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"Antenna Here is a Light Bulb...," p. 28

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COMMUNICATIONS & TECHNOLOGY

APRIL 2019

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- SSB Results, 2018 CQ WW DX Contest, p. 14
- The Family That DXes Together... p. 78

On the Cover: Faith Hannah Lea, AE4FH (foreground), and her sister Hope, KM4IPF, wait for a satellite pass during a family DXpedition to the Dry Tortugas. Their story is on page 78.

KENWOOD

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By taking part in this auction you are helping ARISS continue its mission by inspiring students and teachers alike via Amateur Radio to endeavor into the fields of science, technology, engineering and math. We hope even if you don't win the prizes at the auction, you will find it in your heart to donate to this noble cause.

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Bidding starts April 8th at Noon UTC and ends April 14th at 10PM UTC.
For more details go to www.ARISS.org

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In 2005 LDG introduced the TW-1, an extraordinary wattmeter that spoke the power and SWR levels aloud via a self-contained speaker. It was intended primarily for visually impaired hams, and was quite popular. We sold quite a few of them, then dropped the product from our lineup as we moved on to other new products.

We recently learned that the TW-1 is still highly prized by visually impaired hams, and is even passed down from one to another as they become Silent Keys. LDG is proud to announce the return of the TW-1 Talking Wattmeter to our product lineup, and as a thank you to our loyal customers, we are offering it at its original 2005 price of only $150.

The TW-1 Talking Wattmeter handles all power levels up to 2,000 watts, and speaks the power aloud when you press the button. You can select forward or reverse power, or the Standing Wave Ratio (SWR). The TW-1 will speak in English, Spanish or German as you select. You can also select Tone Mode, in which the TW-1 plays a continuous tone who's pitch varies with Forward or Reverse power, or SWR. This mode is ideal for manually adjusting a tuner, or a vacuum tube transmitter or amplifier. You can watch the plate current meter while listening to the power output.

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Visit us on the web at www.ldgelectronics.com for more information on the TW-1, and all of LDG's other innovative, high-quality products For this special promotion, the TW-1 is available exclusively from MTC Radio (www.mtcradio.com).

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ANNOUNCEMENTS

APRIL

BELTON, TEXAS — The Temple Amateur Radio Club will hold **HamEXPO** from 7 a.m. to noon, Saturday, April 6 at the Bell County Expo Center, 301 W. Loop 121. Website: <www.tarrc.org>. VE exams.

BRANSON, MISSOURI — The Four State QRP Group will hold **OzarkCon** beginning 4 p.m., Friday, April 5 and from 7:30 a.m. to 5 p.m., Saturday, April 6 at the Stone Castle Hotel & Conference Center, 3050 Green Mountain Drive. Website: <www.ozarkcon.com>. Friday kit building workshop, special event station: KØN.

BRAINERD, MINNESOTA — The Brainerd Amateur Radio Club will hold the **Brainerd Area Hamfest** from 9 a.m. to 1 p.m., Saturday, April 6 at the Brainerd National Guard Armory, 1115 Wright Street. Contact: BAARC, 33247 East Shamineau Drive, Motley, MN 56466. Website: <www.brainerdham.org>. Talk-in 147.225+. VE exams, ARRL card checking.

COLUMBUS, INDIANA — The Columbus Amateur Radio Club will hold the **36th Annual Columbus HAMFEST** from 8 a.m. to noon, Saturday, April 6 at the Bartholomew County Fairgrounds-Community Building, 750 W. County Road 200S. Contact: Matthew Bruner, KC9BWO, 325 Robbins Street, Hope, IN 47246. Phone: (812) 375-4860. Email: <kc9bwo@att.net>. Website: <www.carcnet.net>. Talk-in 146.79- (PL 103.5). VE exams.

FORT SMITH, ARKANSAS — The Fort Smith Area Amateur Radio Club will hold the **Hanging Judge Hamfest** from 8 a.m. to 2 p.m., Saturday, April 6 at the Sebastian County Emergency Communications and Training Facility, 8400 South Zero Street. Contact Mike Cole, W5TMC, (918) 427-1431 or (479) 522-3683. Email: <mikew5tmc@gmail.com>. Website: <www.hangingjudgehamfest.com>. VE exams.

GLENWOOD, IOWA — The Heartland Hams will hold **Hamfest – 2019** from 7:30 a.m. to 12:30 p.m., Saturday, April 6 at the American Legion Hall, 104 N. Vine Street. Contact: Don Brown (712) 520-7942 or Sharon Sullivan (402) 551-1673. Website: <http://heartlandhams.org>. Talk-in 145.290.

LONGMONT, COLORADO — The Longmont Amateur Radio Club will hold **LARCFEST 2019** from 8 a.m. to 2 p.m., Saturday, April 6 at the Boulder County Fairgrounds-Exhibit Hall, 9595 Nelson Avenue. Contact: Jeff, <jnoon.kdohaq@hmail.com>. Website: <www.w0eno.org>.

NOBLE, ILLINOIS — The Clay County Area Amateur Radio Club will hold its **9th Annual April Fools' Fest** from 8 a.m. to noon, Saturday, April 6 at the West Richland Center, 320 E. North Avenue. Email: <claycountyradio@gmail.com>. Website: <claycountyradio.webs.com>. Talk-in 146.760- (PL 94.8). VE exams.

NORWICH, NEW YORK — The Chenango Valley Amateur Radio Association will hold the **CVARA Bullthistle Hamfest** from 7 a.m. to noon, Saturday, April 6 at the Chenango County Pomona Grange, 167 County Road 32A. Email: <hamfest@cvaraa.net>. Website: <http://cvara.net>. Talk-in 146.685- (PL 110.96). VE exams.

BOSTON, PENNSYLVANIA — The Two Rivers Amateur Radio Club will hold its **48th Annual Hamfest / Computer Show** from 8 a.m. to 2 p.m., Sunday, April 7 at The Boston Spectrum, 6001 Smithfield Street. Phone: (412) 398-1092. Email: <petersondt@verizon.net> or <information@trarc.net>. Website: <www.trarc.net>. Talk-in 146.73. VE exams and card checking.

FRAMINGHAM, MASSACHUSETTS — The Framingham Amateur Radio Association will hold the **Framingham Flea** from 9 a.m. to noon, Sunday, April 7 at Keefe Technical School, 750 Winter Street. Contact: Andy, KC1DMM, (508) 310-5913 (before 9 p.m.). Email: <tables@w1fy.org>. Website: <http://w1fy.org>. Talk-in 147.15. VE exams.

MADISON HEIGHTS, MICHIGAN — The GM Amateur Radio Club will hold its **Technology Expo** from 9 a.m. to 2 p.m., Sunday, April 7 at the Madison Heights Convention Center, 876 Horace Brown Drive. Contact: Mike Carelli, W8MJC, (248) 835-9545. Email: <swap@gmarc.org>. Website: <www.gmarc.org>. Talk-in 443.075+ (PL 123). VE exams.

CLAREMORE, OKLAHOMA — The Green Country Hamfest and **2019 ARRL Oklahoma State Convention** will be held 4-9 p.m., Friday, April 12 and from 8 a.m. to 3 p.m., Saturday, April 13 at the Claremore Expo Center, 400 Veterans Parkway. Email: <info@greencountryhamfest.org>. Website: <greencountryhamfest.org>. Talk-in 147.09+ (PL 88.5). VE exams, DXCC / WAS / WAC / VUCC card checking.

VISALIA, CALIFORNIA — The Northern California DX Club will hold the **70th International DX Convention** from 8 a.m. to 5 p.m., Friday, April 12; 8 a.m. to 5 p.m., Saturday, April 13; and 7:30-11 a.m., Sunday, April 14 at the Visalia Convention Center, 303 E. Acequia Avenue. Email: <info@dxconvention.com>. Website: <www.dxconvention.com>. DXCC / WAS / VUCC / CQ Award card checking; special event station: N6V.

BARTLETT, TENNESEE — The Mid-South Amateur Radio Association will hold the **Memphis FreeFest** from 9 a.m. to 3 p.m., Saturday, April 13 at the Bartlett Station Municipal Center, 5858 Stage Road. Contact: Art Barnett, WA4PSS, (901) 619-5573. Email: <wa4pss@gmail.com> or <freefest@maraonline.org>. Website: <www.maraonline.org>. Talk-in 145.21/144.61 (PL 107.2) or 147.03/147.63 (PL 107.2). VE exams.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold its **65th Annual Hamfest Electronic and Computer Show** from 8 a.m. to 1 p.m., Saturday, April 13 at the Elidio & Sons Party Center, 48 E. Bath Road. Contact: Pat Morrow, N8OQP, P.O. Box 614, Cuyahoga Falls, OH 44222-0614. Phone: (234) 206-0270. Email: <hamfest2019@cfarc.org>. Website: <www.cfarc.org>. Talk-in147.27+ or 444.850+. Free VE exams.

HAMPTON, NEW HAMPSHIRE — The Port City Amateur Radio Club will hold the **Seacoast Amateur Radio Flea Market** from 8 a.m. to noon, Saturday, April 13 at the St. James Masonic Lodge, 77 Tide Mill Road. Contact: Mark Pride, K1RX, (603) 231-8695 or Dick Cooper, W1MSN, (603) 474-2373. Email: <fleamarket@w1wqm.org>. Website: <www.w1wqm.org>. VE exams.

MOBILE, ALABAMA — The Mobile Amateur Radio Club will hold the **Mobile Hamfest** from 8 a.m. to 2 p.m., Saturday, April 13 at the Abba Shrine Center, 7701 Hitt Road. Contact: Larry, (251) 635-2327. Email: <mobilehamfest@outlook.com>. Website: <http://w4iax.net>. VE exams.

SEATTLE, WASHINGTON — The Communications Academy will be held from 8 a.m. to 5 p.m., Saturday, April 13 and from 8:30 a.m. to 5 p.m., Sunday, April 14 at South Seattle College, 600 16th Avenue SW. Contact: Marina Zuetell <n7sl@arrrl.net>. Website: <http://communicationsacademy.org>. Talk-in 441.800 (PL 141.3).

STOUGHTON, WISCONSIN — The Madison Area Repeater Association will hold the **47th Annual Madison Hamfest** from 8 a.m. to noon, Saturday, April 13 at the Mandt Community Center, 400 Mandt Parkway. Contact: Paul Toussaint, (608) 205-1994. Email: <w9hsy@execpc.com>. Website: <www.w9hsy.org>. Talk-in 147.150+ (PL 123). VE exams.

YAKIMA, WASHINGTON — The Yakima Amateur Radio Club will hold its **Hamfair** from 9 a.m. to 3 p.m., Saturday, April 13 at the State Fair Park-Modern Living Building, 1301 South Fair Avenue. Contact: Bob Rutherford, (509) 945-5366. Email: <w7aqtreasurer@gmail.com>. Website: <www.w7aq.com>. Talk-in 146.660 (PL 123). VE exams, fox hunt.

TOMS RIVER, NEW JERSEY — The Jersey Shore Amateur Radio Society will hold the **Hamfest By The Shore** beginning 8 a.m., Sunday, April 14 at Riverwood Park, corner of Roverwood Drive & Whiteville Road. Contact: Tom, KD9BVC, (732) 403-0448. Email: <kd9bvc@aol.com>. Website: <www.jsars.org>. Talk-in 146.910- (PL 127.3). VE exams.

KANSAS CITY, MISSOURI — The Ararat Shrine Amateur Radio Club will hold **HAMBASH 2019** from 8 a.m. to 1 p.m., Saturday, April 20 at the Ararat Shrine Temple, 5100 Ararat Drive. Website: <www.hambash.com>. Talk-in 145.13. VE exams.

RALEIGH, NORTH CAROLINA — The Raleigh Amateur Radio Society will hold **RARSfest 2019** and the **2019 ARRL North Carolina State Convention** from 8 a.m. to 3 p.m., Saturday, April 20 at the Jim Graham Building-North Carolina State Fairgrounds, 1025 Blue Ridge Road. Contact: Jim Wittich, AC4ZO, (919) 362-4787. Email: <jwittich@nc.rr.com>. Website: <www.rarsfest.org>. Talk-in 146.64. VE exams, ARRL & CQ award card checking, fox hunt, GOTA station.

WALDO, FLORIDA — The Gainesville Amateur Radio Society will hold the **Gainesville Hamfest 2019** from 8 a.m. to 2 p.m., Saturday, April 20 at the First Baptist Church of Waldo, 14730 Kennard Street. Contact: Larry Rovak, WB2SVB, (201) 697-7721. Email: <hamfestchairman@gars.club>. Website: <www.gars.club>. Talk-in 146.82-. VE exams.

LINWOOD, NORTH CAROLINA — The RV Radio Network will hold the **2019 RV Radio Network Spring Eyeball Rally** beginning Wednesday, April 24 through Saturday, April 27 at the Cross Winds Family Campground, 160 Campground Lane. Contact: Hank or Selene Montgomery <hank@k4hm.net>. Phone: (336) 853-4567. Website: <http://radionetwork.com>.

STERLING, VIRGINIA — The Southeastern VHF Society, **Northeast Weak Signal Group**, and **Mt. Airy VHF Radio Club** will hold the **VHF Super Conference** from Friday, April 26 through Sunday, April 28 at the Holiday Inn Washington-Dulles International Airport, 45425 Holiday Drive. Contact: Mark Casey, K1MAP, 303 Main Street, Hampden, MA 01036. Website: <www.vhfsuperconference.com>.

DES MOINES, IOWA — The Des Moines Radio Amateurs Association will hold the **2019 DMRAA Hamfest** from 8 a.m. to 1 p.m., Saturday, April 27 at the Iowa State Fairgrounds-Elwell Family Center, 300 East Grand Avenue. Contact: DMRAA, P.O. Box 88, Des Moines, IA 50301. Email: <info@dmraa.com>. Website: <www/dmraa.com>. Talk-in 146.940 (PL 114.8). VE exams.

GARLAND, TEXAS — The Hella Hams in conjunction with the **ARRL North Texas Section** will hold the **2019 MENTORFEST** from 9 a.m. to 4 p.m., Saturday, April 27 at the Hella Shrine Center, 2121 Rowlett Road. Email: <mentorfest@arrlntx.org>. Website: <www.arrlntx.org>.

GEORGETOWN, DELAWARE — The Sussex Amateur Radio Association will hold the **Delmarva Amateur Radio & Electronics EXPO** beginning 7:30 a.m., Saturday, April 27 at the Cheer Community Center, 20520 Sand Hill Road. Contact: Vic, KC3BUI, (302) 628-3060. Website: <www.radioelectronicsexpo.com>. Talk-in 147.090 (PL 156.7). VE exams, card checking.

(Continued on page 93)

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HAM RADIO NEWS

Nominations Open for Young Ham of the Year Award

Nominations are open for the 2019 Bill Pasternak, WA6ITF, Memorial Newsline Young Ham of the Year Award (YHOTY). *CQ* is a proud corporate sponsor of this award. Nominees must be age 18 or younger and live in the United States or Canada. They must be making a significant contribution to amateur radio and/or using amateur radio to make a significant contribution to their communities (e.g., simply being licensed at age 2 won't cut it). This year, for the first time, only emailed nominations will be accepted. The nomination deadline is May 31, 2019. For complete information and nominating forms, visit <www.arnewsline.org/2019yhotyform>.

WWV Funding Restored, Centennial Preparations Continue

Congress has restored full funding for WWV, WWVB, and WWVH, despite a budget proposal from the National Institute of Standards and Technology to shut down the three standard time and frequency radio stations. The Consolidated Appropriations Act of 2019 included some $725 million for NIST's Scientific and Technical Research and Services (STRS), the budget category that includes the stations' funding, according to NIST Public Affairs Director Gail Porter. The conference report accompanying the budget bill notes that "(t)he agreement rejects the proposed terminations and reductions for all STRS programs" and includes "not less than fiscal year 2018 funding" for several services, including "Time and Fundamental Measurement Dissemination."

With the shutdown threat ended, preparations continue for marking WWV's centennial this fall. According to the *ARRL Letter*, the Northern Colorado Amateur Radio Club will be operating a special event station from the WWV transmitter site from September 28 through October 2, using the callsign WWØWWV.

WWV and WWVH are also making timeslots available from April 20 to May 3 for the Department of Defense to request reception reports of communication during its "Northcom Vital Connection Wisconsin" exercise. The announcements will be broadcast at 10 minutes after each hour on WWV and 50 minutes after the hour on WWVH. It will reportedly serve as a pilot for future broadcasts of similar exercises. (Tnx WA2KBZ)

"RF Seismograph" May Give Advance Notice of Earthquakes

A ham in British Columbia has developed an "RF Seismograph" that detects changes in noise and activity levels on the HF spectrum resulting from earthquakes. According to the *ARRL Letter*, Alex Schwarz, VE7DXW, reports that the device has not only monitored band changes associated with earthquakes as they happen, but in some cases has begun tracking increased noise levels up to an hour before a quake. He says electric field lines associated with earthquakes result in increased RF noise levels. Schwarz is continuing to conduct research and analyze links between earthquakes and HF noise level changes.

Over-the-Horizon Radar Returns

Over-the-horizon radar is making a return to the HF spectrum, causing interference on several amateur bands. The International Amateur Radio Union's Region 1 Monitoring System reports that Russian, Chinese, and British radar have been heard in recent months on the 80-, 60-, 40-, and 15-meter bands. German monitors reported that a Russian radar system has made 60 meters virtually useless there.

Meanwhile, CNN Travel reports that the receive site for the original over-the-horizon radar system — widely known as the Russian woodpecker back in the 1970s — has become a tourist attraction in the Ukraine. The site is located near the Chernobyl nuclear power plant and was abandoned after the meltdown there. The area around the antenna site has been reopened to visitors. (*There is much more to this story; we will try to provide details next month. – ed.*)

Ham Population Ticks Upward as High Numbers of New Licenses Continue

The number of licensed amateurs in the United States increased by about 1% from 2017 to 2018, according to FCC statistics collected by Joe Speroni, AHØA, reaching a total of 755,430 at the end of the year. This number includes both additions of new amateurs — more than 31,000 for the fifth year in a row, according to the ARRL VEC — and reductions due to non-renewed licenses and deaths.

Carole Perry, WB2MGP, receives the first Carole Perry Educator of the Year award from the Orlando Amateur Radio Club at February's Hamcation. (Photo courtesy WB2MGP)

Milestones: Carole, Riley, and Queen Mary

The Orlando Hamcation® has introduced the Carole Perry Educator of the Year award to recognize teachers who promote the use of amateur radio by young people. Carole, WB2MGP, heads up the Radio Club of America's Youth Initiative program and leads youth forums at various hamfests each year, including the Dayton Hamvention® (31 years and counting) and the Hamcation. She was the first recipient of the Orlando award, presented at the 2019 Hamcation in February.

Former FCC amateur radio enforcer Riley Hollingsworth, K4ZDH, will coordinate the development and implementation of ARRL's new Volunteeer Monitors program, a joint ARRL/FCC effort that will replace the Official Observer program. The *ARRL Letter* reports that Hollingsworth resigned as Atlantic Division Vice Director in order to avoid any appearance of a conflict of interest.

The Associated Radio Amateurs of Long Beach (California) are celebrating the 40th anniversary this month of a permanent amateur radio presence on the *Queen Mary* museum ship. W6RO began operations from the ship's radio room on April 22, 1979 and was the first of what the *ARRL Letter* says are now more than 100 ham stations operating from museum ships around the world.

Milestones: Several Prominent Amateurs Become Silent Keys

The amateur radio community has lost several prominent members in recent months, including Don Tyrrell, W8AD, of Alpha Delta; British QRP enthusiast Rev. George Dobbs, G3RJV, who was founder and secretary of the G-QRP Club and editor of its magazine, *SPRAT*; Indian amateur R. Jayaraman, VU2JN, an engineering professor and Director of Technical Education for the state of Kerala, and first recipient of the lifetime achievement award from the Amateur Radio Society of India; former Young Ladies Radio League president Carol Hall, WD8DQG; and former National Traffic System Eastern Area staff chair Bill Thompson, W2MTA.

CONTENTS

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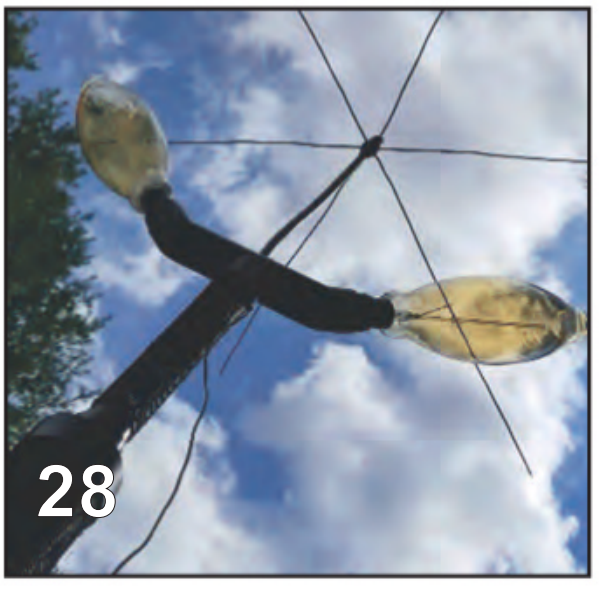
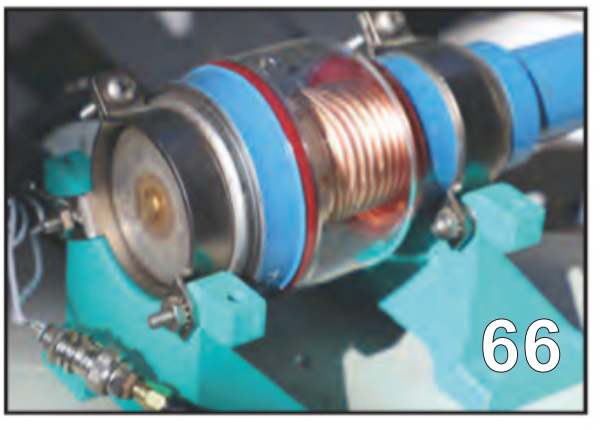
78 COVER: DX

The Family that DXes Together ...

By Bob Schenck, N2OO and Faith Hannah Lee, AE4FH

Faith Hannah Lea, AE4FH (foreground), and her sister Hope, KM4IPF (holding the antenna), wait for an OSCAR-92 satellite pass during a family DXpedition to Dry Tortugas National Park, some 70 miles off Key West, Florida. Faith Hannah recounts the adventure in this month's DX column, starting on page 78. *(Photo by James Lea, WX4TV)*





FEATURES

SPOTLIGHT ON: See the results of the largest radio contest in the world as John Dorr, K1AR, discusses the CQWW DX SSB contest on p.14. See how you did against the thousands of other contestors with the full scores on p. 94. Also, Professor Emil Heisseluft reveals the new age of constesting on p.24!

COLUMNS

DEPARTMENTS

AR-DV1

Multi-mode Digital Voice Receiver

Get your hands on the industry-leading analog and digital voice receiver that automatically recognizes and monitors popular digital modes including APCO P25, DMR, dPMR™, NXDN™, MOTOTURBO™, D-Star™, Digital CR, Yaesu System Fusion, Kenwood and Alinco EJ-47U formats. You also get analog AM, WFM, NFM, CW and Upper & Lower Sideband reception.

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The AR-DV1 can serve monitoring enthusiasts, public safety, military, federal, state and local law enforcement agencies, emergency managers, diplomatic services, news-gathering operations and more.

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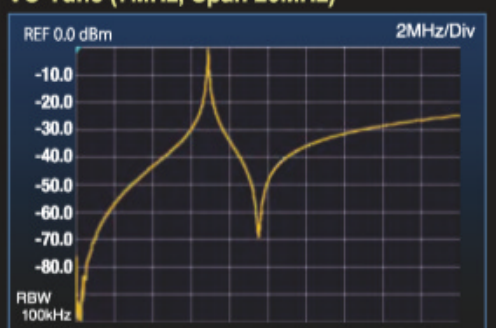
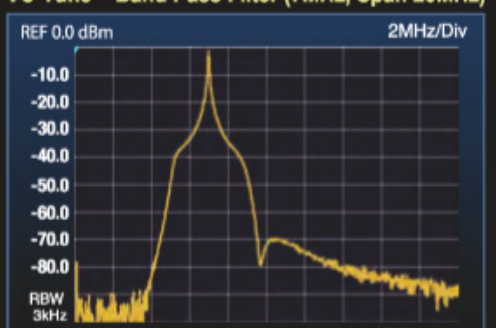
VC-Tune further improves the high performance RF μ-Tuning system design adopted in FTDX9000, using a remarkable miniaturization design while producing an unparalleled attenuation characteristic of maximum attenuation –70 dB. A high precision stepping motor drives a variable capacitor to continuously cover the band as it follows the movement of the selected frequency by the operator. Fine-tuning for optimum improvement point is also available by MPVD (Multi-Purpose VFO Outer Dial) placed outside the VFO dial.

VC-Tune (7MHz, Span 20MHz)



Band Pass Filter (7MHz, Span 20MHz)

VC-Tune + Band Pass Filter (7MHz, Span 20MHz)



Maximum Attenuation: –70dB
–3dB Bandwidth:62kHz

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ZERO BIAS: A CQ Editorial

BY RICH MOSESON,* W2VU

YOTA, YCP, YARC … ARRL is MIA

The key letter in the abbreviations and acronyms in the headline is "Y." In all three cases, it refers to young hams — Youngsters on the Air, Youth Contesting Program, Young Amateurs Radio Club. You'll notice that there's no "Y" in ARRL, figuratively as well as literally, and that's a problem.

It certainly isn't a new problem. My initial involvement in organized amateur radio (beyond my local club) was a program I tried to get the League behind for outreach to young people back in the early 1980s. The response at the time was that it would be best to pursue the program through local clubs and the net result was an article in *QST* and an appointment to the then-newly-created position of Affiliated Club Coordinator for the ARRL section in which I lived at the time. A few years later, "Amateur Radio Newsline" producer Bill Pasternak, WA6ITF (SK), started the Young Ham of the Year award, a program with which *CQ* has been proudly affiliated nearly since its start. Around the same time, Carole Perry, WB2MGP, began showcasing the abilities and accomplishments of young hams at her annual Dayton Hamvention® Youth Forum — #32 is coming up next month!

More recently, Mike Kalter, W8CI, of the Dayton Amateur Radio Association, organized the Dave Kalter Memorial Youth DX Adventure program in memory of his brother, KB8OCP (now the program's callsign). Each year, this program gives a few young hams the opportunity to operate from a DX location with guidance from accomplished DXers. For 2019, three young operators will go to Curacao for DX adventure in July.

This month's Contesting column (p. 82) reports on the formation in 2017 of the Young Amateurs Radio Club (YARC) and its effort to create an American equivalent of Europe's Youth Contesting Program (YCP; also discussed in Contesting this month and in the past). The YCP in Europe is part of the broader Youth On The Air (YOTA) program sponsored by Region 1 of the International Amateur Radio Union (IARU).

Another YOTA activity is its annual youth camp, to which a young American ham is frequently invited. This past January's *CQ* featured a report by Faith Hannah Lea, AE4FH, on her experience as the U.S. member of last year's YOTA camp in South Africa. Faith Hannah returns to our pages this month with a report in the DX column on a family mini-DXpedition to the Dry Tortugas (p. 78). In addition, Tim Duffy, K3LR, regularly hosts young hams at his contest superstation in Pennsylvania (one group was scheduled to be there for the recent CQ WPX SSB Contest). And the Radio Club of America (of which Tim is the current president and Carole is youth activities chair) has an active Youth Activities program which sponsors Carole's Dayton forum each year and presents annual Young Achiever awards.

There is one missing element from all of these great programs and activities: The ARRL. While the League has long sponsored an annual teacher training program, provides grants for equipping school club stations (a program which originated with an idea from *CQ*), holds a "Kids' Day" activity on the air and offers mini-grants to clubs that promote youth activities, virtually all of these programs are a step removed, sticking with the mindset I first heard nearly 40 years ago — "go through the local clubs."

Across the pond, on the other hand, the YOTA program is a direct hands-on activity of IARU Region 1, with a full-time staff member providing coordination. YOTA camps and the YCP program have had the direct support of and participation by the national ham radio association of each host country. There

"When it comes to direct sponsorship of youth recruitment and mentoring programs, ARRL has been missing in action for decades, and it's time for that to end."

is no equivalent on this side of the Atlantic, either by the ARRL or IARU Region 2 (of which ARRL is the 800-lb. gorilla).

Last August, we discussed efforts by one of the first American hams to take part in a YOTA camp to build support for a similar program here. He told us that he first approached the League but could not generate any real interest. That is mind-boggling but hardly surprising.

When it comes to direct sponsorship of youth recruitment and mentoring programs, ARRL has been missing in action for decades, and it's time for that to end. What could possibly be more important to the future of amateur radio, or a better use of ARRL member dues, than direct support and sponsorship of activities that not only encourage young people to get their ham licenses but help them get on the air, learn how to build stuff, and discover all the excitement our hobby has to offer?

Participants in last year's Youngsters on the Air camp in South Africa launched a balloon carrying amateur radio payloads they'd built themselves. ARRL needs to lead similar programs here in the U.S. (Photo by WX4TV)

*Email: <w2vu@cq-amateur-radio.com>

The League's new CEO says he wants to reach out to a broader base of amateurs with ARRL programs and services. Here's a starting point: Get behind — better yet, get out in front of — programs and activities such as an American version of YOTA and the YCP, with direct support and leadership. Programs and activities by individuals, clubs and other organizations are important and should continue to be supported, but there is no substitute for direct hands-on leadership by the national association to show that mentoring the next generation of hams is a number-one priority. It may be that there's no "I" in "team," but there needs to be a "Y" in "ARRL."

Smart Cities, Smart Cars (and QRM?)

In this issue's "Communications Horizons" column (p. 64), Rob de Santos, K8RKD, writes about "smart cities" and the growing need for "smart infrastructure," systems that will allow increasingly autonomous vehicles to be alerted to changing traffic signals, reduced speed limits or road hazards, such as icy conditions or a traffic slowdown ahead. It sounds like science fiction, but the need for this type of communication is right on the horizon. While fully autonomous vehicles are still experimental right now, many of today's cars have close-to-autonomous technology already built in. I had the opportunity during a recent trip to spend a few days driving a rental car that featured look-ahead radar and lane-departure alerts with "steering assist." Combined with traditional cruise control, this car was nearly able to drive itself. If I started drifting out of my lane, it not only beeped at me, but started to pull the car back into the lane on its own (putting on the turn signal disabled this feature; and yes, Mom, I waited until I was in an area with no nearby traffic to play with it). With cruise control on, the car maintained a safe following distance for me. At one point, I was in traffic with the cruise control set at the speed limit of 50 miles per hour. Another driver pulled into my lane ahead of me and my car automatically slowed down to about 45 to maintain a gap of roughly four car lengths. That car then made a right turn … and mine very smoothly accelerated itself back up to 50! It was amazing! I recall thinking that it's too bad it can't tell when a traffic light is turning red or when the speed limit changes. That's exactly the type of smart infrastructure that Rob writes about this month.

What does this have to do with ham radio? There's added spectrum usage for all of these communication systems, of course, but Rob notes that most of them will operate on frequencies already allocated for 5G systems. The big factor for hams is that our cars — in addition to already being rolling computers — are on their way to becoming rolling communication platforms as well. And that creates new levels of electromagnetic compatibility (EMC) concerns for us as hams. Will all of these systems cause interference on our receivers and/or raise our noise floors? (Probably.) But more concerning is whether a mobile amateur radio transmitter will interfere with the vehicle's communication systems — or those of the cars around us — and cause them to behave unpredictably. This is a serious concern that our industry will need to monitor and work to minimize as our vehicles become more dependent on a "clean" RF environment to operate safely and efficiently.

Welcome Back, Gerry!

We're pleased to have "Listening Post" editor Gerry Dexter back in the saddle as of this issue. Gerry has been sidelined for the past three months while recovering from a hip fracture. We're glad to have you back aboard! (PS – We're still looking for new Awards Editor and USA-CA Award Manager. Email me if you're interested.) *–73, Rich, W2VU*

Whether you're a radio amateur, CBer, or shortwave listener (SWL), it's a sure bet one of the questions at the top of your mind is: What will the next solar cycle — Cycle 25 — look like? We asked one of our resident experts to take a look for us.

What's Up with Solar Cycle 25?

BY THEODORE J. COHEN, Ph.D.,* N4XX

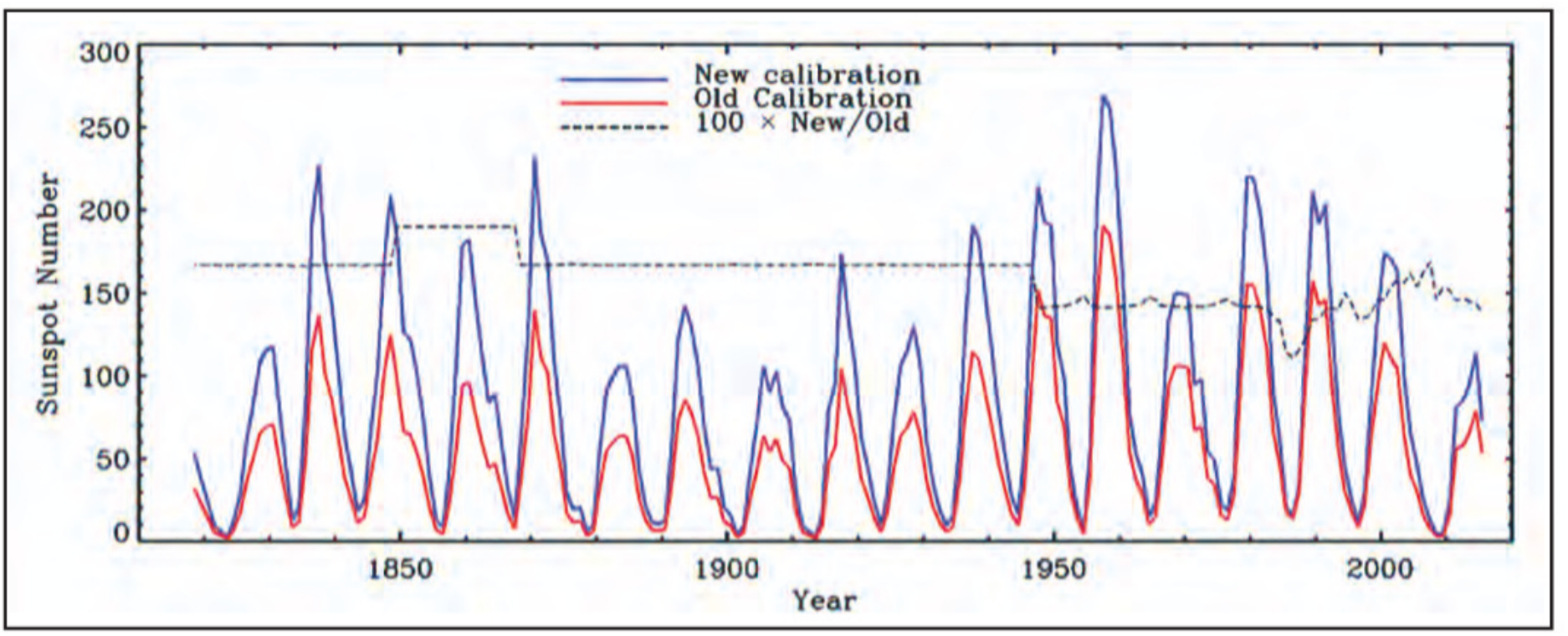


Figure 1. As seen here for the revised sunspot data (called "V2," blue line), the new smoothed sunspot numbers (SSN) are significantly higher in value than those previously stated in the old, "V1" (red line) dataset. (after Space Climate 6, Levi, Finland, April 2016[1])

The nature of the next solar cycle, number 25 since they first were observed and reported by the Swiss Observatory in Zurich, and now, by the Royal Observatory of Belgium, Brussels, is of utmost importance to all users of the high-frequency (HF; 3-30 MHz) spectrum. It's the radiation from the active Sun, after all, that controls the strength of the Earth's ionosphere and hence, our ability to use this naturally occurring phenomenon for long-distance communications.

As seen in *Figure 1*, we currently are in the final years of Cycle 24, which is the weakest in our lifetimes (note that this chart begins in 1820.) So, this is a good time to ask: Where are we heading?

Before I answer that question, you should understand that the 12-month running smoothed sunspot numbers (SSN) now reported have been "recali-

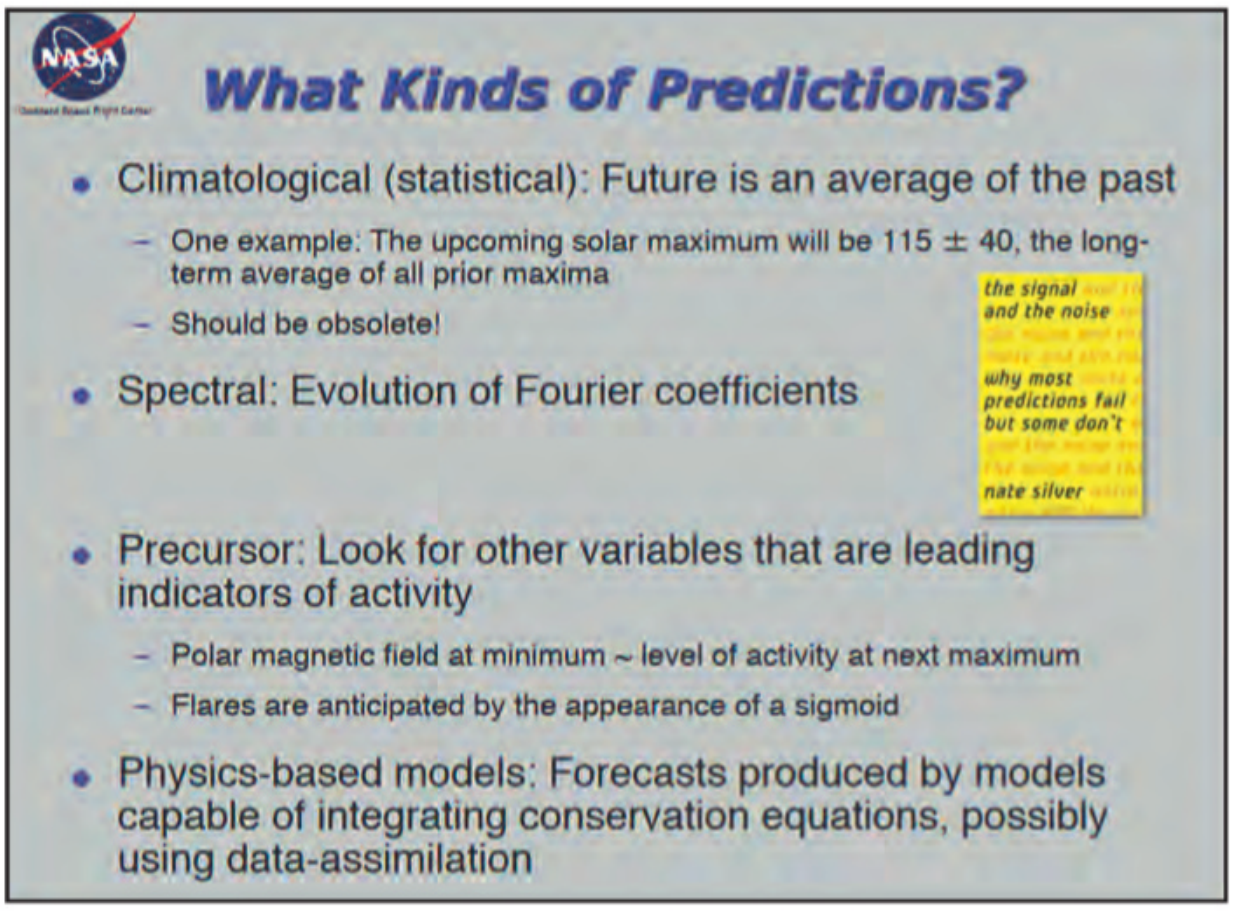


Figure 2. The common methods for producing solar cycle predictions: Climatological (statistical); spectral, precursor, and physics-based. (after Solar Cycle Predictions, W. Dean Pesnell, NASA, Goddard Space Flight Center[2])

** c/o Media-Tech,*
122 Shady Brook Drive,
Langhorne, PA 19047

brated" as of July 2015. As a matter of fact, at that time, the entire sunspot database was republished using recalibrated numbers. This may not have made much of a difference in the numbers you have been seeing reported in various publications, given we are near a solar minimum and the sunspot counts have been low, but take a look at the maximum that occurred in March 1958. Remember that one? Or at least hearing about it? The old method of reporting SSNs had the 12-month running SSN at 201; the new calibration puts that Cycle 19 maximum at just under 300. The lesson here is: Be aware of which SSNs are being discussed in any given presentation. Your *CQ* "Propagation" editor will be reminding you of this as well from time to time.

There are several different ways in which predictions can be made. Some of the more important ones are described in *Figure 2*. And believe me, everybody and their brother (as the saying goes) will be out in force making predictions over the next few years as to where we'll be headed. Don't believe me? Take a look at *Figure 3*. Obviously, only a few even got in the ballpark.

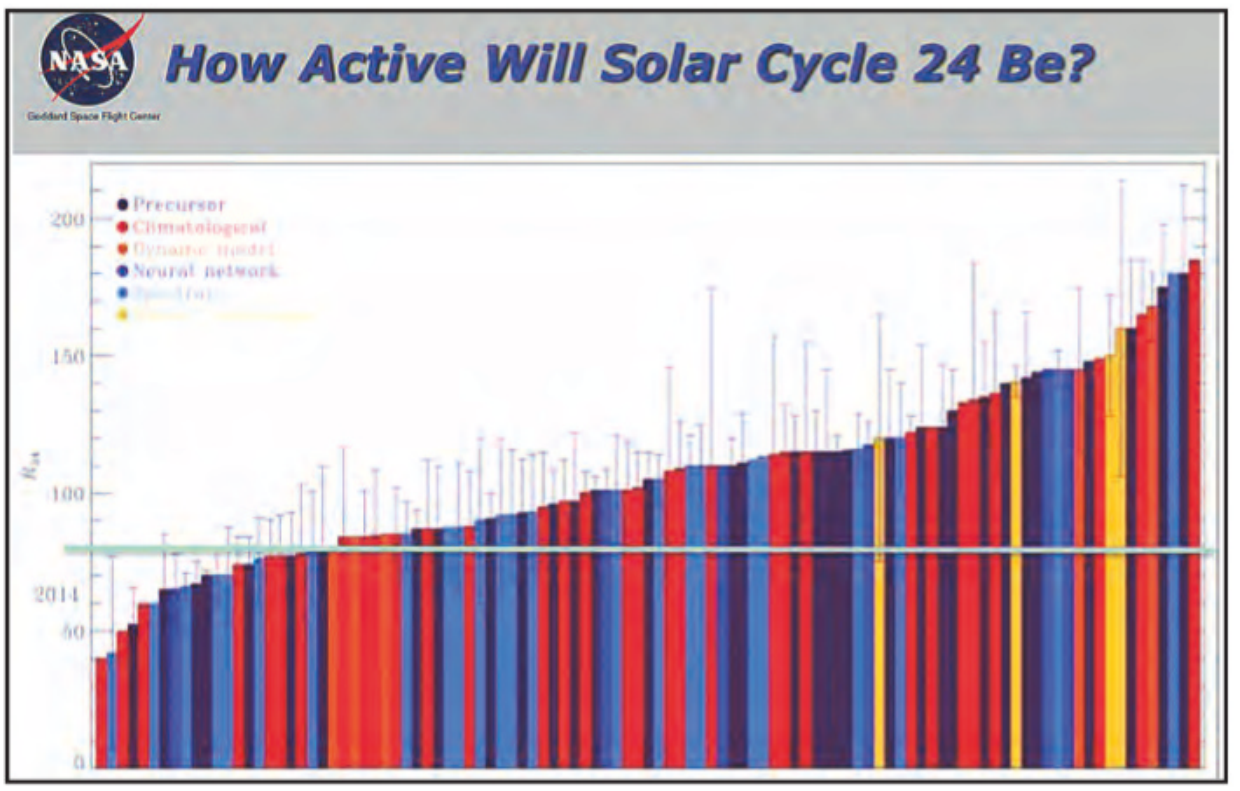


Figure 3. When the smoke cleared, there were more than 100 solar cycle predictions from around the world for the current solar cycle. Most were wrong. (after Space Climate 6, Levi, Finland, April 2016[3])

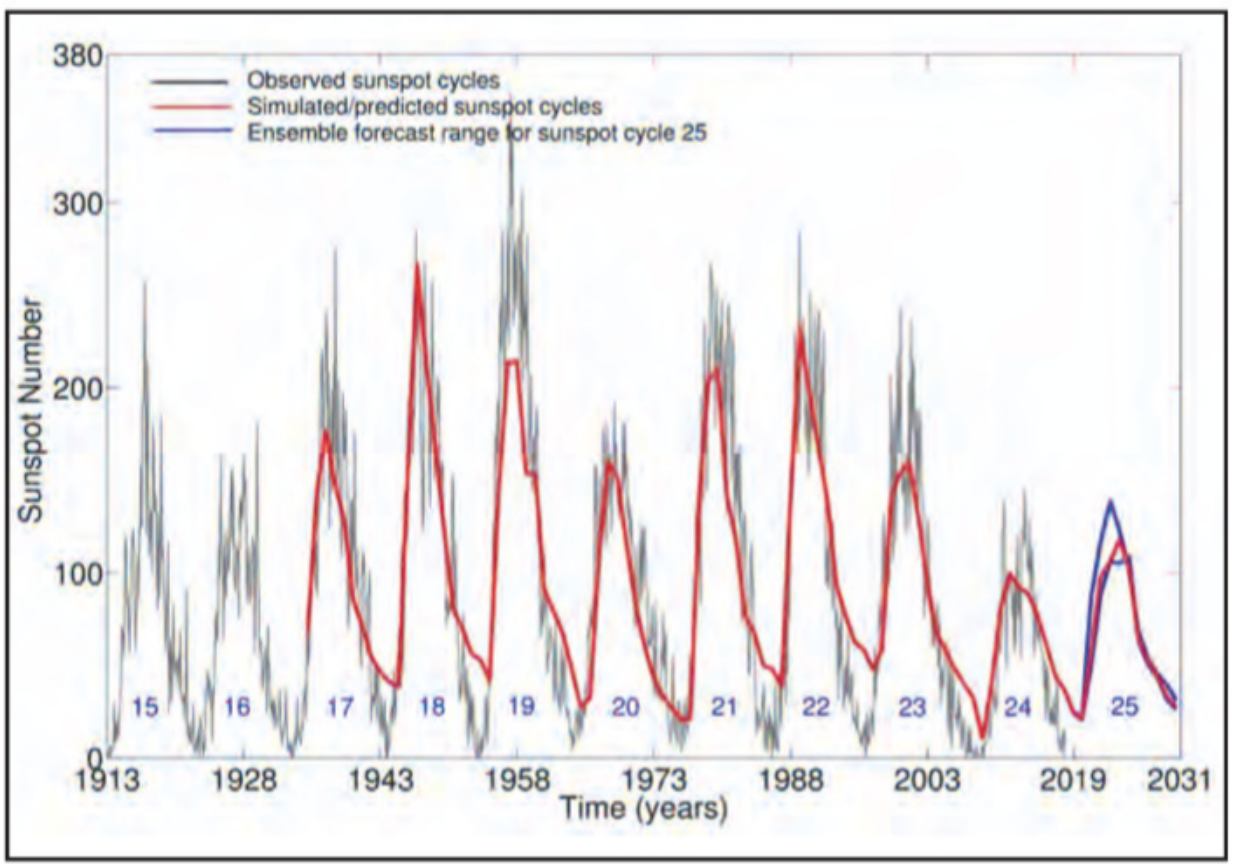


Figure 4. Bhowmik and Nandi successfully reproduced a century of sunspot observations with their model. The red curve represents the simulated (starting from the beginning of solar cycle 17) and predicted (cycle 25) solar activity. The new, observed 12-month smoothed sunspot numbers (V2) are shown in black. (Image via CESSI.[4])

So, back to our original question: Where might we be going in Cycle 25? The fact is, there are not a lot of predictions available at this writing, suggesting that researchers are holding their fire until they get a bit more visibility into the early years of the new cycle. Some, however, are not afraid to step into the arena. As seen in *Figure 4*, Bhowmik and Nandi have some good news for us: Their models predict that next cycle could be stronger than the cycle that is just ending. They expect the new cycle to start rising in approximately a year and to peak in 2024 with a (new) SSN in excess of 100.

Schatten, et al. are not as sanguine. Using a Solar Dynamo Amplitude (SODA) index, which monitors the Sun's buried dynamo fields, his team's prediction methods suggest a reduced amount of buried magnetic flux, and hence, unless the Sun's dynamo processes increase dramatically, Cycle 25 will likely be significantly weaker than Cycle 24. Their results are shown in *Figure 5*.

This result is echoed by Javaraiah[6], who used the amplitudes of the first 24 cycles to predict the relative amplitudes of the solar cycles during the rising phase of what he calls the "upcoming Gleissberg cycle." (The Gleissberg cycle of solar activity spans roughly 80 to 90 years.) He infers that Cycle 25 will be weaker than Cycle 24 (and, by the way, that Cycle 26 will have almost the same strength).

Hathaway and Upton, on the other hand, examined the average strength of the polar fields near the end of Cycle 24 and found them similar to — or slightly weaker than — those measured near the end of Cycle 23. From this, they concluded that Cycle 25 will be similar in strength or, perhaps, slightly weaker, than the current cycle (see *Figure 6*). They also noted that small cycles such as the one we now are experiencing, are usually preceded by "long extended minima." This being the case, they concluded we can expect a similar long, extended minimum before Cycle 25 gets underway.

With respect to using the duration of a minimum to predict the strength of the following solar maximum (this would be considered a precursor method of predicting solar cycles), some years ago,

Carl Luetzelschwab, K9LA, plotted the peak V1 12-month smoothed sunspot numbers of solar cycles versus the durations in months of their preceding solar minima (defined as when the V1 SSNs stayed below 20)[9]. The results are shown in *Figure 7*. Now, a correlation coefficient of R=0.78 between the old (V1) and new (V2) sunspot scales does not denote a perfect correlation, but it does demonstrate that there's an obvious trend to be observed: Specifically, the longer the period of low sunspot activity (that is, the longer the duration

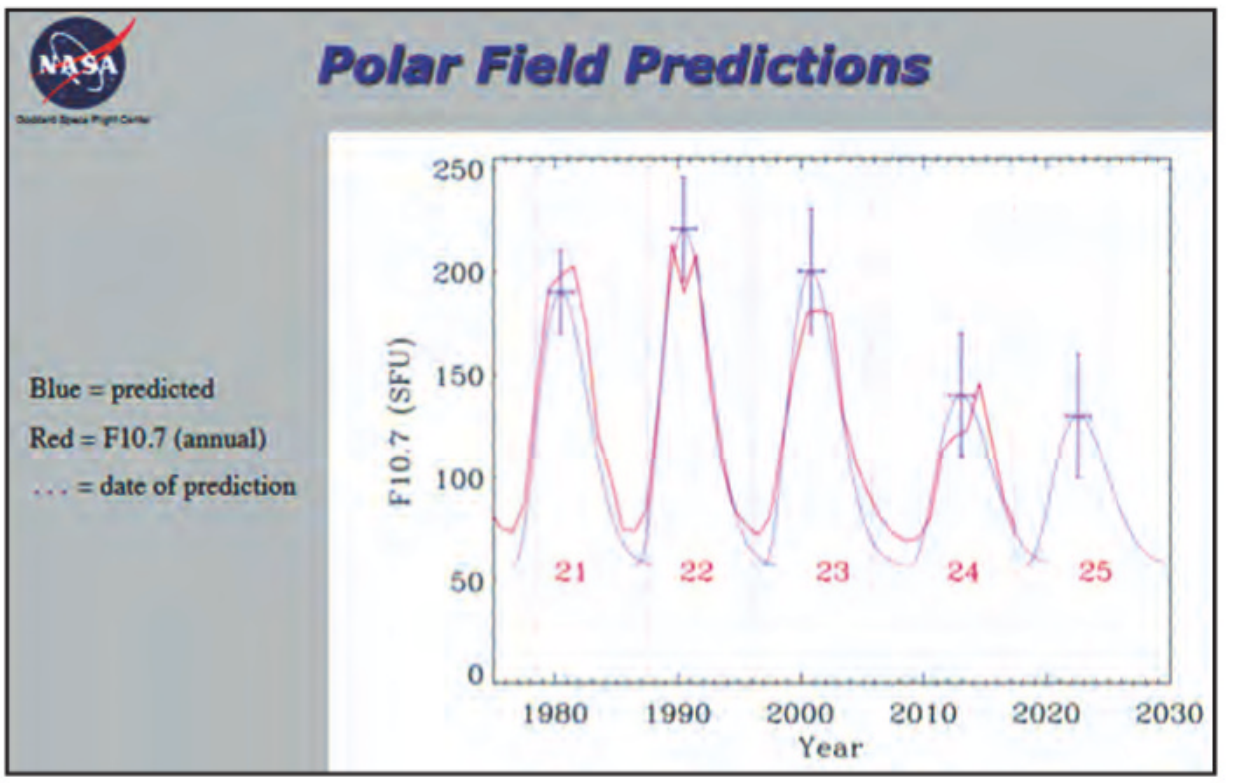


Figure 5. Solar activity predictions by Schatten, et al. use the Sun's polar magnetic field. Be aware that solar predictions are for the new sunspot numbers.[5]

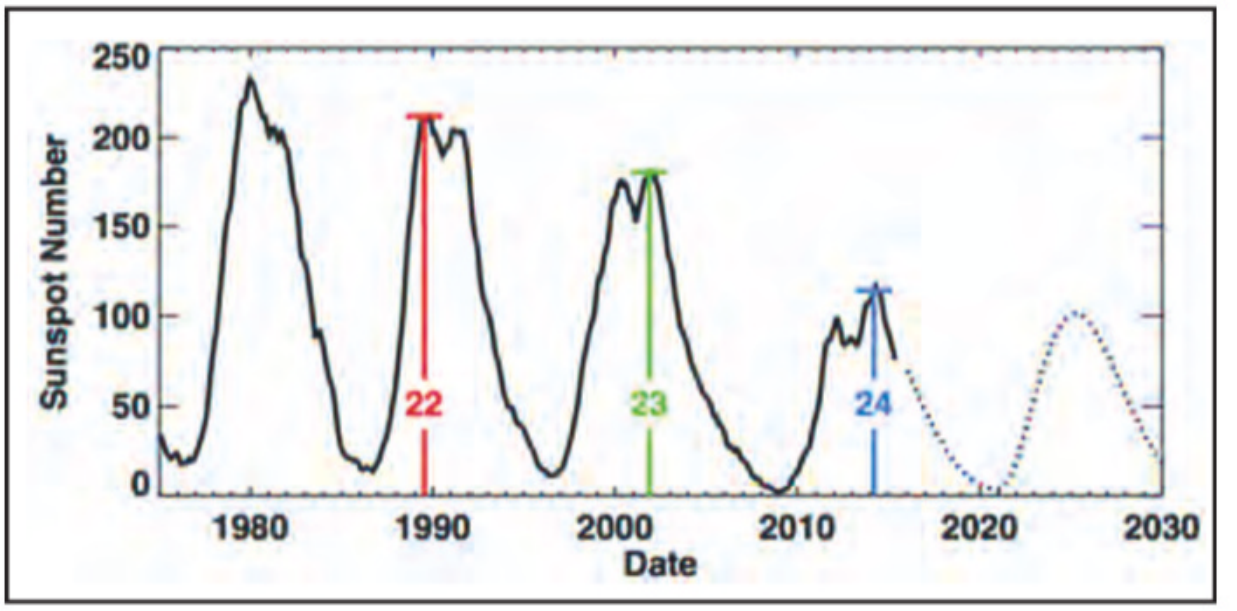
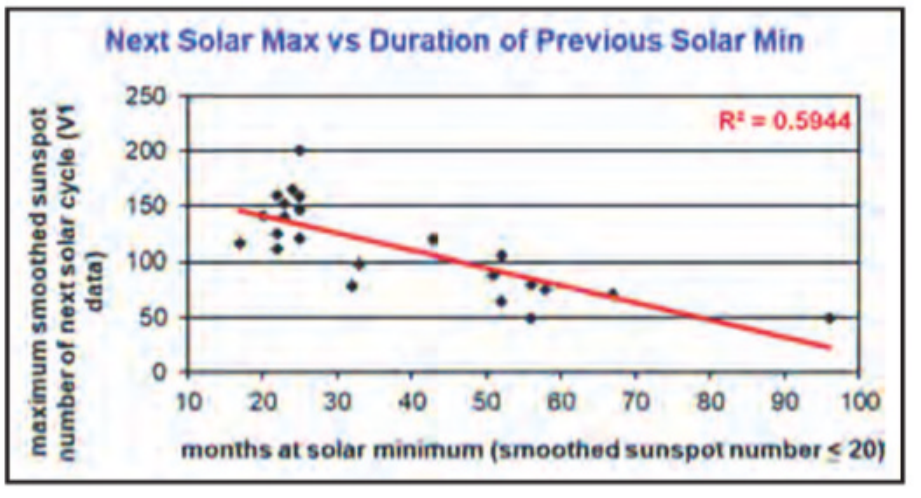


Figure 6. Another Solar Cycle 25 prediction, suggesting that the polar fields indicate that the new (V2) sunspot numbers for Cycle 25 will be similar in size to (or slightly smaller than) the current small cycle, Cycle 24. (after Hathaway and Upton[7,8])

Figure 7. An analysis of solar minima duration to their following solar maxima suggests extended periods of low solar activity are followed by cycles that exhibit low activity. (K9LA date[9])



of the solar minimum), the lower the maximum of the following cycle.

So, how is the minimum between Cycles 24 and 25 doing so far, compared with other recent solar minima? Well, as seen in *Figure 8*, the data appear to be tracking well with the previous minimum. This suggests it could be at least another year or so (at this writing) before the sunspot numbers for the new cycle begin to increase significantly.

Mixed Messages

Taken together, the predictions above for Cycle 25 are mixed. They point to the upcoming cycle being of roughly the same magnitude as the current one, with the chance we'll experience a broad minimum before the new cycle "takes off."

That said, the good news, according to the Solar-Terrestrial Centre of Excellence,[1] is that what appears to be the first sunspot group of Cycle 25 was spotted on the solar disk on December 20, 2016, at a high latitude (23°) and with reverse polarity. At this writing, three new-cycle sunspots had already been observed. While spots from the old and new cycles can overlap for years, sighting of the first spot of the new cycle is something in which we indeed can rejoice.

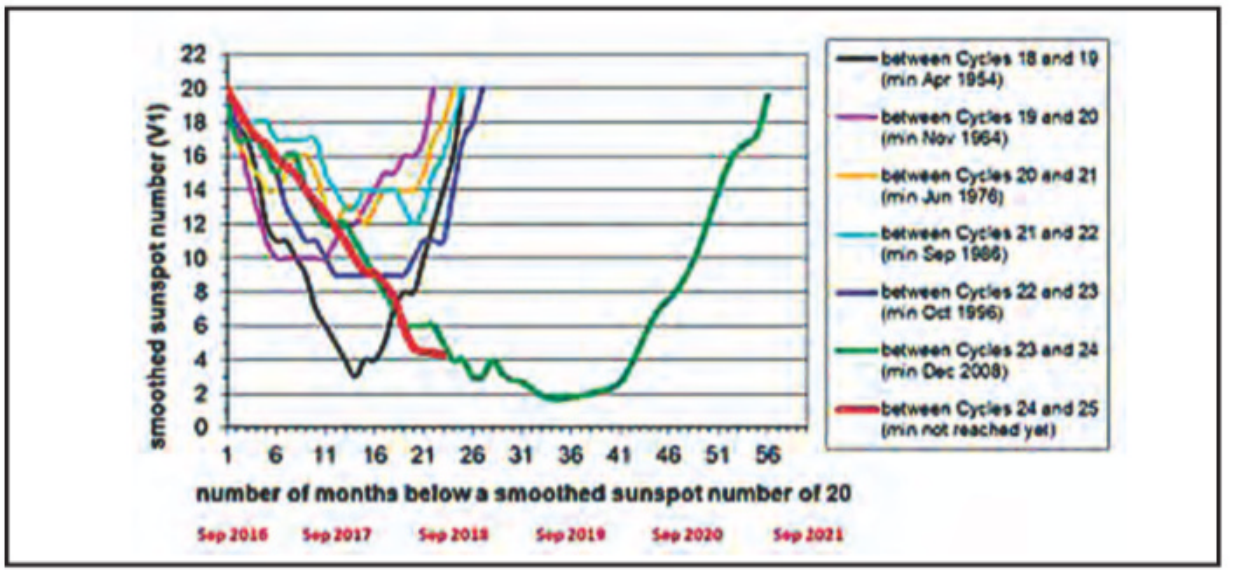


Figure 8. The data suggest it could be at least another year or so (at this writing) before the sunspot numbers for Cycle 25 begin to increase significantly. (Note: This graphic shows the old, V1 sunspot numbers.)

Notes:

1. <http://tinyurl.com/y7qutomn>
2. <http://tinyurl.com/yygded44>
3. Ibid
4. <http://tinyurl.com/yyzgd9og>
5. <http://tinyurl.com/y4fgemo2>
6. Javaraiah, J, Solar Physics 292(11), November 2017 <http://tinyurl.com/y29hh3rm>
7. <http://tinyurl.com/y273gg7e>
8. <http://tinyurl.com/y3dcnmss>
9. Personal communications, February 4, 2019
10. <www.stce.be/node/359>

Results of the 2018 CQWW DX SSB Contest

"Once More a Wonderful Weekend Among Friends Doing Radio" – LU8YE

BY JOHN DORR*, K1AR

It seems almost impossible to believe, but the 71st CQ World Wide SSB contest is in the books. PY2AC won the SOAB (single-operator, all-band) category in 1948 with a "blistering" score of 124,068 points. In sharp contrast, the current SOAB record is now held by EA8BH (N5TJ op.), who stunned the contest community in 1999 with a score of 25M+ points and over 10,000 QSOs!

Of course, for us mortals, making 10,000 contacts in a single weekend not only appears to be unachievable, but frankly is unachievable for 99.99% of those who participate. However, the CQWW SSB contest explodes on the scene in late October and something magical happens. The relatively inactive bands that we are currently experiencing in this torturous solar minimum miraculously light up. Twenty meters becomes filled from one end to the other, 15 meters demonstrates it can still support global communications and even our unpredictable 10-meter band sports contacts between continents.

As it turns out, the CQWW singularly stands out as a contest for everyone — rookie, small pistol, or monster multi-multi. And, with over 38,000 verified stations active in this year's contest, you couldn't help but have a great time.

Some Amazing Results

A long-standing adage in contesting is that, "if conditions are bad for me, they're bad for everyone." Well, if you're looking through the lens of 10 meters in the 2018 CQWW, band conditions were horrible. Fortunately for all of us, the 160- to 15-meter bands were established a long time ago and our fun was rescued.

I'm always amazed at how close the final scores can be for certain categories, especially high-profile ones such as SOAB World. This year did not disappoint as the top three scores were separated by only 193K points. The win-

Charlotte, KQ1F, discovering that operating in the Arctic from KL7RA can be challenging on 15 meters.

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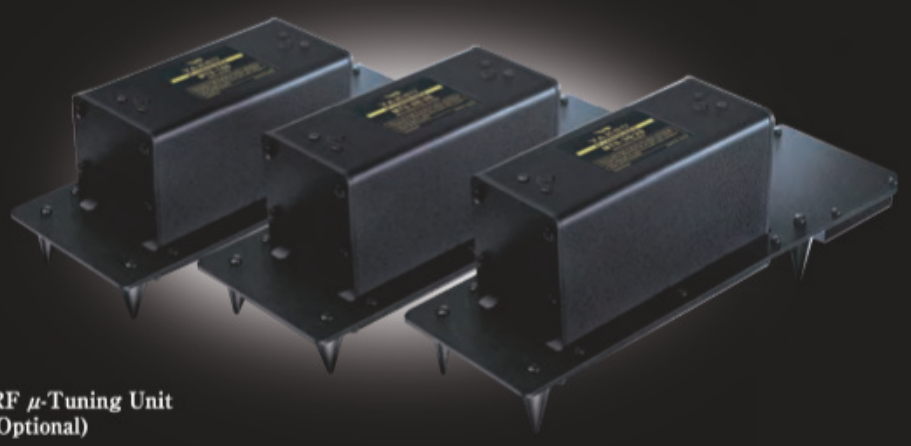

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The winners of the World Radio Team Championship 2018
Gedas Lucinskas (LY9A) and Mindis Jukna (LY4L)

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ning score of CN2CO (RA3CO op.) and #2 P4ØT (VE3DZ op.) had a minuscule difference of only 21K or 0.2%. Yuri's slightly better error rate from P4 (1.3% vs. 1.8%) compared to that of Dimitri from Morocco nearly closed the gap, proving again how much accuracy matters — both for big logs and small.

Speaking of Morocco, the opposite result took place on the World Multi-Multi stage with the CN3A team crushing the competition from K3LR (who notably had a #2 World score this time) by a 17-million-point margin. That's the *margin*, not the score. CN3A had just over 31 million points while K3LR scored just less than 14 million. As a demonstration of poor conditions, the D4C Multi-2 group trailed their Multi-Multi CN3A brethren by only 3 million points.

It shouldn't go unnoticed that remote stations are increasingly joining the top ranks of contesting. This year, Ray, W2RE, topped the SOAB USA HP ranks while operating one of his impressive station options remotely located in Maine. This rapidly growing mode of operation continues to explode as we'll see next month in the CW results.

The CQWW is a DX Machine!

One of the attributes for which the CQWW contest is known is its global level of activity. The CQWW is truly a worldwide contest. 2011 was the benchmark year for DX activity with 282 countries worked across the spectrum of logs submitted. Think about that for a minute — nearly 75% of all available countries (as measured by the CQWW rules) participated that year. Yet, Ol' Sol has impacted us significantly in 2018, with this year's contest results showing a sub-200 total for the first time in over a decade. Of course, that makes multiplier totals in the top logs even more impressive as stations

2018 CQWW DX SSB TROPHY WINNERS AND DONORS

SINGLE OPERATOR

World
CN2CO (Opr.: Dimitri Kryukov, RA3CO)
Donor: Southern California DX Club

World – Low Power
Ted Jimenez, HI3T
Donor: Slovenian Contest Club

World – QRP
Doug Zwiebel, KR2Q
Donor: Jeff Steinman, N5TJ

World – Assisted
KH7XS (Opr.: Bill Kollenbaum, K4XS)
Donor: Glenn Johnson, WØGJ

World – Assisted Low Power
P4ØW (Opr.: John Crovelli, W2GD)
Donor: Gail Sheehan, K2RED

U.S.A.
Ray Higgins, W2RE
Donor: Potomac Valley Radio Club – KC8C Memorial

U.S.A. – Low Power
Ted Rappaport, N9NB
Donor: North Coast Contesters

U.S.A. – QRP
Anthony Luscre, K8ZT*
Donor: Pat Collins, N8VW

U.S.A. – Assisted
Kevin Stockton, N5DX
Donor: John Rodgers, WE3C

U.S.A. – Assisted Low Power
Jim Bowman, KS1J
Donor: LA9Z/LN9Z Leia Contest Club

U.S.A. – Zone 3
Mitch Mason, K7RL
Donor: Northern California Contest Club

U.S.A. – Zone 4
Mike Wetzel, W9RE
Donor: Kansas City DX Club

U.S.A. – Zone 5
Ed Sawyer, N1UR*
Donor: Carolina DX Association – N4ZC Memorial

Europe
TMØT (Opr.: Gildas Ballanec, F4HQZ)
Donor: Potomac Valley Radio Club – W4BVV Memorial

Europe – Low Power
HG6V (Opr.: Imre Gulyás, HA6IAM)
Donor: Tim Duffy, K3LR

Europe – QRP
Karel Karmasin, OK2FD
Donor: Steve "Sid" Caesar, NH7C

Europe – Assisted
Andrius Ignotas, LY7Z
Donor: Martin Huml, OL5Y

Europe – Assisted Low Power
TM3Z (Opr.: Dimitri Cosson, F4DSK)
Donor: Alex Goncharov, R3ZZ

Africa
Mario Xavier Laporte, FR4QT*
Donor: Chris Terkla, N1XS

Asia
UPØL (Opr.: Vladimir Vinichenko, UN9LW)
Donor: Nodir Tursun-Zade, EY8MM

Caribbean/Central America – High Power
8P5A (Opr.: Tom Georgens, W2SC)
Donor: John Rodgers, WE3C

Caribbean/Central America – Low Power
Francisco Vassaux, TG9ANF*
Donor: Albert Crespo, NH7A

Oceania
KH7M (Opr.: Jim Neiger, N6TJ)
Donor: Barbara Yasson, AC7UH

South America
P4ØL (Opr.: John Fore, W6LD)*
Donor: Yankee Clipper Contest Club

Canada
Jeff Briggs, VY2ZM
Donor: Contest Club Ontario –VE3WT Memorial

Russia
Sergey Chebotarev, RW1F
Donor: Roman Thomas, R5AA

Indonesia
Dra. Endah Winarti, YB3VI
Donor: Karsono Suyanto, YBØNDT

Japan
Masaki Masa Okano, JH4UYB
Donor: Rush Drake, W7RM Memorial

Japan – Low Power
Nob Watanabe, JH1EAQ
Donor: Juan Carlos Munoz, TG9AJR

Southern Cone (CE, CX, LU) – Assisted
CB8E (Opr.: Luis Fierro Andrade, CE8EIO)
Donor: LU Contest Group

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU)
Thanawat Nithisantipong, HS5SRH
Donor: YB Land DX Club

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU) – Low Power
4E1A (Opr.: Klaus D Goepel, 4E1ADW)
Donor: World Wide Radio Operators Foundation (WWROF)

SINGLE OPERATOR, SINGLE BAND

World – 28 MHz
Marcelo Egües, CX2DK
Donor: Joel Chalmers, KG6DX

World – 21 MHz
CR3DX (Opr.: Tibor Ferenec, OM3RM)
Donor: Robert Naumann, W5OV

World – 14 MHz
4M1K (Opr.: Julio Rivero, YV1KK)
Donor: North Jersey DX Assn.

World – 7 MHz
CT9ABP (Opr.: Ratislav Hrnko, OM3BH)
Donor: Fred Laun, K3ZO – K7ZZ Memorial

World – 3.7 MHz
UP2L (Opr.: Vladimir Umanets, UA9BA)
Donor: Fred Capossela, K6SSS

World – 1.8 MHz
NP2J (Opr.: Dan Flaig, K8RF)
Donor: OL7M Contest Group, QRO.cz, RemoteQTH.com

U.S.A. – 28 MHz
Chuck Dietz, W5PR
Donor: John Rodgers, WE3C

U.S.A. – 21 MHz
Steve London, N2IC
Donor: 11 P.M. Dayton Pizza Gang

U.S.A. – 14 MHz
Peter Bizlewicz, KU2M
Donor: Yankee Clipper Contest Club – KC1F Memorial

U.S.A. – 7 MHz
Dan Handa, W7WA
Donor: Chuck Dietz, W5PR

U.S.A. – 3.7 MHz
Steven Sussmann, W3BGN
Donor: John Rodgers, WE3C

U.S.A. – 1.8 MHz
Stephen Werner, AG4W
Donor: South Texas DX & Contest Club (STXDXCC)

Europe – 28 MHz
George Charokopakis, SV9GPV
Donor: John Rodgers, WE3C

Europe – 21 MHz
CR6T (Opr.: Antonio Rui Sousa Santos, CT1ESV)
Donor: Tine Brajnik, S5ØA

Europe – 14 MHz
OH8X (Opr.: Pasi Luoma-Aho, OH6UM)
Donor: Charles Wooten, NF4A

Europe – 7 MHz
Angel Turpin Guillamon, EA5SR
Donor: Central Texas DX and Contest Club – NT5C Memorial

Europe – 3.7 MHz
Ivo Jereb, S57AL
Donor: Ted Demopoulos, KT1V

Europe – 1.8 MHz
Lukasz Gruszczynski, SQ7CL
Donor: Robert Kasca, S53R

Caribbean/Central America (21 MHz)
Carlos Paez, TI1T
Donor: Nate Moreschi, N4YDU

Oceania (21 MHz)
9M8YY (Opr.: Yasumasa Yagi, JR3WXA)
Donor: Bruce D. Lee, KD6WW

Asia – 14 MHz
Mamuka Kordzakhia, 4L2M
Donor: Dallas/Fort Worth Contest Group – W5PG Memorial

OVERLAY CATEGORIES

World – Classic
P4ØT (Opr.: Yuri Onipko, VE3DZ)
Donor: John Rodgers, WE3C

U.S.A. – Classic
Randy Thompson, K5ZD
Donor: www.BeLoud.us

such as ES9C (149 countries – 15 million points) and EF8R (151 countries – 15 million points) both worked a sizable percentage of them.

Year	# entities worked
2009	273
2010	268
2011	282
2012	259
2013	236
2014	235
2015	232
2016	224
2017	202
2018	199

Impressive Accuracy

In the end, the most important job of the CQWW Contest Committee is to ensure the logs we receive are properly scored and that the results are accurate. Unfortunately, we also spend a sizable amount of time ferreting out those who choose to not play by the rules. Thankfully, however, the vast majority of CQWW operators do their best to submit accurate logs.

All being said, some entries truly stand out as being exceptionally accurate. Twenty of the best can be found in the following table , with KR2Q owning the distinction of having submitted a perfect "Golden Log." Congratulations to this group for demonstrating a strong commitment to getting it right.

Call	Score Reduction (%) (logs with >100 QSOs)
KR2Q	0.00
WA2FZB	0.33
UA1CUR	0.38
DL2CC	0.40
DF2RG	0.54
JM1NKT	0.55
R3OM	0.69
K2CYE	0.79
R7MM	0.87
N9NC	0.96
OH6ECM	0.97
N4PQX	1.01
DG5E	1.02
DK2LO	1.06
K9BGL	1.11
RZ6BR	1.11
DL7URH	1.16
DL1NEO	1.20
ON6LR	1.34
PY2EX	1.41

Europe – Classic
GD9W (Opr.: Mark Haynes, MØDXR)
Donor: Steve Cole, GW4BLE Memorial

World – Rookie
Todor Todorov, LZ4AW
Donor: Tim Duffy, K3LR – N8SM Memorial

U.S.A. – Rookie
Mason W Matrazzo, KM4SII
Donor: Tim Duffy, K3LR – K3TUP Memorial

Europe – Rookie
Karolina Vaiciunaite, LY5XX*
Donor: EA Contest Club

MULTI-OPERATOR, SINGLE TRANSMITTER

World
EF8R (Oprs.: EA8KW, EA8RM, I4UFH, KU1CW, R3XAW, RA5A, RC5A, RV1AW, RW7K, UA5C, UB6HLW, UB7K, UF1F)
Donor: So. Calif. DX Club – W6AM Memorial

World – Low Power
ED9E (Oprs.: EA9CD, EA9ACD, EA7KI, EA9FY, EA9ACL, EA9ACP)
Donor: Rex Turvin, NR6M

U.S.A.
K1LZ (Oprs.: W1UE, KC1CWF, N1RR, K3JO, YT6W, K1VR)
Donor: Carolina DX Assoc. – W4VHF and K4DXA Memorial

North America
VE3EJ (Oprs.: VE3EJ, VE3EK, VE3EY, VE3OI)
Donor: John Sluymer, VE3EJ

Africa
ED8W (Oprs.: OM5RW, EA8DO, EA7LL, EA7RU)*
Donor: Fabio Schettino, I4UFH

Asia
P33W (Oprs.: LZ2HM, YO3JR, R3DCX, 5B4AIF, R4FO, UA4FER, RW4WR, RA3AUU)
Donor: World Wide Radio Operators Foundation (WWROF)

Europe
IR4X (Oprs.: I4AVG, I4TJE, I4USC, I4YRW, I4VEQ, IK2JUB, IK2NCJ, IK4UPB, IK4ZGO, IT9RGY, IZ4BOY, IZ4JMA)
Donor: Gail Sheehan, K2RED

Europe – Low Power
4U1A (Oprs.: OE1ZZZ, RL5D, HB9RB)
Donor: EA Contest Club

Oceania
AH2R (Oprs.: JI3ERV/NH2C, JR7OMD/WI3O, JO1RUR/KHØG, JR8VSE/NH2N, JA1KSA/N3NQL)
Donor: Junichi Tanaka, JH4RHF

South America
9Y4W (Oprs.: 9Y4W, DK2OY, DK6WL)
Donor: Victor Burns, KI6IM – The Cuba Libra Contest Club

Caribbean/Central America
VP2MDG (Oprs.: AL7BA, K2DM, KA1AF, NØSMX)
Donor: Bob Raymond, WA1Z

Japan
JA7ZFN (Oprs.: JG7PSJ, JH7XMO, JI7GBI, JP7DKQ)
Donor: Arizona Outlaws Contest Club

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU) – Low Power
E28AI (Oprs.: HS1LCI, ZL1DD, E24NQN, E22ZXX, HS5BQT, HS5WYM, E24OEE, E23GLG, E23WQS, E21IZC, E23WWT, HS5NFP, HS9YBR, HSØKQR, HS5YPD, E23WQD)
Donor: Bruce Frahm, KØBJ

MULTI-OPERATOR, TWO TRANSMITTERS

World
D4C (Oprs.: EA8FF, HB9DUR, IK2LFF, IZ4DPV, PY2EL, PY2LED, PY2WC, SQ9D)
Donor: Array Solutions

U.S.A.
K9CT (Oprs.: ND9G, KB9OWD, K9CT, WT2P, K9ZO, K9QQ, AB9YC, N7MB)
Donor: Kimo Chun, KH7U & Mike Gibson, KH6ND - Dan Robbins, KL7Y Memorial

Europe
ES9C (Oprs.: 4O3A, 4O9TTT, ES2MC, ES2NA, ES4BG, ES4NY, ES5JR, ES5QA, ES5RY, ES5TV, ES6QC, ES7GM, HA5BVG, ON1GPS, YL1ZF, YL2BJ, YL2KL, YL3AJA, YL3DW)
Donor: D4C Monteverde Contest Team

Japan
JE2YRP (Oprs.: JR2SCJ, JA1KFX, JA8RWU, JE8KKX, JF2XGF, JM1FHL, JQ1ABC, JQ1BVI)
Donor: Coconut Wireless Contest Club

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU)
9M2CHS (Oprs.: 9M2RMT, 9M2WAN, 9M2KRZ, 9W2KMB, 9W2EXY, 9W2JAG, 9W2WGD, 9W2ERD, 9W2SYX, 9W2EPQ)
Donor: Champ C. Muangamphun, E21EIC – Siam DX Group

MULTI-OPERATOR, MULTI-TRANSMITTER

World
CN3A (Oprs.: IK2QEI, IK2SGC, OK1RI, OK1FFU, OK1JKT, OK1VVT, OM6NM, 9A6A, LY4A, IZ1LBG, IZ2ZOZ, CN8WW)
Donor: Dave Leeson, W6NL & Barb Leeson, K6BL

U.S.A.
K3LR (Oprs.: N2NC, N5UM, AA4WJ, K3LR, KL9A, W2RQ, K3LA, N2NT, K1AR, N3SD, K3UA, DL6LAU, N3GJ, LU7DW, WM2H)
Donor: Jim Lawson, W2PV Memorial

Europe
M6T (Oprs.: MØMDR, MØBCT, MØCLW, MØHKB, MØBTZ, G4PIQ, MØSDV, G4BUO, GØVJG, MØTGV, G7TWC, G4MJS, GØAEV, GØWCW, G3XLG, GØDVJ, GØJJG, M1ACB, G4ADM)
Donor: Finnish Amateur Radio League

CONTEST EXPEDITIONS

World Single Operator
TO1J (Opr.: Hideto Takeda, JF2QNM)
Donor: National Capitol DX Association – Stuart Meyer, W2GHK Memorial

World Multi-Op
XT2SZZ (Oprs: S54W, S57L, S58Y, S59ZZ, S5ØA)
Donor: Gail Sheehan, K2RED

**Awarded to second place finisher*

What's Your Category?

One of the most common areas of feedback your CQWW committee receives is requests for new categories. Some of them can be a little too specific (e.g., SOAB – North Korea) while others are often good ideas. Category proliferation

The VP5W team suffering in Zone 8 with a really loud SteppIR in the background.

2018 CQWW DX SSB TOP SCORES

WORLD

SINGLE OPERATOR
HIGH POWER
All Band
CN2CO (RA3CO) ...10,999,890
P4ØT (VE3DZ) 10,978,352
8P5A (W2SC) 10,806,056
VY2ZM (K1ZM).....6,871,680
ZF9CW (K5GO) 5,985,848
UPØL (UN9LW) 5,829,096
CF3A (VE3AT).....5,351,688
TMØT (F4HQZ) 4,865,616
W2RE.....4,502,126
P4ØL (W6LD) 4,464,437

28 MHz
CX2DK 136,729
CA6CGX 53,648
PY2NA 39,936

21 MHz
CR3DX (OM3RM) ...1,628,172
YW4D (YV1DIG) 1,076,400
9Y4D.....987,420

14 MHz
4M1K (YV1KK) 1,587,131
OH8X (OH6UM) 1,245,108
TM6M (F4DXW).....1,235,234

7 MHz
CT9ABP (OM3BH)...1,056,018
EA5SR 799,106
EI5IX.....661,821

3.7 MHz
UP2L (UA9BA).....609,323
S57AL.....452,374
9A6ØKDE (9A2VR) 138,082

1.8 MHz
NP2J (K8RF).....69,715
SQ7CL 42,559
EW8R.....27,520

LOW POWER
All Band
HI3T.....2,672,504
VC3M (VE3LA).....2,046,369
EK7DX 843,660
N9NB 827,904
EK6SI.....825,907
N4TZ.....767,136
N8II.....736,575
JH1EAQ 686,375
4K6FO.....608,940
HG6V (HA6IAM) 543,904

28 MHz
CA2CEV 46,752
CX8DS 34,750
CE7VPQ 30,243

21 MHz
HK3TK 481,134
PY2CX 389,418
VR2EH (VR2ZQZ) 371,246

14 MHz
4L2M 384,223
UN6LN 314,280
IW1FRU 252,340

7 MHz
JH9URT 133,254
9W2SAF.....101,742
RK3E.....95,817

3.7 MHz
PA2TMS.....122,740
YV4YC 87,904
LY9A.....86,955

1.8 MHz
SNØR (SQ9IAU).....29,106
OE3WMW 15,600
OK1KJO 13,908

QRP
All Band
KR2Q 436,103
OK2FD 340,234
IZ3NVR 248,310
UT5EOX 238,944
JH1OGC 216,828
G4CWH 210,176
JR4DAH 187,620
LZ1DM.....152,992
NP2Q 136,017
IZØFUW 130,207

28 MHz
LU4VZ.....5,320
I5KAP.....2,958
S59GS 1,247

21 MHz
UW5EJX/MM 46,620
TA2IB.....22,579
HG3C (HA3HX) 17,516

14 MHz
CT1BXT.....32,544
RW3AI 26,775
UT1XX 20,724

7 MHz
LY5G.....50,343
LY2NK 28,314
IZ4VQS 25,353

3.7 MHz
OL4W (OK1IF) 17,400
OK6K (OK5IM).....16,484
R2FI 4,284
OZ6OM 4,230

1.8 MHz
HA1TI.....9,165
HA5NB.....4,995
UR5VAA.....3,367

ASSISTED
HIGH POWER
All Band
KH7XS (K4XS).....8,569,888
ZX5J (PP5JR).....8,140,341
LY7Z 5,558,220
CR2L (OE2VEL) 5,127,325
KP3Z (NP4Z).....4,905,740
S53M (S53ZO).....4,844,724
EW6W.....4,696,812
VA2WA 4,395,354
N5DX 4,121,142
RT5Z (RA3CW) 3,996,768

28 MHz
LU2DX 63,232
LU1DX 44,370
IT9VDQ 33,033

21 MHz
CQ3W (DF7ZS) 1,259,503
TM5Y (F8DBF) 750,189
PY2KJ.....712,712

14 MHz
CT9ABO (OM3GI) ...2,103,291
9A9A.....1,495,916
DL2ARD.....1,132,136

7 MHz
US1Q (UW2QU).....847,032
SN3A (SP3GEM).....838,304
HA8M.....789,888

3.7 MHz
OM2VL.....388,314
UW7LL.....369,600
OK8WW 361,666

1.8 MHz
OK7K (OK1BN) 195,917
SP2PIK (SQ2GXO).....92,729
OMØWR.....86,652

ASSISTED
LOW POWER
All Band
P4ØW (W2GD) 3,393,054
NP2P (N2TTA) 1,948,324
TM3Z (F4DSK).....1,881,750
RA3Y 1,488,957
VA3DF.....1,167,974
RL6M.....1,098,197
UA9R 1,037,322
VE3PJ 957,555
UY7MM 887,276
KS1J 869,352

28 MHz
PU2UAF 29,796
9Z4Y 22,554
PU2LEW 9,200

21 MHz
PY2UD 511,784
OK6T (OK1WCF).....355,992
EF8U (EA8DGH).....326,350

14 MHz
E44WE (SP9FIH).....669,824
IK4LZH.....357,018
S52OT.....333,944

7 MHz
9A5Y.....286,800
YT5X.....239,496
OL9R 198,648

3.7 MHz
OL9R (OK6RA) 134,554
YO9FLD 125,939
4L5P 82,758

1.8 MHz
LZ2F (LZ2JE) 39,840
OM5KM 21,655
OL1ØØRCS (OK1AY) ...17,043

ASSISTED
QRP
All Band
VE2IDX (VE3ZF).....791,296
LZ2DF 550,784
RT4W.....298,704
EE3X (EA3KX).....281,144
VA7FC.....140,454
YU1LM.....85,050
9A4OP 72,240
S53NW 62,900
W1JCW.....32,890
IK1ZOF.....25,288

21 MHz
SV1NK 32,965
LZ2A (LZ2DB).....16,698
R4FD.....4,418

14 MHz
IZ3IBL.....137,940
UZ7M (UT9MZ).....134,412
OT6M (ON9CC).....81,756

7 MHz
SQ5CW 39,836
LZ8U (LZ2TU).....11,780
IN3HUU 8,400

3.7 MHz
SP5ES.....9,513
9A4AA/MM 6,615
LZ2DB.....5,084

1.8 MHz
EU1AA 8,262
DL2SAX 1,296

MULTI-OP
SINGLE TRANSMITTER
High Power
EF8R 26,422,692
P33W.....17,552,192
ED8W.....11,255,783
IR4X.....10,641,724
LX7I 10,222,884
DR1A 9,756,279
9Y4W.....9,464,280
IR4M.....9,201,770
LZ5R.....9,159,290
9K2HN 9,138,978

Low Power
ED9E.....3,846,720
XT2SZZ.....3,420,196
PYØF.....3,378,272
YW5DX 2,481,368
HI3LT.....2,284,648
VP9I.....2,192,298
A61HA 1,754,472
4U1A.....1,580,031
PR5O 1,145,724
BD7DT 1,129,824

MULTI-OP
TWO TRANSMITTER
D4C.....28,093,569
FY5KE 21,603,000
PZ5K.....19,525,968
PJ4G.....19,112,148
ZF1A 13,465,836
ES9C.....12,192,700
C4A.....10,647,880
9A7A.....8,972,139
HG7T 8,864,184
KP2M.....8,647,458

MULTI-OP
MULTI-TRANSMITTER
CN3A 31,124,906
K3LR.....13,970,364
ZW5B.....12,184,092
V26B.....12,125,232
A73A.....11,908,694
KH6J.....11,757,078
M6T 11,537,636
W3LPL.....11,474,490
PJ2T 11,385,792
LZ9W 11,307,090

ROOKIE
High Power
LZ4AW.....448,200
PY2MET.....383,280
DK2MX 224,316
W3XOX 184,414
K8PK.....153,225
N7WJ.....140,448
W2KU 133,964
W4BBT.....127,600
VU2ZMK 69,600
N4VLK 63,510

ROOKIE
Low Power
LY5XX.....388,614
EF8U (EA8DGH).....326,350
KM4SII.....234,038
R2ARR.....146,965
EW8LM.....139,821
OK1LRD.....115,540
OK1DWH 114,063
R6KVA 104,580
LY5AX.....103,250
9W2SAF.....101,742

CLASSIC
High Power
P4ØT (VE3DZ) 5,539,345
P4ØL (W6LD) 4,464,437
K5ZD.....3,062,108
GD9W (MØDXR) 2,913,428
DJ5MW.....2,291,408
ES6RW (ES5RW)....2,247,434
EU1A.....2,161,540
RW1F.....2,102,792
DJ8OG 1,767,840
WB9Z.....1,696,940

CLASSIC
Low Power
VC3M (VE3LA).....969,173
N9NB 827,904
R7MM.....532,992
MØUTD.....361,935
MM1E (MMØGOR) 358,722
UT7NW 355,165
4E1A 351,400
UA3BL 347,541
DK1KC 344,320
DG7LAN/P 324,612

UNITED STATES

SINGLE OPERATOR
HIGH POWER
All Band
W2RE.....4,502,126
N1UR 3,918,772
W9RE.....3,580,577
K5ZD.....3,062,108
K3ZO.....2,393,226
AA1K.....2,284,206
N9RV 2,040,560
K6XX.....1,699,775
WB9Z.....1,696,940
K4AB.....1,542,525

28 MHz
W5PR 22,320
W4DD 7,130
WB8WKQ.....2,990

21 MHz
N2IC.....135,783
N6KN 50,652
W6TK.....46,800

14 MHz
KU2M.....876,160
N2PP 475,390
K3ZJ 429,632

7 MHz
W7WA 537,040
KM5VI.....40,984
K9CJ 6,550

3.7 MHz
W3BGN 73,300
K5FUV.....20,999
KØPJ.....5,546

1.8 MHz
AG4W 6,380

LOW POWER
All Band
N9NB 827,904
N4TZ.....767,136
N8II.....736,575
KD9MS 407,480
W6DVS 375,624
N6RV 340,032
K2SDS 309,825
ACØW 261,602
N7IR 259,515
N8GLS 238,350

21 MHz
N5AW 24,708
K8OZ.....23,424
K7XE.....13,176

14 MHz
W2AW (N2GM).....79,310
WA7BNM.....57,200
N7FLT 43,860

7 MHz
KR1A (KL7JT).....15,444
KK4AND.....12,033
K4UB 4,256

3.7 MHz
KK4BZ.....6,380
KT3RR 3,818

QRP
All Band
KR2Q 436,103
K8ZT 77,400
NDØC.....76,000
W6QU (W8QZA) 57,200
N4ZAK 4,848
KC8VWM 1,980

14 MHz
WE6EZ.....15,562

ASSISTED
HIGH POWER
All Band
N5DX 4,121,142
K3WW 3,348,900
N3RS 2,878,656
N2SR 2,667,132
AA3B.....2,519,628
K3PP.....2,258,505
AB3CX 2,068,776
NW3Y 2,009,124
N2MM.....1,993,653
NR3X 1,987,856

28 MHz
WO4O 9,576
K4WI.....9,180
N6SS 2,592

21 MHz
N4PN 189,392
N5FO.....135,250
W3EP.....80,028

14 MHz
KVØQ 547,470
N7DD 456,832
W8CZN 413,838

7 MHz
K3EST 311,125
NJØF.....83,853
K7WP.....30,940

3.7 MHz
W3NO 70,066
K2RR 27,722
WA2BFW 2,025

1.8 MHz
N6RO 1,575
N4RJ.....1,056

ASSISTED
LOW POWER
All Band
KS1J 869,352
N4RA 671,759
W3KB.....513,213
NY6DX 456,041
N4XL.....438,650
W4ZAO 419,604
WT1A.....351,780
K8LY 305,370
KI5MM.....300,829
WT8WV 275,362

21 MHz
WA5WFE.....27,552
K2ZR.....23,298

14 MHz
N4IJ 176,267
N9TGR 138,554
NM2O 96,921

7 MHz
KS4AA 31,395
AAØAI.....2,233
N6ABT 2,052

ASSISTED
QRP
All Band
W1JCW.....32,890

14 MHz
K2GMY 2,156

MULTI-OP
SINGLE TRANSMITTER
High Power
K1LZ 5,524,138
W1NA 4,751,900
K5TR.....3,798,400
N3AD 2,950,848
WW4LL.....2,504,295
AA9A.....1,732,332
WØRIC.....1,483,782
W8PR 1,424,029
W7VJ 840,125
KØDDD 746,112

Low Power
N4SVC 651,264
WK1DS 404,250
W4MLB.....398,698
W3ZGD 215,670
K7SS.....206,360
N8YXR 173,229
WA1F.....132,492
W8AJT 32,370
AD4XT 25,145
W8DC 22,440

MULTI-OP
TWO TRANSMITTER
K9CT.....5,125,098
N4WW 4,350,456
N1MM.....4,180,761
K1RX 3,260,358
K2LE 2,658,816
KA1ZD 2,605,170
N2RJ.....2,310,000
K2AX.....2,086,326

W2CG 1,910,656
KT7E 1,400,250

MULTI-OP
MULTI-TRANSMITTER

K3LR.....13,970,364
W3LPL.....11,474,490
KC1XX 11,227,068
K1TTT 4,868,864
WX3B.....3,573,948
K1KI.....3,548,260
W4AAW 2,382,904
WØAIH.....1,917,403
K1KP.....1,803,108
NE3F 1,493,115

ROOKIE
High Power

W3XOX 184,414
K8PK.....153,225
N7WJ.....140,448
W2KU 133,964
W4BBT.....127,600
N4VLK 63,510
KE8IVY.....50,895
KEØITC 44,811
KE4PLT.....39,368
KN4BIT 23,716

Low Power

KM4SII.....234,038
W2XK.....82,720
KC3INR.....73,904
KC3HXF 49,408
K3ABE.....40,432
AA4LS.....28,381
K2ELV.....21,900
AC9TO 20,196
W7AXN 18,139
KG5WZD.....15,834

CLASSIC
High Power

K5ZD.....3,062,108
WB9Z.....1,696,940
K4AB.....1,542,525
KQ2M.....874,239
K4BAI.....638,514
K1RM.....588,138
W1WEF.....543,312
ND4Y 413,028
AC4G 376,200
K9JF.....368,544

Low Power

N9NB 827,904
K1HT.....180,648
AC2RL 174,460
N1ALO 153,116
W2CCC (K2CS) 141,372
KC6X.....109,248
K3HW 106,368
W8GX 104,652
WD9CIR.....91,040
NDØC.....76,000

And you wondered why Andy, LY7Z, is so loud on the bands?

can be a challenge to all contest organizers as the administrative headaches increase exponentially with the creation of new classes of operation. So, it's a perpetual balancing act, including taking an honest look at categories that have served their time well but may need change for the future (the never-ending debate about combining assisted and non-assisted single operators comes to mind).

Speaking of assisted operators, the legitimate use of assistance has truly taken hold in contesting and the CQWW is no exception. Although low-power, all-band, single operators continue to strongly prefer operating on their own, overall, we are now seeing these categories converging with 41% of all single-operator, all-band entries being assisted in this year's CQWW SSB contest. Will next year see this group cross the halfway point?

All Band Ops	AF	AS	EU	NA	OC	SA	ALL
All Band (U) High	10	125	337	379	28	26	905
All Band (A) High	3	99	476	587	27	29	1,221
All Band (U) Low	13	198	1,057	636	66	57	2,027
All Band (A) Low	10	72	441	300	15	47	885
All Band (U) QRP	1	6	59	12	5	6	89
All Band (A) QRP	1	19	4	3			27
MS High	2	32	145	54	11	11	255
MS Low	5	28	78	22	12	14	159
Multi-2	4	16	47	32	4	9	112
Multi-Multi	1	9	14	18	5	7	54
Checklog	3	52	338	85	5	10	493
All	52	638	3,011	2,129	181	216	6,227

Assisted (A) vs. unassisted (U) entries in the 2018 CQWW DX SSB Contest. All multi-op stations are considered assisted. Unassisted still rules in the single-op all-band low power category, but the number of assisted entries is steadily increasing.

A Look at Overlays

The overlay concept was introduced in the CQWW contest several years ago with the creation of two important new categories: Classic (24 hours of operation) and Rookie (recognition of competitors who have been licensed for less than three years). Needless to say, with over 13% of all submitted logs collectively falling into these overlay groups in 2018, the concept has taken off, particularly in the Classic category, where busy contesters (or maybe those with a little more gray hair) can now compete against each other without the need to make a full weekend commitment. If you are generally time-constrained or know of a new contester, check out this special way to play in the CQWW and give it a try next year.

Overlay	AF	AS	EU	NA	OC	SA	ALL
CLASSIC	3	87	439	250	42	35	856
ROOKIE	3	20	137	89	24	17	290
All	6	107	576	339	66	52	1,146

Log Checking Notes

As good fortune would have it for the contest community, the vast majority of competitors who enter the CQWW contest are honest and maintain a high degree of ethical behavior. Indeed, they embody the best of ham radio — honesty, competitive spirit, embracing new technology, pushing propagation to its limits, etc. As with most aspects of life, however, there is always the small minority that makes the job of log checking a challenge. An amazing amount of energy and time is invested in this part of the process, not only to get the results right but to ensure that the "bad guys" are discovered.

In the end, this year's effort was not unlike the past, with particular focus on illegal use of assistance, self-spotting violations, operating "out-of-band," and rubber-clocking/multi-op time violations. And, of course, the elephant in the room remains the group that believes it's acceptable to run illegal power. Claiming that "everyone else does it" is not an acceptable position. While we have put a serious dent in the small but impactful world of cheaters, the real solution will always come from peer pressure. The CQWW Contest Committee depends on each of you to help us ensure ethical behavior will continue to dominate our event. We're counting on you more than ever.

Closing Comments

As I close, I'm thinking about my own experiences in this contest, going back to 1975. I vividly recall my first CQWW contest, making a few hundred contacts from

2018 CQWW DX SSB BAND-BY-BAND BREAKDOWN—TOP ALL BAND SCORES

Number groups indicate: QSOs/Zones/Countries on each band

WORLD SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
CN2CO	117/11/54	687/22/89	1843/32/107	1606/26/91	1863/30/104	61/14/35
P4ØT	97/15/41	723/24/85	1198/30/113	2050/30/107	1596/29/102	583/14/26
8P5A	134/10/27	726/23/78	2364/30/106	2415/29/96	1954/27/105	528/15/31
VY2ZM	443/17/73	512/21/85	987/24/101	2171/29/107	423/22/80	21/6/11
ZF9CW	168/15/44	699/28/80	1422/24/65	1462/26/85	1624/26/80	29/10/19

WORLD SINGLE OPERATOR ASSISTED ALL BAND

KH7XS	19/10/11	128/24/41	2114/36/97	1625/38/111	1999/33/74	91/9/12
ZX5J	18/10/13	195/24/72	779/34/95	1271/36/115	2244/37/136	266/14/41
LY7Z	496/16/66	943/22/101	1263/35/131	1148/32/115	883/33/120	141/6/28
CR2L	85/11/35	587/18/84	439/22/87	1570/31/112	1816/34/122	21/9/16
KP3Z	63/11/23	582/21/84	1444/30/110	1017/31/81	928/24/85	177/9/14

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

EF8R	247/18/77	1245/28/109	2273/34/135	2979/39/144	4000/38/151	94/21/73
P33W	171/14/65	878/25/110	2064/35/133	2529/37/135	2309/36/134	96/13/47
ED8W	96/13/40	543/23/100	1384/33/122	2234/35/133	1550/34/118	32/9/19
IR4X	93/15/72	524/21/101	1897/38/135	2574/38/141	1198/38/138	44/15/44
LX7I	365/16/71	995/20/101	2056/36/135	2258/36/129	1096/35/143	85/18/51

WORLD MULTI-OPERATOR TWO TRANSMITTER

D4C	262/16/73	1337/28/105	1807/34/124	3402/38/133	4262/39/157	542/22/92
FY5KE	108/14/33	848/24/94	2042/34/125	3189/37/134	3655/33/145	352/16/61
PZ5K	88/10/24	1055/29/93	2183/34/121	3018/36/125	3543/33/131	219/16/41
PJ4G	190/16/50	1061/28/97	2087/32/113	2829/35/117	3282/34/117	535/11/18
ZF1A	171/14/27	1203/24/87	2798/29/115	3662/30/112	2177/33/104	76/11/26

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

CN3A	387/17/73	1624/26/108	2981/36/138	3701/37/140	3624/37/149	470/21/84
K3LR	442/23/76	762/28/103	1593/37/133	2957/38/149	1484/31/128	151/12/28
ZW5B	17/6/11	383/28/83	1606/35/127	1643/39/128	2407/34/127	558/19/47
V26B	251/15/48	1206/24/97	1482/30/112	3409/34/122	1697/29/95	307/13/25
A73A	113/12/41	805/27/101	1871/32/119	2105/34/119	1663/33/124	114/11/38

USA TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
W2RE	148/13/48	325/16/74	556/24/86	1449/25/97	684/21/83	66/9/18
N1UR	58/10/35	251/21/71	451/27/86	1401/29/107	524/22/93	52/7/19
W9RE	46/11/29	223/21/65	451/31/93	1339/34/116	468/25/91	56/8/15
K5ZD	52/11/33	189/18/69	229/20/68	1119/27/101	652/25/89	14/6/9
K3ZO	14/4/9	223/18/70	356/25/80	742/29/95	461/21/77	98/9/22

USA SINGLE OPERATOR ASSISTED ALL BAND

N5DX	64/11/38	205/17/77	410/32/100	1209/31/118	606/26/105	20/7/20
K3WW	57/12/36	187/17/73	277/25/86	1091/29/119	591/27/93	55/9/23
N3RS	46/11/25	184/18/75	287/28/96	706/31/120	585/26/105	56/9/20
N2SR	8/4/6	80/15/46	210/22/82	996/33/122	601/26/101	81/10/25
AA3B	53/9/28	151/16/65	298/27/83	936/28/109	336/26/92	80/9/24

USA MULTI-OPERATOR SINGLE TRANSMITTER

K1LZ	91/13/50	250/22/85	645/32/109	1639/30/126	710/27/113	24/10/24
W1NA	53/11/39	181/23/85	644/31/108	1612/33/133	520/25/98	16/8/16
K5TR	31/17/30	138/26/76	1135/36/104	1040/37/134	704/34/117	23/10/19
N3AD	11/6/9	286/22/80	463/33/99	891/31/124	401/27/102	66/9/22
WW4LL	19/9/15	124/19/71	491/27/93	1086/30/111	145/23/89	13/5/13

USA MULTI-OPERATOR TWO TRANSMITTER

K9CT	73/16/34	263/24/76	693/35/98	1749/37/136	663/29/112	74/9/21
N4WW	34/10/22	257/23/84	893/34/107	1585/35/122	468/28/101	74/9/19
N1MM	44/10/23	263/20/76	363/26/86	1322/31/130	806/25/104	46/9/19
K1RX	41/10/21	129/16/62	393/24/80	1286/30/121	547/27/109	38/5/14
K2LE	41/9/20	244/19/73	358/29/91	957/31/109	398/28/97	6/2/4

USA MULTI-OPERATOR MULTI-TRANSMITTER

K3LR	442/23/76	762/28/103	1593/37/133	2957/38/149	1484/31/128	151/12/28
W3LPL	350/22/72	511/24/93	1435/35/124	2158/37/142	1508/29/125	207/12/30
KC1XX	306/20/46	644/28/100	1292/34/129	2764/36/142	1072/27/122	218/12/28
K1TTT	90/11/29	366/24/87	656/31/106	1591/30/126	668/26/102	131/11/25
WX3B	85/8/12	213/21/68	605/30/93	1112/32/111	706/27/107	109/10/23

Is this an antenna challenge or two VE guys getting ready for ice fishing at VYØERC?

Long Island, New York, with a tri-bander on my roof and a wire hung in one of those "tall" 30-foot trees in my back yard. Fast forward a few years and I'm standing in the living room of long-time contest director, Bob Cox, K3EST, who had boxes of papers everywhere. Those papers were CQWW logs. As I picked one up, I noticed it was the log of UK9AAN, totally re-copied and con-

Katrina, LY5XX, at the station of LY4L. The castle tower on the computer is not part of the station.

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
TMØT	83/6/29	641/16/73	1478/32/106	1934/27/90	841/25/77	55/7/16
EA5DFV	0/0/0	153/9/47	1119/24/87	1858/27/76	1013/29/77	6/3/5
GD9W	193/11/45	665/16/72	534/15/70	1399/24/85	618/25/88	22/5/13
YPØC	132/7/36	364/9/55	1138/27/82	1086/23/79	1036/33/91	80/9/22
G6XX	167/12/48	493/16/75	586/20/64	938/30/88	535/31/99	24/6/14

EUROPE SINGLE OPERATOR ASSISTED ALL BAND

LY7Z	496/16/66	943/22/101	1263/35/131	1148/32/115	883/33/120	141/6/28
CR2L	85/11/35	587/18/84	439/22/87	1570/31/112	1816/34/122	21/9/16
S53M	100/11/50	652/17/85	870/35/119	1277/35/116	740/34/121	146/14/50
EW6W	219/13/55	451/20/85	1260/33/115	1012/28/89	950/32/114	186/8/36
RT5Z	91/8/39	375/19/88	1425/34/126	1344/35/122	655/32/116	17/4/9

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

IR4X	93/15/72	524/21/101	1897/38/135	2574/38/141	1198/38/138	44/15/44
LX7I	365/16/71	995/20/101	2056/36/135	2258/36/129	1096/35/143	85/18/51
DR1A	228/16/69	825/23/104	1312/35/131	2517/39/145	1050/35/143	87/11/42
IR4M	114/15/69	568/22/101	1835/36/135	2486/38/138	682/35/137	53/16/43
LZ5R	151/13/62	781/27/106	2190/37/136	2146/37/141	1448/36/138	130/17/55

EUROPE MULTI-OPERATOR TWO TRANSMITTER

ES9C	542/18/78	1529/26/109	2370/34/137	2979/39/147	1799/36/149	246/12/45
9A7A	175/11/55	1442/20/99	1578/35/129	1779/36/121	1524/38/143	211/16/56
HG7T	213/13/61	1425/30/111	1724/38/141	1870/37/134	1345/35/140	218/12/46
SN8B	357/15/62	1414/26/102	1662/36/131	1867/36/123	1123/35/133	203/7/24
PI4COM	355/12/56	979/18/91	939/33/119	1511/39/125	1124/33/132	40/5/18

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

M6T	681/15/70	2057/28/113	2746/38/139	1977/38/128	1177/34/140	263/17/54
LZ9W	759/15/73	1772/33/121	2354/37/142	2472/39/136	1407/37/125	260/17/55
DFØHQ	891/16/72	1761/27/110	2488/37/141	1772/39/147	1139/34/139	237/18/55
OH5Z	466/11/58	1179/25/101	2043/34/127	2014/38/134	859/33/130	45/10/23
OT5A	635/12/64	1293/16/77	2136/31/120	826/38/116	879/33/118	139/12/35

TOP SCORES IN VERY ACTIVE ZONES

Zone 3

K6XX 1,699,775
K6NA 865,060
N7ZG 581,484
W7AT (W7EW) 544,425
W7WA 537,040

Zone 4

CF3A (VE3AT) 5,351,688
W9RE 3,580,577
*VC3M (VE3LA) 2,046,369
N9RV 2,040,560
WB9Z 1,696,940

Zone 5

VY2ZM (K1ZM) 6,871,680
W2RE 4,502,126
N1UR 3,918,772
K5ZD 3,062,108
VE9CB 2,970,708

Zone 14

TMØT (F4HQZ) 4,865,616
EA5DFV 2,959,872
GD9W (MØDXR) 2,913,428
G6XX (G4FAL) 2,500,413
DJ5MW 2,291,408

Zone 15

ES6RW (ES5RW) 2,247,434
OM7RU 1,480,680
OH8X (OH6UM) 1,245,108
UA2FZ 1,142,532
OK1GTH 920,185

Zone 16

EU1A 2,161,540
RW1F 2,102,792
US5D (UT7DX) 1,486,368
R8WF 1,447,506
RD4F 1,412,670

Zone 20

YPØC (YO3CZW) 2,656,841
4Z5LY 1,258,020
4X2M (4X4DZ) 639,090
YO3RU 429,324
4X1IM 426,972

Zone 25

JH4UYB 3,861,990
JE6RPM (JH5GHM) 3,596,817
*JH1EAQ 686,375
JH3CUL 416,245
JA5FDJ 401,286

**Low Power*

tained in a hardbound book. I asked Bob what was involved in producing the results I would later see in *CQ* magazine. And now, 40 years later, I sit in this chair as the new contest director … still trying to answer that same question. It seems surreal to type these words and I can only hope that I can live up to the amazing accomplishments and skilled leadership of the past. The CQWW was the best contest in the world back then and it still is today.

Finally, I can't offer enough thanks and accolades to the most dedicated and accomplished contest committee members in the world. As a rookie director, there has been so much to learn and I couldn't have done any of it without the support, expertise, suggestions (and occasional "growls") from some of the smartest and hardest-working volunteers I know. They are not only committee members, but also my respected friends, who include: CT1BOH, José Nunes; EA4KD, Pedro Vadillo; ES5TV, Tonno Vahk; F6BEE, Jacques Saget; GØMTN, Lee Volante; HA1AG, Zoli Pitman; IK2QEI, Stefano Brioschi; JH5GHM, Katsuhiro (Don) Kondou; K1DG, Doug Grant; K1EA, Ken Wolff; K3LR, Tim Duffy; K3WW, Charles Fulp; K3ZO, Alfred A. (Fred) Laun, III; K5ZD, Randy Thompson; KR2Q, Doug Zwiebel; LA6VQ, Frode Igland; LU5DX, Martin Monsalvo; N8BJQ, Steve Bolia; OH6LI, Jukka Klemola; PA3AAV, Gert Meinen; RA3AUU, Igor (Harry) Booklan; S5ØA, Tine Brajnik; S5ØXX, Kristjan

The impressive shack of Andy, LY7Z. It's a good thing he knows what all those knobs and buttons do.

Michael, W3MAS, showing the VP5W team how it's done.

Kodermac; UA9CDC, Igor Sokolov; VE3EJ, John Sluymer; VK2IA, Bernd Langer; YO3JR, Andrei (Andy) Ruse; and YU1EW, Zoran Mladenovic. Space doesn't allow me to summarize what it takes for these guys to compile and publish these results after you push your last F1-key late on Sunday, including several who went well beyond the call of duty with their contributions.

Thanks to all who played in the 2018 CQWW SSB Contest. I'll be looking forward to hearing you this fall: SSB on October 26-27 and CW on November 23-24 (*not* Thanksgiving weekend!) in 2019.

73, John, K1AR

Some CQWW SSB Personal Stories

One of the consistent themes after each CQWW contest is not just the amazing scores made by the winners, but the personal stories of accomplishment that happen time after time. What follows are just a few that paint an amazing picture for you to enjoy.

LY5XX

The 2018 CQWW DX Contest was my first WW as a single operator, operating low power. I was extremely happy to have the opportunity to use Mindaugas Jukna's LY4L station while he was away in Qatar participating as a member of A73A team. The equipment I had included a Yaesu FTDX-5000, AD-2334, dipole for 80 meters and Inverted-L for 160 meters. My goal was 1,200 QSOs and at least 30 hours on air. I was ready as I could be to be a rookie.

At first it was a little bit tricky to find a decent spot for CQ-ing, so I was only able to spend the first few hours at a relatively slow rate of 30 QSOs per hour. The equipment was running smoothly; the operator had other problems, mostly a concern about my sore throat (rookies get those, too!).

Finally, I reached a more productive period — Sunday morning — when my average rate increased to 50+ QSOs per hour. The best hour happened to be 0800Z with 109 QSOs. Of course the highlight for me was reaching my goal on Sunday afternoon, so for the rest of the contest I was testing my limits. It turns out that the most productive band for me was 40 meters with 488 contacts. And, like so many others, I didn't manage to make any contacts on 10 meters.

In total, I spent 32 hours operating and used the remaining hours trying to sleep, which is, of course, impossible, knowing that the contest was going on in the background. In some ways, I felt some remorse by sleeping for more than 3 hours.

My sincere thanks to Mindaugas, LY4L, and others who helped me to prepare for this contest. Although I'm still a rookie in some ways, I exceeded my expectations and will consider this as a milestone for all future CQWW DX SSB contests.

KL7RA

We did good, Rich!

The North Pole Contest Group (NPCG) — KL7RA — operated our first really big Multi-Multi contest since we turned the station into a club operation in honor of Rich Strand (*the original KL7RA, who became a Silent Key in 2015 – ed.*). Our friend put an incredible amount of work into the station. We picked up where KL7RA left off with the 2018 CQWW Contest being the first fruit of all of those efforts. No pressure except to make Rich proud as 7,500 QSOs entered our logs.

Given that this is the very bottom of a very deep sunspot cycle, we couldn't have been happier with our Q totals. As for mults, I guess you "gotta hear 'em to work 'em." When looking at our QSO

what's new

DX Engineering's ISO-PLUS

The ISO-PLUS Ethernet RF Filter from DX Engineering provides amateur radio operators with a tool to help pull out weak signals and operate more effectively by combating interference that can affect station performance.

Designed and manufactured by DX Engineering, the patent-pending Ethernet RF Filter suppresses electromagnetic interference (EMI) and reduces common-mode radio frequency interference (RFI) to and from Ethernet cables used between personal computers, printers, routers, multi-port switches, cable modems, transceivers and other devices. This interference is a typical problem on Ethernet Cat5e and Cat6 cables used for local area network (LAN) connections.

The inline ISO-PLUS Ethernet RF Filter joins two RJ-45 connectors together to fight common-mode RFI and EMI for radio frequencies from below 1 MHz to over 100 MHz, including 160- through 6-meter amateur bands. Installed on either end of Ethernet cables, ISO-PLUS filters mitigate RFI caused to the Ethernet-connected device. At the same time, they reduce interference to radio receivers and other Ethernet devices caused by RFI or EMI generated by an Ethernet-connected device.

The ISO-PLUS also provides common-mode attenuation resulting in reduced or eliminated EMI or RFI generated by power supplies, wall power adapters, touch lamps, appliances, and just about anything else near RJ-45 cables. Interference from these devices can creep into Ethernet cables, which then radiate RF signals that can be picked up by a radio receiver.

The filter supports 10/100 Mbps fast Ethernet and GbE Gigabit Ethernet with no effect on data signal or speed. Each ISO-PLUS comes with one shielded RJ-45 patch cable (about six inches). The filters work with Cat5, Cat5e, Cat6 and Cat6a cables with RJ-45 connectors.

DX Engineering's ISO-PLUS is available now in packs of two or 10 and has a retail price of $49.99 for 2 or $239.99 for a pack of 10. For more information, contact DX Engineering, 1200 Southeast Avenue, Tallmadge, OH 44278. Phone: (800) 777-0703. Website: <www.dxengineering.com>.

totals, particularly on 40, 80, and 160 meters — we were thrilled. As most of you know, it's never easy operating from the Arctic. As for 10 meters — well, that just never happens in this part of the cycle.

A few emails and a chance meeting at Dayton led to our guests, Paul, K1XM, and Charlotte, KQ1F, joining us for the effort. A little W1 mojo never hurts.

So, need Zone 1 in the next one? We're your guys (and gals).

SZ1A

In some ways, SZ1A is a training ground for contesters. Many of the operators in the 2018 CQWW SSB Contest were new to contesting. Although we had three stations on the air, only two of them were HP for the entire contest as the third station used a borrowed amplifier that was not available all the time. The team had a great time, promoting contesting and enjoying making new friends, working nearly 4,000 QSOs.

The SZ1A project is described in detail at <www.sz1a.org>. Over the last eight years, we have tried to build a competitive station. Each year we make some improvements that align with the generous donations we receive from team members and friends. Our goal is to offer the station to anyone who wants to operate a contest. Many Greek and foreign operators, experienced or not, have visited us, either operating or helping improve the station. Some of the more well-known guests have included Zorro, JH1AJT; Don, G3XTT; and Tony, LZ1JZ. We hope to include you in our guestbook some day or hear you on the air from beautiful Greece.

VYØERC

In between our scientific observations of the lower atmosphere, Pierre, VE1RUS; and Alexey, VE3KTB, operated the 2018 CQWW SSB contest at VYØERC as we have for the past few years. VYØERC is located in Zone 2 at 80° N latitude, approximately 100 kilometers from the north geomagnetic pole and is housed at the Polar Environment Atmospheric Research Laboratory (PEARL) near the Eureka High Arctic Weather Station on Ellesmere Island (IOTA NA-008). Upon arriving in Eureka a few days earlier, we scrambled to get the antennas ready in time for the contest.

This year, we added a vertical to help with 40 meters and get us on 80 meters. It was an improvement, but better antennas were still needed for those two bands. The 20-meter homebrew Moxon rectangle continues to be our workhorse. All antennas have to be removed at the end of every visit or they WILL be destroyed by the weather. The CQWW takes place after the Sun sets for the year on October 20th and at the time the auroral oval starts to show more activity, so conditions are not usually conducive to good results.

Making 1,007 QSOs was our best effort to date. The productive 20-meter openings into Europe both Saturday and Sunday really helped, but we didn't do as well into Japan as we would have liked. We would have done even better except for some unfortunate events on Sunday afternoon when the amplifier got hot enough to melt the bushings holding the tuning capacitor in place, leading to arcing. Overheating is not a term you hear very often in this location. Although the last four hours were tedious and slow as we were limited to S&P while operating barefoot, we didn't stop.

Yes, we will be back, coats and gloves in hand!

(Continued on page 94)

Professor Heisseluft reveals a plan by several amateur radio organizations worldwide to conduct a revolutionary new Internet-based contest.

A CQ Exclusive: New Competition Announced: Sporadic iCloud Contesting

By Professor Emil Heisseluft*
Lauton Institute, Grossmaul-an der Donau, Austria
<heisseluft.emil@mashuga.orf.ar>

Anyone reading the "Contesting" column in CQ magazine should not be surprised to see more than 50 events highlighted for each two-month period displayed. These events can range from the full-year CQ DX Marathon to such things as a state QSO party or the ARRL Rookie Roundup. All, of course, are meant to spur competition, call attention to a special event, and/or bring together kindred spirits. Whatever the reason, the contests cited have one thing in common: They are on-the-air events. Now, an entirely new type of competition is being envisioned by its planners, a competion for the 21st century: sporadic iCloud contesting. Fortuitously, while on a recent ski trip in the Alps, Professor Heisseluft overheard a multinational group of amateur radio contesters planning the first such event for 2019. He has generously agreed to share what he's learned with us today. –W2VU

** Professor Heisseluft has returned to the Lauton Institute, Grossmaul-an der Donau, Austria, where he is preparing the final exam for the class he teaches on Hamiltonian mechanics. Mail may be conveniently sent to the professor c/o CQ magazine, 17 West John Street, Hicksville, NY 11801.*

For better or for worse, competition is a part of almost every aspect of human endeavor. Certainly, one has only to listen to the amateur bands during the CQ World Wide DX CW and Phone competitions, or during any of the contests sponsored by this magazine and other organizations worldwide, to know that amateurs thrive on testing their mettle at the drop of a hat. It's what drives them to build larger and larger antennas that are mounted on towers of ever-increasing height; to employ power amplifiers that pump the legal limit into these antennas; and to use receivers and coding techniques capable of detecting signals so far beneath the noise it strains credulity. In short, competition is the life-blood of the amateur radio community, and the mere hint that something new might be on the horizon in the way of a contest is enough to get an operator's competitive juices flowing.

So, it was with some interest that I, while having a beer late last year in a pub in the Alps, overhead a hush-hush discussion among several American, European, and Japanese amateurs regarding their plans for a revolutionary new type of contest: A sporadic iCloud competition. The idea, while unbelievably ingenious, had its genesis in a storm-induced fail-

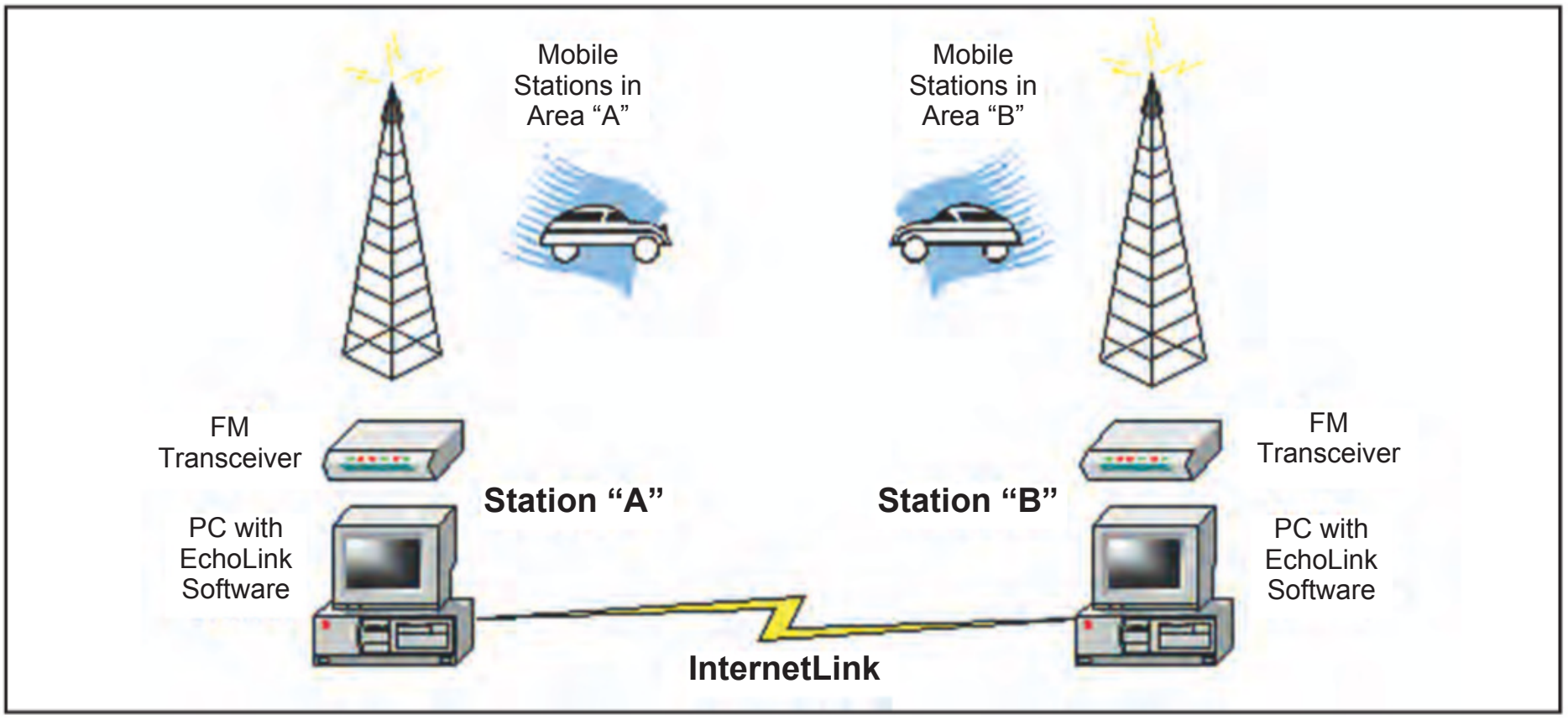

Figure 1. Example of a simulated sporadic-E contest link using EchoLink and DOPES software (modified after EchoLink diagram from Reference 5).

ure of the Amazon Elastic Compute Cloud center in Northern Virginia in 2012.

Cloud Failure

The problem, plain and simple, was a severe thunderstorm in northern Virginia on the night of June 30, 2012. Specifically, at 11:21 p.m. EST, Amazon's Elastic Compute (EC) Cloud went down following reports of torrential rains, "scary winds," lightning and massive power outages in the DC area.[1] According to a *Forbes* report at the time, "Amazon EC2 runs many major websites and services. Netflix, Instagram, and Pinterest have all been taken out of service during the outage. … VentureBeat has reported that Instagram, and Ruby platform Heroku (that runs many other sites) were also down."[2] Even QRZ.com, a ham radio internet site owned by Fred Lloyd, AA7BQ, was affected when it incurred a complete database failure.[3]

As the night wore on, despite power being restored to the impacted Availability Zone, Amazon's EC2 and Elastic Block Store (EBS) application program interfaces (APIs) continued to experience elevated error rates. And even after the EC2 and EBS APIs were again operating normally, some services still were impacted. To say service was sporadic, even more than 24 hours from inception of the event, is an understatement.

Sporadic-E

Aha, you say! Sporadic operation of the iCloud! Well, dear readers, that's exactly the hand-to-forehead thought that simultaneously must have hit the radio amateurs I overheard talking in the Alps. The words "sporadic" and "cloud" had meant only one thing to them until then: Sporadic-E (or E_s). We know this propagation mode allows signals at the upper end of the HF spectrum and above to propagate over long distances via a reflection from electrified clouds at the level of the ionosphere's E layer. What we don't know, however, is what causes it.[4]

That said, we do know its characteristics. Sporadic-E is generally classified into three types: Mid-latitude, equatorial, and auroral. Because of specular or mirror-like reflections, signal propagation via mid-latitude E_s, for example, can suddenly appear out of nowhere and peak to extremely high signal levels, sustain these levels for short periods of time, and then quickly disappear.

In general, E_s openings are unpredictable in terms of (1) when they occur in time of day [though seasonally, mid-latitude E_s openings peak twice a year (roughly), in June and December], and (2) for how long a path actually will exist between two points. And that's exactly what this group of contesters in Bavaria thought: Let's devise an internet-based, sporadic iCloud contest to challenge the worldwide community in which the "openings" on the internet between stations mimic E_s openings.

Ham Radio on the Internet

One way to employ the Internet for amateur-to-amateur communications is through the use of EchoLink (see *Figure 1*). According to EchoLink.org, "EchoLink® software allows licensed amateur radio stations to communicate with one another over the Internet, using streaming-audio technology. The program allows worldwide connections to be made between stations, or from computer to station, greatly enhancing amateur radio's communications capabilities. There are more than 200,000 validated users worldwide — in 151 of the world's 193 nations — with about 6,000 online at any given time."[5]

Another method is to employ D-STAR: D-STAR (Digital Smart Technologies for Amateur Radio) is a digital voice and data protocol specification for amateur radio <https://tinyurl.com/6rk6vu2>. The system was developed in the late 1990s by the Japan Amateur Radio League <https://tinyurl.com/yxzbr54w> and uses minimum-shift keying <https://tinyurl.com/p977bd9> in its packet-based <https://tinyurl.com/gv8sczq> standard. There are other digital modes that have been adapted for use by amateurs, but D-STAR was the first that was designed specifically for amateur radio.[6,7]

Putting it All Together

With the above as background, and based on what I overheard, my take regarding what the international contesters plan to do is to create a new suite of internet-linking software for amateurs called Deployed Operational Programme for E_s Simulation (DOPES). It could be released as soon as next month. The software deployed at each station will include a pseudo-random number generator, the purpose of which is to open internet links for station-to-station communications during the contest period at random points in time and for randomly determined periods of time that will be different for each station. That is, each station using the DOPES software will have their internet connectivity cut in and out unpredictably during a group-sponsored contest. In this way, only when internet availability at two stations occurs simultaneously — that is, when their internet availability coincides in time such that an "opening" occurs between the two stations — will it be possible for them to communicate. Even then, the link will only be available for an unpredictably short period of time.

As you can see from the above, the intent is to replicate what operators might experience in the way of ionospheric conditions during a real E_s opening. This puts a premium on executing fast exchanges, exchanges that likely will be the same as those used in CQ's DX contests (signal report and zone). I am working now, behind the scenes, to determine whether the Lauton Institute's Centre for Radio Amateur Programmes (CRAP) can play a part in the development of the new software, though I have to be careful in this endeavor not to reveal how I learned of the plan.

Summary

I have uncovered a plan by a group of international radio amateurs to create a revolutionary new suite of software to simulate E_s contest communications on the internet via the iCloud, something the creators of the software are developing for sporadic iCloud contesting. Early indications suggest the software, called DOPES, could be made available as early as this April 1, 2019, with the announcement of a contest employing the software soon to follow.

Notes:

1. https://tinyurl.com/yy5uselu
2. ibid
3. https://tinyurl.com/y3o4mwyb
4. Jacobs, G., Cohen, T., and Rose, R., The NEW Shortwave Propagation Handbook, CQ Communications, Hicksville, NY, 1995
5. www.echolink.org
6. https://en.wikipedia.org/wiki/D-STAR
7. https://tinyurl.com/ykqudvv

Do you enjoy top-level contesting but get bored on Sunday afternoon? Do you have more enthusiastic operators than space for antennas? Technology to the rescue, reports N3JT…

Time-Sharing Technology Removes the Tedium of Contesting

BY JIM TALENS,* N3JT

Competitive contesting today increasingly involves using techniques not commonly available even a decade ago. SO2R, which permits a single operator to simultaneously use two radios and two antennas, is an example. QSO rates for those adept at this are impressive, but it requires considerable practice to master. Some do it very well. But for multi-operator situations, a different set of approaches is used. These stations typically have multiple antennas, one dedicated to each operator position, though sometimes with a second person listening for multipliers on a separate receiver. It is now even possible to use the same antenna, such as a tribander, on three different bands by three operators at the same time. Filters with steep bandpass skirts are used, though reportedly there are some noise and artifact issues. The latest idea now under development, which should eliminate these problems, involves application of principles of sampling that have been used in telegraph, telephone, and data networks for a long time. It is referred to as *Time Division Individual Unlimited Multiplexing*, or TDIUM.

Advanced Antenna Sharing

When applied correctly, TDIUM supports the following: A single-band antenna with multiple users (operator and spotter); a triband antenna with multiple users (and spotters); multiple antennas with multiple users. All of these are possible because time slots are assigned to each transceiver and synchronized so that no transmitter emits during a listening slot. Because the sampling is done so quickly, no operator is even aware that there is another signal on the same antenna. Of course, more than one transmitter on a band-mode at one time is not generally acceptable in most contests, so the practical utility of TDIUM lies in using multiple antennas (even a tribander) with multiple operators and spotters without mutual interference.

Basically, each antenna-radio path is sampled at a sufficiently fast rate to permit transfer of the communications content, seamlessly, for both send and receive. The sampling is referred to as the *Nyquist Interval* (later proved by Shannon) and is equal to the reciprocal of twice the highest frequency component of the sampled signal. The communications path (cables between radio and antenna) must be capable of transporting this bandwidth, but as you'll see, this is not a problem in the typical ham radio shack.

As a basic example of how this works, consider that two voice signals can be transmitted along a single pair of wires by switching in a synchronized way between the two users at 6 kHz, with 3 kHz being the highest frequency component of typical human voice transmission. The path, meaning the cables and wires, all have a bandwidth of at least 6 kHz. This can be applied to more than two users, which is where it gets interesting. The sampling rate then must be increased linearly so that four users would need 24 kHz, and so on.

SSB operation may be intuitive, but how does TDIUM apply to CW? At 30 words per minute, there are 150 characters/minute, or 2.5 characters per second (cps). If we digitize CW, we need to accommodate at least 36 characters (plus punctuation, etc.). This means we need 2^6 different values, or 6 bits per character, which translates to 15 bps at 30 wpm, meaning a 30-Hz bandwidth would be sufficient. Two operators could share one antenna (two bands on a tribander, or an operator and spotter on the same band) using a CODEC capable of also sampling at 60 Hz. To be safe and avoid artifacts, let's assume we sample at 3 kHz. In the TDIUM application for the shack, the existing cables would more than suffice for this bandwidth under the Nyquist Interval criterion. A CODEC may soon be available to handle this encoding, too. A preliminary release was expected around April 1st.

Future Contest Stations

Imagine what this all means. At our future HF contest station, we will have a tribander and separate antennas for 40, 80, and 160 meters. There will also be a receiving antenna for 160. With TDIUM, it will be possible to have 12 operators actively sending, receiving, and searching for multipliers on all six contesting bands, two per band, meaning 12 transceivers (or VFOs in transceivers with second receivers) — all without any problem of mutual noise or interference. For Field Day, it can mean using multiple modes on the same band with the same antenna! Each antenna feed will, of course, have to be able to handle the transmit power, but that is already done in other applications with sturdy vacuum switches.

The notion of TDIUM is upon us, and soon the contesting world will be better than we have imagined it, with room for more operators and more active stations at a given location. It is not folly to think that, with this system, most stations in a contest can be worked in a shorter period of time, leaving Sunday afternoon for viewing sporting events or joining the family instead of passing the day suffering the tedium of calling incessant CQs!

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No, this isn't an April Fool article. It's a just-for-fun project that will let you tell your friends you're working DX on a light bulb!

The Light Bulb Antenna

BY DAVID DAY,* N1DAY AND ERNIE HOLLINGSWORTH, KC4SIT

Back in 2000, Tom Shiller, N6BT, wrote an article in *QST* titled "Everything Works."[1] The article's premise was that just about anything will radiate some applied RF energy and details were provided on the use of a 150-watt light bulb in two DX contests during which modest success was achieved in completed QSOs. During the era of tube transmitters, the light bulb was often used as a dummy load to aid in tuning before transmission. Amateur radio operators who were active during the 1950s and '60s will tell stories of other hams returning their calls while transmitting into light bulb dummy loads. This raises the possibility of incorporating a light bulb into an antenna system in which the light bulb would serve as a critical component in antenna operation.

Tungsten as a Radiating Element

Tungsten is the element that radiates light and heat in incandescent bulbs. A review of the thermal and electrical properties of this material found several properties that suggested it could be a fairly good radiator of RF energy. Relative thermal conductivity of tungsten is approximately 45% that of copper, while its electrical conductivity is a little less at 30%. Both the thermal and electrical conductivity of tungsten compare favorably with the conductivity of aluminum when impurities are present in the aluminum mix under consideration (*Table 1*). An interesting finding was that the electrical conductivity of tungsten was much greater than that of stainless steel, which is commonly employed in mobile antennas due to its resistance to atmospheric degradation and structural integrity in harsh environmental applications. This suggests that tungsten could be used as a component in an antenna.[2,3]

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Tungsten filaments have two physical drawbacks when considered for use in antennas. First, the material oxidizes rapidly when power is applied in a non-vacuum environment. Second, as RF power begins to radiate as heat from a tungsten filament, the electrical resistance to energy flow changes dramatically. In a cold state, resistance of the filament contained in common 60- to 100-watt household light bulbs is typically 10-40 ohms. However, when energy is applied and the filament begins to generate heat, that resistance rapidly rises to well over 100 ohms.[4] As expected, this can become a challenge in matching an antenna to a transmitter that expects a 50-ohm impedance load during operation.

Given the physical properties and limitations of tungsten, it was clear that if a light bulb were to be used as a component in an antenna, it would need to have a significant filament length. This was demonstrated in testing a variety of incandescent light bulbs with fila-

Photo A. A 100-watt Satco S2431 light bulb (left) and the Edison "squirrel cage" light bulb (right).

Photo B. LBA MK V Light bulb antenna.

ments varying in length from 2 inches to 84 inches. To serve as the radiating element in a multi-band antenna, the light bulb would also need to be positioned in series with a variable tap induction coil to cancel the capacitive reactance that naturally occurs with electrically short antennas.

From visits to several local hardware, lighting stores, and an internet search, several candidate light bulbs were identified with relatively long tungsten filaments. The first was a 60-watt bulb sold by various companies as the 5.25-inch Edison reproduction "squirrel cage." The bulb gets its name by referring to a 42-inch filament that is folded back upon itself seven times to form a cage-like structure. The second light bulb of interest was the 100-watt Satco S2341. The design of this bulb was similar to the Edison light bulb, but in a much larger 15 inch-long globe. Total filament length in this light bulb is 84 inches in a 7-fold cage-like design similar to the smaller Edison bulb (*Photo A*). Unfortunately, the S2431 was only available through several online stores and the first three bulbs delivered were broken during shipping as a consequence of their fragile glass stem design. While awaiting delivery of an intact S2431, experimentation began with the smaller Edison reproduction light bulb. After a functioning S2431 light bulb was received, the Edison light bulb was retired. Although the Edison light bulb ultimately proved to be a good radiator of RF energy, the S2431 was immediately found to be superior to its smaller cousin, presumably due to the doubling of the filament length.

Antenna Design

Five antennas were constructed over the course of three months. In each case, discoveries of strengths and weaknesses in each antenna were used in the next generation design. Only the last two antenna designs — the LBA MK V and LBA DB "Dual Bulb" are described in this article.

The best way to think about the light bulb antenna is by comparison to a mobile antenna in which the light bulb replaces the whip. Like a mobile antenna, the light bulb antenna has a radiator, variable loading coil, ground system, and an antenna tuner to provide the desired 50-ohm impedance match for the transceiver. (However, the light bulb was found to be only between 30-40% as efficient as a 6-foot whip radiator ... so don't expect miracles. But as you will see, it gets out nonetheless!)

The loading coil of the simpler anten-

RELATIVE ELECTRICAL CONDUCTIVITY

Material	Conductivity (s/m)	Relative to copper
Silver	68 x 10^6	113%
Copper	60 x 10^6	100%
Gold	43 x 10^6	72%
Aluminum (pure)	38 x 10^6	63%*
Tungsten	17.9 x 10^6	30%
Carbon steel	6.0 X 10^6	10%
Stainless Steel	1.4 x 10^6	2%

* 26% - 63% depending on impurities

Table 1. Electrical conductivity of several metals commonly used in electronic applications.

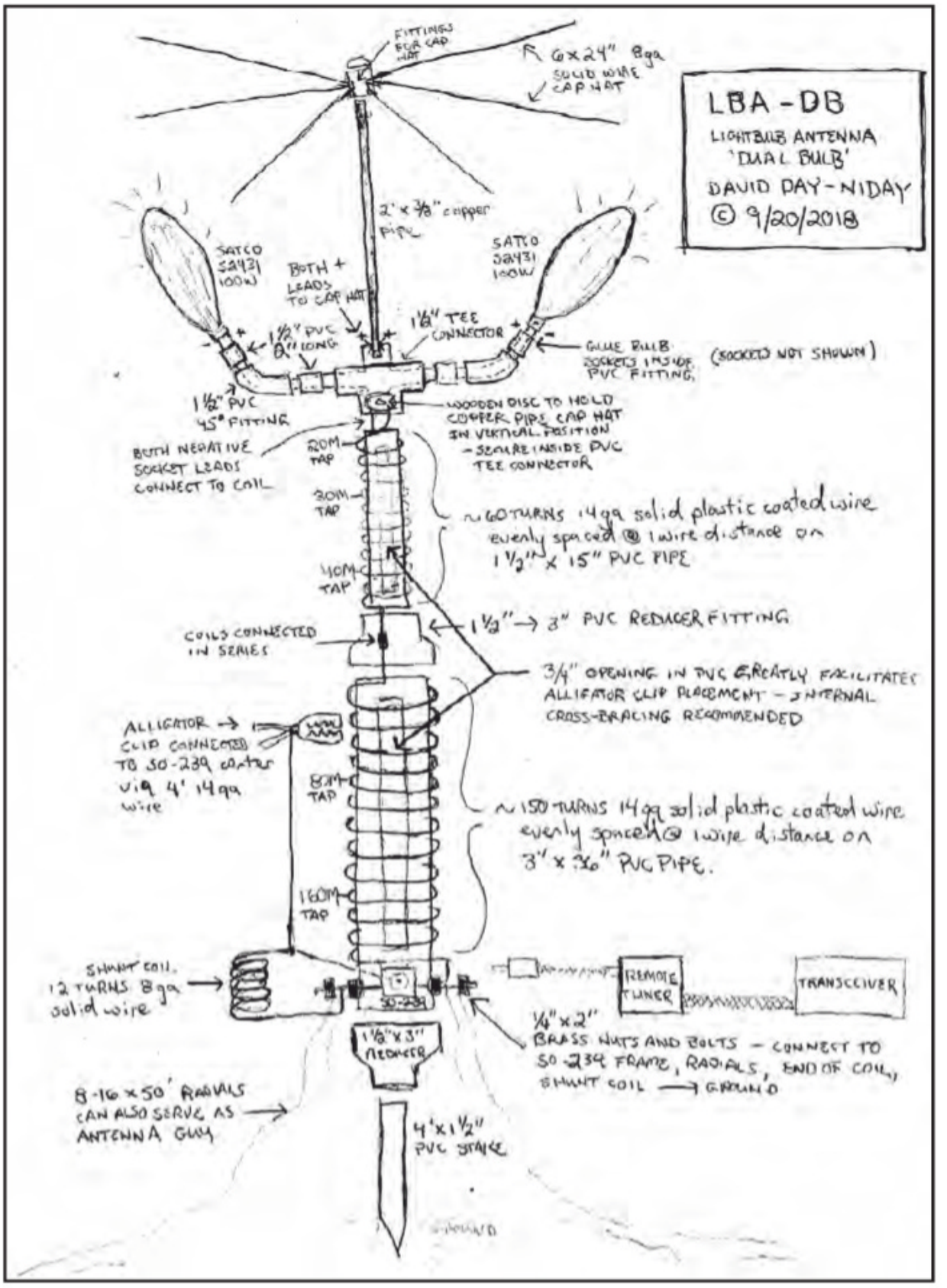

Figure 1. LBA – DB light bulb antenna schematic.

Photo C. Dual light bulb antenna and capacitance hat.

na (LBA MK V) currently being used by KC4SIT consists of two loading coils attached in series leading up to the S2431 light bulb at the top of the structure. The coil at the base of the antenna is constructed on a 3-foot section of 3-inch diameter schedule 40 PVC pipe with 150 turns of evenly-spaced 14-gauge THHN solid copper wire. Above that coil, a second coil containing 60 turns of 14-gauge solid wire is placed in series with the first coil. This coil was wound on a 15-inch piece of 1.5-inch diameter schedule 40 PVC pipe. In earlier designs, it was found that finding a tap point for tuning on the higher HF frequencies (30-10 meters) was difficult on the 3-inch coil and that a smaller coil simplified the process of identifying a tap point that resulted in an acceptable impedance match. So the smaller coil is used for tuning on 30 through 10 meters while the larger coil is used for tuning on the 80- and 40-meter bands.

Four 1/4-inch x 2-inch brass bolts and nuts are connected to the base of the coil form. These serve as connection points for 20 50-foot radials, common ground to the frame of the SO-239 connector, and the base end of the larger loading coil. The base of the antenna is elevated approximately 3 feet above ground to minimize RF losses to ground through the induction coil and improve antenna efficiency. An LDG RT-100 remote antenna tuner is attached to the 3-foot PVC mast below the main coil. In addition to providing a 50-ohm impedance match, remote tuning serves to keep RF energy from radiating off the coax and reduces signal loss due to antenna / feedline mismatch.

Table 2.

Antenna element	No Bulb in Circuit Field Strength (milliwatts per cm^2)	Bulb in Circuit Field Strength (milliwatts per cm^2)
Coax feedline	0.00012	0.00012
Radials	0.12	0.12
Top of coil	0.18	**35**
30° above coil	0.8	**40**

Table 2. Field strength measurements with and without light bulb.

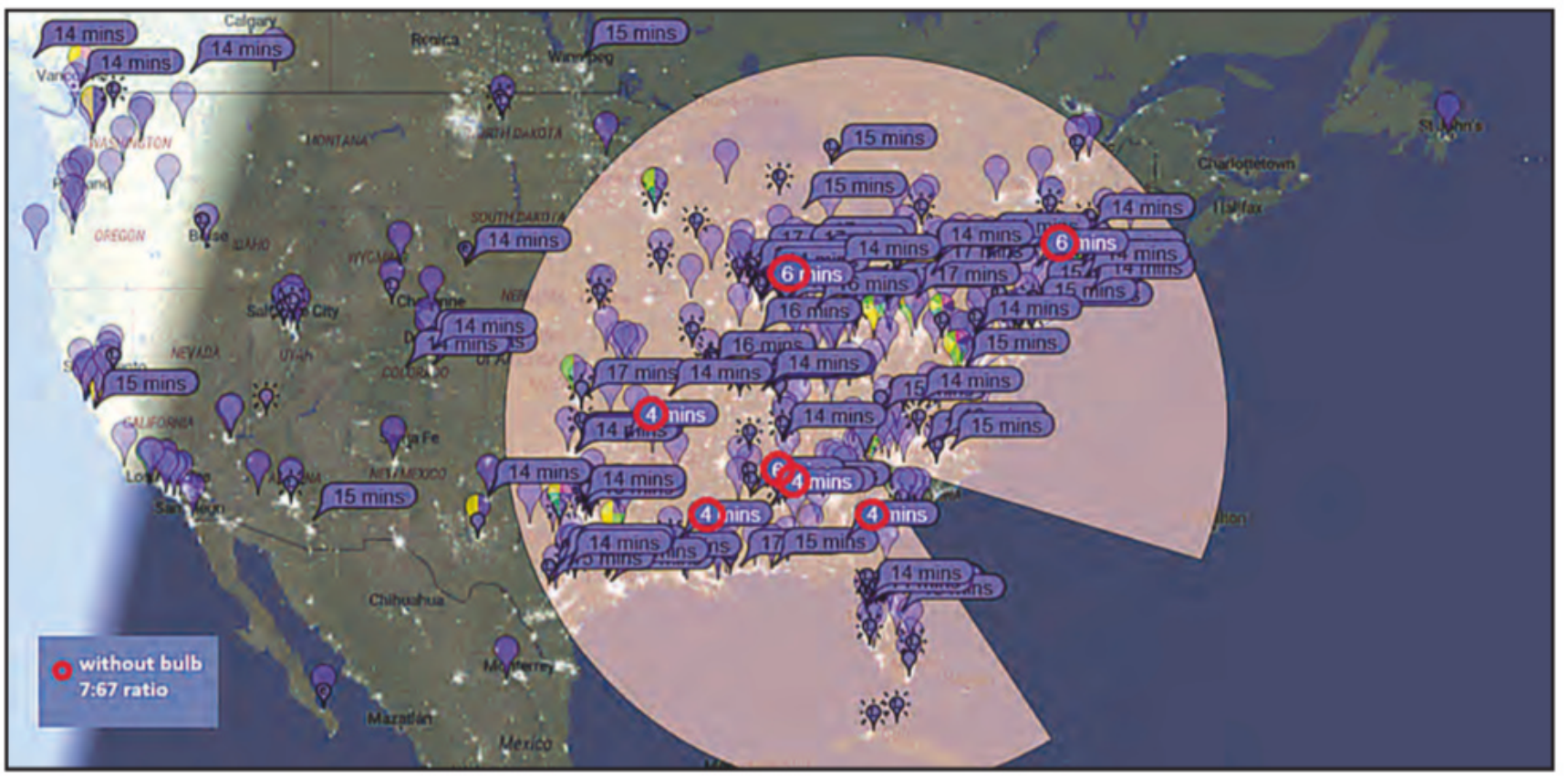

Figure 2. PSK Reporter map with and without the light bulb in circuit (without circled in red).

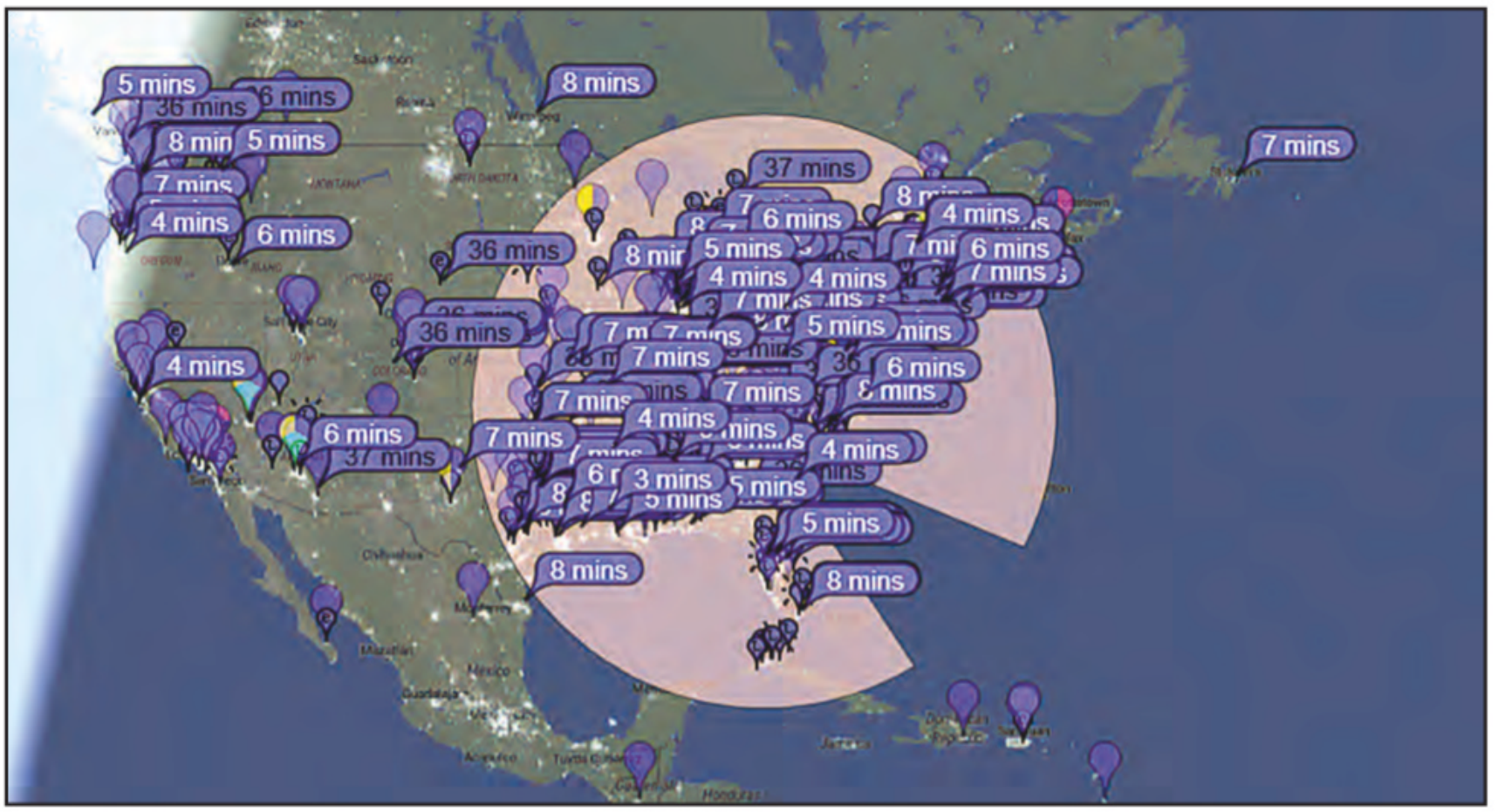

Figure 3. PSK Reporter map after re-insertion of light bulb into the antenna circuit.

It should be noted that only one end of the tungsten filament is attached to the end of the upper coil of the antenna. This was done because the intent was to use the entire length of the 84-inch filament as the "whip" of the antenna. Attaching both leads of the light bulb socket to the upper induction coil would have reduced the electrical length of the filament by 50% and this was considered undesirable in the antenna design.

With an antenna analyzer, taps were located on the induction coils that allowed the antenna to be tuned on all HF bands

from 10-80 meters. In tuning, it was noted that the antenna behaves exactly like any other electrically short antenna. Tap points that included a greater number of coils in the antenna caused the resonant frequency to go down, as one would expect, and vice versa. Once the taps on the coil were located, a length of wire was attached to the center of the SO-239 connector and an alligator clip connected to the opposite end. This allows easy connection to the tap point associated with the desired band of operation. *Photo B* shows the complete antenna.

Branching Out

Several weeks of FT-8 operation at 50-85 watts of transmitter power with over 300 completed QSOs demonstrated that the antenna works on 80-15 meters. One issue noted during this period was that the antenna required periodic retuning during the first few minutes of use. This was presumed to be the result of resistance changes occurring within the tungsten element as it became hot from application of RF energy.

As a workaround to this problem, we decided to use two S2431 light bulbs in a parallel configuration so that, as the light bulbs warmed up, the increase in resistance of the filament would be reduced by half. The open ends of each light bulb filament were eventually connected to a 2-foot length of 3/8-inch copper pipe to which a 6-element X 4-foot-diameter capacitance hat was added to further control the capacitive reactance associated with electrically short antenna designs. A small 10-turn X 2-inch diameter shunt coil was placed between the SO-239 center connector and ground to increase resistance at the resonance points on the 80- to 40-meter bands (see *Figure 1* and *Photo C*). The shunt coil should be considered optional depending on desired bands of operation. Although the shunt coil improved tuning ease on 40 and 80 meters, it ultimately made tuning more difficult on 160 and 30-15 meters.

These changes to the antenna design worked as planned and the changes in impedance that occur with heating of the tungsten filament are no longer great enough to cause the external tuner to trigger an automatic retuning sequence on any band of operation. Like most conventional antennas, once the light bulb antenna is tuned for a specific frequency of operation, it now stays tuned during periods of prolonged use.

It was also noted that after the capacitance hat was incorporated into the design, the need for inductance to bring the antenna to resonance on the lower bands was greatly diminished. As a result, the antenna can now be turned on the 160-meter band with a number of FT-8 contacts being completed on that band out to a distance of approximately 1,100 kilometers (685 miles).

Is the Light Bulb Responsible for RF Radiation?

In early testing of the single bulb antenna at 50 watts of trans-

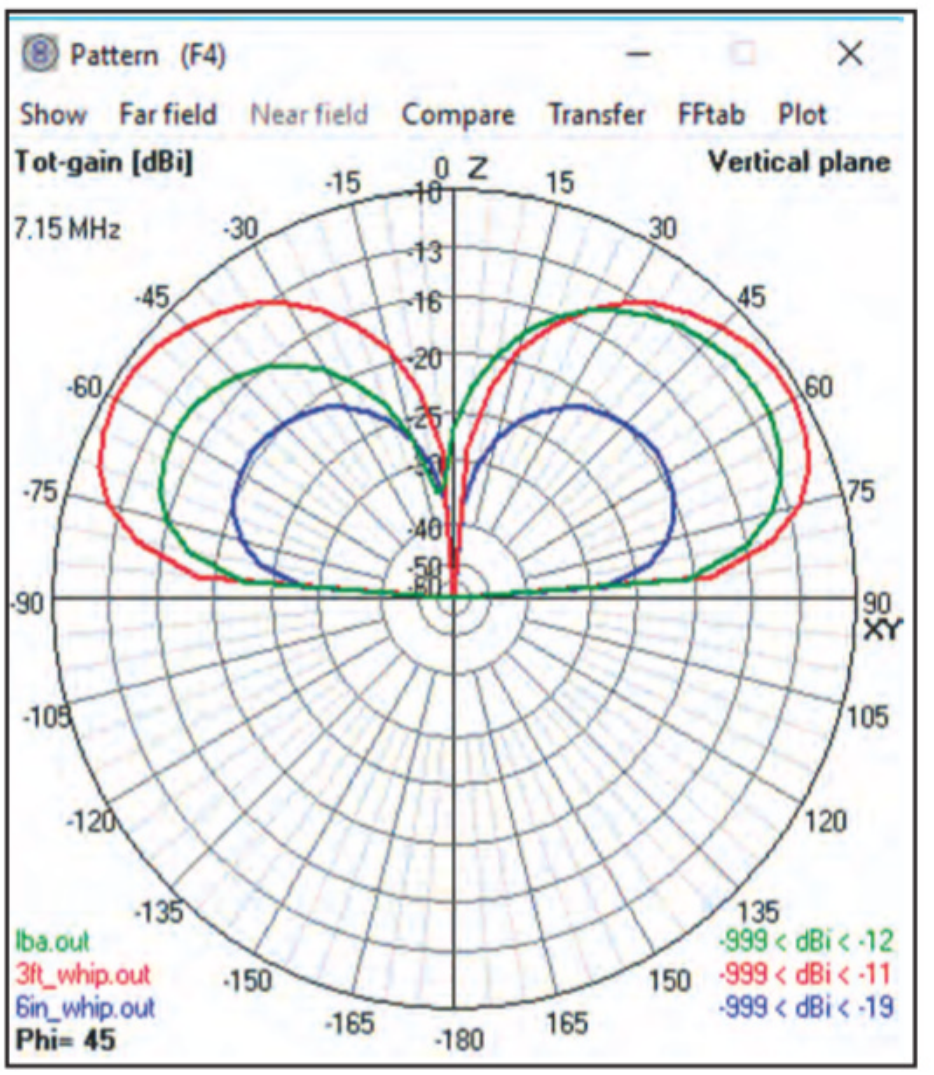

Figure 4. Comparison of modeled radiation patterns for a 3-foot whip (red), S2431 light bulb (green), and 6-inch whip (blue).

Figure 5. Signal-received reports on PSK Reporter from 30-meter operation using FT-8 at 50 watts.

mitter output power, satisfactory success was achieved on all bands of operation, with over 300 QSOs completed on FT-8 in a few weeks of casual use. In comparison to available vertical delta loop antennas, which are dedicated to one specific band of operation, the light bulb antenna was clearly inferior, but not by a lot. FT-8 signal reports from stations reporting transmissions were generally down by approximately 6-10 dB signal to noise ratio (SNR) when comparing the LBA-DB antenna to band-specific vertical delta loop reference antennas. Surprisingly, several transoceanic QSOs were completed on the light bulb antenna and contacts from North Carolina to the West Coast of the U.S. were common on 80-20 meters. Testing has yet to be completed above 20 meters as these bands have had continually poor propagation over the period of testing.

Even though the light bulb antenna appears to be a fair radiator of RF energy, the nagging question was the source of that radiation. Several amateur operators who were aware of the project pointed out that the radiation could be coming from the inductor coils, radial wires, and the coax leading to the transmitter. This was a fair objection and concern that warranted further research.

To find out where radiation was coming off the antenna, a number of field strength measurements were performed on the LBA MK V antenna. Transmitter power was turned down to 250 milliwatts so that we could safely get close to the antenna to do the measurements within the bounds of our field strength meter that has an upper measurement limit of 40 milliwatts/cm^2. With the transmitter generating a steady carrier, field strength measurements at 7.074 MHz were taken at an 8-inch distance from the antenna elements, both with and without the light bulb in the circuit. All measurements were performed with the field strength meter parallel to the antenna element being examined. The results are summarized in *Table 2*. As you can see, the presence of the light bulb in the antenna circuit results in a significant improvement in radiation from the antenna. Subsequent to introduction of the second light bulb and capacitance hat into the antenna design (*Figure 1*), the measurement process was again performed with no changes in results. As expected, the capacitance hat was also found to generate very little additional RF energy, both in field measurements and subsequent computer modeling.

On-air testing was performed on the single light bulb antenna by calling CQ on 40 meters, using the FT-8 digital mode both with and without the light bulb in the circuit. When the light bulb was taken out of the circuit, a new tap on the coil was found to provide an impedance match on 40. CQ was called over 5-minute intervals and the number of stations reporting the signal were counted on the PSK Reporter website.[5]

With the light bulb in the circuit, 67 stations reported receipt of our signal. Without it, only seven stations heard us. This is approximately a 10:1 signal-reporting ratio with vs. without the light bulb in the antenna circuit (*Figure 2*). At the end of the 5-minute transmission without the light bulb in the circuit, the bulb was again affixed to the top of the antenna with retuning and another 5-minute CQ session was conducted. At the end of this session, nearly all of the original stations reporting our signal with the light bulb again reported to the PSK Reporter map (*Figure 3*).

Based on the results of this test, field strength measurements, and subsequent computer modeling, it appears that the light bulb is performing as a key component of the anten-

na. Although other parts of the antenna may contribute small amounts of radiation to the total RF output, the light bulb antenna radiates in a manner similar to other electrically short vertical antenna designs.

To better understand why this was happening, antenna modeling was performed using the 4NEC2 antenna modeling software.[6] In the models, the light bulb was replaced with successively smaller antenna whips starting at 10-foot whip length and ending up with a 6-inch whip (essentially the last turn of the induction coil). After a long time working with the geometry of an 84-inch tungsten filament being folded back on itself seven times, a model of the light bulb was achieved. *Figure 4* shows the results for the comparison of a traditional 3-foot whip, S2431 light bulb, and an extremely short 6-inch whip.

This comparison demonstrates two things. First, the light bulb pattern exhibits a bit of directional behavior, presumably due to the way the tungsten filament is folded and terminated within the light bulb. Second, the bulb produces a radiation pattern and strength approximately equivalent to a 3-foot whip at -12 dBi. Even though the tungsten filament is about 7 feet in length, this result was expected as the folds of the filament likely result in a fair amount of radiated signal cancellation.

Light Bulb SSTV

On December 18, 2018, co-authors N1DAY and KC4SIT completed a slow-scan TV (SSTV) QSO over the nearly 5-mile distance between them, each using a light bulb antenna. N1DAY suggests this might have been the first-ever, two-way light bulb antenna SSTV QSO … and who are we to argue? Here are a couple of the photos they exchanged…

Ongoing Use of the Light Bulb Antenna

As experience progresses with the light bulb antenna, it has become clear that it is an adequate performer despite significant RF energy loss from generation of heat and light relative to conventional antenna designs. Even though the light bulb antenna will likely never achieve the performance success of conventional antennas with longer and straighter radiating elements, it is not uncommon for signals emitted from a light bulb to be heard by distant stations when propagation conditions are good. (*Figure 5*). Completed FT-8 QSOs from North Carolina to the western United States, Mexico, and many Caribbean nations routinely occur. Under good conditions, QSOs have been completed with a number of European and Asian countries on 20, 30, and 40 meters, with the most distant being to Australia on 40 at 9,796 miles (N1DAY to VK3BVW @ -15 dB SNR) during the morning grayline period.

In case you were wondering, the bulbs do glow visibly starting at about 40-50 watts. As power approaches that range, the RF meter shows an increasing power density measured at 50 feet away. At glow level, power density levels off, but at about 70 watts it continues to go up again as TX power is increased. Be careful, though ... the upper limit is a little above the bulbs' power rating. They do burn out if bulb wattage is exceeded.

QRP Capability?

Given the light bulb antenna's signal loss relative to the delta loop antennas used in this study, we were wary of its ability to function at all at transmit powers of 5 watts or less. To test the antenna in QRP mode, KC4SIT and N1DAY transmitted FT-8 CQ calls for two days utilizing both the LBA MK V and LBA-DB antennas. In short, both antennas outperformed our expectations at 5 watts of transmitter power with signals being reported across the United States, Canada, and the Caribbean (*Figure 6*).

During the testing, N1DAY focused on SNR comparisons to a band-specific delta loop reference antenna on 40 meters utilizing PSK Reporter statistics, while KC4SIT attempted to make as many QRP calls as possible. As expected, SNR reports for the light bulb antennas were consistently well below SNR reports for the reference antennas. In the 40-meter SNR comparison, 32 stations reported N1DAY's light bulb-generated FT-8 signal at 5 watts over a transmission time of 10 minutes and 48 stations reported N1DAY's delta loop-generated signal over the same time interval. The most distant station reporting signal receipt from the light bulb transmission was WB1EAZ in Guatay, California, 1,944 miles from N1DAY's QTH. In total, 19 stations reported the signal from both the light bulb and delta loop antennas with the aver-

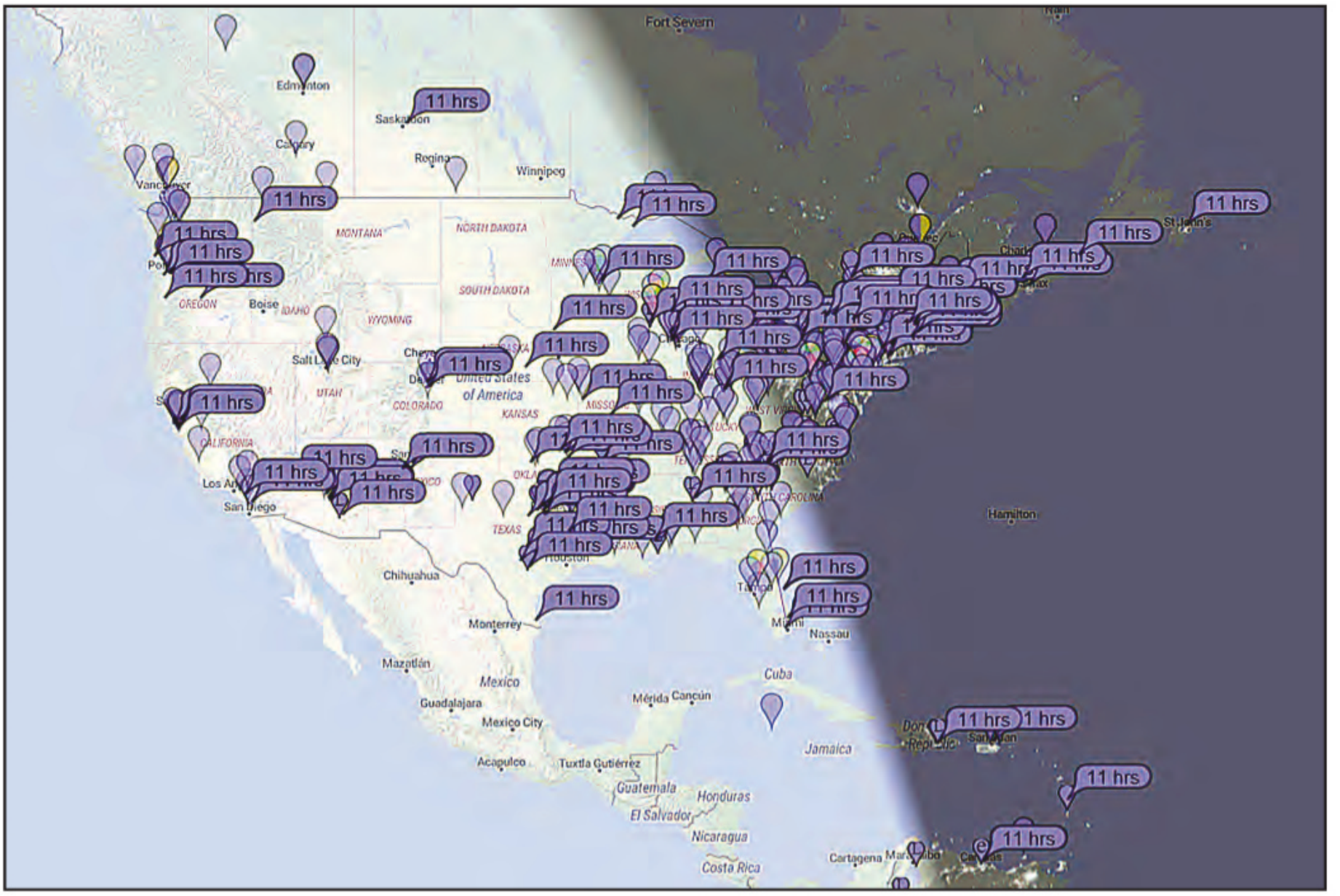

Figure 6. PSK Reporter map from KC4SIT's 5-watt FT-8 CQ calls.

age SNR reduction being -20.7 dB for the light bulb antenna.

KC4SIT's efforts at completing FT-8 QSOs at 5 watts on the LBA MK V antenna yielded 16 QSOs on 80 meters, 35 QSOs on 40, and 9 on 30 meters, while N1DAY completed 4 QSOs on 80, 5 QSOs on 40, and 15 on 30 meters with the LBA-DB antenna. Several of the QSOs exceeded 1,000 miles. KC4SIT also observed signal-received reports on PSK Reporter during his CQ activity utilizing FT-8. This yielded a total of 301 stations reporting his call with the most distant station being NN7U in Astoria, Oregon, at a distance of 2,270 miles on 40 meters.

Keys to Success

During operation at both stations, several operating techniques to improve QRP success became apparent:

• Transmission interference on crowded bands and operators utilizing high power necessitates split operation when answering CQ calls and transmission in an unused portion of the FT-8 band allocation away from operators using high power when calling CQ.

• Utilization of PSK Reporter maps to verify that the station you are trying to call is hearing your signal.

• Continual attention to the waterfall for band shifts and openings. Stations will often not see a QRP station calling CQ on the waterfall and will accidentally transmit over weak signals.

• A mixture of calling both CQ and answering CQ calls maximizes opportunities for success.

• Persistence pays. Sometimes stations do not see or return QRP calls simply because band conditions at any given time may be sub-optimal. Over the course of several hours, propagation conditions can go from very poor to very good, making calls that could not be completed earlier in the day possible at QRP levels of operation.

Summary

Our work has demonstrated that with attention to detail, certain incandescent light bulbs can be successfully incorporated into an antenna for both low power (<100 watts) and QRP (<5 watts). In addition to selecting a light bulb with a long tungsten filament, minimizing RF losses through remote tuning, inductance coil winding uniformity, and mitigation of ground losses with proper coil placement along with an adequate ground path return system, are important to success.

The light bulb antenna has been a good experiment in relearning and applying some of the basics of good antenna design. Other than that, the big benefit of experimentation with the light bulb antenna has been the fun factor. As word gets out about the antenna, we are finding that pileups begin to occur as soon as we start transmitting on FT-8. It seems that everyone wants to talk to the guys using the light bulb antenna so they can say they've had first-hand experience and not just heard the stories of QSOs using light bulbs as dummy loads from someone else.

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Announcing:

2019 CQ World Wide Foxhunting Weekend

May 11-12, 2019 (or whenever works for your group)

Orienteering enthusiast Addison Bosley, KJ4VCV, wore his competition clothes during the on-foot foxhunt at the Dayton Hamvention. (Photo by Bob Frey, WA6EZV)

Mobile or on-foot, one transmitter or many, a radio foxhunt is sure to stir up activity in your ham club. Now is the time to plan for this year's CQ World Wide Foxhunting Weekend, which will be May 11-12, or a different date in the spring if that works better for your group. *CQ* doesn't impose any rules or offer any awards for Foxhunting Weekend. That's up to you and the hams in your hometown. Your hunt can be for mobiles or all on foot. Use the international rules or make up your own.

For many clubs, Foxhunting Weekend kicks off a season of regular transmitter hunts. For others, it's a special once-a-year event, like Field Day. Since the primary objective is lots of hunt participation, we don't insist that your event be on that weekend. Any time in the spring is fine with us!

Some hams prefer the formalities of carefully crafted boundaries, specifications for signal parameters, time limits, and so forth. Others are content just to have one or more signals to hunt. No need for any regulations, they say. Talk it up on the local repeater and social media to find out what your friends have in mind.

**P.O. Box 2508, Fullerton, CA 92837*
email: <homingin@aol.com>
Web: <www.homingin.com>

Foxhunting teaches an important skill — the ability to find the source of signals from afar. RDF, or *radio direction-finding*, is useful for public service and volunteer enforcement. It can even save lives. Most of all, it's fun. Give it a try, but make sure your group has safe fun. See to it that no one can be injured by your hidden transmitter or by trying to get to them.

Don't let the excitement of the hunt make you an unsafe runner or driver. Make sure that all transmitting and receiving antennas are eye-safe. Always be mindful of your own physical limitations and never take chances behind the wheel or in the forest.

Afterward, write up the results and send them to CQWW Foxhunting Weekend Moderator Joe Moell, KØOV.* The list of information in a complete CQ Foxhunting Weekend report is posted on Joe's website at <www.homingin.com/joek0ov/report>. In addition to the details of date, location, hiders and winners, *CQ*'s readers also want to know what was unique about your hunt and what lessons (positive and negative) you learned from it. Don't forget to include some sharp action photos. The higher the resolution, the better.

Let's make Foxhunting Weekend 2019 the biggest ever. I look forward to receiving your reports. Happy hunting!

Enjoy the Hobby read, read, read...

W6SAI HF Antenna Handbook

by Bill Orr, W6SAI

W6SAI was known for his easy-to-understand writing style. In keeping with this tradition, this book is a thoroughly readable text for any antenna enthusiast, jam-packed with dozens of inexpensive, practical antenna projects that work!

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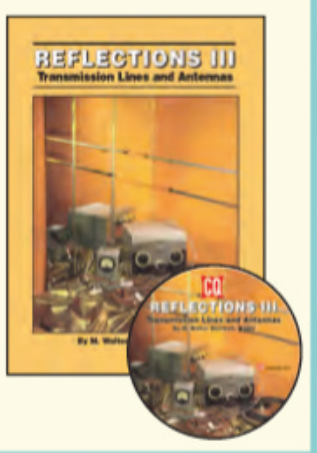

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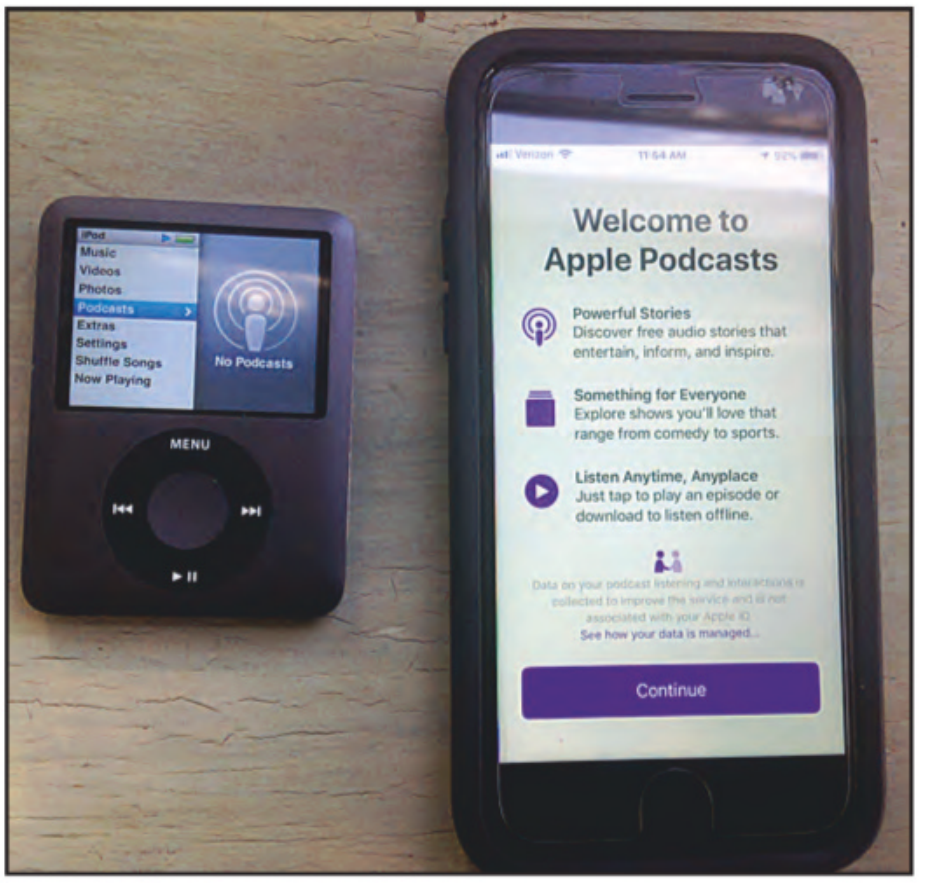
You can learn about different aspects of ham radio from a variety of sources, starting with this magazine! But there are other options as well, including a nearly endless variety of audio "podcasts" available on the internet. AI6OU takes us on a tour of some of his favorites.

Ham Radio Audio Podcasts

BY DAVID GUDER,* AI6OU

About four years ago, my wife and I went to the greater Denver area to visit our son for his winter college break. Although my favorite form of exercise is bicycling, I was not about to go from sea level to 5,000 feet, in February, and ride outdoors. I had an old iPod (portable digital music player), so I decided to load a few podcasts on it and listen to whatever I thought might interest me while spinning away on the stationary bike in the hotel's indoor gym. I had always been interested in amateur radio, so I found a few episodes and added them to my normal selections and we were off. I would have never thought that listening to an amateur radio podcast would be the final push to finally get my license.



Podcasts got their name from combining "iPod" (left) with "broadcast." Even though iPods can be hard to find today, you can still listen to podcasts on your smartphone or any other device that can download audio from the internet.

Podcast Basics

"What is a podcast?" "How do I listen?" "What can I learn?" Let's unpack this and maybe you can learn something new this year as well.

Podcast – The word comes from a blending of the Apple-branded "iPod" and the term "broadcast," hence the name "podcast." You do not need an iPod to listen to a podcast — you can listen on many types of technology, many of which you already have and use daily. It is kind of like an on-demand radio show that is recorded for you to listen to whenever it is convenient. A wonderful thing about podcasts is that they are not only created by the huge media outlets. They can be created by anyone wishing to share or teach something that interests them. Thought to have started in the 1980s, the first officially-named podcast was in 2004 and the name has stuck since then. According to *Podcast Insights*, as of mid-2018 there were over 550,000 podcasts with over 18.5 million episodes[1]. There are many other stats from the Podcast Insights website, including the fact that 64% of the U.S. population is familiar with the term "podcasting." From conversations with some of the hosts of amateur radio podcasts, that number is much lower for the average ham. If you have never listened to a podcast, read on and listen in.

How do I listen? What is unique about podcasts is that you can use many forms of technology to listen. Most have an internet website with links to both the latest shows and a library of past shows that are all pretty much available "on demand." As soon as they are posted, you can click and listen on your home computer. If you have a smartphone, you can find an application (app) that acts as a distribution point for specific shows that you may like. For instance, I can go on iTunes, Stitcher Radio, or RSS (Real Simple Syndication) feeds, select the shows that I like and new episodes will automatically be downloaded to my phone or computer. When you make the time to "mow the back 40," go for that long walk with the dog because the bands are not cooperating, or have a long commute like I do — it's now your time to learn something new. If you have an audio player (iPod, MP3 player, etc.), you can load it the same way you load your favorite music and listen to it on the go.

Social Media — Since podcasts are electronic broadcast shows, many of their fans often have their own ideas, similar experiences, or comments to share with the creators or other followers. Most podcasts also have a presence on social media sites such as Facebook, Twitter, or Instagram. On these sites, the followers (or users) can interact with other users to share how they raised their new antenna, tried the latest radio, contacted that rare DX, or reviewed the nearby hamfest. You do not have to participate in this side of the podcast experience, but this is where ideas are exchanged and relationships beyond a contact over the airwaves can grow.

What can I learn? That week in Colorado, I listened to episodes on FM repeater basics, how to study for the FCC license test, the basics of SOTA (Summits on the Air), and

* *email: ai6ou@yahoo.com*

even a shopping list show. I learned that the FCC test was not as ominous as some say, and that I could actually afford a radio after I passed the exam. However, I still have not found the show on how to justify the purchase of a new radio to your significant other — I need to explore the Marriage Enrichment / Communication genre of podcasts and polish those skills. The amateur radio subjects are almost endless and include interviews with award-winning DXers and icons in ham radio, how to help with JOTA (Jamboree on the Air), how best to study for your upcoming FCC exam, what NVIS is all about, how to use solar power for your station, and much more.

Specific Amateur Radio Podcasts

I will list and describe a few podcasts that I listen to as examples. Consider this a personal list and not a formal endorsement of any podcast, but merely descriptions of the typical type of content presented with more information as warranted. There are many more excellent podcasts I can't mention here but I will assemble a list of these and others (with clickable links to websites) that you can request from me at the end of this article. Here's my personal favorites list:

100 Watts and a Wire: Hosted by Emmy Award-winning producer / director Christian Cudnik, KØSTH, the show focuses on the intersection of life and amateur radio and represents a place where hams can learn from each other, share the challenges and celebrations we experience as a diverse group of amateur radio operators. The podcast addresses common — and some not-so-common — operating issues and solutions from which we can all learn. There is a strong Facebook following (over 10,000 members) where you can contribute conversations on issues from operating and rig questions to sharing Hamvention® experiences. Abbreviated 100WAAW, the community that's grown up around the program has created "activity days" where members and friends gather on the HF bands in the spring and fall as an opportunity to test gear and teach other operators about the 100WAAW community. There is also a weekly on-air presence with the 100 WAAW 40-meter net, held every Sunday night with net control stations scattered across the U.S. and followers talk on the air (spots communicated on Facebook or Twitter).

Amateur Radio Newsline: A weekly newscast of issues and events of interest to radio amateurs worldwide. Often heard on repeaters during or after your local FM net, content ranges from the serious issues such as first-hand reporting from emergency areas to fun issues that have included in-depth interviews with hams and others who are active in current news items. ARN is also the prime sponsor of the Young Ham of the Year Award (YHOTY), started by Newsline founder William Pasternak, WA6ITF (SK), in 1986 to recognize and celebrate the accomplishments of young people to the amateur radio service. A very experienced staff assembles and brings a wealth of information each week.

ARRL Audio News: A weekly newscast of the week's top stories that relate to amateur radio, produced by the American Radio Relay League that includes interviews and features of significance and highlights current events and sources that benefit amateur radio operators worldwide. For those who don't have time to read other sources, this podcast provides brief information so that amateurs can seek further knowledge on the ARRL's website or other resources.

Ham Radio 360: Hosted by Cale Nelson, K4CDN, this was a bi-weekly podcast aimed at the newer ham radio operator. The show provided in-depth interviews with people in every area of the hobby (hence the 360 reference). Although the programs ended in early 2018, the entire library of podcasts is still available on the website and is a valuable resource. The library is voluminous and offers nearly 100 episodes of detailed interviews and instruction on subjects that include APRS, DXpedition reports, mobile installations, traveling with ham radio, Field Day reports, DSTAR/digital radio, and much more. You will likely learn more here than from your local radio club.

Ham Radio Workbench: Hosted by George Zafiropoulos, KJ6VU, and Jeremy Kolonay, KF7IJZ, this podcast is the in-depth technical giant of ham radio podcasts. George and Jeremy were brought in by Cale Nelson to the Ham Radio 360 podcast and together, they eventually decided to launch a new podcast in 2016 with a focus on more detailed technical issues such as exploring electronics, software, hardware (using Arduino, Raspberry Pi, etc.), and making and DIY (do-it-yourself) aspects, even creating ham radio-related projects for their listeners to build. Detailed reviews and introductions on items such as spectrum analyzers, HF antenna design, HF amplifiers, packet radio, VHF/UHF repeaters; and construction projects that include an HF antenna analyzer, 4-port coax relay, and "QRP Smarty" Arduino-enhanced dummy loads challenge their listeners to

constantly learn more about the electronic side of the hobby. This podcast also features a strong Facebook and Twitter following where listeners share projects, questions and experiences in the technical aspects of amateur radio.

Solder Smoke: Hosted by Bill Meara, MØHBR/N2CQR, and Pete Juliano, N6QW, this podcast is focused on homebrewing amateur radio transmitters, receivers, and antennas. If you are interested in all things homebrew, this is your podcast. Bill and Pete do an excellent job of describing projects they are working on so even newbies like me can (almost) understand. The hosts and fans of this podcast also share their construction techniques, latest rigs and news items in videos that are posted on their web blog site. They take time to walk through subjects such as the BitX transceivers (including interviews with designer Ashhar Farhan, VU2ESE), including the latest modifications listeners have created. If you listen to this podcast, I strongly suggest you read Bill's book, *Solder Smoke – Global Adventures in Wireless Electronics*, as it describes his work as a diplomat and how his interest in electronics pushed him along. You too can become part of the "International Brotherhood of Electronic Wizards!"

QSO Today: Hosted by Eric Guth, 4Z1UG, "QSO Today" provides a unique podcast in a one-on-one interview format, in which Eric talks with a prominent leader in the amateur radio community every week. If you've ever heard of famous amateur radio mentors and pioneers, Eric has likely interviewed them on his podcast. This is an excellent source to learn about some of the giants in amateur radio, what interested them, what path radio helped them take in life, and includes advice they may have for new hams. Eric also provides links to most of the subjects that the guest mentions on his website where you can do further research yourself. With over 200 interviews, you are sure to find someone you have heard of and will be surprised at what you can learn.

Beyond Listening

Once you find a subject in which you are interested, you can contact most of the podcast hosts or their guests with questions from links on their websites. I have done this a few times and those contacts have led to other sources to help with specific questions such as providing answers to operating issues. Although these hosts are "electronically published" on the internet, they are hams just like us and like most hams, they too are more than willing to help you learn something they know. We all have areas of expertise and these amateur radio podcasts can help bring those people to your computer, phone, or player so you can fill otherwise empty time with knowledge to better your ham radio experience or plan which part of the hobby to explore next.

Video and Web-Based Podcasts

You may wonder why I have not mentioned well-known video programs such as "Ham Nation," Tom Medlin's "Amateur Radio Roundtable," or "Amateur Logic." The focus of this article is on audio-only podcasts and these (along with many others) are initially video broadcast programs with recorded shows being saved in the audio podcast format. This is great for those of us on the West Coast (and not yet retired), who cannot make it home in time to watch some of these programs "live." I know I am grateful for their creators / producers' willingness to provide their content in the recorded or podcast format for later listening. While you may miss out on some of the visual content in this manner, some programs offer recorded video programs on the internet and you can search on YouTube or their specific web page for video recordings to watch the programs.

In addition, there were several "original" amateur radio internet-based programs in existence before the term "podcast" was created. These programs were typically broadcast over local FM repeaters in conjunction with a club net and many clubs continue the tradition today. Examples of these include the Westlink Amateur Radio News (predecessor of Amateur Radio Newsline), and Hap Holly's "RAIN Report." Some of these programs are currently available on iTunes and other podcast engines, as well as directly accessible on their respective websites. The websites usually also include an archive where you can listen to previous shows on demand.

Where Podcasts Can Lead You…

Back to that winter riding on the stationary bike — those few podcasts I listened to years ago led to a book and websites to study for my license. A few months later, I was off and running with a new Technician license. If you are in a remote area without access to a club, if you are a new parent who can only squeeze in a few minutes to learn something new or can't make it to Dayton and want to hear about the latest gear but can't sit and watch a video for an hour, spend some time listening to a podcast and enjoy.

Resources:

Here are web links for each of the audio podcasts profiled in this article:

* 100 Watts and a Wire: <http://100wattsandawire.com/>
* Amateur Radio Newsline: <www.arnewsline.org>
* ARRL Audio News: <www.arrl.org/arrl-audio-news>
* Ham Radio 360: <http://hamradio360.com>
* Ham Radio Workbench: <www.hamradioworkbench.com>
* Solder Smoke: <www.soldersmoke.com>
* QSO Today: <www.qsotoday.com>

Note:

1. <www.podcastinsights.com/podcast-statistics/>

Many modern transceivers provide a low-level transverter output that can be used to put you on our new 630-meter band. But the power levels coming directly out of the rigs are too low to make yourself heard. W8MQW has a straightforward design for a 14-watt amplifier to get you making contacts on digital modes.

A Simple 14-Watt Amplifier for Digital Modes on 630 Meters

BY CHUCK MACCLUER,* W8MQW

Many modern transceivers have low-level transverter capabilities on 630 meters[1] — our new band at 472-479 kHz. Moreover, many of our HF antennas can be brought into effective service on 630 meters as a Marconi by simply using the feedline as the radiator and the horizontal antenna wire as capacitive top loading. But a basic problem is how to raise the typical -10 to 0 dBm (1-mW) transverter output to a reasonable level to be heard. Two inexpensive active parts plus the familiar IRF510 MOSFET are all that is needed for running 14 watts on the digital modes used at 630 meters, namely JT9, WSPR, and CW.

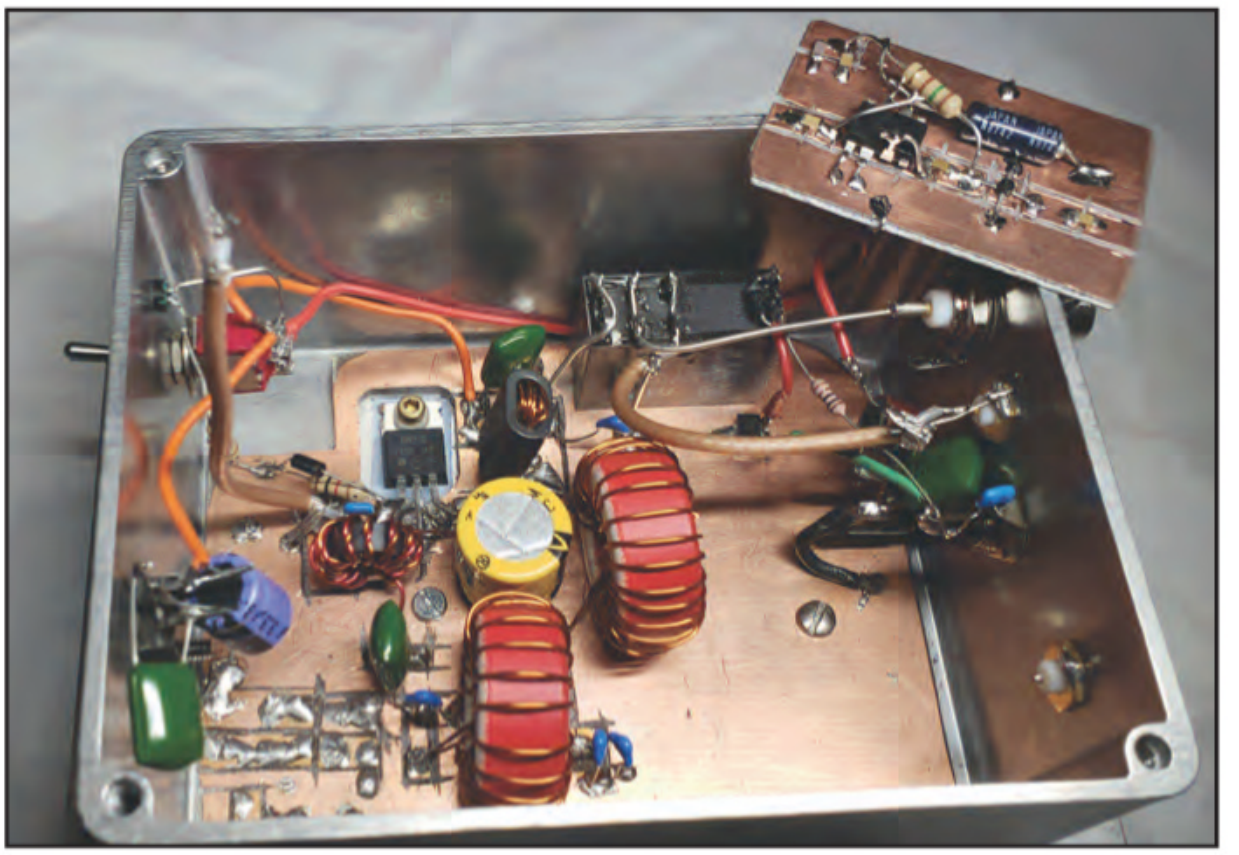


Photo A. The amplifier and low-pass filter mounted on a double-sided PC board bolted through the Hammond enclosure to the heatsink below. The small board in the upper right is the preamp/driver circuit waiting to be installed.

Circuit Description

Figure 1 is the amplifier schematic. It is composed of three sections: The preamp/driver, the broadband amplifier, and the terminal lowpass filter.

First, the preamp/divider consists of the venerable Mini-Circuits MAR-8 monolithic amplifier[2] followed by a MCP1404 MOSFET driver. The MAR-8 is used to raise the transceiver's 0 dBm to a level necessary to trip the MCP1404. The objective is to hit the IRF510 MOSFET amplifier with a 12-volt square wave to toggle it on and off as a switch. But inducing a vertical rise in drain current requires rapid charging of the significant gate capacitance (typically 180 pF), meaning high instantaneous gate current. This is the job of the MCP1404 MOSFET driver. Using the charge stored in the 1-µF capacitor (attached as close as possible to its 12-volt supply, pin 6), the driver delivers the required current to bring the amplifier quickly into full conduction (and to then discharge the gate on the downward swing). Although residing in a petite 8-pin dip IC, the MCP1404 is nevertheless able to source and sink these brief but repetitive high currents. This idea of employing the MCP1404 driver comes from GØMRF's famous 300-watt, 630-meter amplifier design[3]. This preamp/driver would work well as a Class E driver.

Second, the IRF510 amplifier circuit is standard and described in many places, for instance by N6QW[4]. In this case, it is run class C well into cutoff. When powered from a 13.8-volt supply, the output is 13.7 watts[5]. The IRF510 is heatsinked but modest heat is generated because of its 78% efficiency in this configuration.

Third, the low-pass network consists of two cascaded pi-sections of Q=1, where each L and C has reactance of 50 ohms at 475 kHz. This amplifier could be scaled to any frequency by merely scaling these component values — the previous two sections of the schematic are frequency independent.

Construction

The IRF510 circuitry and the low-pass filter can be mounted on a double-sided PC board that is bolted through the bottom of the Hammond enclosure into

* *email: <maccluer13@gmail.com>*

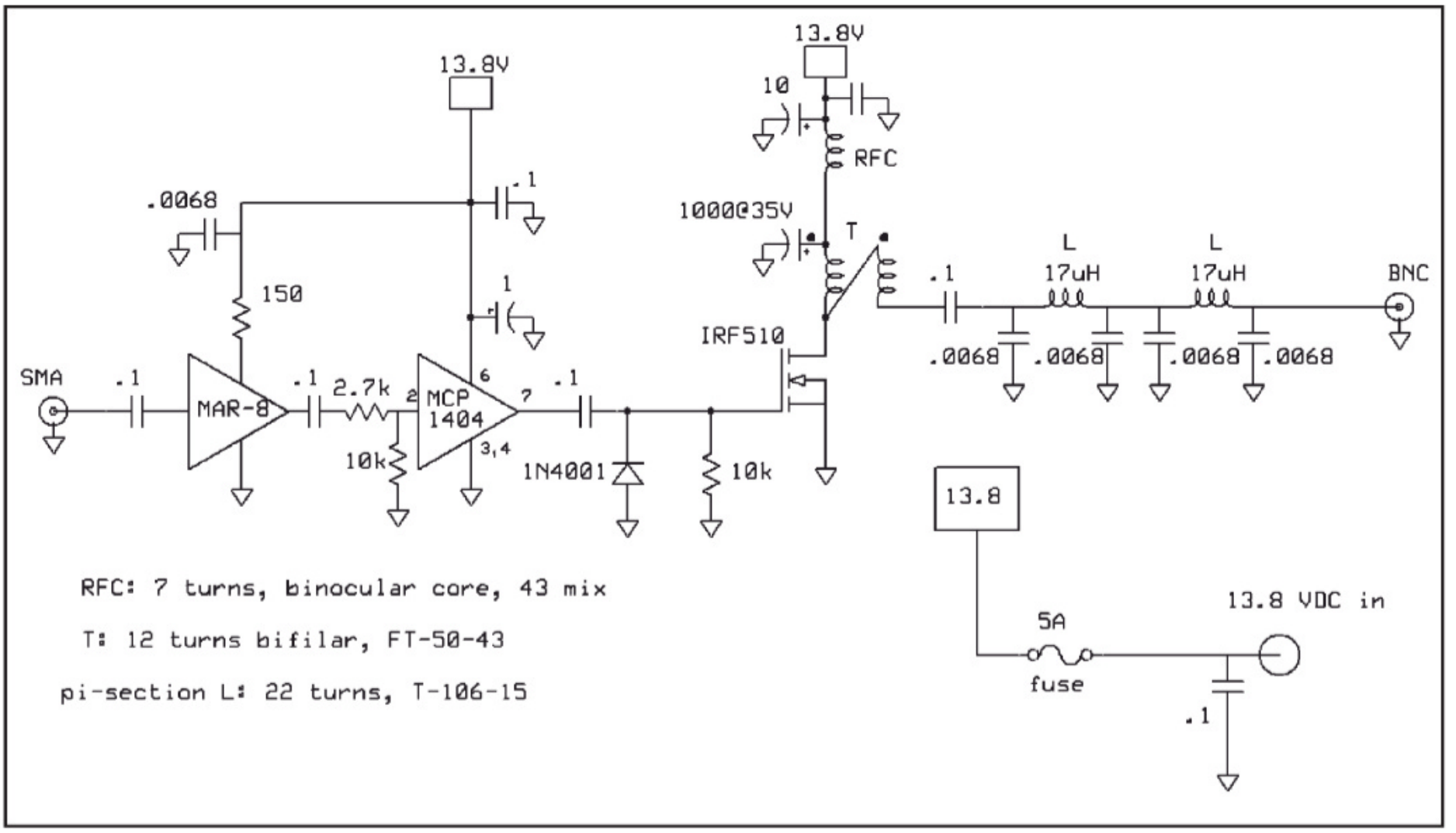


Figure 1. The circuit is composed of three sections: The preamp/driver, an IRF510 MOSFET broadband amplifier, and the terminal low-pass filter consisting of two identical cascaded pi sections.

tapped holes in the heatsink below (see *Photo A*). Convenient solder pads should be outlined with a Dremel® cutting wheel[6]. The only difficult mechanical step will be cutting away matching rectangles in the PC board and the cast aluminum of the enclosure so that the IRF510 and its insulating pad can be mounted directly to the aluminum heatsink. In my experience, the cast aluminum of Hammond boxes is not effective at conducting heat to an attached heatsink. (It would be easier yet to forego the enclosure altogether and build in the open on a PC board bolted to a heatsink.)

The preamp/driver circuit can be constructed dead-bug style on a small PC board scrap and mounted several inches above the bottom amplifier board.

As seen in *Photo A*, I have glued a change-over relay to the amplifier board and included a PTT transceiver protection circuit to create a compact complete amplifier in one box. If you do include a change-over relay on the board, it would be clever to place one of the two pi sections as common to both RX and TX.

Getting on 630 Meters

Your existing HF wire antenna will make a surprisingly effective antenna at 630 meters when configured as a Marconi (see *Figure 2*). The feedline will now be your antenna, while the horizontal wire above will serve only as top loading to pull up the current loop. Connect your inner and outer coax conductors or openline feedline together as it enters the shack. Use an antenna analyzer to measure the impedance of this point against the station ground bus. (You may have to borrow an analyzer like the Rig Expert 54 that actually covers 475 kHz.) You should expect results like Z=120-987j, which I measured from my openline-fed 160-meter dipole[7]. The imaginary part will be very negative since your vertical feedline is a very short stub at this frequency.

Once your antenna is set, the first step is to listen to the band. You will need to match the Marconi's complex Z to 50 ohms with a low-pass L network (*Figure 2*), namely by a shunt C followed by a series L, whose values can be supplied by an online "L network calculator." The C value can be cobbled together from paralleling familiar values. I found my L as a molded RF choke, or you can wind a coil on a ferrite toroid or an AM radio ferrite rod. For instance, to match the above Z = 120 – 987j to 50 ohms will require a shunt C (on the antenna side) of C = 185 pF and a series L = 214 µH (on the receiver side). Depending on your local RF environment you may also need to build up one of the pi low-pass sections of *Figure 1* to use before the receiver. Without some such matching and low-passing, you will hear nothing but mixing product garbage from local broadcast and commercial transmitters. But once low-passed, a rich world of aviation and amateur services awaits your not-so-shortwave listening. Begin by copying and reporting WSPR spots from around the continent.

Transmitting requires more care. Because of the high voltage that will occur at the base of your Marconi, you will need to worry about the voltage breakdown of your matching components. The typical approach is to wind a large diameter base loading coil to cancel the capacitive reactance of your Marconi, then match the remaining real impedance with either a toroidal transformer or an L network[8] (see *Figure 2*). For safety reasons, the base loading coil is most often placed outdoors — for after all, online calculators[9] estimate that even the 14 watts of power from this amplifier will produce nearly 1.5 kilovolts at the base of a typical 40-meter dipole.

Jump On In

But expect to be pounced upon as rare DX. We are all lying in wait for new blood to arrive. You can see in advance what

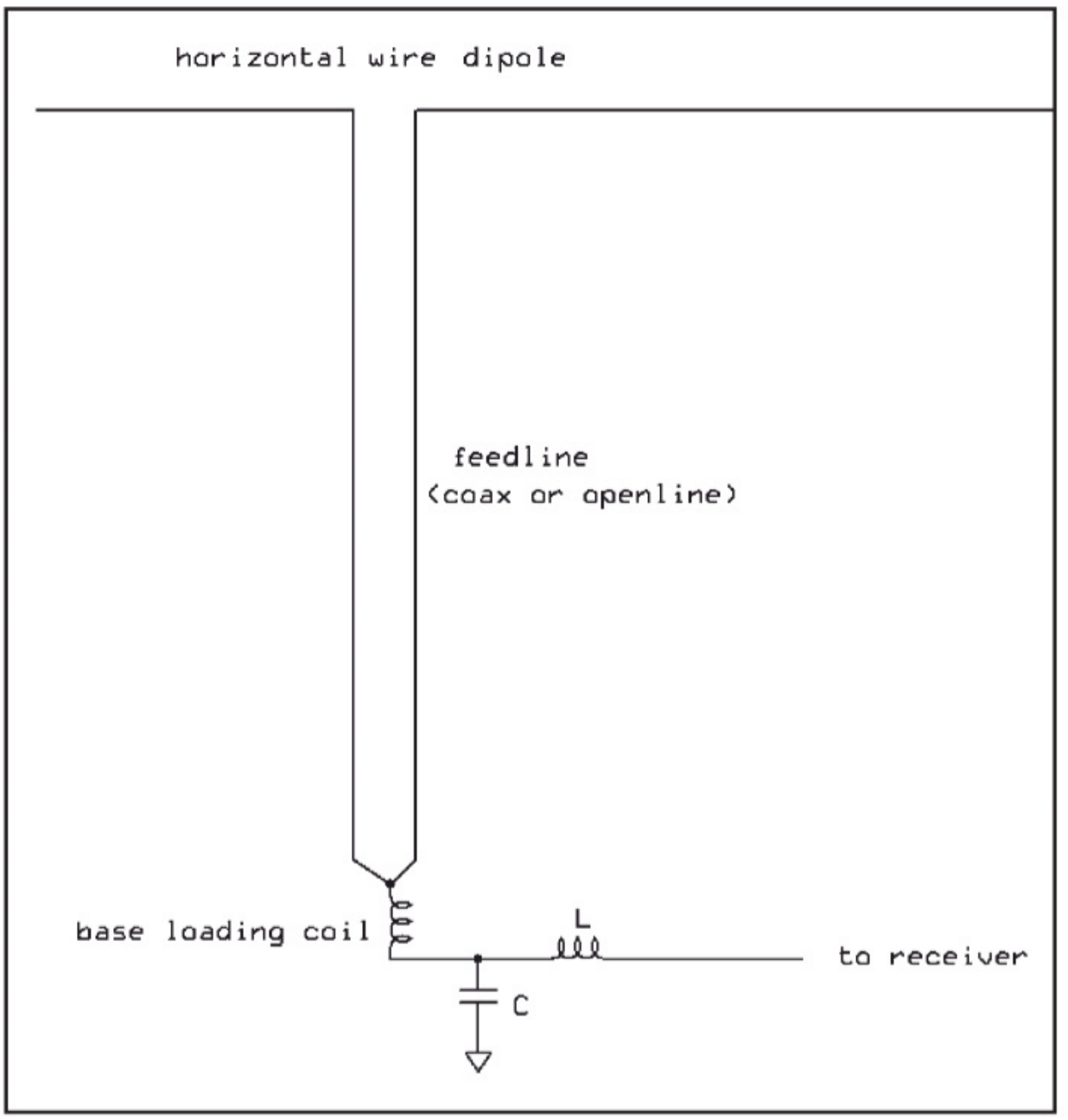


Figure 2. A Marconi antenna is formed by using the transmission line of an HF dipole as a vertical stub that is top loaded by its horizontal wire. To only receive, a simple LC low-pass L network matches the Marconi to 50 ohms. Later, when transmitting, a large outside base-loading coil must be wound to cancel the huge capacitance of the short vertical stub.

propagation you may expect by examining the WSPR map at <https://tinyurl.com/yz4a449>. And remember, if you haven't already done so, be sure to register your station with the Utilities Technology Council (UTC) at <https://tinyurl.com/yab7cnoo> and wait 30 days to receive either approval (including no response) or a rejection.

I thank K9JRI for his critiquing of this manuscript.

Notes:

1. Transceivers with 630-meter transverter capabilities include the Flex 1500, 6300, 6600; the Elecraft K3, K3S; the Kenwood TS-980S, TS-990S; the SunSDR2 pro; and others.
2. A MAV-11 may be more appropriate than a MAR-8 for transverter outputs higher than 0 dBm.
3. <www.g0mrf.com/630m.htm>
4. <www.n6qw.com/IRF510.html>
5. The amplifier will not function below 12 volts. It can, however, be modified to run at higher voltages to obtain higher output by merely supplying the preamp/driver board with regulated 12 volts.
6. Op. Cit., note 4
7. Your local broadcast interference may be so intense that your antenna analyzer will not function. In that case, using an online estimate for your antenna (see Note 9 below), build an interim low-pass filter, measure its output impedance, then arithmetically deduce your Marconi's actual impedance.
8. See for instance, LF Today, by Mike Dennison, G3XDV; RSGB Publications, Bedford, UK.
9. <http://472khz.org> (tools)

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

A Technique for Recovering Very Weak Signals

This month (in keeping with the season), we would like to present an update on a technique we described a number of years ago. This is a scheme that could easily revolutionize communications where extremely weak signals are concerned. The original version was a bit more complex and we received many messages indicating that it was difficult to understand and implement. As a result, we decided to present the technique again but this time with a more understandable explanation of what is going on. To refer to our original comments, as everyone knows, noise limiters, digital signal processing (DSP) and the like are all valuable tools in helping us deal with signals that are in the area of less than S1, but what about signals that are so weak that they are "lost in the noise" and not normally detectable at all? Is there hope? This is what the technique is all about.

Figure 1 is a drawing of what a spectrum analyzer might display when a normal typical signal well above the residual noise level is received. In this case we have used a single carrier (to avoid confusion); however modulated carriers would look similar but with various sidebands as well. The signal shown here is probably in the area of S8 or S9. The noise amplitude compared to the signal is so low that the signal sounds perfect. Now, as the signal gets weaker and weaker, we progress to the drawing in *Figure 2*. Here we have an S1 signal which, as you can see, is just about at or slightly above the noise level. Since there is still some signal, we have a chance … although deciphering it can be an ordeal. Consider *Figure 3*, however. Now the signal (shown by dotted lines) has dropped below the noise level and no matter how long we listen, we hear nothing but a hiss, which is what random noise usually sounds like. If we could somehow eliminate (or at least reduce) the noise level, we would be in business. This is exactly what our technique does. *Figure 4* is a block diagram of the system, which is built around four NPN transistors (Q1-Q4). For the low bands, these can be common 2N4123s. Also present are three general-purpose, low-cost op-amps (A1-A3), which can be any decent quality low cost audio device.

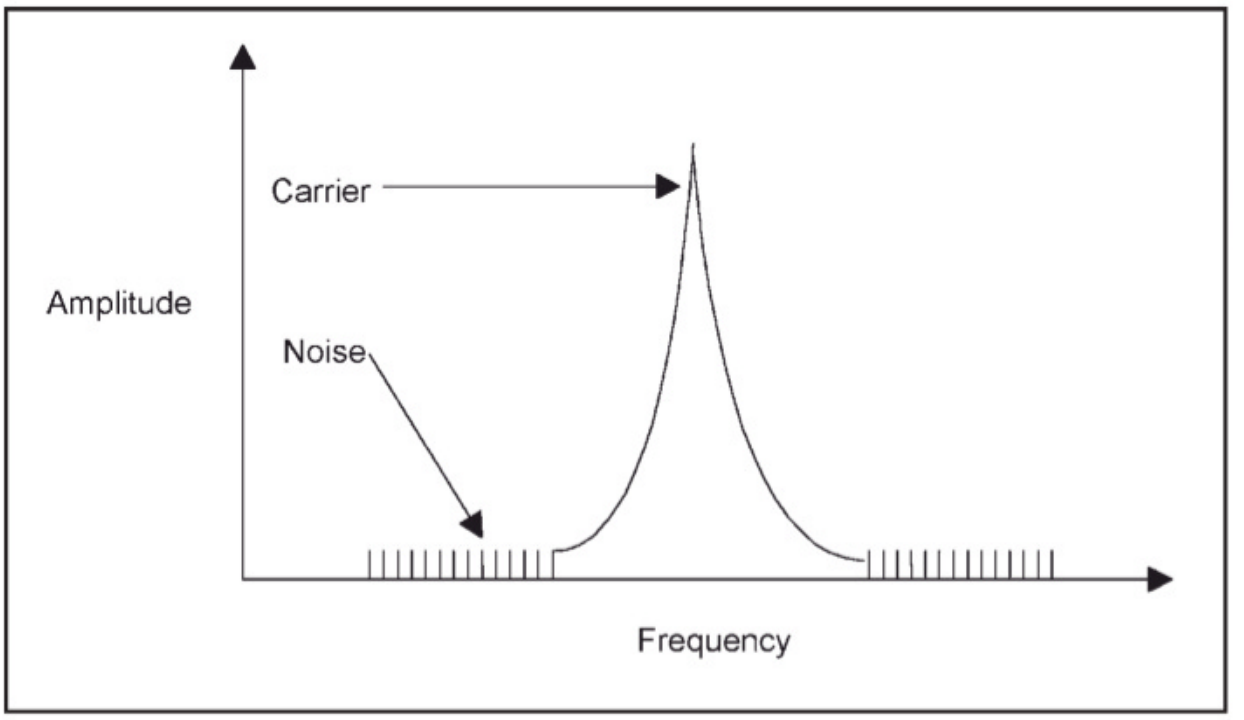


Figure 1. normal S8 or S9 received.

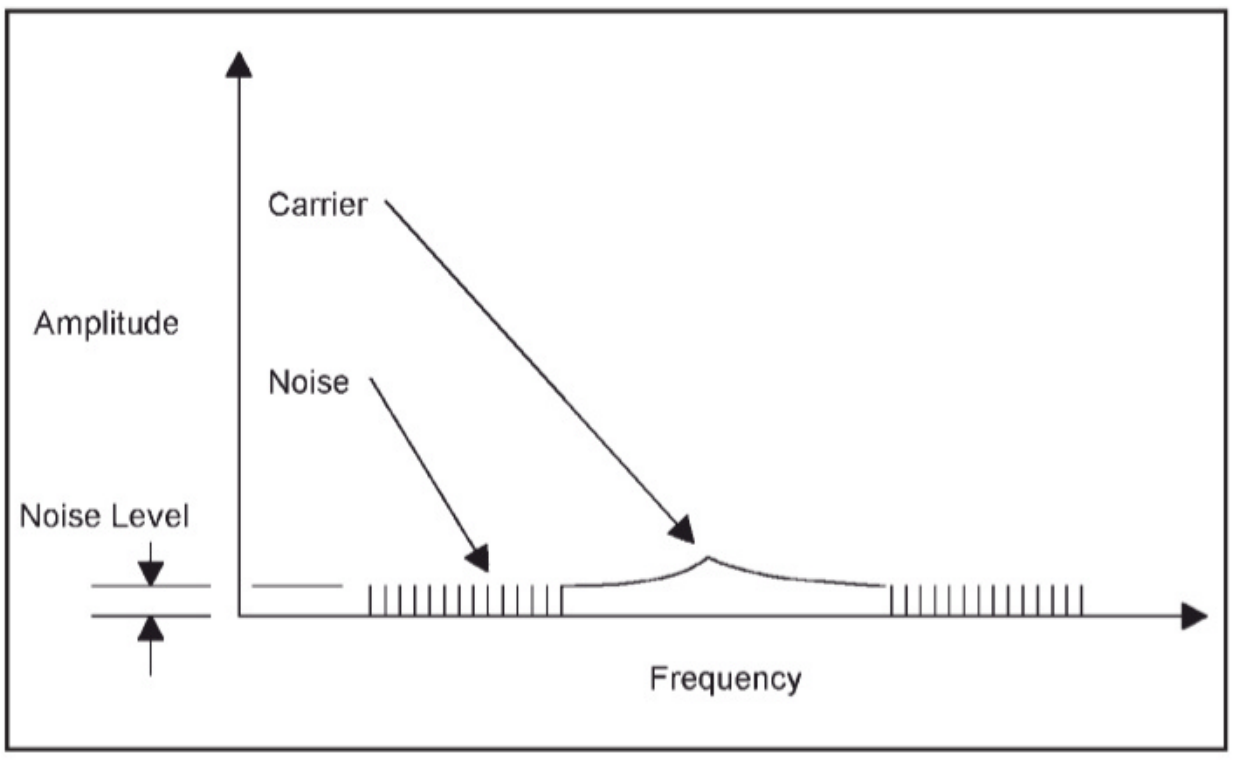


Figure 2. Normal S1 received signal.

In operation, when Q1 is turned on, it shorts the input to the receiver and when cut off, the receiver receives normally. The audio output and audio output plus noise are then applied to two op amp channels comprising A1 and A2. These are common op-amp amplifiers with a gain of one (the two 1K resistors and the 2K feedback resistor for each channel). If Q2 and Q3 are cut off, both amplifiers pass their inputs to their outputs. If either one conducts, however, then the output of that particular amplifier is cut off. Now, notice that there is an oscillator, OSC 1, that drives Q1 and Q2 directly and Q3 opposite, due to Q4. As a result, when Q1 and Q2 conduct, Q3 is cut off and when Q1 and Q2 are cut off, Q3 conducts.

When both Q1 and Q2 are cut off, RF from the antenna (at the input to the receiver) is passed through a 50-ohm load and then through the normal

*c/o CQ magazine

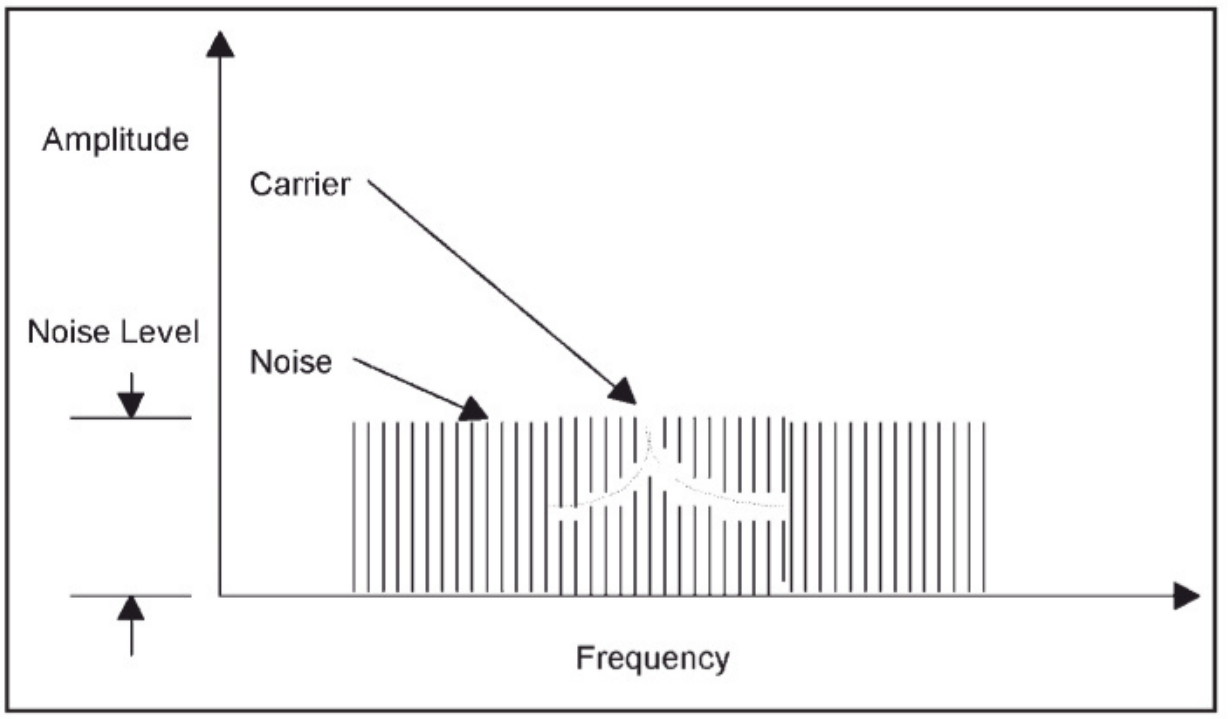


Figure 3. Received signal below noise.

receiver RF/IF/detector chain. Audio output is then passed through channel 1 in the normal manner and appears at the output of channel 1 (A1). This output we will call {signal + noise}. At the same time, Q2 is conducting, so the output from channel 2 (A2) is zero since its input is shorted.

Now consider what happens when Q1 and Q2 conduct and Q3 is cut off. The output from the receiver is now only noise (since Q1 is shorting the input) and the output of channel 1 is zero since Q2 is shorting its input. At this time, Q3 is cut off, however, so the output from channel 2, which can now amplify, is simply {noise}. Next both the {signal + noise} output from channel 1 and the {noise} output from channel 2 are connected to a differential amplifier, A3, which neatly subtracts one from the other according to the following relationship:

{signal + noise} – {noise} = signal

The result is the recovered signal.

As the speed and duty cycle of the oscillator are varied, the ratio of signal-to-noise reduction will also vary, and optimum results can be obtained with all types of signals from AM to FM to SSB by the proper adjustment. The frequency of the oscillator, however, should be at least 2 times faster than the expected maximum modulation frequency of the detected signal. If the oscillator is too slow, portions of the signal that occur during the "noise" channel interval will be lost, resulting in distortion.

Please note that the accuracy of this system is not ideal. Since there is a finite time interval between the {signal + noise} portion and the {noise} alone portion and since noise itself is random in nature, cancellation (of noise) will never be truly perfect. With careful adjustment of the oscillator's frequency and duty cycle, however, it should be easy to "pull" signals that are least 10 to 20 times below the noise up to levels that can be cleaned up by more conventional methods. Obviously, such an approach needs a lot of additional experimentation but the description given here is a very good place to start.

Since the beginning of April is usually filled with all sorts of unconventional noise, we could not think of a better project at this time than noise reduction. We certainly got a fair share of email the last time we proposed this solution. Please let us know of your results.

– *73, Irwin, WA2NDM*

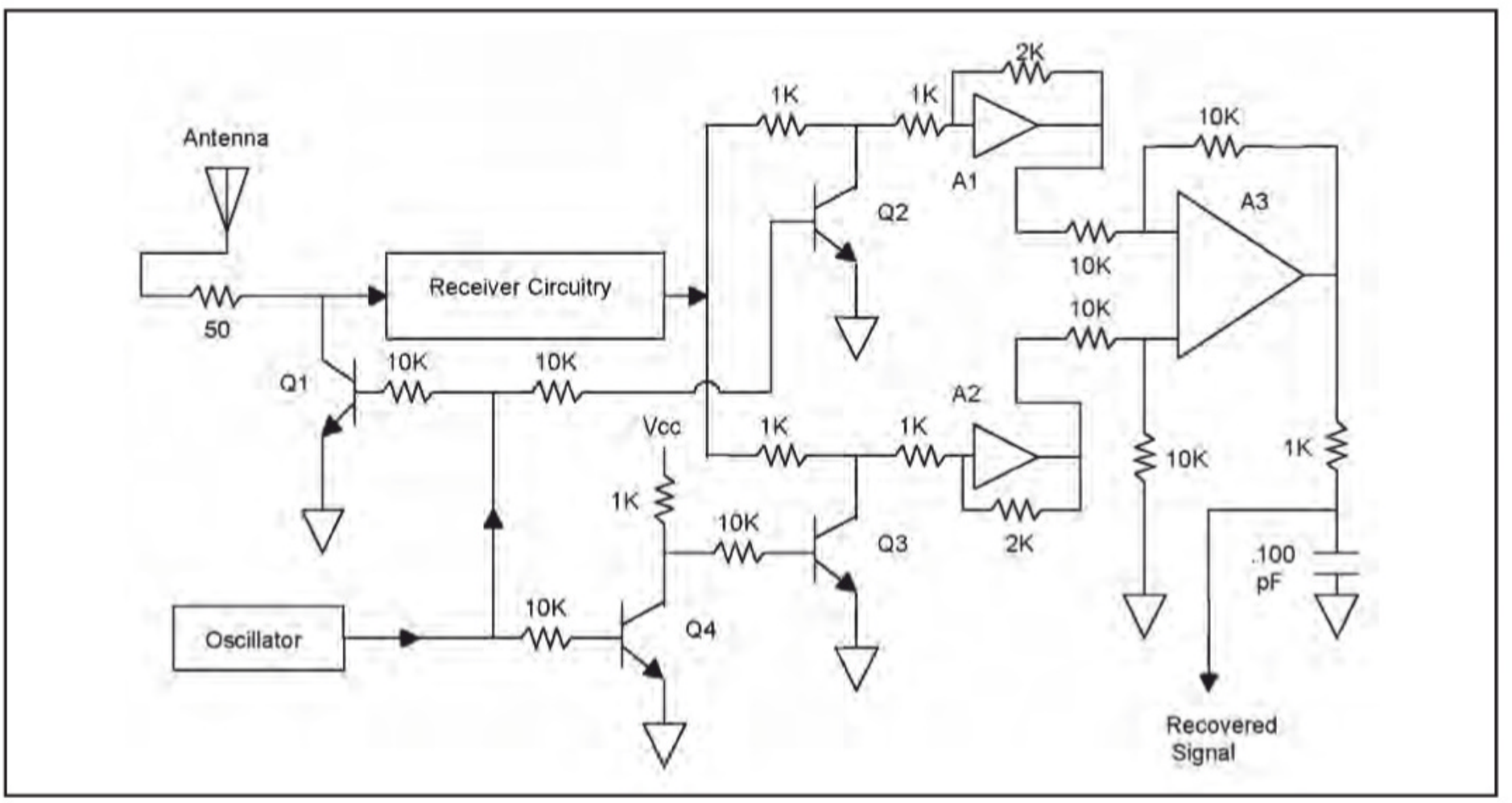


Figure 4. Diagram of noise eliminator.

THE LISTENING POST

BY GERRY DEXTER

Meyerton Shuts Down!

~ Oh no! There comes word that the Sentech-operated Meyerton relay in South Africa was closed down at the end of March. Neither the BBC nor Channel Africa used the facility enough to make it profitable, and the other assorted users didn't occupy enough transmitter time to take up the financial slack. Overrcomer to the rescue?

~ Ralph Perry forwards word about two rejuvenated stations in Colombia: Alcaravan Radio (5910 kHz) and La Voz de Concencia (6010 kHz) are to receive solid-state 1-kilowatt transmitters. Both stations are located in Puerto Lleras and both suffer from local power supply problems. *The World Radio TV Handbook* (WRTH) shows the two as being "irregular" for now.

~ The same group that owns the Colombian stations from the previous shortwavelet is awaiting a license for a shortwave broadcast station in Pucallpa, Peru, although the start-up for that one may be years in the future, if it ever happens.

~ Koode Radio International is the latest opposition broadcaster aiming at Nigeria. The program goes out via Issoudun in France daily from 1900-1930 UTC on 7265 kHz in the Fulfulde, Hausa, and Fulani languages. This is apparently run by Public Radio International, based in Minneapolis.

~ Radio Cultura de Araquara in Brazil has announced plans to reactivate 3365 kHz with a 1-kilowatt transmitter from 2100-0300 UTC. It is already listed on that frequency, and has been for several years.

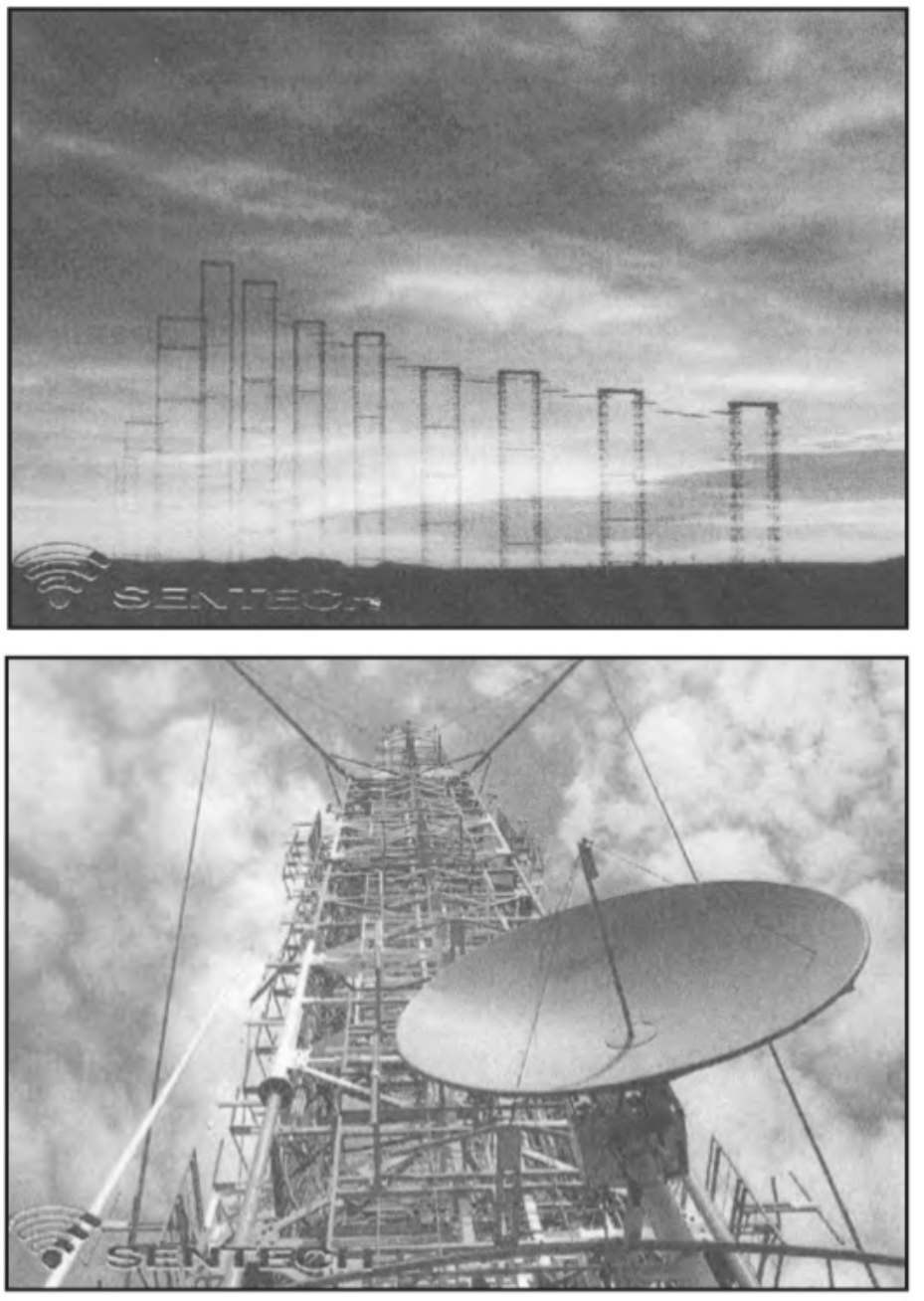
~ Eye Radio, an opposition station aimed at South Sudan, has restarted broadcasts via Madagascar from 0400-0500 UTC on 11630 kHz and 1500-1600 UTC on 15410 kHz via France using Sudanese Arabic, English, and vernaculars.

~ Radio Sinit Eritrea is the latest anti-Eritrean opposition station entry. It's broadcasting via France on Saturdays at 0500 UTC on 9540 kHz. Another new one is Sowt Al-Somood (The Voice of Steadfastness), also via France on 17545 kHz at 1500-1600 UTC in Arabic and Tigrina.

~ After a six-year absence, Radio Nepal is back on 5005 kHz from 1100-1500 UTC in English, though using very low power. However, some say the station is also testing power levels up to 20 kilowatts in the hours before it signs on.

~ Papua New Guinea's national broadcaster (NBC) plans to reopen its station at Daru, which was formerly on 3305 kHz.

~ Radio Spaceshuttle, the (only?) Finnish pirate, says it plans to resume activity on many of the usual pirate frequencies, not to mention 9290 and 12265 kHz, as well as in the 15805-to-15880-kHz range. In other words, just about anywhere on the dial. The list of possibilities is too long to include here. Man the "scan" feature on your receiver.



Two photos of the doomed Meyerton transmitter site antennas in South Africa.

~ As I suspected, the WWV service has been refunded, including all frequencies ... and WWVB and WWVH. The service will celebrate 100 years this year.

~ The federal government has changed the name of the Board of Broadcast Governors to the U.S. Agency for Global Media (USAGM).

Leading Logs

Your shortwave broadcast station logs are always welcome. But please be sure to double- or triple-space between the items, list each logging according to the station's home country and include your last name and state abbreviation after each. Also needed are spare QSLs, station schedules, brochures, pennants, station photos, and anything else you think would be of interest. The same holds for you amateur

**c/o CQ magazine*

radio operators who also listen to shortwave broadcasts. You, too, are also most welcome to contribute.

Here are this month's leading logs. All times are in UTC. If no language is mentioned English is assumed. After you've read the printed logs, you can find more online at <www.cqpluslisteningpostblogspot.com>.

ALGERIA—Radio Algerienne, 5980 via France in Arabic at 2146. (Brossell, WI)

BANGLADESH—Bangladesh Betar, 15105 at *1228-1300* woman reading station ID, opening announcements in English followed by news, comments, and music to close. (D'Angelo, FCDX)

BOLIVIA—Radio Mosoj Chaski, Cochobamba, 3310 at 1004-1036 faded out with man hosting music program in Spanish. (D'Angelo, FCDX)

CHINA—China National Radio, Network 2, 6090, Kunming at 1125 man and woman speaking Chinese with talks and music, several announcements at the bottom of the hour; 6165, Lhasa, Tibet, at 1139 with man speaking in Chinese, traditional Chinese music.

PBS, Lhasa, 6130 at 1157, traditional Chinese vocals, time pips and female announcer in Tibetan. (D'Angelo, FCDX)

PBS, Sichuan, 7225, Chengdu in Mandarin at 2155, obliterated by a ham after about 4 minutes. (Taylor, WI)

ETHIOPIA—Radio Fana, Addis Ababa, at 0424 with terrific HOA vocals and announcer in Amharic. (D'Angelo, FCDX)

INDIA—Athmik Vatra Radio, 15350 at 1432 with talks in Sambalpuri. (Brossell, WI)

PAPUA NEW GUINEA—NBC-Bougainville, 3325 at 1142-1157* some announcer talk, island vocals, but very weak. (D'Angelo, FCDX)

SWEDEN—IBRA/Radio Sadaye Zindagi service via UAE, 5940 at 0249 with man speaking in Dari and a musical bridge. (Taylor, WI)

ZANZIBAR—ZBC, Dole, 6015 at 0351, several men in a heated Swahili discussion. (D'Angelo, FCDX)

You can find the complete log listings online at: <www.cqpluslisteningpostblogspot.com>.

Back in the Day

Zimbabwe Broadcasting Corporation, Gweru, newly on the air with 100 kilowatts on 3306 at 0318 on September 27, 1995, with its domestic service in vernacular.

Just Sayin'

My sincere thanks and deep appreciation to Mark Taylor of Madison, Wisconsin, who took over the reins of collecting and reporting log listings for the past three months. Mark edits the weekly NASWA Flashsheet of the North American Shortwave Association <www.naswa.net>. He had to have more fun with it than I did, what with a broken hip operation, followed by three fun months of physical therapy!

Thanks!

The usual high fives to the too few who checked in this time: Bob Brossell, Pewaukee, WI; Rich D'Angelo, French Creek DXpedition, PA; Mark Taylor, Madison, WI; Harold Sellers, Vernon, ON; and William Hassig, Mt. Pleasant, IL. Thanks to all of you!

Until next month ... Keep on keepin' on, and ... Celebrate Shortwave!

EMERGENCY COMMUNICATIONS

BY WALT PALMER,* W4ALT

Ready, Set… STOP!

Uh, oh … overnight the fit hit the sham. A tornado, dam break, blizzard, major power outage, whatever, has caused your EmComm group to activate. You gather up your "stuff" and are ready to head out the door. You take a quick inventory:

- Go Kit, check
- Batteries, check
- Spare antenna, check
- Extra cables, check

Looks like everything is ready to hit the road. But wait, we forgot the most important part of our inventory: YOU! Are you ready to deploy?

Preparing for your emergency deployment usually requires you to consider:

- Psychological preparedness – for you, your family, and friends.
- Practical readiness, including your personal and professional affairs, and what to pack.
- Situational preparedness. You should study and understand, as much as possible, the operational context in which you will be working.

You may be called to deploy to an emergency at short notice. You may have little time to make yourself ready and deployment will dramatically interrupt and change your daily routine.

An emergency assignment also challenges your wellbeing: The working hours will be long; working conditions will not be ideal; living conditions may be spartan; security may be a concern; your sleep is likely to suffer. You can be effective in such conditions, but you are likely to be able to manage the stress of your deployment much better if you are well prepared.

Emergency missions can also create anxiety in those around you. Deployments can easily disrupt our relationships with partners, spouses, children, and friends. All may have concerns, and it is important to find ways to include them as you prepare to deploy.

Psychological Preparedness

One of the first canons of emergency communications deployment is that your family and home will be safe during your absence. Areas to consider:

- Personal and family issues
- Practical and logistical arrangements at home or at base
- Practical preparations for deployment
- Psychological preparation

When you prepare psychologically, you attune your inner resources to the coming situation. A person who is psychologically prepared expects certain challenges, foresees their impact, understands how he or she will react, is able to identify his or her inner resources, and knows where and how to seek support when needed.

People differ in the degree of preparation they need. Some prepare very thoroughly. Their preparation is planned and detailed. Others are happier to go with the flow. Find out beforehand what level of preparation suits your personal needs.

Attitude is an important factor and will influence your ability to succeed in the demanding and chaotic environment of an emergency. What qualities are required of members of an emergency team?

- To be professional
- To be a team player
- To be flexible and understanding
- To have a sense of humor!

Practical Considerations

The underlying principle is that you should not delay your deployment, because the emergency response operation will need you. A few days in a fast-moving operation can make a big difference.

- Have a primary and alternate child-care plan
- Have a primary and alternate elder-care plan
- Have emergency plans in place in the event of a disaster — where you will go; how you will communicate
- Have an emergency plan for pets in the event of a pet's illness or injury or the family's need to shelter or evacuate in a disaster
- Have a communications plan for your family and friends. Determine and identify someone, preferably outside of the potential local disaster area, or better yet, in another part of the country, whom you can use as a central point of contact should your family need to bug out quickly.

Psychological Readiness

Create a mental picture: Think about the upcoming deployment and compare it to previous deployments. Develop this into a structured preparation by reflecting on what was helpful to you in similar contexts and what you would have done differently. Ask what aspects of the new deployment are likely to be the most challenging for you, professionally and personally.

This exercise will help you to identify the challenges you are likely to face and the resources you will draw on to cope and deal with them.

Assess your current psychosocial wellbeing: It may be difficult to assess your own state of mind. Nevertheless, try to give yourself some honest feedback on how you have functioned in recent months. Have you slept enough and well? What has been your level of energy? What has been your prevailing mood? Have you consumed more alcohol than usual, or other substances? What level of social sup-

* *email: <w4alt@cq-amateur-radio.com>*

Packing Tips

• Make a checklist now
• Adjust it to account for anticipated conditions (climate, weather, culture) in the place to which you are deployed
• Start packing early; do not wait until the last minute
• Have small and large bags
• Pack essential food and medical items that are not standard and may be unavailable
• Pack personal items that will give you comfort
• Shop ahead of time for camping equipment, clothes, etc.
• Prioritize light, essential items. Be ready to adapt packing to actual conditions (cold, hot, humid etc.)
• Find out what you are expected to bring, and what will be available when you arrive (laptop, specialized equipment, etc.)
• Take an inventory with you in case your bag gets lost

Some Packing Ideas for Deep Field Locations

• Mosquito net dome, treated with repellent, freestanding • Sleeping bag, full zip, treated with repellent • Fleece blanket and mattress (including repair kit) • Your favorite pillow, ear plugs, sleeping mask • Tarpaulin, solar shower, fire blanket • Water purification bottle with integrated filter • Micropur tablets • Kitchen utensils (Camp-A-Box), thermos • Multi tool, whistle • LED lamp • Compass, fire steel lighter, sewing kit, waterproof matchbox • Set of cleaning sponges • TSA-approved padlock with code • Refreshing tissues, germicide • Mosquito coils with holder • Working gloves • Batteries

port have you received from others? Have you been able to support people close to you? Are you running away from anything?

Familiarize yourself with typical stress and trauma reactions: When we experience psychological disturbances, if we do not understand what they are linked to, we can feel as if our body or mind has let us down. If you are familiar with the neurobiological symptoms of stress and trauma, you will be able to recognize stress reactions faster and will be more likely to address the situation.

Develop your personal indicators of fatigue: Being aware of your stress reactions is a first step towards building resilience. When you are in the middle of a difficult situation, it is hard to step back and decide what you need to do to change your situation. Put down how you feel, think and behave when you are close to the edge or extremely tired. Discuss your list with friends who know you well; ask them to comment on it and add their observations of you. Be ready to accept critique with the spirit in which it is offered. You are not under attack.

The "buddy system": It has been shown that the support of close friends helps to sustain people who are working in stressful conditions. Ask a few trusted friends or family members to check on you regularly while you are deployed. If possible, discuss how they will "watch over you" and what warning signs they will look for. Make use of your personal indicators of fatigue.

Prepare a self-care plan: Think about what normally relaxes you (music, books, sports, etc.). Keep such items ready: prepare your Kindle and music, food, photographs, exercise equipment (skipping rope, pilates ball, football). Design a realistic self-care plan that you know you can implement.

Take care of your relationships: Emergency deployment will disrupt your relationships. That does not mean they will dissolve, but you need to pay attention to how they are affected. History suggests that relationships survive best when everyone is involved in preparing for deployment. This may seem counterintuitive: You may be tempted to conceal dangerous or ugly aspects of the operation from those you love. In fact, by giving them a role, you help those close to you to prepare themselves; and they often feel fulfilled by supporting you.

Help your children to understand: Today it is harder and harder to keep information away from children. Try to understand how they imagine your world. Help them to understand where you will be going, what you will be doing, and how you will keep in contact.

Practical Readiness

Sort out your affairs: It is important to put your financial, legal and daily affairs in order before you leave. Once you are on mission, it is unlikely that you will be able to settle bills, pay the rent, or take care of other aspects of your life at home. Plan for this in advance and make sure that affairs at home are taken care of or can wait.

Health: Have a medical check-up and, if necessary, obtain medical clearance. If you are on a medical regimen, be aware of side-effects that may flare up during stressful periods. Be sure you have — and bring with you — an adequate supply of any medications you may need.

Paperwork: Make sure your passport, government photo ID, and radio licenses are up-to-date.

Your current work: If you need to take a leave of absence from your current job, make sure that backup arrangements are in place, and that you have agreed with your supervisor how outstanding projects and activities will be managed while you are away.

Situational Preparedness

Do not leave preparation for the last minute. Some things can be done much earlier. While you can and should actively research the area and operational context to which you will deploy, it is well understood that you cannot prepare deeply if you are deployed within a few hours or days.

Be mindful of how stress and lack of recuperative rest can affect your performance, mood, and nerves. Take breaks when available. Stretch and exercise to move and freshen blood. Take deep breaths. These little tasks can improve your overall wellbeing and performance.

There is a world of difference between working an exercise, where you know you will be home in your own bed that night, and a real-world emergency operations deployment. Make sure you are prepared, mentally, physically and tactically for the task at hand. Be careful out there!

QRP: Low-Power Communications

BY R. SCOTT ROUGHT,* KA8SMA

Winter Field Day, Digital QRP Operation, and a Note from Z35M

As I work on this month's column, I am huddled up inside the family travel trailer with my laptop computer, QRP rig, and a hot pot of coffee, operating Winter Field Day (WFD). Last year, I operated WFD from a picnic table in a nearby state park located along Lake Michigan's shoreline. I built a roaring bonfire, roasted hot dogs, and drank an endless supply of coffee brewed over an open flame — it was an excellent adventure (*see April 2018 cover and column -ed.*).

I was planning to do the same this year, but my XYL put a stop to my plans and told me I had to set up operations inside our travel trailer (parked next to our house for the winter) since the high temperature in northern Michigan for WFD was predicted to be in the single digits. As I make contacts from inside the warmth of the trailer, there is a frigid Arctic wind howling outdoors that would have turned my fingers into icicles had I been pounding brass or grasping a microphone outdoors. I give credit to my XYL for saving my fingers and warming my belly as she brought me a bowl of piping-hot chicken noodle soup for dinner a few hours after the start of WFD. Happiness is hot soup mixed with a little QRP fun on a cold winter's day! I am already tinkering with the idea of operating from the travel trailer for next year's WFD and thinking about where I can string my wire antennas. I may even suggest to my XYL that, if I operate from the travel trailer next year, meatloaf with a balsamic mushroom sauce, twice-baked potatoes finished with cheddar cheese and sour cream, and steamed green beans glazed with garlic and bacon should be on the dinner menu instead of soup – HI! I know that operating from a travel trailer is not the most "authentic" emergency operating location, but at least it gets me outdoors and on the air from somewhere other than my ham shack. Now that I've shared my 2019 WFD setup, let's get into this month's column.

Regular readers know that I have not written a lot about digital modes, and for good reason. Until recently, I have not been digitally active. I have operated RTTY, JT65, and other digital modes as a guest operator at other hams' shacks, but never from my QTH. This year, however, Santa Claus left a MFJ-1204 USB Radio Interface under the tree with a note attached to it indicating I should give FT8 and some of the other digital modes a try. It is amazing how well my XYL can read my mind. This month, we discuss the MFJ-1204, my "lesson learned" in setting up the computer so I could successfully operate FT8, and we hear from our friend Vlado Kovaceski, Z35M, in Macedonia, who again makes us marvel with one of his recent QRP endeavors and shares some amazing QSO statistics during this period of minimal sunspot activity.

Photo A. The MFJ-1204 USB Radio Interface (top) mounted atop the Yaesu FT-817.

Getting Digital with the MFJ-1204

The MFJ-1204 (*Photo A*) is a universal USB radio interface that provides a quick and easy way to join the digital age and have fun with the digital modes, such as RTTY, PSK31, AMTOR, JT65, and FT8. The interface is powered by your computer's USB port and can work with nearly any transceiver equipped with a data/accessory jack. MFJ has a complete line of interface cables, each equipped with the appropriate connector for plugging directly into your radio. Since I am using this unit with my Yaesu FT-817, MFJ's model number 1204MD6 equipped with a 6-pin mini-DIN interface cable is the version suited for my radio and other transceivers supporting a similar data port. MFJ's website <www.mfjenterprises.com> provides a breakdown of the product's model numbers to determine which model suits your needs.

What I like most about the MFJ-1204 is that setup is a snap and the only fumbling with cables required is plugging the USB connector from the unit into an empty computer port and connecting the interface cable to the transceiver. Its small size (2-inches H x 4.5-inches D x 3.75-inches W) and light weight should make portable operation easy. I will provide an update later this year after the weather breaks and I hit the trail (with my laptop in tow) for a digital outing. The MFJ-1204 uses no-solder internal jumper wires so that the unit can be easily reconfigured for use with other transceivers, if desired. The instruction manual (downloadable from MFJ's website) provides a wiring diagram showing the jumper wire configuration for different transceivers and connector types.

After connecting the cables, using the interface is as simple as tuning your transceiver to the frequency on which you want to operate, booting up your computer, and adjusting (per the instructions) the receive audio and transmit audio levels on the front panel of the MFJ-1204 for a clean signal. I have found that after making the initial level adjustments,

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Photo B. Z35M's hillside operating position overlooking Skopje, Macedonia. Hold onto that KX-2, Vlado!

Table 1: Z35M's QRP QSO Totals 2016-2018

Year	QRP QSOs Portable Operation	QRP QSOs Home QTH	Total QRP QSOs
2018	3,055	3,431	6,486
2017	1,458	317	1,775
2016	3,736	638	4,374

no future adjustments have been necessary; however, your setup may be different. Setup is so quick I am on the air moments after my computer boots up. The MFJ-1204 makes digital operation a cinch.

Software Decisions

A variety of downloadable software options for operating the digital modes is available on the internet. I was surprised at the number of programs available and, after a bit of research, I decided to download WSJT-X <https://tinyurl.com/hg6rnxm> as it runs both FT8 and JT65, the two weak-signal digital modes that hold my interest, as well as WSPR (Weak Signal Propagation Reporter), a mode designed for sending and receiving weak signals to test propagation. Downloading the WSJT-X software was painless and took just a few minutes. I highly recommend that prior to downloading WSJT-X, you read the "WSJT-X 2.0 User Guide" and either download or print a copy for future reference as it covers important items such as installation, settings, on-screen controls, and instructions on how to operate modes such as FT8 and JT65.

Lesson Learned!

After downloading and configuring the software, making the appropriate cable connections to my computer and transceiver, and setting up my transceiver for digital operation, I was not able to decode any FT8 signals. Since I did not know where to begin troubleshooting this problem, I reloaded the WSJT-X software onto the computer, double-checked the cable connections to be sure none were loose, and went as far as removing the cover on the MFJ-1204 to check if the jumper wires (which came pre-wired for my transceiver) were in the proper configuration. I also checked that each jumper wire was secured and properly seated to the PC board. Still no luck! I was nearly at my wit's end when I remembered that the transmit and receive sequences between the transmitting and receiving stations must be in sync with each other for FT8 to work. Since the timing for each exchange works against the computer's internal clock, if my computer's clock was not set exactly to UTC (to the second), then I would be out of sync with the other station. After realizing this may be the issue, I tuned in WWV on my transceiver, double-clicked the clock on the lower right-hand corner of my computer screen, and listened for WWV's long beep to mark the minute as I watched the clock's second-hand sweep across the dial. I soon discovered that my computer's clock was off by more than 30 seconds. I manually reset the clock so it matched WWV to the second, then went back to try and decode FT8. The fix worked and I was soon decoding FT8. This was a hard lesson learned as I spent several hours troubleshooting a problem that took me less than a minute to fix. I now check my computer clock's accuracy against WWV each time before operating FT8.

Aside from WWV, there are websites such as Time.is <https://time.is> that will indicate if there is a time discrepancy between your computer's clock and the actual time, and Dimension 4 <www.thinkman.com/dimension4> that will automatically adjust your computer's clock to keep it on pace with the actual time. Although it takes a little finagling, I prefer to listen to WWV and manually reset the clock when firing-up the computer for FT8 operation. This is probably "old-school," but to me it seems like the right thing to do since I used to boast to my friends at school (many, many years ago) that my wristwatch was set to a government-run HF radio station linked to an atomic clock. I then argued their watches did not reflect the official United States time since they were set against the "time lady" on the telephone. Yes, I was a nerd and, to this day, still accept only WWV as the standard of time.

A Different Spin on Radio

I knew about FT8's popularity prior to trying it; however, I must admit that I am truly amazed at the number of stations on the air operating this mode. On several occasions, I have tuned across the HF bands in search of a CW or SSB signal and heard only a few stations on the air, but when I switched to FT8, the world lit up on my computer screen as the FT8 waterfall display was jam-packed with signals.

The big question … Is FT8 a mode that I will be spending a lot of time with in the future? Since FT8 is new to me, the jury is still out on how many FT8 contacts will hit my logbook. I do believe that FT8 removes the human element due to its automated approach, but I am getting used to this type of operation. Making an FT8 contact is as simple as scrolling your mouse over a station that is calling CQ (as indicated by the software), clicking on that station, then watching your computer complete the QSO by following a pre-determined

Photo C. Z35M's low-height wire antenna against the rocky hillside.

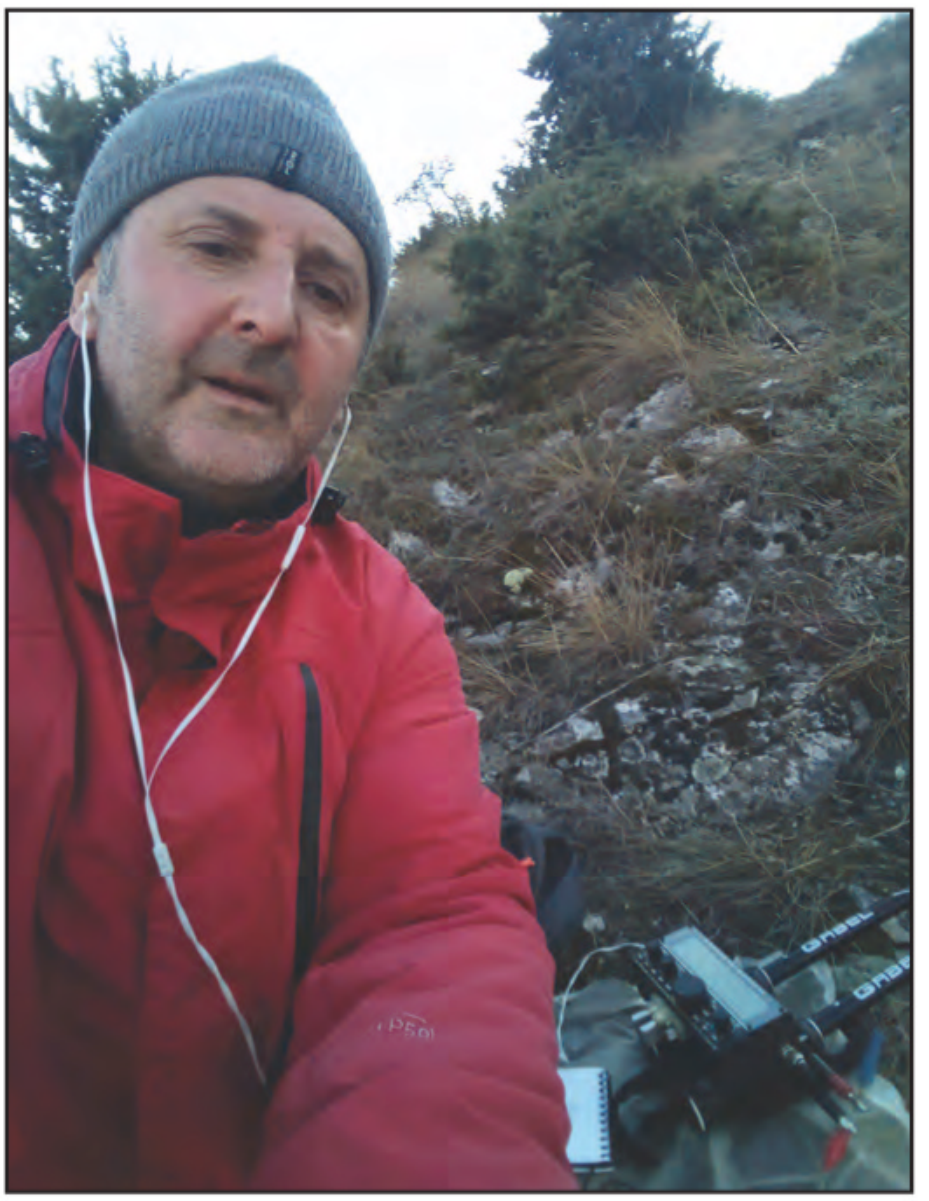

Photo D. Z35M says that at sunspot minimum, "the bands are not closed, the operators are closed."

script containing your callsign, grid square, and power output. The computer also automatically generates a signal report for the other station. FT8 is a completely different experience than CW, SSB, and other digital modes since human action is not necessary to maintain the exchange. What I really like about FT8 is experimenting with power output to determine how low I can go and still make a contact, but I do miss the opportunity for a bit of rag chewing.

Z35M Strikes Again!

Our friend Z35M checked in with the column after the first of the year to share a unique low height antenna test he performed on New Year's Day from a very steep hillside (I call it a mountain – HI!) overlooking Skopje, Macedonia (*Photo B*). He reports stringing two pieces of insulated wire, each measuring 5.3 meters (17 feet 4 inches) in length, along the rocky face of the hillside for use as an antenna (*Photo C*). The wires were fed into the automatic antenna tuner in his Elecraft KX-2. The results for a wire antenna lying on a rocky hillside are very surprising, especially when taking into consideration the contacts were made at QRP levels. After making one CW contact with a station in Finland on 20 meters, he switched to 30 meters and logged several QSOs with stations in Germany, Poland, Lithuania, and Belarus. Even more amazing, Z35M notes that while operating 20 meters he was spotted on the Reverse Beacon Network by stations in the United States. Once again, Z35M shows us just how little is needed to make a QSO.

Z35M also shared his QRP QSO statistics for the past three years as a reminder to all of us that it does not take much to make contacts when sunspots are far and few between. *Table 1* shows the number of QSOs he made each year while working portable and from his home station. His total number of QRP QSOs for the past three years is 12,635! An additional 17,426 QSOs were made during this same period, but running 100 watts. It should be noted that all these contacts were made with single-element wire antennas.

Z35M's secret to making so many QRP contacts is staying active regardless of the sunspot number and implementing an operating strategy as though you are running 100 watts. In other words, do not adopt an inferior mindset because you are operating QRP. As Z35M states, an "inferior QRP mindset results in inferior QSO totals." He also reminds us that QRP contacts can be made when there are no sunspots and the bands are believed to be closed. Z35M has a different view on the topic of no sunspots equals no contacts, and states "the bands are not closed, the operators are closed." I wholeheartedly agree — great statement!

Tying the Knot

Do not overlook the fun the digital modes offer low power enthusiasts. I will be the first to admit I should have jumped into this several years ago. You will be surprised at what can be done when operating FT8, JT65, and some of the other digital modes at QRP and QRPp levels. Also, keep in mind what Z35M is currently accomplishing with simple wire antennas strung at low heights above the ground. He gives QRPers something to strive for and surprises us once again with his low power achievements. Finally, if you have not already done so, be sure to mark your calendars for WFD 2020 (the last full weekend in January) to get outdoors and make some QRP-style contacts while polishing your emergency communications skills. *Until June, 73*

KIT-BUILDING

BY JOE EISENBERG,* KØNEB

Singing the Blues A 49er

One of my favorite parts of kit building is discovering new things that help a builder increase his or her chances for success and enjoyment of the process. For as long as I can remember, I have used a simple cookie sheet to both protect my work surface and to keep my parts from disappearing. I have been introduced to a new item that works with your cookie sheet to make things even nicer!

This new item, at least to me, is called a *soldering mat* (*Photo A*), and is available online from many outlets, including Amazon. The color mat I see offered most often is blue, and the mat is designed to both keep your parts from wandering and to absorb the heat from soldering, especially when blobs of solder are used, like in removing the insulation from certain kinds of enameled wire. Prior to this mat, my solder drips often adhered to the bottom of my cookie sheet, forever becoming a part of my kit building history. A non-stick surfaced cookie sheet can also help with preventing permanent blobs of solder on your work surface.

The soldering mat can prevent the problem of solder adhering to your cookie sheet. These mats are made from a pliable form of silicone and can be rolled up after use for storage. I just keep mine on the cookie sheet I use for my projects. In addition, there are numerous partitions on the mat, ideal for placing the parts you are using, especially when assembling smaller kits with fewer parts. The partitions are of various sizes, making them ideal for sorting various sizes of parts. There are also smaller dimples provided on the mat that are useful for sorting screws taken from disassembling such things as a laptop computer or small radio. There are mats available that have closable compartments as well, if desired.

The best thing about soldering mats is their low cost. I have seen the mats selling online anywhere from around $7 to $30, depending on size and features. Soldering mats also are anti-static, reducing the risk of electrostatic discharge (ESD) causing a problem with sensitive components such as CMOS ICs or MOSFETs. The light weight and flexibility of the mat will make it a must-have item for me when traveling to do a group kit-building experience. Simply searching the web for "soldering mat" will return a wide variety of options and pricing. The size is often only given in centimeters, so be prepared to make a metric measurement of your cookie sheet before ordering. A soldering mat can also protect the finish of your cases when working with them as well.

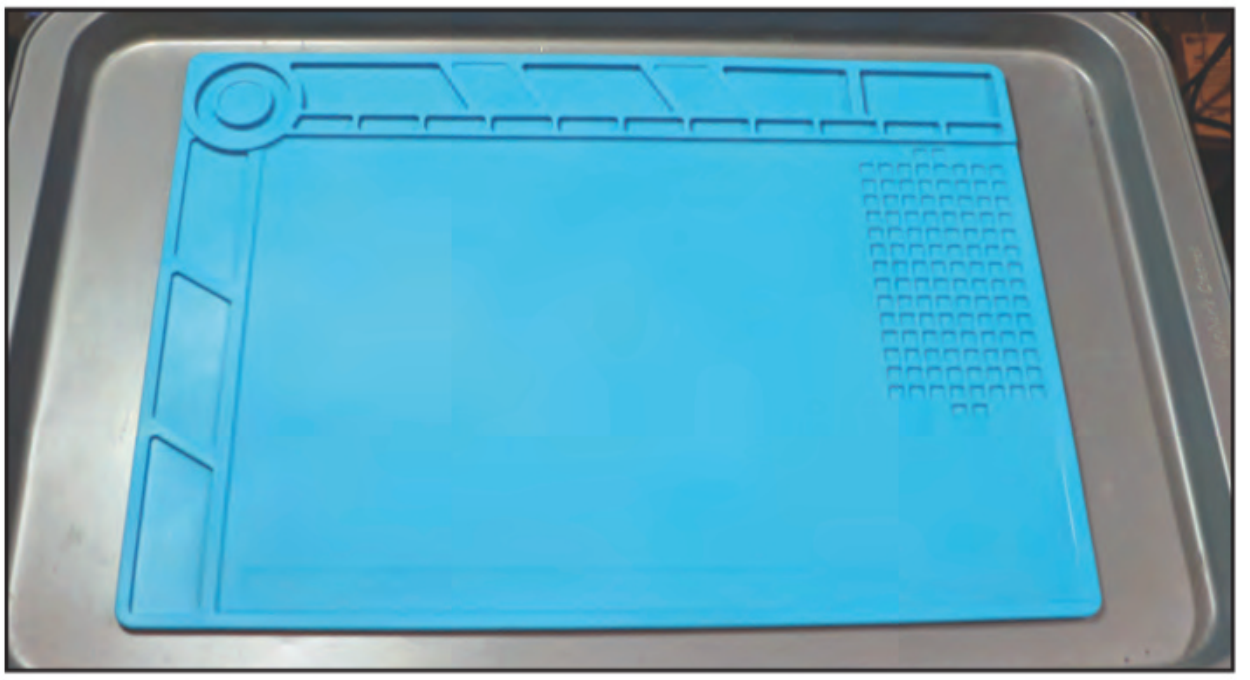

Photo A. Soldering mat in cookie sheet. The mat is very flexible and has anti-static properties as well as providing heat protection.

The 49er on 40

The kit I have chosen for this month is the "49er." Although this kit is no longer

Photo B. Chinese "49er" 40-meter CW transceiver kit ready to assemble.

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e-mail: <k0neb@cq-amateur-radio.com>

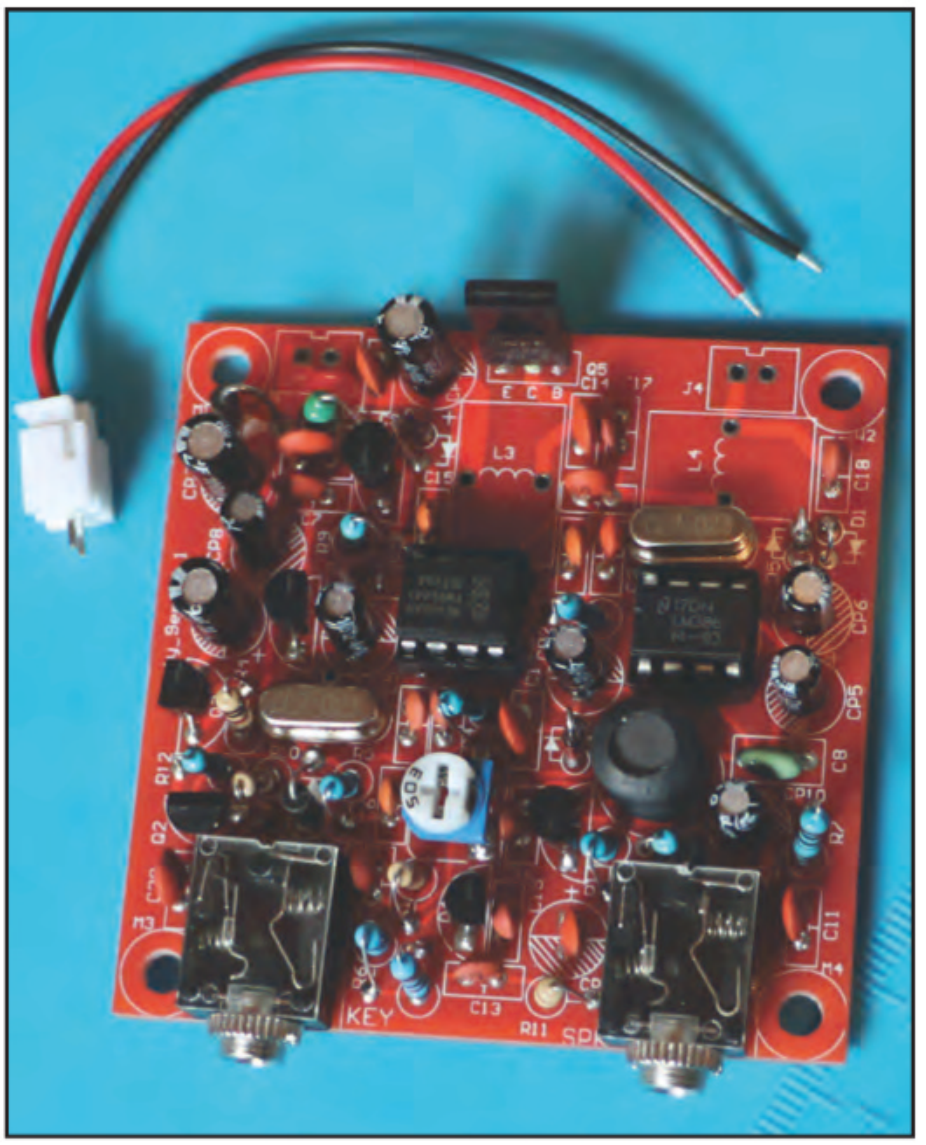

Photo C. Nearly completed 49er. Notice the two toroids are left to assemble as well as the wiring jacks.

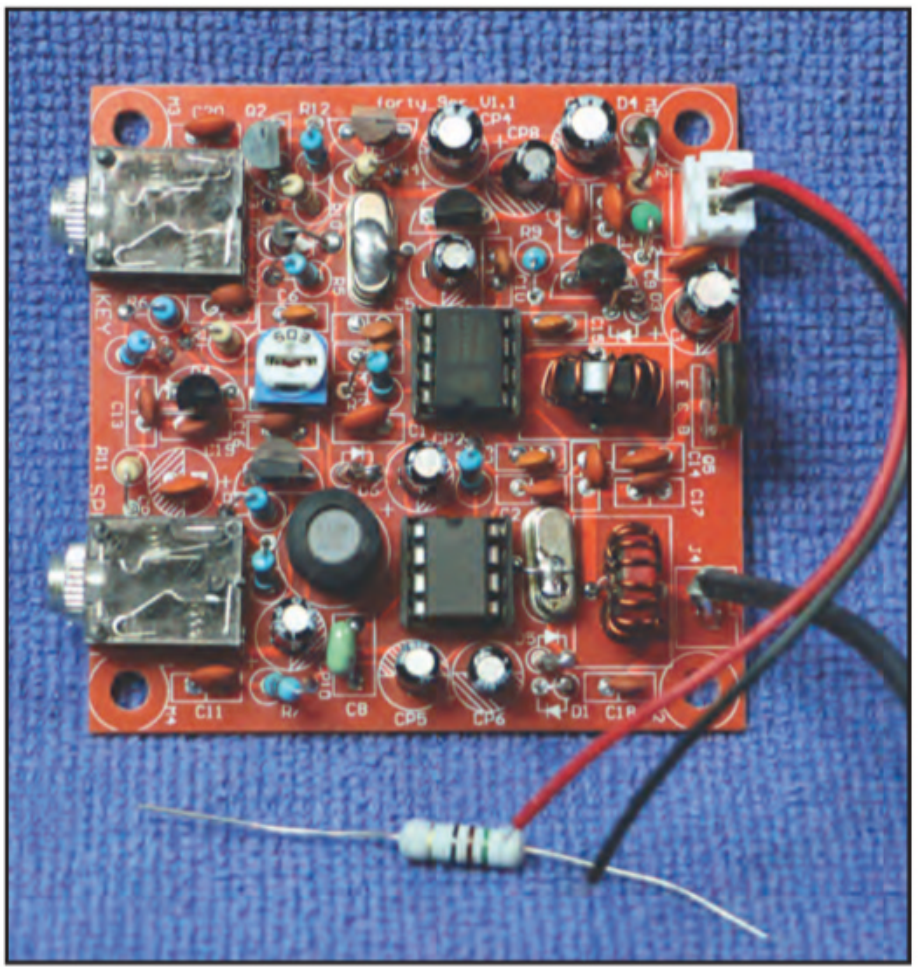

Photo D. Completed 49er ready for mounting in a case. I used the supplied 2-pin jack and cable for the 12-volt DC power supply, but used RG-174 coax on the antenna output instead of the supplied 2-pin plug. The two crystals have their cases grounded.

available in its original form, elements of the design have been incorporated into numerous kits made worldwide. The 49er is a minimalist design 40-meter CW transceiver. I'd say the 49er is a step above the "Pixie" kits in terms of receiver performance, but still very basic. The 49er kit I found online (*Photos B*, *C* and *D*) uses plug connectors to make the connections to the power source and the RF output. You can, however, bypass these connectors if you wish and solder those leads directly to the board. I keep some small gauge red/black wire handy for power connections as well as some RG-174 coax for making connections to your external RF BNC or SO-239 jacks. You can get away with using just regular wire for such small lengths of QRP RF wiring under a couple of inches, but I prefer to use RG-174. At a recent hamfest, I even found some very slim SMA panel-mount jacks, ideal for when using a mint tin or similar small enclosure for any small kit, such as the 49er.

The 49er kit I got had a parts diagram, and the board is marked as well. There are two toroids to wind, so be sure to take your time and be careful when winding these very small toroids. There are two different ferrite cores; one has a red band around it while the other does not. I referred to the online photo of the kit to determine which color core was used in which position. The red one gets 16 turns, while the black one gets 11 turns. Using Google Translate on my cell phone let me scan in the Chinese text and determine which toroid core went where.

Another thing to be aware of is that the power and RF 2-pin jacks may be a bit deceptive when looking at the markings on the board of this particular kit. There is a notch showing, but it does not correctly align with the notch of the jack. Be sure to look at the red/black wires to ensure that the red corresponds to the "+" mark on the board for the power connection and the RF hot lead corresponds to the square hole on the other jack's board space, with the ground being the round hole. Also missing but on the schematic is the fact that both crystal cases need to be grounded. There is a hole provided for that ground connection next to each crystal, and you can just use a scrap piece of wire left over from trimming your resistor leads to form the ground lead for the crystal cases. Next month, I'll complete the 49er, mount it in a case and put it on the air.

Looking Ahead

Also coming soon, I'll look at some very simple and quick kits that will be useful for direction-finding and for the upcoming hamfest season. Are you planning a group kit-building experience for your club? Let me know what you are doing and what kits you are using so I can share your successes and how you solved any problems that arose.

Coming up this month is the long-awaited Ozarkcon QRP convention in Branson, Missouri. Branson is a fun place to take your family as well, and a great time is always had by all. The Four State QRP Group (<4sqrp.com>) always showcases its new kits at Ozarkcon, so stay tuned for the latest new fun kits to be announced in Branson. The annual Friday night kit-build is a highlight of Ozarkcon and will feature the 40-meter version of the Cricket CW transceiver kit. In addition, I'll be at the Green Country Hamfest in Claremore, Oklahoma, also in April.

In May, look for me with my traditional "Cat In The Hat" hat at the Dayton Hamvention® in Xenia, Ohio. This year, I'll be celebrating my 40th visit to Hamvention! July is the Central States VHF Conference right here in Lincoln, Nebraska, and in August I'll be at the World's Friendliest Hamfest in Huntsville, Alabama. *– Until next time, 73 de KØNEB*

LEARNING CURVE

BY RON OCHU, KOØZ

Show Me Pictures!

It's said that variety is the spice of life, and who doesn't like a little variety and spice in life? No doubt, the same adage can hold equally true for ham radio. Newbies to ham radio tend to gravitate towards VHF/UHF (very high frequency/ultra high frequency) repeater systems. And why not? There's a proliferation of inexpensive dual-band handhelds (HTs) and repeater systems serve as ham radio's version of the workplace "water cooler" to mingle and exchange ideas. Not a thing wrong with that; in fact, it's a fine ham radio tradition. But ham radio has other traditions, too. A primary one is to explore and experiment, as evidenced in FCC (Federal Communications Commission) Part 97.1 (c): *Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.*

Explore

That doesn't mean abandoning VHF/UHF repeaters in search of new, electronic, communication frontiers. It also doesn't mean recklessly jumping, feet first, into unknown waters. However, it does mean encouraging amateur radio operators to experiment with existing or new technologies. I suppose, one could argue that any unfamiliar technological or communications mode could be considered "new" for "me"; as opposed to a completely brand new, previously non-existent, technology. I think DXers' (hams who look for long-distance contacts) response to the question of what is an "ATNO" (all-time new one) is apropos. "Any country that you haven't worked before is an ATNO." So, any mode you haven't tried before is a new one.

This month, let's explore the benefits of an existing, older technology that may be new for you. Who doesn't like to look at pictures? Can you imagine a QSO that involves pictures? Slow-scan television (SSTV) enables hams like you and me to send pictures over the air, similar to the one Clint, NW5P, sent in *Photo A*.

SSTV pictures are sent mostly over HF (high frequency) bands. However, there is no reason why SSTV can't be sent using FM on the VHF/UHF bands like the SSTV picture I received from the International Space Station (ISS) on 2 meters (*Photo B*).

SSTV

SSTV derives its name from its means of modulation. Most people are familiar with fast-scan analog TV, which gave viewers live-action pictures. SSTV is akin to watching a slide show (*Photo C*). Today, analog fast-scan TV has been replaced by HDTV (high-definition TV). Viewing live TV, either analog or through HDTV, requires a huge amount of bandwidth, typically around 6 MHz. That's more bandwidth for one channel than the entire amateur radio HF spectrum.

Consequently, live amateur television (ATV) is restricted to amateur frequencies in the UHF and above spectrum. SSTV sends just one picture at a time, which reduces needed bandwidth, therefore allowing TV on the HF bands. SSTV software converts still pictures into audio frequencies, which allows hams to broadcast still pictures with no more bandwidth than a typical single sideband (SSB) signal, which is about 3 kHz. SSTV pictures can be sent worldwide using HF, such as the one I received from Gerald, TI4GSP, in Costa Rica (*Photo D*).

FM & ISS

HF, SSB, SSTV transmissions are fun to send and receive, but VHF/UHF FM (frequency modulation) offers us additional SSTV fun. There is no reason why SSTV cannot be used on VHF/UHF voice segments. However please be sure to avoid sending SSTV pictures on repeater pairs (frequency input/output) and OSCAR (Orbital Satellite Carrying Amateur Radio) uplink and downlink frequencies.

On the other hand, sending FM VHF/UHF SSTV pictures across town or to nearby counties via simplex can be a great way to spend part of the day in a fun, invigorating, and edu-

Photo A. The author is receiving a good SSTV report from Clint Cook, NW5P. (All photos by KOØZ)

Photo B. In February, the International Space Station (ISS) sent a series of SSTV photos from Earth orbit. Photo number 4 of 12 celebrates the Martian rover Curiosity.

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cational way. Transmitting a picture of the progress of your latest project or a newly received QSL card can be loads of fun, as well as serving as a catalyst to inspire fellow hams.

Even NASA astronauts aboard the ISS send SSTV pictures on the ham bands. For two weekends in February, NASA celebrated ham radio's involvement in the manned space program by transmitting 12 pictures from the Earth-orbiting ISS on 145.800 MHz (*Photos E*, *F*, and *G*). If you missed it, don't fret, the ISS periodically transmits SSTV to Earth and there will be other opportunities. In the meantime, now is the time to set up your own SSTV station.

What Do I Need to Receive SSTV?

What do I need for SSTV?

Well, it depends.

Like most anything else in amateur radio, it depends on how deeply you care to delve into the mode. To receive SSTV signals, all that's needed is a receiver, a computer with a soundcard, MMSSTV software, and an audio patch cord to go from the receiver's audio-out port to your computer's soundcard's audio input. Please keep in mind that this configuration is a "bare-bones" minimal approach to receiving SSTV signals.

Twenty meters is a good place to begin searching for SSTV signals; you can find them between 14.230-14.233 MHz. Also keep in mind that this bare-bones approach will require a gradual increase in signal strength to your computer's sound card, which the MMSSTV software lets you monitor with a graph that indicates signal level. Before long, you'll have a better idea of the proper audio drive level for your computer sound card. Since you most likely have all that's necessary to start receiving SSTV there's little, if any, financial commitment to explore a new communications mode. MMSSTV is free to download from <https://tinyurl.com/yxajgb9w>.

Transmitting SSTV

To transmit an SSTV picture, an audio patch cord between your computer sound card's audio output port to your transceiver's microphone input will be required. Again, setting audio levels is important for transmitting pictures and is crucial for a two-way SSTV QSO. In addition to the audio levels, you'll need to have a means to activate your rig's PTT (push to talk) switch. Setting proper audio levels and keying the rig's PTT can be a bit overwhelming. That's why a computer-to-rig interface is highly recommended.

There are a lot of commercially-made computer sound card to rig interfaces, also known as digital mode interfaces <https://tinyurl.com/y6hus96y> such as the West Mountain Radio RIGblaster, Tigertronic's SignaLink and MFJ's 1204. If so inclined, you can even construct your own digital interface. Although I haven't tried this interface – at <https://tinyurl.com/y4l963wm> - it looks very feasible and it is a good spot to start researching a DIY (do it yourself) interface.

Personally, I prefer a commercial standalone external soundcard designed and filtered for amateur radio use. These units isolate ground loop problems and come equipped with the necessary cords to successfully interface

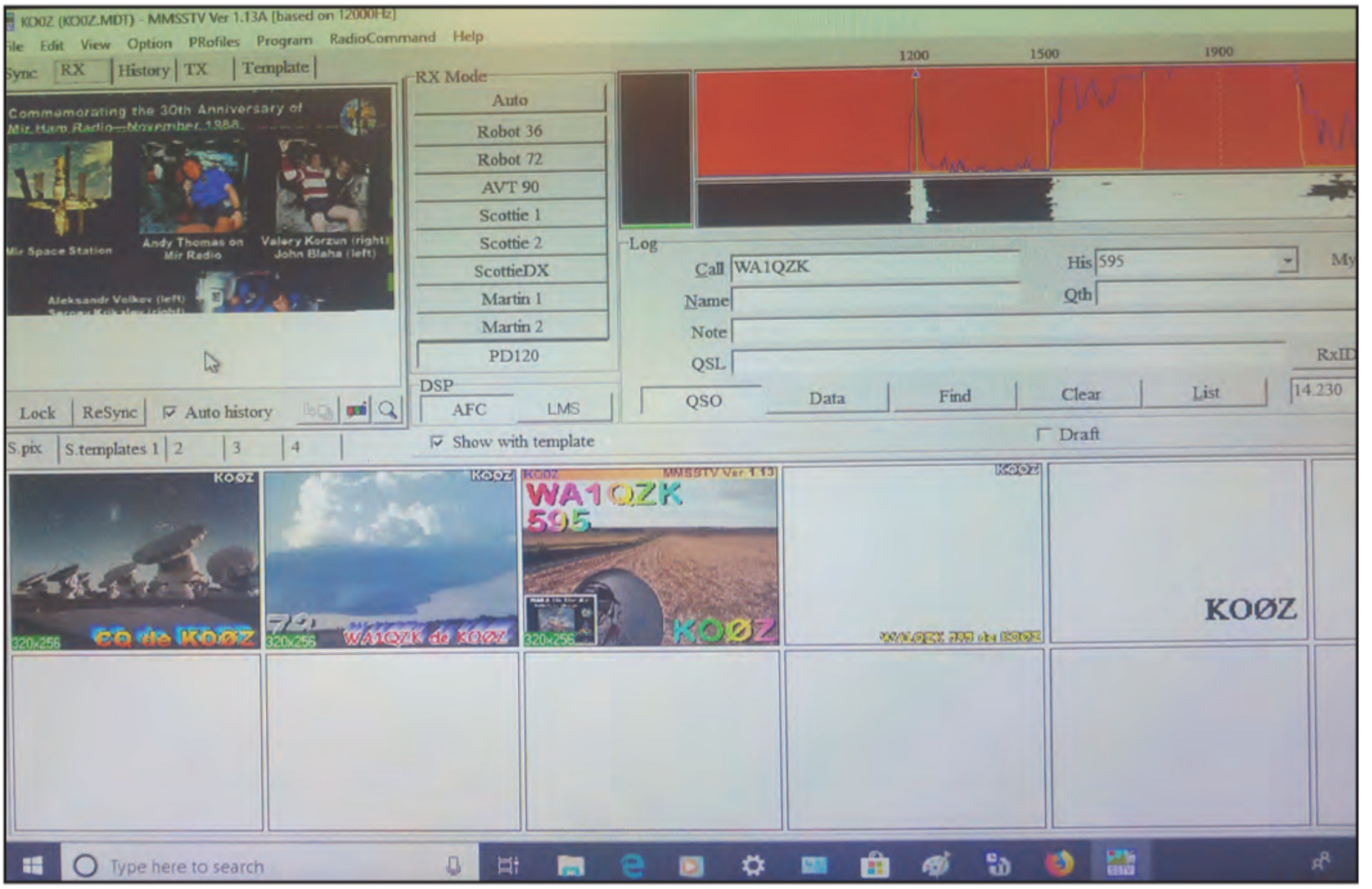

Photo C. The author is receiving an ISS SSTV picture. Note about two-thirds of the picture has been decoded. Further note the 1200-Hz sync pulse and the video information in the orange, spectral display top center of the photo.

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- Dual Antenna
- 1000W SSB / 350W Digital

AT-200PROII
200 Watts Desktop
- Tunes 10:1 SWR
- 2 Year Warranty
- 250W SSB / 100W Digital

Desktop

Stand alone desktop tuner - works with most 100W HF radios.

AT-100PROII
- Dual Bargraph
- Auto / Semi-Auto Mode
- 125W SSB / 30W Digital

Balun / Unun

- RU 4:1 UNUN
- RBA 4:1 BALUN
- RBA 1:1 BALUN
- 200W SSB

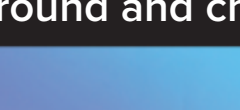
Icom

Tuner dedicated to Icom radios with seamless integration.

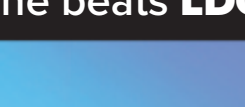
IT-100
- AH-3 & AH-4 Compatible
- Includes Interface Cable
- 125W SSB / 30W Digital

Zero Power

Designed for portable and low power applications - zero current draw once tuned.



Z-100 PLUS
- Low Cost
- Highly Portable
- 125W SSB/30W Digital



Z-11PROII
- LED SWR Indicator
- 10:1 SWR
- 125W SSB/30W Digital

Z-817
- FT-817/818 Compatible
- Operates on 4 AAs
- 20W SSB/5W Digital

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Tuner with built in Yaesu/antenna tuner interface.

YT-1200
- 2000 Memories
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- 125W SSB/30W Digital

YT-100
- 2000 Memories
- For FT-100, FT-857 and FT-897
- 125W SSB/30W Digital

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Remote tuners mounted at or near the feedpoint minimize coax SWR losses.

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Photo D. SSTV is a worldwide (DX) activity. The author received an SSTV CQ transmission from Gerald Salas, TI4GSP, from Costa Rica. Note the pixelated dots indicating noise and static.

Photo E. The ISS transmitting picture 9 of 12 in February. Doppler shift, fading, and signal variations contributed to the noise (pixelated dots) on my received picture. Not a perfect picture, but still exciting to get.

your rig with your PC (*Photo H*). Once the interface is integrated between the PC and the rig, it's time to focus our attention on software.

MMSSTV

In the true spirit of amateur radio, Makoto Mori, JE3HHT (Mako), designed MMSSTV software and made it available for free download. MMSSTV has become a ham radio standard in SSTV circles. It is intuitive and relatively easy to setup. It's a Windows-based system, but there are other programs for Linux (QSSTV) and for Apple in their app store. I have Windows 10 as my OS (operating system) and I've had no problems with installing or operating MMSSTV.

Once you've downloaded Mako's MMSSTV software and open it up, you'll be prompted with a box to enter your callsign. Once you've done so, MMSSTV presents the operational SSTV screen (*Photo I*). Go to the menu bar, select option and click on the Setup MMSSTV (O)… button. In the MMSSTV Setup box, click on the MISC tab (*Photo J*). Make sure, in the sound card section, that your sound card is listed. If not, scroll down to select it. If it still does not appear, you most likely need to install a sound card driver. Now, clicking on the TX tab, your callsign should appear in the callsign template. Everything else contained under these tabs should be fine. YouTube offers good tutorials. Andy Bronze, M3ARB, has an excellent YouTube tutorial:

Photo F. Photo 2 of 12 sent from the ISS over the weekends of February 9-10th and 16-17th.

Photo G. ISS screen shot of the ISS location and its RF signal footprint. Anyone within the shaded circle is within radio range of the ISS as it races overhead.

<https://tinyurl.com/y5j6ho5l> along with Jeffery Kopcak, K8JTK: <https://tinyurl.com/y2drkonk>.

Tuning In a SSTV Picture

If you've set up MMSSTV correctly, tune in a signal on 14.230 MHz. Looking at *Photo C*, you'll notice a green bar towards the top center of the MMSSTV screen. This is an indication that the SSTV signal is being decoded. Just to the right of the green bar is a spectral display. Note that there is a pulse on 1200 Hz. This is the SSTV sync pulse. To the right of the 1200-Hz pulse is the video information in audio form, centered between 1500 and 2300 Hz. Another good sign that the picture is decoding is the picture forming in the upper left-hand corner frame. Be sure the RX tab is pressed so you can see the picture. The other tabs on the top of *Photo C* are for looking at received SSTV pictures (History), TX for picture to

Photo H. The author's Kenwood TS 2000 X used to receive SSTV pictures. Note the West Mountain RIGblaster Advantage sitting on top of the Kenwood. (The author needs to dust off his equipment.)

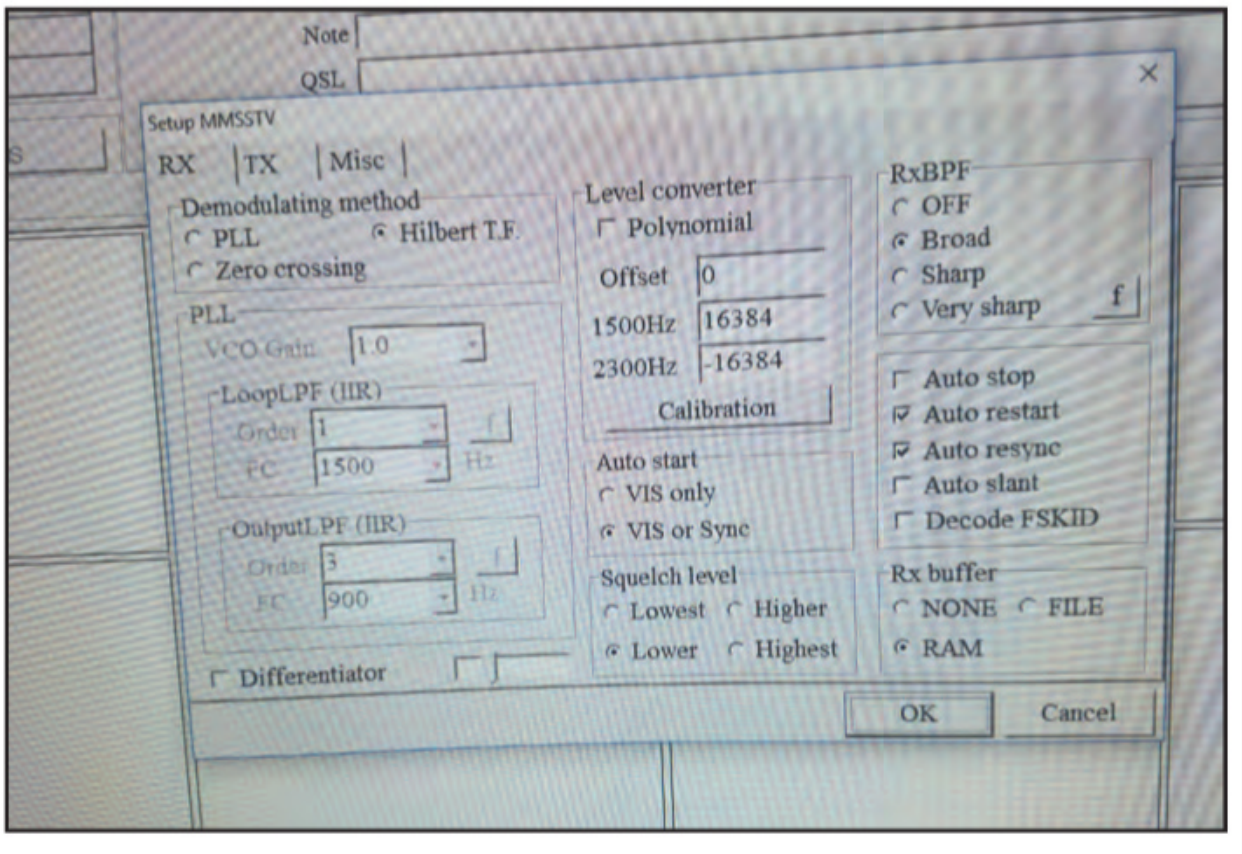

Photo I. MMSSTV operational screen before any templates are filled out or signal applied to the computer sound card.

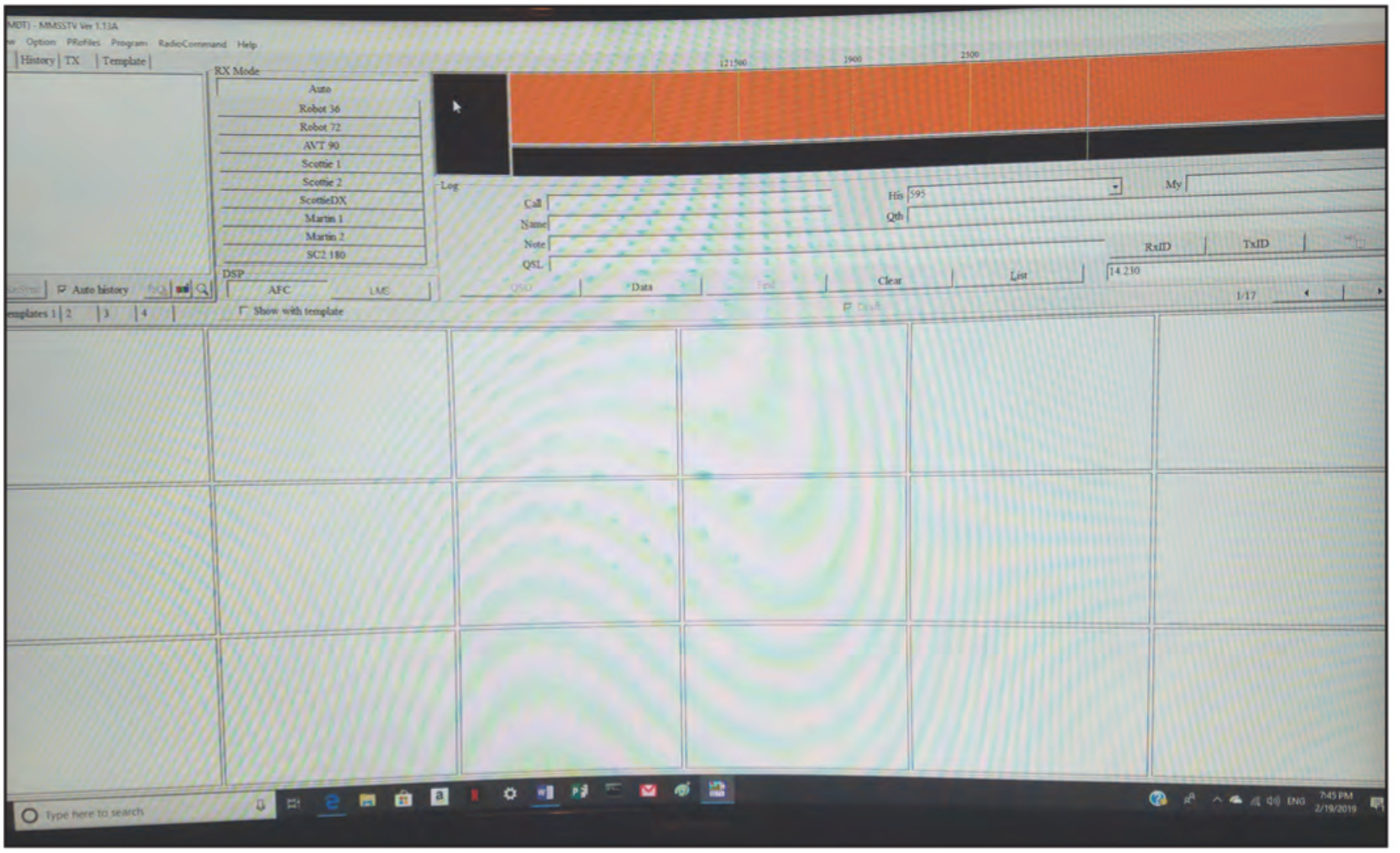

Photo J. MMSSTV setup drop box.

be transmitted, Sync for synchronization of the picture and template for creating custom made pictures to send.

Static and noise appear as pixelated dots on the received picture. To the right of the picture-viewing screen in the upper left-hand corner of MMSSTV, there is a list of RX modes such as Auto, Robot, Scottie, Martin, and SC2 180. These are various encoding schemes to transmit and receive SSTV signals. These modes require different amounts of time to transmit a full SSTV frame. I press the Auto button and almost every time, once MMSSTV detects the SSTV signal, it will automatically select the proper RX mode.

SSTV Signal Reporting

SSTV uses an RSV signal reporting system. R stands for readability (1-5), S stands for signal strength (1-9), and V represents video (1-5). RSV reporting - like RST (readability, strength, and tone) - is somewhat subjective, but that's what the letters represent.

Get on the Air!

SSTV sounds exciting, doesn't it? It's fun to transmit a picture of your progress on an antenna, tower, circuit board, etc. Did you receive a unique QSL card in the mail? Why not share it with friends and become the envy of all via SSTV. Why not create a local, 2-meter or 70-cm simplex SSTV net and experiment? You don't need to have a General or Extra Class license to operate SSTV on the VHF and higher bands. This article is not intended to be an inclusive technical primer on SSTV, but it does serve as a starting point to enter another exciting, fun, and dynamic aspect of the Amateur Radio Service. Thank you for reading *CQ* and I hope to not only hear, but to see you on the air. *73, Ron, KOØZ*

MAGIC IN THE SKY

BY JEFF REINHARDT,* AA6JR

Water, Water, Everywhere....

"The Rime of the Ancient Mariner" by Samuel Taylor Coleridge was written in the late 1700s and the classic has been a staple of English students for nearly as long. Mariners have existed for millennia and their mastery of the sea grew from craft like rafts that barely float to today's behemoth super aircraft carriers, large oil tankers, container ships, and super cruise ships that are floating cities on the sea.

If ever a pursuit of mankind had a need for the miracle of radio communications, the loudest call would likely come from mariners. Indeed, it is no surprise or accident that the dawn of radio saw the U.S. Navy taking initial governmental control of the radio spectrum in our fair country.

With two-thirds of our planet covered by water, and more each day given the melting icecaps, there's a lot of territory for ships to meander about. Until the 20th century, how to communicate with watercraft, and how boats might communicate with one another, was a challenge that brought many attempts at a solution.

Early seamen stayed close to shore for two reasons: one was geolocating by landmarks; the other was self-preservation, so as not to sail off the edge of the world, which was thought to be just beyond the line of sight. Not far into long-distance sailing came intentionally-constructed landmarks and lighthouses, as in the prime examples of the Colossus of Rhodes and the Lighthouse of Alexandria.

Ship-to-ship communications were also a challenge. From the basics, like whose flag the ship flew under, to the more intricate series of banners, pennants, and semaphores that allowed communications between vessels in times of war and peace. However, the vagaries of weather, daylight, and distance, not to mention rising and falling seas, made visual communications a hit-or-miss proposition.

And then there was sound. Ships and ports developed signal cannons, foghorns, harbor buoys with bells on them, whistles, and the trusty megaphone for barking out commands to those within earshot.

Nevertheless, the floor of the sea has a large collection of craft that strayed too close to a reef, got caught up in adverse weather, suffered a structural failure, or fell victim to enemy action.

Along Comes Radio

In an era when the term "game-changer" is applied to almost every development, it's hard to accurately describe the vast impact radio had on maritime pursuits. From the basics of being able to receive or even send distress calls, to sharing weather information, expected arrivals in port up through making a line of battleships coordinate moves similar to those of the Rockettes, radio was the missing link. Add in radar, navigational aids like Loran and now GPS, one can quickly conclude the world's waterways are a far better environment thanks to Marconi and those who followed. And all that happened in less than a century, as we just passed the 30th anniversary of the launch of the first GPS satellite on February 14, 1989.

An Almost Ancient Mariner

Through much of his life, Fred Martin, KI6YN, has been a man of the sea. I've known Fred for a few decades and he's, well, a character in the mold of those old salts who can keep you listening to stories of the sea for hours, especially if the bottom of your glass doesn't go dry.

Fred spent much of his professional life on the water, working for defense contractors on a variety of projects, several having to do with navigation. His work also inspired a love

"Old Salt" Fred, KI6YN, with just a portion of his antique collection of keys and telegraphy gear.

This National classic is in the next batch of items headed to the Channel Islands Maritime Museum.

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On a school field trip, students learn how to spell a message using signal flags. Wouldn't it be great to have a Morse demonstration where they spell their names in code?

and respect for radio and communications in general, but yes, radio has been his passion. And just when you think some of Fred's stories may be getting a bit too tall, out comes some evidence that he may actually have been understating his story. He's also a CW operator *par excellence,* meaning he can go as quickly as you like and head-copy your transmissions, no matter what the speed.

He spoke of a CW contact with VP6MW on Pitcairn Island and developed a long-running friendship with Meralda Warren, one of the *Bounty* crew descendants. After several exchanges, Fred decided to go visit her on that remote dot of an island, which is no easy feat. His adventure led to a most entertaining ham club presentation with numerous photos of the odyssey and portrayals of what life is like in that faraway place that's seldom heard.

Fred also respects lighthouses that he shows through a collection that rings the internal soffits of his home — and yes — they light up. His radio and telegraph key collection from the late 1800s is equally impressive, in quality if not in quantity. However, his collection is about to get somewhat smaller. Fred has already made several equipment donations to the Channel Islands Maritime Museum in Oxnard, California and he has plans to make more.

A Message to Posterity

Unlike our radio transmissions that largely deal with the "here and now," Fred's donations to the museum are intended to be shared with others, some of whom have not yet been born.

An early foghorn used to guide ships safely home.

Indeed, a visit to the museum adjacent to the Channel Islands Harbor and Marina reveals an amazing collection of ship replicas, art, and touchable items that share the history and lore of navigation and its many developments with today's students, their parents, and those interested in the sea. As one example, I witnessed a school tour learning how to send a message using signal flags (see photos).

According to Heather Behrens, Collections Manager for the museum, Fred's donations have inspired the creation of a new exhibit that will recreate the radio room of a ship and relay some of the importance that radio has played in making navigation safer in so many ways. It's a legacy that will keep on giving, just as all that hard-won seamanship drawn from the experiences of centuries past has been handed down across time to the mariners of today.

Following Fred's example, if you have some vintage gear that's only collecting dust, consider donating it to a local museum that will share our story of how communications developed. This old gear helped make nearly every modern convenience we enjoy today possible, from GPS in our cars, microwave ovens in our kitchens, and the ubiquitous cell phone in everyone's pocket. Because even though we joke about our collections of "boat anchors" — once they're gone, they're gone forever.

Worth a visit — The Channel Islands Maritime Museum in Oxnard, California.

A Personal Note

I apologize for missing my last scheduled installment of "Magic In The Sky." If this edition has any grammatical faults or typos they are truly mine, but I have a heartfelt reason. Last November, my life partner, champion, inspiration, supporter, and at times proofreader, was taken after an 11-year battle against cancer. She was many things to many people and is sorely missed. However, we draw comfort from the stories of the many lives she touched with her smile, her unending supply of love, and respect for all. And we know that like radio waves, her spirit will carry on, as KD6BIT is now and forever part of the *Magic In The Sky.*

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With thanks to the OMs who encourage and support us.

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COMMUNICATIONS HORIZONS

BY ROB DE SANTOS, K8RKD*

Smart Cities

There has been extensive news coverage of the move toward smarter cars, particularly autonomous (or self-driving) vehicles. There has been less talk about changes in the infrastructure of roads and cities to support autonomous vehicles and very little about the communications necessary for all of this to work.

First and foremost, we need to look at the types of communications and the methods that will be used to facilitate autonomous vehicles. We'll call these AVs in the rest of this discussion. I will set aside, for now, questions of whether AVs are desirable or practical as we want to focus on the communications aspects.

An autonomous Waymo Chrysler Pacifica making a test drive in Los Altos, California. (Photo via Wikimedia Commons, licensed under Creative Commons Attribution Share-Alike 4.0 International license <https://tinyurl.com/ybdc8zs9>)

Why Do They Need Communications?

Some communications would seem obvious, such as connections to GPS and navigation. Other aspects, such as recognition and communication of hazards or emergency vehicles, less so. For AVs to eliminate the need for occupants to be attentive to these risks, the AV must be able to obtain, act on this information, and communicate its response to the system and other vehicles.

During trials of semi-AVs on roads to date, when an accident occurs, the first blame is usually on the "attendant." As work in heavily automated airplane cockpits has already shown, if the pilot does not have enough to do, he or she may lose focus. At 35,000 feet and with no other aircraft within miles, this is a limited risk. On a roadway with thousands of vehicles, it won't work well. It also eliminates many of the benefits of AVs. To achieve gains in safety, it is increasingly obvious that it is important to work toward fewer and fewer humans in the loop. (Again, whether that's a world we want is another issue.)

In addition, individual AVs cannot be counted on to have nearly enough sensors and processing ability to anticipate the myriad risks and situations they may encounter. However, if the "herd" and the road can interact, most of the remaining risk can be reduced significantly.

What Types of Communication Are Anticipated?

Communications between several different entities are currently being studied:

- Car with road
- Car with traffic equipment
- Car with other vehicles
- Car (indirectly) with emergency vehicles or law enforcement
- Road, infrastructure, and sensors with each other

The fixed infrastructure can be linked by fiber or wire, but anything that moves will be wireless. Some sensors — such as RADAR, SONAR, computer vision recognition systems, in-road sensors, control systems, and AVs — will require wireless bandwidth. Substantial "smarts" will need to be built into the system and it's a given that AVs will need to have protocols to do this communication.

Non-Connected Users Won't Disappear

The roadway will never be completely free of non-connected users. These could be pedestrians, cyclists, animals, etc. Non-connected users will need to be tracked by sensors and appropriate instructions given to the other parts of the "smart road."

The initial approach in the U.S. is a federal system referred to as DSRC (dedicated short-range communications) to communicate with the cars, part of an approach called vehicle-to-everything or V2X communications. Each AV would need to be equipped with a special system to recognize DSRC messages and act accordingly. In the current world, the messages and warnings would appear in a car's head-up display (HUD). DSRC is a wireless protocol similar to that used in home Wi-Fi. Competing V2X approaches depend on the coming "5G" cellular communications. (Though DSRC 5G would use a different frequency range than your future smartphone, Qualcomm says it will make one chipset for both). I suspect that neither the Wi-Fi nor 5G represents where we will be in 20 years as the bandwidth and multiple protocols required are still evolving. I've not yet touched on the different frequency bands and the bandwidth required by sensors that may operate with microwave and SONAR technologies. The current presidential administration has backed off a bit on DSRC, so we'll see where that goes.

Infrastructure, or the Road is Talking

The potential to build smarter roads and supporting equipment such as traffic lights is high, but so will be the cost. The rush is on to do this as municipalities and governments around the world are jumping in and fear being left behind. Cities such as Tel Aviv, Israel, and Columbus, Ohio, are investing millions in piloting the technologies.

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Nearly all of the pilot projects are using existing frequency bands or operating under temporary authorizations and in very early stages. The ultimate focus will again be on 5G bands. One pilot is examining how to enable traffic lights to communicate with cars *now*, in advance of full AVs. You can't run a red light if your vehicle stops you before you enter the intersection. Another area being examined is a roadway that monitors its own condition. For example, if there are weather-related concerns or what the traction level is of the vehicles passing over at any moment. This could give later vehicles warnings that conditions were deteriorating, whether there is a pothole, or if traffic volume dictates an alternate route.

The Sky Isn't Falling (Yet)

Another communications piece in this picture is improved navigation and the view from above. Recently, the FCC voted to allow U.S. users greater access to data from GPS systems other than the U.S. system. Historically, the GPS data was downgraded or limited in accuracy as compared to military systems. Although most of the restrictions to U.S. GPS data were eliminated years ago, limitations still existed on use of foreign GPS systems and military grade accuracy. This was in spite of the fact that your smartphone could detect and receive data from other systems. Prior to this, consumer devices sold in the U.S. could only use non-military data from U.S. GPS and Russian GLONASS satellites for location determination. The FCC voted to allow U.S. users to access more precise data from European Galileo satellites. This may mean an improvement in location accuracy from prior 10 to 15-feet down to 3 feet without depending on Wi-Fi or other "kluges."

The use of drones in assisting future AVs is also under evaluation. Think of the drones as local traffic "eyes in the sky" to further assess conditions along a road and alert vehicles or traffic equipment so better flow can be achieved, or hazards avoided. These systems are also 5G-dependent.

Our whirlwind tour of the communications landscape for your future trip in an autonomous vehicle has drawn to a close. Feel free to pull out your monitoring equipment and get it tuned up now.

What's On Your Mind?

As always, I am happy to receive your comments, suggestions, and ideas. Feel free to reach out to me and share what you are thinking.

MF/LF OPERATING: Life Below the AM Broadcast Band

BY JOHN LANGRIDGE,* KB5NJD

Let's Talk About Transmitting Loops for MF and LF

How N1VF got on the air with a clandestine apartment loop and hacked U3S to make JT9 QSOs on 630 meters, plus "SlowJT9" hits the airwaves with positive results for small stations.

Just a year ago, I was extolling Ben Gelb, N1VF, for his efforts in installing an effective 630-meter antenna in his urban San Francisco neighborhood. From this location and using several different implementations of a vertical antenna over the course of several months and fed against a small radial field, Ben surprised many with high-performance results that led to numerous states confirmed on both coasts and points in between while using JT9. He was also able to take advantage of trans-Pacific openings to Oceania while using WSPR, dispelling many of the preconceived notions about what one might be able to accomplish on 630 meters, much less from a small plot of land using simple antennas.

All things must come to an end, however, and Ben and his family had plans to relocate to a new home with a brief, intermediate stay in an apartment until the house was ready. While the stay was only to be for a few months, it occurred shortly after the start of the 2018/2019 season, something that would be deflating to any low-band operator — it certainly would to me! Ben had been encouraged by many in the MF and LF community to notify UTC of his intent to operate from the apartment just in case the opportunity presented itself. He was one step ahead of us, though, submitting the required information as soon as he knew where he would be temporarily living. A short time following move-in at the apartment, he had an itch to figure out a way to install some type of an antenna that was conducive to his current living situation. Because radials would probably be out of the question under the circumstances, Ben began considering small loops, significantly less than a wavelength in perimeter length, capacitor-resonated and transformer-coupled

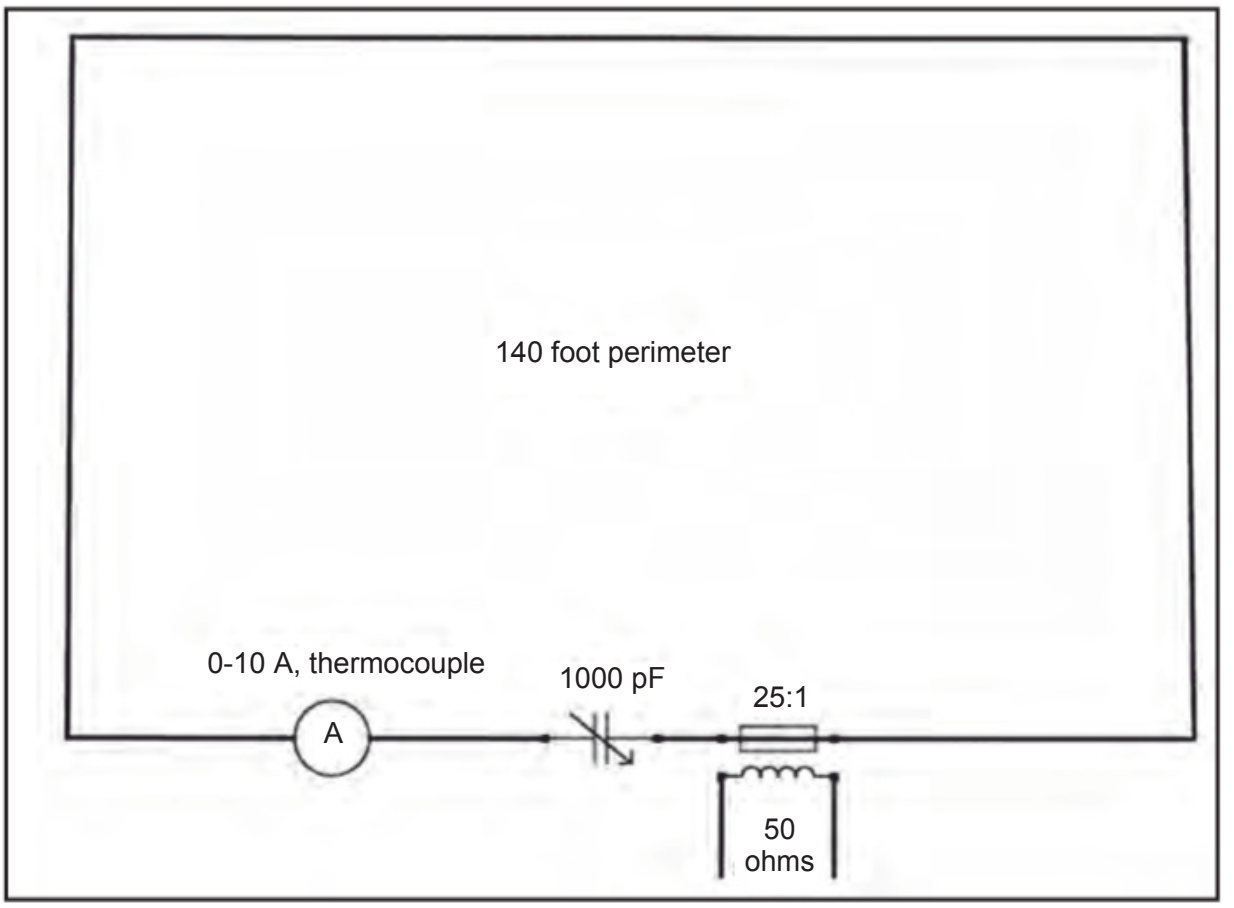

Figure 1. The basic layout for N1VF's loop is a common approach utilizing a vacuum variable capacitor and transformer coupling to a coaxial feed line. A thermocouple-type ammeter allows measurements to be taken for EIRP calculations.

(see *Figure 1*). This approach to transmit antenna design is highly regarded within the Part 15 "lowfer" and 2200-meter community but also works well on 630 meters, particularly in cluttered urban environments or areas where ground conditions are poor. Before installation, Ben had to confirm the operating conditions and metrics of the antenna since it would be in close proximity to trees, which would both support and hide the antenna. He also needed to ensure that voltage on the wire did not exceed the breakdown voltage of the insulation since the tuning and matching components would be located on his third story balcony. Fortunately, loops of this type, even very small ones, are magnetically-dominant where current is often high and voltage is relatively low compared to some of the short, reactive verticals that many of us use on the air. (It should be noted that Ben's first vertical at his previous residence set the supporting tree on fire on his maiden voyage and subsequent verticals using presumed insulators found a path to ground, proving that wood is not an insulator when used with high voltage.) By using high voltage-rated wire[1], Ben's system was going to be safe for the power he was planning to apply, so he proceeded to use his drone[2] to deploy a monofilament line that would be used to pull the loop wire through the trees. In all, the loop was roughly a full wavelength on 40 meters (about 140 feet), deployed in the vertical plane and terminated on his third-floor balcony. What's best is that no one was the wiser that it was strung through the tree.

Resonating the loop required a vacuum variable capacitor, which was ideal

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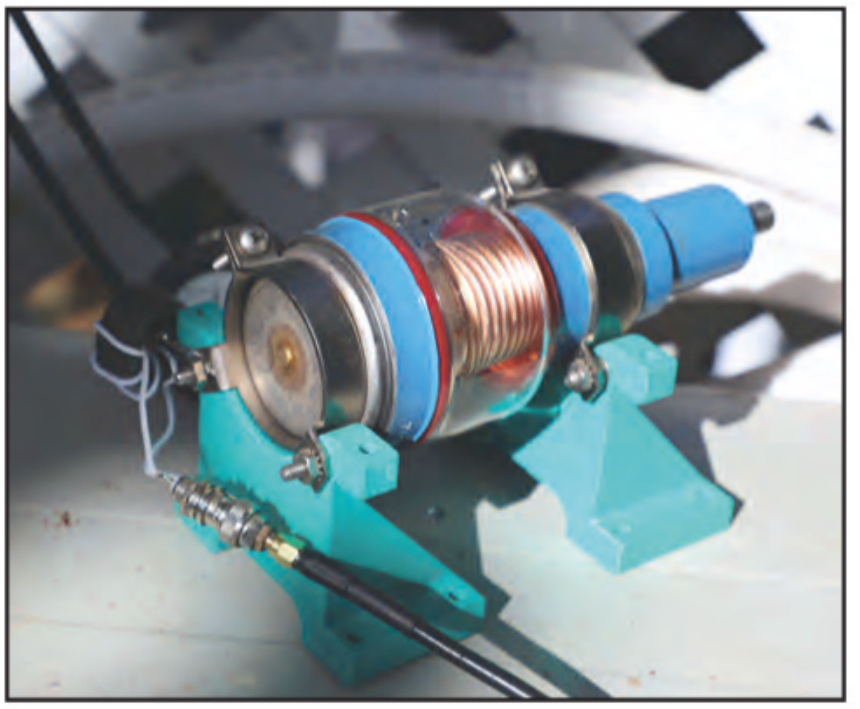


Photo A. Ben's loop tuner, located on his apartment's third-floor balcony, consists of a vacuum-variable capacitor with each plate connected to one end of the loop wire. One side of the loop connects to the capacitor via a thermocouple RF ammeter for current measurement. RF is coupled to the loop from the feeder by way of a coaxial transformer.

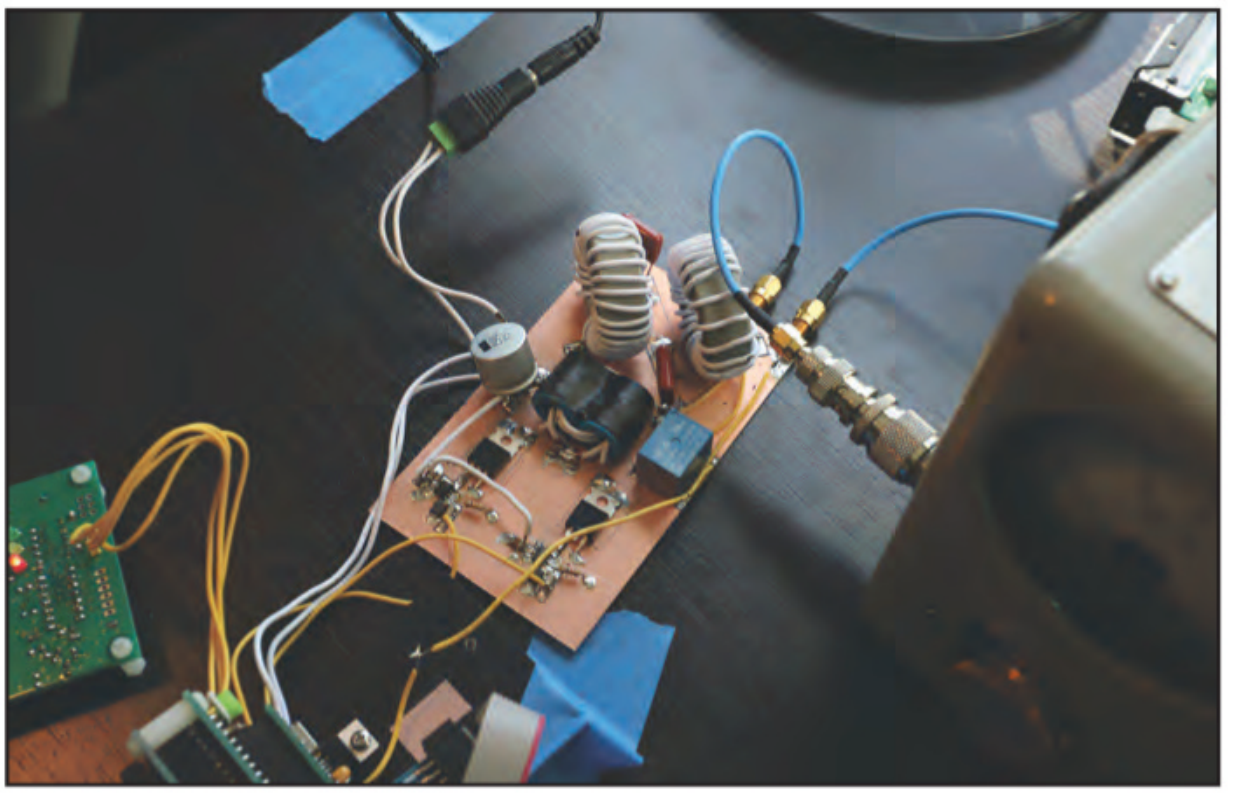


Photo B. N1VF's junkbox class-D amplifier for use with the U3S.

for the current and voltage that he was anticipating. A toroidal transformer matched the loop to a 50-ohm coaxial feeder with a single pass of the loop for the primary and five turns on the secondary connected to the coax (25:1 impedance step-up ratio) (*Photo A*). Ben's initial results were astonishing. At under 10 mW estimated EIRP (probably closer to 1 mW EIRP!) and using WSPR to evaluate whether this exercise was a waste of time, he received detection-limit reports from KL7L, near Anchorage, at a distance of 3,283 kilometers (2,040 miles) with JT9 QSO-level reports being received from British Columbia (*Figure 2*). Based on these results, further effort was warranted. Even better, nothing caught fire during the evaluation.

With the system passing the initial smoke test, Ben incrementally increased the amplifier power to about 60 watts which resulted in about 5.5 amps of RF current flowing in the loop at just under 1,800 volts (*Photo B*). He estimated that the radiation resistance was going to be near 4 milliohms and with 2 Ohms of loop resistance at 472 kHz, the efficiency was going to be about 0.2%. This meant that his EIRP was going to be on the order of 120 milliwatts. While some might think that 120 milliwatts isn't much power, it was plenty under the circumstances (see *Figure 3*), particularly since the alternative was to remain off air until Ben moved into his new home.

Hacking the U3S

After a couple of weeks of testing the system on the air, Ben was ready to stretch his legs a bit and do something

15 spots:

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	az	# Spots
2018-10-20 13:22	N1VF	0.475702	-30	0	CM87wj	0.001	KL7L	BP51ip	3283	334	1
2018-10-20 12:32	N1VF	0.475702	-29	0	CM87wj	0.001	KL7L/9AY	BP51ip	3283	334	1
2018-10-20 10:42	N1VF	0.475702	-26	0	CM87wj	0.001	VE7CNF	CN89ng	1322	358	16
2018-10-20 10:42	N1VF	0.475702	-12	0	CM87wj	0.001	W6GJB	CM87	81	277	26
2018-10-20 09:02	N1VF	0.475704	-25	0	CM87wj	0.001	VE7VV	CN88il	1236	356	40
2018-10-20 09:02	N1VF	0.475702	-13	0	CM87wj	0.001	WB7ABP	CM88ok	130	333	67
2018-10-20 08:52	N1VF	0.475702	-8	0	CM87wj	0.001	KPH	CM88mc	108	317	67
2018-10-20 08:42	N1VF	0.475702	-12	0	CM87wj	0.001	KPH75	CM88mc	108	317	67
2018-10-20 08:32	N1VF	0.475702	-24	0	CM87wj	0.001	KP4MD	CM98iq	161	27	2
2018-10-20 07:42	N1VF	0.475700	-12	0	CM87wj	0.001	KJ6MKI/H	CM88oi	122	331	66
2018-10-20 07:42	N1VF	0.475702	-24	0	CM87wj	0.001	KR7O/V	DM07ba	204	101	38
2018-10-20 07:32	N1VF	0.475699	-22	0	CM87wj	0.001	VE7BDQ	CN89la	1295	357	7
2018-10-20 07:32	N1VF	0.475707	-23	0	CM87wj	0.001	KR6LA	CN90ao	357	2	38
2018-10-20 02:32	N1VF	0.475703	-21	0	CM87wj	0.001	KR7O/L	DM07ba	204	101	58
2018-10-20 02:32	N1VF	0.475703	-16	0	CM87wj	0.001	KJ6MKI/AA	CM88oi	122	331	67

Figure 2. N1VF's astonishing WSPR results on his maiden voyage at the apartment using the hidden loop with about 20 watts applied for an estimated EIRP in the 1- to 10-milliwatt range.

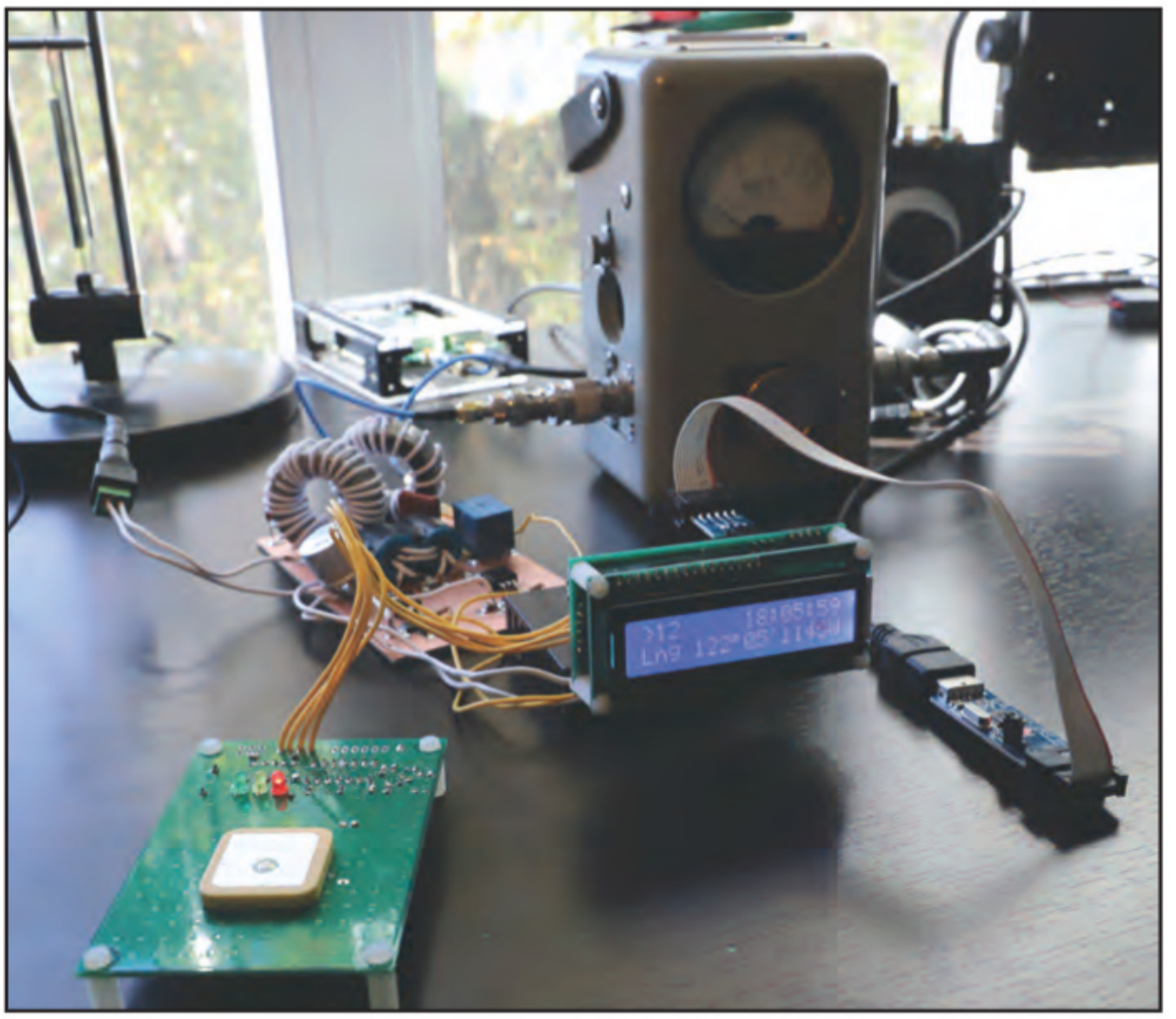


Photo C. Ben's complete apartment MF stations including U3S, GPS standard, homebrew amplifier, and SDR seen in the background. By programming U3S exchanges on-the-fly by flashing the U3S EEPROM, he can complete two-way JT9 QSOs from a platform that was really designed only for beaconing.

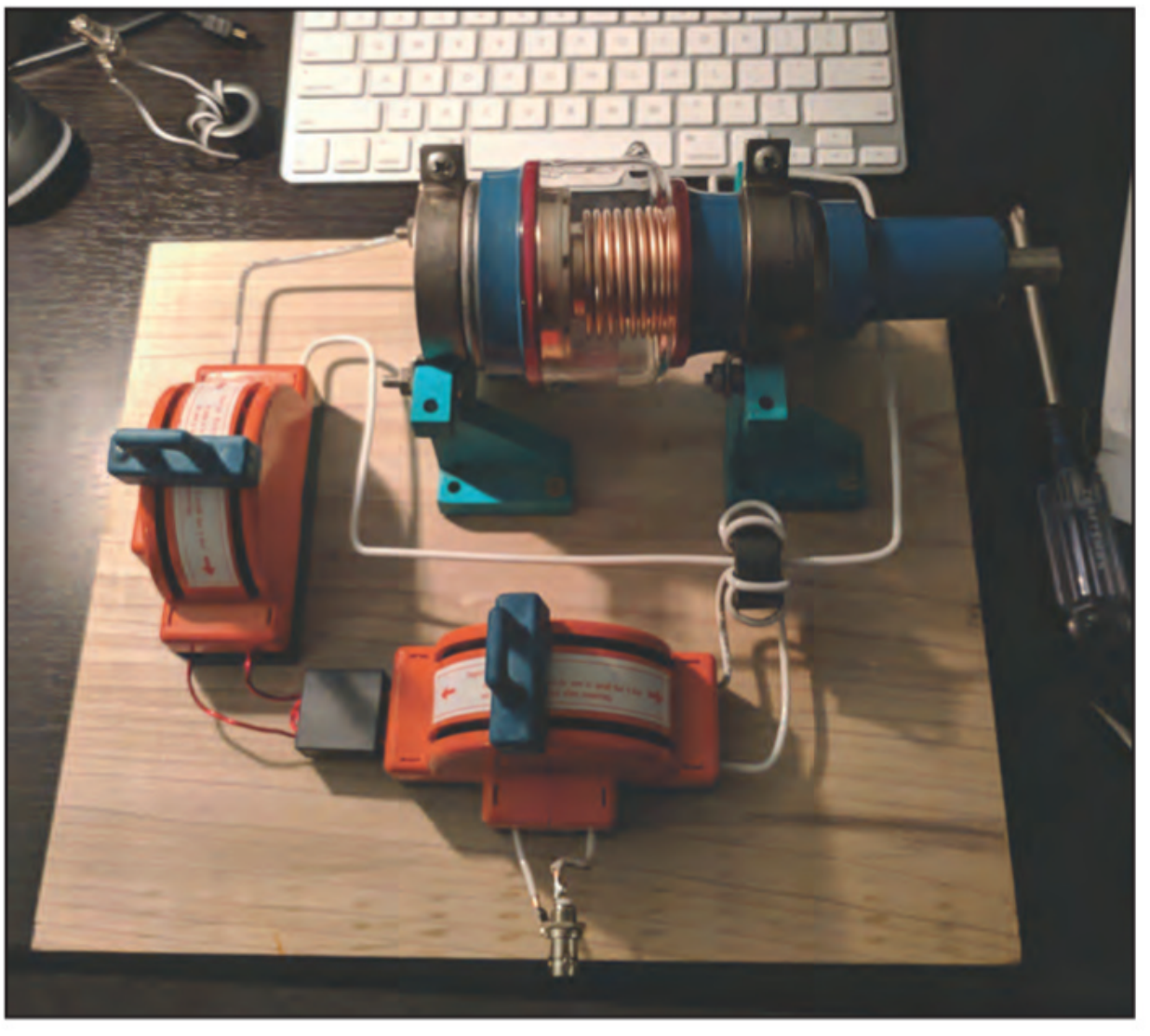


Photo D. The loop tuner, cleaned up and organized with knife switches to allow for resonating and matching the loop on 630 meters or 2200 meters.

bigger than simply transmitting WSPR. He was used to working QSO modes like JT9, but his Elecraft K3S was packed in storage and he was not keen on setting up a full amateur station in the apartment. For WSPR, he had been using the Hans Summers Ultimate 3S (U3S) transmitter,[3] which is, for all intents and purposes, a beacon platform and, while QSO modes like JT9 are part of the package, the act of transitioning from one transmit sequence to another is generally impractical, certainly without missing the next transmit sequence, turning an otherwise three-to-four minute QSO into a nine-to-twelve minute QSO, at best. While one might be safe on 2200 meters with such a time scale where deep fades can often be seen approaching for several minutes, on 630 meters a long QSO could mean several QSB cycles depending on the state of the geomagnetic field. That ultimately could mean an even longer time to complete the QSO and more possibility of something going wrong.

The solution[4] was a bit ambitious but only because it was an extreme approach that research indicated no one had ever tried. Ben was going to program the EEPROM on the U3S with a

Looking Ahead... Here are some of the articles we're working on for upcoming issues of *CQ*.

- CW Results: 2018 CQ World Wide DX Contest
- RWØA: CQWW CW From Siberia
- Spotlight Propagation on 20

Upcoming Special Issues

June: Take it to the Field
October: Emergency Communications
December: Technology

Do you have a hobby radio story to tell? Something for one of our specials? *CQ* now covers the entire radio hobby. See our writers' guidelines on the CQ website at <http://bit.ly/2qBFOdU>.

custom exchange for every transmit cycle. By using a script to automate the "memory flash" process, he learned that he had just enough time between the receive and transmit cycles to make this solution viable. And if something went wrong, he would simply be a cycle behind, as if he disappeared on a fade. Since most of the active community was aware of his situation, missing a cycle was nothing to worry about. With a small SDR and transmit/receive relay to couple to the loop, Ben had a very inexpensive, yet very impressive medium-wave station that was capable of completing two-way QSOs from an apartment (*Photo C*). This accomplishment was something that had never before been accomplished at these frequencies and under amateur radio rules.

At the time that this article is being developed, Ben and his family are preparing to move into their new home and Ben has already stated that a loop will likely be used, at least for experimentation, at his new station (see *Photo D*). Initial site surveys suggest that supporting the loop in the air is possible from surrounding trees but no baseline noise evaluation has been completed at this time.

The Loop Option

In the real-world scenario that I just described, a vertical antenna was going to be out of a question for a number of reasons which have already been explored: High voltage and a potential for fire[5] was not an option, installing a radial system was also going to be a problem and, of course, whatever was installed had to remain hidden from view and inaccessible by living creatures. While loops are not perfect solutions for everyone, there are a number of advantages that make them attractive solutions. Being a magnetically-dominant antenna, when a radiated wave front encounters flora and fauna, particularly in the near field, they do not become part of the loss resistance in the RF return path like a vertical antenna because loops are closed-circuit systems. Attenuation can occur, however, due to RF encounters with the environment, ultimately resulting in a decrease in radiated signal. Similarly, even though an RF return path through the surrounding environment does not exist, RF energy near lossy dielectric, like the ground, can be problematic and some operators have gone so far as to place ground screens under their lower horizontal wire that is closer to the ground. Some of these screens have been as simple as rolling out garden fence or chicken wire, extending beyond the ends of the loop plane.

Finally, the radiation pattern of a loop, which exists in the plane of the wire, is relatively diverse compared to a vertical antenna. While the vertical — with symmetrical, capacitive

Timestamp	Call	MHz	SNR	Drift	Grid	Pwr	Reporter	RGrid	km	az	# Spots
2018-10-25 14:02	N1VF	0.475683	-17	0	CM87wj	0.05	VA7MM	CN89og	1322	358	44
2018-10-25 13:52	N1VF	0.475686	-13	0	CM87wj	0.05	KPH74	CM88mc	108	317	93
2018-10-25 13:32	N1VF	0.475686	-16	0	CM87wj	0.05	WO7I	DN10cw	543	42	45
2018-10-25 13:22	N1VF	0.475686	-23	0	CM87wj	0.05	KA7OEI-1	DN31uo	964	58	39
2018-10-25 13:22	N1VF	0.475687	-12	0	CM87wj	0.05	KJ6MKI/AA	CM88oi	122	331	84
2018-10-25 13:12	N1VF	0.475687	-27	0	CM87wj	0.05	AF7MD	CN85nm	906	356	20
2018-10-25 13:02	N1VF	0.475686	-8	0	CM87wj	0.05	KPH	CM88mc	108	317	93
2018-10-25 12:32	N1VF	0.475681	-24	-1	CM87wj	0.05	KM5SW	DM65	1365	94	22
2018-10-25 12:12	N1VF	0.475690	-17	0	CM87wj	0.05	KR6LA	CN90ao	357	2	38
2018-10-25 12:12	N1VF	0.475689	-27	0	CM87wj	0.05	W0AY	DN26xo	1221	30	23
2018-10-25 12:02	N1VF	0.475682	-23	0	CM87wj	0.05	VE6EGN	DO23	1870	15	32
2018-10-25 11:32	N1VF	0.475686	-16	0	CM87wj	0.05	W0YSE	CN85rq	923	358	41
2018-10-25 11:02	N1VF	0.475686	-24	0	CM87wj	0.05	VE6JYK/WI	DO33	1920	18	26
2018-10-25 10:42	N1VF	0.475686	-15	0	CM87wj	0.05	ND7M	DM16	463	101	36
2018-10-25 10:42	N1VF	0.475687	-23	0	CM87wj	0.05	VE6JY	DO33or	1952	19	74
2018-10-25 10:32	N1VF	0.475687	-14	0	CM87wj	0.05	KR7O/L	DM07ba	204	101	49
2018-10-25 10:32	N1VF	0.475686	-21	0	CM87wj	0.05	WW6D	CM88pk	127	336	43
2018-10-25 10:32	N1VF	0.475684	-10	0	CM87wj	0.05	KJ6MKI/H	CM88oi	122	331	72
2018-10-25 10:22	N1VF	0.475685	-26	0	CM87wj	0.05	KL7L/9AY	BP51ip	3283	334	7
2018-10-25 09:52	N1VF	0.475688	-30	1	CM87wj	0.05	KU7Z	DN41af	972	61	1
2018-10-25 09:42	N1VF	0.475686	-24	0	CM87wj	0.05	KK6PR	CN94ik	786	5	31
2018-10-25 09:42	N1VF	0.475806	-11	0	CM87wj	0.05	W6SFH	CM88pl	131	337	94
2018-10-25 09:32	N1VF	0.475806	-11	0	CM87wj	0.05	WB7ABP	CM88ok	130	333	90
2018-10-25 09:22	N1VF	0.475806	-12	0	CM87wj	0.05	KB6WFC	CM87sq	44	318	72
2018-10-25 09:02	N1VF	0.475686	-30	0	CM87wj	0.05	KA7OEI	DN40ao	947	65	1
2018-10-25 08:52	N1VF	0.475688	-14	0	CM87wj	0.05	VE7BDQ	CN89la	1295	357	41
2018-10-25 08:52	N1VF	0.475686	-18	0	CM87wj	0.05	KP4MD	CM98iq	161	27	12
2018-10-25 08:22	N1VF	0.475687	-28	0	CM87wj	0.05	K9FD	BL11je	3819	252	1
2018-10-25 07:42	N1VF	0.475687	-29	0	CM87wj	0.05	VE7KPB	DN29cm	1441	19	2
2018-10-25 07:22	N1VF	0.475688	-25	0	CM87wj	0.05	VA7JX	CN79kv	1410	351	38
2018-10-25 06:32	N1VF	0.475687	-25	0	CM87wj	0.001	KL7L	BP51ip	3283	334	18

Figure 3. Increasing his power from 20 watts to 60 watts total power out, Ben realized a significant increase in WSPR decode count, range, and reported S/N. While he is reporting 50-milliwatts EIRP, further analysis suggests that he was actually closer to 120-milliwatts EIRP.

top loading — tends to minimize high-angle signals at the zenith (directly above), loops tend to have a fair share of high-angle component, particularly above the antenna, aside from ground reflection losses. We have often thought of this high-angle component as wasted energy except for periods of extremely active geomagnetic conditions but a recent article by Carl Luetzelschwab, K9LA,[6] might suggest otherwise. Carl examined, from a theoretical standpoint, the impact of elevation angle on coupling to extraordinary waves (x-waves) and ordinary waves (o-waves) and how that impact affects ionospheric absorption for short hops on 630 and 2200 meters. It seems that because both bands are found below the "electron gyro frequency," a frequency range that Carl indicates is between 700-1700 kHz and describes the frequency at which free-electrons spiral around magnetic lines of force, one must consider both x-wave and o-wave ionospheric coupling. (Historically, many of us have examined these bands from what we know and could relate to 160 meters, which resides above the electron gyro frequency and is only o-wave dominant.) Carl's theoretical treatment for short hops seems to suggest that higher angles might sometimes favor extraordinary wave coupling better than lower-angle radiators. Therefore, the higher-angle component of the loop might actually find some usefulness not previously recognized. Similar behavior could also be observed from inverted-L and *asymmetric* Marconi-T antennas in which imbalances in current distribution in the top loading wires result in radiation that is often at high angles.

As they say, there is no free lunch and everything has pros and cons, but hopefully, these considerations and even Ben's story will help prospective operators make informed decisions ahead of installing an antenna for these frequencies.

JT9-2 and Longer Variants Return With "SlowJT9"[7]

For at least five years, there have been calls for Joe Taylor, K1JT, to continue development of JT9 variants designed to provide deeper decode limits than the traditional 1-minute transmission variety. One of the predecessors to the modern day WSJTx suite, known as WSPRx, contained versions of JT9 with transmit cycles of 2 minutes, 5 minutes, 10 minutes, and even 30 minutes, and which offered some degree of S/N improvement. The software had problems, though, and many stations lacked the frequency stability for these longer-sequence modes. There were also questions about the rate of fading on 630 meters specifically, and how data transfer might subsequently be impacted, so the project was abandoned. Attempts were made to revive the variants but the code was either never completed or removed from the published source code.

In late 2018, Rik Strobbe, ON7YD, began work to develop his own software utilizing the WSJTx libraries and infrastructure in an attempt to return these longer transmission variants to air. So far, his efforts have paid off with reported decode limits seen near -33 dB S/N in 2.4-kHz bandwidth using the 5-minute version compared to -27 dB S/N for the traditional JT9 variant. While there are varying opinions of these new modes and many stations still do not possess the frequency stability necessary for the longest JT9 variants, several smaller stations have completed QSOs that may not have been possible using traditional JT9. How the nature of rapid fading impacts these modes on 630 meters in the long run will require further study, but slower fading associated with 2200 meters might find better utility with these longer modes. Testing is ongoing and changes are developing rapidly, so stay tuned for more details.

Don't Forget to Submit Notification to UTC for Your Field Day Site!

ARRL Field Day is approaching once again, so if you have plans to try your hand at 630 meters or 2200 meters this year at your Field Day site, don't forgot to submit notification to UTC[8] at least 30 days in advance. Field Day is an excellent opportunity to try these bands in spite of summer noise because many Field Day sites are spacious enough to experiment with antennas and often have a lot of bodies to provide assistance with antenna setup. Give some serious thought to setting something up and plan on operating JT9 or CW. Several of us plan on being on the air again this year.

If you have questions or comments, please contact me at <KB5NJD@gmail.com>.

For your convenience the following links, in addition to bonus material, can be found at <http://njdtechnologies.net/cq>.

Notes

1. High voltage wire for loop: <https://tinyurl.com/ybvevvud>
2. Drone footage of monofilament deployment: <https://tinyurl.com/y7p3j3ua>
3. Hans Summers U3S beacon: <https://tinyurl.com/ya7xnz8v>
4. N1VF U3S hack description and code: <https://tinyurl.com/y84h6hgt>
5. Hall of Flame: <https://tinyurl.com/ybjrxbdg>
6. K9LA Propagation article: <https://tinyurl.com/y8bdol3h>
7. SlowJT9: <https://tinyurl.com/y8fdjrhu>
8. UTC notification: <https://tinyurl.com/yab7cnoo>

ANTENNAS

BY KENT BRITAIN, WA5VJB

NVIR and AMSAT X-Band Antennas

Photo A. German command vehicle on the right with NVIR loop antenna. It obviously did not survive the encounter with the Churchill tank. (Courtesy of Wikipedia.org)

For years, I had watched documentaries on World War II and saw big loops over many of the German military vehicles (see *Photo A*). Always seemed like a good way to hang camouflage netting. Only recently did I find out that these were really NVIR, or Near Vertical Incidence Radiator, antennas for the German radios.

In many ways the NVIR antennas were an excellent choice for tactical communications. In *Figure 1*, we have the pattern of a whip antenna on a typical vehicle. Note how most of the signal goes towards the horizon and we would normally think of this as an ideal pattern for local communications.

In *Figure 2*, we have a loop antenna near the ground. Note how almost all of the signal is going straight up. Gee, that's dumb for a communications system to talk to the other vehicles in your command. Or is it?

When operating well below 10 MHz, signals typically go straight up, hit the ionosphere, and bounce straight back down. Horrible if you are trying to work DX, but great if you are interested in talking with others in a 50-to-100-mile circle.

** 1626 Vineyard, Grand Prairie, TX 75052*
email:<wa5vjb@cq-amateur-radio.com>

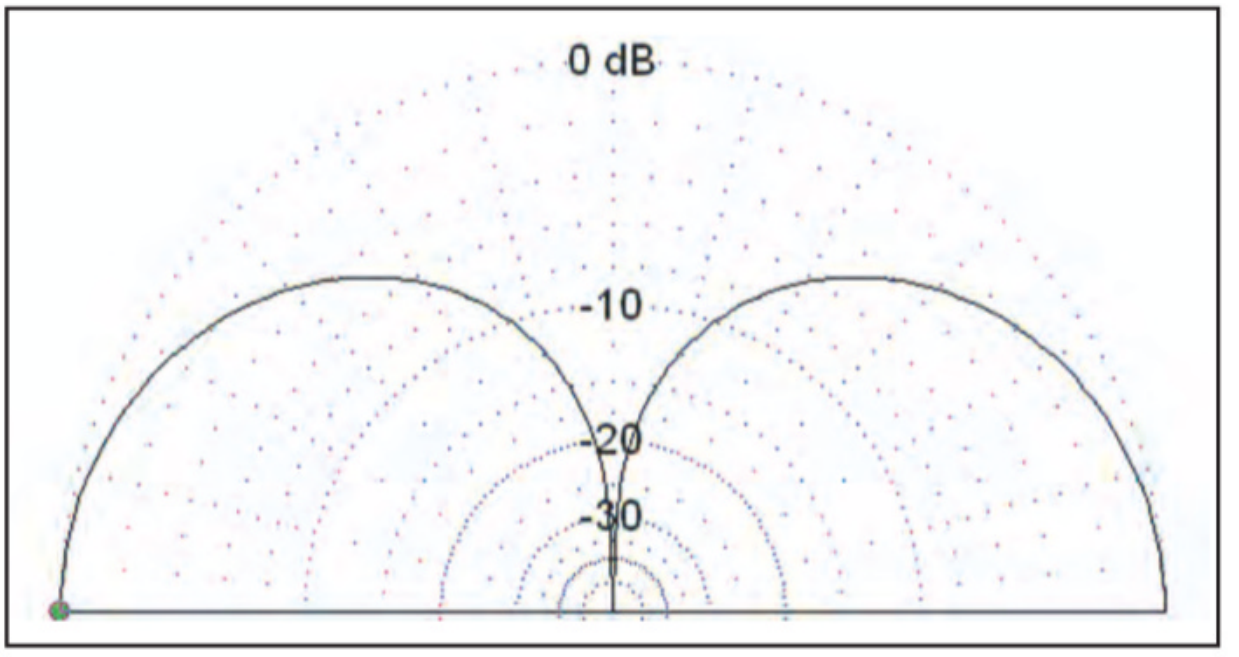


Figure 1. Vertical whip pattern

This is known as NVIS, or Near Vertical Incidence Skywave, propagation.

While higher frequencies skip nicely for DX communications, these higher shortwave frequencies just go straight through the ionsphere at vertical incidence and are useless for NVIS communications. Of course, this depends on where we are in the solar cycle, but NVIS limit is usually below 10 MHz.

So NVIR antenna systems are great for tactical communications and let you easily talk with the guys on the other side of that hill. That's a problem VHF doesn't handle well at all.

Satellite X-Band Antennas

The AMSAT L-Band, S-Band, C-Band, GPS L1, GPS L2 antenna with the 435-MHz add-on shown in the last column generated quite a bit of reader response.

This time we have the X-Band downlink prototype antennas for the AMSAT

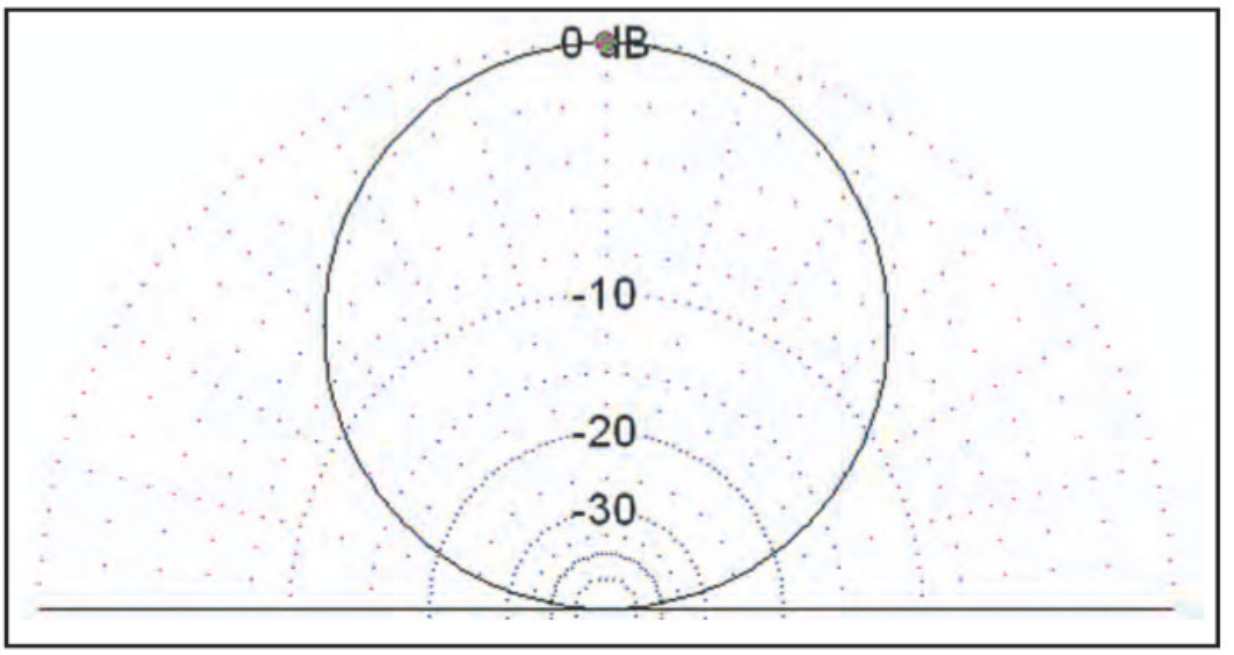


Figure 2. Loop near the ground

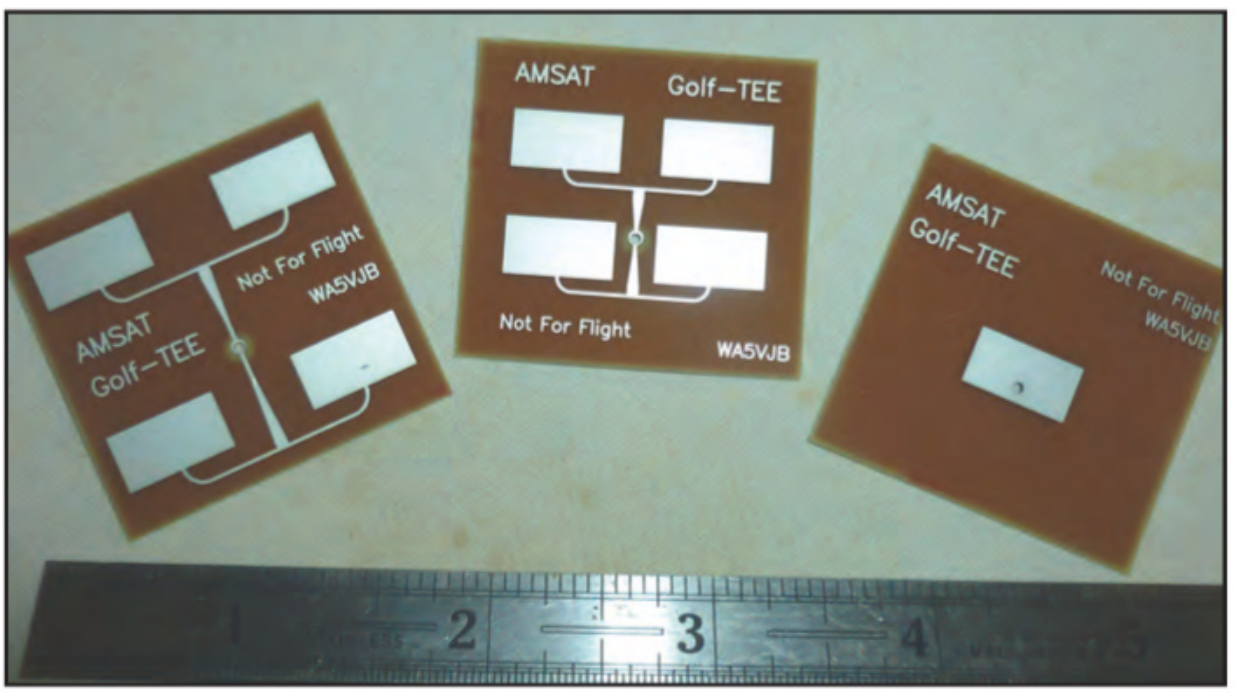


Photo B. AMSAT X-band antenna prototypes. See text for explanation.

GOLF-TEE cubesat (*Photo B*). When the antenna work first started, I had no idea how high the planned orbit was going to be, and that information is still a bit fuzzy. So I did three versions of the antenna. The single patch has a very broad pattern and would be best for low orbits. The version with four patches close together has a tighter pattern and is better for medium orbits. The four patches with a wide spacing are for higher orbits. Yes, those of you with a sharp eye see the "Not for Flight" on the antennas. These antennas will be used for pattern measurements when my antenna range dries out a bit, but the antennas are not on space-qualified PCB material. The problem with common PCB materials is outgassing. Various compounds in the PCB material tend to vaporize when in a vacuum. These "vapors" then condense on solar cells and optics. Now, DC power from the solar cells drops and any cameras or star trackers have fuzzy images. In short, if the material has any kind or odor, it will probably flunk outgassing specifications.

Looking Ahead

I planned this month to revisit my favorite technique for installing ground radials, but poor weather has made that a bit difficult. Guess it gives me a head start on the next column.

As always, we welcome your questions and topic suggestions. You folks do come up with some good questions and topic suggestions. Just drop a snail mail to my QRZ.COM address or an email to <wa5vjb@cq-amateur-radio.com>. Spring is here … time to start planning those big antenna improvements. For other antenna articles and projects you are welcome to visit <www.wa5vjb.com>.

VHF PLUS

BY TONY EMANUELE,* K8ZR

VHF-Plus DXpeditions and More

VHF Plus Calendar

144 MHz Spring Sprint: April 8th
DUBUS EME Contest 1.2 GHz: April 13th & 14th
222 MHz Spring Sprint: April 16th
Lyrid meteor shower predicted peak: April 21st & 22nd
432 MHz Spring Sprint: April 24th
Aurora Conference - White Bear Lake, MN: April 27th
VHF Super Conference - Sterling VA: April 26th-28th
Microwave Spring Sprint: May 4th 0800 to 1400 Local
DUBUS EME Contest 10 GHz & Up: May 11th & 12th
50 MHz Spring Sprint: Saturday May 11th
Hamvention® VHF/UHF/Microwave Forum - Xenia, OH: May 18th
ARRL June VHF Contest: June 8th-10th

Paul Newcombe, N2EME, and Hal Gress, K3NXH, will be activating the sliver of land that is FM13 south of Wilmington, NC (*Figure 1*) using the callsign N4EME from May 7th to May 17th. The team reports that FM13 was selected for this year's DXpedition because it is on the FFMA[1] want list of many VHFers west of the Mississippi. The 50-MHz station will run a kilowatt to at least one 7-element Yagi with elevation control. On 144 MHz, the N4EME team will light up the band with 1.5 kilowatts to four 12-element LFA yagis. Paul and Hal will take advantage of any propagation that comes their way, be it via the moon, meteor scatter, sporadic-E or tropo. (For pictures of their rover see: N4EME on QRZ.com)

Veteran EME DXpeditioners Chris Ploeger, PA2CHR, and Jos Wolters, PA3FYC, are packing their bags once again and this time heading to Anguilla Island. The June 2018 VHF+ column highlighted their very successful DXpedition to Guatemala in February 2018, though there was one glaring mistake in that I incorrectly noted Chris' name and callsign — my apologies, Chris. On Anguilla Island, FK88mg, Chris and Jos will use the callsign VP2EMB from April 12th to April 29th. The pair will be QRV on 144, 432, and 1296 MHz using JT65 and CW with a proven station consisting of an FT-857 and two 20-element, cross-polarized Yagis and SSPA on 2 meters. On 432 MHz, the station is an FT-857 to crossed-polarity 27-element horizontal / 23-element vertical Yagi and a 400 SSPA. The 1296-MHz station will use a GPS locked FT-857 and transverter, 150-watt SSPA and single 67-element yagi. During their testing they have received their own echoes on 70 and 23 centimeters. The team anticipates being online at the HB9Q logger site. Their timetable and other operational notes can be found at <www.pa2chr.nl>. Their online log should be available on the VP2EMB QRZ.com page. Chris noted that they selected a location with back-up power in a more exclusive area of the island in hopes of reducing the local noise that so often plagues operations in populated areas.

The gear for multiband DXpeditions such as this does not fit in the overhead compartment of an airliner and thus a large portion of it must be flown as checked luggage at considerable expense. In this case, the checked bags weigh over 180 kilograms/400 pounds. If you would like to make a small donation to help offset the cost of transporting DXpedition gear, see their website.

Speaking of EME DXpeditions, the team of Sam, HB9COG, and Dan, HB9CRQ, will pack their bags and make their way to the island of Crete in May. Operating on the southeast coast of Crete in KM25xa from May 10th to 17th on 23 centimeters to 3 centimeters,[2] the pair will use the callsign SV9/HB9CRQ. For schedule details see: <https://tinyurl.com/y6gzk5bl>.

Les Rayburn, N1LF, in EM63nf, reports that with the considerable assistance of Marcus Thomas, KF4YHP, the N1LF beacons are now on the air. The beacon site is located at the Pinnacle lookout tower in Shelby County near Birmingham, Alabama, in EM63pf. Les reports that the beacon lineup is as follows: The 10-meter beacon is 28.268.5 MHz @ 3 watts to a half-wave vertical; 6-meter beacon is on 50.068 MHz @ 0.5 watts to a loop antenna; the 2-meter beacon is 144.300 MHz @ 0.5 watt to a loop; the 222-MHz beacon is on 222.068 MHz @ 3 watts to a loop; and the 432 MHz beacon is on 432.298 MHz @ 10 watts to a pair of stacked loops. Beacon reception reports are welcomed. For images of the Pinnacle lookout tower, see <https://tinyurl.com/y6jm9fpy>.

Figure 1. The area within the red box, stretching from Kure Beach to Bald Head Island, North Carolina, is the only bit of land within grid square FM13. (Courtesy of k7fry.com)

KØFQA Silent Key

Jon Lieberg, KØFQA, a central figure in the promotion of VHF in the Midwest, became a silent key in February. In 1984 he organized the first VHF Midwinter Break, which became an annual event evolving five years later into the Aurora Conference. Today the Aurora Conference is the largest annual gathering of weak-signal VHFers in the Upper Midwest and is sponsored by the Northern Lights Radio Society (NRLS), an organization in which Lieberg played an important role. He was also involved with the Central States VHF Society. Jon Platt, WØZQ, fondly remembers working him on "*that exotic band of 2304"* using no-tune transverters @ 5

c/o CQ magazine
email: <k8zr@cq-amateur-radio.com>

milliwatts and surplus BBQ grid dishes. *"Jon was a significant driving force for the NLRS, was a local pioneer and resource that led us into the microwaves. He will be missed."*

Cabrillo Adds "DG" for Digital Modes

Last September, a seemingly minor addition was made to the Cabrillo specification with the addition of *DG* as a new mode. Cabrillo refers to a universal contest log submission format created by Trey Garlough, N5KO. It is the preferred format for all electronic contest logs. Prior to the addition of DG as a recognized Cabrillo mode, all digital QSOs including RTTY, FT8, MSK144, and the others were tagged RY by contest and logging programs. With the addition of DG, the operator can differentiate between keyboard to keyboard modes such as RTTY and PSK and the digital modes of FT8, MSK144, and the JT modes. It is only a matter of time before the use of DG for the WSJT-X modes and RY for RTTY type modes is mandated by your favorite contest. Might as well get into the habit of making the distinction as early as your next log submission.

In is his excellent *ARRL 10 GHz and Up Contest 2018 Results* summary released in February, Jeff Wadsworth, KI5WL, noted that for the 2019 version of the ARRL 10 GHz & Above Contest, the goal is to have as many participants as possible submit their logs in Cabrillo format. Cabrillo does support the 6-digit/character grid exchange required by the contest. He noted that, as is the case with the ARRL 222 MHz and Up Distance Contest, the distances are calculated automatically. For those who use paper logs, there is a tool to translate paper logs to the Cabrillo format. See <www.b4h.net/cabforms>. Submitting contest logs in the Cabrillo standard makes log checking by the contest sponsor easier, produces more accurate results (fewer errors), and permits the contest results to be published much sooner.

Dayton Forum

The VHF/UHF/Microwave Forum at the Hamvention® in Xenia, Ohio is scheduled for Saturday May 18th in forum room 4 from noon to 1:30 p.m.

– 73 and CU on the bands! Tony, K8ZR

Notes:

1. FFMA: The Fred Fish Memorial Award was created in honor of Fred Fish, W5FF (SK), who was the first amateur to work and confirm all 488 Maidenhead grid squares in the 48 contiguous United States on 6 meters.

2. 1296 MHz, 2320 MHz, 3400 MHz, 5760 MHz, and 10 GHz.

Focus on CQ Awards: The CQ Worked All Zones Award

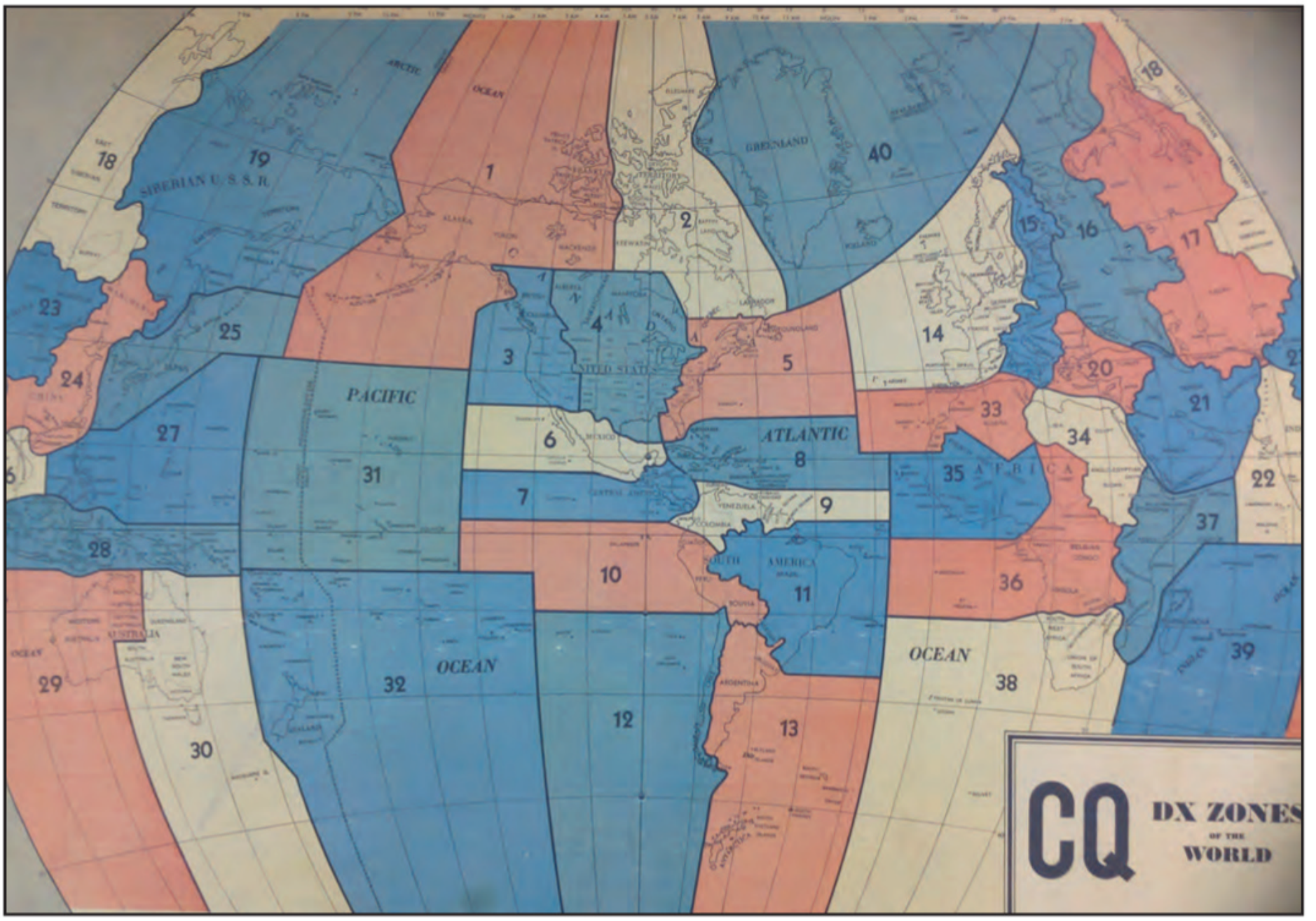
While we continue our search for a successor to K1BV as Awards Editor, we'll use the opportunity to shine a spotlight on CQ's own operating awards, some of which are very well-known, such as USA-CA (the USA Counties Award) and WAZ (Worked All Zones), and others of which don't always grab as much attention. This month, we'll take a closer look at our oldest and most challenging award, WAZ. –W2VU

Later this year, we will be celebrating the 85th anniversary of WAZ, the CQ Worked All Zones award. Introduced in the November 1934 issue of *R9* magazine, one of *CQ*'s predecessors, WAZ has stood the test of time and multiple geopolitical upheavals.

As we recounted in our 50th anniversary issue in January 1995, early *CQ* Advisory Editor Robert York Chapman, W1QV (now a Silent Key), remembered publisher Sanford Cowan exclaiming, after selling out the first issue, "God, I can't believe it. We've sold everything!"

"A week or so later, I went to New York," Chapman recalled, "and John Potts (*CQ*'s first editor) said to me, 'Where do we go from here?' I said to check if, when you bought the magazine, did you buy rights to a thing called WAZ? He said, 'what's that?' I told him it was a very popular program with the DXers and it had been run by *R/9* and then *Radio*. A few weeks later, Potts told me 'I checked that, and I do own that. It came with the magazine.' And he showed me a WAZ certificate."

CQ revived the Worked All Zones award with an announcement in the January 1947 issue, and it has been the cornerstone of our award and contest program ever since.



WAZ is the second-oldest active award program in amateur radio after the International Amateur Radio Union's Worked All Continents (WAC) award. It is older than the ARRL's DXCC award, which was launched in 1936.

One of the keys to WAZ's longevity is the fact that it is not tied to national borders, or to political changes in country names, sizes, or administrations. The zone borders are essentially unchanged since 1934 (there have been a couple of tweaks, but primarily to ease confusion).

While the exact reasoning behind creating 40 zones and setting their boundaries is lost to time, it is thought that the award designers tried to include roughly equivalent populations (in the 1930s) within each zone. Obviously, in some cases, this wasn't possible, such as the various zones that converge on the North and South Poles, but an effort was made to include at least one well-populated area within each zone when possible. For example, Zone 12, in southwestern South America, is mostly ocean, but it also includes Chile. Likewise, adjacent Zone 13 consists of Argentina, the Falkland Islands and a whole lot of water. It wasn't as easy up north, though, which is why Zone 2 (northern Quebec) is so difficult for so many of us to work.

Lots of WAZ "Flavors"

While making the contacts needed to earn the basic Worked All Zones award (at least one confirmed contact in each of the world's 40 CQ zones) is challenging enough, the desire for even greater challenges has led to the introduction over the decades of nearly a dozen more narrowly-focused WAZ awards, including single-mode [AM, CW, Digital, EME, (Baudot) RTTY, Satellite, SSB, and SSTV (slow-scan TV)]; single-band [160, 80, 40, 30, 20, 17, 15, 12, 10, and 6 meters], and most recently, location technology [Traditional (all contacts made from operator-attended station), Remote (some contacts made using remote station technology), and All-Remote (*all* contacts made using remote station technology)]. Some of the more difficult bands and modes have slightly less stringent requirements for the initial award level. The satellite, EME, and 6-meter awards have an initial threshold of 25 confirmed zones, while the 160-meter award requires 30 zones as a starting point. Endorsements stickers are available as you move toward working and confirming all 40 zones.

5-Band WAZ

The "top of the heap" for WAZ is the 5-Band WAZ award, issued for confirmed contacts on all five of the "traditional" HF bands: 80, 40, 20, 15, and 10 meters. The initial award level for 5-Band WAZ is 150 zones out of 200, with the added requirement of needing to have qualified for a full 40-zone award. There is an endorsement sticker for completing all 200 Zones, with the option of purchasing a plaque once you've confirmed all 200 contacts. As of February 25, 1,009 amateurs had confirmed all 200 zones for 5-Band WAZ.

In previous columns, we have printed the complete rules for each issue's highlighted CQ award. The WAZ rules are too long to print here, so instead, we'll refer you to the WAZ home page at <https://tinyurl.com/7mlzqhf>, which includes links to the rules in 10 different languages, plus listings for 5BWAZ holders, those with all 200 zones and "contenders" for 200, as well as standings for the 160-meter (569 awards to date), 6-meter (144), satellite (31), and EME (22) WAZ awards.

WAZ and Logbook of the World

For the past year, ARRL members using the online Logbook of the World (LoTW) system have been permitted to apply LoTW contacts to CQ's WAZ Award (in addition to WPX). For information on how to do this, please visit WAZ Award Manager KC5LK's LoTW page at <http://kc5lk.com/waz_app_proc.html>.

Coming Up…

We will continue our tour of CQ awards next month with WPX, followed by USA-CA, the USA-Counties Award.

Help Wanted: CQ Awards Editor and USA-CA Award Manager

We are still looking for candidates interested in filling K1BV's shoes in both of his former roles — Awards Editor and USA-CA Award Manager. One person does not need to wear both hats. Awards Editor candidates should be accomplished "wallpaper" collectors with a passion for discovering and sharing information on operating awards from around the world, have the time to research and write a monthly column, and be able to reasonably express yourself with the written word. The USA-CA Award Manager must hold at least the basic level of the award (preferably All Counties) and must be a dedicated county-hunter who delights in helping to recognize the accomplishments of his/her fellow county aficionados! If you're interested in either role — or both — please contact Editor Rich Moseson, W2VU, at <w2vu@cq-amateur-radio.com>.

what's new

The TW-1 Talking Wattmeter returns to LDG's lineup

LDG has announced the return of the TW-1 Talking Wattmeter to its product lineup. Intended primarily for visually-impaired radio amateurs, this instrument speaks the RF power level and standing wave ratio (SWR) aloud over a self-contained speaker.

On command, this wattmeter speaks the forward or reverse power level in watts, or the SWR. A constant Tone Mode is also available, in which the TW-1 plays a continuous tone whose pitch varies with forward power, reverse power, or SWR. This mode is ideal for manually adjusting a tuner or a vacuum tube transmitter or amplifier. You can watch the plate current meter while listening to the power output. It's also great for mobile operation, allowing the user to tune screwdriver-type antennas while safely watching the road.

The TW-1 handles all power levels up to 2,000 watts, and covers the 160- to 6-meter amateur bands. You can select forward or reverse power, or the SWR. The TW-1 will also allow you to select English, Spanish or German languages. It runs on 12 volts DC at 200 microamps, so providing power in a car, truck, or van is not a problem.

As a thank-you to its loyal customers, the price remains at its original 2005 level of $150. For this special promotion, the TW-1 is available exclusively from MTC Radio <www.mtcradio.com>.

Like all LDG products, the TW-1 comes with a two-year, fully transferable warranty, and customer support. For more information, contact: LDG Electronics, 1445 Parran Road, St. Leonard, MD 20685. Phone: (410) 586-2177. Email: <support@ldgelectronics.com>. Website: <www.ldgelectronics.com>.

BY BOB SCHENCK, N2OO

The Family that DXes Together…

This month, I have turned over the keyboard to 14-year-old Faith Hannah Lea, AE4FH, to tell us about her Dry Tortugas activation as N4T with her sister and Dad. Last year at the Orlando Hamcation, I learned about this mini DXpedition being planned for these young YLs and their father. I asked Faith Hannah at that time if she would be willing to write a story about their adventure, and she agreed, although I'm not sure if she fully understood at the time. When we saw her again at Dayton, I reminded her that I was serious, and she and dad both reconfirmed! They originally had planned to go in August, but Faith Hannah got an opportunity to participate in the "Youngsters On The Air" (YOTA) South Africa camp which was being held in August. Faith Hannah, who was accompanied by her dad was the only representative from the USA who attended. (See January CQ, p. 20, and <https://tinyurl.com/yxrjnx5n>.) The Dry Tortugas trip was thereby rescheduled for December.

The Lea family is quite "radio" active! Another sister, Grace, KM4TXT, passed her EXTRA at the Orlando Hamcation in February! Dad (James) is WX4TV and Mom (Michelle) is N8ZQZ. The four children are: Zechariah, WX4TVJ; Hope, KM4IPF; Grace, KM4TXT; and Faith Hannah, AE4FH. With Grace passing the Extra license test, now all four of the children hold Extra Class licenses.

James explained to me last year that he wanted his children to experience what it is like to go on a DXpedition somewhere that required them to be self-reliant, and not dependent on the normal infrastructure (electric, cellphone, etc). Dry Tortugas seemed to fit the bill for an introduction to DXpeditioning for 12-year-old Hope and 14-year-old Faith Hannah. I hope you enjoy their story. –N2OO

QRZed November Four Tango — A Mini DXpedition to the Dry Tortugas

BY FAITH HANNAH LEA, # AE4FH

In June 2018, Nathan Wood, K4NHW, and Ryan Kovacs, WG4I, went to the Dry Tortugas (a national park some 70 miles off of Key West) to activate it for all the eager grid, lighthouse, and park chasers out there. My sister Hope, KM4IPF; my dad James, WX4TV, and I were invited to join them on their activation. Although we were unable to participate, this didn't stop us and we decided to activate the Dry

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# Email: <info@hamradio.world>

Photo A. The TN07 Engineering 20-meter X-Beam and RadioWavz 40-meter double bazooka antennas stand atop the MGS MK4-HD push-up mast with Fort Jefferson in the background. The flag is at half staff in remembrance of President George H. W. Bush. (Photos by James Lea, WX4TV)

Tortugas ourselves as soon as possible. We secured the use of N4T as our callsign and began the process of getting to the island. We had originally planned to activate the small island in mid-August 2018, but plans soon changed to mid-December.

After the permits to operate were taken care of, we had to brainstorm various ways to get all of our equipment to the island and still be within the numerous restrictions the National Park Service had. The biggest one was weight.

The WPX Program

CW

3885 . . . . . AA4IB	3886 . . . . . PY2ZW

SSB

4187 . . . . . K9QJ	4190. . . . . IW$$ROT
4188 . . . . . KA7LJQ	4191 . . . . . K2KJ
4189. . . . . K4KSV	

Mixed

3792 . . . . . K9QJ	3796 . . . . . PY2RKG
3793 . . . . . T88UW	3797 . . . . . AA4IB
3794 . . . . . WK$$DX	3798 . . . . . AJ3DI
3795 . . . . . DU3GKT	

Digital

984 . . . . . K9QJ	989 . . . . . AA4IB
985 . . . . . WA8KNE	990 . . . . . JK3JXP
986 . . . . . WK$$DX	991 . . . . . KH2GM
987 . . . . . K1EJL	992 . . . . . K2KJ
988. . . . . NR5O	

CW: 450: JQ1CIV. **2200:** W3LL.

SSB: 350 K9QJ, EI5HVO, K4KSV. **500:** W7TLV. **2500:** PA2TMS. **3350:** W3LL.

Mixed: 450: K6PDL, PY2RKG. **550:** W7TLV. **600:** K2KJ. **700:** VE2SYQ, AA4IB. **800:** WKØDX. **850:** IZ1XBB. **1000:** T88UW, JQ1CIV. **1200:** K9QJ. **2500:** PA2TMS, HB9BIN. **2700:** DL3ANK.

Digital: 350: KH2GM, K2KJ. **400:** KE4KMG, WA8KNE. **550:** JJ3DKQ, IZ1XBB. **800:** WKØDX, JQ1CIV. **850:** NR5O. **1000:** K9QJ. **1300:** HB9BIN. **2600:** W3LL.

160 Meters: K9QJ
80 Meters: K9QJ, PA2TMS
60 Meters: N8BJQ, DL3ANK
40 Meters: K9QJ, WKØDX, PA2TMS, K2KJ
30 Meters: K9QJ
20 Meters: K9QJ, PA2TMS, AA4IB, W7TLV
17 Meters: DL3ANK
15 Meters: K9QJ, PA2TMS, JF2OHQ
12 Meters: N8BJQ
10 Meters: PA2TMS

Asia: K9QJ, WKØDX
Europe: K9QJ, PY2RKG, NR5O, K2KJ
Oceania: K9QJ, NR5O, W7TLV
North America: K9QJ, WKØDX, K1EJL, PY2RKG, NR5O, AA4IB, KH2GM, K2KJ, AJ3DI
South America: K9QJ

60M Bar: N8BJQ, DL3ANK
12M Bar: N8BJQ

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage for airmail) to "CQ WPX Awards," P.O. Box 355, New Carlisle, OH 45344 USA. Note: WPX will now accept prefixes/calls which have been confirmed by eQSL.cc. and the ARRL Logbook of The World (LoTW).

*Please Note: The price of the 160, 30, 17, 12, 6, and Digital bars for the Award of Excellence are $6.50 each.

Only 65 pounds of equipment were allowed per person. Most of this weight was taken up by radios, antennas, batteries, and solar equipment. These restrictions, combined with the fact that we were not allowed to tie anything down to a natural structure (such as trees), created our next challenge — antennas and how to support them. We experimented with several different kinds of antennas and ultimately decided on 40- and 80-meter double bazookas from RadioWavz, 17- and 20-meter Crappie pole antennas (a wire strung up a fishing pole with a few radials), and an X-beam by TN07 Engineering. Since only a few pounds per person were left, we had to find food that would last the trip and not get us over our weight limit. Eventually we found Mountain House freeze-dried food, which is delicious and only takes boiled water. No flammable liquids were allowed on the ferry, and we needed to find a way that didn't take 45 minutes to boil the water. A few weeks before the trip, we found the perfect match — the Kelly Kettle. It was able to boil water in a few minutes with some oak kindling that we got at Lowe's. Finally, having successfully scaled the biggest wall this trip would throw at us, it was time to head south.

We left early Thursday morning with the back of the Suburban loaded to the brim. After traveling for five hours, we made it to the hotel in Key West. Soon after arriving, our long-time friend Val Jacyno, AK4MM, and his wife came to spend some time with us and show us around Key West before we retired to bed for the early morning the next day. While being shown around, we stopped to get a traditional dessert — key lime pie. However, it was not traditional in how it was served — frozen, on a stick, and dipped in chocolate. Having relished our key lime pie-on-a-stick, we decided to get some sleep. The boat for the Dry Tortugas needed to have all our equipment loaded by 6 a.m., so we needed to get everything down there by about 5:30 a.m. With the bags and passengers loaded, it was time to set sail. After two hours on the boat in some rough seas (and after getting a bit green), we docked at Fort Jefferson (the fort on the Dry Tortugas) and unloaded our gear.

When we got off the boat, the winds were steady at about 30 knots. Because of the high wind and the sky looking like it would pour any minute, the first thing we set up was the tent in order to protect any equipment that could be ruined if it got wet. When we found out where we were supposed to set up the radios (which turned out to be on the other side of the island) the process began. During the planning for the trip, we thought that I would get on 20 meters using the 20-meter Crappie pole antenna while Hope and Dad set up the EZup and other antennas. Because it was so windy, this plan didn't work out. Hope and Dad needed a bit of help setting up the EZup so it wouldn't blow away. Once the shelter was erected, we set up the Crappie pole antenna, transmitter, solar panels,

Photo B. Hope, KM4IPF, logs a contact on 20 meters while Faith Hannah, AE4FH, waits for breakfast to finish cooking.

The WAZ Program

SINGLE BAND WAZ

6 Meter

141 .....DK1FW, 25 Zones

10 Meter SSB

608 .....JG8TDZ

17 Meter CW

124.....N6UK

20 Meter SSB

1250 .....N7YDX

80 Meter CW

103 .....K1CP

160 Meter

556 .....DK1FW, 30 Zones
557 .....OK2ZV, 30 Zones
558.....RA3XDX, 40 Zones
559 .....JA5MHD, 39 Zones
560 ..... LA5YJ, 31 Zones
561 .....RA3S, 30 Zones
562 .....N5ZN, 38 Zones
563 .....SV1FJA, 40 Zones
564 .....RMØF, 36 Zones
565.....K6XT, 38 Zones
566 .....W8UV, 30 Zones

160 Meter Updates

542 .....DL7BA, 36 Zones

ALL BAND WAZ

CW

1003.....JA2BDR
1004 .....N8IL
1005 .....AC9EM
1006.....MMØEAX
1007 .....UA1OIW
1008 .....SP3CJS
1009.....US1CT
1010.....RC2A
1011.....W4QK

Digital

50.....JF3LOP
68.....JA4DNC
69.....MMØEAX
70 .....SP3RBG
71 .....IW3GJF

Mixed

9665.....K9NU
9666.....9A1AD
9667 .....AC9EM
9668.....EA4BAS
9669 .....SP9RXP
9670.....JA1GVM
9671.....R3AQ
9672.....KK7YC
9673.....K2RD
9674.....LB6GG
9675.....JF7RJM
9676.....AH6FX/W4
9677.....DL8FBH
9678 .....UR5EDX
9679.....RMØF

RTTY

293 .....SP6IXU
294.....I4UUL
295 .....LZ3YY
296.....MMØEAX

SSB

5434 .....SP3CJS
5435 .....TA7AZC
5436 .....TA6N

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

and Bioenno Power LiFePO4 batteries and I was able to get on the air and call CQ. While Dad and Hope erected the Fiberglass mast, X-Beam, and 40-meter double bazooka antenna (*Photo A*), the answers to my CQs started flooding in! After having made a couple hundred QSOs on 20, we decided to move to 40. A few hundred QSOs on 40 led into a cold, horizontal rain, so we adjourned for the day. Thankfully, our sleeping tent was warm and dry.

Photo C. Faith Hannah waits for AO-92 to make an ascending pass over the Dry Tortugas while Hope holds the Elk antenna. The team made a few dozen satellite contacts from the island.

Photo D. Faith Hannah and Hope explore Fort Jefferson and discover some stalagmites that have been forming for years.

The next morning, things got a little more ordered. While breakfast was cooking, one person operated (*Photo B*). When the next person was ready, he or she would change seats with the operator and the original operator would then get a break. Every hour or so there was a satellite pass which we would work (*Photo C*). The main satellites we worked were AO-91 and -92. During the day, we mostly stayed on 20, but sometimes we would try 17. When evening came, we switched to 40 to get the most out of grayline propagation. After grayline had finished and we weren't getting any more contacts on 40, we took down the 40-meter double bazooka and put up the 80-meter double bazooka. When we weren't getting any more contacts on 80, we closed up the station and went to bed just in time for another storm.

One full operating day was left before we had to pack up and leave the island. During this day, we operated on several different satellites, making the most satellite contacts we had on any of the other days. To go along with the satellites, we ran pile-ups on 20 meters for most of the day before switching to 40 as we had done the last two days. After 40 had been exhausted, we changed the antenna to the 80-meter double bazooka and worked 80 for a few hours before having to shut down because of more rain.

Early the next morning, we got up to call CQ on 80 for the last hour we had left before we had to take down the station. Unfortunately, we didn't get very many contacts during this hour, but we did make 1,970 HF contacts over the 36-hour operating time, plus several dozen satellite contacts.

As luck would have it, when it was time to break down the station, the wind picked up. It wasn't as bad as it was when we were setting up, but it was still about 20 knots. Once the antennas and operating equipment were down and in their respective carrying cases, we had to get everything to the dock before we took down the tent. Thankfully, one of the park volunteers helped us get all the equipment through the half-mile trek to the boat. After everything was at the dock and ready to be loaded when the boat came, we took down the tent. At 10 a.m. the boat came, and we loaded our equipment before getting something to eat (after all that work, who wouldn't want to eat?).

We had about four hours until we had to be on the boat to leave the island, so we decided to take a dip in the beautiful Gulf of Mexico for a while. The staff allowed all the tourists to borrow snorkel gear for the entirety of their visit, so we brought those along to the moat wall around the fort (which is said to be amazing for snorkeling) to see the fish. Most of the fish we saw were stoplight parrotfish, sergeant majors, and various other fish of all sizes and colors (including some barracuda). Everything around the moat wall was beautiful, including the sand.

After snorkeling and enjoying the fish (which seemed to enjoy human company), we explored the fort. It has three levels, the third one being the roof (with lookout posts and old cannons, plus a gorgeous view of the Gulf of Mexico on all sides). The second level has stalactites and stalagmites almost everywhere, some up to about a foot high (*Photo D*). It turns out that all the suspects in the assassination of President Lincoln (as well as the people who were suspected to have helped somehow) were sent to the fort as if it were a prison, which surprisingly enough, it once was.

When it was time to board the boat back to Key West, we decided that because this activation was so much fun, we would try sometime in the next few years to come and activate this little island again. Two hours later, we arrived in Key West and were greeted by a beautiful sunset. When everything was off the boat, Val came to the dock to help us load our equipment into the Suburban. After everything we went through to go on this mini DXpedition, it turned out to be very successful and lots of fun.

I would like to thank everybody who worked us, tried to work us, or just listened to us when we were on the Dry Tortugas. I would like to thank Val and his wife for everything they did for us when we were in Key West. I would also like to thank everybody that helped us get to the island, with special thanks to the South Jersey DX Association for generously offering to print the QSL cards for the trip.

5 Band WAZ

As of February 15, 2019
2115 stations have attained at least the 150 Zone level, and
1005 stations have attained the 200 Zone level.

As of February 15, 2019
The top contenders for 5 Band WAZ (Zones needed on 80 or other if indicated):
CHANGES shown in **BOLD**

Callsign	Zones	Zones Needed	Callsign	Zones	Zones Needed
AK8A	199	17	W1FZ	199	26
DM5EE	199	1	W2LK	199	23
EA5RM	199	1	W3NO	199	26
EA7GF	199	1	W4LI	199	26
H44MS	199	34	W6DN	199	17
HAØHW	199	1	W9XY	199	22
HA5AGS	199	1	WAØMHJ	199	23
I5REA	199	31	WA2BCK	199	23
IKØFVC	199	1	9A5I	198	1, 16
IKØXBX	199	19 on 10M	EA5BCX	198	27, 39
IK1AOD	199	1	F5NBU	198	19, 31
IK8BQE	199	31	G3KDG	198	1, 12
IZ3ZNR	199	1	G3KMQ	198	1, 27
JA1CMD	199	2	HB9FMN	198	1 on 80&10
JA5IU	199	2	JA1DM	198	2, 40
JA7XBG	199	2	JA3GN	198	2 on 80&40
JH7CFX	199	2	JA7MSQ	198	2 on 80&10
JK1BSM	199	2	JH1EEB	198	2.33
K1LI	199	24	K2EP	198	23, 24
K2RD	199	18	K2TK	198	23, 24
K4HB	199	26	K3JGJ	198	24, 26
K5TR	199	22	K3LR	198	22, 23
K7UR	199	34	K4JLD	198	18, 24
K9KU	199	22 on 15	K5FUV	198	18,23
KBØEO	199	23	K5OT	198	18,23
KZ4V	199	26	K6FG	198	17, 18
N3UN	199	18	KZ2I	198	24, 26
N4NX	199	26	N2QT	198	23, 24
N4WW	199	26	N4GG	198	18, 24
N4XR	199	27	N8TR	198	18, 23 on 10
N8AA	199	23	UA4LY	198	6 & 2 on 10
RA6AX	199	6 on 10M	UN5J	198	2,7
RU3DX	199	6	US7MM	198	2, 6
RWØLT	199	2 on 40M	W4UM	198	18, 23
RX4HZ	199	13	W5CWQ	198	17, 18
RZ3EC	199	1 on 40M	W6OUL	198	37, 40
S58Q	199	31	W6TMD	198	34,40
SM7BIP	199	31	W9RN	198	26, 19 on 40
SP3RBG	**199**	**2 on 10M**	WC5N	198	22, 26
VE2TZT	199	23	WL7E	198	34, 37
VO1FB	199	19	ZL2AL	198	36, 37
W1FJ	199	24			

The following have qualified for the basic 5 Band WAZ Award:

Callsign	5BWAZ #	Date	# Zones
K9NU	2105	2019-01-18	200
9A1AD	2106	2019-01-18	180
RA3XDX	2107	2019-01-21	200
MM0EAX	2108	2019-01-22	198
KK7YC	2109	2019-01-31	177
K2RD	2110	2019-02-02	197
SP3RGB	2111	2019-02-07	199
US1CT	2112	2019-02-10	157
UR5EDX	2113	2019-02-12	200
RM0F	2114	2019-02-12	200
LU8ADX	2115	2019-02-12	187

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
MMØEAX	2108	2019-01-22	200
DS4DRE	1748	2019-01-28	178
K9RX	2099	2019-01-28	200
K2RD	2110	2019-02-02	199
KE4KMG	2061	2019-02-04	159
VK3GA	2047	2019-02-04	193
HB9IQB	1831	2019-02-06	188
LU2DX	2035	2019-02-10	190
VK3GA	2047	2019-02-13	194
TF4M	1718	2011-03-15	186

New recipients of 5 Band WAZ with all 200 Zones confirmed:

5BWAZ #	Callsign	Date	All 200 #
2105	K9NU	2019-01-18	1000
2107	RA3XDX	2019-01-21	1001
2099	K9RX	2019-01-28	1002
2108	MM0EAX	2019-02-02	1003
2113	UR5EDX	2019-02-12	1004
2114	RMØF	2019-02-12	1005

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

CONTESTING

BY DAVID SIDDALL,* K3ZJ

Radiosport Provides Common Ground for Young and Old

Plus: Italian and Russian international contests in May; IARU Region 1 Youth Contesting Program expands youth teams and big gun stations; Young Amateurs Radio Club initiates first youth contesting program in the U.S. and Canada; senior hams can enjoy contesting, too, at home or at the right retirement community; WRTC2018 movie available on YouTube.

Some of the smaller and regional contests take center stage during April and May, including the ARI International DX and the Russian CQ-M contests in early May. These contests are reprised below. Both will feature youth teams operating from "big gun" stations in Europe.

This is the fourth consecutive year that European youth teams will participate in the Italian ARI International DX Contest on the first weekend in May using the callsign ES9C at ES5TV's station. The following weekend, another youth team is planning to operate from 9A1A. These youth teams and volunteer contest stations continue to build a strong future for competition in Europe.

For young and old alike, radiosport is an activity in which we all can compete on pretty much a level playing field. We can pit a lifetime of experience against youthful vigor. At WRTC2018 in Germany, some of the "older" teams came out ahead of some of the younger ones, and vice versa.

This spring, a group of "kids" picked up on the theme, called themselves "Team Exuberance," and were to go to K3LR's superstation to learn and maybe to outpace some of the more experienced operators in the March CQWW WPX Phone contest. As noted last month, the team picked up on the young versus old theme and asked whether it is true that "Old age and treachery will always win over youth and exuberance." The quote, by the way, is adapted from one penned by David Mamet.

We also look at growth in the European IARU Region 1 Youth Contesting

email: <k3zj@cq-amateur-radio.com>

Photo A. Young Amateurs Radio Club (YARC) logo. YARC, WY4RC, was founded by an online chat room group. It has initiated a youth contesting program (YCP) patterned on that of the IARU Region 1 in Europe.

Photo B. The CQWW SSB crew members at DQ5M (@DM9EE) pose with their host. The station is located at the host's hotel and restaurant. What more could a group of young contesters want? (Courtesy of DM9EE)

Calendar of Events

All year	**CQ DX Marathon**	**http://bit.ly/vEKMWD**
Apr. 1	RSGB 80m Club Championship, CW	http://bit.ly/2RsAJ4a
Apr. 1-7	IQRP Quarterly Marathon	http://bit.ly/2E1msE2
Apr. 3	UKEICC 80m Contests SSB	http://bit.ly/2cv97YF
Apr. 4	NRAU 10m Activity Contest	http://bit.ly/2RTmcel
Apr. 4	SARL 80m QSO Party	http://bit.ly/H0IqQf
Apr. 6	LZ Open 40m Sprint Contest	www.lzopen.com
Apr. 6-7	PODXS 070 Club PSK 31 Flavors Contest	http://bit.ly/2SESbDg
Apr. 6-7	EA RTTY Contest	http://concursos.ure.es/en/eartty/bases
Apr. 6-7	Mississippi QSO Party	www.arrlmiss.org
Apr. 6-7	Missouri QSO Party	www.w0ma.org/index.php/missouri-qso-party
Apr. 6-7	SP DX Contest	https://spdxcontest-2018.pzk.org.pl/2018/rules.php
Apr. 6-7	Florida State Parks on the Air	http://flspota.org/rules
Apr. 7	RSGB RoLo SSB Contest	http://bit.ly/2EShHhc
Apr. 10	RSGB 80m Club Championship, SSB	http://bit.ly/2RsAJ4a
April 13	QRP Spring QSO Party	www.qrparci.org/contests
Apr. 13-14	New Mexico QSO Party	www.newmexicoqsoparty.org/wp
Apr. 13-14	North Dakota QSO Party	www.kg0yl.net/QSO.html
Apr. 13-14	JIDX CW Contest	www.jidx.org
Apr. 13-14	Georgia QSO Party	http://georgiaqsoparty.org
Apr. 13-14	OK/OM DX Contest, SSB	http://okomdx.crk.cz/index.php?page=englis
Apr. 13-14	Texas State Parks on the Air	www.tspota.org/rules
Apr. 13-14	Yuri Gagarin International DX Contest	http://gc.qst.ru/en/section/32
Apr. 14	ARRL Rookie Roundup, SSB	www.arrl.org/rookie-roundup
Apr. 14	Hungarian Straight Key Contest	http://hskc.ha8kux.com
Apr. 14	International Vintage Contest HF	https://contestvintage.beepworld.it/rules-2012.htm
Apr. 14	WAB 3.5/7/14 MHz Data Modes	http://wab.intermip.net/Contest%20Rules.php
Apr. 19-20	Holyland DX Contest	www.iarc.org/iarc/#HolylandContest
Apr. 20	ES Open HF Championship	http://bit.ly/2BLBNGL
Apr. 20-21	EA-QRP CW Contest	http://bit.ly/2I5SRxs
Apr. 20-21	Michigan QSO Party	www.miqp.org/index.html
Apr. 20-21	Ontario QSO Party	www.va3cco.com/oqp/rules.htm
Apr. 20-21	YU DX Contest	http://yudx.yu1srs.org.rs
Apr. 20-21	CQ Manchester Mineira DX Contest	www.cqmmdx.com/rules
Apr. 20-21	Worked All Provinces of China DX Contest	www.mulandxc.org/582#more-582
Apr. 24	UKEICC 80m Contests CW	http://bit.ly/2cv97YF
Apr. 25	RSGB 80m Club Championship, Data	http://bit.ly/2RsAJ4a
Apr. 27-28	SP DX RTTY Contest	www.pkrvg.org/strona,spdxrttyen.html
Apr. 27-28	10-10 Spring Digital Contest	http://bit.ly/1FrFeBc
Apr. 27-28	Helvetia Contest	http://bit.ly/2lR2L8v
Apr. 27-28	Florida QSO Party	www.floridaqsoparty.org
Apr. 28	BARTG Sprint 75	http://bartg.org.uk/wp/bartg-sprint75-contests-2018
May 1	AGCW QRP/QRP Party	http://bit.ly/1gnVDX0
May 4	FISTS Spring Slow Speed Sprint	http://fistsna.org/operating.html
May 4-5	7th Area QSO Party	http://ws7n.net/7QP/new/Page.asp?content=rules
May 4-5	10-10 Spring CW Contest	http://bit.ly/1FrFeBc
May 4-5	ARI DX Contest	www.ari.it
May 4-5	Delaware QSO Party	www.fsarc.org/qsoparty/rules.htm
May 4-5	Indiana QSO Party	www.hdxcc.org/inqp/index.html
May 4-5	New England QSO Party	www.neqp.org/rules.html
May 11	FISTS Spring Unlimited Sprint	http://fistsna.org/operating.html
May 11-12	Arkansas QSO Party	http://bit.ly/2GiHW1G
May 11-12	**CQWW Foxhunting Weekend**	**www.homingin.com/joek0ov/nfw.html**
May 11-12	CQ-M International DX Contest	http://cqm.srr.ru/en-rules
May 11-12	Volta WW RTTY Contest	www.contestvolta.it
May 11-12	Veron SLP Contest	http://swl.veron.nl/Rules_SLP.html
May 13	RSGB 80m Club Championship, SSB	http://bit.ly/2RsAJ4a
May 18-19	His Majesty King of Spain CW Contest	http://concursos.ure.es/en
May 18-19	Baltic Contest	www.lrsf.lt/en
May 18-19	EU PSK DX Contest	www.eupsk.com
May 22	RSGB 80m Club Championship, Data	http://bit.ly/2RsAJ4a
May 25-26	**CQWW WPX CW Contest**	**www.cqwpx.com**
May 26	QRP ARCI Hoot Owl Sprint	www.qrparci.org/contests
May 30	RSGB 80m Club Championship, CW	http://bit.ly/2RsAJ4a
May 31- June 2	PODXS 070 Club Three Day Weekend Contest	http://bit.ly/2Srdp8A

Program (YCP). Then we describe an attempt to "clone" the YCP in North America by a new youth club, the Young Amateurs Radio Club. This club was founded online in 2017 and already has hundreds of members, with over 900 members participating in the online forum. To conclude, we consider the other end of the age spectrum and what one group of old timers has done to stay in the game.

As noted in earlier columns, competition for team leader positions at WRTC2022 kicked off with the ARRL DX CW and Phone contests in February and early March. Two additional qualifying contests were held later in March, the Russian DX Contest and the CQ World Wide WPX Phone contest. So four eligible competitions are completed and there are 20 in the future. With only the highest 12 eligible scores to be counted for any candidate team leader, there is still time to strategize and compete to win a spot, even if you missed the first six qualifying events completely. Careful picks from the remaining 18 contests and superb operating can still qualify you for a team leader position.

For a little extra incentive for working toward WRTC2022, I suggest viewing the nearly hour-long WRTC2018 movie with English subtitles on YouTube <https://tinyurl.com/yyq2bqxv>.

ARI International DX Contest

The Italian Radio Amateur Association (A.R.I.) sponsors this annual free-for-all where everyone works everyone outside their own country for points using all three common contest modes: CW, SSB, and RTTY. The contest starts at 1200 UTC on Saturday, May 4 and continues through 1159 UTC, Sunday, May 5. You may only use the 80-, 40-, 20-, 15-, and 10-meter bands (no 160). Each station may be worked a total of three times on each band, once per mode.

Italian stations send an abbreviation for their province, including IT9 (Sicily) and ISØ (Sardinia). All other stations send consecutive serial numbers. The multiplier is the sum of DXCC countries and Italian provinces worked per band, regardless of mode. There are 110 Italian provinces. Each QSO with an Italian station collects 10 points, a substantial number compared with 1 point for intra-continental QSOs and 3 points for intercontinental QSOs. QSOs within one's own country do not count for points, but may be worked for the multiplier (only).

Note that as is common with European contests, all competitors can use spotting assistance. There is no separate category for "non-assisted." However, one may not spot his/her own station. You can find the complete rules at <http://tinyurl.com/y2kl7ors>. The log deadline is five days, which is 2359 UTC on May 10, 2019. Logs must be uploaded, using this link: <http://tinyurl.com/yxpz5sot>.

CQ-M International DX Contest

The CQ-M International DX Contest is organized by the Russian association Soyuz Radiolyubiteley Rossii (SRR). The contest starts at 1200 UTC on May 11 and continues through 1159 UTC on May 12. Both CW and SSB are used on the normal HF contest bands (160-80-40-20-15-10 meters). Complete rules in English can be found here <http://cqm.srr.ru/en-rules>.

In this competition, multipliers and QSOs are counted only once per band, regardless of mode. For North and South American stations, QSOs with the Russian Federation and with countries on another continent count for 3 points, while QSOs with another country on the same continent count for 2 points. QSOs with stations in one's own

BEHIND THE BYLINES...

Ted Cohen, **N4XX** ("What's Up with Solar Cycle 25?" p. 10), is an expert in HF propagation and co-author of CQ's *The* NEW *Shortwave Propagation Handbook*. In addition to his extensive writing in the field of propagation, Ted also conducted the "CQ Interviews" series in the 1980s while living in the Washington, DC area. He currently lives in Langhorne, Pennsylvania.

CQ World Wide DX Contest Director **John Dorr**, **K1AR** (2018 CQWW SSB Results, p. 14), is a former *CQ* Contesting Editor and long-time member of the CQWW Contest Committee. He also worked as CQ's marketing director back in the 1990s.

Professor Emil Heisseluft ("New Competition Announced: Sporadic iCloud Contesting," p. 24) is a distinguished researcher and careful observer of technology and society. His always thought-provoking articles — which have frequently predicted advances in technology — appear in *CQ* every April.

Jim Talens, **N3JT** ("Time-Sharing Technology Removes the Tedium of Contesting," p. 27), is a communications attorney who spent more than two decades at the FCC. He also enjoys CW (he is CW Operators Club member #1) and contesting, which he does not find at all tedious.

"The Light Bulb Antenna" (p. 28), is **David Day**, **N1DAY's** second article for *CQ*. His first, in July 2017, was "Ocean Wave Height as a Variable in Predicting HF Propagation." Co-author **Ernie Hollingsworth**, **KC4SIT**, has been a radio hobbyist since the 1960s and a ham since 1990. He enjoys digital modes and held an experimental license for 630 meters before it was opened for general ham use.

Photo C. Pete, N4ZR (left), and Linn, W1LWH (right), getting ready to operate in the ARRL DX CW Contest 60 years after their first team effort. (Courtesy of N4ZR)

country count for 1 point. The country list for multipliers is the Russian P-150-C list, which is found here <http://tinyurl.com/y3vtkh5o>. Logs must be submitted within 30 days by email <cqm@srr.ru> or uploaded to <http://tinyurl.com/y3jvgbhw>.

Youth Contesting Program (YCP) in Europe

IARU's Region 1 Youth Contesting Program (YCP) in Europe, which we first described in this column in April 2016,[1] has doubled in size over the past year. In addition to last fall's successful CQWW Phone operation at DM9EE (using DQ5M, see *Photo B*), three new stations have been added to the 2019 contest schedule:

- LX7I for the ARRL phone contest March 2-3 (now past);
- OZ5E for the Islands on the Air (IOTA) contest July 27-28; and
- LZ9W for the Scandinavian Activity Contest (SAC) Phone weekend, October 12-13.

In addition, ES9C (using ES5TV's station) and 9A1A will return to the contesting airwaves with YCP teams this spring. They will participate in the same contests as in past years. ES9C will be captained by a youth team for the ARI International DX Contest over the weekend of May 4-5. Similarly, 9A1A will host a YCP group for the CQ-M DX Contest on May 11-12. Why not get on the air and work the youngsters?

New U.S. Youth Contesting Initiative

A ham radio youth club based in North America has initiated its own YCP patterned on the YCP administered by IARU Region 1.

The Young Amateurs Radio Club (YARC) is an international ham radio youth group that originated online from a post on Reddit, a social media site. The club focuses on promoting amateur radio among youth worldwide. It manages the 900+ member online chat group known as the Young Hams Discord server for young people interested in radio, sponsors contests and QSO parties with a focus on youth participation, and authorizes activations of the YARC club station callsign WY4RC. Perhaps best of all, it is an online community with free membership. I checked as I wrote this, and found 160 members reported to be online at that moment. That's a pretty large group.

Photo D. Dick Wilder, K3DI (SK) at the K3CCR station at the Collington Retirement Community in suburban Washington, DC. (Courtesy of Collington Retirement Community)

The club and chat group originated in October 2017, when now-YARC President David, KF1SHY, (which is a vanity call) submitted a post titled "Discord for Young Hams" <https://tinyurl.com/yy68rjc8> to the Amateur Radio subreddit <www.reddit.com/r/amateurradio>. David noted that there is a lack of a strong, active youth community in amateur radio. The server exploded with nearly 100 members within its first week and the YARC subsequently was formed. Today there are 900-plus users in the online forum from all over the world.

In February 2019, YARC announced that it has formed the Youth Contesting Program (YCP), which it modeled on the YCP in Europe. It is intended to be a weekend program throughout the U.S. and Canada for groups of up to four young amateur radio operators interested in contests. The idea is to meet at a nearby-as-possible volunteer station, preferably within a 5-hour or shorter drive. YARC acknowledges that its YCP is inspired by the efforts of the original YCP in Europe, as well as by "Team Exuberance" discussed in last December's column[2].

The first event was scheduled to be the 2019 CQ World Wide WPX Phone Contest on March 30-31, 2019. This is the same weekend that "Team Exuberance" plans to be active from K3LR's superstation for the contest.

Additional weekend contests are likely be added later. It is, as they say, a work in progress. If you have a contest-grade station that you are willing to share with some youngsters during a contest weekend, check the YARC website <https://yarc.world/ycp> for current information.

Contest Fun Isn't Just for the Youngsters

Friendships made among ham radio contesters frequently endure for a lifetime. Unlike most other sports, radio sport seniors participate on the same basis as youngsters, and even beat them sometimes. One example that I noted in an article published in *CQ* last September[3] was in the highly competitive and demanding WRTC environment. A 77-year-old retiree qualified and competed at WRTC2018 on the same playing field as a 14-year-old student. The team with the oldest member placed higher than many of the younger teams, including the team with the youngest competitor.

So even as youth teams and young individuals enter the fray in more and more contests, it's worthwhile to remember that the rest of us can do so too, and have fun while at it. Whether contesting with old friends or new, competing in one of the multi-operator categories can be lots of fun and perhaps better-suited to health and age.

I was reminded of this recently when I read a note from Pete, N4ZR. Pete explained that he and Linn, W1LWH, last operated together during the 1959 ARRL DX CW Contest when they were in high school. The two decided to do it again for the 60th anniversary of the original operation. They operated together from Pete's modest station in Maryland this past February, entering the multi-one class in this year's ARRL DX CW weekend (*Photo C*).

Another note directed my attention to K3CCR. Some senior hams have succeeded in establishing ham stations in retirement communities. Even contest stations. Most notable and consistent are the many contest scores submitted by active contester retirees at K3CCR, which is the Collington Community Radio Club located at the Collington Retirement Community in Mitchellville, Maryland (a suburb of Washington, DC). Collington is a continuing-care retirement community where W3GB, N3UM, K3DI (SK), N3ADY, and KB3US founded a club and convinced management to allow a tower so that they could participate in emergency preparedness, other ham activities … and contests (*Photo D*).

You can expect to hear K3CCR again this year in the CQ World Wide WPX contests, both phone and CW, with mainstays W3GB and N3UM at the controls. They will join the youth teams on the air, and all of us at various points along the road from youth to senior+. Grant, W3GB, wrote an excellent article about establishing the Collington club. It was published in the January 2013 issue of QST, pages 70-72. There also is a video on YouTube <http://tinyurl.com/y6bdhzxx> in which Grant is interviewed about the club when the club was in its early stages.

– Until next month, 73, Dave, K3ZJ

Notes:

1. *CQ Magazine*, vol. 72, No. 4: Contesting at p. 85 (April 2016)
2. *CQ Magazine*, vol. 74, No. 12: Contesting at p. 101 (December 2018)
3. *CQ Magazine*, vol. 74, No. 9: A Competition to Top all Contests: Six Days in Wittenberg, Germany at pp. 10-17 (September 2018)

Oops…

• We accidentally transposed two characters in Frank Krozel's callsign in the February issue ("QRP on the Cruise of a Lifetime"). Frank's call is KG9H, not K9GH. Sorry about that, Frank.

• And in January's "Zero Bias" editorial, we forgot to fill in the page number for KL7AJ's "Tickled" article. In case you still can't find it, look on page 34.

• In our December news story on the death of professional tower climber Ken Waddell during the installation of a new tower for a ham in Cookeville, Tennessee, we reported that the accident occurred at the home of Dale Darling, W9WBA. We have been informed that the incident actually occurred at the home of Cookeville amateur Gordon "Skip" Morris, K5FC. W9WBA lives in nearby Crossville, Tennessee. We regret the error. – Tnx. W5KUB

PROPAGATION

BY TOMAS HOOD,* NW7US

Random Joy and Planned Success

A Quick Look at Current Cycle 24 Conditions
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, January 2019: 5
12-month smoothed, July 2018: 4

10.7-cm Flux:
Observed Monthly, January 2019: 72
12-month smoothed, July 2018: 70

A_p Index:
Observed Monthly, January 2019: 6
12-month smoothed, July 2018: 7

***One Year Ago:* A Quick Look at Solar Cycle Conditions**
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, January 2018: 4
12-month smoothed, July 2017: 13

10.7-cm Flux:
Observed Monthly, January 2018: 70
12-month smoothed, July 2017: 77

A_p Index:
Observed Monthly, January 2018: 6
12-month smoothed, July 2017: 11

Have you heard fellow radio hobbyists express, "I don't really need to know what the Sun is doing, I just get on the air and try my luck at catching some DX," or, "I like the thrill of the hunt; get on the radio, tune around, and just see what I can catch," or other comments that convey the idea that exploring the science of propagation is a waste of time, or perhaps even anti-sportsmanship-like?

I admit: I, too, have fully enjoyed the sheer joy of randomly picking a range of frequencies and patiently tuning around to find new and exotic signals. What a pleasure to discover a radio broadcast from South Africa, or hear a DX pile-up between North and South America and the rare European running his 1-kilowatt, studio-quality signal into his five-over-five-over-five (that's three separate five-element beam antennas, one above the other, phased together for maximum signal power) on a day when barely any other signal can be heard.

I once had just such a memorable experience that was totally unexpected. I awoke one morning, just after the early sun began warming up the eastern Montana springtime air. I had this strange draw to stop in at my little radio room, sat down, fired up the Kenwood transceiver, and decided to check out the CW-only segment of 15 meters. As the three tubes warmed up, I tuned from one band-edge to the other and heard nothing but a steady hiss. It seemed that the band was dead. I figured that if you heard nothing, from band edge to band edge, then signals were being lost in space. I was sure, given the high number of amateurs around the entire world, that someone, somewhere, was on 15 meters having a conversation, or at least calling CQ.

After I waited about 10 minutes for the transmitting tubes to fully warm up and settle in, I decided to just try sending a nice seven-words-per-minute CW call for any station. I got comfortable in my chair, adjusted my WWII Navy signaling key (one used for signal lamps from ship to ship, and not originally for radio), and started tapping out the standard, "CQ CQ CQ" with my callsign. I sent my CQ call several times. And then, I waited.

I did not have to wait long. Within seconds, a steady, rather strong signal came out of the speakers. So strong, in fact, that I quickly thought it was a call from nearby neighbors who are also hams. But the answering callsign had a JA prefix, from Japan.

The QSO lasted well over a half-hour and was quite pleasurable. Eventually the fine gentleman, in his 7th decade, sent me a picture of himself, his station, and a QSL card (*Figure 1*).

This whole experience was unplanned, and certainly a surprise since I heard no one else before or after that, for a few

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2019

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 3, 11-13, 15-16, 18, 20-22, 30	A	A	B	C
High Normal: 1, 6, 8, 14, 19, 27-28	A	B	C	C-D
Low Normal: 2, 4-5, 7, 10, 17, 26, 29	B	C-B	C-D	D-E
Below Normal: 9, 23	C	C-D	D-E	E
Disturbed: 24, 25	C-D	D	E	E

Where expected signal quality is:
A--Excellent opening, exceptionally strong, steady signals greater than S9
B--Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C--Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D--Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E--No opening expected.

HOW TO USE THIS FORECAST

1. Find the propagation index associated with the particular path opening from the Propagation Charts appearing in "The New Shortwave Propagation Handbook" by George Jacobs, Theodore J. Cohen, and R. B. Rose.

2. With the propagation index, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening on a given signal path between two stations as shown in the Propagation Charts with a Propagation Index of 2 will be fair on April 1, poor to fair on April 2, good on April 3, and so forth.

Alternatively, you may use the Last-Minute Forecast as a general guide to space weather and geomagnetic conditions throughout the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these geomagnetic conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at <http://SunSpotWatch.com> provided by NW7US.

Figure 1. The picture of JA1KFN (SK) at his radio shack, and the QSL card received by your columnist after making an unexpected CW QSO on a quiet morning on the 15-meter band (see text). (Photo by NW7US)

hours, anywhere on that band. This was a testament to the fact that I did not need to know any propagation science to have a very exciting radio experience.

That's not unlike going fishing on a warm, lazy summer day. Hike up to a favorite fishing spot, sit down on a large sun-warmed rock, and drink in the sounds and sights of nature while waiting for a bite on your bait.

It might be fun to just "try your luck" and muck about fishing, enjoying the outdoors. However, if you have a limited budget of time and resources, and want to maximize your experience (and maybe bring home dinner), you might want to know when and where to fish. It is considered good sportsmanship to acquire the type of equipment that helps sports enthusiasts maximize their investment in time, energy, and expense.

Wouldn't it then make sense that the radio hobbyist might want to build better antennas, study space weather, and apply the tools of propagation forecasting, and hone operating skills?

Sure.

That is why, each month, my column explores space weather and radio signal propagation, with forecasts as well as observations.

The Challenge

The technical challenge of radio communication is getting our signal from point A to point B. With shortwave (high-frequency, or, HF) radio transmissions, we hope the signal from our transmitter will be heard by a ham in some far off (DX) location.

Many factors come into play once that signal leaves our antenna system, and there are conditions that influence the distant station's ability to "hear" our signal, such as local noise (generated by automobile engines, plasma TVs, electric motors) and weather-related noise. Beyond that, weather (both terrestrial and space) influences propagation. With so many factors playing a role in radio communications, the question is asked, "When is the best time to try and make a radio contact with that DX station?"

Noise

Local noise interference is one of the most obvious challenges in all radio reception. With some effort, we can usually eliminate the offending culprits. But even after dealing with local noise problems, there are two primary sources of noise not made by our own devices: Atmospheric and cosmic noise. Cosmic noise, which originates from points outside of the Earth's atmosphere, doesn't contribute much to the problem of radio signal reception. Atmospheric noise, however, has a significant impact on the reception of radio signals.

As we begin our look at atmospheric noise, it is most useful to look at the problem as an issue of effectiveness. Often, when people talk about radio reception, signal strength is touted as the most useful factor in broadcasting radio signals. However, since the problem of reception is more complex than a simple power issue — just pump more watts into the antenna — the better way to get a handle on the problem is to use the signal-to-noise ratio (SNR) measurement of a circuit (the path between, and including, the transmitter and receiver). The SNR is a genuine measure of effectiveness. With it, we can better understand how effectively a signal can get from point A to point B.

Look at the four sample radio circuit analysis graphs in *Figure 2* (graphs *a*, *b*, *c*, and *d*). These are all modeled with isotropic antennas on both ends of the radio circuit, and the transmitter is running 100 watts. Each graph shows the signal-to-noise ratio (SNR) in decibels (dB) on each of the standard amateur radio HF bands, at 2000 UTC for February, between Washington State and Alaska. *Figure 2a* models the circuit with a manmade noise level of "remote" at the receiver (164 -dBW-Hz, for 1 Hz bandwidth at 3 MHz). Note that "propagation" is possible on several bands. The green color for a frequency band indicates that the circuit reliability is at least 80%. This means that for 80% of the month, statistically speaking, the signal will be reliably received on this circuit.

Increase the manmade noise by 10 dB, and we see a slight degradation on the bands, but the same bands are mostly usable, as charted in *Figure 2b*. Increase noise by another 10 dB, however, and you can note a significant degradation in circuit quality on most bands, as shown in *Figure 2c*. Finally, increasing the noise level a full 24 dB over the remote level as shown in *Figure 2a*, you can see in *Figure 2d* severely limited circuit usefulness on any band.

This means that with all parameters except noise staying the same (power, antenna, solar activity, azimuth, time-of-day), manmade noise makes a huge difference in the quality of a circuit. Be careful not to generalize from that finding, though, as different circuits and different seasons would yield different data. The other source of noise also plays the same way in a circuit's usefulness.

All atmospheric noise is created by weather. More specifically, this noise comes from lightning flashes, with most of the noise caused by cloud-to-ground flashes because the

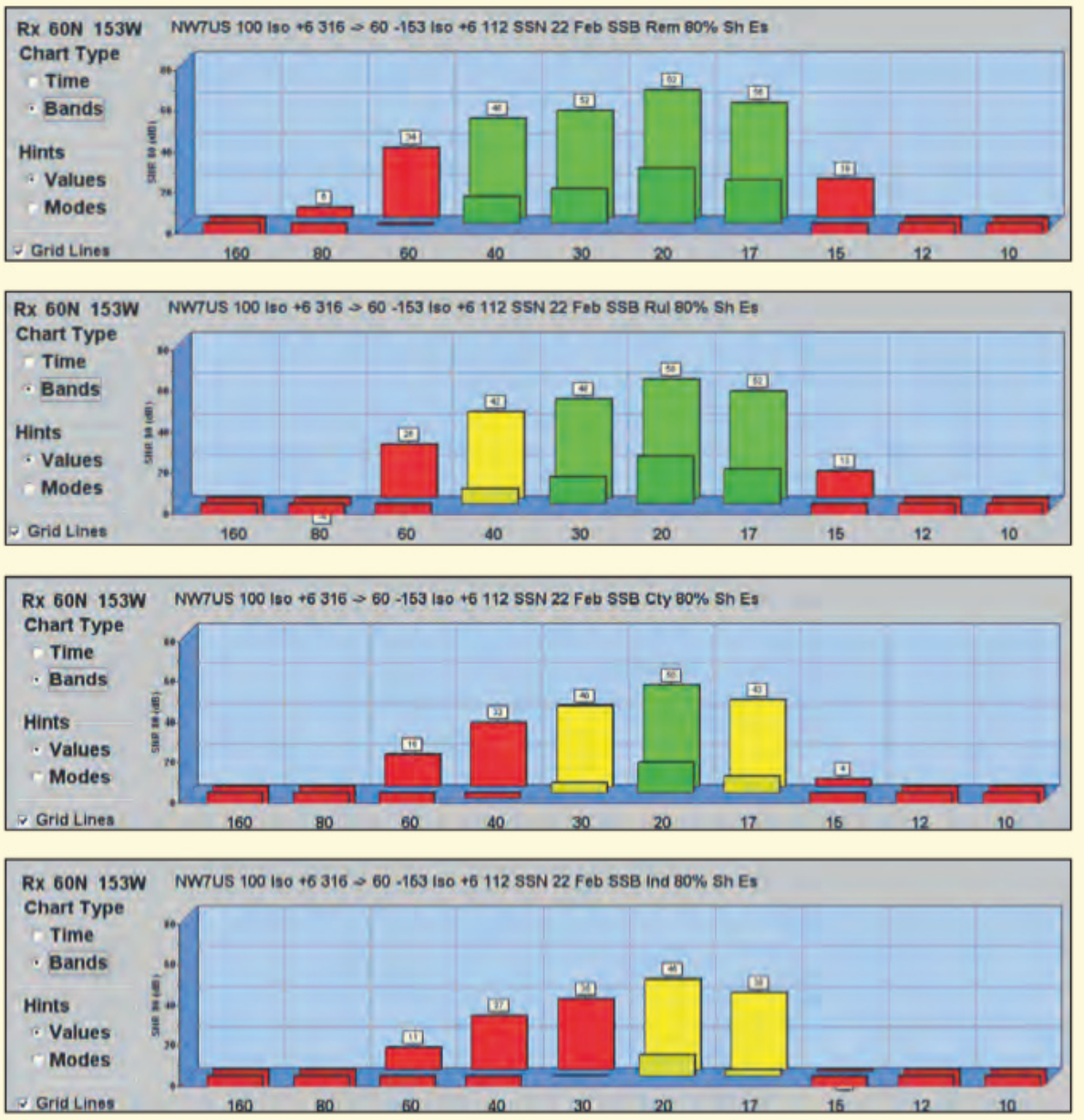


Figure 2. Four sample radio circuit analysis graphs, each modeled with isotropic antennas on both ends of the radio circuit, and with the transmitter running 100 watts. Each graph (a, b, c, and d) shows the signal-to-noise ratio (SNR) in dB, on each of the standard amateur radio HF bands, at 2000 UT, for February, between Washington state and Alaska. Clearly, noise makes a difference (see text). (Courtesy of NW7US, using the ACE-HF PRo software <www.longwaveinc.com/ace>)

currents in those strokes are much stronger than cloud-to-cloud flashes. However, some energy from horizontal flashes gets converted into vertically-polarized energy and adds to the total at the ground receiver. Horizontally-polarized energy doesn't propagate well to the surface, but is an important factor with airborne radio reception, such as used in trans-oceanic flights.

Worldwide, more than eight million lightning flashes occur daily (just the day before this column was penned, we had winter thundersnow! <https://g.nw7us.us/2IduVlk>). That's roughly 100 lightning flashes per second. If your receiver is very far away from the storm center, you'll only experience what is sometimes called "white noise." Atmospheric noise is impulsive, though, and is not evenly distributed as is true white noise. White noise, when viewed on a 'scope is pretty well evenly distributed, much like cosmic "background" noise. A Gaussian distribution of most parameters usually follows a "normal" (or Gaussian) probability curve — often called a bell-shaped curve. But Impulsive noise is just that — impulsive. If you view it on a 'scope, it looks like short-lived pulses rising out of an even bed of background noise.

Atmospheric noise, then, is the combination of many, many lightning flashes. Radio scientists model each thunderstorm center as a radio transmitter, usually called an "Equivalent Noise Transmitter" or ENT. Such energies then propagate around the world, just like shortwave transmissions. At a receiver we can then add up all those energies propagated from worldwide storm centers. We find that the amount of that power-sum varies with seasons and with the proximity of the major storm centers.

Starting in the 1960s and continuing through the 1980s, a worldwide effort was made to measure all of this. The result was the CCIR 322 publication <https://g.nw7us.us/2IbhIcR>. Now in its third edition, a reader of the publication will quickly note that frequency plays a great part in HF communication from a noise standpoint. Lightning creates a broad-spectrum emission, but in the HF range, it is frequency-dependent, with noise power decreasing as frequency increases. In VLF work, atmospheric noise dominates nearly completely (assuming an electromagnetic interference-clean local environment and EMI-clean radio components). At HF, however, manmade noise is a large part of the total energy in the high bands.

When the question is asked, "When will good propagation occur?" the reader should look at more factors than just concentrating on the space-weather disturbed environment. The other factors that affect propagation are radio circuit path length and orientation, frequency, diurnal effects, as well as the transmitter power, antenna gain, and the parameters of the receiving station. Space weather and geophysical (weather, geomagnetic field, location) factors are not changeable by the average radio hobbyist. The rest of these factors are the parts you can control.

The principal effect is always propagation itself, which is the result of ionospheric profiles that vary over the world as the day-night terminator sweeps through — and that cannot be controlled by the radio operator. One might start by running propagation analysis tools like <www.voacap.com/hf> to see how different the ionosphere is between steady-state daytime and nighttime, and how that affects reception on simple circuits. You might not need the power of a computer propagation tool to see what happens in cases where the radio circuit exists completely in either a day or night ambient environment. But when the circuit crosses the terminator and part is in day and part in night, the problem gets harder, and using computer modeling to sort out all the variables is about the only practical solution.

We have just begun to explore "when good propagation will occur." And we haven't touched on the disturbed environment. What then about A and K indices, solar flux, solar flares, geomagnetic fields, and so on? I suggest that to emphasize those factors alone is a mistake, because propagation analysis and prediction software that use the Voice of America VOACAP engine (which is keyed to the CCIR data) <www.greghand.com/hfwin32.html> have built-in

compensations for such factors. This is where statistics comes in.

The reason is that VOACAP was calibrated through measurements made during a wide range of environmental conditions, so that the resulting SNR distributions implicitly include the effects of a range of disturbed conditions. The range of environmental effects is built into the model, and shows up in the statistical factors. Since VOACAP was validated through so many years of testing, and is generally acknowledged to be the "gold standard" of propagation models, it's a relief to know how easy it is to use with confidence. From a radio hobbyist standpoint, it is much easier to use tools based on VOACAP than other models where such factors must be laboriously worked out and input.

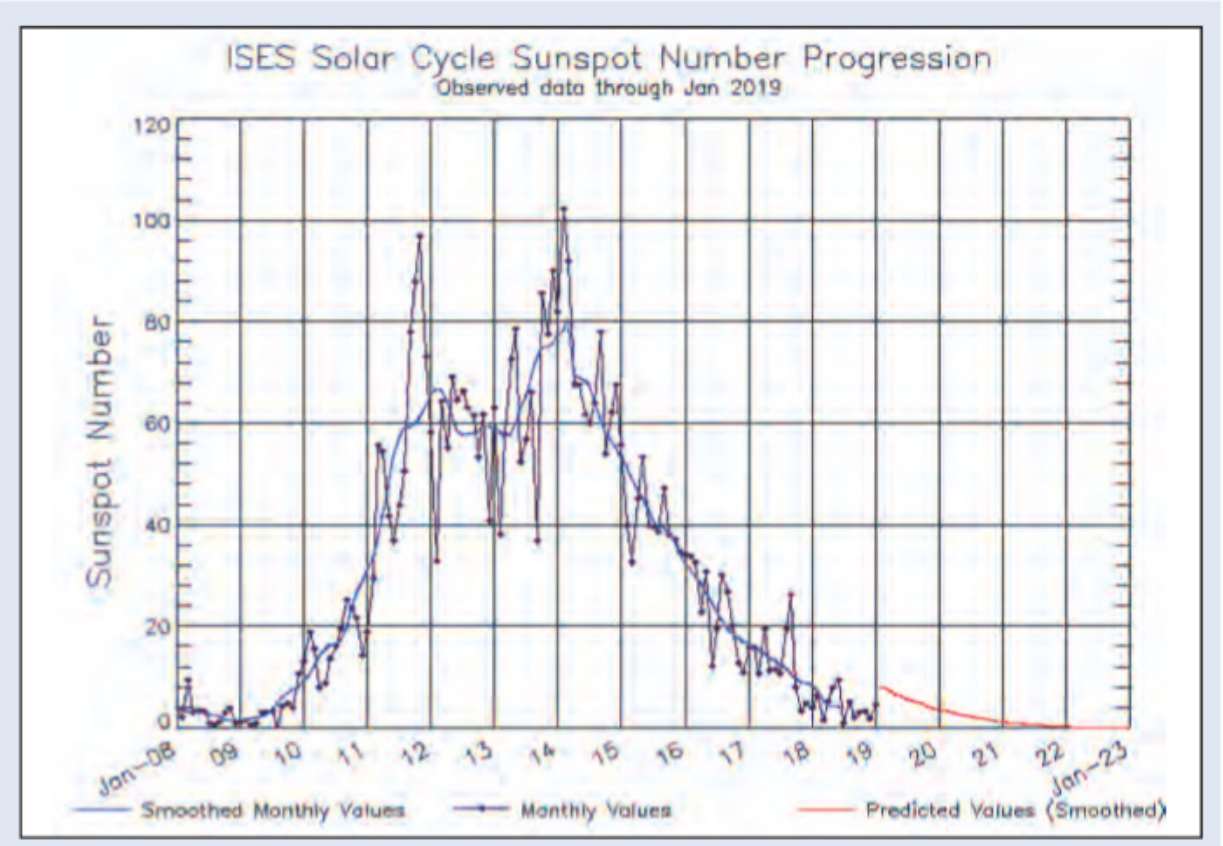
In upcoming issues, we'll explore how to use these tools to begin unlocking the science of radio propagation at HF. More than ever before, any radio hobbyist can begin to make sense of all these factors that play a role in radio communications on HF.

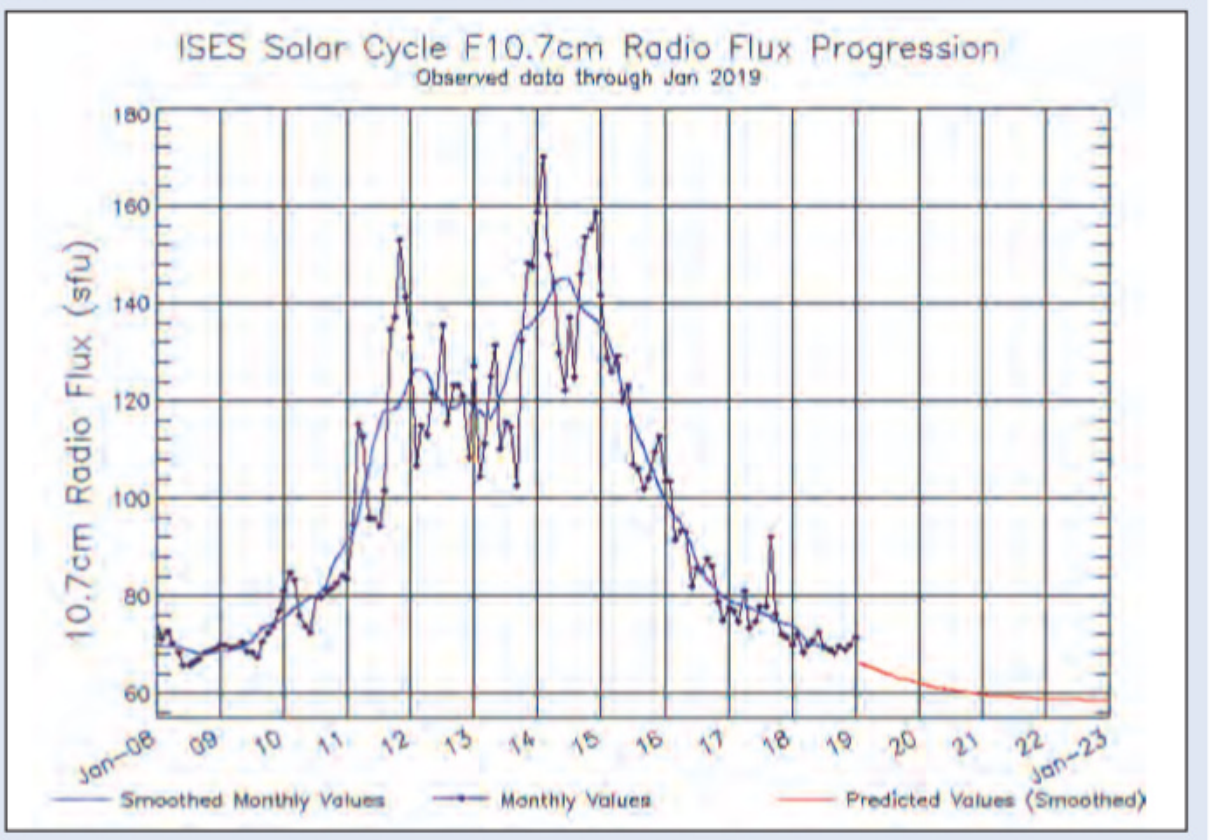
What to Expect During April

It has been observed by some readers of this column that the forecast for any given month one year does not appear much different from the year before. This observation is accurate because space weather and propagation conditions have not changed that much from year to year over the last few years. This is a result of the very quiet sunspot activity we've witnessed at the end of the current sunspot cycle, Cycle 24. Consider: When you have weeks of constant rain, the weather forecaster only can come up with unique ways to say, "Tomorrow's forecast calls for rain."

With that in mind, what can we expect for April this year? The lowest HF bands become less useful because of increasing seasonal noise, while higher bands close down due to changes in the ionosphere. This forces more activity to focus on the middle of the spectrum; daytime bands will be 15, 17, 20, and 30 meters. The night bands will be 40 and 30 meters.

Ten- and 15-meter propagation suffers during April and the summer





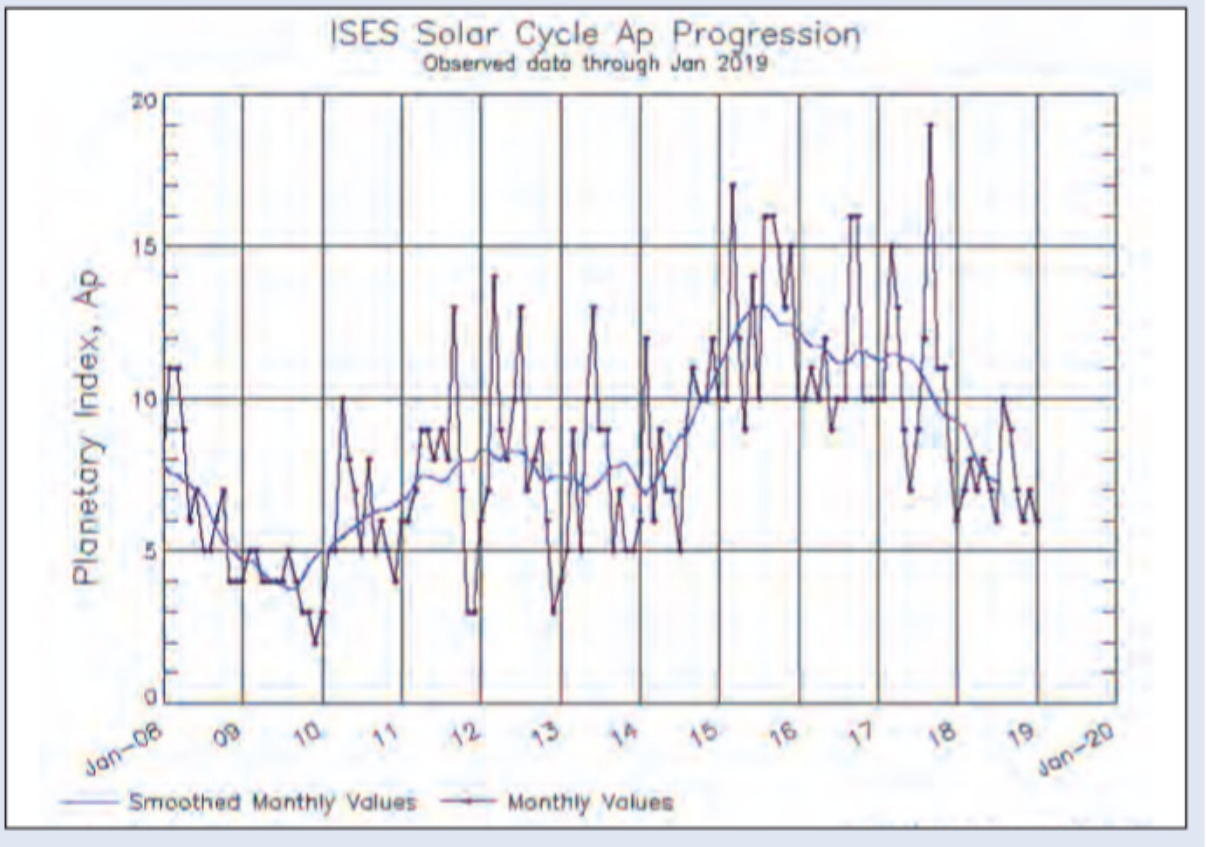


Figure 3. Sunspot Cycle 24 progression charts from February 2019. As can be seen, the ending of Cycle 24 is upon us. We are right at the edge of solar cycle minimum between current Cycle 24 and the new Cycle 25. (Courtesy of SWPC/NOAA)

months due to lower MUFs (Maximum Usable Frequencies) in the Northern Hemisphere. MUFs peak very late in the day during summer. Summertime MUFs are lower due to solar heating, which cause the ionosphere to expand. An expanded ionosphere produces lower ion density, which results in lower MUFs. Short path propagation between countries in the Northern Hemisphere will drop out entirely. Ten-meter propagation peaks in the autumn. April and May are autumnal months in the Southern Hemisphere making long-path DX possible. Short-path propagation to South America, South Pacific, and other areas south of the equator will be strong and reliable when open. But, with the decline of the current solar cycle, solar activity is not supporting the higher HF band propagation, so don't expect a lot from 10, 12, and 15 meters.

From April to June, fair to good propagation occurs on both daytime and nighttime paths on the middle HF bands. The strongest propagation occurs on paths that span areas of both day and night, following the MUF. During April, peaking in May, and still during June, the 17- and 20-meter bands may offer occasional 24-hour DX to all parts of the world. If you hear a lot of echo on a signal, you might be beamed in the wrong direction. Try the opposite azimuth. Twenty meters is more stable as a nighttime band, with propagation following gray-line and nighttime paths.

Low-band propagation is still hot on 40 meters, with Europe in the evening and Asia in the mornings. Occasional DX openings will occur on 80 meters around sunrise. However, these bands are quickly being degraded by the seasonal increase in noise.

VHF Conditions

The Lyrids, a major meteor shower, should take place April 16-28. Expect it to peak during the night of April 21-22, 2019. The unpredictability of the shower in any given year always makes the Lyrids worth watching, since we cannot say when the next unusual return may occur. If this year's event is average or better (up to 80 good-sized meteors entering the atmosphere every hour), this should make possible meteor-scatter type openings. However, some predict only a peak of 18 per hour this year.

Widespread auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the VHF bands. The best times for these to occur are during periods of radio storminess on the HF bands. Look for days with high planetary K (K_p) and A (A_p) figures, when a coronal hole may be present, emitting high-speed solar wind that in turn could increase geomagnetic activity (watch a typical coronal hole as it rotates across the Earth-facing solar disc from October 31 to November 2, 2018: <https://tinyurl.com/y637x6bw>).

If you use Twitter.com, you can follow @hfradiospacewx for hourly updates that include the K index numbers. You can also check the numbers at <http://sunspotwatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for January 2019 is 4.7, a good upward bump from December's 1.9. The lowest daily sunspot value of 0 (zero) was recorded on January 6-20, and January 31 — a total of 16 days with zero sunspots. The highest value of 26 was recorded on January 26. The 12-month running smoothed sunspot number centered on July 2018 is 4.3. A smoothed sunspot count of 6, give or take about 6 points is expected for April 2019.

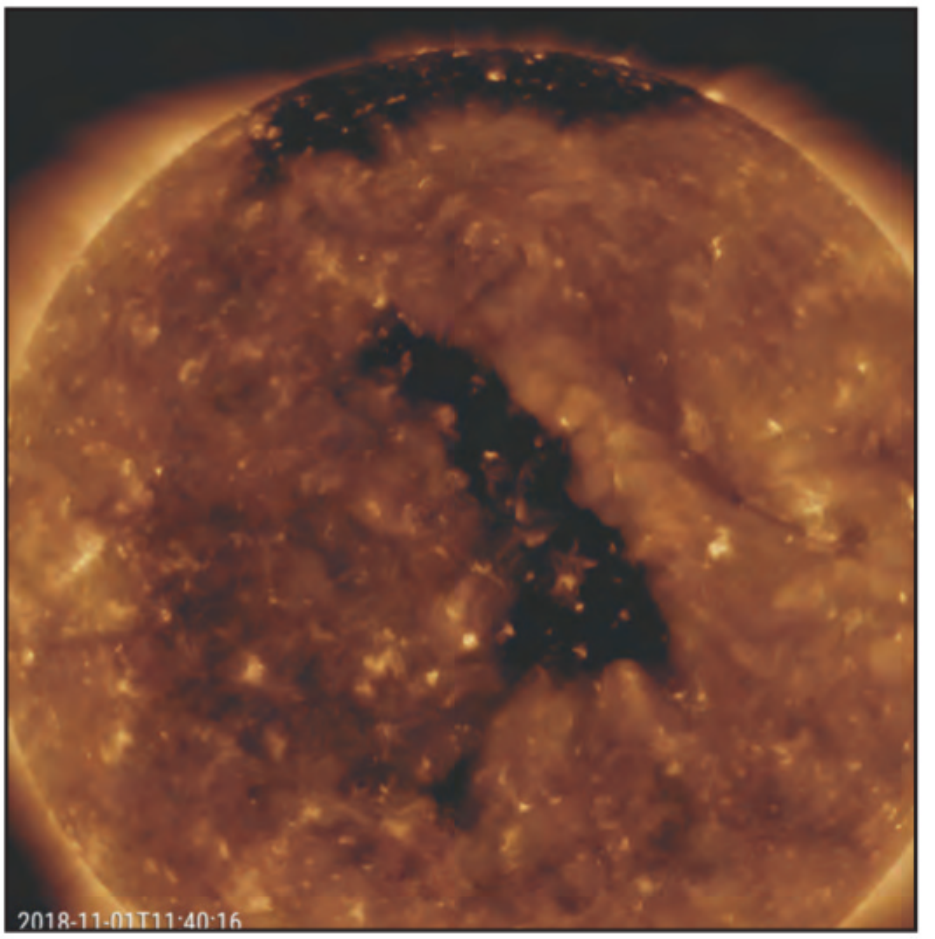


Figure 4. The darker area at the center on the Earth-facing solar disc is a coronal hole — an area of weaker magnetic structure — from which faster solar wind is ejected out toward the Earth. If these particles impact Earth's magnetosphere, they will likely generate aurora near the Earth's polar regions. Watch this coronal hole as it rotates across the Earth-facing solar disc from October 31 to November 2, 2018: <www.youtube.com/watch?v=EahbCshadzY>. (Courtesy of NASA/SDO)

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 71.6 for January 2019. The 12-month smoothed 10.7-cm flux centered on July 2018 is 70.0. The predicted smoothed 10.7-cm solar flux for April 2019 is 64, give or take about 9 points.

The observed monthly mean planetary A-Index (A_p) for January 2019 is 6. The 12-month smoothed A_p index centered on July 2018 is 7.3.

Geomagnetic activity this month should be mostly quiet with fair to good propagation conditions, except for those days indicated in the Last-Minute Forecast during which we expect degraded propagation (remember that you can get an up-to-the-day Last-Minute Forecast at <http://SunSpotWatch.com> on the main page).

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may email me, write me a letter, or catch me on the HF amateur bands. If you are on Facebook, check out <www.facebook.com/spacewx.hfradio> and <www.facebook.com/NW7US> — speaking of Facebook — check out the *CQ Amateur Radio* Magazine fan page at <www.facebook.com/CQMag>.

– 73, Tomas, NW7US

ANNOUNCEMENTS *(from page 2)*

MORGANTOWN, NORTH CAROLINA — The Lenoir Amateur Radio Club, **McDowell Amateur Radio Club**, and **Western Piedmont Amateur Radio Club** will hold the 22nd Annual Catawba Valley Hamfest beginning 8 a.m., Saturday, April 27 at the Burke County Fairgrounds, 145 Bost Road. Phone: (828) 437-2787. Website: <www.cvhamfest.org>. Talk-in 145.210+ (PL 94.8). VE exams, DXCC / VUCC / WAS card checking.

NORWICH, CONNECTICUT — The Radio Amateur Society of Norwich will hold the **RASON Auction 2019** beginning 9 a.m., Saturday, April 27 at the Gales Ferry Fire House, 1722 Route #12. Contact: Larry, N1LFG, <lfgarvin@comcast.net>. Website: <www.rason.org>. Talk-in 146.730- (PL 156.7).

PALMRYA, NEW YORK — The Drumlins Amateur Radio Club will hold the **33rd Annual Drumlins Hamfest** from 8 a.m. to 1 p.m., Saturday, April 27 at the Palmyra VFW Post 6778, 4306 Route 31. Contact: Rich Hamill, KC2TNJ, (315) 986-8589. Email: <hamfest@drumlinsarc.us>. Website: <www.drumlinsarc.us>. Talk-in 146.745 (PL 71.9). Free VE exams.

PERU, INDIANA — The Cass County, **Grant County**, **Miami County**, and **Kokomo Amateur Radio Clubs** will hold the **15th Annual North Central Indiana Hamfest** from 8 a.m. to 1 p.m., Saturday, April 27 at the Miami County 4H Fairgrounds, 1029 W. 200 North. Contact: Steve Shepler, P.O. Box 824, Marion, IN 46952. Email: <shepler1@gmail.com>. Talk-in 147.345+ (PL 131.8). VE exams.

RESACA, GEORGIA — The Cherokee Capital Amateur Radio Society will hold the **22nd Annual Calhoun, Georgia Hamfest** from 8 a.m. to 2 p.m., Saturday, April 27 at Hill City Baptist Church, 1411 Hill City Road NW. Contact: Felton Floyd, AF4DN, (770) 324-9859. Email: <af4dn@arrl.net>. Website: <http://k4woc.com>. Talk-in 146.746- (PL 100), 146.685- (PL 167.9), or 443.675+ (PL 100). VE exams.

SONOMA, CALIFORNIA — The Valley of the Moon Amateur Radio Club will hold its **Hamfest** from 8 a.m. to noon, Saturday, April 27 at the Sonoma Veterans Memorial Building, 126 First Street. Phone: (707) 935-7441. Website: <www.vomarc.org>. Talk-in 145.350- (PL 88.5). VE exams, fox hunt.

SPRING GROVE, PENNSYLVANIA — The York Hamfest Foundation will hold the **2019 York Hamfest** from 8 a.m. to 1 p.m., Saturday, April 27 at Elicker's Grove Park, 511 Roth Church Road. Email: <duane.sterner@yahoo.com>. Website: <www.yorkhamfest.org>. Talk-in 147.330+ (PL 123). Free VE exams, DXCC / WAS / WAC / VUCC card checking.

WHITE BEAR LAKE, MINNESOTA — The Northern Lights Radio Society will hold the **Aurora Conference** from 9 a.m. to 5:30 p.m., Saturday, April 27 at the Community of Grace Lutheran Church, 4000 Linden Street. Contact: John Platt, WØZQ, <w0zq@aol.com>. Website: <www.nlrs.org>.

MIDDLETOWN, NEW YORK — The Orange County Amateur Radio Club will hold its **Spring Hamfest** from 8:30 a.m. to 12:30 p.m., Sunday, April 28 at the Town of Wallkill Community Center, 2 Wes Warren Drive. Phone: (845) 391-3620. Website: <www.ocarcny.org>. Talk-in 146.76 (PL 100). VE exams.

THOMPSON, CONNECTICUT — The Eastern Connecticut Amateur Radio Association will hold its **Amateur Radio Flea Market**, from 8 a.m. to noon, Sunday, April 28 at the Raceway Restaurant at Thompson Speedway, 205 East Thompson Avenue. Contact: John, KA1MPG, (508) 943-4467. Email: <jonas217@verizon.net>. Website: <www.ecara.net>. Talk-in 147.225 (PL 156.7). VE exams.

MAY

BOONSBORO MARYLAND — The Antietam Radio Association will hold **The Great Hagerstown Hamfest** from 6 a.m. to 1 p.m., Saturday, May 4 at the Washington County Ag-Center, 7313 Sharpsburg Pike. Contact: Steve Struharik, WA8EIH, (240) 818-1248. Email: <struhariks@gmail.com>. Alternate Contact: William Collins, K3WJC, (304) 676-9391. Email: <colli020@gmail.com>. Website: <http://w3cwc.org>. Talk-in 147.090+ (PL 100). VE exams, card checking, fox hunt.

CADILLAC, MICHIGAN — The Wexaukee Amateur Radio Club will hold the **59th Annual Cadillac Swap** on Saturday, May 4 at the Cadillac Junior High School, 500 Chestnut Street. Contact: Duane, KD8ULW, (231) 824-9813 (before 8 p.m.). Email: <kd8ulw@arrl.net>. Website: <www.wexaukeearc.org>. Talk-in 146.98. VE exams, card checking.

CEDARBURG, WISCONSIN — The Ozaukee Radio Club will hold its **41st Annual Spring Indoor Swapfest** from 8 a.m. to 1 p.m., Saturday, May 4 at the Columbia St. Mary's Center, W67N866 Washington Avenue. Contact: Kristian Moberg, KC9TFP, (262) 385-6027. Website: <www.ozaukeeradioclub.orrg>. Talk-in 146.97 (PL 127.3).

NORTHPORT, ALABAMA — The Black Warrior Hamfest Association will hold the **Black Warrior Hamfest** from 8:30 a.m. to 4:30 p.m., Saturday, May 4 at Echols Middle School, 2701 Echols Avenue. Email: <kf4dgs1@gmail.com> or <kirkjema@gmail.com>. Website: <www.blackwarriorhamfest.org>. Talk-in 147.060- (PL 179.9). VE exams.

SIERRA VISTA, ARIZONA — The Cochise Amateur Radio Association will hold the **Cochise Hamfest** and **7th Area Communications Exercise** beginning 7 a.m., Saturday, May 4 at the club's grounds, 2756 S. Moson Road. Contact: Charles, K4AFN, (520) 508-7087. Email: <k4afn@arrl.net>. Website: <www.k7rdg.org>. Talk-in 146.46- (PL 162.2). VE exams.

SUPERIOR, WISCONSIN — The Arrowhead Radio Amateur Club will hold its **HAM FEST!** from 9 a.m. to 1 p.m., Saturday, May 4 at the Head of Lakes Fairgrounds-Multi Purpose Building, 4700 Tower Avenue. Contact: Robert Schulz, KCØNFB, 115 Eden Lane, Duluth, MN 55805-1533. Phone: (218) 481-7458. Email: <arac_hamfest@charter.net>. Website: <www.thearac.org>. Talk-in 146.940- (PL 103.5), 147.000- (PL 103.5), or 146.940- (PL 114.8). VE exams, card checking.

BRISTOL, PENNSYLVANIA — The Warminster Amateur Radio Club will hold the **WARC 2019 Hamfest** beginning 7 a.m., Sunday, May 5 at the Bucks County Community College-Lower Bucks Campus, 1304 Veteran's Parkway (Rt. 413). Contact: Michael Shanblatt, W3MAS, <hamfest@k3dn.org>. Website: <www.k3dn.org>. Talk-in 147.09 or 443.950. VE exams, DXCC card checking.

FISHKILL, NEW YORK — The Mt. Beacon Amateur Radio Club will hold the **Spring Into Summer Hamfest** from 8 a.m. to 1 p.m., Sunday, May 5 at the Employee's Recreation Center, 83 Red Schoolhouse Road. Contact: Adam Nowick, AE2AN, (845) 849-3666. Email: <president@wr2abb.org>. Website: <htttp://wr2abb.org>. Talk-in 146.97- (PL 100). VE exams.

SANDWICH, ILLINOIS — The Kishwaukee Amateur Radio Club will hold the **DeKalb Hamfest** from 8 a.m. to 1 p.m., Sunday, May 5 at the Sandwich Fairgrounds. Contact: Bob Yurs, W9ICU, (815) 757-3219. Email: <w9icu@arrl.net>. Website: <www.karc-club.org>. Talk-in 146.730- (PL 100).

REIDSVILLE, NORTH CAROLINA — The Rockingham County Amateur Radio Club will hold the **15th Annual Rockingham County Swapfest** from 8 a.m. to noon, Saturday, May 11 at the Community Baptist Church, 509 Triangle Road. Contact: Paul Paterson, (336) 548-2027 or Roger D. Joyner, (336) 549-1222. Website: <www.n4iv.org>. Talk-in 147.345 (PL 103.5).

RENSSELAER, NEW YORK — The East Greenbush Amateur Radio Association will hold its **2019 Hamfest** beginning 8 a.m., Saturday, May 11 at the East Greenbush Volunteer Fire Department, 65 Phelps Road. Contact: Tom Scorsone, KC2FCP, <kc2fcp@rr.nycap.com>. Website: <www.egara.cub>.

STANWOOD, WASHINGTON —The Stanwood-Camano Amateur Radio Club will hold the **SCARC 28th Annual Electronic Flea Market & Hamfest** from 9 a.m. to 1 p.m., Saturday, May 11 at Stanwood Middle School, 9405 271st Street NW. Contact: Fred Laun, N7KRN, (360) 387-0624. Email: <w7pig@arrl.net>. Website: <www.scarcwa.org>. Talk-in 145.19. VE exams.

XENIA, OHIO — The Dayton Amateur Radio Association will hold the **Dayton Hamvention** from 9 a.m. to 5 p.m., Friday, May 17; 9 a.m. to 5 p.m., Saturday, May 18; and 9 a.m. to 1 p.m., Sunday, May 19 at the Greene County Fairgrounds, 120 Fairgrounds Road. Phone: (937) 276-6930. Email: <info@hamvention.org>. Website: <http://hamvention.org>. Talk-in 146.94- (PL 123) or 146.985- (PL 120). VE exams, card checking, T-hunt, special event station W8BI.

GOSHEN, CONNECTICUT — The Southern Berkshire Amateur Radio Club will hold its **28th Annual Hamfest** from 8 a.m. to noon, Saturday, May 18 at the Goshen CT Fairgrounds, 116 Old Middle Street. Contact: Don, KB2SMZ, (845) 373-7035 or Lee, K1LEE, (860) 435-0051. Website: <www.sberk.org>. Talk-in 147.285+ (PL 77). VE exams.

PINELLAS PARK, FLORIDA — The Glorious Society of the Wormhole will hold the **2019 Wormfest** beginning 8 a.m., Saturday, May 25 at Freedom Lake Park, corner of U.S. 19 and 49th Street. Contact: Mike Scott, (727) 492-6454. Email: <k4zpe@jemke.com>. Talk-in 146.850 (PL 146.2).

TOWNSHIP OF WASHINGTON, NEW JERSEY — The Bergen Amateur Radio Association will hold the **BARA Spring Hamfest** from 8 a.m. to 1 p.m., Saturday, May 25 at Westwood Regional Jr./Sr. High School, 701 Ridgewood Road. Contact: Jim Joyce, K2ZO, (201) 664-6725. Email: <k2zo@arrl.net>. Website: <www.bara.net>. Talk-in 146.19+ (PL 141.3). VE exam, DXCC card checking.

WEST FRIENSHIP, MARYLAND — The Maryland FM Association will hold the **Memorial Day Hamfest** from 8 a.m. to 2 p.m., Sunday, May 26 at the Howard County Fair Grounds, Rt. #144. Contact: Maryland F.M. Association, P.O. Box 351, Hanover, MD 21076. Phone: (301) 641-5313 (between 6-10 p.m.). Email: <marylandfm@verizon.net>. Website: <www.marylandfm.org>. Talk-in 146.16+ (PL 107.2), 223.16+ (PL 107.2), and 449.00- (PL 107.2). Free VE exams.

PRESCOTT, ARIZONA — The Eagle Amateur Radio Club and the **Yavapai Amateur Radio Club** will hold the **2019 Prescott Hamfest at ERAU** and the **2019 ARRL Arizona State Convention** from 7 a.m. to 4 p.m., Friday, May 31 and from 9 a.m. to 3 p.m., Saturday, June 1 at Embry Riddle Aeronautical University, 3700 Willow Creek Road. Contact: Don Braun, KB8BOB, <kb8bob@cox.net>. Website: <www.prescotthamfest.com>. Talk-in 146.880- (PL 100) VE exams, DXCC card checking.

SEASIDE, OREGON — SEAPAC and the **2019 ARRL Northwestern Division Convention** will be held from 9 a.m. to 4 p.m., Friday, May 31; 9 a.m. to 4 p.m., Saturday, June 1; and 9 a.m. to 2 p.m., Sunday, June 2 at the Seaside Convention Center, 415 First Avenue. Phone: (503) 882-7388. Email: <info@seapac.org>. Website: <www.seapac.org>. VE exams, card checking.

JUNE

BOONE, IOWA — The 3900 Club will hold **Hamboree 2019** from 8 a.m. to 1 p.m., Saturday, June 1 at the Boone County Fairgrounds-Community Building, 1601 Industrial Park Road. Contact: Clay Conard, WØFS, (515) 838-2285. Email: <hamboree@3900club.com>. Website: <www.3900club.com>. Talk-in 146.850-. VE exams, DXCC card checking.

HILTON, NEW YORK — The Rochester Amateur Radio Association will hold the **92nd Rochester Hamfest** from 8 a.m. to 2 p.m., Saturday, June 1 at the Hilton Exempt Club, 137 South Avenue. Email: <hfproducer@rochesterham.org>. Website: <https://rochesterham.org>. VE exams, WAS / WAC / DXCC / VUCC card checking.

MARIETTA, GEORGIA — The Atlanta Radio Club and **Kennehoochee Amateur Radio Club** will hold the **Atlanta Hamfest** from 8 a.m. to 3 p.m., Saturday, June 1 at Jim Miller Park, 2245 Calloway Road. Contact: John Talipsky, N3ACK, <n3ack@atlantaradioclub.org>. Website: <www.altantahamfest.org>. VE exams.

PLYMOUTH, MINNESOTA — The Twin City FM Club will hold its **Spring Tailgate Swapfest** beginning 8 a.m., Saturday, June 1 at the West Medicine Lake Community Center, 1705 Forestview Lane North. Contact: Mike (612) 718-4718. Email: <trustee.tcfmc@gmail.com>. Talk-in 146.76 (PL 114.8).

PROSPECT, PENNSYLVANIA — The Breezeshooter Amateur Radio Club will hold its **65th Annual Hamfest** and **2019 ARRL Western Pennsylvania Section Convention** from 8 a.m. to 5 p.m., Saturday, June 1 and from 8 a.m. to 2 p.m., Sunday, June 2 at the Big Butler Fairgrounds, 1127 New Castle Road (Rt. 422). Phone: (412) 389-1739. Email: <hamfest@breezeshooters.org>. Website: <www.breezeshooters.org>. VE exams, DXCC card checking.

TEDROE, OHIO — The Fulton County Amateur Radio Club will hold its **Summer Hamfest 2019** from 8 a.m. to 1 p.m., Saturday, June 1 at The Roth Family Woodlot, 105 Hill Avenue. Contact: Bryan Patterson, KB8ELG, (419) 822-5038 or (419) 250-6694. Email: <kb8elg@hotmail.com>. Website: <http:///k8bxq.org>. Talk-in 147.195+. VE exams.

PLANO, TEXAS — Ham-Com 2019 and the **2019 ARRL Western Gulf Division Convention** will be held from noon to 5 p.m., Friday, June 7 and from 8 a.m. to 5 p.m., Saturday, June 8 at the Plano Event Center, 2000 East Spring Creek Parkway. Contact: HamCom, P.O. Box 260721, Plano, TX 75026. Email: <info@hamcom.org>. Website: <www.hamcom.org>. Talk-in 147.18 (PL 107.2). VE exams.

LIME RIDGE, PENNSYLVANIA — The Columbia-Montour Amateur Radio Club will hold the **29th Annual Bloomsburg Hamfest** from 7 a.m. to 1 p.m., Saturday, June 8 at the Lime Ridge Community Center, 6405 4th Street. Contact: Dave, WC3A, (570) 951-9694. Email: <ten_speed_99@yahoo.com>. Website: <www.qsl.net/cm-arc>. Talk-in 147.225+ (PL 85.4). VE exams.

HELENA, ALABAMA — The Shelby County Amateur Radio Club will hold the **Helena Hamfest 2019** from 4-7 p.m., Friday, June 14 and from 8:30 a.m. to 3 p.m., Saturday, June 15 at the Helena Community Center, 100 Sports Complex Drive. Contact: William Shores, KM4SKC, (205) 365-1053. Email: <km4skc@gmail.com>. Website: <www.w4shl.com>. VE exams.

KNOXVILLE, TENNESEE — The Radio Amateur Club of Knoxville will hold its **53rd Annual Hamfest & Electronics Exposition** from 8:30 a.m. to 3 p.m., Saturday, June 15 at the Kerbala Temple, 315 Mimosa Avenue. Contact: Dave Garner, K4YRK, (865) 966-9811. Email: <dgarner@usit.net>. Website: <www.w4bbb.org>. Talk-in 147.300 (PL 100). VE exams.

MANASSAS PARK, VIRGINIA — The Ole Virginia Hams Amateur Radio Club will hold the **45th Annual Manassas Hamfest** beginning 6:30 a.m., Saturday, June 15 at the Manassas Park Community Center, 99 Adams Street. Contact: Don, WA2SWX, <chairman@manassashamfest.org>. Website: <http://manassashamfest.org> or <http://w4ovh.net>. Talk-in 146.97-. VE exams, DXCC card checking.

OWENSVILLE, OHIO — The Milford Amateur Radio Club and **Southwest Ohio DX Association** will hold the **2019 Milford Hamfest** in conjunction with **W8DXCC** from 8 a.m. to 6 p.m., Saturday, June 15 at the Clermont County Fairgrounds-Multipurpose Building, 1000 Locust Street. Contact: Dave, K8DV, <president@w8mrc.com>. Website: <www.w8mrc.com>. DXCC & CQ award card checking. Special event stations: K8S, K8W, K8O, and K8H.

PISCATAWAY, NEW JERSEY — The Raritan Valley Radio Club will hold the **W2QW – Hamfest** from 8 a.m. to noon, Saturday, June 15 at Piscataway High School, 110 Behmer Road. Contact: Drew, W2OU, (732) 801-4654 (before 9 p.m.) Email: <w3oudrew@gmail.com>. Website: <www.w2qw.org>. Talk-in 146.625- (PL 103.5) or 442.250+ (PL 141.3). VE exams, DXCC / VUCC / WAS card checking.

MONROE, MICHIGAN — The Monroe County Radio Communications Association will hold the **Monroe Hamfest and Computer Show** from 7:30 a.m. to 1 p.m., Sunday, June 16 at the Monroe County Fairgrounds, M-50 at Raisinville Road. Contact: Fred VanDaele, KA8EBI, 4 Carl Drive, Monroe, MI 48162. Email: <ka8ebi@yahoo.com>. Website: <www.mcrca.org>. Card checking.

UPPERCO, MARYLAND — The Baltimore Amateur Radio Club will hold the **Father's Day Hamfest & Marketplace** from 8 a.m. to 2 p.m., Sunday, June 16 at the Arcadia Carnival Grounds, 16020 Carnival Avenue. Email: <w3ft67@yahoo.com>. Website: <www.w3ft.com>. DXCC card checking.

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. An A after the band indicates an Assisted category. Certificate winners are listed in bold. Late logs are listed in italics. (All country terminology reflects the DXCC list at the time of the contest.)

2018 CQWW DX SSB RESULTS

SINGLE OPERATOR NORTH AMERICA

United States District 1

W2RE	**A**	**4,502,126**	**3228**	**108**	**406**
N1UR	"	3,918,772	2737	116	411
K5ZD	"	3,062,108	2255	107	369
N1PGA	"	1,292,760	1167	95	310
KQ2M	"	874,239	1286	61	188
K1RM	"	588,138	860	54	195
W1WEF	"	543,312	706	74	220
NB1N	"	363,042	554	54	189
K1IX	"	248,862	403	50	172
N1DD	"	246,738	443	69	177
K1LU	"	210,444	354	59	169
KK1W	"	180,320	307	66	158
W1XX	"	136,655	296	53	128
W1NSK	"	101,976	233	45	123
WØJAY	"	59,400	185	37	95
K1GMM	"	24,319	114	20	63
KA1J	"	19,364	80	31	63
K2HZN	"	17,862	91	25	53
NF1L	"	10,780	60	29	48
NM1Y	"	9,438	63	25	41
W1GXZ	"	8,721	55	17	40
K1MTD	"	5,875	49	15	32
K1DVL	"	3,108	29	19	23
N1TAA	"	1,701	23	10	17
K1TCP	"	1,092	20	10	16
W1SVC	"	759	17	9	14
AB1WT	"	704	15	8	14
W1IS	*"*	*448*	*11*	*6*	*8*
W1BCR	"	130	5	5	5
W1OHM	**14**	**7,200**	**63**	**11**	**34**
K1BIF	"	1,650	22	12	18
***K1HT**	**A**	**180,648**	**329**	**45**	**148**
*N1ALO	"	153,116	305	50	152
*N1STN	"	116,441	291	47	122
*W1KM	"	101,374	198	50	132
*WW1WW	"	69,342	199	35	92
*KC1SS	"	58,519	170	40	99
*N1DC	"	49,320	145	43	94
*NP2GG	"	45,360	146	35	91
*KG1V	"	42,160	138	39	97
*W1JQ	"	41,730	125	41	89
*K1LK	"	33,633	118	34	77
*WA1LAD	"	21,560	100	34	64
*N1VH	"	20,200	83	35	65
*K1VUT	"	18,249	85	27	52
*AK1K	"	12,877	73	31	48
*WA1BR	"	12,483	71	23	50
*KC1EDE	"	10,730	59	28	46
*KG6CIH	"	9,114	56	22	40
*W1GHD	"	8,778	60	30	47
*KB1FRK	"	8,424	61	16	38
*N1YL	"	8,211	57	25	44
*N1BOX	"	6,250	49	15	35
*K1WCC	"	4,992	43	16	32
*W1CRK	"	4,905	43	14	31
*AG2K	"	4,080	41	12	28
*KC1FOZ	"	3,956	44	17	29
*N1WTT	"	3,871	40	19	30
*W1FOY	"	3,652	37	16	28
*WA1OTZ	"	3,010	29	17	26
**WA1EMG*	*"*	*2,660*	*27*	*12*	*23*
*K1CGZ	"	1,767	26	10	21
*KA1VMG	"	1,376	32	17	26
*KB1IRB	"	1,085	26	13	18
*KC1CBQ	"	620	11	9	11
**K1LHO*	*"*	*486*	*15*	*8*	*10*
*W1LUS	"	486	12	8	10
*N1TYH	"	196	8	7	7
*NØIZE	"	133	17	10	9
***N1WRK**	**28**	**736**	**16**	**5**	**11**
*KU1N	"	260	10	3	7
***AB1EP**	**14**	**1,924**	**35**	**8**	**18**
*AB1ZQ	"	532	14	7	12
**AA1SU*	*"*	*220*	*10*	*3*	*7*
*K1DJB	"	195	8	6	7
*W1CRB	"	180	12	6	12
*N1DCH	"	30	4	3	3
*W1RFY	"	12	9	4	2
***KR1A**	**7**	**15,444**	**92**	**16**	**50**
		(OP:KL7JT)			
W1GD	**AA**	**1,717,242**	**1232**	**114**	**389**
WX1S	"	1,291,848	1007	102	354
W1NT	"	1,259,681	1173	92	305
N1DG	"	1,204,258	915	110	363
K1KA	"	979,864	846	105	319
N8RA	"	741,984	751	81	273
W1CTN	"	634,200	662	84	266
KV1J	"	603,710	600	82	283
N9NC	"	583,928	561	84	292
W1CU	"	550,384	610	80	248
W1EBI	"	464,412	497	81	257
K1SM	"	421,737	619	59	198
AB1JV	"	387,702	425	89	273
AB1XX	"	385,284	478	71	220
K1JB	"	369,200	435	86	239
WA1T	"	349,680	423	80	230
KG1E	"	311,977	506	55	168
K1RO	"	247,338	382	59	175
WK1J	"	237,720	343	70	210
K1RV	"	198,584	310	60	181
W1HS	"	167,475	320	57	146
W1RM	"	151,008	216	73	191
NV1Q	"	150,590	305	49	136
KC1BOH	"	139,194	243	57	165
K1ZE	"	120,960	208	57	159
W1PEF	"	116,725	261	42	133
K1TH	"	97,110	212	45	121
WV1M	"	51,840	148	37	98
W1UK	"	50,605	134	37	108
K1DBO	"	48,952	157	30	86
W1NG	"	47,705	125	49	96
AC1EN	"	42,465	112	39	110
W2JU	"	31,460	108	35	75
NE1B	"	30,562	101	37	81
N1MD	"	26,883	113	20	67
WA1DRQ	"	21,052	100	22	54
W1SS	"	19,754	106	19	64
N5WVR	"	19,104	88	29	67
K1JE	"	9,362	57	21	41
KB1NYT	"	6,240	47	16	32
AC1DC	"	3,680	32	10	30
W1ZR	"	2,268	28	11	25
K1GQ	"	1,519	18	14	17
W3EP	**21A**	**80,028**	**255**	**26**	**91**
KA1YQC	"	19,565	115	16	49
K1TR	**14A**	**126,108**	**359**	**26**	**98**
W1NK	"	49,164	168	22	80
KE1NZY	"	1,530	21	10	20
K2RR	**3.7A**	**27,722**	**133**	**16**	**67**
***KS1J**	**AA**	**869,352**	**896**	**83**	**273**
*WT1A	"	351,780	457	67	219
*N1API	"	190,404	295	61	185
*W1ARY	"	148,031	297	54	139
*KA2KON	"	136,080	269	45	135
*W1DYJ	"	86,800	191	47	128
*N1FTP	"	45,738	142	35	86
*W1JGM	"	42,795	177	40	95
*WO1N	"	29,810	100	35	75
*AE1T	"	27,839	107	31	66
*AB1J	"	15,200	83	22	54
*NF1O	"	15,130	72	32	57
*W1VB	"	14,823	71	26	55
*N1GSA	"	12,744	90	23	49
*N1HTS	"	12,709	66	19	52
*NU1P	"	10,320	65	26	54
*K1RCT	"	8,294	56	22	36
*K1OR	"	6,786	46	20	38
*NE1F	"	6,741	42	24	39
*W1HMM	"	6,500	48	24	41
*N1SFE	"	6,466	46	21	40
*W1T	"	5,810	63	25	45
		(OP:AE1N)			
*WA1TE	"	5,510	40	24	34
*K1TW	"	4,558	40	15	28
*KX1X	"	3,071	29	14	23
*NØBGS	"	2,867	25	22	25
*KC1FD	"	2,808	27	15	24
*KB1YO	"	2,320	27	8	21
*W1PJE	"	2,208	28	9	23
*W4FEB	"	1,924	26	15	22
*W1PY	"	1,008	19	7	11
*KG4V	"	640	13	9	11
*NW1S	"	540	10	10	10
*W1ALP	"	532	12	8	11
**WD1S*	*"*	*48*	*3*	*3*	*3*
***AC1EW**	**14A**	**4,592**	**42**	**11**	**30**

District 2

KZ2I	**A**	**669,300**	**745**	**82**	**263**
W2ID	"	517,424	646	76	216
NS2N	"	415,280	530	72	218
NX2X	*"*	*261,976*	*419*	*57*	*172*
WS9M	"	213,188	366	62	161
W2LU	"	209,198	368	73	184
W2KU	"	133,964	304	52	162
KC2MBV	"	124,355	263	48	139
W2XL	"	124,256	251	47	129
WB2PJH	"	100,277	285	35	114
NW2K	"	100,168	233	39	113
		(OP: @W2FU)			
WA3AFS	"	66,572	154	55	132
N2RR	"	63,597	187	40	89
N2JJ	"	55,200	136	43	107
W3PR	"	45,895	128	45	92
N2IIE	"	31,350	129	29	66
N2ZN	"	30,634	112	38	68
W2UDT	"	15,936	100	26	57
KA2ISM	"	15,810	85	30	55
KD2DC	"	12,512	69	22	46
KB2MN	"	9,504	58	25	47
KD2NXM	"	6,148	47	21	32
W2RAL	"	4,841	39	17	30
KD2OAM	*"*	*3,000*	*34*	*7*	*23*
N1UFO	"	1,740	26	11	19
N2YIR	"	1,530	22	12	18
W2JDB	"	1,450	19	12	17
KF2UJ	"	1,189	33	11	18
W2KRY	"	364	9	5	9
K2XA	**21**	**18,744**	**100**	**16**	**50**
KU2M	**14**	**876,160**	**2020**	**34**	**126**
N2PP	"	475,390	1258	31	106
K2QB	"	4,371	49	6	25
N2DDX	*"*	*4,060*	*45*	*12*	*23*
KD2OMV	"	561	14	5	12
K2CBI	"	324	10	6	6
***K2SDS**	**A**	**309,825**	**465**	**63**	**180**
*N1NQD	"	206,064	338	71	172
*AC2RL	"	174,460	300	56	164
*W2CCC	"	141,372	282	56	133
		(OP:K2CS)			
*AB2TC	"	138,284	276	52	139
*AH2O	"	81,788	213	44	117
*N2MTG	"	65,025	170	44	109
*WA2QAU	"	52,824	142	43	99
*KB2FMH	"	49,572	128	62	100
*KD2JOE	"	23,634	115	22	56
*NT2I	"	22,707	107	25	62
*K2ELV	"	21,900	89	34	66
*W2MC	"	20,181	88	25	68
*W2YW	"	17,226	127	24	63
*KX1W	"	16,638	93	35	59
*KD2GUD	"	13,244	77	27	50
*K2TV	"	13,144	80	19	43
*WA2ALY	"	11,325	90	25	50
*KD2BXD	"	6,750	49	14	36
*N2AWD	"	6,076	41	26	36
*N2NDF	"	5,586	42	21	36
*W2FUN	"	5,340	48	22	38
*W2VU	"	5,335	40	21	34
**N2YB*	*"*	*5,217*	*44*	*16*	*31*
*N2PTF	"	4,940	58	22	30
*K2WJL	"	4,606	53	18	31
*K2YG	"	4,606	38	13	34
*KD2OTP	"	3,404	35	17	29
*WB2NFL	"	3,078	32	12	26
*AC2QH	"	2,856	28	18	24
**AK2G*	*"*	*2,176*	*25*	*10*	*22*
*N2IVN	"	1,440	24	12	18
**WB2ELD*	*"*	*1,066*	*17*	*10*	*16*
*N2NOW	"	988	29	11	15
*KC1JGT	"	897	16	9	14
*K2XM	"	861	21	10	11
*K2AL	"	817	16	7	12
*K2KU	"	810	17	13	14
*AD2J	"	660	17	9	13
*W2JAT	"	520	14	10	10
*KC2VPE	"	240	9	7	9
***N2VIG**	**28**	**136**	**6**	**3**	**5**
***WB2AMU**	**21**	**6,026**	**51**	**12**	**34**
***W2AW**	**14**	**79,310**	**281**	**22**	**81**
		(OP:N2GM)			
*W2PIP	"	7,884	55	14	40
**K1TZT*	*"*	*2,040*	*27*	*7*	*23*
**N2YG*	*"*	*1,950*	*27*	*9*	*21*
*N2EIM	"	1,350	23	7	18
*AC2VK	"	600	14	8	12
*AC2VB	"	416	10	7	9
*KC2PJH	"	360	10	8	10
*KD2KEH	"	255	13	5	10
*KG2DWS	"	154	6	5	6
*W2GFV	"	84	5	3	4
*AC2WG	"	6	1	1	1
***W2AAB**	**7**	**2,356**	**33**	**8**	**23**
N5DX	**AA**	**4,121,142**	**2514**	**124**	**458**
N2SR	"	2,667,132	1976	110	382
AB3CX	"	2,068,776	1561	114	373
N2MM	"	1,993,653	1544	111	378
W2RD	"	1,137,724	907	107	347
KF2O	"	951,431	786	98	351
K2CYE	"	813,018	798	84	274
KE2TR	"	812,197	794	82	297
K2CJ	"	768,159	683	91	320
N1IBM	"	684,507	630	98	303
WA2FZB	"	650,097	660	90	267
K2RET	"	536,180	586	85	247
N2SQW	"	522,284	607	80	242
KE1IH	"	427,707	582	67	212
W2NO	"	416,702	541	68	218
W2GDJ	"	416,560	490	84	244
W2LE	"	401,580	501	70	221
N2WK	"	372,924	438	80	244
W2TV	*"*	*363,506*	*482*	*70*	*216*
N2CU	"	357,240	436	81	231
N1JP	"	345,840	537	54	186
KM2O	"	319,886	375	76	237
W6XR	"	293,940	422	81	195
AB2E	"	261,291	396	58	193
N2OO	"	239,499	427	48	159
KC2GOW	"	235,352	340	60	188
K2QPN	"	225,412	376	53	165
K2RB	"	203,615	380	48	163
WO2X	"	203,105	331	66	179
N2ED	"	166,950	289	59	166
N2VW	"	122,206	234	54	149
K2BX	*"*	*108,756*	*247*	*42*	*117*
N2CJ	"	106,470	212	49	133
W2VQ	"	105,966	219	46	128
K2UT	"	90,522	221	35	106
N2NKX	"	57,888	161	49	95
W2YR	"	54,400	135	53	107
K2QMF	"	53,245	168	23	92
N2MEE	"	49,878	120	47	116
K2PAL	"	48,257	174	28	79
WC2L	"	33,810	126	33	72
AA2AW	"	29,874	139	15	63
AB2DE	"	25,740	100	23	67
NO2C	"	24,276	96	32	70
K2MK	"	23,290	102	26	59
K2GC	"	22,900	96	29	71
WA2MCR	"	21,114	82	37	65
K2WR	"	17,640	78	29	55
WA3RGY	"	17,052	88	27	60
KM2C	*"*	*14,700*	*85*	*19*	*51*
WB2NVR	"	13,601	72	17	50
KC2LST	"	11,315	57	26	47
N2VM	"	9,920	75	26	54
W2CCW	"	9,272	66	22	39
K2UA	"	9,120	60	19	41
K2RYD	"	7,353	48	22	35
WA2DE	"	6,254	48	17	36
KC2LRC	*"*	*5,626*	*37*	*24*	*34*
KC2LSD	"	5,060	46	18	37
N2UZQ	"	4,437	35	19	32
W2JAZ	*"*	*3,634*	*34*	*19*	*27*
W9KXI	*"*	*3,234*	*29*	*17*	*25*
AK2S	"	3,116	33	11	30
WF2B	"	3,010	30	17	26
WB2AIV	"	110	6	5	5
WR2G	**14A**	**153,660**	**430**	**28**	**102**
WB2WPM	"	115,320	368	25	95
N2MUN	"	78,182	288	18	79
K2MFW	"	45,305	195	18	67
N2WLY	*"*	*798*	*15*	*5*	*14*
***NY6DX**	**AA**	**456,041**	**578**	**80**	**233**
*N2BEG	"	232,305	348	73	182
*N2FF	"	183,801	342	50	147
*KC2QJB	"	83,776	182	44	132
*W2XK	"	82,720	191	48	112
*WA3RHW	"	67,068	183	41	97
*W2TT	"	60,691	182	38	99
*W2NTV	"	56,525	173	34	99
*W2FDJ	"	36,226	121	34	84
*KD2IWW	"	23,668	97	28	69
*K1NY	"	10,921	64	18	49
*N2GA	"	10,906	58	25	57
*AG2V	"	10,132	58	19	49
*KC2QNK	"	9,417	61	22	51
*K2SI	"	7,119	47	20	43
*KN2X	"	3,080	32	18	26
*K2OAK	"	2,556	29	13	23
		(OP:WV2ZOW)			
*W2VM	"	2,520	30	17	23
**KG2NV*	*"*	*1,680*	*23*	*13*	*22*
*KD2IZQ	"	1,040	20	11	15
*KB2URI	"	144	6	6	6
***KC2WUF**	**28A**	**546**	**16**	**4**	**9**
***K2ZR**	**21A**	**23,298**	**138**	**18**	**48**
***NM2O**	**14A**	**96,921**	**281**	**27**	**94**
*K2MFY	"	25,200	124	22	58

District 3

K3ZO	**A**	**2,393,226**	**1894**	**106**	**353**
AA1K	"	2,284,206	1822	114	360
K3TC	"	705,960	707	92	278
K3UL	"	592,839	739	91	260
K3SWZ	"	575,512	630	88	256
K3ZA	"	268,882	423	63	170
N3CB	"	192,712	322	57	161
WK2G	"	142,560	326	43	122
K1BZ	"	141,918	259	62	155
W2GPS	"	141,300	299	51	129
NY3C	"	113,306	229	49	132
K3ATO	"	110,840	264	48	122
N3LH	*"*	*81,567*	*210*	*43*	*116*
WA2VUM	"	69,696	217	32	100
N3DUE	"	54,360	202	50	101
N3XF	"	49,861	156	36	83
W8LYJ	"	47,040	160	43	104
WB3CJU	"	44,440	156	29	72
W3DF	"	44,407	138	44	77
KA2C	"	42,822	146	35	82
K3FAZ	*"*	*36,720*	*117*	*41*	*95*
WN3I	"	35,454	124	32	82
K3WU	"	34,048	125	36	76
4U1WB	"	26,418	556	26	48
		(OP:AJ3M)			
N3KBF	"	24,424	108	25	61
K9ZU	"	22,968	95	24	64
NC3Y	"	21,004	96	26	63
K3DCW	"	14,630	73	28	49
AC2BI	"	13,775	92	35	60
K4JLD	"	12,814	75	30	56
AK3Y	"	12,462	71	21	46
W3SCA	"	5,394	36	23	35
KB3RCT	"	4,128	38	18	30
W3GZ	"	3,080	31	20	24
KX3C	*"*	*2,706*	*30*	*11*	*22*
N3ZP	"	1,196	19	11	15
KB3RKM	"	900	22	6	14
N3XL	"	506	17	9	13
W4KV	"	420	15	10	11
KC3FQF	"	48	12	6	6
AI3Q	**14**	**28,200**	**137**	**19**	**56**
W3QE	*"*	*464*	*11*	*5*	*11*
W3BGN	**3.7**	**73,300**	**285**	**20**	**80**
***N8NA**	**A**	**213,108**	**339**	**68**	**168**
*K2LNS	"	192,528	360	44	147
*K3SU	"	189,818	344	61	153
*K3HW	"	106,368	236	51	141
*K3ABE	"	40,432	148	41	92
*NS3T	"	26,818	100	36	70
*KX2S	"	24,108	108	21	61
*N3XZ	"	21,800	102	33	67
*K3LAB	"	19,698	80	31	67
*K3URT	"	17,160	94	30	58
*NX3V	"	16,450	105	28	66
*W3MBC	"	16,356	78	33	61
*N3UR	"	13,870	72	21	52
*KG4USN	"	10,998	59	26	52
*K2CQW	"	9,452	63	26	42
*K3KU	"	6,386	44	25	37
*AJ3DI	"	6,032	60	21	31
*KC3LZT	"	3,160	46	14	26
*K3NDM	"	2,850	30	13	25
**KC3HRV*	*"*	*2,482*	*31*	*13*	*21*
*W3DLD	"	2,166	29	14	24
*KC3SWL	"	1,952	23	13	19
*N3RUM	"	1,408	20	13	19
*N3TIR	"	1,152	22	16	20
*K3JAG	"	1,147	17	14	17
*WA3FIR	"	1,003	20	4	13
**N3VFK*	*"*	*910*	*30*	*15*	*20*
*W8YPV	"	899	17	13	16
*KC3HSQ	"	792	14	9	13
*K3TEF	"	703	15	7	12
*N3PEC	"	546	12	10	11
*K3LA	"	368	10	7	9
*N8HM	"	126	5	4	5
*KE3TW	"	108	7	6	6
*KB3K	"	88	4	4	4
*K3STD	"	64	6	4	4
*AI3Z	"	36	6	3	3
*W3GY	"	20	2	2	2
***KA3MZR**	**28**	**348**	**12**	**4**	**8**
***AJ4TJ**	**21**	**455**	**14**	**5**	**8**
***N3MWQ**	**14**	**2,987**	**37**	**6**	**23**
*KE3O	"	2,849	29	11	26
*KC3EWJ	"	2,210	28	10	24
*N3HWH	"	1,450	22	5	20
***KB3LIX**	**7**	**702**	**16**	**8**	**10**
*KC3KBE	"	99	10	5	6
***KT3RR**	**3.7**	**3,818**	**52**	**11**	**35**
K3WW	**AA**	**3,348,900**	**2258**	**119**	**430**
N3RS	"	2,878,656	1864	123	441
AA3B	"	2,519,628	1854	115	401
K3PP	"	2,258,505	1733	108	357
NW3Y	"	2,009,124	1488	107	379
K3MD	"	1,590,680	1352	105	350
W3FV	"	1,577,760	1207	109	371
K3SW	"	1,568,783	1254	102	359
N3MX	"	1,449,460	1144	104	356
W3EA	"	1,345,146	1088	106	352
KU2C	"	1,299,480	1040	103	352
NN3Q	"	1,253,392	1024	99	335
K3OO	"	1,167,516	863	111	381
WY3A	"	1,164,168	958	101	343
W3FIZ	"	1,007,097	949	91	312
K2PLF	"	991,450	919	92	303
W3JX	"	954,415	880	89	318
N3ED	"	919,600	853	91	309
K3CT	"	882,000	755	103	338
WW3S	"	820,446	745	95	306
K3WJV	"	809,564	741	98	308
W8FJ	"	735,750	728	84	291
N3FJP	"	690,690	737	84	261
N3ZA	"	662,235	669	84	273
K1RH	"	611,737	703	74	237
AA3S	"	600,096	691	83	246
N3RJ	"	566,262	679	78	248
WB2ZAB	"	524,160	563	76	260
KB3Z	"	497,376	593	75	239
N3AM	"	448,970	591	66	212
K3FMQ	"	441,936	514	79	245
NF3R	"	440,062	579	79	222
KC3WX	"	437,382	570	70	212
W3OU	"	373,860	439	74	236
NK3Y	"	345,644	568	49	172
W3PA	"	338,328	480	53	201
NB3I	"	314,632	436	68	200
NG3J	"	305,762	403	70	219
K3WI	"	294,984	443	60	181
WC3N	"	289,680	447	59	181
W1EG	"	275,058	420	71	188
WØBR	"	267,000	393	67	183
NA3M	"	251,160	346	77	199
K3SOM	"	220,864	342	57	175
K3RL	"	219,369	325	67	182
WA3AAN	"	218,370	335	67	184
W3EKT	"	201,348	389	65	173
W3YR	"	185,097	318	55	158
W3XOX	"	184,414	338	53	158
K4JDF	"	178,020	329	53	154
N3OZT	"	153,710	299	48	142
K3QF	"	149,917	278	46	151
KW3Z	"	128,816	284	39	127
N3LPJ	"	126,084	221	61	167
KE3GK	"	100,085	291	45	140
K3TN	"	92,520	191	52	128
KA3YJM	"	78,221	201	33	110
W6YTG	"	76,440	199	45	111
N3YPJ	"	75,640	191	39	116
N3TTT	"	62,178	181	29	100
K2PM	"	56,420	152	38	102
W3OD	"	54,249	126	53	116
NN3RP	"	43,310	139	36	86
W3GVX	"	43,121	151	39	68
W3NRJ	"	41,978	128	45	94
NS3L	"	35,588	115	37	87
NX3Z	"	32,522	115	32	69
N3ALN	"	27,472	106	34	67
W6WU	"	15,288	77	27	51
KE3X	"	12,900	64	31	55
W3RGA	"	10,011	58	24	47
W7IGC	"	7,888	50	29	39
KC3DRZ	"	7,800	59	22	43
N3QE	"	7,506	54	17	37
NY9H	"	7,500	49	23	37
K3ZU	"	6,960	44	22	38
WV2M	*"*	*3,483*	*31*	*16*	*27*
WB3IWC	"	2,208	27	11	21
K8GU	"	2,117	25	9	20
K3RON	**14A**	**20,700**	**117**	**15**	**54**
W3NO	**3.7A**	**70,066**	**244**	**24**	**82**
***W3KB**	**AA**	**513,213**	**560**	**88**	**259**
*K2XR	"	148,824	239	66	168
*KN3A	"	129,846	262	60	141
*K3UW	"	119,988	218	46	152
*KC3INR	"	73,904	178	40	109
*N3OJL	"	66,374	162	40	114
*KC3HXF	"	49,408	151	35	93
*AC3BU	"	47,676	141	47	90
*WA3WOM	"	26,784	99	34	74
*K3MAW	"	23,754	98	40	71
**W3ICM*	*"*	*19,306*	*91*	*31*	*67*
*N3WMC	"	15,366	84	25	53
*NE3I	"	13,148	66	24	52
*W3ZX	"	12,876	77	29	45
*KC3ESH	"	11,020	60	26	50
*N3CHX	"	9,570	67	21	45
*AB3SX	"	5,832	47	19	35
**KZ3W*	*"*	*5,280*	*45*	*22*	*38*
*NO3U	"	4,806	50	19	35
*WB3J	"	3,569	37	14	29
*W3XY	"	2,623	27	19	24
*W3ADC	"	1,242	19	10	17
*W2BAP	"	1,215	20	11	16
*W3CDW	"	1,075	19	9	16
*W3FA	"	176	7	5	6
***N3HCN**	**14A**	**5,600**	**47**	**16**	**34**
*N3ATE	"	578	13	5	12
*KC3LIV	"	180	7	3	6

District 4

K4AB	**A**	**1,542,525**	**1285**	**114**	**357**
K4PV	"	797,330	1153	96	259
K4BAI	"	647,064	729	88	254
N4MM	*"*	*490,336*	*534*	*95*	*257*
ND4Y	"	413,028	582	79	219
KA8Q	"	408,293	520	68	213
AC4G	"	376,200	492	84	216
K4FX	"	263,942	401	63	175
WB4YDY	"	251,906	383	62	177
KU8E	"	178,420	306	64	156
K4FYM	"	167,562	287	67	147
W7HJ	"	159,936	300	53	151
W4GHS	"	138,320	262	54	154
W4WRS	"	128,184	283	58	138
W4BBT	"	127,600	279	53	147
WA3DQS	"	126,072	244	62	142
WX8V	"	103,395	220	57	126
N4CF	"	90,280	196	54	131
AD8J	"	85,405	212	44	111
W3IP	"	82,732	197	56	116
K4KAY	"	59,079	192	40	101
K9ANN	"	51,788	161	36	85
W4MRJ	"	50,456	159	43	93
		(OP:NP2B)			
K7OM	"	44,023	154	45	88
KE4PLT	"	39,368	134	45	88
ND4G	"	34,220	113	36	82
KD4ISM	"	32,452	116	40	82
N4LZ	"	32,445	116	30	75
W4NZ	"	30,394	117	21	70
KØSTP	*"*	*28,392*	*135*	*31*	*73*
KA2NFG	"	27,918	111	36	63
W4VIC	"	27,664	114	36	76
WA4MFK	"	21,567	87	29	62
WB5WAJ	"	21,156	99	24	62
NE4EA	"	18,720	90	31	59
WA4CAX	"	18,236	83	33	61
W4IPC	"	10,920	69	16	44
WB4QOC	"	10,863	72	20	51
KB8SB	"	10,350	73	23	46
W4TYB	*"*	*4,950*	*40*	*18*	*32*
WD2E	"	4,944	60	15	33
KD4DRJ	"	3,827	37	15	28
WB2DHY	"	2,419	30	16	25
N4EPD	*"*	*2,301*	*28*	*15*	*24*
WA2FTC	"	2,257	21	16	21
KK4WX	"	1,984	26	10	21
W4UT	"	1,950	25	13	17
KM4TIN	"	1,820	25	11	17
KM4IK	"	1,620	21	12	18
N4ZY	"	1,530	21	9	21
KK4GLG	"	504	15	10	11
NN4RB	"	493	11	8	9
AD4TJ	"	392	13	6	8
NR4C	"	294	14	10	11
WO4K	*"*	*182*	*8*	*6*	*7*
N4WLF	"	60	18	14	16
W3WOT	*"*	*54*	*7*	*2*	*7*
W4DD	**28**	**7,130**	**92**	**9**	**22**
WB3D	**21**	**14,042**	**97**	**16**	**43**
N4KZ	"	378	10	5	9
AB4B	**14**	**276,220**	**838**	**34**	**106**
N4OX	"	247,680	793	32	112
W4RRE	"	39,425	162	21	74
KA4TOM	"	5,880	54	10	32
KN4NJR	"	4,830	47	12	30
KM4AHP	"	3,465	34	8	27
WA2PCN	"	1,566	29	12	17
K4FBI	"	1,512	25	7	17
W4MY	"	1,320	24	4	16
K4MJA	"	273	13	4	9
AI4WW	**7**	**2,146**	**29**	**8**	**21**
N3JT	"	1,276	23	12	17
W2IKN	"	756	22	9	12
K4HZF	"	700	13	7	13
KF4RAL	"	260	10	5	8
NX4N	"	112	5	3	5
WA4YJB	*"*	*99*	*10*	*6*	*5*
W4BH	*3.7*	*936*	*17*	*8*	*16*
AG4W	**1.8**	**6,380**	**147**	**14**	**30**
K3SV	"	390	11	6	9
***N9NB**	**A**	**827,904**	**803**	**97**	**287**
*W6DVS	"	375,624	485	70	212
*WA4TMJ	"	133,385	287	52	133
*KK4RV	"	89,268	221	48	124

*KD3GC	"	82,593	196	46	115
*N1XL	"	81,458	212	42	127
*KC4TEO	"	72,320	173	51	109
*NT4MM	"	59,830	155	50	105
*K4SXT	"	56,743	128	64	115
*N4EK	"	56,277	176	28	89
*K4ML	"	53,694	174	27	87
*WØMPM	"	53,196	149	45	98
*KN4EWI	"	51,300	149	36	99
*KD4YDD	"	45,568	151	40	88
*K4FJW	"	43,344	138	46	83
*N4XYZ	"	42,713	142	37	84
*AE4M	"	38,735	132	42	85
*AI4GR	"	34,866	129	40	77
*WA4JA	"	33,930	118	38	79
*W9WI	"	32,242	128	31	63
*WN4AFP	"	31,941	125	34	83
*KS4S	"	31,937	123	32	77
*KW4NN	"	30,397	118	39	74
*KG4WOJ	"	30,186	113	41	76
*AA4LS	"	28,381	125	30	71
*K4BC	"	27,940	107	39	71
*K4KSV	"	27,300	112	36	69
*KD4QMY	"	26,980	106	27	68
*K4FTO	"	26,085	121	36	75
*KT4FQ	"	24,182	100	36	71
*KR4NO	"	24,024	98	28	63
*K4ORD	"	23,377	102	34	63
*K3NF	"	19,096	90	26	62
*K2WPM	"	18,177	89	29	54
*N2NYR	"	13,244	75	24	53
*K4DTR	"	13,197	76	26	57
*KR4M	"	12,220	71	20	45
*KT3V/4	"	11,935	76	28	49
*WR4I	"	11,920	69	30	50
*N4RMK	"	11,856	63	26	50
*KØEJ	"	11,725	66	25	42
*KM4HQL	"	11,220	63	23	43
*AF2T	"	9,720	57	27	45
*WJ4HCP	"	9,443	62	24	47
*AAØO	"	9,384	58	23	45
*KO4OL	"	8,976	60	23	45
*KJ4KKD	"	7,584	79	27	52
*W2ECK	"	6,608	48	23	36
*KK4TJP	"	6,554	50	19	39
*W9XYL	"	5,820	43	24	36
*WA2OMT	"	5,550	41	16	34
*K2PS	"	5,200	40	20	30
*KW4CK	"	5,145	43	16	33
*NØDIM	"	4,998	50	16	33
*AJ4VA	"	4,582	39	24	34
*KJ4EU	"	4,576	46	20	32
*KF4AV	"	4,559	40	18	29
*KN4LTR	"	4,374	115	21	33
*N1XRR	"	4,185	39	16	29
*KA3PCX	"	4,042	39	15	32
*KN4DXT	"	3,901	43	18	29
*KG2E	"	3,696	37	17	27
*N4DE	"	3,649	39	15	26
*N5UOV	"	3,510	33	17	28
*N4PIR	"	3,500	43	19	31
*WB4RA	"	3,403	30	14	27
*K4GOP	"	3,108	28	17	25
*K4CGA	"	2,926	33	13	25
*K4GRE	"	2,852	26	20	26
*KM4F	"	2,331	26	17	20
*KM4HVE	"	2,294	33	15	22
*N4JRG	"	2,072	26	16	21
*AE4TH	"	2,024	27	18	26
*W4JNC	"	1,980	22	16	20
*KN4GPE	"	1,960	27	16	24
*WD4KTF	"	1,938	22	13	21
*KC8YRK	"	1,696	24	15	17
*KB4XO	"	1,680	23	9	21
*KD9DBF	"	1,652	24	11	17
*W4WHF	"	1,652	25	10	18
*AK4VQ	"	1,624	24	11	17
*KA3MTT	"	1,620	24	13	17
*W4NWT	"	1,598	28	15	19
*WØNV	"	1,518	22	15	18
*K4LSK	"	1,505	24	16	19
*KE4QCM	"	1,479	21	11	18
*N6UBO	"	1,470	20	14	16
*W4MBX	"	1,458	21	10	17
*W4CRV	"	1,377	25	12	15
*AA4RX	"	1,344	21	9	19
*N4FXZ	"	1,325	22	10	15
*W4GFY	"	1,316	21	11	17
*W3ERN	"	1,296	18	9	18
*AJ4AY	"	1,260	21	12	18
*KG5HVO	"	1,248	20	14	18
*KK4BK	"	1,215	18	10	17
*N6DME	"	1,188	23	10	17
*KT4OO	"	1,161	24	9	18
*WG8Y	"	1,144	18	12	14
*WT4BT	"	1,085	19	13	18
*KF4SKY	"	1,075	16	9	16
*W4OEP	"	1,012	17	9	13
*W2UW	"	850	22	10	15
*KN4MBK	"	805	22	9	14
*KC9GNQ	"	770	15	8	14
*W4EMB	"	676	24	12	14
*KJ4UC	"	660	22	12	10
*AE2KP	"	528	22	11	11
*N4KXO	"	496	24	12	19
*W4LOM	"	440	16	8	12
*AF4TQ	"	435	10	5	10
*W4PM	"	425	11	7	10
*AK3Q	"	400	12	7	9
*AA4JS	"	399	13	8	11
*N4IDH	"	360	10	8	7
*KB1WEZ	"	24	6	4	4
*AA4NP	21	9,018	64	16	38
*KC4WQ	"	2,100	25	10	20
*WB4MSG	"	1,025	18	8	17
*W4DFR	"	1,012	16	8	14
*N4ARO	"	360	10	5	7
*W4LC	14	33,418	151	16	61
*NØKOE	"	3,159	35	12	27
*K4HWS	"	2,573	36	12	19
*KA4RXP	"	340	18	7	10
*N4JAH	"	322	11	5	9
*NQ4K	"	266	9	6	8
*KN4KEY	"	224	15	6	10
*W4KLS	"	204	9	5	7
*K4WRX	"	150	8	4	6
*K4OTO	"	132	7	5	6
*NC4MI	"	98	5	3	4
*KX4LL	"	24	11	6	6
*KW4TO	"	20	2	2	2
*KF4LIS	"	8	2	2	2
*WB2ART	"	6	1	1	1
*KK4AND	7	12,033	77	18	45
*K4UB	"	4,256	52	14	24
*KN4LKC	"	1,764	36	9	19
*KG4UVU	"	576	13	7	11
*KN4GBO	"	532	14	7	12
*KK4BZ	3.7	6,380	67	11	33
*KQ4LA	1.8	126	9	3	4
*N4NTO	"	8	2	1	1
NR3X	AA	1,987,856	1555	121	382
K5EK	"	1,499,040	1141	114	366
N1LN	"	1,159,656	1033	95	327
K3IE	"	1,140,912	1034	102	315
K5KG	"	1,103,080	937	106	334
N4PQX	"	1,033,668	798	109	350
N6AR	"	892,952	813	101	321
WJ2D	"	842,016	863	87	271
WX4G	"	813,348	726	117	326
W3OA	"	723,822	741	94	269
K2WK	"	716,552	762	81	263
AD4EB	"	652,600	739	84	241
K4RO	"	641,763	576	101	316
NO9E	"	602,504	609	97	274
N4QS	"	544,784	626	80	236
W7WZ	"	523,575	620	83	242
K4FS	"	513,216	542	86	266
W4EEY	"	475,846	619	79	208
NR4O	"	454,894	558	78	241
W4NF	"	374,126	494	75	208
K1KNQ	"	334,012	403	83	233
KG6MC	"	292,434	412	76	206
N4ZZ	"	286,272	469	60	164
W4JVN	"	279,380	448	54	175
K4MMW	"	267,206	411	76	195
W4JAM	"	263,378	408	58	181
K4BBH	"	254,331	430	64	167
W4KW	"	250,624	390	79	177
K5VIP	"	240,350	333	67	208
KT4Q	"	238,128	335	73	191
AC4GW	"	225,120	325	82	186
K4XL	"	207,230	330	62	168
W3YY	"	205,318	317	69	182
N4CW	"	192,182	237	74	233
KM4VTE	"	188,790	362	57	146
N4BCD	"	180,063	284	78	165
WA4WR	"	167,518	280	60	161
AA4DD	"	166,850	266	69	166
KR4F	"	163,834	260	68	174
N4HB	"	152,309	255	61	162
W1IE	"	148,461	336	57	156
W2YE	"	142,506	302	44	130
N7WJ	"	140,448	277	61	148
KT4O	"	137,280	244	56	152
KA4RRU	"	134,907	264	49	144
KM4ZQE	"	129,408	250	48	144
N2YO	"	120,379	228	60	143
KU4FX	"	109,045	223	58	135
KA4CDN	"	105,336	211	60	171
N4PD	"	79,857	172	48	123
K4NPC	"	77,717	263	26	83
WC4D	"	74,694	183	51	126
K4YYL	"	72,446	155	59	119
KC3D	"	70,180	190	44	101
N4VLK	"	63,510	178	45	100
K4RG	"	63,395	143	35	120
ND4V	"	59,660	141	46	111
W4XO	"	59,307	144	43	116
KE4YOG	"	54,715	132	51	104
NG4V	"	49,010	131	47	98
K4MM	"	48,233	136	38	101
K4SWE	"	42,350	180	34	87
NN2T	"	40,700	123	50	98
AF2D	"	40,560	129	36	94
AD4IE	"	33,027	120	31	70
W4CU	"	32,704	109	40	72
K4MI	"	31,734	102	41	88
KM4JA	"	30,783	127	33	60
K4QPL	"	25,168	106	25	63
N4DU	"	24,592	99	39	67
KN4BIT	"	23,716	104	33	65
N4TL	"	23,157	103	27	56
K2KXK	"	22,620	118	22	56
K4BGV	"	17,091	89	23	58
K4NC	"	16,884	72	28	56
KC4FWS	"	15,840	76	26	54
AD4YQ	"	13,464	67	28	60
K3TD	"	11,904	73	20	44
K2GER	"	10,425	59	28	47
W4KPG	"	9,936	54	27	42
N4APR	"	9,656	53	25	43
K4QD	"	9,558	69	19	40
N4WQH	"	8,710	60	23	44
NC4VA	"	7,139	54	21	38
N4DEN	"	6,710	43	22	39
K4IDD	"	6,612	42	19	38
NN4X	"	5,406	40	20	31
W5LGK	"	5,311	42	18	29
KM4HQE	"	4,888	36	19	33
N3LBJ	"	4,600	39	15	31
KF3FRK	"	3,572	31	19	28
N5ST	"	2,752	32	17	26
KI4DT	"	2,652	27	13	21
W4UCK	"	2,535	29	10	29
N3MOW	"	2,240	25	11	24
ND2O	"	1,984	25	10	21
N3JUY	"	1,976	23	15	23
N4FP	"	1,848	29	18	24
WD9GMK	"	1,584	23	12	21
KC4YT	"	1,400	17	11	17
AB4TT	"	1,296	23	8	16
KW4VK	"	592	13	7	9
N4QBS	"	570	11	8	11
N9KY	"	170	6	4	6
N4BAY	"	84	4	3	4
WO4O	28A	9,576	95	11	25
K4WI	"	9,180	96	12	24
N4PN	21A	189,392	553	28	105
N4EEB	"	29,970	163	22	52
KM4HI	"	29,568	133	21	63
N4BP	"	24,743	84	27	82
WA4JUK	14A	70,200	258	23	81
KM4IZZ	"	32,045	145	20	65
W4TTY	"	16,598	72	20	66
K1ZW	"	5,474	46	15	31
K4KUB	"	4,664	39	16	28
N4KH	"	1,600	23	12	20
KD4RH	7A	7,038	55	13	33
W4PG	"	4,932	46	10	26
NK4K	3.7A	720	14	7	13
N4RJ	1.8A	1,056	24	7	17
*N4XL	AA	438,650	528	78	232
*W4ZAO	"	419,604	534	79	213
*KM4SII	"	234,038	392	58	171
*N4GU	"	197,792	324	58	166
*K4ELI	"	174,873	345	60	153
*W4TM	"	103,984	217	60	134
*K4SBZ	"	94,724	200	66	133
*W3ZL	"	84,402	198	46	116
*W4IOD	"	63,000	154	52	116
*KG4IGC	"	53,940	141	48	107
*NC4RY	"	48,512	142	37	91
*W4PR	"	46,944	132	34	110
*K2TE	"	38,912	127	37	91
*WB8YXF	"	32,736	108	39	85
*KK4R	"	30,576	110	34	70
*KC2DPF	"	29,205	113	28	71
*WF7T	"	29,184	107	39	75
*WB4HRL	"	27,216	108	38	70
*K4VBM	"	23,500	106	31	63
*K4LDC	"	22,932	98	31	67
*N1ADM	"	19,176	75	25	69
*NR4CW	"	18,720	96	29	67
*W4JUU	"	15,573	72	28	59
*AD5NL	"	13,944	71	27	57
*KM4AF	"	13,816	57	35	53
*WUØB	"	13,120	69	31	51
*KA4JON	"	13,110	79	33	62
*N4ETC	"	11,826	72	29	52
*KM4RK	"	11,508	60	29	55
*W1CY	"	10,744	68	22	46
*W4WNT	"	9,656	56	25	46
*K4WDY	"	9,315	54	25	44
*KB1AWM	"	8,510	52	30	44
*KJ4YKG	"	7,772	50	19	39
*AC4MG	"	6,840	62	22	35
*N4RLG	"	6,710	49	16	39
*KD4LEM	"	5,940	47	22	33
*W4SFG	"	5,500	43	22	33
*W7ZP	"	5,280	37	24	36
*KG4LST	"	4,752	36	20	34
*KF4GTA	"	4,230	40	18	27
*K4XB	"	3,608	33	17	27
*W4STV	"	3,440	30	19	24
*WW4LS	"	3,040	52	17	23
*AC6WI	"	2,952	29	14	27
*K4HYJ	"	2,728	30	16	28
*KK4RWB	"	2,294	29	13	18
*KB8ABJ	"	2,223	25	15	24
*W4CMG	"	1,734	20	15	19
*N4YB	"	1,710	26	9	21
*KC5CMX	"	1,530	18	16	18
*WB4OBF	"	1,504	19	14	18
*N4JN	"	1,410	24	12	18
*AA4XA	"	1,064	20	7	12
		(OP:HK1A)			
*KC2ABP	"	792	15	8	14
*K1CE	"	644	32	12	11
*KS4AA	7A	31,395	142	24	67
*W4EE	3.7A	90	5	5	5
*K3TW	1.8A	697	22	5	12

District 5

AD5XD	A	495,824	729	90	214
AI5SF	"	210,080	382	56	152
K5LAD	"	126,633	276	62	129
N5DD	"	124,630	229	66	140
KB5WWW	"	78,732	192	51	111
K5IB	"	73,408	200	51	97
AE5P	"	70,679	174	54	107
K5MV	"	44,478	146	37	89
WQ5L	"	43,681	134	46	75
KF5YUB	"	21,492	93	46	62
K5HTE	"	14,007	83	36	51
K5TA	"	11,480	62	23	47
K5NOW	"	10,836	66	36	48
WA5DSS	"	4,956	45	15	27
W5RYC	"	3,956	33	17	29
AB5GI	"	2,982	31	17	25
K5MWR	"	2,415	30	14	21
K5MSI	"	1,944	39	17	19
KJ5MA	"	1,767	22	13	18
KF5OMH	"	264	18	10	12
WB4KTF	"	228	13	9	10
N5ZDT	"	225	12	7	8
KF5NRS	"	48	3	3	3
W5PR	28	22,320	198	15	30
N2IC	21	135,783	485	30	77
WD5K	14	131,976	416	26	91
KF5ZNQ	"	29,200	147	20	60
N5KF	"	12,844	90	18	34
N5KAE	"	7,056	52	17	39
K5CEL	"	1,840	29	9	14
KM5VI	7	40,984	309	30	64
WY6K	"	3,710	40	11	24
K5FUV	3.7	20,999	128	22	61
K5RX	"	496	11	7	9
*K5XU	A	112,976	233	51	133
*NN5T	"	71,145	181	53	100
*K5DHY	"	51,375	150	51	86
*WA5SOG	"	50,944	163	41	87
*NZ5O	"	43,940	143	44	86
*NW5Q	"	41,412	137	46	70
*KE5LQ	"	38,430	119	48	78
*NO5V	"	29,370	110	41	69
*KF5BA	"	29,318	125	38	69
*KR5G	"	29,040	119	48	72
*K1JHS	"	27,904	104	37	72
*W5KV	"	21,513	162	38	63
*W5TV	"	18,952	93	32	60
*AB5TH	"	14,940	73	34	56
*N5KXI	"	14,560	67	31	49
*KG5JCK	"	9,900	53	25	41
*W4WLF	"	7,930	57	23	42
*N5UUA	"	7,808	49	23	38
*KD5FBA	"	7,020	55	21	39
*K5NMT	"	6,664	51	22	34
*KG5GCC	"	6,270	51	21	36
*KC5LK	"	5,777	50	19	34
*KJ6DQ	"	4,410	42	19	23
*KØBWQ	"	4,272	37	18	30
*K5JEP	"	4,067	33	18	31
*W5ULR	"	3,312	26	20	26
*K5GDX	"	3,255	32	12	23
		(OP:WQ5L)			
*K9ING	"	3,198	36	15	26
*N5BYZ	"	3,108	39	18	24
*WD5ENH	"	2,664	30	17	19
*K5DCX	"	1,968	24	18	23
*NØLD	"	1,911	27	17	22
*KC5DCT	"	1,564	31	16	18
*KB5QR	"	1,421	19	12	17
*WB5JJJ	"	1,300	21	11	14
*AF5VO	"	1,272	26	11	13
*KM5FW	"	1,247	35	14	15
*WA5IEK	"	1,189	21	14	15
*KU5Y	"	1,150	21	10	15
*WX5SAT	"	984	22	9	15
*AG5DB	"	952	15	13	15
*N6EB	"	792	14	10	14
*N5PBP	"	714	17	9	12
*KG5DKG	"	620	14	8	12
*KY5M	"	588	19	9	12
*KG5ZMG	"	572	14	10	12
*W5CYF	"	460	24	11	12
*WA6EEM	"	374	15	7	10
*AA5AH	"	64	4	4	4
*K5TMT	"	50	5	2	3
*K5WZS	"	17	11	8	9
*K8OZ	21	23,424	141	20	44
*KZ5OH	14	42,978	223	23	64
*WBØRUR	"	2,484	32	6	21
*KC2FKM	"	1,215	27	9	18
*NO5F	"	551	11	9	10
*K7MOK	"	400	10	8	8
*KB5SFL	"	27	8	5	4
*W5SWG	"	4	1	1	1
*KC5RGQ	7	56	4	4	4
K5GN	AA	1,045,092	1088	123	313
N5JR	"	903,350	756	118	327
K5LLA	"	830,000	773	107	293
N5XJ	"	429,702	573	77	196
WØVX	"	349,006	501	69	188
NT5V	"	326,793	452	80	211
KD5JRY	"	311,918	510	71	192
K5UA	"	286,520	406	67	180
AA5AU	"	211,939	364	57	164
KF5SM	"	195,444	270	92	175
K9MK	"	185,948	307	71	158
AC4CA	"	141,276	268	56	137
WA2VYA	"	130,682	278	61	120
N5OT	"	129,299	211	81	158
W2GS	"	112,464	246	51	125
K4DG	"	94,905	211	53	118
K1TU	"	92,150	203	53	137
KE5OG	"	87,720	212	52	120
WD5R	"	87,626	221	46	108
W5GN	"	85,650	227	41	109
N5WNG	"	83,720	201	55	106
KI5LR	"	83,352	207	62	122
WA5LFD	"	40,713	146	42	81
K5CKS	"	38,988	146	28	80
W5GFI	"	32,832	106	41	73
W5THT	"	31,000	98	44	81
KA5M	"	26,928	100	34	68
N5RMS	"	13,530	68	30	52
N5KDA	"	8,060	46	25	40
K5CI	"	7,980	50	20	37
K5BG	"	7,830	54	20	34
KE5TD	"	6,180	40	25	35
W5ZP	"	5,632	44	23	41
W5JDF	"	4,717	38	22	31
N5TJ	"	4,042	35	17	30
N5ATM	"	3,655	42	17	26
WV5Y	"	2,065	25	14	21
K5BAK	"	1,581	18	13	18
K6RAH	"	984	17	9	15
KD5AFS	"	741	16	9	10
WØEA	"	567	12	10	11
NH7RO/W5	"	256	8	8	8
N5FO	21A	135,250	521	29	96
K5CD	14A	333,270	1072	35	126
N7DF	"	34,224	160	24	68
*KI5MM	AA	300,829	459	81	202
*N9JA	"	90,342	221	58	131
*K5SVV	"	59,356	161	49	93
*AG5W	"	59,340	171	40	89
*KN5S	"	22,794	107	36	51
		(OP:K5WW)			
*KG5WZD	"	15,834	86	33	54
*W5PKK	"	13,137	96	36	51
*N5YT	"	12,654	70	27	47
*N5MT	"	11,753	63	26	47
*W5CMM	"	11,325	76	26	49
*W5PAA	"	10,902	70	31	38
		(OP:KF5GTX)			
*W5TCB	"	9,514	57	27	40
*K5LGX	"	7,524	55	25	41
*W5HP	"	6,968	56	18	34
*KØYA	"	3,010	33	18	25
*KF5ITM	"	2,520	26	17	23
*K2ZP	"	2,275	26	13	22
*KG5ZLE	"	1,350	26	13	14
*AG5NH	"	1,075	19	11	14
*WD5GBS	"	960	17	11	13
*KC5SDY	"	814	24	10	12
*N6XVZ	"	672	17	11	13
*AK5SD	"	667	12	11	12
*KMØI	"	665	13	9	10
*N5XXD	"	72	5	4	4
*WA5WFE	21A	27,552	119	23	61
*KS5Z	"	546	12	9	12
*W5XNA	"	6	1	1	1
*N4IJ	14A	176,267	447	34	115
*K5KJ	"	78,474	246	29	94
*KG5WJZ	"	1,150	18	10	15
*W3LEO	7A	64	4	4	4
*NA5NN	1.8A	880	20	5	15
		(OP:K2FF)			

District 6

K6XX	A	1,699,775	1657	118	267
K6NA	"	865,060	988	107	227
N6JS	"	173,301	543	60	123
AI6LY	"	155,568	395	61	107
W1PR	"	146,850	341	55	110
KW6S	"	127,608	315	54	102
K6YK	"	106,640	269	50	105
W6UE	"	101,150	225	49	121
		(OP:N6AN)			
K6LRN	"	82,611	243	42	95
KE8FT	"	82,150	246	58	97
WA6URY	"	53,120	161	56	72
K6TQ	"	46,104	165	44	69
NG6M	"	44,544	171	47	81
		(OP:KF6QH)			
KG6WIK	"	40,215	152	41	64
NC6R	"	35,490	235	51	79
W6UM	"	32,085	120	31	62
K8TR	"	24,864	115	34	62
WU6X	"	22,968	107	36	51
N6VOH	"	22,656	129	34	62
K6BEW	"	21,804	104	39	53
W6FB	"	19,575	105	31	44
WA6MRK	"	16,968	84	37	47
K6RWM	"	11,840	71	31	43
KB6A	"	9,690	75	23	28
AJ6V	"	8,855	70	20	35
W6FA	"	8,352	66	23	35
AK6R	"	7,000	57	24	32
NT6F	"	6,020	53	19	24
AI6CX	"	5,358	38	23	34
WB6HVW	"	4,250	36	24	26
KM6HB	"	3,008	36	16	16
K6YYL	"	1,792	28	14	18
K6SZQ	"	1,118	18	10	16
AC6MW	"	735	14	10	11
N6ADO	"	558	11	9	9
NZ6G	"	462	13	10	11
KM6NTW	"	300	9	7	8
N6JCN	"	189	14	10	11
W6BDX	"	143	7	5	6
N6KN	21	50,652	233	26	58
W6TK	"	46,800	224	26	54
K6JAT	"	31,614	190	22	44
N6GP	"	2,730	29	14	21
W6AFA	14	140,910	551	30	92
K2YY/6	"	80,000	377	28	72
KM6G	7	6	1	1	1
*N6RV	A	340,032	506	77	176
*WN6K	"	117,034	288	67	96
*K7CAR	"	39,816	135	52	74
*KD6RMS	"	36,000	139	43	57
*W6BJB	"	30,199	124	37	64
*KE6WC	"	24,722	110	40	54
*AE6YB	"	20,436	114	34	44
*W6JK	"	16,709	90	32	45
*WB6CZG	"	15,840	94	36	52
*K6PGH	"	15,466	76	27	47
*K6WDE	"	12,616	63	36	40
*WB6HYH	"	12,168	63	31	41
*K6MCS	"	11,868	75	30	39
*K6MUG	"	11,286	70	31	35
*WB6BET	"	8,308	50	26	36
*WB6ZAM	"	7,869	63	31	30
*N6REK	"	6,726	68	25	34
*K6BBQ	"	6,566	54	19	30
*KM6KJI	"	5,777	64	27	26
*NR7Z	"	5,358	41	19	28
*KD6HOF	"	5,332	60	20	23
*W6VIO	"	4,545	65	23	22
		(OP:K6ICS)			
*K6MXA	"	4,484	57	20	18
*KF6I	"	2,660	26	16	22
*K6OWS	"	2,479	32	17	20
*K6ELE	"	2,352	49	24	25
*K6CSL	"	1,891	27	16	15
*N7UWD	"	1,881	32	16	17
*AD6GE	"	1,768	35	18	16
*W6JGR	"	1,536	23	12	12
*N6YEU	"	1,485	21	11	16
*K6ACV	"	1,392	32	13	16
*W6YNO	"	1,155	28	15	18
*N6TCE	"	1,121	53	28	31
*N2JNR	"	989	23	10	13
*K6KWI	"	897	33	12	11
*N4DLA	"	684	19	9	9
*K6AAI	"	594	26	12	10
*W6ELA	"	475	13	10	9
*AI6UW	"	450	12	9	9
*WA6GD	"	420	24	18	17
*AI6IN	"	384	11	8	8
*W6DPM	"	384	12	7	9
*KQ6RS	"	350	9	7	7
*KB6JJR	"	308	13	7	7
*W6LU	"	289	17	9	8
*W5OM	"	196	9	7	7
*KF6ZYD	"	170	8	5	5
*WB6ETY	"	48	3	3	3
*W6MES	"	6	2	1	2
*N3RC	28	20	2	2	2
*WZ6ZZ	"	6	1	1	1
*K7XE	21	13,176	102	18	36
*N6RM	"	10,712	78	20	32
*N6BHX	"	312	11	6	6
*WA7BNM	14	57,200	215	27	73
*K6QCB	"	2,573	41	14	17
*N2VAJ	"	648	13	9	9
*K7QDX	"	468	13	6	6
*KD6NFD	"	420	12	7	7
*AB6WC	"	170	10	5	5
*WA7ER	"	120	7	5	5
*W6RQ	"	99	13	6	5
*KM6FOY	"	70	15	7	7
*KI6UDZ	"	48	5	3	3
*KK6VZE	"	42	11	3	3
*AI6JB	"	24	2	2	2
*KK6TGM	"	4	1	1	1
*N6DRU	7	1,472	39	11	12
*KD6GWH	"	144	12	4	4
*KI6WXS	"	144	7	5	4
W6PH	AA	1,022,681	1021	112	277
N6JV	"	494,480	677	80	200
N6QQ	"	271,656	427	73	179
K6MR	"	194,233	325	79	144
N5KO	"	177,282	335	70	131
WC6H	"	143,865	284	69	138
N2NS	"	125,433	257	59	122
N6WS	"	121,968	226	72	126
W6SX	"	109,664	271	62	122
NI6G	"	106,470	245	63	106
K6SRZ	"	95,450	224	58	108
AA6PW	"	79,821	203	44	103
W6HYI	"	66,581	194	49	90
AF6SA	"	53,317	164	52	79
KG6AO	"	36,542	125	50	71
W1RH	"	31,734	135	24	58
W6TMD	"	29,430	108	41	68
WE6Z	"	29,088	117	38	58
W6RC	"	26,884	120	38	56
N6AJ	"	26,112	101	32	64
N6IC	"	23,560	108	32	63
NJ6G	"	21,715	81	38	63
WB6JJJ	"	20,670	103	31	47
W6MOB	"	19,364	92	44	59
K6DLB	"	19,360	96	31	49
AI6DR	"	15,984	90	26	46
K6RIM	"	9,128	59	22	34
N3DEB	"	7,216	67	22	22
AG6AY	"	6,820	48	23	32
N6LZ	"	6,710	48	24	31
K6SEM	"	6,601	68	21	20
KB6YYH	"	6,174	49	22	27
AG6AG	"	6,106	54	18	25
K6WV	"	5,424	54	24	24
W6TWH	"	4,872	43	27	31
N6ETO	"	3,232	49	16	16
AI6Z	"	1,269	16	13	14
N6RK	"	1,140	20	5	14
NA6O	21A	23,919	154	21	46
		(OP: @N6RO)			
NK6A	"	17,052	113	19	39
WX5S	14A	162,032	400	33	119
		(OP: @N6RO)			
W6BVB	"	5,764	61	16	28
W6EF	"	4,092	46	13	20
W6UZ	"	450	11	8	10
NX6D	"	253	8	4	7
K3EST	7A	311,125	1009	36	95
N6RO	1.8A	1,575	41	11	14

*W6ZL	AA	85,943	224	47	96
*N6ORB	"	32,451	145	33	54
*WB6POT	"	30,060	120	38	52
*N6JNL	"	14,904	89	31	38
*W6VAR	"	10,260	64	29	31
*AG6JA	"	9,975	74	28	29
*AD6SF	"	9,198	93	29	34
*W6GAE	"	8,265	59	25	32
*KE6PLA	"	8,262	68	20	34
*AE6PL	"	4,142	50	15	23
*KM6KRO	"	3,948	33	21	26
*W6JBR	"	3,485	40	20	21
*NO6G	"	2,349	30	13	14
*W6IFN	"	2,130	28	15	15
*WW6G	"	2,013	32	17	16
*KJ6TTR	"	612	17	9	9
*WA6WPG	"	578	12	8	9
*K6GHA	14A	26,068	132	26	50
*KJ6JEP	"	576	13	7	9
*KI6SCT	"	150	9	5	5
*N6ABT	7A	2,052	28	11	16

District 7

K7RL	A	2,148,459	2353	112	269
N9RV	"	2,040,560	2119	111	257
N7ZG	"	581,484	854	88	194
W7AT	"	544,425	746	102	203
		(OP:W7EW)			
W7XQ	"	379,695	616	80	175
K9JF	"	368,544	527	85	179
W7YAQ	"	352,350	496	92	178
N7GP	"	293,975	469	89	186
KD7RF	"	169,645	337	60	125
K7TTU	"	148,200	287	71	124
		(OP:K2SS)			
K7ABV	"	131,157	282	57	114
W7MEM	"	108,360	254	59	109
KE2VB	"	95,493	280	49	90
WB7BBQ	"	86,867	226	53	96
AD7XG	"	79,056	213	49	95
W5UJ	"	60,066	196	44	97
WN7T	"	41,760	144	52	68
KØJJ	"	40,643	153	29	68
KI7N	"	35,828	133	45	61
K7STO	"	25,912	145	29	53
KS7T	"	25,491	120	33	54
KB7RJ	"	24,752	107	38	66
N3EG	"	17,176	88	32	44
WU6W	"	16,016	90	32	45
KB7N	"	14,861	84	33	44
KH6VM	"	12,814	103	34	52
W7TX	"	12,412	74	23	35
K9JDV	"	11,376	75	32	40
KD7H	"	11,024	78	25	28
W7QHZ	"	10,585	72	26	47
KS4R	"	9,943	72	28	33
K7TM	"	8,432	74	34	34
W7FD	"	7,250	61	24	34
W7ON	"	7,140	55	29	39
NO7E	"	6,785	63	29	30
KG7SXF	"	5,250	55	22	28
W7AUM	"	4,750	50	15	23
N6TR	"	4,500	39	25	25
KE7HTL	"	4,257	41	16	27
K6LR	"	2,992	35	14	20
WE7H	"	2,844	28	16	20
K7WXK	"	2,765	27	16	19
WA9MSR	"	1,782	20	14	19
AG7NC	"	840	23	13	11
W7WVF	"	720	14	10	14
KBØOLA	"	221	8	6	7
W7PU	14	32,712	185	27	60
AG7KO	"	14,616	100	20	43
N7LR	"	252	10	6	6
W7WA	7	537,040	1441	36	101
KK7DP	"	1,316	103	11	17
KD7JR	"	1,098	25	9	9
N7TWP	"	525	20	8	7
N6TCO	"	240	10	6	6
W7WOO	"	221	8	6	7
WA7NS	1.8	675	31	10	15
K7CW	"	660	17	9	11
*N7IR	A	259,515	409	78	159
*WZ8T	"	221,325	459	65	130
*AA7UN	"	114,624	290	43	101
*NF7E	"	106,260	285	51	110
*AC7GL	"	73,253	212	49	90
*N7ZUF	"	70,955	250	35	80
*NT7MM	"	62,665	244	52	99
*W1DGL	"	49,256	200	48	83
*KA7T	"	49,068	198	53	88
*KK7AC	"	48,490	145	44	86
*AA7TV	"	46,592	160	50	78
*W7MCP	"	29,003	113	38	59
*N7VZU	"	27,435	110	32	61
*WA7NWL	"	22,352	104	36	52
*N7MU	"	20,100	100	46	54
*K7TQ	"	19,944	118	31	41
*AC7AF	"	19,035	91	34	47
*KNØW	"	16,116	91	35	44
*KV7J	"	14,220	93	36	43
*KB6UNC	"	13,160	81	24	46
*KG7OH	"	12,180	88	37	50
*KE7F	"	10,570	96	32	38
*NR7RR	"	9,900	66	26	34
*N7AME	"	9,211	79	24	37
*W7JHR	"	8,640	62	33	39
*KF6CRW	"	8,160	70	22	29
*AF7NX	"	8,064	58	30	34
*K6BSR	"	7,380	64	25	35
*W7OTL	"	6,498	57	28	29
*KR2E	"	5,632	47	20	24
*WJ7R	"	5,487	60	14	17
*K7DBN	"	5,474	47	22	24
*KW7WP	"	5,304	44	23	29
*NL7D	"	4,641	67	20	31
*N7VS	"	4,128	47	21	27
*N7JI	"	4,002	54	14	15
*KC7ITP	"	3,159	32	19	20
*KG7VDX	"	3,096	33	17	19
*AG7CC	"	2,958	37	15	19
*AG7GP	"	2,952	35	18	18
*AF7LZ	"	2,660	50	18	20
*KM7N	"	2,635	30	13	18
*N7DSX	"	2,618	36	16	18
*K7OVW	"	2,604	42	14	14
*WØJTC	"	2,550	38	15	15
*KG7DAB	"	2,418	38	15	16
*AC7CA	"	2,376	32	16	20
*KF7YED	"	2,272	38	15	17
*KE7ZAC	"	2,190	37	15	15
*KBØNHW	"	2,024	34	10	12
*WR7X	"	2,024	33	10	12
*K1AUS	"	1,984	30	16	15
*NS7U	"	1,537	39	15	14
*KI7UIN	"	1,296	28	12	12
*W7DBA	"	1,128	29	12	12
*WW7KE	"	975	15	11	14
*N7LAN	"	925	31	13	12
*KG7PDC	"	651	22	11	10
*WØPAN	"	551	18	9	10
*W7EEH	"	550	16	12	10
*KQ7TJ	"	496	14	8	8
*K6GDP	"	375	13	8	7
*KDØPYF	"	306	11	8	10
*KI7TYH	"	306	25	17	17
*K5PSN	"	290	15	5	5
*W7HBP	"	240	13	8	8
*W7AMR	"	170	10	7	10
*K7JSG	"	154	10	8	6
*K7RMZ	"	88	8	4	4
*W7DRN	"	72	10	6	6
*W7UPF	21	11,712	130	20	41
*K7HKR	"	5,304	50	14	25
*KI7BP	"	3,348	40	12	24
*K6VHF	"	276	19	6	6
*N7FLT	14	43,860	189	24	61
*K7ACZ	"	6,532	53	21	25
*KG7UAV	"	1,064	22	8	11
*K3TP	"	962	26	13	13
*W7SY	"	768	19	9	7
*W7RTC	"	703	17	10	9
*KI7ZYE	"	481	22	7	6
*K1LOK	"	190	11	5	5
*K6ST	"	130	11	5	5
*W7OLA	"	110	14	6	5
*W7TCT	"	42	11	4	3
*KG7SWD	"	24	6	4	4
*K7XTN	"	8	2	2	2
*N7FXT	"	6	1	1	1
*N6LB	7	1,250	24	10	15
*WF7BSR	"	252	8	6	6
*KT9X	"	18	3	1	1
*KI7MZH	"	6	1	1	1
KC7V	AA	1,342,088	1543	120	284
KA6BIM	"	924,561	1010	113	250
K2PO	"	696,465	918	96	201
NA2U	"	681,312	1035	108	268
NX1P	"	410,020	744	89	158
K2RD	"	341,315	446	91	204
K7AR	"	332,704	434	93	203
K7UT	"	326,472	651	76	168
KF7U	"	292,320	485	78	174
NC7M	"	291,907	494	67	156
AA6AA	"	290,157	424	97	190
K7XC	"	280,623	428	81	168
KG7CW	"	263,592	396	84	168
N7GCO	"	222,075	397	75	150
NA7OM	"	195,252	370	70	142
K7HP	"	194,700	348	79	141
W7CT	"	156,114	306	60	129
WA7LNW	"	154,940	248	73	171
AA7V	"	152,382	244	72	161
KI7M	"	148,934	368	78	148
N9NA	"	145,957	303	70	133
NG7M	"	107,402	251	56	110
KN7K	"	82,240	209	61	99
W7RIS	"	81,483	208	54	103
N7RVD	"	72,930	225	47	83
NK9I	"	64,780	147	57	107
K7VIT	"	53,001	163	46	71
AK7MG	"	52,992	151	47	91
KX7YT	"	50,050	174	37	73
K6UM	"	48,496	157	43	69
AE7VA	"	38,610	129	40	77
WS7L	"	27,775	102	37	64
KB7KYK	"	23,660	106	40	51
KF7ZN	"	9,815	61	25	40
K3WYC	"	9,443	53	28	43
WR7Q	"	7,809	53	14	43
N7SJM	"	7,104	72	25	39
WAØPFC	"	6,909	62	18	31
KØIP	"	5,360	49	16	24
KT7G	"	4,750	55	22	28
KG7QXE	"	4,140	51	21	25
KF7F	"	3,600	34	11	29
K7EG	"	2,960	30	15	22
N6RW	"	1,222	17	10	16
K7MZ	"	1,110	28	16	14
WB7BWZ	"	1,040	18	10	10
W7ZB	"	312	10	5	8
W7SLS	"	15	4	3	2
N6SS	28A	2,592	68	8	10
W7ZR	21A	32,186	194	25	52
K7MY	"	10,504	82	16	36
N7DD	14A	456,832	1032	35	131
WX7P	"	43,522	185	27	67
K7HPT	"	6,118	65	17	29
W7ZFG	"	1,920	26	11	19
KF7WRS	"	1,425	26	13	12
K7WP	7A	30,940	157	28	57
KC1BB	"	9,169	67	19	34
WA2BFW	3.7A	2,025	65	11	16
KI6QDH	"	338	11	4	9
*W7OM	AA	95,312	247	65	96
*W7ISG	"	71,651	204	44	93
*N7UJJ	"	70,705	171	55	124
*N7MZW	"	62,208	196	41	87
*NW7E	"	52,890	152	44	79
*KD6TR	"	40,950	137	48	78
*K7VAP	"	18,865	95	36	41
*W7AXN	"	18,139	93	36	61
*K7HV	"	17,300	66	36	64
*KB7JJG	"	12,628	74	30	47
*WA7YXY	"	11,704	67	33	43
*N7CPM	"	6,156	45	24	33
*WA7RR	"	5,600	38	24	32
*KF7DUR	"	5,487	47	25	34
*WA7DUH	"	3,956	36	18	28
*K7AHF	"	3,549	39	13	26
*W7BP	"	2,870	28	18	23
*NG2Q	"	2,016	31	15	21
*K7VZ	"	1,904	26	17	17
*WM5F	"	1,222	19	12	14
*AD7MM	"	1,080	18	13	17
*K2DT	"	884	17	12	14
*K7JKM	"	861	16	10	11
*K7MK	"	840	15	8	12
*W7CO	"	616	23	15	13
*K7QA	"	576	13	7	9
*KC5EGZ	"	252	11	10	8
*N7JB	"	240	8	5	5
*KG7HAX	"	228	9	6	6
*AG7PW	"	168	8	5	7
*WØBF	14A	3,663	39	13	24
*WAØWWW	"	3,420	44	9	21
*K7AMB	"	612	14	8	10
*W7EEU	"	81	5	5	4
*NG2G	"	72	5	3	3

District 8

NA8V	A	1,496,412	1388	105	317
K8GL	"	772,964	836	94	252
K8AO	"	419,608	623	67	187
W8MET	"	239,424	402	68	164
WA8RCN	"	174,838	357	64	150
K8MR	"	165,898	287	65	153
N9RC	"	143,100	255	65	160
KB8U	"	82,782	208	48	98
AF8C	"	62,832	195	45	91
N8RJP	"	36,840	112	39	81
WM8Z	"	35,420	123	38	77
K8TLC	"	32,155	120	34	75
KD8BXE	"	26,578	99	35	62
K8ESQ	"	24,310	108	23	62
W8YV	"	19,521	92	25	56
WRØN	"	14,697	79	21	48
KS8U	"	8,100	56	22	38
N8PMR	"	5,880	49	20	36
K8SAS	"	5,472	43	21	36
NQ8O	"	5,445	47	22	33
KB8DEX	"	5,270	55	22	40
K8MP	"	4,896	46	19	29
W8JJW	"	1,496	21	13	21
WB8RNV	"	936	24	11	13
KUØD	"	690	20	11	12
WB8WKQ	28	2,990	55	7	16
N8BJQ	21	41,238	172	20	67
KE8Y	"	5,535	66	16	29
K3ZJ	14	429,632	1163	33	104
W8WA	"	97,464	291	29	102
K8IV	"	72,684	282	24	84
AA8DC	"	34,020	153	18	63
KG9Z	3.7	4,536	46	10	32
*N8II	A	736,575	778	89	256
*N8GLS	"	238,350	385	60	167
*W8GX	"	104,652	241	46	116
*N8BV	"	67,779	174	49	104
*KS8Z	"	60,532	172	50	98
*W8KNO	"	45,612	149	43	83
*KC8MUE	"	33,174	117	36	78
*K8BKM	"	28,600	114	34	66
*W8ASA	"	27,336	100	33	69
*N8NX	"	27,234	114	32	70
*W8TM	"	26,730	91	33	77
*N8MME	"	20,584	99	24	59
*K8LBT	"	17,304	75	29	55
*N8PPF	"	12,920	76	26	50
*K3DMG	"	9,646	65	13	40
*W8PDH	"	8,970	54	22	43
*N8WCP	"	8,576	62	22	42
*AD8BV	"	7,752	60	23	45
*NF8M	"	7,625	52	23	38
*WE8P	"	5,400	43	19	31
*AB8OU	"	5,358	44	22	35
*AC8WC	"	3,698	49	19	24
*KD8YNG	"	3,003	27	16	23
*AA8SW	"	2,838	33	16	27
*NE8O	"	2,700	32	12	24
*W8JJB	"	2,067	27	15	24
*WA8TWM	"	1,980	24	14	22
*KE8HAF	"	1,944	26	15	21
*KD8OBW	"	1,936	34	18	26
*K7DR	"	1,815	25	12	21
*N8TFD	"	1,815	22	16	17
*KE8KRX	"	1,767	25	13	18
*KE8BNE	"	1,333	19	14	17
*KB8VGD	"	1,020	20	14	16
*K8WAY	"	1,012	19	9	14
*KB8SRQ	"	925	18	11	14
*K8GIB	"	713	16	11	12
*KI8N	"	651	12	10	11
*KB8NAK	"	494	15	9	10
*AC7JN	"	486	11	7	11
*K8JEH	"	399	13	10	11
*AC8ZT	"	342	10	9	9
*KC8VGG	"	209	7	5	6
*K8BHX	"	182	7	7	7
*W3EIN	14	518	18	4	10
*W8LKG	"	390	10	3	10
*W8SJB	"	182	8	5	8
*W8CO	1.8	290	23	4	6
WA3C	AA	1,141,832	983	102	322
W8MJ	"	947,700	880	98	307
K1LT	"	861,138	737	98	333
N8BI	"	860,292	789	95	319
K8CX	"	699,940	827	75	241
NW8U	"	499,905	567	79	236
W8GNM	"	392,329	495	83	204
KM8AM	"	348,100	449	76	219
ND8L	"	337,755	460	64	203
N8CWU	"	307,516	488	66	175
KD8FS	"	180,096	368	55	137
K8PK	"	153,225	262	64	161
K8AJS	"	140,000	297	48	127
N8JBR	"	131,248	268	63	145
AC8G	"	126,936	288	37	127
KA8G	"	109,252	297	33	110
W8HPJ	"	89,488	246	36	100
N8PCN	"	87,984	177	60	128
K3EQ	"	55,440	178	46	108
KE8IVY	"	50,895	151	43	92
K8GM	"	47,946	142	32	90
K8MEG	"	30,160	115	34	70
KA8SBI	"	26,442	100	45	68
W8EH	"	25,755	103	35	66
W8ENO	"	21,470	91	29	66
KF8YC	"	19,662	75	41	72
W8MSP	"	18,810	80	36	54
AE8U	"	18,128	69	36	67
AC8ZX	"	12,640	64	25	54
N8QMU	"	10,915	68	15	44
W8UF	"	6,882	49	19	43
N8XCO	"	4,796	43	14	30
N8KK	"	3,465	30	18	27
KD8VMM	"	2,622	27	13	25
W3CDG	"	962	16	11	15
KD8RQE	"	408	11	8	9
W8CZN	14A	413,838	992	35	131
K8LX	"	42,800	154	25	75
NR8Z	3.7A	816	21	7	10
N8NB	1.8A	544	15	6	11
*N4RA	AA	671,759	707	91	262
*K8LY	"	305,370	432	66	195
*WT8WV	"	275,362	399	71	191
*KG8P	"	27,904	100	35	74
*KD8JAM	"	15,092	81	25	52
*WB8JUI	"	13,616	79	24	50
*K8BL	"	8,470	51	26	44
*K8TS	"	8,051	90	33	64
*KV4ZY	"	6,996	40	29	37
*N8JDM	"	4,272	34	17	31
*W8ZAC	"	4,176	43	18	30
*N8VV	"	3,948	35	15	27
*KE8JIT	"	3,120	33	15	25
*N8XTH	"	1,488	21	14	17
*NE8J	"	1,488	24	6	18
*AB3DC	"	1,092	22	9	19
*N8REA	"	360	11	9	9
*W4MLZ	"	195	10	6	9
*WC8P	14A	748	13	9	13
*KD8MRM	"	66	5	4	2

District 9

W9RE	A	3,580,577	2583	130	409
WB9Z	"	1,696,940	1346	121	339
K9BGL	"	462,689	591	80	209
W9OP	"	251,900	419	63	166
W9GT	"	180,420	345	50	136
WS9W	"	116,725	255	56	119
KF9US	"	84,320	212	48	112
N9DJ	"	66,820	190	39	91
N9LYE	"	61,887	160	57	90
N9EP	"	26,108	99	37	70
K9RU	"	19,136	80	32	60
K9LA	"	18,624	76	37	59
K9GWS	"	17,845	95	27	56
K9KGM	"	16,268	77	25	58
WI9Z	"	15,795	79	31	50
W9SE	"	9,648	61	25	42
KA9CAR	"	8,940	61	23	37
KJ9P	"	8,442	59	22	41
WBØPTO	"	8,100	56	15	39
W9/NP2I	"	5,580	53	21	39
W9AN	"	3,504	30	20	28
K9ZMI	"	3,200	37	16	24
KC9OYE	"	3,055	32	18	29
W9WAW	"	2,640	33	19	25
WA9LJK	"	150	9	7	8
W9YM	14	1,300	21	9	17
K9CJ	7	6,550	56	20	30
K9IDQ	"	4,752	41	13	31
KØPJ	3.7	5,546	58	11	36
*N4TZ	A	767,136	744	103	290
*KD9MS	"	407,480	513	87	218
*KD9GY	"	106,755	283	52	113
*WD9CIR	"	91,040	230	51	109
*KE9UA	"	66,708	176	48	105
*W9VQ	"	22,454	85	37	66
*AC9TO	"	20,196	94	40	59
*NN1N	"	19,594	83	39	58
*KB9OZI	"	18,423	92	28	61
*AA5UK	"	15,792	83	27	57
*KD9AC	"	14,104	72	30	56
*WB9HFK	"	14,014	74	29	48
*W8NWG	"	13,398	87	29	48
*K9VER	"	9,581	71	24	43
*AC9SJ	"	7,366	64	22	36
*K9PMV	"	6,336	49	16	32
*W9ABK	"	6,264	44	20	34
*WO9S	"	5,280	48	23	32
*NØXXL	"	4,802	42	16	33
*WO9I	"	3,950	50	24	26
*KD9JKU	"	3,901	40	18	29
*NA9VY	"	3,850	42	21	29
*K9DEB	"	3,634	37	21	25
*WB9DAR	"	3,538	60	23	35
*KE9UR	"	2,560	39	15	25
*N9UQD	"	2,204	28	15	23
*KD9HPN	"	2,170	22	15	20
*K9WPV	"	1,666	22	15	19
*WB9BWP	"	1,479	20	12	17
*N9SRS	"	1,421	19	11	18
*KB9LYB	"	1,110	16	14	16
*N9WEW	"	1,040	19	9	17
*AC9QM	"	990	23	15	18
*WB9NOO	"	990	17	9	13
*AC9HQ	"	638	13	10	12
*KA9MOT	"	630	16	7	14
*KC9NUW	"	378	13	9	9
*KD9EBS	"	299	10	5	8
*K9STT	"	187	16	6	5
*KF6EFG	"	112	9	6	8
*W9BLP	21	570	14	7	12
*KC9VYX	14	3,850	41	11	24
*K9KDE	"	3,784	40	14	30
*W9TAM	"	3,268	35	13	25
*WG9L	"	765	17	5	12
*K9HMX	"	665	13	8	11
*K9EMF	"	30	3	3	3
*K9ELF	"	6	1	1	1
*KEØL	7	228	8	6	6
*WB8BZK	1.8	112	10	4	3
K9NW	AA	1,445,694	1076	123	375
NØIJ	"	854,775	849	105	288
K9IMM	"	846,742	833	101	276
WO9Z	"	668,520	683	95	265
N9MW	"	575,484	629	97	260
N9ZM	"	557,375	621	91	234
W9NY	"	549,780	631	87	253
K9KE	"	431,858	570	72	211
KDØEE	"	380,768	489	80	212
AG9S	"	375,840	475	80	208
NV9L	"	374,220	503	74	196
AC9S	"	298,989	463	65	174
W9IIX	"	196,560	383	58	158
KC9K	"	177,451	336	66	145
KC9FNM	"	177,429	311	66	147
N8KR	"	125,488	252	57	127
N9WK	"	119,340	235	47	133
W9RN	"	113,568	249	48	120
N9GUN	"	111,202	232	55	127
N9LQ	"	98,029	224	53	114
WD9Q	"	94,464	186	65	127
W9YK	"	94,150	214	52	123
N9CK	"	64,714	177	37	94
N9OK	"	61,690	169	49	106
W9OA/9	"	60,768	151	41	103
WW9R	"	50,170	143	47	98
KW9R	"	48,600	176	29	79
KC9EOQ	"	33,938	102	45	97
AA9DU	"	33,189	116	33	78
W9UUM	"	26,643	119	27	56
K9YX	"	24,843	112	25	66
KA9FOX	"	11,475	66	26	49
W9VA	"	7,353	50	18	39
WI9WI	"	5,253	41	15	36
W9TC	"	4,992	39	25	27
K9DUR	"	4,664	41	15	29
W9LR	"	3,360	39	12	23
N9MS	"	221	8	6	7
W9WO	28A	6	1	1	1
K2UR	21A	75,264	250	26	86
NQ9A	14A	25,228	131	12	56
W9JA	"	18,841	105	20	63
W9ILY	"	20	2	2	2
KC9BG	3.7A	64	5	4	4
N9NBC	1.8A	16	3	2	2
*K9PG	AA	130,962	231	69	150
*N9TF	"	115,456	239	50	126
*KD9CLH	"	100,776	253	46	106
*N5RP	"	94,522	215	45	122
*W9AV	"	81,954	210	47	110
*KA9O	"	16,450	78	37	57
*AE9LL	"	14,365	74	33	52
*W9LW	"	13,590	62	34	56
*N9VPV	"	10,050	62	26	41
*KC9UJS	"	9,000	57	29	46
*WA9LEY	"	4,753	54	20	29
*N9EAT	"	4,002	32	18	28
*WB9VPG	"	3,630	39	19	36
*WO9B	"	1,300	20	10	15
*N9BT	"	1,100	22	10	12
*KA9GDW	"	1,080	18	10	14
*KB9FDX	"	220	8	3	8
*KC9PKF	"	72	4	4	4
*N9TGR	14A	138,554	359	30	116
*KD9FSQ	"	99	7	4	5
*KC9HKT	7A	476	17	7	10

District Ø

KQØC	A	400,158	577	87	195
NCØB	"	347,106	530	71	175
KØJJR	"	232,464	399	68	164
N7WY	"	184,324	349	60	143
NØUU	"	158,550	334	51	124
NØOST	"	126,369	304	53	118
W7UT	"	119,764	302	44	114
WØOR	"	108,936	248	55	123
K9MWM	"	107,580	290	59	106
KØLBR	"	78,842	197	49	109
KAØLDG	"	75,647	205	45	98
KDØS	"	68,376	175	51	103
NUØC	"	55,461	171	48	91
KØJM	"	48,625	162	42	83
ADØH	"	48,387	182	50	77
WAØN	"	45,073	128	47	90
NEØU	"	27,166	112	29	65
NFØN	"	19,106	84	29	53
WBØWIV	"	18,426	84	28	55
KDØZV	"	18,308	78	36	56
WØOVM	"	13,725	72	23	52
WØKIT	"	13,286	71	23	50
KEØCRP	"	9,280	60	21	37
KØGXI	"	4,452	44	20	33
KDØJLE	"	3,116	40	17	21
KCØUUT	"	2,960	31	17	23
NØNZG	"	2,816	53	20	24
K5EMI	"	1,705	22	12	19
W7FIZ	"	1,020	47	17	17
AKØSK	"	132	10	6	5
NØWRK	21	4,356	51	17	27
W9YAC	14	660	14	8	14
NØEHX	7	1,275	24	9	16
*ACØW	A	261,602	403	77	176
*WØETT	"	127,501	308	52	121
*KC6X	"	109,248	239	65	127
*WØYJT	"	58,558	204	41	93
*NGØT	"	54,120	152	45	87
*WØTLE	"	52,628	193	37	81
*NØVRM	"	38,628	138	39	72
*WAØLIF	"	23,500	119	35	65
*NØFY	"	19,694	88	29	57
*WA2JQZ	"	16,432	82	27	52
*KEØKOT	"	13,430	92	25	54
*KDØCVZ	"	12,936	82	25	41
*WØIZ	"	11,616	97	18	30
*AAØCW	"	10,332	85	26	37
*WØZF	"	10,248	69	25	36
*NEØDA	"	8,856	58	33	39
*KA8HDE	"	6,496	45	24	34
*WØDAS	"	6,270	55	26	31
*KDØUWZ	"	5,220	42	18	27
*AFØY	"	5,170	44	19	28
*NDØTS	"	4,140	33	17	29
*WBØDYZ	"	3,838	48	17	21
*KCØJRW	"	3,393	41	18	21
*KEØGXN	"	3,344	28	18	26
*NØQLT	"	3,139	31	18	25
*KGØEW	"	3,096	35	19	24
*KØHNC	"	2,698	33	18	20
*WØNFS	"	2,652	31	18	21
*NØEMU	"	2,592	48	17	19
*KØEAP	"	2,535	34	18	21
*KCØVDY	"	2,304	46	18	18
*KEØMHJ	"	2,052	29	16	22
*KEØPAP	"	2,016	25	11	21
*WØHL	"	1,908	22	16	20
*KBØQEF	"	1,848	24	12	21
*KDØNPT	"	1,739	23	16	21
*KDØWAN	"	1,680	36	19	21
*WB9QAF	"	1,647	32	13	14
*KBØJIT	"	1,566	21	13	14
*N6BXO	"	1,029	17	6	15
*KEØJYJ	"	920	17	10	13
*KAØZLG	"	891	23	16	17
*KDØWUQ	"	600	20	11	9
*KD5YPH	"	494	12	10	9
*W7KAM	"	456	14	9	10
*KEØJHC	"	432	15	8	8
*NØWKR	"	117	8	6	7
*KEØRNB	"	8	2	2	2
*N5AW/Ø	21	24,708	131	22	49
*KDØOYC	14	2,856	38	16	18
*WA5SWN	"	1,943	31	14	15
*WFØT	"	1,820	27	12	16
*AEØAF	"	1,586	38	10	16
*AEØDM	"	646	28	9	8
*WAØILD	"	400	20	7	9
*WØND	"	299	24	6	7
*KBØPHK	"	54	4	3	3
*WDØBGZ	7	2,176	31	12	20
*AD5IN	"	130	8	4	6
*KD8HAM	"	15	3	3	2
KØKX	AA	1,796,320	1264	129	386
KØMD	"	882,557	961	103	274
WØGJ	"	719,740	818	111	260
KØCN	"	590,240	633	85	255
NØAT	"	445,686	478	96	258
KIØF	"	379,215	551	71	194
NØBK	"	334,656	488	65	184
WGØU	"	319,200	414	79	201
KØTRL	"	257,288	431	65	167
NØAV	"	255,200	392	61	171
KØRC	"	224,013	327	85	182

AAØAW	"	216,864	385	62	154
WBØN	"	215,004	358	67	161
NØODK	"	196,418	331	63	155
KØVXU	"	194,880	346	66	166
KØAD	"	189,819	384	64	143
NRØT	"	141,038	271	55	139
NØBUI	"	109,850	243	49	120
WXØZ	"	101,752	244	52	109
K5ZG	"	91,314	250	58	113
KØRJW	"	83,520	227	44	100
WAØMHJ	"	65,120	130	62	123
NØLRA	"	60,024	154	51	113
WØZQ	"	48,556	157	46	76
KEØITC	"	44,811	155	37	80
NUØW	"	41,676	120	47	104
KØAP	"	37,454	112	33	89
NWØM	"	33,027	119	30	71
KBØHP	"	32,148	107	41	73
KØPC	"	25,203	99	30	63
KBØVHA	"	19,656	113	24	48
KCØCC	"	18,490	91	29	57
N9GB	"	16,954	67	38	60
KØTLG	"	16,380	79	32	52
W5HWZ	"	10,902	152	28	41
KDØEZS	"	10,863	77	29	42
KBØYH	"	10,269	69	25	38
WØYES	"	9,315	57	24	45
KBØXY	"	9,211	55	21	40
AKØBC	"	8,911	52	25	42
ADØRW	"	8,778	56	23	43
NØKQ	"	7,458	57	28	38
NYØA	"	7,192	51	20	38
WØMN	"	4,753	55	21	28
NØBAK	"	4,641	37	22	29
WB2UFO	"	3,870	41	15	30
K9TWW	"	3,350	30	21	29
WØMB	"	1,147	19	15	16
WØLM	"	880	17	11	11
K6DJ	"	594	20	14	19
AE2L	"	272	9	8	9
KVØQ	14A	547,470	1398	36	129
NJØF	7A	83,853	294	31	90
W9RM	"	17,784	89	27	49
KØARY	"	322	8	6	8
*NØUR	AA	124,476	291	48	116
*AD1C	"	103,428	236	54	115
*K4IU	"	36,600	121	45	77
*KIØJ	"	30,458	124	37	60
*W6NF	"	22,950	99	42	60
*AEØEE	"	18,600	81	37	56
*WZ1Y	"	15,075	75	27	48
*WØSEI	"	8,733	57	27	44
*KØMPH	"	8,208	57	25	32
*KØVBU	"	7,744	47	26	38
*W6GMT	"	4,356	45	20	24
*KØNUK	"	4,250	37	18	32
*K4EQ	"	3,312	35	12	24
*KØMUL	"	1,980	23	13	20
*KEØOR	"	1,632	26	13	21
*KJØP	"	1,550	23	11	20
*KØLAF	"	1,488	21	12	19
*K7MKL	"	1,380	21	13	17
*KE6LL	"	1,320	27	16	17
*KWØKW	"	1,104	20	10	14
*KØAE	"	1,035	18	11	12
*WØGAS	"	609	14	10	11
*AKØM	"	272	10	7	10
*KØTNT	21A	210	8	4	6
*WØAD	"	84	4	3	4
*AAØAI	7A	2,233	36	10	19

Alaska

AL7LO	A	199,172	826	40	76
AL1G	"	66,440	749	21	23
AL7KC	AA	172,120	600	47	83
KL7IH	"	572	12	11	11
NL8F	3.7A	4,462	102	12	11
*KL4OB	AA	7,956	126	17	17
*KL1JP	14A	3,255	76	10	11

Barbados

8P5A	A	10,806,056	8121	134	443 (OP:W2SC)
*8P1W	A	47,970	274	28	54

Belize

*V3A	3.7	26,532	292	12	32 (OP:V31MA)

Bermuda

*VP9AD	AA	24,570	102	31	74

Canada
District 1

VY2ZM	A	6,871,680	4557	119	457 (OP:K1ZM)
VO1TX	"	2,085	81	7	8
*VE1JS	A	61,270	201	29	81
*VE1BZI	"	12,879	96	21	60
*VE1AOE	"	8,911	53	22	45
*VE9RLW	"	1,943	35	12	17
*VE1SQ	14	28,324	150	16	57
VE1RSM	AA	96,280	299	39	106
VE1IOU	"	26,442	87	37	76
VE1OP	21A	10,439	55	19	54
VA1MC	7A	15,795	93	15	50

District 2

VE2GSO	A	342,550	992	43	112
VA2OBW	"	37,024	140	31	73
VE2VIA	"	13,166	106	18	40
VA2LGQ	"	3,567	41	16	25
VE2BHH	"	660	15	8	12
VY2TT	21	104,737	373	21	80 (OP:K6LA)
VE2JM	14	4,563	50	12	27
*VA2CO	A	80,990	260	36	94
*VE2BVV	"	32,864	130	29	75
*VA2BN	"	29,853	124	40	67
*VY2GF	"	11,966	98	21	41
*VE2SMS	"	11,736	86	27	45
*VA2SG	"	6,118	50	15	31
*VA2YAF	"	4,017	49	14	25
*VA2RIO	"	2,496	31	11	21
*VO2ET	"	980	24	9	11
*VE2ZWA	"	936	25	8	10
*VE2NCG	21	240	9	4	8
*VE2HAY	"	180	7	5	7
*VE2CYC	14	495	15	3	12
*VE2CXA	7	6	2	1	2
VA2WA	AA	4,395,354	3381	121	413
VO2NS	"	744,861	1578	56	157
VA2AM	"	524,745	581	80	265
VA2CZ	"	202,797	446	52	137
VA2QR	"	113,238	270	46	116
VE2CSM	"	102,114	233	54	129
VE2SCA	"	61,425	190	40	95
VE2KTA	"	32,634	148	33	78
VA2AGW	"	9,480	67	16	44
VE2GT	21A	1,416	24	8	16
VA2MM	14A	91,015	339	25	84
*VE2GTZ	AA	71,669	184	39	110
*VE2CJR	"	31,623	102	38	89
*VA2GNQ	"	9,765	80	23	40
*VE2LPW	"	925	17	12	13
*VE2KAH	"	273	12	7	6
*VA2SK	14A	40	3	2	3

District 3

CF3A	A	5,351,688	4617	114	364 (OP:VE3AT)
VC3R	"	1,448,550	1962	86	247 (OP:VE7VR)
VA3CCO	"	696,755	852	87	244 (OP:VE3KZ)
VE3UTT	"	599,248	891	67	201
VE3GYL	"	95,756	246	40	108
VE3RX	"	88,343	215	55	112
VE3MT	"	18,690	98	28	61
VE3GNI	"	10,521	72	22	41
VE3FTM	"	4,896	48	17	31
VE3BF	"	3,608	32	16	25
VE3SDF	"	192	7	6	6 (OP:VE3ZVY)
VA3FP	14	23,808	162	14	50
VA3MCX	"	20,412	88	20	61
VE3PN	7	58,710	277	24	71
*VC3M	A	2,046,369	2066	100	311 (OP:VE3LA)
*VE3CV	"	301,320	497	69	179
*VE3TU	"	102,663	270	39	114
*VA3GD	"	79,365	226	41	102
*VE3MH	"	67,188	222	37	95
*VE3JAR	"	55,935	174	52	113
*VE3IDT	"	41,736	144	32	79
*VE3SST	"	40,515	151	36	75
*VE3LVW	"	32,421	111	35	72
*VE3SCN	"	29,536	122	30	74
*VE3SD	"	28,737	126	32	61
*VE3CNA	"	27,927	128	34	73
*VE3AYR	"	23,852	113	28	61
*VE3LMS	"	23,670	113	28	62
*VE3GFN	"	18,620	78	25	70
*VE3TJI	"	17,316	90	18	56
*VE3PQ	"	11,323	68	21	46
*VE3DQN	"	11,175	73	25	50
*VE3ISO	"	9,982	71	19	43
*VA3NU	"	6,216	44	22	34
*VE3NQM	"	5,940	50	20	34
*VE3KBI	"	4,896	46	21	30
*VE3LBG	"	3,264	31	18	30
*VA3EON	"	2,790	35	20	25
*VE3MDX	"	1,728	33	11	21
*VE3EL	"	1,568	28	12	16
*VE3ITU	"	1,188	27	13	14
*VE3FWF	"	1,170	31	10	8
*VA3JHQ	"	968	25	10	12
*VE3RWA	"	960	15	10	14
*VE3FYN	"	950	17	4	15
*VA3NW	"	946	25	12	10
*VE3ON	"	900	15	10	15
*VE3XNS	"	864	15	9	15
*VA3EC	"	390	10	5	10
*VE3TG	14	22,847	123	13	54
*VE3NFW	"	224	9	6	8
*VA3PEN	"	81	5	4	5
*VA3FN	7	533	18	6	7
*VE3PYJ	"	152	20	2	2
*VA3KTT	"	20	7	1	1
*VA3AC	1.8	6,784	234	8	8
*VE3BR	"	196	15	3	4
VA3WW	AA	347,674	592	74	188
VE3RZ	"	186,534	276	64	194
VA3MW	"	108,006	308	40	101
VA3XFC	"	62,040	168	39	102
VA3ROC	"	24,910	108	31	63
VA3QB	"	21,330	136	30	60
VE3HED	"	3,604	28	27	26
VE3VEE	14A	943,080	2129	35	139
*VA3DF	AA	1,167,974	1089	95	302
*VE3PJ	"	957,555	1080	97	272
*VA3UG	"	86,523	218	44	107
*VA3WB	"	59,055	214	44	83
*VA3IPG	"	51,350	191	45	85
*VE3XKZ	"	27,666	114	39	67
*VE3MXJ	"	17,640	109	20	50
*VE3MJD	"	1,176	18	12	16
*VE3TM	14A	79,831	329	20	77
*VA3TTZ	"	663	19	8	9

District 4

VE4JBB	A	156,341	1050	26	53
*VA4HZ	A	57,015	286	38	67 (OP:VE4HAZ)
*VE4VJR	"	53,040	193	36	84
*VE4EV	"	5,764	75	20	24
*VE4PDX	"	1,216	42	7	9
*VE4DLA	"	90	10	5	4

District 5

*VE5SR	A	972	20	13	14
*VE5DLC	"	940	19	10	10
*VE5AAD	"	918	21	10	8
*VE5KEL	"	176	12	6	5
VE5MX	AA	824,642	960	85	237
*VE5SF	AA	64,119	263	22	65

District 6

VE6TK	A	75,500	236	39	86
VE6IVN	"	72,360	244	42	78
VE6FT	"	30,360	149	36	56
VE6TWP	14	4,600	52	15	25
*VE6AX	A	19,712	92	20	57
*VA6AN	"	19,630	138	29	36
*VE3RCN	"	595	21	9	8
*VE7CQE	"	442	18	9	8
*VE6KEB	"	112	8	4	3
*VE6TRZ	"	81	10	5	4
*VE7XH	14	3,775	67	12	13
VE6TN	AA	743,580	1322	76	167
VE6LB	"	23,782	105	38	56
VE6WQ	7A	259,812	1004	33	93
*VE6CSX	AA	12,685	112	28	31
*VE6SPS	"	6,528	95	18	16

District 7

VA7ST	A	376,350	1201	52	98
VE7BC	"	118,272	500	49	63
VE7SO	7	13,005	121	16	35
VA7FFT	3.7	259	22	4	3
*VA7CRZ	A	111,706	277	57	101
*VE7RSV	"	24,817	132	36	47
*VA7EGZ	"	6,909	79	23	24
*VE7KPB	"	5,418	55	21	22
*VE7BAV	"	3,885	47	19	18
*VE7BGP	"	2,408	34	13	15
*VE7WJ	"	2,340	38	13	13
*VE7KCY	"	476	15	8	6
*VE7BNR	"	264	21	6	5
*VE7DZO	14	32,472	463	16	20
*VE7ZZV	"	1,258	24	15	19
*VE7GZG	"	360	20	7	5
*VA7DGT	"	198	10	6	5
*VA7ADI	7	1,992	35	12	12
VE7NY	AA	716,083	1369	70	159
VE7YBH	"	116,616	439	42	87
VE7CV	"	68,510	202	39	91
VA7VF	"	59,598	206	46	83
VE7CKZ	"	34,691	125	44	69
VA7JW	"	19,810	107	24	46
VE7CNW	"	14,328	79	32	40
VE7TI	"	10,579	64	24	47
VE7AX	"	943	20	11	12
VE7FO	14A	20,808	328	16	18
*VA7BEC	AA	266,230	821	53	105
*VE7WNK	"	66,690	196	54	81
*VE7AHT	"	10,432	66	27	37
*VE7SXM	"	9,464	73	26	30
*VA7DXC	"	7,215	90	19	18
*VE7EME	"	630	15	10	8
*VE7JH	14A	2,684	41	4	18
*VE7DAY	7A	644	20	9	14

District 9

VE9CB	A	2,970,708	2878	90	327
VE9EX	AA	12,462	80	21	46
*VE9OA	AA	1,584	22	12	21
*VE9WH	14A	1,248	17	9	17
*VE9HF	"	1,242	20	10	17
*VE9ML	7A	5,460	50	11	31

Cayman Islands

ZF9CW	A	5,985,848	5404	129	373 (OP:K5GO)

Costa Rica

TI2OY	A	738,560	1348	66	190
TI1T	21	385,642	1777	27	82 (OP:TI2CC)
*TI4VAA	A	23,900	97	36	64
TI7W	AA	269,750	1071	44	81 (OP:N3KS)

Cuba

*CO5LB	A	115,544	562	28	76
*CO2RQ	"	83,080	328	39	85
*CM2HYR	"	59,640	256	26	79
*CO6HZ	"	59,508	261	32	76
*CM8RBD	"	440	35	11	11
*CO8RH	28	4,761	81	9	14
*CM2XN	21	276,940	1052	30	92
*CM2RSV	"	76,285	534	19	54
*CO8AW	"	6,912	78	12	36
*CO2AJ	14	1,316	28	8	20
*CO8SJ	"	988	28	9	10
*CO8ZZ	7	89,318	634	19	52
*CM8NMN	"	25,773	188	18	53
*CO8WN	"	7,708	94	10	37
*CO6LE	21A	59,843	333	23	60

Dominican Republic

*HI3T	A	2,672,504	3524	87	259
*HI8PAP	"	280,030	624	58	147
*HI8KW	7	987	19	8	13
HI8RD	AA	766,874	1383	76	186

Guadeloupe

FG4KH	A	926,532	1536	75	201 (OP:F1DUZ)
FG5GP	"	16,500	125	24	36

Guatemala

*TG9ANF	A	475,632	1399	54	108
*TG9AMD	7A	13,800	102	19	41
*TG9NRS	"	36	3	3	3

Haiti

*HH2AA	A	36,400	238	26	44

Martinique

TO1J	A	2,230,095	3146	84	251 (OP:JF2QNM)
FM5DN	3.7	26,767	238	15	56
FM5AN	AA	2,448	26	14	20
*FM1HN	14A	20,076	243	17	25

Mexico

XE2T	A	47,088	440	27	27
XE2V	"	40,170	245	41	62
XE2S	7	91,611	529	27	54
XE1UN	1.8	3,059	78	9	14
*XE1CT	A	88,320	342	43	77
*XE1SRA	"	18,846	183	25	29
*XE1XZQ	"	17,510	89	34	51
*XE2JUM	"	11,178	65	29	40
*XE2PDZ	"	6,223	67	25	24
*XE3WM	"	5,610	43	21	34
*XE1HON	"	3,360	30	18	24
*XE2MVY	"	736	17	11	12
*XE2LVM	21	306	10	9	8
XE1MEX	AA	230,160	305	79	201
XE1B	14A	213,304	992	25	79
XE2X	3.7A	233,688	1027	27	80
*XE2JS	AA	148,463	596	50	77
*XE2AD	"	88,580	407	37	66
*XE2AU	"	67,116	326	35	67
*XE1AY	"	15,015	86	35	42
*XE2JTS	"	1,482	21	11	15

Panama

HP1ALX	14	5,425	55	12	23
*HP2BWJ	A	55,660	304	35	57
*HP1RIS	21	24,026	254	15	26
HP1STB	AA	8,970	55	27	38
HP1BD	"	792	12	10	12
*HP1COO	3.7A	640	21	4	12

Puerto Rico

KP4RV	A	486,864	1638	42	102
WP4I	14	9,399	93	10	29
KP4DRB	"	22	8	5	6
KP4JFR	7	2,706	33	9	24
*NP3LY	A	111,216	508	38	74
*WP3EF	"	37,448	114	44	80
*WP3GW	"	21,888	117	26	50
*WP4RF	"	9,462	60	22	35
*NP3OT	"	2,496	34	12	20
*WP4MPC	"	48	4	4	4
*KP3LR	28	19,778	321	12	19
*WP4NXI	"	60	73	7	8
*NP4AW	14	48,804	487	17	32
*NP4ET	"	33,850	347	15	35
*KP4LE	"	13,080	208	11	19
*KP4JRS	3.7	4	1	1	1
KP3Z	AA	4,905,740	4211	126	397 (OP:NP4Z)
KP4/K6DTT	"	60,190	206	47	83
KP4JJO	"	6,313	50	26	33
*NP4TX	AA	129,778	265	50	137
*NP4RA	7A	2,436	32	8	20

Sint Maarten

*PJ7PL	A	15,664	191	18	26

St. Kitts & Nevis

V47X	14A	122,304	589	23	75 (OP:GM3POI)

St. Lucia

J68GD	14	343,200	1485	24	86

US Virgin Islands

NP2J	1.8	69,715	472	16	57 (OP:K8RF)
*NP2P	AA	1,948,324	3299	84	214 (OP:N2TTA)
*KP2DX	1.8A	663	22	4	13 (OP:KP2BH)

AFRICA

African Italy

IG9/I2ADN	28	8,816	96	12	26

Algeria

7X2VFK	A	243,164	727	28	96

Canary Islands

EA8/EA4BQ	A	20,970	97	34	56
*EA8BQM	A	133,056	345	44	100
*EA8AQV	"	124,620	246	51	135
*EB8AC	"	44,352	159	38	88
*EA8DEG	"	15,642	74	26	53
*EA8AM	"	6,380	41	18	37
*EC8AZE	"	3,822	44	15	27
*EA8DGS	"	3,002	39	17	21
*EA8DED	28	13,585	100	15	40 (OP:OH2BP)
*EA8BGO	14	53,710	247	17	65
EA8ZT	3.7A	95,472	342	20	84
*EA8CNR	AA	254,466	442	51	160
*EC8AQQ	"	195,729	445	33	126
*EF8I	"	71,552	207	30	98 (OP:EA8TK)
*EA8ACW	"	65,208	261	25	79
*EA8DSB	"	57,834	167	36	90
*EF8U	21A	326,350	951	26	96 (OP:EA8DGH)

Cueta & Melilla

EA9KB	14A	927,921	2361	30	111

Dem. Rep. of the Congo

9Q6BB	A	140,049	429	33	84

Egypt

*SU9JG	21A	65,952	316	17	55 (OP:EA7TN)

Kenya

*5Z4BV	A	2,448	26	12	22
*5Z4/LZ4NM/P	AA	14,981	95	23	48

Libya

*5AØYL	14	5,694	81	5	21

Madeira Islands

CT3EN	A	3,672	33	21	30
CR3DX	21	1,628,172	3618	36	120 (OP:OM3RM)
CT9ABP	7	1,056,018	2505	33	113 (OP:OM3BH)
CT9/OM2KW	3.7	85,848	370	16	68
CQ3W	21A	1,259,503	2716	36	125 (OP:DF7ZS)
CT9ABO	14A	2,103,291	4166	38	139 (OP:OM3GI)
*CS9ABE	21A	77,693	382	17	60

Mauritius

3B8CW	AA	21,402	88	30	57

Morocco

CN2CO	A	10,999,890	6177	135	480 (OP:RA3CO)
*CN8PA	A	110	13	10	12
*CN8MAA	14	168,840	651	18	72
*CN8YZ	AA	10,395	67	17	38
*CN8SG	14A	1,199	37	6	5

Namibia

*V51JP	AA	78,120	225	38	88

Reunion Island

FR4QT	A	3,292,254	2978	95	311

Sao Tome & Principe

*S9CT	AA	231,360	520	36	124 (OP:CT1BOL)

Senegal

6W1SU	21	156,702	607	22	69

Sierra Leone

9L1YXJ	AA	252,900	614	35	115

South Africa

ZS2ABE	A	109,392	240	56	116
ZS2HR	"	66,548	228	41	86
ZS6HON	"	7,497	58	14	37
ZS2MAC	"	931	17	10	9
*ZS2NF	A	180,272	414	53	99
*ZS1S	"	48,076	148	34	85
*ZS6ELI	"	2,074	27	12	22
*ZS2EC	"	700	17	9	11
*ZS6AI	21	10,887	81	15	42
*ZS6MM	"	2,580	34	9	21
ZS6TVB	21A	512,848	1377	30	103
ZS1RJQ	7A	294	14	4	3
*ZS6C	AA	2,886	26	18	21

Tanzania

*5H3EE	7	171	7	4	5
5H3MB	AA	187,720	498	35	95

ASIA

Armenia

*EK7DX	A	843,660	1228	50	208
*EK6SI	"	825,907	1279	51	190
*EK3GM	"	48,134	219	16	66

Asiatic Russia
District 9

R8WF	A	1,447,506	1487	77	277
RV9CTD	"	337,743	671	41	148
RJ9U	"	233,372	719	52	112
RU9CC	"	170,640	501	27	108
RA9JBA	"	82,750	293	31	94
RA9UAD	"	81,087	230	46	105
RZ9WU	"	70,889	224	31	102
RW9DX	"	70,200	245	27	81
RW9OW	"	58,421	200	34	79
R9UA	"	35,650	137	34	81
R9CC	"	26,508	110	27	67
RM9T	"	9,065	70	16	33
RU9UC	"	7,686	54	20	41
R9WF	"	1,813	31	16	21
RZ9WO	"	897	21	8	15
RZ9QQ	14	77,841	344	20	73
RT8O	"	71,712	345	18	65
R9CD	"	70,525	324	20	71
R9WDV	"	23,896	156	15	43
RV9MA	"	2,520	33	15	27
RD9U	7	68,276	302	29	72
RC9W	"	16,275	98	21	54
RL9L	"	9,752	90	10	36
RC9O	3.7	1,530	22	12	22
RW9CD	1.8	3,192	47	8	20
UA9UUD	"	987	18	7	14
*UA9ZZ	A	281,248	583	52	136
*RZ8U	"	178,068	506	36	106
*UA9SUV/8	"	148,764	420	38	109
*R8UT	"	93,432	269	34	102
*R9PS	"	84,096	354	49	95
*R9JAD	"	64,400	251	28	87
*RL9I	"	61,404	226	27	75
*UI8C	"	46,492	163	32	86
*RA9YE	"	42,665	166	37	78
*UA9JNT	"	34,776	150	25	67
*RA9MLR	"	32,093	169	14	53
*R9TV	"	25,056	124	33	75
*RO9U	"	8,673	60	20	39
*RG8U	"	6,144	54	30	34
*RA9OCP	"	3,978	49	15	24
*RD8O	"	3,200	36	10	22
*RZ9OW	"	1,474	25	7	15
*UA9CHL	"	121	7	5	6
*RX9CCJ	21	21,846	132	14	52
*R9QQ	"	21,168	150	10	39
*UA9JBV	14	26,904	182	13	46
*R9VK	"	26,796	178	14	44
*R8JAL/M	"	3,290	51	10	25
*R9OO/9	"	15	3	3	2
*UA9SMU	7	57,768	256	17	70
*RW9CQ	"	36,352	200	15	56
*UA9OMT	"	2,175	33	11	18
*RT9YA	3.7	2,380	33	11	23
UA9MA	AA	3,862,416	2669	121	415
UI8J	"	1,603,145	1504	96	319
R9MJ	"	1,342,323	1276	101	316
RO9A	"	1,138,540	1165	80	297
RT9S	"	621,403	823	62	209
UC8U	"	447,026	900	49	153
RW8T	"	400,140	551	74	211
RC9A	"	394,944	798	36	140
RZ9SZ	"	308,070	613	49	140
RA9AAA	"	221,972	416	48	163
RM9RZ	"	195,020	341	73	172
UA9CAW	"	157,221	280	61	182
RK9AX	"	136,404	447	20	88
RW9AW	"	99,760	252	42	130
UA9CTT	"	72,261	249	29	82
RX9WN	"	70,300	198	40	108
RQ9O	"	61,854	207	35	87
RK8I	"	53,992	151	39	97
R9LM	"	8,855	76	17	38
R8LA	21A	121,520	506	22	76
RA9AEA	"	2,100	29	6	22
RT8U	14A	210,293	739	26	87
RA9JM	"	12,932	96	13	40
RA9V	7A	424,612	1240	31	117
*UA9R	AA	1,037,322	1183	75	263
*RV9UP	"	844,710	930	99	271
*RK9UE	"	196,655	521	52	133
*RZ9AD	"	188,121	351	50	169
*R8US	"	143,910	302	56	149
*RT9YT	"	78,540	271	42	98
*R9AB	"	61,180	161	46	115
*R9AM	"	34,056	149	21	67
*R9CM	"	7,020	52	19	35
*RZ9UO	"	4,032	58	9	15
*RX8A	"	612	14	8	10
*RV9UCN	21A	34,262	200	19	55
*UA9CUA	14A	126,243	403	28	89
*RA9AP	"	120,510	389	25	92
*RW9TP	"	51,579	201	22	77
*RN8U	"	40,368	209	22	65
*RC9S	"	22,100	163	9	41
*RW9MZ	"	8,918	73	12	37
*UA9AGX	"	448	12	5	11
*UA9LBQ	"	80	6	4	6
*R9RA	3.7A	10,241	81	12	37

District Ø

RAØQD	A	290,079	982	53	114
RWØUM	"	106,548	417	58	98
RAØLMO	"	71,700	262	59	91
UAØXAK	"	68,530	362	38	51
RØWC	"	39,050	176	41	69
UAØIHY	"	13,826	132	24	38
UCØW	"	88	5	4	4
UAØFAM	14	11,742	114	18	39
*RCØAAB	A	118,422	343	43	110
*RØAGY	"	51,246	191	31	86
*UAØUV	"	35,805	191	31	62
*RZØA	"	13,104	104	19	37
*UIØA	"	10,731	68	27	46
*RCØCB	"	9,020	106	19	36
*RAØLE	"	2,176	44	17	17
*RØSI	"	2,112	34	11	21
*RØCAF	"	864	34	8	8
*RIØBC	"	132	6	5	6
(OP:RW1AI)					
*RAØUJ	21	9,900	114	11	33
*RYØWWX	"	8,651	86	11	30
*RØUT	14	48,587	308	22	55
*RØCW	"	15,190	217	16	33
*RWØCV	"	1,501	63	9	10
*RUØLAX	"	814	21	11	11
*RMØC	"	442	27	8	9
UAØSE	AA	381,340	760	68	162
RDØA	"	121,472	434	41	87
RUØLL	"	119,794	327	66	112
RYØA	"	110,979	300	57	114
UAØSR	"	75,006	198	55	107
RKØW	"	44,758	137	40	99
(OP:RAØWKX)					
RAØACM	"	1,320	25	7	17
UAØW	"	192	6	6	6
RAØSMS	21A	209	11	8	11
RKØUT	14A	164,731	782	27	74
RMØA	"	4,107	52	12	25
RTØF	7A	290,116	1368	34	88
*RXØAE	AA	474,012	817	60	171
*RMØL	"	380,000	1163	72	128
*UAØSU	"	236,742	465	61	150
*RØAS	"	44,982	195	35	67
*RMØW	28A	8	4	2	2
*RAØWHE	14A	18,816	143	11	38
*RUØW	7A	3,993	68	11	22
(OP:RAØWMJ)					

Asiatic Turkey

TA3BP	A	142,560	333	41	124
TA4CS	"	140,750	435	30	95
TA3AVC	"	532	14	5	9
TA3EL	21	36	3	2	2
TA2RG	14	68,208	342	19	65
TA7OYG	"	35,910	258	13	44
TA7MVL	7	10,534	95	10	36
*TA2LP	A	119,890	288	50	140
*TA4A	"	118,950	312	32	118
*TA2EJ	"	102,999	283	31	108
*TA4MA	"	98,988	254	36	110
*TA2MN	"	43,338	180	22	71
*TA3PZ	"	28,028	138	21	77
*TA4PR	"	18,585	112	18	45
*TA3EP	"	8,892	67	14	38
*TA5BS	"	832	17	12	14
*TA2RN	"	220	18	7	15
*TA7I	21	31,164	264	11	38
*TA1FA/2	14	4,640	61	6	23
*TA2DR	"	324	14	3	6
(OP:TA2ACW)					
*TA2TR	"	90	5	1	5
*TA4ALQ	"	54	3	3	3
*TA4APR	"	15	3	2	3
*TA7AMF	7	1,444	26	5	14
TA5FA	AA	26,400	112	29	67
TA3LKJ	"	22,950	125	18	57
TA3B	21A	420	10	6	9
TA3LKC	7A	1,625	31	6	19
TC3COTA	"	189	7	2	7
(OP:TA3X)					
*TA4RC	AA	196,350	392	43	144
*TA4SO	"	6,480	53	14	34
*TA3MA	"	3,960	39	13	27
*TA3LHH	21A	252	9	3	9
*TC3T	"	16	2	2	2
*TA2OLS	14A	5,882	65	6	28
*TA4MSO	"	2,958	41	7	22
*TA3OKK	3.7A	1,625	36	6	19

Azerbaijan

*4K6FO	A	608,940	906	59	196
*4K9W	"	90	5	5	5

Bahrain

A92GR	21	75,348	309	22	69
A92AA	14A	36,580	234	11	51
*A93DX	AA	41,888	155	36	83
*A92FQ	"	18,880	111	23	57

China

BA5AJ	A	711,917	1276	77	194
(OP:IK7YTT)					
BA3MC	"	23,206	148	23	59
BD2BT	"	13,806	82	36	42
BI4WRI	14	13,334	121	19	40
BG2VIA	"	1,449	63	10	13
*BG8TFN	A	21,600	158	36	54
*BG4JO	"	17,052	130	30	57
*BH3SCC	"	9,660	109	31	38
*BG9XD	"	2,304	63	15	17
*BI1EIH	"	2,067	44	18	21
*BD4KM	"	2,046	48	13	18
*BG3RRJ	"	1,850	56	18	19
*BD7KUE	"	1,675	33	10	15
*BG2QMO	"	1,178	36	19	19
*BD7LMA	"	910	22	12	14
*BH1RWJ	"	775	29	15	16
*BG6VGZ	"	504	14	10	11
*BH4LLP	"	442	18	9	8
*BG4HYK	"	340	16	10	10
*BG5NKC	"	286	12	5	6
*BI4SZP	"	195	9	7	8
*BG1TPT	"	104	9	6	7
*BD7BW	"	33	7	5	6
*BG8INK	21	23,596	143	21	47
*BG8IL	"	17,487	109	21	46
*BG8NKX	"	1,768	27	9	17
*BDØAAI	"	780	28	8	12
*BA3MM	14	75,795	512	26	67
*BD4WG	"	945	35	9	12
*BG1HGS	"	910	26	10	16
*BG6SNJ	"	805	21	9	14
*BG2XYW	"	396	19	9	9
*BH1SCW	"	360	18	9	6
*BG6TTI	"	90	13	3	6
*BI4SHV	7	2,343	39	16	17
*BA9BF/6	"	377	41	14	15
BA4DL	AA	960,795	1608	93	204
BA7QT	"	618,202	871	103	235
BH7PFH	"	57,722	200	45	88
BG5EFD	"	32,080	232	29	51
BD5HST	"	25,988	168	34	55
BD7IS	14A	189,036	829	31	87
BD3CB	"	59,708	330	26	66
BH1EBF	"	22,922	125	21	52
BD7KBQ	"	13,248	217	19	29
BD5FFK	"	12,198	106	19	38
BD3PXM	"	9,416	102	12	32
BD2RJ	"	1,326	25	9	17
BA7JA	7A	294,228	1127	32	100
*BH6KOK	AA	36,729	218	38	61
*BD3QT	"	31,407	169	26	61
*BG3ITB	"	18,170	152	30	49
*BA4VE	"	12,036	100	28	40
*BG6LQZ	"	4,576	66	22	30
*BH4SKP	"	4,536	51	27	27
*BH4AYG	"	3,999	46	16	27
*BG4IAK	"	3,510	64	27	27
*BH8ASZ	"	2,494	41	19	24
*BG5BAA	"	1,450	45	14	15
*BD3QF	"	1,140	22	12	18
*BI4SQM	"	420	27	9	12
*BG5OA	"	285	9	7	8
*BH4WPN	"	272	11	8	9
*BG3UTD	"	156	9	6	7
*BG7NPQ	"	143	13	6	7
*BH8NSC	28A	20	3	2	2
*BG9NJY	21A	21,024	135	21	52
*BG8NNG	"	19,296	148	20	52
*BI4VXX	"	560	14	5	9
*BG5HEK	14A	9,020	129	16	25
*BG4UQX	"	7,203	88	15	34
*BH4OUF	"	2,088	47	11	18
*BD4QK	"	1,472	36	11	12
*BH4BQI	"	221	13	5	8

Cyprus

C4T	3.7	27,360	180	9	48
(OP:5B4AGL)					
*5B4AJV	A	3,360	30	19	29
C44C	21A	423,630	1156	27	108
(OP:5B4AHJ)					

Georgia

*4L2M	14	384,223	1043	31	100
*4L8A	AA	3,116	32	13	28
*4L5P	3.7A	82,758	407	14	64

Hong Kong

VR2CO	A	38,586	192	40	69
VR2XAN	3.7	71,760	334	28	76
*VR2EH	21	371,246	1464	33	89
(OP:VR2ZQZ)					

India

VU2RCT	A	1,211,824	1607	72	224
VU2DED	"	124,584	314	56	123
VU2IVV	"	110,720	311	51	122
VU2LOC	"	54,058	181	46	105
VU2CVS	"	1,160	19	13	16
AT5M	21	5,110	62	9	26
(OP:VU2MUD)					
VU2YQ	14	14,388	106	18	48
*VU2IT	A	33,394	140	43	75
*8T8S	"	33,304	148	25	67
(OP:VU2AE)					
*AT2NR	"	18,424	139	35	63
(OP:VU3ELR)					
*VU2SMS	"	16,646	97	27	55
*VU3OUM	"	12,144	82	23	43
*VU3EDG	"	8,576	70	22	45
*VU3RSB	"	2,640	53	19	29
*VU3RGB	"	1,881	29	14	19
*VU3VBK	"	704	19	9	13
*VU3SXL	"	616	16	10	12
*VU2BOT	"	285	11	9	10
*VU3LOL	"	252	9	9	9
*VU3LMS	"	240	16	10	10
*VU3EQG	"	204	20	8	9
*VU2TOO	"	182	7	7	7
*VU3GEQ	"	182	7	7	7
*VU3SIO	"	156	8	5	8
*VU3PQL	"	40	5	5	5
*VU2ISH	"	24	4	3	3
*VU3WBB	21	51,686	274	23	63
*VU2BL	"	3,535	52	11	24
*VU3OXH	"	924	19	8	14
*VU2QDX	14	902	25	9	13
*VU3OBO	"	384	15	7	9
*VU2JOS	"	273	17	5	8
*VU2TO	"	70	9	3	4
*VU2GGM	"	55	7	5	6
*VU2NSL	"	16	2	2	2
*VU2UI	"	2	1	1	1
*VU3ONE	"	0	1	1	1
VU2OT	AA	971,358	1424	63	228
VU2YVK	"	441,288	875	61	166
VU2CPL	"	205,590	423	65	145
VU2IBI	"	33,695	134	39	76
VU2ZMK	21A	69,600	281	26	74
AT3A	14A	20,376	140	21	51
(OP:VU2XE)					
*VU3ESV	AA	47,916	178	43	89
*VU2ABS	"	26,712	118	38	68

Israel

4Z5LY	A	1,258,020	1646	61	229
4X1IM	"	426,972	690	52	186
4X2M	21	639,090	1700	30	105
(OP:4X4DZ)					
4XØA	"	131,892	548	23	64
(OP:4X1VF)					
4XØT	3.7	76,880	353	15	65
(OP:4Z5FI)					
*4X4LF	A	21,854	89	19	79
*4Z5OI	"	10,595	61	27	38
*4Z5TK	"	5,253	54	12	39
*4Z5FW	14	3,132	63	6	23
*4Z5UN	3.7	33,976	211	11	51
4Z5SL	AA	76,960	179	54	131
4X4DK	"	986	16	13	16
4Z4AK	7A	6,820	48	12	43
*4X6DK	AA	75,844	216	33	101

Japan
District 1

JR1GSE	A	301,752	592	80	118
JF1OPL	"	189,000	348	83	127
JA1DCK	"	124,836	263	75	131
JA1XRA	"	109,727	235	66	113
JR1IJV	"	93,009	270	50	79
JH1EVD	"	68,208	241	55	61
JR1JCB	"	60,852	223	57	75
JA1FWS	"	58,564	198	44	77
JA1WQD	"	57,368	216	38	63
JF1LMB	"	55,499	203	58	69
JR1DUP	"	42,237	153	46	71
JG1ITH	"	37,628	163	36	56
JA1IAW	"	30,846	130	36	61
JA1IHD	"	27,216	124	49	59
JL1RXW	"	19,800	105	40	48
JE1BMJ	"	14,850	92	34	41
JH1FNU	"	6,300	66	24	26
JS1BIB	"	4,851	59	23	26
JJ1VFE	"	4,653	43	23	24
JH1LYE	"	4,218	51	15	23
JA1UXV	"	1,456	20	13	13
JS1NDM	"	1,404	20	13	13
JA1TMG	"	1,152	22	10	8
JI1TYA	"	1,147	17	15	16
JA1ZLO	"	1,102	30	14	15
(OP:JJ1MDY)					
JG1TUC	"	693	17	10	11
JA1GVM	"	570	12	9	10
JK1UVL	"	560	16	8	12
JA1NRY	"	304	9	8	8
JG1DUZ	"	54	3	3	3
JE1RZR	28	462	15	7	7
JA1NFD	21	28,044	161	27	49
JA1JNM	"	3,268	32	14	24
JE1RXJ	14	229,125	759	32	93
JK1NJH	"	7,828	72	13	25
JA1UOA	"	627	15	7	12
JA1MJN	"	390	10	4	9
JS1MRA	"	180	10	3	3
JA1DOT	7	4,896	34	18	33
JI1JPJ	"	560	15	8	8
JH1CTV	"	465	14	8	7
JA1PIG	"	18	2	2	1
JE1VTZ	3.7	1,617	24	15	18
JA1IXY	"	551	12	9	10
JI1CIN	"	4	3	2	2
*JH1EAQ	A	686,375	828	112	211
*JS1KKY	"	101,108	262	58	99
*JE1RRK	"	73,948	244	53	86
*JF1WNT	"	70,609	222	54	77
*JA1CHY	"	59,474	206	57	74
*JA1GLE	"	46,291	183	51	68
*JR1QBA	"	45,675	184	46	59
*8N1T	"	31,714	130	35	66
*JR1EMT	"	27,918	134	39	55
*JA1SCE	"	27,548	132	47	50
*JF1VVR	"	25,370	127	38	48
*JM1UTT	"	20,020	97	41	50
*JR1JRW	"	12,988	88	32	36
*JA1CRJ	"	11,700	72	34	41
*JHØROS/1	"	10,608	80	33	35
*JP1KLR	"	6,027	55	25	24
*JI1RSF	"	3,404	36	23	23
*JF1KWG	"	3,185	37	18	17
*JI1LAI	"	3,096	32	14	22
*JJ1MBU	"	2,820	42	22	25
*JQ1VDJ	"	2,040	24	16	18
*JR1WCS	"	1,430	25	12	14
*JA1ATM	"	1,404	22	12	14
*JH1EYM	"	1,066	17	14	12
*JF1DWJ	"	1,024	22	17	15
*7N4JXR	"	1,000	28	13	12
*JR1MEG	"	756	20	10	11
*7L3OBQ	"	272	13	7	9
*7K3DPL	"	260	21	10	10
*JJ1XCL	"	238	10	7	10
*JI1VDM	"	150	12	7	8
*JR1USU	"	144	6	6	6
*JQ1COB	"	126	6	4	3
*JH1HHP	"	100	6	5	5
*7K1JFM	"	48	4	4	4
*JS1WWR	"	22	6	6	5
*JA1NEZ	28	1,909	40	11	12
*JF1OVA	"	1,134	27	8	10
*JA1MYW	"	1,045	24	9	10
*7N2UQC	"	832	23	8	8
*JJ1LBJ	21	36,192	184	26	52
*7K4XNN	"	30,586	153	29	53
*JA1RYC	"	11,596	92	20	32
*JA1JLP	"	6,834	74	19	32
*JK1BII	"	3,354	42	15	24
*JA1FFB	"	3,036	38	13	20
*JA1GQC	"	690	20	7	8
*JF1RFZ	"	680	16	9	11
*JK1EXF	"	608	14	7	9
*JR1BQJ/1	"	450	18	8	10
*JG1XRA	"	294	15	7	7
*JA1DBG	"	273	8	6	7
*JO1JKH	"	156	8	6	7
*7N2JZT	"	24	2	2	2
*JA1QIF	14	7,030	65	14	24
*7J1YAD	"	2,856	40	12	16
(OP:JF1TEU)					
*JG1GCO	"	1,128	23	11	13
*JF1OPO	"	918	28	9	8
*JK1NSR	"	686	19	7	7
*JE1GZB	"	198	14	5	6
*JH1RDU	7	480	14	8	7
*JK1WSH	"	48	4	3	3
*JJ1HHJ	3.7	6	1	1	1
JE1LFX	AA	454,256	738	76	156
JA1XEC	"	204,052	516	44	95
JG1FML	"	132,096	328	62	110
JR1EMO	"	131,905	307	70	115
JE1NVD	"	105,504	264	64	104
JH1SJN	"	103,812	258	63	101
JH1APK	"	101,703	244	66	101
JA1LNZ	"	67,734	162	47	112
JE1FQV	"	59,041	159	60	91
JM1XCW	"	56,144	232	36	52
JA1CJP	"	49,728	164	48	64
JH1OAI	"	29,032	132	28	48
JM1PIH	"	12,393	69	38	43
JA1WWO	"	11,305	55	37	48
JQ1PCT	"	4,725	45	19	26
JR1BAS	"	1,736	26	14	14
JQ1TIV	"	1,430	25	12	10
7N4GIB	"	990	23	14	16
JH1CML	28A	3,795	68	14	19
JA1BPA	21A	85,428	321	32	76
JH1OLB	14A	78,396	332	26	68
JN1THL	"	68,154	356	22	52
JH1ACA	"	38,720	200	25	55
JH1RFM	7A	33,538	167	25	57
JF1UVJ	"	6	1	1	1
*JM1NKT	AA	491,834	658	105	196
*JL1EEI	"	25,608	118	34	54
*JG1VHA	"	24,070	124	39	44
*JJ1XBQ	"	21,945	113	44	51
*JH1UBK	"	17,177	101	37	52
*JA1GFD	"	5,508	48	23	28
*JP1GUW	"	648	12	9	9
*JQ1EPD/1	"	96	6	5	3

District 2

JR2PMT	A	351,902	565	85	166
JE2DJC	"	222,696	444	68	148
JA2VHO	"	127,908	316	66	105
JE2PCY	"	118,320	272	68	106
JA2KPW	"	57,024	192	50	82
JA2BIV	"	55,335	215	45	74
JG2REJ	"	24,804	125	33	45
JH2BTM	"	14,620	95	29	39
JA2DHF	"	5,200	52	22	28
JA2ATE	"	1,148	21	9	19
JA2HBK	"	288	10	8	8
JH2KKW	28	1,776	31	10	14
JE2OTM	"	1,554	36	10	11
JA2KQE	14	16,592	128	21	40
JR2BCF	"	15,390	104	18	39
JA2GTW	7	10,011	53	25	46
JA2HNP	"	528	11	8	8
*JG2RFJ	A	94,800	270	60	90
*JH2XQY	"	93,725	247	64	99
*7K1MAG/2	"	30,576	148	41	50
*JA2GHP	"	20,100	116	31	44
*JA2KKA	"	9,150	82	28	33
*JR2TTS	"	6,500	66	23	27
*JA2IXS	"	3,738	38	21	21
*JS2AAV	"	2,880	42	15	17
*JA2AC	"	2,016	32	17	19
*JE2BOM	"	1,920	28	14	16
*JF2CTY	"	1,320	23	11	13
*JF2FIU	"	1,176	21	11	13
*JA2VKU	"	690	21	15	15
*JR2EUE	"	210	10	8	7
*JA2RWU	"	117	9	6	7
*JH2MYN	21	47,564	216	32	62
*JH2UVB	"	12,608	119	24	40
*JF2WXS	"	8,120	57	22	34
*JR2KQE	"	1,500	26	11	14
*JR2MIO	14	1,380	25	10	10
*JE2EVX	"	351	19	7	6
*JL2OGZ/2	"	70	4	3	4
*JQ2OUL	"	30	4	2	3
*JA2PFO	7	144	8	5	4
*JH2GZY	3.7	42	3	3	3
JR2GRX	AA	3,164,924	2738	135	301
JN2AMD	"	577,530	942	95	175
JA2AXB	"	496,392	911	77	145
JA2XCR	"	353,472	515	80	183
JF2OZH	"	62,625	200	48	77
JH2FXK	"	20,493	109	30	39
JA2XYO	"	20,467	97	43	54
JJ2CJB	21A	32,720	166	27	53
JR2WLQ	14A	1,311	31	10	13
*JK2VOC	AA	179,728	421	70	118
*JE2HXL	21A	27,284	156	27	49
*JF2VAX	7A	30,861	160	25	56
*JR2ALA	"	6,392	67	18	29

District 3

JH3CUL	A	416,245	571	97	198
JL3JRY	"	66,548	215	53	78
JA3IBU	"	65,554	199	54	92
JR3RIU	"	56,876	212	42	76
JA3KKE	"	45,162	154	51	66
JA3XOG	"	41,055	141	45	70
JN3QNG	"	40,120	166	50	68
JA3LIL	"	16,425	89	29	46
JA3FRI	"	15,566	99	37	49
JJ3JJL	"	6,336	46	21	27
JA3IJW	"	190	9	5	5
JA3QOS	28	588	18	6	8
JR3RIY	21	72,802	339	28	61
JR3NZC	14	183,135	799	26	61
JI3BFC	"	67,640	295	26	69
JN3MXT	7	1,148	21	11	17
*JA3EBT	A	26,095	149	35	50
*JR3JRI	"	13,050	82	32	43
*JP3MFV	"	9,394	60	27	34
*JG3EWE	"	8,874	69	28	30
*JA3DAY	"	7,314	60	23	30
*JP3KPJ	"	6,222	63	22	29
*JJ3TBB/3	"	4,982	48	21	26
*JA3PFY	"	4,524	55	25	27
*JA3HKR	"	950	18	12	13
*JH3GMI	"	598	18	11	12
*JF3FYD	"	475	11	10	9
*JP3OYB	"	130	9	5	5
*JP3OUY	28	96	9	3	3
*JF3BFS	21	110,400	409	35	80
*JA3JRI	"	8,325	85	19	26
*JM3QIS	"	2,320	32	9	20
*JA3BBG	"	483	23	9	12
*JA3UWB	14	495	19	6	9
*JN3ONX	"	242	17	9	13
*JG3EHD	7	16	2	2	2
JN3SAC	AA	114,003	295	60	99
JN3TMW	"	101,376	241	67	109
(OP:JF1RPZ)					
JA3HBF	"	34,730	154	52	63
JM3UGA	"	26,832	110	43	61
JA3ENN	"	495	11	5	10
JS3CTQ	21A	110,696	411	27	74
JO3DDD	14A	94,010	475	26	59
JF3LOP	7A	7,936	61	23	39
JK3NSD	"	126	6	4	3
*JL3MCM	AA	214,248	407	92	145
*JL3RNZ	"	104,632	266	61	103
*JL3VUL/3	"	84,915	296	49	86
*JF3EIG	"	47,736	138	57	79
*JH4PUL/3	"	26,818	109	42	64
*JI3DST	"	340	12	7	10
*JL3DQX	14A	168	8	3	4

District 4

JH4UYB	A	3,861,990	3487	127	296
JI4WHS	"	37,917	156	39	60
JA4EZP	"	8,316	58	29	34
JA4KTG	"	828	14	11	12
JA4BEV	"	198	17	7	11
JG4AKL	14	120,803	457	29	78
JE4ADO	"	189	9	4	3
*JH4CES	A	2,988	33	18	18
*JF4XUT	"	1,225	23	12	13
*JR4LRY	21	1,748	43	10	13
*JR4INQ	"	555	13	6	9
*JN4ESD	14	2,378	42	13	16
*JE4URN	"	360	10	6	6
*JH1MTR/4	7	512	16	8	8
JR4VEV	AA	184,300	409	61	129
JH4ADK	"	61,610	183	45	77
JA4OPW	"	1,760	28	15	17
JH4UTP	14A	259,376	881	31	85
JR4OZR	7A	313,627	805	34	117
*JA4JBT	AA	1,728	26	13	19
*JM4WUZ	7A	16,380	103	25	45

District 5

JA5SUD	A	32,967	121	49	62
JF5SIM	"	10,431	63	23	38
JA5FDJ	21	401,286	1107	36	105
JJ5GMJ	"	111,720	436	32	73
JH5FIS	"	1,690	25	8	18
JA5FBZ	AA	54	3	3	3
JH5MXB	14A	54,557	240	24	65
JA5FNX	"	42	3	3	3
*JH5HDA	AA	7,865	81	25	30

District 6

JE6RPM	A	3,596,817	3304	119	294
(OP:JH5GHM)					
JA6BWH	"	82,800	232	54	96
JA6FEG	"	76,812	225	54	94
JA6EML	"	76,383	248	47	76
JG6SRB	"	73,440	229	49	95
JA6FFO	"	22,794	112	33	54
JA6LCJ	7	18,042	137	23	39
*JA6CVR	A	29,300	158	47	53
*JA6ONQ	"	23,232	122	32	56
*JA6GPR	"	1,848	29	12	12
*JG1NCL/6	"	42	3	3	3
*JA6CDC	28	81	5	4	5
*JH6SCA	21	2,108	32	14	17
*JN6AVV	"	816	22	7	10
*JS6SRY	"	544	14	6	11
*JE6PJP	"	435	13	6	9
*JE6ETZ	"	330	10	8	7
*JE6PVG	"	117	7	5	4
*JE6VAG/6	"	45	3	2	3
*JA6FHF	7	234	8	7	6
JA6BZI	AA	521,904	624	102	230
JE6CMG	21A	33,288	190	24	52
JA6GMC	3.7A	4,136	39	18	26
*JH6QIL	AA	54	3	3	3
*JH6WHN	21A	68,952	278	31	71

District 7

JA7QVI	A	105,029	292	49	78
JA7VEI	"	38,007	139	40	63
JI7UUO	"	30,680	117	39	65
JH7QXJ	"	17,710	92	29	48
JJ7GCL	"	17,175	97	28	47
JG7EHM	"	17,160	90	19	46
JA7UES	"	15,360	84	23	41
JN7TAN	"	11,088	68	32	40
JA7AKH	"	10,258	89	18	28
JA7EFR	14	1,827	35	11	10
JJ7PMS	7	882	19	10	8
*JA7BEW	A	219,300	446	80	135
*JA7HYS	"	167,232	328	76	125
*JH7VTE	"	23,051	99	36	53
*JP7GRU	"	4,944	51	24	24
*JL7CTR	"	3,920	44	12	23
*JA7KED	"	1,944	32	13	14
*JH8SST/7	"	540	15	11	9
*JE7KJG	21	34,928	196	24	50
*JI7EMD	14	4,773	59	16	21
*JL7LUI	"	2,349	43	13	14
*JA7GFJ	"	35	3	2	3
JA7NVF	AA	1,187,550	1555	104	211
JG7AMD	"	162,810	328	73	128
JO7KMB	"	107,105	254	53	102
JF7PHE	"	66,297	189	59	88
JA7GYP	"	26,720	122	27	53
JA7OWD	28A	7,880	111	16	24
*JA7ZP	AA	44,409	144	55	76
*JA7RPC	21A	45,752	220	29	57
*JH7RTQ	14A	405	9	6	9

District 8

JA8IJI	A	105,560	294	53	87
JH8CXW	"	703	15	9	10
JA8TGD	21	15,246	101	24	42
JH8FIH	7	2,448	26	14	20
*JA8CXY	A	18,796	100	33	41
*JM8FEI	"	15,522	97	37	41
*JA8HBO	"	700	19	8	12
*JH8RXM	14	16,896	144	20	28
*JK8NIP	"	9,408	75	17	32
*JA8DNV	3.7	989	19	10	13
JA8COE	AA	925,290	1309	92	178
JH8DBJ	14A	75,348	320	29	63
*JK8CEE	21A	624	18	13	11

District 9

JA9CCG	A	68,558	230	42	76
*JH9CEN	A	59,750	218	51	74
*JA9EJG	"	7,290	61	21	33
*JH9FCP	"	6,784	60	30	34
*JA9GEW	21	11,016	90	22	32
*JH9JJD	"	216	8	5	4
*JH9URT	7	133,254	556	30	69
*JR9NVB	"	6,048	64	18	24
JF9JTS	AA	734,426	1088	82	169
JH9DRL	"	41,040	175	44	64
JR9GMS	"	10,384	62	20	39
*JH9AUB	14A	61,758	260	26	68

District Ø

JHØILL	A	255,335	480	77	152
JAØLBE	"	45,469	390	21	20
JAØCLB	"	8,910	68	26	29
JAØAVS	"	1,344	32	8	8
JHØMJY	"	768	16	8	8
JHØMXV	14	16,380	108	18	45
*JHØNEC	A	135,622	331	60	106
*JJØNSL	"	82,597	214	55	96
*JAØBJY	"	31,842	146	37	50
*JRØDZH	"	16,875	87	35	40
*JRØBNF	"	3,431	37	21	26
*JAØRCK	"	1,344	18	15	17
*JHØEPI	14	57,276	297	21	53
*JIØWVQ	7	364	10	7	6
JJØJML	AA	884,534	1082	101	221
JHØGHZ	"	215,742	343	83	163

JHØKHR	"	10,716	66	26	31	
*JAØBZY	AA	1,400	28	9	11	
*JA5QJX/Ø	7A	3,808	58	13	19	

Kazakhstan

UPØL	A	5,829,096	4598	103	373	(OP:UN9LW)
UN7QF	14	78,884	377	18	64	
UP2L	3.7	609,323	1529	32	111	(OP:UA9BA)
*UN7MBH	A	71,337	217	27	102	
*UN7PGA	21	24,949	180	17	44	
*UN6LN	14	314,280	890	30	105	
*UNØLM	"	138,125	620	17	68	
*UN7CN	"	36,750	208	14	56	
*UP7G	"	17,416	141	18	38	
UN5GM	AA	1,006,422	1105	87	267	
UN9L	"	176,619	550	26	87	
UN2E	"	48,852	160	31	87	
UN4PG	21A	69,960	354	21	67	
UP4L	7A	735,770	1726	33	128	(OP:UN7LZ)
*UN7ZAF	AA	302,128	596	39	145	
*UN7LAN	"	10,902	64	24	45	

Kyrgyzstan

EX8MAT	A	112,574	323	45	109	
*EX2M	14	64	4	4	4	

Lebanon

OD5YA	AA	153,549	449	29	92	
OD5ZF	"	26,979	141	17	52	
*OD5PY	AA	17,485	99	14	51	
*OD5ZZ	21A	24,811	197	9	34	

Mongolia

*JT7AA	A	28,294	163	29	65	

Ogasawara

*JD1BIA	A	500	11	10	10	

Palestine

*E44WE	14A	669,824	1861	29	99	(OP:SP9FIH)

Qatar

A75GA	AA	5,253	42	18	33	

Republic of Korea

*HL1IWD	A	36,720	330	29	56	
*DS4FWI	"	4,356	43	17	27	
*HL2VXK	"	2,470	34	20	18	
*HL2CFY	"	2,040	26	11	19	
*HL3/IU1GMK	"	580	21	10	10	
*HL2ASZ	"	110	8	5	6	
*HL5ZEE	14	70	4	4	3	
*HL1OVG	7	518	28	7	7	
HL2DBP	AA	63,616	232	60	82	
HL5YI	7A	624	17	8	8	
*HL1VAU	AA	85,407	294	53	94	
*DS5TOS	"	2,200	50	12	13	

Saudi Arabia

7Z1SJ	14	256,610	719	32	102	
*HZ1VV	A	3,977	39	14	27	
HZ1HZ	AA	650,256	925	69	207	
*HZ1SK	21A	146,696	579	19	69	

Singapore

*9V1OW	A	20,750	111	30	53	(OP:JG1OWV)
*9V1WO	7	130	10	4	6	

Taiwan

BV1EK	A	220,000	501	74	126	
BU2AU	"	208	10	6	7	
*BX2AFU	A	12,127	87	27	40	
*BU2BO	"	10,659	109	20	31	
*BX3ACB	"	592	15	7	9	
*BU2EC	"	195	10	7	8	
*BU2BE	14	11,100	165	16	21	
*BV3UJ	"	1,512	47	10	14	
BVØR	AA	519,824	1142	71	141	(OP:BM2JCC)
*BX2AFS	AA	25,688	156	27	49	
*BV1EL	"	20,856	154	33	46	
*BX5AAU	14A	2,890	47	12	22	
*BV9AA	"	1,596	40	7	14	

Thailand

HS5SRH	A	1,138,914	1678	82	240	
E21YDP	14	41,877	262	23	58	
*E2ØPFE	A	52,098	260	39	75	
*HS5ZLD	"	31,160	134	31	64	
*E23HSW	"	19,458	122	35	59	
*HS8LVC	"	6,500	69	21	31	
*E2ØSJC	"	4,796	64	16	28	
*E21FYK	"	1,312	33	13	19	
*E29AHU	"	770	21	9	13	
*HSØZLW	"	560	14	9	11	
*HS3LSE	14	30,820	261	23	44	
HSØACS	AA	14,022	95	26	56	
HSØZED	21A	73,968	399	23	69	
E2ØWUE	14A	78,185	433	25	70	
*HS8JWH	AA	35,148	193	37	64	
*HS7BHK	"	6,438	68	23	35	
*E2ØZFD	"	5,734	60	19	28	
*HS1JZT	"	48	4	4	4	
*HS8JYX	21A	4,046	53	10	24	
*HS5NMF	14A	7,644	93	12	30	
*HS8KVH	7A	77	17	4	7	

United Arab Emirates

A61ZX	A	542,961	1085	36	171	
A65DC	"	21,948	105	32	61	
*A65CR	14	13,923	110	11	40	
A61EK	AA	1,091,616	1242	77	255	
A65CA	"	782	12	11	12	(OP:RV6AJJ)

Uzbekistan

*UK9AA	7A	322,934	995	25	97	

Vietnam

*XV9NPS	A	880	49	7	9	

West Malaysia

9M2MDX	7	11,088	167	12	16	
9M2VBC	"	1,029	36	9	12	
*9M4CHM	A	1,936	52	6	10	(OP:9M2NAL)
*9M2YDX	"	1,782	49	11	16	
*9W2OPB	28	160	20	5	5	
*9W2SAF	7	101,742	516	25	68	
*9W2VRD	"	10,701	150	10	19	
*9W2VIR	"	10,368	140	13	19	
*9W2GVR	"	7,801	113	11	18	
*9W2HXP	"	6,390	95	12	18	
*9W2LRN	"	5,921	97	11	20	
*9W2JQD	"	5,817	113	8	13	
*9W2JST	"	5,628	119	7	14	
*9W2DVH	"	5,610	82	12	21	
*9W2SAN	"	5,103	93	9	18	
*9W2DCW	"	3,888	67	9	15	
*9W2BXN	"	2,116	38	9	14	
*9W2VMW	"	1,694	67	4	7	
*9W2GZH	"	1,540	45	5	9	
*9W2XTK	"	1,501	42	8	11	
*9W2AUG	"	795	21	7	8	
*9W2FSY	"	690	27	6	9	
*9W2BDG	"	352	16	4	7	
*9W2GID	"	350	20	2	5	
*9W2AEB	"	60	4	3	3	
*9W2MWZ	"	54	6	1	2	
*9W2MIQ	"	18	11	2	4	
*9M2FUL	AA	56,005	231	43	72	

EUROPE

Aland Islands

*OHØRJ	A	900	23	9	21	
OHØV	AA	2,471,140	2790	115	417	(OP:OH6LI)
OHØR	"	1,063,044	1114	129	450	(OP:OH2PM)

Andorra

*C31LK	A	39,324	401	20	96	

Austria

OE5BGN	A	600,768	1662	61	237	
OE1ØØTKW	"	98,208	333	47	151	(OP:OE1TKW)
OE3NEC	"	50,901	289	30	111	
OE6HWF	"	41,888	232	31	105	
OE5WHN	"	29,070	203	23	79	
OE3ILW	"	15,438	142	18	75	
OE5DRM	"	1,120	36	8	20	
*OE1HHB	A	449,514	935	71	268	
*OE1KFR	"	90,675	383	34	121	
*OE1CIW	"	72,800	348	38	122	
*OE6SWG/P	"	40,300	283	28	102	
*OE3TWA	"	31,360	273	21	91	
*OE5CWO/P	"	28,405	170	32	83	
*OE3GAS	"	10,296	104	18	60	
*OE9SEV	"	7,420	91	17	53	
*OE3OSB	"	3,600	68	10	30	
*OE1MSW	"	3,108	54	12	30	
*OE6PJF	"	1,944	44	11	25	
*OE5WGL	"	1,482	29	10	16	
*OE1PPA	"	1,188	24	12	15	
*OE1YIU	"	323	15	7	10	
*OE3PYC	"	304	14	8	11	
*OE1HLB	"	256	14	5	11	
*OE5JKL/P	"	153	11	7	10	
*OE5FPL	28	999	33	6	21	
*OE1WWL	21	10,920	93	21	44	
*OE2E	14	64,908	346	23	85	(OP:OE2GEN)
*OE5PEN	7	9,593	172	6	47	
*OE2ROL	"	4,988	88	8	35	
*OE2YYL	3.7	1,620	58	4	23	
*OE3WMW	1.8	15,600	345	6	42	
OE8Q	AA	1,357,635	1641	91	344	(OP:OE8SKQ)
OE5JSL	"	388,700	651	81	257	
OE6MMD	"	349,650	724	69	246	
OE3DXA	"	109,710	250	60	147	
OE1ØØKFV	"	49,098	165	39	108	
OE3KAB	"	30,345	195	27	92	
OE4VIE	"	14,043	93	34	59	
*OE3KPC	AA	4,617	61	18	39	
*OE1VMC	"	3,996	69	13	41	
*OE3RNB	"	570	14	7	12	
*OE5HIL	"	510	12	8	9	
*OE3SPR	"	210	10	7	8	
*OE9MHV	14A	968	36	6	16	

Azores

*CU3BR	A	5,130	70	16	41	
*CU2CE	"	450	9	9	9	
CR2L	AA	5,127,325	4518	125	456	(OP:OE2VEL)
CU3AN	"	167,063	650	42	139	

Balearic Islands

EA6DE	A	2,205	31	12	23	
EA6UP	"	713	13	11	12	
*EC6DX	A	88,970	510	32	123	
*EA6EA	"	18,145	121	25	70	
EA6EE	AA	51,040	226	34	76	
EA6FO	3.7A	295,336	1477	27	107	(OP:EC3TW)
EC6AAE	"	197,538	1124	22	101	
*EA6AKN	AA	10,875	104	19	56	

Belarus

EU1A	A	2,161,540	2321	113	395	
EV1R	"	1,151,766	1793	104	358	
EW2A	"	1,041,492	1440	95	363	
EW8OP	"	356,265	1496	40	163	
EW8OM	"	190,710	608	51	183	
EW8DX	"	157,680	579	42	177	
EW3LN	"	1,482	35	14	25	
EW1TZ	14	136,731	760	24	95	
EW8R	1.8	27,520	388	11	53	
*EW8LM	A	139,821	534	48	161	
*EU1FQ	"	52,592	196	48	104	
*EU1TL	"	39,928	276	26	98	
*EV6Z	"	37,352	187	35	81	
*EW8MZ	"	8,400	102	18	52	
*EW2EO	"	5,590	55	22	43	
*EU6AA	"	2,772	52	13	29	
*EW8AX	14	49,302	340	20	79	
*EU6DX	7	9,234	130	11	46	
*EU1ADO	"	500	19	7	13	
*EW4DDC	3.7	16	6	3	5	
*EU4RK	"	2	1	1	1	
EW6W	AA	4,696,812	4078	134	494	
*EW1P	AA	102,627	310	50	139	
*EW4R	"	93,508	349	47	147	
*EW7DK	"	192	6	6	6	
*EU3A	7A	64,294	370	24	98	
*EW6F	"	16,356	250	10	48	
*EW4GL	3.7A	15,600	218	8	57	

Belgium

ON4KCY	A	705,575	1315	73	252	
OT5L	"	451,950	1220	62	200	
ON4MW	"	256,122	576	66	213	
ON7PS	"	3,434	35	14	20	
ON3ONX	"	1,000	30	11	29	
ON5GQ	14	150,600	615	27	93	
ON4AT	"	77,147	389	24	83	
ON4KGA	7	255	15	4	13	
*ON3ND	A	168,264	593	43	185	
*ON5UJ	"	161,945	395	59	186	
*ON3AR	"	146,600	461	46	154	
*ON6AT	"	131,242	404	47	164	
*ON4APU	"	106,524	300	51	147	
*ON5AFB	"	99,456	394	39	153	
*ON3VS	"	77,927	373	38	111	
*ON4MAD	"	36,840	196	31	89	
*ON3SAT	"	36,432	246	30	102	
*OR5N	"	11,856	108	20	58	
*OT4R	"	6,206	96	14	44	
*ON3AWT	"	3,417	72	11	40	
*ON7KC	"	2,944	46	15	31	
*ON8MA	"	2,156	55	9	35	
*ON7LG	"	572	18	9	17	
*ON2LMP	"	77	6	5	6	
*OPØJ	14	9,408	147	10	39	(OP:ON5GF)
*ON6VOX	"	8,892	121	11	41	
*OR2A	"	6,216	113	9	33	(OP:ON1DX)
*ON5RT	"	306	14	6	11	
*ON5IA	7	6,811	132	6	43	
*ON4AYM	"	4,085	48	12	31	
*ON4CT	1.8	3,053	56	8	35	
ON6LR	AA	408,842	522	90	281	
OR1Z	"	291,720	1168	44	177	
ON9COP	"	167,055	434	45	170	
OT1L	"	93,960	421	35	127	(OP:ON4MHO)
ON4VDV	"	57,112	202	35	83	
ON4PJA	"	18,624	110	31	65	
ON4QX	"	17,952	110	30	66	
OQ4Q	21A	112,268	453	29	98	
OP4K	14A	341,460	1242	33	107	
OO5M	3.7A	151,792	1101	17	89	(OP:ON5ZO)
OS8A	"	118,944	1076	19	77	
*ON8ZA	AA	82,560	253	45	115	
*ON5RZ	"	80,990	351	39	143	
*OT1A	"	29,890	195	26	96	
*ON4AVJ	"	13,904	106	20	59	
*ON6LO	"	3,486	71	10	32	
*ON4CCV	"	2,880	44	15	33	
*OO7R	"	1,739	34	16	31	(OP:ON6OM)
*OT1V	"	720	18	12	18	(OP:ON8VM)
*ON8PL	14A	221	13	5	12	
*ON6FC	1.8A	3,010	95	3	32	

Bosnia-Herzegovina

E74X	A	46,368	314	25	119	
*E74UK	A	79,560	364	38	142	
*E73RB	"	57,524	317	26	120	
*E73JO	"	34,224	208	30	94	
*E79EA	"	11,100	120	18	57	
*E73RV	"	7,844	111	17	57	
*E77EA	7	11,716	188	9	49	
E78T	7A	44,100	382	19	79	
*E78IW	AA	19,570	150	21	74	
*E72JG	"	17,061	133	32	89	
*E72MM	1.8A	2,204	77	5	24	

Bulgaria

LZ1VVD	A	73,780	373	29	126	
LZ1GE	"	33,456	184	37	99	
LZ1GU	21	87,884	342	31	96	
LZ5DB	7	8,460	163	10	35	
LZ5W	3.7	3,510	88	6	33	
*LZ3SD	A	132,512	497	38	164	
*LZ2ZY	"	85,444	299	47	117	
*LZ1DQ	"	63,954	257	45	126	
*LZ1PUB	"	42,050	249	31	114	
*LZ7EA	"	16,800	159	18	62	
*LZ1VKI	"	8,184	106	15	47	
*LZ1YE	"	2,596	54	13	31	
*LZ7MT	"	756	25	11	17	
*LZ2GS	28	182	12	6	8	
*LZ9V	21	135,509	657	31	96	
*LZ2FM	"	3,880	61	11	29	
*LZ3DJ	"	2,822	43	11	23	
*LZ2PS	14	36,935	326	19	64	
*LZ1UBO	7	3,588	60	12	27	
*LZ5U	"	3,510	50	11	28	(OP:LZ1MC)
*LZ4NS	"	2,870	74	7	28	
*LZ5PL	"	936	33	5	19	
LZ4AW	AA	448,200	1031	73	259	
LZ3FN	"	343,539	482	88	311	
LZ1QN	"	216,094	760	45	161	
LZ5RD	"	74,867	343	38	131	
LZ1ST	"	20,497	131	29	74	
LZ1CRI	"	14,700	66	39	59	
LZ4TX	28A	32,062	355	18	64	
LZ8R	"	3,159	67	10	29	
LZ5K	7A	350,779	1779	30	113	(OP:LZ1RAY)
LZ3BB	"	35,945	346	18	73	
LZ6F	"	33,321	302	18	69	
LZ2FP	"	6,604	79	15	37	
LZ2ZG	1.8A	6,681	125	8	43	
*LZ7PW	AA	55,713	205	41	106	
*LZ2JU	"	31,284	199	32	100	
*LZ5B	"	7,820	84	20	48	(OP:LZ7DP)
*LZ3V	"	7,488	101	13	51	(OP:LZ1NY)
*LZØM	"	2,320	44	12	28	(OP:LZ2SX)
*LZ1NG	28A	4,165	71	12	37	
*LZ1VDR	"	1,400	52	7	21	
*LZ1FH	"	80	8	5	5	
*LZ2UW	21A	4,788	48	17	25	
*LZ1TEA	"	104	5	3	5	
*LZ6O	14A	111,800	605	31	99	(OP:LZ3DX)
*LZ6Z	7A	12,144	141	13	56	(OP:LZ2CM)
*LZ1COM	"	1,269	37	6	21	
*LZ2F	1.8A	39,840	478	15	65	(OP:LZ2JE)

Corsica

TK4RB	AA	547,856	1082	80	308	
TK4LS	21A	49,049	260	25	66	

Crete

SV9GPV	28	16,524	197	19	49	
SV9RGI	AA	45,415	138	49	106	
SV9FBG	14A	296,616	1565	31	105	

Croatia

9A9RR	21	290,378	1115	34	100	
9A6ØKDE	3.7	138,082	1293	15	83	(OP:9A2VR)
*9A2KI	A	67,262	277	45	124	
*9A6RT	"	65,565	308	28	113	
*9A1MM	"	26,040	205	26	94	
*9A3SM	"	13,916	99	26	72	
*9A9I	"	13,650	120	27	64	
*9A1SZ	"	13,197	126	23	60	
*9A3EJZ	"	12,702	99	23	64	
*9A3DOS	"	12,556	99	23	63	
*9A1EA	"	12,155	98	23	62	
*9A3QB	"	10,640	105	21	55	
*9A5DO	"	6,480	101	13	47	
*9A5ALC	"	6,384	117	10	47	
*9A9CW	"	4,895	65	17	38	
*9A4R	"	2,240	46	10	30	
*9A2TX	"	1,584	42	10	26	
*9A6KZH	21	24,382	158	24	49	
*9A3TU	"	2,516	36	12	22	
*9A2EY	14	30,096	287	15	57	
*9A4TX	"	12,760	120	16	39	
*9A5CZK	"	7,200	122	10	38	
*9A5ADI	"	4,797	89	10	29	
*9A6ZZ	7	35,298	246	22	84	
*9A6DDA	"	26,384	377	9	59	
*9A2VX	"	22,126	272	12	62	
*9A5HZ	"	6,576	121	9	39	
9A2EU	AA	1,835,820	1602	134	517	
9A7Y	"	297,336	516	77	235	
9A7R	"	25,488	89	38	80	
9A2JK	"	24,244	84	44	72	
9A2G	28A	10,044	167	12	42	
9A1CFR	21A	58,875	223	30	95	(OP:9A2NO)
9A9A	14A	1,495,916	3881	40	148	
9A3XV	"	284,750	1134	31	103	
9A9R	7A	259,776	1017	34	110	
*9A6DJX	AA	81,144	398	33	128	
*9A7BGU	"	30,240	136	37	83	
*9A5BAA	"	19,580	144	26	84	
*9A7KR	"	18,252	140	22	86	
*9A2B	"	9,750	90	23	52	
*9A5YY	"	1,008	14	14	14	
*9A7JCY	28A	780	39	5	15	
*9A2KD	21A	116,000	395	30	95	
*9A1AD	14A	72,924	387	26	92	
*9A2AE	"	28,635	183	17	52	
*9A5ST	"	15,906	143	17	49	
*9A3ST	"	6,384	64	13	44	
*9A1CC	7A	9,912	157	7	49	
*9A6IND	"	3,906	71	9	33	
*9A7DR	"	3,652	59	7	37	

Czech Republic

OK1GTH	A	920,185	1935	63	242	
OK1OA	"	406,386	851	73	248	
OK1FED	"	10,324	108	26	63	
OK1PPL	"	7,107	96	17	52	
OK1FRO	"	6,888	81	17	39	
OK2ABU	28	90	11	3	7	
OK1XC	14	39,240	256	21	69	
OK1HFP	7	41,563	426	18	71	
OK5D	3.7	123,849	1061	17	82	(OP:OK1DTP)
*OK2MBP	A	358,248	1054	50	226	
*OK2BZE	"	352,242	758	62	235	
*OK1MKU	"	172,913	374	63	220	
*OK2BRX	"	143,318	442	43	160	
*OK1DKR	"	140,958	442	51	195	
*OK1HEH	"	122,496	501	40	152	
*OK1LRD	"	115,540	421	47	171	
*OK1DWH	"	114,063	514	37	160	
*OL3E	"	88,242	456	35	119	(OP:OK1JOC)
*OK2SGY	"	82,665	427	34	133	
*OK1LO	"	63,648	346	38	118	
*OK1TFH	"	54,872	241	41	111	
*OK1BJ	"	53,361	296	36	111	
*OK7N	"	50,887	207	43	108	
*OK2VV	"	45,648	284	27	117	
*OK2TC	"	42,210	302	27	99	
*OK1ULL	"	37,026	247	27	94	
*OK2IH	"	35,100	203	33	102	
*OK1MSP	"	32,828	153	33	83	
*OK1XBF	"	29,464	235	22	94	
*OK1DVA	"	24,210	228	17	73	
*OK2AK	"	15,604	123	24	70	
*OK1IO	"	6,375	87	23	52	
*OK2SBE	"	5,890	101	15	47	
*OK1PFM	"	5,640	92	14	46	
*OK2MRJ	"	5,253	104	12	39	
*OK1DSX	"	5,005	46	24	41	
*OK9RKZ	"	4,459	85	12	37	
*OK1VKC	"	3,621	69	13	38	
*OK2SDE	"	3,456	58	13	35	
*OK1TVL	"	1,564	40	12	22	
*OK2SWD	"	182	11	6	8	
*OK1HZ	"	117	10	4	9	
*OK2BUT	21	28,036	143	26	60	
*OK1TD	14	67,400	380	21	79	
*OK2TS	"	30,888	236	18	60	
*OL3R	"	28,296	250	15	57	(OP:OK1VWK)
*OK2PBG	"	10,835	129	13	42	
*OK1MMN	"	3,277	65	9	20	
*OK2BRQ	"	836	34	5	17	
*OK1FNT	7	14,690	214	12	53	
*OK1FPS	3.7	67,545	860	12	67	
*OK1TNM	"	4,059	101	5	36	
*OK1KJO	1.8	13,908	247	8	49	
*OK1JOK	"	5,934	145	6	37	
OK2QA	AA	656,502	992	86	320	
OK1C	"	188,190	462	60	195	
OK1DOY	"	91,184	286	39	100	
OLØW	"	67,312	578	20	92	(OP:OK1DSZ)
OK1DO	"	22,995	142	25	38	
OK6AA	"	22,272	90	33	54	
OK7R	28A	682	25	6	16	(OP:OK1TNM)
OK1NP	21A	478,800	1204	37	143	
OLØM	14A	849,800	2356	38	137	(OP:OK1CDJ)
OK1FMX	"	104,454	442	26	100	
OK1PRI	"	89,000	431	28	97	
OK1CF	7A	718,942	2563	37	141	
OK7GU	"	52,959	308	28	99	
OK8WW	3.7A	361,666	2211	25	109	
OK6DJ	"	7,790	206	4	37	
OK7K	1.8A	195,917	1467	19	88	(OP:OK1BN)
OK1T	"	53,746	746	13	64	
OK1A	"	1,275	59	4	21	
*OK6Y	AA	387,660	706	81	283	(OP:OK2PTZ)
*OK2BFN	"	333,268	768	69	269	
*OK1DPU	"	162,282	445	54	204	
*OK1PMA	"	105,342	442	43	138	
*OK5OK	"	95,931	422	34	137	
*OL1ØØT	"	77,401	256	47	110	
*OL5Y	"	16,030	101	24	46	
*OK6T	21A	355,992	918	34	134	(OP:OK1WCF)
*OK1MGJ	"	23,010	152	25	53	
*OK1AY	"	13,845	91	23	42	
*OK1K	14A	50,694	274	22	80	(OP:OK1XOE)
*OK1AOU	"	850	26	8	17	
*OL9R	3.7A	134,554	1312	14	84	(OP:OK6RA)
*OK1UKC	"	14,210	247	7	51	
*OL1ØØRCS	1.8A	17,043	323	8	49	(OP:OK1AY)
*OK3KW	"	874	49	4	19	

Denmark

OZ11A	A	584,974	1478	64	234	
OV1RR	"	36,990	194	32	105	(OP:OZ1HHH)
OZ6GH	"	31,980	180	30	93	
OZ1OP	"	30,960	232	32	97	
OZ3BJ	28	1,798	55	8	21	
OZ7X	14	543,205	1766	34	103	
*OZ4NA	A	183,791	650	45	194	
*OZ1ACB	"	122,220	493	40	140	
*OZ8CT	"	96,499	483	31	138	
*OZ1KKH	"	80,600	247	47	153	
*OZ8ZS	"	70,890	345	36	134	
*OZ2BKK	"	69,984	330	35	127	
*OZ7DK	"	60,514	281	36	122	
*5P9R	"	48,276	274	32	117	(OP:OZ5XN)
*OZ1DYI	"	45,408	275	22	107	
*OZ6AGX	"	34,524	210	27	99	
*5P1V	"	24,976	200	25	87	
*OZ1OM	"	11,781	159	14	63	
*OZ2LC	"	11,552	134	17	59	
*OZ1AOO	"	10,208	123	20	68	
*OZ4NE	"	8,288	97	20	54	
*OZ1QZ	"	5,820	93	14	46	
*OZ4QX	"	910	21	12	14	
*OZ9V	21	8,322	97	16	41	
*OZ1RE	7	11,918	182	9	50	
*OZ8UW	"	2,418	66	5	34	
*OU8A	3.7	20,280	363	9	51	
*OZ1NF	1.8	1,269	53	3	24	
OZ4O	AA	100,488	345	52	160	
OZ1AA	"	90,825	193	54	121	
OZ3SM	"	33,276	154	34	107	
OZ1GNN	"	23,607	119	32	97	
OZ7PBI	"	7,700	104	19	51	
OZ1DWK	"	2,862	39	15	39	
OZ1JVX	7A	17,886	248	10	56	
OZ1ZD	3.7A	13,650	158	13	57	
*OZ4MU	AA	261,230	493	78	224	
*OZ1KVM	"	225,388	651	50	218	
*OZ8AE	"	210,681	458	64	225	
*OU2P	"	15,312	154	19	69	
*OZ1KIH	"	2,745	87	13	48	
*OZ6CM	"	696	13	11	13	
*OZ7MC	"	30	9	4	6	

Dodecanese

*SV5BYP	A	4,731	53	19	38	

England

G6XX	A	2,500,413	2743	115	388	(OP:G4FAL)
MØMCV	"	476,480	1155	67	253	
M8C	"	136,127	524	42	155	(OP:G4DBL)
G4PWO	"	98,992	403	41	143	
G1SCT	"	85,562	418	36	143	
G3ZGC	"	82,103	207	57	202	
MØYKS	"	64,779	239	36	107	
GØDTX	"	57,477	290	35	112	
MØRBE	"	53,268	306	35	103	
M1DNC	"	34,450	201	34	96	
MØGDX	"	20,292	122	40	74	
G8GNI	"	11,622	127	18	60	
MØHHG	"	8,500	107	17	51	
G4IUF	"	6,138	44	26	36	
G4RKO	"	5,202	86	13	38	
2EØILF	"	4,488	76	12	39	
GØIPE	"	2,418	34	15	24	
G3RCV	"	198	19	5	17	(OP:M1TAD)
M3D	21	160,750	662	28	97	(OP:G3XTT)
G4FKA	"	43,344	308	19	67	
GØAZH	14	336	14	5	7	
MØMJA	7	47,328	435	14	73	
G2Z	"	1,508	48	5	24	
G4L	3.7	92,115	810	15	74	(OP:G4LDL)
*MØUTD	A	361,935	636	71	244	
*G4NBS	"	140,901	528	38	163	
*G4DDL	"	98,462	397	41	141	
*GØOOF	"	85,345	343	35	134	
*G8ZRE	"	47,946	327	27	104	
*G7SYW	"	44,384	253	36	110	
*G4WWG/P	"	42,408	258	25	68	
*MØKED	"	39,243	187	36	91	
*G6UBM	"	39,162	214	35	87	
*MØYDB	"	38,080	260	28	91	
*G7WHI	"	35,862	254	23	106	
*M6GOX	"	33,916	203	31	91	
*G4ADJ	"	32,175	198	30	113	
*MØACM	"	31,369	212	27	100	

*M1G	"	29,250	218	20	97
					(OP:GØUWS)
*MØNPT	"	27,180	210	27	63
*MØIHT	"	25,000	200	20	80
*G8GHD	"	24,354	152	22	60
*GØOFD	"	23,421	202	23	88
*M6KCI	"	19,902	183	25	82
*G3YCH	"	19,840	106	31	93
*G4HBI	"	17,661	162	23	64
*G3JKL	"	15,624	176	14	48
*M3ZZF	"	15,088	133	20	62
*MØKPW	"	14,280	160	16	52
*G3YZO	"	13,195	124	22	69
*MØLDP	"	13,175	147	17	68
*GØMCV	"	12,456	119	16	56
*MØCUK	"	11,178	109	21	60
*GØBBO	"	10,833	148	12	57
*MØCVO	"	10,640	126	17	59
*2EØFTD	"	9,230	118	15	50
*G6EES	"	7,314	103	14	55
*2EØHSP	"	6,741	110	14	49
*M6VWX	"	6,545	109	12	43
*MØMPM	"	6,156	81	15	39
*M5DZH	"	6,136	62	19	40
*MØRNW	"	6,039	87	14	47
*G4TGJ	"	5,980	83	16	49
*2EØIHX	"	5,429	84	15	46
*GØOIK	"	5,418	82	13	50
*G4ENZ	"	5,400	48	19	41
*2EØLMD	"	5,395	91	15	50
*GØCPA	"	5,395	109	14	51
*MØAUG	"	5,356	65	16	36
*GØMTN	"	5,307	72	16	45
*G4DDX	"	4,872	60	17	39
*MØMXX	"	3,478	66	11	36
*MØSDM	"	3,468	56	15	36
*MØPVM	"	3,465	67	12	33
*2EØLGP	"	3,168	54	12	36
*MØORY	"	2,726	59	13	34
*2EØEZF	"	2,668	56	11	35
*MØJCE	"	1,960	40	9	26
*G4IQW	"	1,728	35	11	25
*G2BKZ	"	1,674	21	13	18
*2EØFYR	"	1,610	38	10	25
*MØCCA	"	1,472	32	9	23
*MØPKZ	"	1,350	34	9	18
*G3OMB	"	1,152	42	10	26
*2EØWCG	"	1,089	33	9	24
*MØLYF	"	1,080	25	9	15
*M1AMF	"	988	32	12	26
*G3WBB	"	900	33	10	26
*2EØSQB	"	897	25	9	14
*G3ZJF	"	864	16	10	14
*G1EIX	"	783	23	11	18
*2EØLKC	"	780	27	9	21
*G4TCI	"	780	30	6	20
*G1VWC	"	675	25	7	20
*2EØDUZ	"	648	21	7	17
*G7MBH	"	644	18	10	13
*G8FMC	"	594	23	6	16
*MØWHP	"	576	20	6	12
*M1SLH	"	552	21	6	18
*MØIKO	"	540	29	6	14
*MØXXJ	"	440	22	6	14
*GØUKZ	"	420	15	7	13
*G3KMQ	"	306	11	7	10
*2EØGBK	"	288	12	8	10
*G4NTW	"	228	16	6	13
*MØJSB	"	208	9	7	9
*MØIAX	"	182	11	4	10
*MØBQE	"	112	13	5	11
*MØHUI	"	40	6	4	6
*G7Y	21	86,913	575	19	68
					(OP:MØZDZ)
*G3Y	14	87,264	493	22	79
					(OP:G3YBY)
*GØRAH	"	16,610	221	10	45
*M6OWV	"	7,800	143	9	31
*MØNOM/P	"	1,098	37	5	13
*MØYTT	"	288	16	5	11
*2EØONH	"	272	17	3	13
*G1HYD	"	252	8	6	8
*MØLSG	"	88	11	1	7
*G9Y	7	20,482	247	13	64
					(OP:MØNCG)
*2EØVCC	"	19,180	248	12	58
*G3SVK	"	14,250	168	16	59
*G7VNN	"	2,144	55	7	25
*M6NTV	"	192	12	4	8
*2EØEJZ	"	88	8	3	8
*GØMBA	3.7	1,240	47	6	25
*G2X	1.8	5,488	128	7	42
G3Q	AA	409,266	751	64	222
					(OP:G3RXQ)
G3YSX	"	145,418	442	55	183
G3AB	"	110,638	314	52	162
G3PXT	"	102,884	414	38	140
G3XSV	"	87,768	257	40	119
G8DX	"	85,974	245	49	112
MØVCB	"	68,452	250	37	120
G4RRM	"	52,598	198	34	85
G4ZCS	"	22,360	140	24	62
M1DDD	"	12,480	106	18	60
G3YBO	"	8,268	59	21	31
MØMCX	"	5,518	77	14	48
G4YDM	"	3,936	63	14	34
G4IRN	"	3,816	51	18	35
MØXAC	"	3,552	34	21	27
MØWLF	"	3,325	50	12	13
G3RTU	"	3,318	73	8	34
MØYOM	"	3,120	53	12	36
MØBJL	"	2,160	42	12	33
MØGMS	"	884	22	10	16
M5A	21A	21,514	153	18	44
					(OP:G3WVG)
G5K	14A	271,414	1082	33	113
					(OP:GØBNR)
G3YJQ	"	5,763	87	10	41
*G4PVM	AA	410,592	771	69	267
*MØKOX	"	124,032	508	41	163
*MØTWB	"	112,545	401	42	163
*M6ETL	"	90,558	336	41	121
*G4OZG	"	89,356	438	34	144
*G8KEK	"	83,172	428	31	143
*G4HCC	"	76,260	357	39	125
*MØPGX	"	60,750	395	24	101
*G4WWS	"	56,248	220	43	115
*G3VDB	"	51,520	225	38	122
*MØICR	"	50,120	281	30	110
*2EØIFC	"	46,545	248	33	112
*G4P	"	39,116	266	26	101
					(OP:G3YPP)
*GØHEU	"	31,635	199	26	85
*M4M	"	26,040	185	26	79
*G8XTJ	"	23,575	182	23	92
*G4WGE	"	20,493	162	24	75
*G8ZZK	"	19,897	159	21	80
*2EØCVN	"	16,182	150	18	69
*MØGKC	"	15,652	110	24	67
*MØTQR	"	14,100	116	24	70
*M6YGL	"	11,322	138	17	57
*MØSNA	"	11,076	136	16	62
*G8OO	"	10,192	125	22	69
*G1SQY	"	9,800	126	17	53
*M6YTU	"	4,095	65	12	33
*2E1BRT	"	4,050	60	15	39
*MØBWY	"	3,196	62	13	34
*G4AYU	"	2,079	37	12	21
*MØWMS	"	1,792	48	8	24
*MØHZT	"	825	31	7	18
*G4JFS	"	504	20	9	9
*MØKEP	"	391	15	8	9
*M6VFT	"	56	5	3	5
*G1VDP	21A	1,728	32	7	17
*M1N	14A	52,716	359	19	73
					(OP:M1DST)
*M5Z	"	5,002	112	7	34
					(OP:JK3GAD)
*2EØUDX	"	600	26	6	14
*G8X	7A	60,672	547	16	80
					(OP:G4FJK)
*M1U	3.7A	32,130	285	13	72
					(OP:MØUTD)
*M7V	"	100	11	2	8
					(OP:MØVAA)

Estonia

ES6RW	A	2,247,434	2747	113	384
					(OP:ES5RW)
ES5MG	"	265,512	590	70	242
*ESØIA	A	105,930	441	47	151
*ES6RMR	"	27,750	153	31	94
*ES1TAR	"	4,536	61	16	40
*ES4RLH	"	49	4	3	4
*ES1OV	28	35	5	3	4
*ES5RIM	14	19,648	210	13	51
*ES6RQ	"	4,545	43	14	31
*ES1TN	"	425	23	5	12
*ES8SX	7	6,811	123	7	42
*ES2UK	"	513	34	5	22
*ES1BA	"	24	2	2	2
*ES3O	3.7	1,363	51	5	24
					(OP:ES2UK)
ES1BH	AA	183,920	584	53	189
ES1CN	21A	37,900	186	26	74
ES4RD	14A	27,645	216	19	76
ESØDJ	3.7A	9,261	126	12	51
*ES2MA	AA	26,226	114	33	61
*ES8GP	"	18,480	101	33	87
*ES6PA	7A	25,680	263	16	64

European Russia

District 1

RW1F	A	2,102,792	2822	116	372
RW1CW	"	793,924	1083	95	317
RD1AH	"	315,854	810	67	226
RV1CB	"	49,302	237	40	126
U1BD	"	19,404	196	25	74
RZ1O	"	1,350	21	13	17
RJ1O	"	42	3	3	3
RM1T	14	77,792	794	23	65
					(OP:R1TE)
RA1TDP	1.8	7,585	195	7	34
*UA1D	A	234,612	586	57	195
*UA1CUR	"	188,276	570	48	194
*R1CAM	"	111,744	391	49	143
*R1QE	"	41,877	202	37	104
*U1BA	"	40,375	212	32	93
*UA1ZJV	"	15,691	97	28	43
*RM1F	"	6,435	80	19	46
*RA1CE	"	2,772	45	16	28
*R1AI	"	800	24	7	13
*R8MB/1	"	50	8	4	6
*R1BBL	14	43,020	361	21	69
*R1ZM	"	13,124	156	14	54
*R1CAV	"	12,416	169	15	49
*UA1CBM	"	9,500	128	11	39
RC1W	AA	333,184	807	66	238
RD1A	"	140,936	257	63	253
RU1AB	"	30,709	126	39	68
RW1A	"	29,302	195	27	71
RV1CC	"	6,624	56	17	31
UA1OMS	1.8A	21,300	294	13	58
*RN1AO	AA	34,290	208	34	101
*RU1AT	"	3,504	63	13	35
*R1LN	"	2,790	58	13	32
*R1AT	14A	6,192	109	9	39

District 3

UA3VFS	A	555,360	978	87	303
RC2SB	"	208,780	383	79	207
RT2H	"	121,176	440	43	161
R3RZ	"	97,461	402	39	108
RC5Z	"	77,572	368	39	125
RM3A	"	66,815	445	18	65
					(OP:RN3AC)
RK3DK	"	66,564	297	43	129
RV3YR	"	64,515	171	46	119
RA3NC	"	63,897	219	46	131
RA3ZH	"	48,786	134	47	94
R2GB	"	34,146	196	34	92
UA3YCZ	"	33,909	235	29	98
R2DPM	"	15,842	92	26	63
R3QF	"	12,450	54	35	48
RA3BQ	"	750	19	14	16
RU3SD	"	96	4	4	4
RA3XM	21	232,254	874	31	122
R3GZ	14	2,596	38	15	29
RA3THN	"	1,219	22	9	14
R2AD	7	52,374	535	16	70
R3XA	"	20,880	141	19	71
R3ST	1.8	10,292	158	13	49
R5ER	"	6,413	137	7	46
RL3BZ	"	5,424	107	9	39
*UA3BL	A	347,541	787	66	237
*R3OM	"	209,709	548	54	189
*RZ5D	"	188,928	485	63	193
*R2ARR	"	146,965	399	57	164
*RK3DYB	"	143,220	563	42	144
					(OP:R2DAW)
*UA3RKK	"	133,945	384	56	159
*RA3DIH	"	124,200	386	51	165
*R3DCB	"	78,260	258	47	135
*R2ZCA	"	67,106	273	45	133
*RT3S	"	64,500	222	47	125
*R2OFF	"	53,848	279	26	101
*RN3YA	"	41,422	259	28	111
*RU3UB	"	39,852	187	41	123
*RA3DQP	"	33,456	234	24	78
*RX3VF	"	22,374	161	27	86
*RT3G	"	20,340	156	22	68
*R3WZ	"	18,792	106	25	62
*R5AU	"	18,343	113	28	55
*RV3VR	"	17,856	156	21	72
*R5FC	"	15,022	132	20	54
*RW3ZA	"	14,946	91	37	69
*R2AOD	"	13,350	135	20	69
*RA3VE	"	11,907	98	22	59
*UG3G	"	11,607	123	18	55
*R2BV	"	9,480	105	18	61
*RW3YB	"	8,450	56	26	39
*R2EL	"	8,418	115	17	52
*UA3EUW	"	5,508	92	14	40
*UB5MBA	"	4,100	66	14	36
*RU3VV	"	3,564	42	15	18
*R3RAE	"	3,042	33	16	23
*R3SV	"	2,294	26	13	24
*R2PT	"	1,209	23	10	21
*RU3XY	"	1,188	32	9	27
*R3LC	14	44,965	328	19	66
*RX3QFN	"	19,440	190	16	56
*RA3DGH	"	8,037	162	6	41
*R3PIQ	"	3,616	81	8	24
*R2AHS	"	2,848	63	9	23
*R2AED	"	1,215	32	8	19
*UA3LG	"	120	5	3	5
*RK3E	7	95,817	640	26	97
*RD3AJB	"	14,744	145	14	62
*RU3WR	"	13,534	165	13	54
*R3RK	"	5,950	101	7	43
*UA3WF	"	2,112	52	7	26
*RK3DHU	"	336	17	5	9
*RV3ZN	3.7	195	17	4	11
RT5Z	AA	3,996,768	3907	132	500
					(OP:RA3CW)
RM3DA	"	1,747,977	2477	98	385
RU5A	"	449,290	786	82	276
RA3BL	"	355,366	534	87	232
RM2D	"	197,472	504	71	193
					(OP:SM6LRR)
RZ2D	"	124,695	260	67	188
					(OP:UA3BZ)
R5FU	"	94,044	303	48	156
R3KF	"	87,914	396	52	174
UA3UBT	"	52,298	202	37	121
R3QX	"	15,045	77	33	52
UA3AGW	"	13,464	68	33	55
RN3B	"	2,844	31	17	19
RN3OG	"	2,013	21	13	20
R2AOQ	"	308	10	5	9
RW3DU	21A	108,129	463	28	105
R5AJ	14A	414,315	1771	34	121
RW3XZ	"	324,478	1659	31	123
RL5A	"	191,880	1189	28	95
RA3W	"	113,652	638	26	97
					(OP:RM5W)
RW3QJ	"	49,396	395	23	83
RA3OA	"	49,164	376	20	82
UC5D	"	29,667	173	23	70
RK3IT	"	3,003	59	9	30
RT3F	3.7A	145,824	1041	24	100
					(OP:R2DA)
RT2O	"	102,440	655	27	103
RV3FF	"	54,338	487	17	84
R3LA	1.8A	1,600	35	6	34
*RA3Y	AA	1,488,957	2442	91	356
*R2AL	"	475,660	785	81	259
*R3AQ	"	181,293	404	56	211
*R3AAA	"	122,570	414	43	163
*RA3FY	"	101,924	339	44	122
*R3AP	"	92,157	313	44	177
*UA3DVB	"	62,252	248	38	120
*RK2M	"	56,480	221	42	118
*RC7LI/3	"	43,218	250	26	100
*UB3ARX	"	42,233	199	34	123
*RN3TT	"	31,024	135	39	73
*RA3S	"	25,048	88	50	74
*R3RT	"	16,016	92	24	88
*UA3PI	"	9,840	90	27	55
*UB3AQA	"	8,760	113	16	57
*RA3RBL	"	8,352	105	17	41
*RW3WX	"	2,590	30	14	23
*UA3DLD	"	1,118	21	9	17
*R2ADC	"	825	15	11	14
*RX3XA	21A	16,974	112	25	57
*RW3RQ	"	5,170	59	13	34
*RZ3Z	14A	198,016	1037	30	106
*RU5TT	"	158,990	935	26	104
*RM3F	"	32,034	140	22	92
					(OP:UA3DPX)
*RA3VX	"	6,664	94	11	45
*UA3YCX	7A	5,720	102	9	43
*R5DF	"	5,246	46	15	28
*UA5F	3.7A	20,405	253	14	63
*RZ3QM	"	1,650	52	7	26

District 4

RD4F	A	1,412,670	1971	99	391
RL4F	"	838,840	1796	77	258
RM4HZ	"	257,226	719	60	198
RN4NF	"	138,968	313	58	174
R4RT	"	87,945	310	54	151
UA4NC	"	12,555	99	25	68
RA4AR	"	9,849	156	13	54
RW4NN	"	7,668	46	33	38
UB4W	"	5,440	68	17	51
RN4HKH	7	22,831	163	20	59
RU4HU	"	9,834	106	14	52
RW4M	"	96	4	4	4
RU4AA	3.7	20,128	269	13	55
*R4FAN	A	397,478	650	74	279
*RN4HAB	"	166,562	539	49	177
*RA4HBS	"	94,954	364	41	156
*UA4CNJ	"	62,586	289	33	138
*R4AC	"	51,030	220	42	120
*RN4SC	"	47,450	240	32	114
*R4ACY	"	34,830	189	38	97
*RT4H	"	24,000	112	32	88
*RW4F	"	16,356	114	22	72
*RA4FUT	"	8,800	99	20	60
*R4WT	"	6,900	92	17	52
*R4RB	"	4,288	72	16	48
*RA4UAT	"	252	7	5	7
*UA4ACP	21	51,920	429	23	65
*R4IO	"	41,114	565	13	48
*UA4WGM	"	5,633	76	13	30
*UA4SJO	14	17,160	206	12	53
*RA4L	"	7,696	137	9	43
*RA4DB	"	1,302	38	7	24
RJ4P	AA	2,574,378	3094	119	418
RL4A	"	991,515	1319	115	382
R4BZ	"	272,136	835	56	176
RW4W	"	80,325	364	37	138
RT4M	"	1,530	24	13	21
RM4R	"	840	16	13	15
UA4CC	21A	46,774	319	23	68
R4MM	14A	67,860	304	27	103
R4IB	"	41,184	305	21	75
UA4C	"	41,070	216	24	87
UD4FD	"	7,410	87	13	26
R4LR	7A	104,974	553	34	112
*RK4FAO	AA	182,721	542	49	182
*RN4SN	"	168,868	374	55	204
*RA4DAR	"	103,515	319	49	152
*UC4I	"	35,420	195	35	105
*RX4CH	"	31,780	140	40	100
*RZ4AG	21A	6,318	63	15	39
*RW4WA	14A	86,670	421	28	107
*RA4W	"	7,620	98	12	48
*RD4A	"	840	17	8	16
*RU4LM	"	117	5	4	5

District 6

R7AY	A	8,023	47	30	41
RC7B	"	918	18	11	16
UA6EE	21	85,137	511	27	84
R7KZ	14	444,976	2097	32	105
					(OP:W6NV)
RM6G	7	6,966	96	12	42
R6CC	3.7	17,082	212	12	61
RU6MO	"	10,863	139	11	60
*R7MM	A	532,992	990	75	272
*RZ6BR	"	197,106	528	55	192
*RM7C	"	144,900	729	36	139
*R7NP	"	121,768	286	64	184
*R6KVA	"	104,580	339	54	156
*RW6AEW	"	70,490	380	39	94
*RA6LIS	"	59,286	327	28	95
*RY6AAG	"	54,128	290	33	103
*R6DBT	"	53,165	279	38	117
*R6FY	"	48,574	156	46	103
*R6LBK	"	38,822	226	30	88
*UA6YN	"	35,125	239	26	99
*R7KX	"	27,336	143	35	101
*RD7KW	"	15,624	126	17	67
*RN6DR	"	14,688	105	29	67
*R7AC	"	10,044	112	22	59
*R6NI	"	3,192	47	15	41
*R6KY	"	2,288	53	11	33
*R6YP	21	60	12	1	5
*UA4ASE/6	14	6,864	103	10	42
*R6LHQ	"	450	13	5	13
*R6DIP	7	5,940	98	8	37
*R7RAI	"	342	19	3	15
RC6U	AA	1,857,944	2674	112	379
RC7A	"	207,144	520	65	209
RM7M	"	145,580	262	79	211
RM7G	"	129,000	339	56	159
RX6AM	"	9,734	63	23	39
RA6DT	"	1,938	21	14	20
RU6K	"	440	12	10	12
RU6B	"	30	3	3	3
RU6YJ	21A	53,530	285	26	80
*RL6M	AA	1,098,197	1864	89	354
*RT6C	"	20,384	123	26	78
*RK6AQP	"	7,935	79	19	50
*RA6AAW	"	4,680	50	20	40
*RL6K	"	736	19	10	13
*RT6N	21A	7,992	108	15	39
*R7CA	14A	22,308	160	20	58

District 9

UA9XMC	A	590,888	1499	66	251
RC9F	"	3,720	47	15	25
*UA9XF	A	109,143	419	43	158
*RC9X	"	40,736	208	32	102
*R9XV	"	8,037	129	12	45
*RA9FEL	21	13,056	215	10	41
*RA9XSL	14	1,320	30	8	22
R9FM	AA	88,374	251	60	146
R9XM	"	9,920	57	24	40
*UA9XX	AA	2,700	75	10	35

European Turkey

TA1API	A	30,422	193	29	77
*TA1CM	A	131,970	352	62	187
*TA1HF	"	14,359	141	19	64
*TA1MK	14	1,860	52	7	24
*TA1OSN	7	4,860	100	8	37
TA1ED	1.8A	2,720	83	5	27

Faroe Islands

OY9JD	7	580,117	2838	36	127
*OY1R	A	55,062	415	24	109

Finland

OH1VR	A	716,538	1273	87	302
OH2PQ	"	514,475	1049	82	243
OH1C	"	331,128	772	65	227
					(OP:OH1CX)
OH9AR	"	126,485	373	49	156
					(OP:OH9VC)
OH1LAR	"	74,448	317	42	156
OH5NZ	"	43,824	144	50	82
OH6JE	"	31,488	234	29	94
OH4UI	"	5,824	55	24	40
OH3KX	"	5,247	87	15	38
OH2LIR	"	304	10	9	10
OH3AA	"	156	8	6	7
					(OP:OH2KI)
OH5ZA	28	72	9	4	8
					(OP:OH1ZAA)
OH4BCS	21	13,260	108	20	48
					(OP:OH1ZAA)
OH8X	14	1,245,108	3710	39	133
					(OP:OH6UM)
OH5BM	"	427,968	1756	34	110
OH3BCX	"	7,112	104	13	43
					(OP:OH1ZAA)
OH6NEV	"	120	5	4	4
					(OP:OH6RE)
OH1QX	7	14,742	193	12	51
					(OP:OH1ZAA)
OH5UQ	"	6,785	91	11	48
*OH6ECM	A	244,860	597	54	211
*OH1XFE	"	114,642	392	47	151
*OH9GGY	"	100,068	342	47	139
*OH1SIC	"	69,204	377	27	131
					(OP:SM5SIC)
*OH8EJW	"	59,928	276	34	98
*OH6UX	"	58,608	292	41	107
*OH6XY	"	55,792	216	45	131
*OH8JIX	"	38,740	229	31	99
*OH1JW	"	23,532	195	26	80
*OH6EHZ	"	16,082	123	27	59
*OH1TS	"	8,288	152	18	56
*OH2EPW	"	7,590	103	16	50
*OH7JL	"	980	25	8	20
*OH6UAV	"	580	21	8	12
*OH2BAV	"	480	20	7	13
*OH6EPM	"	63	7	3	6
*OH2BKX	21	94,672	364	31	91
*OH2MZA	"	738	23	6	12
					(OP:OH1ZAA)
*OH3MHA	3.7	3,526	68	8	33
					(OP:OH1ZAA)
*OH1ZAA	1.8	40	5	3	5
OG7A	AA	3,097,296	3117	133	495
					(OP:OH6MW)
OG6N	"	1,669,115	2081	103	412
					(OP:OH6NIO)
OH2KW	"	755,497	1467	72	251
OH1RX	"	634,283	717	101	402
OG1D	"	365,165	527	97	270
					(OP:OH1JD)
OH3JR	"	287,861	356	91	322
OH2FNR	"	208,040	485	67	213
OH6OS	"	207,240	322	78	236
OH4XX	"	148,392	530	60	156
OH8A	"	124,720	699	21	59
					(OP:OH8WW)
OH3FM	"	124,657	438	47	176
OH8GET	"	121,390	260	57	142
OH3RT	"	60,236	215	40	108
OH5ZZ	"	59,520	227	43	112
OH6DX	"	28,160	124	38	72
OH7HM	"	19,968	192	22	74
OH2BJ	"	18,746	94	37	66
OH2GEK	"	17,888	136	30	74
OH5KW	"	11,954	60	34	52
OH3UU	"	7,493	43	21	38
OH3KAV	"	6,120	82	16	44
OH2KI	"	5,394	41	23	35
OH5XB	"	1,900	30	22	28
OH3RB	"	1,512	21	15	21
OH7WV	"	442	10	7	10
OH8WW	21A	153,296	709	31	103
OH2BEN	"	71,919	290	30	101
OH3WW	"	42,522	178	28	86
OH8WR	"	39,425	203	26	69
OH5BQ	"	22,022	113	23	68
OH1HB	"	21,420	113	25	59
OG73X	14A	679,857	2127	38	129
					(OP:OH8LQ)
OH6RE	"	161,253	945	28	95
OH2CK	"	83,688	327	30	102
OH1TD	"	21,054	112	21	66
OH2BO	1.8A	7,280	81	15	50
OG55W	"	2,394	78	5	33
					(OP:OH2OT)
*OH6E	AA	65,567	193	47	126
*OH6NEQ	"	53,537	237	40	117
*OH2ECG	"	26,314	185	32	86
*OH3NAQ	"	9,360	98	20	58
*OH8KVY	"	9,044	81	23	45
*OH7EBA	"	4,845	51	17	34
*OH4KA	"	1,080	31	15	21
*OH2BEG	"	80	4	4	4
*OH6GDX	1.8A	2,625	77	6	29

France

TMØT	A	4,865,616	5032	113	391
					(OP:F4HQZ)
TM2Y	"	1,253,672	1477	95	332
					(OP:F6BEE)
F2JD	"	799,792	1152	90	296
F5LIW	"	683,730	1096	76	245
F5OHM	"	447,533	1051	68	183
F4HRM	"	238,914	638	68	166
F8VNU	"	127,459	399	48	149
F5PHY	"	59,472	254	32	94
F4HZZ	"	31,104	162	31	77
F1PNJ	"	15,326	130	27	70
F8AAB	"	8,906	61	26	35
F1SZP	"	7,935	55	28	41
F2NY	"	5,832	78	18	36
F5MMF	"	4,992	53	16	23
F6LIA	"	460	11	9	11
F3JP	"	345	9	7	8
F4FQZ	28	375	29	3	12
TM6M	14	1,235,234	3616	37	117
					(OP:F4DXW)
TM4L	"	847,455	2843	33	114
					(OP:F8ARK)
F8DVD	"	329,130	1233	31	107
F4FXH	"	3,737	71	8	29
F4FET	7	150,916	1239	22	94
F1ULQ	"	667	29	4	19
F8KLY	1.8	9,063	200	8	45
					(OP:F6CWA)
F8AAN	"	1,148	35	7	21
*F5TLZ	A	248,976	786	54	180
*F4HXJ	"	209,484	494	61	192
*F6FTB	"	192,768	542	55	196
*F4HMV	"	164,671	492	53	186
*F5JU	"	134,070	386	49	156
*F6BQG	"	129,930	391	50	163
*F4ETG	"	117,475	403	41	144
*F4DXP	"	113,240	408	40	150
*F1GRH	"	105,840	310	53	157
*F6DRP	"	103,964	428	39	119
*F1ICS	"	99,981	345	53	154
*F4DBD	"	80,370	328	36	135
*F4HTZ	"	70,533	297	39	114
*F1GZV	"	55,610	212	48	118
*F4WBL	"	49,098	159	48	99
*F5PAL	"	47,844	267	30	78
*F4BIV	"	42,768	262	31	101
*F4AYI	"	40,848	243	33	115
*F6FET	"	40,455	189	35	110
*F5OHH	"	37,465	229	33	94
*F4CDR	"	36,120	196	29	100
*F6EQZ	"	29,704	120	38	56
*F6CYT	"	29,016	155	31	86
*F6FNA	"	28,792	195	25	97
*F4GWO	"	26,288	179	32	92
*F5IPE	"	19,800	186	18	81
*F1GKS	"	16,608	135	21	75
*F5INJ	"	11,466	115	16	62
*F4HTA	"	11,050	132	19	66
*F1IGY	"	8,613	72	27	60
*F4HNP	"	7,560	89	17	53
*F5MA	"	7,245	75	17	46
*F4FRG	"	5,712	59	16	40
*F4HQO	"	5,564	45	23	29
*F5PNI	"	5,358	69	13	44

*F4DLM	"	4,928	76	14	50
*F/PA3DCU	"	3,525	49	18	29
*F8CPA	"	3,500	59	13	37
*F5PVJ	"	2,537	56	11	32
*F4CKF	"	2,275	33	13	22
*TM5PAX	"	2,250	55	12	18
*F4FYC	"	2,107	47	12	31
*F1MLN	"	1,739	39	10	27
*F8OOI	"	1,369	27	12	25
*F6GLZ	"	588	21	10	18
*F5PTI	"	361	13	9	10
*F4FRQ	"	156	12	3	9
*F4IDM	"	68	12	5	12
*F5DBT	21	792	16	8	10
*F1SMV	"	49	5	3	4
*F4IVV	14	69,336	349	28	80
*F6EWX	"	23,775	200	16	59
*F1MQJ	"	1,200	28	6	14
*F4FVW	"	936	27	7	17
*F4FIA	"	140	8	3	7
*F4HKH	"	48	4	2	4
*F5BEG	3.7	72,030	665	14	84
F4CWN	AA	1,136,580	1561	88	292
TM5EE	"	1,068,051	1169	118	411
(OP:F6AGM)					
F6KOP	"	1,039,842	1280	89	280
(OP:IUØBMX)					
F6BGC	"	936,572	1282	94	309
F6DZU	"	830,484	1420	73	233
F1RHS	"	733,920	803	112	305
F4DPW	"	638,648	1023	88	300
F8CRS	"	599,646	742	98	319
F8ATM	"	443,680	535	96	280
F4FEP	"	337,440	497	67	229
TM2F	"	258,003	831	47	216
(OP:F4GTT)					
F5MUX	"	176,640	757	30	66
F1AGR	"	102,460	267	58	160
F5JFU	"	65,570	165	50	108
F5SDD	"	51,708	214	38	86
F1UIJ	"	32,396	142	28	63
F4EPU	"	9,362	53	26	36
F6AXN	"	7,810	58	21	34
F5NBX	"	3,969	34	29	34
F5SRH	"	2,679	27	20	27
F5PHW	"	805	18	17	18
F1UOD	"	32	19	15	17
TM5Y	21A	750,189	1910	35	144
(OP:F8DBF)					
F1UVN	"	64,752	249	27	87
F4ENK	14A	595,658	1883	37	120
F4GGQ	"	558,909	1730	34	119
F4FFZ	"	423,852	1518	35	108
F8DFP	"	1,980	42	7	26
F6ALX	"	234	8	6	7
F4DVX	7A	457,068	1764	35	129
F4HIK	"	103,138	925	20	86
F1DHX	"	45,747	511	16	53
F4HUA	3.7A	72,254	667	13	78
F8BDQ	"	21,556	297	12	56
*TM3Z	AA	1,881,750	2109	117	462
(OP:F4DSK)					
*F5DRD	"	238,134	605	55	203
*F4KKE	"	80,359	326	36	127
(OP:F6JSZ)					
*F4GOT	"	50,516	299	25	121
*F4GDO	"	38,727	217	32	85
*F4HXC	"	17,622	137	25	74
*F4FRF	"	11,305	67	33	52
*F1IEH	"	4,424	65	13	43
*F4GVE	"	2,760	41	14	32
*F4GLD	"	2,279	45	21	32
*F5LDY	"	1,440	22	16	20
*F4EPP	"	1,110	29	9	21
*F5UAY	"	966	27	18	24
*F1TRE	"	720	12	12	12
*F5TGR	14A	29,714	198	19	64
*F4BHW	7A	68,068	475	22	97
*F4BDG	1.8A	80	8	2	8

Germany

DJ5MW	A	2,291,408	2568	107	392
DJ8OG	"	1,767,840	2056	111	369
DL7BC	"	976,125	1314	88	323
DK6CQ	"	250,900	536	61	199
DG1IU	"	167,889	770	39	152
DH1PAL	"	128,570	388	52	178
DL1TRK	"	127,738	450	47	174
DJ4MO	"	127,070	393	43	151
DF3TE	"	124,574	391	45	154
DKØOF	"	96,624	318	48	150
(OP:DH6BH)					
DR6R	"	94,810	391	44	146
(OP:DL6RBO)					
DK4IO	"	77,924	285	41	120
DL5AWE	"	74,029	316	39	142
DL6DVU	"	64,306	282	37	121
DK5EZ	"	58,136	207	41	131
DL9CP	"	49,724	289	27	97
DM5SB	"	46,200	250	37	117
DKØDI	"	44,902	197	31	112
(OP:DF2ZV)					
DJ9YL	"	44,890	207	43	91
DF6PB	"	43,824	153	50	116
DL2VM	"	42,300	161	49	101
DJ7ØWAE	"	41,031	296	26	115
(OP:DL3FF)					
DL2DSA	"	33,120	160	38	106
DF5BX	"	32,964	276	21	102
DL2KMS	"	31,464	196	30	84
DKØSU	"	24,582	205	22	80
(OP:DF7SA)					
DJ3WE	"	20,910	168	25	77
DK1FW	"	20,485	115	28	57
DL7LX	"	20,178	147	29	89
DL4ABR	"	18,905	157	22	73
DK5WB	"	17,850	137	25	77
DL1BSN	"	17,112	109	30	62
DB3FS	"	17,072	184	22	75
DJ8QA	"	14,040	149	21	69
DH2DAM	"	13,120	121	18	46
DKØUU	"	10,850	75	24	46
(OP:DF2CD)					
DH6MES	"	10,504	94	17	35
DG7FB	"	8,160	108	18	62
DL3BRE	"	5,808	80	16	50
DL3LAB	"	5,676	59	16	28
DL5ML	"	5,406	85	12	39
DC7DX	"	4,836	33	30	32
DD2TC	"	4,661	58	15	44
DL6JH	"	3,192	37	16	26
DL6SBD	"	2,849	53	11	26
DK1LRS	"	2,142	37	12	30
DL2FK	"	2,080	34	14	26
DG4KAL	"	1,376	22	15	17
DL2VNL	"	1,368	46	8	28
DK9MW	"	1,276	23	11	18
DL4DBL	"	300	14	5	10
DL1EIP	"	180	11	4	8
DG1DHS	"	160	18	8	12
DG8KAD	"	90	8	3	7
DB6LY	21	4,794	42	17	34
DK3GG	"	1,326	21	11	15
DK5QN	14	347,795	1234	32	101
DL9LM	"	25,900	230	17	57
DL2LDE	7	57,462	306	26	96
DL5RU	"	33,028	301	18	74
DF2DJ	3.7	10,877	134	14	59
DJ2YE	"	8,619	174	6	45
DJ8ES	1.8	4,972	110	6	38
DM5RC	"	3,040	83	5	35
DK3AX	"	132	13	2	9
*DF3IS	A	365,007	745	71	218
*DK1KC	"	359,488	726	69	259
*DG7LAN/P	"	324,612	1102	55	199
*DM4EE	"	301,474	668	62	245
*DF5BM	"	158,999	606	43	180
*DLØNG	"	151,369	458	54	175
(OP:DK8NC)					
*DL4ZA	"	139,355	542	46	189
*DK2WU	"	128,520	460	45	159
*DL8UV	"	123,692	493	45	169
*DL7VX	"	103,488	450	41	151
*DG2JA	"	102,128	351	47	161
*DF6QC	"	84,175	415	33	152
*DL5LB	"	83,952	416	36	123
*DM7W	"	78,848	325	39	115
(OP:DL8MAS)					
*DL1SA	"	76,287	410	36	141
*DLØRD	"	72,861	306	42	121
(OP:DL7NV)					
*DKØBM	"	66,030	394	30	125
(OP:DK7CH)					
*DL8ULO	"	64,462	340	34	133
*DF6QE	"	63,081	294	39	124
*DL5KBO	"	58,387	335	30	103
*DO1CS	"	55,440	335	32	108
*DK8HE	"	53,760	267	35	125
*DK3WM	"	52,268	200	41	138
*DM5JL	"	48,511	278	34	105
*DJ3GE	"	48,425	249	33	116
*DF1ZN	"	48,128	218	36	92
*DH8DR	"	47,905	237	39	104
*DD5MA	"	47,414	215	37	120
*DM2AWM	"	46,784	245	32	104
*DL1VJL	"	43,086	163	40	89
*DF5RF	"	41,180	216	35	107
*DJ6DO	"	40,828	220	33	85
*DL9OLI	"	37,895	227	32	111
*DD5AJ	"	37,700	167	31	85
*DF7DC	"	34,830	218	30	99
*DF9WB	"	34,020	171	36	99
*DL6MDG	"	33,782	224	29	98
*DL5JS	"	33,517	228	26	95
*DF9IX	"	33,166	170	30	73
*DL5RMH	"	32,315	224	24	91
*DL9HB	"	30,988	164	28	94
*DF6RI	"	29,456	198	23	89
*DO7DOC	"	29,388	267	20	73
*DK7ZH	"	26,781	203	22	91
*DL7FUA	"	26,208	196	29	88
*DL8ZAJ	"	25,760	167	30	82
*DL3SDN	"	24,321	159	31	90
*DO9SR	"	24,196	182	21	71
*DK1YH	"	22,360	229	15	71
*DB2BJT	"	21,505	193	26	89
*DG1LS	"	21,276	202	21	87
*DH9DX/P	"	21,008	178	20	81
*DO6NI	"	20,839	209	19	72
*DK7MCX	"	19,722	134	30	84
*DJ6HR	"	19,228	131	21	71
*DJ9SN	"	18,032	131	24	68
*DK3YD	"	16,848	115	29	75
*DK1WZ	"	16,376	125	24	68
*DL6TS	"	15,834	131	22	65
*DK1MCS	"	15,386	134	23	75
*DL6CT	"	14,450	119	25	60
*DL9FB	"	14,329	114	23	66
*DL6DJ	"	14,028	159	19	65
*DL8AX	"	12,546	111	20	62
*DO3GE	"	12,288	100	26	70
*DG7DBR	"	12,160	172	16	64
*DL4JWU	"	12,144	108	24	68
*DL4ZAA	"	11,782	135	21	65
*DG6DAF/P	"	11,664	118	21	51
*DK4WK	"	11,562	121	19	63
*DD1OP	"	11,388	104	22	56
*DO4HRE	"	11,388	132	15	63
*DL4HWM	"	11,200	129	12	58
*DO2HEY	"	11,154	115	17	61
*DL1LSW	"	10,790	107	21	62
*DO4WLL	"	10,530	142	14	51
*DL1RGA	"	10,191	93	21	58
*DL6EZ	"	10,140	123	17	61
*DJ1FZ	"	10,005	152	15	54
*DL8ZU	"	9,975	89	23	52
*DL9SCO	"	9,514	61	21	50
*DF4LB	"	9,176	116	18	56
*DO8BKF	"	9,000	93	16	44
*DL8TN	"	8,064	67	20	44
*DC5LY	"	7,878	83	21	57
*DK9ZE	"	7,840	103	21	59
*DL1AWC	"	7,370	101	15	52
*DL5HP	"	7,221	74	24	59
*DK6AC	"	6,720	86	19	51
*DL3BCR	"	6,630	58	19	46
*DM4AB	"	6,588	71	18	43
*DF9OB	"	6,510	61	21	41
*DJ6TK	"	6,396	75	16	25
*DO1TOM	"	6,318	119	10	44
*DG9BEO	"	6,279	94	18	51
*DK1AUP	"	6,188	74	18	50
*DK2TS	"	4,898	78	13	49
*DJ4DN	"	4,602	54	17	42
*DL1EJD	"	4,524	70	16	36
*DG9FBA	"	4,361	47	20	29
*DD5KD	"	4,107	47	12	25
*DL1EMA	"	3,976	68	13	43
*DM3BN	"	3,315	58	15	36
*DL1JPF	"	3,264	56	13	35
*DJ3ABC	"	3,124	46	16	28
*DM5CQ	"	3,024	60	13	29
*DL2FBG	"	2,950	54	14	36
*DL5DWF	"	2,760	27	17	23
*DC1DB	"	2,601	59	11	40
*DG1DBY	"	2,501	55	10	31
*DK9MOS	"	2,491	45	14	39
*DK9OS	"	2,444	57	11	36
*DH9FAX	"	2,392	43	14	32
*DO2EN	"	2,268	50	10	26
*DF8UO	"	2,223	45	9	30
*DL1DF	"	1,974	42	14	28
*DK4VF	"	1,734	34	13	21
*DO1BEN	"	1,716	46	8	18
*DL1SMA	"	1,650	39	9	24
*DC6CO	"	1,628	46	8	29
*DD9PS	"	1,612	28	11	15
*DL7CU	"	1,598	40	10	24
*DL7TG	"	1,560	37	12	27
*DK2MB	"	1,406	35	11	27
*DB1VQ	"	1,344	27	12	12
*DO9YJ	"	1,107	25	9	18
*DG3MNF	"	1,054	35	6	25
*DG1SR	"	930	37	7	24
*DJ2IA	"	754	17	12	17
*DH1UZ	"	728	19	10	16
*DM2RH	"	700	21	10	18
*DL6ZNG	"	648	17	11	16
*DD9NT	"	644	18	7	16
*DF1GRA	"	625	25	7	18
*DB3GI	"	456	17	7	12
*DO5MF	"	456	17	10	14
*DL4SZB	"	440	14	9	13
*DG1BQC	"	416	13	7	9
*DH7OM	"	405	9	7	8
*DO2CRB	"	400	19	8	12
*DO1MIC	"	374	19	5	12
*DO1HE	"	340	22	3	14
*DL8MV	"	280	11	6	8
*DL7LZ	"	264	15	9	15
*DK7RD	"	192	6	6	6
*DO6GS	"	120	16	2	10
*DC4CP	"	98	13	5	9
*DL9MFY	28	2	1	1	1
*DO1PCD	21	11,712	99	20	44
*DJ9KH	"	11,594	90	21	41
*DL5KUD	"	8,370	77	16	38
*DO8JL	"	3,920	42	13	22
*DL1RPR	"	3,240	60	10	20
*DK3CC	"	2,178	33	12	21
*DO7ES	"	1,943	39	10	19
*DO5ZX	"	1,612	32	8	18
*DK2YL	"	147	7	2	5
*DO9SL	"	70	4	3	4
*DL9ZP	14	36,893	317	19	60
*DK5FF	"	18,944	189	15	49
*DLØGEO	"	10,494	151	11	42
(OP:DL2YAK)					
*DL7FB	"	9,666	165	11	43
*DL3LJ	"	2,117	35	9	20
*DL7BTW	"	1,632	48	8	16
*DL2QT	"	1,102	24	7	12
*DL1SXB	"	216	10	6	6
*DF4SR	"	110	10	4	7
*DG6SCP	"	100	6	5	5
*DL1STV	"	72	5	3	5
*DL4WA	7	23,788	283	12	64
*DL7DY	"	7,176	107	11	41
*DM2DLG	"	1,260	49	5	25
*DL3LQM	"	288	19	2	14
*DM9MB	"	99	10	3	8
*DG1YHP	"	96	12	3	9
*DO3GLM	3.7	17,700	298	8	52
*DO1RWM	"	3,700	140	4	33
*DO3NN	"	1,140	47	5	25
*DL3EAZ	1.8	5,106	110	6	40
*DL2RZG	"	1,984	66	4	28
*DL2PK	"	130	13	3	10
DM4X	AA	3,307,388	3005	125	477
(OP:DD2ML)					
DL1MGB	"	1,587,716	1691	120	374
DL1NKS	"	1,169,144	1692	96	376
DL4LAM	"	1,021,515	1350	92	359
DL5AN	"	982,016	1022	114	398
DL5GAC	"	887,801	1166	105	382
DF2LH	"	871,416	1022	104	390
DL2CC	"	868,644	1072	83	300
DP5N	"	853,710	1501	83	315
(OP:DJØACA)					
DG9SEH	"	718,094	990	85	304
DF2RG	"	700,448	913	92	332
DL7ON	"	700,425	735	109	386
DLØESA	"	672,404	980	85	303
(OP:EA1HEO)					
DL1ATZ	"	613,872	867	100	332
DK5TX	"	610,600	1031	72	272
DL7URH	"	608,542	894	93	305
DM4M	"	548,954	1047	74	273
(OP:DM4IM)					
DK2LO	"	543,444	955	76	282
DL7CX	"	525,007	791	91	328
DK4VW	"	499,664	840	86	248
DF8XC	"	477,792	619	88	290
DJ5AN	"	454,328	684	101	291
DM5EM	"	446,085	712	83	262
DG5E	"	431,361	672	88	281
(OP:DK2CX)					
DJ9HX	"	388,960	617	81	271
DL7UXG	"	348,270	756	66	216
DL1NEO	"	322,354	597	73	250
DK8AX	"	312,480	404	94	278
DK2AT	"	291,116	599	65	216
DL6DH	"	260,715	561	57	216
DL4SKF	"	245,594	522	69	212
DL5YM	"	243,285	543	59	186
DJ8QP	"	231,073	392	79	232
DK1AX	"	230,112	344	87	201
DK2MX	"	224,316	548	65	203
DL4JLM	"	201,960	390	66	189
DL2DQL	"	199,434	467	63	195
DJ6TB	"	197,955	468	66	199
DL8AAE	"	186,221	492	64	195
DG7NFX	"	168,300	482	50	175
DL6ON	"	167,919	499	47	204
DK7A	"	158,064	340	65	231
(OP:DJ8VH)					
DK5DQ	"	153,426	233	76	205
DF9VJ	"	153,296	455	50	158
DG7JB	"	146,412	452	50	202
DK6VCO	"	140,748	489	47	175
DD5ZZ	"	137,940	358	57	163
DC2YY	"	136,276	396	51	166
DB25ONN	"	133,666	463	51	143
(OP:DC3RJ)					
DL5ST	"	121,983	441	50	169
DH8LAW	"	121,599	360	51	178
DJØIF	"	113,090	344	57	158
DC1HR	"	111,447	349	51	152
DJ7YP	"	109,002	250	51	171
DL9BBE	"	90,744	279	50	149
DJ1TU	"	88,566	301	45	129
DJ5LA	"	87,429	195	55	138
DJ2QV	"	84,360	248	54	131
DJ1AA	"	79,790	299	38	120
DK6AH	"	79,692	295	44	130
DG4MB	"	76,936	341	40	123
DL5YL	"	76,152	256	51	116
DL2OE	"	65,940	176	47	110
DL3SKF	"	64,944	237	46	130
DK9KW	"	57,450	182	47	103
DL6JZ	"	57,330	229	37	110
DL1YM	"	55,664	198	37	61
DL3DW	"	54,720	211	47	124
DL5AXX	"	53,952	289	22	42
DH5MK	"	53,328	202	36	140
DK9IP	"	46,800	171	41	109
DK5KK	"	43,500	239	25	100
DK6SP	"	42,458	222	37	105
DG7CF	"	31,892	196	29	105
DL1DBR	"	30,562	186	32	86
DR2P	"	29,253	239	32	115
(OP:DJ4AK)					
DL6MFK	"	26,864	126	33	59
DL1HAZ	"	25,920	156	33	102
DL9FBF	"	25,185	109	30	85
DL9FCR	"	23,218	179	25	69
DL1LOD	"	22,500	118	29	71
DK7ZT	"	22,230	147	27	90
DLØLK	"	22,072	158	18	44
(OP:DG7AK)					
DG4DX	"	21,658	137	25	66
DL5ASK	"	19,095	117	25	70
DP4D	"	18,975	129	22	53
(OP:DJ4MG)					
DL8UI	"	18,357	79	40	47
DL1CG	"	15,222	87	26	60
DJ2YA	"	14,652	85	15	84
DL1STG	"	13,167	79	31	68
DF1LON	"	12,960	112	19	62
DK5RL	"	12,019	70	36	65
DL7USM	"	10,323	79	28	65
DB4MM	"	10,176	73	23	41
DK3GI	"	9,204	66	27	51
DJ1TO	"	7,742	87	18	61
DK3HV	"	5,184	44	22	32
DM3JAN	"	5,100	66	18	50
DC2FB	"	4,250	72	14	36
DG7RO	"	3,762	43	23	43
DM3ZF	"	3,392	45	11	42
DF2FR	"	3,120	45	16	36
DF3QG	"	2,337	33	15	26
DK2WF	"	2,128	24	18	20
DL9OHA	"	1,152	18	15	17
DL7FP	"	928	17	15	17
DF4JM	"	896	32	10	22
DF1LX	"	160	11	5	11
DK7AC	"	54	3	3	3
DH8BQA	21A	305,888	845	32	126
DL1SEH	"	43,290	211	24	66
DL1RG	"	5,412	59	14	27
DL2ARD	14A	1,132,136	2764	40	148
DK7TX	"	168,270	577	32	110
DF6QV	"	21,252	151	15	51
DL1KID	"	70	4	3	4
DL5L	7A	281,714	1226	34	124
(OP:DGØOKW)					
DK9HN	"	650	18	7	18
DMØY	3.7A	184,920	1482	24	96
(OP:DL3BQA)					
DB2B	"	88,755	925	14	83
(OP:DL8OBF)					
DM5TS	"	1,131	40	5	24
DH8WR	1.8A	1,363	60	4	25
*DF2AJ	AA	565,869	853	94	323
*DQ1P	"	565,323	738	98	309
(OP:DK1IP)					
*DL1WA	"	519,520	838	77	305
*DR1F	"	227,900	432	67	198
(OP:DG3FK)					
*DH4PSG	"	225,720	559	57	228
*DJ1OJ	"	193,140	464	58	203
*DG5MLA	"	183,194	481	56	186
*DK5DC	"	178,347	322	67	202
*DM5Z	"	175,770	489	48	169
(OP:DM5JBN)					
*DJ6OZ	"	135,675	381	50	151
*DD1LD	"	129,340	327	53	170
*DB8AH	"	118,440	413	44	166
*DJ3JD	"	117,055	439	45	160
*DL1EHR	"	106,964	408	44	143
*DL1JNA	"	103,790	307	46	148
*DL2SWR	"	100,602	331	49	158
*DL5ALW	"	98,250	256	56	194
*DL1GME	"	87,612	324	45	151
*DO6LE	"	76,908	297	39	117
*DL3DRN	"	73,062	325	38	124
*DL6RBH	"	66,789	261	44	137
*DH1TST	"	63,070	241	42	128
*DJ6RN	"	62,884	298	37	121
*DG1PM	"	54,058	235	40	111
*DC2CB	"	49,432	259	37	111
*DD6DR	"	43,941	274	32	119
*DJ2FR	"	36,564	218	28	104
*DO4TP	"	35,178	196	28	95
*DJ9MH	"	34,606	177	32	111
*DF1MM	"	32,092	150	30	112
*DJ7A	"	30,523	280	25	106
(OP:DJ7AT)					
*DO1SJF	"	28,548	142	34	83
*DF5FS	"	27,830	185	26	89
*DL2FQ	"	25,425	114	38	75
*DO5JD	"	24,648	263	19	85
*DKØKG	"	24,628	283	17	77
*DL7YS	"	23,712	114	37	77
*DL5ANS	"	20,944	111	25	94
*DO9ST	"	18,011	171	19	64
*DL7UGN	"	17,992	119	26	78
*DL5ZB	"	17,869	70	43	64
*DB1BAC	"	17,748	120	29	87
*DM6DX	"	15,616	104	36	86
*DGØOJO	"	15,048	137	23	65
*DLØGEL	"	13,261	119	24	65
*DL1NHW	"	10,412	116	21	55
*DO1MPR	"	10,125	113	22	59
*DGØLFG	"	10,086	70	26	56
*DL1SO	"	9,652	105	18	58
*DK4MDA	"	9,135	90	22	65
*DC8WPA	"	9,120	125	17	59
*DK9LB	"	8,640	104	16	64
*DL6BS	"	7,995	114	16	49
*DF2DR	"	7,524	62	19	38
*DL2ADI	"	7,420	87	18	52
*DL6RAI	"	6,916	76	17	35
*DL/PA3DAT	"	5,100	74	18	50
*DR4K	"	4,704	81	10	46
*DF6YC	"	4,575	62	19	42
*DM3F	"	4,575	41	24	37
(OP:DH5FS)					
*DL5OCR	"	4,212	81	11	43
*DL1DVE	"	4,080	73	13	38
*DL8BFV	"	3,780	31	25	29
*DH2PAF	"	3,710	60	12	41
*DL7AOS	"	2,886	65	9	30
*DO1KUB	"	2,652	57	11	28
*DD9WL	"	2,211	29	15	18
*DG2GG	"	2,142	25	15	19
*DL1NKB	"	1,813	37	12	25
*DL9GMN	"	1,680	31	12	23
*DJ3XM	"	1,620	42	9	21
*DL8JDX	"	1,584	22	14	22
*DL1NUX	"	1,512	26	11	13
*DL1PT	"	1,462	41	13	30
*DM2XM	"	1,368	30	15	21
*DM5DX	"	1,064	22	16	22
*DL4LT	"	972	26	13	23
*DL2BO	"	874	16	12	11
*DO1BA	"	840	27	8	16
*DF5EM	"	650	27	8	18
*DL8RB	"	598	16	4	9
*DK7NC	"	400	12	7	9
*DFØSL	"	220	8	5	6
(OP:DDØNM)					
*DG1UAE	"	110	6	5	6
*DL8MH	21A	17,464	113	23	51
*DO7JLF	"	9,234	96	17	37
*DL4VAI	14A	56,448	319	20	76
*DL4YR	"	19,570	103	22	73
*DL9NCR	"	15,738	128	17	44
*DG2BHB	"	13,940	113	15	53
*DM5MR	"	2,368	28	15	22
*DM7CW	"	1,827	43	9	20
*DL2YCD	7A	5,082	66	11	55
*DL7PY	"	2,520	56	8	27
*DK2DQ	"	1,566	22	8	21
*DF2EBT	"	180	18	3	12
*DL3ANK	3.7A	16,758	260	9	54
*DO6PA	"	5,031	159	4	35

Greece

SV6JHA	A	122,760	239	71	193
SV2DGH	"	27,328	129	37	85
SV1JSO	"	21,420	126	30	89
SV3FUO	"	180	11	5	10
SV1KYC	21	27,141	169	19	64
SV1PMR	14	152,570	1118	27	83
*SV2HJQ	A	121,346	616	37	129
*SV2AIU	"	97,432	355	45	107
*SV2DFK	"	51,013	206	39	100
*SV1RMB	"	43,548	279	27	87
*SV1OCQ	"	21,691	183	26	83
*SV6NNZ	"	12,900	107	21	65
*SV7CUD	"	11,904	91	30	63
*SV3QUY/1	"	8,374	104	22	57
*SV1CEI	"	2,484	23	18	18
*SV1RUX	"	2,160	36	12	28
*SV1QVY	"	2,107	51	15	34
*SV2SDP	"	2,016	51	11	31
*SY3CMU	"	1,855	35	10	25
*SV1VN	"	525	11	10	11
*SV1AZL	"	340	10	10	10
*SV2YC	14	9,169	97	13	40
*SV4RNT	"	4,720	98	6	34
*SV2QQZ	"	0	1	1	1
*SW3JH	7	20,172	212	14	68
(OP:DJ5JH)					
SV2GJV	AA	65,352	212	44	124
SV1BFW	"	28,994	88	54	79
SV4LQW	"	8,034	86	21	57
SV1DKD	"	6,264	99	13	41
SV3EXU	"	3,772	34	21	25
SV1IYY	"	3,234	34	17	32
SV2KGA	"	816	14	11	13
SV7QNV	"	224	14	4	12
*SV7BVM	AA	85,251	318	49	132
*SV3RPQ	"	56,440	238	44	122
*SV6EBQ	"	13,494	125	20	58
*SV7JJZ	"	8,505	93	16	47
*SV2MJY	"	7,315	98	15	40
*SV8NBI	"	3,180	57	15	38
*SV1DZI	"	2,544	35	18	30
*SV8LMQ	"	2,115	34	18	27
*SV1XV	"	744	17	10	14
*SV7RRL	"	520	12	10	10
*SV7RIB	"	266	7	7	7

Guernsey

*MUØFAL	A	31,262	193	25	73
*MUØGSY	7	47,808	531	15	68

Hungary

HA3DX	A	853,596	1415	89	304
(OP:HA4XH)					
HA1BC	"	586,606	1203	77	282
(OP:DL1MAJ)					
HA2KSD	"	2,318	58	10	28
HA8JV	14	24,804	311	9	27
HG8R	7	368,100	1709	34	116
(OP:HA8JV)					
HG2DX	3.7	108,240	832	20	90
HG5R	"	71,841	923	12	65
(OP:HA8JP)					
*HG6V	A	543,904	1068	76	292
(OP:HA6IAM)					
*HA6NL	"	212,052	689	52	194
*HA7PO	"	86,304	352	44	142
*HA3FHH	"	41,496	156	32	101
*HA9MDN	"	32,107	213	27	70
*HA3FMR	"	1,023	27	10	21
*HA4UC	14	3,952	79	7	31
*HA8MZ	"	800	36	6	19
*HA7JIV	7	273	21	3	10
*HA9GKL	"	144	10	5	7
HA7VK	AA	317,322	731	64	242
HA1TNX	"	221,760	407	78	230
HA5BI	"	112,860	345	55	143
HA5DDX	"	43,061	109	58	91
HAØHW	"	30,969	177	31	80
HA1TJ	21A	575,575	1578	38	137
HG3R	14A	784,399	2462	40	127
HA3LN	"	629,680	2095	36	134
HG4F	"	254,520	1155	33	107
(OP:HA4FF)					
HA9A	"	168,960	827	29	103
(OP:HA9AX)					
HA8M	7A	789,888	2846	37	139
HA7RY	"	66,783	446	24	89
HA8TP	"	14,190	137	15	51
HA7I	1.8A	60,183	706	13	68
(OP:HA7JTR)					

*HA6PJ	AA	209,250	560	65	205
*HA1RJ	"	35,912	203	33	101
*HA7MS	"	2,773	49	10	37
*HG8C	21A	54,012	276	24	60
*HA5PP	7A	137,760	1018	22	98
*HG8YKO	3.7A	12,376	209	8	48

Iceland

TF3SG	*A*	*2,970*	*44*	*19*	*36*
TF3CW	7	126,635	950	19	76
TF2LL	"	60,687	508	19	80
TF3T	3.7	62,080	736	13	67
*TF8KY	A	110,722	430	41	125
*TF2MSN	"	97,728	341	43	149
TF3DT	AA	51,042	288	27	114
TF3AO	14A	54,112	595	15	61
TF3JB	3.7A	31,360	398	12	58
*TF3DC	AA	8,613	76	20	67

Ireland

TF1AM	A	276,390	1107	48	174
TF3Y	"	7,350	71	20	30
*TF2MSN	A	33,919	179	25	82
*TF8KY	"	23,765	197	22	75
*TF3VS	"	12,127	119	17	50
*TF3VP	"	741	42	6	13
TF3DT	AA	18,500	133	22	78
TF3T	3.7A	50,730	435	17	72

Ireland

EI9CN	A	86,840	388	37	130
EI5KG	"	61,149	263	33	76
EI7M	14	931,042	3095	35	111
					(OP:EI3JZ)
EI5IX	7	661,821	2738	38	129
EI5GUB	1.8	18,810	272	11	55
*EI4GNB	A	323,680	813	56	224
*EI3ENB	"	48,672	247	40	116
*EI9HSB	"	20,384	186	24	80
*EI/OK1NYD	"	3,330	62	14	31
*EI5KO	"	2,664	50	10	26
EI7CC	AA	81,648	312	41	127
EI7HVB	"	9,100	120	16	49
EI8IU	1.8A	7,968	171	6	42
*EI4CF	AA	57,720	172	44	141
*EI9HX	7A	320,160	1676	29	116
*EI5KF	1.8A	195	12	4	11

Isle of Man

GD9W	A	2,913,428	3431	96	373
					(OP:MØDXR)
*GD7RVP	A	19,260	149	22	85
*2DØXPS	"	5,220	83	14	46

Italy

IB2M	A	859,805	1309	79	280
IØLYO	"	699,270	1219	84	306
IZ6ERS	"	662,660	1494	82	258
IZ8FFA	"	519,720	997	80	275
IZ5WTV	"	289,971	585	69	234
IZ6OUX	"	158,286	661	49	173
IZ2SMQ	"	156,832	398	56	176
IK8NSR	"	150,096	455	53	159
II4A	"	114,318	386	46	100
					(OP:IK4ADE)
IK7NXU	"	90,636	278	51	131
I4AUM	"	90,538	291	52	151
IW1FGY	"	86,460	282	45	120
IK1BPL	"	49,617	176	43	106
IK3SSW	"	43,248	144	36	123
IZ3ZLG	"	35,535	217	29	86
IU5JHK	"	31,944	206	34	87
IZ4EFP	"	27,965	145	34	85
IZ8QNS	"	23,940	136	35	91
IK2AHB	"	22,008	123	28	56
IW1RGP	"	18,768	136	27	65
IX1FIT	"	17,266	115	21	68
IZ3DVU	"	16,068	90	28	50
IK2OLJ	"	10,584	96	25	59
IZ5NSH	"	7,930	48	27	34
IZ2SNI	"	7,797	51	24	45
4U73B	"	6,100	84	17	33
					(OP:9A3A)
IN3EIS	"	*5,632*	*60*	*22*	*42*
IK2IKW	"	4,928	63	18	46
IU2CKS	"	4,005	96	9	36
IU1AUG	"	2,924	48	14	29
IWØEZW	"	1,240	36	9	22
IU5FFM	"	1,210	21	11	11
IK3GBG	"	728	18	11	17
IZ4UFB	"	640	21	13	19
IW5DPF	"	*638*	*20*	*13*	*16*
IN3ELX	"	342	10	8	10
IK2UUJ	"	252	7	5	7
IR7R	21	42,028	279	23	53
					(OP:IZ7GXB)
I4LCK	"	29,868	182	21	55
IQ5PO	"	24,929	127	29	68
					(OP:IZ5VCI)
IW3RQT	"	672	16	6	10
IK4AUY	14	78,085	345	26	89
IIØI	"	45,815	431	22	55
					(OP:IZØPAU)
IZ2JCD	"	29,393	174	23	68
IU4FIT	"	25,670	187	21	64
IW1RBI	"	8,970	86	13	33
IWØBLW	"	4,224	72	10	23
IU4HMP	"	2,822	48	9	25
IK3ZAQ	7	175,571	1325	27	94
IZ7NMD	"	30,168	446	14	58
IQ2XZ	"	19,740	170	17	67
IØBYR	"	120	8	4	6
IZ1GAR	3.7	41,496	483	12	64
*IK2QLX	A	211,560	540	62	196
*IK1XPK	"	188,370	522	59	175
*IU1FSL	"	183,995	574	54	191
*IK1JJM	"	157,560	605	53	149
*IK1RGK	"	153,397	455	53	158
*IZ2OOS	"	120,367	420	44	153
*IZ2SXZ	"	113,460	348	43	140
*IK2JTS	"	94,478	377	50	144
*IU4APB	"	71,400	279	41	127
*IK5MES	"	66,495	247	38	117
*IU4HMY	"	62,390	261	42	128
*IKØVWH	"	60,759	253	37	120
*IU3GKJ	"	60,000	246	39	121
*IW2NEF	"	58,557	232	34	115
*IUØKAH	"	56,457	227	41	112
*IZ2NZQ	"	53,196	242	36	120
*IK4BEI	"	51,491	232	37	114
*IU8DSP	"	49,200	186	35	115
*IK5BDG	"	47,334	257	33	105
*IZ1UKF	"	46,860	177	46	96
*IU2GGD	"	46,282	224	37	109
*IQ2XI	"	44,484	200	33	99
*I1RB	"	44,250	245	39	111
*IV3EWO	"	38,989	242	27	100
*I4VIL	"	34,452	167	30	86
*IK4NZD	"	34,200	252	16	41
*IZ2BKA	"	30,294	179	25	77
*IZ4EKI	"	29,854	234	29	89
**IV3WMI*	"	*27,735*	*144*	*34*	*95*
*IZ2BZP	"	26,085	166	24	87
*IK4JQQ	"	25,645	198	25	90
*IU6FUB	"	25,272	156	32	85
*IW2FUT	"	24,864	198	18	78
*IU3GJD	"	23,871	131	35	74
*IZ4AIF	"	23,865	150	33	78
*IK3XTT	"	23,816	148	32	72
*IW4EGX	"	23,498	139	22	40
*IZ1LAY	"	22,990	158	31	90
*I2OGV	"	22,900	137	29	71
*IU1FIB	"	22,770	144	27	83
*IX1HPN	"	22,568	158	25	79
*IK8ARF	"	21,850	144	28	67
*IN3JRZ	"	19,992	190	20	78
*IU8GYT	"	18,480	191	29	103
*I3GWE	"	18,468	99	29	85
*IK2SAR	"	18,304	94	34	70
*IK6SBW	"	17,949	119	29	64
*IWØHLZ	"	16,218	174	24	78
*I3TXV	"	15,520	84	30	50
*IN3EOM	"	13,824	109	26	70
*IU8JPG	"	12,784	70	31	63
*IV3APH	"	11,726	111	20	62
*IZ7EUB	"	11,680	56	34	46
*IK2YSJ	"	11,316	116	23	59
*IK2OFS	"	11,026	99	27	47
*IW1BEF	"	10,608	102	22	56
*IW2BZY	"	9,804	76	22	54
*IK8JVG	"	9,760	70	29	51
*IWØAEN	"	9,758	96	22	60
*IC8AJU	"	9,372	74	23	43
*IN3FWK	"	8,960	136	17	63
*IK6UBY	"	8,954	99	18	56
*IQ5ZR	"	8,715	70	31	52
*IK2AUK	"	8,694	96	18	51
*IU8CNE	"	8,505	63	28	53
*IK3MLF	"	7,245	50	29	40
*IU4FJL	"	7,102	84	17	50
*IX1AMY	"	7,029	77	18	53
*IU3KHI	"	6,930	101	14	56
*IZ3ZBP	"	5,888	50	25	39
*IZ3NUI	"	5,244	74	13	33
*IU5BKR	"	5,220	61	15	45
*IW8ENL	"	4,650	72	19	43
*IN3MNS	"	4,248	57	12	47
*I2RBR	"	4,214	42	18	25
*IU2KBY	"	3,950	67	11	39
*IQ3VI	"	3,700	66	11	39
					(OP:IZ3ZOO)
**IK2UJF*	"	*3,500*	*57*	*12*	*38*
**IU8LCS*	"	*3,480*	*85*	*12*	*46*
*IW2OEV	"	3,363	52	19	38
*IZ5IMB	"	2,880	55	12	36
*IU2HUQ	"	2,852	57	11	35
*IZ8SFM	"	2,765	31	15	20
**IZ2SDK*	"	*2,730*	*25*	*19*	*23*
*IU3EIY	"	2,337	25	20	21
*IZ2JNN	"	2,294	34	13	18
*IUØJIW	"	2,156	41	16	28
*IU5KZG	"	2,128	28	14	24
*I1DXD	"	1,932	26	18	24
*IN3ADW	"	1,480	37	10	27
*IK1HZZ	"	1,320	19	10	14
*IK5AMB	"	1,260	19	12	16
*IU2JWP	"	1,188	22	9	18
*IU2ACI	"	1,152	18	14	18
*IU4FKM	"	1,120	30	11	21
*IU1CYF	"	1,102	26	8	21
*IU8DFD	"	1,089	37	8	25
*IW3IOD	"	1,088	32	10	22
*IZ8CLM	"	1,053	15	13	14
*IK2WQD	"	988	22	10	16
**IK3TZB*	"	*936*	*16*	*12*	*14*
*IU4CZW	"	930	28	11	20
*IK8YFW	"	900	22	12	18
*IZ5HQB	"	900	28	9	16
*IK2SYK	"	896	24	12	20
*IU7BPF	"	792	12	10	12
*IU2IHM	"	704	25	10	22
*IWØGVG	"	550	14	11	14
*IZ1MHY	"	432	13	8	8
*IZ1FRM	"	378	9	6	8
*IW1BBQ	"	221	13	6	11
*IK2REA	"	192	12	5	7
*IK5AFJ	"	156	12	3	9
*IW2DFS	"	88	6	5	6
*IW8FBM	"	8	4	4	4
*IZ3EBA	"	0	2	2	2
*IK4DCX	21	21,420	124	21	42
*IZ7WWY	"	17,812	111	24	49
*IU5CTX	"	13,608	82	22	50
*IV3ZNK	"	10,738	94	19	40
*IU4DAF	"	10,404	92	16	35
*IW2ENA	"	4,797	62	14	27
*IZ5HZO	"	3,774	51	12	25
*IX1CKN	"	2,268	52	8	20
*IZ1PHT	"	1,298	28	8	14
*IW1FRU	14	252,340	934	31	117
*IZ1PNT	"	40,200	182	28	72
*IZ4IRX	"	19,338	169	16	50
*IU2HEE	"	7,592	105	10	42
*IU1DUB	"	5,504	76	10	33
*IZ2ABI	"	5,040	76	12	36
*IU3KPF	"	4,280	88	8	32
*IN3EMI	"	1,479	41	5	24
*IV3XPP	"	276	16	10	13
*IV3HJB	"	8	2	2	2
*IK4OMO	7	28,269	318	15	66
*IK7JVE	"	10,465	208	10	55
*IU5ICR	"	2,294	42	12	25
*IU8GWJ	"	1,271	50	8	23
*IZ8IBC	"	1,247	33	8	21
*IU4BUQ	"	195	9	6	9
*IZ2CSX	"	168	12	3	11
*II3BVV	"	60	9	4	8
					(OP:I3GJJ)
*IU5KZL	"	18	5	2	4
*IU1HHA	"	16	2	2	2
*IW4CNY	3.7	12,876	230	8	50
*IV3UHL	"	5,934	130	6	40
*IK5TBK	"	5,610	119	8	43
*IK3AVM	"	3,990	104	6	36
*IK3SSJ	1.8	9,792	209	7	44
I2WIJ	AA	1,708,168	1565	128	488
I2SVA	"	601,250	890	85	285
IK3TPP	"	333,576	490	88	281
IKØXBX	"	237,250	406	86	279
IV3DSG	"	236,652	525	65	181
IK5IFH	"	176,412	354	66	178
IZØOTV	"	149,600	336	62	158
IO2X	"	142,386	496	36	78
					(OP:I2VXJ)
IK5PWS	"	102,375	368	45	150
IZ1OSP	"	88,944	353	49	155
IU4FLO	"	87,932	287	76	171
IV3JVJ	"	*75,750*	*252*	*46*	*104*
I4MKN	"	66,066	200	49	105
IZ4JMU	"	57,539	341	41	122
IK2TYL	"	51,840	188	47	97
IØWBX	"	45,753	220	40	111
IZ3XEF	"	33,027	125	40	69
IK2YFT	"	25,704	125	29	79
IZØBVU	"	22,774	115	35	83
IU8LMC	"	16,128	99	32	64
IK8SCR	"	14,746	84	36	65
IK5FKF	"	11,552	84	21	55
IZ2WTZ	"	11,175	97	22	53
IKØYUT	"	7,260	66	19	25
IV3DXW	"	6,960	48	23	35
IK3SCB	"	5,876	50	16	36
IK4DZB	"	*5,415*	*37*	*21*	*36*
IZ8DVD	"	5,141	43	22	31
I1CHC	"	*5,060*	*39*	*17*	*27*
IK4UOA	"	4,698	45	23	31
IX1CLD	"	4,620	35	16	28
IK2WSJ	"	*4,094*	*43*	*17*	*29*
IZ8HUJ	"	3,286	44	19	34
IC8POF	"	3,042	39	11	15
IZ5FDJ	"	*1,643*	*23*	*14*	*17*
IR4Y	"	1,634	30	7	12
IV3IPS	"	1,584	24	13	20
IKØMAZ	"	912	16	10	14
I7CSB	"	792	12	10	12
IB4X	21A	212,226	665	34	129
					(OP:IZ4ORO)
IZ5CML	"	147,254	455	31	111
IZ8IEV	"	75,120	289	32	88
IR4E	"	55,458	260	31	86
					(OP:IK4ZHH)
IK5NLA	"	1,680	23	12	18
IZ4COW	14A	297,807	973	34	125
IK2XDE	"	244,461	936	32	115
IK4UXB	"	233,600	897	32	114
IO3X	"	229,555	843	35	120
					(OP:IV3JCC)
IK6QON	"	211,437	1226	28	95
I1NVU	"	165,760	633	34	114
IW1CHX	"	118,389	794	21	72
IU3BTY	"	69,972	498	24	78
IZ2FLX	"	44,404	323	16	52
IZ5RKC	"	828	26	7	16
IW2MZX	7A	169,830	1083	29	106
IK5RUN	"	93,456	441	29	103
IU1JCZ	"	49,344	493	17	79
I8UZA	"	22,454	152	21	82
I1JTQ	3.7A	124,187	944	20	93
IZ7ECL	"	11,832	216	9	49
*IZ3NYG	AA	360,927	588	96	261
*IZØDXD	"	190,816	487	64	204
*IQ2DN	"	174,730	582	47	155
					(OP:IZ2JQP)
*IK3XTV	"	121,429	355	52	157
*IV3ONZ	"	53,480	347	25	115
*I2BRT	"	51,084	195	39	93
*IU3EDK	"	42,826	249	28	105
*IW3BAS	"	37,632	236	26	102
*IW2EVH	"	34,596	148	37	87
*IK3XJP	"	31,020	103	47	63
*IU4DTV	"	18,928	143	27	77
*IW2MYH	"	18,540	102	31	59
*IU2GPJ	"	13,110	88	30	65
*IZ7GEG	"	12,470	63	35	51
*IR1X	"	10,998	136	19	59
					(OP:IZ1GLX)
*IU1LCU	"	8,768	105	16	48
*IU1IMC	"	8,700	103	18	57
*I5IIL	"	7,540	77	22	43
*IN3FOI	"	7,236	90	15	52
*IZ8LKL	"	6,231	46	25	42
*IV3DCZ	"	4,560	66	15	45
*I3MDU	"	4,085	49	14	29
*IW5ECW	"	2,496	40	11	28
*IK5YJK	"	2,440	40	12	28
*IK2RLS	"	2,220	44	9	28
*IZ4XAI	"	2,166	40	13	25
**IK4MTF*	"	*1,836*	*29*	*10*	*26*
*IZ2ZPM	"	1,394	26	15	26
*IZ5MMT	"	1,147	28	9	22
*IW5EIJ	"	1,128	21	10	14
*IW7DZN	"	527	11	7	10
*IU1LFA	"	315	16	8	13
*IZØYIQ	"	169	17	3	10
*IUØDMP	21A	7,130	79	15	31
*IK3SSG	"	6,768	70	16	32
*IK4WMH	"	420	10	6	9
*IK4LZH	14A	357,018	1221	34	123
*IZ8EFD	"	95,130	531	29	97
*IW2MXY	"	62,348	367	24	85
*IZ5CMI	"	36,720	200	24	78
*IU2JMZ	"	26,070	287	15	51
*IK2ULV	"	6,552	74	13	39
**IK1TTD*	"	*725*	*31*	*6*	*19*
*IZ4REF	7A	110,823	787	24	99
*IR4P	"	57,245	438	17	90
					(OP:IK4RVG)
*IK8DNJ	"	37,932	257	25	84
*IZØHLY	"	13,200	141	14	61
*IU4JJP	"	9,240	133	10	50
*IQ3UV	"	2,178	86	4	29
*I2GPT	"	1,040	24	9	17
*I3QJZ	"	594	13	10	12
*IU2GGS	"	475	19	6	13
*IZ5ILK	3.7A	3,225	59	9	34
*IB5A	1.8A	266	20	3	11
					(OP:IZ5OQX)

Kaliningrad

UA2FZ	A	1,142,532	1484	104	343
RA2F	"	155,480	536	42	142
*RA2FB	28	54	9	2	4
*R2FCC	14	7,693	117	11	38
*RW2F	3.7	43,602	468	15	63
					(OP:RA2FA)
UA2FF	21A	338,778	945	35	142
*RT2F	AA	32,926	199	28	73
*R2FBK	"	18,684	155	29	79

Latvia

YL2GD	A	510,543	1013	74	223
YL3HE	"	48,692	295	31	117
YL2CI	14	272,875	1207	31	94
*YL2JR	A	3,233	47	16	37
*YL3GY	"	1,512	28	10	18
*YL2LW	21	21,312	128	25	49
*YL3AD	3.7	18,018	266	8	55
*YL3AKM	"	33	11	4	7
YL2SM	AA	2,216,622	2168	129	442
YL2SW	"	1,735,181	2188	106	403
YL2PP	"	205,744	446	75	233
YL2KO	"	177,408	393	62	162
YL5T	"	63,798	219	42	105
					(OP:YL3DQ)
YL2IP	"	10,010	108	19	58
YL7X	21A	391,326	1091	36	138
					(OP:YL2LY)
YL7A	7A	50,407	248	31	102
					(OP:YL2GM)
YL3FO	1.8A	10,850	205	10	40
*YL2QV	AA	93,867	288	51	150
*YL2NK	"	44,551	281	29	120
*YL3GX	"	17,169	129	28	69
*YL3GV	21A	24,336	205	21	57
*YL3IR	"	2,760	34	18	28

Lithuania

LY2AE	*A*	*232,068*	*579*	*57*	*192*
LY2BAA	"	35,518	225	28	90
LY5O	"	16,195	118	23	56
LY2BIS	14	64,893	480	21	76
LY2AJ	"	42,408	401	18	58
LY2KA	7	81,625	491	29	96
LY4T	1.8	3,069	106	5	26
*LY5XX	A	388,614	1323	57	214
*LY1SR	"	310,208	998	55	207
*LY2N	"	203,090	582	46	184
*LY5AX	"	103,250	540	33	142
*LY2DX	"	94,248	389	39	159
*LY1M	"	40,375	266	28	97
**LY1K*	"	*28,375*	*188*	*28*	*97*
*LY2LF	14	1,204	51	6	22
*LY5AT	"	741	27	6	13
*LY5T	7	82,566	726	19	80
*LY5I	"	34,224	294	17	75
*LY9A	3.7	86,955	984	13	72
*LY5Q	"	16,368	246	10	56
*LY5S	"	3,852	129	6	30
*LY5YY	1.8	54	9	3	6
LY7Z	AA	5,558,220	4874	144	561
LY5Y	"	1,415,775	1664	99	340
LY2NY	"	701,800	1067	90	350
LY2SA	"	594,819	1084	85	302
LY1R	"	503,754	839	74	265
LY2TS	"	464,548	1012	68	261
LY9Y	"	445,397	647	88	331
LY2BKT	"	375,099	1088	55	236
LY3CY	"	87,381	399	35	136
LY2XW	"	87,016	320	43	103
LY7M	"	42,614	239	39	110
LY2CX	"	29,088	123	33	63
LY4BP	"	8,410	152	11	47
LY2W	21A	14,299	94	28	51
LY2MM	14A	626,454	1995	37	125
LY2K	"	415,380	1815	37	124
LY1FW	7A	544,978	2429	35	131
LY2FN	3.7A	102,960	729	23	97
LY2PAD	1.8A	8,470	148	9	46
LY2AX	"	494	27	4	15
*LY5BT	AA	55,937	497	20	111
*LY4MA	"	23,700	306	17	58
*LY3B	"	19,796	172	25	76
*LY3A	21A	52,156	178	31	87
*LY2BBF	14A	11,118	168	12	39
*LY2OU	7A	66,976	575	18	86
*LY2MC	"	24,414	260	13	65

Luxembourg

LX4A	21	39,042	352	24	57
					(OP:LX1NO)
*LX1DKE	A	27,552	206	24	88
LX1HD	AA	179,740	674	48	172
LX1IQ	7A	17,190	119	21	69
*LX/G1TPA	AA	186,498	637	47	187
*LX/PA3DAT	"	4,284	57	18	45

Macedonia

Z35M	A	57,900	284	32	118
Z33B	14	16,482	208	15	52
Z36N	1.8	8,721	166	8	43
*Z35W	A	139,682	522	49	162
*Z35O	"	17,114	139	23	63
*Z33ST	"	8,256	98	15	49
*Z34PEC	"	5,616	70	16	36
Z35Y	AA	17,513	150	22	61
Z32U	"	14,535	101	26	69
*Z36W	AA	132,977	483	41	152
*Z33C	7A	185,806	1290	23	99

Malta

*9H3ZY	14	8,968	92	14	45
					(OP:OK1FZM)
*9H3HZ	AA	85,008	386	46	138
					(OP:TA1HZ)

Moldova

*ER4LX	A	207,644	561	62	182
*ER1JA	14	28,512	306	14	58
*ER3CT	AA	162,006	560	47	154

Montenegro

*4O/E73A	A	13,246	127	20	54
*4O1HQ	"	5,525	69	18	47
					(OP:YU3EEA)
4O4A	AA	30,502	278	21	80

Netherlands

PC2T	A	453,552	1010	57	207
PA1X	"	56,595	290	34	113
PA4GDR	"	26,370	203	21	69
PA4DN	"	10,611	102	20	61
PA4B	"	10,296	80	21	23
PA3J	"	8,500	100	18	50
PA1CWI	"	*3,528*	*61*	*16*	*40*
PAØMIR	3.7	17,030	236	10	55
*PA1P	A	133,772	525	44	168
*PA1REG	"	110,800	355	45	155
*PD8DX	"	73,584	401	23	61
*PDØMHZ	"	61,824	465	21	91
*PA3ACA	"	60,450	295	38	112
*PA2CVD	"	59,075	353	27	112
*PG1R	"	51,408	305	26	110
*PA1TO	"	46,284	326	24	109
*PH2A	"	39,848	247	33	103
*PE2HG	"	38,076	297	22	92
*PD1B	"	37,296	217	29	82
*PC9F	"	37,120	262	26	102
*PC7E	"	32,718	258	22	101
*PA3ARM	"	29,095	196	24	91
*PAØTCA	"	27,456	157	32	56
*PA1LIO	"	23,210	187	23	87
*PA3CXB	"	17,765	131	29	66
*PE1OKY	"	16,926	144	23	68
*PA3MET	"	16,554	158	21	72
*PD2DVB	"	16,324	180	16	61
*PD5ISW	"	16,093	151	19	58
*PDØWVB	"	16,072	170	16	66
*PDØWR	"	15,477	131	19	58
*PD3ALX	"	14,124	150	16	50
*PE2JMR	"	13,692	112	21	63
*PA3HCC	"	13,608	150	17	67
*PA3DBS	"	12,090	112	24	69
*PD5WSQ	"	10,854	110	19	48
*PB4PT	"	9,576	101	14	58
*PE1OFJ	"	8,732	99	19	55
*PBØACU	"	8,601	106	13	48
*PB7TT	"	8,496	102	19	53
*PA3GXB	"	8,470	100	20	57
*PA2W	"	7,437	84	16	51
**PB2Z*	"	*7,424*	*102*	*16*	*48*
*PA2HD	"	6,762	100	16	53
*PA2VS	"	5,544	101	8	48
*PC4D	"	3,036	51	12	34
*PAØCT	"	2,790	50	9	22
*PDØRS	"	2,709	51	10	33
*PD9MK	"	2,688	58	9	33
*PA2MUL	"	2,214	52	11	30
*PA4EL	"	1,856	22	15	17
**PE1CUP*	"	*1,120*	*25*	*12*	*20*
*PAØRHA	"	1,050	36	8	22
*PEØDNY	"	1,044	20	12	17
*PA5P	"	784	24	9	19
*PD4BER	"	784	35	6	22
**PA4T*	"	*480*	*12*	*8*	*12*
*PA1GS	"	280	12	8	12
*PDØJBZ	"	40	5	3	5
*PA2REH	28	247	21	3	10
*PDØMGX	14	6,846	123	9	33
*PA3TA	"	5,964	100	8	34
*PA3CVR	"	456	26	5	14
*PD1JAZ	"	224	10	5	9
*PD3EDA	"	152	7	4	4
*PA2TMS	3.7	122,740	1338	15	80
*PA3DTR	1.8	1,260	49	4	24
PA3AAV	AA	1,923,220	1934	121	448
PA1T	"	969,054	1663	83	290
PA2LO	"	411,207	691	83	256
PHØAS	"	217,071	581	65	206
PA3EVY	"	171,990	358	66	179
PA3GRM	"	122,138	313	52	121
PAØM	"	112,582	394	40	141
PF1MO	"	70,366	294	38	113
PA2LEN	"	61,190	272	34	111
PA7AL	"	48,638	587	13	70
PA7WW	"	38,280	197	28	92
PA2LS	"	37,128	201	28	91
PAØGJV	"	35,700	198	28	74
PC4H	"	*32,144*	*199*	*27*	*85*
PA3ELQ	"	25,398	171	24	78
PA5KT	"	20,349	119	34	85
PA5FN	"	13,351	165	16	63
PA3GDD	"	12,403	109	22	57
PA1CA	"	12,312	100	21	51
PA3JQD	"	7,844	96	18	56
PE5TS	"	*6,958*	*52*	*25*	*46*
PE1NYQ	"	6,900	96	16	53
PA5N	"	5,830	98	11	44
PC2F	"	4,074	33	17	25
PA1WBU	"	2,814	39	16	26
PA2KW	"	800	14	12	13
PD2MDR	"	651	25	6	15
PI4DX	14A	142,336	495	29	99
					(OP:PD1DX)
PE1LUB	"	28,272	210	16	60
PA5DX	"	9,487	144	14	39
PA5CT	7A	17,250	212	12	57
PE1HWO	"	2,537	42	13	30
PA9M	3.7A	238,204	1619	21	103
*PC3T	AA	755,856	1039	101	363
*PA2PKZ	"	393,736	778	70	246
*PA8KW	"	296,383	663	70	241
*PE5O	"	216,468	592	55	197
*PA3DDP	"	124,260	443	37	181
*PE1EWR	"	108,192	458	38	158
*PB2A	"	85,613	285	44	137
*PD1RO	"	80,542	352	33	121
*PD2TW	"	78,600	396	28	103
*PG2AA	"	65,940	329	27	113
*PE1FTV	"	54,600	309	29	121
*PC1PM	"	41,895	247	29	104
*PA1VD	"	39,825	233	31	104
*PH4E	"	37,570	255	26	104
*PDØME	"	31,977	208	24	75
*PI4FL	"	27,864	185	35	94
*PA2Z	"	25,070	193	24	85
*PD1AT	"	24,366	150	24	69
*PC4AD	"	23,940	189	19	86
*PA2RG	"	22,310	159	26	71
*PA3HFJ	"	20,085	148	24	79
*PAØB	"	15,295	151	18	77
*PAØGRU	"	14,819	163	16	57
*PAØMJM	"	14,534	103	26	60
*PE1RDP	"	10,725	103	20	55
*PC4C	"	7,992	97	15	59
*PA2A	"	7,986	100	14	52
*PD2GSP	"	7,680	97	12	48
*PA3GEO	"	2,365	48	12	31
*PE1NBD	"	2,255	33	14	27
*PC9DB	"	2,210	35	12	14
*PD5S	"	882	41	15	27
*PA3GDG	"	644	25	8	15
*PH7A	21A	45,240	129	33	123
*PA5O	"	6,776	100	13	31
*PD7RB	14A	31,920	231	17	59
*PD1BHZ	"	1,984	28	14	18

Northern Ireland

*MIØI	A	189,945	768	43	158
					(OP:MIØRRE)
*MIØOBC	"	91,656	438	36	135
*MIØJZZ	"	25,960	147	30	80
*MIØDWE	"	13,800	114	22	53
*GI4MBM	"	9,288	115	17	55
*MIØULK	"	9,176	110	15	47

*MI6WGX	"	300	17	7	13
*MIØM	21	173,937	829	25	86
(OP:MIØSAI)					
GI4VHO	21A	50,324	367	22	70
GI4T	"	2,618	53	12	22
MIØSLE	3.7A	15,444	224	13	53
*MI1M	14A	39,355	231	18	67
(OP:MIØLLG)					
*2IØWMN	7A	336	20	3	11

Norway

LC5C	A	113,750	540	36	139
(OP:LA6KOA)					
LC5W	"	75,240	334	40	125
LA7SI	"	10,005	121	19	50
LA2US	14	799	17	7	10
LA7RRA	"	342	19	6	12
LC7T	7	6,624	134	7	41
(OP:LA1BFA)					
*LB1LG	A	115,830	484	41	154
*LA2HFA	"	62,160	266	41	127
*LA2ONA	"	56,140	295	32	108
*LA2QJA	"	53,721	349	27	100
*LC7D	"	27,250	206	23	86
*LA6M	"	27,192	216	22	81
(OP:LA6GX)					
*LA2GCA	"	22,671	232	19	80
*LA3RNA	"	16,109	153	18	71
*LA8RTA	"	11,385	147	16	53
*LA7TN	"	8,236	107	16	55
*LA9DK	"	5,940	95	17	43
*LC9T	"	5,208	66	18	44
(OP:LA9VKA)					
*LA7USA	"	154	11	5	9
*LA2QUA	14	182	14	4	9
*LB4UH	7	44,408	490	16	75
*LBØOG	"	7,844	139	7	46
*LA8OKA	3.7	2,754	83	5	29
*LC1P	1.8	66	11	2	9
(OP:LA1DSA)					
LC6C	AA	862,524	1636	57	190
(OP:LA6VQ)					
LC5K	"	354,609	1082	60	219
(OP:LA5YJ)					
LA8HGA	"	326,536	1108	46	150
LA6ZP	"	141,750	578	38	172
LA6UL	"	30,163	139	36	103
LA6SK	"	1,056	16	12	12
*LA9TY	AA	287,339	693	68	231
*LA3BPA	"	261,900	624	58	242
*LC8P	"	62,348	310	28	115
*LA2GKA	"	53,841	352	24	113
*LC9A	"	36,088	297	23	81
(OP:LB1TI)					
*LA2XNA	"	10,360	128	17	53
*LB6UH	"	6,240	49	22	30
*LB3TI	14A	39,375	236	24	81

Poland

SQ1OD	A	536,310	1199	73	281
SN5U	"	137,588	420	53	159
SP1JQJ	"	88,556	382	40	129
SP5ICS	"	67,080	315	34	122
SQ9NIU	"	59,184	310	38	106
3Z1ØØM	"	49,387	297	27	104
(OP:SP6IEQ)					
SQ5LTT	"	45,140	271	34	114
SP5AKP	"	34,272	106	47	106
SQ5EXM	"	33,744	220	30	84
SP2NNO	"	20,178	159	34	80
SP5UGP	"	15,990	76	33	49
SP2JMR	"	14,981	105	24	47
SP2AND	"	13,940	80	28	54
SP7MOQ	"	*6,572*	*44*	*27*	*35*
SP2YWL	"	4,026	54	17	16
(OP:SP2FWC)					
SP7D	21	68,252	289	28	85
SP8MRD	"	3,042	40	13	26
SP8HXN	"	24	2	2	2
SP9NSJ	14	41,216	257	22	70
SQ9DXT	"	18,496	195	14	50
SP4JTJ	7	1,110	23	10	20
SN5V	3.7	108,398	1210	15	68
(OP:SQ5EBM)					
SP9KUP	"	10,912	307	7	37
SP9SMD	"	5,781	170	7	34
SQ7CL	1.8	42,559	629	11	62
SP9EML	"	552	28	4	19
*SQ2WHH	A	463,410	917	77	265
*SP6LUV	"	205,857	410	66	191
*SP2GMA	"	150,525	482	50	173
*SN4EE	"	148,595	437	63	200
(OP:SP4AWE)					
*SQ5PMB	"	145,220	525	44	168
*SQ8Z	"	143,325	395	56	169
*SP1RKR	"	140,812	497	44	144
*HF1ØØI	"	137,196	410	52	154
*SQ5AM	"	89,760	315	48	139
*SP1V	"	87,575	333	44	111
(OP:SP1QXK)					
*SN1ØØL	"	85,248	395	43	149
(OP:SP9ADU)					
*SP2GCE	"	70,875	334	38	137
*SP8BDF	"	64,962	344	32	130
*SP5DRE	"	63,342	301	36	117
*SP8FB	"	60,323	268	44	135
*SP5Z	"	58,400	312	38	122
*SQ3POS	"	56,791	295	32	101
*SP1FRC	"	53,558	340	22	100
*SO3O	"	53,431	411	22	97
*SQ8W	"	52,398	356	26	116
*SP5KD	"	48,018	188	45	106
*SQ2EAN	"	47,740	310	27	113
*SP2AWJ	"	44,712	246	34	104
*SQ3HLB	"	43,500	279	30	115
*SP8UFY	"	42,350	214	31	90
*SP4DDS	"	40,170	261	32	98
*SP9ENV	"	35,190	202	31	107
*SQ9GIW	"	34,181	218	32	101
*SQ4JUM	"	34,153	246	29	90
*SQ7LQJ	"	33,930	180	29	88
*SQ9IWS	"	33,558	242	27	92
*SP3QDX	"	31,122	211	29	85
*SP8ALT	"	25,252	116	37	70
*SP3BBS	"	24,640	184	31	79
*SP4SHD	"	22,936	100	33	61
*SQ3MIS	"	22,360	198	24	80
*SQ9PL	"	21,024	196	22	74
*SQ9MLZ	"	20,706	154	30	72
*SN5L	"	16,287	174	19	70
*SQ2TAC	"	15,312	151	21	66
*SQ5TDZ	"	14,329	99	32	57
*SQ3YAY	"	13,524	87	29	55
*SP6HED	"	12,920	64	29	56
*3Z6O	"	12,546	116	20	62
*SP9RHN	"	12,201	95	26	57
*SQ6IYV	"	10,962	102	23	64
*SP9GZW	"	10,152	121	14	58
*SP4GHL	"	9,776	84	32	62
*SP7K	"	9,718	122	22	64
*SP8GK	"	9,350	167	18	67
*SP9IHP	"	9,176	52	23	39
*SO1ØØI	"	8,960	100	20	50
(OP:SQ9NOS)					
*SQ5RTI	"	8,025	71	21	54
*HF1ØØN	"	7,840	112	16	54
(OP:SP9BRP)					
*SP9KB	"	7,480	158	20	68
*SQ9ZAX	"	6,000	55	19	31
*SP8CGU	"	5,742	65	20	38
*SP3AYA	"	5,510	47	21	37
*SQ7M	"	5,418	102	15	48
*SP9CH	"	4,508	97	8	38
*SP3UCW	"	3,481	55	18	41
*SP3YM	"	3,230	29	16	22
*SQ5SUL	"	2,915	45	17	36
*SQ8FEU	"	1,748	34	14	24
*SQ8NQW	"	1,012	22	8	14
*SQ2DYL	"	952	30	9	19
*SQ9FVE	"	928	22	11	18
*SP3ATB	"	740	13	10	10
*SQ3ONE	"	627	27	12	21
*SP7TQ	"	416	23	11	21
*SP6DG	"	108	29	7	20
*SP5SJR	"	42	9	5	9
*SQ9LPO	21	26,568	176	22	60
*SP3LD	"	18,490	103	25	61
*SQ8BGR	"	12,627	75	20	49
*SP1II	"	10,266	85	16	43
*SN1ØØN	"	9,204	74	20	39
(OP:SP9MDY)					
*SP4AAZ	"	7,975	85	15	40
*SP1APZ	"	2,627	29	13	24
*SP4MPA	"	578	14	7	10
*SQ9DEO	"	56	5	3	5
*SP6DVP	14	70,300	426	22	78
*SP9MAT	"	31,746	228	18	60
*SQ5AAG	"	24,747	229	15	58
*SP8IOV	"	17,220	184	18	52
*SP9EMI	"	16,750	177	14	53
*SP5DXU	"	11,628	116	14	43
*SQ1KW	"	10,816	136	13	39
*SP9BMH	"	9,540	107	12	48
*SP8P	"	9,405	117	13	44
*SQ3PMX	"	8,272	100	12	35
*SP2CYK	"	6,210	103	10	36
*SP6GTN	"	4,329	73	10	29
*SP5TIM	"	3,045	69	8	27
*SP3FSM	"	2,046	52	8	23
*SO1MK	"	368	27	4	12
*SO5MK	"	30	5	2	4
*SP5LGN	"	6	1	1	1
*SP5X	7	24,300	242	12	69
*SP7RFF	"	11,913	193	9	48
*SQ6ELV	"	8,640	104	13	47
*SQ9GOL	"	6,533	128	7	40
*SQ5SAA	"	3,520	90	5	35
*SP5ETS	"	2,450	66	6	29
*SP6EIY	"	754	24	6	23
*SP9TTT	"	425	27	4	13
*SQ9Z	3.7	15,756	303	7	45
*SQ8NGO	"	6,591	202	6	33
*SP3KX	"	2,656	83	5	27
*SQ9BDB	"	1,512	76	4	23
*SQ1ØØPOL	"	1,375	74	4	21
(OP:SP3SLU)					
*SO8OO	"	720	65	5	25
*SNØR	1.8	29,106	442	11	55
(OP:SQ9IAU)					
*SP6JOE	"	4,440	119	4	36
*SP6OJK	"	1,500	49	4	26
*SQ9PPT	"	1,008	44	4	24
*SP2NBV	"	480	25	4	16
SP1NY	AA	771,253	1041	102	359
SP1GA	"	732,032	1758	71	233
SP9QMP	"	637,681	1210	63	256
SP4Z	"	579,835	635	109	336
SQ8ERS	"	461,168	895	75	253
SQ9KEJ	"	370,988	599	75	251
SQ8N	"	117,586	263	72	155
SP9IVD	"	51,101	271	29	108
SP1MWN	"	30,076	126	43	60
SP9FUY	"	25,080	78	43	71
SP9M	"	18,909	105	31	68
SN7Q	"	14,384	86	22	40
(OP:SP7GIQ)					
SP1O	"	13,500	128	21	69
SP6JZL	"	7,680	50	27	33
SN6A	"	5,369	40	28	31
(OP:SP6CES)					
SP3FAR	"	3,024	34	21	27
SP5AUY	21A	237,655	825	32	113
SN2M	"	10,416	95	21	41
(OP:SP2XF)					
SN2B	14A	1,016,820	2609	39	141
(OP:SP2WKB)					
SO9C	"	192,984	966	28	101
(OP:SQ9CNN)					
SO7O	"	127,872	497	32	112
(OP:SP9OHP)					
SQ4O	"	96,681	532	23	88
SP3A	"	83,952	309	30	102
SN3A	7A	838,304	2785	37	147
(OP:SP3GEM)					
SP8K	"	349,011	1507	34	123
SQ9C	"	85,920	791	18	78
SQ9IWT	"	14,399	131	16	61
SQ2PHG	3.7A	170,464	1371	19	93
SP3GTS	"	128,915	940	20	95
SP2PIK	1.8A	92,729	944	15	76
(OP:SQ2GXO)					
*SQ9KDT	AA	196,330	521	68	222
*SP6DZ	"	162,206	692	40	162
*SP6A	"	159,004	524	55	199
*SO5L	"	150,021	612	42	169
(OP:SP5WIT)					
*SP5GNI	"	121,210	380	56	174
*SO7BIT	"	114,800	438	46	159
*SN6D	"	91,665	303	55	134
*SP7TEX	"	82,179	269	56	151
*SQ1BSY	"	62,900	264	36	149
*SP2WGB	"	50,985	289	37	128
*SQ3WW	"	49,880	201	47	125
*SP9FMP	"	47,867	221	37	114
*SQ6SGV	"	37,665	228	29	106
*SQ1EIC	"	32,619	205	31	100
*SQ1ØØI	"	28,737	148	31	72
(OP:SP1PBW)					
*SQ7WOJ	"	26,433	267	19	80
*SP3SC	"	21,210	98	30	71
*SQ1BHH	"	19,929	117	31	60
*SQ1GQT	"	18,480	118	25	59
*SP5BUJ	"	16,830	134	22	80
*SQ5ASR	"	9,869	116	14	57
*SQ6IUS	"	8,927	85	22	57
*SQ7OFB	"	6,195	71	19	40
*SN1ØØPOL	"	5,655	46	24	41
(OP:SP3HLM)					
*SQ7BCN	"	3,657	45	19	34
*SP9FOW	"	1,330	21	18	20
*SP8PKP	"	1,295	35	11	26
*SP7C	21A	150,560	423	33	127
*SQ6PLD	"	24,928	166	20	56
*SO6R	"	13,115	105	21	40
*SP4DZT	14A	111,754	476	31	111
*SP6CYN	"	53,025	275	25	76
*SP9IBJ	"	26,175	218	16	59
*SQ3TGV	"	7,525	97	11	32
*SQ5CSF	"	2,652	70	9	25
*SN7O	"	2,352	48	8	20
(OP:SP7IVO)					
*3Z5A	7A	50,904	435	20	81
*SP9JZT	"	20,008	141	19	63
*SPØT	"	18,200	235	9	56
*SQ4LP	"	4,949	58	14	35
*HFØDKI	"	576	12	6	12
*SQ8GBG	"	272	18	4	12
*SP3P	3.7A	53,820	721	12	66
*SP5EWX	1.8A	2,380	79	5	30
*SP2KFD	"	420	24	4	16
(OP:SP2NBV)					
*SP9UOP	"	32	5	3	5

Portugal

CT7AKW	A	18,758	99	26	57
CT1IW	"	8,855	76	20	57
CR7ATQ	"	6,104	57	21	35
CT1APN	"	2,320	24	18	22
CR6T	21	791,532	2288	37	125
(OP:CT1ESV)					
CT1IQI	"	58,800	301	26	74
CT2HTM	"	3,081	53	12	27
CR5A	14	14,344	237	9	35
CT1AL	7	12,586	148	12	46
CT7AHV	"	2,450	70	7	28
*CT7AJL	A	423,678	985	64	229
*CT1EKU	"	51,030	228	34	101
*CT2JBD	"	30,888	160	31	77
*CT7AGI	"	20,227	105	25	88
*CS7AMN	"	11,070	98	24	58
*CT1FHL	"	10,640	109	20	60
*CT1EBM	"	4,532	49	17	27
*CS7AOM	"	2,964	49	14	38
*CT7ABE	"	2,701	36	14	23
*CT7AIX	28	1,386	22	7	14
*CS7AOL	21	72	5	4	4
*CT7/HB9AAP	14	15,194	166	14	57
*CS2I	3.7	55,932	413	13	66
(OP:CT1BWU)					
CT1ENV	AA	212,232	349	74	222
CT1DSV	"	156,784	365	60	179
CT1AHU	21A	309,281	1214	26	93
CT1AGS	1.8A	2,415	54	6	29
*CT7AQS	AA	124,544	348	58	166
*CS7APD	"	91,168	309	46	130
*CT7ADH	"	5,454	67	14	40
*CT1BOH	"	3,268	26	20	23
*CT2HPM	"	42	3	3	3
*CT5GOJ	28A	12	2	2	2

Republic of Kosovo

Z61DX	A	12,411	183	18	45
*Z62FB	A	197,607	980	34	165

Romania

YPØC	A	2,656,841	3836	108	365
(OP:YO3CZW)					
YO3RU	"	429,324	1114	64	202
YO4RST	"	203,980	496	58	177
YO7CJB	"	91,744	392	39	149
YO3GNF	"	58,366	261	37	117
YO3CIY	"	38,907	230	28	103
YO7DBR	"	29,380	158	35	78
YO8SGQ	"	24,875	168	33	92
YO9IKW	21	1,305	15	15	14
YO3FFF	14	26,372	226	17	59
YO9AYN	7	32,204	293	21	76
YO3JW	"	5,035	65	11	42
*YO2LEA	A	385,411	735	78	221
*YO6GUU	"	132,804	538	40	164
*YO7MPI	"	113,960	449	46	174
*YO7LPZ	"	109,143	413	41	160
*YO5BRE	"	105,198	482	33	145
*YO8BDW	"	100,450	493	35	140
*YO8SMM	"	95,160	381	39	156
*YO3FLM	"	52,836	223	38	110
*YO4AAC	"	44,979	203	41	100
*YO7LYM	"	44,472	255	34	102
*YO9FEB	"	41,035	189	38	107
*YO6DBL	"	36,654	194	36	113
*YO2CJX	"	35,258	248	28	94
*YO4SI	"	30,240	170	34	106
*YO7LDT	"	24,640	172	28	82
*YO6HSU	"	19,530	102	36	69
*YO9BNP	"	17,664	136	25	67
*YO9HG	"	16,296	166	21	76
*YO8RKP	"	15,618	143	29	85
*YO5IA	"	13,288	95	25	63
*YO8AAZ	"	11,832	138	21	66
*YO8TGE	"	10,578	97	23	63
*YO9BXE	"	9,976	90	20	66
*YO7NSP	"	9,694	115	18	56
*YO8SBQ	"	9,454	64	21	37
*YO3IWZ	"	8,844	80	19	47
*YO3GGO	"	8,395	107	18	55
*YO2LXW	"	6,468	91	24	60
*YO8PS	"	936	13	11	13
*YO3GD	"	702	22	9	17
*YO7JBB	"	280	18	5	15
*YO9DF	"	154	9	6	8
*YO8THG	21	18,031	122	19	54
*YO2IS	"	12,084	137	16	41
*YO3BA	"	375	17	5	10
*YO9FLL	"	306	20	5	12
*YO7FEY	"	99	7	4	5
*YO8TNB	14	36,288	294	18	63
*YO4BEX	"	20,976	275	15	54
*YO9CWY	"	12,824	177	12	44
*YO5BQQ	"	2,244	52	9	25
*YO4GPC	"	2,205	54	8	27
*YO5OHY	7	24,726	239	17	61
*YO9AGI	"	10,584	168	8	48
*YO2MJZ	"	2,088	44	7	29
*YO5BIM	3.7	1,479	54	6	23
*YO2CMI	1.8	440	21	4	16
*YO9DBP	"	240	17	3	12
YQ6A	AA	329,783	645	71	252
(OP:YO6BHN)					
YO7CVL	"	235,470	836	50	185
YO4AR	"	92,340	544	30	141
YR8D	28A	12,200	231	10	40
(OP:YO8TTT)					
YO3HOT	"	1,551	30	12	21
YO3FRI	21A	75,924	311	30	81
YP3A	14A	391,248	1868	33	110
(OP:YO3IMD)					
YO9HP	"	310,284	1287	33	123
YO4RIU	3.7A	234,496	1511	24	104
YO3APJ	1.8A	51,243	554	15	72
*YO9IAB	AA	79,670	415	31	124
*YO4NF	"	54,000	334	28	107
*YO3OM	"	37,752	210	35	108
*YO2MHJ	"	37,376	146	43	103
*YO5ER	"	12,367	111	21	62
*YO2MLS	"	8,378	92	19	52
*YO8ST	"	5,658	65	17	52
*YO5PBW	28A	360	22	5	10
*YO7DAA	21A	75,891	315	30	93
*YO2LLL	"	17,928	85	28	55
*YO3CVG	14A	9,744	89	17	41
*YO9FLD	3.7A	125,939	1082	16	91
*YO5PBF	"	55,161	665	12	69

Sardinia

ISØBSR	A	24,528	296	17	67
*ISØHXK	A	4,408	44	20	38
*ISØGRB	14	55,142	526	17	62
*ISØDFC	"	918	28	8	19
*ISØHNF	"	792	16	9	13
*ISØLYN	AA	552	15	11	13
*ISØNHT	21A	38,700	250	25	75

Scotland

MMØCEZ	A	1,998	37	11	26
GM4O	14	42,030	345	18	72
(OP:KQ8Z)					
*MM1E	A	358,722	691	54	219
(OP:MMØGOR)					
*GM3TAL	"	7,210	89	19	51
*MMØCPZ	"	6,466	98	13	48
*GMØBZS	"	3,696	49	14	34
*2MØVKP	"	224	18	4	12
*MMØGOR	7	17,100	169	15	60
MM3T	28A	558	36	3	15
*MMØPHG	AA	80	4	4	4

Serbia

YT1RK	A	29,568	209	29	83
YT9X	21	555,930	1796	34	111
(OP:YU1ZZ)					
YT2ZZ	"	37,620	184	26	69
YT1A	14	514,216	2092	36	116
YT2ISM	"	7,140	148	8	26
YTØW	7	408,164	2089	31	103
(OP:YU1JW)					
*YU1YV	A	98,604	372	43	155
*YU4GUV	"	11,248	177	14	62
*YTØI	"	858	37	8	18
*YU4SZZ	"	648	23	7	20
*YU4YES	"	286	13	6	7
*YU4KIS	"	224	18	4	10
*YT2RIS	"	208	20	4	12
*YU4OIZ	28	5,304	136	8	31
*YU1VG	21	33,654	232	23	56
*YU4MOM	"	700	20	6	14
*YU4NSL	"	378	17	5	13
*YU4GPS	"	345	14	6	9
*YU4JAN	"	308	19	4	10
*YU4LED	"	308	13	5	9
*YU4MLL	"	289	15	5	12
*YU4IKA	"	30	3	3	3
*YU5T	14	40	8	2	8
*YU3MLD	"	10	4	2	3
*YU5W	7	12,276	155	12	54
*YU4OWL	"	7,280	117	8	44
*YT7M	"	2,205	49	7	28
*YT7B	"	1,938	45	10	28
(OP:YU7BJ)					
YU6DX	AA	256,355	607	66	229
YU1EW	"	32,205	246	20	75
YU2STR	"	21,935	89	34	73
YU1RSV	"	9,660	135	16	54
YT2SS	21A	362,080	1229	35	125
YT7R	"	11,591	80	25	42
(OP:YU7BW)					
YT1X	14A	793,080	2560	38	142
YT1HA	7A	607,250	2274	37	138
YT5A	"	386,784	1826	33	120
(OP:Z3ØA)					
YT8A	1.8A	38,475	498	11	64
(OP:YU1EA)					
*YT5IVN	AA	800,394	1497	83	316
*YT1TX	"	55,300	294	33	125
*YT5DEY	"	20,865	181	24	83
*YUØW	"	2,200	49	13	27
*YT2RX	"	1,870	37	13	21
*YT3H	"	1,104	20	10	14
*YT1XN	28A	546	28	6	15
*YT5LD	14A	25,365	396	12	45
*YU7ZZ	"	6,710	71	15	40
*YU1LG	7A	8,320	141	9	43
*YT3TPS	"	4,620	104	7	35
*YU1ANO	"	1,785	23	12	23
(OP:YU1RA)					
*YT4T	3.7A	23,625	292	12	63
*YUØU	"	2,852	43	8	38

Sicily

IT9ZTX	A	244,496	841	53	206
IT9FUN	"	36,848	171	31	81
IT9ZZO	"	20,900	82	41	69
*IR9Z	A	290,646	887	49	192
(OP:IT9VCE)					
*IT9PZM	"	89,646	299	45	156
*IT9TFX	"	21,186	153	28	79
*IT9CLN	"	18,444	86	33	83
*IT9OPR	"	14,110	104	23	60
*IT9CTG	"	5,865	145	11	40
*IW9FI	"	128	12	6	10
*IT9NAN	28	247	12	6	7
*IT9AXQ	21	828	24	9	14
*IT9BIJ	14	16,125	145	21	54
*IT9KXK	"	5,203	96	12	31
*IT9DSZ	1.8	221	15	3	14
IT9ESW	AA	99,630	295	47	158
IT9EWR	"	459	9	9	8
IT9VDQ	28A	33,033	376	17	60
IT9ACN	"	1,364	49	7	15
IT9ZMX	21A	214,420	811	35	116
II9L	"	150,750	609	31	119
IT9IMJ	14A	20,377	197	16	55
IR9W	7A	323,330	1359	32	123
(OP:IZ8EYP)					
IT9FRX	"	151,765	922	23	104
IT9DFI	"	57,820	325	24	94
IT9BLB	1.8A	12,462	179	10	52
*IT9LKX	AA	11,523	70	27	42
*IT9BYS	"	7,626	57	21	41
*II9Y	21A	117,530	346	35	111
(OP:IT9IQQ)					
*IB9A	14A	159,616	858	27	101
(OP:IZ2WFL)					
*IF9A	"	107,260	647	28	96
(OP:IT9WDC)					
*IT9DGG	"	29,133	225	22	61
*IT9RBW	3.7A	77,220	554	17	91

Slovak Republic

OM7RU	A	1,480,680	1973	102	355
OMØR	"	690,616	1384	75	271
OM3IAG	"	629,038	1134	89	278
OM8GT	"	160,056	481	56	172
OM1DK	"	156,864	374	57	135
OM5VS	"	2,552	28	18	26
OM2AGN	14	24,990	111	25	73
*OM5WW	A	436,009	1086	61	252
*OM4KK	"	211,905	606	54	201
*OM5NL	"	90,598	283	52	142
*OM4IK	"	81,503	455	29	120
*OM6AT	"	81,104	529	23	114
*OM2DT	"	42,582	225	38	103
*OM7AG	"	31,050	211	30	108
*OM7ZM	"	27,848	101	43	75
*OM8ADU	"	21,146	196	23	86
*OM8ST	"	20,691	176	18	81
*OM1AKU	"	15,840	188	18	62
*OM3ZBG	"	476	40	9	25
*OM6W	14	61,404	415	21	81
(OP:OM6DN)					
*OM8JP	"	18,330	182	17	48
*OM3ZWA	3.7	37,512	511	11	61
*OM6TX	"	22,336	334	9	55
OM3PA	AA	190,120	447	68	212
OM5CM	21A	160,160	714	34	109
OM2Y	14A	975,908	2735	40	139
(OP:OM2KI)					
OM3DX	"	15,957	121	19	62
OM3CW	"	15,438	108	18	65
OM7JG	7A	445,480	1924	37	135
OM2VL	3.7A	388,314	2123	29	112
OMØWR	1.8A	86,652	898	16	71
*OM5UM	AA	41,616	256	27	109
*OM1AVL	"	8,249	73	24	49
*OM7YC	"	7,700	79	22	48
*OM4O	"	4,896	66	15	36
(OP:OM3NI)					
*OM7LW	14A	91,602	423	26	100
*OMØATP	"	37,890	241	20	70
*OM3TZZ	"	6,987	93	12	39
*OM8ADM	3.7A	7,884	130	7	47
*OM7AES	"	7,371	206	6	33
*OM5KM	1.8A	21,655	358	9	52

Slovenia

S51DD	A	21,830	102	43	75
S58RU	"	12,087	87	27	52
S57WJ	"	7,742	103	11	38
S57NL	"	4,592	50	21	35
S51RE	"	860	15	9	11
S58D	28	14,982	195	15	51
S5ØB	7	48,682	369	19	82
S57AL	3.7	452,374	2376	30	107
*S56WYB	A	287,922	722	62	220
*S56AX	"	99,900	403	42	143
*S52CQ	"	76,319	393	35	132
*S57YK	"	56,918	283	38	111
*S51I	"	20,140	121	33	73
*S51B	"	17,250	152	19	50
*S57FJ	"	3,599	62	15	44
*S58BO	"	320	23	6	14
*S54S	"	196	22	9	19
*S51JQ	14	16,632	114	20	46
*S53MR	7	6,533	136	7	40
*S52GO	"	616	23	7	15
*S5ØBH	"	210	17	4	10
*S57NAW	3.7	32,157	347	13	68
*S53X	"	3,198	74	7	34
S53M	AA	4,844,724	3785	146	541
(OP:S53ZO)					
S53K	"	1,302,825	1775	99	336
S53GO	"	110,600	331	50	150
S57S	"	83,160	348	38	82
S51R	"	24,192	206	22	62
S51DX	"	11,100	110	22	52
S5ØW	21A	484,176	1278	35	141
(OP:S57K)					
S52ZW	"	359,352	1028	36	132
S57Q	"	91,080	305	31	107
S57DX	14A	1,043,646	2854	40	146
S5ØK	"	988,624	2621	39	143
S5ØR	"	623,960	2065	34	118
S5ØG	"	529,704	1607	36	132
(OP:S56M)					
S56X	7A	453,952	1817	35	129
S56Y	"	400,160	1716	35	125
S51CK	"	312,056	1767	31	121
S57O	"	200,152	1449	30	97
*S56A	AA	194,112	464	57	231
*S52BT	"	153,595	386	52	169
*S51Z	"	121,923	357	56	151
*S53EA	"	35,310	210	28	82
*S57T	"	33,600	196	27	93
*S57KM	"	25,272	164	31	86
*S52ON	"	20,972	216	19	79
*S59AA	"	14,356	76	37	60
*S52WW	"	8,750	85	20	50
*S57MJC	"	8,505	65	24	57
*S56LXB	"	1,980	28	17	28
*S52OT	14A	333,944	1250	34	118
*S55G	7A	41,866	258	24	97
*S57LR	"	528	24	4	18

Spain

EA5DFV	A	2,959,872	4149	92	292
EA3HJO	"	142,270	503	48	157
EA2XR	"	136,000	449	49	151
EE4CC	"	123,765	445	47	138
(OP:EA4GSL)					
EA2KV	"	73,253	325	36	103
EA3GBU	"	51,620	190	42	103

EA2ECA	"	20,685	186	25	80
EA5CRC	"	1,710	39	12	33
EA4HT	"	*1,104*	*35*	*17*	*29*
EB1EWE	"	1,050	27	9	21
EA3DYY	"	690	29	10	20
EA3HAB	**21**	**3,822**	**66**	**11**	**28**
EA5SR	**7**	**799,106**	**2890**	**33**	**121**
EC1KR	"	40,592	348	15	44
EA3MR	"	6,192	134	8	40
EA3CI	**3.7**	**68,967**	**772**	**13**	**66**
***EA3FZT**	**A**	**220,249**	**507**	**61**	**196**
*EE7R	"	206,965	490	62	203
					(OP:EA7IA)
*ED1MK	"	175,150	496	53	173
					(OP:EA1MK)
*EA1JO	"	169,936	405	57	190
*EA3KT	"	166,440	492	53	175
*EA1OL	"	122,794	392	47	132
*EA4EJR	"	105,630	318	53	157
*EA1ANB	"	95,749	381	40	141
*EA1IOW	"	81,266	312	43	136
*EA1HTF	"	78,223	365	45	134
*EC5EA	"	62,328	231	43	104
*EA4BAS	"	56,350	163	45	116
*EA1FBU	"	49,491	191	35	82
*EB5CS	"	45,292	205	31	103
*EA1AJV	"	41,500	251	32	93
*EA1MW	"	38,324	190	37	97
*EA1DBX	"	31,668	175	34	82
*EA5/R3AR	"	26,912	180	24	92
*EB3JT	"	23,793	95	37	66
*EA3BRL	"	21,560	140	30	80
*EA4GWL	"	20,760	298	30	90
*EA1DOB	"	20,475	165	27	78
*EA4GUU	"	19,110	109	33	65
*EC5WR	"	17,630	137	23	63
*EB1IFK	"	17,202	161	19	75
*EA1IMP	"	16,150	96	32	63
*EA4GZD	"	15,088	148	18	74
*EA5DNO	"	12,628	81	25	52
*EA4CFT	"	11,534	84	28	51
*EA1GQ	"	10,810	129	21	73
*EA4LU	"	10,153	98	23	48
*EA7JWT	"	8,460	107	17	43
*EE2A	"	8,160	74	19	49
					(OP:EA2SN)
*EA4FLY	"	6,650	49	22	48
**EA3TB*	"	*6,572*	*55*	*19*	*34*
*EA3DNC	"	6,460	92	18	50
*EA7VJ	"	6,344	50	18	34
*EA5BAH	"	5,985	64	16	41
					(OP:OH2BAH)
*EA3EAN	"	4,810	84	18	47
*EA2RW	"	3,569	43	16	27
*EA7JZZ	"	3,528	42	16	33
*EA1IXQ	"	3,520	46	21	34
*EA1FEB	"	3,360	64	20	36
*EA4FET	"	3,315	70	22	43
*EA4GZW	"	3,213	43	16	35
*EA3BE	"	3,024	65	16	38
*EC4AHH	"	2,808	24	18	21
*EA5UJ	"	2,736	39	16	32
**EA4CRP*	"	*2,508*	*45*	*19*	*38*
*EA3HWC	"	2,310	30	15	18
*EA5IJD	"	2,200	34	17	23
*EA3DUR	"	2,091	50	11	30
*EA4RR	"	1,320	42	10	20
*EA5EZA	"	1,224	37	10	26
*EA4EUW	"	990	27	9	21
*EA2XG	"	837	24	10	21
*EA1ITX	"	493	20	10	19
*EA7JOE	"	420	14	10	11
**EA4MD*	"	*380*	*10*	*9*	*10*
*EA4AFP	"	221	7	6	7
*EA7IIW	"	196	12	5	9
*EA4GQS	"	108	8	5	7
*EA4RCT	"	96	8	5	7
					(OP:EA4ETT)
***EE7Y**	**21**	**205,626**	**910**	**31**	**98**
					(OP:EC7WA)
*EA5BCQ	"	10,800	80	18	42
*EA5HJO	"	5,508	72	15	36
*EA3HLM	"	3,600	50	13	23
*EA3HKY	"	3,196	50	12	22
*EA1HXK	"	2,844	49	14	22
*EA5ITW	"	2,025	32	10	17
*EA5HKC	"	378	13	8	10
**EA7HLU*	*14*	*53,768*	*448*	*18*	*70*
***EE1B**	**"**	**51,982**	**307**	**20**	**74**
					(OP:EA1YB)
*EA5IIX	"	20,732	170	17	56
*EA3DJL	"	16,038	156	13	53
*EA3FAJ	"	1,680	46	7	23
*EA5IMM	"	6	1	1	1
***EA3YK**	**7**	**3,696**	**71**	**10**	**38**
*EA2CE	"	2,904	92	7	37
*EA7FUN	"	918	26	7	20
***EA4FTA**	**3.7**	**1,575**	**38**	**7**	**28**
ED7W	**AA**	**2,237,892**	**2193**	**114**	**402**
					(OP:EA7OT)
EF1W	"	2,157,840	2581	96	336
					(OP:EA1WS)
EA2LMI	"	1,144,108	1798	92	314
EE3E	"	1,094,995	1248	107	356
					(OP:EA3ELZ)
EA1SA	"	824,535	1131	85	280
EA4ETN	"	725,420	1135	92	288
EA1BNF	"	372,372	568	86	255
EA1XT	"	345,114	872	41	157
EC3AIT	"	212,868	590	55	188
EA2DMH	"	209,520	569	68	172
ED4A	"	110,696	299	54	148
					(OP:EA4TV)
ED7K	"	95,004	233	58	176
					(OP:EA7TH)
EF2O	"	93,224	277	50	122
					(OP:EA2AOO)
ED1A	"	91,000	419	32	98
					(OP:EA1AST)
ED4T	"	80,626	208	43	139
					(OP:EA4CWN)
EA1CK	"	76,260	305	41	123
EA3OW	"	72,252	333	32	130
EA3NA	"	70,579	271	40	123
EA2OT	"	64,024	166	48	164
EA4YC	"	48,990	185	39	103
EA2RCP	"	41,600	292	19	46
					(OP:EA2DT)
EA4GMX	"	36,332	137	42	82
EA4ZK	"	27,540	130	32	49
EA2OK	"	27,090	112	42	87
EB1AC	"	20,492	122	29	80
EA4ETF	"	11,200	84	23	47
EA7TG	"	9,159	61	28	43
EA2AAZ	"	6,039	37	24	37
EA1HV	"	5,358	37	23	34
EA3EQT	"	4,864	50	29	47
EC4TA	"	*4,500*	*45*	*16*	*44*
EA2CCG	"	4,368	66	11	31
EA5RS	"	4,325	61	12	13
EB1IC	"	3,268	36	19	24
EA2DDE	"	1,638	24	16	23
EC5CSW	"	714	12	10	11
EA5NK	"	475	13	12	13
EA4EQD	"	392	10	6	8
EA3XL	"	24	2	2	2
ED1R	**21A**	**308,498**	**1116**	**34**	**112**
					(OP:EA4AOC)
ED5T	"	224,910	752	36	111
					(OP:EA5KV)
EF5Y	"	165,816	555	32	109
					(OP:EA5FR)
EA7ZY	"	129,642	686	22	80
EA5IGO	"	128,455	602	29	86
EC7WR	"	64,771	209	33	100
EA3OH	"	17,700	107	24	51
EE1I	"	15,114	165	19	47
					(OP:EA1SB)
EA3KN	"	13,509	73	21	58
EA4TX	"	7,200	124	9	16
EC4DX	**14A**	**870,012**	**2839**	**38**	**131**
EA5ON	"	551,002	2006	34	115
EE7P	**7A**	**170,553**	**776**	**30**	**109**
					(OP:EA7ATX)
EA5CTE	"	128,520	597	28	91
EA1TL	"	30,875	237	18	77
EB1DJ	"	29,240	283	17	68
EA4UV	**3.7A**	**15,928**	**114**	**16**	**72**
EA1DVY	**1.8A**	**8,364**	**136**	**12**	**39**
EA7JW	"	3,024	73	6	36
***ED7R**	**AA**	**517,371**	**1283**	**58**	**179**
					(OP:EA7GX)
*EA4EUI	"	362,643	627	76	251
*ED1S	"	218,595	590	54	193
					(OP:EA1IQM)
*EA1TI	"	104,139	308	49	140
*EB1EB	"	95,200	328	45	155
*EA3XR	"	84,100	317	40	105
*EA7JXZ	"	70,048	227	47	152
*EA1EHW	"	58,400	290	37	123
*EA4NI	"	50,165	223	37	90
*EA1AOQ	"	37,632	192	35	77
*EA1ASG	"	32,315	149	35	80
*EA4BT	"	27,864	164	40	89
*EA3IAZ	"	26,214	181	25	77
*EB4DMH	"	18,910	135	33	89
*EA5FCW	"	16,836	125	27	65
*EC7DZZ	"	11,562	65	28	54
*EA2DUX	"	7,360	113	18	46
*EA5HEW	"	6,975	105	19	56
*EA1OT	"	3,710	67	11	24
*EA5IUN	"	3,185	39	18	31
*EA7MT	"	1,645	21	15	20
*EA7IHS	"	640	12	8	12
***EA4AA**	**28A**	**2,352**	**36**	**10**	**18**
***EA1YG**	**21A**	**115,500**	**573**	**29**	**96**
***EA5IJG**	**14A**	**80,400**	**570**	**20**	**80**
*EA1DAX	"	39,262	240	17	50
*EA1CS	"	32,164	266	18	68
*EA1DHB	"	21,420	261	11	57
***EB1ADD**	**7A**	**9,796**	**139**	**10**	**52**
*EC4YO	"	4,800	96	8	40
*EA2CW	"	3,827	59	10	33

Sweden

SMØO	**A**	**100,079**	**343**	**54**	**149**
					(OP:SAØDIJ)
SM6CMU	"	89,142	243	47	119
SM2S	"	63,357	219	43	104
SM5B	"	45,059	190	45	112
					(OP:SM5EMR)
SM7DQV	"	25,784	149	27	61
SF6C	"	19,320	151	25	67
SD6M	"	16,259	197	17	54
					(OP:SA6BGR)
SM6NT	"	12,367	109	22	61
SA6P	"	*8,004*	*94*	*19*	*50*
SGØM	"	7,308	102	13	50
SM5V	"	6,420	77	17	43
SB3W	"	2,912	43	18	34
					(OP:SM3RAB)
SAØBMV	"	2,700	58	13	32
SM7AWQ	"	*1,269*	*33*	*18*	*29*
SA5M	"	240	8	7	8
					(OP:SM5CZQ)
SM5CZQ	"	144	11	8	8
SF4D	**14**	**68,875**	**427**	**23**	**72**
					(OP:SM4LMV)
SA6BKI	"	374	16	6	11
SM6Q	**7**	**9,408**	**156**	**10**	**46**
***SM5ACQ**	**A**	**102,486**	**371**	**43**	**143**
*SA2APO	"	52,750	332	26	99
*SM6FZO	"	51,952	356	27	109
*SM5DXR	"	49,984	311	27	115
*SM5ALJ	"	44,928	275	31	113
*SM2T	"	17,343	95	33	90
					(OP:SM2EZT)
*SA5HUB	"	12,636	144	17	61
*SD6W	"	10,823	117	20	59
					(OP:SM6PVB)
*SE3E	"	10,710	122	18	67
					(OP:SA3AZK)
*SM5CCT	"	7,611	123	11	48
*SA7J	"	2,378	68	10	31
					(OP:SM7XGG)
*SM3UQK	"	1,470	33	10	20
*SM7B	"	483	19	8	15
					(OP:SM7LAD)
*SD3A	"	286	15	8	14
					(OP:SM3FJF)
*SA3MTS	"	204	11	7	10
*SA3XYZ	"	192	10	6	10
***SM6C**	**21**	**7,802**	**74**	**14**	**33**
*SM4JSF	"	2,842	52	8	21
***SA6BPD**	**14**	**13,719**	**165**	**15**	**36**
*SM6OPW	"	2,010	59	8	22
*SG3O	"	1,769	31	11	18
					(OP:SM3AGO)
***SD1A**	**7**	**126**	**13**	**3**	**11**
					(OP:SM1TDE)
***SM3TTZ**	**1.8**	**2**	**1**	**1**	**1**
8SØC	**AA**	**689,216**	**748**	**97**	**387**
					(OP:SMØMPV)
SA6U	"	631,680	957	90	330
					(OP:SM6LJU)
SE3X	"	210,795	680	48	187
					(OP:SA3BYC)
SE5N	"	123,624	409	50	152
					(OP:SM5ISM)
SI3A	"	64,540	280	37	103
					(OP:SM3LIV)
8S8S	"	55,536	201	43	113
					(OP:SM5XSH)
SA5JUS	"	21,210	136	34	71
SMØNJO	"	16,019	65	33	50
SEØP	"	13,608	104	26	58
					(OP:SAØBYP)
SB7W	**14A**	**24,336**	**216**	**14**	**58**
SJ2W	"	14,850	288	10	8
					(OP:SM2WMV)
SMØFPR	**7A**	**256**	**16**	**3**	**13**
***SE4E**	**AA**	**409,220**	**986**	**66**	**250**
					(OP:SM4DQE)
*SM5NQB	"	104,468	443	36	146
*SM6MVE	"	76,588	353	38	126
*SM8B	"	53,820	312	28	110
					(OP:SAØBVA)
*SM5SYO	"	36,195	225	29	98
*SA6SKA	"	28,033	259	24	73
*SK6QA	"	24,888	198	22	80
					(OP:SA6AXR)
*SK3UB	"	8,216	70	28	51
					(OP:SM3PXO)
*SMØBYO	"	4,599	78	13	50
*SC2M	"	1,421	33	8	21
					(OP:SA2BRJ)
***SM3EAE**	**14A**	**6,946**	**87**	**13**	**33**

Switzerland

HB9EFJ	**A**	**139,294**	**308**	**57**	**214**
HB9TOC	"	71,978	347	33	113
HB9FEX	"	22,572	196	26	82
HB9RYZ	"	16,716	77	31	53
HB9AZO	"	840	14	8	12
HB9BEM	"	*540*	*11*	*10*	*10*
HB9EGA	"	504	24	7	14
HB9AA	**14**	**31,746**	**281**	**18**	**56**
					(OP:HB9ARF)
***HB9AWS**	**A**	**133,760**	**503**	**46**	**174**
*HB9HFM	"	64,963	330	35	132
*HB9OAU	"	56,833	248	39	122
*HB9MXY	"	26,329	197	23	90
*HB9FLX	"	15,675	130	27	68
*HB9GIS	"	9,856	90	22	55
*HB9FVR	"	5,915	103	13	52
*HB9GKM	"	5,576	68	19	49
*HB3YXD	"	5,428	90	14	45
*HB9TRR	"	5,130	59	16	38
*HB9FHV/M	"	4,686	54	21	45
*HB9PLB	"	3,150	51	15	35
*HB9FXU	"	3,096	50	13	30
*HB9DAQ	"	1,008	30	6	6
**HB3XRB*	"	*837*	*25*	*7*	*20*
*HB9FZI	"	442	31	11	23
**HB9FBP*	"	*403*	*13*	*6*	*7*
***HB3YGD**	**21**	**2,380**	**50**	**11**	**23**
***HB9CSA**	**7**	**1,560**	**52**	**4**	**26**
*HB9DOS	"	1,326	53	3	23
HB9EOU	**AA**	**1,810,200**	**2224**	**115**	**410**
HB2U	"	769,749	1339	88	291
					(OP:HB9EYP)
HB9AUS	"	30,997	110	36	103
HB9GFP	"	3,196	61	11	36
HB9FKK	**7A**	**14,774**	**123**	**20**	**63**
					(OP:IK1PMR)
***HB9VQQ**	**AA**	**253,116**	**573**	**55**	**182**
*HB9GNP	"	57,615	245	40	127
*HB9FSE	"	2,788	26	17	24
***HB9MH**	**14A**	**60,830**	**308**	**23**	**87**
					(OP:HB9OCR)
*HB9GPR	"	308	14	10	12
***HB2K**	**7A**	**30,576**	**247**	**17**	**74**
					(OP:HB9OCR)
***HB9OCR**	**3.7A**	**25,040**	**278**	**11**	**69**

Ukraine

US5D	**A**	**1,486,368**	**2397**	**104**	**312**
					(OP:UT7DX)
UZ5ZU	"	679,323	1392	79	302
UXØLL	"	415,664	1065	86	227
UX2MF	"	321,451	618	65	248
US7IA	"	271,852	698	55	211
UT6EE	"	241,376	460	67	237
UX3IT	"	223,554	770	45	177
UR5RP	"	188,150	458	61	204
US6IKF	"	143,325	408	66	179
UT2UB	"	134,318	420	56	183
UR5CN	"	96,320	379	54	170
UW7RV	"	95,604	384	39	147
UR4EI	"	72,924	301	40	137
UT1QQ	"	70,065	373	38	135
USØU	"	63,544	294	39	130
					(OP:USØUX)
UT3UV	"	36,900	222	38	112
US3LX	"	31,598	191	29	93
UX7QG	"	22,176	158	23	73
UR4LRG	"	12,390	124	18	41
US8QQ	"	1,702	28	13	24
US5QRW	**28**	**300**	**25**	**4**	**11**
UY5QZ	"	6	2	1	2
UT5LO	**21**	**78,232**	**282**	**30**	**97**
UR6IJ	"	46,904	259	29	75
US7IB	"	12,864	137	16	51
UX3HA	**14**	**45,848**	**354**	**17**	**71**
US5UO	"	38,448	257	20	69
UR5NLA	"	22,557	216	16	57
UZ5ZV	"	15,123	158	16	55
UR4QZZ	"	56	5	3	5
UT7FA	**7**	**34,216**	**329**	**17**	**74**
UV5EUK	"	609	27	5	16
***UY3U**	**A**	**393,216**	**1085**	**62**	**194**
*UT7NW	"	376,710	924	62	228
*UY2UQ	"	283,581	1001	53	190
*US5UC	"	282,286	558	78	236
*UW6E	"	278,721	748	59	220
					(OP:UR6EA)
*UX7MR	"	190,422	783	43	170
*UR6QS	"	187,425	553	56	199
*UT8IM	"	157,176	485	51	185
*UY5QJ	"	149,600	499	43	144
*UV3QF	"	138,648	465	45	167
*UT3SO	"	136,915	556	43	154
*UR5KO	"	133,278	449	53	176
*UR2LX	"	120,594	388	55	147
*UT5UN	"	98,070	319	51	159
*UTØCK	"	97,310	386	37	148
*UT8IBU	"	89,430	366	36	129
*UV7MA	"	53,872	280	33	115
*UR5WCQ	"	53,298	283	27	114
*UR5WHQ	"	52,456	234	34	132
*UT3UZ	"	51,988	204	41	123
*UT4MM	"	47,628	268	32	115
*UT1V	"	46,816	268	34	118
					(OP:US1VM)
*UT5HX	"	44,805	251	32	113
*UT3IA	"	42,075	203	39	126
*UR3VKR	"	41,860	208	28	102
*UY5TE	"	39,746	281	25	94
*UR5AMJ	"	39,390	145	44	86
*UT4USA	"	36,297	282	25	86
*UT3UFI	"	30,240	234	31	104
*US7UU	"	29,346	183	34	100
*UR5ZDZ	"	25,992	194	24	90
*UT1WW	"	21,338	219	19	75
*UX7QV	"	19,897	129	26	75
*UR5FQB	"	19,300	168	22	78
*US5WDJ	"	14,535	99	26	69
*US7WW	"	14,448	154	17	69
*US4IQS	"	14,235	233	11	54
*UZ1WW	"	14,168	108	23	65
*UX4MX	"	14,155	81	31	64
*UT2MZ	"	13,857	61	42	51
*UW5U	"	12,580	170	16	58
					(OP:UY2UA)
*UR3ABQ	"	12,000	117	21	75
*UT5ZL	"	10,934	98	24	53
*UV5EEO	"	9,840	107	19	61
*US7IID	"	9,222	95	20	67
*UR5IFM	"	8,946	105	14	57
*UR3PHG	"	6,210	119	7	47
*UT6UZ	"	6,204	58	17	49
*US3IZ	"	3,036	53	12	32
*UX9Q	"	1,645	52	12	35
					(OP:UR9QQ)
*UTØFC	"	1,617	72	9	24
*UT7HM	"	1,365	36	10	29
*UR4MF	"	520	10	10	10
*UR7QDO	"	448	18	6	10
*UTØZT	"	352	20	6	16
*UR6QV	"	224	16	5	9
*UR6IM	"	135	5	4	5
***UX2HH**	**21**	**32,200**	**174**	**26**	**74**
**UT1AN*	"	*17,892*	*95*	*24*	*47*
*UT4RZ	"	5,782	60	17	42
*UT3UCL	"	2,752	37	17	26
*UTØNB	"	1,332	42	11	26
***UT3EV**	**14**	**67,424**	**559**	**20**	**78**
*UX4CR	"	35,559	288	17	64
*UR7CT	"	29,920	193	18	67
*UR8QR	"	24,282	233	14	57
*US5AT	"	22,842	204	17	64
*UR8QE	"	14,446	165	12	50
*UR4MS	"	8,932	96	10	48
*UR3QTN	"	2,604	70	6	25
***UT4EK**	**7**	**38,258**	**303**	**19**	**75**
*UT3QD	"	31,842	271	16	71
*UY3CC	"	27,342	284	18	75
*UR4WWR	"	2,660	73	5	30
*UR6LF	"	1,770	58	6	24
***UT7QL**	**3.7**	**16,900**	**240**	**9**	**56**
*UT8AS	"	6,278	132	7	36
*UY1IP	"	2,849	93	6	31
***UT2AB**	**1.8**	**117**	**5**	**4**	**5**
UW5ZM	**AA**	**3,249,884**	**3610**	**135**	**499**
UW5Y	"	3,061,408	3007	133	499
					(OP:US2YW)
UW1M	"	2,770,800	2549	132	468
					(OP:UR5MW)
UV5U	"	1,542,128	1743	124	438
					(OP:UX1UA)
UT7CR	"	1,172,841	1681	111	390
UW2M	"	859,160	1324	85	291
					(OP:URØMC)
US9IDD	"	810,522	1900	74	259
UX1VT	"	554,760	1120	73	287
UT7NY	"	438,834	899	75	252
UWØK	"	375,642	569	91	278
					(OP:USØKW)
UW8SM	"	360,150	970	66	228
UT1UL	"	292,152	541	57	239
UT3V	"	191,254	578	51	215
UTØEA	"	170,208	455	48	168
US5QUB	"	138,446	420	44	173
UT5ECZ	"	65,631	306	31	136
USØSY	"	64,990	189	54	140
UR5E	"	51,194	197	43	136
					(OP:UR5EDX)
UT5EL	"	*25,414*	*104*	*37*	*60*
UT5EDX	"	*16,170*	*162*	*21*	*45*
UR5R	"	9,617	69	26	33
					(OP:UTØRM)
US1IV	"	725	15	10	15
UT7HA	**21A**	**316,480**	**1181**	**34**	**126**
UY1HY	"	98,150	374	32	98
UW3HM	"	9,106	89	15	43
EM2G	**14A**	**401,962**	**2000**	**33**	**118**
					(OP:UR7GO)
UT3RS	"	97,112	516	28	94
UXØRR	"	25,500	197	17	58
US1Q	**7A**	**847,032**	**2868**	**37**	**137**
					(OP:UW2QU)
UT4U	"	575,592	2229	37	137
					(OP:UT5UJO)
UT1KWA	"	8,844	209	7	37
UW7LL	**3.7A**	**369,600**	**1812**	**33**	**117**
US6EX	"	56,358	471	18	83
UT2AA	**1.8A**	**13,671**	**201**	**9**	**54**
UX5IS	"	11,716	194	9	49
UX5MC	"	2,294	67	8	29
US5WE	"	1,849	40	8	35
***UY7MM**	**AA**	**887,276**	**1441**	**94**	**358**
*UR2Y	"	725,948	1192	85	303
					(OP:USØYW)
*UX1UX	"	537,033	1215	72	249
*UY7C	"	511,850	894	82	271
*UT8EL	"	288,435	696	60	227
*UR4QFP	"	99,671	409	42	145
*UX7UU	"	75,465	205	52	143
*UXØFF	"	45,151	129	60	103
*UT1AA	"	33,578	184	28	75
*UT4UB	"	30,250	183	32	93
*UX5UN	"	21,736	135	29	75
*UR5XMM	"	15,486	102	26	61
*UTØNT	"	11,475	99	25	60
*UT6HX	"	9,120	58	30	50
*UT8IK	"	8,692	103	17	65
*UT3WX	"	7,973	103	17	50
*UR4QR	"	3,904	79	18	43
*UR5EPG	"	1,824	31	13	25
*UT3UKQ	"	735	34	10	25
*UT9UZ	"	357	18	8	13
*UR5XGJ	"	63	25	6	15
***UR4CYT**	**21A**	**9,600**	**71**	**18**	**32**
***US7IY**	**7A**	**29,029**	**284**	**15**	**62**
**US7UW*	"	*28,220*	*289*	*15*	*68*
*US8MS	"	225	16	4	11
***UW1U**	**1.8A**	**9,256**	**172**	**8**	**44**
					(OP:UT7UA)
*UT1US	"	1,520	42	8	32

Wales

GW4OKT	**21**	**11,000**	**150**	**14**	**41**
***MW8R**	**A**	**211,600**	**704**	**48**	**182**
					(OP:GW4SHF)
*MW1MDH	"	13,937	161	18	59
*2WØDOE	"	13,795	130	20	69
*MW6M	"	11,036	114	20	69
					(OP:GW4BVJ)
*GW8KBO	"	9,632	76	26	60
*GWØANA	"	4,087	51	21	40
***GWØFRE**	**28**	**1,056**	**39**	**7**	**17**
***MW2I**	**21**	**31,440**	**204**	**20**	**60**
					(OP:G4FRE)
***GW5L**	**14**	**59,892**	**403**	**19**	**73**
					(OP:GW4ZAR)
*MW6PQU	"	2	1	1	1
***GW9J**	**7**	**57,700**	**476**	**16**	**84**
					(OP:GWØGEI)
*GW4W	"	39,000	461	12	66
					(OP:GW4EVX)
***GWØNVN**	**1.8**	**255**	**13**	**5**	**10**
MWØJZE	**AA**	**8,555**	**63**	**25**	**34**
***GW7ERI**	**AA**	**39,406**	**219**	**31**	**91**
***GW1HRW**	**28A**	**25**	**5**	**1**	**4**
***MW9W**	**14A**	**39,000**	**436**	**16**	**59**
					(OP:GWØKRL)
***GWØIRW**	**3.7A**	**72**	**8**	**2**	**7**
***GW8Z**	**1.8A**	**42**	**6**	**2**	**5**

OCEANIA

Australia

VK4SDD	**A**	**620,172**	**1117**	**73**	**134**
VK2WWV	"	229,554	413	76	142
VK3IO	"	61,362	184	46	80
VK7GN	"	53,872	190	40	64
VK4QO	"	*13,616*	*74*	*30*	*44*
VK4ME	"	4,644	53	22	32
VK2YX	"	3,096	38	20	23
VK6BMW	"	840	18	14	14
VK6GOM	"	500	21	10	10
VK7QP	"	465	11	6	9
VK4TL	**21**	**233,205**	**852**	**28**	**77**
VK2GR	"	12,121	149	15	16
VK4BRT	"	7,831	70	15	26
VK5SFA	"	966	18	9	14
VK2CZ	**14**	**83,952**	**303**	**31**	**75**
VK2KS	"	14,656	90	20	44
VK3AVV	"	8,869	70	14	35
VK4JBY	"	72	4	4	4
VK4QS	**7**	**7,410**	**53**	**24**	**33**
***VK8VWA**	**A**	**26,578**	**126**	**35**	**62**
*VK4MAP	"	24,472	149	40	52
*VK4SP	"	13,860	74	34	36
*VK3BSP	"	7,526	64	24	29
**VK2HOT*	"	*1,995*	*23*	*17*	*18*
*VK2GZ	"	1,131	16	14	15
*VK5NS	"	1,120	22	10	10
*VK6WE	"	992	23	14	17
**VK2OP*	"	*629*	*15*	*7*	*10*
*VK3TNL	"	527	13	8	9
*VK5IR	"	504	24	10	11
*VK4PZZ	"	432	13	8	8
*VK7DW	"	400	18	8	8
*VK3UKW	"	396	19	12	10
					(OP: @VK3BNW)
***VK6RT**	**14**	**13,585**	**113**	**18**	**37**
*VK2HBG	"	2,130	27	12	18
*VK2VRC	"	684	12	7	12
***VK6MIT**	**7**	**1,404**	**27**	**13**	**13**
*VK4ATH	"	900	19	10	10
*VK2FHQQ	"	308	20	5	6
*VK6ATS	"	255	11	7	8
**VK6BEC*	"	*140*	*8*	*4*	*3*
VK4QH	**AA**	**250,128**	**499**	**69**	**124**
VK6DW	"	112,700	327	58	103
VK4ACN	"	56,848	166	47	89
VK3KE	"	43,956	173	35	76
VK3BDX	"	40,119	126	44	85
VK2BCQ	"	31,801	206	23	36
VK2CA	"	19,926	90	30	52
VK4FB	"	15,385	73	31	54
VK5GR	"	6,105	45	23	32
VK3MB	"	5,712	59	21	21
VK3KTT	"	2,380	24	13	21
***VK2LPF**	**AA**	**8,350**	**69**	**23**	**27**
***VK4FJ**	**14A**	**144**	**6**	**6**	**6**
***VK5WU**	**7A**	**324**	**18**	**6**	**6**

Brunei Darussalam

***V85T**	**A**	**14,049**	**127**	**28**	**35**

East Malaysia

9M8YY	**21**	**306,423**	**903**	**30**	**87**
					(OP:JR3WXA)
***9M6GOH**	**A**	**60,786**	**361**	**27**	**39**
*9M8ADX	"	21,045	189	26	35
***9W8DEN**	**7**	**8,928**	**165**	**16**	**20**
*9W6VAT	"	3,318	150	8	13
*9W6PJM	"	1,656	56	8	10
*9W6AMC	"	300	27	3	7
*9W6AJA	"	195	11	5	8
*9W6MM	"	81	8	4	5
*9W6NSP	"	18	4	1	2

Guam

***KN4IAS/KH2**	**A**	**1,175**	**35**	**12**	**13**

Hawaii

KH7M	**A**	**2,699,900**	**2701**	**124**	**226**
					(OP:N6TJ)
NH7A	"	2,480,850	3040	101	197
KH6DL	"	1,272	23	12	12
***KH6DH**	**A**	**8,109**	**69**	**24**	**27**
*KH6XL	"	825	19	8	7
**NH7PE*	*21*	*28*	*3*	*2*	*2*
KH7XS	**AA**	**8,569,888**	**5976**	**150**	**346**
					(OP:K4XS)
AH7C	"	2,394	23	16	22
***KH6FHI**	**AA**	**1,200**	**22**	**13**	**12**

Indonesia

YB3VI	**A**	**777,444**	**1355**	**66**	**156**
YB1AR	"	628,704	816	84	204
YC7TUU	*"*	*119,662*	*414*	*49*	*85*
YB4NY	"	18,326	107	28	49
YB2BNN	"	17,784	121	38	66
YC2EEE	"	1,700	74	10	15
YC3IMS	"	464	29	7	9
YB2VMC	"	42	9	3	4
YC3GOQ	**21**	**1,475**	**43**	**10**	**15**
YBØMWM	**14**	**22,236**	**142**	**19**	**49**
YB3RO	**7**	**14,750**	**141**	**21**	**38**
YCØPOG	"	13,200	172	21	39
YBØVB	"	11,350	99	19	31
YE4IDL	"	9,828	109	16	26
YC9SBP	"	2,701	32	16	21
YB3SZM	"	2,001	34	13	16
YB3FTD	"	1,755	32	12	15
YC3NHW	"	210	37	6	9
YF3DFB	**3.7**	**1,026**	**28**	**12**	**15**
YF3CYT	**1.8**	**24**	**4**	**3**	**3**
***YB2GV**	**A**	**89,352**	**263**	**50**	**96**
*YB7WR	"	65,790	217	45	84
*YB2VYY	"	46,968	169	38	76
*YC4FIK	"	36,784	197	37	51
*YB1NOE	"	23,068	112	23	56
*YC9JAU	"	21,525	158	26	49
*YB3BME	"	18,486	104	26	53
*YB2UFM	"	15,610	97	24	46
*YC1DMK	"	13,206	90	28	43
*YBØJVZ	"	12,544	72	24	40
*YC1KK	"	11,972	64	34	48
*YB8ADX	"	10,500	85	24	46
*YB2BBZ	"	9,702	63	25	38
*YC1HLT	"	7,788	99	20	39
*YC2LLC	"	6,848	103	23	41
*YC7UDD	"	6,579	57	22	29
*YBØBAJ	"	5,992	69	20	36
*YBØYAD	"	5,888	53	18	28
*YCØBAS	"	5,148	69	16	23
*YB4MDL	"	4,524	77	24	34
*YB8XOB	"	3,525	39	20	27
*YB3FUA	"	3,060	40	15	19
*YB9YBB	"	2,920	34	16	24
*YB2TS	"	2,870	38	17	24
*YE3CGG	"	2,870	43	18	23
*YC6UAF	"	2,368	50	13	19
*YC2BDZ	"	2,115	51	18	29
*YB1IM	"	1,479	19	12	17
*YBØPTR	"	1,242	23	13	14
*YB3BX	"	651	17	8	13
*YD9JKT	"	560	37	7	9
*YG3DPH	"	152	22	8	11
*YC2DFD	"	85	21	7	10
*YC6BVV	"	80	6	3	5
***YB8FIJ**	**28**	**2**	**1**	**1**	**1**
***YC9FAR**	**21**	**86,071**	**387**	**23**	**60**
*YB5OUB	"	7,638	70	10	28
*YBØOKR	"	6,630	78	13	38
*YB1EGP	"	5,535	41	11	34
*YC1BON	"	3,230	53	9	29
*YC8OBM	"	629	33	8	9
*YC4IWS	"	620	13	10	10
*YB1HDR	"	176	6	5	6
*YB8BY	"	144	10	6	6
*YB2OBI	"	54	15	8	10
*YC3RWT	"	24	2	2	2
*YC3EON	"	6	1	1	1
*YC3SGQ	"	6	1	1	1
			(OP:YC3TTS)		
*YC3TTS	"	6	1	1	1
*YC3XJH	"	6	1	1	1
***YB2CPO**	**14**	**26,996**	**159**	**22**	**46**
*YB2MM	"	24,759	159	20	43
*YB7SKM	"	12,426	97	21	36
*YB2BOB	"	10,293	97	17	30
*YB6UAK	"	7,436	82	16	28
*YB9GV	"	2,046	30	12	19
*YB3KK	"	18	3	3	3
***YD9VIZ**	**7**	**20,178**	**162**	**25**	**32**
*YD3YSF	"	20,064	160	21	45
*YB7OO	"	18,166	123	21	41
*YDØMAT	"	9,900	79	19	31
*YD1JGE	"	6,864	111	15	29
*YD9KNX	"	6,766	173	14	20
*YD3BGM	"	6,120	99	16	29
*YD7YGR	"	5,880	115	18	24
*YD9ATS	"	5,640	65	12	28
*YB1LUE	"	5,002	78	14	27
*YC1DWD	"	4,914	87	17	25
*YC2CTE	"	4,389	76	14	19
*YDØODC	"	3,959	122	14	23
*YC1EJL	"	3,740	48	14	20
*YD2YSW	"	3,434	45	15	19
*YG3CZW	"	3,315	53	16	23
*YD1EDH	"	3,300	54	12	18
*YB3BAR	"	3,220	62	14	21
*YDØUVZ	"	2,860	51	12	14
*YDØSCZ	"	2,754	57	13	14
*YD2CPQ	"	2,640	69	13	17
*YD2DPK	"	2,584	30	14	20
*YG3CMS	"	2,550	63	15	19
*YF4ICC	"	2,332	40	10	12
*YC7WNC	"	2,262	75	13	16
*YC4JOY	"	1,988	40	11	17
*YG3DBH	"	1,938	98	15	23
*YDØMZH	"	1,752	32	10	14
*YG2UFA	"	1,702	47	9	14
*YB8TDK	"	1,624	35	11	18
*YD7YCO	"	1,560	35	11	15
*YD1CCZ	"	1,496	35	8	14
*YD2GBS	"	1,218	28	11	18
*YD7YDB	"	1,204	37	11	17
*YC4KAO	"	1,092	20	9	12
*YD1SGB	"	1,092	59	9	12
*YD7VLT	"	1,060	28	9	11
*YF4IFT	"	902	20	9	13
*YDØRLX	"	836	17	8	11
*YB1NCR	"	798	18	9	12
*YC3RBI	"	720	30	7	8
*YC8VRS	"	651	27	9	12
*YC8VRA	"	646	28	9	10
*YB3BBF	"	640	68	8	12
*YD9DE	"	638	29	8	14
*YB8ACM	"	624	42	10	14
*YD1NVX	"	594	22	9	13
*YD9SVS	"	486	14	9	9
*YG3EBO	"	476	27	7	10
*YD9AOS	"	448	12	6	8
*YD7ITF	"	442	24	5	8
*YD1EMV	"	380	49	8	11
*YC3BQS	"	360	32	7	11
*YC7MIB	"	348	19	4	8
*YG3FBV	"	340	13	4	6
*YF3CXB	"	336	16	5	7
*YG3BUP	"	325	22	5	8
*YD1LRG	"	289	21	7	10
*YD3DXG	"	288	39	3	5
*YD7VGB	"	238	59	7	10
*YD7UVB	"	216	66	11	13
*YDØEGA	"	198	33	3	6
*YC9SXI	"	140	6	6	4
*YG3FAP	"	136	7	3	5
*YC8BJK/9	"	112	11	3	4
*YC8VSR	"	96	20	5	7
*YD7MHZ	"	77	5	3	4
*YG3DKB	"	74	66	15	22
*YC1HBO	"	70	12	4	6
*YD2KJC	"	70	21	2	5
*YD3CRW	"	64	6	3	5
*YC1LBQ	"	63	12	3	4
*YB9RRE	"	54	8	5	4
*YD1IDB	"	54	6	2	4
*YD2PTC	"	36	11	1	3
*YD7VPZ	"	36	19	2	4
*YD3YPD	"	27	15	1	2
*YD3PRG	"	18	3	1	2
*YD9XYN	"	12	3	3	3
*YD9WKN	"	8	2	2	2
*YG9VTT	"	8	2	2	2
*YD1HVZ	"	6	1	1	1
*YD9VTA	"	2	1	1	1
*YG9VTA	"	2	1	1	1
*YD9VTT	"	0	0	0	0
***YD8CPZ**	**3.7**	**360**	**21**	**8**	**10**
*YF3CYS	"	208	9	8	8
*YC3TEN	"	165	9	7	8
*YB6DE	"	144	10	6	6
*YC2YEN	"	0	1	1	1
***YF3CYU**	**1.8**	**2**	**1**	**1**	**1**
YBØNSI	**AA**	**152,950**	**380**	**61**	**114**
YC6RMT	"	146,965	404	43	90
YB2IQ	"	63,315	193	48	87
YBØDJ	"	54	3	3	3
YB9BCS	"	24	19	6	6
YC3RJL	**21A**	**5,805**	**65**	**14**	**29**
YB8UM	"	720	21	9	11
YBØNDT	**14A**	**214,484**	**711**	**30**	**86**
YE3AA	"	330	11	5	5
YB7GRN	**7A**	**9,416**	**83**	**17**	**27**
YB3OIB	"	2,852	44	13	18
YG8BIR	"	1,190	78	14	20
YB9QP	"	522	15	8	10
YD1KCX	"	406	25	5	9
YC1EAV	"	104	15	3	5
YF9CDL	**3.7A**	**384**	**13**	**7**	**9**
YC3VRY	"	224	9	7	9
***YC2YIZ**	**AA**	**178,872**	**404**	**57**	**117**
*YB8RW	"	90,739	380	47	66
*YB8IBD	"	55,330	205	43	67
*YB8ROP	"	21,660	136	32	44
*YC1TQL	"	18,549	110	28	53
*YC2CAA	"	14,931	110	25	54
*YE8XBN	"	13,695	156	24	31
*YB7BIM	"	7,748	63	23	29
*YG8DX	"	836	33	7	12
*YCØOXA	"	667	15	10	13
*YCØNGA	"	264	8	5	7
***YB9GWR**	**28A**	**84**	**4**	**3**	**4**
***YC2VOC**	**21A**	**43,706**	**193**	**19**	**63**
*YB1UUN	"	29,520	131	24	58
*YC2CAB	"	437	11	8	11
*YBØEIN	"	198	6	5	6
*YB3VY	"	6	1	1	1
***YBØANJ**	**14A**	**9,823**	**84**	**15**	**32**
			(OP:4F3JX)		
*YBØISE	"	6,204	73	15	32
***YGØTUR**	**7A**	**7,266**	**125**	**15**	**27**
*YG3BWY	"	5,548	62	15	23
*YG3DGQ	"	5,535	115	17	24
*YB8ASY	"	4,464	58	15	21
*YC1AD	"	3,904	54	14	18
*YDØSDD	"	3,232	64	14	18
*YG3EOY	"	1,904	36	11	17
*YG3CMQ	"	1,891	37	13	18
*YDØRXA	"	1,650	42	9	16
*YD9YSS	"	1,470	39	13	17
*YB8UTI	"	1,404	41	7	11
*YB7XYO	"	1,173	52	8	15
**YG3DEA*	*"*	*1,152*	*48*	*10*	*14*
*YC3CQY	"	882	25	6	8
*YD7JLI	"	770	28	10	12
*YD1IFR	"	720	26	6	10
***YG3FKD**	**3.7A**	**84**	**7**	**6**	**6**

Marshall Islands

***V73MT**	**A**	**13,350**	**80**	**42**	**47**
			(OP:JAØRQV)		

New Caledonia

FK8IK	**A**	**206,028**	**450**	**66**	**111**
FK4QX	"	187,974	451	65	112

New Zealand

ZM4T	**A**	**2,659,480**	**2824**	**108**	**232**
			(OP:N5ZO)		
ZL2X	"	23,885	133	35	50
			(OP:ZL4CZ)		
ZL2BCO	"	23,520	117	32	52
ZL1DK	*"*	*12,719*	*91*	*33*	*46*
ZL3DW	**14**	**629**	**15**	**8**	**9**
ZL3RIK	**7**	**350**	**20**	**7**	**7**
***ZL2XC**	**A**	**5,499**	**48**	**23**	**24**
*ZL1FAB	"	5,247	52	24	29
*ZL2AYZ	"	1,000	16	13	12
***ZL4CTS**	**7**	**924**	**18**	**9**	**12**
ZL2AJ	**AA**	**229,670**	**376**	**82**	**156**
ZL4AS	"	60,489	158	51	90
ZL2RX	"	25,020	108	34	56
ZL2IFB	"	6,136	49	23	29
ZL3DMC	"	3,234	35	16	26
ZL4FZ	"	2,720	28	18	22
***ZL4YY**	**AA**	**420**	**18**	**7**	**8**
*ZL2MM	"	391	18	8	9
***ZL3TE**	**3.7A**	**221**	**8**	**6**	**7**

Philippines

DU1IVT	**A**	**199,383**	**661**	**47**	**76**
DU1EG	**21**	**16,638**	**104**	**16**	**43**
DU1RB	**14**	**1,824**	**56**	**8**	**8**
DU1R	**7**	**68,952**	**346**	**25**	**53**
			(OP:DU1UGZ)		
4F3FSK	**3.7**	**840**	**32**	**8**	**13**
***4E1A**	**A**	**351,400**	**761**	**68**	**107**
*DU1JM	"	43,056	166	37	55
*DV1YAI	"	11,781	106	17	34
*DV1TBT	"	5,559	61	19	32
*DU9XL	"	713	22	10	13
**DW9IGT*	*"*	*616*	*22*	*10*	*12*
*DU1VHY	"	567	16	9	12
*DW7RAR	"	325	35	11	14
***DV9CA**	**21**	**2,431**	**57**	**8**	**9**
*DU1KIR	"	1,386	36	11	10
***DU1Q**	**14**	**12,400**	**111**	**20**	**30**
*4E1EEE	"	1,564	38	10	13
*DV1VGX	"	108	8	2	4
***DV1UUU**	**7**	**2,548**	**41**	**12**	**16**
*DV3RXC	"	1,250	31	10	15
*DW1NOL	"	726	35	9	13
*DU1ZC	"	540	23	7	11
*DU9XM	"	360	28	5	10
**DW7PGO*	*"*	*285*	*16*	*5*	*10*
*DV1YAH	"	16	2	2	2
DU3T	**AA**	**914,544**	**1315**	**85**	**176**
DU3/KB7DV	"	315	12	10	11
DU1AV	**7A**	**28,755**	**341**	**19**	**26**
***DU1AVC**	**14A**	**2,938**	**53**	**10**	**16**

Samoa

5W1SA	**AA**	**8**	**2**	**2**	**2**

SOUTH AMERICA

Argentina

LV1F	**A**	**290,173**	**737**	**60**	**109**
			(OP:LU4FTA)		
LU1BJW	"	57,728	269	29	53
LU8DY	"	4,590	64	17	28
AY8A	"	3,384	74	8	10
			(OP:LU8ADX)		
LU3HS	**28**	**13,695**	**179**	**15**	**18**
LU5VV	**21**	**424,872**	**1379**	**21**	**87**
LU9MDH	"	19,845	172	15	30
LU9MBY	**14**	**169,168**	**751**	**24**	**73**
LU2DVI	**3.7**	**19,180**	**123**	**25**	**45**
LU1VM	"	5,687	55	20	27
LU6DU	*"*	*459*	*11*	*8*	*9*
***LW1EUD**	**A**	**263,186**	**648**	**55**	**99**
*LQ7E	"	249,084	694	47	106
			(OP:LW3DN)		
*LU5EVK	"	26,040	183	21	39
*LU1DW	"	17,296	90	40	54
*LU6EQV	"	15,330	112	29	41
*LU1EXR	"	13,206	95	22	40
*LU8EHR	"	10,011	85	33	38
*LU9EHU	"	7,261	89	22	31
*LU1JHF	"	5,562	41	21	33
*LU6KA	"	4,921	108	13	24
*LU9JX	"	1,980	31	15	18
*LU6DCN	"	1,911	70	22	27
**LU1ALF*	*"*	*171*	*11*	*9*	*10*
***LU4VI**	**28**	**196**	**19**	**6**	**8**
*LW9ENF	"	24	4	2	2
***LU2NI**	**21**	**21,184**	**149**	**17**	**47**
*LU5MEC	"	2,688	57	11	17
*LU3JVO	"	341	15	6	5
LU5FF	**AA**	**21,112**	**159**	**23**	**29**
LU6ETB	"	7,718	164	8	9
LU2DX	**28A**	**63,232**	**401**	**17**	**47**
LU1DX	"	44,370	325	16	42
LW3EK	"	25,960	251	14	30
L77D	**21A**	**139,740**	**511**	**23**	**79**
			(OP:LU6DC)		
LU3MO	"	46,915	315	18	37
LU7MT	**7A**	**21,141**	**134**	**26**	**55**
LU2DKT	**1.8A**	**10,545**	**82**	**18**	**39**
***LW4EF**	**AA**	**259,346**	**648**	**58**	**120**
*LU7DH	"	209,880	629	42	90
*L73H	"	21,750	114	35	52
			(OP:LU4HK)		
*LU3EBG	"	8,056	111	16	22
***LU7DV**	**21A**	**47,334**	**282**	**19**	**50**
***LU3MAM**	**14A**	**56,820**	**360**	**21**	**39**

Aruba

P4ØT	**A**	**10,978,352**	**6247**	**142**	**474**
			(OP:VE3DZ)		
P4ØL	"	4,464,437	4155	103	270
			(OP:W6LD)		
***P4ØW**	**AA**	**3,393,054**	**2776**	**103**	**338**
			(OP:W2GD)		

Bolivia

CP5HK	**A**	**110,600**	**408**	**54**	**86**
CP6UA	**AA**	**46,515**	**332**	**38**	**67**

Brazil

PS2T	**A**	**3,883,684**	**3469**	**108**	**290**
			(OP:PY2NY)		
PY9GC	"	805,263	1445	60	159
ZW2T	"	512,600	991	68	152
			(OP:PY2RKG)		
PY5WW	"	506,862	1094	59	115
PY2MET	"	383,280	731	69	171
PY2SBY	"	192,050	515	55	112
PT9AL	"	3,710	62	25	28
PY5KA	"	1,034	35	21	26
PY2EU	*"*	*1,008*	*22*	*10*	*14*
PY2KP	"	713	27	14	17
PY2NA	**28**	**39,936**	**309**	**16**	**36**
PY3VB	**21**	**37,044**	**193**	**19**	**65**
PY2XJ	"	25,515	185	18	45
PP5RT	**14**	**139,986**	**569**	**22**	**77**
PS8DX	"	18,360	118	16	56
ZV1D	"	779	39	8	11
PY7BEL	"	6	1	1	1
PY9MP	**7**	**9,044**	**82**	**21**	**47**
PY4JW	"	2,279	45	14	29
***PY5DD**	**A**	**71,001**	**264**	**52**	**95**
*PY2SEI	"	54,384	243	29	59
*PP5XA	"	35,532	159	38	70
*PY1NS	"	34,545	162	38	67
*PY2LPM	"	28,248	129	41	66
*PY1KB	"	24,564	152	39	53
*PY2RMY	"	14,964	111	32	55
*PY2AB	"	9,230	111	25	46
*PY2VCP	"	8,174	63	24	37
*PY2OQ	"	7,744	110	24	40
*PY2XRP	"	7,598	88	22	36
*PY2MIA	"	6,448	95	23	29
*PY1LU	"	6,060	57	23	37
*PY5AP	"	4,624	69	16	18
**PV8IG*	*"*	*4,130*	*59*	*28*	*42*
*PY2KG	"	3,640	47	22	30
*PY1CDR	"	2,610	83	19	26
*PY1LV	"	2,440	46	19	21
*PU1JSV	"	1,950	48	13	17
*PY5JO	"	1,491	39	10	11
*PY2EBD	"	1,312	27	13	19
*PR7KSA	"	1,176	59	12	16
*PY2CYD	"	702	17	12	15
*PY3ASQ	"	504	23	12	12
**PY4MHZ*	*"*	*475*	*18*	*9*	*10*
*PY1FOG	"	312	37	12	14
*PY3EAM	"	210	26	10	11
*PU2OXB	"	4	6	2	2
***PU2WDX**	**28**	**20,944**	**251**	**13**	**21**
*PU5BOY	"	8,288	135	10	18
*PU5DUD	"	2,808	68	9	17
*PU8MRS	"	2,555	82	14	21
*PU2SDX	"	1,740	34	13	16
*PU3KNG	"	1,250	39	10	15
*PU4ABA	"	1,170	29	11	15
*PU2PZE	"	748	17	10	12
*PU2KUL	"	726	47	10	12
*PU2UGO	"	429	32	6	7
*PU2NBI	"	345	27	8	7
**PU3IKE*	*"*	*336*	*12*	*6*	*6*
*PU2NAX	"	180	12	5	5
*PU8MGB	"	156	19	5	7
*PU7EYL	"	150	24	4	6
*PU1WZY	"	143	30	5	6
*PU3JFF	"	110	10	5	6
*PU2WAV	"	84	13	3	4
*PU4CGT	"	78	17	5	8
*PU2UAH	"	4	5	2	2
***PY2CX**	**21**	**389,418**	**1160**	**28**	**95**
*PY2CP	"	93,912	480	18	68
*PP7LP	"	45,144	263	18	48
*PY4XX	"	20,678	176	16	33
*PY3ND	"	2,528	46	13	19
**PY2PCZ*	*"*	*21*	*13*	*9*	*12*
***PY2RTB**	**14**	**54,660**	**355**	**20**	**40**
*PP5IP	"	49,350	371	24	46
*PP2BK	"	9,352	83	22	34
*PY2SRL	"	3,234	42	17	25
*PP5FE	"	504	35	12	16
***PY2DPM**	**7**	**884**	**23**	**11**	**15**
*PY1ZP	"	360	20	7	11
***PU2SDW**	**3.7**	**0**	**8**	**1**	**1**
ZX5J	**AA**	**8,140,341**	**4773**	**155**	**472**
			(OP:PP5JR)		
ZX2B	"	3,336,894	2788	106	312
			(OP:PY2MNL)		
PY2EX	"	928,505	1415	68	165
PR2D	"	181,300	298	77	168
			(OP:PY2LCD)		
PY3PA	"	164,465	496	49	78
PY1VOY	"	129,244	321	51	107
PY5DC	"	99,280	266	46	100
PY2VOX	"	58,529	260	37	70
PY2FSG	"	58,446	175	47	106
PY2ZZ	"	58,381	300	26	53
PY2TOP	"	52,074	211	35	64
PT2AW	"	47,200	229	28	52
PY5XH	"	45,684	135	60	102
PP1CZ	"	27,135	157	30	51
PY6HD	"	23,004	97	36	72
PY2NFT	"	8,040	74	10	30
PY3LBO	"	8,008	56	30	47
PY2DR	"	3,430	71	21	28
PY3TX	"	2,604	34	17	25
PY4ME	"	1,722	41	18	24
PP5GWM	"	962	19	13	13
PY2GZ	"	957	23	14	15
PY2AE	"	616	20	10	12
PY2KJ	**21A**	**712,712**	**1604**	**34**	**120**
PY5ZHP	"	203,308	713	23	83
PP1WW	"	177,216	645	23	81
PY2EJ	*"*	*122,056*	*538*	*22*	*66*
PP2FRS	**14A**	**377,804**	**1069**	**34**	**97**
PY2MP	"	151,810	588	25	70
PR7AP	**3.7A**	**1,456**	**21**	**11**	**15**
***PY1SX**	**AA**	**117,775**	**275**	**53**	**122**
*PY5FO	"	90,206	345	41	65
*PY4RL	"	60,465	208	51	94
*PY2XC	"	58,702	273	30	68
*PY2FRQ	"	46,920	178	42	73
*PY1RY	"	38,157	214	30	49
*PR7RBA	"	34,226	147	37	72
*PY2WND	"	33,524	161	44	72
*PP2RON	"	32,153	152	26	53
*PY2ZR	"	25,950	155	27	48
*PY3KN	"	23,868	109	45	63
*PY1AN	"	21,065	163	22	33
*PY2CAT	"	16,110	97	33	57
*PY3DX	"	14,553	90	31	46
**PY2COY*	*"*	*14,028*	*128*	*21*	*21*
*PY2KS	"	8,208	76	33	39
*PR7CJ	"	5,772	50	20	32
*PY7BR	"	4,420	75	25	43
*PY5II	"	3,312	35	19	29
*ZV2B	"	2,574	59	17	22
			(OP:PY2OX)		
*PY2WLM	"	2,552	53	20	24
*PY2MSR	"	2,220	38	15	22
*PP2CS	"	1,482	55	16	22
**PY2SR*	*"*	*729*	*43*	*12*	*15*
*PY2OP	"	441	11	10	11
**PU2XMY*	*"*	*340*	*47*	*9*	*11*
*PU3NVN	"	322	11	7	7
*PU5KGB	"	289	25	8	9
*PY7AC	"	192	16	8	8
*PQ2HX	"	175	27	11	14
*PY4LDS	"	156	13	6	6
*PY7BC	"	24	2	2	2
***PU2UAF**	**28A**	**29,796**	**249**	**15**	**37**
*PU2LEW	"	9,200	140	13	27
*PU8YAB	"	3,429	108	8	19
**PY2HT*	*"*	*578*	*39*	*8*	*9*
*PP5KC	"	504	19	7	7
*PU3LTA	"	392	11	7	7
*PU4HUD	"	272	14	8	9
*PU7ASP	"	221	24	6	7
*PY2ZA	"	195	17	7	8
*PU7EDR	"	180	56	4	5
*PY2GFA	"	169	13	6	7
*PU2XSK	"	162	22	4	5
*PU1SSH	"	126	10	4	5
*PU2LHA	"	24	14	4	4
*PU7ABC	"	10	26	4	6
***PY2UD**	**21A**	**511,784**	**1193**	**33**	**119**
*PP5DZ	"	41,850	207	19	56
*PY2FSR	"	22,631	161	16	45
*PV8AJ	"	736	18	10	13
***PP7DX**	**14A**	**24,163**	**139**	**23**	**50**
*PY2XO	"	252	9	6	6
***PY6TS**	**7A**	**6,136**	**51**	**20**	**39**
*PS8ET	"	5,580	49	12	33
***PY2KC**	**3.7A**	**80**	**11**	**5**	**5**
*PU2TNT	"	10	16	2	3
***PV8DX**	**1.8A**	**49**	**5**	**2**	**5**
*PY2GTA	"	12	3	2	2

Chile

CB8E	**A**	**1,081,856**	**1617**	**79**	**177**
			(OP:CE8EIO)		
CE2SQE	"	39,690	139	49	86
CA6CGX	**28**	**53,648**	**431**	**16**	**40**
XR2K	"	35,389	348	15	28
			(OP:CX1EK)		
CE5JZO	**21**	**220,697**	**1012**	**20**	**63**
CE3DNP	"	101,460	661	17	40
CE3NR	**14**	**38,006**	**254**	**22**	**40**
CE2WNW	"	27,897	247	18	33
CE2ML	"	208	8	6	7
CE3OP	**7**	**6,318**	**104**	**16**	**23**
***CD4PSH**	**A**	**8,352**	**128**	**14**	**18**
*CE4CBJ	"	5,005	80	26	29
*CE6TK	"	850	27	11	14
***CA2CEV**	**28**	**46,752**	**413**	**17**	**31**
*CE7VPQ	"	30,243	297	14	37
*XQ5CIE	"	5,940	127	11	22
*CE5AUC	"	5,626	117	11	18
*CE4CBK	"	5,390	123	8	14
*CA3JBD	"	3,591	90	12	15
*CA4UFC	"	2,968	70	11	17
*CE3TL	"	1,474	60	10	12
**CA6WKD*	*"*	*253*	*23*	*6*	*5*
CE3WYZ	**AA**	**26,410**	**146**	**41**	**54**
***CE7KF**	**AA**	**56,580**	**211**	**49**	**89**
*CE6PGO	"	21,510	142	35	55
*CB3UP	"	14,694	119	27	35
			(OP:XQ7UP)		
*CE5JTC	"	702	23	8	10

Colombia

HK3C	**A**	**631,475**	**1572**	**42**	**103**
HK6J	"	497,420	1060	56	114
HK4W	"	99,484	326	48	106
HK4CO	"	7,668	58	26	45
HK6P	**3.7**	**79,032**	**328**	**23**	**66**
***HK4KM**	**A**	**1,178**	**34**	**12**	**19**
***HK3TK**	**21**	**481,134**	**1880**	**25**	**77**
***HK3J**	**AA**	**27,730**	**153**	**40**	**78**
***HK4GOO**	**14A**	**289**	**9**	**8**	**9**

Curacao

**PJ2DD*	*AA*	*654,560*	*1459*	*39*	*121*
			(OP:PF4T)		

Ecuador

HC5DX	**A**	**75,660**	**179**	**64**	**131**
***HC7AE**	**A**	**158,060**	**420**	**42**	**98**
***HC5VF**	**21**	**48,360**	**298**	**20**	**42**
*HC2AP	"	19,383	199	14	25
***HC1DX**	**7**	**55,616**	**302**	**20**	**59**
*HC1HN	"	630	44	15	30
***HC2AO**	**AA**	**619,340**	**1233**	**63**	**116**
*HC2TKV	"	38,306	182	40	67

Paraguay

ZP4KFX	**A**	**520**	**12**	**9**	**11**
***ZP5DVD**	**A**	**220,242**	**629**	**46**	**95**
***ZP6SKY**	**7**	**510**	**31**	**6**	**9**
ZP5DA	**AA**	**316,960**	**829**	**51**	**109**

Peru

***OA4SS**	**A**	**276,749**	**748**	**53**	**86**
**OA2DRG*	*"*	*575*	*22*	*8*	*15*

Trinidad & Tobago

9Y4D	**21**	**987,420**	**2610**	**32**	**108**
***9Z4A**	**A**	**442**	**19**	**12**	**14**
***9Z4Y**	**28A**	**22,554**	**256**	**14**	**28**

Uruguay

CX9AU	**A**	**479,755**	**892**	**78**	**151**
CX2DK	**28**	**136,729**	**751**	**18**	**55**
CV7S	**21**	**926,508**	**2619**	**29**	**103**
			(OP:CX7SS)		
CX5AL	**7**	**2,176**	**37**	**14**	**20**
CX5BDE	"	54	10	4	5
**CX2TL*	*A*	*3,740*	*67*	*27*	*28*
***CX1CAN**	**"**	**1,269**	**37**	**13**	**14**
***CX8DS**	**28**	**34,750**	**281**	**16**	**34**
***CX7BBR**	**21**	**30,442**	**240**	**18**	**44**
**CX2TQ*	*7*	*1,972*	*48*	*13*	*16*
CX5UA	**AA**	**394,267**	**847**	**48**	**125**
CX4BW	**21A**	**672**	**14**	**7**	**14**
CX7ACH	**7A**	**97,524**	**419**	**28**	**80**
**CX4AD*	*28A*	*434*	*15*	*7*	*7*
***CX2CC**	**14A**	**182,756**	**725**	**28**	**79**

Venezuela

YV2CAR	**28**	**29,564**	**315**	**13**	**25**
YV5AM	"	8,415	142	12	21
YW4D	**21**	**1,076,400**	**2426**	**34**	**122**
			(OP:YV1DIG)		
4M1K	**14**	**1,587,131**	**3455**	**35**	**128**
			(OP:YV1KK)		
4M6R	**7**	**236,457**	**801**	**26**	**91**
			(OP:YV6CR)		
***YV5EMG**	**A**	**140,715**	**393**	**48**	**111**
*YV6CA	"	16,154	94	26	56
*YY5AEP	"	13,041	105	20	43
*YV5JGO	"	675	17	12	13
*YV5AJI	"	575	16	10	13
***YY2EDF**	**21**	**97,580**	**512**	**19**	**51**
*YV4NR	"	39,195	260	17	50
***YV5OIE**	**14**	**320**	**21**	**6**	**10**
***YY2HCM**	**7**	**45,180**	**477**	**14**	**22**
*YY2WTF	"	15,282	140	16	38
*YV5CDE	"	1,768	31	14	20
***YV4YC**	**3.7**	**87,904**	**382**	**16**	**66**
YV6BXN	**14A**	**82,644**	**356**	**26**	**71**
***YV4AW**	**AA**	**510,272**	**870**	**68**	**156**
*YY5KAT	"	6,960	58	20	40
*YV5COR	"	4,374	46	20	34
***YV1SW**	**28A**	**364**	**22**	**6**	**8**
***YY5ATN**	**7A**	**407**	**32**	**10**	**27**
***YY1AFL**	**3.7A**	**638**	**29**	**9**	**20**

QRP

KR2Q	**A**	**436,103**	**560**	**71**	**212**
OK2FD	**"**	**340,234**	**760**	**67**	**244**
IZ3NVR	**"**	**248,310**	**606**	**58**	**221**
UT5EOX	**"**	**238,944**	**612**	**57**	**205**
JH1OGC	**"**	**216,828**	**394**	**87**	**141**
G4CWH	**"**	**210,176**	**560**	**60**	**196**
JR4DAH	**"**	**187,620**	**436**	**64**	**113**
LZ1DM	**"**	**152,992**	**518**	**48**	**176**
NP2Q	**"**	**136,017**	**549**	**47**	**72**

IZØFUW	"	130,207	472	47	162
UV2IZ	"	108,040	368	45	140
K8ZT	"	77,400	186	52	120
NDØC	"	76,000	200	52	100
UA3OQ	"	72,765	393	31	134
UR5FEO	"	72,558	330	34	140
EW8G	"	66,924	326	30	126
UZ5DM	"	61,633	457	31	112
W6QU	"	57,200	177	51	79
		(OP:W8QZA)			
DK8TA	"	46,576	302	29	113
F4HHL	"	45,150	290	27	102
HA5BA	"	31,034	218	30	88
OH3KQ	"	23,940	180	28	86
IW1BCO	"	23,183	169	22	75
LZ7H	"	22,684	148	26	80
RW9AV	"	18,830	105	20	50
IK3XTY	"	14,685	139	22	67
IO2S	"	14,535	124	19	66
		(OP:IU2IGX)			
VE6EX	"	13,760	166	21	22
UX8IX	"	11,120	117	19	61
YB3EDD	"	11,032	84	19	37
M6OXO	"	10,920	140	24	67
EA5EX	"	10,208	102	24	64
SN1ØØU	"	9,408	120	18	66
		(OP:SP2UUU)			
PY2BN	"	8,360	81	32	44
F4GWM	"	7,991	99	17	44
SP9TKW	"	7,600	92	21	59
YU3VIP	"	6,985	135	16	39
PS8MT	"	6,912	103	26	38
BD4HZX	"	6,413	83	24	29
IZ2JPN	"	5,856	71	15	46
N4ZAK	"	4,848	50	19	29
G3PLE	"	4,784	72	16	36
EA8DDS	"	4,704	50	18	30
F4BIT	"	3,900	79	12	40
DF7XR	"	3,876	60	12	39
SQ3OGP	"	3,588	48	18	28
MØJGX	"	3,477	61	15	42
YBØANN	"	3,090	39	11	19
HB9NBN	"	2,970	46	13	32
SM/OZ4PAT	"	2,726	54	13	34
RZ3ARO/6	"	2,628	55	9	27
DM5CT	"	*2,352*	*45*	*15*	*34*
UAØSBQ/P	"	2,352	29	8	20
PY2IAX	"	2,176	43	16	18
PA7N	"	2,068	45	11	33
KC8VWM	"	1,980	31	17	19
VK2FHRK	"	1,980	41	15	15
G7PVZ	"	1,700	36	10	24
SY1AQG	"	1,443	27	13	24
DU7OK	"	1,376	40	14	18
R1FW	"	1,295	38	10	25
PY2MM	"	980	24	11	17
OE3VET	"	957	27	10	19
SP3BES	"	924	31	7	21
RZ5A	"	918	32	7	20
9M6ZAE	"	810	19	8	10
DL7DR	"	806	28	11	20
PA1B	"	704	28	6	16
CM3EFM	"	608	13	7	12
KK7VL	"	540	12	9	9
OM3KHT	"	525	24	7	18
		(OP:OM7ANT)			
DM7C	"	441	15	8	13
		(OP:DL7CX)			
M6ODZ	"	432	27	6	18
YO3IHG	"	380	17	7	13
AD3Y	"	351	10	6	7
DL9ZAL	"	*252*	*14*	*6*	*12*
DO5TMM	"	198	30	5	13
ON4ANE	"	176	16	2	9
PU2USK	"	165	19	7	8
EA3GYE	"	143	9	6	7
VA3MYC	"	133	9	4	3
JP3OUG	"	132	9	6	6
PY1XR	"	126	8	7	7
IU5HES	"	100	6	4	6
MWØDNF	"	70	19	16	19
EA3HLF	"	66	9	4	7
M6VUK	"	45	5	4	5
DL2SFO	"	35	7	3	4
ON6EB	"	9	8	4	5
LU4VZ	28	5,320	96	13	22
I5KAP	"	2,958	50	11	23
S59GS	"	1,247	39	6	23
EA8BUE	"	880	20	7	13
LU7VCH	"	640	19	8	12
EC4AA	"	448	11	6	10
PU2NKC	"	375	22	8	7
PU2TRX	"	144	25	6	6
3Z3Z	"	49	6	3	4
		(OP:SQ3ET)			
UW5EJX/MM	21	46,620	201	22	62
HKØRMR	"	*39,435*	*351*	*19*	*36*
JQ1NGT	"	*23,310*	*154*	*23*	*40*
TA2IB	"	22,579	135	18	49
HG3C	"	17,516	164	16	42
		(OP:HA3HX)			
SP5DDJ	"	17,228	115	23	50
JR2EKD	"	15,660	108	20	34
OK1LV	"	7,498	88	15	31
JR1NKN	"	4,983	70	15	18
F1ICR	"	2,074	55	10	24
JL1KLK	"	1,620	22	13	17
GU4YBW	"	1,150	34	5	20
JI1NZA/1	"	735	17	9	12
DF3SM	"	608	24	5	14
JI1IKC	"	594	15	9	13
RA7RA	"	510	25	4	13
DF7LS	"	506	26	6	16
ADØBI	"	416	14	4	9
BD4SY	"	357	16	7	10
YO6PIB	"	294	12	5	9
VR2UNG	"	256	14	8	8
7L1DST	"	126	6	4	5
RØSBZ	"	84	4	3	4
PY2YAS	"	78	9	3	3
KIØG	"	25	3	2	3
CT1BXT	14	32,544	278	14	58
RW3AI	"	26,775	254	14	61
UT1XX	"	20,724	232	13	53
IZ1ANK	"	19,950	192	16	59
R6LHD	"	17,080	185	15	55
UR7HCX	"	15,721	147	16	63
WE6EZ	"	15,562	99	20	42
RZ4WZ	"	13,333	148	17	50
UX8ZA	"	13,224	194	10	47
E72NA	"	12,040	185	12	44
IV3DDN	"	12,031	168	10	43
I4PZP	"	9,858	136	16	46
SY1AEA	"	6,660	132	10	35
TA3AER	"	5,012	69	6	22
DK1MIR	"	3,920	98	6	29
		(OP:E73WM)			
UAØA	"	2,660	41	12	26
YB1PEF	"	2,046	32	10	21
UR5FAI	"	1,764	39	6	22
LZ5QZ	"	*1,650*	*54*	*7*	*18*
LU7DUE	"	1,560	47	12	12
MØJBA	"	1,550	48	7	24
USØFF	"	1,365	51	6	15
OE3MDB	"	1,219	41	5	18
LZ2JR	"	980	25	6	14
SQ1NXO	"	693	33	6	15
DL2DWP	"	561	33	4	13
IV3BTY	"	480	14	8	12
R2WW	"	396	21	4	14
KZ3I	"	240	8	6	6
SP9RQH	"	132	13	4	8
JH7BMF	"	120	5	4	4
JJØSFV	"	72	5	4	5
BH4IWK	"	66	7	3	3
EA3FHP	"	63	5	4	5
M6PGU	"	40	7	2	6
BY2HIT	"	*6*	*3*	*1*	*1*
LU4DPL	"	2	1	1	1
LY5G	7	50,343	427	16	81
LY2NK	"	28,314	322	14	64
IZ4VQS	"	25,353	244	15	66
SQ8MFB	"	11,816	191	8	48
SP5FKW	"	11,220	163	10	56
CR5M	"	6,370	118	8	41
		(OP:CT1HSN)			
OK6OK	"	4,440	122	5	35
OP4A	"	3,871	65	10	39
M1LCR	"	2,448	64	7	29
UR5KBP	"	2,108	52	8	26
JA2MWV	"	1,474	30	11	11
TA7AGL	"	1,280	28	5	15
YC7OCS	"	1,190	49	6	11
JRØBUL	"	893	21	10	9
YT2SMS	"	630	29	4	17
UB6RNB	"	320	27	5	15
G3ZNR	"	*255*	*27*	*2*	*13*
RAØAY	"	240	14	9	7
W7RLF	"	220	10	4	6
YD3KNJ	"	220	14	4	6
DW3TRZ	"	216	19	5	7
MWØMWZ	"	169	11	4	9
UB1AHI	"	154	14	3	8
TB7EM	"	120	5	3	5
SP9BJV	"	78	10	4	9
DG2FDD	"	66	11	2	9
YC1ELP	"	63	4	3	4
N2SRK	"	56	6	4	4
YD1BED	"	45	3	2	3
9W2VWT	"	18	4	1	2
E27AH	"	0	1	1	1
		(OP:HS4WLA)			
OL4W	3.7	17,400	292	8	52
		(OP:OK1IF)			
OK6K	"	16,484	320	6	46
		(OP:OK5IM)			
R2FI	"	4,284	132	5	29
OZ6OM	"	4,230	98	7	38
OM7KW	"	3,939	108	6	33
GW7APP	"	3,840	77	9	31
HF4ØCUF	"	2,618	96	5	29
DO3KTM	"	1,568	55	5	27
PAØAWH	"	1,368	62	4	20
OM6AMD	"	364	27	3	11
JH1APZ	"	168	6	6	6
HA1TI	1.8	9,165	207	6	41
HA5NB	"	4,995	112	5	40
UR5VAA	"	3,367	95	6	31
RA2FDX/3	"	1,242	59	6	17
R7NA	"	1,080	43	5	22
DL5SFC	"	648	32	3	21
DF1TB	"	323	23	3	14
YO4JQ	"	238	15	3	11
SV1BJY	"	88	9	4	7
HK3W	"	6	1	1	1
VE2IDX	AA	791,296	1252	73	208
		(OP:VE3ZF)			
LZ2DF	"	550,784	725	91	325
RT4W	"	298,704	710	60	234
EE3X	"	281,144	565	65	246
		(OP:EA3KX)			
VA7FC	"	140,454	421	57	96
YU1LM	"	85,050	399	37	138
9A4OP	"	72,240	372	33	135
S53NW	"	62,900	359	34	114
W1JCW	"	32,890	111	40	75
IK1ZOF	"	25,288	166	26	83
SQ8P	"	22,330	168	28	82
DO8YX	"	16,954	148	24	74
RA3DJA	"	16,928	145	21	71
PE2K	"	16,650	190	15	75
IN3UFW	"	9,546	121	14	60
JK1TCV	"	7,124	55	24	28
OK1DMP	"	4,641	33	19	32
S54X	"	2,891	42	18	31
VK2YI	"	2,516	33	16	21
DDØVS	"	1,833	48	7	32
OK1HBP	"	702	34	6	21
YF3DGO	"	672	18	11	10
K7JAN	"	506	19	11	11
DL8MF	"	345	15	9	14
MØWLY	"	140	14	3	7
EI4GXB	"	52	8	5	8
YC1HBP	"	*18*	*7*	*3*	*3*
PU2RTO	28A	966	35	10	11
SV1NK	21A	32,965	203	27	68
LZ2A	"	16,698	127	21	48
		(OP:LZ2DB)			
R4FD	"	4,418	62	12	35
ES7A	"	1,769	38	12	17
		(OP:ES7GN)			
JH3DMQ	"	945	16	8	13
G3WW	"	80	6	4	4
JM2RUV	"	12	2	2	2
IZ3IBL	14A	137,940	620	31	101
UZ7M	"	134,412	636	31	107
		(OP:UT9MZ)			
OT6M	"	81,756	456	22	86
		(OP:ON9CC)			
YP8W	"	67,392	430	20	76
		(OP:YO8SEP)			
UA1AFT	"	67,068	324	24	84
UA1ANA	"	61,491	376	18	85
E74Y	"	52,624	266	29	75
YU1NR	"	41,976	286	24	75
OQ4B	"	33,040	201	21	59
		(OP:ON4BHQ)			
IV3UTV	"	18,648	144	17	57
DL1DXA	"	5,217	77	13	34
SMØR	"	5,031	121	7	32
		(OP:SMØRUX)			
EA2GM	"	4,592	109	7	34
E77D	"	3,848	94	6	31
LZ2AU	"	3,071	73	7	30
K2GMY	"	2,156	28	11	17
UT5WAA	"	1,302	42	7	24
YE3WIL	"	578	16	7	10
ON9EEE	"	252	18	3	11
VE3CBK	"	187	9	5	6
YB8RBI	"	135	7	4	5
JM2LHB	"	24	2	2	2
SQ5CW	7A	39,836	358	16	76
LZ8U	"	11,780	152	11	51
		(OP:LZ2TU)			
IN3HUU	"	8,400	163	5	45
YT5CQ	"	3,081	51	10	29
E2ØWXA	"	170	26	2	3
LW2EE	"	55	13	4	7
SP5ES	3.7A	9,513	135	9	54
9A4AA/MM	"	6,615	67	5	30
LZ2DB	"	5,084	118	7	34
OE1ØØMDB	"	483	39	4	17
HA8V	"	208	17	3	10
		(OP:HA8MV)			
JA5NSR	"	3	5	1	2
EU1AA	1.8A	8,262	170	7	44
DL2SAX	"	1,296	51	4	23
NW3R	"	140	15	2	3
		(OP:NH7C)			

MULTI-OPERATOR SINGLE TRANSMITTER

NORTH AMERICA

United States

District 1

K1LZ	5,524,138	3359	134	507
W1NA	4,751,900	3026	131	479
W1OO	528,360	570	86	271
W1DX	471,213	496	97	272
KA1IOR	250,800	380	56	184
W1YK	5,633	55	12	31

District 2

W2IRT	724,950	760	85	273
W2ZQ	369,264	485	73	221
WA2JQK	209,042	358	64	190

District 3

N3AD	2,950,848	2118	128	436
W3SQ	66,960	225	22	98
K3OQ	66,297	172	39	108
K3PH	2,257	26	11	26
*W3ZGD	215,670	382	66	171

District 4

WW4LL	2,504,295	1878	113	392
W4AQL	680,442	732	92	265
W5MX	338,428	450	81	211
WA4IPU	212,724	342	61	167
*N4SVC	651,264	729	95	289
*WK1DS	404,250	466	90	240
*W4MLB	398,698	596	85	241
*WA1F	132,492	261	45	136
*AD4XT	25,145	121	41	66

District 5

K5TR	3,798,400	3071	160	480
W5RRR	24,200	102	34	66

District 6

NW6P	498,465	734	81	184
NX6T	428,624	800	96	205
W6AX	143,034	306	61	125
*N6UTC	12,144	92	28	41
*AI6V	10,220	81	33	37

District 7

WØRIC	1,483,782	1636	120	282
W7VJ	840,125	1039	97	228
KZ1W	663,312	1004	95	217
W7VO	307,530	459	87	183
K7RI	172,056	545	33	101
N7BV	119,616	259	54	124
KA7LJQ	106,088	269	50	99
W7E	88,517	238	41	102
W7TVC	50,500	190	48	77
KU7T	31,262	159	30	47
AB7HP	10,143	67	18	45
*K7SS	206,360	370	74	146
*KG7YPB	32	3	2	2

District 8

W8PR	1,424,029	1284	116	345
*N8YXR	173,229	303	65	154
*W8AJT	32,370	112	39	91
*W8DC	22,440	105	36	66

District 9

AA9A	1,732,332	1360	116	376
W9VW	164,167	349	52	129
W9YB	12,264	65	28	45
*W9GRS	693	28	11	10

District Ø

KØDDD	746,112	784	104	244
KØYR	454,140	623	88	202
N5KB	52,800	170	36	96
*WØSV	12,921	73	25	48

Bermuda

*VP9I	2,192,298	2663	88	294

Canada

District 1

VO1GRC	327,033	778	52	151

District 2

VE2BWL	2,875,597	2914	99	320
VE2PIB	185,377	387	54	143

District 3

VE3EJ	8,498,832	4873	159	549
VE3SOO	608,675	1007	74	177
*VE3LON	54,864	191	41	86

District 6

VE6SV	3,321,544	3596	117	295
VE6AO	392,676	1627	45	84

District 7

VE7GL	1,532,912	2394	91	207
VE7SAR	294,624	714	64	134

District 9

*VE9UNB	285	8	7	8

District Ø

VYØERC	392,253	992	41	118

Cuba

T42T	2,109,184	3420	82	226
*T42W	79,544	742	19	42

Dominican Republic

*HI3LT	2,284,648	3321	89	258

Greenland

OX7A	3,892,810	4024	91	295

Mexico

*XE1CRG	4,788	56	15	21
*XE2N	4,680	67	19	20

Montserrat

VP2MDG	5,796,440	4927	124	396

Turks & Caicos Islands

VP5W	2,297,997	3048	80	271

AFRICA

Burkina Faso

*XT2SZZ	3,420,196	2774	105	337

Canary Islands

EF8R	26,422,692	10838	178	689
ED8W	11,255,783	5839	147	532
*ED8G	351,102	779	40	123
*EE8V	116,095	316	39	116

Ceuta & Melilla

*ED9E	3,846,720	2921	100	380

Ethiopia

*ET3AA	744,760	1282	52	163

ASIA

Asiatic Russia

District 9

RT9L	2,059,228	1815	101	335
RK9CYA	656,064	929	67	221
RC9J	495,180	750	68	194
RN9T	200,304	564	35	109
R8IZ	136,284	243	72	174

District Ø

RØAK	430,320	758	79	185
*UIØL	2,220	48	18	19

Asiatic Turkey

TC7C	2,536,320	2616	84	300
TCØF	2,027,808	2581	53	235
TC2MK	1,661,088	1758	80	272
*YM3KC	628,716	968	54	188
*YM3VBR	484,840	760	56	192
*TC29OCT	60,976	246	20	83
*YM2KK	46,848	189	22	74

Cambodia

XU7AJA	29,565	223	32	49

China

BG5BWZ	463,360	906	85	171
B7P	402,300	1095	78	147
BD7NWZ	198,730	691	51	119
BD7JPC	140,910	525	52	102
BY3MM	20,727	227	24	39
*BD7DT	1,129,824	1798	80	208
*BI8FZA	543,172	972	77	189
*BY1AS	234,675	626	68	157
*BD1LT	100,717	369	52	99
*BY6LY	64,368	226	48	96
*BG7RCX	35,100	235	41	67
*BG5BRT	4,784	78	24	28
*BH2RO	3,230	81	16	22
*BG7TTZ	2,006	41	12	22

Cyprus

P33W	17,552,192	8047	160	624

Israel

4X1DX	6,342,413	4199	120	419
4X6TT	3,337,848	2953	95	313

Japan

District 1

JR1ZTI	46,252	191	49	75
JH1BNC	4,224	46	15	17
*JA1YAD	7,072	63	31	37
*JE1YEM	2,232	30	16	15
*JQ1ZCK/1	592	15	7	9
*JO1ZEJ/1	429	13	6	7

District 2

JI2ZJS	1,689,114	1705	119	274

District 3

JL3RDC	158,545	380	64	121

District 6

JA6BXA	983,630	1261	101	233
JA6YDH	969	17	7	12

District 7

JA7ZFN	4,784,808	3360	146	386
JA7YRR	1,273,271	1485	116	237

District Ø

**JAØZAV*	*700*	*19*	*12*	*16*

Kuwait

9K2HN	9,138,978	5278	138	501

Macao

*XX9O	340,800	868	68	132

Mongolia

*JT1KAI	495,159	1041	62	157

Singapore

9V1YC	446,040	927	68	168

Thailand

HS6VW	61,899	248	47	94
HSØAC	6,604	93	14	38
*E28AI	241,215	594	56	139
*E27EK	227,900	604	82	133
**E27AZ*	*58,681*	*319*	*31*	*70*

United Arab Emirates

*A61HA	1,754,472	2126	73	255

West Malaysia

9M2SJK	79,100	317	39	74
9M4COK	1,760	52	10	22
*9M2R	132,132	470	42	112
*9M2SDX	16,520	133	25	34
*9M4CKM	1,360	33	8	12

EUROPE

Austria

OE5XRL	389,503	1323	55	208
*OE1ØØXA	59,488	271	39	137
*OE1XTU	16,848	122	26	82
*OE6XFL	2,014	39	13	25

Azores

CQ8M	1,574,172	2053	98	340

Belarus

EU1WW	3,246,440	3758	132	454
*EW2WW	31,204	195	27	89
*EW4WE	552	21	7	17

Belgium

OR2M	4,282,170	3386	145	560

Bosnia-Herzegovina

E7DX	*5,078,745*	*4444*	*145*	*556*
E73KT	655,368	1449	79	253
E7CW	592,668	1741	60	243

Bulgaria

LZ5R	9,159,290	6846	167	638
LZ1D	424,960	996	69	263
LZ1ABC	102,660	448	41	136

Croatia

9A5Y	7,012,520	5502	155	605
9A1EZA	150,586	513	41	165
*9A1CBM	76,610	370	34	129
*9A5G	25,641	174	25	86
*9A9D	4,543	89	13	46
*9A7B	3,510	63	17	37

Czech Republic

OK5Z	4,933,319	4078	152	599
OL7T	2,089,450	2496	115	435
OK2KOJ	486,477	897	68	215
*OL1Z	473,040	927	80	280
*OK2OCT	182,784	593	53	185
*OL1B	132,145	415	58	189
*OL6A	21,185	156	23	72

Denmark

OZØTX	1,653,858	2410	92	394
OZ5E	1,515,654	1670	114	409
*OZ7D	277,146	705	56	211

England

M4A	2,116,800	2366	123	477
G2F	1,682,716	2080	105	427
G4IIY	1,057,029	1523	86	377
G3B	655,038	947	96	357
MØREG	178,451	501	56	203
MØSNB	*34,800*	*453*	*13*	*62*
**G4ATH*	*233,520*	*645*	*53*	*227*
*G3CO	109,620	453	43	160
*G3RCM	67,878	372	33	129
*G1MPW	14,105	138	18	73
*M7P	3,344	49	11	27

Estonia

ES3V	805,233	1509	81	348

European Russia

District 1

RM1Q	1,073,058	2023	90	316
RC1O	774,009	1846	74	253

District 3

RL3A	6,719,900	5446	150	595
RO5F	550,875	1163	74	301
RU3C	14,365	140	18	67
RK3SWS	5,353	104	11	42
RK3DXW	2,394	67	8	34
*RZ3DZI	7,904	97	20	56

District 4

UA4M	5,957,325	5450	153	572
UA4S	5,306,304	5208	141	555
RT4D	826,804	1377	89	329
*RY4A	1,376	33	12	20

District 6

RT6A	6,914,476	5886	159	599
R7AB	2,050,616	2236	111	437
UC6K	174,640	775	40	108
*R7GU	31,031	129	34	109

Finland

OG6ØF	4,964,030	4749	132	538
OH6K	888,122	1348	96	353

France

TM3R	4,955,852	3898	145	546
TM1T	3,816,960	3670	121	447
TM2T	3,032,640	3075	124	461
TM1M	451,704	766	83	265

F8KGH	443,394	676	87	304
F5KSE	329,588	711	72	226
TM5AHO	301,056	625	70	266
F6KFV	196,425	647	52	173
F4HRU	137,025	420	62	163
***F8KGS**	**536,484**	**1011**	**78**	**284**
*F5KKE	343,970	851	71	224
*F1PYN	28,728	158	37	89

Germany

DR1A	**9,756,279**	**6019**	**159**	**634**
DP7D	3,596,628	3177	133	525
DP9I	913,767	1598	79	312
DJ4MX	553,395	761	83	312
DL1M	361,460	625	70	240
DLØHMK	339,066	760	62	237
DLØWM	300,468	800	72	220
DLØZZ	291,165	695	63	232
DGØYS	220,042	527	61	208
DKØKKB	124,260	325	53	165
DKØSB	109,604	425	47	165
DKØIW	73,542	358	47	159
DLØPS	63,124	198	48	124
***DR7B**	**114,048**	**395**	**42**	**156**
*DL1D	91,875	290	53	122
*DM6A	23,919	178	26	93
*DLØIL	7,140	114	11	40
*DKØGM	3,796	90	9	43
*DQ4X	2,948	56	12	32
*DLØII	2,592	61	12	42
*DLØHDB	1,998	50	15	39

Greece

J42L	**5,130,561**	**5321**	**138**	**531**
SX2X	*2,280,276*	*3225*	*116*	*466*
SZ3P	729,630	1845	70	260
SZ2TSL	17,473	113	29	72
***SZ4KRD**	**110,745**	**419**	**46**	**161**

Hungary

HG5A	**4,779,720**	**4352**	**136**	**476**
HG6N	4,384,278	3688	141	540
***HG5P**	**45,543**	**303**	**27**	**114**

Iceland

TF2R	**2,350,080**	**3430**	**85**	**323**

Ireland

EIØR	**1,497,241**	**1636**	**101**	**392**

Isle of Man

***MDØGLK**	**29,120**	**196**	**29**	**83**

Italy

IR4X	**10,641,724**	**6330**	**165**	**631**
IR4M	9,201,770	5738	162	623
IO5O	8,720,864	5731	149	587
IR6T	8,490,794	5540	155	599
IR2L	3,509,820	3203	134	486
IR8P	3,282,104	3404	127	475
IQ4FA	2,589,896	2584	128	491
IQØRU	555,592	1172	66	230
IN3FOX	336,638	945	54	227
IQØRM	253,053	826	60	219
IU2BEE	32,487	234	26	93
IQ5FI	5,475	81	24	49
IB2T	4,370	61	15	31
IQ2MI	2,046	72	5	26
***IQ7YP**	**232,394**	**751**	**63**	**199**
*IQ8XE	182,952	488	61	191
**IQ3BM*	*163,125*	*459*	*55*	*206*
**IU1CZH*	*4,558*	*50*	*16*	*37*

Jersey

GJ2A	**731,612**	**1300**	**69**	**302**

Latvia

***YL1ZR**	**1,008**	**26**	**10**	**18**

Liechtenstein

HBØA	**1,730,310**	**2510**	**79**	**332**

Lithuania

LY5W	**1,640,688**	**1976**	**107**	**407**
LY2J	943,170	1609	99	348
***LY5AA**	**533,950**	**1255**	**75**	**287**

Luxembourg

LX7I	**10,222,884**	**6855**	**161**	**630**
***LX8M**	**913,872**	**1337**	**99**	**375**

Malta

9H6A	**2,249,811**	**3445**	**114**	**433**

Netherlands

PI4AMF	**1,795,600**	**2121**	**114**	**422**
PC2L	1,389,570	2067	99	410
PI25KAR	*415,162*	*903*	*68*	*266*
PE5JW	93,259	426	36	143
PI4MM	50,955	325	28	101
PI4VPO	14,453	140	21	76

Norway

LA3T	**279,818**	**634**	**65**	**188**
LN2D	234,117	721	46	215
LA1K	32,480	368	14	56

Poland

SO4R	**2,295,447**	**2970**	**112**	**411**
SN7H	1,492,700	2381	90	370
SP2KPD	900,111	1326	90	363
SO1ØØN	831,312	1729	82	286
3Z1K	654,042	1248	81	285
SO1ØØZHP	607,545	1472	77	268
SP9KDA	519,921	1053	78	291
SN5O	357,012	1196	62	220
***SN6E**	**300,310**	**718**	**62**	**233**
*SP2TMT	273,008	639	70	232
*3Z1ØØI	201,552	657	49	198
*SN9A	135,828	486	42	154
*SP3KQV	89,950	244	54	121
**SP5PDB*	*67,240*	*343*	*33*	*131*
*SN9H	61,920	343	36	124
*SP5PRF	53,428	302	36	112
*SP1ØØZCF	10,648	108	22	66

Portugal

CR5E	**8,209,080**	**5879**	**144**	**547**
***CR5K**	**164,302**	**436**	**55**	**171**

Romania

***YR1ØØR**	**765,960**	**1394**	**86**	**304**
*YO4KAK	37,859	184	39	92

Sardinia

ISØBWM	**267,734**	**837**	**52**	**211**
***IQØID**	**51,824**	**299**	**35**	**123**

Scotland

GMØV	**2,033,205**	**2753**	**92**	**353**
***MMØTGH**	**123,046**	**516**	**38**	**149**
*GM7A	71,394	390	32	131

Serbia

YU5R	**3,917,730**	**3879**	**136**	**509**
YT7ØSRV	1,009,683	1928	82	305
YT5C	3,105	56	13	32
***YU2A**	**431,648**	**1006**	**69**	**259**
*YU1AFV	98,280	1250	20	70
*YTØB	14,268	152	19	63
*YU1HFG	3,315	63	14	37
*YT5L	2,142	66	8	26

Sicily

IO9A	**3,324,860**	**3846**	**108**	**400**
***IO9R**	**812,160**	**1600**	**77**	**243**

Slovak Republic

OM4Q	**1,528,098**	**1966**	**108**	**399**

Slovenia

S5ØC	**6,622,646**	**4733**	**158**	**600**
S51A	2,521,254	2842	112	442
S54K	1,386,538	1947	101	356
***S56K**	**615,650**	**1373**	**75**	**275**
*S54I	386,384	1059	58	246

Spain

ED7P	**5,543,672**	**4431**	**148**	**546**
ED3X	4,812,516	4057	138	528
EE5V	1,925,136	2889	97	364
EE1G	821,121	1140	93	334
ED1T	742,752	1648	64	224
EA5/LN2G	529,544	1041	71	225
EA3IBS	459,984	924	67	229
ED2W	140,890	559	35	111
EE2K	112,554	426	43	126
ED2R	44,856	189	37	89
***EC5AN**	**672,388**	**1055**	**84**	**344**
*ED3D	361,956	927	69	209
*ED1LO	230,112	648	58	224
*ED1N	30,800	128	50	104
*EA1GTX	10,400	136	13	52

Sweden

SJØX	**3,016,818**	**3542**	**126**	**495**
SK7K	1,908,309	2779	105	396
SKØQO	500,964	1192	66	261
SJ3A	84,476	319	48	148
SE3T	58,058	244	40	114
SA6MIW	18,423	162	23	66

Switzerland

HB9H	**3,906,619**	**3679**	**139**	**528**
HB9OK	769,440	1481	82	338
HB9ZZ	503,644	844	70	262
HB2S	160,734	339	65	193
HB9BS	135,400	349	56	144
HB2C	84,504	395	37	131

Ukraine

UZ2I	**1,112,372**	**2205**	**85**	**343**
UT1S	144,878	660	35	179
UR4RWW	43,806	228	29	118
UT7AXA	11,297	121	14	65
UR4PWC	7,452	98	14	55
***UW7W**	**861,960**	**1107**	**91**	**349**
*UW6M	125,050	479	46	159
*UZ5P	118,365	491	40	155
*UT2HZT	891	21	9	18

Vienna International Center

***4U1A**	**1,580,031**	**2827**	**98**	**351**

Wales

GWØRHC	**193,965**	**563**	**49**	**152**
***GW9T**	**529**	**30**	**5**	**18**

OCEANIA

Australia

VK2RSG	**817,600**	**1047**	**95**	**197**
VK3GK	**284,565**	**598**	**67**	**116**

Brunei Darussalam

***V84SB**	**64,167**	**367**	**32**	**41**

East Malaysia

9M6SKT	**80,484**	**330**	**47**	**67**
***9M6ZIM**	**37,620**	**254**	**29**	**37**
*9M6FC	9,000	103	20	30

Guam

AH2R	**4,003,378**	**3194**	**137**	**321**

Hawaii

KH6TU	**452,298**	**1022**	**61**	**93**

Indonesia

YE1ZAD	**19,513**	**103**	**24**	**55**
YBØZZD	8,673	85	20	29
YBØZZE	2,622	125	19	27
YBØZZ	260	26	6	7
***YB5C**	**130,020**	**335**	**52**	**113**
*YE1R	124,168	315	53	113
*YE1ZAL	5,824	44	21	35

New Zealand

ZL1RQ	**841,035**	**1134**	**95**	**190**

Philippines

***DX2R**	**723,690**	**1262**	**75**	**140**
*DX3H	262,480	610	61	109
*DX1EVM	15,196	216	23	35
*DX9EVM	11,186	180	20	27
*DX4BR	7,540	81	22	30
*DX1ARC	6,608	72	24	35

Vanuatu

YJØGC	**684**	**16**	**7**	**12**

SOUTH AMERICA

Argentina

LT1F	**6,084,608**	**4287**	**132**	**380**
LU2DD	2,183,571	2453	103	248
LO7H	1,675,180	1727	111	268
LU3DX	766,320	1418	62	144
LU3DRP	248,540	573	65	150
LU1VKQ	*43,757*	*182*	*48*	*85*
***LU1DBQ**	**244,446**	**711**	**37**	**94**

Bonaire

PJ4Q	**7,148,438**	**4698**	**127**	**415**

Brazil

PQ5B	**4,373,186**	**3378**	**127**	**355**
***PR5O**	**1,145,724**	**1476**	**81**	**226**
*ZX2T	165,111	526	45	96
*PV2B	129,034	418	52	97
*ZV4SL	12,978	154	29	34
*ZW1WPT	1,200	39	10	14
*PY2OSL	667	49	11	12

Chile

CE3CT	**4,462,644**	**3657**	**120**	**324**
***3G1D**	**699,811**	**1171**	**76**	**181**
*CE3PA	85,993	385	50	63
*CB3ET	56,444	273	54	83
*XR1B	31,125	204	33	42

Fernando de Noronha

***PYØF**	**3,378,272**	**3284**	**93**	**293**

Paraguay

ZP6A	**2,467,435**	**2719**	**98**	**263**
***ZP9MCE**	**26,640**	**156**	**34**	**56**

Trinidad & Tabago

9Y4W	**9,464,280**	**5694**	**137**	**456**

Venezuela

***YW5DX**	**2,481,368**	**2429**	**105**	**299**

MULTI-OPERATOR TWO TRANSMITTER

UNITED STATES

K9CT	**5,125,098**	**3515**	**150**	**477**
N4WW	**4,350,456**	**3311**	**139**	**455**
N1MM	**4,180,761**	**2844**	**121**	**438**
K1RX	3,260,358	2434	112	407
K2LE	2,658,816	2004	118	394
KA1ZD	2,605,170	1654	123	432
N2RJ	**2,310,000**	**1930**	**104**	**358**
K2AX	2,086,326	1551	112	402
W2CG	1,910,656	1454	114	392
KT7E	**1,400,250**	**1713**	**115**	**260**
N3DPB	**1,279,606**	**1102**	**113**	**365**
W1QK	1,098,896	1007	88	309
K8AZ	**954,906**	**1052**	**79**	**255**
NØMA	**877,800**	**886**	**99**	**300**
WV4P	728,474	768	101	281
K3CCR	528,540	568	79	266
WA8MCD	515,679	630	88	239
W1FM	359,324	465	68	219
W1AEC	244,872	435	57	171
W2DLT	204,736	380	62	162
WC8VOA	36,153	138	34	83
W7DK	30,394	129	31	60
W2ZJ	14,760	79	28	54
K1LEE	336	16	11	13

NORTH AMERICA

ZF1A	**13,465,836**	**10087**	**141**	**471**
KP2M	**8,647,458**	**6669**	**135**	**443**
VE3JM	**6,841,718**	**4732**	**133**	**465**
K4AJA/VP9	**2,576,874**	**2706**	**96**	**330**
VE3MIS	1,555,110	2185	83	250
VE6FI	**1,441,571**	**2696**	**81**	**188**
VE9FI	**543,890**	**817**	**67**	**207**
VA7QD	**350,094**	**1116**	**58**	**108**

AFRICA

D4C	**28,093,569**	**11612**	**177**	**684**
Z23MD	*736,560*	*1204*	*61*	*179*
EF8L	**653,660**	**1061**	**48**	**182**
ZS6MRK	**1,760**	**29**	**16**	**24**

ASIA

C4A	**10,647,880**	**6103**	**126**	**494**
RTØC	**3,910,995**	**3767**	**141**	**354**
A5A	**1,907,712**	**2046**	**102**	**282**
JE2YRB	**1,401,410**	**1446**	**120**	**277**
BH4PYC	**1,069,134**	**1632**	**98**	**236**
VR2CC	**759,800**	**1980**	**73**	**159**
BY1AA	749,650	1272	94	225
JA1ZGP	**192,600**	**470**	**66**	**114**
BY4QA	152,192	523	58	106
BY3GA	143,916	549	62	117
BV2A/3	**120,375**	**614**	**43**	**82**
BY1CY	93,051	583	49	98
9M4CHS	**30,615**	**220**	**25**	**40**
D73G	**29,484**	**484**	**27**	**27**
JRØYHF	**17,440**	**88**	**36**	**44**
JA2YGP	1,804	32	20	21

EUROPE

ES9C	**12,192,700**	**9465**	**165**	**665**
9A7A	**8,972,139**	**6709**	**156**	**603**
HG7T	**8,864,184**	**6795**	**165**	**633**
SN8B	**8,165,050**	**6626**	**155**	**575**
PI4COM	**5,666,601**	**4948**	**140**	**541**
EI9E	**5,224,032**	**5203**	**119**	**463**
DR5N	**5,217,797**	**4595**	**136**	**553**
II2S	**4,987,568**	**4641**	**137**	**519**
IK2YCW	4,532,962	4354	136	522
CR6P	**4,384,765**	**4988**	**109**	**430**
RO2E	**4,217,682**	**3825**	**153**	**580**
ED7B	**4,010,459**	**3709**	**129**	**464**
IR7T	3,772,416	4163	126	488
DA2X	3,422,508	3473	134	512
DLØAO	3,170,008	2911	118	450
IR3Z	3,111,610	3288	129	481
ED3M	2,897,297	3372	119	440
EE5T	2,564,625	3419	109	416
GM2T	**2,471,970**	**2989**	**104**	**406**
DP6A	2,363,760	2233	122	466
GS7V	**2,293,652**	**3804**	**92**	**374**
G5O	**2,040,200**	**2559**	**105**	**400**
SO7M	1,960,584	3090	100	353
PA6AA	1,923,813	2695	109	422
PI4M	1,882,648	2697	101	407
DQ5M	1,756,405	2268	109	426
C37NL	**1,697,174**	**2903**	**86**	**353**
LA4C	**1,592,184**	**2417**	**93**	**396**
DR6C	1,501,245	2108	101	356
CR5T	1,469,602	1931	94	339
OE5T	**1,384,857**	**2165**	**98**	**319**
G6MC	1,365,780	2032	97	345
PAØAA	*1,325,184*	*1860*	*94*	*370*
II3E	1,203,360	1636	99	361
OM1ØØCSR	**1,155,066**	**2144**	**89**	**318**
R2VA	814,625	1847	75	268
JW5E	**800,730**	**1371**	**86**	**224**
LY2RJ	**701,220**	**1632**	**75**	**302**
OE3A	690,664	1396	79	298
PI4D	*654,615*	*1501*	*80*	*293*
LC1U	467,853	1600	49	228
IQØNU	**260,148**	**851**	**53**	**213**
IQ3ME	188,775	817	43	182
M3P	128,896	498	42	170
ED3ST	25,284	209	32	97
PI4FRG	*18,957*	*132*	*30*	*59*
RK1M	**1,026**	**22**	**10**	**17**

OCEANIA

VK4KW	**3,775,200**	**3267**	**132**	**297**
YE2A	**2,570,178**	**2480**	**114**	**283**
VK9XG	**1,280,368**	**1450**	**98**	**246**
DYØMK	**542,430**	**1053**	**75**	**130**

SOUTH AMERICA

FY5KE	**21,603,000**	**10194**	**158**	**592**
PZ5K	**19,525,968**	**10106**	**158**	**535**
PJ4G	**19,112,148**	**9984**	**156**	**512**
PX2A	**8,629,612**	**5595**	**138**	**439**
ZV5O	3,792,633	3540	109	294
CB1H	**2,914,160**	**3010**	**98**	**267**
LU8YE	**1,744,506**	**2208**	**86**	**220**
OA4O	**1,125,996**	**1469**	**76**	**233**
ZW8T	812,600	1286	67	172

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

K3LR	**13,970,364**	**7389**	**169**	**617**
W3LPL	11,474,490	6169	159	586
KC1XX	**11,227,068**	**6296**	**157**	**567**
K1TTT	4,868,864	3502	133	475
WX3B	3,573,948	2830	128	414
K1KI	3,548,260	2344	132	458
W4AAW	**2,382,904**	**1918**	**110**	**378**
WØAIH	**1,917,403**	**1731**	**134**	**375**
K1KP	1,803,108	1628	91	326
NE3F	1,493,115	1269	106	359
W3MF	1,420,258	1127	105	353
W1CSM	1,025,233	939	98	309
WB2P	**985,675**	**817**	**105**	**340**
K5LRW	**59,670**	**194**	**54**	**99**

NORTH AMERICA

V26B	**12,125,232**	**8352**	**145**	**499**
KL7RA	**7,892,964**	**7498**	**132**	**327**
VE5PV	**905,250**	**1765**	**85**	**170**
VE3DC	**548,624**	**1005**	**72**	**200**

AFRICA

CN3A	**31,124,906**	**12787**	**174**	**692**

ASIA

A73A	**11,908,694**	**6671**	**149**	**542**
A44A	**6,900,135**	**4662**	**136**	**453**
JA3YBK	**6,417,500**	**4281**	**161**	**443**
RWØA	**5,459,540**	**3968**	**136**	**444**
B9K	**4,899,479**	**3950**	**141**	**406**
B4T	1,747,564	2307	108	256
JA1YPA	**408,852**	**674**	**82**	**164**
9M4DX	*123,018*	*502*	*67*	*107*
JA2YCK	**630**	**30**	**15**	**15**

EUROPE

M6T	**11,537,636**	**8901**	**170**	**644**
LZ9W	**11,307,090**	**9024**	**178**	**652**
DFØHQ	**10,722,235**	**8288**	**171**	**664**
OH5Z	**6,904,788**	**6606**	**151**	**573**
OT5A	**5,556,096**	**5908**	**142**	**530**
DP6T	3,976,250	4498	126	499
SZ1A	**2,904,132**	**3914**	**125**	**463**
LZ7A	2,501,100	3640	110	415
DR3W	1,742,490	2110	115	455
TM6AM	**316,517**	**776**	**68**	**239**
OZ4EDR	**310,896**	**1022**	**58**	**214**
IR8W	**256,594**	**726**	**63**	**215**
MØSQC	164,802	627	43	184
IQ3QU	53,808	314	32	120

OCEANIA

KH6J	**11,757,078**	**7826**	**169**	**365**
DX9M	**252,857**	**705**	**68**	**113**
DU1EV	188,480	608	44	80
VK2BV	**19,012**	**112**	**41**	**57**
YB3ZBD	**3,009**	**42**	**24**	**27**

SOUTH AMERICA

ZW5B	**12,184,092**	**6614**	**161**	**523**
PJ2T	**11,385,792**	**7182**	**136**	**440**
PJ4K	**4,696,710**	**3571**	**120**	**350**
ZY2A	2,790,400	2833	107	293
HCØE	**1,314,684**	**2048**	**73**	**186**
PT4B	187,800	509	59	91
PY3AA	*6,644*	*103*	*20*	*24*

ROOKIE

NORTH AMERICA

United States

District 1

AC1DC	**3,680**	**32**	**10**	**30**
N1TAA	1,701	23	10	17
***NU1P**	**10,320**	**65**	**26**	**54**
*W1HMM	6,500	48	24	41
*N1BOX	6,250	49	15	35
*W1FOY	3,652	37	16	28
*N1DCH	30	4	3	3

District 2

W2KU	**133,964**	**304**	**52**	**162**
KD2NXM	6,148	47	21	32
***W2XK**	**82,720**	**191**	**48**	**112**
*K2ELV	21,900	89	34	66
*KD2OTP	3,404	35	17	29
*KC1JGT	897	16	9	14
*AC2XM	861	21	10	11
*AD2J	660	17	9	13
*KD2KEH	255	13	5	10

District 3

W3XOX	**184,414**	**338**	**53**	**158**
***KC3INR**	**73,904**	**178**	**40**	**109**
*KC3HXF	49,408	151	35	93
*K3ABE	40,432	148	41	92
*W3CDW	1,075	19	9	16
*W8YPV	899	17	13	16
*N3PEC	546	12	10	11
*KC3LIV	180	7	3	6
*KC3KBE	99	10	5	6

District 4

N7WJ	**140,448**	**277**	**61**	**148**
W4BBT	127,600	279	53	147
N4VLK	63,510	178	45	100
KE4PLT	39,368	134	45	88
KN4BIT	23,716	104	33	65
WB4QOC	10,863	72	20	51
KN4NJR	4,830	47	12	30
N4WLF	60	18	14	16
***KM4SII**	**234,038**	**392**	**58**	**171**
*AA4LS	28,381	125	30	71
*N4ETC	11,826	72	29	52
*KK4BZ	7,832	80	11	33
*KN4DXT	3,901	43	18	29
*KB8ABJ	2,223	25	15	24
*KN4LKC	1,764	36	9	19
*W4MBX	1,458	21	10	17
*KN4GBO	570	17	7	12
*N4JAH	322	11	5	9
*K4WRX	150	8	4	6
*K4OTO	132	7	5	6
*KX4LL	24	11	6	6

District 5

K5NOW	*10,836*	*66*	*36*	*48*
***KG5WZD**	**15,834**	**86**	**33**	**54**
*N5BYZ	3,108	39	18	24
*K2ZP	2,275	26	13	22
*KG5ZLE	1,350	26	13	14
*AG5NH	1,075	19	11	14
*AG5DB	952	15	13	15
*KG5ZMG	572	14	10	12
*AA5AH	64	4	4	4
*K5TMT	50	5	2	3

District 6

N6JCN	**189**	**14**	**10**	**11**
***N6REK**	**6,726**	**68**	**25**	**34**
*N6DRU	1,472	39	11	12

District 7

W7ZFG	**1,920**	**26**	**11**	**19**
***W7AXN**	**18,139**	**93**	**36**	**61**
*AG7GP	2,952	35	18	18
*AG7PW	168	8	5	7
*K7XTN	8	2	2	2

District 8

K8PK	**153,225**	**262**	**64**	**161**
KE8IVY	50,895	151	43	92
***KE8JIT**	**3,120**	**33**	**15**	**25**
*AA8SW	2,838	33	16	27
*KE8HAF	1,944	26	15	21
*KE8KRX	1,767	25	13	18
*K8BHX	182	7	7	7

District 9

***AC9TO**	**20,196**	**94**	**40**	**59**
*AC9SJ	7,366	64	22	36

District Ø

KEØITC	**44,811**	**155**	**37**	**80**
NØEHX	1,275	24	9	16
***WZ1Y**	**15,075**	**75**	**27**	**48**
*KEØKOT	13,430	92	25	54
*KEØMHJ	2,052	29	16	22
*KEØRNB	8	2	2	2

Canada

District 2

***VA2YAF**	**4,017**	**49**	**14**	**25**
*VE2NCG	240	9	4	8

District 3

***VE3SCN**	**29,536**	**122**	**30**	**74**
*VE3XKZ	27,666	114	39	67
*VE3MJD	1,176	18	12	16
*VA3JHQ	968	25	10	12
*VA3TTZ	663	19	8	9

District 4

***VE4VJR**	**53,040**	**193**	**36**	**84**

Guatemala

***TG9NRS**	**36**	**3**	**3**	**3**

Mexico

***XE1SRA**	**18,846**	**183**	**25**	**29**

AFRICA

Canary Islands

***EF8U**	**326,350**	**951**	**26**	**96** (OP:EA8DGH)
*EA8DGS	3,002	39	17	21

South Africa

ZS2MAC	**931**	**17**	**10**	**9**

ASIA

Asiatic Turkey

TA3LKJ	**22,950**	**125**	**18**	**57**
***TA3LHH**	**252**	**9**	**3**	**9**

China

***BH4LLP**	**442**	**18**	**9**	**8**

India

VU2ZMK	**69,600**	**281**	**26**	**74**
***VU3WBB**	**60,888**	**335**	**23**	**63**
*VU3OXH	924	19	8	14
*VU3OBO	384	15	7	9
*VU3EQG	204	20	8	9

Japan
District 1

JS1BIB	**4,851**	**59**	**23**	**26**

District 2

***JS2AAV**	**2,880**	**42**	**15**	**17**

Republic of Korea

HL2DBP	*63,616*	*232*	*60*	*82*
***HL3/IU1GMK**	**580**	**21**	**10**	**10**

Taiwan

***BX2AFS**	**25,688**	**156**	**27**	**49**

Thailand

***E2ØSJC**	**4,796**	**64**	**16**	**28**

West Malaysia

9M2VBC	**1,029**	**36**	**9**	**12**
***9W2SAF**	**101,742**	**516**	**25**	**68**
*9W2GVR	7,801	113	11	18
*9W2HXP	6,390	95	12	18
*9W2LRN	5,921	97	11	20
*9M2YDX	1,782	49	11	16

EUROPE

Austria

***OE9SEV**	**7,420**	**91**	**17**	**53**

Belarus

***EW8LM**	**139,821**	**534**	**48**	**161**
*EU1TL	39,928	276	26	98
EW8MZ	*8,400*	*102*	*18*	*52*
*EU1ADO	500	19	7	13

Bulgaria

LZ4AW	**448,200**	**1031**	**73**	**259**
***LZ7PW**	**55,713**	**205**	**41**	**106**
*LZ7EA	16,800	159	18	62
*LZ1TEA	104	5	3	5

Croatia

***9A3EJZ**	**12,702**	**99**	**23**	**64**

Czech Republic

***OK1LRD**	**115,540**	**421**	**47**	**171**
*OK1DWH	114,063	514	37	160
*OK9RKZ	4,459	85	12	37
*OK2SDE	3,456	58	13	35
**OK1HBP	702	34	6	21

Denmark

OZ7PBI	**7,700**	**104**	**19**	**51**
**OZ7MC*	*30*	*9*	*4*	*6*

England

***M6KCI**	**19,902**	**183**	**25**	**82**
*MØLDP	13,175	147	17	68
*M6YGL	11,322	138	17	57
*M6VWX	6,545	109	12	43
*2EØIHX	5,429	84	15	46
*M6YTU	4,095	65	12	33
*2EØLGP	3,168	54	12	36
*MØWMS	1,792	48	8	24
*2EØWCG	1,089	33	9	24
*2EØSQB	897	25	9	14
*MØIAX	182	11	4	10
**M6ODZ	432	27	6	18
**M6VUK	45	5	4	5

Estonia

***ES1TAR**	**4,536**	**61**	**16**	**40**

European Russia
District 1

***R1ZM**	**22,100**	**270**	**14**	**54**
*R1CAV	12,416	169	15	49

District 3

***R2ARR**	**146,965**	**399**	**57**	**164**

District 6

***R6KVA**	**104,580**	**339**	**54**	**156**
*R6YP	138	26	1	5
**UB6RNB	320	27	5	15

Finland

***OH6UX**	**58,608**	**292**	**41**	**107**
*OH6UAV	580	21	8	12
*OH2BAV	480	20	7	13

France

***F4HXC**	**17,622**	**137**	**25**	**74**
*F4HQO	5,564	45	23	29

Germany

DK2MX	**224,316**	**548**	**65**	**203**
DK5KK	43,500	239	25	100
DM3JAN	5,100	66	18	50
DL7FP	*928*	*17*	*15*	*17*
***DO7DOC**	**29,388**	**267**	**20**	**73**
*DF5FS	27,830	185	26	89
*DK1YH	22,360	229	15	71
*DO3GE	12,288	100	26	70
*DO4WLL	10,530	142	14	51
*DO1MPR	10,125	113	22	59
*DO7JLF	9,234	96	17	37
*DM4AB	6,588	71	18	43
*DL8BFV	3,780	31	25	29
*DM3BN	3,315	58	15	36
*DG1SR	930	37	7	24
*DO2CRB	400	19	8	12
*DO1MIC	374	19	5	12
*DM9MB	99	10	3	8

Greece

***SV1QVY**	**2,107**	**51**	**15**	**34**
*SV2SDP	2,016	51	11	31

Hungary

***HA8MZ**	**800**	**36**	**6**	**19**

Italy

IU1JCZ	**49,344**	**493**	**17**	**79**
IU5JHK	31,944	206	34	87
***IU4HMY**	**62,390**	**261**	**42**	**128**
*IUØKAH	56,457	227	41	112
*IU2GGD	46,282	224	37	109
*IU6FUB	25,272	156	32	85
*IU3GJD	23,871	131	35	74
*IX1HPN	22,568	158	25	79
*IU2GPJ	13,110	88	30	65
*IU4JJP	9,240	133	10	50
*IU1LCU	8,768	105	16	48
*IU2HEE	7,592	105	10	42
*IU3KHI	6,930	101	14	56
*IU3KPF	4,280	88	8	32
*IU2KBY	3,950	67	11	39
**IU8LCS*	*3,480*	*85*	*12*	*46*
*IU2HUQ	2,852	57	11	35
*IU2IHM	704	25	10	22
*IV3HJB	8	2	2	2
**IO2S	14,535	124	19	66
			(OP:IU2IGX)	
**IU5HES	100	6	4	6

Kaliningrad

***R2FCC**	**7,693**	**117**	**11**	**38**

Lithuania

***LY5XX**	**388,614**	**1323**	**57**	**214**
*LY5AX	103,250	540	33	142
*LY5BT	55,937	497	20	111
*LY5YY	54	9	3	6

Netherlands

***PC4AD**	**23,940**	**189**	**19**	**86**
*PD5WSQ	10,854	110	19	48
*PD4BER	784	35	6	22
*PDØJBZ	40	5	3	5

Northern Ireland

***2IØWMN**	**336**	**20**	**3**	**11**

Norway

***LC9A**	**36,088**	**297**	**23**	**81**
			(OP:LB1TI)	

Poland

***3Z5A**	**52,419**	**442**	**20**	**81**
*SQ8W	52,398	356	26	116
*SQ4JUM	34,153	246	29	90
*SP8GK	9,350	167	18	67
*SQ9GOL	6,533	128	7	40
*SQ7M	5,418	102	15	48
*SP9CH	4,508	97	8	38
*SP3KX	2,784	85	5	27
*SP8PKP	1,295	35	11	26
*SP3ATB	740	13	10	10
*SO8OO	720	65	5	25
*SO5MK	30	5	2	4

Portugal

***CS7AOL**	**72**	**5**	**4**	**4**

Romania

***YO8TGE**	**10,578**	**97**	**23**	**63**

Sardinia

***ISØHNF**	**792**	**16**	**9**	**13**

Serbia

***YU4GUV**	**11,248**	**177**	**14**	**62**
*YU4OWL	7,280	117	8	44
*YU4OIZ	5,304	136	8	31
*YU4MOM	700	20	6	14
*YU4NSL	378	17	5	13
*YU4GPS	345	14	6	9
*YU4JAN	308	19	4	10
*YU4LED	308	13	5	9
*YU4MLL	289	15	5	12
*YU4YES	286	13	6	7
*YU4KIS	224	18	4	10
*YU4IKA	78	11	3	3

Slovak Republic

***OM4IK**	**81,503**	**455**	**29**	**120**

Spain

***EA4GWL**	**20,760**	**298**	**30**	**90**
*EA7JZZ	3,528	42	16	33
*EA4GZW	3,213	43	16	35
*EA5IUN	3,185	39	18	31
*EA5ITW	2,619	48	10	17

Sweden

SA5JUS	**21,210**	**136**	**34**	**71**

Switzerland

***HB9GNP**	**57,615**	**245**	**40**	**127**
**HB3XRB*	*837*	*25*	*7*	*20*
*HB9GPR	308	14	10	12

Ukraine

UR5NLA	**22,557**	**216**	**16**	**57**
***UT8IBU**	**89,430**	**366**	**36**	**129**
*UR5FQB	19,300	168	22	78
*UR6LF	1,770	58	6	24
**UT5WAA	1,240	46	7	24

OCEANIA
Australia

***VK8VWA**	**26,578**	**126**	**35**	**62**
*VK6MIT	1,404	27	13	13
*VK4PZZ	432	13	8	8

Guam

***KN4IAS/KH2**	**1,175**	**35**	**12**	**13**

Indonesia

YC3IMS	**464**	**29**	**7**	**9**
***YD9VIZ**	**20,178**	**162**	**25**	**32**
*YDØMAT	9,900	79	19	31
*YGØTUR	7,266	125	15	27
*YD2YSW	3,434	45	15	19
*YDØSDD	3,232	64	14	18
*YD2CPQ	2,640	69	13	17
*YD2DPK	2,584	30	14	20
*YG3EOY	1,904	36	11	17
*YG2UFA	1,702	47	9	14
*YG3FAP	136	7	3	5
*YG3DKB	74	66	15	22
*YD1IDB	54	6	2	4
*YG3FKD	12	7	6	6
*YD1HVZ	6	1	1	1

New Zealand

***ZL1FAB**	**5,247**	**52**	**24**	**29**

Philippines

**DW9IGT*	*616*	*22*	*10*	*12*
***DU1ZC**	**540**	**23**	**7**	**11**
*DW7RAR	325	35	11	14
*DV1VGX	210	22	2	4

SOUTH AMERICA
Argentina

***LW9ENF**	**28**	**5**	**2**	**2**

Brazil

PY2MET	**383,280**	**731**	**69**	**171**
***PY2FRQ**	**46,920**	**178**	**42**	**73**
*PY2XRP	7,598	88	22	36
*PU8MGB	156	19	5	7
*PU7EYL	150	24	4	6
*PU4CGT	78	17	5	8
*PU7ABC	10	26	4	6
*PU2UAH	4	5	2	2
**PS8MT	6,912	103	26	38

Chile

***CD4PSH**	**8,352**	**128**	**14**	**18**

Equador

***HC2TKV**	**38,306**	**182**	**40**	**67**
*HC2AP	27,534	279	14	25

Venezuela

***YY2WTF**	**15,282**	**141**	**16**	**38**
*YY5AEP	13,041	105	20	43
*YY5KAT	6,960	58	20	40
*YY5ATN	777	51	10	27

CLASSIC
NORTH AMERICA
United States
District 1

K5ZD	**3,062,108**	**2255**	**107**	**369**
KQ2M	874,239	1286	61	188
K1RM	588,138	860	54	195
W1WEF	543,312	706	74	220
K1IX	248,862	403	50	172
KK1W	180,320	307	66	158
W1NSK	101,976	233	45	123
W1OHM	7,200	63	11	34
***K1HT**	**180,648**	**329**	**45**	**148**
*N1ALO	153,116	305	50	152
*KC1SS	58,519	170	40	99
*N1DC	49,320	145	43	94
*NP2GG	45,360	146	35	91
*W1JQ	41,730	125	41	89
*N1VH	20,200	83	35	65
*KR1A	18,150	107	16	50
			(OP:KL7JT)	
*W1GHD	8,778	60	30	47
*WA1OTZ	3,010	29	17	26
*KB1IRB	1,085	26	13	18

District 2

W2LU	**209,198**	**368**	**73**	**184**
N2JJ	55,200	136	43	107
KD2DC	12,512	69	22	46
KB2MN	9,504	58	25	47
K2QB	4,371	49	6	25
N2DDX	*4,165*	*46*	*12*	*23*
N1UFO	1,740	26	11	19
***AC2RL**	**174,460**	**300**	**56**	**164**
*W2CCC	141,372	282	56	133
			(OP:K2CS)	
*KD2BXD	6,750	49	14	36
*W2FUN	5,340	48	22	38
*W2VU	5,335	40	21	34
*AC2QH	2,856	28	18	24
*N2IVN	1,440	24	12	18
*K2AL	817	16	7	12
*K2KU	810	17	13	14

District 3

K1BZ	**141,918**	**259**	**62**	**155**
N3XF	49,861	156	36	83
K9ZU	22,968	95	24	64
K3DCW	14,630	73	28	49
***K3HW**	**106,368**	**236**	**51**	**141**
*N3XZ	21,800	102	33	67
*W3MBC	16,356	78	33	61
*N3UR	13,870	72	21	52
*AJ3DI	6,032	60	21	31
*N3RUM	1,408	20	13	19
*N3TIR	1,152	22	16	20
*KB3LIX	702	16	8	10

District 4

K4AB	**1,542,525**	**1285**	**114**	**357**
K4BAI	638,514	719	88	254
ND4Y	413,028	582	79	219
AC4G	376,200	492	84	216
K4FX	263,942	401	63	175
KU8E	178,420	306	64	156
WA3DQS	126,072	244	62	142
WX8V	103,395	220	57	126
K4KAY	59,079	192	40	101
ND4G	34,220	113	36	82
KD4ISM	32,452	116	40	82
N4LZ	32,445	116	30	75
WB5WAJ	21,156	99	24	62
WB3D	14,042	97	16	43
KM4AHP	3,465	34	8	27
WA2FTC	2,257	21	16	21
N4ZY	1,530	21	9	21
K4FBI	1,512	25	7	17
AD4TJ	392	13	6	8
***N9NB**	**827,904**	**803**	**97**	**287**
*KC4TEO	72,320	173	51	109
*NT4MM	59,830	155	50	105
*K4SXT	56,743	128	64	115
*WØMPM	53,196	149	45	98
*KN4EWI	51,300	149	36	99
*AE4M	38,735	132	42	85
*W4LC	33,418	151	16	61
*WN4AFP	31,941	125	34	83
*KG4WOJ	30,186	113	41	76
*K4BC	27,940	107	39	71
*K2WPM	18,177	89	29	54
*KR4M	12,220	71	20	45
*KK4AND	12,033	77	18	45
*KT3V/4	11,935	76	28	49
*WJ4HCP	9,443	62	24	47
*KJ4KKD	7,584	79	27	52
*KJ4EU	4,576	46	20	32
*N4DE	3,649	39	15	26
*NØKOE	3,159	35	12	27
**W4NWT*	*1,598*	*28*	*15*	*19*
*AJ4AY	1,260	21	12	18
**W2UW*	*850*	*22*	*10*	*15*
*NC4MI	98	5	3	4
*WB2ART	6	1	1	1
**N4ZAK	4,848	50	19	29

District 5

AI5SF	**193,800**	**357**	**55**	**149**
K5IB	52,116	166	45	84
KM5VI	40,984	309	30	64
KF5YUB	*21,492*	*93*	*46*	*62*
KJ5MA	1,767	22	13	18
***NN5T**	**71,145**	**181**	**53**	**100**
*K5DHY	51,375	150	51	86
*NW5Q	41,412	137	46	70
*K1JHS	27,904	104	37	72
*KD5FBA	7,020	55	21	39
*KC5LK	5,777	50	19	34
*K9ING	3,198	36	15	26
*NØLD	1,911	27	17	22
*AF5VO	1,272	26	11	13
*KM5FW	1,247	35	14	15
*KC5RGQ	56	4	4	4
**WE6EZ	15,934	102	20	42

District 6

N6JS	**173,301**	**543**	**60**	**123**
W1PR	146,850	341	55	110
W6UE	101,150	225	49	121
			(OP:N6AN)	
KE8FT	82,150	246	58	97
WA6URY	53,120	161	56	72
N6KN	50,652	233	26	58
KG6WIK	40,215	152	41	64
NC6R	35,490	235	51	79
W6UM	32,085	120	31	62
N6VOH	22,656	129	34	62
KB6A	9,690	75	23	28
K6SZQ	1,118	18	10	16
KM6G	6	1	1	1
***W6BJB**	**30,199**	**124**	**37**	**64**
*KE6WC	24,722	110	40	54
*AE6YB	20,436	114	34	44
*WB6ZAM	7,869	63	31	30
*NR7Z	5,358	41	19	28
*W6VIO	4,545	65	23	22
			(OP:K6ICS)	
*K6ELE	2,352	49	24	25
*N6BHX	348	13	6	6
**AB6WC*	*170*	*10*	*5*	*5*
*WA7ER	120	7	5	5
*WB6ETY	48	3	3	3
*KK6VZE	42	11	3	3

District 7

K9JF	**368,544**	**527**	**85**	**179**
W7YAQ	352,350	496	92	178
WN7T	41,760	144	52	68
N3EG	*17,176*	*88*	*32*	*44*
WU6W	16,016	90	32	45
KH6VM	12,814	103	34	52
W7ON	7,140	55	29	39
NO7E	6,785	63	29	30
KG7SXF	5,250	55	22	28
KE7HTL	4,257	41	16	27
AG7NC	840	23	13	11
***N7FLT**	**44,795**	**193**	**24**	**61**
*N7MU	20,100	100	46	54
*KNØW	16,116	91	35	44
*K7HKR	10,179	103	14	25
*K7ACZ	6,532	53	21	25
*AG7CC	2,958	37	15	19
*N6LB	1,250	24	10	15
*K3TP	962	26	13	13
**W7RTC*	*703*	*17*	*10*	*9*
*WF7BSR	252	8	6	6
*K7JSG	154	10	8	6

District 8

W8MET	**239,424**	**402**	**68**	**164**
K8MR	165,898	287	65	153
W8WA	97,464	291	29	102
K8IV	72,684	282	24	84
AF8C	62,832	195	45	91
AA8DC	34,020	153	18	63
WB8RNV	936	24	11	13
***W8GX**	**104,652**	**241**	**46**	**116**
*K8BKM	28,600	114	34	66
*W8TM	26,730	91	33	77
*K8LBT	17,304	75	29	55
*AB8OU	5,358	44	22	35
*K7DR	1,815	25	12	21
*KB8SRQ	925	18	11	14
*W8SJB	182	8	5	8

District 9

WB9Z	**1,696,940**	**1346**	**121**	**339**
WS9W	116,725	255	56	119
K9RU	19,136	80	32	60
W9SE	9,648	61	25	42
***WD9CIR**	**91,040**	**230**	**51**	**109**
*NN1N	19,594	83	39	58
*KD9AC	14,104	72	30	56
*KC9VYX	3,850	41	11	24
*NA9VY	3,850	42	21	29
*K9DEB	3,634	37	21	25
*W9TAM	3,382	37	13	25
*K9WPV	1,666	22	15	19
*WG9L	765	17	5	12
*KEØL	228	8	6	6

District Ø

NØUU	**158,550**	**334**	**51**	**124**
KØLBR	78,842	197	49	109
KAØLDG	75,647	205	45	98
NUØC	55,461	171	48	91
KØJM	48,625	162	42	83
ADØH	48,387	182	50	77
NEØU	27,166	112	29	65
NØWRK	4,356	51	17	27
KDØJLE	3,116	40	17	21
NØNZG	2,816	53	20	24
***KC6X**	**109,248**	**239**	**65**	**127**
*WØYJT	58,558	204	41	93
*NØFY	19,694	88	29	57
*WØZF	10,248	69	25	36
*KA8HDE	6,496	45	24	34
*KDØOYC	2,856	38	16	18
*NØEMU	2,592	48	17	19
**WA5SWN*	*1,943*	*31*	*14*	*15*
*AEØDM	646	28	9	8
*WAØILD	400	20	7	9
*KD8HAM	15	3	3	2
**NDØC	76,000	200	52	100
**ADØBI	416	14	4	9

Alaska

AL7LO	**199,172**	**826**	**40**	**76**

Belize

***V3A**	**116,644**	**1285**	**12**	**32**
			(OP:V31MA)	

Canada
District 1

***VE1JS**	**61,270**	**201**	**29**	**81**
*VE9RLW	1,943	35	12	17

District 2

VA2LGQ	**3,567**	**41**	**16**	**25**
***VY2GF**	**11,966**	**98**	**21**	**41**
*VE2SMS	11,736	86	27	45

District 3

VA3CCO	**681,912**	**841**	**87**	**241**
			(OP:VE3KZ)	
VE3UTT	599,248	891	67	201
VE3GYL	95,756	246	40	108
VE3RX	88,343	215	55	112
VE3FTM	4,896	48	17	31
***VC3M**	**969,173**	**1180**	**87**	**262**
			(OP:VE3LA)	
*VE3CV	301,320	497	69	179
*VE3MH	67,188	222	37	95
*VE3SST	40,515	151	36	75
*VE3LVW	32,421	111	35	72
*VE3LMS	23,670	113	28	62
*VE3KBI	4,896	46	21	30
*VE3LBG	3,264	31	18	30
*VE3MDX	1,728	33	11	21
*VA3KTT	20	7	1	1

District 4

VE4JBB	**156,341**	**1050**	**26**	**53**

District 6

VE6IVN	**72,360**	**244**	**42**	**78**
VE6TWP	4,600	52	15	25
***VA6AN**	**19,630**	**138**	**29**	**36**

District 7

VE7BC	**118,272**	**500**	**49**	**63**
***VA7CRZ**	**111,706**	**277**	**57**	**101**
*VE7KPB	5,418	55	21	22
*VA7DGT	198	10	6	5

Cuba

***CM2XN**	**276,940**	**1052**	**30**	**92**
*CO8ZZ	89,318	634	19	52
*CM8NMN	25,773	188	18	53
*CO8RH	4,761	81	9	14
*CO8SJ	988	28	9	10

Haiti

***HH2AA**	**36,400**	**238**	**26**	**44**

Puerto Rico

KP4RV	**486,864**	**1638**	**42**	**102**
WP4I	*9,399*	*93*	*10*	*29*
***KP3LR**	**19,778**	**321**	**12**	**19**
*KP4LE	13,080	208	11	19
*WP4RF	9,462	60	22	35
*NP3OT	2,496	34	12	20

AFRICA
Canary Islands

***EA8BQM**	**133,056**	**345**	**44**	**100**
*EA8DEG	15,642	74	26	53

South Africa

***ZS6MM**	**2,580**	**34**	**9**	**21**

ASIA
Asiatic Russia
District 9

R8WF	**1,447,506**	**1487**	**77**	**277**
RW9DX	70,200	245	27	81
RW9OW	58,421	200	34	79
RL9L	9,752	90	10	36
***R9JAD**	**64,400**	**251**	**28**	**87**
*UA9JNT	34,776	150	25	67
*UA9JBV	26,904	182	13	46
*R9TV	25,056	124	33	75
*RA9OCP	3,978	49	15	24
**R8JAL/M*	*3,290*	*51*	*10*	*25*
*RT9YA	2,380	33	11	23
*UA9OMT	2,175	33	11	18

District Ø

RAØQD	**290,079**	**982**	**53**	**114**
UAØXAK	68,530	362	38	51
***RØUT**	**48,587**	**308**	**22**	**55**

Asiatic Turkey

***TA2EJ**	**102,999**	**283**	**31**	**108**
*TA7I	31,164	264	11	38
*TA1FA/2	4,640	61	6	23
*TA2RN	220	18	7	15
**TA7AGL	1,280	28	5	15

China

BA5AJ	**711,917**	**1276**	**77**	**194**
			(OP:IK7YTT)	
***BG8INK**	**23,596**	**143**	**21**	**47**
*BG8TFN	21,600	158	36	54
*BG8IL	17,487	109	21	46
*BD4KM	2,046	48	13	18

*BD7LMA	910	22	12	14
*BG6VGZ	504	14	10	11
*BI4SZP	195	9	7	8
India				
VU2DED	**122,108**	**310**	**56**	**122**
VU2YQ	14,388	106	18	48
AT5M	7,420	103	9	26
		(OP:VU2MUD)		
VU2CVS	1,160	19	13	16
***8T8S**	**33,304**	**148**	**25**	**67**
		(OP:VU2AE)		
*VU2SMS	16,646	97	27	55
*VU2BL	3,535	52	11	24
*VU3VBK	704	19	9	13
*VU3SXL	616	16	10	12
*VU2JOS	273	17	5	8
*VU3LMS	240	16	10	10
*VU3SIO	156	8	5	8
*VU2TO	70	9	3	4
Israel				
***4Z5TK**	**5,253**	**54**	**12**	**39**
Japan				
District 1				
JA1NFD	**28,044**	**161**	**27**	**49**
JA1ZLO	1,102	30	14	15
		(OP:JJ1MDY)		
JK1UVL	560	16	8	12
JI1CIN	232	32	2	2
***JS1KKY**	**101,108**	**262**	**58**	**99**
*JA1CRJ	11,700	72	34	41
*7N2UQC	832	23	8	8
*JK1EXF	608	14	7	9
*JH1RDU	480	14	8	7
*JG1XRA	294	15	7	7
*JQ1COB	126	6	4	3
*JH1HHP	100	6	5	5
*JS1WWR	22	6	6	5
**JL1KLK	1,620	22	13	17
**JI1IKC	594	15	9	13
**7L1DST	126	6	4	5
District 2				
***JA2GHP**	**20,100**	**116**	**31**	**44**
*JA2KKA	9,150	82	28	33
*JE2BOM	1,920	28	14	16
*JL2OGZ/2	70	4	3	4
District 3				
JR3RIY	**72,802**	**339**	**28**	**61**
JR3RIU	56,876	212	42	76
JN3QNG	40,120	166	50	68
JA3QOS	588	18	6	8
***JP3KPJ**	**6,222**	**63**	**22**	**29**
*JJ3TBB/3	4,982	48	21	26
*JF3FYD	475	11	10	9
*JG3EHD	16	2	2	2
District 5				
JF5SIM	**10,431**	**63**	**23**	**38**
District 7				
JA7QVI	**105,029**	**292**	**49**	**78**
JA7VEI	38,007	139	40	63
JH7QXJ	17,710	92	29	48
JG7EHM	17,160	90	19	46
***JA7HYS**	**167,232**	**328**	**76**	**125**
JA7GFJ	*35*	*3*	*2*	*3*
District 8				
***JA8DNV**	**1,748**	**32**	**10**	**13**
District 9				
***JA9EJG**	**7,290**	**61**	**21**	**33**
District Ø				
JAØLBE	**45,469**	**390**	**21**	**20**
***JHØNEC**	**135,622**	**331**	**60**	**106**
Kazakhstan				
***UNØLM**	**151,810**	**680**	**17**	**68**
*UN7MBH	71,337	217	27	102
*UN7PGA	48,312	352	17	44
Republic of Korea				
***HL1OVG**	**518**	**28**	**7**	**7**
Saudi Arabia				
7Z1SJ	**256,610**	**719**	**32**	**102**
***HZ1VV**	**3,977**	**39**	**14**	**27**
EUROPE				
Aland Islands				
***OHØRJ**	**900**	**23**	**9**	**21**
Austria				
OE6HWF	**41,888**	**232**	**31**	**105**
OE5WHN	29,070	203	23	79
***OE2E**	**64,908**	**346**	**23**	**85**
		(OP:OE2GEN)		
*OE6SWG/P	40,300	283	28	102
*OE3TWA	31,360	273	21	91
*OE3PYC	304	14	8	11
Balearic Islands				
EA6UP	**713**	**13**	**11**	**12**
Belarus				
EU1A	**2,161,540**	**2321**	**113**	**395**
EV1R	1,151,766	1793	104	358
EW2A	1,041,492	1440	95	363
EW8DX	157,680	579	42	177
***EU1FQ**	**52,592**	**196**	**48**	**104**
*EV6Z	37,352	187	35	81
*EW2EO	5,590	55	22	43
Belgium				
ON4KCY	**705,575**	**1315**	**73**	**252**
ON5GQ	150,600	615	27	93
***ON3SAT**	**36,432**	**246**	**30**	**102**
*OPØJ	9,408	147	10	39
		(OP:ON5GF)		
OT4R	*6,206*	*96*	*14*	*44*
*ON4CT	3,053	56	8	35
*ON2LMP	77	6	5	6
Bosnia-Herzegovina				
****E72NA**	**12,040**	**185**	**12**	**44**
Bulgaria				
***LZ1PUB**	**42,050**	**249**	**31**	**114**
*LZ2PS	36,935	326	19	64
*LZ2FM	3,880	61	11	29
*LZ4NS	2,870	74	7	28
Croatia				
***9A2VX**	**22,126**	**272**	**12**	**62**
*9A3DOS	12,556	99	23	63
*9A1EA	12,155	98	23	62
*9A5ADI	4,797	89	10	29
Czech Republic				
OK1GTH	**920,185**	**1935**	**63**	**242**
OK1XC	39,240	256	21	69
OK1PPL	*7,107*	*96*	*17*	*52*
***OL3E**	**88,242**	**456**	**35**	**119**
		(OP:OK1JOC)		
*OK1LO	63,648	346	38	118
*OK2BUT	61,662	383	26	60
*OK1BJ	53,361	296	36	111
*OK7N	50,887	207	43	108
*OK2VV	45,648	284	27	117
*OK2TC	42,210	302	27	99
*OK1XBF	29,464	235	22	94
*OK1FNT	14,690	214	12	53
*OK1TVL	1,564	40	12	22
OK2BRQ	*836*	*34*	*5*	*17*
**OK1LV	11,316	144	15	31
Denmark				
OZ11A	**584,974**	**1478**	**64**	**234**
***OZ8CT**	**95,992**	**480**	**31**	**138**
*OZ8ZS	70,890	345	36	134
*OU8A	20,160	363	9	51
*OZ1OM	11,781	159	14	63
*OZ1AOO	10,208	123	20	68
*OZ1QZ	5,820	93	14	46
England				
M8C	**136,127**	**524**	**42**	**155**
		(OP:G4DBL)		
MØRBE	53,268	306	35	103
MØGDX	20,292	122	40	74
G4IUF	6,138	44	26	36
G2Z	1,508	48	5	24
***MØUTD**	**361,935**	**636**	**71**	**244**
*G4NBS	140,901	528	38	163
*GØOOF	85,345	343	35	134
*G6UBM	39,162	214	35	87
*MØYDB	38,080	260	28	91
*MØACM	31,369	212	27	100
*M1G	29,250	218	20	97
		(OP:GØUWS)		
*G8GHD	24,354	152	22	60
*GØOFD	23,421	202	23	88
*G3YCH	19,840	106	31	93
*GØRAH	17,105	228	10	45
*MØKPW	14,280	160	16	52
*G3SVK	14,250	168	16	59
*G3YZO	13,195	124	22	69
*GØBBO	10,833	148	12	57
*M6OWV	7,800	143	9	31
*MØRNW	6,039	87	14	47
*G4TGJ	5,980	83	16	49
*GØCPA	5,395	109	14	51
*MØAUG	5,356	65	16	36
*GØMTN	5,307	72	16	45
*MØORY	2,726	59	13	34
*MØPKZ	1,350	34	9	18
*GØUKZ	420	15	7	13
**M6OXO	10,920	140	24	67
**M1LCR	2,448	64	7	29
**G7PVZ	1,700	36	10	24
**MØJBA	1,550	48	7	24
Estonia				
ES6RW	**2,247,434**	**2747**	**113**	**384**
			(OP:ES5RW)	
***ES5RIM**	**19,648**	**210**	**13**	**51**
*ES8SX	6,811	123	7	42
European Russia				
District 1				
RW1F	**2,102,792**	**2822**	**116**	**372**
RW1CW	793,924	1083	95	317
RM1T	79,024	806	23	65
			(OP:R1TE)	
RV1CB	49,302	237	40	126
U1BD	19,404	196	25	74
RA1TDP	7,585	195	7	34
***UA1CUR**	**177,779**	**559**	**46**	**187**
*R1BBL	43,020	361	21	69
*U1BA	40,375	212	32	93
*RM1F	6,435	80	19	46
**UB1AHI	154	14	3	8
District 3				
UA3VFS	**555,360**	**978**	**87**	**303**
RA3XM	231,795	873	31	122
RC2SB	208,780	383	79	207
R2AD	83,076	706	16	70
R2GB	34,146	196	34	92
R3ST	10,292	158	13	49
R3GZ	2,596	38	15	29
RA3THN	1,219	22	9	14
***UA3BL**	**347,541**	**787**	**66**	**237**
*RA3DIH	124,200	386	51	165
*R3DCB	78,260	258	47	135
*RX3QFN	19,440	190	16	56
*R3WZ	18,792	106	25	62
*R5FC	15,022	132	20	54
*RA3DGH	8,037	162	6	41
*R3RK	5,950	101	7	43
*RU3VV	3,564	42	15	18
*RU3XY	1,188	32	9	27
**RW3AI	26,775	254	14	61
District 4				
RM4HZ	**257,226**	**719**	**60**	**198**
R4RT	87,945	310	54	151
RU4AA	20,128	269	13	55
UB4W	5,440	68	17	51
***RA4HBS**	**94,954**	**364**	**41**	**156**
*RA4L	7,696	137	9	43
*UA4WGM	5,633	76	13	30
District 6				
UA6EE	**85,137**	**511**	**27**	**84**
R6CC	17,082	212	12	61
***R7MM**	**532,992**	**990**	**75**	**272**
*RM7C	144,900	729	36	139
*RA6LIS	59,286	327	28	95
*R6DBT	53,165	279	38	117
*R6LBK	38,822	226	30	88
*R7KX	27,336	143	35	101
*R7RAI	342	19	3	15
District 9				
***RA9FEL**	**13,056**	**215**	**10**	**41**
Finland				
OH1VR	**716,538**	**1273**	**87**	**302**
OH2PQ	514,475	1049	82	243
OH1C	331,128	772	65	227
			(OP:OH1CX)	
OH1QX	14,742	193	12	51
			(OP:OH1ZAA)	
OH4BCS	13,260	108	20	48
			(OP:OH1ZAA)	
OH3BCX	7,112	104	13	43
			(OP:OH1ZAA)	
OH5ZA	72	9	4	8
			(OP:OH1ZAA)	
***OH6ECM**	**221,709**	**570**	**54**	**209**
*OH2BKX	94,672	364	31	91
*OH1SIC	69,204	377	27	131
			(OP:SM5SIC)	
*OH8JIX	38,740	229	31	99
*OH2EPW	7,590	103	16	50
*OH3MHA	3,526	68	8	33
			(OP:OH1ZAA)	
*OH2MZA	738	23	6	12
			(OP:OH1ZAA)	
*OH1ZAA	40	5	3	5
France				
TM2Y	**1,253,672**	**1477**	**95**	**332**
			(OP:F6BEE)	
F8KLY	9,063	200	8	45
			(OP:F6CWA)	
F6LIA	460	11	9	11
***F1ICS**	**97,104**	**337**	**53**	**151**
*F4HTZ	70,533	297	39	114
*F4IVV	69,336	349	28	80
*F1IGY	8,613	72	27	60
*F4FRG	5,712	59	16	40
*F8OOI	1,369	27	12	25
*F4FVW	936	27	7	17
**F1ICR	2,074	55	10	24
Germany				
DJ5MW	**2,291,408**	**2568**	**107**	**392**
DJ8OG	1,767,840	2056	111	369
DL7BC	976,125	1314	88	323
DK5QN	347,795	1234	32	101
DJ9YL	44,890	207	43	91
DL2VM	42,300	161	49	101
DKØSU	24,582	205	22	80
			(OP:DF7SA)	
DJ3WE	20,910	168	25	77
DL7LX	20,178	147	29	89
DL4ABR	18,905	157	22	73
DK5WB	*17,850*	*137*	*25*	*77*
DL1BSN	17,112	109	30	62
DH6MES	10,504	94	17	35
DM5RC	3,040	83	5	35
***DK1KC**	**344,320**	**716**	**67**	**253**
*DG7LAN/P	324,612	1102	55	199
*DF5BM	158,999	606	43	180
*DG2JA	102,128	351	47	161
*DL5LB	83,952	416	36	123
*DM7W	78,848	325	39	115
			(OP:DL8MAS)	
*DLØRD	72,861	306	42	121
			(OP:DL7NV)	
*DF9WB	34,020	171	36	99
*DL5JS	33,517	228	26	95
*DL9HB	30,988	164	28	94
*DF6RI	29,456	198	23	89
*DL7FUA	26,208	196	29	88
*DL8ZAJ	25,760	167	30	82
*DH9DX/P	21,008	178	20	81
*DJ6HR	19,228	131	21	71
*DL8AX	12,546	111	20	62
*DJ9KH	11,594	90	21	41
*DK4WK	11,562	121	19	63
*DO1TOM	6,318	119	10	44
*DG9BEO	6,279	94	18	51
*DK2TS	4,898	78	13	49
*DG9FBA	4,361	47	20	29
*DL1JPF	3,264	56	13	35
*DO7ES	2,001	41	10	19
*DL2RZG	1,984	66	4	28
*DM2DLG	1,260	49	5	25
*DG1BQC	416	13	7	9
*DL3LQM	288	19	2	14
*DK2YL	147	7	2	5
**DK8TA	46,576	302	29	113
**DG2FDD	66	11	2	9
Greece				
***SV2HJQ**	**121,346**	**616**	**37**	**129**
*SV1RMB	43,548	279	27	87
*SV7CUD	11,904	91	30	63
Guernsey				
***MUØGSY**	**45,738**	**549**	**14**	**63**
Hungary				
HA3DX	**853,596**	**1415**	**89**	**304**
			(OP:HA4XH)	
HG2DX	108,240	832	20	90
****HA1TI**	**9,165**	**207**	**6**	**41**
Iceland				
TF3Y	**7,350**	**71**	**20**	**30**
Ireland				
EI9CN	**86,840**	**388**	**37**	**130**
***EI3ENB**	**48,672**	**247**	**40**	**116**
*EI/OK1NYD	3,330	62	14	31
Isle of Man				
GD9W	**2,913,428**	**3431**	**96**	**373**
			(OP:MØDXR)	
***2DØXPS**	**5,220**	**83**	**14**	**46**
Italy				
IB2M	**859,805**	**1309**	**79**	**280**
IZ6ERS	352,512	965	72	216
IØLYO	341,930	779	70	240
IZ5WTV	289,971	585	69	234
IZ2SMQ	156,832	398	56	176
IZ6OUX	141,075	619	47	162
IK7NXU	90,636	278	51	131
IW1FGY	86,460	282	45	120
IK1BPL	49,617	176	43	106
IK3SSW	43,248	144	36	123
IK2OLJ	10,584	96	25	59
IZ5NSH	7,930	48	27	34
IK2IKW	4,928	63	18	46
IU2CKS	4,005	96	9	36
IZ4UFB	640	21	13	19
IN3ELX	342	10	8	10
***IK5MES**	**66,495**	**247**	**38**	**117**
*IU3GKJ	60,000	246	39	121
*IK4BEI	51,491	232	37	114
*IK5BDG	47,334	257	33	105
*I1RB	44,250	245	39	111
*IV3EWO	38,989	242	27	100
*IK4NZD	34,200	252	16	41
*IZ2BKA	30,294	179	25	77
*IZ2BZP	26,085	166	24	87
*IK4JQQ	25,645	198	25	90
*IW4EGX	23,498	139	22	40
*IZ1LAY	22,990	158	31	90
*IU1FIB	22,770	144	27	83
*IK8ARF	21,850	144	28	67
*IN3JRZ	19,992	190	20	78
*IU8GYT	18,480	191	29	103
*I3GWE	18,468	99	29	85
*IK6SBW	17,949	119	29	64
*IWØHLZ	16,218	174	24	78
*IN3EOM	13,824	109	26	70
*IV3APH	11,726	111	20	62
*IK2YSJ	11,316	116	23	59
*IU4DAF	10,404	92	16	35
*IW2BZY	9,804	76	22	54
*IC8AJU	9,372	74	23	43
*IK6UBY	8,954	99	18	56
*IU4FJL	7,102	84	17	50
*IX1AMY	7,029	77	18	53
*IK5TBK	5,610	119	8	43
*IZ3NUI	5,244	74	13	33
*IU5BKR	5,220	61	15	45
*IW2ENA	4,797	62	14	27
*IW8ENL	4,650	72	19	43
*IZ5HZO	3,774	51	12	25
*IW2OEV	3,363	52	19	38
*IZ8SFM	2,765	31	15	20
*I1DXD	1,932	26	18	24
*IK1HZZ	1,320	19	10	14
*IU4FKM	1,120	30	11	21
*IU8DFD	1,089	37	8	25
*IZ8CLM	1,053	15	13	14
*IK2WQD	988	22	10	16
*IK8YFW	900	22	12	18
*IZ1FRM	378	9	6	8
*IV3XPP	276	16	10	13
*IW1BBQ	221	13	6	11
*IK2REA	192	12	5	7
*IZ2CSX	168	12	3	11
*IW8FBM	8	4	4	4
*IZ3EBA	0	2	2	2
**IZ3NVR	212,784	545	56	208
**IZ1ANK	19,950	192	16	59
Kaliningrad				
UA2FZ	**1,142,532**	**1484**	**104**	**343**
Latvia				
YL2GD	**510,543**	**1013**	**74**	**223**
YL2CI	272,875	1207	31	94
Lithuania				
***LY2N**	**203,090**	**582**	**46**	**184**
*LY5T	74,593	663	18	79
*LY1M	40,375	266	28	97
Luxenbourg				
LX4A	**39,042**	**352**	**24**	**57**
			(OP:LX1NO)	
Macedonia				
***Z35W**	**139,682**	**522**	**49**	**162**
Moldova				
***ER1JA**	**38,088**	**389**	**14**	**58**
Netherlands				
PAØMIR	**22,100**	**302**	**10**	**55**
***PA1REG**	**110,800**	**355**	**45**	**155**
*PDØMHZ	61,824	465	21	91
*PG1R	51,408	305	26	110
*PD1B	37,296	217	29	82
*PD5ISW	16,093	151	19	58
*PBØACU	8,601	106	13	48
*PA2VS	5,544	101	8	48
**PAØAWH	1,896	80	4	20
**PA1B	704	28	6	16
Northern Ireland				
***MIØI**	**189,945**	**768**	**43**	**158**
			(OP:MIØRRE)	
*MIØDWE	13,800	114	22	53
*MIØULK	9,176	110	15	47
Norway				
***LB1LG**	**91,175**	**415**	**38**	**137**
*LA2HFA	62,160	266	41	127
*LA2ONA	56,140	295	32	108
*LA6M	27,192	216	22	81
			(OP:LA6GX)	
*LA7TN	8,236	107	16	55
*LA8OKA	7,956	212	5	29
*LBØOG	7,844	139	7	46
*LC9T	5,208	66	18	44
			(OP:LA9VKA)	
*LA2QUA	182	14	4	9
Poland				
SN5V	**101,094**	**1124**	**15**	**68**
			(OP:SQ5EBM)	
SP5ICS	67,080	315	34	122
SQ5LTT	45,140	271	34	114
SQ5EXM	33,744	220	30	84
SP2JMR	14,981	105	24	47
SP7MOQ	*6,572*	*44*	*27*	*35*
SP8MRD	3,042	40	13	26
SP9EML	552	28	4	19
***SN4EE**	**127,428**	**407**	**58**	**188**
			(OP:SP4AWE)	
*SP5DRE	63,342	301	36	117
*SP2AWJ	44,712	246	34	104
*SQ9IWS	33,558	242	27	92
*SQ3MIS	22,360	198	24	80
*SP9EMI	16,750	177	14	53
*SN5L	16,287	174	19	70
*SQ9Z	16,224	312	7	45
*3Z6O	12,546	116	20	62
*SP9RHN	12,201	95	26	57
*SQ3PMX	7,990	100	12	35
*SP6JOE	4,440	119	4	36
*SQ5SAA	3,520	90	5	35
*SP3YM	3,230	29	16	22
*SP5TIM	3,045	69	8	27
*SQ8FEU	1,748	34	14	24
*SO1MK	384	28	4	12
**SN1ØØU	9,408	120	18	66
			(OP:SP2UUU)	
**SQ1NXO	693	33	6	15
Portugal				
CT1IW	**8,855**	**76**	**20**	**57**
***CT1EKU**	**51,030**	**228**	**34**	**101**
*CS7AMN	11,070	98	24	58
*CT7AIX	2,499	41	7	14
Romania				
YO3RU	**429,324**	**1114**	**64**	**202**
YO4RST	203,980	496	58	177
YO7CJB	91,744	392	39	149
YO3GNF	58,366	261	37	117
YO9AYN	32,204	293	21	76
YO3FFF	26,372	226	17	59
***YO7MPI**	**102,335**	**430**	**42**	**169**
*YO8BDW	77,688	421	30	126
*YO3FLM	52,836	223	38	110
*YO5OHY	24,726	239	17	61
*YO8THG	18,031	122	19	54
*YO9BNP	17,664	136	25	67
*YO9HG	16,296	166	21	76
*YO9CWY	12,824	177	12	44
*YO2IS	12,084	137	16	41
*YO8SBQ	9,454	64	21	37
*YO4GPC	2,345	56	8	27
*YO8PS	936	13	11	13
**YO6PIB	294	12	5	9
Sardinia				
***ISØHXK**	**4,408**	**44**	**20**	**38**
Scotland				
***MM1E**	**358,722**	**691**	**54**	**219**
			(OP:MMØGOR)	
Serbia				
*YTØI	858	37	8	18
*YT2RIS	208	20	4	12
*YU5T	40	8	2	8
*YU3MLD	10	4	2	3
****YU3VIP**	**6,985**	**135**	**16**	**39**
Sicily				
IT9ZTX	**244,496**	**841**	**53**	**206**
***IT9TFX**	**21,186**	**153**	**28**	**79**
*IT9CLN	18,444	86	33	83
IT9CTG	*5,865*	*145*	*11*	*40*
*IW9FI	128	12	6	10
Slovak Republic				
OM2AGN	**24,990**	**111**	**25**	**73**
OM5VS	*2,552*	*28*	*18*	*26*
***OM6AT**	**72,864**	**492**	**22**	**110**
*OM8ST	20,691	176	18	81
*OM1AKU	15,840	188	18	62
*OM3ZBG	476	40	9	25
**OM3KHT	525	24	7	18
			(OP:OM7ANT)	
**OM6AMD	364	27	3	11
Slovenia				
S5ØB	**48,682**	**369**	**19**	**82**
***S57NAW**	**32,157**	**347**	**13**	**68**
*S53X	3,198	74	7	34
Spain				
EA2KV	*73,253*	*325*	*36*	*103*
EA3MR	**6,192**	**134**	**8**	**40**
EA3HAB	3,822	66	11	28
EA4HT	*1,104*	*35*	*17*	*29*
***ED1MK**	**175,150**	**496**	**53**	**173**
			(OP:EA1MK)	
*EA3KT	117,585	401	47	154
*EC5EA	62,328	231	43	104
*EA5/R3AR	26,912	180	24	92
*EA4GZD	15,088	148	18	74
*EA1GQ	10,810	129	21	73
*EE2A	8,160	74	19	49
			(OP:EA2SN)	
*EA5HJO	5,508	72	15	36
*EA2RW	3,569	43	16	27
EA4CRP	*2,508*	*45*	*19*	*38*
*EA4FTA	1,575	38	7	28
*EA4RCT	96	8	5	7
			(OP:EA4ETT)	
*EA5IMM	6	1	1	1
Sweden				
SMØO	**100,079**	**343**	**54**	**149**
			(OP:SAØDIJ)	
SF4D	68,875	427	23	72
			(OP:SM4LMV)	
***SM6FZO**	**51,952**	**356**	**27**	**109**
*SA6BPD	13,719	165	15	36
*SD1A	126	13	3	11
			(OP:SM1TDE)	
Switerland				
HB9AA	**31,746**	**281**	**18**	**56**
			(OP:HB9ARF)	
***HB9FLX**	**15,675**	**130**	**27**	**68**
*HB9TRR	5,130	59	16	38
*HB9FHV/M	4,686	54	21	45
Ukraine				
UX2MF	**321,451**	**618**	**65**	**248**
UR5CN	96,320	379	54	170
UW7RV	95,604	384	39	147
UR4EI	72,924	301	40	137
***UT7NW**	**355,165**	**888**	**62**	**221**
*UW6E	278,721	748	59	220
			(OP:UR6EA)	
*UT3SO	134,550	553	42	153
*UR5WCQ	53,298	283	27	114

OUR READERS SAY...

The Most Wanted Countries…

Editor, *CQ:*

Excellent informative article (February DX column, "The Most-Wanted Countries … and Why"). Thanks!

Of the 4 DXCC entities I need, I had a good idea of what needs to happen for me to have a chance to work three of them — North Korea, Bouvet Island, and Mount Athos. But until I read your article I had not been able to find out much about Pratas Island.

– 73, Marsh, KA5M

The following letter was directed to author Ted Cohen, N4XX:

Hi Ted,

Just received our January *CQ* magazine and read your article, "A Coaxial Inverted-L Antenna for Top Band Revisited," and enjoyed it very much. This looks like it could be the answer to a prayer!

I have an inverted L hanging off a 56-foot tower at the 50-foot level. Given the much shorter vertical leg, we have a much lower feedpoint impedance. So I use a 1:2 transformer to match it. It seems to work very well, but I'm only seeing about 55 kHz of usable bandwidth. Your coaxial antenna looks like it could be just what I'm looking for! It looks very straightforward, except I have one question (which results from my lack of mechanical skills). Where you solder the shield and inner conductor together, is there a method to do this without cutting the coax in two pieces and then soldering them back together again? My concern is that I might make something mechanically unreliable. HELP! :-)

Thanks in advance for any help.

– 73, Bob Schreibmaier, K3PH

N4XX replies:

Hi, Bob!

How kind of you to write. And yes, it's the answer to a prayer! This is a killer antenna, to be sure. I couldn't believe the difference it made in my operations, from the very first second I hooked the coax connector to my transceiver. Signals just boomed in! And on the transmit side, well ... you read the article.

What I did at the upper end was to slit and open the outer insulation a bit, spread the outer shield, scrape open the tubular insulating layer around the inner conductor, and wrap some copper wire around both the inner conductor and the outer shield. (Bending the cable will allow you to work the copper wire under the inner conductor.) Then, I put some solder flux on the inner conductor, outer shield, and copper wire and let solder flow over the connection using a solder gun (or you could use a big iron). This effectively shorted the coax at that point without breaking the cable open.

I hope this helps.

– 73 and DX, Ted

The "invigorating" outdoors at VY0ERC. Can you spell COLD?

*UR4WWR	2,660	73	5	30
*UR6IM	135	5	4	5
*UT2AB	117	5	4	5
**UX8ZA	13,224	194	10	47
**UX8IX	11,120	117	19	61
**UR5KBP	2,108	52	8	26
Wales				
***MW8R**	**211,600**	**704**	**48**	**182**
		(OP:GW4SHF)		
*MW2I	40,400	262	20	60
		(OP:G4FRE)		
*MW6M	11,036	114	20	69
		(OP:GW4BVJ)		
*GWØFRE	1,200	41	7	17
**GW7APP	3,840	77	9	31
OCEANIA				
Australia				
VK2GR	**12,121**	**149**	**15**	**16**
***VK6RT**	**13,805**	**115**	**18**	**37**
*VK5NS	1,120	22	10	10
*VK7DW	400	18	8	8
*VK3UKW	396	19	12	10
		(OP: @VK3BNW)		
East Malaysia				
***9M6GOH**	**60,786**	**361**	**27**	**39**
*9W8DEN	8,928	165	16	20
Indonesia				
YBØMWM	**22,236**	**142**	**19**	**49**
YB4NY	18,326	107	28	49
YB3FTD	1,755	32	12	15
YC2EEE	1,700	74	10	15
YC3GOQ	1,475	43	10	15
YF3DFB	1,053	29	12	15
YC3NHW	210	37	6	9
YB2VMC	42	9	3	4
YF3CYT	24	4	3	3
***YD3BGM**	**6,120**	**99**	**16**	**29**
*YB1LUE	5,002	78	14	27
*YC1EJL	3,740	48	14	20
*YG3CMS	2,550	63	15	19
*YC4JOY	1,988	40	11	17
*YD1SGB	1,092	59	9	12
*YC3BQS	360	32	7	11
*YD8CPZ	360	21	8	10
*YG3BUP	325	22	5	8
*YF3CYS	224	10	8	8
*YC3TEN	165	9	7	8
*YD7MHZ	77	5	3	4
*YD3YPD	27	15	1	2
*YF3CYU	2	1	1	1
*YC2YEN	0	1	1	1
New Zealand				
ZL2X	**23,885**	**133**	**35**	**50**
		(OP:ZL4CZ)		
***ZL4CTS**	**924**	**18**	**9**	**12**
Philippines				
DU1IVT	**199,383**	**661**	**47**	**76**
DU1R	93,444	461	25	53
		(OP:DU1UGZ)		
4F3FSK	1,239	42	8	13
***4E1A**	**351,400**	**761**	**68**	**107**
*DV1UUU	2,548	41	12	16
*DU1VHY	567	16	9	12
DW7PGO	*285*	*16*	*5*	*10*
**DU7OK	1,376	40	14	18
**DW3TRZ	216	19	5	7
SOUTH AMERICA				
Argentina				
LU5VV	**601,776**	**1992**	**21**	**87**
LV1F	290,173	737	60	109
		(OP:LU4FTA)		
AY8A	3,384	74	8	10
		(OP:LU8ADX)		
***LU6EQV**	**15,330**	**112**	**29**	**41**
*LU1EXR	13,206	95	22	40
*LU8EHR	10,011	85	33	38
*LU9EHU	7,261	89	22	31
Aruba				
P4ØT	**5,539,345**	**3848**	**121**	**384**
		(OP:VE3DZ)		
P4ØL	**4,464,437**	**4155**	**103**	**270**
		(OP:W6LD)		
Brazil				
PY7BEL	**6**	**1**	**1**	**1**
***PY2CP**	**93,912**	**478**	**18**	**68**
*PY2RMY	14,964	111	32	55
*PU5BOY	8,288	140	10	18
*PY5AP	4,624	69	16	18
*PU8MRS	2,695	86	14	21
*PU2SDX	1,740	34	13	16
*PY2CYD	702	17	12	15
PY4MHZ	*475*	*18*	*9*	*10*
PY2PCZ	*21*	*13*	*9*	*12*
**PY2BN	8,360	81	32	44
**PY2IAX	2,176	43	16	18
**PY1XR	126	8	7	7
Chile				
XR2K	**35,389**	**348**	**15**	**28**
		(OP:CX1EK)		
CE3OP	6,318	104	16	23
CE2ML	208	8	6	7
***CA2CEV**	**46,752**	**413**	**17**	**31**
*XQ5CIE	5,940	127	11	22
*CE4CBK	5,390	123	8	14
*CA4UFC	2,968	70	11	17
*CE3TL	1,474	60	10	12
Colombia				
HK3C	**631,475**	**1572**	**42**	**103**
Ecuador				
***HC7AE**	**158,060**	**420**	**42**	**98**
Uruguay				
CX9AU	**479,755**	**892**	**78**	**151**
***CX1CAN**	**1,269**	**37**	**13**	**14**
Venzuela				
***YV5AJI**	**575**	**16**	**10**	**13**

Check Logs

3V8SS, 4M8E, 4Z5ML, 5B4AAB, 5B4ALS, 9A1CMC, 9A2R, 9A3GVD, 9A6TT, 9A6W, 9K2K, A45XR, A61ET, AA7EA, AB4SF, AC2OC, AC9JU, AC9LF, AC9PR, ADØPE, AFØZ, AI6EG, AL4Y, BD3ND, BD7OB, BG2TAA, BG3FB, BG4VRG, BG9HKP, BH3CKQ, CM2MM, CO8RCP, CX2BR, CX3BZ, DCØHD, DC1GUN, DDØNM, DD1UN, DF2SD, DF8TY, DF9XI, DG3MR, DG8OBN, DHØMB, DK1TBL, DK3PM, DK4JA, DK8NC, DL1BFR, DL1EAL, DL1EMY, DL1GZW, DL1SL, DL2DXA, DL2GPK, DL3AQJ, DL3BZ, DL3KVR, DL3LAR, DL3ZZA, DL5DTG, DL5JAG, DL5MK, DL6ATM, DL6GV, DL6JV, DL6MIG, DL6UD, DL7USW, DL7VEE, DL9GCG, DL9RDW, DL9VF, DM1LM, DM1PL, DM5EL, DM7MRE, DO2STS, E7ØEA, E71W, E72U, E74O, E77ØD, EA1AAA, EA1ACP, EA1AF, EA1CF, EA1FDI, EA2KR, EA3IAA, EA4LG, EA4SE, EA5AJB, EA5AJX, EA5YI, EA5YT, EA6GP, EA8TX, EA9LZ, EC1DJ, EC7ABV, EF7A, EU2EU, EU4A, EW4RF, EY8MM, F1TIO, F4EUG, F4FPR, F4FTA, F4WCE, F6ARC, F6BGV, F6GEU, F6GOE, F6HSZ, G1OSI, G4BEE, G5W, G6OKU, G7WIR, GIØMXT, GM3MZX, GS8VL, GU4EON, GW4BKG, GW4J, HA1DAE, HA2MM, HA3FUT, HA3MN, HA3NU, HA5KY, HA7ME, HA7NK, HB9CIP, HF5L, HG17ØVA, HG3FMZ, HK4L, IK2MXM, IK2SAU, IK5ZUK, IK8NBE, IN3XUG, IO3A, IO3T, IT9CML, IT9GSF, IT9YHR, IU2BHI, IU2CVS, IV3ARJ, IV3ZCS, IZ2DII, IZ3GNG, IZ5NFD, IZ8IFL, JA1RFF, JA2KVD, JA3AVO, JA5EXW, JA8AZN, JA8FFM, JE1AYU, JE6JZP, JG3GOM, JHØINE, JH1LEM, JH1SAJ, JH4IFF, JH8SGR, JI3MJK, JJ1SWI, JK1PIU, JP7CFP, JR7RZK, JT1CS, K1SX, K2MRH, K3NK, K4ZO, K5ML, K5PS, K5TBA, K6DAJ, K6DTT, K6TET, K7DPS, K9JWP, K9OR, KA6KEN, KBØWMQ, KCØFOT, KC1BJG, KC1CJD, KC2FQ, KC9LVT, KD6UY, KD7F, KE2A, KF5RUW, KG5KRZ, KI7DG, KJ6PON, KK4ADQ, KK4RXC, KL7KK, KT2UU, KX2A, KZ5J, LC2C, LU1DZ, LU3EBT, LY1CT, LY2CO, LY3G, LY3NX, LZ1JZ, LZ1MS, MØCLH, MØIPU, MØKNG, MØLDW, MØMGO, MØYRX, M3ECT, M3I, M5ADL, M6LXF, M6OPU, MWØIDX, MWØYVK, MW5R, N1IA, N3UA, N5XE, N6CW, N6DNU, N6WT, N8AMI, N8OO, N8ROY, N8ZVT, N9UFO, NQ5M, NS3X, NT4K, NV5E, OE1ØØFTE, OE2LCM, OE3HZW, OE4RGC, OE4XLC, OE5CYL, OE5FZO, OE8TTR, OH1ZK, OH2BLV, OH2IS, OH2XX, OH6CT, OH6IO, OH6UBC, OH7MFO, OK1DWC, OK1ITK, OK1TA, OK1YM, OK2BZ, OK2EQ, OK2PAY, OK4FF, OK6TT, OM2XW, OM5CD, OM7OM, ON3HAT, ON5XX, ON8WV, OO4O, OO9O, OS8D, PAØFVH, PAØLUX, PAØPIW, PAØVLY, PAØWBP, PA1FNW, PA2S, PA3C, PA3HLE, PA4WG, PA7JWC, PDØFW, PDØHF, PD4JUF, PH9E, PI4CC, PP6ZZ, PY2DV, RØCM, R1CU, R2AA, R2DR, R2SA, R3AT, R3FA, R4HM, R4SA, R6YY, R7RC, RAØR, RA1AL, RA3DNC, RA3RLJ, RA3WDK, RA4AAT, RA4FUN, RA4LPC, RA4UKL, RA4UVK, RA9CIN, RA9MX, RC3W, RC7KY, RK3MXT, RK7A, RMØF, RM2A, RNØCT, RN6LG, RO4I, RQ7R, RT3W, RU9CY, RV6LCT, RWØAR, RW3DKK, RW3RN, RW9HSB, RX3DPK, RX3DTN, RX3I, RY9C, RZ1OA, RZ4Z, S51AD, S52AW, S52CU, S52F, S52GP, S52X, S53F, S56M, S58Q, S59A, SF7WT, SM3GSK, SM6MSG, SM7IUN, SO9PC, SP2EWQ, SP2MKT, SP3J, SP3JDZ, SP3QFZ, SP4W, SP4YPB, SP5EAQ, SP5GDY, SP5NZZ, SP6AB, SP6BPK, SP6EF, SP6HEQ, SP6OWY, SP7CDH, SP7ICE, SP7LIE, SP8NTH, SP9MDY, SP9PDF, SQ3RX, SQ4HRN, SQ4NR, SQ5TA, SQ8JMC, SQ8LUU, SQ8VPS, SQ9FK, SQ9MZ, SQ9NFC, SV1GRB, SV1JMC, SV1MO, SV1RHL, SV1RRP, SV8/DK3SJ, SV9DJO, T77C, TF3DC, TF3SG, TM7XX, UA1CEI, UA3GAF, UA4AAC, UA6ACA, UA6CT, UA6JBX, UA9CEP, UB3DLM, UN6G, UN8PT, UP2F, UR4LTX, UR5UZ, UR5WA, UR5WCW, UR7LY, UR8QV, USØLW, US3EW, US5VX, UT3UCP, UT5EO, UT5GW, UT5IA, UT5PY, UT5UHX, UT7E, UT7EV, UT7IS, UT7LW, UT7UX, UX1LW, UX5UO, UX7U, UX7VA, VA2EI, VA3AMX, VA3OB, VE3JSO, VE3XBH, VK2BJ, VK2IG, VK2JON, VU2KWJ, VU3BUN, VU3NXI, WØTK, WØZAP, W1AJT, W2MRD, W3BNN, W3QT, W3SA, W3TJW, W4RQ, W6MZ, W6YA, W7SMW, W8QL, W9KG, WA6LBU, WA7URJ, WB2RIS, WCØEM, WD4EGF, WD5DBV, XU7AKL, YB3MM, YL2TD, YL2VW, YO2SH, YO3IPR, YO6CFB, YO6KGS, YO8SBR, YO8SSQ, YO9GDN, YO9TDN, YRØMB, YT1Q, YU1UO, YU1XX, YU7ØEXY, YU7PEP, YY5YAM, Z35F, Z3B, ZL1ANH, ZW2K

Disqualified: *A61FK (use of spotting as single-op), EN4U (self-spotting), HZ1TL (self-spotting), II8T (self-spotting), IK4GRO (self-spotting), LY4ZZ (self-spotting), LZ2JA (self-spotting), MØHMJ (self-spotting), MM3AWD (self-spotting), R4FCJ (use of spotting as single-op), S52NR (self-spotting), S53O (use of spotting as single-op), S54ZZ (self-spotting), S57PKT (self-spotting), SN7D (use of spotting as single-op), UR5AS (self-spotting), YT8WW (self-spotting), Z33F (self-spotting).*

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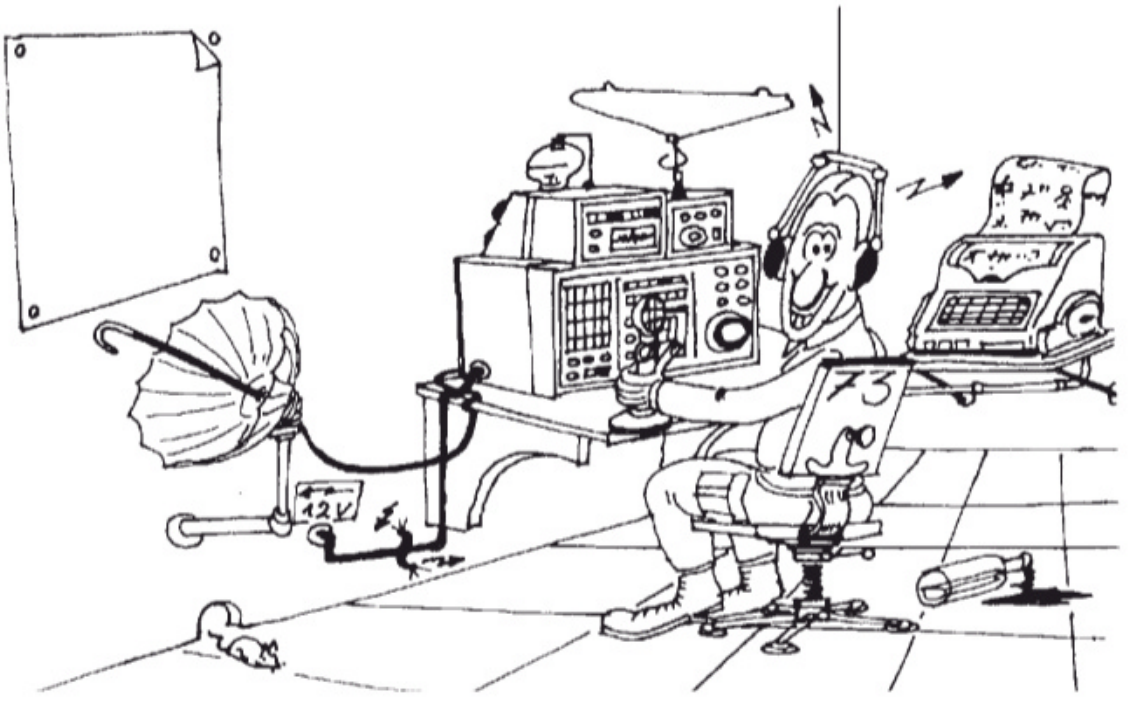

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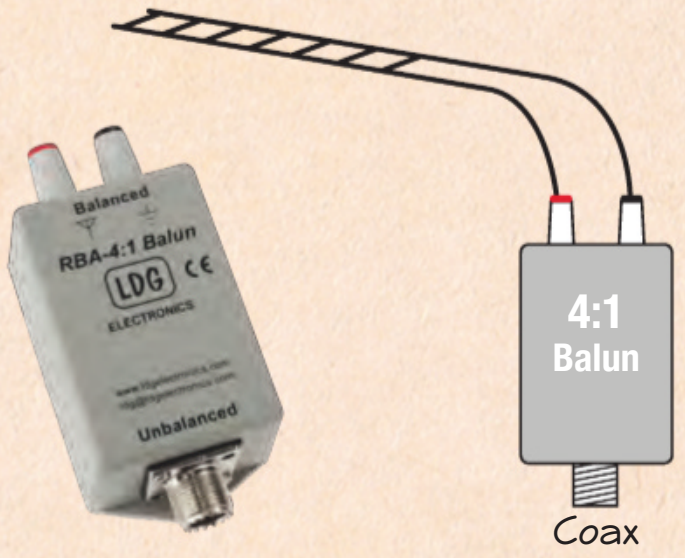
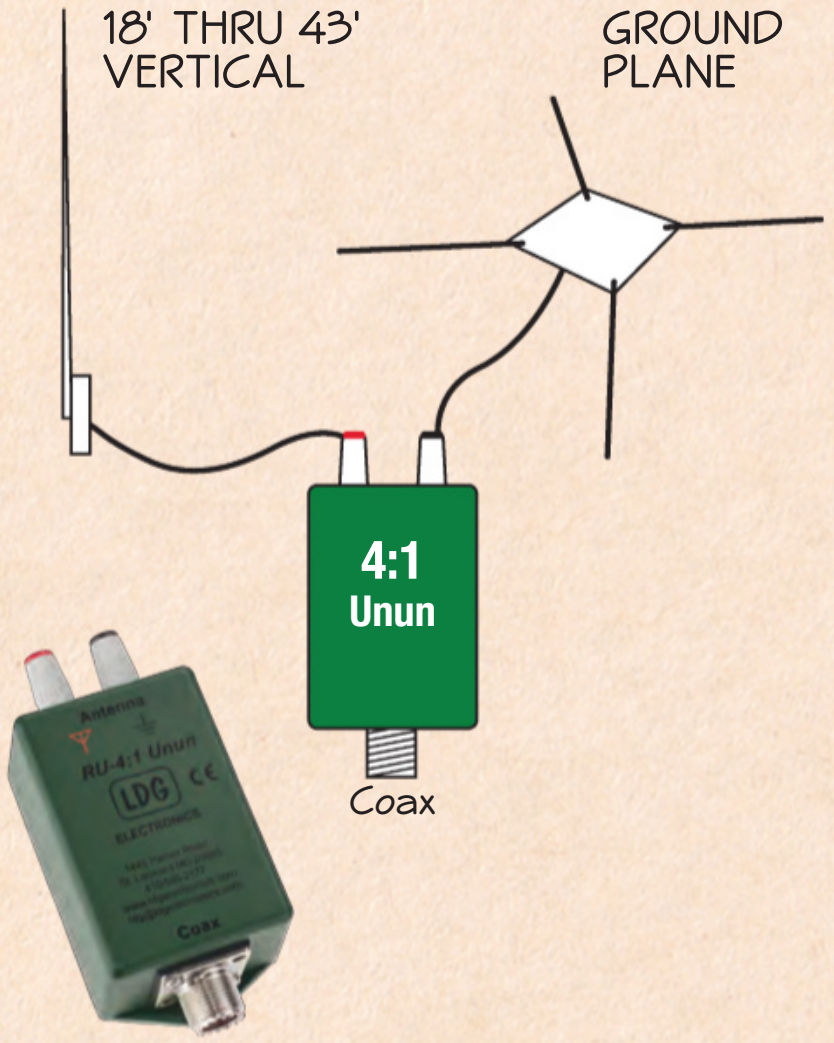


18' THRU 43' VERTICAL

GROUND PLANE



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