Professor Heisseluft on Green Power, p.34



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announcements

APRIL

BURNIPS, MISSISSIPPI — The Allegan County Amateur Radio Club will hold the AC8RC April Fools Day Mini-Swap from 9 a.m. to 5 p.m., Saturday, April 1 at the Salem Township Hall, 3003 142nd Ave, Burnips, MI. Contact: John Hanse, AC8HZ. Email: < johnhanse@charter.net>. Website: < https://tinyurl.com/2faaxnaf>. Talk-in 147.240 94.8.

BAYTOWN, TEXAS — The East Side Amateur Radio Service will hold the Baytown Hamfest from 7 a.m. to 1:30 p.m., Saturday, April 1 at the Baytown Community Center, 2407 Market Street Baytown, TX 77520. Contact: Wes Harris, W5WES. Email: <w5wes@arrl.net>. Website: < https://earstx.org/>. Talk-in 145.310 PL 167.9. VE exams.

COLUMBUS, INDIANA — Columbus Amateur Radio Club will hold the Columbus Indiana Hamfest from 8 a.m. to noon., Saturday, April 1 at the Columbus North High School Cafeteria, 1400 25th St. Contact: Mike Idlewine, WE9MI. Email: <idlewine@comcast.net>. Website: < http://carcnet.net>. Talk-in 146.790-103.5 Hz. VE exams.

LONGMONT, COLORADO — Longmont Amateur Radio Club will hold the LARCfest from 9 a.m. to noon, Saturday, April 1 at the Events Center — Boulder County Fairgrounds9595 Nelson Rd. Longmont, CO 80501. Contact: Richard Paige, KE0VT. Email: <gwabi2@hotmail.com>. Website: < http://w0eno.org>. Phone: (720) 220-1931. Talk-in 147.270 MHz +, 100 Hz CTCSS tone. VE exams.

MERIDIAN, IDAHO — The South West Idaho ARC will hold the SWIARC Spring Hamfest Saturday, April 1 at the 10 Mile Christian Church 3500 W Franklin Rd. Contact: Kim Gross, KI0E. Email: <swidahoarc@gmail.com>. Website: http://www.k7swi.org>. Talk-in 146.580.

CORINTH, MISSISSIPPI — The Alcorn County ARES will hold the April Fool – Jess Ables Memorial Hamfest from 9 a.m. to 5 p.m., Saturday, April 1 and from 8 a.m. to noon, Sunday, April 2 at the Crossroads Arena, 2800 South Harper Road. Email: <Harold.butler@me.com>. Website: <www.acares.reiselt.com>. Talk-in 146.925. VE exams.

CLAREMORE, OKLAHOMA — The Green Country Hamfest 2023 and the 2023 ARRL Oklahoma Section Convention will be held from 4 p.m. to 9 p.m., Friday, April 7 and from 8 a.m. to 3 p.m., Saturday, April 8 at the Claremore Expo Center, 400 Veterans Parkway. Email: <info@greencountryhamfest.org>. Website: <www.greencountryhamfest.org>. Talk-in 147.090+ (PL 88.5). VE exams, DXCC / WAC / WAS / VUCC card checking.

DADE CITY, FLORIDA — The East Pasco Amateur Radio Society, Inc. will hold the EPARS Talegate from 7 a.m. to noon., Saturday, April 8 at the Church Ave Parking Lot, 37746 Church Ave. Contact: Chris Bloxsom, AA4CB. Phone: (224) 221-5064. Email: <aa4cb@arrl.net>. Talk-in 146.880 PL 146.2 (-.600). VF 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 8 at the St. James Masonic Lodge 77 Tide Mill Road. Contact: Steve Roberts, KC1ILT, Phone: (207) 337-1512. Email: <kc1ilt@maine.rr.com>. Talk-in 145.150- PL 127.3. VE exams..

HAYES, VIRGINIA — The Middle Peninsula Amateur Radio Club will hold the 3rd Annual Gloucester Hamfest from 9 a.m. to 4 p.m., Saturday, April 8 at the Abingdon Ruritan Club, 8784 Guinea Road. Contact: Joy Safrenek, Phone: (757) 871-7772. Email: <w2jms2001@gmail.com>. Talk-in 145.370.

RALEIGH, NORTH CAROLINA — The Raleigh Amateur Radio Society will hold RARSfest and the 2023 ARRL Roanoke Division Convention from 8 a.m. to 3 p.m., Saturday, April 8 at the Jim Graham Building, NC State Fairgrounds, 4285 Trinity Road. Contact: Chuck Littlewood, K4HF, (919) 630-9358. Email: <k4hf953@yahoo.com>. Website: <www.rarsfest.org>. Talk-in 146.64. VE exams.

WINDSOR, CONNECTICUT — The North East Weak Signal Group will hold the Eastern VHF-UHF Conference and Microwave Update from Friday, April 14 to Saturday, April 15 at the Hilton Garden Inn, 555 Corporate Drive, 48 E. Bath Road. Contact: Mark Casey, K1MAP, Phone: (413) 777-9828. Email: <caseyhardware@gmail.com>. Website: know; know; know;

BRAINERD, MINNESOTA — The Brainerd Area Amateur Radio Club will hold the Brainerd Area Hamfest Saturday, April 15 from 9 a.m. to 1 p.m., at the Brainerd National Guard Armory1115 Wright St. Contact: Lyle Amundson, KØLFV, Phone: (218) 330-5110. Email: <k0lfv@arrl.org>. Website: < http://brainerdham.org>. Talk-in 147.225 No Tone. QSL Card Checking.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold its 67th Annual Hamfest from 8 a.m. to 1 p.m., Saturday, April 15 at the Emidio & Sons Expo Center, 48 E. Bath Road. Contact: Bruce Ferry, Phone: (330) 790-1680. Email: kmamfest2023@w8vpv.org>. Website: kwww.w8vpv.org/ hamfest>. Talk-in 147.270+ (PL 110.9) or 444.850+ (PL 110.9). Free VE exams.

NORWICH, NEW YORK — The Chenango Valley Radio Association, Inc. will hold the Bullthistle Hamfest Saturday, April 15 from 7 a.m. to noon., at St. Bartholemew's Parish Hall 81 E. Main St. Contact: Matthew Jenne, KD2HKB, Phone: (607) 674-5785. Email: <kd2hkb@yahoo.com>. Website: <https://cvara.net/hamfest>. Talk-in 146.685+ 110.9.

GEORGETOWN, DELAWARE — The Sussex Amateur Radio Association will hold the Georgetown Hamfest and 2023 ARRL Delaware State Convention from 8 a.m. to 3 p.m., Saturday, April 15 at the Cheer Community Center, 20520 Sand Hill Road. Contact: Jamie, W3UC, Phone: (410) 202-7690. Email: kmare@gmail.com. Website: kmare@gmail.com. Talk-in 147.090 (PL 156.7). Free VE exams, DXCC / VUCC / WAS / WAC card checking.

ROSWELL, NEW MEXICO—The Pecos Valley Amateur Radio Club will hold the Second Annual PVARC Alien City Hamfest from 8 a.m. to 2 p.m., Saturday, April 15 at Beginnings, 3908 SE Main Street. Contact Gerald Cox, WØCOX, Phone: (575) 840-8586. Email: <w0cox@gmail.com>. Website: <www.pecosvalleyarc.com>. Talk-in 147.320 (PL 146.2).

STOUGHTON, WISCONSIN — The Madison Area Repeater Association will hold the 52nd Annual Madison Hamfest from 8 a.m. to noon, Saturday, April 15 at the Mandt Community Center, 400 Mandt Parkway. Phone: (608) 205-1994. Email: kamfest@w9hsy.org. Website: kamww.w9hsy.org. Talk-in 147.150+ (PL 123). VE exams.

ELIZABETH, PENNSYLVANIA — The Two Rivers Amateur Radio Club will hold the 51st Annual Amateur Radio / Computer Show from 8 a.m. to 2 p.m., Sunday, April 16 at the Elizabeth VFD Bingo Hall, 101 South

(Continued on page 59)

ham radio news

KB3UJW Joins CQ Staff as Associate Editor

Sabrina Herman, KB3UJW, of Lyndhurst, Ohio, has been named *CQ* magazine's Associate Editor, succeeding Managing Editor Jason Feldman, KD2IWM, who is leaving CQ Communications after 12 years to pursue opportunities outside of publishing.



Herman has been a ham for close to 13 years and comes to CQ from Hermes Press, a small book publisher in Pennsylvania, where she served as Managing Editor and Promotional Coordinator. At *CQ*, she will be an integral part of the editorial team producing each issue of the magazine and will work to expand CQ's social media presence as well.

Herman says she hopes to learn

more about the ham community in her new position, noting that nearly all of her friends are hams, including her husband, Jacob, about whom she says, "[H]e's the reason I decided to take the license exam back in 2010!"

"I have two dogs who are my fur babies, Ginger Rogers and Noodle," she adds. "I am an avid collector of Disney paraphernalia, books of all kinds, and original comic book art. I play lots of Nintendo Switch games, my favorite being "Animal Crossing"."

Welcome, Sabrina, and thank you, Jason, for your many contributions to *CQ* and amateur radio.

Hamvention Names 2023 Award Winners

The Dayton Amateur Radio Association has announced the winners of the 2023 Hamvention awards. The awards, among the most prestigious in amateur radio, recognize the Amateur of the Year, Special Achievement, Technical Achievement, and Club of the Year.

Dayton's 2023 Amateur of the Year is Carsten Dauer, DM9EE, a longtime advocate for youth in amateur radio (he and his children are featured in the 2021-22 *CQ* Amateur Radio calendar). Carsten was honored for his work in collecting and transporting amateur radio equipment to hams in Ukraine and, on the return trips, driving war refugees from Ukraine to safe havens in Germany, including his own hotel. To help, visit https://tinyurl.com/25baptav.

This year's Technical Achievement Award goes to Dr. James Breakall, WA3FET, a prolific antenna designer and professor emeritus of electrical engineering at Penn State University. He helped develop the Numerical Electromagnetic Code, or NEC, which is the basis for most of today's antenna modeling programs. He also worked with K1JT, WP3R, and NP4A in 2010 to operate moonbounce from the Arecibo Observatory (SK) in Puerto Rico.

The Special Achievement Award for 2023 honors Dr. Jason McDonald, N2TPA. A trauma surgeon by profession, his major ham radio interest is promoting amateur radio among young people, particularly through Radio Scouting, and forming scout radio clubs in the U.S., Canada, and the Philippines. Through these clubs, he has gotten more than 500 young people licensed and on the air.

The 2023 Club of the Year is the Delaware Valley Radio Association in Trenton, New Jersey, whose wide range of amateur radio activities and events has led the club membership to triple in size over the past six years.

The honorees will be formally recognized at the Dayton Hamvention awards dinner in May,

Sohn Withdraws as FCC Nominee

Gigi Sohn has withdrawn from consideration for membership on the FCC, after her nomination by President Biden was not acted on by the Senate for nearly two years. According to "The Hill," a Capitol Hill newspaper, Sohn's decision came soon after West Virginia Senator Joe Manchin announced that he would not support her confirmation, which has been supported by most Democrats and opposed by most Republicans and many in the media and wireless industries. The White House has not yet indicated when the President might announce another nomination to fill the fifth Commission seat.

3YØJ Wraps Up Weather-Shortened DXpedition

The much-anticipated 3YØJ DXpedition to Bouvet Island is over and the team is safely back in friendlier climes. While the team's original goal was to operate 12 stations simultaneously for 22 days and hoped to make 200,000 QSOs, they were only able to get two stations on the air and made about 19,000 contacts, according to the *ARRL Letter*. In addition to terrible weather and extreme difficulty getting equipment on shore, the effort was beset by massive amounts of deliberate interference. In addition, the only safe place on the island to set up camp had a huge rock blocking the short path to most of North America. *CQ* will have a complete report on the expedition in the May issue.

ARDC Releases 2022 Annual Report

The Amateur Radio Digital Communications (ARDC) foundation has released its annual report for 2022, outlining more than \$7 million in grants made during the year. The *ARRL Letter* reports that ARDC made grants in four categories: amateur radio (\$2.1 million), education (\$2.3 million), scholarships (\$1.5 million), and research-and-development (\$2.4 million). The foundation's philanthropy included 47 grants to amateur radio clubs and projects, as well as 95 scholarships. For more information, visit <www.ardc.net>.

Nominations Open for Young Ham of the Year

Do you know a young radio amateur, age 18 or younger, who is doing extraordinary things for his/her community or for amateur radio? If so, the Amateur Radio Newsline Bill Pasternak Young Ham of the Year Award committee wants to hear from you. Nominations for the 2023 YHOTY award are being accepted through May 31. For more information and nominating forms, visit <arnewsline.org> and click on the YHOTY tab. *CQ* is a corporate sponsor of the Young Ham of the Year Award.

Milestones: Former FCC Chief Engineer W4QAW Silent Key

Raymond Spence, W4QAW, became a Silent Key in February at age 93. According to *Newsline*, Spence was retired from a career at the FCC, capped off by service as the agency's Chief Engineer. He was also a dedicated DXer and contester. He lived in Washington's Virginia suburbs and was a ham for much of his life.

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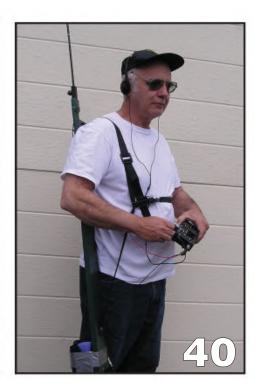
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ON THE COVER

ICOM America Senior Sales Manager Ray Novak, N9JA, brought the company's brand-new IC-905 transceiver to Florida's Orlando Ham cation in February. It is the first microwave-focused transceiver from a major ham manufacturer. Details on page 85. First look at the 905 on page 72. (Cover photo by Joe Eisenberg, KØNEB)







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FOCUS ON: Ham radio and current events ... Ham radio is often a part of the story when it comes to emergency communications, but it doesn't stop there. In this issue, we look at the Bottlecap Balloon Brigade Mystery (page 8), in which we explore the possibility that one of the balloons recently shot down by the U.S. military was a ham radio club project; plus an "interview" with an AI "chatbot" on the future of ham radio and artificial intelligence (page 12), and, on page 16, a DIY seismometer to chart earthquakes from your basement!

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zero bias: a cq editorial

BY RICH MOSESON,* W2VU

The Next Revolution in Amateur Radio

echnical advances in amateur radio seem to follow a predictable pattern, one that's been consistent for pretty much the past 100 years. We start with "the way it is" – currently popular bands, modes, and activities – along with a certain comfort level that says to many of us, "this is the way it's always been" (which it never has) and "this is the way it should always be" (which it never is). But there are always innovators out there as well, finding new ways to communicate and new areas for growth and continued technical development. Eventually, those innovations with "staying power" become mainstream and the next generation of hams sees a new "way it is."

Going way back, we've seen it in the transition from spark to CW, the arrival of AM phone, followed by SSB and FM, then digital modes beginning with RTTY and packet radio. Over the past half-century, the key to moving an innovation from the fringes to the mainstream has been its adoption by a major manufacturer and availability at a price point that fits into many hams' budgets.

We saw it in the 1950s with single sideband, introduced by Collins and then popularized by Central Electronics with much more budget-friendly gear, the evolution of VHF FM from converted public safety radios to gear designed specifically for hams, and the introduction of PCs and affordable packet controllers in the 1980s. Each of these revolutionized the way we "do" ham radio.

In 1995, Icom revolutionized the hobby once again with the introduction of its IC-706 transceiver, which had two major impacts. It was among the first HF radios to include both 6 and 2 meters, providing multimode access to both bands and beginning to once again make six meters a "mainstream" ham band. Today, nearly every new HF transceiver includes six meters. Perhaps even more importantly, it packaged a QRP HF/VHF radio in a very transportable package, opening the door, literally, to moving ham radio out of the house and into the great outdoors. This encouraged the growth of QRP-portable operating and blazed the path for some of today's most popular ham activities, including summits, parks, lighthouses, and so many more "OTAs" or "on the air" programs. It not only helped Icom's bottom line but spawned a new minindustry catering to the QRP-portable operator.

Today, Icom is doing it again with the IC-905. While it isn't my habit to spotlight specific products or manufacturers in this column, I believe that the 905 is the IC-706 for microwave hamming and will lay the groundwork for much-needed expansion of activity on our bands above 1 GHz. These bands are incredibly valuable to commercial interests and we risk losing them if we don't make better use of them.

If you haven't yet been introduced to the IC-905, it covers 2 meters, 70 centimeters, 1.2 GHz, 2.4 GHz, and 5.6 GHz, with an option for adding a 10-GHz transverter. And to make sure every ounce of transmitter power makes it to the antenna, the 905 is designed to have the RF module mounted just below the antenna, with an Ethernet connection to the remotely located control module carrying power as well as audio and frequency information.

If you ask most hams today about operating on microwave frequencies, you may hear that "it's too complicated" or "those frequencies scare me." Yet virtually all of us carry microwave transceivers in our pockets or purses and most of us use them constantly. The rest of the world calls them smartphones but we know they're really two-way radios! And they all operate on microwave frequencies.

One may wonder why the designers chose the 2.4- and 5.6-GHz bands as the primary frequency ranges for the IC-905. Well, I haven't asked Icom, but I can guess, and it circles back to the 706 spawning a mini-industry beyond the walls of Icom. Take a look at your WiFi modem – chances are that it operates on either 2.4 or 5 GHz (with some frequencies in each range overlapping the ham bands). This means that there is already a *ton* of time-tested, low-priced, ancillary gear in the marketplace for setting up our own networks and doing all sorts of great stuff that we haven't even thought of yet. Like the 706, the 905 has the potential to be the base for a mini-industry focused on our SHF bands.

Of course, some hams are already doing this. Many ham radio mesh networks operate on 2.4 GHz using minimally-modified WiFi modems. But most of the current radio setups rely on transverters connected to multimode rigs for 2 meters or 432 MHz. The gear gets complicated. The IC-905 will make the microwave bands much more accessible to many hams whose technical strengths may not lie in lashing up mini-networks of transverters, preamps, sequencers, etc.

"But what about DX?" you may ask. Well, amateur satellites have been using these bands for years now, and they don't care about sunspots! Plus, if you refine your definition of DX to include anything farther away than you might expect on a given band (think sporadic-E or transequatorial propagation on 6 meters), then a world of propagation wonders awaits you on these bands. Things like rain scatter, airplane scatter, knifeedge propagation, the waveguide effect, and more.

We applaud Icom for taking this step to bring greater access to a new frontier for many hams, and possibly usher in the next ham radio revolution, just as it did with portable QRP operating nearly 30 years ago. For more about the IC-905, see this month's VHF-Plus column on page 72 and Icom's product info webpage at https://tinyurl.com/mr3yap3x.

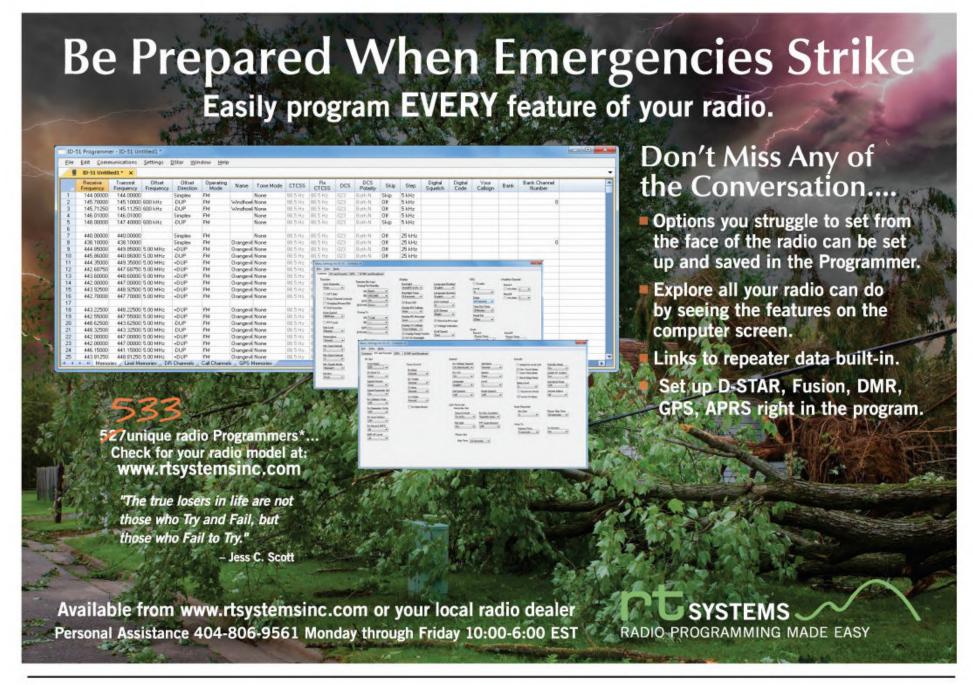
73 to KD2IWM

This is the final issue for which Jason Feldman, KD2IWM, will serve as Managing Editor. Jason has been with *CQ* for 12 years and has been Associate or Managing Editor of this magazine since late 2014. Jason has decided to take a position outside of publishing. We thank him for his many years of hard work on behalf of *CQ* and the amateur radio community and wish him all the best in his new position. Sabrina Herman, KB3UJW, has joined our staff as Associate Editor and began working with us on this issue. See News on page 3 for an introduction.

Spring is here! Go enjoy the great outdoors, and don't forget to take your QRP portable ham gear along!

73, Rich W2VU

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news bytes: Quartzfest Distance Challenge Winners

uring the Northern Arizona DX Association's recent Quartzfest, held in January 2023 at Quartzsite, Arizona, the club held its fourth Distance Challenge event to see which attendees could make the longest distance contact from the gathering site in the Sonoran Desert.

There were four different classes of competition: Class A: 100 watts or less; SSB or CW Class B: 100 watts or less; FT8 Class C (QRP): 5 watts or less; SSB or CW Class D (W7Q special event station): 100 watts or less; SSB, CW, or FT8

According to Distance Challenge Co-Chairmen Bob Wertz, NF7E, and Lou Arminio, W7KFT, the winners and runners-up (Photo A) were as shown in Table 1. Each of the winners received a commemorative hard hat and



bag of goodies. NF7E pointed out that since KM6BIP was their first YL champion, "[W]e ran into Quartzsite and bought some pink ribbon, made a bow and placed that on her hat as we announced her being the winner."

Quartzfest is an annual winter gathering of RV-active hams in the desert outside Quartzsite, Arizona. More information on Quartzfest and the Northern Arizona DX Association may be found on the NADXA website at <www.nadxa.com>.



Photo A. Winners and runners-up of the 2023 Quartzfest Distance Challenge. From left, K8TX, W1RO, AC6YY, KC5QOC, N9AGC, KU7K, W5RE, and KM6BIP. (Photos by W7FYW, courtesy Northern Arizona DX Association)

Class A	Name/Call	Radio	Antenna	Distance Miles
CHAMP RUNNER UP	Joe Rogers, KU7K Bobby Sullivan, W5RE	TS480 IC-7000	Butternut vertical Inverted V	10,099.6 6,727.1
B CHAMP RUNNER UP	Greg Smith, N9AGC John Mocho, KC5QOC	FT991A FT991A	MFJ Octopus Hamstick	11,380.8 9,989.5
C CHAMP RUNNER UP	Jim Bassett, W1RO Ned Tufekcic, AC6YY	IC 705 K2X	YoYo Inverted V Dipole	7905.8 5974.6
D CHAMP RUNNER UP	Eva Kidwell, KM6BIP Robert Morrow, K8TX	TS590 TS590S	MFJ EFHW MFJ EFHW	8463.8 6679.3

Table 1. Champions and runners-up for each competition class in the 2023 Challenge.

No one is certain if the mystery object shot down by the U.S. Air Force over the Yukon in February was the K9YO-15 ham radio balloon. But this is certain ... the speculation that it might have been is shining a spotlight on this small but growing corner of our hobby, with potentially positive impacts.

The Bottlecap Balloon Brigade Mystery

BY RICH MOSESON,* W2VU

n February 12, 2023, at the request of Canada's prime minister, a U.S. Air Force jet shot down an unidentified object floating above the remote Yukon Territory, and speculation quickly turned to the possibility that it was a high-flying amateur radio balloon which had been tracked in the region the day before and has not been heard from since.

The mystery object was one of three shot down by U.S. fighters in the week following the tracking and eventual takedown of a much larger Chinese spy balloon that made its way across much of the United States before being brought down in the Atlantic Ocean off the coast of South Carolina. At press time, Canadian authorities were still searching for any wreckage that might possibly be recovered, to help determine with certainty what it was and what it was doing. Unless and until that occurs, though, the primary speculation continues to be that it was the Northern Illinois Bottlecap Balloon Brigade's K9YO-15 balloon. And that possibility has brought worldwide media attention to amateur radio high altitude ballooning, or ARHAB.

These flights to "near space" (*Photo A*) attract young people to amateur radio, promote skills in building very small and lightweight transmitters, increase understanding of atmospheric science and represent the ultimate in "foxhunting," tracking a balloon's path and trying to recover the payload once it returns to Earth. Here at CQ, we have been reporting on this aspect of ham radio periodically for at least 25 years, 1 but it has remained a niche activity.

Importantly for this discussion, the current generation of "pico balloons" being launched by hams (*Photos B* and *C*) do not have to be registered with the Federal Aviation Administration because they weigh far less than the four pounds specified in FAA rules for regulated flight.² To keep the weight down, they have no batteries and rely solely on tiny solar panels for all needed power.

The flight in question, K9YO-15, was built by the Northern Illinois Bottlecap Balloon Brigade and launched last October. It had already circled the Earth six times and was predicted to be flying over Yukon at the time that the mystery object was shot down by the Air Force. It has not been heard from since.

"While we can never be 100 percent certain whether the small metallic balloon with a small payload that was shot down over the Yukon was actually the NIBBB balloon unless the military shows camera footage of the event," said Bill Brown, WB8ELK, considered by many to be the 'father' of ham radio ballooning, "the fact is that they flew a metallized foil balloon and the flight path prediction (Photo D) shows the balloon would've been in that region of the Yukon at the same time as the jet shooting something down. Add in the fact that it has been aloft since October and been around the world six times and after the incident K9YO-15 has not been heard on WSPR since, that gives you a pret-

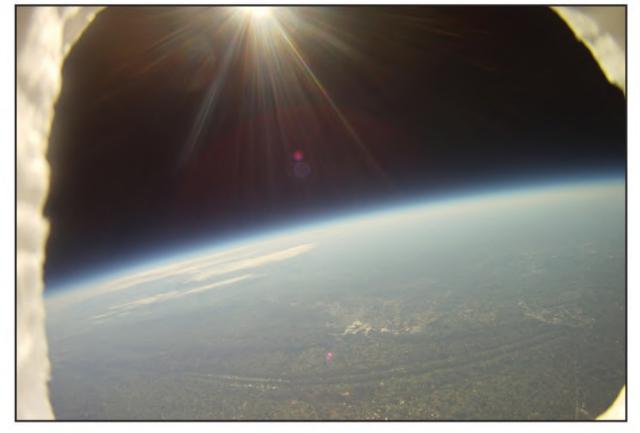


Photo A. GoPro photo from the stratosphere over northern Alabama from a balloon launched by members of the University of Alabama-Huntsville Space Hardware Club. The curvature of the Earth and the blackness of space can be seen from this photo taken at 85,000 feet. (Photo courtesy WB8ELK)

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^{*} Editor, CQ



Photo B. Amateur radio ballooning pioneer Bill Brown, WB8ELK, launching a Skytracker transmitter (see text for details) on a small foil party balloon. (Photo by Bev Teter, WB4ELK)

ty high confidence that it was actually their balloon that was shot down."

Brown added, "Shooting down a \$12 balloon that carried a payload that cost under \$100 with a \$450,000 missile is akin to swatting a mosquito with a sledgehammer. All they had to do is fly closely to the balloon and the turbulence would've taken it down."

However, the NIBBB's Ken Daniel, K9YO, said it's still too soon to jump to conclusions, noting in an e-mail that "because the solar collector is flat, I did not expect to hear from the balloon after the last transmission. The sun needs to reach above 17 degrees to get enough power to transmit. It has been in and out of the dark all winter. We did not hear from it for all of January, so it might still be out there somewhere around the North Pole."

Under the Hood

While news reports from the Associated Press, National Public Radio and other outlets discussed the political and potential regulatory issues arising from these incidents, we thought CQ readers would be interested in learning more about the technology used on these flights. The tracker on this balloon weighed 7.5 grams (1/4 of an ounce), 14 grams with the solar panel attached, according to Daniel, who notes that by comparison, a nickel weighs 5 grams. The tracker transmitter in *Photo E* weighs 7.8 grams and is made from three components which can be purchased on Amazon.com. It is geared toward school science clubs and is the type flown on K9YO-15. The even smaller transmitter in *Photo F* is custom-built and weighs only 1.7 grams (0.06 ounces). Daniel says the balloon itself was a 32-inch diameter sphere with a shiny surface, purchased from Balloons Online. Other launches have used clear balloons made by Yokohama Balloon in Japan.



Photo C. Launch of a clear plastic Skytracker SBS-13 cylinder balloon by Scientific Balloon Solutions (WB8ELK photo)

WB8ELK filled in some of the technical details for us:

"Their particular payload was totally solar powered just like the ones that Tom (Medlin, W5KUB,) and I fly and use the same telemetry encoding method that I came up with some years ago ... The K9YO-15 pico balloon ... was flying a payload that consisted of separate GPS, Arduino, power supply and Si5351a breakout boards. I think the Arduino board was by HiLetGo and the Si5351a RF synthesizer board was either an Adafruit or HiLetGo module. The antenna was a magnet wire dipole connected to fishing line.

The transmissions were on 20-meter WSPR every 10 minutes, (each comprising) two transmissions, one call-sign sequence followed by a telemetry callsign sequence.

Telemetry encoding method (WB8ELK format) is as follows on my Skytracker boards and also on Tom W5KUB's payloads:

First transmission example:

WB8ELK EM64 10 (power field is substituted with the coarse altitude encoded in 1000-meter increments.)

Second transmission example:

0a7bcd EM64 13 where

a = number of GPS satellites acquired (alternate used on WB8ELK Skytrackers it to mix GPS status and temperature in this field)

b = solar panel voltage

c and d = 5th and 6th grid square characters (example if 0Z7LOJ is would be a 6-digit grid square of EM64oj)

The power field is used to encode the fine altitude in 60-meter increments.

To get the actual altitude add the coarse and fine altitude fields.

The 0 and the 7 form a channel number to allow multiple flights to fly in the same time slot. The first character should be either 0,1 or Q which are invalid international callsigns)...the 3rd telemetry callsign field ranges from 0 to 9.

The WSPR data is received by amateur radio ground stations worldwide running the WSJT-X or similar decoding software which is uploaded to the WSPRnet.org database by the decoding software. I wrote a Python script to grab the received data from WSPRnet.org's database, decode the telemetry, reformat it to APRS format and then send this directly to the APRS-IS servers. This allows a WSPR balloon to show up on the balloon tracking maps such as amateur.sondehub.org> and <a pre>aprs.fi>, just like

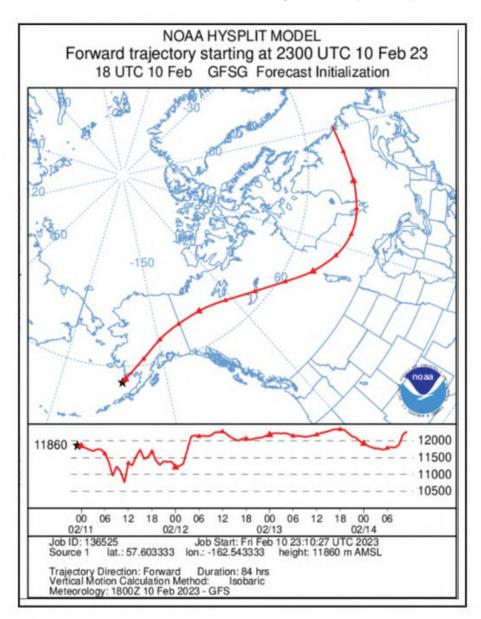


Photo D. NOAA HYSPLIT trajectory model predicting the path of the K9YO-15 balloon from the time it was last heard. The path places it in the area of the Yukon where a mystery object was shot down at approximately the same time as that occurred. (NOAA image)

it was an APRS object. QRP-Labs has its own tracking map when using their U4B transmitter but those can be linked to the balloon tracking maps using a Python script or by using a website by the LU7AA group which also can link other format methods as well.

A Silver Lining

All of the news stories about ham radio ballooning have had a silver lining – increased interest in the pursuit, particularly among young people. K9YO notes that one high school student in their group who had been denied permission to start a ham radio club in the school now has an OK; plus, a 12-year-old and a 14-year-old in their group have gotten General Class licenses to be able to operate on 20 meters, and are planning their own balloon launch this spring with NIBBB.

For more information on amateur radio pico balloons, visit K9YO's website at https://tinyurl.com/bdh86zxa.

Notes:

- 1. See Verhage, "Flight of the Isaac Asimov," *CQ VHF*, May 1997, and much more recently, Medlin, "Adventures With Pico Balloons Using Amateur Radio," *CQ*, Oct. 2020.
 - 2. See 14CFR101, §101.1(a)(4)

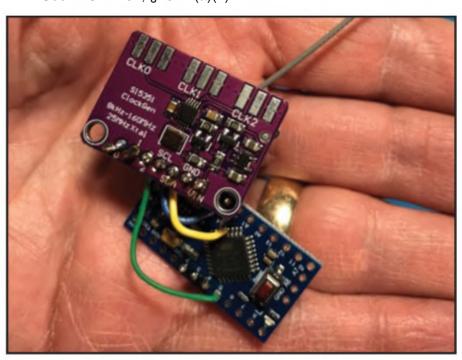


Photo E. The type of tracker transmitter used on the K9YO-15 balloon flight. It weighs 7.8 grams and can be assembled from parts purchased on Amazon.com. Both this and the tracker shown in Photo F are used in conjunction with solar panels made of a flat piece of Styrofoam® - like a party picnic plate — and uncoated polycrystalline solar cells. (K9YO photo)

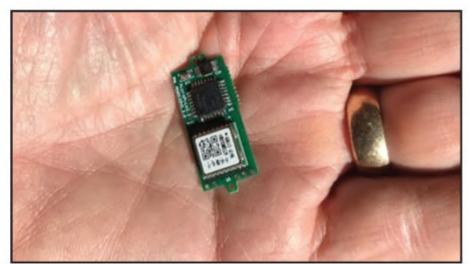


Photo F. An even smaller tracker is used on some flights. This custom-made board weighs only 1.7 grams, or 0.06 ounces. (K9YO photo)

COMPROMISE WAS NOT AN OPTION FOR THE NEW HG3 QRO-A!

No Compromises Mag Loop

The new HG3 QRO-A raised the bar again for Magnetic Loop Antennas (MLA). MLAs are well known for their superior performance. The remotely tuned HG3 QRO-A MLA covers 80*-10 meters with stepper motor precision and resolution. The high Q vacuum capacitor allows for 1.5 KW PEP*. The 45,000-step resolution delivers an unprecedented 511 Hz resolution bandwidth allowing you to set your band preferences spot on. Rapid-Tune automatically scans each band for the lowest SWR and works with most HF radios.

It Pays to Pay Attention

How do you make a great product even better? You listen to your customers. The heart of an MLA is the tuner. We made so many improvements to it that we now call it the HG3 QRO-A. The HG3 Plus Controller also received new firmware and an improved SWR function. *Some limitations may apply or are optional.



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While we can't vouch for anything else in this issue, the following is definitely NOT an April Fool article, although part of us wishes it was...

An Interview With ChatGPT on the Future of Ham Radio

BY JIM MILLNER,* WB2REM

n the future, amateur radio will most likely involve incorporating Al-enhanced radio transceivers. In a previous article written by this author and Gene Hinkle, K5PA, entitled "Al Meets AR, The Coming Convergence of Amateur Radio and Artificial Intelligence,"1 we were able to demonstrate, in practical terms, how artificial intelligence (AI) devices connected to radio transceivers could serve a practical purpose. In the few years since that article was published, there has been a significant advancement in Al ability. One of the newest Al bots that has come on the scene is called ChatGPT.² ChatGPT is a conversational Al model developed by OpenAI. It's a version of the GPT (Generative Pretrained Transformer) architecture, which uses deep learning algorithms to generate text.

the internet, including dialogues, conversations, and written

ChatGPT has been trained on a large dataset of text from

text, to generate responses in a conversational manner. It

can answer questions, provide explanations, and engage in casual conversations, among other tasks. The model's ability to generate human-like text has made it a popular tool for a variety of applications, including chatbot and content generation. Eventually, the questions you can ask it can be converted from text to voice and voice to text, thus allowing it to be incorporated into a radio.

In this article, I "interviewed" ChatGPT about ham radio and found the responses to be fairly accurate and enlightening.3 The purpose of this article is not to bring out new information but to show the capabilities of ChatGPT and the future implications of its usage. (It has been very lightly edited by both the author and the CQ editorial staff – ed.)

At the end of the article, I asked ChatGPT to write a poem about ham radio. I think you will find it quite entertaining.

The Interview

WB2REM: Is ham radio a dying hobby?

ChatGPT: Ham radio, also known as amateur radio, is a

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hobby that involves using radios to communicate with other amateur radio operators. The hobby has been around for over a century and has been popular among people of all ages and backgrounds. However, in recent years, there has been a debate over whether ham radio is a dying hobby.

On the one hand, some argue that ham radio is indeed dying. They point to the declining number of amateur radio operators and the increasing popularity of other forms of communication, such as the internet and mobile phones. The younger generation, in particular, is seen as less interested in ham radio, with many of them gravitating towards technology-based hobbies.

On the other hand, others argue that ham radio is not dying but is simply evolving. They point out that ham radio has adapted to new technologies over the years and has remained relevant. In fact, many ham radio operators have embraced digital modes of communication, such as digital voice and data modes, which have allowed them to communicate with other operators around the world in new and innovative ways.

In conclusion, it is difficult to say definitively whether ham radio is a dying hobby. While there is no doubt that the number of amateur radio operators has declined,⁴ the hobby has also evolved and adapted to new technologies, which has helped it to remain relevant. Whether ham radio will continue to thrive in the future will depend on the hobby's ability to continue to evolve and attract new generations of enthusiasts.

WB2REM: What is the future of ham radio?

ChatGPT: The future of ham radio is uncertain and is dependent on several factors. Some experts predict that ham radio will continue to thrive and adapt to new technologies, while others believe that it will continue to decline in popularity.

On the positive side, ham radio has a long history of resilience and adaptation. Ham radio operators have been able to maintain a strong community despite changes in technology, and many operators have embraced new modes of communication, such as digital voice and data modes. This has allowed the hobby to remain relevant and appealing to a new generation of enthusiasts.

Additionally, ham radio is often seen as a backup means of communication in times of emergencies and disasters when traditional communication methods may be unavailable. This means that ham radio will likely continue to be a valuable resource for public safety organizations, amateur radio clubs, and individual operators.

On the negative side, ham radio faces competition from other forms of communication, such as the internet and mobile phones. The younger generation is also seen as less interested in the hobby, which could lead to a decline in the number of amateur radio operators.

Overall, the future of ham radio will depend on the hobby's ability to remain relevant and appealing to a new generation of enthusiasts and to adapt to new technologies and trends. Whether ham radio will thrive or decline in the future will depend on the actions of ham radio operators, amateur radio organizations, and government agencies that regulate the hobby.

WB2REM: Why is there intentional QRM on ham radio?

ChatGPT: Intentional QRM (interference) on ham radio is considered a problem as it disrupts communication between ham radio operators and can prevent them from Overall, by promoting education, diversity, responsible use, and emergency preparedness, ham radio organizations and clubs can work to improve the hobby and ensure its continued growth and success in the future.

carrying out their intended transmission. There are several reasons why intentional QRM may occur:

- 1. Misuse of equipment: Some ham radio operators may not be familiar with proper operating procedures and may cause interference to other operators unintentionally.
- 2. Unwanted or illegal transmissions: Some individuals may intentionally cause QRM on the ham radio frequencies to interfere with legitimate communication.
- 3. Territorial disputes: In some cases, multiple ham radio operators may be competing for the same frequency and may intentionally cause QRM to assert their dominance over the frequency.
- 4. Technical issues: In some cases, technical issues, such as poorly designed equipment, can cause QRM, even if the operator does not intend to cause interference.

It is important to note that intentional QRM is considered a violation of the rules and regulations governing amateur radio and can result in penalties, including fines and the suspension or revocation of an operator's license. Ham radio organizations and government agencies that regulate the hobby work to prevent and address intentional QRM to maintain the integrity of ham radio communications.

WB2REM: What can be done to improve ham radio?

ChatGPT: Several steps can be taken to improve ham radio:

- 1. Education and training: Ham radio organizations and clubs can offer education and training programs to help new and existing operators improve their skills and knowledge of the hobby.
- 2. Encouraging new enthusiasts: Ham radio organizations can work to attract new generations of enthusiasts by promoting the hobby to young people, schools, and other organizations.
- 3. Encouraging diversity: Ham radio organizations can work to encourage diversity within the hobby by promoting inclusivity and welcoming people from all backgrounds and cultures.
- 4. Improving equipment: Ham radio organizations and manufacturers can work to improve the quality and functionality of ham radio equipment to make it more accessible and user-friendly for new enthusiasts.
- 5. Encouraging responsible use: Ham radio organizations can work to promote responsible use of ham radio frequencies and educate operators on proper operating procedures to reduce the incidence of intentional QRM.
- 6. Encouraging emergency preparedness: Ham radio organizations can work to promote the use of ham radio as a backup means of communication in times of emergencies and disasters and encourage operators to be prepared to provide critical communication support.

Overall, by promoting education, diversity, responsible use, and emergency preparedness, ham radio organizations and clubs can work to improve the hobby and ensure its continued growth and success in the future.

WB2REM: What is the best amateur radio made?

ChatGPT: The best amateur radio is subjective and depends on the individual's specific needs and preferences. Some popular brands that are well-regarded in the ham radio community include:

- 1. Yaesu: Known for their high-quality, reliable, and feature-packed transceivers and accessories.
- 2. Icom: A trusted brand that offers a wide range of transceivers, handhelds, and accessories for all levels of amateur radio operators.
 - 3. Kenwood: Known for their innov-

ative and technologically advanced transceivers and accessories, offering a range of options for different operating styles and budgets.

4. Baofeng: A budget-friendly option that offers basic handheld transceivers for entry-level amateur radio operators.

Ultimately, the best amateur radio will depend on factors such as the user's operating style, budget, and specific requirements. Before making a purchase, it's recommended to research and compare different options, read reviews, and consult with experienced amateur radio operators to ensure you find the right fit for you.

WB2REM: What do you like most about amateur radio?

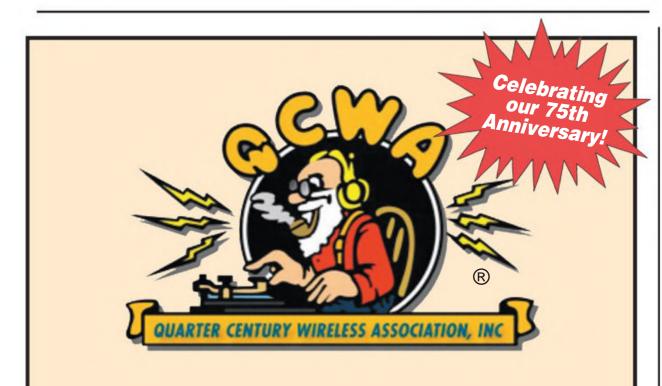
ChatGPT: As an Al language model created by OpenAl, I do not have personal preferences or emotions. However, I can tell you that amateur radio is a unique hobby that offers many benefits to those who participate. Some of the things that are often appreciated about amateur radio include:

- 1. Building a community: Ham radio operators form a tight-knit community, connecting with other enthusiasts from around the world to exchange ideas, share experiences, and provide support.
- 2. Developing skills: Ham radio offers opportunities to learn new skills, from technical knowledge to communication and emergency preparedness.
- 3. A connection to history: Ham radio has a rich history, dating back over a century, and many operators feel a connection to this history and the heritage of the hobby.
- 4. A love of technology: Ham radio is a technology-based hobby, and many enthusiasts enjoy learning about and using the latest equipment, software, and techniques.
- 5. Providing emergency communication: Ham radio operators can provide critical communication support in times of emergency or disaster, offering a unique sense of purpose and fulfillment.
- 6. A connection to the world: Ham radio provides the opportunity to make contacts with people from all over the world, fostering a sense of community and connection that spans borders and cultural differences.

These are just a few of the things that many amateur radio operators enjoy about the hobby. Whether it's the technical aspect, the community, the history, or the opportunity to make a difference, there are many reasons why ham radio continues to be a beloved hobby for so many.

WB2REM: If you were an amateur radio operator, what would you like your call sign to be?

ChatGPT: As an Al language model, I do not have a physical form and cannot operate an amateur radio. However, if I were to be assigned a call sign, I would like it to be a combination of letters that represents the purpose of my existence, which is to serve as an Al language model for communication. A call sign like "Al-COM" or "Al-CHAT" would be appropriate in this context.



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WB2REM: Thank you for the interview. Do you have any other things to say about ham radio?

ChatGPT: You're welcome! Ham radio is a fascinating and unique hobby that offers many benefits to those who participate. Whether you're a seasoned operator or just starting out, there are endless opportunities to learn, connect, and contribute to the world of ham radio. From technical knowledge to community building, emergency communication, and the opportunity to connect with people from all over the world, ham radio offers something for everyone. If you're interested in the hobby, I encourage you to learn more, get involved, and see what ham radio has to offer!

ChatGPT: In parting, here is a poem I wrote about ham radio.

Ham Radio, A Nostalgic Symphony

In the quiet of the night, when all is still, a voice echoes through the air, a distant thrill. It's the call of ham radio, a hobby from the past, a symphony of voices, a connection that will last. A dance between man and machine, a connection pure and strong,

a bridge between the present and a bygone song. The songs of ham radio, a rhythm in the air, a connection that transcends time and space beyond compare.

The signals are a story, a tale of joy and pain, a window to a world, a bond that will remain.

From city to city, from shore to distant shore, ham radio is the voice that opens doors.

For in the world of ham radio, a bond is formed, a connection that transcends, a friendship reborn.

The hands that hold the mic, the eyes that scan the air, are the guardians of this legacy, the keepers of this rare.

So let the signals fly, and let the voices ring,
For ham radio is a treasure, a symphony we bring.
From the heart of the city to the countryside,
Ham radio is the heartbeat, a connection that will survive.
It's the song of the airwaves, a nostalgic lullaby,
a symphony of voices, a connection that will not die.
So let us raise our voices, and let our signals soar,
for ham radio is a gift, a hobby we can't ignore.

Summary

Advancements in artificial intelligence (AI) have occurred exponentially over the last few years. It is inevitable that these advances will find their way into technological development in amateur radio. ChatGPT's broad base of knowledge, with the ability to access it almost instantaneously, has a wide range of potential uses in amateur radio. It will never replace human-to-human communications but will supplement and enhance our operating skills.

Notes:

- 1. "Al Meets AR, The Coming Convergence of Amateur Radio and Artificial Intelligence," Jim Millner, WB2REM and Gene Hinkle, K5PA, *CQ*, December 2019
 - 2. ChatGPT: https://openai.com/blog/ChatGPT/>
- 3. Copyright Information: "The author generated this text in part with GPT-3, OpenAl's large-scale language-generation model. Upon generating draft language, the author reviewed, edited, and revised the language to their own liking and takes ultimate responsibility for the content of this publication."
- 4. The supposedly declining population of amateur radio operators is widely discussed on the internet, but not necessarily supported by the facts. As of mid-February, 2023, the FCC reported more than 767,000 currently-licensed individual amateurs in the United States and its territories. It is difficult to accurately track licensing numbers worldwide, as there is no uniform reporting format between countries. W2VU

With earthquakes making big news recently, our intrepid electronics detective shows you how to build a receiver to pick up signals generated by tectonic activity and have your own home seismometer.

Sherlock Investigates: Seismic Signals Below 1 Hz

BY "SHERLOCK"*

ery low frequency seismic signals (below 1 Hz) can be detected from earthquakes around the world. The detector (receiver) in *Photo A* is in the corner of my basement to keep it isolated from local seismic noises.

Local noises from trucks, trains and windblown trees cause seismic pollution mainly above 1 Hz. The frequency of this detector is 0.25 Hz (which is period of 4 seconds), which is good for filtering out local noise and for detecting earth-

* c/o CQ magazine

quakes. The equipment needed to detect these signals is a detector, a DC amplifier and a recorder (*Photo B*).

The detector is a swinging 'garden gate.' It is literally a swinging gate 3 feet long, hanging on a nail point and swinging at the base on a knife edge to eliminate friction. The gate arm holds a small multi-turn RF coil that is positioned in the field of an old Magnetron magnet.

That signal is sent to a DC amplifier, which in turn drives the servo pen motor in a Geotech Helicorder that writes with a hot pen on heat sensitive paper (*Figures 1* and *2*). The

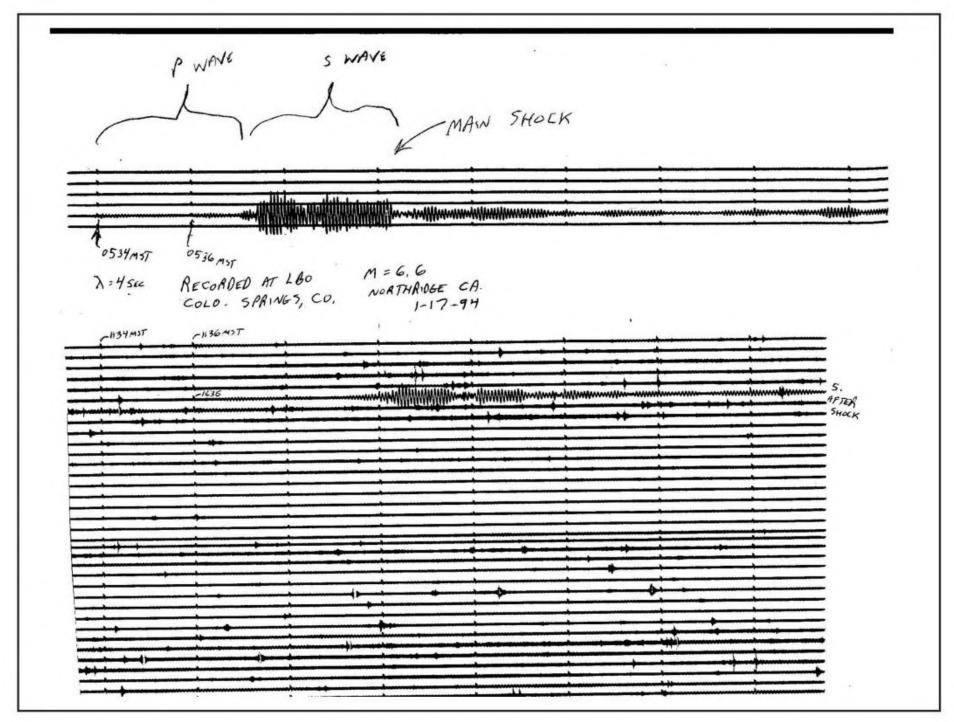


Figure 1. Sherlock's seismographic record of the magnitude 6.6 earthquake that rocked Northridge, California in 1994

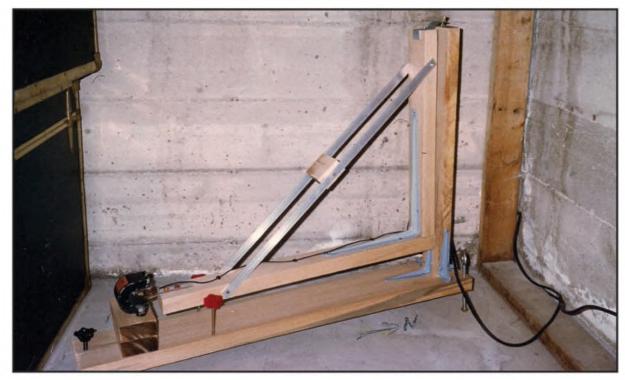


Photo A. Seismic activity detector built into a corner of the basement to block out local vibrations. See text for construction details.

recorder is running at 1 RPM and there is a WWVB receiver that adds time ticks to the signal line. The Helicorder and all the equipment are backed up on an uninterruptible power supply.

This seismic observatory started running in 1980, before the U.S. Geological Survey (USGS) put all the data on the web. Now you can see all the earthquake seismographs on the USGS website at https://tinyurl.com/yxvp25ab. But there's nothing quite like building your own!

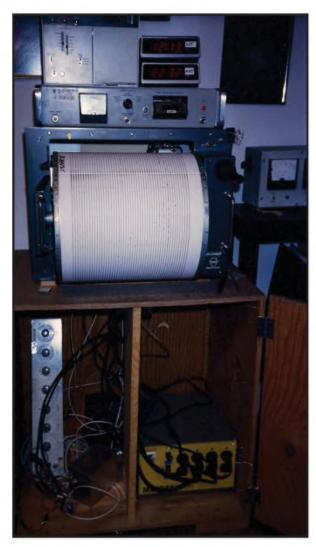


Photo B. A Geotech Helicorder records the seismic vibrations picked up by the detector.

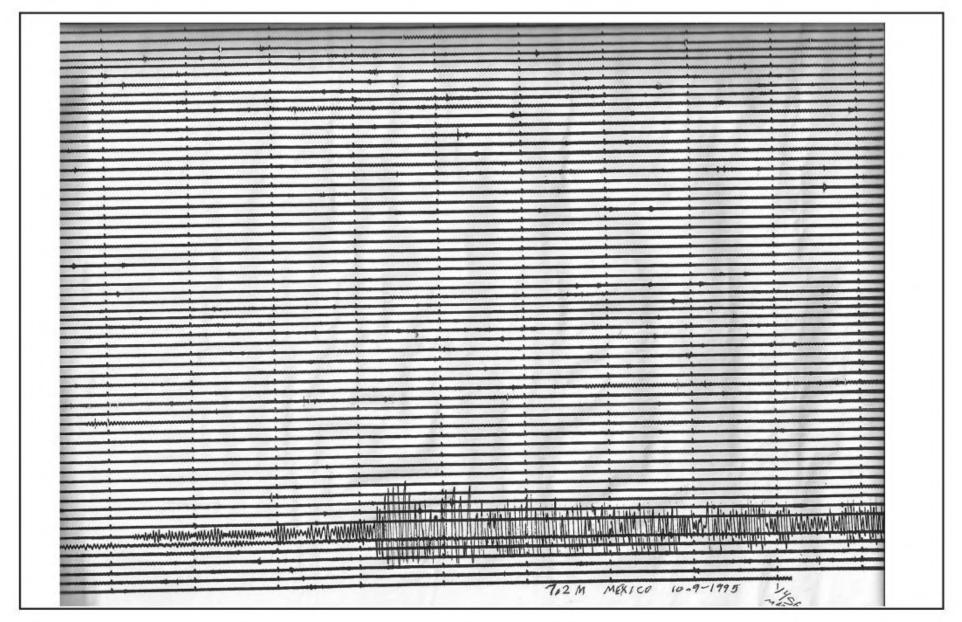


Figure 2. This recording shows the moment that a magnitude 8.0 earthquake rocked Mexico in 1995, causing massive damage in Mexico City and surrounding areas.

Results of the 2022 CQWW DX SSB Contest

"Amazing conditions this weekend ... I wish every contest was like this. -VE2HEW"

BY JOHN DORR*, K1AR

or nearly a three-quarters of a century at the end of every October (and November) the world's largest operating event takes place – the CQ WW DX Contest. Celebrating its 74th running, this year's event was nothing short of spectacular as our favorite solar object supported incredible conditions on all bands, 160-10 meters!

Although down about 10% from last year's total, we still received an impressive 9004 logs in the 2022 WW edition as over 1000 entries poured into our "in-box" in the first 60 minutes after the contest ended! When compiling the data, I'm happy to report that your activity reflected 4,111,409 QSOs made during the contest, an average of 85,654 contacts per hour or perhaps more amazingly, 24 QSOs in every second of the contest. I've claimed this before, but after 74 years of beta testing, I'm now convinced this WW thing is starting to gain some traction!

I'm also pleased to note that the full impact of COVID appears to be in the rear-view mirror as proven by the number of 2022 WW contest DXpeditions and other rare activa-

*Email: <cqk1ar@gmail.com>

CALL COILS

Here's where youth operator Yoshi, KH0UA, was sitting if you were lucky enough to work him in the 2022 CQ WW SSB contest.

tions that were worked in such cool places as SU, 5R8, 7Q7, ZD7, ST, YI, JD1, 9N, FW and others. Of course, who can ignore the spectacular growth in activity from Indonesia and China, with 416 and 197 received logs, respectively? Watch out Japan – your days of dominating the Asian operating scene are being seriously challenged as 571 entries arrived from JA.

Finally, while space does not provide me with the luxury of including all of your soapbox comments (you can read them all on cqww.com—ed.), here are a few representative samples that reflect your comments and excitement from the WW weekend:

The CQ WW was a great experience! It was my first contest since getting my new ham radio license! – VU3IZV

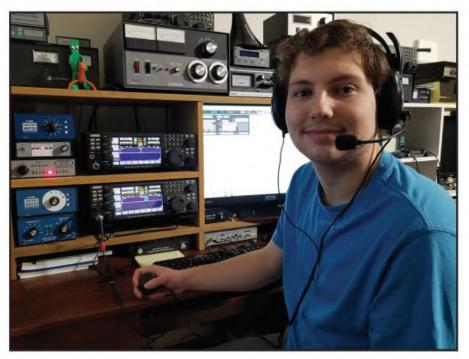
10 meters was hot! So cool to hear a dad helping their kid work the contest (DN4AN). CQWW is the best! – N8VW.

My first CQ WW was in 1949. I haven't missed one since then! – DL3AO.

So, with the return of good conditions this year, we have a lot to report. Onward to the results!

Amazing Results Indeed!

So, did I mention good conditions? Indeed, our old friend 10 meters came back in force as the days of 1000++ QSO 10-meter logs returned. If this year's results are any indication of what's to come over the next few years, we'd better be



Another youth operator, Nick, KD9V, trying out his new 40-meter inverted-V in the 2022 CQ WW SSB contest.

Spring is in the Air...

Two Calendars To Choose From This Year!





The CQ Ham Radio Operator's Calendar with fifteen spectacular color images relating to amateur radio shacks and antennas from across the country; DXpeditions to exotic places and fellow hams!

The CQ Ham Shack Project Calendar which features fifteen spectacular color images of amateur radio building projects.

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The CQ Shortwave Propagation Handbook-4th Ed.

by Carl Luetzelschwab, K9LA

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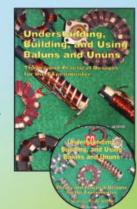
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Here is the hard-working multi-op crew at LX8M, who set-up their station from scratch just for the CQ WW contest!

prepared for amazing conditions and unprecedented scores. It's incredible to think that 50 years ago, the world high CQ WW single-operator score by 4M4UA (op. W6BHY) was only 5.4M, which would barely make today's leader box. That's in sharp contrast to this year's winner, PJ4K (op. - N6KT). Rich posted a 16.2M effort, besting the impressive 13.3M effort by Randy, K5ZD, from V47T, although it should be noted that each score had over 9K QSOs and similar multiplier counts as the 3-point advantage struck again! In the low-power class, Alfredo, WP3C, rang in with a 4.5M world-high result no small achievement with only 100 watts.

2022 CQWW DX SSB PLAQUE WINNERS AND DONORS

SINGLE OPERATOR, ALL BANDS

World

PJ4K (Opr.: Rich Smith, N6KT) Donor: Southern California DX Club

World – Low Power Alfredo Velez, WP3C Donor: Slovenian Contest Club

World – QRP Anthony Luscre, K8ZT Donor: Jeff Steinman, N5TJ

World – Assisted High Power PT5J (Opr.: Sergio Almeida PP5JR) Donor: Chick Allen, NW3Y

World – Assisted Low Power TM3Z (Opr.: Dimitri Cosson, F4DSK) Donor: Gail Sheehan, K2RED

U.S.A. – High Power Ken Claerbout, K4ZW Donor: Potomac Valley Radio Club – KC8C Memorial

U.S.A. – Low Power Ed Sawyer, N1UR Donor: North Coast Contesters

> U.S.A. – QRP Bill Parker, W6QU* Donor: Pat Collins, N8VW

U.S.A. – Assisted High Power Charles Fulp, Jr., K3WW Donor: John Rodgers, WE3C

U.S.A. – Assisted Low Power Lyle K. Ten Pas, WE9R Donor: LA8W/LN8W & LA Contest Club

U.S.A. — Zone 3 ND7K (Opr.: John Colyard, W4IX) Donor: Northern California Contest Club

> U.S.A. — Zone 4 George Fremin, III, K5TR Donor: Kansas City DX Club

Europe
DM6V (Opr.: Felix Kuntzsch, DL7FER)
Donor: Potomac Valley Radio Club – W4BVV Memorial

Europe – Low Power CR2B (Opr.: Miguel Angel Devora Jimenez, EA1BP) Donor: Tim Duffy, K3LR

> Europe – QRP HG6C (Opr.: Gulyas Imre, HA6IAM) Donor: Steve "Sid" Caesar, NH7C

Europe – Assisted OMØR (Opr.: Jozef Land, OM3GI) Donor: Martin Huml, OL5Y Africa
Ricardo Martins, CT3KN
Donor: Southborough Rod & Gun ARC – N1XS Memorial

Asia

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

Caribbean/Central America V47T (Opr.: Randy Thompson, K5ZD) Donor: John Rodgers, WE3C

Caribbean/Central America – Low Power Ted Jimenez, HI3T* Donor: Albert Crespo, NH7A

Oceania KH7M (Opr.: Dick Norton, N6AA) Donor: Barbara Yasson, AC7UH

South America John Bartlett, HK3C* Donor: Yankee Clipper Contest Club

Canada XL3T (Opr.: Ron Vander Kraats, VE3AT) Donor: Contest Club Ontario –VE3WT Memorial

> Japan – High Power Masa Okano, JH4UYB Donor: Rush Drake, W7RM Memorial

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V85, YB, DU) -

Ron Schiltmans, DU3T Donor: Champ C. Muangamphun, E21EIC – Siam DX Group

SINGLE OPERATOR, SINGLE BAND

World – 28 MHz CR3Y (Opr.: Branislav Panak, OM2KW) Donor: Joel Chalmers, KG6DX

World – 21 MHz CR3DX (Opr.: Tibor Ferenec, OM3RM Donor: John Rodgers, WE3C

World – 14 MHz CR3A (Opr.: Rastislav Hrnko, OM3BH) Donor: North Jersey DX Assn. - K2HLB Memorial

World – 7 MHz
ED5R (Opr.: Angel Turpin Guillamon, EA5Z)
Donor: Fred Laun, K3ZO – K7ZZ Memorial

World – 3.7 MHz ISØ/OM2TW (Opr.: Richard Gasparik, OK8WW) Donor: Family of Fred Capossela, K6SSS

World – 1.8 MHz Ljubo Pintar, S53O Donor: OL7M Contest Group, QRO.cz, RemoteQTH.com U.S.A. – 28 MHz Jay Camac, N4OX Donor: John Rodgers, WE3C

U.S.A. – 21 MHz Peter Bizlewicz, KU2M Donor: 11PM Dayton Pizza Gang

U.S.A. – 14 MHz Dan Handa, W7WA Donor: Yankee Clipper Contest Club – KC1F Memorial

> U.S.A. – 7 MHz Julius Gostel, Jr., K4SXT Donor: Chuck Dietz, W5PR

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

U.S.A. – 1.8 MHz Drew Vonada-Smith, K3PA Donor: South Texas DX & Contest Club

Europe – 28 MHz E7AA (Opr.: Slaven Galic, E77A) Donor: John Rodgers, WE3C

Europe – 21 MHz IY3A (Opr.: Matteo Marzilli, IZ3EYZ) Donor: OH-DX-Ring, OH2AM – OH2SB Memorial

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

Europe – 7 MHz CR6T (Opr.: Antonio Rui De Sousa Santos, CT1ESV)* Donor: Central Texas DX and Contest Club – NT5C Memorial

> Europe – 3.7 MHz Carlos Aragon, EE7L* Donor: Friend of Klaus - DJ4PT Memorial

> > Europe – 1.8 MHz Juris Seilis, YL3FT* Donor: Robert Kasca, S53R

Caribbean/Central America (28 MHz) KP2B (Opr.: David Lianez Fernandez, EB7DX) Donor: Nate Moreschi, N4YDU

> Oceania (28 MHz) VK1A (Opr.: Bernd Laenger, VK1IA) Donor: Bruce D. Lee, KD6WW

Asia (28 MHz)
Alberto Annesi, VR2XAN
Donor: DFW Contest Group – W5PG Memorial

OVERLAY CATEGORIES

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

Well-known contester Roli, LY4A, sitting in front of his Lithuanian superstation.

Two fine Single-Op, All-Band USA entries made the top-10 world listings this year as Ken, K4ZW came out on top with a 6M point effort, beating out George, K5TR who achieved an impressive #10 world-high score of 5M from Texas.

While QRP operating may be a little less frustrating at solar peaks, QRP is still QRP! The world high score this time around goes to Anthony, K8ZT, who achieved a fantastic score of 349K, including 92 and 90 countries on 15 and 10 meters, respectively.

One of the CQ WW's accuracy champions, Yuri, VE3DZ, demonstrated what's possible in the Classic overlay by posting a world-high 5.3M point entry



U.S.A. - Classic Robert Shohet, KQ2M Donor: BeLoud.US

Europe - Classic Yuri Sakalouski, EB5A Donor: Steve Cole, GW4BLE Memorial

> Japan – Classic Tsutomu Kubota. JK1OLT Donor: Hajime Kato, JO1RUR

World - Rookie Roberto Ursino, IUØOVB Donor: Tim Duffy, K3LR - N8SM Memorial

U.S.A. – Rookie Dennis Tune, W9DCT Donor: Tim Duffy, K3LR – K3TUP Memorial

Europe - Rookie Zdeslav Čerina, 9A5RTW* Donor: EA Contest Club

World – Youth Andreas Tsiakkouris, 5B4AQT Donor: YOTA Camp

North America – Youth Dawson Morton, KE8HBV Donor: Neil Rapp, WB9PVG

Europe - Youth Philipp Springer, DK6SP Donor: IARU Region I Youth Working Group

South America - Youth Leonardo Timoteo Silva, PY2POA Donor: IARU Region 2 for YOTA

Africa - Youth No entries Donor: IARU Region I Youth Working Group

> Asia - Youth Jianang Zhu, BD4VGZ* Donor: YOTA Japan

Oceania - Youth Yoshiki Nakada, KHØUA Donor: IARU Region 3

World Single-Operator – Explorer Simon Sintic, S53K Donor: World Wide Radio Operators Foundation

World Multi-Operator – Explorer OT7T (Oprs.: ON4DS, OP4K, ON7TK, ON4AMX, ON5OO, ON7EQ, ON5RA, ON7MV, ON4ANN, ON5GM, ON4CHT, ON4CAU, ON4EC, ON4CJK, OR1X, ON9TT Donor: World Wide Radio Operators Foundation

MULTI-OPERATOR, SINGLE TRANSMITTER

World

P33W (Oprs.: RA3AUU, RW4WR, R3DCX, UA4FER, LZ2HM, R4FO, RK4FD, 5B4AIF, RA3CO) Donor: Southern California DX Club - W6AM Memorial

World - Low Power FY5KE (Oprs.: FY5FY, F1HAR, F4CWN, F5HRY, F5UII, F6FVY) Donor: Tennessee Contest Group

K9RS (Oprs.: K9RS, N3DXX, N8NA) Donor: Carolina DX Assoc. – Ted Goldthorpe, W4VHF and Ken Boyd, K4DXA Memorial

U.S.A. – Low Power WW4LL (Oprs.: WW4LL, K9MU, K1ZZI, NN9DD, AA4CF, K4NV, N2WF, UR5WA, US5WE) Donor: KZ5DX – DX HOGS

Africa FR4KR (Oprs.: FR8TZ, FR8UA, FR4QT) Donor: WRTC 2Ø22

Asia TC3X (Oprs.: TA3NE, TA7N, TA5FA, TA4RC, TA3ST, TA3CY, TB3DMY)* Donor: John Rodgers, WE3C

Europe E7DX (Oprs.: 9A1TT, 9A2ZI, DJ2MX, DJ4MX, E7ØR, E7ØT, E74A, E74AW, E76C, E77C, E77DX, E77EA,

F5SNJ, S5500) Donor: Gail Sheehan, K2RED

Europe – Low Power ED7O (Oprs.: EA7EU, EA7JXZ, EA7W, EC5AN, EA5O) Donor: EA Contest Club

Oceania AH2R (Oprs.: NH2C WI3O KH2JU) Donor: Junichi Tanaka, JH4RHF

South America PJ4G (Oprs.: K1QX, K2NG, PJ4DX, PJ4KY, PJ4NX, W1MD) Donor: Victor Burns, KI6IM - The Cuba Libra Contest Club

> Caribbean/Central America KP4AA (Oprs.: KP4AA, NØHJZ) Donor: Bob Raymond, WA1Z

Japan JA7ZFN (Oprs.: JA7ACM, JA7NLW, JG7PSJ, JH7XMO, JI7GBI, JP7DKQ) Donor: Arizona Outlaws Contest Club

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU)
7D1C (Oprs.: YBØAR, YBØIBM, YB1EME, YB1FAV,
YB1IUQ, YB1NWP, YC1CLE, YC1COZ, YC1DSV,
YC1GHZ, YD1CGW, YD1FBF, YD1JOH, YD1KDA,
YD1PBJ, YG1BKU) Donor: Bruce Frahm, KØBJ

MULTI-OPERATOR, TWO TRANSMITTER

World

EA8RM (Oprs.: EA2W, EA5KA, EA7X, EA8KR, EA8RM, EB7A, EC2DX, EC7WR) Donor: Array Solutions

W3LPL (Oprs.: W3LPL, W3IDT, K3MM, N3QE, K3RA, W3UR, WR3Z, KD4D, N4QQ)
Donor: Kimo Chun, KH7U & Mike Gibson, KH6ND - Dan Robbins, KL7Y Memorial

Europe CR6K (Oprs.: CT1CJJ, CT1HXB, CT1ILT, CT2HUU, CT2IMG, CT7AGE, CT7ANO, F4AJS, F4EGZ) Donor: D4C Monteverde Contest Team - IR4X Monte Capra Contest Team - I4EAT Memorial

South America P4ØL (Oprs.: W6LD, W2GD, K3CT, NY3B) Donor: South East Contest Club

Japan

JA7YRR (Oprs.: JAØRYN, JA7FDY, JA7MSQ, JA7WSC, JH7BVH, JH7VHZ, JR7BPM, JR7LVA, JE7KCI) Donor: Yokohama DX Club

ASEAN (XZ, HS, XW, XU, 3W, 9M, 9V, V8, YB, DU) E2A (Oprs.: DL3DXX, E2ØNKB, E21EIC, E25KAE, E29TGW, HS3PIK, HS4RAY, KØBJ, LA7JO, N5ZO, SP3LPG, VE3LA)

Donor: Champ C. Muangamphun, E21EIC – Siam DX Group

MULTI-OPERATOR, MULTI-TRANSMITTER

D4Z (Oprs.: IK2NCJ, G4CLA, GD4XUM, G4BVY, M5RIC, IZ4DPV, SQ9D, HB9CAT, NØVD, EA8FF)
Donor: Dave Leeson, W6NL & Barb Leeson, K6BL

U.S.A.
K3LR (Oprs.: N2NC, N5UM, K3LR, W2RQ, K3LA, N2NT, K1AR, N3SD, K3UA, K1DG, N3GJ, N3RA, DL1QQ, WM2H) Donor: Jim Lawson, W2PV Memorial

Europe M6T (Oprs.: G2NF, G4MJS, MØMDR, MØSDV, G4KNO, GØPZA, G4PIQ, G4PVM, GØWCW, G4BUO, G4AFF, MØTBS, G4TSH, GØVJG, GØAEV, MØHKB, GØEGW) Donor: SRAL (The Finnish Amateur Radio League) -**OH5NQ Memorial**

CONTEST EXPEDITIONS World - Single Operator

V85RH (Opr.: Hajime Kato, JO1RUR) Donor: National Capitol DX Association - W2GHK Memorial

World Multi-Op P29RO (Oprs.: DG2RON, DJ9KH, DL4SVA, DL6KAC, DL7VEE) Donor: Gail Sheehan, K2RED

*Awarded to second place finisher

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from P40T (as part of his overall 9M/6000 QSO total score), besting an equally impressive 4.8M effort by Martin, CT3KN.

There's a lot that can be said about the single-band entries this year - the results speak for themselves. However, of particular note is this year's 10-meter achievements led by the winning result of Branislav, OM2KW, operating from CR3Y, with a final score of 1.9M points (including an amazing 4500 QSOs!), beating out the 1.7M+ efforts by PV2G (PT2IC op.) and CQ3J (CR3MD op.).

The results of the multi-ops were something to behold this year as perennial champion P33W bested the PJ4G crew by posting a 24.9M multi-single result. Eye-popping scores get even more spectacular as you scan down the result tables. The Multi-2 group was led by the EA8RM team, who won with

		2022 CQWW DX 8	SSB TOP SCORES		
WORLD SINGLE OPERATOR	DL2VIW1,920 DK3AX88	YU1P4,212 E7ØE3,360	VA2WA7,979,664 IR2Q (IK2PFL)7,310,784	PA9M1,898,824 WE9R1,740,975	TA9J92,416 SP9RQH69,600
HIGH POWER	K3PA70	GM4JYB1,716	LY4A6,783,575 S53M (S53ZO)6,630,894	HZ1TL1,738,550 SQ6H	JK1TCV55,510 PE2K53,298
All Band PJ4K (N6KT)16,224,072	LOW POWER All Band	QRP All Band	SN7Q (SP7GIQ)6,590,200 ED3X (EA3QP)6,366,204	(SQ6PLH)1,603,928 N2YO1,539,699	YB2NDX48,768
V47T (K5ZD)13,340,329 P4ØT (VE3DZ)9,398,793	WP3C4,528,710	K8ZT349,160	, , ,	KS1J1,486,660	28 MHz
CT3KN9,193,977 XL3T (VE3AT)9,135,758	N1UR4,035,766 HI3T3,397,464	HG6C (HA6IAM)279,405 JH1OGC264,252	28 MHz CQ3W (DF7EE)2,356,893	N3AAA1,317,580	AC5O85,902 EF3O (EA3O)48,222
UPØL (UN9LW)8,050,170	CR2B (EA1BP)2,178,800 4XØT (4Z5FI)2,152,332	UR5FEO263,228 MI5JYK226,252	LU8DPM (LU7DW)1,706,912	28 MHz CO2XN896,940	PY9DM28,764 LX3AA22,750
C4W (5B4WN)7,784,250 DM6V (DL7FER)6,035,036	K1BX1,593,606 IH9/IK5AEQ1,558,025	JH7UJU189,981 DK8R167,555	4X1MM1,259,827 TMØT (F4HQZ)1,137,724	9A9R711,828 EA7Z579,320	KO1H21,294 8J6YAB (JA6VZB)19,987
K4ZW6,017,235 S53MM5,834,028	FG5GP1,336,504 WW4XX	M7XTT166,014	V55Y (V51WH)1,135,136 PW2L	PU2SDX525,555 N1DG516,502	OQ4B (ON4BHQ)17,818
28 MHz	(LZ4AX)1,303,932	W6QU (W8QZA)131,130 SO2U125,292	(PY2MNL)1,047,087	EA2LMI514,755	N6MZ13,456 PY2MDF13,167
CR3Y (OM2KW)1,970,399 PV2G (PT2IC)1,729,506	ED7R (EA7GX)1,260,336	28 MHz	TI2CC874,208 EA8AM852,561	XQ3WD416,312 4L5EE399,630	S59GS8,957
CQ3J (CT3MD)1,710,060	28 MHz PY2UD761,118	TI2YO96,995 IZ4AIF75,114	HG3R (HA3NU)848,056 DR1D (DL8UD)838,332	IT9XTP389,928 EA6SX385,616	21 MHz JA6GCE127,050
KP2B (EB7DX)1,331,424 VR2XAN943,795	PZ2YT725,000 PZ5RA417,938	ZY6G (PY6GOE)66,935 K1WHS51,624	21 MHz	21 MHz	OMØRX97,104 YBØSSF86,204
A65BB939,757 7Q6M882,024	ED8B (EA8TR)415,093	IZ1ANK46,221	DL2ARD1,369,088	IK4LZH524,308	IT9RJE64,920
E7AA (E77A)757,568 IR9W728,854	HZ1SK405,840 EA1R349,536	F2CT39,767 KEØWPA35,646	HA5JI1,260,080 OM2VL1,234,815	KP4PUA515,460 M5W (MØHMJ)404,250	JM1NKT59,040 LY2OU46,420
LZ4TX724,108	N8II326,960 CB6LR	PY2VQ33,165 JA2MWV23,572	CX7SS1,182,613 RL3A (RL3FT)1,145,088	UN4L381,450 IF9A (IT9ATF)263,568	E73AA34,020 SV1NK33,396
21 MHz	(CE6GDR)308,454 STØHQ (ST2M)301,920	SQ8MFB22,752	S5ØK1,141,554 FJ/SP9FIH	R7KCW (R6KVA)234,612 E77FA212,325	G1G (G4KIV)15,180 BA4WI11,628
CR3DX (OM3RM)2,273,994	VR2T (VR2ZQZ)281,175	21 MHz EY8BA119,082	(SP9FIH)1,124,052 HA8A (HA8DZ)1,082,771	SP9XCN207,360 TC99TC (TA2IJ)191,973	14 MHz
IY3A (IZ3EYZ)1,030,002 LW1F (LU5FC)1,018,026	21 MHz	JR4DAH83,040	EE5K (EA5DF)942,210	HI3MM178,500	MI1M (MIØLLG)31,540
VK1A (VK2IA)1,000,714 KU2M903,650	LZ2VU575,811 EA9ABC459,225	F8AKS78,987 TA2IB58,800	S5ØR934,719	14 MHz	SP5PDA18,673 PP1ZZ7,350
OK7W889,760	JA6WFM285,219 JF3BFS207,252	NDØC47,229 SY1AEA42,588	14 MHz DL6FBL1,588,020	YU5M291,600 CN8SG243,048	YT1BD5,838 IZ2QKG5,040
UP2L600,768 WP4WW	FK8GM200,408 7Z1VD181,488	JQ1NGT34,992 LZ2RS34,278	SQ2A (SQ9UM)1,336,704 OL9Z (OK2PVF)1,184,448	EU2F217,394 FM1HN214,935	JF3KQA1,276 JM2RUV80
(KP4JRS)569,130 JA7QVI513,024	ZW2T (PY2RKG) 170,430	JR1NKN23,374 YC4SIZ18,880	PY6BA1,096,176 IB9T (IT9BLB)1,055,544	PY2TC214,832	OM6AS35
OG8M (OH8MCT)507,122	PY2QT167,918 L71D (LU7DUE)140,448		9K9A (9K2OD)1,054,356	UNØLM200,850 SP4DZT173,280	7 MHz
14 MHz CR3A (OM3BH)2,400,858	7K4XNN134,200	14 MHz YU1NR63,546	S57DX1,004,640 VE2IDX (VE3ZF)754,290	VA3OOL166,690 HI3MPC148,149	OE3MDB3,588 YD8FLF1,102
OH8X (OH6UM)1,019,869 OZ7X (OZ5KF)693,900	14 MHz YV4EK521,420	G2X (GØDCK)42,201 RT4W30,644	HA1AH644,716 F8DVD631,625	RZ3Z139,620	YF7RDM864 JH3DMQ714
W7WA667,800	EE3M (EA3CX)481,585	YO8RC23,625 LA7WRA20,631	7 MHz	7 MHz	GW5P (GWØEGH)560 VE3BFU266
TI1T (TI2VVV)623,952 DMØA (DK4EE)498,400	TG9ANF431,607 PY2NY375,972	SP9NSA15,844 IZ8EWD15,123	SN3A (SP3GEM)660,576 S51YI538,720	HK3EA565,677 EI9HX89,748	9M2CDX48
YT7B494,700 HZ7C (7Z1SJ)401,604	UT3EV287,421 IQ4JO219,890	YO4BEX13,860 W2VRK12,393	YT1A517,450 EY8MM391,952	IR4P (IK4RVG)71,344 SP3AYA62,178	3.7 MHz
YB1DX323,177 CE3QY292,905	HZ1CY129,753 F4EIH110,538	ON4MGY/P8,268	JH7MQD348,864 OH7K (OH8SR)246,500	EA9KB56,800 F4BIV50,715	SP5FKW13,167 IO5K (IK5TBK)12,210
7 MHz	ISØGRB100,896 EA5EOR82,600	7 MHz	G8X (G4FJK)239,242	E77X25,456 F4IRT24,840	SP5ES11,820 EA5S10,123
ED5R (EA5Z)930,155 4L2M924,189	7 MHz	IZ4VQS23,858 OK6OK18,496	UK9AA191,748 F4FJH186,615	OE2ROL24,702 9A3QB20,824	SQ9SX99 VA7IR50
CR6T (CT1ESV)848,318	4Z5UN244,881 IT9EWR126,260	HA3GC9,760 LY2NK9,750	9K9C135,897	3.7 MHz	1.8 MHz
S57AL775,465 S51CK388,798	9W2JHZ65,898	SV1DZB6,765 G4Y (M6OXO)3,772	3.7 MHz IB3M (OE6MBG)222,860	IZ4REF62,916	S54ZZ18,872 9A/IZ3NVR2,904
OM5R (OM5WW)365,560 JJØVNR256,743	ON8LX47,346 YO3JW36,921	GM4M (GM4ÚBJ)3,696 HG7J2,925	HA1TJ203,796 IK2QPR143,936	OM5KM28,121 SP2N (SQ2HCW)26,260	9A4QV576
YT5DXX175,890 SP4LVG120,524	S53MR35,189 UR5WCQ35,105	E78CB2,730	TI1K (TI5CDA)127,038	YT5ANA24,428 EA3CN18,585	MULTI-OP
R4SA81,699	RC7KY33,666 YDØNHG33,616	ISØAGY2,255	I1JTQ116,748 SP2PIK (SP2MKT)95,351	OK1AY11,544 LY2AT10,965	SINGLE-TRANSMITTER HIGH POWER
3.7 MHz ISØ/OM2TW	Z35U31,950	3.7 MHz OL4W (OK1IF)8,159	YU1LD91,430 W3NO59,580	MMØGOR10,944 DJ6OI10,320	P33W24,948,370 PJ4G19,282,256
(OK8WW)319,277	3.7 MHz	PAØAWH1,972 ES6KW42	MI5K (MIØSLE)40,328 SQ7NSN33,120	OM4AQP9,585	E7DX15,649,472
EE7L151,892 OK5D (OK1DTP)150,474	SQ9MR58,112 SQ8NGV28,842	UB4IIQ/UA6L/QRPP (UB4IIQ)2	1.8 MHz	1.8 MHz	IR4X15,237,992 TM6M14,895,924
W3BGN59,013 VE9FI50,304	S53NW25,288 OM6TX22,420		S56X48,709	OK6Y (OK2PTZ)29,295 E79D26,523	LZ5R13,684,872 EW5A13,254,210
W1FQ21,229 CT1EKD19,520	SP4SHD22,176 EA4IS21,608	1.8 MHz UN9LDC3,354	IKØNMJ21,924 LC5K (LA5YJ)9,844	HF7A11,025 ED3M (EA3FP)10,300	VE3EJ11,834,130 IR4M11,621,455
W1HI19,093 JAØJHA16,215	LY5GT16,165 IN3HEZ13,932	HA1TI3,232 LY4T2,880	DR3W (DL6MHW)7,380 K5UR4,510	MM1E (MMØGOR)4,576 EI6JK2,610	IR6T11,524,994
OK1KTW (OK1DEZ)12,427	OK7R (OK1TNM)13,160 E74SL12,561	DL1AOB1,568 UT4UBZ108	OH2BO2,795 EA1HV2,448	4L7ZS480 RT6C54	LOW POWER
	,		LY7M210 K2KW77	VE9ML24	FY5KE
1.8 MHz S53O65,284	1.8 MHz SP6LUV26,255	SINGLE OPERATOR ASSISTED	LZ2ZG45	QRP	ED7O5,900,622 VP5DX4,417,865
UP7L (UN6LN)38,308 YL3FT28,500	SNØR (SQ9IAU)19,822 YT8A14,716	HIGH POWER All Band	LOW POWER	All Band OK2FD225,990	HZ1BW4,339,212 ED1B3,475,200
OK4U (OK1TP)27,724 EI5GUB6,525	SQ8MFM12,691 RA7KX8,003	PT5J (PP5JR)11,807,370 KP3DX (NP4Z)8,487,812	All Band TM3Z (F4DSK)3,736,488	HG5O (HA5OB)138,831 HF9CW136,344	LX8M3,399,088 WW4LL3,342,634
SP9TPZ4,000 DL2DSA1,947	LC9X (LA9XGA)5,655 OE3WMW5,580	OMØR (OM3GI)8,357,640 V31XX8,312,928	9A2EU2,591,238 UA9MA2,241,680	SQ5CW129,024 YU1LM103,601	IO3F3,311,885 TC7G2,722,296
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	22377777	V 0 17/70,012,920	2,10,11,11,11,11,11,11,11,11,11,11,11,11,		. 5, 6

an incredible 38.7M score. Perhaps the most amazing result of the entire contest, however, goes to the D4Z multi-multi team, who achieved an incredible 50M point score and over 19,000 QSOs! And that included an unexpected one-hour off-time due to a station problem. Imagine the reaction of the CN3A team, who scored 47.4M but came in second. Hats off to both groups for a job well done.

Before moving on, we need to acknowledge our Rookie and Youth entries. Between the two overlay groups, we received 470 logs this year. The CQ WW is indeed attracting newer operators, which bodes well for the contest's future! Roberto, IU00VB, led the Rookies with a fine score of 1.5M. There is some good contest mentoring going on in Italy. And, the Youth contingent was won by Andreas, 5B4AQT, with a

MULTI-OP	KH6CJJ1,060,811	3.7 MHz	WB3GBL6,624	KS1J1,486,660	W2MKM6,047,919
TWO-TRANSMITTER	OL5Y927.639	W3BGN59,013	W8IQ4,590	N3AAA1,317,580	KM8Q4,197,402
EA8RM38,749,256	CO8NMN793,026	W1FQ21,229	KØVK1,848	W3KB1,306,216	AA4VT3,844,200
P4ØL24,628,032	PZ2YT725,000	W1HI19,093	W4RLS1,035	N4XL1,013,520	W4NF3,150,264
ZF1A24,295,992	YO7SR619,440	K2PM9,555	KA7T704	NS3T722,990	K8LX2,220,568
CR6K19,736,855	WA3LXD524,210	W6RKC2,001	04 MH-	KA2KON695,980	W2EN1,980,090
EI7M18,787,860		K5IB36	21 MHz	K8LY670,542	
PX2A17,619,751	YOUTH	1.8 MHz	NDØC47,229	NC1A651,130	MULTI-OP
W3LPL16,260,048	HIGH POWER	K3PA70	14 MHz	00 MH I=	MULTI-TRANSMITTER
ES9UKR16,250,324	5B4AQT1,152,580	K3FA70	W2VRK12,393	28 MHz N1DG516,502	K3LR25,835,784
9A1P15,959,447	DK6SP1,085,640	LOW POWER	K4CUZ230	W4RN304,428	K1LZ21,461,871
ED1R15,804,510	E7ØAW943,236 KHØUA922,209	All Band	K1NLL80	N3UA224,000	WX3B11,870,899 K1TTT11,127,144
MULTI-OP	LX7I (F4HWS)757,520	N1UR4,035,766		W9XT163,280	W3PP6,004,999
MULTI-TRANSMITTER	KE8HBV540.792	K1BX1,593,606	7 MHz	W6ZL67,080	K1KI5,509,664
D4Z50,007,304	DK5AV386,884	WW4XX	WU2M1,333	WA2LMC45,630	K3EST5,432,178
CN3A47,413,520	OE8DDX291,555	(LZ4AX)1,303,932	WA2NYY60	KB3NJB42,930	W2A3,848,526
PJ2T34,239,262	F4IDC249,240	W6DVS791,336		K2ZR37,696	K1KP3,700,234
K3LR25,835,784	DC2CL216,800	K8ZM740,124	SINGLE OPERATOR	K2IW37,146	NE3F2,836,592
M6T21,693,672		N1NQD725,637	ASSISTED	K4JPD35,178	
K1LZ21,461,871	YOUTH	K3SWZ682,348	HIGH POWER	0.1.841.1	EXPLORER
V26B20,092,748	LOW POWER	K5FUV676,620 ACØW559,721	All Band	21 MHz	SINGLE-OP
LZ9W19,672,752	9A3GVJ594,392	WA3LXD524,210	K3WW6,141,828 WB9Z5,813,697	N4IJ151,230	W2MRD11,304
YT5A19,599,723	BD4VGZ256,795	WASEAD524,210	AA3B5,674,212	N9TGR146,727 WA1FCN130,438	ROOKIE
DFØHQ17,362,332	SP3GTP180,632 LY5AX167.014	28 MHz	N2IC5,410,368	WA5WFE77,998	HIGH POWER
EXPLORER	DL2ALY161.200	N8II326,960	N3RS5,085,948	WB9HFK40,940	W9DCT1,093,680
SINGLE-OP	HA1BB157,740	K5OF254,562	K4AB5,004,090	W8TJM11,800	K3AK613.410
S53K479,765	NR1K144,504	N1WRK141,022	N2SR4,869,000	KEØITC10,738	W3FR544,600
9A1DR87,516	KE8RJU142,064	N3GB119,704	AB3CX4,444,160	WV7S940	KO4VW177,310
SQ5EXM16,380	VE3GKT131,338	K4TMC114,814	NN1SS4,209,824		K7WXB141,966
W2MRD11,304	VE3OMV76,428	WK2G110,016	AA1ON4,182,408	14 MHz	KD2UBH135,044
PY2YAS7,168	LINUTED OTATES	W4RYW91,350	00 MH	KO4WPO5,891	N7RBL132,258
	UNITED STATES	N8VW90,780	28 MHz	N1KJS4,700	KI5QKL95,964
EXPLORER	SINGLE OPERATOR	W8JGU76,845	N4EEB618,852	WA8ZNC3,312	N3AML64,800
MULTI-OP	HIGH POWER	WBØLQC70,196	AA9A441,450 NJØF344,800	K4WWP3,016	KFØADW50,410
OT7T9,900,208	All Band	21 MHz	WJ2D284,592	AK2U2,244 W9QEE532	LOW DOWED
IOØA4,328,676 EA4URE3,519,552	K4ZW6,017,235	WA7BNM92,432	W1UE262,780	K1NDU440	LOW POWER AEØDX550,525
9H6A3,297,650	K5TR5,005,155	W9QL64,155	N6SS248,381	WØSAB6	K1MWH250,776
EE7K1,961,756	W9RE4,980,048	W5CUB50,140	N1MM223,524	**************************************	KY4KP220,834
IB2C652,320	KQ2M4,467,840 K3ZO4,289,844	KC8ZMN32,452	W8CZN170,240	7 MHz	N3BAS126,528
9M8J231,504	NR3X (N4YDU)4,127,820	N6RM26,044	W7RN (K5RC)169,500	K1IM18,292	KFØHCN126,224
EA6URL138,533	ND7K	WØJIM13,560	W1AJT161,379	KA9A3,570	KFØIDT123,633
	(@N6WIN)3,007,544	KF5RLL11,913	04.1411	AA4NP2,430	N2EPE102,912
ROOKIE	N2QV2.785.321	N9HDE8,816	21 MHz		N8ACP97,913
HIGH POWER					
	KØEJ2,636,412	WB8SAG4,914	WA2OAX483,653	3.7 MHz	KD2VSD92,160
IUØOVB1,514,955	KØEJ2,636,412 K7RL2,337,120	KI5IQE4,680	W6AFA370,668	W1DYJ3,848	KD2VSD92,160 KR3L80,842
IUØOVB1,514,955 W9DCT1,093,680	K7RL2,337,120	KI5IQE4,680	W6AFA370,668 N7DD328,614		KR3L80,842
IUØOVB1,514,955 W9DCT1,093,680 9A5RTW1,079,910	K7RL2,337,120 28 MHz	KI5IQE4,680	W6AFA	W1DYJ	KR3L80,842
IUØOVB	28 MHz N4OX695,360	KI5IQE4,680	W6AFA	W1DYJ3,848 WZ6ZZ960 QRP	KR3L80,842 CLASSIC HIGH POWER
IUØOVB	28 MHz N4OX695,360 K2XA599,666	14 MHz KB8VND	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M4,467,840
IUØOVB	28 MHz N4OX	KISIQE 4,680 14 MHz 27,335 KB8VND 5,412 K4QR 5,085 KV4AC 4,386	W6AFA .370,668 N7DD .328,614 W9PA .280,716 KM4HI .203,060 W7IL .183,084 NØRN .41,055 WT2J .31,692	W1DYJ	CLASSIC HIGH POWER KQ2M4,467,840 KØEJ2,636,412
IUØOVB	28 MHz N4OX	KI5IQE 4,680 14 MHz 27,335 KB8VND 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420	W6AFA .370,668 N7DD .328,614 W9PA .280,716 KM4HI .203,060 W7IL .183,084 NØRN .41,055 WT2J .31,692 N9TCA .17,301	W1DYJ	CLASSIC HIGH POWER KQ2M4,467,840 KØEJ2,636,412 K7RL2,337,120
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570	28 MHz N4OX	KI5IQE 4,680 14 MHz 27,335 KB8VND 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790	W6AFA .370,668 N7DD .328,614 W9PA .280,716 KM4HI .203,060 W7IL .183,084 NØRN .41,055 WT2J .31,692	W1DYJ	CLASSIC HIGH POWER KQ2M4,467,840 KØEJ2,337,120 WS7X1,553,752
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522	28 MHz N4OX	KI5IQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 5,085 KV4AC 4,386 A31F 3,420 W3EH 2,790 KE3O 2,528	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342	28 MHz N4OX	KI5IQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 5,085 KV4AC 4,386 A31F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342	28 MHz N4OX	KI5IQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER	28 MHz N4OX	KI5IQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 5,085 KV4AC 4,386 A31F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132	KISIQE 4,680 14 MHz 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525	28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132	KISIQE 4,680 14 MHz 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699	28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 KU2M 903,650 N1LN 400,650	KI5IQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565	28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679	KISIQE 4,680 14 MHz 27,335 KBØVND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 KU2M 903,650 N1LN 400,650	KISIQE 4,680 14 MHz 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178	28 MHz N4OX	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178	Z8 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER	28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743 KI5QKL 95,964 WD6DBM 90,948	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ)5,338,158	28 MHz N4OX	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712	28 MHz N4OX	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ)5,338,158	K7RL 2,337,120 28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743 KI5QKL 95,964 WD6DBM 90,948 14 MHz W7WA 667,800 KE8FT 64,480	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352	28 MHz N4OX	Name	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944	K7RL 2,337,120 28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743 KI5QKL 95,964 WD6DBM 90,948 14 MHz W7WA 667,800 KE8FT 64,480 N7TU 59,940 KA3LKM 51,260 W8GOC 19,832	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18 QRP All Band K8ZT 349,160	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) 3,979,508	28 MHz N4OX	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18 QRP AII Band K8ZT 349,160 W6QU (W8QZA) 131,130 W3EK 77,355	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) 3,979,508 ZF2AA (VE9AA) 3,170,244	28 MHz N4OX	Name	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561 KD4RH 5,700 KB7QFE 77 3.7 MHz W3NO 59,580 K3MM 22,400	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) 3,979,508 ZF2AA (VE9AA) 3,170,244 DL2CC 2,677,106	28 MHz N4OX	Name	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561 KD4RH 5,700 KB7QFE 77 3.7 MHz W3NO 59,580 K3MM 22,400 KM2G 16,897	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) 3,979,508 ZF2AA (VE9AA) 3,170,244	K7RL 2,337,120 28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743 KI5QKL 95,964 WD6DBM 90,948 14 MHz W7WA 667,800 KE8FT 64,480 N7TU 59,940 KA3LKM 51,260 W8GOC 19,832 KC3RRF 18,288 W2IKN 5,586 K1ALA 1,342 KI5ODW 384	Name	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) .3,979,508 ZF2AA (VE9AA) .3,170,244 DL2CC 2,677,106 KØEJ 2,636,412	28 MHz N4OX	Name	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB	28 MHz N4OX	Name	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561 KD4RH 5,700 KB7QFE 77 3.7 MHz W3NO W3NO 59,580 K3MM 22,400 KM2G 16,897 W4TTY 4,998 N2KA 1,976 1.8 MHz <td>W1DYJ</td> <td>CLASSIC HIGH POWER KQ2M</td>	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB	28 MHz N4OX	Name	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB 1,514,955 W9DCT 1,093,680 9A5RTW 1,079,910 LX1LC 686,154 K3AK 613,410 IU1NKS 546,720 W3FR 544,600 VE3GJP 423,522 DD5VL 360,570 F4JJS 247,342 ROOKIE LOW POWER EA4HKF 687,635 AEØDX 550,525 EA5JEG 413,699 VA3OKG 331,420 SP9PD 320,565 DL9DX 313,635 TK4TH 308,847 SN3J (SP3DAT) 295,875 IU4NGP 284,130 WP4TZ 266,178 CLASSIC HIGH POWER P4ØT (VE3DZ) 5,338,158 CT3KN 4,838,712 KP2M (KT3Y) 4,586,904 KQ2M 4,467,840 WH7T (WH7W) 4,440,352 EB5A 4,027,944 ED8M (EA8DIG) 3,979,508 ZF2AA (VE9AA) 3,170,244 DL2CC 2,677,106 KØEJ 2,636,412 CLASSIC LOW POWER K1BX 1,593,606	28 MHz N4OX	Name	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB	28 MHz N4OX	Name	W6AFA 370,668 N7DD 328,614 W9PA 280,716 KM4HI 203,060 W7IL 183,084 NØRN 41,055 WT2J 31,692 N9TCA 17,301 KI7N 1,260 14 MHz KVØQ 313,058 WA4JUK 114,829 WM1G 108,000 WF7T 96,247 NIØK 49,294 W7ZR 10,030 W7CO 2,295 N5KAE 1,170 AD7LJ 1,134 7 MHz W6KW 65,508 W4PG 31,995 N9LR 31,125 KG1E 18,291 N7RK 15,561 KD4RH 5,700 KB7QFE 77 3.7 MHz W3NO W3NO 59,580 K3MM 22,400 KM2G 16,897 W4TTY 4,998 N2KA 1,976 1.8 MHz <td>W1DYJ</td> <td>CLASSIC HIGH POWER KQ2M</td>	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB	K7RL 2,337,120 28 MHz N4OX 695,360 K2XA 599,666 K4WI 520,277 N1PGA 467,200 W5PR 375,804 KØPJ 322,010 K1RM 235,524 W4DD 208,080 KW9A 173,476 WE6EZ 138,132 21 MHz KU2M 903,650 N1LN 400,650 WC6H (NU6S) 328,679 N7RQ 269,001 NE8P 233,112 N5CR 171,384 W9ILY 114,400 KØBBB 106,743 KI5QKL 95,964 WD6DBM 90,948 14 MHz W7WA 667,800 KE8FT 64,480 N7TU 59,940 KA3LKM 51,260 W8GOC 19,832 KC3RRF 18,288 W2IKN 5,586 K1ALA 1,342 K15ODW 384 K89ORA <t< td=""><td>KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18 QRP AII Band K8ZT 349,160 W6QU (W8QZA) 131,130 W3EK 77,355 KA8SMA 72,695 N7JI 35,805 NF2L 22,892 N3CI 19,926 KB4FUW 11,826 WC7S 10,296 K7FR 9,316 28 MHz K1WHS 51,624</td><td>W6AFA</td><td>W1DYJ</td><td>CLASSIC HIGH POWER KQ2M</td></t<>	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 K4QR 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18 QRP AII Band K8ZT 349,160 W6QU (W8QZA) 131,130 W3EK 77,355 KA8SMA 72,695 N7JI 35,805 NF2L 22,892 N3CI 19,926 KB4FUW 11,826 WC7S 10,296 K7FR 9,316 28 MHz K1WHS 51,624	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M
IUØOVB	28 MHz N4OX	KISIQE 4,680 14 MHz KB8VND 27,335 KBØKFH 5,412 5,085 KV4AC 4,386 AA1F 3,420 W3EH 2,790 KE3O 2,528 KG5TKF 2,016 KG5ZNJ 1,150 AB1J 666 7 MHz K4SXT 19,440 K7BWC 3,100 N1UMJ 1,472 KM1NDY 1,071 W8WJC 903 N5QNS 684 N5MKY 391 KD5CMW 360 N8TCP 228 K6WBY 187 1.8 MHz W1HIS 18 QRP AII Band K8ZT 349,160 W6QU (W8QZA) 131,130 W3EK 77,355 KA8SMA 72,695 N7JI 35,805 NF2L 22,892 N3CI 19,926 KB4FUW 11,826 WC7S 10,296 K7FR 9,316	W6AFA	W1DYJ	CLASSIC HIGH POWER KQ2M

1.1M point result. What's more amazing about Andreas is that the 2022 CQ WW was his first contest, including his first amateur radio QSO. How's that for getting off to a good start?

What's Your Favorite Category?

When reviewing this data from the 2022 contest (see *Table* 1), I had to do a double-take as it looked almost identical to last year's numbers. We certainly are set in our ways from an operating point-of-view. Keeping in mind that this is solely all band data, the split between assisted and unassisted entries remains the most informative; the unassisted single operator entries far exceeded their assisted counterparts by 3277 to 2344. Interestingly, the unassisted low power group, in particular, led by over 2:1. It's clear, at least for the CQ WW, that the assisted and unassisted entry classes will be here to stay for some time to come.

			To	able 1				
Category	AF	AS	EU	NA	OC	SA	ALL	% of total
SOAB High/Assisted	2	76	462	658	30	38	1266	20.7%
SOAB High/Unassisted	11	136	276	357	59	28	867	14.2%
SOAB Low/Assisted	3	76	537	343	40	46	1045	17.1%
SOAB Low/Unassisted	16	270	1047	733	153	72	2291	37.5%
SOAB QRP/Assisted		3	14	2	3	1	23	0.4%
SOAB QRP/Unassisted		14	66	23	8	8	119	1.9%
Multi-2	2	13	44	27	8	5	99	1.6%
Multi-Multi	2	6	21	18	5	4	56	0.9%
Multi-Single/High	1	16	114	42	9	18	200	3.3%
Multi-Single/Low		23	65	25	12	6	131	2.1%
Explorer/Multi		1	7		1		9	0.1%
Explorer/Single-Op			3	1	1		5	0.1%
ALL	37	634	2656	2229	328	227	6111	100.0%
% by Continent	0.6%	10.4%	43.5%	36.5%	5.4%	3.7%	100.0%	
*Single band entries not	included	in analysis.						

Table 1. 2022 CQ WW SSB Logs by Entry Class

903/23/86 2040/36/129

581/11/57 1744/21/95 3377/36/131 2570/39/142 2823/38/144 1847/35/133

K3LR

M6T

340/14/37

2022 CQWW DX SSB BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

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

USA TOP SINGLE OPERATOR ALL BAND WORLD SINGLE OPERATOR ALL BAND Station 160 80 40 20 15 10 Station 160 80 20 10 PJ4K 130/10/17 524/22/64 1126/26/82 2226/33/84 2361/35/97 3019/27/100 K4ZW 32/10/21 216/16/56 306/25/75 866/30/103 1048/29/106 1205/24/100 V47T 41/6/14 613/17/71 1367/26/89 1992/34/98 2319/29/93 3071/25/97 K5TR 26/10/16 83/18/48 793/30/77 514/32/84 1178/32/97 1289/32/97 P4ØT 11/5/10 399/15/59 568/23/63 1338/32/99 1619/27/86 2030/28/94 W9RE 23/5/11 118/17/53 369/26/74 798/33/103 1025/33/103 991/30/90 CT3KN 22/5/16 347/13/51 324/16/62 1157/29/88 1527/31/95 2457/31/100 KQ2M 18/8/13 201/15/51 92/17/47 595/29/82 1104/26/81 1402/22/89 XL3T 151/7/12 K3ZO 255/13/49 387/24/72 701/20/61 1017/27/90 1847/33/99 1263/26/95 1312/24/99 10/6/6 501/29/81 1098/30/93 797/24/87 WORLD SINGLE OPERATOR ASSISTED ALL BAND USA SINGLE OPERATOR ASSISTED ALL BAND PT5J K3WW 432/27/89 8/4/5 130/17/53 613/32/99 1416/36/113 1637/35/121 2424/33/130 32/9/18 173/18/59 701/33/105 888/30/111 1286/28/117 KP3DX 45/8/13 304/14/59 1102/25/89 1483/35/103 1174/31/105 1868/32/108 WB9Z 26/8/13 206/20/67 192/28/80 366/37/109 770/35/120 1586/33/131 OMØR 210/10/51 577/18/76 846/30/107 1107/36/120 1273/36/124 1142/36/127 AA3B 29/10/20 213/17/58 328/23/81 763/33/105 823/30/110 1106/28/118 882/29/73 V31XX 34/5/7 428/21/65 897/27/88 762/33/96 1595/29/108 2143/31/114 N2IC 25/8/9 108/20/37 367/36/102 1045/33/112 878/32/115 VA2WA 148/9/17 370/16/59 366/22/69 1352/35/109 1408/29/107 1317/27/117 N3RS 30/10/19 133/16/54 186/25/77 555/36/106 942/31/115 996/28/117 WORLD MULTI-OPERATOR SINGLE TRANSMITTER USA MULTI-OPERATOR SINGLE TRANSMITTER 2435/39/149 1863/38/146 3183/39/151 P33W 202/10/56 499/19/78 1921/33/120 K9RS 18/9/16 333/16/66 289/28/88 1164/38/123 1001/32/121 1150/28/120 1540/36/124 2028/36/128 3205/34/129 21/10/19 PJ4G 38/9/16 498/23/79 1690/30/105 K8AZ 68/16/51 192/28/84 394/34/112 623/31/119 1147/32/123 52/11/52 701/22/90 686/31/73 E7DX 1832/34/132 1616/39/144 2013/35/141 2215/38/140 W7RM 17/7/7 165/22/35 541/36/107 880/35/111 381/26/74 IR4X 48/9/48 515/20/80 1333/34/120 1700/39/140 2038/39/146 1943/37/141 K4RM 16/6/6 182/18/60 198/27/77 457/37/108 608/29/110 750/29/122 1491/39/132 1808/37/143 2505/39/139 TM6M 123/11/46 535/19/75 1382/33/114 *WW4LL 3/2/2 122/13/53 174/24/77 383/32/100 404/27/102 1032/27/112 USA MULTI-OPERATOR TWO TRANSMITTER WORLD MULTI-OPERATOR TWO TRANSMITTER 2979/39/143 4464/38/147 4692/38/155 EA8RM 193/11/47 893/21/83 2221/31/115 W3LPL 34/12/28 481/22/81 1126/31/108 1481/39/131 2670/36/141 1822/31/138 2656/38/115 3739/33/119 2972/32/113 456/32/96 1576/33/128 1456/31/126 P4ØL 72/8/18 576/23/75 2120/28/102 K1CC 45/10/29 282/18/72 1380/38/125 784/20/75 2781/29/109 2897/38/116 4186/34/124 4021/33/126 ZF1A 97/6/14 K9CT 42/9/17 212/22/63 512/29/92 786/38/116 1497/35/126 1716/34/129 1098/20/84 1718/31/112 2177/37/133 3457/36/128 2978/38/136 20/8/10 658/34/101 1254/30/116 1432/28/120 CR6K 209/12/48 K2AX 162/13/55 250/26/75 153/14/49 EI7M 173/11/46 1196/16/80 1647/34/119 2257/40/123 3358/38/136 2530/36/127 W2MKM 18/5/6 193/27/78 888/34/113 1284/30/118 1042/28/119 USA MULTI-OPERATOR MULTI-TRANSMITTER WORLD MULTI-OPERATOR MULTI-TRANSMITTER D4Z 1306/23/89 2856/35/119 4819/39/145 4850/37/144 5222/39/153 K3LR 340/14/37 903/23/86 2040/36/129 2767/40/158 3158/38/148 2727/33/142 313/12/53 1981/25/101 3150/32/124 4093/38/144 4328/36/142 4693/39/149 729/23/83 1336/33/112 2361/40/145 2667/37/140 2472/33/137 CN3A K1LZ 178/16/50 954/23/86 2656/30/118 3490/38/130 3973/33/115 4429/34/123 218/14/52 751/28/86 1927/38/117 2227/32/127 1855/30/123 PJ2T 227/14/29 WX3B 22/5/9

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K1TTT

W3PP

178/12/33

16/9/10

397/21/74

120/18/56

828/28/95

1425/37/130 1713/34/130 1681/29/126

170/25/75 1142/37/109 725/30/121 1278/28/119

2767/40/158 3158/38/148 2727/33/142

How Much Time Did You Operate in the 2022 CQ WW?

Operating any contest is an investment in time, especially for serious competitors. For many of us feeling the effects of age, it's a challenge to put in the time it takes to deliver a top score. The CQ WW has an added challenge – it's addicting, especially if we are blessed with the propagation experienced in the 2022 contest.

Operating by yourself as a single operator presents a unique set of physical challenges. However, there are those unique individuals that continue to figure out ways to power through the excuses. As you can see in *Table 2*, there were 14 operators that put in 45+hours of operating – several of whom were active for the entire 48 hours!

Congratulations to the superman club as well as everyone as a whole who averaged 10+ hours this time around. What's your goal for this year?

Getting it Right in the CQ WW!

This is a list of callsigns that you want to be on – the lowest error rates! Each entry in *Table 3* worked at least 1000 QSOs, submitting logs with less than 1% mistakes (e.g., bad calls, not-in-log reports, bad exchanges). Imagine, in several cases, working 5000+ QSOs and having only ~50 QSOs identified as being invalid. These results demonstrate that delivering a winning log is more than simply delivering the highest raw score; it's also about accuracy.

Congratulations to each of these competitors for setting a fine example of world-class operating!

Our CQ WW Youth Operators are Everywhere!

While there is little debate about the advancing age of ham radio operators

			Tab	ole 2			
Op hours	AF	AS	EU	NA	ОС	SA	All
0.1-5	5	162	567	535	64	36	1364
5.1-10	4	124	604	519	85	45	1377
10.1-15	7	120	439	376	57	37	1036
15.1-20	6	58	313	284	38	31	730
20.1-25	6	50	209	194	22	20	501
25.1-30	1	28	122	97	10	13	271
30.1-35	1	17	72	56	11	5	162
35.1-40	2	12	34	33	4	2	87
40.1-45		2	35	18	1	3	59
45.1-48		2	6	4	1	1	14
All	32	575	2401	2116	293	193	5613
Median hour Median time	_	15.2 10.3 houi	10.5	10.3	10.1	9.6	12.3

Table 2 – Operating Time Analysis for the 2022 CQ WW SSB Contest (Single-Op All Band entries)

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
DM6V	101/8/36	510/10/50	762/21/81	1131/31/90	1097/32/92	1108/32/91
S53MM	176/7/37	725/17/72	734/26/90	1061/32/94	991/31/97	807/34/99
EB5A	61/8/31	391/12/61	698/23/79	398/22/69	914/29/88	1045/33/97
OM7K	148/5/35	357/11/53	786/24/86	964/28/84	602/27/69	330/26/61
HB9TOC	186/7/35	636/14/66	667/21/78	421/22/58	678/27/70	501/24/76

EUROPE SINGLE OPERATOR ASSISTED ALL BAND

OMØR	210/10/51	577/18/76	846/30/107	1107/36/120	1273/36/124	1142/36/127
IR2Q	128/9/44	424/15/71	772/30/101	940/37/123	1175/36/128	949/36/124
LY4A	333/11/57	800/21/84	1091/32/107	1013/35/121	727/30/106	1191/33/138
S53M	72/8/43	704/18/81	976/31/112	741/39/124	787/34/119	856/37/132
SN7Q	130/9/35	511/18/68	437/27/85	1486/33/97	1004/33/103	1014/36/120

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

E7DX	52/11/52	701/22/90	1832/34/132	1616/39/144	2013/35/141	2215/38/140	
IR4X	48/9/48	515/20/80	1333/34/120	1700/39/140	2038/39/146	1943/37/141	
TM6M	123/11/46	535/19/75	1382/33/114	1491/39/132	1808/37/143	2505/39/139	
LZ5R	56/9/44	723/21/83	1674/34/120	1941/40/142	1746/37/141	2124/38/147	
EW5A	178/10/51	957/24/94	1423/31/120	1413/40/142	2079/37/145	1657/36/144	

EUROPE MULTI-OPERATOR TWO TRANSMITTER

CR6K	209/12/48	1098/20/84	1718/31/112	2177/37/133	3457/36/128	2978/38/136
EI7M	173/11/46	1196/16/80	1647/34/119	2257/40/123	3358/38/136	2530/36/127
ES9UKR	364/10/54	1172/23/90	1997/34/124	2652/40/157	2830/38/148	1570/37/144
9A1P	221/8/45	1178/20/81	1599/34/118	2629/40/129	2015/38/136	2044/39/145
ED1R	137/10/46	969/18/76	1792/31/110	1790/38/128	2575/37/134	2598/37/132

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

M6T	581/11/57	1744/21/95	3377/36/131	2570/39/142	2823/38/144	1847/35/133
LZ9W	566/10/56	1819/24/99	2876/34/131	3636/40/146	2343/38/141	1458/37/132
YT5A	587/11/58	1634/22/88	2836/35/123	3340/40/144	2556/37/139	1747/38/138
DFØHQ	805/14/65	1673/23/93	2777/34/128	2250/40/145	2086/37/145	1390/37/136
OT5A	496/8/47	1527/17/74	1990/28/109	1865/39/126	1601/35/121	1131/32/106



Bob, W3HKK, built this low-budget 10M Moxon Yagi just for the CQ WW contest. Who says you need big antennas to have fun?

Remembering Fred Laun, K3ZO

BY KEN CLAERBOUT, K4ZW

grew up in Cedar Grove, Wisconsin. A short thirty-five-mile trip to the northwest would find you in Kiel, home of the AA Laun Furniture Company. Given that my parents ran a furniture store, I would make frequent trips, while in high school, to Laun Furniture to pick up needed items. During that time, although Fred had moved to the Washington, DC, his legend with the local hams was already well established.

I was once told if you ever heard Fred running a pileup, just yell "Sheboygan County" and he'll stop the pileup in its tracks and answer you. Shortly thereafter I found HS1ABD on SSB for a new one and I did as I was told. Sure enough, Fred told everyone to standby while he worked the station from Sheboygan.

I first met Fred in 1984 after I moved to the DC area. One day, I called him on the phone and he graciously invited me to visit on a sunny Saturday morning. Fred said, "The crew will be here putting up an 80-meter beam." Really? An 80 meter beam?!? This was the mid-80s. Not many people had rotatable 80-meter yagis back then and still don't today.

Over the years, like most of you, I came across Fred in almost every contest. There was always that extra "dit dit" at the end of the exchange as a couple of cheeseheads were doing nothing more than exchanging good wishes.

Some years ago I was visiting Fred and he said, "Can I ask a favor?" Not knowing what it was, but coming from Fred, I said, "Of course!" It turned out that he had a couple TenTec Titan amps that needed to be repaired. Fred mentioned, "I understand you have a bench and that you do repair work. Could you look at these amps for me?" Well in fact I didn't have a bench and I didn't do equipment repair but I said, "Sure I'll take a look." Over time, this unexpected beginning morphed into my becoming the K3ZO station engineer, helping with other projects in the shack. KC1XX and team took care of the outside projects.

One upside to volunteering for this work was that we would get together on a more frequent basis, often going out to dinner together. When COVID



Beloved contester Fred Laun, K3ZO (SK), standing next to one of his many passions — the Yasme QSL collection at Austria's DokuFunk museum in Vienna, Austria.

hit I would cook up some brats, bring him some Gibbsville (WI) cheese, and we would hang out at his place chewing the rag. Topics ranged from ham radio, sports and the Green Bay Packers, our experiences working overseas with the government, and world events. Fred's degree was in political science, after flunking out from the engineering program at UW Madison. His broad view of the world always provided an interesting perspective. I valued that time together and was happy to have had a hand in keeping his beloved ham station operational, because I knew it meant a lot to him and it was something that kept him active in his later years.

On Sunday morning, December 18, 2022, I was standing in the international arrivals baggage area at Dulles airport having just spent 17 hours on an Ethiopian Airlines flight from Addis Ababa in a cramped economy seat. I was looking forward to getting home. Two calls from the same number came in back-to-back, the second time leaving a voice message. It was his neighbor Roger. Fred was ill and

slipped getting out of bed. At that time, he was alert but too weak to move around on his own. Naturally, I immediately drove over to his house. Shortly thereafter, K4YT's XYL, a doctor and close friend of Fred, arrived. With the help of paramedics, we moved Fred into Roger's car and took him to a local hospital at his request. The ensuing days were a blur as we spent many hours together in that hospital room. Sadly, K4YT and I last saw him on Monday, January 2, 2023. Before we left, I squeezed his hand, told him I cared about him, and let him know the Packers kicked the Vikings' butt on Sunday and that they still had a chance to make the playoffs. He would have taken great delight in that. There was no response. We lost him the next day.

How fortunate we are to have such icons in our club. Like most everyone in the contest world, I've never operated a major contest without K3ZO being on the bands. His station will eventually be dismantled. But the memories that so many of us cherish will last forever.

RIP OM. It was a hell of a run.

SINGLE-OPERATOR TOP SCORES IN MOST ACTIVE ZONES

Zone 3	Zone 15
ND7K (@N6WIN)3,007,544	\$53MM5,834,028
K7RL2,337,120	OM7K (OM7RU)3,035,167
K6XX2,272,739	YT3D2,435,860
K6NA1,478,655	S57K2,283,131
W7WA667,800	OH5BM1,584,008
Zone 4	Zone 16
XL3T (VE3AT)9,135,758	*UA3BL543,968 R3RZ390,033
K5TR5,005,155 W9RE4,980,048	*RC5Z318,396
KØEJ2,636,412	*R6KX293,917
VC3R (VE7VR)2,323,322	*UT3EV287,421
VOSIT (VL7 VIT)2,525,522	01027,421
Zone 5	Zone 20
Zone 5 K4ZW6,017,235	
Zone 5 K4ZW6,017,235 VY2TT (K6LA)4,993,944	Zone 20 C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332
K4ZW	C4W (5B4WN)7,784,250
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745 Zone 25
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745 Zone 25 JH4UYB3,562,173
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745 Zone 25 JH4UYB3,562,173 JF2QNM1,791,325
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745 Zone 25 JH4UYB3,562,173 JF2QNM1,791,325 JF1NHD (N6VI)1,574,703
K4ZW	C4W (5B4WN)7,784,250 *4XØT (4Z5FI)2,152,332 TA3DE1,992,144 YPØC (YO3CZW)1,779,138 YM7KA (TA7I)1,164,745 Zone 25 JH4UYB3,562,173 JF2QNM1,791,325

	Table 3						
Entrant	Continent	Power	Raw Qsos				
P40T (VE3DZ)	SA	HIGH	6021				
WP3C	NA	LOW	4980				
DM6V (DL7FER)	EU	HIGH	4754				
WH7T (WH7W)	OC	HIGH	4474				
ED8M (EA8DIG)	AF	HIGH	3301				
9N7AA (S53R)	AS	HIGH	2620				
KH6CJJ	OC	LOW	2336				
OA4SS	SA	HIGH	2143				
K6XX	NA	HIGH	2049				
4X0T (4Z5FI)	AS	LOW	2019				
K0EJ	NA	HIGH	1947				
FG5GP	NA	LOW	1842				
PY2KJ	SA	HIGH	1463				
K1BX	NA	LOW	1414				
OK2MBP	EU	LOW	1408				
ZD7BG	AF	HIGH	1395				
YO3RU	EU	HIGH	1373				
K6NA	NA	HIGH	1359				
PC2T	EU	HIGH	1309				
OE1HHB	EU	LOW	1227				
DP5P (DL1MHJ)	EU	LOW	1175				
WW4XX (LZ4AX)	NA	LOW	1174				
KN2M	NA	HIGH	1152				
OH2PQ	EU	HIGH	1099				
G9P (M0NCG)	EU	LOW	1017				
OL5Y	EU	LOW	1016				
*single operator, all band entries only							

Table 3 – Accuracy Winners for the 2022 CQ WW

overall, it's exciting to see the participation by the Youth crowd (25 years old or younger) in the CQ WW. Table 4 demonstrates that the youth phenomenon is certainly global in nature with logs having been received from 31 countries, led by Germany which squeaked out a log entry win over the U.S. participants.

A Few Words from the Director

It's rewarding to this log checker that the vast majority of this year's operators played by the rules, submitting some of the cleanest logs we have seen in years. Unfortunately, there are still some notable challenges, particularly in the areas of:

Self-spotting (while allowed by some contests, it is still not permitted in the CQ WW),

Out-of-band operation (this is a combination of operating outside of IARU/country restrictions or the bounds of your current license class).

Recordings (this continues to be a challenge as many scoring leaders are not providing requested audio recordings making it more difficult to defend the log entry's claims),

Interlocks (the rules are clear; interlocks for multi-op stations are required to prevent simultaneous in-band transmissions and risk of disqualification).

Lastly, one of the least desirable aspects of creating this report each year is to recognize the friends that have left us. And, while I can't acknowledge everyone, there was one spe-

			Table	4		
Country 5B 9A BY DL E7 EA	AS 1 9	EU 3 15 2 1	NA	OC	SA	ALL 1 3 9 15 2 1
EI F G HA I JA	4	1 1 1 3 2				1 1 3 2 4
K KH0 LX LY OE OK PA PY		1 3 3 2 1	14	1	1	14 1 3 3 2 1
SP SV TA UA9 VE VK VU	1 1	8 1	2	1		8 1 1 1 2 1
YB YO YT ZL Totals	17	2 1 51	16	6 1 9	1	6 2 1 1 94

Table 4 – 2022 CQ WW Youth Entries by Geography

April 2023 • CQ • 27

^{**99+%} callsign accuracy with >1000 QSOs

One of this year's Explorer station entries: Here is Jun, BD3CT, blasting away from BY3CQ.



Youth Operators in Action

My First Contact, Andreas Tsiakkouris, 5B4AQT

Hello from the beautiful island of Cyprus! My name is Andreas and I am 12 years old. I was licensed in September 2022, one month before the CQ WW SSB 2022 contest. In fact, my first-ever QSO was my first contact in this year's CQ WW SSB contest with Marios, C4W!

My father, 5B4AFM, has been an amateur radio operator and contester for many years and I was able to see him operate contests and sense the excitement and energy that went into every contest effort. The sound of HF radio and rapid-fashion QSOs was familiar to me but this year was my turn to have a go in the driver's seat!

I was able to operate for about 15 hours, enjoying every single contact and the thrill that came with it. It felt like I was undergoing the ultimate crash course in amateur radio as I was learning all about CQ zones, DXCC entities, openings to various parts of the world, low bands, high bands and the phonetic alphabet with all its variations! At times, it all became quite daunting and when the pile-ups grew out of control I had to take a break. The experience was unforgettable and amazing fun! By the end of the contest, I had more than 1000 QSOs in the log and achieved DXCC!

I am already looking forward to my next contest, becoming involved in the youth community, and meeting new friends from all around the world that share my passion for amateur radio!

Hello from Croatia, Josipa Vincetic, 9A3GVJ

My name is Josipa, 9A3GVJ, from



Here is 12-year-old 5B4AQT at work. Andreas' first ham radio contact was in the 2022 CQ WW SSB Contest!

Croatia. Ever since I was a little kid I have listened to my dad, 9A3AG and other members from my local radio club working big contests. I was amazed by the pile-ups and got hooked on the adrenaline rush, even when I was just listening! For many years I was scared to operate as a single-op in a big contest like the CQWW and would maybe do an hour here and there. But, with the new Youth overlay opportunity, it felt like it was now my chance to see what I can do on my own and against competitors like me.

I participated in the CQWW SSB in 2022 as a single-op, low power, all band entry from my home location. I had a

goal of operating at least 24 hours and making 1000 QSOs. With an operating time of just over 27 hours I reached my goal with over 1000 QSOs! It was really exciting to work with just 100W and discover what I could achieve. I was thrilled to work many new DXCC entities as well as learning rare country names, including many Caribbean islands, while logging my QSOs. While calling CQ, the pileups calling me were amazing — like I always imagined! It was also exciting to "hunt" for stations and trying to be heard amongst a pileup of higher-powered stations. My fear of operating by myself quickly disappeared within the first 15 minutes! Hearing a lot of young

cial individual who we simply can't ignore, Fred Laun, K3ZO. Fred was a long-standing member of the CQ WW Contest Committee. His level-headed guidance was a treasure to my team and to all of you as was his friendship. It was while I was standing in Fred's living room one afternoon nearly 50 years ago that I first became exposed to CQ WW log checking. There are so many things that have been said since Fred passed. Ken, K4ZW, wrote one the best tributes, which I'm honored to include in this write-up. In the meantime, thanks for everything, Fred. You were one of a kind, the likes of which we'll likely never experience again.

And, Finally...

This is my fourth year serving as your CQ WW Director. If I've learned anything through this experience, it's that we have the most dedicated and competent team of log checkers in all of contesting! They make my job so much easier and it's my privilege to give them all the credit for the results being reported this month. In particular, my sincere thanks go to: AA3B, Bud Trench; CT1BOH, José Nunes; EA4KD, Pedro Vadillo; ES5TV, Tonno Vahk; F6BEE, Jacques Saget; G0MTN, Lee Volante; HA1AG, Zoli Pitman; IK2QEI, Stefano Brioschi; JH5GHM, Katsuhiro (Don) Kondou;



Youth operator Josipa, 9A3GVJ, having a blast in the WW! Look at all those QSOs on her computer screen!

voices was amazing. It feels like the network of young hams is growing rather than disappearing.

In my opinion, the new Youth overlay in CQWW is an amazing opportunity for youngsters. It gives the feeling of a "safety net, like you are competing with other youngsters and beginners and not just the big-gun stations. It also eliminates the pressure of having to be perfect and connects youngsters around the world, which is truly needed. I hope to see more and more youngsters submitting their log in the Youth overlay every year and hear them on the air! And, why not consider youth overlays in the multi-op categories too?

Small Station, Youthful Operator, Joseph Bondi, VE3GKT

I'm Joseph, VE3GKT, and at 25 years old, have been licensed just shy of

three years. I operated the 2022 CQWW SSB from my second-floor bedroom in the Toronto area, with a 40meter EFHW and 100 watts from my IC-7100. The window is about 15 feet above ground with the wire sagging down from its peaks of 30 feet in the backyard tree. I feel like I've done very well, especially for such a low antenna! It was a blast to work so many excellent operators, and it was very interesting to work some of the Caribbean stations on several bands and to hear propagation changes throughout the day/night cycle. The high point was working FR4KR, Reunion Island, on 10m SSB!

Although I'm still learning how to become a better HF contester, my operating situation at home is not the most comfortable. In the meantime, I'm gaining more experience including activating POTAs, plus some Limited Rover operations in VHF contests and, of course, looking forward to the next WW.



Exploring the CQ WW Contest

BY FERNANDO, EC3A

'm Fernando, EC3A (formerly EA3KU). For some time, together with two other colleagues - EB4Z and CT1DRB, I have collaborated with the HF Committee of the Unión de Radioaficionados Españoles – URE in Spain. The result was that our team entered the Multi-Operator Explorer category in the 2022 CQ WW contest as EA4URE.

Taking advantage of the recently created Multi-Distributed category for the CQ WW WPX and the Explorer overlay in the CQ WW, our team eagerly anticipated the possibility of participating in these contests and categories. The objective was simple: to encourage our teammates to participate in contests, teach the use of currently available technological tools and improve everyone's contest operating techniques.

As our planning began, we discovered that operators wanted to be part of a team in the multi-multi category while also using their own stations. In the end, our group was a multi-multi team with a mixture of both expert and inexperienced operators, using a variety of LP or HP stations and antennas ranging from simple dipoles, vertical or small yagis distributed throughout the territory of operation. All that was absolutely required was a share of the shack's personal computer and the radio station itself (transceiver, antenna and amplifier for those participants who had them) to support the following technical goals:

- Chat and videoconferencing software for meetings required for planning, pre-contest coordination, etc. of all group.
- Logging software. N1MM+ properly configured to perform interlock functions in stations to guarantee compliance with the contest rules, guaranteeing that only one simultaneous signal is transmitted per band/mode.
- Communications software to implement the VPN network required by N1MM to implement the distributed computer network.
- Assurance that the interconnection of all the PCs of the N1MM+ network received the information of the DX Cluster Network from the master computer that was connected to the DX Cluster server of EA4URE-5.
- Availability of the chat window during the contest that N1MM+ incorporates as a communication tool between the different team operators.

The operation of the infrastructure was perfect. The network worked without interruption during the entire 48-hours of the contest and the software used, together with the strategy for its use, allowed team members adequate operating time according to their availability. The resynchronization option between the different PCs on the network worked correctly when, due to circumstances, some of the PCs on the network were temporarily disconnected and reconnected later.

Additionally, my role or that of another assigned member of the HF Board of URE, ensured that the connection status of the different PC's of the group stations was supervised and monitored as well as the correct operation of the interlock requirements between the RUN and S&P stations.

In the end, we want the EXPLORER category to be maintained and included in other contests as it is a good way to encourage participation in contests and integrate new technologies.

73 and good DX, Fernando, EC3A (formerly EA3KU 1979-2020)

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; OH6LI, Jukka Klemola; PA3AAV, Gert Meinen; RA3AUU, Igor (Harry) Booklan; S50A, Tine Brajnik; S50XX, Kristjan Kodermac; UA9CDC, Igor Sokolov; VE3EJ, John Sluymer; VK2IA, Bernd Laenger; YO3JR, Andrei (Andy) Ruse.

The next CQ WW SSB contest is only a short six months away! I hope to hear you in October!

73, John, K1AR, CQ WW Contest Director

(Scores begin on page 92)

A Makeshift CQWW Yagi and Other Antenna Musings

BY BOB ELEK, W3HKK

ith only a few days to go before the beginning of the 2022 CQ WW SSB contest, I decided to build a 10-meter Moxon from my scrap heap of spare parts (see W3HKK photo). Being a lightweight antenna, I was able to erect it on a 16-foot PVC mast located on our rear patio, turning it by the old-fashioned Armstrong method. That little antenna did an amazing job, giving me a taste of what it was like back when I had a KT34XA at 60 ft, and ruled the world on 10-15-20. It's hard to appreciate an ugly duckling that cost nothing to build – that is UNTIL you put it to the test in the CQWW!

The contest and DX bug has always been part of my operating experience since joining the ranks of ham radio in 1956. My long ham radio story of make-shift antennas includes operating experiences in 1969 when I was working in offshore seismic oil exploration based in Takoradi, Ghana. Having purchased a Swan 500C in London, I brought the radio with me into Ghana, stopped by the Ghanaian PTT on a lark and inquired about obtaining a ham license with the Director, Mr. Amatewee. In reality, he was actually more interested in whether I thought we would actually find oil than anything else. But, within five days I had his signature on my license as 9G1GS. And, while the timing wasn't right to operate in the CQWW, I borrowed some tower sections and a spare rotator from the ship's supplies, hired four local kids to chop some bamboo for me, and built a 2-el 15m quad, carried it through the lobby of the Hotel Atlantic and onto the beach in Takoradi.

One day I heard a guy with an unusual accent talking on 15 Meter SSB to his "press agent" near Washington, DC. After about a half hour of listening to reports about his crew and his vessel, I learned it was a papyrus raft floating on the currents off the coast of Ghana. He mentioned his name (Thor) and that he would continue daily updates as the stern of his boat was reportedly slowly sinking into the sea. I finally figured out it was Thor Heyerdahl of Kon-Tiki fame, trying to cross the Atlantic on his recently built vessel, the "Ra." Heyerdahl went on to build a second Ra raft with improvements in design and made the trip a second time one year later, reaching Trinidad before the crew finally had to abandon ship and be rescued. I was able to hear it all with via his single radio transmitter and small antenna. Having read his books as a kid and then being able to listen to him via ham radio as he tried another death-defying adventure was amazing. How great was that for a young kid just out of college who has since had many DX and contest adventures of his own?

Announcing:

The 22nd Annual CQ World Wide Foxhunting Weekend

Saturday, May 13- Sunday, May 14, 2023

he 22nd annual CQ World Wide Foxhunting Weekend will be held on Saturday, May 13th and Sunday, May 14th, 2023. *CQ* doesn't impose any rules or offer any awards for this activity. That's up to you and the hams in your hometown. Your hunt can be mobiles or all on foot. Since the primary objective is lots of participation, we don't even insist that your event be on that weekend. Any time is fine with us.

For mobile "T-hunts," some groups 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. For on-foot hunts, use the international rules <www.homingin.com/intlfox.html> or make up your own. Talk it up on the local repeater and social media to find out what your friends have in mind.

Foxhunting teaches an important skill — the ability to find the source of signals from afar. RDF (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 ensure your group has *safe* fun. See to it that no one can be injured by your hidden transmitter or by trying to get to it.

Don't let the excitement of the hunt make you an unsafe runner or driver. Make sure that all transmitting and receiving antennas are safe for the eye. Always be mindful of your own physical limitations and never take chances behind the wheel or in the forest. For more foxhunting ideas, see "Homing In" in the February 2023 issue of *CQ*.

Afterward, write up the results and send them to me at <k0ov@homingin.com>. The list of information in a complete CQ Foxhunting Weekend report is posted on my website <www.homingin.com/joek0ov/report.html>. 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.

I look forward to receiving your news and photos of mobile and on-foot transmitter hunts in your locality. Happy Hunting!

Joe Moell, KØOV

what's new

Cobra Announces Production of AM/FM CB Radios

While we don't normally cover CB radio in CQ, the FCC's 2021 decision to permit the use of FM as well as AM and SSB on CB is one of the service's biggest changes in decades, and since many of our readers also operate on 27 MHz, we felt that the addition of FM-capable CB gear was worthy of a report. – Ed.

Cobra Electronics, known for its production of AM CB radios, has recently announced that it has widened its range to include FM alongside already-existing AM radios. The addition of this new capability was originally reported in *RadioWorld*.

The company says that the new FM transmission in CB radios will provide high-quality audio during radio conversations with nearby CB radio transceivers, helpful for truckers, off-road vehicle operators and others. If, however, distance is the priority, AM can be used with full AM and single sideband modes.

The addition of FM capability is the product of four years of Cobra petitioning the FCC for a rule change to Part 95 to make the FM mode to be legal for use in CB radio products. During this time, the company reached out to its CB radio customers, off-road vehicle clubs, and CB radio distributors in order to boost its case for the need for FM in their radios. In 2021 this strategy paid off, and the FCC granted permissions for AM/FM CB radios to be sold in the United States.



Cobra is now the second major CB manufacturer to introduce AM/FM CB radios.

"Our team has been on the forefront of working with the FCC since 2016 to make AM/FM CB radios possible," said Gail Babitt, CEO of Cedar Electronics, parent company of Cobra, in a news release. "The implications this will have on users like professional truck drivers, fleet managers, and local delivery services will be amazing — making communication clearer and more productive than ever while on the road."

The new dual-mode capabilities are available on several Cobra models, including the 29 LTD Classic, 29 LTD Chrome and 19 MINI AM/FM. The 29 LTD NW AM/FM CB Radio will be available later this spring.

Operating Winter Field Day out in the field is always a challenge. W4FSV added to his personal challenge by operating outdoors with vintage tube gear. At least it kept him warm!

A Vintage Winter Field Day...

Keeping Warm With Vacuum Tubes

BY WILLIAM F. MINIKIEWICZ,* W4FSV

inter Field Day was only a week away when I received permission to operate in a local county park. This location was just about 10 miles from my home QTH and had covered picnic pavilions that would protect against precipitation, but do little for wind and cold temperatures (*Photo A*). The local (South Carolina) forecast was calling for overcast skies and chilly temperatures in the 40s and 50s. Certainly, the weather would not be much of a problem. So, I found another way to make things interesting.

For some time, I have contemplated the possibility of operating a modern contest with vintage gear. Winter Field Day provided the opportunity. I decided to dust off my 1960-vintage Hallicrafters SX-140 receiver and 1961 HT-40 transmitter along with the matching HA-5 VFO with the intention

Photo A. The author's Winter Field Day setup in a picnic pavilion at a local county park. Note the generator in the background, straight back from the brim of the author's hat.

^{*} E-mail: <w4fsv@breadboardradio.com>



Photo B. Front view of the author's vintage Winter Field Day setup. From left, Hallicrafters SX-140 receiver, HA-5 VFO and HT-40 transmitter.

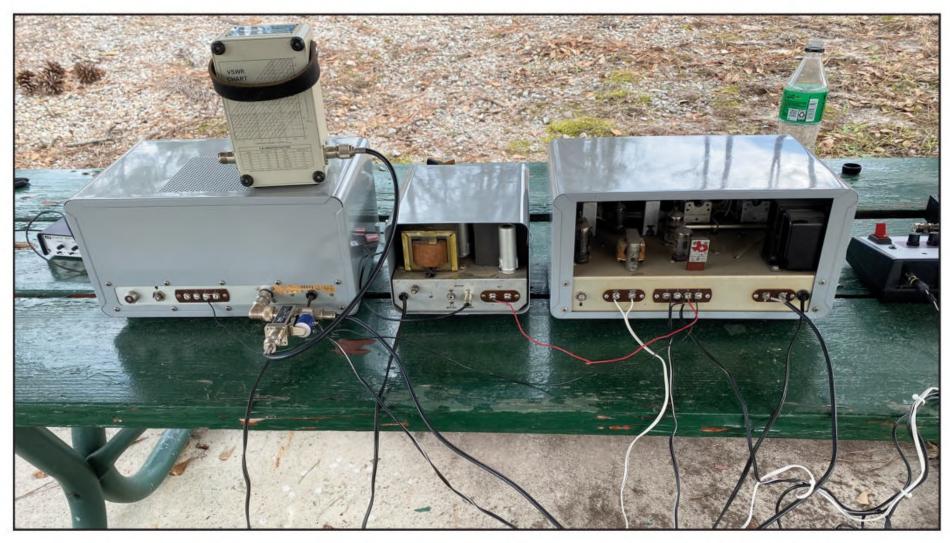


Photo C. Rear view of the vintage equipment. Even 60 years ago, "wireless" wasn't really wireless!

of operating in the Winter Field Day with 60-plus year-old equipment.

You Gotta Love a Challenge

While my fellow operators above the Mason-Dixon Line would be challenged with keeping warm, I would be enjoying the gift of 13 vacuum tubes with ductile tungsten filaments glowing red hot at around 1500 degrees. Spoiler alert: while that



Photo D. If you look closely, you can see a crystal plugged into the HT-40 transmitter. Bill's backup supply of vintage crystals came in handy when he realized that spotting a contact with the VFO was too time-consuming in a 21st century contest setting.

sounds pretty hot, the actual temperature of a tube's glass envelope is generally less than 500 degrees which could still burn curious fingers or toast a bagel. The only benefit I noticed was that my ceramic coffee mug was kept warm sitting on the top of my HT-40 above the 6DQ5 final amplifier tube. On the other hand, my vintage Hallicrafters gear that thrilled many a novice class operator in the 1960s proved to be quite a disadvantage in the 21st century contest environment.

Living the Dream

I arrived at the park around 10:00 am and was met by two ham friends, Richard Rivera, KQ4AMD, and Phil Shreves, N7GZT. They were there to give me a hand with the setup and to operate their own stations in other areas of the park. My vintage gear was arranged on a picnic table (*Photos B* and *C*) and augmented by an audio CW filter and an electronic keyer used to supply a sidetone (which was not provided by the 1961 HT-40). The 60 watts of RF output was delivered to a 40-meter off-center-fed dipole that was hung between two trees at about 30 feet high. Antenna T/R switching was handled by a coaxial switch actuated by the function switch on the SX-140. Electricity was supplied by a small gasoline-powered generator.

Before the event officially started at 2:00 p.m., I tested the set-up on the air and made two contacts. These test contacts revealed a potential problem. The VFO required way too much time to accurately spot on a station, especially during a contest. Luckily, I had a good supply of FT-243 crystals with me to save the day (*Photo D*). Of course, using rocks limited me to repeatedly calling "CQ WFD" and relying on stations to answer my call. Four hours later, it was time to QRT and we had worked only six other stations. While contacts were few, it was great fun using my six-decades-old gear. Besides, try keeping your coffee warm with transistors!

Professor Emil Heisseluft investigates how potatoes have the potential to solve the world's energy problems.

ACQ Exclusive: Emergency Power Generation Systems Using Starchy Tuber Arrays

BY PROFESSOR EMIL HEISSELUFT*
LAUTON INSTITUTE, GROSSMAUL AN DER DONAU, AUSTRIA

The availability of emergency power-generation systems is becoming an ever-increasing challenge, especially given the impact of climate change and with it, the number of natural disasters occuring worldwide. Amateur operators are among those most affected, for who among us at one time or another has not been inconvenienced, at best, by not having access to the airwaves because our primary power source was unavailable? Gasoline- and propane-powered electrical generators, of course, have always been used in such situations, though noise (both of the audible and electrical varieties) impose limitations (the former, especially, limiting their use in urban areas). Now, solar systems are increasingly being employed, though their costs still can be prohibitive in some applications. Below, the good professor introduces us to still another option: the use of starchy tuber arrays that portend the generation of electrical power at a uniquely low cost, giving us the promise of efficient emergency power generators, even for use in the Third World. -- W2VU

Introduction and Background

The Lauton Institute has a long and distinguished history of participating in the exploration of bleeding-edge science, including molecular biology and genetic engineering. For example, the first paper published in the popular literature by the Lauton Institute on molecular engineering was an article that appeared in the April, 1982, issue of CQ on the threat to molecular electronics from microbes produced by genetic engineering.¹ The seminal research on this topic was performed by the Institute's prestigious Genetic Engineering and Research Center (GERC; see Figure 1), which was formed in 1971 and which, by the early 1980s, was recognized as a world leader in the development of new microbes using genesplicing techniques.² In the years that followed, GERC discovered revolutionary new ways to slow the aging process.³ The research was paid for by three well-known, high-scoring DXers

who had approached me in Dayton in the early 1990s. They offered to fund a research program that would lead to the development of drugs that extended their lives to the point where they could ascend to and remain at the top of the ARRL DXCC Honor Roll for decades while their competitors died off. So, you see, my dear readers, the Lauton Institute has been at the forefront of

molecular biology and genetic engineering since the early 1970s. This legacy bodes well for the success of our most recent work in the field of emergency power generation systems using tuber arrays.

The Lauton Institute's Genetic Engineering and Research Center [which also houses the Center for Research of Abnormal Personalities (CRAP)], seen

Photo A. The Lauton Institute's Genetic Engineering and Research Center outside Grossmaul an der Donau, Austria.⁴

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^{*}Professor Heisseluft has returned to the Lauton Institute, Grossmaul an der Donau, Austria, where he is assisting his government in developing a new strain of potato that will yield a superior electrical potential when employed in a tuber array. Mail may be conveniently sent to the professor c/o CQ Magazine, PO Box 1206, Sayville, NY, 11782.

in *Photo A*, is located in a forested setting just outside Grossmaul an der Donau, Austria. The facility currently is treating five Radio Amateurs who recently formed a DX contesting club. The members anticipate erecting a rotating tower with Yagis for 160 through 6 meters at the peak of the mountain. Doctors and nurses are in attendance during all contests. The club will be using an all-tuber array of power supplies during the next DX contest to text its capability to function under emergency conditions.

Some Background on Starchy Tuber Electrical Generation Arrays

The first mention of the use of potato batteries in the scientific literature highlights the work of Golberg, Rabinowitch, and Rubinsky at Hebrew University and the University of California at Berkeley. According to these researchers, "we show that boiled or irreversible electroporated potato tissues with disrupted cell membranes generate electric power up to tenfold higher than equal galvanic cell made of untreated potato. The study brought about basic engineering data that make possible a systematic design of a Zn/Cu-potato electrolytic battery. The ability to produce and utilize low power electricity was demonstrated by the construction of a light-emitting diode-based system powered by potato cells. Primary cost analyses showed that treated Zn/Cupotato battery generates portable energy at 9USD/kWh, which is 50-fold cheaper than the currently available 1.5 V AA alkaline cell (retail) or D cells (49-84USD/kWh)."5

First Application to Amateur Radio

Dear readers, you are most fortunate that, with *CQ* at the forefront of developments in amateur radio, the first amateur-related application of potatoes to power generation has already been described in the pages of this august magazine. Specifically, Hiroki Kato, AH6CY, in the July 2022, issue, published a seminal article titled "'Green' Power for QRPp."

Here, he described how it was possible to obtain between 0.5 and 0.9 volts from a single potato regardless of the size of the potato or the distance between the two electrodes used. He also noted that by increasing the size of the electrodes, he could increase the current output without changing the voltage, and that it was possible for a

potato to produce output for as long as a month even after it became moldy or rotten.

Beginning with a number of experiments employing a variety of copper and zinc-plated electrodes, one of Kato's more successful batteries, shown in *Photo B*, comprised a bank of eight cooked potatoes tightly wrapped in plastic tape. The two electrodes (again, copper and zinc) were bent into a "U" shape to increase the contact sur-

faces. Further experimentation by Kato yielded a 6-cell mashed-potato array in a 6-section plastic case that generated about 5 volts and a current greater than 30 mA.

High-Power Systems

While little known outside of the academic community, The Lauton Institute's Genetic Engineering and Research Center (GERC) has for the last several years worked with the Hebrew

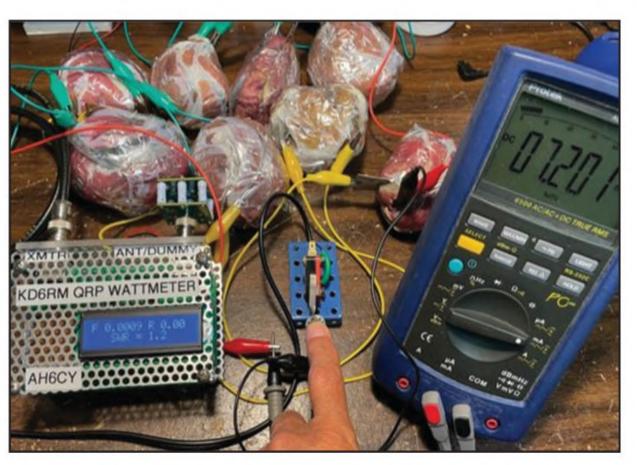


Photo B. This eight-bank tuber array produced 1 mW of power with a current drain of 7.729 mA. (AH6CY photo)



Photo C. Shady Brook Farm in Yardley, Pennsylvania, yields from 25,000 to 35,000 pounds of potatoes per acre, more than enough for the Lauton Institute's experiments.⁷

behind the bylines...

... a little bit about some of the authors whose articles appear in this issue.

Jim Millner, WB2REM ("An Interview with ChatGPT on the Future of Ham Radio," p. 12), is a frequent contributor to CQ, and is a retired licensed psychologist. He is keenly interested in the integration of ham radio and robotics, and previously published an article in the December 2019 issue of CQ entitled, "Al Meets AR – The Coming Convergence of Artificial Intelligence and Amateur Radio." He has been a ham for 60 years and is a high-speed CW operator and DXpeditioner.

Sherlock ("Sherlock Investigates: Seismic Signals Below 1 Hz," p. 16), is a longtime investigator and analyst of failures in electronic equipment. He lives inside the head of his alter ego and is a regular contributor to *CQ*.

Professor Emil Heisseluft ("Emergency Power Generation Systems Using Starchy Tuber Arrays," p. 34), visits our pages every April, reporting on his latest work at the Center for Research on Abnormal Personalities of the Lauton Institute in Grossmaul-an-der Danau, Austria. In a recently released anthology of his *CQ* articles, Herr Professor revealed himself to actually be longtime *CQ* author and contributor Ted Cohen, N4XX. "The Collected Works of Professor Emil Heisseluft" is available from the CQ Bookstore at https://tinyurl.com/mrxyta27.



Mark Persons, W0MH ("Unusual Facts About Cable Loss," p. 41), was first licensed in 1962 as WNØAXD. He is a retired radio broadcast engineer and life member of the ARRL. The Society of Broadcast Engineers named him Engineer of the Year in 2018 and then honored him with a Lifetime Achievement Award in 2020. Mark and his wife Paula, WØHA, seen above, reside in Brainerd, Minnesota. Their website is <www.mwpersons.com>.

Kenneth Miller, K6CTW ("Learning Cyrillic Morse Code," p. 42), is a longtime CW enthusiast, perhaps best-known for his 2005 appearance with Chip Margelli, K7JA, on "The Tonight Show with Jay Leno," in which the two of them proved that they could send a message in Morse code faster than another pair could send it via text message. Ken was on the key.

University and the University of California at Berkeley to develop highpower, tuber-based power systems for the emergency response community (including the Amateur and Amateur-Satellite Services). Our first goal is the limited production of a unit capable of producing 5 A at 12 VDC for at least 30 minutes from activation. Initial estimates suggest at least 1000 tubers will be required to achieve our design goals, but battery longevity has been a problem, and we are "burning" through potatoes faster than resupply is possible. To this end, the Institute has entered into a multi-year agreement with Shady Brook Farm (Photo C) for the delivery of its annual potato crop through the year 2033, to ensure an adequate supply of tubers for experimentation and product development.

Summary

Power generation systems using starchy tuber arrays have the potential to provide low-cost emergency power worldwide. Such systems have already been demonstrated in amateur radio applications and are under further development by the Lauton Institute. The intent is to fabricate units capable of producing 5 A at 12 VDC for at least 30 minutes from activation. To further such development activities, the Institute has contracted with Shady Brook Farms—whose acreage can yield up to 25,000 to 35,000 pounds of potatoes per acre—to supply it with potatoes through 2032. In addition to providing a cheap form of energy, this power source (with the exception of the electrodes) is biodegradable.

Notes:

- 1. Heisseluft, E., "The Threat To Molecular Electronics From Microbes Produced By Genetic Engineering," CQ, April, 1982, p.13
- 2. Heisseluft, E., and J. Ostermond-Tor, "Fundamental Principles Behind the Use of Genetic Engineering to Create New Life Forms," Lauton Institute Report LI-1-71, 1971.
- 3. Heisseluft, E., "How To Stay at The Top of The DXCC Honor Roll Until You Reach At Least Age 100," CQ, April 1996, p. 11
- 4. Castle Hochosterwitz, this file is licensed under the Creative Commons Attribution-Share Alike 3.0 Austria license. Photo by Johann Jaritz
- 5. Golberg, A., H. D. Rabinowitch, and B. Rubinsky, Biochem. ZN/Cu-vegetative batteries, bioelectrical characterizations, and primary cost analyses, Biophys. Res. Commun. 389, 2009, p. 168; https://tinyurl.com/2czj22j2; Abstract: https://tinyurl.com/3ezau73r
- 6. Kato, H., "'Green' Power for QRPp," CQ, July, 2022, p. 32
- 7. Potato harvest; this file is licensed under the Creative Commons Attribution-Share Alike 2.0 Generic license. Photo by Richard Croft.

CQ CLASSIC

The Gift That Keeps On Giving...

CQ's April Fool articles are the gifts that keep on giving, even three decades later! This great one, on a circular Yagi from April, 1991, came back to our attention when a reader who recalled seeing it recently asked for help in finding it and wondered why he'd never seen anything since about the design. We figured that if it was good enough to stick in his mind for 32 years, it's good enough to share again!



It may look strange, but that's just because you haven't seen one before. NR5Q presents a fundamentally new antenna design based upon extrapolations of Pasquinade equations.

The Concentric Yagi

BY BRUCE VAUGHN, NR5Q

t was during the blizzard of '86, just five days before the big CQ DX contest, when my rotator failed. The old unit was replaced with one much larger and more expensive, with the hope that it would withstand the most severe ice storms. It did, only to be burned out by a lightning storm in July of '87. While waiting for the rotator to be returned by the repair facility, I started thinking of a way to avoid rotator problems.

Verticals were eliminated because of higher noise levels, relatively low gain, and the need for radials. Switchable phased arrays were also considered, but their modest gain versus the large area required for installation did not offer the solution we were looking for.

It seemed the best route to pursue was that of modified quads or Yagis. Time has proven that both antennas exhibit good forward gain, can be erected on most any lot, and are normally not too difficult to install and adjust. Of the two, the Yagi seemed to offer more potential.

The antenna shown in the picture is the result of two years of study and experimenting. As you well know, the typical Yagi consists of a ¹/2-wave dipole, with one or more parasitic elements, the longer elements being the reflector(s) and the shorter elements being the directors.



The overall size may tend to put some amateurs off the idea of trying a concentric Yagi, especially multi-element arrays. Here we see the original version installed near a conventional tribander.

It was reasoned that if we could design a circular Yagi with the elements spaced in the normal manner, then we could achieve maximum gain in all directions, thus eliminating the need for a rotator.

Twenty meters was selected as the band to use for our test model. I was sure if we could attain operation on 20, we could duplicate the results on other bands.

All measurements were taken from the *ARRL Handbook*. The tables and formulas need not be repeated here. For a frequency of 14,050 kHz the length of a halfwave dipole (driven element) is 33 feet, 8 inches. Since we wished to construct a circular antenna, we used our eighth-grade arithmetic to

calculate a diameter of 10 feet 8¹/2 inches, the radius being 5 feet 4¹/4 inches.

From the same table of measurements, we could see that the director length was 31 feet 11⁵/8 inches, and the reflector length 35 feet 5¹/4 inches. These were starting measurements, and we knew some adjustment of these dimensions could be necessary. Spacing between the elements then became 10 feet 1 inch (.15 wavelength).

With these figures in hand, we decided to first draw a diagram of the antenna before actually starting construction. This is where the first problems surfaced. When the director was placed 10 feet 1 inch from the driven element, we had a radius of 15 feet 5¹/2 inches, the circumference being approximately 97

180° 210° 150° 120° 240° 90° 270° 60° 300° 00

Fig. 1-A chart of the concentric Yagi's radiation pattern.

feet. While some variations in the dimensions may be permitted, 65 feet longer than the calculated length did present a problem. But wait! If we broke the 97 foot director into three lengths, using 4 inch long insulators, we could be back on track.

Our next problem occurred with the reflector. Since our driven element was only 5 feet 4¹/₂ inches from the center of our circle, if we moved behind the driven element 10 feet 1 inch, this would place the reflector in front of the driven element, concentrating our signal back toward the center of the antenna and thus creating a negative power gain. I assumed this would be similar to the black holes in space.

I could see that this was going to take more than eighth-grade arithmetic. Since it was a little late for me to take up Quantum Mechanics and Functions of Complex Variables, I decided to build my antenna the way amateurs have built antennas for years—cut, try, and experiment.

To keep the project simple and easy to construct we chose to build a three-element antenna. If it worked, we could always try for more elements. However, adding one more element could present problems, since the effective boom lengths would be more than 50 feet, and the length of the wire in the second director would be approximately 160 feet. Obviously, 6- and 7-element arrays were going to be very difficult.

As my first step in construction I drew two circles on paper. Looking at them, I discovered my error. It was easy to see that for any given beam heading, the outer, or larger, circle, being in front of the inner circle, or driven element, became the reflector when we moved 180 degrees from our heading. This was working out better than I had hoped. We could forget the black-hole concept. Our problem now became how to make the larger loop (director-reflector) both longer and shorter at the same time. Compared to the difficulty of making a TNT transmitter stay in the 20 meter band, we thought this one should be easy.

Once construction was started, the answer became quite clear: use another loop. We calculated the circumference of the reflector loop, 106 feet 3³/4 inches, by taking the reflector length given in the table, multiplying by 3, and adding 12 inches (three 4 inch long insulators). The radius of this loop would be 17 feet. But what about the .15 wavelength spacing? I was also concerned

Many of the amateurs in our club are skeptical of this antenna. Since it is somewhat unusual, I can understand their doubts and amusement.

until I reread the chapter on beam construction in the *Handbook*. Chapter 20, page 19: "Fig. 44 shows the gain variation with director spacing is not especially critical." It seemed reasonable to assume that reflector spacing is also a flexible figure.

Our first model to undergo tests was constructed from the preceding calculations. As suspected, breaking the director and reflector loops into three segments gave us a pattern somewhat similar to a three-leaf clover. It was then we decided to build the version shown in the photograph. You can see that we placed two loops, separated by 18 inch spreaders, at the director and reflector position, breaking each loop into three parts. The insulators of the top loop were placed 60 degrees from the insulators of the bottom loop. This resulted in the pattern shown in fig. 1. Not really ideal, but improving.

The booms used for the project were wood. Aluminum or fiberglass would have been a better choice, but I had a supply of wood dowels left over from my experiments with roof-top Rhombics.

The driven element is aluminum tubing, fed at the center with coax, through a conventional 8-turn choke. The reflector and director loops are made from #16 wire. The elements are all insulated from the boom, and spreaders, with short pieces of plastic pipe. I believe the rest of the construction details are best left up to the builder.

After three months of use we are well pleased with the antenna—with one exception. CQs often result in simultaneous answers from Europe, Japan, South America, and Australia, with the result that we are unable to copy any of the calls.

Many of the amateurs in our club are skeptical of this antenna. Since it is somewhat unusual, I can understand their doubts and amusement. I do feel, however, that the term "Mickey Mouse Antenna" is undeserved and without foundation.

I am working on a way to make the antenna directional. If my experiments go as planned, I should have the answer by next April.

Looking Ahead

Here are some of the articles we're working on for upcoming issues of CQ:

- 3Y0J: Report from Bouvet
- CW Results: 2022 CQ WW DX Contest
- CQ Interviews: IARU Region 2 VP PT2ADM

Plus...

- Bramham and Guanella Baluns
- A University Foxhunt in India
- A Skeleton Slot Antenna for HF Through 432 MHz

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

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Regular readers will know that WØRW loves operating pedestrian mobile, often in remote locations. Several years back, though, he tried his hand at operating from a very NON-remote location, resulting in ...

My Dumbest Portable Operation

BY PAUL SIGNORELLI,* WØRW

bout 16 years ago, I was visiting Washington, D.C. after a work trip to Canada. As a Colorado resident, I am just a tourist on the east coast.

My idea was to visit the U.S. Naval Observatory (*Photo A*) and work into a QRP net from there. I like observatories (*He has one of his own! – ed.*) and thought I could at least see the USNO atomic clock. When pulling into the driveway I noticed a bank of very unfriendly tire puncturing spikes and a truck barricade (*Photo B*). The U.S. Naval Observatory was closed.

So I went around to the back of the USNO to a shopping mall parking lot.

It was a muggy evening there on June 30, 2006. The fireflies were bobbing around the grassy fields. I had always wanted to catch a firefly and see if I could excite its phosphorescent tail light with RF. I caught a few in a plastic bag and held them up to my high-power UHF mobile antenna. No luck.

After that, I got my KX1 out for some pedestrian mobile operation at the USNO. I always like to operate from historical sites and this is the first time I had been there.

PM Setup, QSOs and ... Oops

My pedestrian mobile antenna is a 10-foot whip and it is "socketed" in my rear pocket and attached at my shoulder with a cloth loop on my vest (Vestenna / Photos C and D). The KX1 is hand held in the left hand and keyed with the right hand.

I worked John, K4BAI; Russ, K8AF; and Roy, N8RN. Georgia, Michigan and Ohio, not too bad for 3 watts to a 10-foot whip from D.C. While I was walking along the northern fence, a cop on a bicycle pulled up and asked me what I was doing. My answers did not really seem to satisfy him, so he asked for my



Photo A. Aerial view of the U.S. Naval Observatory in Washington, D.C. (National Archives photo)



Photo B. When I arrived at the observatory, the gates were closed and highly secured. But that didn't stop me from getting on the air! (WØRW photo)

^{*} E-mail: <w0rw1@msn.com>



Photo C. My "Vestenna" and KX-1 setup for pedestrian mobile operation. See text for details. (WØRW photo)

ID and ran me in the computer. Maybe he felt less threatened when he found out I had a security clearance. He didn't officially detain me since I was not going anywhere anyway. (I had him pose for a picture with me, he was a nice guy. The picture got lost in my last hard drive crash.)

After resuming a few CQs using the KX1, he called for backup. Then more Capitol Police arrived. This old Colorado tourist didn't realize that the USNO is also the official residence of the Vice President of the United States (Dick Cheney at the time) and it is heavily guarded. I gave the officer a QSL card.

Paul, WØRW/3/PM

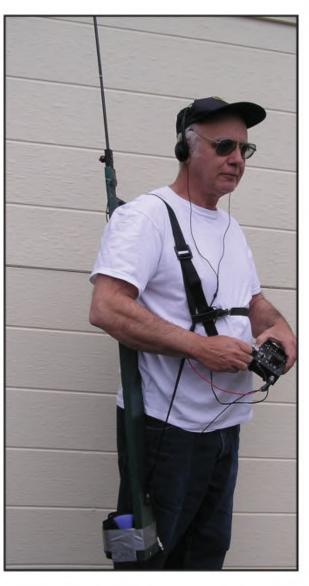


Photo D. Detail of the antenna setup, minus the vest. (WØRW photo)

Most of us know that any antenna feedline carries both forward and reverse power. But very few hams realize that certain coaxial cables are designed to more efficiently carry energy in one direction than the other. WØMH, a former Society of Broadcast Engineers "Engineer of the Year," explains this new twist on coax.

Unusual Facts About Cable Loss

BY MARK PERSONS,* WØMH

here is a little-known fact that coaxial cables, such as RG-8, RG-213, RG-214, and RG-58, have more RF loss in one direction than the other. This is due to the twist direction of the inner conductor and the braid twist on the outer conductor of the cable. The inner conductor controls forward power and the braid is the return path for receive signals.

This phenomenon was discovered and documented by Professor Loof Lirpa, SM9LL, in Sweden, now SK. He came across this while doing basic research at the University of Stockholm in April, 1956. This science does not apply to hardline, in which the inner and outer conductors are solid, not braided.

Manufacturers of quality braided cable today print an arrow on the outer jacket of their cables, indicating which way the transmitted RF should go (Photo A). You may not have noticed it because the arrows are tiny.

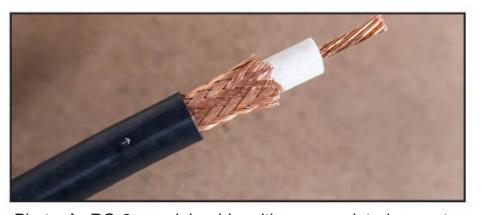


Photo A. RG-8 coaxial cable with arrow printed on outer insulation.

If the coaxial cable in your shack does not have an arrow, you can experimentally determine it. Connect your transmitter to one end of a cable and a wattmeter, with dummy load, to the other end. Check the power and then reverse the cable to see which way it works best. Then mark the cable with an arrow so you will always know the "sending end" of the cable for minimum loss to your antenna. Install it accordingly.

This can be a significant advantage for the ham radio operator trying to make long-distance contacts, especially in a pileup.

^{*} E-mail: <mark@mwpersons.com>

Increase the enjoyment of your CW QSOs with hams in Russia and other countries where the Cyrillic alphabet is used (including Ukraine) by learning some basics of Cyrillic Morse Code. K6CTW has developed an app that can help.

Learning Cyrillic Morse Code

BY KENNETH V. MILLER,* K6CTW

Ithough currently not exactly "politically correct," the author's interest in multi-language CW communication, specifically Russian using the Cyrillic Morse alphabet, came about a number of years ago. Progress in the development of a technique to enable rudimentary QSOs was eventually developed and then documented in an article for CQ magazine, "Russian CW and QSO Phrases," in the November, 2013 issue. This "worked" for slowspeed CW QSOs using a "cheat sheet" for conversion and translation. However, this was not a very satisfying method as it did not allow for more "free form" conversations.

What was needed was a method to improve copying speed and transcription capability using the Cyrillic characters directly as well as a basic facility in the Russian language. Should you also be interested in voice communications with your Russian-speaking amateur radio friends, a superb set of documents and audio is contained in Les Traubman, W6JKH's, "Russian Phrases for Amateur Radio" 1 to help you in that endeavor.

The author hopes that this effort will promote friendship, good will and fun! Starting a conversation with a foreign ham in their own language and/or Morse alphabet is a wonderful way to bring people together, promote good will and foster lifelong friendships. Isn't that one of the great features of amateur radio?

On a side note, there are many languages other than Russian that also use the basic Cyrillic alphabet, e.g., Ukrainian. Adapting the application to Ukrainian, besides the language changes, will require four alphabetic

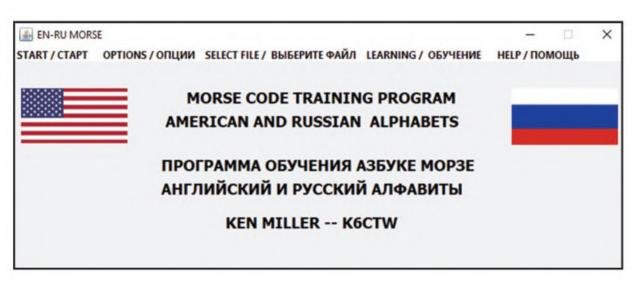


Figure 1. EN_RU_Morse Application Main Screen

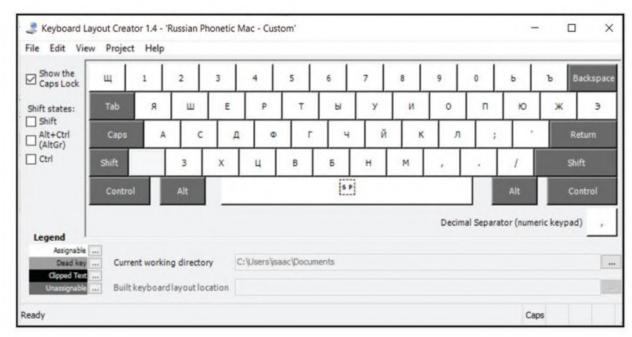


Figure 2. Russian Phonetic Keyboard Layout

changes in the code generation section (yes, their Cyrillic alphabets are slightly different)

The Application

The application, *EN_RU_Morse* (*Figure 1*), has evolved over a number of years from a simple command line to a full GUI (graphical user interface) and through three versions of Microsoft Windows® (7 Pro, 8 and 10), as well as a series of Java and Netbeans ver-

sions. It is 100% Java and so it will be much more easily ported to a number of other platforms. The initial release is aimed at an American/English speaking user who would like to learn either the International Morse Code, which supports the Latin-based alphabet for the English language and/or the Russian Morse code for the Cyrillic alphabet. The application also provides some basic QSO and conversational help in both languages. It is hoped that

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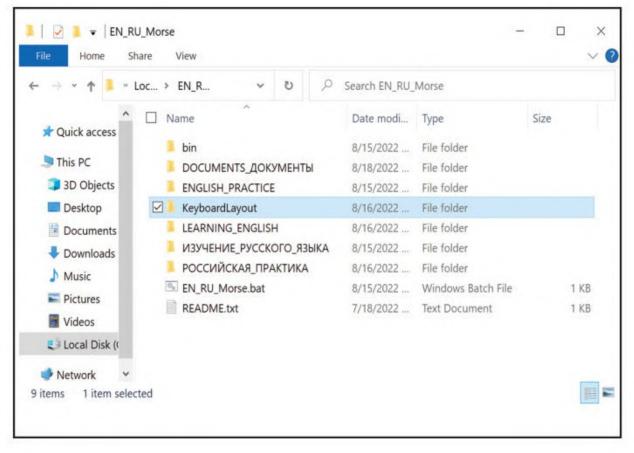


Figure 3. EN_RU_Morse Application Directory Structure

in the future, additional help from native Russian-speaking hams will enable this application and the user's manual to be augmented to better support native Russian speakers who would like to learn/practice International Morse code while also learning some English. As such, the menus and pull-downs are all bilingual which, through repetitive viewing, enables the user to enjoy a more immersive learning experience.

With thanks to the author, Isaac de la Pena, included with the *EN_RU_Morse* download is another application, *rus-mac*² that will re-map the keys on your keyboard to a "phonetic" Russian keyboard (*Figure 2*). This simply means that when you enable this mapping, and you "copy" a dah-di-dit character, and press the "D" key on your keyboard, what will be displayed in the word processor window you are using will be the Russian letter \mathcal{I}. This makes it easier for those touch typists who learned

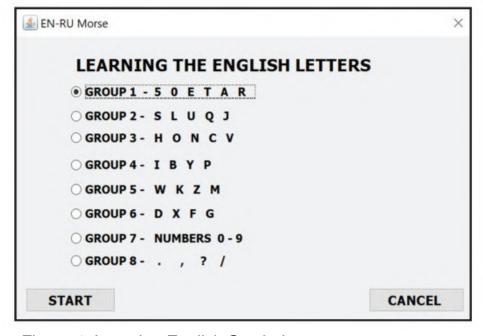


Figure 4. Learning English Symbols

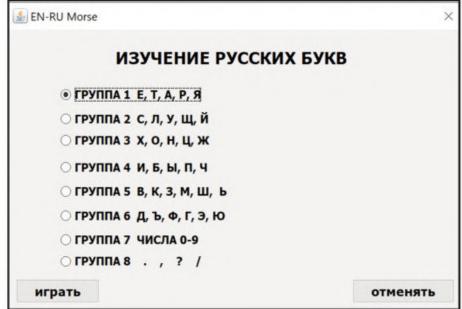


Figure 6. Learning Russian Symbols



Figure 5. Play File (English)

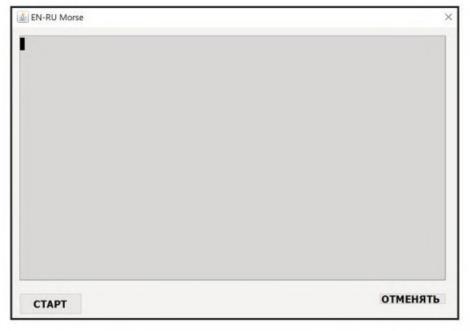


Figure 7. Play File (Russian)

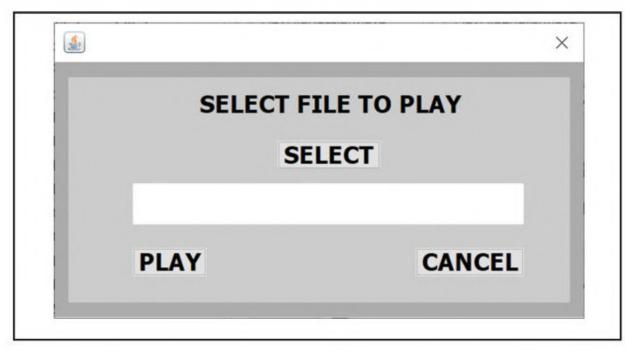


Figure 8. Select File (English)

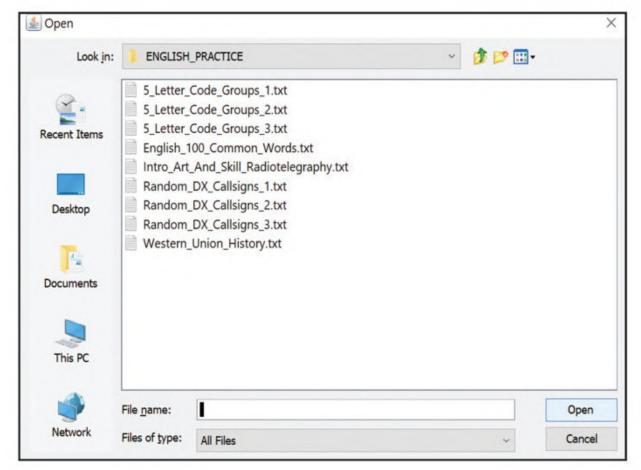


Figure 9. English Practice Files

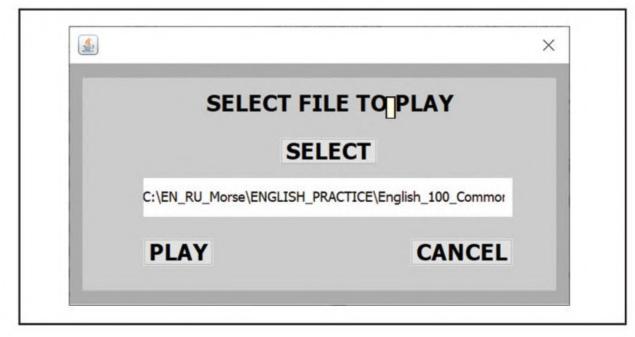


Figure 10. Play Selected File (English)

on the standard US QWERTY keyboard as there are only six changes to learn. The author did this for an external USB keyboard and using new keycap decals to implement the keyboard settings below.³ As a side note, using this application will enable you to copy in Russian without having to learn to hand-write the Russian alphabet.

One note, since this application is Java-based, you'll need to have the Java Runtime Environment (JRE) installed on your computer. To verify installation, open a command window by going to the Search area on the bottom left of your screen and typing in "CMD" and then click on the Command Prompt icon. When the command line window appears, enter the following command: java -version

If the JRE is installed, there should be a response. If not, then follow this link to download and install the latest version https://www.java.com/en/>.

The application itself is installed from a Zip file that will be uncompressed in the root section of the C: drive of a Windows PC. The resulting layout of the directories can be seen in *Figure 3*.

More detailed installation instructions are included in the EN_RU_Morse_Users_Guide.pdf in the DOCMENTS_AOKYMEHTЫ folder. The Keyboard Layout folder contains a series of directories that will enable the user to install and use a Russian "phonetic" keyboard mentioned earlier (rusmac).

Additionally, there are the following folders:

- * ENGLISH PRACTICE
- * ПРАКТИКА РУССКОГО ЯЗЫКА (Russian_Practice)
 - * LEARNING_ENGLISH
- * ИЗУЧЕНИЕ_РУССКОГО_ ЯЗЫКА (Learning_Russian).

The learning folders contain beginners' practice files. These are to enable the user to acquire basic skills in the character-set/symbols for each language, in a graduated method.

The practice folders contain files which can be used/enjoyed once all of the corresponding alphabet and symbols for a given language have been mastered. These include random callsigns, coded groups and text files with relevant content. These are intended for extended copying sessions to improve speed and just for the enjoyment of the stories and information. The user's guide also contains instructions for how to add your own content to these directories.

Operation

To start the application, double click on

the EN_RU_Morse.bat file. During startup, you should hear the following in code: "WELCOME ДОБРО ПОЖАЛОВАТЬ", i.e., "welcome" in both English and Russian.

Once it is running, the first thing to do is to select the language of operation. That is done using the pull-down menu item from the **START** / **CTAPT** selection (default is English). Note that with this selection, all of the remaining items will be displayed in that language. The next would be the Morse code tone frequency and speed using the **OPTIONS** / **ОПЦИИ** selection. Defaults here are 700 Hz and 20 WPM.

Before you begin on this wonderful journey of learning either or both codes, however, here are some thoughts that may help you acquire this skill more quickly and easily.

First, just listen to the entire group of elements in Group 1 and follow along with the displayed letters. Remember to stay relaxed and listen to the timing and spacing of each letter. Then, play the group again but this time, try to write down (copy) all the characters you can. This can be with either pencil and paper or by bringing up the text editor of your choice.

If you miss some, let them go and just try to keep focused on the flow of the characters. Don't get bothered or discouraged for the letters that you miss. The purpose of the exercises is not to memorize the letters, but to establish an automatic recognition in your brain as you listen to them. This kind of automated recognition is achieved only by means of repetition. If you are not satisfied with how many characters you copied one day, you can always repeat the exercise the next day. However, try not to exceed 15-30 minutes of practice per day, but do try to train every day. Once Group 1 has been mastered, go on to Group 2 and so on, until you have mastered all of the letters, numbers and punctuation symbols.

Now let's examine the training options. Selecting **LEARNING/OБУЧЕНИЕ** (with English as the default) will display the pop-up seen in *Figure 4*.

For some of those more "seasoned" operators, who, like the author, learned International Morse back in the 60s, the groupings for each of these lessons may be familiar. They are all taken directly from the now out-of-print ARRL publication, "Learning The Radiotelegraph Code." Once the group has been selected, the blank dialog/pop-up in *Figure 5* will be displayed:

To start the group playing, click on the START button which will sound the letter(s) and then display each one on the screen. Selecting the CANCEL button will stop the group playing and will return to the LEARNING THE ENGLISH LETTERS menu. To pause the session without canceling it, click the mouse in the display area. To restart the session again, just click the mouse again.

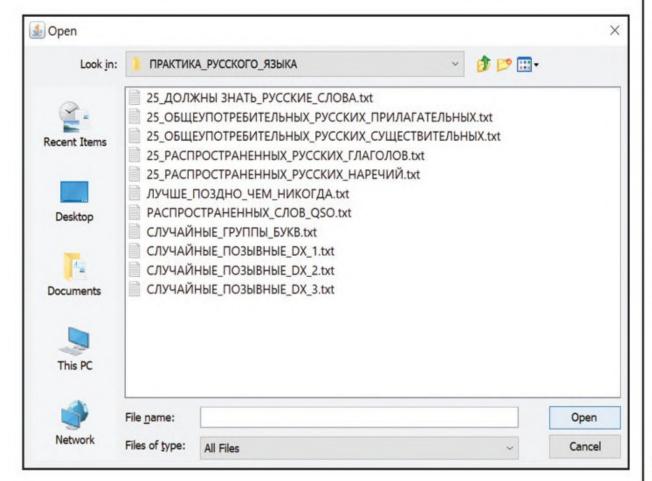


Figure 11. Russian Practice Files



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If the language selection is **РУССКИЙ** (Russian), then the **ИЗУЧЕНИЕ РУССКИХ БУКВ** (Learning Russian Letters) dialog box (*Figure 6*) will be displayed.

Unlike the American/English training methods, the equivalent texts/books in Russian have not been located. Thus, the **ГРУППА** (Group) structure was set up to mirror the ones in the English lessons above but with the addition of Russian letters to each so that all the Russian symbols will be accommodated in the six basic **ГРУППА** (groups), with **ГРУППА** 7 and 8 remaining as the numbers and the punctuation and short sentences. Similarly, once the group has been selected, the blank dialog/pop-up in *Figure 7* will be displayed. The same mechanization to **CTAPT** (start), **OTMEHSTL** (cancel) and pause also work with this menu item.

As noted earlier, the **SELECT FILE** / **BЫБЕРИТЕ ФАЙЛ** selection provides longer practice files with a variety of materials, and the menus and elements will be displayed in accordance with the language selected. For ENGLISH, the display will be as seen in *Figure 8*.

Pressing the SELECT option will display the practice files available (*Figure 9*).

The files currently included in this directory are as follows:

- * 5_Letter_Code_Groups_1.txt
- * 5 Letter Code Groups 2.txt
- * 5 Letter Code Groups 3.txt
- * English 100 Common Words.txt

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- * Intro Art And Skill Radiotelegraphy.txt
- * Random DX Callsigns 1.txt
- * Random DX Callsigns 2.txt
- * Random DX Callsigns 3.txt
- * Western Union History.txt

The names of the files are self-explanatory. Note that the Introduction to the Art & Skill of Radiotelegraphy contains the introductory paragraphs from the book. The Western Union History is an article from the internet that has been set up for long duration copy as it is quite a long file. Finally, the English 100 Common Words is really for typing practice, to assist in developing muscle memory for those most common words. Although not included in this version, the author also put together, in chapter files, the book, "A Princess of Mars," by Edgar Rice Burroughs which makes for great relaxing copy.

Once the selection has been made, the resulting display should be something like the dialog box shown in *Figure 10*. Selecting PLAY will bring up the same display and maintain the same options as seen earlier in *Figure 5*. If the language selection had been **PYCCKUŬ** (Russian), then the selection of files to play are as seen in *Figure 11*.

Once again, the filenames describe the contents. The first file contains 25 "must-know" Russian words. The next four files are also for rapid comprehension through repetition and typing practice as they are, in order, the 25 most common adjectives, nouns, verbs and adverbs. The next file is a Russian short story, "Better Late Than Never." Following that is a file with a number of common words that would be used in an amateur radio conversation (QSO). The next file is composed of random Russian letters in 5-letter groups, as would be generated in coded messaging. The last three files are random DX callsigns. Note that callsigns for all countries are identified using International Morse code so these do not contain any Russian characters but were included for practice just like the English language suite of practice files.

Conclusion

As noted, the author hopes that this effort will promote friendship, good will and fun! This system should enable the user to get a much better appreciation for, and enjoyment of, the Russian code and language, and thus the ability to have more meaningful conversations with our Russian-speaking amateur radio colleagues. If however, Russian isn't your "cup of tea", there are about 50 languages that also use the basic Cyrillic alphabet, and this application can be modified to support those.

The application (EN_RU_Morse.zip) can be supplied by the author upon email request, which includes all the directories/files noted in Figure 3. For the adventurous Java programmer, contact the author via email for the source code and the myriad number of configuration settings and support libraries also needed to construct your own version for another language.

Have fun and hope to see you on the air! 73

REFERENCES

- 1. "Russian Phrases for Amateur Radio," by Len Traubman, W6HJK, https://traubman.igc.org/hamradio.pdf
- 2. Russian Phonetic Keyboard, by Isaac de la Pena, https://tinyurl.com/37edvtxj
- 3. Russian/Cyrillic Keycap decals (Etsy), https://tinyurl.com/bdfypneu
- 4, 5. "The Art and Skill of Radio-Telegraphy," by William Pierpont, N0HFF, at hfradio.org: https://tinyurl.com/49akjmka, or purchased on Amazon. This can also be found online in French! The downloaded version is included in the DOCUMENTS_ДОКУМЕНТЫ folder.

math's notes

BY IRWIN MATH,* WA2NDM

A Universal AM Modulator

sually this month, I like to provide a column that, while exhibiting some "unknown" phenomenon or unresolved technique, has unique possibilities. This time, however, I would like to bypass that and provide a so-called "Universal AM Modulator" which, while not intended as an attempt to solve an impossible application, nevertheless has all sorts of opportunities for the true experimenter.

Figure 1 is the schematic of the device. You will note that while this is really just a simple basic audio amplifier, it has all sorts of other applications beyond just amplifying an audio signal to drive a speaker. It uses a common LM-386 with a control to adjust the maximum output. Before going any further, however, let me also indicate that the basic applications that follow do not have to be just limited to the 1-watt LM-386. You could use any audio amplifier up into the kilowatt range (with the appropriate components) as we will now explain.

Application 1 – AM RF Transmitter

For ordinary well known RF applications you could just connect the power supply of an RF oscillator in series with a suitable audio transformer and the amplifier as shown in *Figure 2* and you would have a conventional RF AM transmitter.

Application 2 – Ultrasonic AM Transmitter

If you simply replaced the RF oscillator with an ultrasonic audio oscillator, you would now have an ultrasonic AM audio transmitter. This could be at any frequency above the audible hearing range as an alternate form of transmission to experiment with. Of course, in this case, you would need a speaker (or device) that could respond to the ultrasonic frequency with which you wished to experiment.

Application 3 – Optical AM Transmitter

If you connect a simple flashlight in series with a basic audio transformer as shown in *Figure 3*, you would have an AM-modulated visible light beam transmitter which could then be directed to a

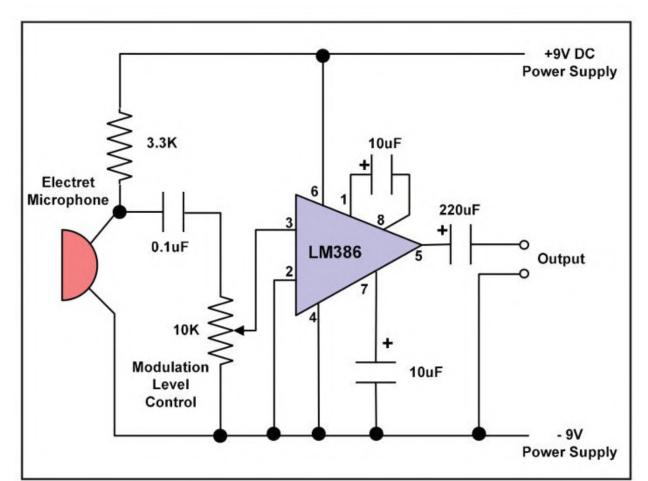


Figure 1. Universal AM Modulator

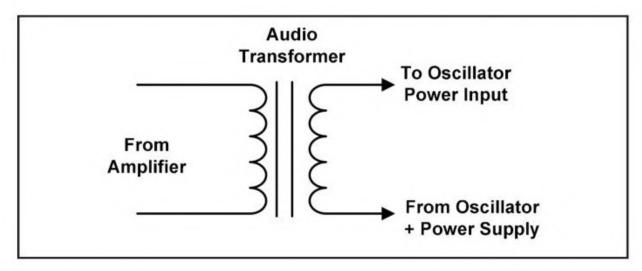


Figure 2. Applications 1 and 2

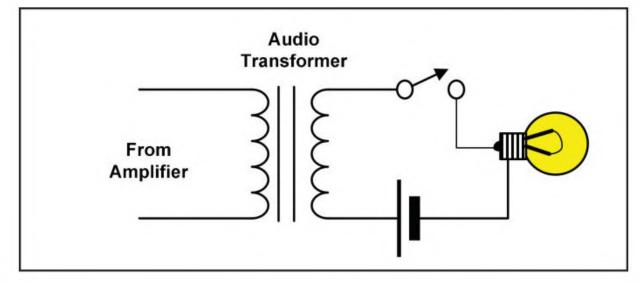


Figure 3. Application 3

*c/o CQ magazine

VHF Propagation

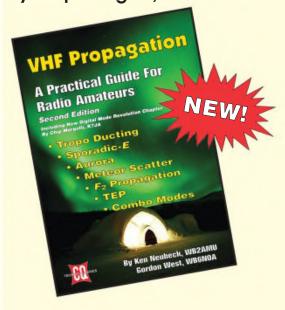
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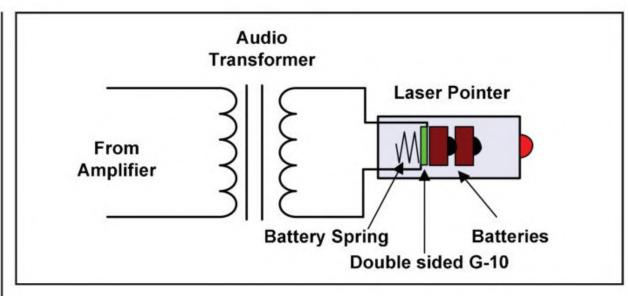


Figure 4. Application 4

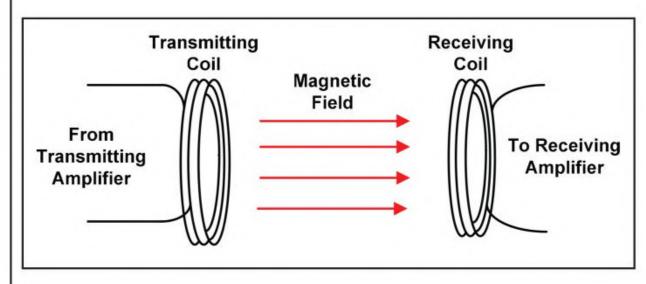


Figure 5. Application 5

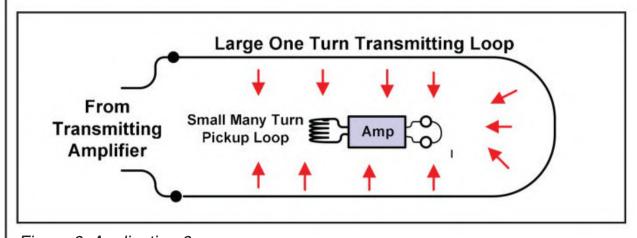


Figure 6. Application 6

distant photocell for a simple visible optical communication system. The more powerful the flashlight, the greater the range of the unit. For this, you would obviously need a transformer that could handle the current of the flashlight.

Application 4 – AM Laser Transmitter

If you replaced the flashlight with a laser pointer as shown in *Figure 4*, you would now have a long-distance narrow-beam AM-modulated transmitter that could be used as is or even coupled into an optical fiber. Note that, in this case, the transformer is connected between the batteries and the common connecting

spring with a thin piece of double sided G-10 circuit board material to make sure it is in series with the laser pointer power supply.

Application 5 – Magnetic Transmitter

If you replace the audio transformer with a large coil of wire (several feet in diameter) you would have an AM-modulated magnetic field transmitter that could send a magnetic signal to another large diameter coil at a distance for a truly magnetic (not electromagnetic) wireless system. Old-time experimenters could get transmission ranges of hundreds of feet with this configuration.

There are applications that also use this technique to communicate with locations under the Earth, such as in mines.

Application 6 – Direct Audio Transmitter

If you connected the output of the modulator directly to a one turn loop of wire wrapped around the perimeter of a room you could have a system that would transmit audio to another loop of wire with many turns that could be connected to an set of earphones and have a wireless system that would cover a single room (inside the loop) for all sorts of applications. In this case you would

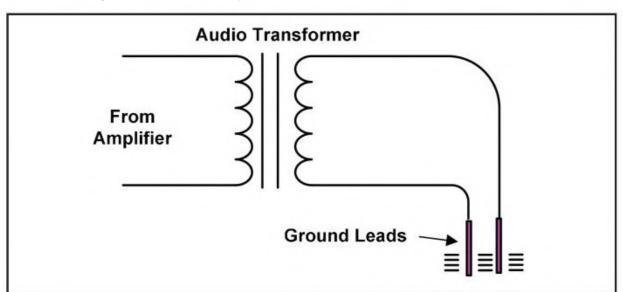
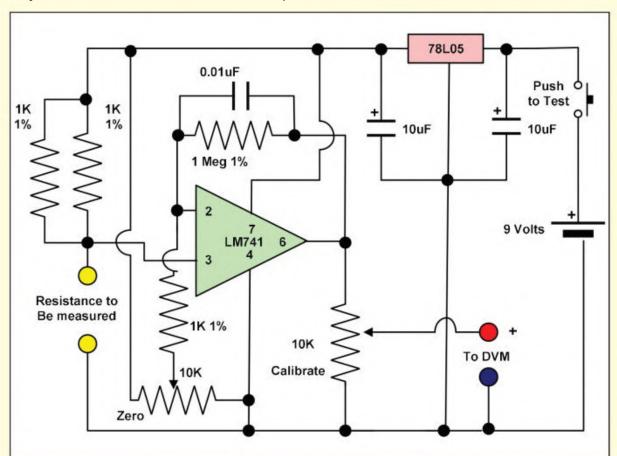


Figure 7. Application 7

Correction to January Column

Thanks to eagle-eyed reader Ed Fong, WB6IQN (who just happens to be an electrical engineering professor), we have a small correction to the circuit shown in Figure 1 of our January column, "Low Resistance Ohmmeter." The text reference to the capacitor across the **1K-**gain resistor should refer to the **1-Meg** gain resistor ("The capacitor across the 1-Meg gain resistor is used to eliminate any residual noise or jitter that may be present due to the high gain."). As WB6IQN noted, "The op amp circuit has a gain of x1000. The way the resistors are configured, it has a gain of 1/1000. Seems like the 1 Meg and 1k resistors are switched?" Indeed they were. A corrected schematic is printed below.



Corrected schematic for low-resistance ohmmeter discussed in the January 2023 column. The 1K and 1-Meg resistors above and below the LM741 IC are reversed in their positions in the circuit. (Tnx to WB6IQN)

use an audio transformer with a low output impedance to match the impedance of the wire loop.

Application 7 – Ground Wave Transmitter

Finally, If you used an audio transformer with a high voltage output connected to two metal rods a foot or so long which you pounded into the ground a few feet apart, you would have an AM-modulated ground signal that could be picked up by another two similar rods also pounded into the ground a distance away. These would then be connected to earphones, perhaps with an additional local amplifier.

These are only a few applications for a simple (low or high) power audio amplifier. Remember, with all of these, you are really generating AM-modulated audio signals (not RF), which when used alone are not electromagnetic at all and as a result may have applications that you could discover.

- Regards, Irwin, WA2NDM

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emergency communications

BY JOHN FERGUSON,* K3PFW

A Collaborative Effort

col·lab·o·ra·tive

Co Labor, as in working together towards a common goal.

he art and science of providing emergency and disaster communication is not a solo sport. You can't do it all by yourself. Communication involves moving a message from one intelligent being to another. We may not all be Einsteins, but we did pass a license exam, OK?

Providing communication support to a served agency, government or non-government, requires teamwork and planning. We've already talked about planning, and will definitely revisit it in the future. It is the only way we can be assured of providing the absolute best service we can offer to our clients. And we are serving clients. The information we pass is for their use, not ours.

I will agree that this great hobby of ours includes those who, for their own reasons, prefer to go it alone. And there are some stellar examples in the DX competitions that leave me gasping; how one individual can bring that much concentration and effort to a task over long hours, amassing an impressive score. But then what happens when we get a team of these superstars together? The scores are astronomical! History and literature often extol the "Lone Wolf." In reality, though, wolves work together for the common good and survival of the pack.

We don't give scores for disaster traffic handling, although we may report the number of health-and-welfare messages handled. The number of messages handled for the local Red Cross chapter or the county Emergency Operations Center never get counted. Yet each class of message is valuable in its own way.

So how do we achieve this team effort? That's the simple answer: Through organized groups, starting at the local community level and building

* 20116 Donovans Rd. Georgetown, DE 19947 Email: <K3PFW@cq-amateur-radio.com> to the national level. A group that is organized, by its very nature, has a plan, a framework it uses to function efficiently.



ARES

Perhaps the broadest and most recognized emergency communications group in our hobby/service is the Amateur Radio Emergency Service (ARES®), sponsored by the American Radio Relay League, (ARRL) with head-quarters in Newington Connecticut. With 15 divisions and 71 sections, the ARRL covers the 50 states plus U.S. territories. Each division is managed by a director, and each section by a manager. These individuals are volunteers elected by the membership they serve.

For ARES® at the section level, the Section Manager appoints a Section Emergency Coordinator (SEC), a volunteer who manages the ARES® program for the section and appoints District Emergency Coordinators (DECs), if the size of the section warrants it, and Emergency Coordinators (ECs) for the local level. It will be the EC who manages the local group. You do not have to be a member of the ARRL to be a member of ARES, but why not? The advantages are enormous, giving you access to all kinds of support and information. The ARRL website (see references sidebar) will have the contact information for the Section Manager of the section in which you reside. He or she will be able to direct you to the Emergency Coordinator for your local area.

You will find the ARES® program to be very well-structured with a task book

available to guide your progress in the organization. Local ARES® groups may be involved with the Red Cross, the local government, hospitals and possibly other agencies. Over the last several years, the training requirements for the three levels of qualification in the program have been upgraded to keep pace with the changes in emergency management.

One other recent change has been the development of ARESMAT, which is the process of developing mutual assistance agreements between ARES® groups, often across jurisdictional (county/state) lines. The accent is on mutual agreements for similar training and qualifications.



Skywarn and MARS

A group that often works closely with the ARES® is Skywarn, sponsored by the National Weather Service through its regional Weather Forecast Offices (WFOs). After completing a short training course, you are issued a Spotter ID, and can participate in the tracking of severe weather in your locale. There will be a Skywarn Coordinator somewhere local to you. The actual management varies somewhat under each Weather Forecast Office (see information sidebar for details).

If you are looking for a real challenge, operationally and technically, look no further than the two Military Auxiliary Radio System, or MARS organizations,

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sponsored by the Department of Defense. There is the Army MARS and the Air Force MARS (Navy-Marine Corps MARS was disbanded several years ago). These groups operate on Department of Defense frequencies, just outside the ham bands. Your equipment may have to be modified to do so. Usually, it is not a difficult procedure. During the Vietnam era, MARS stations "in theater" and here at home ran thousands of phone patches as a morale activity. There is still some of that activity, both morale and official. An interesting technical note, all official MARS traffic today is encrypted, and part of your training to become a MARS operator would include that.

In celebration of Armed Forces Day and other occasions, such as exercises, hams get the opportunity to interoperate with military stations and MARS stations. On Armed Forces Day, you would work "split" with the military station outside the ham band. For the exercises, the MARS stations, because they are still hams, sometimes come up on the ham bands to exchange traffic. When I was younger and single, I thoroughly enjoyed my time in Air Force MARS, as an operator (AFA3SQ) and moving up to State, Region and then Area Director. This is an activity that will require a considerable commitment of



your time, as any emergency and disaster communication activity will, but maybe a bit more. It will, however, be time well spent.

Faith-Based Organizations

Not as widely known are the faith-based disaster relief organizations that have amateur radio operators, sometimes as a component, and sometimes embedded in the staffing. There are two that are active over a wide area of the country. The Salvation Army Team Emergency Radio Network (SATERN) is sponsored by The Salvation Army and is used as a component of its disaster

relief plan. If they are active in your local area, you might investigate what they have to offer. The second one is the Mobile Kitchen Ministries of the several Baptist Church groups. Frequently there are hams embedded in the staffing, working in food service when not needed on the radio. I've had the opportunity to work with some of these mobile kitchen groups, and I have two takeaways; they are dedicated, committed volunteers, and the food is excellent!

RACES and AUXCOMM

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plete without something about the most misunderstood portion of the amateur service, the Radio Amateur Civil Emergency Service (RACES). In the FCC Rules and Regulations (47 CFR § 97.407 - Radio amateur civil emergency service https://tinyurl.com/ycxawnsk), you will find the relatively simple, for a government regulation, description of what and how the RACES operation is structured. First of all, RACES, as its name implies is a service. Secondly, it is a component of state and local emergency management agencies and may only be officially activated by those agencies or when the War Powers Act is engaged by the President of the United States. Third, if you are not registered with a RACES entity, you will not be able to operate.

The problem of the RACES registration is few agencies keep it up to date. Amateur groups would do well to find the RACES Radio Officer for their jurisdiction, and keep the roster up to date. That said, there are RACES groups active around the country doing what hams do. They are established as part of the volunteer communication support to a government agency involved in response and recovery operations, and function as your everyday ham club.

A natural evolution forward from RACES, relatively new in about the last decade, is AUXCOMM. This is an auxiliary communication service, sponsored and managed by an agency involved with response and recovery activities in disasters. This is usually a government agency. In many ways it could be called the "New RACES." It is organized to fit in and work with the Incident Command System (ICS). It has been directed by the Department of Homeland Security that the ICS will be used for all response and recovery

operations! The development of the program was started in about 2009, and first came out in about 2012. Many states across the country have adopted it to manage their Auxiliary Communication Service program. Volunteers in AUXCOMM can be expected to perform any communication-related task for which they have the applicable training and competence. This makes it a very flexible, somewhat dynamic, program. It is not exclusively hams. You don't need an FCC license to answer a phone, operate a FAX machine or make copies; but these are critically important



tasks in an Emergency Operations Center actively managing a major disaster. There has been controversy, somewhat frequently, as AUXCOMM is adopted in local and state government jurisdictions. We must remember and keep in perspective, that we are the communicators, not the emergency managers, who by governing statute are have the authority for the response and recovery operations.

There are other organizations, of course, such as two that I mentioned in this column last August, REACT International and the Oregon ACES, and I'm sure there are other groups like them, maybe in your locale.

As I said at the beginning of this column, you really can't go it alone in emergency communications and be effective. Here's why: The FCC Rules and Regulations state as the first premise for the existence of amateur radio in the United States, "Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications." [§97.1(a)] The FCC expects us to serve our communities in time of need. The best way we can do that is by being organized, trained and practiced in our craft.

On the Home Front

An update on last month's column on the rebuilding of the station here at my QTH. A few of my original thoughts are changing. First, the inverted-L for 160 meters is now going to be an end-fed random wire that will do 160, 80/75 and 40. This puts a second multi-band HF antenna in the inventory. The two 100-amp-hour SLA batteries did not pass the load test and will be replaced by two slightly smaller ones. Those big ones are way too heavy to conveniently move when necessary. The work continues slowly, much too slowly...

73, John K3PFW

References

Follow these links for more information on the organizations discussed in this month's column:

ARRL - Home: https://www.arrl.org ares>

SKYWARN https://www.weather.gov SKYWARN> U.S. Army MARS https://netcom.army.mil mars> U.S. Air Force MARS: https://www.mars.af.mil

SATERN: https://tinyurl.com/3jkewvrn>

RACES (FCC Rules & Regs, Part 97.407): https://www.law.cornell.edu/cfr/text or https://tinyurl.com/mr2vwwe5

REACT International: https://reactintl.org

kit building

BY JOE EISENBERG,* KONEB

Updates, Antennas and Tools, Oh My...

hen building kits, some of the greatest modifications and upgrades often come from the individual builders. A popular kit recently put out by the Four State QRP Group is the 4S Dummy Load, a kit I have previously reviewed. The modification created by Jim Sheldon, W0EB, is very simple and requires no modification to the PC board.

The 4S Dummy Load is a 10-watt dummy load that incorporates 4 LEDs that indicate the power level being supplied by the ARP transmitter. I highly recommend connecting a dummy load to any QRP kit transceiver or transmitter during initial power up to prevent damaging the final output stage should the kit be inadvertently keyed into transmit mode by either an unknown problem or the key being accidentally shorted. Most QRP kits have no VSWR protection, and so connecting the dummy load on initial power up is a great step to preventing a problem.

The 4S Dummy Load kit incorporates a PC board-mounted BNC connector which normally is placed on the top of the PC board. Because this part is symmetrical, it can also be mounted on the bottom of the board. The reason to do this is to make the kit easier to fit into a 3D printed case Jim has designed and has made the files available free as Thing #5407722 on <thingiverse.com>. Jim offers two different versions of the case (*Photo A*), one being the original version that accommodates the kit with the BNC connector on top and utilizes "light pipes" to allow the 4 LEDs to be visible through the top cover of the 3D case. The other version rearranges the lower part of the case to accommodate the positioning of the BNC connector onto the bottom of the PC board and eliminates the need to print clear "light pipes" to shine the light to the lid. This new configuration allows the LEDs to be directly viewed through the top of the case. No other changes need to be made to the kit assembly process.

Wire Winders

While on the subject of 3D printing, I

*7133 Yosemite Drive, Lincoln, NE 68507 email: <k0neb@cq-amateur-radio.com> Hamfest Hotline #5855 have discovered a number of wire antennas popular with those who enjoy portable operating. Parks On the Air (POTA) as well as Summits On the Air (SOTA) operators often deal with the problem of storing and deploying these wires for end-fed antennas and dipoles which can also include counterpoise wires for vertical antennas. Adam Kimmerly, K6ARK, has designed a number of extremely compact wire antenna kits that I'll be reviewing soon. In addition, Adam also provides the 3D printing files to make winders for

portable wire antennas including his lineup of kits (*Photo B*). To find Adam's 3D printable objects, go to <www.printables.com>. This website is aimed at the users of the Prusa line of 3D printers, but the files are easily printable on other 3D printers as well. To find his designs on Printables, just search for K6ARK in the search field. To prepare the file for your printer, just use the slicer program you normally use for your printer to process these files for printing.

Adam gives an online source for the Velcro® strips needed for assembling



Photo A. The original 4-State QRP Group 4S Dummy Load mounted in the original version of the 3D printed case (left), and the new design case (right) made for having the BNC connector mounted on the bottom of the PC board.

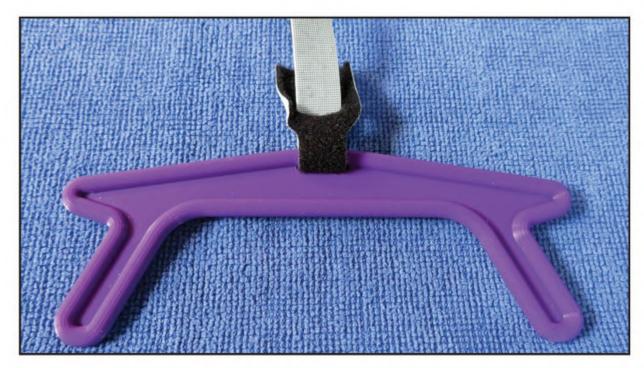


Photo B. A K6ARK-designed wire winder with a Velcro® strip attached.

























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this winder on the Printables page. I used his simple antenna winder design to print several winders for an upcoming group kit build a local club is doing that involves the Pacific Antenna 30/17-meter dual-band trap dipole kit (*Photo C*). This inexpensive kit sells for \$25 and is also available as a 40/20-meter dual band version. There are several other winders as well as many 3D designs available on his page that would be very useful to those operating portable. With warm weather finally here, it is time to put together some great antennas and accessories for enjoying the fun of portable operation.

Soldering Pen

Harbor Freight has again come up with a tool that can be useful for hams in the form of a cordless soldering iron (*Photo D*). This tool is sold as a 4-volt Lithium-lon Soldering Pen, but it isn't very pen-like. I found the handle to be quite thick. The tool comes with an equally sized stand to allow for safe storage while the tip still is hot, a very nice touch. Many other cordless soldering tools come with no place to safely cradle it while the tip cools. This cordless soldering tool heats up to about 900 degrees and recharges using a USB cable, which is supplied. I found it useful for working with connectors outdoors or in automotive installations. The higher temperature is more useful for repairing antenna wires and connections as



Photo C. A Pacific Antennas 20/40M trap dipole kit wrapped on two K6ARK-designed 3D printed winders.



Photo D. The Schneider 4V cordless soldering iron from Harbor Freight. This tool utilizes USB-C charging cables.

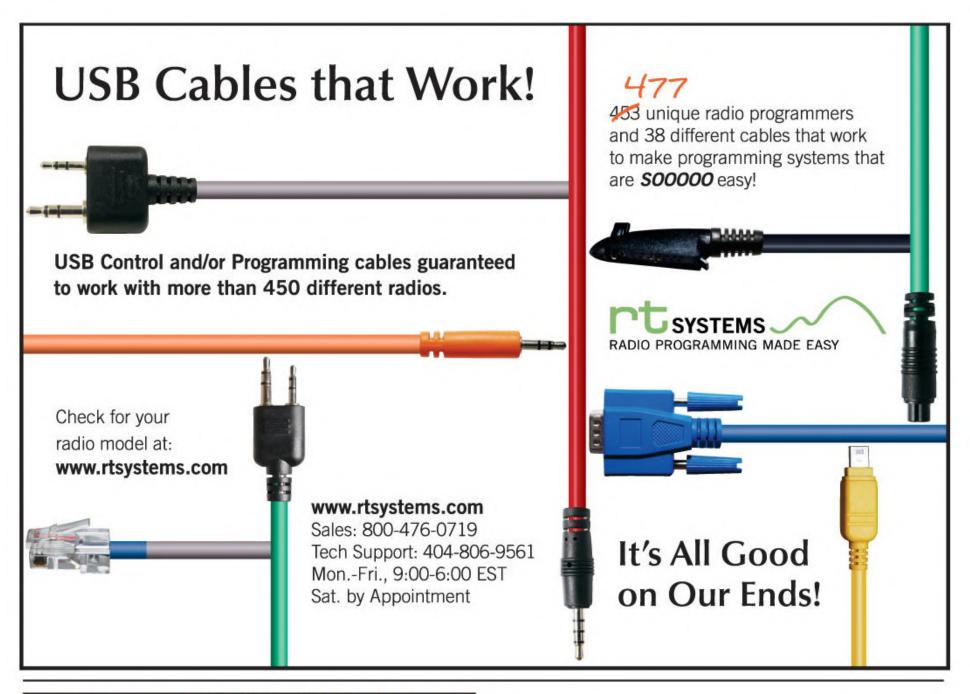




Photo E. A Southwire multimeter featuring a lighted display, Bluetooth connectivity, and an LED "headlight" to illuminate the circuit being tested.

well as other types of connections outside of finer work. I would not use it on PC boards as I believe it to be a bit too hot. You can find this cordless iron for sale at your local Harbor Freight store or at <www.harborfreight.com> for \$39.99. As with most items at Harbor Freight, big savings can be had from the list prices by watching their online coupons and ads.

Getting a Good Reading

Finally, I had the occasion to visit my local Menards store recently and discovered their electrical section now has a much more extensive selection of multimeters and other electrical test equipment than I have seen in the past. I only saw maybe 2 or 3 different types of meters there in the past. They now carry a broad line of meters including those sold by Southwire that include models that have Bluetooth connectivity to a smartphone app that lets you record and observe readings. Some of their meters include a "headlight" that lets you illuminate the circuit being tested (*Photo E*). This feature can be very handy when testing things in darkened areas, such as in repeater or equipment rack cabinets, closets, under desks, etc. This is in addition to the backlight feature that illuminates the digital display. Menards is a home improvement store that is primarily in the central part of the US and also is available online at <www.menards.com>.

Hamfests on the Horizon

April brings lots more hamfests and May is just around the corner with the Dayton Hamvention® being the highlight. I hope to see everyone at one of these great events and look forward to finding even more new kits and tools!

Until next time, 73 de KONEB

magic in the sky

BY JEFF REINHARDT,* AA6JR

I Need a Bigger Antenna!

f you saw the 1997 movie, *Contact*, you might remember the plaint of the main character, Ellie Arroway (played by Jodie Foster) as she portrays a young ham radio operator seeking to feed her curiosity about the universe. The dramatic cut shows a grown young woman at the Karl G. Jansky Very Large Array (VLA) in New Mexico, the site of 28 receiving dishes, each weighing 230 tons and able to be tightly concentrated or spread across a distance of some 22 miles, depending on the area currently being studied.

If you haven't seen the movie, it's worth the investment of time, as it explores a wide range of topics, beliefs, science and emotions tied to our understanding of the universe. You would expect no less from a film inspired by a book of the same name, written by the late astrophysicist Carl Sagan. A key element of the story is the search for intelligent life beyond our home planet, but scientific research at the VLA goes far beyond that single pursuit.

Road Trip

Those familiar with my writings in *CQ* may know that I'm a "road warrior" who

*5904 Lake Lindero Drive, Agoura Hills, CA 91301

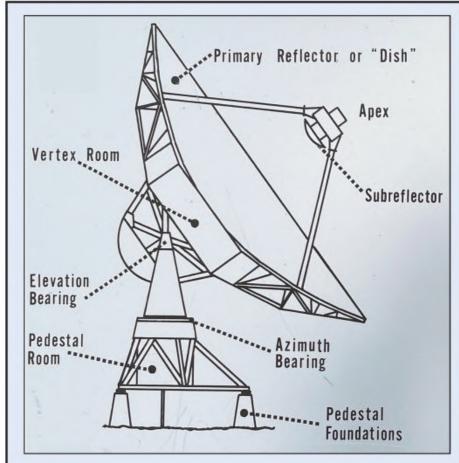
e-mail: <aa6jr@cq-amateur-radio.com>



What's 90 feet tall, weighs 230 tons and moves in a tightly choreographed ballet with its 27 siblings? Read on to find out...



Just some of the Very Large Array's receiving dishes at work. The array is too large to capture in one photo. (All photos by the author)



Antenna Specifications

Type: Offset cassegrain with asymmetric subreflector

Mount: Altitude-Azimuth Focal Ratio: f/.35 Total Weight: 235 Tons

Total Height: 29 Meters (94 ft.) when pointed straight up

Dish Diameter: 25 Meters (82 ft.)

Drive System: 4 Electric motors (2 per axis)

Range of Motion: 540 degress azimuth, 120 degrees

elevation

Tracking Accuracy: 15 arc seconds in winds up to 18 mph Founations: Height above track 1.9 Meters (6ft. 4in.)

Depth below track 9.7 Meters (32ft.)

Technical specifications of the VLA radiotelescope dish antennas.

has enjoyed exploring highways and back roads in every state of this great country from coast to coast, from Canada to the Gulf shores and the Mexican border, with visits to Alaska and Hawaii. To be sure, there are breathtaking sights and experiences to be found in each state, but a visit to the VLA could (and should) cause recalibration of your ability to measure awe.

The Road Less Traveled

Unlike many tourist attractions, such as Hollywood, Las Vegas, Broadway or the Disney parks, you have to really want to visit the VLA. By design, it's not near, well, anything, so as to provide a quiet (from a radio perspective) home for the antenna system. Operated by the National Radio Astronomy Observatory, the VLA was constructed in the 1970s on the Plains of San Agustin, several miles west of Socorro, New Mexico. The nearest settlement is Magdalena (blink and you missed it), and if you like wide open spaces, you'll enjoy the vistas along US 60 as you make your way along the road to the VLA.

Do Your Homework

However, before tossing your suitcase in the car, do become familiar with the VLA and what's required of those who intend



Jessica, KD6ARA, and Steven, K6SJR, give an idea of the scale of just one of the receiving dishes. Steven is 6'2" tall.

to visit. Start on the web at https://tinyurl.com/4sbb5by7. The website contains vital information on the limited days and hours visitors may be welcome, the nominal admission fees, and importantly, the radio emissions that are prohibited at the site. For example, drones are not allowed under any circumstances and commonplace items like cell phones and Bluetooth devices must also be turned off in and around the facility. RV operators need to be sure the microwave oven is not used! Frequencies monitored at the VLA range from 1 to 50 GHz with equipment that could sense a cell phone on the moon!

What You'll Experience

The small visitor center has a friendly and helpful staff along with a theater and dioramas that explain the purpose of the facility and some of the scientific studies being undertaken there. The theater shows a short informative film, appropriately narrated by Jodie Foster, that gives greater understanding to the missions of the VLA.

You can then head outdoors and begin a self-guided walking tour past several exhibits, each with interpretive signs and several of them are interactive. But the real thrill is approaching one of the actual dishes and marveling at the size and precision of the unit (see photos). Each antenna unit is over 90 feet high and the receiving dish is 82 feet across, with a



Signals from light years away find their to dishes in New Mexico.

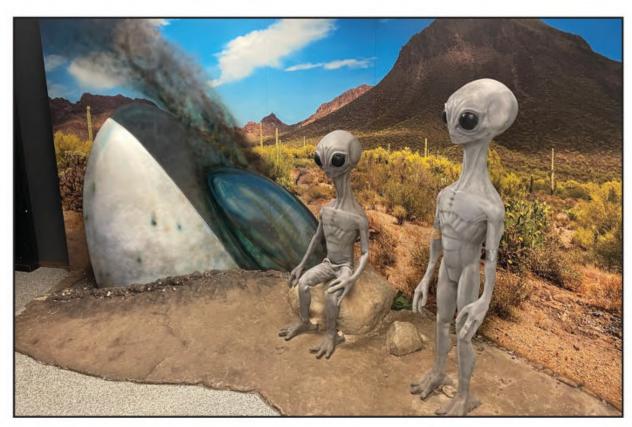
total weight of 230 tons. Captured signals are then conveyed to a cryogenically-cooled receiver. While the numbers are impressive, remember that when in use, there are 27 of these behemoths (the 28th is kept as a spare) and they are mobile!

Depending on what is being observed by the VLA's radio telescopes, the 27 active dishes can be configured in different reception patterns, enabling wider or more concentrated areas of resolution. Grouping the dishes in their varied configurations is a time-consuming operation, as they move along rails to their respective connection points. A reconfiguration occurs every four months. While observing, the data from each dish is conveyed to a central control building which is enclosed in a Faraday cage, where a supercomputer assembles the data and converts the received signals into formats the scientists can analyze, including visual images. Sadly, but understandably, a visit inside the control building is not permitted but one may climb the stairs to a second story observation deck to take in the site and perhaps capture some photographs.

During our visit, we witnessed the coordinated and simultaneous movement of the dishes as they were aimed at different targets and that motion was perceived as an amazing but exacting ballet. Silence fell over the visitors as the graceful precision movements took place.

Just What's "Out There"?

In its nearly 50 years of operation, the VLA has detected the "invisible universe" of radio emissions from distant galaxies, solar systems, planets, black holes, gas clouds and stellar "nurs-



No, these folks were not calling us through the VLA – but you can visit them in Roswell, New Mexico, about a 3¹/₂-hour drive to the east. And remember – this is the April issue!

eries." Since operations began in 1976, the VLA has observed some 43,000 different cosmic objects. While the stunning visuals from both land-based telescopes and the Hubble and Webb telescopes orbiting in space add to our understanding of the universe, radio astronomy still has a valued place by detecting that which cannot be viewed in the visual spectrum, or objects that cannot be observed because they are obscured by cosmic dust.

While the film *Contact* placed much focus on the search for extra-terrestrial intelligence (SETI), that is not the main focus of the VLA, so the movie image of an observer listening intently to headphones is not quite the case. Scientists from all over the world have used the

VLA to explore topics too numerous to list but they include studies ranging from our own solar system to the farthest reaches of the known universe.

New discoveries frequently open the door to new mysteries. Can we come to understand the enigmatic "dark matter" of the universe or look back in time to the Big Bang? Are there sources of energy we have yet to define? And – are there any signs of life beyond the (relatively) tiny speck of celestial dust we call Earth?

As you read this, consider that radio signals that originated untold eons in the past have been making their way toward Earth at the speed of light. Some of those emissions are being detected right now, as the VLA captures another aspect of the *Magic In The Sky*.

antennas

BY KENT BRITAIN, WA5VJB

Care and Feeding of SWRs

or some years, there has been considerable speculation about those tiny SWRs crawling around on our antennas and soaking up RF energy. Do they have six legs? Do they have eight legs? Microscopic studies have shown that they are indeed related to arachnids and thus have eight legs. But they don't necessarily put them all down on your feedline at the same time. Get those radio



waves going up and down the antenna and it burns their feet! They lift up one foot, then another, and when they have seven legs in the air and are standing on only one foot, your SWR is 1 and you get out best!

Of course, this brings up the question of with only eight legs, how can you have an SWR higher than 8?

Studies into SWR breeding habits continue. We hope to report on the results of this research in next April's column.

Late News Flash!

The Environmental Protection Agency has declared the SWR an endangered species. As explained by the EPA's Dr. Chart Smith, "It's a classic case of habitat destruction! With all these hams using antenna tuners and getting their SWR counts down to 1, they simply don't have an opportunity to breed." Regulations to ban the use of automatic antenna tuners are planned.

Email: <wa5vjb@cq-amateur-radio.com>

SPURIOUS SIGNALS

By Jason Togyer W3MCK www.jaythurbershow.com



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announcements (from page 2)

1st Avenue. Contact: Bill Powers, Phone: (412) 260-5699 or Del Peterson, Phone: (412) 974-9695. Email: <hamfestchairman@trarc.net>. Website: <www.trarc.net>. Talk-in 146.73. VE exams.

DOVER, OHIO — The Tusco Amateur Radio Club will hold its 2023 Hamfest, Computer & Electronics Show from 8 a.m. to 1 p.m., Saturday, April 22 at the Tuscarawas County Fairgrounds, 259 S. Tuscarawas Avenue. Contact: Rick Dingman, KE8URA, Phone: (303) 934-0575 or Cindy Gray, KE8JNN, Phone: (330) 340-4946. Email: <w8zx@n8bag.bet>. Website: <www.w8zx.net>. Talkin 146.730.

LANDING, NEW JERSEY — The Splitrock Amateur Radio Association will hold the 2023 North Jersey Tailgate Hamfest beginning 8 a.m., Saturday, April 22 at the Landing Park Recreation Complex, 165 Landing Road. Email: kara.org>. Website: kara.org>. Talk-in 146.985-(PL 131.8). DXCC card checking.

SONOMA, CALIFORNIA — The Valley of the Moon Amateur Radio Club will hold its Hamfest 2023 from 8 a.m. to noon, Saturday, April 22 at the First Congregational Church of Sonoma, 252 W. Spain Street. Email: <valley-ofthemoonarc@gmail.com>. Website: <www.vomarc.org>. Talk-in 145.350 (88.5). VE exams, fox hunt.

ODENTON, MARYLAND — The Maryland Mobileers Amateur Radio Club will hold the MMARC Spring Hamfest from 7:30 a.m. to noon, Sunday, April 23 at the Odenton Volunteer Fire Department, 1425 Annapolis Road (Rt. 175). Contact: Bruce McPherson, AB3AC, Phone: (410) 456-2500. Email: kmcpherson73@verizon.net>. Website: https://tinyurl.com/2p935p6k>. Talkin 146.805- (PL 107.2).

OCALA, FLORIDA — The Marion County Emergency Radio Team will air a special event station KG4NXO from 1200-2359 UTC, Saturday, April 29 to celebrate 20 years of amateur radio support for Marion County Emergency Management. Frequencies include 14.262, 7.262 MHz and D-STAR on 146.790 MHz REF 037. Request further information about Certificate & QSL at the website <www.mert20.org>.

SPRING GROVE, PENNSYLVANIA — The York Hamfest Foundation will hold the 2023 York Hamfest from 8 a.m. to 1 p.m., Saturday, April 29 at Elicker's Grove Park, 511 Roth Church Road. Email: <duane.sternee@yahoo.com>. Website: <www.yorkhamfest.org>. Talk-in 147.330+ (PL 123). Free VE exams, DXCC / VUCC / WAS / WAC card checking.

MAN

CADILLAC, MICHIGAN — The Wexaukee Amateur Radio Club will hold the 63rd Annual Cadillac Amateur Radio and Computer Swap beginning 8 a.m., Saturday, May 6 at the Mackinaw Trail Middle School, 8401 S. Mackinaw Trail. Website: <www.wexaukee.org>. Talk-in 146.980. VE exams, card checking.

CEDARBURG, WISCONSIN — The Ozaukee Radio Club will hold its 43rd Spring Indoor Swapfest from 8 a.m. to noon, Saturday, May 6 at the Ascension Columbia St. Mary's Center, W67N890 Washington Avenue. Contact Tom Trethewey, KC9ONY, Phone: (262) 421-6351. Email: <swapfest@ozaukee radioclub.org>. Website: <www.ozaukeeradioclub.org>. Talk-in 146.97- (PL 127.3)

BOONSBORO, MARYLAND — The Antietam Radio Association will hold The Great Hagerstown Hamfest from 7 a.m. to 1 p.m., Saturday, May 6 at the Washington County Ag Ed Center7313 Sharpsburg Pike, Rte MD-65 South Boonsboro. Contact: Steve Struharik, WA8EIH, Phone: (240) 818-1248. Email: <struhariks@gmail.com>. Website: <http://W3CWC.org>. Talk-in 146.730-(PL 100). VE Exam and card checking.

SANDWICH, ILLINOIS — The Kishwaukee Amateur Radio Club will hold The DeKalb Hamfest from 8 a.m. to 1 p.m., Sunday, May 7 at the Sandwich Fairgrounds, 1401 Suydam Road. Contact: Bob Yurs, W9ICU, Phone: (815) 757-3219. Email: <w9icu@arrl.net>. Website: <www.karc-club.org>. Talk-in 146.730- (PL 100).

TOLEDO, OHIO — The Lucas County ARES will hold its Trunk Sale & Swap Meet from 9 a.m. to 1:30 p.m., Sunday, May 7 at the Toledo Speedway, 5639 Benore Road. Phone: (419) 370-2882. Email: <swap@lucasares.org>. Website: kitp://www.swap.lucasares.org>. Talk-in 146.940- (PL 103.5).

PRESCOTT VALLEY, ARIZONA — The Yavapai Amateur Radio Club will hold the 2023 Prescott Hamfest from 8 a.m. to noon, Sunday, May 13 at the Granville Elementary School, 5250 Stover Drive. Contact: John Stover, KT7P, <a href="mailto:k

STANWOOD, WASHINGTON — The Stanwood-Camano Amateur Radio Club will hold the SCARC 30th Annual Electronic Flea Market & Hamfest from 9 a.m. to 1 p.m., Saturday, May 13 at the Stanwood Middle School, 9405 271st Street NW. Email: <scarchamfest@yahoo.com>. Website: <www.scarcwa.org>.

XENIA, OHIO — The Dayton Amateur Radio Association will hold the Dayton Hamvention 2023 from 9 a.m. to 5 p.m., Friday, May 19; 9 a.m. to 5 p.m., Saturday, May 20; and 9 a.m. to 1 p.m., Sunday, May 21 at the Greene County Fair and Expo Center, 210 Fairground Road. Phone: (937) 276-6930. Email: <info@hamvention.org>. Website: <www.hamvention.org>. Talk-in 146.94-(PL 123). VE exams, card checking, special event station W8BI.

qrp: low-power communications

BY R. SCOTT ROUGHT,* KA8SMA

Winter Field Day with My Old Friend ... the FT-817

ecember 28, 2022 was a sad day for the QRP world when Yaesu announced it was discontinuing production of the FT-818 due to parts availability. The FT-818 and its predecessors, the FT-817ND and FT-817, are a solid line of highly portable, rugged, QRP transceivers that introduced many hams to the joy of low-power communication. These "shack in a box" rigs were touted as the world's first self-contained, battery-powered, multi-mode portable QRP transceivers covering the HF, VHF and UHF bands. Soon after the FT-817 was released in 2001, I bit the bullet and purchased one. For nearly 20 years, I used the FT-817 as my primary transceiver until I purchased an Icom IC-7300 (with the output power set at 5 watts, of course). I now use the FT-817 primarily for Parks on the Air (POTA) activations, Winter Field Day (WFD), and general portable operation.

I have contested, rag-chewed, worked DXpeditions, and had memorable QSOs with several notable hams including Sid May, ET3SID (SK), and John Delvodere, ON4UN (SK), and contacted RI1ANC (Russian research station in



Photo A. Last year's ground-mounted Winter Field Day (WFD) shelter.

Antarctica) with the FT-817. Although my FT-817 is in working order and does everything I need, a part of me feels empty knowing that I cannot replace it with a new one in the event it goes kablooey. One reader recently asked me if I would buy an FT-818 on the used market knowing it has been discontinued. I responded with a resounding yes! As part of Yaesu's December 28th announcement, it was indicated that support for the FT-818 and the availability of replacement parts will continue long after production. As long as there are talented radio technicians who like working in tight quarters on small boards (my pudgy fingers do not belong inside these radios) the FT-817/817ND/818 will be around for a long time to come. In fact, I am considering purchasing another just to have on hand. One cannot have too many QRP rigs, right?

The big question now is, what does Yaesu have in store to replace this iconic series? Many want to see Yaesu's next QRP transceiver equipped with a built-in sound card for digital operation, a larger display, less current draw for longer battery life, and a built-in antenna tuner. I am sure Yaesu will include all these features and many more on its next go, but what I don't want changed is the stock hand mic and audio output. These items may seem trivial, but I really like the stock mic (MH-31) that came standard with these radios as it fits in my hand comfortably and does not slip out like some of the smaller mics that come with other QRP transceivers. Also, the audio output through the built-in speaker is loud and crisp, just what the doctor ordered for portable operations in noisy environments.

Whether or not you are a fan of the FT-817/817ND/818, I believe the QRP community owes Yaesu a huge thank you for helping introduce thousands of hams to the thrill of low power communications and turning skeptics who believed you cannot work the world with 5 watts or less into believers.

WFD 2023

WFD – Winter Field Day - is one of my favorite events of the year as it provides an escape from the wintertime doldrums and allows me to get outdoors and have fun with my QRP gear. Last year, I visited the Manistee National Forest in northern Michigan where I set up camp off a two-track trail in the middle of nowhere and constructed a makeshift ground shelter in which I spent the night (*Photo A*). I wrote about my experience in last year's April column and soon after it went to print, I received positive feedback from several readers and was petitioned by one of my local ham clubs to discuss my adventure at an upcoming meeting.

For those who may not be aware, the idea behind WFD is to practice setup/operational skills under less-than-ideal conditions. I took this to the next level by using only materials I had on hand to construct my shelter (a tarp, Visqueen® plastic sheeting, rope and binder clips). To stay in line with my "keep it simple" and minimalistic ways (I am a QRPer, after all), I prohibited myself from purchasing any items to construct the shelter.

Since last year's event was a success, I decided to do the same this year and construct a homebrew shelter near the

^{*&}lt;ka8sma@cq-amateur-radio.com>



Photo B. Support posts zip-tied to the truck bed's cargo bars. Note the rope for supporting the tarp roof.



Photo C. Securing the roof and walls with binder clips.



Photo D. Ooh la la! The finished shelter.

same location where I operated last year. The thought of 24 hours with no cell reception, being outdoors with Mother Nature, eating salt bagels and scallion cream cheese (my favorite junk food), and of course, operating QRP in the woods, made me giddy with excitement.

The Makeshift Shelter Revisited

One lesson learned last year was cold air emanating from the frozen ground made for cold feet and legs, so getting off the ground was my number one consideration for this year's shelter. I accomplished this by building the shelter in the bed of my Dodge Ram 1500 pickup truck. The bed (5 feet wide and 7 feet long) provided a solid foundation and the sprayin bedliner made for a non-slippery surface (no melting ice or snow to deal with). I used the same materials as last year (rope, a tarp, Visqueen clear plastic, and binder clips), except I added four wooden 2x2s (to be used as corner support posts) and a handful of zip ties to construct the shelter. Prior to setting out for WFD, I cut the 2x2s to a length of 6.5 feet and pre-drilled holes in each one so I could zip-tie them to the cargo bars inside the bed. I shortened the 2x2s because I did not need an 8-foot ceiling and it made for easier construction. Rope was used to secure the tops of the 2x2s so they would not flop around and to provide support for the roof tarp. Photo B shows the structure prior to applying the roof tarp and clear Visqueen for the sides. Binder clips were used to clamp the roof and sides together. To do this, I bunched the tarp and Visqueen together then rolled them over a few times before clamping (Photo C). Excess Visqueen was pulled down inside the bed of the truck. This simple shelter (Photo D) will not win any prestigious "Better Homes and Gardens" awards, but it gets the job done!

A utility table (4 feet long by 2 feet wide) and folding chair were set up inside the shelter for the operating position.



Photo E. The operating position – a nice view of the woods!

Like last year, I borrowed my brother's Mr. Heater[®], a propane radiant heater that is safe for use in indoor environments, for heat. I took along several one-pound propane cylinders that I had on hand which, in total, could supply around 20 hours of heat. I placed the heater beneath the table which not only kept my feet and legs warm but provided a warm tabletop for operating. Within 45 minutes of turning on the heater I was basking in 60-degree temperatures against an outdoor temperature of 33 degrees. When the temperature inside reached 70 degrees, I turned off the heater to conserve propane. In comparison, last year, the warmest I could get the inside of my ground mounted shelter was in the low to mid-50s against an outdoor temperature in the upper 20s. Without question, getting the shelter up off the ground created a much warmer environment.

Fun in the Woods

As you may have already guessed, I took my FT-817 along for this operation. I coupled the FT-817 with my MFJ-971 portable antenna tuner, hand key and a Bioenno 20Ah Lithium Iron Phosphate battery ($Photo\ E$). I also packed my Buddipole Powermini Solar Charge Controller and Powerfilm foldable solar panel in the event I needed to charge the battery.

I kept my antenna simple and used a slingshot to help string approximately 100 feet of 16-gauge wire high into the trees. When erected, my wire antenna resembled the shape of an inverted V. Total setup time was about an hour to erect the antenna, build the shelter, and set up the equipment.

When I turned on the FT-817, both 20 and 40 meters were a solid wall of stations across the phone portion of each band. CW traffic was high, too. For the first couple of hours I searched and pounced across 20 meters and made a slew of contacts before finding a clear frequency I could hold and call CQ without any neighboring QRM. After a few hours of WFD activity, I decided to operate POTA and activated Manistee National Forest (K-4583). My little QRP rig received



Photo F. Snack time – nothing beats a toasted salt bagel.

a good workout as there was no shortage of hams participating in WFD or POTA hunters who needed K-4583 in their log.

To make the most of this adventure. I spent the night in the woods. I thought about sleeping in the shelter; however, I was concerned that a pesky squirrel that hung around the truck all Saturday afternoon and evening would come for a nighttime visit, so I opted for the truck's back seat instead. Sleeping in the back seat worked out for the better as I was able to stay tucked in my sleeping bag and remote start the truck (with heater on) using my key fob when it got chilly. To satisfy my hunger, I brought a bag of salt bagels and a tub of scallion cream cheese which was Saturday's dinner, breakfast on Sunday, and snacks in between, exactly what was needed to keep me going! Thankfully, I remembered to pack my tongs so I could toast my bagels in front of the heater (*Photo F*).

Before breaking camp late Sunday morning, I hopped on 15 meters and worked several DX stations. The DX operators were not participating in WFD but were very surprised to hear I was operating QRP from the middle of the woods. After a few exchanges with the DX stations, I packed up and headed for home. The only item left behind was a bagel for the annoying squirrel that hung around Saturday and kept a distant eye on me as I packed up.

Update - The V Stands

I am happy to say that the inverted delta loop antenna (dubbed the "V") I built last fall (see December column) is still standing. The extendable fishing poles I used for support arms have not failed and appear to be in good condition despite several winter storms, including the epic Christmas week blizzard that paralyzed much of the Midwest. I am very impressed with these fishing poles and am making plans to purchase a few more for upcoming antenna projects this spring.

I am also happy with the V's performance. In mid-January, I broke a moderate pileup on 12 meters to work TN8K (DXpedition to the Republic of Congo) with 5 watts SSB and received a 59 signal report. My signal report was no surprise as the magic of a DXpedition always yields a 59 report both ways, even for QRP stations - HI! This spring, I am planning to give the V a permanent home atop the house – my wife will be thrilled.

Until June, 73











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learning curve

BY RON OCHU, KOØZ

DX Abides...

It's the Journey, Not the Destination!

rat! Darn the luck! I was hoping to work the 3Y0J Bouvet Island DXpedition (ham radio excursion to activate a distant, remote entity; Photo A) into my logbook for an ATNO (all time new one). Unfortunately, Mother Nature, space weather propagation and deliberate QRM (interference) prevailed. At least, it sure seemed so in my neck of the woods in eastern Missouri and with my existing city lot vertical antennas. This DXpedition team made it to Bouvet and encountered tremendous challenges. The island is very remote (Photo B), and the hardships associated with freezing temperatures, high winds, rough seas, and pounding surf proved to be unrelentless and daunting. From what I've read, and seen of posted videos, it is an amazing feat that the team was even able to safely get onto the island, much less put it on the air under such harsh conditions. I know I couldn't do it. I admire the 3Y0J team's intrepid spirit and willingness to activate the island. It is a remarkable achievement.

Win Some, Lose Some

It's too bad that the 3Y0J team wasn't able to achieve its initial goal of getting more antennas, generators and amplifiers on the island to transmit a robust, louder signal, thereby increasing everyone's chances for an ATNO. Instead, Mother Nature severely hampered their plans. Still, the team found a way to erect some antennas and to put two 100-watt transceivers on the air rather than giving up. "If there is a will, then we will find a way!"

Dedicated ham radio operators are resourceful. Instead of no one getting an ATNO, their efforts gave some of us, worldwide, a chance to put the station in the log. Unfortunately, constant, deliberate QRM by some, combined with the team's low power and shorter stay on the island, hampered the DX-pedition's goal of making contacts available to a wider community. I was able to hear their signal weakly on 17 meters



Photo A: The 3Y0J DXpedition took on the challenge of getting to, setting up on and operating from Bouvet Island. To say that it is inhospitable is an understatement! An Arctic-rated ship is required to navigate the rough seas to the island and getting ashore is downright dangerous. It ranked number two on the most needed DX entity list by ham radio operators prior to the 3Y0J DXpedition. North Korea ranks as number one.

and a little better on 30 meters, but the constant QRM interfered with my ability to copy their signal. I didn't even try to make contact. It is sad there were operators displaying selfish, poor behavior by QRMing (interfering) with 3Y0J's transmissions, severely limiting fellow hams from obtaining an ATNO. Sure, I wish I had made a two-way Q (DX ham radio parlance for QSO or contact), but alas and alack, that's part of the thrill of DXing. I am reminded of ABC television network's "Wide World of Sports" announcer Jim McKay's famous phrase, "The thrill of victory, and the agony of defeat." I deeply appreciate all the planning, expenditure of resources, time and effort that went into activating Bouvet and the opportunity to "land an ATNO."

DXpeditions Are Exciting

DXpeditions generate excitement among DXers. DXpeditions to rare places generate tremendous excitement. Maybe it's the thrill of the hunt and chase. Maybe, it's excitement generated from putting up a new antenna or getting a new rig. Maybe it's the allure of

working an ATNO. Maybe it's the desire to not only be on the DXCC Honor Roll, but to become a member of "Top of the DXCC Honor Roll!" Maybe, like fishermen, it's the fun of swapping shared experiences associated with working DXpeditions at gatherings and club meetings. I suspect it's all of the above and then some. I enjoy attending the Dayton Hamvention[©] DX forum to listen to the stories and to see the slides and videos that DXpeditioners bring to the forum. I always learn something new. In a small way, I feel like I am part of a bigger ham radio community picture which reinforces my love and my enthusiasm for our hobby.

All DX is Exciting!

As exciting as DXpeditions are in the ham radio community, I never get bored of the daily thrill of turning on my transceiver and making an unplanned, distant (DX) contact with someone I've not met before. Likewise, I enjoy coming across a DX operator I've worked before to see how he/she and his/her family are doing. They may not be a rare DX entity, but communicating with

^{*}Email: <ko0z@cq-amateur-radio.com>

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someone on another continent is always exciting! For the most part, DXpeditions to rare entities tend to be seasonal. They tend to be operated around the months surrounding the fall and spring equinoxes when DX propagation is most favorable. Fortunately for us, "regular" DX contacts still abound all

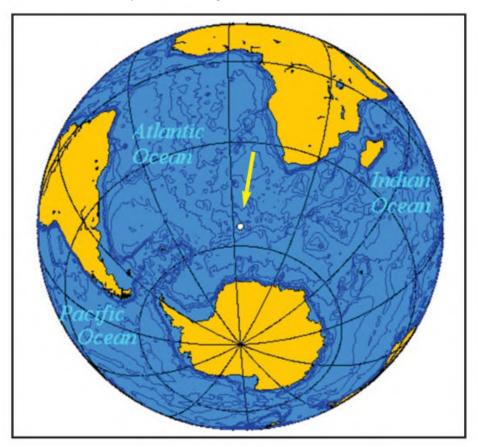


Photo B: Bouvet Island – the white dot on this map - is an extremely remote island in the South Atlantic Ocean between South America, Africa and Antarctica. (Source: Wikimedia Commons)

year long. These "casual" DX contacts are the real gist of this month's article. No matter the time of day or the season of the year, I can almost always find someone to chat with.

There are times when a DX station gets on the air and the operator is trying to work (contact) as many hams as possible. These types of contacts are quick and simple. For example, the on-the-air exchange will only consist of call signs, a signal report and a 73 (goodbye and best wishes). Sure, those contacts are fun, but the ones I remember the most are the more relaxed, personal contacts that entail more than call signs and a signal report.

My Typical Radio Day

Now that I am a retired, I have more time to devote to amateur radio. I usually begin my mornings with breakfast and the morning news. Afterwards, I get a piping hot cup coffee from my Keurig, sit down at my operating desk and I begin to scan the HF (high frequency) bands for activity. Sometimes, I call CQ (general call to all stations), but more often than not, I listen for others calling CQ. Recently, I had two very interesting contacts. These ham radio operators don't know me from Adam, or that I am a CQ magazine columnist always on the prowl for a future topic to write about. As far as they know, I am just another ham radio operator (which I am), and they have no idea that my QSO with them inspired me to write about them in CQ! I hope they will be pleasantly surprised.

Signals Across the Pond

Local mornings are a good time, propagation wise, to listen to Europeans from Midwest U.S.A. As I am beginning my day, hams across the Atlantic are in the middle of their day.

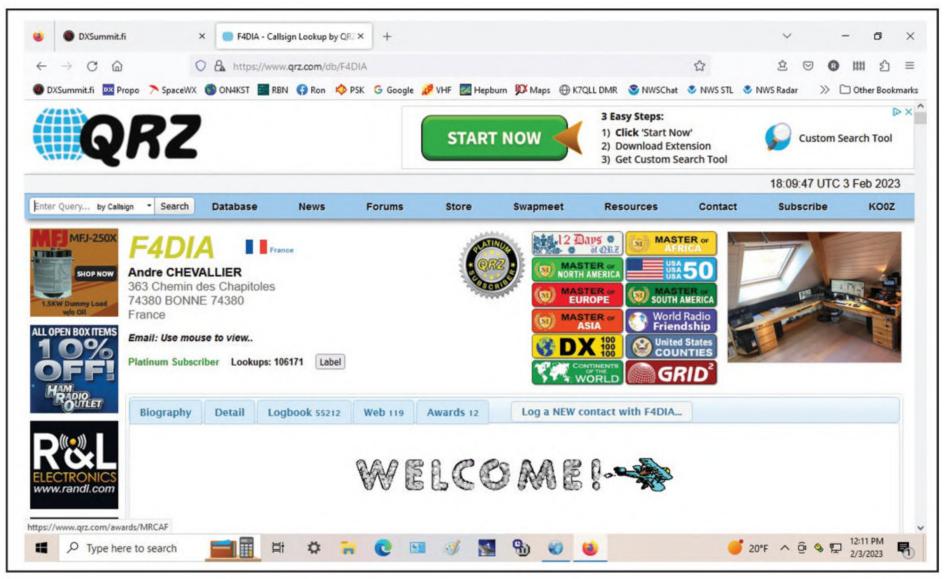


Photo C: Screenshot of Andy Chevallier, F4DIA's, QRZ.com webpage. It was good catching up with Andy since our last QSO three years earlier.

It's their afternoon and HF propagation tends to follow the Sun's path. As my morning becomes early afternoon, Europeans are enjoying evening hours.

Andy Chevallier, F4DIA

The month of February, 2023, inspired me. On February 3around 1804 Z (Zulu time, abbreviation for UTC, or Co-

ordinated Universal Time) on 17 meters CW, I gave a call to Andy, F4DIA. Andy came back to my call and a nice, relaxed CW QSO ensued. Andy lives in Bonne, France (*Photo C*). It had been three years since I first contacted Andy. It was good to catch up with him again, especially since the pandemic, to see (hear) he is alive and well! Andy is an excel-



Photo D: Screenshot of Andy's impressive HF Yagi, also from his QRZ page. He has an impressive signal on the bands.

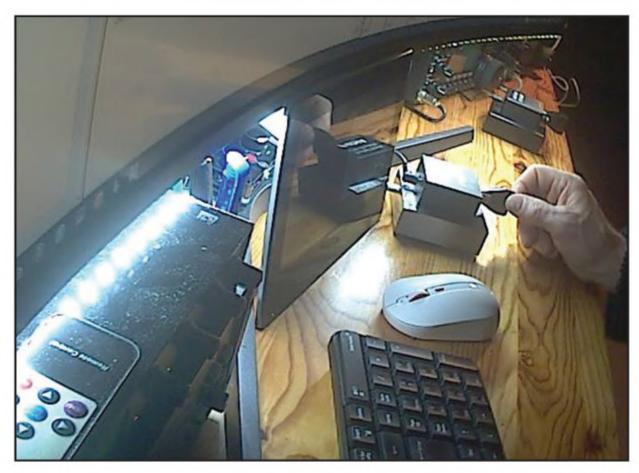


Photo E: When Andy is on the air, he transmits video from his shack. It is fun to listen to his transmitted Morse code and a few seconds later see his fingers working the paddles. BTW, F4DIA sends very copyable code.

lent CW operator. I easily copied his CW and band conditions on 17 meters were good. His HF Yagi (beam antenna; Photo D) goes a long way towards making his signal easy copy. Andy and I chatted about the weather and our stations. The last time we talked, I was living in Illinois. Back then, I was still using the same transceiver (Elecraft K3S), but I had a rotatable 17-meter dipole up 45 feet. This time, I had the same transceiver, but I was using my MFJ cobweb antenna mounted ten feet off the ground. So my signal this time wasn't quite as strong, but we had good propagation and solid copy between us. Looking at Andy's QRZ page, I noticed that he has a webcam link. He has a camera focused on his CW paddles and you can actually see Andy's fingers move the paddles and send in almost real time (*Photo E*). There is a slight delay between receiving his radio signal and seeing his fingers send CW over the video via the internet. Too cool! I look forward to my next QSO with Andy. Perhaps, one of these days we'll be able to have a face-to-face, in person QSO!

Time for Phone

After I completed my enjoyable CW QSO with Andy, I decided to switch it up and to listen to voice (phone). Taking another sip of coffee, I switched my rig to upper sideband and proceeded to tune across the band. Before long, I came across a very interesting QSO with club station M0SNB in England. They had a good signal into the Midwest. What made the QSO particularly interesting to me was one of the operators describing their club station. Their club station (Photo F) is located at a former British government nuclear bunker! MOSNB is the call sign for the Secret Nuclear Bunker Contest Group (Photo G). The bunker is located about 32 kilometers (20 miles) northeast of London. It secretly operated from 1952 to 1993 according to their website, https://www.gb0snb.com/>. I highly recommend going to their webpage and reading the fascinating history associated with the bunker and the Cold War. I had the most enjoyable time listening to the QSO and learning more about MOSNB's unique clubhouse.

Time for Lunch

While listening to MOSNB, I checked out their website and before I knew it, lunchtime arrived. I had promised my wife, Debbie, KC9ULA, that we'd go out for lunch. Since discretion is the better part of casual DXing (especially when it comes to lunch with your spouse), I

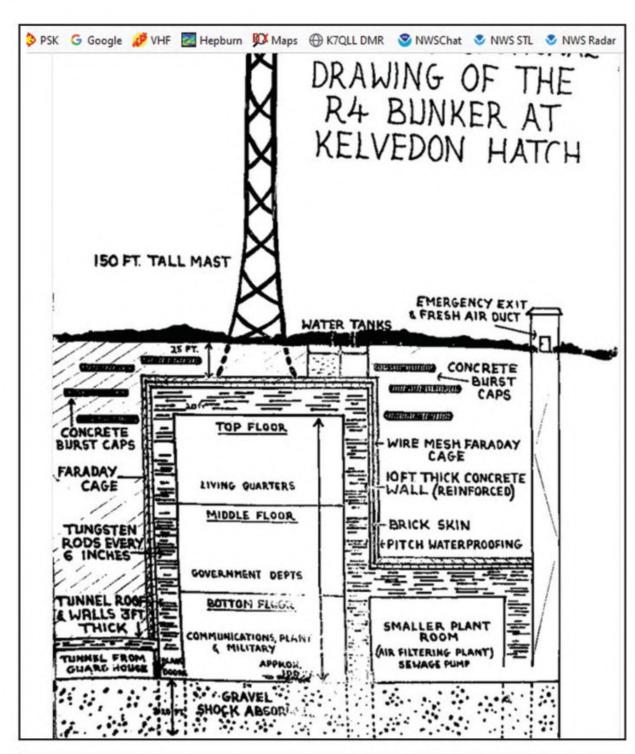


Photo F: Screenshot of England's Kelvedon Hatch Secret Nuclear Bunker and club station for M0SNB.

somewhat reluctantly turned off the rig and we made our way to a nearby restaurant. Our lunch was very satisfying, but so, too, was my morning working DX from my radio bench in St. Peters, Missouri! I was happy to reconnect with Andy and to find him well and active on the bands. I'm glad to learn that a former secret nuclear bunker is now a museum and the home for a very active British radio club.

The thing is there are a lot of similar stories to be told every day. Fortunately, I am able to discover some of them and to share these discoveries with you. Luckily, ham radio is filled world-wide with fun, interesting operators who make getting on the air fun. Too bad our ranks also contain a minority of discontented operators, but by far my logbook and my memories are filled with contacts like I've described this month. I've learned that the real reward is not in the destination, but in the journey and the people you meet along the way! Thank you for reading CQ and I hope to hear 73, Ron KO0Z. you on the air.

Photo G: Screenshot of M0SNB's QRZ page. I became fascinated and spent part of a very enjoyable morning listening to a QSO with M0SNB describing their very unique club station!



analog adventures

BY ERIC P. NICHOLS,* KL7AJ

Ye Olde Octopus Curve Tracer

accumulate stuff. One of my old bosses, who taught me an awful lot about running a business, once said, "If you don't have it, you have to buy it." I took his words of wisdom to heart, sometimes to the XYL's mild chagrin. But there's a difference between having and hoarding. I don't hoard; I have.

My Box du' Junque is impressive even by ham standards. For the past couple of years, I've had some child labor actually going through my vast inventory of electronics components, sorting them all and inserting them into a spreadsheet. Someone else once said, "If you can't find it, you don't really have it." So, not only do I have it, but I know where it is. Which is a good thing.

One of the items which recently acquired have status in my shop is a Tektronix 620 monitor scope (*Photo A*). It doesn't actually qualify as an oscilloscope; it has no time base, no calibrated vertical amplifiers, nor any calibrated horizontal amplifiers. It's essentially nothing more than a CRT, a high voltage supply, and a set of X and Y deflection plates. That's it.

Perhaps some of you are asking, "What conceivable purpose could an oscilloscope with no internal electronics possibly have?"

I'm glad you asked that. This bareboned embryonic facsimile of an oscilloscope is a wonderful adjunct to a device I will describe herein, known as a *curve tracer*. A curve tracer does nothing more than plot current THROUGH a device vs. a voltage ACROSS a device. Couldn't be simpler.

In January 1975 *QST*, David Ludlow, W7QHX, described a profoundly simple curve tracer adapter he dubbed "The Octopus." I had a brief correspondence with Mr. Ludlow a couple of years ago, wherein he assured me that he was indeed the very same David Ludlow who invented the device. Not that I had any doubts, of course; it's just that I don't meet many famous hams. I'm easily impressed. *Figure 1* shows the circuit in all its glory, shamelessly gleaned from that *QST* article.

*3763 Lyle Avenue North Pole, AK 99705 email: <kl7aj@cq-amateur-radio.com> I only made a couple of small modifications to my particular specimen of the Octopus (*Photo B*). Since the Tektronix XY monitor has no input gain adjust, I added a pair of internal 10-megohm potentiometers in series with the vertical and horizontal input terminals to

form a pair of 10:1 voltage dividers with the nominal 1-megohm input impedances of the '620 scope. This allows me to keep the trace fully on-screen, both horizontally and vertically. I also used a 9-volt AC wall wart instead of the center-tapped 6-volt transformer in the



Photo A. Tektronix 620 monitor scope



Photo B. KL7AJ Octopus

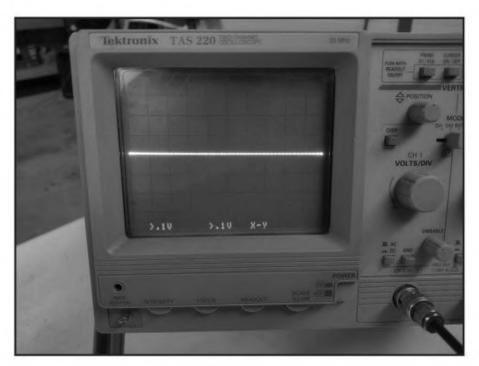


Photo C. Open circuit display

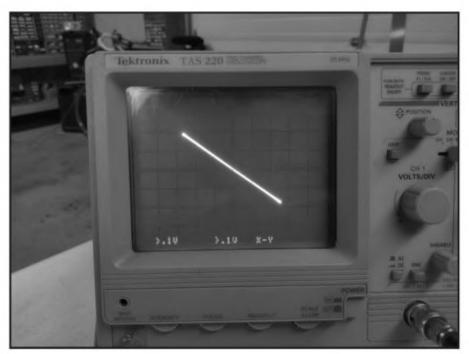


Photo E. Resistor

original, since this allows the testing of slightly higher voltage Zener diodes and such than David's version. (My "haves" include an infinite supply of wall warts, as you have probably suspected).

Aside from being a very handy (and cheap!) universal component tester, the Octopus is quite educational, demonstrating some basic principles of both linear and non-linear components.

Now, since most of our readers will probably not have a Tektronix X-Y display at their disposal, but probably DO have some sort of "normal" oscilloscope, the screenshots in *Photos C-H* were taken from one of my several such standard analog scopes in the XY mode. A note is in order here. Although every analog scope that I know of CAN be used as an XY display, not all of them are good at it. The frequency response and linearity of the vertical and horizontal amplifiers of most "bottom rung" scopes are greatly mismatched. Most

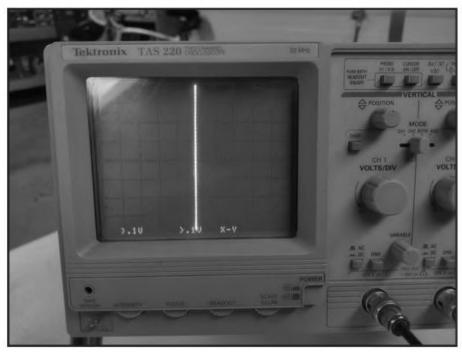


Photo D. Short circuit

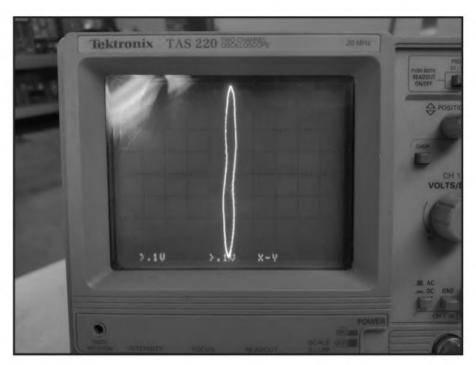


Photo F. Leaky electrolytic capacitor

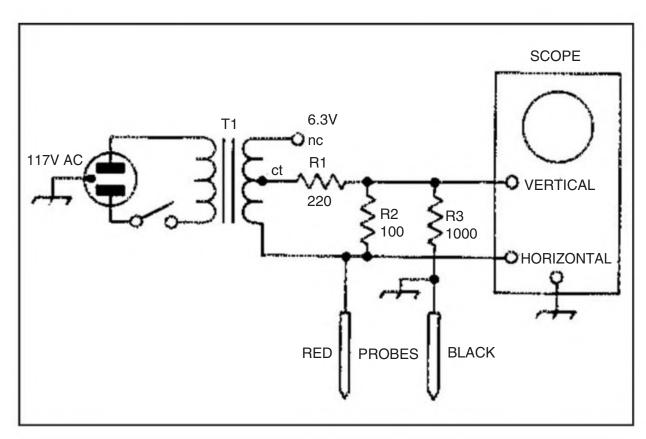


Figure 1. Schematic of the "Octopus" curve tracer adapter described in a January 1975 QST article by David Ludlow, W7QHX. (Courtesy January 1975 QST)

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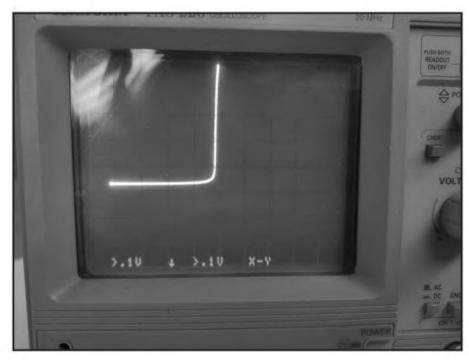


Photo G. Germanium diode

DUAL CHANNEL analog scopes do an excellent job in the XY mode, since they simply switch one of the identical vertical amplifiers to the horizontal sweep circuitry. Following are some typical displays, by no means is this an exhaustive catalog. You are encouraged to build your own octopus and experiment with various components.

After playing around with the Octopus for a while, you'll probably want to experiment with a little more elaborate curve tracer. There are a number of "official" curve tracer projects on the web. I believe the Arduino-based projects are the most interesting. But at their core, they are nothing more than I vs E plotting devices, like this primitive Octopus.

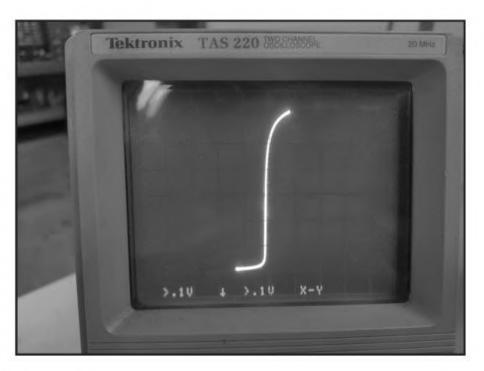


Photo H. Silicon diode and inductor in series

One of the more practical troubleshooting tasks of a curve tracer is IN-CIRCUIT component testing, and a curve tracer can do an amazing job of this...even with some fairly elaborate ICs. There are extensive catalogs of oddball component defects that a curve tracer can identify.

We trust you will have some fun with your Octopus ... maybe not quite as much fun as a REAL octopus, but probably a little safer!

In our next Analog Adventure, we will uncover the mysteries of the ubiquitous transmitter Pi network, with a little help from the VNA.

- 73! Eric, KL7AJ





ICOM's IC-905: A Commercial Radio for the Microwaves

've watched a number of YouTube videos, perused all the Icom literature and announcements, and read a number of articles discussing this radio. First and foremost, I have to say how pleased and excited I am that Icom is making a commercial unit to help folks more easily get on SHF frequencies. It is great to see a manufacturer work to help hams better use frequencies that are allocated to us. I am going to maintain that attitude as we see this device become available, and we finally get our hands on it. Here's my initial take: the majority of early adopters will be rovers and hilltoppers, seeking to simplify their mobile setups and perhaps add additional bands more easily. Our friend in Ireland, John, EI7GL, experimented with the IC-905 in Japan and posted an article about his experiences at <https://tinyurl.com/4yzhwvuv>.

Of course, it remains as a prototype in the US, so our talk is mainly speculation—but of course that's to be expected and is a lot of fun. I think this radio will delight some, and miss the mark with others, but again, that is about par for the course.

My friend and colleague Joe Eisenberg, K0NEB, a popular fixture at many ham radio events, was present at Hamcation® in Orlando in February and was able to get some photos of the new radio, seen in *Photos A* and *B*. Thanks, Joe!

While the concept and early press and compelling, I'm not sure that I fully understand Icom's "mission" with the IC-905, so I won't comment on whether they succeeded. Instead, I will offer some observations that I think will impact how the radio is and isn't used.

First, the treatment of 2 meters, 70 centimeters, and 23 centimeters. There is a single antenna port for these three bands, and a maximum power out of 10 watts. For serious weak-signal work, this will require splitters and amplifiers. So I don't think the radio is intended to meet that requirement, but I do think that having access to those bands for repeaters (such as the Cactus Net in the western states) and simplex access will prove to be valuable.



Photo A. Front panel of IC-905 shown in backpack carrier (Photos A & B by Joe Eisenberg, K0NEB)



Photo B. A look from the rear at the head and remote units of the IC-905

^{* &}lt;n4dtf@cq-amateur-radio.com>

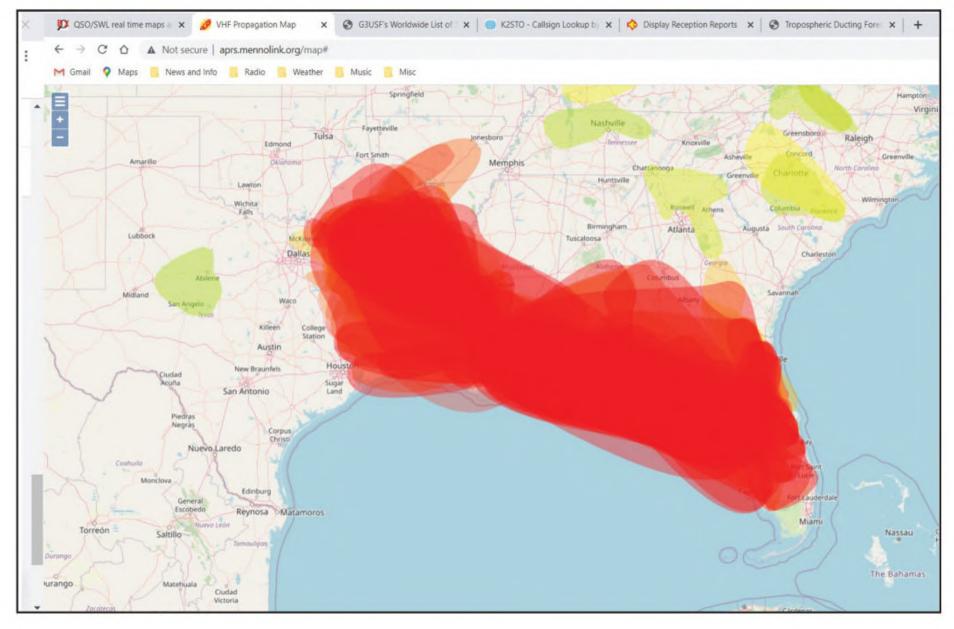


Photo C. Hepburn map of the southeastern US during the evening of February 14, 2023 showing the potential for tropospheric propagation.

Second, having 10 GHz as an option, rather than built in, seems to ignore the popularity of that band and the work that is being done across the world to advance knowledge of scatter modes, tropo modes, and even EME on 10 GHz. But at least it is an option.

On a positive note, Power over Ethernet (POE) is an exciting technology and it is nice to see a manufacturer implementing it. The potential to reduce or eliminate loss in transmission lines is very exciting to SHF enthusiasts.

Finally, price point is going to be an issue, so we will have to wait and see on that one. Kudos to Icom for the effort to serve the microwave community!

Again, just some thoughts. I look forward to your questions, comments, and hurled vegetables in response.

On the Air

Winter often brings tropo openings. A good example was on the evening of February 14, around 0400 – our friend David Their, WA3GWK, in EM60 reported the following activity: "The following stations were worked on 2-meter SSB and those with * were also worked on 432 SSB: N4DLW* EL87, KD4ESV* EL87, N4TUT* EL98, KW4BY EL97, KW4G EL97, NO5G EM32, WB5HIL EM43."

Microwave enthusiasts have been active as well. Gedas, W8BYA in EN70 reported on the following activity. On February 4, he said that "despite the freezing temperatures and VERY windy conditions we were able to find 3 brave souls willing to give me a FB CW QSO on 10 GHz: K8ZR in EN91KT at 360 kilometers, N8IUP in

EN81PF at 225 kilometers, and W9ZIH in EN51NV at 330 kilometers."

Then, on February 16, Gedas reported a 10-GHz contact with Tony, K8ZR, at a distance of 330 kilometers: "Several hours ago, Tony set up at EN91KT (330 km away) so we could have a 10-GHz RS (rain scatter) QSO using a huge blob of yellow & orange rain surrounding his entire area. We pointed direct at each other since it coincided with the middle of the rain mass. Signals were 100% RS and of nominal (expected) strength....in other words about what we expected. Then, for fun, we turned our dishes south about 6 degrees from "direct" so our signals hit a more dense area of this rain blob and signals were much stronger, at least 10 dB better than the RS signals when pointing direct. Tony was booming in. What was SO weird was that Tony's CW signal had tone to it, almost like no RS at all! I have never experienced RS like this. Has anyone else made RS QSOs and had the CW sound almost normal and with no spreading on the waterfall? (This prompted a discussion on the Midwest Microwave reflector about such variances in CW tonality.)"

Six-Meter DX Ahead!

Thanks as always for the info on your contacts. As we discussed last month, higher sunspot numbers are producing F_2 propagation on 6 meters. This will likely be a great year for 6-meter contacts, especially if you want to work DX. Please keep me posted on your activities, and send along your questions, thoughts and project plans.



BY STEVE MOLO, * KI4KWR

World Castles Award

ecently I was working a 160-metrer QSO with an individual in the UK and he was chasing a rare-to-him award...the World Castles Award, or WCA. So, he shared what the awards are about and mentioned that it is chased by many so I told him I would share it among *CQ* magazine readers around the world.

This international award program was created to work castles, fortresses and other fortifications anywhere in the world, although it is based in Europe as you will see from a list later in the article. The program includes several awards and was founded early 2009 by members of RZ1CWC Radioclub under the support of the international "Castles On The Air" or "COTA" organization.

The program goal is working amateurs from different countries who are activating these historical castles and fortresses from all over the world. Another piece is learning about the maintenance required to protect and preserve the monuments and architectural constructions used in these fortified structures.

The rules package is very straightforward and listed below, as taken from the WCA Group website at http://wcagroup.org/:

- 1. International program "World Castles Award" (WCA) has been instituted by group of the Russian radiohams, members of Radioclub RZ1CWC, founders of "Castles On The Air-Russia" (COTA-Russia) award program.
- 2. The purpose of the program is joining of efforts of radiohams in different countries for activation and popularization historical objects relating to fortification (fortresses, castles, forts, etc.) and attract attention to historical and architectural heritage as well as visiting existing historical monuments all over the world.
- 3. Fortifications are military constructions and buildings designed for defense in warfare and military bases. Humans have constructed defensive works for many thousands of years, in a variety of increasingly complex designs. The term is derived from the Latin *fortis* ("strong") and *facere* ("to make").

Fortifications are usually divided into two branches, namely permanent fortification and field fortification. Permanent fortifications are erected at leisure, with all the resources that a state can supply of constructive and mechanical skill and are built of enduring materials. Field fortifications are extemporized by troops in the field, perhaps assisted by such local labor and tools as may be procurable and with materials that do not require much preparation, such as earth, brushwood and light timber, or sandbags.

4. Contacts with objects of permanent fortification such as castles, fortresses, forts, fortified areas (including their parts like gate, walls, towers, etc.) having obviously expressed signs of preservation or are newly restored are valid for WCA.

Contacts with newly restored objects of field fortification such as stockaded towns, fortified ancient settlements, etc., are valid too.

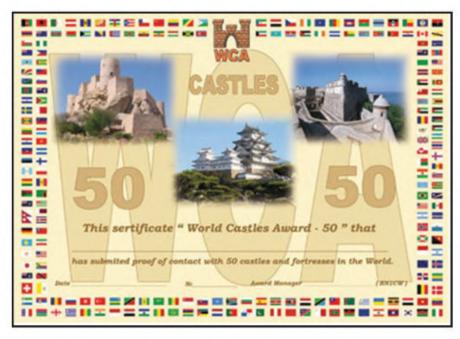


Photo A. This is the basic Worked Castles Award certificate, earned for confirmed contacts with at least 50 castles or fortifications around the world.

5. The World Castles Award Program (WCA) includes following diplomas:

WCA 50 – for QSO/SWL with any 50 valid objects in the world ($Photo\ A$);

WCA 100 – for QSO/SWL with 100 objects in the world; WCA 200 – for QSO/SWL with 200 objects in the world; WCA 300 – for QSO/SWL with 300 objects in the world; WCA 400 – for QSO/SWL with 400 objects in the world; WCA 500 – for QSO/SWL with 500 objects in the world; WCA 600 – for QSO/SWL with 600 objects in the world; WCA 700 – for QSO/SWL with 700 objects in the world; WCA 800 – for QSO/SWL with 800 objects in the world; WCA 900 – for QSO/SWL with 900 objects in the world; WCA 1000 – TOP Award – for QSO/SWL with 1000 objects

The "World Castles Activator Award – WCAA" is issued for work on the air form historical objects (activation) such as castles, fortresses, forts etc.

in the world.

WCA HONOR ROLL PLAQUE is issued for QSO/SWL with 1001 or more objects located in any 10 countries and on any 3 continents of the world.

E-Awards: WCA Hunter – for QSO/SWL for each 500 objects in the world beginning with 1500.

6. For WCA 50 – WCA 900, need to have QSO/SWL with not less than 2 countries from any continents.

For WCA-1000 – TOP Award and WCA HONOR ROLL are issued for QSO/SWL with 1000 and 1001 objects located in any 10 countries and on any 3 continents of the world. For WCA Hunter there are no limitations by number of countries and continents.

7. Activators must be no more than 1 kilometer away from the activated reference/s. More than one reference may be activated at the same time as long as this distance rule is maintained, meaning one activation can be valid for multiple WCA references.

^{*}Email: <KI4KWR@cg-amateur-radio.com>

* The exception from basic rules about distance from historical object are the criteria which were established earlier by some national award programs (9A-COTA, BCA, CASHOTA, DCE, DFCF, DCI, DCS-SSD, DMHP...etc.)

It is not necessary to notify WCA Committee about object activation. The WCA Committee can require necessary data (photos, videos etc.) if some activation gives rise to doubt.

- 8. For WCA activators, any activated object is valid for all awards of WCA series (WCA-50, WCA-100 etc.) on conditions that at least 50 QSOs are made. In this case, the application for the award needs to mark activated objects.
- 9. Recommended frequencies for work on the air during expeditions on fortresses and castles.

CW: 3.531; 7.031; 10.121; 14.031; 18.081; 21.031; 24.911; 28.031

SSB: 3.731; 7.131; 14.251; 18.131; 21.251; 24.951; 28.551

- 10. On the base of S50CLX Cerkno Linux DX Cluster http://s50clx.infrax.si was created WCA cluster to inform about expeditions on fortresses and castles.
- 11. WCA Committee has decided to institute a greeting code when working from fortification objects.

Code "11" ("Two towers") means "best wishes form castles and fortresses of the world." Thanks a lot to Sergey Beresnev, UR7UT (WCAG # 002), for the idea.

12. The new system of WCA identification numbers is constituted since November 1st, 2009. All objects (castles, fortresses, forts etc.) are identified by an alphanumeric designation. Letters indicate the country according to prefixes, for example: DL – (Germany), I – (Italy), LY – (Lithuania), etc., and the next digits indicate the serial number of objects. For example: DL-00001, I-00002, LY-00003 etc.

The official WCA List is organized by countries and may be downloaded from the award website. The WCA-List is not final and will be constantly updated.

- * It is permissible not to transmit superfluous zero during QSO to simplify transmission and receiving of identification numbers.
- ** Correspondence between identification numbers of national award programs (BCA, CASHOTA, CASHOTA-EI, CASHOTA-NI, CCA, COTA-9A, COTA-DL, COTA-NL, COTA-RU, COTA-UN, COTA-YL, CPBA, DCE, DCE 1.0, DCFP, DCI, DCS, DFCF, DMHP, HCS, IDES, RHO, S5-WCA, SCA, UCFA, ZWP) and WCA identifi-

cation numbers is in the WCA-List table.

- 13. Repeated QSOs are not valid. The object is valid only once regardless of bands or mode.
- 14. The same award rules are for SWL.
- 15. QSO/SWL are valid since January 1st, 1995 on any bands (including WARC) by any kind of modes.
- 16. Application for diploma is based on the received QSL cards according to the WCA application form and must be signed by two radio hams. Each QSL card must have identification number according to WCA-List.

WCA Committee recommends using the WCA application form on the award website to register and apply for awards.

QSL cards having object name or identification number according to national castles and fortresses award programs are valid for the diploma.

No QSLs should be submitted, only a certified application is required. The award manager can require QSL for check.

17. The WCA E-LOG (at<https://www.qth.cz/wcagroup/log_rus.php>) allows participants to check up data



Last Year, our members worked thousands of hours for

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yes even emergencies and disasters, if needed!



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about completed QSOs without QSL validation for all awards of WCA series and make application for awards online. The author and manager of the WCA E-LOG is Jiri Suchy, OK5NN.

- 18. The award can be issued for separate MODE (optionally).
- 19. The application should be sent to the award manager by e-mail: wca11team@gmail.com or via post to the following: Andrey A. Petushkov, RN1CWul. Komsomolskaya, 12-49 Sosnovyj Bor,Leningrad oblast, 188540 Russia
- 20. Since January, 1st, 2011 the order of issue of the "World Castles Award (WCA)" and "Castles On The Air Russia Award (COTA-RU" will change. Awards will be issued by two means:
- in electronic form JPG (free of charge);
- in print form, the fee of WCA and COTA-RU will be:
- For Russia 200 Rubles, for the CIS countries 7 EURO,
 7 USD,
 7 IRC.
- For the others 10 EURO, 10 USD, 10 IRC.
- Fee for HONOR ROLL please ask Award Manager at the moment of application.
- 21. Award certificates "World Castles Activator Award WCAA" and "WCA Hunter" are free of charge. You can obtain them in electronic form JPG files completely ready for printing in A4 format (297×240), which will be sent by e-mail.

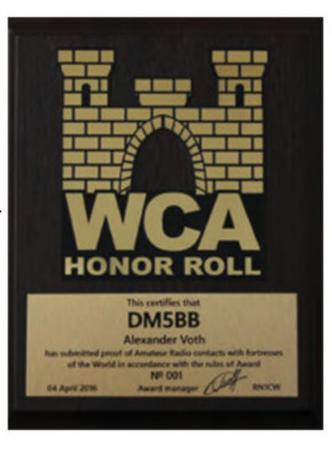


Photo B.
The WCA
Honor Roll
plaque may be
earned by
making more
than 1000
valid castle/
fortification
QSOs.

WCA Honor Roll Plaque

Now to even make this more interesting, there is also a WCA Honor Roll Plaque (*Photo B*) that is issued for QSO/SWL with any 1001 objects located in any 10 countries and on any 3 continents of the world.

The fee of WCA Honor Roll Plate is:

- for Russia 2000 Rubles;
- for the others 50 Euro (or equivalent in USD).

As of this writing, only 13 amateurs have obtained this prestigious plaque....amazing.

WCAA - World Castles Activator Award

The "World Castles Activator Award – WCAA" (Photo C) has been instituted by the founders of the World Castles Award

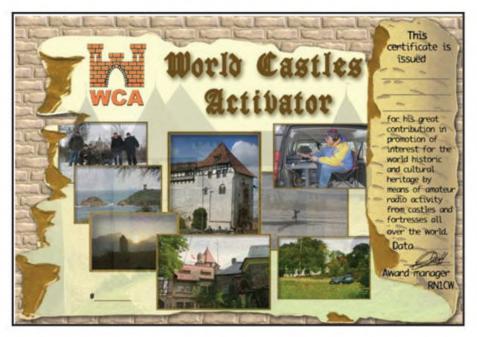


Photo C. The WCA Activator award is issued to hams who make a required number of QSOs from a minimum number of valid sites.

Program (WCA) as a mark of commendation for work on the air from historical and memorial places.

The "World Castles Activator Award – WCAA" is issued for work on the air from historical objects (activation) such as castles, fortresses, forts, etc.

To obtain the "World Castles Activator Award – WCAA," you need to make not less than 50 QSOs from each of five various objects qualifying for WCA. Radio hams living near castles, fortresses, forts, etc., within the 1-kilometer circle, need to make at least 1000 QSOs to qualify.

QSOs are valid since January 1st, 1995 on any bands and modes.

The "World Castles Activator Award – WCAA" certificate is free of charge. There are two ways to obtain it:

- 1) in electronic form JPG file completely ready for printing in A4 format (297×240) will be sent by e-mail;
 - 2) in paper form by post (need to pay the postage).

The application for the "World Castles Activator Award – WCAA" is made in free-form but needs to specify participants name, numbers by national award program or WCA-number, total number of QSOs and dates when they were made.

The Award Manager is: Petushkov Andey Alexandrovich, RN1CWul. Komsomolskaya 12-49 Sosnovy Bor, Leningrad Oblast, 188540, Russia *E-mail*: <wca11team@gmail.com> or <cqrn1cw@gmail.com>.

This award has been given to almost 200 award chasers so far and is quite an accomplishment if I don't say!!

This group has something that not always is seen in awards; partnerships with other award groups to make this program and theirs become known and worked as seen below in the list:

At the present time, the World Castles Award program cooperates and keeps up friendly relations with nearly four dozen well-known national castle and fortress award programs.

Monuments and architectural constructions relating to fortification from countries of Asia, Europe and South America are present in lists of historical objects for the World Castles Award program.

This award has a very strong base of organizers and partners from around the world and I congratulate them for creating and maintaining an award program that is strong and worldwide.



Playing With Meteors

Exploring the Universe With Amateur Radio

By Eric Nichols KL7AJ

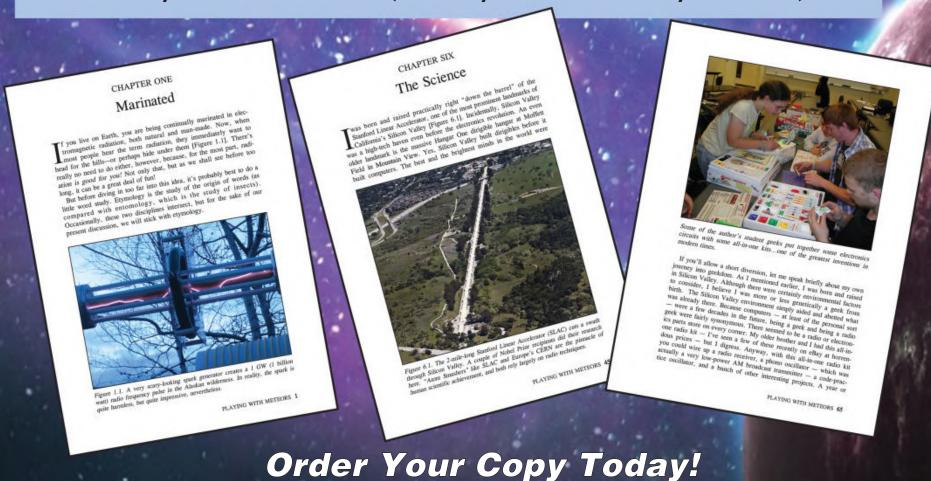
Playing With Meteors

Exploring the Universe
With Amateur Radio

By Eric Nichols, KL7AJ

Wouldn't it be a blast to be a master of technology rather than to be at its mercy? Or better yet, to actually create the next new thing? While it's true that a lot of what we consider high-tech involves computer technology, an equal or greater part of the next new thing is going to involve wireless, also known as radio. In fact, our entire universe is connected by radio, and the entire universe is the radio amateur's sandbox.

In *Playing With Meteors*, author Eric Nichols takes you on a tour of the opportunities that amateur radio can bring you, and how you can leverage the knowledge you gain in "hobby radio" to a career in hi-tech, or just to being smarter than your "smart devices" (and maybe even some of your friends).



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Club Profile: The Carolina DX Association

BY GARY DIXON,# K4MQG WITH JOHN SCOTT, K8YC; PAUL TROTTER, AA4ZZ, AND ROGER WEBB, W4MW

The group decided to form a new

club and named it the Carolina DX

Association, CDXA. Some years later,

the repeater was actually donated to

the CDXA and the call W4DXA was ac-quired. A packet network was used before the internet for members to



Photo A. DXers gather in 1981 to discuss formation of Carolina DX Association (Photos courtesy of the authors and CDXA)

For this month's DX column, I've asked Gary Dixon, K4MQG, and a couple of friends to introduce us to one of the premier DX clubs in the eastern US, the Carolina DX Association. – N2OO

large number of DXers in North and South Carolina were very active on the bands. Many of them chatted and exchanged DX info on a 2-meter repeater in Fort Mill, South Carolina. The repeater was located on top of a multi-story hotel right on the state line. The Internet was not invented or in use at the time, so the repeater was the information link for spotting DX and other information.

There was no DX club in the area and, through the repeater, a large group decided to meet at the home of N4ZC near Charlotte, North Carolina to discuss forming a club. The meeting occurred in July 1981 with approximately 15 DXers present (see *Photo A*).

spot HF and VHF DX. After the Internet became available in the early 1990s, CDXA used it for DX spotting 1990s, CDXA used it for DX spotti



Photo B. AA4ZZ VHF antennas



Photo C. Drone view from AA4ZZ's VHF site

*email: <n2oo@comcast.net> # email: <gdixon@comporium.net>

and a club website. The CDXA grew to be an ARRL affiliated club. Over the past 42 years, the CDXA has also supported well over 50 DXpeditions to rare DX entities.

In 1983 the CDXA assumed management of the W4-K4-N4 Single Letter ARRL Incoming QSL Bureau. In 2022, the bureau merged with the W4 two-letter bureau. Many CDXA members continue to be involved with the merged bureau. CDXA also has club members in other states who have been approved by the ARRL and CQ magazine for field checking of QSLs for DXCC, VUCC, WAS and CQ awards.



Photo D. 6-meter antennas at W4MW's QTH

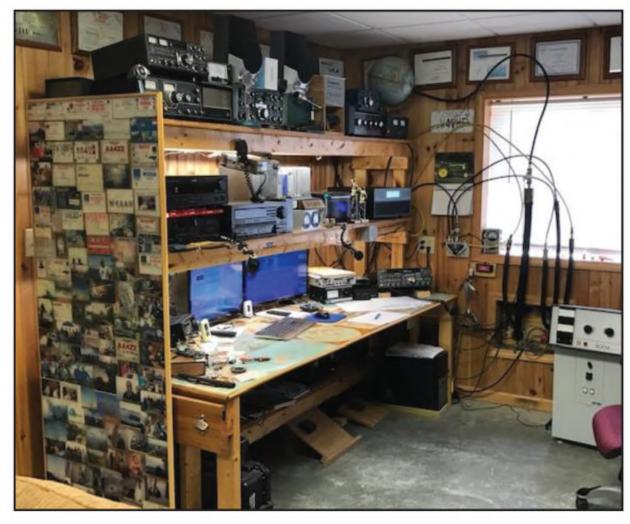


Photo E. W4MW's VHF QTH in Boone, North Carolina

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- Modular System

Car Mount Kit

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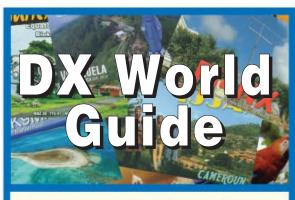
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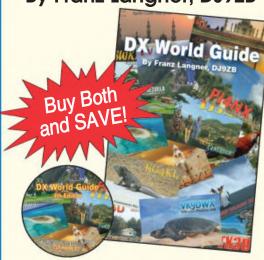
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4th Edition! By Franz Langner, DJ9ZB



Known throughout the DX and DXpedition world as a meticulous and tireless operator, Franz Langner, DJ9ZB, is also noted as one of the most knowledgeable individuals in Amateur Radio in terms of documenting DXCC entities.

This is the fourth edition of his series of books bearing the title *DX World Guide*. It was first published in Germany in 1988 and followed by a second edition, also in Germany in 1977. The third edition, published in the U.S.A in 2012 was the first to use color throughout. This 380-page, fourth edition, also full color throughout, includes information on well over 300 DX entities.

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Photo F. CDXA's own AA4NN on Scarborough Reef



Photo G. HF antennas at K4MQG's QTH ... 80- and 40-meter beams at 120 feet, Moseley Pro 57 at 80 feet



Photo H. CDXA fall barbeque at AA4NN's QTH

SINGLE BAND WAZ
10M Digital 5HI8RD 6N1NK
12M CW 114WX2S
12M Digital 9JR2LJO 10JA1QJI
15M Digital 16HI8RD 17JA4FCV 18JA4IXI 19JA8UIV
17M CW 140DK1FW
17M Digital 32
20M Digital 62HI8RD 63KC10PD 64JA8UIV
30M Digital 24JR2LJO 25JA1QJI
40 CW 341WZ8P
40M Digital 30HI8RD

The WAZ Program

31W7AH	SSB
32KC1OPD	5551NONE
	5552NONE
160M	5553OK1XOE
706EA5CI, 30 Zones	0000
707ES1GO. 33 Zones	RTTY
708	319DL6ZBN
700 11, 00 201100	010
	Mixed
ALL BAND WAZ	10388HI8RD
	10389JH8FIH
CW	10390W9WO
1230OZ1OXQ	10391W9VOB
1231JP1GUW	10392NT9J
1232JL1SAM	10393K9AQ
1233K1JD	10394JE1FQV
1234JH3VWN	10395KC1OPD
	10396JL3OUW
Digital	10397JPJ1GUW
425HI8RD	10398JK3RHX
426W9WO	10399SQ2OMK
427	10400LX1JH
428 NT9J	10401
429JL3OUW	10402OK1XOE
430	10403AAA8KY
431JF1CPH	10404JA2CPD
432LX1JH	10405K9NR
433K9NR	10406
434JA1QJI	10407AA5NT
435NY1V	10408XE1SAX
436JA1UBZ	10409WO2T
437	10410
438JR1CAD	10410
439W3ICM	10411JR0QFA
403VV3ICIVI	10412JA3KVIV

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, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. 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 Jose Castillo, N4BAA. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

QSL of the Month: VU7AF, Nepal

VU7AF was Surjit S. Majithia. He was an Indian politician, diplomat, and air force officer. He commanded a fighter squadron in the Indian Air Force until 1944. He then left to pursue a political career. He was appointed ambassador to the neighboring country of Nepal where he remained until

TO RADIO WAR OP.

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The 1940s QSL of VU7AF, an Indian diplomat serving in Kathmandu, Nepal. His was the first known amateur operation from Nepal. The card shows a drawing of the Boudhanath Stupa, a Buddhist shrine in the Nepalese capital. (Images courtesy K8CX Ham Gallery <www.hamgallery.com>)

1949. The VU7AF operation was from the Indian Embassy in Kathmandu, Nepal. It is the earliest known operation from Nepal, starting in 1948, and the only VU7 from Nepal. Father Marshall Moran, 9N1MM, was the next ham to operate from Nepal, starting in 1951.

The photo on the front of Surjit's QSL card is of the Boudhanath Stupa, a type of Buddhist shrine, located in Kathmandu. Its massive mandala makes it one of the largest spherical stupas in the world.

73, Tom K8CX



A photo of the Boudhanath Stupa, one of the largest spherical stupas in the world. (Wikipedia photo)



Photo I. Annual CDXA Christmas party

One of the facets of the club for many years are the various VHF contests that have won using the calls of AA4ZZ, W4VHF and W4MW.

CDXA is a vibrant group of elite HF and VHF DXers. With over 200 members from several continents at one time, the CDXA has placed very high in the ranks and recognition of accomplishments. Currently the Carolina DX Association is ranked #3 in the Club Leagues listings produced by Club Log. One of the facets of the club for many years are the various VHF contests that have won using the calls of AA4ZZ, W4VHF and W4MW. A team of club members has operated from the mountains of North Carolina for many years. AA4ZZ is the call of our current President. He has a second home up near Boone, North Carolina, next to W4MW's second QTH. Both of these locations have been used in many VHF contests. They are located above 4000 feet and have wonderful antennas that provide outstanding performance at this

	The	e WPX Program		
CW 4075WA1LAD		OH7CBC	1877 1878	
4075		KD5DDV		W5MBG
4077W9DCT	4548	IW1PVT	1880	144.05
4078ISØAFM		IUØRBE	1881	
4079NØJRN		NU4H KD9TLI	1882 1883	
SSB		NT4TN	1884	
4461KY4KP		T90DQ	1885	
4462VE2HTC		N8LFK	1886	NU4H
4463W3CWT		W9NC	1887	
4464IT90DQ		WK9X	1888	
4465W9DCT 4466K3YQA		HL5LX DL1OMP	1889 1890	
4466K3YQA		W9DCT	1891	
Mixed		N9AZZ	1892	
4538K6DSP		W8ASH	1893	
4539W2TI	4562	SP5HHP	1894	
4540KQ4ADO	1070	Digital WA1LAD	1895	
4541W5MBG 4542W2RLK		K6DSP	1896 1897	
4542		JJ1NRX	1898	
4544DL8MRE		JJ1SZA		

CW: 350 W9DCT, NØJRN. 400 WA1LAD, KG7YU. 550 ISØAFM. 600 F5VHQ. 2000 WA6KHK

SSB: 350 K3YQA. 400 W3CWT. 450 IT9ODQ. 500 W9DCT. 550 WR7X. 650 WA1LAD. 700 W5UJ. 850 IZ4DPV. 900 W8KSC. 1000 DL8MRE. 1100 F5VHQ. 1950 WA6KHK

Mixed: 450 K6DSP. 500 N3JIM, NT4TN, WK9X. 550 NR6AM, KBØUGQ. 600 OH7CBC, DU1/NF0O, HL5XL. 650 W2RLK. 700 KQ4ADO, NU4H. 800 NA7KR. 900 KF8QL, W1DNP, N4SV, W8KSC, JS1ERB. 950 WB8LEM. 1000 DL8MRE, N2TC, AD2BO. 1050 JHØEYA, N1HO, KV8P. 1100 N6DSC. 1150 NA5WH. 1200 WA1LAD, KM4VI, NA5WH. 1250 IZ4DPV. 1300 N4DJT. 1550 JK1VXE, KC1UX, W9DCT. 1600 WR7X. 1650 MØHIH. 1700 N8IK. 1850 IT9ODQ. 2250 F5VHQ. 2500 WA6KHK. 2550 JR3UIC

Digital: 350 W5MBG, K4JIP, KD5DDV, IUØRBE, WB6EQK. 400 JJ1NRX, IW1PVT, N8LFK, DL1OMP. 450 K6DSP, NR6AM, WB8LEM, WK9X, KBØUGQ. 500 N3JIM, NT4TN, HL5XL. 550 WA1LAD, W2RLK. 600 DU1/NF0O. 650 IZ4DPV. 700 KQ4ADO, NU4H, JS1ERB, KV8P. 750 NA7KR. 800 N4SV, N1HO. 850 KF8QL. 900 W1DNP. 950 N2TC. 1050 JHØEYA. 1100 N6DSC. 1150 KM4VI, NA5WH. 1200 JK1VXE, N4DJT, NA5WH. 1300 N8IK. 1350 W9DCT. 1450 MØHIH. 1500 WR7X, KC1UX. 1600 F5VHQ. 1750 IT9ODQ. 2200 JR3UIC

160 Meters: WA1LAD, DL1OMP, N9DCT

80 Meters: WA1LAD, N4SV, AD2BO, NT4TN, N9DCT

40 Meters: WA1LAD, NR6AM, N4SV, W8KSC, JHØEYA, N3JIM, AD2BO, KC5CMX, NT4TN, IT9ODQ, WK9X, W9DCT, NA7KR

30 Meters: W1DNP, N1HO, W9DCT

20 Meters: WA1LAD, JJ1SZA, JK1VXE, KG7YU, W8KSC, JHØEYA, N3JIM, DL8MRE, AD2BO, W3CWT, IT9ODQ, W9DCT

17 Meters: N4DJT, W9DCT

15 Meters: WA1LAD, K6DSP, W1DNP, W8KSC, AD2BO, KM4VI, N4DJT, IT9ODQ, W9DCT

12 Meters: N8IK, W9DCT

10 Meters: WA1LAD, KQ4ADO, N2TC, N8IK, N4DJT, DU1/NF0O, KD9TLI, KD9VQD, W9DCT, JS1ERB

Asia: JJ1NRX, 7N4EXO, JK1VXE, DL8MRE, OH7CBC, N1HO, NT4TN, IT9ODQ, HK5XL, KBØUGQ, W9DCT, IU1HGN, ISØAFM

Europe: WA1LAD, W1DNP, JJ1SZA, N4SV, JK1VKE, KQ4ADO, JHØEYA, W2RLK, DL8MRE, OH7CBC, AD2BO, IW1PVT, IUØRBE, NU4H, W3CWT, NT4TN, IT9ODQ, HL5XL, DL1OMP, KBØUGQ, W9DCT, ISØAFM, SP5HHP

Oceania: MØHIH, IZ4DPV, WR7X, JK1VXE, N9DCT

North America: WA1LAD, K6DSP, W2TI, JK1VXE, KG7YU, W8KSC, KQ4ADO, W5MBG, K4JIP, JHØEYA, W2RLK, N3JIM, KY4KP, AD2BO, N1HO, KD5DDV, NU4H, K6FXZ, KD9TLI, N8LFK, WK9X, KBØUGQ, WB6EQK, W9DCT, W4XED, NØJRN, W8ASH, K3YQA

South America: N1HO, N4DJT, KC5CMX, W9DCT, KV8P

Digital Bar: N6PEQ

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.

On the Air in Addis Ababa



Youth visiting the ET3AA club station at Addis Ababa Institute of Technology in Ethiopia. Members Joe (standing) and Nahom (sitting), showing 8-year-old Milkias ham radio on the air at ET3AA. (Photo courtesy ET3AA)

CQ DX Awards Program

No Update

The basic award fee for subscribers to CQ is \$6. For nonsubscribers, it is \$12. In order to qualify for the reduced subscriber rate, please enclose your latest CQ mailing label with your application. Endorsement stickers are \$1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, selfaddressed, stamped envelope to CQ DX Awards Manager, Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA. We recognize 341 active countries. Please make all checks payable to the award manager. Photocopies of documentation issued by recognized national Amateur Radio associations that sponsor international awards may be acceptable for CQ DX award credit in lieu of having QSL cards checked. Documentation must list (itemize) countries that have been credited to an applicant. Screen printouts from eQSL.cc that list countries confirmed through their system are also acceptable. Screen printouts listing countries credited to an applicant through an electronic logging system offered by a national Amateur Radio organization also may be acceptable. Contact the CQ DX Award Manager for specific details.

5 Band WAZ

				o Barro		
As of February	15, 2023		Callsign	Zones	S	Zones
	ave attained at least th	e 150 Zone level, and	Ü			Needed
	ave attained the 200 Z	•	W6DN	199		17
			W6RKC	199		21
As of February	15. 2023		W6TMD	199		34
	ders for 5 Band WAZ (2	Zones needed on 80	W900	199	1	8 on 10M
or other if indica	•		W9XY	199		22
CHANGES show			9A5I	198		1, 16
			AB4IQ	198		23, 26
Callsign	Zones	Zones	DL6JZ	198		1, 31
· · · · · · · · · · · · · · · · ·		Needed	EA5BCX	198		27, 39
AK8A	199	17	F5NBU	198		19, 31
DM5EE	199	1	F6DAY	198	2 or	n 10M & 15M
EA5RM	199	1	G3KDG	198		1, 12
EA7GF	199	1	G3KMQ	198		1, 27
H44MS	199	34	G4OWT	198		1, 27
HAØHW	199	1	HB9FMN	198	1 or	n 80M & 10M
HA5AGS	199	1	I1EIS	198	1 8	k 19 on 10M
I5REA	199	31	JA1DM	198		2, 40
IKØXBX	199	19 on 10M	JA3GN	198	2 or	n 80M & 40M
IK1AOD	199	1	JA7MSQ	198	2 or	n 80M & 10M
IT9GSF	199	1	JH1BNC	198	2 or	n 80M & 10M
IZ3ZNR	199	1	JH1EEB	198		2, 33
JA1CMD	199	2	KØDEQ	198		22, 26
JA5IU	199	2	K1BD	198		23, 26
JA7XBG	199	2	K2EP	198		23, 24
JH7CFX	199	2	K2TK	198		23, 24
JI4POR	199	2	K3JGJ	198		24, 26
JK1BSM	199	2	K3WA	198		23,26
JK1EXO	199	2	K3XA	198		23,34
K1LI	199	24	K4JLD	198		18, 24
K3LR	199	23	K9MM	198		22, 26
K4HB	199	26	KI1G	198	24	, 23 on 10M
K5TR	199	22	KZ2I	198		24, 26
K7UR	199	34	LA3MHA	198	31	&32 on 10M
KZ4V	199	26	N4GG	198		18, 24
N3UN	199	18	NXØI	198		18, 23
N4NX	199	26	ON4CAS	198		1,19
N4WW	199	26	OZ4VW	198		1, 2
N4XR	199	27	RL3FA	198		n 80 & 10M
N8AA	199	23	UA4LY	198	6	& 2 on 10M
N8DX	199	23	UN5J	198		2, 7
N8TR	199	23 on 10M	US7MM	198		2, 6
RA6AX	199	6 on 10M	W5CWQ	198		17, 18
RU3DX	199	6	W7AH	198		22, 34
RWØLT	199	2 on 40M	W9RN	198	26	, 19 on 40M
RX4HZ	199	13	WC5N	198		22, 26
RZ3EC	199	1 on 40M	WL7E	198		34, 37
S58Q	199	31	Z31RQ	198	1,	& 2 on 10M
SM7BIP	199	31	ZL2AL	198		36, 37
SP9JZU	199	19 on 10M				
USØSY	199	1 on 15M		g have qualified fo	r the basic 5 Ba	and WAZ
VK3HJ	199	34	Award:			
VO1FB	199	19	Callaian	ED\\\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Dots	# 7
W1FJ	199	24	Callsign	5BWAZ #	Date	# Zones
W1FZ	199	26	TA2LG	2440	01/21/2023	192
W3LL	199	18 on 10M	W9WO	2441	01/22/2023	165
W3NO	199	26	JE1FQV	2442	01/25/2023	200

KC10PD

26

W4LI

199

JG1PUW	2444	01/25/2023	171
JF1UVJ	2445	01/27/2023	200
LX1JH	2446	01/29/2023	167
JE1SYN	2447	01/29/2023	200
AA8KY	2448	01/29/2023	151
K9NR	2449	01/29/2023	181
AA5NT	2450	02/03/2023	172
JH1GZE	2451	02/03/2023	200
JL1SAM	2452	02/04/2023	200
WO2T	2453	02/05/2023	184
JA4LKB	2454	02/11/2023	200
JR0QFA	2455	02/11/2023	175
DL6UAA	2456	02/11/2023	192
VK2HV	2457	02/11/2023	151

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ#	Date	# Zones
HI8RD	2372	5/16/2022	192
IT9DAA	2414	10/9/2022	193
JK1AJX	1078	5/8/1998	200
G4OWT	1614	11/1/2008	198
N6PF	1877	6/14/2014	200
JA1QJI	1988	4/21/2018	200
JA6GPR	2174	12/13/2019	189
W2IRT	1546	5/11/2007	200

New recipients of 5 Band WAZ with all 200 Zones confirmed:

Callsign	Date	All 200 #
JK1AJX	1/23/2023	1113
JE1FQV	1/25/2023	1114
N6PF	1/25/2023	1115
JF1UVJ	1/27/2023	1116
JA1QJI	1/29/2023	1117
JE1SYN	1/29/2023	1118
JH1GZE	2/3/2023	1119
JL1SAM	2/4/2023	1120
W2IRT	2/11/2023	1121
JA4LKB	2/11/2023	1122
JH3VWN	2/11/2023	1123
	JK1AJX JE1FQV N6PF JF1UVJ JA1QJI JE1SYN JH1GZE JL1SAM W2IRT JA4LKB	JK1AJX 1/23/2023 JE1FQV 1/25/2023 N6PF 1/25/2023 JF1UVJ 1/27/2023 JA1QJI 1/29/2023 JE1SYN 1/29/2023 JH1GZE 2/3/2023 JL1SAM 2/4/2023 W2IRT 2/11/2023 JA4LKB 2/11/2023

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, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. 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 Jose Castillo. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@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).

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01/25/2023

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2443

Within the club, the members have an annual HF DX contest that is called the "DX King" that mirrors the CQ DX Marathon. Nice prizes are given for various levels.

altitude (see *Photos B, C, D* and *E*). AA4ZZ and the VHF contests participants have won five major ARRL and CQ VHF contests in past years.

Many of our club members have been guest operators or team leaders on major DXpeditions to such locations as Scarborough Reef (*Photo F*), Svalbard, Cocos Island, Wake Island, Swains Island, Navassa, Palmyra, Kingman Reef, Peter 1st, Willis Island, Western Sahara, Sovereign Military

Order of Malta, Malta, Rwanda, Andorra, Morocco, San Andres, Lesotho, Botswana, South Africa, Thailand, Vatican, UN Headquarters, Puerto Rico, French Saint Martin, Bermuda and Bahamas.

The club has many members who participate in the annual ARRL CW and SSB DX contests, the CQ DX Marathon and the CQ World Wide CW and SSB DX contests (*Photo G*). Within the club, the members have an annual HF DX contest that is called the "DX King" that mirrors the CQ DX Marathon. Nice prizes are given for various levels.

CDXA members often gather several times a year for fun and food (*Photos H* and *I*). The CDXA members know how to work DX and have fun eating as well! The CDXA web site is <www.cdxa.org>, where you can find more information about the club and its members' accomplishments.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 340 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is \$1.00 each plus SASE. (Stickers for the 340 level and Honor Roll are available.) Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA.

CW DL3DXX	295 292 286 284 282 280 280 280 277
K3JGJ 339 OK1MP 339 W1DF 337 K9VKY 331 4Z5SG 321 K4DGJ 307 Y06HSU K3UA 339 W3GH 339 W7IIT 337 N7WO 331 N2LM 321 W4ABW 306 K4CN 339 W4OEL 339 K8ME 336 OK1DWC 331 ON4CAS 321 K7ZM 305 K4JLD 339 W5BOS 339 W6OUL 336 K6YK 329 W2OR 320 HA5LQ 301 K4MQG 339 W7CNL 339 JA7XBG 335 W9IL 329 HB9DAX/ RN3AKK 300	
K5RT339 W7OM339 F6HMJ334 IKØADY328 QRPp319 WA9PIE298 SSB	
AB4IQ 340 KE5K 340 W7BJN 340 W9IL 338 WD9DZV 333 KE4SCY 326 KA1LMR DJ9ZB 340 KM2P 340 W7OM 340 N4FN 337 AA1VX 332 KF4NEF 325 RA1AOB DL3DXX 340 KZ2P 340 W8ILC 340 IOZV 336 KE3A 332 W6WF 325 XETMEX DU9RG 340 N4CH 340 W9SS 340 K3LC 336 N2VW 332 W9GD 325 IK5ZUK EA2IA 340 N4JF 340 WB4UBD 340 K8ME 336 N2VW 332 W9GD 325 IK5ZUK EA2IA 340 N4JF 340 WB4UBD 340 K8ME 336 N5YY 332 VE7EDZ 324 IOYKN EA4DO 340 N5ZM 340 WSSV 340 F6HMU 335 KSUO 331 F6BFI 323 K4IE IBROL 340 N7BK 340 WSSV 340 F6HMU 335 KSUO 331 F6BFI 323 K4IE IK1GPG 340 N7BK 340 XE1AE 340 HB9DQD 335 KC2Q 331 ON4CAS 323 K4ZZR IK1GPG 340 N7RO 340 YU3AA 340 IK0AZG 335 SV3AQR 331 VE6MRT 323 K7ZM IN3DEI 340 NOFW 340 JA7XBG 339 IW3YGW 335 W0ROB 331 W5GT 323 K7ZM IN3DEI 340 OK1MP 340 KOKG 339 OE2EGL 335 W6OUL 331 N6PEQ 322 K7SAM K2TQC 340 OZ3SK 340 W2FKF 339 VK2HV 335 XE1MEX 331 N6PEQ 322 K7SAM K4CN 340 VE1YX 340 W9FKF 339 W4WX 335 KDZO 330 NACAS 323 KAZZR K3IGJ 340 OZ5EV 340 W4UNP 339 W4WX 335 KDZO 330 K8HQ 321 4K6DK K4CN 340 VE1YX 340 W9FMP 339 W4WX 335 KDZO 330 TIBIL 320 F5MSB K4ILD 340 VE2GHZ 340 EA8EQT 338 AA4S 334 W0YDB 330 TIBIL 320 F5MSB K4ILD 340 VE2GHZ 340 K3UA 338 EA5BY 334 ZL1BOQ 330 TIBIL 320 F5MSB K4ILD 340 VE3MRS 340 K9HQM 338 W8AXI 335 WARDING 330 TIBIL 320 F5MSB K4ILD 340 VE3MRS 340 K9HQM 338 W8AXI 335 MAFC 329 XF1RBV 317 N3KV K4MZU 340 VE3MRS 340 K9HQM 338 W8AXI 334 NAPC 329 XE1RBV 317 N3KV K4MZU 340 VE3MRS 340 K9HQM 338 WARXI 334 NAPC 329 XE1RBV 317 N3KV K4MZU 340 VE3MRS 340 K7LAY 338 K9OW 334 AD7J 329 XE1RBV 317 N3KV K4MZU 340 VE3MRS 340 K9HQM 338 WARXI 334 NAPC 329 NFNB 315 W6MAC K5DVC 340 W3AZD 340 K1UO 338 K8LG 334 W6VDL 329 NBSHZ 312 IZ1JLG K5TVC 340 W3AZD 340 K1UO 338 K8LG 334 W6DUL 328 KICU 311 WA9PIE K6VYC 340 W3ABW 340 WANX 338 K8LG 334 W6DDL 329 NBSHZ 312 IZ1JLG K5TVC 340 W3ABW 340 WASDG 338 K8LG 333 K6GFJ 326 G3KMQ 308 SQ7B	308308308308307306305304303301301298295293291289289282282281276276
NI4H	

On the Cover...

Icom America Senior Sales Manager Ray Novak, N9JA, shows off the brand new IC-905 transceiver at the Orlando Hamcation[®] in Florida this past Feb-

ruary. Ray has had a long career in the business of amateur radio. Starting out as a technician at MFJ Enterprises, Ray got his Novice license as KB5KCL while working there. Ray advanced at MFJ to become the Domestic and International Sales Manager before he went to work for Icom America in tech support. His 28 years at Icom America began with a change of call sign to KC7JPA and his career at Icom later took advantage of his sales expertise. Following the introduction of the IC-7800, Ray became an Extra and acquired the callsign N9JA.

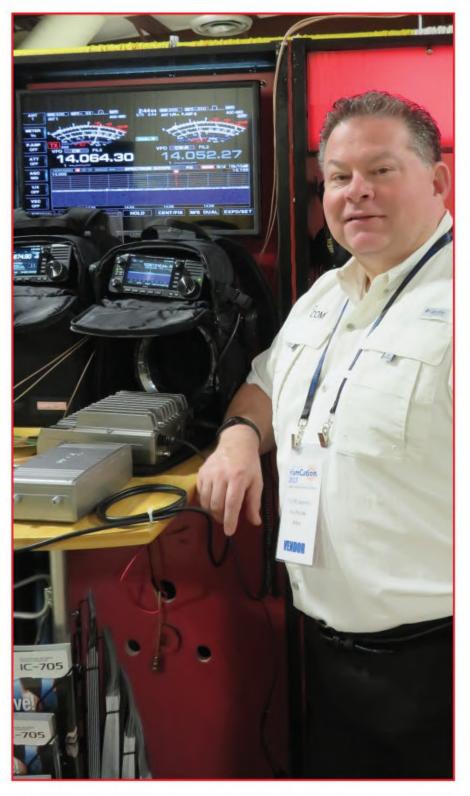


After becoming the sales manager for amateur radio products and successfully marketing many innovative new products, Ray was promoted to Senior Sales Manager, covering the amateur, aviation and marine product lines. Having personally met Tokuzo Inoue, the founder of Icom, Ray was impressed with the founder's emphasis on technology and performance and is excited to be a part of introducing Icom's latest product, the IC-905.

Icom says the IC-905 brings VHF, UHF and microwave bands to the amateur radio community in a form factor that maximizes ease of use and optimizes reduction of feedline losses at microwave amateur frequencies such as 2.4, 5.6, and 10 GHz in addition to covering the 2-meter, 70-centimeter and 1.2 - GHz bands. The IC-905 builds on Icom's storied history of innovation including the IC-781 having the first built-in panadapter. Another huge stride forward at Icom was represented by the very successful introduction of the IC-7300, the first full featured SDR-based transceiver to not require an external computer.

Ray has taken his love of DX on a DXpedition to Mozambique as C82DX as well as another DXpedition to Bhutan. When Ray is not finding new innovations in his trunk to share with his fellow hams, he enjoys traveling in his motor home as well as riding on his motorcycle. Look for N9JA not only at major ham radio events but at major boat shows as well as the annual aviation extravaganza at Oshkosh, Wisconsin.

For more about the IC-905, see this month's VHF Plus column on page 72 and Zero Bias editorial on page 6. (Cover photo and "On the Cover" text by Joe Eisenberg, K0NEB)





Ray and Frank Lappin, KF5AHJ on YouTube Channel Tank Radio.



BY TIM SHOPPA,* N3QE

After the Contest

his month, let's look closely at the required after-contest activity of preparing and officially submitting your Cabrillo log to the sponsor. Then we'll discuss the many online tools available today for sharing your claimed scores with your local buddies, the members of your club, and the contest world at large.

The first action item is to collect any paper or electronic notes you may have made during the heat of the contest and correct/update your log to match what you heard and exchanged. Optimally you will make these corrections in the logging software itself and rescore the log to come up with your claimed score.

Note that any corrections must come from your on-air experience and notes during the contest. Sending emails to QSO partners to ask them to verify or updated an exchange is strictly forbidden. Checking DX clusters or Reverse Beacon Network skims for call corrections is also not allowed. If you made a recording of the contest, you cannot go back and listen to develop corrections to your log.

You might be tempted to look up callsigns in online databases, such as QRZ.com, to correct name and state exchanges, or to check DX newsletters for a confirmation or fill on a rare DX callsign. Not only are these strictly forbidden by contest rules, but any attempt to do so may lead to erroneous information, as many active contesters will remote to stations in different states, and name exchanges as used in the North American QSO Parties may vary to honor recent Silent Keys.

Immediately after the contest, it's a great idea to write a couple of sentences describing your contest experience. Was this the first contest in which you made a real attempt at calling CQ? Do you want to brag about any specific DX multiplier efforts that paid off? Maybe you made a recent station improvement that you'd like to share. Contest sponsors are specifically looking for succinct comments to include in their final published writeups, and you can pass these comments to the sponsor by putting them in the "Soapbox" section of your log file. With the popular N1MM+logger, it's easy to type these on the same screen where you select your category.

Soapbox comments are not as popular as they once were. I quickly reviewed the CQ WW SSB public logs from 2005 and found that more than a third of contesters included more than one line of comments. In contrast, only 6% of 2022 CQ WW SSB entrants included more than a single line in their Soapbox. Contest article authors really appreciate these soapbox comments, and they are especially likely to appear in the "Full Articles" that appear on the *ARRL* Contest results website.

After you've applied the allowed corrections in your logging program, you generate your Cabrillo file, the log format the contest sponsors universally accept. The Cabrillo format consists of header lines, that you can carefully inspect for correctness at this point. The CATEGORY-ASSISTED: header line should show ASSISTED if you've used any Telnet Cluster or Reverse Beacon spots during the contest. CATE-GORY-POWER specifies either HIGH, LOW, or QRP; note, for many events like the NAQPs, any log showing high power will be classified as a checklog.

email: <n3qe@cq-amateur-radio.com>

The OVERLAY field may be present if you are entering a special overlay category allowed by the contest sponsor. The CQ WW DX contests have CLASSIC and ROOKIE overlays, and the CQ WPX contest has the TB-WIRES overlay. *Carefully* read the contest-specific rules for any overlay you claim. The details of these overlay categories are very specific, and your logger does nothing to help verify that you've operated within those rules.

For multioperator, special-event and club entries, very careful attention must be made to the CALLSIGN and OPER-ATORS Cabrillo headers. The CALLSIGN field must show what was used on the air during the contest. OPERATORS may list only your callsign if you were a single-op guest of a station host. In a multi-operator entry, the OPERATORS line should show all operators, including the station owner if he/she was also an operator. You can credit the station owner by appending an "@" and his/her callsign at the end of the OPERATORS line.

Below the headers, you'll find a list of QSO lines in the Cabrillo. Quickly verify that the callsign and exchange you sent on the air appears correctly. Corrections here might be made in a text editor with a global search and replace, or you can go back to your logger, edit the exchange information, and re-export.

Contest sponsors do not want you to ever delete any questionable QSOs from your log. On review, you might note there's an obvious typo in the exchange you copied from the other station, or that the callsign cannot possibly be correct. If you delete these QSOs from your log, the other station will receive a *NIL* (Not-In-Log) penalty. You should keep these questionable QSOs in your log but change the "QSO:" prefix of the line to read "X-QSO:".

Note, all editing of Cabrillo files should be done in an ASCII text editor, such as the Notepad application in Windows, and saved as pure text. Copying your log file into a full-featured text editor and saving for example, in Microsoft Word format, will not be useful for submission, as the contest sponsors do not accept that file type. Opening a Cabrillo log file with Excel may look like it works, but you'll find that Excel auto-identifies fields such as dates and times and will reformat these into completely different internal formats. Exporting the QSO data as text may look like it works to the human eye, but the resulting dates and times will be incorrectly formatted for parsing by the contest logchecking software.

Submitting Your Log

For most contests, the best way to submit a log is via the web. For several years, CQ WW has accepted logs only via website submission. *ARRL* strongly encourages website submissions but will still take email submissions. As you fill out the web entry form, you'll likely find that you answer some questions regarding your entry category. For *ARRL* contests, you'll enter the grid square from which you operated; this is important for your log to count towards club competition, as the grid is used to compute whether you're in your contesting club's circle.

Every contest has a deadline for log submittal; for many HF contests sponsored by *ARRL* and *CQ* you have seven

days from the end of the contest to submit your log (*CQ* contests have a 5-day deadline – ed.). VHF contests and state QSO parties may allow more time – please always check the detailed rules. The best time to send your log in is immediately after the contest. I noted that in the February 2023 ARRL DX CW Contest, more than half of all logs were submitted by Monday after the contest.

Contest sponsors make use of early log entries to find callsigns that were active in the contest but have not yet submitted logs. A day or two before the deadline, many contest sponsors use these early entries to email any stragglers and remind them before the deadline.

If you're encountering a technical challenge getting your log prepared and submitted by the deadline, please reach out to the contact e-mail address in the contest rules to explain the details and request a special case extension of the log deadline.

What happens to late log submissions? For the *ARRL* and *CQ* contests, a late submission may be listed in the final result but will not be eligible for any awards. In printed or online score listings, late entries are shown in italics. Most notably, your contest club will not receive any credit for a late submission.

After submitting a log via the web, you'll see a confirmation page which will again echo back details such as your entry category for one more check. The sponsor may also provide a "raw score" at this stage; look for at least a rough agreement between the number of QSOs and mults your logger shows you, and the log robot's raw score calculation. Deviations between your logger and the robot by several percent are normal and can be ignored; if you see a drastic difference, there's something to investigate and correct.

Even after you've gotten a response from the log robot that your log was received, you might want to double-check that the sponsors have it in their computer system. All the major contests offer a logs received web page that is updated either continuously or at least daily in the days after the contest.

For the contests sponsored by *CQ* magazine, you'll find the link to the logs received report under the "Logs" tab on the home page of each individual contest. An alphabetical list of all log submissions will show. Note that for the *CQ* contests, details such as entry category, overlay, and club are shown.

To check your log's received status for ARRL-sponsored contests, you start with the ARRL Contest Portal at https://contests.arrl.org/ and click on

the Logs Received tab at the top. The *ARRL* keeps the category hidden until after the log deadline, but you'll be able to cross-check your callsign and club credit for correctness.

After Submitting Your Log to the Sponsor

Here are a few recommendations for follow-up once your log has been submitted to the contest sponsor and you've confirmed that it's been received:

- * Submit log to Super Check Partial database.
 - * Compare to past years.
- * Compare to your competition. What is your competition? SO2R vs single-radio. Big station vs home station. HP vs LP vs QRP. Your buddy across town.

3830

Historically, the very largest US stations would gather on 3830 kHz LSB in the minutes after the contest was over and share their scores and make qualitative

observations of activity and band conditions. Smaller stations would listen in as the giants of the airwaves shared their opinions. In the past few decades, the shift by contesters both large and small has been towards online sharing of claimed scores and comments. Posting to 3830, as the website https://www.3830scores.com/ is commonly known, has become the common online platform worldwide not just for scores, but also for comments containing opinions, successes, and grievances.

For many on-air contest-type activities, notably including the Thursday night NCCC Sprint and the Wednesday CWOps events, there is no sponsor to send your logs to; instead, you simply post your claimed scores to 3830. Bruce Horn, WA7BNM, not only runs the 3830scores.com website – he also hosts the de facto international contesting calendar at http://contest calendar.com. If you are organizing any kind of on-air contest-type activity,





reach out to Bruce and get it listed on both his calendar and 3830scores.com.

How many hams submit scores to 3830? In CQWW SSB 2022, 1348 hams submitted 3830 reports vs. 9004 logs submitted. The bulk of 3830 score website reporting is done by North American hams; looking at a NA-centered event like NAQP SSB from January 2023, nearly half of those submitting logs also submitted to 3830.

The 3830 website is highly promoted by contest clubs to help track member activity. There is a tab at the top, labeled "Activity Tracker," that allows you to see club standings. My regional contest club, the Potomac Valley Radio Club, collects claimed scores from all our members through the 3830 reporting system, and uses it for our own internal intramural activity award.

You might notice in the 3830 comments for the very biggest contests – ARRL DX, CQ WW, and CQ WPX – that several dozen of the most serious efforts have included very detailed by-hour, by-band, and by-country statistical breakdowns.

Even if you made a more modest effort, it's worthwhile to run the same statistics on your own logfile and compare with the big guns. These detailed statistical reports are prepared by contest log analyzer software. The *CBS Cabrillo log analyzer* by Ken Adams (now a silent key, formerly K5KA) and Bob Wilson, N6TV, is a free log analyzer that produces such detailed output. You can download it at https://www.kkn.net/~n6tv/cbs and run it against your Cabrillo. By comparing your log analysis with other geographically nearby stations, you'll learn key strategies for operating on the best band and the best hours in each contest. As we approach the peak of this solar cycle, specifically look at the band usage by the biggest stations.

Contesters are prolific users of ARRL's *Logbook Of The World* – more than half of my contest QSOs are confirmed in LoTW. For digital and RTTY mode contests, the confirmation rate is over 65%. LoTW confirmations count towards the ARRL Worked All States (WAS), DXCC, and grid square-based awards. To sign up for LoTW, visit https://www.nccenter.com/

Calendar of Events

All year	CQ DX Marathon	bit.ly/3FyPiui
Mar. 31-Apr. 1	Sasquatch Stomp	https://www.pnwqrp.org/sasquatch-stomp
Apr. 1	RSGB FT4 International Activity Day	bit.ly/3TxCrxl
Apr. 1-2	EA RTTY Contest	http://concursos.ure.es/en/eartty/bases/
Apr. 1-2	Florida State Parks on the Air	http://flspota.org/
Apr. 1-2	Louisiana QSO Party	http://laqp.org/
Apr. 1-2	Mississippi QSO Party	http://www.arrlmiss.org/
Apr. 1-2	Missouri QSO Party	https://bit.ly/3rkAl87
Apr. 1-2	PODXS 070 Club 31 Flavors Contest	http://bit.ly/2SESbDg
Apr. 1-2	SP DX Contest	https://spdxcontest.pzk.org.pl/2023/rules.php
Apr. 3	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
Apr. 5	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Apr. 5	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 6	SARL 80m QSO Party	http://bit.ly/H0lqQf
April 8	QRP Spring QSO Party	http://www.qrpcontest.com/
Apr.8-9	FT8 DX Contest	https://europeanft8club.wordpress.com/
Apr. 8-9	Georgia QSO Party	https://gaqsoparty.com/
Apr. 8-9	IG-RY World Wide RTTY Contest	https://www.ig-ry.de/ig-ry-ww-contest
Apr. 8-9	JIDX CW Contest	http://www.jidx.org/
Apr. 8-9	New Mexico QSO Party	http://www.newmexicoqsoparty.org/wp/
Apr. 8-9	OK-OM DX SSB Contest	http://bit.ly/3ioS3Cl
Apr. 8-9	Yuri Gagarin International DX Contest	http://gc.qst.ru/en/section/32
Apr. 9	Hungarian Straight Key Contest	http://hskc.ha8kux.com/
Apr. 9	International Vintage Contest HF	http://www.iv3ehh.it/vintage.htm
Apr. 9	WAB 3.5/7/14 MHz Data Modes	http://bit.ly/31yE4kT
Apr. 10	144 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 10	DARC Easter Contest	http://bit.ly/3bOk9pd
Apr. 12	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 14-15	Holyland DX Contest	http://www.iarc.org/iarc/#HolylandContest
Apr. 15	ES Open HF Championship	https://www.erau.ee/en/es-open-contests
Apr. 15	QRP to the Field	http://www.zianet.com/qrp/qrpttf/pg.html
Apr. 15-16	CQ Manchester Mineira DX Contest	http://www.cqmmdx.com/rules/
Apr. 15-16	North Dakota QSO Party	https://www.ndarrlsection.com/index.html
Apr. 15-16	Michigan QSO Party	https://miqp.org/index.php/rules/
Apr. 15-16	Ontario QSO Party	http://www.va3cco.com/oqp/rules.htm
Apr. 15-16	Texas State Parks on the Air	https://www.tspota.org/
Apr. 15-16	Worked All Provinces of China DX Contest	http://www.mulandxc.com/index/index
Apr. 15-16	YU DX Contest	http://yudx.yu1srs.org.rs/
Apr. 16	ARRL Rookie Roundup, SSB	http://www.arrl.org/rookie-roundup
Apr. 18	222 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 19	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
Apr. 19	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 22	YOTA Contest	https://www.ham-yota.com/contest/

www.arrl.org/logbook-of-the-world>. The best format for exporting to LOTW is the ADIF format, if your logger supports it. Cabrillos can also be up-loaded with an extra conversion step.

If you're chasing awards, DX, or working in the CQ DX Marathon, the Clublog website lets you upload all logs (including contest logs) to be included in your statistics. I found Clublog's "DXCC Leagues" and "Zone Leagues" to be particularly strong motivations to work *not* just contests, but *also* chase DXpeditions for counters in my CQ DX Marathon entries. Uploading all your logs to Clublog also makes it easy to process OQRS (Online QSL Requests) for DXPeditions. Learn more at https://clublog.org/>.

April and May Contest Highlights

The 4-hour North American SSB Sprint is held Saturday night, April 22. (That's 0000-0359Z April 23 in UTC time). The required QSY rule mandates that every time you work a station calling CQ, he has to find a new frequency and you inher-

it his run frequency, at least briefly. The exchange is name, state, and serial number. You'll find full rules, along with operating and logging hints for the unique Sprint format, at https://ssbsprint.com.

The 2023 Contest University is held May 18-19, right before the Dayton Hamvention[®]. Register for it at https://contestuniversity.com/. The Saturday evening of Hamvention also has the Contest Dinner, which features the induction of new members to the CQ Contest Hall of Fame. Reserve a seat via https://contestdinner.com/.

The weekend after Dayton, Memorial Day weekend in the US, has the CQ WPX CW Contest. Although we are all excited about the amazing DX openings likely on the 10-meter band, plan your operating time to get on the 40-meter band before dusk in order to take advantage of the unique WPX score table that gives you 6 points for each DX QSO on the low bands; see the rules at https://cqwpx.com for full details. Single-operator entries may operate up to 30 hours of the 48-hour contest weekend starting at 0000Z May 27.

Apr. 22-23 Apr. 23 BARTG Sprint75 Contest Apr. 23 BARTG Sprint75 Contest Apr. 24 RSGB FT4 Contest Series Apr. 24 Apr. 26 Apr. 26 Apr. 26 Apr. 27 RSGB BOM Contest Series Apr. 29 Apr. 27 RSGB 80m Club Championship, Data Apr. 29-30 Ap	Apr. 23 BARTG Sprint75 Contest http://bartg.org.uk/wp/contests/ Apr. 23 North American SSB Sprint https://ssbsprint.com/rules/ Apr. 24 RSGB FT4 Contest Series bit.ly/3TxCrxl Apr. 26 432 MHz Spring Sprint http://bit.ly/3XM4RpW Apr. 26 UKEICC 80m Contests CW https://ukeicc.com/80m-rules.php Apr. 27 RSGB 80m Club Championship, Data Apr. 29-30 10-10 Spring Digital Contest http://bit.ly/1FrFeBc Apr. 29-30 Florida QSO Party http://www.floridaqsoparty.org/ Apr. 29-30 UK/EI DX Contest, CW https://www.uska.ch/ Apr. 29-30 UK/EI DX Contest, CW https://www.ukeicc.com/dx-contest-rules/ May 1 AGCW QRP/QRP Party https://www.agcw.de/contest/qrp-qrp/	
May 3 VHF-UHF FT8 Activity May 4-5 MIE 33 Contest May 6 Microwave Spring Sprint May 6 Microwave Spring Sprint May 6-7 7th Area QSO Party May 6-7 10-10 Spring CW Contest May 6-7 ARI DX Contest May 6-7 Delaware QSO Party May 6-7 Indiana QSO Party May 6-7 New England QSO Party May 6-7 SBMS 2.3 GHz and Up Contest May 7 WAB 7 MHz Phone May 8 May 8 May 10 VHF-UHF FT8 Activity May 13-14 CQ-M International DX Contest May 13-14 CO-M International DX Contest May 13-14 CO-M International DX Contest May 13-14 Volta WW RTTY Contest May 17 RSGB 80m Club Championship, Data May 17 VHF-UHF FT8 Activity May 18 QRP Minimal Art Session May 17 VHF-UHF FT8 Activity May 18 QRP Minimal Art Session May 19 VHF-UHF FT8 Activity May 19 TAKABASA QSO Party May 20-21 Baltic Contest May 20-21 NZART Sangster Shield Contest May 22 QRP ARCI Hoot Owl Sprint May 22 RSGB FT4 Contest Series http://www.rea.it/ http://www.rfa.corg/qsoparty/rules.htm http://www.nep.org/rules/ http://www.nep.org/rules/ http://www.nenon.corg/inqp/index.html http://www.ft8activity.eu/index.php/en/ http://www.ftsactivity.eu/index.php/en/ http://www.ftsactivity.eu/index.php/en/ http://www.ftsactivity.eu/index.php/en/ http://www.ftsac		
May 27-28 CQ WW WPX CW Contest http://www.cqwpx.com/	May 4-5 Mis 33 Contest May 6 Microwave Spring Sprint May 6-7 Tth Area QSO Party May 6-7 Delaware QSO Party May 6-7 May 6-7 May 6-7 May 6-7 Delaware QSO Party May 6-7 May 6-7 New England QSO Party May 6-7 May 6-7 May 6-7 May 6-7 New England QSO Party May 6-7 May 1-1 May 7 May 7 May 8 May 8 May 10 May 10 May 13-14 Canadian Prairies QSO Party May 13-14 Canadian Prairies QSO Party May 13-14 CQ-M International DX Contest May 13-14 CQ-M International DX Contest May 13-14 May 17 May 17 May 17 May 17 May 17 May 17 May 18 May 17 May 17 May 18 May 19 May 20-21 May 20-21 Malic Contest May 20-21 May 20-21 Malic Contest May 20-21 M	ml ntent=rules n



BY TOMAS HOOD,* NW7US

April Propagation Revisited

Quick Look at Current Cycle 25 Conditions:

(Data rounded to nearest whole number)

Sunspots:

Observed Monthly, January 2023: 144 12-month smoothed, July 2022: 87

10.7-cm Flux:

Observed Monthly, January 2023: 182 12-month smoothed, July 2022: 130

NW7US was unable to produce his column this month, so we are reprising his April 2022 column, which offered a general look at what to expect on the bands in this month of "equinoctial" propagation. Sunspot numbers have been updated. For the Last-Minute Forecast, please visit Tomas's website at https://SunSpotWatch.com. – W2VU

s we move into spring in the Northern Hemisphere, the Sun is mostly overhead above the equator this month. This creates equal day and night periods in both hemispheres, which leads to improved DX conditions around the world on HF.

The Vernal Equinox in mid-March marks the day when the hours of daylight and darkness are about equal around the world. This creates an ionosphere of similar characteristics throughout more of the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere.

This equalization of the ionosphere during the equinoctial periods (autumn and spring) is responsible for optimum DX conditions starting late in February and lasting through late April. The improvement in propagation is most noticeable on long circuits between the Northern and Southern hemispheres. During this season, conditions are optimum for long-path as well as short-path openings, and during gray-line twilight periods associated with sunrise and sunset.

DXers (those who seek out signals from across the world) love April because the seasonal change this month plays out on HF: Activity (propagation) moves up from the 40-meter band and down from the 10-meter band, with stronger, more stable openings on paths on frequencies from 30 meters through 17 meters. Propagation on the higher HF frequencies (20 through 10 meters) begins to suffer late in April and into the summer months due to lower MUFs (Maximum Usable Frequencies) in the Northern Hemisphere, but the mid-HF bands are very usable, especially late in the day when MUFs peak.

Summertime MUFs are lower due to solar heating which causes 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. Higher frequency propagation peaks in the fall, north of the Equator.

April and May are autumnal months in the Southern Hemisphere, resulting in enhanced long-path DXing. At the same time, short-path propagation from South America, the South Pacific, and other areas south of the equator to points in the Northern

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@hfradiospacewx (https://Twitter.com/HFRadioSpaceWX)

One Year Ago: (Data rounded to nearest whole number)

Sunspots:

Observed Monthly, January 2022: 57 12-month smoothed, July 2021: 32

10.7-cm Flux:

Observed Monthly, January 2022: 104 12-month smoothed, July 2021: 83

Hemisphere will be strong and reliable when open. However, these do not happen every day on the higher frequencies—but do on mid-HF frequencies such as in the 20-meter band.

From April to June, excellent propagation occurs on both day-time and nighttime paths. The strongest propagation occurs on paths that span areas of both day and night, following the MUF. During April, peaking in May, and still in June, the 16-meter broadcast and the 15-meter amateur bands may offer 24-hour DX to all parts of the world, with both short- and long-path openings occurring, sometimes at the same time! If you hear a lot of echo on a signal, you might be beamed in the wrong direction. Try the opposite azimuth. Propagation on frequencies from the 30-meter band through 17 meters is more stable at night, 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 90 and 75 meters around sunrise.

VHF Conditions

The Lyrids meteor shower occurs in mid-April, peaking on the UTC night of April 21/22. The hourly visual meteor rate is expected to be low, with average meteor velocities of about 48 kilometers per second with broad outbursts. However, this shower's peak lasts for several days.

The debris expelled by comet Thatcher as it moves through its orbit causes the Lyrids. It is a long period comet that visits the inner solar system every 415 years or so. Despite this long period, there is activity every year at this time, so it is theorized that the comet must have been visiting the solar system for quite a long time. Over this long period, the debris left with each pass into the inner solar system has been evenly distributed along the path of its orbit.

This material isn't quite evenly distributed however, as there have been some years with outbursts of higher than usual meteor activity. The most recent of these outbursts occurred in 1982, with others occurring in 1803, 1922, and 1945. These outbursts are unpredictable, and one could occur this year. The best time to work this shower should be from midnight to early morning.

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, this should make possible meteor-scatter type openings on the VHF bands.

A seasonal increase in sporadic-E (E_S) ionization usually begins during April and continues through the spring and summer months. Expect an increase in short-skip openings on both the 15- and 10-meter bands during April, as well as a possible occasional opening on 6 meters. While sporadic-E openings may occur at any time, they tend to peak between 8 a.m. and noon, and again between 5 and 9 p.m. local time.

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Widespread auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the VHF bands. Best times for these to occur are during periods of radio storminess on the HF bands.

For a detailed list of meteor showers, check out https://tinyurl.com/bdcpttcw for a complete calendar of meteor showers in 2023.

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 https://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

Solar Cycle 25 continues to significantly outperform most of the predictions. The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for January 2023 is

143.6, up considerably from 113.1 in December 2022. The twelvemonth running smoothed sunspot number centered on July 2022 is 86.5, up from 80.9 in June. A smoothed sunspot count of 87, give or take about 6 points, is expected for April 2023.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 182.47 for January 2023, up from 148.46 for December 2022. The twelve-month smoothed 10.7-cm flux centered on July 2022 is 129.73, up from 119.74 for June.

For a look at geomagnetic activity levels this month, check out the *Last-Minute Forecast* at https://SunSpotWatch.com on the main page.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF Amateur bands. If you are on Facebook, check out https://fb.me/spacewx.hfradio and https://fb.me/NW7US. Speaking of Facebook—check out the CQ Amateur Radio magazine fan page at https://fb.me/CQMag. Also, please check out the new alternative social networking ham radio group at https://amateurhamradio.locals.com/ and please share this with your amateur radio friends and clubs.

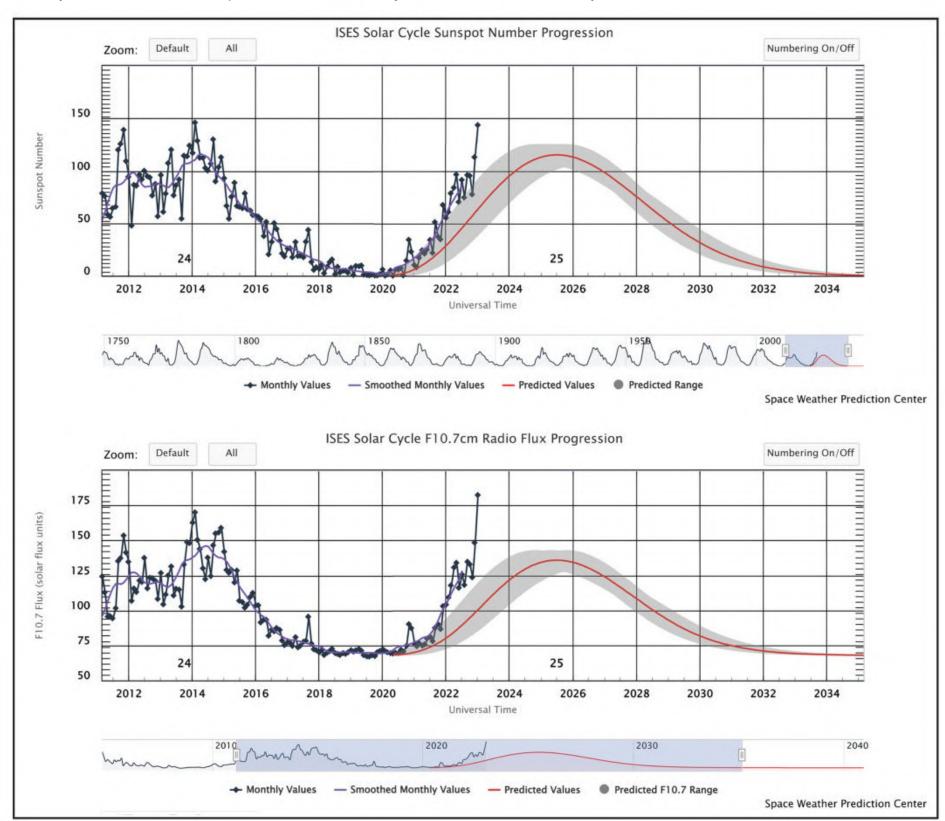


Figure 1. Cycle 25 continues to beat the "official" predictions by a huge amount, lending more and more credibility to Dr. Scott McIntosh's "outlier" prediction that this could be one of the best solar cylces ever. (Graphs courtesy SWPC/NOAA)

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zoones, and Countries. An asterisk (1) 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.) **Provided States** **DISTRICT OF CONTRICT OF CONTRI	KUZM	121 NSUP	**XY4HV	38,150 134 35 74 33,354 138 40 69 27,000 106 42 66 26,620 118 44 66 21,912 94 33 55 21,624 87 46 60 118,690 103 35 54 17,533 107 36 53 9,240 84 29 47 3,311 30 17 26 2,788 35 11 30 880 18 11 11 522 13 8 10 28 375,804 1168 28 104 110,300 411 26 74 23,562 138 20 43 21,515 52 214 25 71 112,810 109 19 51 7,776 67 15 33 4 384 11 7 9 9 A 676,620 712 100 258 292,982 441 79 184 285,912 455 85 179 269,124 401 71 175 288,916 418 73 168 292,934 401 71 175 288,916 418 73 168 291,34 401 71 175 4 285,912 455 85 179 269,124 401 71 175 4 285,912 455 85 179 269,124 401 71 175 8 292,982 441 79 184 285,912 451 85 85 179 286,124 401 71 175 8 194,331 360 63 148 101,200 227 61 115 8 85,260 227 53 87 61,460 164 49 91 144,308 307 51 121 110,100 227 61 115 8 85,260 227 63 87 61,460 164 49 91 57,057 184 51 92 52,528 161 44 90 1 37,873 123 47 74 34,524 109 53 73 32,616 125 40 68 33,672 129 42 74 34,524 109 53 73 32,616 125 40 68 33,692 117 38 76 30,972 129 42 74 34,524 109 53 73 32,616 125 40 68 33,696 87 27 52 18,779 118 33 56 18,300 115 41 61 23,100 89 44 61 23,184 90 41 71 23,100 89 44 61 23,184 90 41 71 23,100 89 44 61 23,184 90 41 71 23,100 89 44 61 23,184 90 41 71 23,100 89 44 61 23,184 90 41 71 23,100 89 44 61 23,184 90 41 71 24,150 83 37 68 23,496 117 24 64 23,184 90 41 71 23,100 89 44 61 34,460 17 24 48 11,302 129,070 108 41 61 34,460 17 24 48 11,302 129,070 108 41 61 18,300 115 41 59 17,301 89 26 53 73 32,616 125 40 68 18,300 15 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 33 56 18,300 115 41 59 18,779 118 30 56 18,300 115 41 59 18,779 18 41 51 19,416 11 50 19,416 11 50 19,416 11 50 10,417 11 50
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*HI3T A 3,397,464 3610 102 326 *V55AF *HI3A " 640,320 980 80 210	A 326,043 804 44 109 (OP: V51MA) 14 732 126 19 42	*BH1XEC " *BG8FZ "	5,865 78 30 39 4,794 54 21 30	JF1NHD A 1	,574,703 1544 125 262 (OP: N6VI)	*JQ1VDJ " *JA1DBG "	4,788 50 17 25 4,636 59 14 24
*HI8J " 204,864 496 55 139	Senegal	*BD2IAQ " *BA7LCS " *BGØDAP "	4,773 73 17 26 4,675 58 23 32 4,656 60 18 30	JR1GSE "	972,360 1121 107 226 637,377 922 101 176 555,458 774 99 190	*JO1KTD " *JA1CTB " *JJ1SVC "	4,026 54 12 21 2,592 36 12 15 2,560 44 10 22
Guadeloupe *FG5GP A 1,336,504 1832 67 217 6W1QL	21 52,948 310 11 51 South Africa	*BH2UAE " *BA7LYS "	4,590 59 18 27 4,320 71 20 28	JQ1ABC " JH1QDB "	527,772 849 94 150 489,048 671 98 189	*JA1JLP " *JK1PDC "	2,244 42 14 19 1,891 35 12 19
Guatemala ZS2ABE ZS6HON 3769ANF 14 431,607 1585 31 92 ZS6HON 3769ANF 31 31 32 ZS6HON 3769ANF 31 31 32 ZS6HON 3769ANF 31 31 31 31 31 31 31 31 31 31 31 31 31	A 176,190 331 71 139 " 61,800 216 31 72	*BD4TWZ " *BG7SPN " *BI7LVU "	3,861 63 16 23 3,526 43 17 24 3,393 50 17 22	JH1OLB "	340,816 564 76 162 303,150 560 82 133 158,194 328 64 117	*JE1GZB " *JM1XBD " *JJ1SWV "	1,836 32 12 15 1,638 23 10 16 627 17 9 10
*TG9ADM 3.7 208 9 6 7 ZS6PS ZS2MAC	" 28,152 102 27 75 " 819 15 9 12	*BA7LBM " *BI8EFI "	2,923 40 14 23 2,419 61 15 26	JA1CRJ " JR1IJV "	121,680 252 65 115 117,624 272 57 99	*JA1LKY " *JH1VIX "	304 21 8 8 273 9 5 8
Martinique ZS6KOB ZS6TVB FM5DN A 33,668 197 28 48 ZS6TVB ZS1AO	" 162 15 8 10 21 236,832 868 21 75 A 342,478 569 52 166	*BD8AQY " *BG6LH " *BG6SZD "	2,405 36 15 22 2,400 61 21 29 2,318 50 27 34	JR1JCB " JH1CTV " JM1PIH "	100,650 264 66 99 91,044 264 55 107 66,792 214 55 77	*JP1PEA " *7K1EAS " *JF1TEU 14	84 6 3 3 40 14 5 5 17,214 105 20 37
Mexico *ZS1S XE1CKJ A 346.060 1383 44 77 *ZS2EC	" 114,608 265 45 107 " 37,072 132 41 71	*BD4ULB " *BG8KUQ "	1,836 38 13 21 1,617 30 14 19	JK1HIX " 7K4GUR "	66,792 214 55 77 61,579 165 51 82 60,129 179 41 90	*JH1WHA " *JI1DGW "	722 14 9 10 228 11 5 7
XE2S " 151,371 557 51 70 *ZS6HI XE2T " 64,923 570 25 32 *ZS6ELI XE2O " 29,412 402 14 22 *ZR6DM	" 36,630 129 43 68 " 18,260 85 32 51 " 540 16 8 10	*BH4FCY " *BG5FOX "	1,225 34 17 18 924 21 15 18	JS1NDM " JH1LEM "	57,385 186 45 70 54,002 147 55 79	*JN1GNL " *JG1CMT "	60 4 2 3 6 1 1 1
XE2Q " 29,412 402 14 22 ZH6DM XE1CT 28 456,114 1778 28 86 ZS6MDX *XE1SPM A 571,976 1837 49 103 ZS2G	" 475 24 12 13 28 5,796 45 14 32	*BH2SMF " *BG2TAA " *BH3XZT "	816 50 11 13 658 52 23 24 525 34 12 13	JQ1IBI " JA1FFB " JA1RPK "	48,411 180 30 69 46,004 176 37 69 37,440 140 42 54	*JH1RDU 7 *JJ1BDX " *JA1KJC 3.7	1,798
*XE1ACA " 220,306 891 49 69 *XE2ANT " 64,368 629 23 31	St. Helena A 891,549 1383 49 170	*BD8AIS " *BH6PKX "	506 26 10 13 459 20 12 15	JJ1WWL " JS1BIB "	31,833 109 54 77 21,052 125 29 47	*JE1SPY 1.8	160 44 5 5
*XE2NK * 56,592 179 51 80 2D76G *XE1GLA * 15,164 95 31 37 *XE1O * 2,870 28 16 25	Sudan	*BH5HFK " *BH6AOV " *BD7JJQ "	391 15 7 10 174 33 12 17 135 11 7 8	JK1HIY " JA1VUA " JM1LKI "	21,040 97 32 48 19,500 98 31 47 15,930 84 37 53	JF2QNM A JR2PMT "	District 2 1,791,325 1799 126 269 300,160 510 78 146
*XE1SVT " 2,272 29 16 16 *STØHQ *XE2KSL " 820 17 11 9	28 301,920 858 28 92 (OP: ST2M)	*BG8KUV " *BD4VDA "	117 8 4 5 48 7 4 4	JJ1XTG " JL1JJD "	14,008 92 27 41 10,428 62 25 41	JG2CNZ " JE2DJC "	256,908 424 96 141 187,068 311 85 153
*XE1RE " 525 18 8 7 *XE2JA 28 60,165 477 17 46 *XE1ZTW " 37,027 253 17 44	ASIA Asiatic Russia	*BH4JPA " *BA4SCP " *BI1MCZ 28	14 5 3 4 10 9 5 5 31,755 206 21 52	JA1IAW " JH1DGJ "	7,065 59 15 30 2,278 23 12 22	JE2BOM " JA2HOL " JQ2BBC "	122,230 276 58 112 110,526 244 57 112 102,185 386 45 62
*XE1ZTW " 37,027 253 17 44 *XE1CIC " 35,464 375 15 29 *XE2AA " 26,950 297 14 35 *UA9CUA	District 9	*BG7XWF " *BG8BXM "	30,550 310 21 44 15,250 112 16 45	7M2FTR " JA1JNM " JH1LYE "	1,953 31 15 16 1,716 20 14 19 782 18 7 16	JF2FIU " JA2JWH "	102,185 386 45 62 73,500 219 61 86 53,568 202 52 72
*XE1AQY " 24,795 109 24 63 *UA9CAW *XE2JT " 6,794 62 16 27 *RT9YT	" 153,472 340 41 135 " 70,752 268 42 90	*BG8PM " *BH1HUK "	6,840 53 19 41 6,468 80 14 30	JE1RXJ 28 JA1ELY "	234,321 905 33 78 56,376 409 24 34	JR2BCF " JA2VHO "	43,758 164 32 67 35,643 151 45 64
*XE2N 21 210 14 8 7 *R8KAY *6D5C 7 12,032 117 19 28 *RA9W (OP: XE1H) *UA9CHL	" 18,183 107 30 57 " 9,052 62 18 44 " 3,358 35 22 24	*BI8AO " *BD4SBH " *BG8KVC 21	4,928 62 16 28 352 18 5 6 44,019 296 19 54	JG1ITH " JA1FWS " JA1FNO "	46,412 237 26 56 7,980 83 18 42 850 20 8 9	JH2BTM " JG2REJ " JF2CTS "	30,744 142 28 56 15,211 107 18 35 13,430 90 36 43
Panama **NW9Y **UBBOBD	" 1,250 18 10 15 28 1,254 24 4 15	*BG3ITB " *BD7LQM "	40,626 329 20 54 32,178 411 19 43	JA1GVM " JA1NFD 21	6 1 1 1 42,042 216 22 55	JA2IXS " JA2BHJ "	9,794 76 27 32 9,324 94 26 37
HP1ELV A 8,362 127 14 23 *R9MBY *HP2BWJ A 36,893 224 28 51 *R9WD *RA9YC*	21 3,298 63 9 25 " 171 17 5 14	*BH4AHC " *BG7SSK " *BYØAB "	14,280 127 19 37 14,200 134 17 33 12,408 100 11 36	JO1VRK " JG1LHB " JA1GHR "	40,753 197 25 58 25,323 147 23 46 23,218 93 29 65	JI2ZEY " JA2VQF "	7,812 57 31 31 (OP: JA2BIV) 72 6 6 6
*HP1RIS 21 20,493 114 18 51 *HP1ALX 14 3,700 41 14 23 RØWC	District Ø A 140,425 341 61 144	*BG7LDM "	(OP: BGØBWG) 12,012 266 18 26	JE1JNJ " JG1TUC "	17,700 120 20 39 15,652 115 16 36	JH2KKW 28 JH2DFJ "	21,597 124 22 47 63 7 4 3
Puerto Rico RAØACM RAØLMO KP4PR A 3,012,012 4112 82 252 RAØLMO LLAGDAR	" 66,429 274 38 83 " 37,842 128 41 78	*BG8AMG " *BH8OCW " *BH3DHE "	11,550 102 15 40 11,460 127 19 41 9,016 85 17 32	JF1KML " JR1NHD " JA1YPA "	8,658 76 16 23 3,483 45 14 13 2,475 37 6 19	JE2OTM 21 JE2PCY " JR2ALA "	234,738 708 33 93 17,877 121 22 37 7,875 70 18 27
WP4RF	" 29,568 191 34 43 " 6,048 56 23 40 " 126 7 3 3	*BG8INK " *BG8KCQ "	8,619 77 16 35 7,065 70 14 31	JK1NJH 14	(OP: JA1PEJ) 55,104 214 30 66	JE2LPC " JR2IOB "	462 11 6 8 315 9 7 8
WP4WW 21 509,130 1909 25 97 RNØCT (OP: KP4JRS) *UBØABG	14 73,695 370 27 58 A 140,015 312 65 140	*BG8IL " *BH4LLP "	7,065 70 14 31 2,765 49 12 23 2,550 54 14 20	JH1JNJ " JI1JPJ 7	96 6 4 4 1,302 26 10 11	*JG2RFJ A *JA2KPW "	184,828 375 65 131 111,350 271 60 110 86,976 220 51 93
*NP4VM	" 66,465 427 43 62 " 14,536 91 37 42 21 19,220 125 20 42	*BI1JBV " *BG8LCQ " *BD4QXR "	2,550 54 14 20 448 51 6 8 380 15 9 10	JK1BAB " *JS1OYN A *JA1BJI "	16 2 2 2 805,392 955 113 223 567,945 716 105 210	*JA2ODB " *JA2GHP " *JI2KUJ "	86,976 220 51 93 79,186 234 49 88 30,456 110 38 70
*WP3GW " 139,440 332 50 116 *UAØA *UAØA *UCØC ** 78,064 221 41 95	14 25,086 167 23 51 " 9,471 151 17 24	*BH4LFG " *BH6JOG " *BI8CCJ "	324 36 8 10 320 20 9 11	*JS1KKY " *JJ1VJQ "	364,560 578 84 161 199,988 438 56 117	*JA2ULV " *JS2PHO " *JM2LEI "	28,886 118 38 63 25,368 135 36 48
*KP4JFR " 77,910 203 44 103 *NP3CW " 68,912 238 34 84 TA3DE	Asiatic Turkey A 1,992,144 2357 64 230	*BD7BW " *BD9CJH "	60 5 5 5 30 3 3 3	*JF1WNT " *JK1HWU " *JH1BHW "	114,741 281 67 104 98,580 265 64 95 92,196 233 61 95	*JS2EEF " *JS2ITI "	5,490 46 17 28 4,462 35 15 31
*WP4JD 2,240 23 16 19 YM7KA *WP4LFS 28 6 1 1 1 1 *MP4AJW 14 22,900 162 17 42	" 1,164,745 1491 62 219 (OP: TA7I)	*BD4ULO " *BD4SVT 14	16 2 2 2 1,950 66 13 17	*JR1QBA " *JO1VVT "	69,690 251 60 78 62,980 184 52 82	*JS2IWE " *JR2KQE "	3,760 32 21 26 3,115 35 15 20
*KP4DQC 7 4,560 49 8 32 TA4AU	" 141,344 443 26 86 " 101,384 248 32 120 " 89,100 214 46 116	*BH1IZQ " *BH2VPV " *BI1LGP "	56 10 4 4 36 10 3 3 16 6 4 4	*JE1ICU " *JA1SCE " *JK1BVN "	59,976 219 49 70 56,168 204 40 79 52,734 203 59 82	*JE2DOD " *JS2BGJ " *JR2BOF "	1,029 23 10 11 820 15 9 11 714 16 8 13
*PJ7PL 28 184,828 1044 19 63 TA7AO *TA5O	28 2,738 54 11 26 A 298,655 469 59 186	*BH4TIH " *BH8MSA "	16 14 2 2 12 3 2 2	*JE1QHP " *JK1JAS "	44,619 159 41 66 37,700 125 48 68	*JJ2AVH 28 *JH2JNU "	21,831 133 19 38 10,441 85 17 36
St. Kitts & Nevis *TA2UCT *TA2WN A 13,340,329 9403 137 462 *TA2WN	" 147,441 299 39 138 " 97,608 250 32 115	*BH4UMN " *BD8ARO "	4 3 2 2 4 2 2 2	*JR1LEV " *JK1NSR " *JR1MRG "	37,149 179 32 55 35,619 153 35 58 29,853 131 40 53	*JR2TRC " *JG2VSF " *JF2VFN "	2,288 32 12 14 288 12 8 8 198 8 4 5
(OP: K5ZD) *TC29EKM US Virgin Islands	" 90,915 238 35 110 " 87,240 291 27 93 (OP: TA1BX)	C4W A	Cyprus 7,784,250 5086 110 425	*7L3KJV " *JA1HNW "	29,790 127 35 55 26,068 104 43 55	*JR2MIO 21 *7K1MAG/2 "	43,890 237 25 52 34,875 193 22 53
KP2M A 4,586,904 4450 111 345 *TA7YLY (OP: KT3Y) *TA8DX	" 70,875 212 30 95 " 40,115 156 26 87	*5B4APJ A	(OP: 5B4WN) 48,960 144 41 95 4,356 36 15 29	*JK1AUY " *JK1AUH "	25,017 113 39 54 24,800 178 29 33	*JH2UVB " *JH2RIH "	14,756 142 20 42 6,768 63 17 31 4,148 50 12 22
KP2B 28 1,331,424 4254 32 102 *TA3P (OP: EB7DX) *TA7LZB *TA0ACL	" 36,064 140 27 85 " 21,402 110 19 68 " 21,252 101 18 66	*5B4ANY " *5B4AJV 28	4,356 36 15 29 31,290 191 18 52	*JR1ABS " *JR1DVB " *JR1EMO "	21,824 110 41 47 21,472 100 32 56 19,840 104 35 45	*JA2KKA " *JS2MYR " *JF2KWM "	4,148 50 12 22 2,546 29 15 23 968 18 9 13
AFRICA *TA2L African Italy *TAØTA	" 13,430 75 23 56 " 9,676 64 17 42	4L2M 7	Georgia 924,189 2297 31 116	*JF1DWJ " *JA1ALE "	18,096 88 36 51 15,484 98 33 46	*JE2EVX " *JR2GYA "	264 13 4 4 24 7 4 4
*IH9/ IK5AEQ A 1,558,025 1756 72 235 *TA2DB	" 8,046 63 19 35 " 2,945 41 7 24	*4L9M 28 *4L4GB "	54,531 270 15 58 (OP: R3XA) 594 24 9 18	*JR1TCY " *JL1EUP " *JF1VVR "	13,452 71 31 45 11,160 61 29 43 8,636 67 27 41	*JF2WXS 7 *JI2IXA "	1,584 24 5 19 36 3 2 2
*TAAKDC *TA2NL/P *7X2GK A 402,960 653 44 186 *TA4Q	" 2,581 31 11 18 " 1,035 15 9 14 28 67,056 354 17 49		Hong Kong	*JP1SCQ " *JR1JRW "	8,544 76 18 30 7,020 56 21 33	JH3CUL A	District 3 798,163 883 115 234
Canary Islands *TA4/ OH2KW	57,152 315 14 50	VR2XAN 28 *VR2WTM A *VR2XAB "	943,795 2573 37 118 66,340 324 47 77 12,464 87 28 48	*JK1EXF " *JI1FLB " *JL1EUF "	7,020 47 23 31 5,530 58 18 17 5,502 47 19 23	JR3RIU " JA3IBU " JE3RMQ "	229,779 441 73 138 203,256 407 73 143 63,700 180 43 87
(OP: EA8DIG) *TA2E EA8ZS " 3,440 36 15 28 *TA3BC	" 28,880 166 22 54 " 26,828 149 23 53 " 20,460 119 22 44	*VR2T 28	281,175 1115 28 87 (OP: VR2ZQZ)	*JH1EYM " *JL1FAR "	5,300 40 20 33 4,004 33 17 27	JP3UBR " JA3LIL "	20,060 98 34 51 14,204 94 23 44
EF8BBM 28 284,070 972 24 78 *TAØN (OP: EA4BQ) *YM7KK	14 4,104 54 7 29 " 3,168 44 4 20	*VR2VRC " *VR2JM 14	36,960 341 21 45 7,298 93 13 28	*JK1ECX " *JA1UOA "	3,800 43 17 23 3,420 36 13 25	JA3AVO " JA3KKE "	10,700 94 22 28 10,368 66 30 34
*EA8DGO A 337,725 536 50 175 *EA8AQV " 283,290 464 54 156 *EA8BQM " 209,838 600 42 81	(OP: TA7OZJ) 1.8 128 8 2 6	VU2IVV A	India 136,590 397 43 114	*JE1VMZ " *JK1HFB " *JI1LAI "	3,375 41 20 25 2,128 30 17 21 2,100 26 12 18	JQ3ELZ " JR3UIC " JF3KCH "	7,564 48 23 39 6,760 48 30 35 6,413 79 23 30
*EA8BN " 14,104 70 28 58 *EA8AUW " 5,734 44 18 29 BA3MM	China A 637,436 1163 88 204	VU2EII " VU2BGG "	48,944 224 39 73 27,972 103 35 73	*JH1KLE "	2,014 25 18 20	JA3BXF " JQ3DEW "	1,456 22 10 18 864 28 12 15
1							

JASXOG 28 46,228 202 26 65 JA3XOGOS 47,844 74 93 93 JASIACRY 21 51,435 229 27 31 74 JASILERY 21 51,435 229 27 31 JASILERY 21 78,8652 100 18 24 JESVRJ 7 8,8652 100 18 24 JESVRJ 7 8,8652 100 18 24 JESVRJ 7 8,8652 100 18 24 JESVRJ 17 8,8652 100 18 24 JESVRJ 17 8,8652 100 18 24 JESVRJ 18 652 195 53 79 JIJASKU 18 55,348 166 58 79 JIJASILU 18 55,348 166 58 79 JIJASILU 18 55,348 166 58 79 JIJASILU 18 3,483 37 17 26 JIJASILU 18 2,451 46 18 25 JIJASILU 18 2,451 46 18 25 JIJASILU 18 2,080 27 15 17 JIJASILU 18 2,451 46 18 25 JIJASILU 18 2,080 27 15 17 JIJASILU 18 2,080 27 17 15 17 JIJASILU 18 2,080 27 17 15 17 JIJASILU 18 2,090 26 14 15 JIJASILU 18 2,0	JH8FIH	HSOZOK		OKA2MR
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*SV1JDY " 5,427 53 23 44 *SV2SKD " 2,419 45 13 28 *SV7CUD " 2,385 33 18 27 *SV1EEM/8 " 2,035 51 17 38 *SV4LQW " 1,845 41 11 30 *SV1MO " 792 14 11 11 *SV1AGU " 20 6 4 6 *SV1AZL 28 6,952 70 17 27 Guernsey *MUØFAL 28 1,584 30 8 10	*IW1FPK	83 *Z35K
HA1BC A 766,035 825 102 333 (OP: DL1MAJ) HA2D " 48,336 359 25 81 (OP: HA9MDP) HA5BMG " 21,186 191 23 76 HA5EA 14 13,440 127 17 53 *HA7AVU A 51,948 246 33 115 *HA3FHH " 27,720 116 34 50 *HA5BMS " 17,280 116 31 65 *HG1VN " 4,484 58 19 40 *HA8KM " 2,250 38 14 31 *HA3OOM " 957 35 8 21 *HG8CK " 644 35 5 18 *HAØLZ 28 12,720 87 21 39 *HAØVI 7 11,658 184 11 47 *HA8MBM " 735 53 4 17	*IK2DJY	iM) LAØGE 14 36,764 296 20 71 *SQ6PA " 1,189 31 11 18 41 LC9S " 7,052 160 7 36 *SP3BES " 800 16 12 13 42 (OP: LA9GSA) *SP3QLO " 575 23 7 16 24 *LA2AB A 256,688 807 59 204 *SQ6LH " 510 12 8 9
Iceland	*IWACXK	07
*EI4GNB A 697,340 1126 74 266 *EI4KU " 385,776 743 69 235 *EI3ENB " 150,096 443 51 185 *EI4II " 145,665 373 51 144 *EI6IKB " 40,136 148 41 75 *EI5FQB " 26,656 135 32 80 *EI7LC " 22,464 143 32 85 *EI5HZB " 4,988 57 18 40 *EI3LC " 4,779 59 20 39 *EI7INB " 2,847 37 16 23 *EI9IKB " 1,850 42 10 27 *EI8IOB 28 6 1 1 1 1 *EI2JIB 14 4,848 133 9 39 *EI9IDB " 77 9 4 7 *EI9IDB " 44 8 3 8	*IZ7VII	SP8BQL "10,147 79 24 49 "SP2GTJ 4,633 47 14 27 SP6CES 54 3 3 3 "SQ5SUL 3,154 51 10 28 46 SP8ARY 28 26,460 114 30 60 "SQ8MZW 14 34,000 345 18 62
See of Man *GDØAMD A 82,641 342 37 126	*IB5R	19 SP9JBE " 7,668 75 13 41 *SQ9ZAY " 4,446 63 9 29 24 SP9MAT 14 65,817 491 24 79 *SQ7BTY " 3,393 65 9 30 15 SP4LVG 7 120,524 918 25 91 *SP9DLS " 3,268 83 6 32 67 SP6A 3.7 10,700 241 6 44 *SP3DRM " 2,379 36 10 29 70 SP9TPZ 1.8 4,000 100 7 33 *SP7MJL " 2,310 50 8 27 31 *SP9DTE A 415,373 720 78 265 *SO1MK " 1,175 34 5 20 *HF9F " 402,732 875 72 252 *SQ2DYL " 651 25 4 17 79 *SP5UFK " 395,927 799 79 <
IU4LEC	*IU1MRH	13 *SP3GTP " 180,632 500 60 208 *SQ7LQJ " 2,272 65 8 24 41 *SP2GMA " 170,478 498 53 178 *SP3GTP " 161,397 424 59 178 *SP3GTB " 836 38 4 18 29 *HF9E " 160,230 437 62 183 *SP9MUF " 63 7 4 5 5 97 *SP3BKR " 152,131 585 47 164 *SP3QDX " 40 9 3 5 5 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
IZOUIN	*IUØDUM	55 *SQ5DTL " 65,620 204 47 123
IWØHLZ	*IU3OUR	37
*IZ6BTN	*IK2AIT " 851 22 9 14 *PA3FIW 7 882 49 2 1 *IK7RWE " 600 12 10 10 *PA3HCB " 9 3 1 *IK2LOT " 528 11 8 8 1 North Macedonia	

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YP3A 28 165,300 787 29 87 (OP: YO3IMD) YO2LEL " 16,896 102 19 45	*YU7XW 14 32,508 255 2: *YT2ISM " 2,890 85 : *YT5LD " 2,720 48 10	′ 27 *EA7GSL " 14	355 121 22 65 168 88 30 62 717 82 28 53	*UR9QQ	YB1AYO " 106,470 217 66 116
YO2SH 14 19,684 171 17 59 *YO7SR A 619,440 1127 81 267 *YR2X " 523,852 707 94 277	*YU4ZLA 7 4,418 92 9) 38 *EA1FKI " 11	305 91 25 60 305 108 22 63 890 87 19 47	*UT1KY	YC8DUL " 79,902 223 43 95
*YO8/LZ4UU" 215,298 726 53 190 *YO6EL " 183,222 493 57 186	*YU1P " 4,212 114 ! Sicily	5 34 *EA4FIT " 10 *EA3GYE " 9	863 79 24 47 834 74 23 43 940 127 18 42	Wales	YC1RYX " 65,408 207 36 92 YCØSCZ " 47,595 189 33 62
*YO4RST " 177,375 399 58 157 *YO3DAM " 169,416 482 55 179	IT9FUN A 227,374 398 73 IT9DWF " 3,465 91 13	' 221	475 103 20 55 705 68 27 40	MWØJKU " 340,180 668 61 172 GW5NIC " 19,418 130 23 50	2 YC3CNE " 25,080 103 34 61 YB4PE " 24,738 117 31 62
*YO8PS " 140,293 390 58 181 *YO4AAC " 136,728 401 55 161 *YO8SMM " 122,436 416 47 181	IT9NSM	' 121	599 63 21 30 (OP: EA5KO) 056 54 24 39	GW1W 7 50,634 332 18 69	YB1VHC " 23,229 97 31 56
*YO5DAS " 110,966 351 51 175 *YO6PVX " 90,280 404 40 145 *YO6HSU " 78,568 263 48 136	*IT9BGE	8 64 *EA3HWC " 4	853 65 26 51 864 56 14 18 320 65 17 37	GW9J 3.7 7,550 129 11 39 (OP: GWØGE) *GW4HBK A 102,612 310 48 156	YCØATP " 16,498 110 29 44
*YO5BRE " 67,860 349 33 123 *YO6MP " 63,360 282 45 135 *YO5PVZ " 58,986 235 43 131	*IT9HEQ " 5,782 54 19 *IT9AJP 28 22,392 120 24 *IT9AXQ 21 8,680 91 19	9 40 <i>*EB2DJ " 3</i> 4 48 *EA4AZ " 3	621 59 12 39 478 26 21 26 145 37 16 21		B YB1RQX " 10,332 64 24 39 YC3BUE " 9,882 109 23 38
*YO2MJZ " 50,400 261 29 115 *YO2MIT " 46,900 283 34 106	*IT9EWR 7 126,260 596 2	7 91 *EA1JDC " 2 *EA7HCB " 2	730 32 17 25 580 42 16 27	*MW6PNW " 12,441 123 19 68 *GW4W 28 43,040 218 19 61	3 YB2SPP " 5,159 94 24 43 YC6HSK " 3,936 64 17 24
*YO7LDT " 43,146 198 35 106 *YO8BFB " 42,050 192 40 105 *YO8BDQ " 40,975 137 48 101	OM7K A 3,035,167 3187 12 (OP: ON	388 *EA4HFK " 1 17RU) *EA7WV " 1	938 31 15 23 892 41 15 29 769 24 11 18	*MWØMFX " 96 10 2 2 *MW8R 21 130,848 655 27 89	YC7LTE " 1,232 23 10 12 YC8SGY " 1,056 31 15 17
*YO8AAZ " 39,457 152 44 143 *YO3YV " 34,304 208 31 103 *YO5PUV/P " 29,376 150 34 74	OM3CPF " 170,200 631 43	//4KK) *EA1FPG " 1 ' 183 *EA2BSJ "	620 35 11 25 200 23 13 17 324 16 11 16	*GW5L 14 82,100 651 23 77 (OP: GW4ZAR	Y YB9YSS 28 2,438 59 10 13 YF8DJ 21 42,846 245 23 51
*YO2MOO " 27,360 130 38 76 *YO6DBL " 25,676 149 31 100 *YO8DRV " 24,444 191 25 72	*OM4lK A 338,245 806 60	5WW) *EA7AAF " 134 5 239 *EA3T " 83	536 1145 33 99 760 578 28 92 260 295 32 83	OCLANIA	YB9YKU " 19,520 125 22 42 YC3GOQ " 19,057 139 17 42 YC4JPR " 11,330 100 16 39
*YO6QCD " 22,632 189 26 97 *YO3CIY " 15,886 103 27 67 *YO7MPI " 11,954 97 28 58	(OP: Of	16FN)	760 390 22 74 (OP: EA5IWZ) 465 217 29 86	Australia VK4A A 3,310,680 3235 113 263 (OP: VK4NM	YC4SJA " 3,096 43 9 27
*YO6PLL " 8,282 93 25 57 *YO5ODT " 6,890 103 13 40 *YO5DBM " 5,775 87 12 43	*OM7AG " 57,263 296 4	132 *EA1LP " 22	971 167 24 63 644 138 21 53 021 137 17 44	VL2A	YC4RWH " 567 27 11 16
*YO4GOU " 4,608 70 16 48 *YO9FLL " 2,990 59 12 34 *YO7HHE " 1,476 49 8 28	*OM3CDN " 34,840 257 26 *OM8AGA " 25,536 211 20	5 108 *EC4TR	990 188 13 42 792 78 20 44 470 70 15 30	VK5RS " 95,635 255 50 105 VL2N " 44,462 190 35 59 (OP: VK2PN)	5 YB2MM
*YO9BNP " 700 20 10 15 *YO3APJ 28 49,104 217 27 72	*OM7AHJ " 5,922 42 26 *OM3ZAH " 4,758 110 13	5 37 *EA7FWM " 5 8 48 *EA4EJR " 4	029 47 16 31 692 52 12 22	VJ2D " 30,144 119 33 63 VK7GN " 20,880 95 35 45 VK7QP " 12,870 87 27 39	3 YF4SDF " 3,977 93 14 27 YC2CQO " 3,306 37 15 23
*YO2CMI " 23,850 134 24 51 *YO4CSL " 3,608 42 16 25 *YO5CTS " 3,024 54 12 24	*OM8JP 14 14,381 155 18	3 17 *EA5DLP " 2 3 55 *EA4HIA "	444 36 12 14 176 15 6 10	VK5MK " 11,826 74 33 40 VK7C " 8,255 51 30 35	YE3DFB " 2,484 41 13 23 YC2DMA " 2,412 51 16 20
*YO6DBA " 1,488 52 7 17 *YO3KPA 21 29,930 239 21 61 (OP: YO3GOD)		5 19 *EA5V " 3 51 *EA5BCQ 21 62	132 8 5 6 48 4 4 4 315 320 23 80	VJ3A " 8,190 49 23 40 VL5L " 1,960 27 12 16	YB2XDU " 1,400 30 10 10 YF3DZU " 1,288 29 11 12
*YO2IS	Slovenia	*EA3KT " 42	074 321 20 78 (OP: EA1Y) 840 263 20 70	VL2G 28 2,760 48 11 13 (OP: VK2GR)	3 YC8AYJ " 1,054 28 7 10 YC8ET " 165 48 6 9
*YO8TNB 14 19,497 219 12 55 *YO7PED " 15,330 156 18 55 *YO2LTA " 7,695 140 11 46	S57K) 310 *EA3HLM " 2) 166 *EA3HKY " 2	273 75 12 29 277 48 7 26 277 48 7 26	VK1A 21 1,000,714 2550 33 110 (OP: VK2IA VK4QS " 10,972 90 20 32	*YB9ELS A 336,960 519 70 170 *YB2CPO " 266,240 488 66 142
*YO7HBY " 7,105 121 9 40 *YO4BXX " 4,300 87 7 36 *YO9HG " 864 41 6 21		5 120	585 1802 36 119 (OP: EA3CX) 600 459 28 90	VL4U 14 287,184 899 29 95 VJ2J " 85,456 295 26 83 (OP: VK2CZ)	*YB9VED " 212,829 516 68 115
*YO3JW 7 36,921 321 19 74 *YO8RZJ 1.8 1,352 57 5 21	\$530 1.8 65,284 835 13 *\$57NAW A 556,140 839 9 *\$57YB " 251,082 616 64	299 *EA3FUJ " 16	050 452 23 74 698 138 19 50 776 28 11 26	VJ3O	*YB1CQU " 105,258 258 53 106
San Marino *T77NC A 360 23 9 15 (OP: IU4AAJ)	*S56C " 133,425 439 5	174 *EA7JTT " 1 ! 130 *EA2XG "	482 21 11 15 960 27 6 18 638 21 5 17	*VK4Y A 203,720 389 80 140 *VJ2Z " 69,160 199 47 83 *VK2PAA " 52,535 206 33 62	0 *YB8RW " 87,048 370 41 52 8 *YB9AOS " 85,995 262 43 92
*T77CX 28 51,336 418 14 32 Sardinia	*S53KS " 35,910 197 29 *S5ØPB " 28,914 197 30 *S57WW " 20,520 160 29) 76 *EA7IUK ") 92 *EA1BCK 7 14	496 51 7 24 973 184 13 56 608 237 12 61	*VK5LTD	' *YB7WR
ISØ/ OM2TW 3.7 319,277 1877 22 97 (OP: OK8WW)	*S58MU " 11,430 82 29 *S51C " 6,348 70 19 *S5ØBH " 1,862 41 11	61 *EA1FBU " 50	266 12 7 12	*VK3OM	*YB1LRG " 57,584 223 42 80 *YC1BTK " 52,275 175 40 83
*ISØIYM A 39,889 327 32 81 *ISØLYN " 22,932 131 28 70 *ISØHNW " 19,838 110 29 62	*S56MH " 1,254 31 14 *S53MR 7 35,189 400 13 *S54ZO " 759 17 8	24 SM5Q A 479 3 64 SEØDX " 204	983 685 92 267	*VK4SP	2 *YB8UF/7
*ISØILP " 6,596 61 24 44 *ISØPAH " 6,222 64 18 43	*S53NW 3.7 25,288 440	7 51 SM3PZG " 47	082 228 40 93 345 285 19 86	*VK5Y	*YB1DCW " 26,746 118 31 55 *YC5NBY " 26,208 104 41 71
*ISØBPX 28 16,860 111 18 42 *ISØGRB 14 100,896 899 20 76	EA5DFV " 2,543,590 3072 99	307 SM6NT " 20	(OP: SMØDSF) 380 172 30 80 273 171 22 75	(OP: VK6WX) *VK2JEH " 1,806 37 19 23	*YC1KAJ
Scotland GM2V A 120,328 379 37 132 (OP: GM3WOJ)	EA3CI	3 209 SA5HUB " 180 SE3T "	312 144 21 66 416 22 11 15 405 9 6 9	*VK7DW " 646 16 9 10 *VK3DLN " 306 10 9 9	0 *YCØOXA " 20,398 104 33 61 0 *YC1CWO " 19,104 105 36 60
GM5BDX " 54,171 240 30 87 MMØLGR " 33,930 198 28 89 GM5X 28 623,858 1890 31 115	EA1FDJ " 178,849 429 64 EA3OH " 169,195 400 58 EC4T " 102,037 345 50	3 189 3 117 *SM5DXR A 108		*VK7IAN " 276 9 5 7 *VK3DL " 99 11 5 6 *VK1XYZ " 32 5 3 5	*YC7YCP " 15,912 104 30 42
(OP: GM4YXI) MM3T	EA4HLP " 33,516 136 39 EA3IND " 26,001 173 20 EA4HKV " 25,942 135 32	6 81 *SB5X " 97	536 399 45 139 512 297 50 154 326 356 46 153	*VK8NSB 28 246,560 873 30 85 *VK5COL " 435 14 7 8 *VK3VDX 21 738 25 8 10	3 *YC1CBY " 15,721 102 35 44 0 *YC9BOE " 15,428 105 27 49
*2MØVGT A 80,460 407 38 142 *GM9C " 78,370 383 36 134	EA7IYF " 17,556 134 3 EA5NY " 2,200 41 15 EC7R 28 545,904 1973 3	<i>9 25</i> *SE4L " 86	(OP: SAØAQT) 592 379 37 127 (OP: SAØFIA)	*VK2SLM " 12 2 1 1 *VK3GF 14 1,311 28 8 11 *VK2GPU " 231 7 6 5	
(OP: MMØGHM) *MMØLBX " 64,050 253 43 132 *GM7MTK " 32,595 185 34 89	ED3C " 542,121 1354 36 (OP: EA EE3A " 522,692 1327 33	BHXT)	784 325 30 122 (OP: SM6FZO) 648 180 39 103	*VK2EG/P " 176 6 5 6 *VK5UE " 18 4 3 3 *VK3STL 7 4 2 2 2	*YDØASO " 13,671 99 24 39
*MMØEDZ " 25,875 146 32 83 *2MØWIC " 13,699 125 25 78 *MMØSDK " 8,625 111 17 52	(OP: EASEL	3 70 ×SA6CCZ " 20	480 204 24 80 904 174 22 82 714 109 26 71	Brunei Darussalam V85RH A 4,246,905 3613 133 302	*YD1CGW " 13,570 93 26 33 *YC5KXI " 13,104 78 22 41 *YB8UFM " 13,064 127 22 24
*GM7OAW " 7,236 78 18 49 *MMØTXT " 7,062 82 12 21 *MMØCPZ " 4,040 49 16 24	EA5GVV 14 1,064 23 6 EA3HHF " 660 19 5 ED5R 7 930,155 3275 33	' 13 *SM5LSM " 2	451 51 9 34 368 62 9 28 621 19 11 16	(OP: JO1RUR *V85AHV A 45,291 223 39 54 *V85T " 36,208 279 28 45	*YB3ATK " 10,620 120 26 33
*MMØMUN " 3,800 58 13 37 *2MØVEY " 3,698 73 10 33 *2MØBEC " 2,478 39 9 33	(OP: EE7L 3.7 151,892 1287 13 *FD7B A 1,260,336 2371 80	EA5Z) 5 77 *SA7BMV "	(OP: SM3AGO) 528 22 7 15 840 95 21 59	*V85ZX " 3,690 47 17 24 East Malaysia	
*2MØYZT " 1,242 25 8 10 *2MØIIG " 132 10 4 7 *GM3TAL 28 65,852 260 24 77	(OP: E, *EA4HKF " 687,635 1188 76 *EA3FZT " 424,960 726 78	A7GX)	561 119 19 52 393 93 6 33	9M6MUL 28 800 20 6 10 *9M8DEN A 540,882 1077 64 135 *9W6MST " 16,168 201 20 27) *YC2YWF
*MM7BWK " 9,494 112 10 37 *GM6DX 21 1,760 36 9 23 *GM3ZDH 14 17,024 216 12 52	*EA4WW " 244,480 604 57 *EA2EWL " 238,420 526 69	7 199 Switze 9 193 HB9TOC A 2,775	852 3089 115 383	*9W6PKJ	*YC2KDU " 8,330 74 18 31 3 *YBØULI " 7,830 60 25 33
*GM4JYB 1.8 1,716 69 2 24 Serbia	(OP: E/ *EA3DJL " 161,920 399 52	A2SN) HB9RN " 183 ! 168 <i>*HB9SHI A 25</i>	241 447 57 200 <i>938 102 41 58</i>	Fiji 3D2AG A 168,918 671 36 58	*YC1WOZ " 6,996 62 21 32 *YE3EKS " 6,776 66 15 29
YT3D A 2,435,860 2711 121 387 YTØW " 832,614 1507 77 225 (OP: YU1JW)	*EA5UJ " 119,900 362 52 *EA1HTF " 90,288 280 5	! 168	600 54 17 23 698 52 13 30	Guam *KH2INC A 28,458 227 23 28	*YCØARK " 5,658 67 20 26 *YCØHLE " 5,500 56 16 28
YT1RK " 24,444 162 23 74 YU7WW " 2,982 52 11 31 YT7B 14 494,700 2111 34 116	*EA3HLF " 87,044 298 50 *EA3W " 54,576 216 30 *EA4RR " 53,724 260 30 *EA4RR " 53,724 260 30	3 106 *HB9FHV " 1 3 112 <i>*HB9GFP "</i>	168 32 18 30 584 34 12 24 198 6 6 5	(OP: KH2ZZ	*YB2CTE
YT5DXX 7 175,890 1185 27 103 YT2ZZ " 33,030 320 19 71 YT4A 3.7 5,992 58 14 42		6 134 *HB9FLX 21 3 111	110 6 5 6 840 52 12 28	Hawaii KH7M A 4,877,180 4516 133 252 (OP: N6AA	YB5MB " 4,081 77 21 32
*YU4EWW A 56,625 315 27 98 *YT2VP " 42,799 231 36 91 *YT2SIN " 40,880 212 40 100	*EA4Z	97 UT3UV A 25 102 UY5OO " 8	215 166 35 88 736 52 33 45	WH7T	*YCØAUN " 3,936 50 21 27 3
*YU4MVP " 39,000 183 37 88 *YU4GUV " 18,414 193 21 78 *YT3VLA " 10,452 78 25 53	*EA4GJT " 36,237 172 37 *EA5DB " 32,963 156 39	7 104 UT1KWA 14 5 9 80 *UT3SO A 206	440 120 22 51 535 107 9 36 628 592 54 203	AH6FC " 29,798 126 42 52 KH6LC " 4,635 109 8 7 KH6Y " 1,302 24 12 9	*YG9EEY " 2,976 50 14 18 *YB8SCP " 2,944 40 14 18
*YT2MDM " 10,368 138 23 73 *YU1ML " 9,581 139 13 54 *YU1UUU " 9,450 82 19 56	*EA5IXX " 31,855 159 32 *EA4HLZ " 30,464 141 33 *EA2ESK " 25,839 158 23	2 83 *US6IKF " 81 7 91 *UW8SM " 77 7 72 *US7UK " 50	216 195 68 124 264 283 47 129 616 188 53 118	NH6V 28 23,840 404 9 11 (OP: @KH6LC *KH6CJJ A 1,680,840 2313 94 158) *YB7NUS
*YU6TM	*EA4EIY " 25,545 115 39 *EB3AKL " 22,011 132 2	92 *UR1HR " 43 ' 60 *UR5UJ " 29	624 124 49 84 475 155 39 92 774 36 21 30		*YB3EDD " 2,183 40 16 21 *YB7VGB " 2,145 27 20 19
*YU4SRB " 2,820 82 16 44 *YU3MPN " 896 46 9 23	*EA5JDG " 16,833 119 29 *EA5JBG " 16,554 109 29	0 64 *UT9UY " 0 64 *UX3UU "	930 20 12 19 665 15 9 10 354 231 23 75	Indonesia YBØECT A 1,316,040 1438 99 231	*YB4TM " 1,512 49 12 16 *YDØBMC " 1,392 43 13 16 *YB1KFQ " 1,326 23 12 14
*YT4ZZ 28 35,148 181 25 62 *YU1VG 21 39,867 277 23 74			872 124 22 47		

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*YCØIEM *YBØYAD *YF1APQ *YD3CYO *YD3AHB *YC1BVK *YC7HYK *YB1MBV *YG9EBT *YC1BAW *YB1EIG *YB5YWBC *YB5HPT *YC7FAI *YG1ARX *YDØAWI *YC2KME 28 *YD9MBM *YDØBCG *YD1CHM *YB3BGM *YD1CMZ *YEØPO *YD8CPZ *YC2UXN *YD9BJX *YB7GRN *YB1HDR *YG1AEX *YD9BJX *YB7GRN *YB1HDR *YG1AEX *YD2UTC *YB7SKM *YB2YEN *YD2UTC *YB8YSKM *YB1HDR *YC9KA *YC2KJ *YC9KA *YC2KJ *YC9KA *YC2KJ *YC9KA *YC2KEJ *YCØNAN *YC2BDZ *YCZKEJ *YCØSCL *YB8KOB *YC2BDZ *YCZKEJ *YCØSCL *YB8KOB *YC2COQR *YB1MBA *YC2BDZ *YCZKEJ *YCØSCL *YB8WJG *YC9BVB *YC9BVB *YC1DEA *YB4HPI	184 23 2 6 112 6 4 4 98 12 7 7 78 5 3 3 77 5 3 4 72 5 3 4 72 5 3 4 63 11 3 4 63 23 3 4 63 23 3 5 49 4 3 4	Table	*LQ5D	169,078	*PUBPJG	6 7 AC1EV AA1SU AA1SU AA1SU AA1SU AA1SU WIARY WIARY WIARY WIARY WIARY WIARY WIARY WIARY WIARY AA1SU WIARY WIARY AA1SU AA	708,120 695 81 279
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WB2PJH " 257,712 389 64 172 K3MTT " 235,770 326 59 212 WA2TDE " 201,924 303 63 174	N3NGE " 66,750 N3AML " 64,800 K3QIA " 50,220	139 60 118 NU4E 160 48 114 K2SX 154 37 87 W4RQ	" 36,010 " 31,992 " 31,644	108 53 77 115 44 80 111 30 78	N2IC AA K5WA "	District 5 5,410,368 3305 158 448 3,491,298 2096 157 500	*W6ZL 28A *AC6DX " *WQ6X "	67,080 275 25 61 22,494 122 24 45 7,831 76 17 24
WA2UBK " 198,403 346 43 156 N2NKX " 185,005 297 64 163 WO2Y " 137,142 292 33 138 WE2DX " 135,171 254 56 151 KD2UBH " 135,044 252 65 147 W6JTB " 108,480 269 41 119	KC3UEX " 41,796 N3OZT " 32,670 N3RM " 30,261 W2QFV " 28,482 W3YR " 28,126 N2IW " 21,527	185 28 80 N4CWZ 126 36 63 K8LF 94 45 86 W4CMM 116 30 64 N4FP 123 22 60 NN4NT 83 39 64 KB4OI	" 31,565 " 29,103 " 26,136 " 24,975 " 22,540 " 22,344	105 34 73 107 38 71 120 36 63 100 44 67 96 29 63 88 38 76	N5RZ " KE5MMT " WZ5M " N5XJ " W9DCT "	2,538,800 1775 149 428 1,256,752 1022 123 335 1,194,384 1004 110 337 1,154,538 1206 78 265 1,093,680 964 113 307	*KA9A 7A *WZ6ZZ 3.7A	3,570 39 15 27 960 23 10 10 District 7 1,428,116 1188 125 312 1,131,444 1377 100 218
W631B 100,460 269 41 119 W2JV " 77,616 198 33 111 N2HMM " 68,464 156 58 118 K2QPN " 62,550 162 39 100 W2VQ " 61,180 174 42 98 KR2Q " 58,995 156 44 91	WV2M " 18,815 K3RMB " 8,164 W3NRJ " 4,368 KC3DQA " 3,450 K3PH " 874	94 14 57 KS4X 56 17 35 K1ZW 45 19 33 K4ELI 46 17 29 NS4X 14 9 14 K8AC	" 20,909 " 17,945 " 16,732 " 14,060 " 13,284	77 40 63 74 39 58 75 33 56 70 24 52 61 29 52	AA5H " AD5XD " K5TA " NT5V " N5OT " W5GN "	1,001,250 811 120 330 816,740 774 101 287 560,399 572 111 248 548,236 594 86 252 492,410 456 116 294 490,686 671 74 220	KA6BIM " K7AR " W7GES " AA7V " KH7X/W7 "	7,13,444 1377 100 216 1,042,860 1038 117 273 758,970 725 123 282 720,556 745 109 252 591,826 538 104 294 527,065 637 115 270
K7RB		377 28 111 KØMO 203 26 105 N4GU 237 20 70 K9QJS 162 12 44 N1PEB 1076 111 341 KE4D	" 12,462 " 11,825 " 9,798 " 9,112 " <i>8,255</i>	66 23 44 74 13 42 54 22 47 57 25 43 49 21 44	KC5DI " WW5L " K5NZ " W5LO " WBØTEV "	473,984 607 91 231 458,858 541 89 224 455,793 471 99 278 451,242 504 91 227 439,920 355 128 342	N7GCO " W7PP " W7CXX " AC7DC "	(OP: KH6ND) 505,968 587 101 231 441,620 534 92 219 411,510 504 105 214 351,024 492 95 189
WK2H		1025 111 347 KB4QZH 730 92 275 N4 DH 429 65 193 W8WZ 304 72 222 W4TG 358 42 142 N4CNZ 269 54 143 W4GHV	" 5,400 " 4,850 " 3,772 " 3,744 " 3,420 " 3,363	35 23 31 41 20 30 32 19 27 29 21 27 36 16 29 41 27 32	W2GS " N5AA " K5PS " K5JTH "	375,360 504 76 196 363,744 324 113 308 (OP: K5NA) 350,649 381 93 240 331,632 430 70 212	K7SS " K7WP " K4XU " KN7K " KE6GFI " K7QA "	324,852 491 89 164 285,600 395 82 190 270,480 363 94 200 239,904 386 86 152 205,725 439 76 135 198,372 322 73 171
W2KV " 46,125 157 26 99 WA2OAX 21A 483,653 1143 32 119 WT2J " 31,692 155 16 60 N2KA 3.7A 1,976 28 7 19 *NC1A AA 651,130 777 65 233	*N3BAS " 126,528 *NR3Z " 118,776 *KA3D " 80,262 *NE3I " 66,300 *K3RLW " 45,672	234 46 146 WD4DAN 259 45 123 KE4YOG 156 48 134 KM4HQE 184 35 95 ND2O 145 59 114 KN4RHC	" 3,195 " 2,418 " 2,040 " 1,680 " 1,450	50 16 29 25 17 22 21 14 20 21 15 20 19 11 18	N5KWD " N5EE " K4DG " W5GCX " W5GFI " N5WNG "	330,820 449 80 198 317,282 441 80 182 234,459 357 73 166 223,146 364 73 158 190,950 362 52 138 190,950 256 93 192	WB6JJJ " AL7RF " KØNG " NK7C " KØIP "	195,143 333 83 138 192,477 316 90 159 184,440 334 82 150 164,160 330 85 143 144,359 231 74 167
*W2NTV	*KE3KU " 41,984 *KC3UDO " 39,788 *W3WHK " 35,380 *N3HRO " 27,645 *KC3SVR " 22,040	150 35 93 K4XG 146 33 83 NØCRL 140 38 84 KX4JN 115 28 67 K4NMR 96 27 68 N4EEB	" 352 " 280 " 280 " 84 28A 618,852	8 8 8 8 6 8 8 6 8 4 3 4 1457 31 125	N5ZC " N5QJ " K5DU " K5TIA " AC4CA "	188,500 287 86 164 178,068 309 70 158 153,201 247 56 167 125,584 281 63 125 114,580 244 52 118	KD7VIK " K7WXB " WA7AN "	144,192 297 64 128 141,966 293 65 133 134,596 244 68 141 (OP: K9DR) 132,258 279 77 124
*W2AAB	*KA3KAG " 21,306 *K3RSS " 11,736 *WA7PBE " 8,946 *W3TAS " 7,150 *N3NQP " 6,102 *W3RFX " 714	88 30 76 WJ2D 61 22 50 W1AJT 58 25 46 K4FS 50 13 37 W3US 50 21 33 K3SV 12 10 11 N3CW	" 284,592 " 161,379 " 135,592 " 58,144 " 52,128	693 29 118 453 26 103 350 29 107 224 23 69 196 23 73 126 20 65	KK5LO " KE5CDE " KG5VK " WV5Y " KA5M "	92,950 199 51 118 77,010 181 60 110 61,047 166 33 100 60,590 160 56 90 57,105 153 39 96	K7VIT " KN7Y " WA7DUH " K6WSC " KA7LJQ "	131,760 274 68 112 130,071 283 75 116 121,056 228 69 139 120,960 185 85 167 113,238 265 55 107
*W2LCQ " 80,661 195 50 117 *KD2PTX " 60,640 137 47 113 *K3WHD " 42,656 134 36 88 *K2AL " 31,301 105 33 80 *KD2UVT " 28,080 98 37 83 *KD2SGM " 27,013 101 41 78	*W3RFX " 714 *AB3GS " 374 *KC3TYX " 156 *KB3NJB 28A 42,930 District 4	12 10 12 KM4HI 2 7 5 7 WA4JUK 2 209 19 62 WF7T KC2YEB	" 28,560 21A 203,060 44A 114,829 " 96,247 " 24 7A 65,508	126 20 65 533 31 112 348 32 89 446 27 82 2 2 2 251 26 80	WDØGTY " K5TU " W5KI " WD5ENH " WØZW " WA5LXS "	42,770 121 44 86 30,179 105 26 77 25,080 91 44 66 23,760 100 33 66 21,112 76 41 63 20,746 97 30 52	N7IP	109,272 186 77 155 97,188 201 66 116 95,765 218 63 116 92,700 210 66 114 79,407 213 61 112 64,800 184 52 83
*KD2KEH " 12,000 62 28 52 *K2SQS " 4,800 43 12 28 *W2KYM " 4,557 45 15 34 *W2MSA " 2,772 28 13 23 *N2NRV " 936 14 13 13	NO9E	1942 130 426 KM2G 3 1582 143 475 W4TTY 1537 137 446 K2KW	" 31,995 " 5,700 .7A 16,897 " 4,998 .8A 77	158 18 63 52 9 29 105 12 49 40 16 33 6 3 4	N5ZKK " K5PAR " KC5EGZ " W5RZ " N5JGE "	20,468 85 30 56 6,300 48 26 34 2,709 27 16 27 1,209 18 14 17 450 11 8 10	W7DBA " K9RZ " K7EKD " KX7TL " NZ2S "	54,329 167 51 70 45,974 147 48 79 44,160 141 51 87 34,136 101 44 92 33,561 145 46 67
*K2ZR 28A 37,696 191 18 58 *K2IW " 37,146 167 17 65 *N2YBB " 16,704 98 16 48 *K2NV " 736 16 4 12 District 3	K4PI	609 111 375 *N4XL 430 138 425 *KK4ADQ 451 114 382 *KG2MM 459 121 369 *W4EE	AA 1,539,699 " 1,013,520 " 595,643 " 363,870 " 295,596 " 273,420	1189 104 367 921 103 309 687 75 242 434 79 232 437 71 181 398 76 176	NJØF 28A N5KAE 14A K5UR 1.8A *WB5N AA *AB5NX " *KI5GNH "	1,170 17 9 17	N7EPD	32,334 114 40 62 31,204 126 47 69 31,161 93 53 88 29,754 125 36 51 26,784 107 39 54 25,668 113 42 51
K3WW AA 6,141,828 3512 145 499 AA3B " 5,674,212 3262 141 492 N3RS " 5,085,948 2842 146 488 NW3Y " 3,592,015 2164 137 458 W3MA " 3,411,529 2130 139 454 K3PP " 3,302,796 2021 132 456	N4PQX " 1,144,121 K4CAE " 1,134,521	259	" 224,000 " 216,790 " 211,992 " 201,815 " 193,623	347 77 179 306 69 197 319 77 187 351 60 163 257 80 197	*K5DXR " *WA5LFD " *KG5KRZ " *K5MR " *AB5KM "	156,122 237 79 172 149,366 289 78 149 106,689 255 61 122 94,584 214 51 117 43,035 122 54 97	K7GS " K7EG " W7NIK " KF7U " KG7QXE "	23,976 99 46 65 23,136 97 28 68 22,311 94 44 67 20,025 104 25 50 17,922 82 41 46
KU2C " 2,566,912 1583 134 458 W3FIZ " 2,392,486 1606 123 415 NN3Q " 2,344,986 1608 121 397 W8FJ " 2,322,750 1487 129 441 K3SW " 2,113,054 1521 113 401	W4KW " 942,064 ND4Y " 916,400 K4QQG " 865,360 K4WMS " 854,143 K4JKB " 852,768 W3IP " 792,610	940 114 274 *N2ESP 836 98 297 *W4HRL 868 102 291 *K4DR 701 110 357 *KN4UOW 739 109 323 *NR1K 628 114 355 *NE5W	" 175,700 " 151,905 " 146,601 " 144,585 " 144,504 " 135,342	269 73 178 283 57 148 311 46 133 298 51 138 255 65 158 232 60 159	*KJ6DQ " *N3BUO " *KJ5FA " *NØLD " *AG5AY " *N5VHT "	35,047 123 37 64 32,262 113 41 73 30,916 106 51 67 28,832 131 39 67 28,815 102 38 75 27,474 107 43 71	KA6RWL " WA7BAM " WA7CPA " AK7MG " WT8P " W7FCL "	14,620 69 32 54 9,344 49 28 45 6,499 45 28 39 5,508 40 23 31 3,362 42 18 23 2,646 41 21 28
WC3N	N4CW " 776,520 N4LA " 770,814 N3MN " 713,661 WC3W " 712,990 AA4R " 657,342 NE4EI " 641,598	768 79 281 *W4LT 608 114 344 *K4VBM 692 94 283 *WS4WW 686 98 312 *W4TM 722 74 259 *NK4O 649 96 270 *K6ES	" 132,275 " 131,138 " 122,838 " 119,250 " 105,200 " 96,446	279 52 133 250 63 140 255 43 134 225 71 154 210 63 137 239 50 116	*K2ZP " *W5CSM " *KI5MPX " *W5JCC " *AF5CC " *KI5FQJ "	14,112 69 34 50 11,592 93 29 40 10,044 63 33 48 7,254 48 18 44 5,353 43 20 33 2,379 22 17 22	KR7D " KK7L " N6SS 28A W7RN "	144 7 4 5 128 6 4 4 248,381 658 32 105 169,500 698 28 85 (OP: K5RC) 148,104 488 29 92
K3MD	N4EXA " 629,850 K5EK " 592,999 AA4V " 577,395 AJ4A " 575,990 NF4A " 557,424	693 78 247 *K5VG 533 100 307 *K3ABE 598 96 255 * <i>NT4W</i> 461 120 362 *KM4IAJ 627 77 239 *N4BQQ	" 86,376 " 79,849 " 71,446 " 66,300 " 64,728	186 43 140 171 46 141 <i>204 39 100</i> 179 50 106 147 53 121	*KC6ZBE " *KC5UXO " *KF5VH " *KN5S "	2,088 22 15 21 1,767 20 12 19 340 9 8 9 48 3 3 3 (OP: K5WW)	N7DD 21A W7IL " KI7N " W7ZR 14A W7CO "	328,614 896 34 109 183,084 605 29 85 1,260 24 10 11 10,030 81 22 37 2,295 31 14 13
WW3S " 1,279,791 953 117 360 W3ICM " 1,270,512 1075 114 345 K3RL " 1,233,392 923 120 371 N3AM " 1,199,950 950 109 357 N3FJP " 1,168,090 1013 92 315 K3ZA " 1,158,300 999 100 329	N4PD	536 98 275 *W4ZD 623 75 228 *WR4K 605 81 233 *KN4USA 542 90 233 *W44IPU 468 95 242 *K4LDC 640 75 194 *KB4YPN	" 57,007 " 55,480 " 45,030 " 42,828 " 38,586 " 38,170	190 28 81 148 44 102 118 45 113 131 37 92 120 37 81 146 34 76	*AF5JM 28A *WA5WFE 21A N6RV AA NT6X "	703 15 7 12 77,998 240 29 89 District 6 2,418,950 1855 137 368 1,705,190 1529 115 295	AD7LJ	1,134 24 12 15 15,561 96 22 41 77 4 3 4 367,242 462 99 192 221,098 382 81 146 197,985 387 68 133
W3FOX " 1,140,000 933 106 350 NT3U " 1,068,507 815 109 364 WY3A " 1,030,050 992 91 287 N3ZA " 986,232 815 104 332 KD3TB " 970,470 878 100 310	NQ4I " 417,962 AC2AC " 417,360 AC4MC " 403,480 N3MK " 366,792 K1BDC " 363,240	483 81 242 *AD4YQ 543 74 208 *KD4LEM 527 78 202 *WA8IHW 370 80 292 *WN8Y 369 83 277 *KN4TCF	" 36,811 " 30,199 " 30,179 " 29,750 " 29,606	118 43 88 120 29 72 111 33 70 111 41 84 99 36 77	W6YI " N6ZFO " WE6Z " K6TQ " W7PC "	664,986 521 141 356 637,092 775 101 205 608,190 774 99 231 353,375 513 82 175 315,040 325 81 277	*WAØWWW" *W7OM " *KD7PCE " *K6PF " *WN6W "	183,201 298 78 159 180,576 334 76 140 177,366 315 71 135 136,715 309 69 116 107,500 247 68 104
KB3Z " 927,914 851 89 312 AG4Q " 920,402 877 102 304 N3AD " 903,903 797 106 323 N3FCP " 858,730 801 94 301 N3EEN " 854,958 892 83 256 K3ATO " 809,480 807 98 294	AA4GA " 328,104 K2WK " 308,102 K2TE " 296,980 N4TL " 292,448 K2AOE " 256,302 AA4DD " 219,500	406 68 226 *NA4X 436 61 193 *K4TTM 368 75 235 *KT3T 428 68 179 *KK4E 361 67 194 *K2ZBA 314 70 180 *KA3PCX	" 26,182 " 25,172 " 24,970 " 24,308 " 23,940 " 22,422	102 34 72 82 38 78 92 40 70 92 42 61 93 23 72 87 35 66	N6QQ " WA6KHK " K6RIM " WA7G " K6MM " W8GJK "	284,890 374 85 225 223,925 338 94 171 175,480 313 70 135 169,417 322 69 122 146,878 265 62 144 144,690 278 76 119	*WZ8T " *N7ESU " *K7STU " *WA7YXY " *K7VAP " *KC7H "	93,024 244 46 98 57,232 160 51 95 45,752 170 58 75 35,105 122 45 74 28,116 112 41 58 27,392 139 49 58
N3RJ " 760,518 826 74 260 K3FMQ " 718,410 565 105 357 AK3B " 625,392 689 84 260 K3AK " 613,410 647 82 263 NX3Z " 609,000 652 79 269	K4TMG " 218,526 N4KH " 213,857 KZ3P " 205,953 K2SD " 200,151 NZ4N " 198,940	320 81 177 *KN4HGI 358 60 163 *AF4NJ 327 73 164 *KEØL 392 49 140 *KC4WQ 300 74 171 *K4MI	" 19,320 " 15,416 " 14,476 " 13,200 " 11,232	77 39 66 70 30 52 60 36 58 60 30 50 53 30 48	N5KO " WX6G " K6GFJ " WI6X " W6MOB "	121,334 227 70 136 109,956 229 74 130 76,172 211 47 90 74,088 194 61 86 63,918 150 63 96	*K7HV " *WA7RJ " *WA7YAZ " *NØBK " *NA6JD "	24,871 84 43 76 23,529 109 39 54 21,505 96 31 54 13,908 79 32 44 12,859 91 33 44
K3OO	AA5JF " 192,066 W1BQ " 189,397 WB4EHG " 180,995 K3JWI " 180,853 KO4VW " 177,310 N3KN " 171,084	257 62 207 *NG4V 311 58 163 *K4IEY 265 74 191 *K4OMD 294 62 161 *NU4N 294 70 168 *W4JH 300 58 154 *WB9VPG	" 10,428 " 9,675 " 9,462 " 9,300 " 6,496 " 6,405	62 28 51 63 20 55 77 19 38 59 20 42 47 23 33 44 21 40	WD6T " KG6AO " K6DW " W6SC " W1SRD " K6XV "	59,520 154 60 95 54,520 147 56 89 51,912 154 56 70 49,852 160 46 75 41,615 105 53 92 29,016 111 47 57	*K7MK " *NU7K " *W7ZRC " *W7JHR " *K7ACZ " *K7TDM "	10,248 63 26 35 10,224 58 31 41 9,600 59 18 42 5,544 48 27 29 4,512 32 19 28 4,484 53 29 30
K2XR " 481,187 463 87 284 W3OU " 472,230 525 75 255 W3JX " 464,204 534 68 248 K3BHX " 446,653 522 70 247 W3UL " 367,488 465 74 214	K2WPM " 169,048 W3PJ " 166,600 AI4WU " 163,850 W4JVN " 137,600 K3RV " 137,600	323 46 141 *KC2DFF 266 73 165 *AA4LR 280 72 154 *AD4SA 235 56 159 *K4PQL 234 62 153 *WC4H	" 4,100 " 3,990 " 3,608 " 3,388 " 2,135	38 15 26 49 14 16 35 15 26 34 14 30 26 12 23	NK6A " W6XK " K6WV " AJ6TL " K6ELE "	28,690 119 35 60 26,896 114 34 48 25,544 113 42 61 22,752 106 41 55 20,412 106 38 43	*KE7NGO " *KK7FEL " *WM5F " *N7FXT " *WA7SHP "	3,648 56 26 31 3,510 35 19 26 768 17 8 8 522 14 9 9 378 11 9 9
KF3C " 353,664 450 77 211 W3LL " 331,290 327 100 305 KA3YJM " 316,665 500 58 169 K3TN " 307,040 372 79 225 W3SQ " 305,214 428 63 195 NN3RP " 289,587 426 53 196	KW4LS " 134,964 KK4R " 123,519 K8YC " 116,886 K4KKC " 111,510 W4VIC " 111,321 KK4ODQ " 108,667	341 42 121 *KK4SNO 226 67 142 *W8QI 184 66 176 *KO4YJA 243 57 132 *K4LXX 230 41 148 *K2LAT 239 33 136 *W4CMG	" 1,645 " 975 " 792 " 720 " 494 " 450	26 14 21 16 11 14 20 11 13 13 7 13 15 12 14 11 6 9	AI6DR	10,812 67 31 37 9,728 58 35 41 4,278 35 17 29 3,772 32 18 23 1,176 19 10 11 63,976 271 25 63	*KK7A " *N7GRC " *WØOKE " *AC6DF " *AK8E 28A *NS7B "	378 10 9 9 9 306 11 7 10 66 8 5 6 20 11 6 4 29,155 135 24 61 17,546 105 22 40
W3MAM " 228,313 383 61 168 KG4USN " 226,908 292 73 224 WA3AAN " 200,618 312 68 174 N3DUE " 195,500 327 64 166 W3MM " 185,928 284 72 182	K4SO " 105,092 K8YFM " 105,084 KT4O " 100,192 KA4RRU " 88,960 KG3V " 83,030	200 65 123 *KO4ZRB 272 34 105 *N9MLR 187 62 140 *W4RN 2 216 47 113 *N3UA 167 57 133 *WA2LMC	" 104 " 96 28A 304,428 " 224,000 " 45,630	8 5 8 5 3 5 790 27 111 561 29 111 209 23 67	W6AFA 21A *KM6WCC AA *N6ORB " *NT5A "	(OP: W7IV) 370,668 1058 33 105 97,020 243 57 108 85,820 220 51 89 67,520 201 66 94	*WØBF " *N7MSI " *N7XB "	16,250 91 23 42 48 3 3 3 24 2 2 2 (OP: NX7B) 24 2 2 2
(OP: W3EA) K3SOM	KZ5ED	183 57 117 *K4JPD 157 59 129 *N4SFC 128 77 118 *N1GMV 168 58 104 *KO4CNU 160 31 98 *KQ4AEJ 140 46 102 *KO4TDQ	" 35,178 " 19,698 " 14,310 " 480 " 90 " 6	160 25 57 107 16 51 97 15 38 11 7 9 7 5 5 1 1 1	*KE6PLA " *W6RQ " *KD6HOF " *KW6AA " *K6ST " *N06G "	59,892 185 58 80 33,880 117 42 68 32,643 140 41 52 20,882 76 46 60 15,300 84 40 45 10,812 65 32 36		11,800 79 20 39 940 17 8 12 3,312 53 16 20 District 8 2,691,414 1642 133 458
W3IZ " 101,556 227 36 120 N3WMC " 73,315 193 45 110 KD3H " 72,720 160 57 123 K3TM " 69,144 193 34 100 N3ZP " 67,598 185 40 106	AF2D " 53,286 WD9GMK " 53,157 K3PXJ " 52,380 KB9RKK " 47,880		21A 151,230 " 130,438 4A 5,891 " 3,016	394 33 109 404 31 90 66 10 33 37 7 22 28 9 21	*KN6MYI " *W6APH " *K6EI " *AE6PL "	5,885 41 22 33 1,720 29 22 21 1,075 16 11 14 648 14 12 12 600 11 10 10	K8CX " N4RA " N8CWU " KG8CW "	2,025,364 1522 116 366 1,994,362 1325 122 425 1,838,668 1402 121 373 1,456,128 1157 119 355 993,762 745 114 364

KE8HBV " 540,792 626 83 250 *K9 KV3R " 479,214 515 81 256 *KU N8BI " 457,710 515 83 247 *W	9WBT " 1,680 24 15 20 99QA " 1,200 18 10 15 109SAW " 650 14 11 14 9XT 28A 163,280 445 31 99	VA2QR " 74,400 177 48 112 VEZEVQ " 11,222 73 25 37 VEZWAT 28A 113,288 354 25 94 VEZIDX 14A 754,290 2159 38 115	Puerto Rico KP3DX AA 8,487,812 5976 145 477 (OP: NP4Z) WP4SK " 187,180 345 49 147	*BA5AB " 2,220 24 16 21 *BG6QLL " 2,090 30 17 21 *BI6LFJ " 1,457 35 15 16 *BD7JIR " 600 18 12 13
KA8G " 318,602 492 63 178 *NS K8AJJ " 233,541 371 61 170 *NS N8HO " 233,179 349 57 194 *WI W8HPJ " 130,494 297 50 132 *WS AD8FD " 129,720 207 71 159	19VPV	*VA2OT AA 281,505 464 61 184 *VE2HTC " 135,590 281 49 133 *VE2HEW " 125,343 304 53 118 *VE2OWL " 41,064 127 33 83 *VA2VT 28A 1,485 21 11 16	*KP4PUA 21A 515,460 2269 26 84 St. Barthelemy FJ/ SP9FIH 21A 1,124,052 3196 32 109	*BGØDFS " 408 21 10 14 *BD8AJV " 90 7 5 5 *BD4VXX " 90 18 13 17 *BG8GAM " 24 2 2 2 *BH7JUO 28A 216,828 785 29 85 *BIBFYD " 8,692 78 15 38 *BIBFYD " 8,692 78 15 38
WZ8P " 108,297 231 56 135 W@ KC8ZKI " 102,718 211 56 147 KØ N8SDR " 102,510 220 48 122 W@	District Ø AØMHJ AA 1,260,601 912 128 365 ØBM " 934,400 862 105 295 ØYR " 776,720 795 113 267 ØPSY " 743,684 802 99 257 ØCN " 515,052 547 97 245	District 3 VA3DF AA 2,812,857 1754 133 440 VA3MW " 1,026,432 1130 95 289 VA3WB " 987,530 1059 88 282 VE3NE " 774,333 920 83 274	St. Martin *FS5GL AA 0 4 4 4 US Virgin Islands *NP2X AA 784,966 1380 73 193 (OP: K9VV)	*BG5UZW " 2,201 42 14 17 *BI4VXX " 1,000 20 6 14 *BA7LAC " 297 13 4 5 *BG4UQX 21A 55,521 301 25 68 *BH8MDV " 50,828 212 24 73 *BH8PVC " 14,874 122 18 49
N9RC " 85,695 158 60 137 W€ W8MJ " 67,824 154 40 117 N€ W8EH " 59,340 168 39 90 K€ W8RID " 44,409 143 35 78 NW AC9GK " 41,866 134 39 82 N€	ØMB	VA3CW " 731,747 759 93 268 VA3LR " 562,998 635 73 236 VE3KTB " 330,261 457 78 205 VE3ZZ " 279,424 439 59 177 VE3EY " 216,064 370 63 148	AFRICA African Italy *IH9YMC 28A 169,244 516 30 86	*BI4VKA " 12,996 98 17 40 *BG5GDP 14A 688 52 7 9 *BH3EMV " 506 31 10 12 Cyprus
K8ESQ " 34,916 110 36 80 KØ NR8Z " 33,750 102 45 80 K1 KD8FS " 33,276 129 26 68 AK KT8Y " 29,928 127 28 58 WØ KE8RCI " 23,968 92 30 77 K52	ØARY " 385,866 468 68 223 ØCF " 378,420 526 67 188 IKD " 373,248 522 69 187 AØFO " 308,853 470 70 173 ØRX " 283,974 341 96 222 5ZG " 269,916 431 72 177	VA3TNM " 200,668 333 65 162 VA3PC " 171,360 248 67 188 VE3BK " 113,405 250 57 128 VE3YT " 83,763 316 45 78 VE3NR " 69,600 165 45 115 VE3YAA " 62,878 160 43 106	Canary Islands EA8AM 28A 852,561 2267 30 99 EF8K " 408,240 1102 29 106 (OP: EA8DET) *EC8AQQ AA 293,670 526 44 151	5B4AAB
W8LRJ " 2,655 25 20 25 KV KE8DAX " 1,755 23 8 19 WB K8ALM " 592 13 5 11 NX W8CZN 28A 170,240 424 31 121 KØ	ØPMO " 263,940 316 83 235 /Ø] " 255,374 462 65 173 BØN " 243,398 356 82 180 KØI " 236,406 390 79 167 ØAD " 232,080 394 74 166 CØBC " 226,014 308 81 190	VE3RCC " 53,856 161 47 97 VE3LRL " 35,332 127 39 82 VE3QN " 14,850 77 23 52 VA3WPS " 13,468 65 27 47 VE3KG 28A 297,916 810 28 114	*EA8DIB " 21,483 84 29 64 *EA8DED 28A 36,288 209 12 51 (OP: OH2BP) *EA8CNR 21A 107,892 338 23 88	5B4AHZ 14A 271,558 813 29 90 *5B4AJT 28A 80 4 4 4 Georgia 4L8A AA 91,504 235 39 113 *4L5EE 28A 399,630 1434 24 81
K8TLC " 2,550 38 9 21 W8 *K8LY AA 670,542 712 78 261 N51 *AA8CA " 422,530 516 81 229 KØ *N8HRZ " 415,716 515 80 214 KØ *N8OH " 263,856 370 82 194 KC	8XAL " 202,212 321 86 160 5KB " 178,752 350 57 139 ØRJW " 160,440 300 60 131 ØPC " 154,176 264 68 151 C6R/Ø " 127,263 286 47 130	VA3WW " 57,387 198 24 87 VE3VN 21A 780,604 1859 32 125 *VE3WG AA 707,363 862 88 249 *VA3SWG " 505,196 994 57 155 *VE3VY " 389,424 698 66 178	*EA9KB CQ3W CQ3W CQ3W CQ3W CQ3W CQ3W CQ3W CQ3W	*4L5P
*KE8PX " 196,605 296 74 183 KØ *KC9LA " 172,584 304 74 142 WX *K4YJ " 169,694 280 64 153 WX *N8CUB " 120,960 220 62 148 WB	ØOR " 119,574 201 69 165 ØGD " 109,230 288 55 110 ØNY " 98,658 234 53 109 XØZ " 94,336 207 67 109 BØWIV " 94,287 216 51 108 ØIR " 88,556 198 58 111	*VE3CWU " 379,440 532 67 188 *VE3BX " 314,688 873 53 123 *VA3IDD " 288,225 537 60 165 *VA3WU " 187,812 273 77 205 *VE3HZ " 132,430 351 51 119 *VE3HG " 83,772 192 42 114	CT3HF	VR2XYL 21A 23,232 249 18 46 VR2XMT 14A 1,992 51 9 15 *VR25C 21A 2,133 49 10 17 (OP: VR2YDC)
*WS6K	SØR " 81,838 199 58 108 ØPR " 78,720 196 56 104 34BA " 72,300 192 62 88 ØGJ " 62,046 157 64 98 ØKQ " 58,032 166 48 96 TØA " 42,699 126 46 83	*VE3FZ	*CN8SG 14A 243,048 815 24 80 Namibia V55Y 28A 1,135,136 2535 34 118	VU2ZMK AA 576,688 810 61 205 VU2YYF " 197,800 420 39 133 VU2DCC " 79,016 190 48 118 VU2YAP " 50,697 177 37 94 *VU2DED AA 826,946 1007 81 232 *VU3NPI " 160,380 335 51 147
*N8CWX " 17,472 73 34 62 KSI *N8FYL " 4,914 47 14 25 KØ *N8KZZ " 4,503 40 23 34 AKI *W8TGB " 3,094 35 12 22 KIØ *N8UVM " 247 10 6 7 W7	SØAA " 42,284 133 47 77 DTG " 31,174 113 40 69 KØDX " 29,088 137 39 57 ØF " 26,076 101 35 71 7II " 26,058 101 34 67	*VA3ROC " 8,658 55 30 44 *VE3JZT " 7,839 65 27 40 *VE3OU " 2,442 28 12 21 *VA3MQS " 2,412 35 13 23	South Africa *ZS6JBZ AA 6,076 53 21 28 Tanzania	*VU3ESV " 154,448 340 51 145 *VU2YQ " 4,536 43 25 31 *VU2YUU " 1,344 33 21 27 *VU2FGQ 21A 36,024 202 21 55
*KE8BWQ 28A 2,548 34 12 16 W@ *AK2U 14A 2,244 29 10 23 AD WD	ØUY	*VE3DPS " 630 16 7 11 *VA3EJN 28A 32,376 159 19 57 *VA3OOL 14A 31,080 143 21 63 District 4	*5H8HZ 28A 9,964 86 11 36 (OP: TA1HZ) *5H3TSA 21A 2 1 1 1	Iraq *YI3WHR 14A 4,318 47 7 27 Israel 4X1IM AA 489,185 783 49 178
WB9Z AA 5,813,697 3146 161 520 K97 K9NW " 2,606,615 1642 133 438 ADI N9TTK " 1,452,256 1272 105 311 KB K9KE " 1,410,750 1057 119 356 KØ AJ9C " 1,326,682 1000 120 371 NØ	DTWW " 2,688 24 19 23 DØAB " 132 12 7 5 BØEO 28A 150,088 371 33 113 DEU " 6,574 64 15 23 DRN 21A 41,055 172 25 60	VE4VT AA 2,309,725 2740 110 297 *VA4HZ AA 5,850 50 17 28 (OP: VE4HAZ) District 5	9J2BS AA 42,681 141 41 82 ASIA Asiatic Russia	4Z1MS
WO9Z " 1,033,969 869 112 319 NI2 N2BJ " 1,018,050 1085 76 254 *AE KBØV " 770,525 697 119 306 *K2 W9KEY " 699,132 765 94 254 *W	VØQ 14A 313,058 843 38 119 ØK " 49,294 219 24 74 LEØDX AA 550,525 681 84 221 ØKX " 484,552 617 89 207 VØJM " 428,139 544 87 216 ØXF " 351,542 501 88 186	VE5MX 28A 222,264 1001 23 75 *VE5SF AA 756,510 1095 88 214 *VE5KS 28A 39,888 214 22 50 District 6 VE6TN AA 1,064,532 1323 98 250	District 9 UA9CDC AA 1,062,815 947 101 314 UA9AX " 8,378 46 27 44 RX9DZ " 4,560 38 25 32 UA9CTT 7A 17,112 116 12 50	*4X1ST AA 464,702 658 56 210 *4Z5OI " 151,536 244 64 167 *4Z4KX " 6,636 54 31 48 Japan District 1
AC9S " 610,416 692 87 227 *NØ AK9PL " 553,392 609 89 247 WØELT " 500,256 584 89 235 *KØ KM9E " 441,192 471 103 269 *AE	ØRC	VE6FI " 376,272 1199 58 98 VA6MA " 76,160 234 61 99 VE6DDD " 6,222 41 28 33 VE6WQ 21A 309,350 1247 27 88 "VE6CSX AA 19,106 106 39 43 "VA6TI " 1,470 30 18 17	*UA9JFH	JE1LFX AA 1,681,125 1662 112 263 JM1XCW " 729,000 872 91 209 JF1LMB " 197,072 380 78 140 JG1FML " 173,900 361 68 117 JL1CNY " 150,311 314 72 125
K9CCW " 347,520 505 58 182 *KN K9AWS " 321,368 432 89 200 *W9YK " 318,504 431 78 198 *W W9XY " 315,010 417 90 199 *K4 WB8BZK " 188,384 312 70 162 *KF	NØL " 115,276 259 61 118 LEØJR " 114,835 254 58 135 VØUC " 108,600 218 68 132 ¼IU " 77,401 194 49 108 £F9MT " 72,611 184 59 102	District 7 VE7NY AA 988,880 1764 74 161 VE7WNK " 274,050 406 88 173 VE7IZ " 85,994 235 58 88	RZØL " 22,041 106 38 55 UAØSU " 3,008 26 22 25 RMØW 21A 99,704 439 24 79 *UDØW 14A 144 6 4 4 Asiatic Turkey	JA1XRA " 130,200 254 66 120 JJ1XBQ " 105,400 232 66 104 JH1ACA " 33,702 114 53 70 JS1KQQ " 29,400 128 33 65 JN1ILK " 26,144 143 26 50 JITFOE " 19,459 117 32 29
KC9K " 161,385 235 82 183 NL N9SB " 156,560 299 53 137 NL KJ9B " 153,360 239 72 168 NK KD9V " 147,500 246 87 163 KE	.ØIL " 67,320 160 55 115 IDØTS " 43,710 147 59 82 VØOS " 42,826 109 56 105 IØUJJ " 32,287 144 28 55 IBØNES " 29,592 115 40 68 VØADL " 24,592 95 42 64	VETFE " 36,846 147 33 56 VA7TU " 15,975 98 29 46 VETDX 28A 160,565 921 25 60 VETSZ 21A 276,840 987 31 89 VETTI 14A 1,560 24 7 19 "VA7BEC AA 553,440 1062 79 161	TC6ØTRAC AA 4,238,696 3866 84 308 (OP: TA7OM) TA4J 14A 73,752 458 10 46 TA3X 7A 4,563 49 11 28 *TA3O AA 4,080 36 15 25	JA1WWO " 11,205 53 36 47 JA1ILA " 10,296 56 26 40 JN1THL " 8,798 64 23 30 JA1KZP " 5,400 46 25 29 JK1WSH " 150 7 6 4
K9CI	VBØLJK " 18,920 72 45 65 KØM " 17,577 78 36 57 LØWRY " 11,644 64 37 45 LØY " 9,520 59 30 38 LØMPH " 9,372 53 31 40	*VE7AX	*TA4CS " 60 4 3 3 ** *TA2NC 28A 19,839 137 14 37 ** *TC99TC 21A 191,973 764 20 69 (OP: TA2IJ) *TA2SUA 14A 44,204 194 21 65 ** *TA3EP " 1,071 20 6 15	JA1XEC 28A 147,660 488 31 84 JE1FQV " 131,527 463 33 88 JJ1RDX " 85,137 311 32 79 JH1SJN " 60,466 250 29 69 JE1CKA 21A 440,014 1107 33 118 JH1APK " 39,234 190 25 53
KA9I " 67,150 156 54 104 KF W9CY " 49,926 141 48 109 NG KC9BG " 38,125 115 33 92 NG W9RN " 34,155 114 39 76 KF	V6GMT " 1,802 23 14 20 IFØEIR " 1,638 26 18 21 IØRC " 1,080 21 15 15 IØUK 28A 10,400 76 17 35 IFØADU " 35 3 2 3	*VA7LGN " 63 7 4 3 Costa Rica TI7W AA 88,173 359 28 73 (OP: N3KS)	*TA7MHZ 7A 12,928 109 15 49 *TA7SSB " 4,674 57 9 32 Azerbaijan	JE1RZR 14A 113,331 372 32 79 JA1LNZ 7A 19,000 94 26 50 JF1UMK " 18,316 97 24 52 7M4CLF " 297 11 5 4 *JH1EAQ AA 1,030,501 1020 125 254
K9STM " 27,140 99 43 72 *WI N9RMB " 13,608 63 30 51 W9EJL " 12,212 65 26 60	EØITC 21A 10,738 76 13 46 VØSAB 14A 6 1 1 1 Alaska _2F AA 171,717 670 51 60	TI2CC 28A 874,208 2775 29 107 TI1K 3.7A 127,038 620 20 73 (OP: TI5CDA) *TI2WMP AA 747,240 1321 71 189	China BA4DL AA 917,350 1238 98 252 BG2AUE " 157,314 499 49 108	*7J1ADJ
KN9P " 1,632 21 15 17 KL AA9A 28A 441,450 1135 32 118 KL AG9S " 114,480 370 23 85 K	.7KK	Dominican Republic HI8RD AA 4,097,275 3958 112 343	BD1IIJ	*JI1HFJ
W9PA 21A 280,716 754 32 117 N9TCA " 17,301 84 24 55 N9LR 7A 31,125 194 23 60 *WE9R AA 1,740,975 1251 127 374 *KC9JML " 220,069 349 69 160	Belize 31XX AA 8,312,928 5859 146 478	*HIBHRD AA 579,832 1051 71 171 *HI3TT " 22,479 209 18 41 *HI3MPC 14A 148,149 960 24 57 *HI3K 7A 16,335 139 13 42 *HIBHCW " 2,624 32 9 23	BD3CB	*JI1RSF " 4,756 50 14 27 *JA1NEZ 28A 34,320 194 27 53 *JH1RFM " 26,196 130 22 52 *JL1EEI " 23,331 134 28 49 *JF10VA " 13,098 90 21 38 *JHØUUY/1 " 5,560 62 16 24
*N9UA " 127,720 190 59 189	Bermuda P9AD AA 71,231 177 47 116 Canada	*HI8HCW " 2,624 32 9 23 Guadeloupe FG4KH AA 1,283,256 1519 71 241 (OP: F1DUZ) FG8OJ " 33,276 119 25 69	COP: BI4XDT) BD4RQ 3.7A 5,724 173 13 14 BY6BB 1.8A 44 14 2 2 COP: BG6GQE) *BGØCAB AA 959,928 1207 73 223 *BH6KOK " 293,571 627 71 178	*JJ1AEB 7A 10,608 85 20 32 *7M4KSC " 16 2 2 2 District 2 JR2GRX AA 4,055,466 2941 155 364
*KB9FPY " 53,600 158 42 92 VO *K9FRO " 42,444 128 46 85 VE	District 1 A1CC AA 135,235 235 52 163 D2NS " 91,042 477 30 68 E9XX 28A 574,650 1505 30 120 D2AC " 348,066 1216 23 99	Honduras *HR9/ K6VHF AA 1,189 22 15 14	*BG3IAY " 115,937 327 63 128 *BG3ILY " 44,160 166 35 85 *BH4AYG " 40,820 149 49 81 *BG5BAA " 38,727 171 42 75 *BG6HOK " 22,572 121 37 62	JN2AMD
*KD9NNZ " 33,401 119 43 84 VO *NM9P " 28,060 102 43 72 *VE *W9PI " 18,952 81 28 64 *VE	D1CH " 236,022 656 26 113 /E9WH AA 71,485 192 47 98 /E9RA 14A 32,096 225 15 53 /E9ML 1.8A 24 6 1 2	Martinique *FM1HN 14A 214,935 846 26 89 Mexico 4A2B 28A 5,271 113 10 11	*BI1NJI " 20,425 123 37 58 *BG5GLV " 20,400 132 30 50 *BH3EYL " 12,956 127 32 50 *BD3QT " 11,880 119 33 55 *BI4MPH " 8,512 78 28 36	JA2HYD " 19,995 83 37 56 JF2XGF 28A 99,904 353 31 81 JA2KQE " 39,648 196 26 58 JA2KVD " 36,865 148 31 70 JJ2VLY 21A 25 3 2 3
*NQ9A " 10,200 63 30 45 *AG9A " 9,380 51 26 41 VA: *KD9OIN " 7,735 45 25 40 VA: *K9WNIG " 3,234 36 19 23 VF:	District 2 A2WA AA 7,979,664 4961 138 478 A2EBI " 1,299,682 1001 107 371 E2CSM " 201,472 716 34 94 E2CV " 193,842 315 74 168 E2EZD " 96,560 257 36 106	*XE2AD AA 295,500 621 58 139 *XE2OK " 64,640 521 30 34 *XE2JS 28A 382,699 1624 26 83 *XE1EE " 17,720 192 17 23 *XE1AY 14A 962 19 9 17	*BH3CGF " 5,115 110 26 29 *BG3GBZ " 3,975 58 24 29 *BH6ODC " 3,534 77 17 21 *BG8KUB " 3,087 48 22 27 *BH4RRG " 2,772 39 19 25 *BD4UJ " 2,530 36 19 27	JA2GTW 7A 46,176 173 30 74 *JF2VAX AA 718,947 832 104 229 *JS2KWL " 41,516 166 36 71 *JF2OZH " 7,800 54 30 35 *JG2AIG 21A 10,300 88 16 34 *JF2MBF 3.7A 544 15 9 8

District 3	*HS8NKB AA 203,565 412 58 147		*M1U	DK4VW " 1,148,812 1198 111 350
JN3TMW " 485,112 562 106 222 1	*HS8KAY	5 9A2U " 19,188 125 22 56	*2EØINN	DK2IT " 1,122,193 1336 108 395 DF2RG " 1,109,220 1001 127 429 DK6SP " 1,085,640 1129 123 422
JM3UGA " 37,800 123 50 70 JH3EQP " 13,860 88 29 41	*HSBJWH " 486 10 8 10 *HSBHEX 21A 7,965 79 14 31 *E2ØHHK 14A 6 1 1 1	9 9A6D " 15,272 69 32 60 9A3YT 14A 93,599 457 31 96	*G8KEK " 204,470 553 52 202 *MØNVK " 192,225 511 58 175	DG9SEH " 1,081,591 1244 97 330 DL8AAE " 1,081,440 1173 107 373 DL7URH " 1,080,540 1012 125 415
JF3LOP 28A 104,980 383 29 87 7 14,652 86 20 46	*E27AAA 7A 336 19 5 7	7 *9A3GVJ	*GØFGI " 165,483 314 57 186 *G4OZG " 151,905 487 50 155	DL5IC " 941,184 1152 84 260 DJ5AN " 899,040 867 118 362
JR3RIY 21A 281,930 893 32 89 JO3DDD " 96,720 430 27 66 J	United Arab Emirates A61ZX 21A 146,064 569 22 80 A65DR " 19.810 103 16 54		*M6ETL " 120,170 309 54 143 *GØH " 113,324 328 45 119 (OP: GØHEU)	DK8ZZ " 837,310 989 89 276 DH2PA " 779,688 999 114 354 DQ5T " 730,566 646 117 372
*JF3EIG AA 59,305 155 56 89 *JN3DSH " 44,286 141 36 85	*A61HA 28A 42,660 269 13 47) *9A5BAA " 47,895 230 38 117 7 *9A7ABN " 12,470 97 26 60	*G8HBS " 98,670 343 49 146 *2EØIFC " 87,262 302 40 121	(OP: DL4LAM) DL1ATZ " 699,244 843 98 344
*JE3OUU " 6,534 68 22 32 *JH4PUL/3 " 2,829 33 17 24 *JR3RWB 28A 100,210 361 30 80	Uzbekistan UK9AA 7A 191,748 607 24 92		*G4CXT	DF8XC " 692,850 775 112 335 DL7AOS " 671,895 1071 91 314 DL1CG " 633,996 888 88 308
*JL3VUL/3 21A 325,252 1102 32 92 *JG3FEA " 62,055 209 27 78	Vietnam XV9BPO AA 45,276 210 30 68	*9A5BWW " 1,364 24 12 19 *9A9R 28A 711,828 1730 37 132	*MØLDW " 67,500 221 52 128 *GØRXA " 51,450 238 36 111 *MØURB " 37,515 221 29 94	DK8AX " 525,890 563 112 318 DL1SEH " 446,106 708 75 223 DL4DBM " 412,692 559 88 269
District 4	EUROPE	*9A3QB 7A 20,824 210 15 61	*MØWMS " 34,629 203 32 87 *MØXFJ " 25,788 137 25 59	DL4SKF " 410,552 737 71 225 DQ1P " 402,732 501 106 290
JH4UTP AA 1,679,391 1636 118 281 JA4RED " 115,165 283 53 102 JA4GXS " 54,516 157 52 80	*OHØV AA 1,031,085 1360 107 388		*MØCGF " 23,114 93 43 84 *G1WVK " 22,135 162 24 71 *G3RTU " 21,600 171 23 73	(OP: DK1IP) DK5AV " 386,884 816 72 239 DF2LH " 375,558 473 91 227
JA4CZM " 54,496 164 51 80 JH4CPC " 37,252 106 54 85 JE4USZ " 27,840 120 39 57	(OP: OH6LI) Austria	OL1T	*G4PNC " 19,698 95 31 67 *2EØGKW " 12,410 97 24 49 *2EØEBM " 12,285 81 28 63	DD5VL " 360,570 542 87 270 DJ2TG " 349,560 618 85 275 DM4IM " 342,720 811 73 233
JR4VEV 28A 84,364 351 24 68 1	OE2S AA 4,846,485 2990 152 555 (OP: OE2VEL) OE9MON " 765,911 1292 70 243	6 OK2QA	*MØRKK " 10,458 105 15 48 *MØVLX " 9,504 84 22 50	DG8DP " 319,227 679 67 224 DJ6HR " 307,785 397 91 264
District 5	OE5KKP " 679,098 978 100 299 OE6MDF " 543,204 838 79 237	0 OK1FMX " 41,124 194 39 99 7 OK4AR " 37,628 161 35 57	*MØOAU " 8,720 80 23 57 *M7JRF " 8,625 128 18 51 *G1VWC " 7,854 64 27 50	DL3SKF " 300,048 510 76 228 DK2AT " 284,087 583 73 216 DC1HR " 283,500 398 89 235
*JH5FTY 28A 6 148 44 19 34	OE1TKW " 399,852 637 84 264 OE6RNT " 352,490 779 85 264 OE8DDX " 291,555 1356 42 167	OLØW 28A 174,230 513 30 101	*G7MBH " 7,004 72 21 47 *G7G " 6,608 60 23 33 *MØJQQ " 6,466 106 13 48	DJ5MO " 266,476 682 60 157 DL6TK " 231,977 410 73 156 DC2CL " 216,800 371 73 198
District 6 JA6MWW AA 439,499 598 82 201	OE6Z " 97,240 262 57 163 (OP: OE6MMD) OE2LCM " 88,641 181 80 121	B OK2HA " 624 20 5 11 OL9Z 14A 1,184,448 3427 39 147	*G4AWP " 2,730 29 18 24 *MØIPU " 2,635 35 12 19	DL7YS
*JH6QIL AA 104,940 239 55 104 (*JH6OPP " 84,785 225 56 99 (OE5JSL 28A 99,765 333 35 100 OE3G " 99,000 376 28 92	O OL3R	*2EØKCI " 1,152 30 12 24 *G4JFS " 990 17 11 11 *MØVQP " 600 18 8 16	DL4JLM " 204,828 359 65 137 DF8V " 204,088 382 75 188 (OP: DF8VO)
OHOWIN ZOA OOI II I O	OE1SGU " 10,624 66 23 41 *OE5MZL AA 60,188 236 49 115	*OK1K AA 388,833 665 83 256	*GØFCT " 255 9 6 9 *GØMBA 28A 24,726 132 23 55 *G4HPY " 14,070 74 20 47	DL9ECA " 194,285 383 62 183 DL9SCO " 183,516 573 70 176 DL8WEM " 168,805 326 72 173
	*OE2RPL " 16,638 115 29 65 *OE3SZE " 44 8 4 7 *OE2ROL 7A 24,702 336 13 56	6 *OK1ALX	*M7TDV " 2,040 32 9 15 *M5W 21A 404,250 1190 35 115 (OP: MØHMJ)	DAØC " 168,734 475 61 178 (OP: DK8WG) DL5RDO " 162,932 321 70 183
JH7CUO " 66,038 223 45 61 JA7ZP " 7,320 62 27 33	Balearic Islands EA6EE AA 70,794 194 47 91	*OK2YZ " 68,145 236 48 129 *OK3SN " 50,974 216 41 113	*G1GEY " 12,988 105 14 54 *G4N 7A 5,712 107 9 39	DK2CX " 155,232 328 69 183 DJ9MH " 132,432 255 75 192
JA7GYP 14A 135 5 4 5 JH7MQD 7A 348,864 977 34 104	EC6DX 28A 632,016 1639 36 132 EA6FO 21A 369,720 1172 34 122	2 *OK1TRJ " 5,307 73 17 44 2 *OK1HBO " 3,836 50 13 15	(OP: G4ZVB) Estonia	DL4PY " 129,839 297 53 104 DL3SFB " 126,144 321 53 166 DF6QV " 125,477 410 40 147
*JP7NOW AA 54,280 186 43 75 *JH7VTE " 37,742 130 49 64 *JH7XVB 7A 6,860 65 21 28	(OP: EA3AIR) *EA6SX 28A 385,616 1011 34 120		ES1CN 21A 34,037 196 22 79 *ES1BH AA 48,018 267 37 114	DL7CX " 122,255 246 72 173 DL2DQL " 119,067 246 65 148 DK6TW " 114,330 421 52 154
District 8	Belarus EW1OW AA 106,133 339 53 158 EU1DX " 76,923 174 67 122		European Russia District 1	DL5ASK " 109,953 280 54 117 DB7BN " 104,706 369 41 148 DL5ST " 99,675 297 54 171
JH8SLS " 84,084 174 64 118 JR8ORC 7A 18 2 2 1	EV1R 28A 182,070 539 34 119 EW2A 21A 274,816 1019 33 119 EW1M 7A 56 8 3 4	Denmark DOZ7AM AA 1,046,400 1067 106 374	*R1MJ AA 6,175 79 16 49 District 3	DJ6TB " 99,360 246 61 119 DL4YAO " 96,368 244 53 99
District 9	*EW1P AA 64,768 168 60 124 *EU7X " 5,795 45 23 38	OZ1FHU " 426,060 700 87 318 OZ1KZX " 64,328 177 53 119	RM3DA AA 2,055,105 2302 132 453 RZ3B	DK1AX " 94,757 244 58 139 DL5OCD " 84,107 228 53 98
JH9DRL AA 292,415 473 89 162 7 162 7 163 162 7 163 162 7 163 163 163 163 163 163 163 163 163 163	*EU2EU 28A 19,275 115 25 50 *EU2F 14A 217,394 1106 33 113 *EW4GL " 40,180 288 25 73	B OZ7DK " 40,176 197 37 107 B OZ1KIH " 37,113 204 35 104	RA3S " 12,337 63 27 46 R2AOQ " 1,530 17 14 16	DG7NFX " 77,850 217 52 121 DK5JM " 77,602 179 60 101 DL1LOD " 74,700 200 52 114
(OP: JAØTEA)	*EW7TSW 7A 5,777 93 12 41 Belgium	OZØQF " 12,927 143 19 74 OZ2PBS 28A 98,560 299 32 108 OZ1ADL 21A 421,659 1163 37 124	RG2A " 990 15 8 14 RU3SD " 216 6 6 6 RC2A " 216 6 6 6	DR5W " 73,910 209 52 138 (OP: DL1RTL) DL7AUO " 68,904 296 39 135
JAØFVU " 336,156 505 99 158	OR1Z AA 560,320 1469 62 210 OO7P	0 OZ1ZD " 37,062 166 28 59 4 *OZ6CM AA 336,530 456 93 272	RA3OA 28A 369,738 1321 34 133 RA3RCL " 100,625 487 28 87 RL5A " 65,291 341 24 85	DL8RDL " 66,516 191 49 89 DR5X " 65,096 296 28 51
*JHØNEC AA 284,856 434 84 165 (OP7T " 68,747 233 47 114 (OP: ON4IT)	*OZ4MU " 222,720 293 95 253 *OZ1CK " 143,104 346 53 155	RL3A 21A 1,145,088 2938 40 152 (OP: RL3FT) UI5R 14A 269,280 1452 34 119	(OP: DL8LAS) DHØDM " 47,520 187 43 101 DK3GI " 45,200 138 43 70
JAONIF 7A 294 14 4 3	ON7TA " 60,738 185 47 112 ON4TTT 28A 121,856 360 32 104 ON4TO " 103,334 359 27 94	*OZ6TM " 25,308 190 23 91	*RK2M AA 103,936 328 55 169 *R3IBZ " 23,622 213 27 66	DH8GHH " 43,615 222 36 107 DL1STG " 43,274 143 49 105 DG5LW " 41,021 221 29 98
UP5B AA 1,159,500 1369 68 232 (OP: UN7ZO)	*ON8UK AA 272,890 485 79 211 *ON7AH " 188,750 315 73 177 *ON3AT " 3.266 31 20 26	' *OZ9AAR 14A 16,946 164 18 56	*R3QX " 16,856 92 32 66 *R2AL 28A 83,472 267 32 116 *RA3RLJ 21A 44,526 478 16 66	DB1MUC " 36,828 128 36 88 DD4DA " 33,312 139 35 61 DL1BUG " 33,306 113 46 76
UN9L 28A 494,060 1469 30 110 , UN3G " 41,563 189 21 68 , UN7FW " 42 5 3 3 ,	*ON4VDV " 1,665 37 8 7 *ON6LR 28A 300 10 5 5	England	*UA3YCX " 5,512 71 13 39 *RZ3Z 14A 139,620 793 30 100 *R3TE " 90,042 511 30 99	DK4JA " 31,964 150 35 87 DL5XJ " 20,254 95 30 52
*UN4PG " 46,926 184 23 76	Bosnia-Herzegovina	G3RXQ " 1,303,456 1468 107 399 MØICR " 928,560 1298 79 286	*UA3PI 7A 8,255 173 14 51 District 4	DG2NMH " 18,426 111 35 76 DF4MAA " 15,111 81 25 48 DK3HV " 14,022 71 30 52
*UNØLM 14A 200,850 699 26 77	E7ØAW AA 943,236 1689 92 307 E72U " 36,204 145 31 53 E78WW 28A 340,803 868 37 134		RU4PU AA 189,810 315 84 249 UA4CC 28A 102,691 645 23 80	DL3ABL " 10,380 61 24 36 DF9LJ " 8,096 136 10 12 DB3KB " 6,798 60 25 41
9K2HN 28A 564,068 1280 36 130 9K2JJ " 258,720 978 23 75	E71A	G (OP: MØNPK) G4NBS " 355,008 621 56 202	*RA4DX AA 226,443 536 67 220 *RN4SN " 174,616 326 73 226 *UA4CNJ " 117,746 349 58 168	DL6UAA " 5,814 36 24 33 DL3BY " 5,625 60 11 34 DL9SEV " 5,512 40 21 31
9K9A 14A 1,054,356 2324 37 127 (OP: 9K2OD) (9K9C 7A 135,897 532 20 77)	*E77X 7A 25,456 243 18 68 *E73KT " 7,410 132 11 46	(OP: G8FMC) 6 MØDCX " 89,229 327 39 108	*RW4O " 35,235 135 44 91 *RU4SO " 34,935 167 32 105 *UB4NAL " 5,952 58 21 41	DL7TJ " 4,897 35 25 34 DC8TT " 4,752 88 11 43
Lebanon	*E79D 1.8A 26,523 414 10 53 Bulgaria	M4U " 79,055 269 47 116 (OP: MØJVC @ MØJVC)	*RW4NW " 36 4 3 3 *RW4C 21A 6 1 1 1	DK8CB " 4,743 47 20 31 DL4FCJ " 2,880 26 21 24 DJ5LA " 2,496 36 11 15
Macao	LZ6Y AA 1,894,848 2320 123 433 LZ2FP " 249,210 557 65 205 LZ1UK " 43,956 221 34 74	B G4RRM " 66,810 179 55 115 6 6 6 6 6 6 6 6 6	District 6	DL2AMD " 2,065 23 16 19 DF3QG " 1,680 20 14 16 DQ5M " 144 6 4 4
Qatar Qatar	LZ1W	3 M5KJM	RX6AM AA 94,714 391 47 95 RM7G " 40,100 220 26 74 R7DI 28A 50,944 182 30 98	(OP: DK6SP) DL5M " 90 5 3 3 (OP: DK6SP)
A71EM 21A 157,304 528 23 83	LZ8R " 10,679 76 19 40 LZ3BB 14A 20,700 304 12 38	MØTPT " 33,630 239 29 89 8 MØNAM " 29,458 142 32 71	R6CA " 19,760 96 25 51 *UA6YN AA 315,810 663 73 257 *RV6LCT " 6,090 37 25 33	DKØED " 90 5 3 3 (OP: DK6SP)
	*LZ6O AA 305,088 581 86 250 (OP: LZ3DX)	MØEAS " 14,105 81 34 57 M1PTR " 12,408 70 25 69	*RJ6N " 54 3 3 3 3 *RA6DT 28A 81 5 4 5 *R7KCW 21A 234,612 972 32 101	DL8GM " 24 2 2 2 DR1D 28A 838,332 1933 37 137 (OP: DL8UD)
*HL1VAU 28A 25,116 149 20 49 , *D7ØLW 14A 5,891 59 16 27 ,	*LZ8GT	B MØKCV " 6,298 48 28 39	*RT6C 1.8A 54 5 4 5	DD2ML " 699,650 1701 37 138 DKØ5ØBN " 391,114 978 37 130 (OP: DL2SAX)
Saudi Arabia	*LZ1VCT	MØDSL " 2,784 75 7 25 G6URD " 1,935 35 15 30	District 9 RG8G AA 16,954 127 24 74	DL5L " 147,364 491 31 102 (OP: DGØOKW) DL6JZ " 95,106 327 30 91
HZØYL 28A 773,744 1891 34 114 ,	*LZ1ZP " 68,804 306 25 78	(OP: G3WVG) 3 M7X	*UA9XX AA 8,064 99 18 54 European Turkey	DL9NEI " 33,250 178 20 50 DN4AN " 297 11 5 4
Singapore	*LZ3DJ 21A 16,730 157 16 54 Corsica	MØMCX " 130,536 524 23 75 G4LPD " 56,257 215 25 76	*TA1HF AA 1,225 33 12 23 *TA1FM " 986 34 9 20	DL1FY " 6 1 1 1 DC2PG " 6 1 1 1 DL2ARD 21A 1,369,088 2994 39 152
Taiwan	TK5EP AA 458,738 578 99 203 *TK/ DL5GA AA 452,800 1262 68 215	3 G3P " 37,754 172 20 66 (OP: G3WPH)	*TA1ED 14A 27,621 271 18 63 Faroe Islands	DH8BQA " 650,988 1677 35 134 DL5AN " 299,085 791 35 122 DL4DXF " 97,664 348 30 98
BW2/ JP1RIW 21A 205,260 1025 30 80	*TK4TH " 308,847 1019 44 147 Crete	G1MSE " 17,980 132 18 44 MØYRX " 6,960 49 19 39	OY1CT AA 64,464 194 34 170 Fed. Rep. of Germany	DL5YM " 11,001 102 12 45 DJ6TF " 8,255 63 21 44
*BU2EP AA 175,110 439 62 133 *BX6ACR " 17,415 112 34 47	SV9JI AA 61,537 297 41 108 *SV9SMS AA 25,896 167 26 78	(OP: G3TBK) GØB " 29,848 139 21 70	DF9XV AA 3,200,108 2138 147 515 DK7R " 2,674,647 2195 145 512	DL1TC " 33,488 134 28 84
*BV3UN " 1,540 29 8 14 *BV3US " 1,326 32 11 15	*SV9CJO 28A 28,046 221 20 54 Croatia	G8X 7A 239,242 1750 22 100 (OP: G4FJK)	(OP: DK7AM) DL6ZBN " 1,586,032 1321 141 437 DL9UP " 1,498,774 1293 136 478	DK6BA " 1,155 21 10 11 DKØIG " 18 3 1 1 (OP: DK6SP)
Tajikistan	9AØBB AA 6,073,920 3707 164 596 (OP: 9A3XV) 9A5RTW " 1,079,910 954 125 382	6 G3M	DL7ON " 1,412,829 1197 141 498 DL5JS " 1,395,275 1506 92 333 DL1NKS " 1,332,441 1786 111 362	DM3VL " 6 1 1 1 DM3W 7A 108,290 657 30 100 (OP: DM6DX)
	9A4BA " 219,032 506 69 193 9A1KDE " 119,543 247 58 115 (OP: 9A2VR)	(OP: M1DST) (OP: M	DL1NEO " 1,246,154 962 128 446 DK9IP " 1,187,236 953 139 447	DK5TX " 3,741 69 9 34 DR3W 1.8A 7,380 202 7 38
11001VIVII AA 1,740,409 2008 100 280	(OP: 9AZVR)) *MØWLF	DK5DQ	(OP: DL6MHW)

*DL1GME AA 1,248,555 1283 113 404 *DF2AJ " 1,143,018 1096 128 421 *DK1KC " 764,522 1045 89 329	OH1MM " 109,143 275 56 145 HA7RY	" 1.017.117 1327 105 328 *IK4RQJ	" 116,748 999 17 77 1.8A 21,924 398 10 53 AA 504,888 539 100 336	LX1LC " 686,154 1177 83 274 LX1FP " 97,240 307 46 141 LX1SG 28A 99,779 347 30 83
*DL4VAI	OH3NAQ " 89,722 235 57 169 HA6P OH7KD " 73,726 238 46 147 OH3RF " 68,160 207 58 134 HA3OU OH2BJ " 55,440 191 45 99 HA5AQ OH5KW " 54,405 152 48 107 HA2UF	** 812,535 1263 69 216 *IK1ZOF *IB7B *IB7B *IK6OIN *IB7B *IK6OIN *IK1ZOF *IB7B *IK6OIN *IK1ZOF	" 494,263 757 84 259 " 435,916 716 89 243 " 420,800 713 79 241 " 405,405 642 76 221 " 374,865 683 81 254	Malta 9H1CG AA 11,970 64 25 38
*DL1ABR	OH1X " 41,736 139 36 105 HG8YKO OH5VT " 29,904 109 34 78 OH2KI " 19,502 85 36 62 OH6TN " 1,539 19 11 16 OH2KI " 1,539 19 11 16 HA3LN	" 21,567 304 11 68 *IZ2SXZ 28A 848,056 1965 37 147 *IU4NGP (OP: HA3NU) " 682,352 1665 37 139 *IW1RLC	" 367,666 591 72 286 " 284,130 465 82 248 " 282,900 499 69 177 " 279,822 679 71 227	Moldova ER1BF AA 247,256 783 59 189 *ER3CT AA 250,830 576 65 205 Netherlands
*DG6OAG " 159,850 402 56 174 *DM1KM " 156,972 308 73 181 *DO4OD " 141,834 337 51 180 *DL2OE " 136,488 249 80 184 *DO1CS " 132,192 428 50 154	OG7A 28A 147,423 404 33 124 (OP: OH6MW) OG9X 21A 204,591 969 33 108 OH1TD 14A 6,713 56 20 29 OH7K 7A 246,500 1454 33 112 HA4A	" 360,157 959 36 125 (OP: HA4FF) 100 140 140 140 140 140 140 140 140 140	" 258,142 431 95 288 " 248,805 366 93 192 " 203,112 470 68 205 " 176,904 416 67 206 " 172,516 345 63 173	PA4WM A 2,241,198 2194 119 415 PA3AAV " 2,230,232 2064 123 473 PA1LX " 513,620 933 82 223 PA4EL " 504,360 623 93 267
*DL6RAI " 131,775 324 63 188 *DK5WO " 124,341 350 57 160 *DR7T " 118,604 249 57 142 (OP: DF1DN)	OH1HB " 1,312 35 7 25 OH2BO 1.8A 2,795 58 7 36 *OH7GGX AA 227,230 453 72 238 *OH7GGX AA 227,230 453 72 238	" 1,082,771 2594 39 140 11,082,771 2594 39 140 (OP: HA8DZ) 1101KGS (OP: HA1DAF) 125NRF	" 145,824 415 51 166 " 121,536 299 58 153 " 104,533 300 54 167 " 99,682 227 61 136	PC2K " 490,842 716 88 245 PC3M " 403,056 617 79 232 PA3EVY " 359,916 532 86 181 PA3ETM " 248,192 517 56 168
*DM4EAX " 115,997 328 57 170 *DO7PIP " 109,350 365 43 119 *DC5CH " 103,416 388 36 150 *DJ6DO " 89,872 325 43 121 *DL2LRT " 89,621 315 49 168	*OH7KC	" 484,224 1516 35 121 *IK7LMX 14A 644,716 1947 40 138 *IK40MU " 471,086 1808 40 121 *IU2CVS 3.7A 203,796 1329 21 87 *IU5HES AA 246,050 703 57 202 *IZ4KAN	" 91,317 240 51 132 " 60,000 204 42 108 " 58,590 177 52 103 " 57,970 173 56 131 " 52,052 158 53 129	PE1PIX " 108,680 349 57 152 PF1MO " 102,265 292 43 138 PC4H " 82,476 296 46 128 PA1X " 73,255 226 45 116 PA4GDR " 51,042 252 35 106
*DL2SWR " 79,092 179 56 113 *DB2WD " 74,095 254 49 154 *DL2FK " 73,101 234 50 127 *DA22LGS " 62,352 253 41 103	*OH2MAS " 168 6 6 6 *HA1BB *OH3JP " 16 2 2 2 2 *HA8AR *OH6FSG 21A 3,321 44 12 29 *HA5GBR *OH6JUM 14A 7,344 118 9 39 *HA5OO	" 157,740 300 75 164 *IQ5ZP " 67,044 414 27 124 " 36,720 201 37 99 *IK5JRZ " 17,334 112 24 57 *IN3HUU	" 47,260 196 44 126 (OP: IZ5DKR) " 45,496 194 31 90 " 44,831 212 36 91	PA5N " 48,891 198 36 93 PA2A " 41,715 200 39 96 PA3ELQ " 32,648 153 31 75 PA4R " 11,664 70 30 42
*DL2OHL	France F4IVV AA 4,290,297 3532 137 446 **HA5PP TM9C	" 9,976 55 32 54 *IW1RBI 28A 303,552 796 34 119 *IC8TEM " 113,283 414 31 92 *I2OGV " 3,724 48 14 24 *IW1QEA " 1,566 28 12 17 *IW1QEA	" 40,548 140 45 79 " 40,002 169 36 82 " 33,798 142 34 95 " 30,680 199 33 97 " 28,340 159 28 81	PA5KT " 11,520 100 21 51 PA1AKM " 4,860 69 11 43 PA9RW " 4,590 53 14 40 PA3MRO " 3,910 29 21 25 PA1LEX " 1,440 30 10 22
*DM2HEY " 53,298 210 43 119 *DH1DA " 51,590 197 38 96 *DL9YJ " 51,305 210 42 113 *DG2MB " 50,244 199 42 117 *DO9PL " 49,896 200 36 90	TM2Y " 1,788,633 1188 145 478 "HA6PJ (OP: F6BEE) F1RHS " 1,650,588 1477 126 397 F4DPW " 1,234,525 1402 105 370 F10PD " 1,234,525 1402 1402 1402 1402 1402 1402 1402 1402	14A 42,966 291 23 76 *IK3TCK 7A 5,664 102 8 40 *IZ2OBS *IW2FUT Iceland *IK2CMI	" 28,224 168 35 91 " 24,804 106 36 81 " 24,112 148 25 63 " 23,246 123 31 87 " 21,808 163 29 87	PI4DX 28A 792,352 1839 36 140 (OP: PD1DX) PD4RW " 4,144 48 13 24 PA3DRL 21A 24,660 117 25 65 PA4OES 14A 3,861 52 12 27
*DL5ANS	F6EZV " 885,468 1392 100 352 F5MYK 824,190 1049 107 308 F72LL 74GTT " 516,032 1123 74 278 F6CZV/P " 297,246 418 82 239	7A 28,301 211 21 70 *INØLRV *IK8TEM *IZ8FCA *IV3HAX	" 20,566 138 33 80 " 18,328 124 35 81 " 15,930 164 21 69 " 15,554 103 23 54	*PA9M AA 1,898,824 1866 126 442 *PA8KW " 465,318 727 90 288 *PA1BD " 303,133 602 65 168 *PF1SCT " 301,119 655 59 214
(OP: DL8DXL) *DM4AB	F6GPT " 276,125 766 63 172 E15JQ F4HBM " 232,128 356 85 203 F5BDJ " 197,895 316 78 159 F6KGL " 163,404 392 59 145 FEISLER	AA 158,885 471 48 167 " 41,745 184 36 85 ** IIMTO	" 15,180 66 39 53 " 11,160 64 24 38 " 10,744 76 23 56 " 8,848 61 28 51 " 7,884 56 26 47	*PA4O
*DL1GWS " 32,619 182 34 97 *DL5ALW " 32,109 136 41 98 *DL1DF " 29,889 150 34 89 *DK5WN " 26,676 129 37 71 *DK2ZO " 26,536 174 29 95	TMOGL	" 32,508 118 38 88 " 21,600 158 24 76 " 1C8/UR8C " 4,070 68 13 42 " 1U1LCK 14A 85,728 637 22 72 " 1W3BAS (OP: EI4KH) " 1K3DVY	0X" 6,264 44 25 33 " 6,213 100 11 46 " 5,460 51 15 50 " 5,427 57 25 42 " 2,650 36 18 32	*PD1RO " 169,911 564 47 142 *PA3MM " 108,353 295 46 115 *PD5S " 93,280 316 39 121 *PA2JCB " 80,229 257 45 96 *PA2HD " 72,928 306 44 128
*DK3WW " 25,944 92 51 90 *DK7SM " 23,052 160 25 88 *DL3IAS " 22,898 85 40 67 *DF7CB " 22,184 134 35 83	F5SDD	7A 89,748 609 23 85 *IU1IMC *IK3SCB 1.8A 2,610 89 4 26 *IU0PYH *IW7ED	" 2,432 26 14 18 " 2,068 31 17 30 " 1,566 20 11 18 " 1,122 58 8 25	*PEØCD " 72,581 263 52 129 *PA5ØPKZ " 60,160 191 57 103 *PAØB " 58,022 301 30 104 *PA3HFJ " 57,440 218 41 119
*DM7DS " 19,074 136 28 74 *DF1GA " 18,124 115 29 63 *DL2ADI " 17,949 84 38 55 *DL6RBH " 16,435 123 24 71 *DL7ED " 14,805 77 37 68	F4IRA	Isle of Man */IZ4XAI 21A 838,755 2453 35 136 *IU7OTK (OP: G3NKC) *IU6LSJ *IW3HV *IM3EJN	" 1,080 20 12 15 " 899 33 9 22 " 650 15 12 14 " 504 20 6 12 " 432 12 7 11	*PE1RWP " 57,408 227 42 114 *PD7K " 55,728 274 32 97 *PD1B " 45,210 174 42 95 *PE4A " 35,250 174 35 90 *PA4HJH " 33,655 153 38 89
*DK7AC " 12,566 99 28 75 *DG4MH " 12,282 100 24 65 *DG2BHB " 11,730 100 20 49 *DM6AT " 11,408 63 34 58 *DL4NHP " 10,836 82 26 58	F5NBX " 557,440 1349 36 124 IR2Q F8DFP " 6,235 52 17 26 F4GGQ 21A 876,978 2322 37 129 IBØL F8DVD 14A 631,625 2206 37 126 F4EMI " 159,505 970 27 88 IO6A	AA 7,310,784 4388 163 591 *IK2MMM (OP: IK2PFL) " 4,081,244 3403 130 432 *IZ8BGY (OP: IKØETA) *IZ8GNR " 3,202,332 3307 133 436 *IZ2KPE	" 306 10 7 10 28A 247,270 623 36 122 " 69,664 333 26 86 " 68,499 206 30 99 " 61,272 234 27 84	*PE1NBD " 33,240 124 40 80 *PA8E " 30,192 192 37 99 *PA3CGJ " 30,130 199 25 90 *PE1FTV " 29,290 163 31 70 *PA3DSB " 28,560 173 31 88
*DH6KM " 10,716 100 22 54 *DJ8UHU " 10,270 87 24 55 *DL1EJD " 8,316 87 23 43 *DK4RR " 8,195 88 17 38	F4FJH 7A 186,615 1329 22 95 *TM3Z AA 3,736,488 2944 137 507 (OP: F4DSK) IZ3NYG *F5DRD " 439,420 688 82 264 IZ2ODM	(OP: IK6QON) *IZ8EPY " 1,514,955 1704 112 345 *IW5EID " 1,384,317 1412 141 390 *IIGXV " 1,305,464 1194 117 376 *IZ2ABI	" 35,796 246 17 59 " 25,938 129 24 75 " 16,240 99 23 47 " 11,300 85 15 35	*PD3LPA " 25,276 115 27 62 *PAØFEV " 25,228 135 35 84 *PG6F " 24,416 175 26 83 *PDØW " 23,205 183 27 78
*DM6LE " 7,469 63 28 49 *DF8ZH " 7,205 49 24 31 *DM2XM " 6,873 72 25 54 *DL6UMR " 6,624 58 24 45 *DF7GG " 6,519 51 21 32	*F5TGR " 253,008 403 68 184 IB2M *F4CVQ " 209,475 303 82 233 I2WJ *F5SGI " 176,379 403 57 170 I2OLV *F6DZD " 175,950 439 54 176 IK2XSL *F5TGC " 124,485 339 56 159 IK1PMR	" 1,127,520 1037 119 367 *IU2ECB " 843,684 922 117 384 *IU8ADS " 679,470 737 112 314 *IC8FBU " 669,874 888 87 220 *IK4LZH " 642,257 768 107 332 *IV3UHL	" 5,248 61 11 21 " 920 18 9 14 " 819 23 6 7 21A 524,308 1400 34 130 " 74,467 338 28 85	*PA3DNA " 17,250 102 24 51 *PA2Z " 16,089 108 28 65 *PC7E " 14,833 156 21 70 *PA5AD " 13,694 145 21 61 *PAØRBL " 12,775 97 21 52
*DL8AX " 6,144 55 25 39 *DB4REB " 5,850 83 16 49 *DM7AK " 5,796 50 27 42 *DO1PGH " 5,720 50 19 33 *DB1WT " 5,280 75 17 49	*F4IYU	" 442,680 965 77 280 *IR8W " 407,316 654 99 274 *IZ1PKV " 379,431 500 90 209 *IZ5FDD " 317,772 477 78 213 *IU4MTY " 311,260 440 87 229 *IZ5IOV	" 24,708 176 22 65 " 13,601 101 19 48 " 2,627 27 13 24 14A 20,580 228 14 56 " 11,346 116 14 47	*PA3JB " 11,811 141 23 70 *PE1HWO " 11,550 100 20 57 *PE5JW " 11,174 115 24 50 *PA5W " 10,001 59 28 45 *PA1MAR " 8,340 71 22 38
*DL1AMT " 4,819 86 15 46 *DL9FBF " 4,095 37 16 23 *DK1SI " 4,056 36 22 30 *DO3OLI " 2,898 60 12 30	*F4FRF " 43,470 184 39 99 IK5PWS *F4HOT " 39,184 199 35 89 IUØOPT *F4HZA " 37,118 157 40 94 IZ6OUX *F8CPA " 34,650 172 34 71 IB6B	" 298,452 513 87 236 *IA5/ON8J " 182,784 418 73 199 *IW2NEF " 179,529 627 59 190 *IA5/ " 164,121 353 68 159 ON2PAI	A " 3,948 66 8 39 3,850 52 13 22 M " 156 10 4 9	*PA4J
*DH1PV " 2,392 50 12 34 *DO2MS " 2,232 28 14 22 *DL1KLF " 2,226 44 17 36 *DM5CW " 1,953 39 10 21 *DC2CT " 1,620 22 11 16	*F4HYQ " 33,117 199 37 96 F5FRM " 15,485 120 25 70 IZ2JCD F4BHK " 15,130 66 35 54 IZ2ZSF F4FAQ " 7,992 69 24 48 IK3SSW F4DSA " 7,881 71 24 47 IZ4TNW	" 120,445 276 64 157 *IB5A " 102,910 236 76 175	7A 71,344 557 22 90 (OP: IK4RVG) 3.7A 62,916 768 15 69 " 2,070 69 4 26 (OP: IZ5OQX)	*PA3A
*DM4YWL " 1,140 32 9 21 *DM4WH " 1,056 29 10 22 *DHØGHU " 1,008 16 12 16 *DG3YJB " 805 17 10 13 *DL9LA " 627 26 13 20	*F4JAO " 4,512 48 16 32 ISMPN	" 99,000 268 55 165 " 89,095 225 59 114 " 44,525 215 29 108 " 37,680 213 34 86 UD2F (OP: E73A)	Kaliningrad AA 40,981 155 41 66 28A 572 18 8 14	*PA2WLE " 266 9 6 8 *PE4BAS 28A 130,662 420 29 90 *PA4JJ " 69,336 247 31 77 *PD2JAM " 32,712 150 25 62 *PD4RD " 3,872 48 11 21
*DD4SG " 551 15 7 12 *DL8JDX " 374 10 8 9 *DL1NKB " 285 9 7 8 *DF2AP " 220 12 5 6 *DD7AB " 132 8 4 7	*F8CGL 28A 114,597 371 33 86 IK3ORD *F4FSV " 35,757 171 25 62 IW3QTG *F4DNU " 6,000 68 18 30 IW3GST *F4WCE 21A 15,753 114 19 40 IWØRQJ *F4IXM " 522 17 7 11 IK2WSJ	" 32,000 110 52 73 " 29,946 94 49 89 YL7X " 29,610 142 35 91 " 23,360 168 24 56 *YL2KO " 8,576 52 32 35 *YL5T	Latvia 14A 342,626 1383 37 126 (OP: YL2LY) AA 205,860 495 74 218 " 6,000 81 15 45	*PDØFW " 1,323 17 12 15 *PD4US " 288 8 5 7 *PAØJED 211A 12,663 104 16 47 *PAØRRS " 987 21 8 13 *PG2AA 14A 32,472 240 21 67
*DP4M 28A 84,842 289 29 89 (OP: DJ4MH) *DFØRW " 49,470 196 25 72 (OP: DL1EFW)	*F4HUA 14A 1,767 41 8 23 IW2NOO *F4BIV 7A 50,715 383 21 84 IZ1WIX *F4IRT " 24,840 191 18 74 IK1JTP *F4FHV 3.7A 132 8 5 7 IR1Q	" 7,480 70 19 36 *YL3IR " 5,750 41 17 33 *YL2EA " 4,160 30 23 29 *YL3JI " 3,864 95 11 45	" 4,838 36 28 31 28A 14,912 101 21 43 " 2,380 25 12 22	*PDØRS " 5,848 124 7 36 North Macedonia *Z32U AA 5,565 47 21 32
*DH5MK	Greece IZ1NBX SV8OVH AA 155,760 300 86 209 IKØTIX SV2KGA " 77,448 215 57 111 IZ2CSX SV1SLC " 17,712 88 33 75 IK2QIN	(OP: IU1JCZ) " 3,300 57 14 30 LY4A " 2,597 31 18 31 LY7T " 1,776 28 16 21 LY2SA " 1,624 20 14 15 LY2AX	Lithuania AA 6,783,575 5155 162 613 " 384,264 800 76 248 " 282,387 491 81 258 " 23,432 100 37 64	*Z39A 7A 8,784 77 13 59 Northern Ireland GI4SNA AA 155,375 283 81 194 MI5K 3.7A 40,328 519 13 58
*DL4SDW " 2,139 31 9 14 *DB1BAC " 1,224 17 8 16 *DK1YH 14A 5,808 118 8 36 *DL7FB " 4,512 83 7 41 *DL1FW " 1,316 33 8 20	SV2CXI " 2,867 31 21 26 IU4FCW SV1BJW " 2,058 33 10 32 IZ7NLJ SV3AQT " 150 5 5 5 IO3X SX2K 28A 142,417 620 29 92 II3W (OP: SV2BXZ) "	" 1,440 25 14 22 LY7Y 28A 428,526 1117 37 134 " 401,388 955 35 131 LY2K " 278,880 676 36 130 LY1R (OP: I3VFJ) LY7M	" 19,468 120 23 39 (OP: LY1VP) " 17,472 100 23 41 28A 90,282 355 26 97 1.8A 210 17 2 12	*MI4I AA 89,961 320 48 143 (OP: GI4SJQ) Norway
*DM3F	J42L 21A 919,191 2977 37 132 IR4B (OP: OK1CDJ) SV1JG 14A 149,471 934 32 99 IK2SND *SV3RPQ AA 599,445 1325 73 242 IK4POI *J41J " 235,850 688 60 205 IK7IMO	" 252,096 625 35 121 *LY2N (OP: IK4AUY) *LY5AX " 181,032 498 35 117 *LY4BF " 92,256 358 31 65 *LY9W " 70,760 290 30 86	AA 280,612 558 69 223 " 167,014 385 58 168 " 160,770 475 56 177 " 124,169 358 57 170 (OP: LY3HD)	LA6ZP AA 332,310 712 68 217 LB6KC " 268,128 506 73 263 LA8OM " 256,824 659 53 193 LA8HGA " 201,250 438 56 119 LA7XK " 40,950 177 41 109
Finland OH1F AA 3,743,784 3297 146 506 (OP: OH1TM) OH8L " 1,664,971 2061 123 416	*SV2DXG " 85,225 267 47 128 IU2IDU *SV1AAK " 69,738 204 55 122 I7CSB *SV2SIF " 38,442 194 36 93 IK2UME	" 44,275 166 26 89 *LY2GN " 24,653 116 28 61 *LY3AB " 19,224 100 22 50 *LY2MC " 11,124 78 19 35 *LY2CO	" 87,360 394 41 154 " 75,036 436 32 124 " 66,051 276 38 141 " 40,656 261 27 85	LA6SK " 2,128 22 17 21 LA9BM " 238 13 5 12 LC8C 21A 54,827 345 25 84 (OP: LA8FTA)
OH8WW " 1,482,030 1840 110 389 OG3B " 1,200,100 1461 120 430 OG6N " 1,036,830 1155 119 451 (OP: OH6NIO)	*SV8SYK	14A 263,054 1445 29 92 *LY2TS " 218,448 815 34 110 *LY4Q " 110,654 718 33 89 *LY3LB	" 4,779 63 19 40 " 1,080 20 11 16 28A 132,568 423 32 114 " 437 13 7 12 14A 216 18 3 9	LC5K 1.8A 9,844 237 7 39 (OP: LA5YJ) *LA5LJA AA 421,898 708 89 297 *LC9A " 107,062 390 47 152 (OP: LB1TI)
OH6RE " 670,792 1333 86 296 OH1Z " 547,404 975 98 331 OH8KXK " 350,817 741 85 252 OH7KBF " 259,854 559 70 252 OH6OS " 199,728 339 65 227	*SV2RIM " 66 7 4 7 IZ4VTZ *SV1EJD " 8 2 2 2 IX1HPN *SV8CS 28A 49,496 206 29 63 IK2XDE *SV2HJW " 46,640 234 25 55 IB3M *SV2DFK " 27,158 161 23 51		3.7A 10,965 210 7 44 " 2 1 1 1 1 Luxembourg AA 757,520 1834 41 129	*LBØWI " 55,444 225 38 129 *LA6CF " 50,688 155 54 122 *LA1SDX " 41,272 293 27 107 (OP: LA4XLA) *LC7W " 16,692 90 30 48
OH1EB " 176,449 405 71 206	*SV1QVY 14A 3,024 92 8 34 K2QPR	" 143,936 1099 20 84	(OP: F4HWS)	(OP: LB7UI)

	074051/ 224 225			
*LA3CLA " 13,563 121 24 75 *LB4ZI " 13,299 91 33 60 *LB6UH " 9,088 55 25 39	CT1GFK 28A 30,954 106 31 103 CT1ETX 14A 89,600 448 25 87 CT7AHV 3.7A 11,501 213 7 46	7 *OM1ST " 21,424 175 20 84	*EA4AFP	VK4L " 134,044 260 62 126 VK3Y " 94,140 210 67 113 VK6DW " 27,025 93 42 73
*LA9NKA 28A 57,600 238 22 74	*CT1BXT AA 720,450 809 101 349 *CT2GSN " 183,556 617 54 164	9 *OM1BCO " 9,638 100 24 55 4 *OM7PY 28A 11,948 96 20 38	*EC3CVD " 366,380 1078 33 107 *EE7E " 307,457 1113 31 100	VK3KE " 8,512 64 26 38 VK3ICM " 1,050 18 11 10
Poland SN7Q AA 6,590,200 4582 156 508	*CT7ABP " 149,210 396 55 160 *CT7ADQ " 116,116 247 61 225	5 *OM4AQP " 9,585 210 5 40	*EA2DMH " 195,704 596 33 103 *EA4AA " 179,672 614 35 113	VK3X 21A 13,629 93 22 37 (OP: VK3GK)
(OP: SP7GIQ) SN7D " 3,461,302 3341 127 406 (OP: SQ7D)	*CT7AWB " 93,558 356 48 138 *CT1BOH " 34,884 120 45 69 *CR7BCP " 33,176 239 23 81	9 Slovenia	*EA1ACP " 172,620 500 35 105 *EE3Z " 151,776 407 31 113 (OP: EA3NO)	VK4DX 14A 158,619 524 28 83 *VK6OZ AA 181,076 380 69 154 *VK2AZ " 18.810 86 36 54
SN8K " 1,212,903 1679 92 277 (OP: SQ8ERS)	*CT1EXR " 30,186 153 28 58 *CT1BWU " 11,310 68 33 54	(OP: S53ZO)	*EA1GY " 129,888 463 32 91 *EA7KOL " 103,884 473 29 103	*VK3YV
SN7B " 1,017,569 1186 111 392 (OP: SQ7BFC)	*CT5GOJ 28A 18,450 124 20 55	5 S59AA	*EC5KXA " 78,897 313 27 92 (OP: HK1A)	*VK1NS
HF1K " 844,200 1286 97 372 (OP: SP1MGM) SP3HLM " 836,406 795 113 373	Republic of Kosovo *Z68XX AA 142,494 652 47 140 (OP: DL2JRM)		*ED1O	*VK5WU 14A 4,141 42 16 25 *VL2U " 3,724 37 13 25 (OP: VK2BNG)
SP1NY " 768,570 895 107 304 SP9KDA " 431,262 832 85 257	Romania	S58AT	*EB1ADD " 21,090 124 17 57 *EA5JN 21A 73,696 459 24 88	East Malaysia
SP3HRN " 412,080 802 87 253 SQ8N " 367,875 432 109 266	YO9HP AA 2,565,696 2808 118 434 YQ6A " 1,993,383 2099 131 466	6 S56B " 239,355 905 31 104	*EA5JDC " 67,367 492 22 79 *EA5IXO " 42,456 240 20 67	*9W6EZ 28A 27,720 181 25 31
SP2GWH " 356,662 605 85 217 SO5L " 291,951 648 71 226 (OP: SP5WIT)	YO4NF " 929,370 1998 82 308 YO7OWI " 240,759 393 87 246	8 S55G " 63,099 304 31 92	*EA4FJX " 37,950 159 25 90 *EC4TA " 5,346 85 8 14 *EA2EVC 14A 5,800 100 9 41	Guam NH2DX 21A 462,314 1189 37 102 (OP: KG6DX)
SP3A	YO5AVN " 193,800 397 68 217 YO4AR " 101,016 384 46 161	7 S57O " 114,840 978 21 89 1 S56X 1.8A 48,709 732 10 57	*EA2CE 7A 14,910 154 14 56 *EA3CN 3.7A 18,585 317 10 53	Hawaii
SO9P " 102,300 239 66 154 SP5UGP " 75,400 254 58 142 SP9IVD " 56,270 219 41 129	YO2MFC " 14,027 83 30 53 YO8ERC " 13,376 70 32 56 YO8BSE " 756 18 12 15	6 *S52BT " 553,900 799 85 297	*ED3M 1.8A 10,300 226 8 42 (OP: EA3FP)	WH6R AA 118,300 367 58 72 AH7C " 1,536 20 13 19
SP2V " 50,250 266 30 120 SP7V " 23,001 128 34 89	YO8SSB 28A 99,416 338 31 105 YO9RIJ " 2,250 39 11 19	5 *S52ON " 330,576 869 64 220	Sweden SK7K AA 621,746 1004 73 220	Indonesia YBØBAC AA 1,166,100 1348 95 230
SQ6BOR " 2,800 26 16 24 HF9R " 2,444 31 17 30	YR8D 3.7A 21,868 387 15 62 (OP: YO8WHT)	") *S52W " 41,160 196 42 98	(OP: SM7XEN) SM5EPO " 401,391 635 80 229	YBØAGW " 94,990 221 55 106 YBØET " 56,007 177 47 80
SP3SC " 936 14 12 14 SQ9RPX " 440 17 6 14 SQ6LJV " 147 7 4 3	*YO9IAB AA 111,150 431 38 157 *YO5QDI " 108,480 416 41 151 *YO7BGA " 100,436 300 58 153	1 *S56VHR " 11,648 110 24 67	8SØC	YB1MAE " 41,965 194 32 77 YBØPJF " 37,744 127 42 70 YB2IQ " 34,384 117 32 80
SP2JMR 28A 74,865 304 28 77 SP8K " 45,661 229 21 56	*YO2DFA " 46,035 187 43 112 *YO9GDN " 8,208 59 24 24	2 *S51RBC " 7,029 64 26 45 4 (OP: S57LR)	SM3YBP " 172,750 463 51 199 SM5VFE " 113,634 308 59 155	YB4HKR " 33,026 151 34 64 YC1CRR " 28,200 110 36 64
SP5GNI " 30,452 138 27 65 SP1O " 16,640 109 24 56 SQ6NEJ " 7,656 68 15 29	*YO4FZX 28A 3,960 70 11 22 *YO6CFB " 1,225 19 11 14 *YO6XK 21A 77,504 358 26 86	4 *S5ØB " 27,690 133 23 55	SM6YNO " 34,692 122 32 66 SE5E " 7,590 72 23 46 (OP: SM5AJV)	YB7YGR " 24,531 89 48 63 YB9DE " 23,805 189 27 42 YB1RUS " 8,856 62 17 37
SN2B 21A 914,205 2237 37 140 (OP: SQ2GXO)	*YO6LA 14A 7,599 133 8 43		SK3W 28A 340,704 1110 32 124 (OP: SM3SGP)	YBØISE " 6,840 44 20 37 YB2CRN " 5,548 56 13 25
SN5X	Sardinia IMØA 28A 226,941 832 33 110		SE5N 21A 5,544 60 14 22 (OP: SM5ISM)	YC3GFN " 4,464 55 24 38 YBØSAS " 4,160 46 19 21
SQ9V " 73,396 307 30 88 SP9EML " 43,470 206 28 77 HF6R " 15,768 91 23 50	(OP: ISØBSR) ISØNHT " 165,718 511 32 101 ISØMHD " 32,357 108 33 98	í (OP: EA3QP)	7S9A 14A 61,610 502 23 78 SB7W " 12,308 125 15 53 *SE4E AA 324,900 832 65 235	YB1DOL 28A 36,784 175 23 53 YB3IZK " 19,266 140 16 41 YB2TS " 1,728 24 8 16
(OP: SP6FAF) SQ2A 14A 1,336,704 3552 40 152	*ISØHXK AA 10,011 65 27 44	4 EA7DHT " 1,453,098 2414 95 303 EA7I " 1,234,032 2030 92 284	(OP: SM4DQE) *8S8S	YB3BX " 476 14 6 11 YB1RET 21A 102,368 333 28 84
(OP: SQ9UM) SP7TEE " 207,904 932 34 112 SP5DC " 24 2 2 2	Scotland GMØV AA 2,986,380 2976 105 365 (OP: GMØOQV)		*SM3OMO " 71,556 256 47 131 *SM7BHM " 27,864 162 19 62	YC8RAG " 11,552 120 14 24 YF3DGK " 1,595 29 11 18 YB3FTD " 1,254 19 6 16
SN3A 7A 660,576 2678 37 131 (OP: SP3GEM)	MM9I " 2,836,865 2685 116 449 (OP: GMØOPS)	9 EC3AIT " 394,524 505 93 258	*SA3MGL " 14,442 154 20 63 *SE5W " 6,760 53 19 33	YBØDJ " 35 3 2 3 YE3AA 14A 1,456 18 11 17
SP1SR " 11,210 175 10 49 SP2PIK 3.7A 95,351 886 18 79 (OP: SP2MKT)	GM4Z " 257,742 448 74 148 (OP: GM4ZUK)) EF1A " 357,408 669 70 222	*SF5O " 600 10 10 10 (OP: SM/GEOS)	YE3FAX 7A 3,816 55 15 21 YC7OCS " 1,854 44 7 11 YF3EOY " 390 21 4 6
SQ7NSN " 33,120 457 12 57 SP5ELA " 26,796 400 11 55	GMØAZC " 45,696 167 39 89 GMØVMV " 31,900 193 31 85 MM5AII " 15,554 121 24 53	5 EC1T " 341,136 510 84 225	*SDØN " 400 10 8 8 (OP: SMØNSJ)	YF3EOY " 390 21 4 6 *YC2VOC AA 1,185,453 1322 81 240 *YBØNSI " 441,451 590 84 197
SP3GTS " 21,600 219 13 62 SO4P " 21,576 361 11 51	MMØTFU 28A 230,736 618 31 107 *MM4D AA 86,884 352 31 85	7 EA4UV " 306,160 402 95 249 5 EA2A " 188,916 441 52 121	Switzerland	*YB1LUE " 278,460 428 70 182 *YB8IBD " 105,032 315 50 102
(OP: SP4DEU) SO5MAX " 11,752 236 8 44 *SQ6H AA 1,603,928 2093 121 408	(OP: GM4ATA) *GM5TDX " 63,842 327 40 97 *2MØKIE " 40,470 211 40 102	(OP: EA5JDN)	HB9DQL AA 1,037,622 1104 99 339 HB9EHJ " 533,871 837 85 266 HB9OAU " 499,074 1055 81 292	*YB1MIG " 63,168 198 51 90 *YCØJOY " 56,581 157 46 91 *7C9R " 52,029 170 46 77
(OP: SQ6PLH) *SP2R	*MM7EST " 2,244 50 11 33 *MMØGOR 3.7A 10,944 229 7 41	3 EA1DA " 137,655 458 44 117 1 1 EA4HQV " 113,120 247 66 158	HB9CVQ " 373,500 895 58 192 HB9BOI " 355,338 503 89 253	(OP: YB9GWR) *YC2DBW " 26,910 94 40 75
*SN8J	*MM1E 1.8A 4,576 99 7 37 (OP: MMØGOR)		HB9BTI	*YB1ABY " 26,829 118 32 67 *YC1TCA " 24,128 95 34 70 *YB2CAA " 23,618 118 41 57
*SP9PD	Serbia YT7R AA 2,554,434 2706 129 444	EA2DDE " 34,100 129 46 54 4 EF2O " 33,147 219 35 92	HB9HID " 122,783 363 52 147 HB9CRY " 108,997 266 54 107	*YF3DEA " 23,250 125 27 48 *YD2BIU " 20,910 109 32 53
(OP: SP3DAT) *SP7TEX " 221,370 458 71 211 *SP5EWX " 220,759 427 86 243	YU7KW " 816,704 1142 109 339 YU3DKO " 90,729 303 47 106	9 EA4K " 22,572 `104 33 66	HB9FEX " 90,272 292 56 161 HB7X " 48,825 209 31 62 (OP: HB9FMU)	*YC6HRI " 16,756 88 27 44 *YE9PBZ " 16,350 85 28 47 *YC4SMK " 11,096 62 30 43
*SQ1REX " 213,792 507 64 198 *SP7JS " 205,056 545 58 209	YT7AA " 22,500 180 21 69 YT1X 28A 636,888 1569 37 131	9 EA5HRM " 7,770 49 30 40 1 EA3IJT " 510 10 7 10	HB9EXR " 4,340 \ 44 20 42 HB9HLM 28A 306,565 978 31 102	*YC9UAB " 9,954 68 27 36 *YG1BMZ " 9,240 89 25 31
*SQ3POS " 120,625 330 53 140 *SQ9SEB " 120,564 435 49 155 *SQ7OVT " 110,976 340 51 153	YT8WW " 564,068 1511 37 129 YU5W " 226,452 607 37 130 YU7OM " 5,490 54 12 33	D ED4T " 258,258 706 32 111	HB9IQB 14A 49,257 223 28 89 *HB9CU AA 865,650 1039 98 300 *HB9CIC " 101,104 285 46 96	*YE8DWC " 8,456 68 24 32 *YC1BMI " 5,376 67 15 27 *YC1AUI " 4,312 36 21 28
*SQ7OVT " 110,976 340 51 153 *SP8FB " 105,780 326 54 161 *SP3BBS " 77,430 258 46 128	YU7OM " 5,490 54 12 33 YTØZ 21A 857,394 2320 36 135 (OP: YU1ZZ)	5 EA2KB " 122,047 468 30 97	*HB9CIC " 101,104 285 46 96 *HB9HTF " 68,052 291 37 122 *HB9TWU " 38,354 179 36 91	*YC1AUI
*SQ9KDT " 59,755 237 51 134 *SP2HHX " 55,130 196 42 107	YT7X " 68,234 331 28 81 (OP: YU7CF)) EA7O " 95,104 356 30 98	*HB9BXQ " 37,375 142 40 75 *HB9HKE " 7,752 68 28 48	*YC2MPF " 2,604 52 13 18 *YC1HLT " 1,960 52 12 23
*SQ9PUW " 53,790 264 40 123 *SP6NIV " 50,508 215 40 98 *SP3FMF " 49,434 235 33 121	YT6T " 51,921 310 21 60 (OP: YU7CM) YU2MFM 14A 120 6 4 6) EA3KN " 32,849 124 31 76	*HB9FSE " 1,530 19 14 16 *HB9HRG " 1,104 46 13 33 *HB3XAW " 825 13 12 13	*YE3ESW 1,647 23 11 16 *YC9BFQ 1,450 28 12 17 *YC1JZK 893 32 8 11
*SQ9ZAX " 48,789 185 49 90 *SQ5JUP " 44,055 145 49 116	YT1A 7A 517,450 2222 34 124 YT3K " 109,088 818 22 90	4 EA4DE " 9,930 135 11 19 0 EB1IC " 4,656 37 19 29	*HB9FBK 14A 891 31 5 22 *HB9HPO " 588 22 6 15	*YB9JIP " 874 25 10 13 *YB7XYO " 544 26 13 21
*SP8GNF " 41,700 170 41 109 *SQ3TGN " 33,500 219 34 100 *SP4KHM " 30,744 202 27 95	YU1LD 3.7A 91,430 982 15 67 *YU4AST AA 78,937 328 49 144 *YT5BOS " 50,949 203 49 104	(OP: EA5DF)	Ukraine UW1M AA 466,488 646 99 297	*YF8AFW " 384 14 6 6 *YB1HR 28A 63,038 301 27 59 *YC9AAI " 42,525 189 23 58
(OP: SP4GAP) *SP2DKI " 30,744 115 40 86	*YT5IVN 28A 12,540 76 18 39 *YU7ZZ 21A 83,286 382 30 96	9 EA1KP " 39,676 195 25 84 6 EA1B " 31,635 123 28 83	UTØU " 290,304 605 80 176 (OP: UT5UDX)	*YB1DIU " 40,670 183 27 56 *YB2ECG " 25,272 170 20 32
*SP7CF " 25,984 143 36 92 *SP3ZHP " 22,320 269 16 64 (OP: SQ3JPV)	*YU5M 14A 291,600 1354 38 112 *YT7E " 76,446 683 20 73 *YT5ANA 3.7A 24,428 379 9 53	3 EA7TS 14A 93,462 702 25 86	UXØFF " 175,953 329 79 188 US5QUB " 145,285 311 61 184 UT5UGR " 88,800 311 48 112	*YD3ASV " 24,455 155 24 43 *YBØJVZ " 10,092 62 17 41 *YD9BIJ " 6,888 59 16 26
*SP7HOV " 5,382 39 18 28 *SP9WOL " 4,662 43 20 22	Sicily	EC5APA " 9,555 139 15 50 EA2GR " 5,658 120 9 37	US8QQ " 15,036 63 35 49 UR5EDX " 4,830 40 21 25	*YG3EMH " 6,345 49 15 32 *YD2UWF " 2,080 33 11 21
*SP2WGB " 3,770 59 15 43 *SQ9ALW " 2,204 40 12 26	IR9Z AA 1,075,184 1709 91 360 (OP: IT9VCE)	0 EB5KT 3.7A 28,638 357 12 62 0 EA1HV 1.8A 2,448 66 7 29	UTØRM " 1,825 27 10 15 UR7EZ " 1,196 18 9 14	*YD3CZV " 315 13 7 8 *YDØRFS " 231 9 5 6
*SP2GOW " 2,109 23 16 21 *SQ3M " 1,352 19 11 15 *SP6MI " 1,161 15 13 14	IT9YHR	2 *EA1G " 768,016 1083 87 281	UT5EL 28A 42,750 179 27 68 UZØU 14A 253,176 1085 35 119 (OP: UY5ZZ)	*YG2AZV " 42 3 3 3 3 *YC5AKH 21A 95,670 428 27 63 *YB1EGP " 51,243 260 23 70
*SP7JDI " 180 6 4 6 *SNØW 28A 106,765 354 30 101	IT9IVU	(OP: EA3ICJ) 3 *EA7BD	UY3U " 150,921 972 32 91 (OP: UT8UF)	*YCØSJK " 15,142 86 20 47 *YC2XCD " 10,664 116 16 27
(OP: SQ9HQ) *SP9RHN " 96,868 341 32 90 *SP3CCT " 29,412 161 23 53	(OP: IT9BLB) IT9ESW 7A 8,400 73 16 54 *IT9DGG AA 279,645 503 74 235	4 *EA1IQM " 545,072 989 75 251	UW7LL 3.7A 32,873 427 13 58 *UT1UL AA 314,565 513 77 236 *UR5RP " 196,402 358 81 202	*YC1GHZ " 4,826 49 10 28 *YC1IFR " 3,104 61 12 20 *YF8FOR " 2,920 59 9 11
*SP6TRH " 5,764 51 16 28 *SP9XCN 21A 207,360 716 31 113	*IT9ZMX " 63,940 245 38 101 *IW9GRL " 45,144 136 50 121	1 *EA3XR	*UT6CW " 45,144 142 42 129 *US5WBJ " 17,738 105 30 68	*YF3FZR
*SOØN	*IW9BJP " 31,524 147 39 109 *IT9BYS " 11,289 65 31 40 *IT9XTP 28A 389,928 1106 34 120	*EA4EF " 403,650 702 71 228	*UR9LM " 9,768 97 25 63 *UW7CN " 9,313 63 22 45 *UX3IW " 4,293 33 22 31	*YC1BTG
*SP9UOP " 32,806 208 24 70 *SQ6PLD " 11,748 72 19 47	*IT9WDC	1 *EA5GX	*UW5U 28A 94,560 373 27 93 (OP: UY2UA)	*YD8NEH 7A 2,520 52 11 17 *YC2CZF " 2,492 38 12 16
*SP4DZT 14A 173,280 782 35 117 *SP6DVP " 92,520 533 32 88 *SP3WKW " 48,888 392 22 75	*IF9A 21A 263,568 1031 35 117 (OP: IT9ATF)	7 *EA1FW " 112,266 374 65 133	*UT1US 21A 4,995 55 14 31 Wales	*YE3DGS " 384 25 5 7 *YC3BQO " 264 34 9 13 *YC1LNE " 261 41 4 5
*SN5N	*IT9VDQ 14A 4,089 `58 10 37	7 *EA5FCW " 71,576 211 53 131 *EA3IFV " 61,596 181 53 121	MWØLKX AA 386,280 695 73 260 GWØARK " 272,208 431 80 241	*YG1BJZ
*SP7JLH	Slovak Republic OMØR AA 8,357,640 5155 166 605 (OP: OM3GI)		GW9T 28A 730,240 1816 35 128 (OP: MWØZZK) GW4J " 238,469 676 32 101	*YF3ERE " 140 7 4 6 *YG4SAP " 27 7 1 2 *YG3ASH " 18 3 1 2
*SP3AYA 7A 62,178 678 14 72 *SP2N 3.7A 26,260 446 10 55	OM7LM " 22,000 134 27 83 OM7JG " 5,152 51 19 37	3 *EA5IUS	(OP: GWØETF) MW2I	New Zealand
(OP: SQ2HCW) *HF7A 1.8A 11,025 255 6 39	OM1DZ " 2,394 27 18 24 OM2VL 21A 1,234,815 2772 39 152	4 *EA4HIH	*MWØCRI 21A 80,476 379 27 97	ZM4T AA 4,427,000 3424 130 336 (OP: ZL3IO)
Portugal CT1BOL AA 1,562,288 1435 125 393	*OM5CM AA 154,330 503 55 175 *OM6MW " 67,816 326 39 134	5 *EA4EUW " 7,777 78 23 54 4 *EA5IQN " 7,194 71 22 44	OCEANIA	ZM1A
CT7AKW " 511,280 772 79 229 CT1FSG " 409,552 1109 45 134	*OM1AKU " 60,021 299 42 129 *OM5UM " 33,000 198 32 100	9 *EA1AAP " 4,774 56 20 42 0 *EA4GJM " 500 16 10 15	Australia VJ4T AA 4,429,000 3720 127 303 VJ2W " 644,436 764 95 211	ZL2RX " 13,124 80 27 41 ZL1T 28A 5,796 113 9 9 (OP: ZL1ANH)
CT7/DL6IAK" 255,024 958 44 132	*OM1AVV " 27,930 163 33 81	1 *EB5HAH " 399 20 6 15	VOLVV 044,400 /04 90 211	(UP: ZLIANH)

ZL1BBW 14A 63,936 236 25 71 ZL4YY " 13,552 98 18 38 *ZL2MM AA 1,320 20 10 14	*PY2FRQ " 83,172 348 21 66 SP9TKW *PS2B " 61,523 500 18 29 PY2BN	" 125,292 395 49 163 SN5Z " 116,604 389 54 183 F8AKC " 111,706 418 32 69 WB3GBL "	7,176 94 12 34 PAØAWH " 1,972 72 4 25 6,724 62 16 25 SNØE " 400 29 4 16 6,624 64 12 36 (<i>OP: SO8OO</i>)
Philippines DU3T AA 1,869,923 1820 116 273	*PU2OGQ " 45,792 202 26 70 JK2VOC *PY2HT " 44,032 209 24 62 HA5BA	" 107,520 301 66 94 YG3FAP " 88,615 342 47 138 YO5OHY " 77,355 228 35 100 SN5R "	6,566 58 20 29 JH1APZ " 65 5 3 2 6,468 67 15 29 ES6KW " 42 4 3 4 6,292 50 18 34 UB4IIQ/UA6L " 2 1 1
DV3A	*PU5ABB	" 72,695 182 50 105 " 61,577 305 37 102 PU5ALE "	(OP: SP5XMU) 1 5,328 69 12 25 UN9LDC 1.8 3,354 43 5 21
*4I1EBD AA 735,804 1235 75 168 *4I1BNC " 13,826 92 25 37	*PU2VLW " 33,258 225 19 50 OH3KQ *PV2D " 31,110 152 23 62 E77XL	" 55,250 196 48 122 F6FTB " 48,900 195 40 123 W8IQ " 46,810 222 36 119 IT9NAN "	4,860 57 12 18 HA1TI " 3,232 107 4 28 4,590 41 15 30 LY4T " 2,880 90 4 28 4,160 72 10 30 DL1AOB " 1,568 61 3 25
SOUTH AMERICA Argentina	(OP: PY2AD) M6KCI *PU7IRR " 30,514 183 16 57 I3MDU *PY2MOR " 29,422 177 25 69 IK3BVD	" 46,472 266 35 113 IT9IRV " 40,755 198 33 110 DL5EC " 40,448 208 32 96 US5VX "	3,256 40 13 24 UT4UBZ " 108 10 4 8 3,224 50 9 17
LV1D AA Ž10,512 396 67 156 LU7MT " 55,031 203 42 71	*PU4BOT	" 39,837 209 40 107 EA3FHP " 39,298 185 34 64 EA2GM "	2,686 39 12 22 QRP ASSISTED 2,584 50 10 24 NORTH AMERICA
LU9OZX " 52,345 170 50 95 LU8DPM 28A 1,706,912 3692 37 127 (OP: LU7DW)	*PY4XX	" 35,805 152 47 46 PR1D " 32,072 180 23 53 28,908 180 27 105 <i>PY2UGO</i> "	2,380 47 8 20 (OP: PY1PTS) United States 2,068 56 8 14 District 1
LT6M " 703,437 2000 27 102 (OP: LU8MHL)	*PY1CD	" 25,351 172 30 71 KØVK " 24,528 152 29 83 W4RLS "	1,848 32 12 16 KO1H 28A 21,294 133 15 48 1,035 19 8 15
LU3WC " 528,640 1734 25 87 LU7YZ " 482,328 1637 23 93 LU3MO " 166,540 593 27 83	*PP1BM	" 22,892 94 34 63 JL1KLK " 22,557 195 22 81 KA7T "	846 25 7 11 K2PI AA 19,448 80 24 64 704 17 11 11
LU2D 21A 79,695 412 18 51 (OP: LU2DX) L33M " 50,840 225 24 58	*PY1SX	" 19,926 95 23 59 IW2ODC " 19,570 135 26 69 DV9IGT " 17,649 97 37 74 CE3ERM "	703 23 9 10 District 5 672 18 6 8 NO5V AA 8,576 57 21 43 540 22 7 8 ACSO 28A 85,902 342 26 77
(OP: LU3MAM) *LU6ETB AA 1,159,434 1385 92 214 *LU1MAW 28A 112,765 492 20 75	*PY2TTN " 13,464 111 18 50 G8AFN *PU2TWZ " 12,322 118 18 43 DJ3HW	" 17,574 118 29 72 BG3LTM " 16,650 104 23 52 PP1JE " 16,600 149 22 78 JA1GZK "	504 36 6 12 390 27 5 8 District 7 250 11 5 5 N6MZ 28A 13,456 89 19 39
*LU7DV " 50,869 216 19 72 *LU9EAE " 4,154 73 11 20	*PY1KIH	" 14,355 125 23 76 YO8DHD " 14,025 113 28 47 JA5NSR "	209 7 5 6 154 6 5 6 District 3
*LU5ILA 21A 5,434 79 14 24 Brazil	*PU7HLT " 9,672 98 15 37 SP3PDO *PU8YPL " 9,050 98 15 35 *PU2XYT " 8,976 112 15 33 M7ELC	" 13,770 114 27 75 G4SGI " (OP: SP3TYJ) F4IVY/P " 12,103 99 30 61 VK3KRL "	84 9 2 2 VE3BFU 7A 266 26 4 3 65 5 2 3 District 7
PT5J AA 11,807,370 6228 157 521 (OP: PP5JR) PY2WH " 3,320,730 3222 96 282	*PY2ZDU " 7,896 85 14 28 KB4FUW *PU3YST " 7,175 91 12 29 MMØINH *PY1MK " 7,052 83 15 28 DG3T	" 11,826 75 31 50 4F9AM " 11,760 110 22 62 DM5QZ " 11,322 76 22 52 EY8BA 21	32 4 2 2 VA7IR 3.7A 50 13 2 3 6 1 1 1 119.082 498 20 69
PY2KC " 2,295,120 2215 93 300 PP2CC " 1,728,545 1703 97 280	*PU2YXB " 5,940 83 14 31 *PU2RXE " 5,559 93 17 34 9M2SPN	(OP: DF5RF) JR4DAH " " 11,270 104 20 29 F8AKS "	83,040 338 28 68 78,987 323 28 85 Asiatic Turkey
PV2K	*PU5KJN " 4,900 78 13 22 *PU5MFI " 4,608 62 12 24 WC7S	" 10,720 124 16 24 TA2IB " (OP: DV4ZAR) NDØC " 10,296 65 28 38 SY1AEA "	47,229 188 24 67 42,588 364 21 70 China
(OP: PP1KV) PY5AMF		" 9,975 106 26 69 JQ1NGT " 9,600 64 19 41 LZ2RS " 9,417 89 24 49 JR1NKN "	34,992 196 25 47 BHTQP AA 1,053 18 13 14 34,278 234 20 67 BA4WI 21A 11,628 132 18 39 23,374 168 20 38
PS2M " 521,216 816 75 181 (OP: PY2OX) PY1FI " 344,805 713 50 131	*PP5FMM " 2,553 56 10 13 M7DAD *PY1XA " 2,380 145 20 48 K7FR *PU3LOB " 2,325 40 12 13 YBØOHG	" 9,324 104 20 54 YC4SIZ " 9,316 70 31 37 HF5WIM " 8,208 63 19 38 EA2BO "	18,880 119 18 41 Israel 12,600 120 15 48 4Z4UO 28A 4,154 63 6 25 10,384 119 13 46 4X5WZ " 24 2 2 2
PY3FOX " 295,767 687 61 116 PY3PA " 263,865 664 57 90	*PU7ASP	" 8,040 68 21 46 JR2EKD " 7,923 50 21 36 JI1NZA/1 "	9,588 78 14 33 8,880 94 15 25 Japan
PT7BI " 206,610 562 35 107 PY3DX " 118,104 294 54 114 PY2VN " 41,360 142 37 73	*PY5PLL " 828 20 5 13 KD2RZW *PU3BDJ " 782 36 8 9 JG6XYS	" 7,392 73 25 52 SP4NKJ " 7,375 48 19 40 M6W " 7,228 67 21 31	8,085 101 15 40 7,399 98 11 38 JK1TCV AA 55,510 169 46 76 (OP: G3W) JM1NKT 21A 59,040 250 27 63
PY2TOP " 32,802 181 20 46 PY4ME " 30,240 147 29 67 PY4LI " 22,344 138 46 52	*PU1LEO " 476 40 8 9 JE3AKU	" 6,993 101 14 49 IW2NRI " 6,783 73 22 29 IW1BCO " 6,723 75 24 57 JA1KPF "	5,920 74 9 31 5,852 75 11 33 5,990 56 17 22 District 2
PT2AP " 19,007 126 25 58 PY3APY " 16,905 116 27 42 PY5KA " 8,364 68 23 45	*PY2OKW " 260 12 7 6 KD2MU *PY3BEG " 78 5 3 3 CE3RIF	" 6,612 55 21 37 UTØNB " 6,579 83 22 29 PY2CER " 5,963 83 17 50 7L1DST "	4,608 62 13 35 1,749 26 13 20 1,729 20 10 14 District 3
PY5DK " 5,684 42 21 37 PT2NP " 4,557 41 17 32	*PU2NAX " 16 8 2 2 SP9UA *PY2FSR 21A 149,842 565 26 72 M6IGE	" 5,917 76 17 44 JK1NWD " 5,640 80 17 43 JI6NFX "	1,430 29 12 14 1,254 34 10 12 JH3DMQ 7A 714 17 9 8
PY2AE " 3,237 54 16 23 PW2L 28A 1,047,087 2606 30 109 (OP: PY2MNL)	*ZW2A	" 5,376 86 14 42 R7RBE " 3,800 45 21 29 YU4BMX " 3,600 37 16 24 JI1AEP "	638 15 8 14 468 20 5 13 435 11 6 9 8J6YAB 28A 19,987 130 22 57 (OP: JA6VZB)
PY5ZHP " 456,565 1298 28 99 PY2DY " 398,208 1100 33 103 PT4Z " 216,999 975 19 62	*PY2COY " 6,647 149 8 9 DF7XR *PS8ET " 6,272 41 16 40 IK1BBC	" 3,536 41 22 30 BI4SQM " 3,381 45 16 33 BI1JNP " 3,162 54 16 35 YU1NR 14	240 16 5 5 176 16 6 5 63,546 396 30 89 District 8
(OP: PY4JW) PY2TMV " 103,253 553 23 56 PY5IN " 80,106 378 21 57	*PT2SR	" 3,105 39 17 28 G2X " " 3,015 45 17 28 " 2,808 54 12 40 RT4W "	42,201 3/4 19 62 (OP: GØDCK) (OP: GØDCK)
PY4DK " 62,250 331 16 59 PY2LC " 40,716 181 25 62	Chile OE6NOA/F CE1TT AA 1,840,896 2276 80 226 YB1BBW	2 " 2,805 35 16 17 YO8RC " 2,479 37 16 21 LA7WRA "	23,625 230 15 60 20,631 243 13 56 9M2CDX 7A 48 9 1 3
PY2EBD " 17,528 139 13 43 PY2GZ " 13,311 196 13 16 PY2NFE " 1,342 34 11 11	CE3NC " 145,071 308 68 131 PY2BND CE3VRT " 2,001 30 13 16 MØYJB	" 1,870 44 15 19 IZ8EWD " 1,776 36 12 25 YO4BEX "	15,123 148 14 57 13,860 179 12 54 EUROPE Austria
PY8WW 21A 471,960 1274 31 107 PY2PPZ " 24,221 209 15 38 PY6BA 14A 1,096,176 2358 37 127	CE5NK " 2,233 36 11 18 <i>SM/OZ4PA</i>	" 1,767 59 13 18 W2VRK " T" 1,598 45 10 24 ON4MGY/P " 1,530 24 13 17 MMØXDG "	12,393 91 13 38 8,268 124 9 44 4,469 97 8 33 Belgium
PY3LX " 18,316 117 24 52 PY2XJ " 14,025 161 13 20 PT6T " 1,150 23 8 17	*CE2GT AA 127,534 312 63 124 BG2JET *CE2SCZ " 89,838 402 31 62 SQ5SAA	" 1,488 34 13 18 MØJBA " 1,440 32 11 19 PY2MAM " 1,440 39 15 21 E77MA "	3,492 113 6 30 3,200 51 10 22 2,788 82 6 28 OQ4B 28A 17,818 111 20 39 (OP: ON4BHQ)
(OP: PY6TS) PY3TR " 247 11 7 6	*CA2YWW " 25,344 209 22 42 ** *XQ3WD 28A 416,312 1493 21 83 CE3PCG	(OP: HS1JQP) SP7K " 1,400 28 17 18 EA7JTP "	2,622 72 7 31 Bosnia-Herzegovina 1,653 50 6 23 <i>E7ØAA 28A 8,046 76 15 39</i>
PY5QW 7A 101,200 391 28 72 ZV1T " 64,703 336 25 64 (OP: PP1WW)	*CA6JQN " 1,340 32 5 15 UW5EJB *CE1PTT 21A 100,521 489 24 57 SQ8P	(OP: CE3BC) IW2EPE " 1,380 26 9 21 <i>GWØVSW</i> " 1,050 29 12 23 OE3VET "	1,485 50 5 28 E73AA 21A 34,020 275 17 64 1,150 42 5 20 Bulgaria
PY5DC 3.7A 176 25 5 6 *PY5FO AA 649,728 1076 64 152 *PT7ZT " 246,826 534 54 113		" 1,044 30 10 26 SQ1NXO " 1,035 18 11 12 SN5L " 980 26 15 20 M3TZX "	1,144 38 6 20 777 37 6 15 775 31 5 20 LZ2AF AA 1,377 25 10 17 Croatia
*PY3RS	Colombia VK40TZ HK4W AA 151,632 425 42 120 NØLMQ	" 896 21 14 14 BA7LFI " 840 18 10 10 IK5RUN " 825 22 12 13 E77BW "	585 16 7 8 9A/ 480 12 8 12 IZ3NVR 1.8A 2,904 93 4 29
*PT2AW " 90,839 245 41 92 *PR7RBA " 75,920 277 38 92	*HK3EA 7A 565,677 1623 27 96 HB9HGW	" 798 18 10 11 K4CUZ " 792 18 10 14 Z33ST/P "	230 9 3 7 126 15 4 10 Czech Republic
*PY2DR " 75,715 354 29 66 *PY1AN " 64,949 251 38 69 *PY2GM " 51,448 189 38 80	ZP5VIA AA 17,550 146 18 47 LY5G ZP5DA " 10,224 56 26 46 VK8D/P	" 754 17 11 15 VU3ICW " " 704 20 12 20 IU1QEA " " 589 16 8 11 ON2EE "	100 8 4 6 OK1DMP " 22,272 87 41 87 96 10 3 9 OK8CY/P " 9,951 88 27 66
*PP2CS	Trinidad & Tobago YB3BAR *9Z4Y 28A 290,297 978 28 85 KB3SQV	" 500 13 8 12 K1NLL " 448 14 7 7 9M2RAD " 425 12 6 11 <i>BG3RRJ</i> "	80 12 5 5 5 36 3 2 2 Denmark 11,036 88 16 46
*PY2WLM " 31,104 198 33 63 *PY2POA " 30,281 135 37 70 *PP5ZB " 24,024 116 37 54	Uruguay N6HI	" 416 12 8 8 IZ4VQS 7 " 400 9 7 9 OK6OK " 380 14 8 12 HA3GC "	23,858 236 15 64 18,496 251 13 55 0 750 150 10 51 England
*PP2RON	CX4CP " 56,408 254 30 58 DL7PY CX6VM " 45,154 158 46 61 VU2MIB	" 306 18 5 13 LY2NK " 272 11 7 10 SV1DZB " 260 22 5 15 G4Y "	9,750 182 7 43 6,765 126 10 45 3,772 87 11 35 G4ABX AA 8,208 78 19 35 G1G 21A 15,180 171 14 46 (OP: G4KIV)
*ZV8C	CX2CC 28A 739,500 2262 29 96 JJØSFV CX9ARH " 310,905 1113 24 81 W5CWC	" 221 12 6 7 " 132 7 5 6 GM4M "	(OP: M6OXO) Fed. Rep. of Germany 3,696 124 4 29 DOBAB 21A 16 2 2 2
*PY3FBI " 18,150 97 28 47 *PY2MSB " 12,060 130 22 38 *PY2KME " 10,143 69 24 45	CX5UA	" 99 8 4 7 " 98 9 6 8 HG7J " 70 15 5 5 E78CB "	2,925 66 7 32 France 2,730 63 6 33 F4GWM AA 47,080 254 29 78
*PY3TAM " 6,996 72 16 28 *PP1AA " 6,161 119 25 36 *PY4WWW " 5,580 56 24 36	*CX2RA 28A 182,784 717 22 74 PY1XR DB7YI	" 69 15 10 13 <i>YD8SPY</i> " 60 4 3 3 ISØAGY " 30 3 3 3 SQ9DEO "	2,349 3/ 11 16 2,255 95 8 33 Greece 2,100 56 7 28 SVINK 21A 33,396 244 22 70
*PY1ID " 4,400 82 13 27 *PV8AAS " 4,320 39 15 30 *PY5IQ " 4,200 41 18 32	Venezuela TI2YO YV5NEA 14A 412,191 1271 26 91 IZ4AIF	28 96,995 457 24 71 9A2EY "	1,860 59 5 25 1,792 56 5 23 Hungary
*PY2OKB " 3,900 57 36 42 *PY2MIA " 3,332 65 12 22	*YV5LMW " 2,520 26 17 25 K1WHS	(OP: PY6GOE) SP7PSD " 51,624 252 16 56 WU2M " 46,221 221 25 68 SP3JUN "	1,725 53 9 14 HG5O AA 138,831 412 59 172 (OP: HA5OB) 1,260 46 5 23 Italy
*PU1KVD " 2,475 58 13 20 *PY1SGT " 1,856 37 11 18	QRP F2CT KEØWPA	" 39,767 187 22 69 YD6ROA " 35,646 173 23 55 BH4FBB "	960 22 9 11 IZ5CMI 28A 5,070 48 14 25 527 17 8 9 IZ2QKG 14A 5,040 102 7 38
*PY5VE " 1,776 30 16 21 *PT2YW " 1,400 49 10 18 *PY2NNM " 696 25 13 16	HG6C " 279,405 636 75 240 JA2MWV (OP: HA61AM) SQ8MFB	" 33,165 183 16 51 ON4ANE " 23,572 139 23 48 YCØBAS " 22,752 175 22 50 IZ3NVR "	504 31 3 15 IO5K 3.7A 12,210 213 8 47 406 12 6 8 266 22 2 12 (OP: IK5TBK)
*PU2SDX 28A 525,555 1401 30 105 *PY4YY " 354,654 1205 27 87 *PY2CX " 328,909 903 29 104	JHTOGC	" 22,400 125 19 51 BH4TQX " 20,916 151 15 48 DG2FDD " (OP: LU4VZ) EA8DIG "	260
*PY2BRA " 294,252 981 29 84 *PU4MMZ " 223,816 808 27 74 *PY2VZ " 222,360 775 25 84	JH7UJU " 189,981 341 82 127 LUTVCH DK8R " 167,555 495 54 181 YB1UUN M7XTT " 166,014 501 52 155 FB3FPR	" 19,654 122 18 44 PDØRZH " 19,344 117 19 43 2EØTKO " 16,762 100 20 38 WA2NYY "	112 17 2 6 81 9 2 7 60 4 3 3
*PY2CPS " 161,249 615 27 80 *PU1JSV " 113,040 529 26 54	W6QU " 131,130 265 72 114 DK5FF	" 15,080 120 18 40 OL4W 3.7 " 14,514 101 21 38	8,159 202 5 36 Netherlands (OP: OK1IF) PE2K AA 53,298 337 37 104
		,	

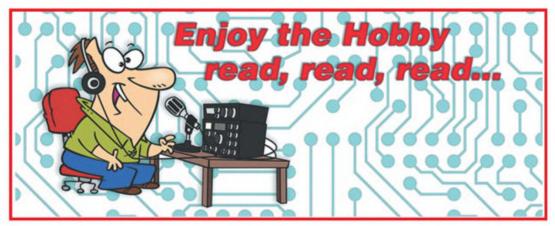
MI1M	Northern Irela 14A 31,540	232 19 64	N6VOH NN6P	160,244 348 91 145 130,500 325 63 87	*HZ1BW	Saudi Arabia 4,339,212 3565 101 343	TMØR *F6KPW	73,696 630 22 72 310,959 728 67 230	*ED1W *EA5WZ	439,488 920 87 249 276,080 482 84 256
LC5L	Norway AA 6,206	(OP: MIØLLG) 77 18 40	* <i>ADØBO</i> W7RM	3,920 53 26 30 District 7 3,960,408 2670 157 407	*BV2A	Taiwan 242,144 740 58 126	*F4IZG *F4KMI *F4KIY *F6KMB	186,018 535 61 197 179,765 464 57 172 147,175 311 64 139 60,984 267 41 127	SJ2W SJØX	Sweden 7,246,272 5265 164 588 966 228 1642 103 335
	Poland	(OP: LB4FH)	NA2U WM7A W7VJ	3,257,604 2554 146 412 865,251 927 113 268 646,000 717 100 240	*HS2UPF	Thailand R 135,124 339 56 110 37,976 192 34 67	SZ1A	Greece 3,916,690 3693 154 564	SK6DG SK6AW SK6EI	966,228 1642 103 335 886,812 1634 90 312 284,310 870 49 185 214,122 588 55 199
HF9CW SQ5CW SP9RQH	AA 136,344 " 129,024 " 69,600	459 53 175 473 54 170 217 51 123	W7YED AB7HP *N6JRL	24,598 102 38 60 984 20 11 13 19,800 123 46 64	*E27AH	3,139 43 18 25 United Arab Emirates	J42I SZ7SER	3,886,344 4016 134 482 333,879 1013 62 211	SE3Y *SK6AB	53,380 197 48 109 30,562 199 30 88
SP7M SP5PDA SP5FKW SP5ES	28A 4,329 14A 18,673 3.7A 13,167 " 11,820	47 14 25 215 14 57 276 9 48 190 9 51	K8AZ *KA8YNW	District 8 4,458,135 2445 151 508 166,192 306 63 158	A61QQ	4,089,730 3471 96 334 West Malaysia	HG6N HG5A HA3DX	Hungary 7,426,440 5083 157 578 7,344,029 5053 157 594 3,808,432 3429 143 489	HB9ZZ *HB2C	Switzerland 90,404 230 52 142 97,278 403 38 148
SQ9SX	" 99 Serbia	9 3 8	*W8AJT *N8YXR	72,800 170 54 128 30,969 113 38 73	9M2U	179,952 545 50 113 EUROPE	*HG5P	29,213 190 38 93 Italy		OCEANIA Australia
YU1LM YT1BD	AA 103,601 14A 5,838	371 47 164 51 16 26	K9YY	District 9 1,979,964 1505 125 361	OHØZ	Aland Islands 510,017 777 84 239	IR4X IR4M IR6T	15,237,992 7577 178 675 11,621,455 6602 176 623 11,524,994 6151 172 634	VK2M VL4A VK4KSS	699,980 863 96 214 538,740 1061 75 144 11,704 105 23 33
IT9RBW IW9FRA IT9RJE	Sicily AA 22,401 28A 3,920 21A 64,920	114 30 101 48 14 21 290 29 91	WØMI *KEØOR	District Ø 16,200 77 35 46 63,574 182 38 95	OE5XRL OE4C	Austria 576,910 1316 75 235 541,280 1700 64 208	II8K IR7T IB1D IR2L	7,365,920 4988 162 598 6,252,345 4483 157 586 5,242,203 3379 156 555 4,196,980 3373 149 543		cos (Keeling) Islands 104,663 503 20 63
OMØRX	Slovak Repul	olic 410 28 91	*ADØFJ	3,311 30 19 24 Canada	OE1XTU *OE1XA *OE5XPN	43,068 271 39 109	IV3WMS IQ2MI IQ1RF	2,259,096 1821 131 457 2,140,625 2054 141 484 1,872,052 2549 118 438	*9M4CRP	East Malaysia 8,055 113 19 26
OM6AS	Slovenia	5 2 5	VO1GRC	District 1 319,318 1065 45 113	CQ8M	Azores 6,814,720 5590 126 479	IR7R IQ8BB IQ4CT	1,529,580 1825 115 415 1,190,115 1839 117 382 617,638 1251 71 243	*9M4CKT	2,625 41 17 18 Guam
S59GS S54ZZ	28A 8,957 1.8A 18,872 Spain	81 15 38 350 8 48	VE2PIB	District 2 954,487 1265 81 236	EW5A *EW8ZO	Belarus 13,254,210 7707 178 696 69,745 304 41 144	IR3P IU7GQZ IQ3CO IR2C	531,763 1008 93 296 429,951 712 89 272 314,825 618 71 186 204,851 629 40 87	AH2R NH6JC	6,584,220 4458 146 388 Hawaii 779,207 1919 58 85
EF3O EA5S	28A 48,222	196 23 71 (OP: EA3O) 186 8 45	VE3EJ VC3U *VE3LON	District 3 11,834,130 6049 173 597 4,057,184 2800 139 469 32,660 123 37 78	OT7J	Belgium 71,712 765 16 67	IQ2XI IQ5LV IQ3TN	162,708 320 71 227 121,142 379 60 178 69,700 367 38 132	7D1C	Indonesia 1,852,548 2139 83 234
GW5P	Wales 7A 560	28 4 16	VE6SV	District 6 3,025,599 3481 119 300	E7DX *E7GZ	Bosnia-Herzegovina 15,649,472 8429 179 699 1,014,930 1092 122 415	*IO3F *IQ2DN *IQØTE *IWØEYT	3,311,885 2741 154 559 759,750 940 95 280 60,536 273 46 115	7AØD 7AØB *7AØA *7E1A	178,200 392 66 150 2,700 69 11 16 300,906 603 69 160 35,258 139 37 85
	OCEANIA	OP: GWØEGH)	VE7SAR	District 7 609,000 973 90 190	*E74BYZ	." 8,084 173 8 39 Bulgaria	IWOLIT	43,754 176 38 93 Latvia 835,212 1295 104 385	*7E1A *7E1T *7A5K *7B1K	35,258 139 37 85 32,960 159 42 61 15,600 101 21 39 1,776 25 17 20
NH6O	Hawaii AA 4,940	51 25 27	*YS1YS	El Salvador 762,736 1499 68 179	LZ5R LZ7A LZ2KTS	13,684,872 8264 179 677 1,222,446 1907 105 369 25,252 117 41 77	YL1ZX *YL1ZS	8,960 110 20 60 Liechtenstein	*ZL3AC	New Zealand 4,472 57 22 30
YB2NDX YE3DGO YBØSSF	Indonesia AA 48,768 " 14,553	168 48 79 100 20 43	4A7R	Mexico 43,240 481 19 27	*TK5KT	Corsica 666,027 1186 82 305	HBØA *LX8M	1,712,142 2039 91 347 Luxembourg 3,399,088 3241 134 489	*DX3A *DX9EVM	Philippines 109,032 674 28 38 65,892 530 30 46
YBØSSF YC1LJT YC2CLH YC8IKU	21A 86,204 " 5,328 " 2,688 " 2,142	373 28 64 60 14 22 54 14 18 33 12 22	KP4AA KP4US	Puerto Rico 9,535,011 6621 140 489 340,326 581 68 191	9A5Y 9A9D	Croatia 10,045,200 6072 172 653 72,618 302 38 109	PA6AA	Netherlands 1,340,394 1444 109 397	*DX7HQ *DX2EVM	24,387 321 15 18 23,408 157 32 44
YB1DGG YC8FKN YC8CGK	" 1,140 " 972 " 969	27 9 11 38 10 17 27 8 9	V48DM	St. Kitts & Nevis 304,029 1197 26 85	*9A9J *9A1CRT *9AØKG	1,608,275 1578 128 447 899,200 1698 85 315 132,096 434 68 188	PI4RS PC2L PI4MM	594,863 1249 84 275 404,140 939 54 166 170,595 555 60 195		OUTH AMERICA Argentina
YD8FLF YF7RDM	7A 1,102 " 864	29 8 11 20 7 11	*J68HZ	St. Lucia 7,195,568 6253 128 396	OK5Z OL7T	Czech Republic 8,852,112 5283 176 661 1,767,031 2063 118 409	*PI4KAR *PA6DX	856,000 1085 98 330 481,320 1266 59 193 North Macedonia	LP1H LS2D LO7H	10,619,928 6130 153 483 4,428,813 3669 117 354 4,097,771 3692 117 292
DU7RH	Philippines 28A 392	21 4 4	то5М	St. Martin 8,227,119 6453 130 433 arks & Caicos Islands	OK2KOJ *OL1Z *OL8ØW	872,175 1192 101 334 1,529,280 1706 120 420 PN 298,809 858 61 218	Z35T	4,063,962 3703 132 469 Northern Ireland	L74V LU3DK LT5D AY1V	1,314,950 2040 84 154 945,126 1946 51 131 732,942 1148 85 192 616,759 1338 66 143
LW9HZI	SOUTH AME Argentina 28A 4,046	64 15 19	*VP5DX	4,417,865 4043 112 373	G7C G4ANT	England 4,916,864 3718 151 567 4,122,880 3054 141 499	*MNØVFV	Norway	LU3DNT *LU2UF *LU2HHH	181,584 703 24 73 185,704 546 56 83 147,862 473 45 76
PY9DM	Brazil 28A 28,764	185 18 50	FDAKE	AFRICA Reunion Island	G5O G3B G4R	2,004,944 2147 95 369 1,586,144 1434 115 396 1,356,750 1780 86 316	LA1ØØB LN2G	1,013,842 1546 91 358 301,020 739 62 228 Poland	PJ4G	Bonaire 19,282,256 8999 168 581
PY2MDF PY1CMT PP1ZZ	" 13,167 " 648 14A 7,350	87 18 45 34 5 7 74 14 36	FR4KR	3,872,730 4150 76 258 ASIA	G6AD MØREG *M4Y *MØYRC	1,196,744 1455 103 351 324,532 673 71 245 1,426,062 1788 106 421 79,055 362 40 123	SP8R SO7E *3Z1K	10,226,502 5960 174 648 1,885,930 2318 111 404 1,361,118 1836 119 384	PT4A PQ5B	Brazil 6,330,444 4367 122 402 4,331,516 3598 110 342
CE4WT 3G3O	Chile AA 4,930 28A 308	54 28 30 18 6 5	*RL9M	Asiatic Russia District 9 6,875 60 14 41	ES2B	Estonia 102,295 242 64 141	*SN6E *SP9YGD *SN9H *SP6ZHP	327,316 627 79 267 319,716 690 69 263 254,617 640 61 232 50,978 230 34 108	PY2NA PR2RP ZY2A *PY2RH	1,657,465 1618 94 271 603,351 1176 55 128 25,088 158 18 46 493,619 1172 48 103
MI	JLTI-OPER	(OP: XQ3OP)	*RM8Y *UB8O	782 14 9 14 84 4 3 4	*ES7A	1,996,150 2157 134 516 European Russia	*SP9PBB *SP4KVA	5,940 88 10 50 1,558 45 13 28	*PY2MIG	465 22 8 7 Chile
SING	GLE-TRANS NORTH AME	MITTER	TC3X *TC7G	Asiatic Turkey 5,464,836 4178 102 366 2,722,296 2676 78 294	RU1A	District 1 10,015,776 6439 177 661 European Russia	*CR5L *CR5K	Portugal 1,508,350 1472 113 372 189,750 474 60 193	CB3W CB1C	2,981,394 2816 116 295 2,186,340 2159 114 276
W1TJL	United State District 1	es	*TC7TR *TC3EC *YM3KZ	1,283,040 1598 53 235 71,276 256 23 80 4,704 91 8 34	*R5AN *RZ3DZI	100,035 319 52 143 13,311 110 23 64	*CS4AT	2,478 36 16 26 Romania 490,364 1125 70 262	*FY5KE	French Guiana 13,951,476 6926 152 541
AI4MD NC1CC N1KT	1,218,516	1509 122 415 1025 101 337 1072 94 310 306 58 140	B7C B1Z	China 3,285,696 3158 111 325 2,586,682 2619 134 377	RT4G *RZ4NW	District 4 3,773,172 3679 155 567 B 3,233 41 15 38	*YO4KAK	39,576 195 35 101 Sardinia	ZP5AA *ZP6RAI	Paraguay 3,321,864 3308 98 266 615,846 1116 65 152
NM1B *WW4LL *W1QK	1,168,790	240 55 139 2118 125 446 1035 92 321	BD4UNT B4T BA7MT BG5BWZ	1,832,658 2463 103 251 1,688,094 1989 106 281 383,469 1082 67 152 337,212 713 70 158	*YM1XE	European Turkey A 33,938 258 31 111	ISØANU IQØID ISØBWM	1,758,184 2283 117 421 1,640,935 2518 96 341 1,128,809 1364 122 369	CX5A	Uruguay 2,436,880 2763 95 272
*W1OP *W1JSR	283,884 160,590 District 2	483 59 187 307 52 150	BH2RO BA3RA *BY4DX	183,350 569 62 128 45,123 252 24 65 530,376 1103 85 179	DRØW DP7D	Fed. Rep. of Germany 8,888,808 5194 170 638 6,778,390 4310 163 592	MM2N GM5G	Scotland 4,513,916 3967 132 461 1,107,160 1744 74 282		LTI-OPERATOR
W2IRT *K1RQ	2,067,450 12,144 District 3	1407 118 407 66 34 54	*BI8AM *BY6DX *BD7LMB *BY1TL	492,894 766 74 204 285,440 519 77 179 171,770 492 59 119 1,488 59 15 16	DP9A DP7R DL2W	4,390,779 3019 155 568 1,596,784 1795 123 415 1,132,098 1191 131 430	*GM4AGG	Serbia 631,116 1078 85 288		O-TRANSMITTER NITED STATES 16,260,048 7614 171 627
K9RS K3AJ KC3NNO	7,117,835	3955 151 534 1737 119 390 590 83 252	P33W	1,488 59 15 16 Cyprus 24,948,370 10103 178 700	DP4G DD4A DLØHMK DKØTU	569,916 1030 72 252 560,448 1374 35 133 542,208 1015 84 300 494,550 1117 78 237	YU1AFV *YTØB *YU7GMN	83,864 915 20 68 43,648 257 27 97	K1CC K9CT K2AX	10,751,922 5195 162 576 8,219,670 4765 167 543 6,387,920 3776 139 477
NS3L K3OQ N3SVB	323,424 215,694 15,288	421 73 215 379 44 163 70 20 64	*VR2YIM	Hong Kong 51,409 299 37 64	DR2P DP7P *DLØAJ	312,650 618 72 253 33,880 168 35 86 832,041 1033 101 322	II9P	Sicily 7,345,620 5227 159 573	W2MKM KM8Q AA4VT	6,047,919 3578 138 483 4,197,402 2610 151 487 3,844,200 2475 139 461
*W3ZGD K4RM	958,500 District 4 3,704.810	847 105 321 2211 146 483	*VR2UNG	6,363 123 25 38 Japan	*DC6K *DL1D *DG4O *DMØE	695,296 920 90 298 603,165 893 97 298 299,806 688 76 262 71,115 265 48 117	IO9A OM7M	5,659,192 4974 137 479 Slovak Republic 10,997,343 6361 172 665	KQ3F W4NF K8LX W2EN	3,346,926 2147 131 430 3,150,264 2117 126 426 2,220,568 1551 129 403 1,980,090 1509 111 379
N4UU NJ4P N4SS	3,093,960 2,591,512 2,565,640	2257 130 440 1617 147 469 1732 126 413	JQ1YUF *JA1YAD	District 1 1,341,764 1473 105 251 22,785 115 39 54	*DN2TL	4,582 59 19 39 Finland	*OM6H	301,940 599 75 235 Slovenia	KT7E W8BI W1FM	1,831,648 2257 125 291 1,170,240 1068 114 346 1,099,406 964 92 321
AD4ES W4MLB *WA1F *KT4XA		1222 119 372 1265 111 347 988 90 281 549 85 220	JI2ZJS *JA2YKA	District 2 3,394,593 2433 149 380 348 11 5 7	OH5Z TM6M	4,303,291 3450 167 606 France 14,895,924 7844 178 649	S58Y S58W S54K *S54I	2,404,299 2273 126 375 1,104,964 1207 124 408 611,220 1386 75 259 274,066 959 51 203	WA8MCD WC8VOA NRØT W1SRG	935,730 980 99 271 853,550 873 103 294 682,970 808 90 236 494,560 646 63 218
*AA2MF *AD4XT *KM4WPI	281,162 114,264	354 62 240 273 53 131 93 38 68	JL3ZHU	District 3 261,000 487 77 148	F8KCF F6KRK TM2RJ	3,501,641 3043 141 470 2,620,360 2548 118 427 1,569,960 1977 114 327	EE7P	Spain 5,341,960 4842 115 405	K4GSO K4GIG	341,530 431 77 210 46,800 175 40 77
*W5WX	District 5 6,840	67 28 44	*JA4YPE	District 4 9,729 67 26 43	TM1Q TM1D F6KJS	1,128,810 1931 87 295 896,586 955 104 334 823,137 1322 95 304	EE1G EF3R ED5A	947,169 994 125 426 244,856 790 62 192 224,400 515 74 201	ZF1A VA2UR	DRTH AMERICA 24,295,99214766 160 564 8,744,256 6067 138 474
*KI5UMW *W3XO	1,984 1,595 District 6	28 13 19 21 11 18	*JA5FDJ	District 5 1,465,354 1197 137 336	F6KFV F4KLW F8KHN F5KSE	683,730 978 91 335 524,388 763 90 266 504,450 1007 79 263 477,242 825 84 277	*ED2W *ED7O *ED1B *ED3D	51,408 231 34 85 5,900,622 4531 152 555 3,475,200 2960 135 505 924,288 1327 92 292	VE9FM HP1XT <i>VY2OM</i>	536,760 742 59 221 332,677 523 79 198 270,675 490 57 168
NX6T W6TK	1,482,264	1771 118 228 757 102 218	JA7ZFN	District 7 5,358,936 3076 171 465	F4KJN	476,190 682 96 237 316,799 807 68 203	*EA5RCG		WP3E	137,059 378 51 118 69,310 196 41 104

								J					
EA8RM S79VU	AFRICA 38,749,256 15442 178 690 329,058 613 63 139	PI4CC	8,668,737 5922 157 536 8,092,608 6242 160 586 3,096,320 3638 138 518	K7WXB N7RBL	District 7 141,966 132,258		65 133 77 124		EUROPE Austria			*IU2OZU *IUØPYH *IU4PRA	6,666 87 16 50 1,566 20 11 18 1,248 29 13 19
37340	ASIA	EE4Y MØHFC	2,356,925 2557 132 443 2,295,168 3279 110 406	*KC3OSK *W7BKS	18,480 10,854	106 4 70 3	40 40 38 43	*OE3EDS *OE5MZL *OE1KSG	127,379 60,188 24,600		167 115 6 65	*IU4OAY *IU7OTK	1,020 35 10 24 899 33 9 22
4X7R E2A	13,881,375 7185 140 535 10,417,873 6523 158 509		1,202,016 2052 101 355 1,126,913 1985 94 345 756,448 1149 83 269	*KK7BWJ *KK7FEL *K7DNG	5,148 3,510 3,431	35	22 22 19 26 24 23	*OE7KNK/P	98	9 6		*IU4PRT	36 4 3 3 Latvia
JA7YRR 9M2A	3,960,236 3163 140 329 1,459,350 1956 90 255	PI4D TM8AB	676,368 1042 92 304 308,700 721 67 227	*K7LAP *N7GRC	392 306	16 11	14 14 7 10	*EW7TSW	Belarus 5,777	93 12	2 41	*YL3ANB *YL3ANT	5,670 63 16 38 486 17 6 12
JA6ZPR BY1AS BD4RWR	1,356,588 1723 87 231 1,047,266 1495 94 268 922,320 1878 75 177	LY2ZO CS5CC SP8ZOC	274,572 791 55 206 137,616 425 55 189 63,126 303 47 142	*N7LFO	120 District 8	7	7 5	*ON3BJK	Belgium 2,280	62 6	32	LX1LC	Luxembourg 686,154 1177 83 274
E2E YM3VBR VU3SPD	874,725 1408 85 236 654,522 1189 47 164	IQ2VC	42,560 224 39 121	KE8RCI *N8ACP	<i>23,968</i> 97,913	209	<i>30 77</i> 58 121	*LZ8GT	Bulgaria 204,876	591 63	3 189	*PA1VS	Netherlands
TC3A BVØTY	277,109 501 53 164 168,320 432 45 115 62,274 474 42 65	7A2A	OCEANIA 3,760,680 3082 125 337	*KE8NSW *W1CHL *W8RKW	40,610 14,013 12,567	78 3	43 88 32 49 17 42		Corsica			*PA7TG *PE4I	76,639 296 44 129 40,141 194 37 100 5,723 78 16 43
JA6YBR	20,900 101 39 56	DX1MK 7I3I VK2W	165,767 659 44 75 84,774 282 48 94 67,050 215 62 88	*KE8MOI	10,608		24 44	*TK4TH	308,847 Croatia	1019 44	147	*PD2HSB *PD4V	3,552 77 12 36 2,808 26 15 24
CR6K	EUROPE 19,736,855 11637 174 641	7A3C	22,776 155 37 67	*N9ATF *W9PHL	District 9 41,990 13,090		46 84 29 48	9A5RTW	1,079,910 Szech Repub	954 125	382	*LBØWI	Norway 55,444 225 38 129
EI7M ES9UKR 9A1P	18,787,860 11161 175 631 16,250,324 10585 182 717 15,959,447 9686 179 654	PJ2T 3	TH AMERICA 34,239,262 15729 172 601	*N9NCY *W9KMZ	2,000 1,863		8 17 9 18	OK4AR *OK2BB		161 35	5 57	*LBØGI	580 16 13 16 Poland
ED1R II2S 9A7A	15,804,510 9861 171 626 15,133,842 8712 174 648 14,630,778 8637 174 648	HD1A ZZ3M CB3VS	4,698,446 4110 114 340 218,326 726 64 109 122,496 388 70 104	KFØADW	District Ø 50,410	155 4	49 93	*OK3SN *OK1JCB *OK2MTB	50,974 39,783 21,018	216 41 150 49 119 33	100	*SP9PD *SN3J	320,565 686 70 231 295,875 788 66 197
TM7A <i>HG7T</i>	13,665,560 8328 168 592 11,618,000 7916 169 616			*AEØDX *KFØHCN	550,525 126,224	681 8 273 6	84 221 61 123	*OK3TV	16,892	115 29		*SP7JS *SP3BKR	(OP: SP3DAT) 205,056 545 58 209 152,131 585 47 164
PI4COM UA4M CR6P	10,933,312 6854 165 608 9,517,775 7580 169 606 8,291,052 6817 127 467		(PLORER E-OPERATOR	*KFØIDT *NØJDK *KFØACN	123,633 6,450 286	55	63 108 19 31 6 7	*MØNVK *2EØIGD	England 192,225 74,543		3 175 3 118	*SQ9SEB *SP9ADG	120,564 435 49 155 106,981 378 60 157
UW5Y DP6T	7,766,664 6191 146 550 7,611,910 5145 159 596	S53K 9A1DR	479,765 815 72 233 87,516 291 50 137	*NØLRB	247	23	7 6	*MØLKW *MØYTE	73,235 63,960	392 35 185 48	5 116 3 72	*SQ9MR *SP3WKW *SP2ROC	58,112 385 33 95 48,888 392 22 75 33,516 142 39 75
OR2M IQ4FA EI9E	7,211,372 4574 159 590 6,922,230 4949 154 560 6,772,761 5223 137 502	SQ5EXM W2MRD PY2YAS	16,380 98 27 63 11,304 61 25 47 7,168 61 21 35	*VE2HTC	Canada District 2	001	40 100	*G5LSI *2EØTXQ *MØXFJ	59,305 53,655 25,788	209 40 231 37 137 25		*SP9TS *SP9QBA *SP5BOT	32,900 200 25 69 28,792 218 25 97 23,421 158 30 81
DP6A SX9V	6,642,400 4832 162 598 6,265,332 6110 154 557	1121740	7,100 01 21 33	*VE2KLW	135,590 2,697		49 133 10 19	*2EØGKW *MØRKK	12,410 10,458	97 24 105 15	49 48		Portugal
SO4R DAØT CR5T	5,950,830 5388 145 532 5,940,912 4625 153 579 5,810,375 5072 130 445		PLORER	VE3GJP *VA3OKG	District 3 423,522 331,420		79 200 60 167	*2EØGYI *MØJQQ *M7TDV	9,720 6,466 3,534	99 20 106 13 40 15	3 48	*CS7AWL	151,844 460 49 154 Romania
IR3Z GM2T M4A	4,844,456 3617 161 555 4,670,784 4057 138 510 4,402,200 3643 134 504	OT7T	-OPERATOR 9,900,208 7678 159 617 4,328,676 3987 142 501	*VA3OOL *VE3KOT	166,690 79,092	307 6 196 4	62 149 49 107	*MØKUK *M7DUO	3,358 1,419	53 12 58 7	2 34 26	YO8ERC *YO3DAM	13,376 70 32 56 169,416 482 55 179
DAØRR IO7T	3,555,409 3120 137 474 3,317,137 3112 131 456	EA4URE 9H6A	3,519,552 4109 121 431 3,297,650 4500 111 394	*VE3JZT *VA3PAI *VA3IHG	7,839 2,030 1,875	26	27 40 11 18 7 18	*MØLYB *MØROZ *MØMGZ	648 306 256	16 12 18 4 16 4	13	*YO2MIT *YO8DRV *YO6PLL	46,900 283 34 106 24,444 191 25 72 8,282 93 25 57
IO9R OM5M C37N	3,163,104 4331 119 404 3,062,728 2932 134 488 3,007,248 3302 107 409	EE7K IB2C BY3CQ	1,961,756 2124 131 435 652,320 841 110 343 647,280 1561 79 182	*VE6CLG	District 6 26,677		47 56	*M7XTT	166,014 Estonia	501 52	155	*2MØVGT	Scotland 80,460 407 38 142
PI4M OZ5W OE5T	2,948,470 3038 125 452 2,703,204 2789 139 473 2,521,440 2338 118 392	9M8J EA6URL	231,504 647 66 116 138,533 265 86 195	*VA6TVA *VE6SYD	6,345 4,212	67 2 34 2	22 25 23 29	*ES5TVI *ES5MEL	171,196 51,660		192 137	*GM5TDX *2MØVEY	63,842 327 40 97 3,698 73 10 33
SZ3P OQ4Q	2,232,292 3824 104 354 1,771,684 1739 123 425	R	ROOKIE	*VA6AGR *VE6CLE	2,432 792		16 16 12 12	Eu	uropean Rus District 3	sia		*MM7EST	2,244 50 11 33 Serbia
PAØAA LA4C ED2R	1,448,568 1734 111 420 1,104,813 1688 93 366 1,078,245 1920 94 347		TH AMERICA nited States	*VA7CTG	District 7 48,762	166	51 75	*R3DCY	837	22 8	3 19	YU2MFM *YU4AST *YU4EWW	120 6 4 6 78,937 328 49 144 56,625 315 27 98
HG5KID M3P	327,600 766 68 184 278,850 649 65 221		District 1 42,075 193 16 59	*TI3YAM	Costa Rica 3,840	ι 33 2	20 28	*TA1AQW	uropean Turl 1,155		25	*YT2SIN *YU4MVP	40,880 212 40 100 39,000 183 37 88
LA1K LN1K EA4RCH	254,421 1037 49 194 185,166 1154 31 131 15,106 144 27 56	*KC1OXM *KC1RET *KC1QEM	18,091 98 24 55 65,412 178 33 105 56,574 173 34 92	*XE1O	Mexico 2,870	28	16 25	DD5VL	Rep. of Ger 360,570	542 87	270	*YU1UUU *YU3MPN *YU4BMX	9,450 82 19 56 896 46 9 23 806 26 7 19
SM6XUZ	1,050 35 7 23	*N1KJS *KC1QOD	4,700 48 14 36 630 12 8 10		Puerto Rico)		*DL9DX *DM1KM *DO7OO	313,635 156,972 43,335	634 73 308 73 217 30	3 181	*OM8GRS	Slovak Republic
VJ4K KH6J	OCEANIA 9,331,920 6548 149 371 6,655,584 5692 133 283	*K1NDU *K1THE	440 14 7 13 16 2 2 2	*WP4TZ	266,178	542 (60 158	*DL7KJ *DB3MI *DC5AQ	40,320 33,012 <i>26,795</i>	210 34 196 33 145 34	98		Slovenia
P29RO 7A1A	6,142,680 5098 123 330 1,543,969 1686 99 268	KD2UBH *KD2ZEL	District 2 135,044 252 65 147 143,856 492 25 83		ASIA China			*DGØDM *DJØMA	20,910 14,110	136 32 134 21	70 62	*S55BG *S55AL	106,449 387 32 79 97,614 398 45 129
7AØC VK4DH 7C8C	698,763 992 89 210 510,900 626 101 224 88,163 383 51 80	*N2EPE *KD2VSD	102,912 222 61 131 92,160 227 43 117	*BGØDPG *BI8FRF *BG8KVC	<i>65,040</i> 63,510 44,019	251	31 89 55 91 19 54	*DO2ACR *DL7RBA *DM6LE	13,715 12,920 7,469	92 22 145 24 63 28	71	EF5T	Spain 183,372 609 58 164 (OP: EA5JDN)
7E3E	13,833 102 24 29	*KI2D *KD2WOZ *KD2WDN	67,781 171 50 111 57,624 160 37 110 920 16 9 14	*BI1NJI *BD4SVU	20,425 15,752	123 3 117 3	37 58 37 51	*DJ7NT *DB4REB *DM7AK	6,554 5,850 5,796	76 17 83 16 50 27	3 49	EA4HQV EA3IND	113,120 247 66 158 26,001 173 26 81
P4ØL PX2A	JTH AMERICA 24,628,032 12135 162 542 17,619,751 9789 149 498	K3AK	District 3 613,410 647 82 263	*BG8AMG *BI1JOT *BH1XEC	12,027 7,497 5,865	69 2	16 41 23 40 30 39	*DO1PGH *DO5MN	5,720 5,226	50 19 58 13	33 26	*EA4HKV *EA4HKF *EA5JEG	25,942 135 32 77 687,635 1188 76 279 413,699 641 84 179
PP4T CE3CT	9,509,292 6711 120 387 7,397,297 5365 132 377	W3FR N3AML	544,600 593 91 259 64,800 160 48 114	*BH3CGF *BI8AO *BD4TWZ	5,115 4,928 3,861	62	26 29 16 28 16 23	*DL2MFR *DL9UW *DO1SLB	4,576 4,000 2,691	54 18 48 17 39 15	7 33	*EA2EWL *EA3IMR *EA4HLZ	238,420 526 69 193 45,758 184 40 97 30,464 141 37 91
LU9WE	257,730 745 65 148	KC3UEX KC3RRF *N3BAS	41,796 185 28 80 18,288 123 20 52 126,528 234 46 146	*BD4SVT *BG8KUQ	1,950 1,617	66 30	13 17 14 19	*DL1FW *DO1TLP *DL9LA	1,316 1,218 627	33 8 29 11 26 13	18	*EA4HOT *EA5JBG	16,815 115 34 61 16,554 109 29 64
1	TI-OPERATOR -TRANSMITTER	*KR3L *K3THS *KC3UDO	80,842 194 47 119 55,176 183 41 91 39,788 146 33 83	*BH4FCY *BH3EMV *BG8LCQ	1,225 506 448		17 18 10 12 6 8	*DO1TKL *DO1NPX	600 189	26 7 9 4	18	*EA4HSY	99 8 4 7 Sweden
UNI	ITED STATES	*N3HRO *KC3SVR	27,645 115 28 67 22,040 96 27 68	*BI8CCJ *BD7JJQ *BD4VDA	144 135 48	13 11 7	6 6 7 8	*DB4SCW *DO1SBS *DO2MZ	121 18 8	11 5 6 2 2 2	2 4	SA6OHM *SA6KOD *SA3MGL	51,800 286 35 113 25,480 204 24 80
K3LR K1LZ WX3B	25,835,78411935 184 700 21,461,871 9743 182 667 11,870,899 7000 147 514	*N3BMX *KN1OLA *WB3JAC	21,335 96 26 59 12,250 72 25 45 11,748 71 32 57	*BD4ULO *BH4FBB	16 527	2 17	2 2 8 9	F4JJS	France		204		Switzerland
K1TTT W3PP K1KI	11,127,144 6222 161 588 6,004,999 3451 147 490 5,509,664 3016 147 521	*KC3TYX	156 7 5 7 District 4	*BG3LTM	504 India	36	6 12	F4JPE *F4IVC	247,342 70,200 137,800	332 47 488 51	7 148 149	HB9HHN HB9HID *HB9HRG	197,784 537 54 192 122,783 363 52 147 1,104 46 13 33
K3EST W2A	5,432,178 4234 154 425 3,848,526 2383 136 458	KO4VW KO4DJG	177,310 294 70 168 7,497 62 16 35	VU2EII *VU3IZV	48,944 1,178		39 73 14 17	*F4IYU *F4JJY *F4IZZ	83,990 56,376 15,048	252 50 158 53 87 39	3 109	*HB9HGW	798 18 10 11
K1KP NE3F W3MF	3,700,234 2504 124 418 2,836,592 1882 130 438 2,761,542 1770 129 429	*K1MWH *KY4KP *K4ZMF	250,776 437 57 159 220,834 384 58 160 30,866 111 42 80		Japan District 1			*F4JAB *F4JAW	2,961 2,080 616	43 11 37 10 21 10	36	*US5WBJ	Ukraine 17,738 105 30 68
WT3K W2NPT K5LRW	2,586,612 1669 135 453 237,805 404 60 179 80,852 206 66 98	*KO4IVS *N4TLC *KO4WPO	21,408 104 35 61 8,379 64 26 37	JK1BAB *JJ1VJQ	District 1 16 199,988		2 2 56 117	*F4JAK	Greece				OCEANIA Australia
	RTH AMERICA	*KO4ENU *K4PQL	3,808 83 24 32 3,388 34 14 30	*JK1AUY *JK1ECX *JK1PDC	25,017 3,800 1,891	43	39 54 17 23 12 19	*SV1SXV	147,420 Hungary	451 60	192	*VK3GJG *VK3DLN *VK3KDI	15,760 98 31 49 306 10 9 9
V26B KL7RA	20,092,748 12429 157 519 9,489,835 7792 141 382	*WE4BE *KO4JKV *KO4IJH	1,820 24 9 19 1,365 23 13 22 594 12 10 12		District 2			HA5MIG *HA1GBR	21,186 36,720	191 23 201 37	7 99	*VK3KRL	50 6 2 3 Hawaii
VE5PV VE6AO	1,665,906 3283 79 179 189,572 1183 39 44	*KO4ZRB *KQ4AEJ *N4RAF	104 8 5 8 90 7 5 5 36 4 3 3	*JS2MYR	2,546 District 3	29	15 23	*HA8KM	2,250 Iceland	38 14	31	KH6KW	51,254 234 49 49 Indonesia
D4Z	AFRICA 50,007,304 19262 188 704		District 5	*JQ3DXA	598	19	11 15	*TF3JG	4,087	60 20) 41	YC3BUE YC6HSK	9,882 109 23 38 3,936 64 17 24
CN3A	47,413,520 18558 182 713	W9DCT KI5QKL *ND7C	1,093,680 964 113 307 95,964 288 37 95 18,779 118 33 56	*JO4MJU	District 4 6	1	1 1	*EI7LC *EI7INB	22,464 2,847	143 32 37 16	23	*YDØBCG *YD9BIJ *YC6HRI	20,519 112 22 49 18,408 89 32 46 16,756 88 27 44
A44A JT5DX	ASIA 13,212,196 7418 146 516 8,345,944 6218 138 446	*KI5UTQ *KI5IQE	9,438 60 34 44 4,680 56 10 30	*JJ5RCX	District 5 1,080	26	12 18	*EI9IKB	1,850 Italy	42 10) 27	*YD1REA *YDØASO *YD1CGW	15,912 88 29 39 13,671 99 24 39 13,570 93 26 33
JA3YBK B7P	8,025,864 5171 162 440 7,289,749 5603 154 439	*KI5LST *KC5UXO *KI5PED	3,196 48 21 26 1,767 20 12 19 1,104 19 9 15	*JJØVXN	District Ø 7,182	73 2	23 34	IUØOVB IU1NKS	1,514,955 546,720	876 81	254	*YC4SMK *YF1ANL	11,096 62 30 43 9,954 96 30 49
JA6YLP BI1JY	122,793 333 62 121 98 12 7 7	*KI5RQG *KI5UPP *W5PTX	576 24 12 12 345 9 6 9 209 15 5 6	*AP2MS	Pakistan 11,232		27 45	IUØOPT II3Z	44,649	418 73 274 24 (OP: IV:	1 75 3JAG)	*YD9HJD *YG1AEX *YD3BSB	3,844 52 13 18 1,911 39 10 11 1,770 25 12 18
M6T	EUROPE 21,693,672 12942 180 702	*W5LMO *KI5MFF	36 7 3 3 69 15 10 13		Thailand			IN3IIR IUØPXQ *IU4NGP	20,250 12,826 284,130	120 27 96 18 465 82	7 108 3 35	*YD1CZE *YB1KFQ *YD2UTC	1,360 34 8 12 1,326 23 12 14 1,196 18 11 15
LZ9W YT5A DFØHQ	19,672,752 12698 183 705 19,599,723 12700 183 690 17,362,332 10981 185 712	*KN6ODG	District 6 44,838 146 56 85	*E25CRF	29,264 West Malays	sia	21 41	*IV3JAK *IU1PZX	203,112 58,512	470 68 210 46	3 205	*YD3BTX *YD9GHS	1,054 30 7 10 792 27 8 10
OT5A F6KOP	11,082,512 8610 159 583 9,377,250 7712 160 590	*N6JSO *W6MSN *K6WBY	33,578 132 48 55 28,670 128 38 56 187 7 4 7	*9M2MAD *9M2DGA *9M2BAD	38,133 4,512	262 2 67	14 18	*IU1OPM *IU1OLR *IV3IPA	34,362	177 55 159 37 125 33	101	*YD2CRO *YD3DBG *YD9LAU	735 32 7 8 560 15 7 9 522 30 13 16
LN8W	8,720,502 6750 164 630	NOVVD1	10/ / 4 /	*9M2RAD	36	3	2 2		,50.	. 30		1	3 30 10 10

*YC1DEA 156 8 6 7	District 4 *NF7E	33,375 116 56 69	*VE6ZC 20,174 120 37 40	*JK1BVN 52,734 203 59 82
*YDØAWI 102 8 2 4 KØEJ *YD9RHV 98 12 7 7 WS7X *YG2AZV 42 3 3 3 KU8E	2,636,412 1929 132 366 *N7VS 1,553,752 1585 82 277 *K7ROG 1,088,235 1044 101 304 *N7DB	25,484 109 39 53 25,338 114 33 49 19,436 131 36 50	*VE6GK 16,767 87 36 45 District 7	*7N2UQC 45,360 224 24 60 *JR1LEV 37,149 179 32 55 *JR1DVB 21,472 100 32 56
*YG3AUH 35 20 2 3 AC4G *YG4SAP 27 7 1 2 N1LN	472,068 545 97 227 *NS7U 400,650 976 30 120 *KC7STK	17,889 81 41 48 16,131 103 19 38	*VE7COR 12,810 132 17 25 *VA7RYL 720 19 8 12	*JR1EMO 19,840 104 35 45 *JK1EXF 7,020 47 23 31
*YG3ASH 18 3 1 2 W3DQS *YB1BBW 2,479 37 16 21 NE8P *YC8IKU 2,142 33 12 22 W4FNZ	263,592 391 65 187 *WB7EUJ 233,112 736 30 102 *KI7MJU 198,882 326 82 179 *WAØPFC	15,570 141 40 50 14,220 79 39 51 13,130 75 27 38	Cayman Islands ZF2AA 3,170,244 4470 89 240	*JJ1KZZ 5,760 52 17 28 *JL1FAR 4,004 33 17 27 *JA1CHY 2,310 27 15 20
*YD2UFR 1,725 53 9 14 K4BAI *YC8CGK 969 27 8 9 WN3F	143,927 269 57 146 *KC7MDT 100,470 237 46 124 *N7JOE	10,030 66 29 30 8,192 53 28 36	(OP: VE9AA)	*JL1WRV 2,117 37 10 19 *JH1RDU 1,798 28 14 15
Marshall Islands WA8YVF *V73MS 13,056 98 31 37 KN4LIU	100,392 210 57 131 *K7BWC 89,670 231 36 111 *W7MTL 55,577 152 49 100 *AC7MX	3,100 45 12 19 2,106 27 20 19 1,815 51 17 16	Cuba *CO8NMN 793,026 1598 70 164 *CO8ZZ 241,533 839 47 94	*7K1BIB/1 697 21 7 10 *JH1VIX 273 9 5 8 *JH1HHP 228 16 9 10
New Zealand N9GQA K4NWX	53,636 230 36 70 *WU7W 53,190 146 42 93 *K8TX	1,716 30 18 21 1,443 27 17 20	Guadeloupe	*JE1SPY 160 44 5 5 *7K1EAS 40 14 5 5
*ZL3PIE 9,920 69 26 36 NC4S *ZL3CRG 5,814 48 20 31 KM4ALL *ZL2MLQ 980 26 15 20 K1GU	49,147 163 29 90 *KD7WNV 48,622 119 49 102 *KI7ILD 37,560 130 40 80 *N9NA	1,376 33 22 21 441 18 11 10 126 10 9 9	*FG5GP 1,336,504 1832 67 217 Mexico	*JJ1BDX 36 3 2 2 *7L1DST 1,728 30 10 14 *JK1NWD 1,430 29 12 14
Philippines K3WR KR4EZ	24,232 102 37 67 *KJ7AKV 14,948 94 24 50 *K7JSG	90 5 4 5 56 4 4 3	XE1CKJ 346,060 1383 44 77 *XE1ZTW 38,241 254 18 45	*JEØCBS/1 1,035 18 11 12 *JI1AEP 435 11 6 9
*4G1FKH 35,112 276 20 36 KA3MTT *4G1OAL 1,007 27 9 10 W3UO *DW2KED 377 18 6 7 KJ4BIX	14,560 69 38 53 *N7SMD 11,537 75 36 47 3,744 43 8 24 *N7JI	18 5 4 2 35,805 152 47 46	*XE1CIC 35,464 375 15 29 *6D5C 14,040 121 23 31 (OP: XE1H)	*JA1GZK 250 11 5 5
SOUTH AMERICA W8FN *WW4XX	3,597 40 9 24 1,303,932 1168 97 302 KD8NKY	District 8 48,224 144 39 98	*XE1SVT 2,272 29 16 16 *XE2N 210 14 8 7	District 2 JG2CNZ 181,050 338 88 125 JE2BOM 122,230 276 58 112
Argentina	(OP: LZ4AX) KE8E 524,210 605 82 228 K2PM 259,182 403 64 174 W8SJS	44,954 152 42 91 9,555 157 16 33 272 12 7 9	Panama *HP1RIS 20,493 114 18 51	JA2JWH 53,568 202 52 72 JR2ALA 7,875 70 18 27
*LU1XAV 5,320 67 14 21 *WA4JA *NC4MI	155,020 270 72 158 *N8II 150,500 317 42 133 *N8BAP	326,960 852 26 108 224,013 331 73 194	Puerto Rico	JH2DFJ 63 7 4 3 *JG2RFJ 184,828 375 65 131 *JI2KUJ 30,456 110 38 70
Brazil *KM4SK *PU4BOT 26,274 199 16 42 *N3GB *PP1BM 18,645 164 14 41 *KW4SW	139,744 294 47 129 *KW8KW 119,704 399 22 82 *K7DR 119,144 221 71 141 *N8BV	94,119 251 43 94 82,998 202 59 100	*WP3GW 139,440 332 50 116 *KP4YO 85,590 264 39 96	*JS2PHO 25,368 135 36 48 *JA2KKA 18,300 104 30 45
*PY2AAK 16,461 132 16 43 *K4TMC *PU2VPW 11,200 146 19 37 *W4IOD	114,814 348 25 93 *K2SY 105,165 243 46 125 *W8EOG	38,500 119 30 95 25,764 99 42 72 4,320 39 18 30	Sint Maarten *PJ7PL 204,210 1051 23 67	*JR2GYA 24 7 4 4 District 3
*PU7HLT 9,672 98 15 37 *KV4ZY *PU7BEN 9,650 85 13 37 *K3YDX *PU1KVD 2,475 58 13 20 *K4SBZ	84,348 160 52 146 **KC8R 71,380 169 53 113 *NF8M 61,593 173 44 103 *KE8TTU	4,233 33 22 29 3.942 40 20 34	US Virgin Islands	JR3RIU 229,779 441 73 138 JP3UBR 20,060 98 34 51
*PU4WTB 1,843 75 6 13 *W4WCD *PT2YW 1,400 49 10 18 *K4FJW	56,677 184 52 105 *AA8SW 54,806 152 45 89 *KE8BNE 40,500 195 22 59 *KD8TJB	2,470 29 15 23 1,989 24 18 21 966 18 7 14	KP2M 4,586,904 4450 111 345 (OP: KT3Y)	JA3QOS 7,844 74 19 34 JL3DQX 936 22 13 13 *JL3MCM 352,898 502 94 183
*PY2OKW 260 12 7 6 *N4OO *N4DJ *N4DJ *K4FTO	40,500 195 22 59 *KD8TJB 31,680 111 37 73 *AD8JL 26,558 111 31 67 *NK8D	850 20 17 17 154 6 5 6	AFRICA	*JP3KPJ 63,228 195 53 79 *JJ3TBB 61,600 192 51 89
Chile *AK4VQ *CD6LKR 5,004 64 13 23 *N4LKB	23,496 101 26 62 14,773 70 21 58	District 9 565,211 640 88 229	African Italy *IH9/IK5AEQ 1,558,025 1756 72 235	*JA3KDJ 3,800 55 17 23 *JA3BBG 88 5 4 4
*CA6JQN 1,340 32 5 15 *KN4IXT *K4ADX *K4WY	10,668 59 32 52 W9GT 8,208 73 13 35 N9JR	302,016 445 65 177 221,892 368 70 176	Canary Islands ED8M 3,979,508 3270 94 318	*JE3AKU 6,783 73 22 29 District 4
*PJ2SD 8,816 70 21 37 *KA1RRX *K8MR *KB6QPI/4	8,016 74 14 34 K9YZ 7,705 46 28 39 K9XN 6,264 42 21 37 KJ9C	197,028 319 67 167 196,140 355 61 149 44,826 179 22 71	(OP: EA8DIG) *ED8B 415,093 1103 29 104	*JH4FUF 5,852 60 14 24
CLASSIC *K4QR *KV4AC	5,085 52 12 33 KØPG 4,386 42 12 31 *WD9CIR	15,386 80 42 56 285,500 429 68 182	*EA8BQM 209,838 600 42 81 *EA8AUW 5,734 44 18 29	District 6 JA6BZI 694,127 808 94 229
NORTH AMERICA *WS4Z *NS4E *KF4NQN	1,232 24 8 14 *N9EAX 972 16 13 14 *NY1V 6 1 1 1 *AC9TO	168,036 284 68 160 149,917 289 54 143 99,858 218 62 116	*EA8DIG 210 7 3 7	JA6BWH 237,931 399 72 157 *JA6CVR 57,204 200 47 79 *JH6FTJ 54,050 184 43 72
KQ2M 4,467,840 3412 117 363	bistrict 5 *KB9OZI *W9IZ	85,424 218 49 103 73,304 178 52 102	Kenya 5Z4FV 407,268 604 66 177	*JG6VMO 5,720 60 15 29 *JH6SCA 1,500 26 11 14
W1JQ 1,035,954 918 88 314 N5YT NG1M 807,234 1019 71 220 N5AW W1WEF 624,987 723 80 241 WQ5L	820,386 803 106 277 *W9QL 772,213 956 84 227 *KC9GPY 692,289 858 79 212 *N9UPU	64,155 240 27 78 56,100 172 49 101 38,674 129 44 78	Madeira Islands CT3KN 4,838,712 3727 105 339	*JF6ABL 1,464 25 12 12
K1RM 235,524 741 24 90 KM5VI K1RO 234,080 373 55 169 AI5SF	654,922 887 89 228 * <i>KF4LXS</i> 320,712 439 88 188 *NV9X	15,488 80 33 55 10,686 63 27 51	Namibia *V55AF 326,043 804 44 109	District 7 JG7AMD 968,365 1229 93 200 JH7QXJ 842,786 1208 89 170
NE1RD 116,571 238 57 126 KD5QHV W10HM 48,678 153 34 88 W5ORC W1FQ 21,229 116 18 53 N5TJ	238,387 408 69 154 *KC9YL 235,470 396 67 168 *K8VGL 177,030 316 60 150 *WA9EKQ	9,438 71 24 42 7,326 52 29 37 3,366 35 20 31	(OP: V51MA) *V51WW 732 126 19 42	JA7QVI 513,024 1103 51 116 JA7OWD 184,016 713 36 70
W1HI 19,093 121 14 47 W9DXM W1/PY1MX 13,410 99 30 60 *WA5JMZ	9,240 84 29 41 *W3ZAP 259,316 418 73 168 *AJ9U	1,560 24 9 17 1,392 18 12 17	South Africa *ZS1AO 338,040 567 51 165	JA7GFN 50,050 155 48 82 JA7VEI 14,427 83 30 33 JA7UES 13,926 73 27 39
*K1BX 1,593,606 1402 92 307 *AI5NE *N1DC 393,666 527 67 206 **M5CUB	169,274 293 75 139 *KD9GN 101,200 227 61 115 50,140 172 40 75	952 16 12 16 District Ø	*ZS6HI 36,630 129 43 68 *ZS6ELI 18,260 85 32 51	*JA7HYS 88,218 290 33 84 *JA7KHQ 4,361 37 21 28 *JA7MCB 2,108 24 16 18
*KA1YQC 293,702 412 66 196 *K5TS	29,070 108 41 61 WØETT 24,150 83 37 68 <i>W7RF</i>	282,462 432 85 178 214,130 359 78 152	*ZS6MDX 475 24 12 13	*JA7RPC 250 9 4 6
*K1HT 166,662 303 58 139 *KC7QY *KR1A 164,101 314 50 147 *N55KT	23,587 102 43 60 KJØI 17,301 89 26 53 KØBBB 1,537 36 12 17 NØZB	210,784 352 77 147 106,743 355 30 89 85,842 188 50 121	ASIA Asiatic Russia	District 8 JA8RUZ 550,314 866 88 170
*WA1HXH 121,638 241 63 131 *K5TMH	1,488 24 6 18 K9DU 360 12 10 10 KØJM	68,175 187 39 96 48,396 137 51 97 36,894 162 21 65	District 9 *UA9CAW 153,472 340 41 135 *R8KAY 18,183 107 30 57	JH8XVT 195,585 367 78 143 *JA8RWU 338,504 538 89 173 *JM8FEI 45,310 174 46 69
*ND1T 56,832 161 32 96 *K5HV *N1ADX 56,400 152 39 102 *K5HRB	286 9 6 7 WDØJ 255 12 5 12 AG7O	32,038 164 23 60 6,014 59 25 37	District Ø	*JM8SMO 20,498 111 27 47 *JR8QFG 19,584 108 29 39
*N1OIG 42,066 135 32 82 *KØMHC *WB2ITX 39,445 125 32 83 *KI5AHF	216 8 3 6 NGØE 88 7 4 4 *NGØC	1,196 17 10 16 259,080 418 76 178 182,781 332 68 139	RØQAF 6,048 56 23 40 Asiatic Turkey	*JE8UHY 6,960 58 27 31 *JA8HBO 1,560 44 12 14
*NV1P 11,040 68 19 41 *KG5TKV *K1NZ 4,452 36 21 32 *N3CI	8 2 2 2 *WØSJE 19,926 95 23 59 *KBØARZ	128,694 295 63 115 73,920 192 58 110	YM7KA 1,147,720 1475 62 218 (OP: TA7I)	*JA9NEG District 9 *JA9NEG 608 16 8 8
*K5ATA 3,577 33 19 30 *N1YIS 3,234 32 21 28 *KC1NCN 2,926 31 12 26	*WBØLQC *WØPI *WYØX		TA2ANL 141,344 443 26 86 TA4ORZ 89,100 214 46 116 *TA7I 8,046 63 19 35	District Ø *JIØWVQ 10,140 94 27 38
*N1UMJ 1,472 39 8 24 K6NH AJ6V	505,047 842 84 153 *KOØZ 505,047 842 84 153 *KØSCO	43,310 141 51 91 38,571 133 49 80	China	*JHØDUG 6,435 57 25 30 *JAØOWR 24 3 3 3
KN2M 1,466,874 1149 120 334 W2CN 465,885 550 83 232 K6YK	(OP: NU6S) KBØCFD 193,116 341 75 153 *KBØCFD	25,830 124 25 57 22,320 100 34 59 5,412 57 16 28	BG9NJY 62,064 195 38 106 *BH3PLA 57,387 203 46 95 *BD6JN 43,722 187 48 78	Kazakhstan *UN1EAU 23,058 96 43 83
KC2G 332,555 415 80 213 WD6DBM KB2DX 25,990 89 42 73 WA6URY KC2BBI 14,364 68 24 52 W6JBR	80,850 239 65 82 *KKØD 68,089 181 54 83 *KDØFAR	2,679 37 22 25 575 13 12 13	*BD3OD 14,442 116 36 51 *BH3DHE 9,016 85 17 32	Kyrgyzstan
*N2MTG 216,648 357 70 166 KE8FT WA6MRK	64,480 259 30 74 KDDYPH 48,678 143 55 78 KDDYPH	560 15 9 11 247 12 10 9 47,229 188 24 67	*BG8INK 8,619 77 16 35 *BG8KCQ 7,065 70 14 31 *BG8IL 7,065 70 14 31	*EX8MK 1,320 22 12 18 Lebanon
*KE2SD 125,660 247 63 143 N6TTV 12,994 67 27 46 N6TTV 14,994 67 27 46 W6RKC	2,982 31 20 22 2,001 30 12 17	840 18 10 10	*BD6AHP 6,976 62 28 36 *BH4LFG 1,190 51 16 19	*OD5UI 165,321 401 35 122 *OD5ZF 4,794 57 7 27
*K2HVE 682 21 6 16 *N4DLA *W2VJ 276 8 4 8 *K6TLH	56,848 168 56 80 24,057 98 40 59 20,930 121 33 32	Alaska 119,966 321 61 93	*BH4TIH 16 14 2 2 *BH4TQX 260 26 5 5 *BI1JNP 176 16 6 5	Nepal 9N7AA 2,264,925 2601 85 260
*K2JF 12 2 1 1 *KQ6UP *WR2RWII 8 2 2 2 *WK6A	10,140 61 38 40 8,580 59 29 37	Canada District 1	Georgia	(OP: S53R)
*NF2L 22,892 94 34 63 *K6KTS *W6EMR	8,308 67 29 33 VA1XH 3,960 37 23 22 *VE1BSD	502,806 656 71 211 64,625 189 39 86	*4L9M 57,519 272 17 60 (OP: R3XA)	Saudi Arabia HZ7C 401,604 986 36 111 (OP: 7Z1SJ)
K3FF 382,382 498 68 218 *KJ6PTX *WWØMAN	2,574 31 20 19 *VY2LI 1 2,244 26 14 19		India VU2IBI 141,185 362 39 112	*HZ1SK 405,840 1197 27 93 *HZ1CY 129,753 416 30 87
4U1WB 246,642 570 62 160 *KM6RRS (OP: AJ3M) *KG6YJ	1,558 35 19 19 1,452 24 17 16 VA2LGQ	6 500 60 14 04	*VU2SMS 69,278 202 37 97 *VU3GDS 52,771 206 28 85 *VU2MCW 450 17 11 14	Thailand *E22UUW 52,488 317 24 57
N3LH 196,900 338 62 158 N3MWQ 94,800 223 43 115 W3BGN 59,013 392 15 64	District 7	District 3	*VU2MCW 450 17 11 14 *VU2JOS 240 15 6 10 *VU3LMS 40 4 4 4	West Malaysia
WW3HAM	2,337,120 2154 130 302 VE3TW 515,508 750 90 176 VE3GYL	636,222 736 80 241 452,760 758 70 175 216,112 389 53 155	Israel *4Z5MY 308 8 6 8	9M2HUS 72,625 340 36 47 *9W2AIX 46,575 388 21 48 *9W2FSY 504 16 8 10
*KD3HN 98,102 194 52 129 K9JF/7 *KD9QS 82,082 341 41 102 N7RQ *NH7TV 47,082 145 34 84 K7JQ	269,001 949 30 93 *VA3DBT 157,341 345 68 111 *VA3MLV	143,336 303 54 130 131,859 626 23 68	Japan	EUROPE
*AB3JF 41,344 134 43 93 <i>WE7H</i> *WM2Y 38,186 116 39 83 K7MY	66,880 160 57 95 *VE3TM 34,540 141 40 70 *VA3CK		District 1 JK10LT 972,360 1121 107 226 JR1GSE 637,377 922 101 176	Austria *OE3KAR 41,952 206 36 116
*WD8RYV 23,310 88 33 72 WØFLZ *NR3S 23,184 99 24 60 N7VGO	23,712 96 47 57 17,672 81 40 54 VE5CPU	District 5 57,475 190 46 75	JA1CRJ 121,680 252 65 115 JH1CTV 91,044 264 55 107	*OE5MKE/P 2,574 70 8 31 *OE3MCS 1,325 25 10 15
*KB3RKM 15,675 74 24 51 W7FD *K3ADA 12,975 64 24 51 KI7Y *N8URE 12,283 68 21 50 KE7NLU	14,616 83 36 48 *VE5SKI 10,207 63 29 30 *VE5GC 2,914 38 20 27	2,366 87 7 7	7K4GUR 60,129 179 41 90 JR1NHD 3,483 45 14 13 JA1FNO 850 20 8 9	*OE5WEO 6 3 3 3 3 Balearic Islands
*AJ3DI 3,956 35 17 29 K5IB *N3UP 770 16 9 13 *N7VZU	36 4 3 3 99,351 223 59 112 VE6IVN	District 6 82,450 210 60 110	JH1LYE 782 18 7 16 *JS1KKY 364,560 578 84 161	*EA6OM 77,478 286 31 80 *EA6VY 22,624 149 26 86
*N3WS 3,800 45 21 29 *W7TMT	65,554 188 56 90 VE6CA	3,892 67 11 17	*JO1VVT 62,980 184 52 82	*EA6AOH 19,656 141 32 85

*EU1VA	Belarus 145,068 403 57 Belgium	74 *ES5RIM *ES6KW	1,885 65 4 25 42 4 3 4 European Russia	F5LIW F5LBL F5PCV	France 574,864 44,339 34,510	913 70 178 223 26 75 152 30 55 10 5 6	YL2PJ *YL2LW *YL2NK *YL3GY	97,152 36,990 32,964 23,575	228 26 1	69 *IT9FRX 08 *IT9EWR 84 *IT9BGE	54,480 225 37 83
ON7QC ON7ET OR7G *ON5UJ	59,409 215 41 36,801 113 47 22,140 375 12 319,908 574 82	94 *RC5Z 48 *RN3DN	District 3 489,211 917 80 287 318,396 670 86 252 213,070 503 72 214	F1UTB *F4WDL *F4BIT *F4ETG *F5GN	308 341,820 287,260 234,000 76,791	10 5 6 609 83 241 613 66 205 529 61 179 197 55 124	LY1M *LY2EW *LY5GT	Lithuania 10,650 53,048 16,165	126 16 329 31 1 308 7	21 *OM4IK 46 *OM6APF	10,184 118 19 48 Slovak Republic 208,025 573 61 204 55,645 287 32 123
*ON8LX *ON4MAD *ON7DC *ON5GF *ON4SC	47,346 595 13 40,680 203 32 21,816 156 27 7,301 78 16 2,193 27 19	65 88 81 * <i>UA4FDK</i> 33 *R4PCT 24 * <i>UC4Y</i>	District 4 88,788 279 52 144 28,595 155 37 96 22,230 132 26 69	*F4IGP *F4IIQ *F5JME *F4IAY *F4DVO	68,850 54,378 53,397 49,800 29,869	269 39 114 247 42 129 314 36 117 167 45 105 227 27 92	*LY2NK *LY4T *LX1GQ	9,750 2,880 Luxembourg	90 4	43 *OM3CDI 28 *OM8AG/ *OM8JP *OM7SR	N 34,840 257 26 108 A 25,536 211 20 76 14,381 155 18 55 2,940 72 9 33
*E7/Z35M	8,268 124 9 snia-Herzegovina 117,552 582 38		District 6 4,316 39 18 34	*F1DJE *F1ICR *F4IAW *TM9ØGF	28,602 18,000 12,800 11,904	177 30 96 138 17 43 116 19 61 158 25 71	*ER1JA	Moldova 145,886	636 35 1	*OM7AT 46 <i>S5ØLD</i>	500 20 8 17 Slovenia 21,597 172 18 51
*E77SH *E76MB *E73EKK *E7ØE	56,072 160 55 35,100 160 38 22,785 157 26 (OP: E73 3,360 115 6	92 *R6DOP 79 (T)	109,335 421 46 151 4,646 82 10 36 District 9 20,838 213 14 55	*F4HRN *F4HVV	4,284 133 Greece	(OP: F4AHN) 55 24 44 19 6 13	PAØMIR PA9JO *PA2VS	Netherlands 60,705 <i>27,621</i> 22,310 12,220	249 47 1 179 29 204 23	70 *S55C 74 *S53WW	7 324,065 601 81 248 217,476 549 63 189 133,425 439 51 174 111,930 317 52 130 35,910 197 29 76
LZ5Y *LZ7M	Bulgaria 779,708 1209 89 (OP: LZ1 86,490 260 55	E) DI acc	18,286 150 20 62 ed. Rep. of Germany 2,677,106 2606 111 346	SV2DSJ SV1PMR *SV1PMH *SV1OCQ *SV2RZJ	693,500 558 261,765 43,654 14,652	1387 93 272 31 7 11 602 67 210 211 41 105 128 25 74	*PA3DBS *PA3EQN *PD2GSP *PA3HLE	12,150 5,335 5,029	39 20	*S53KS 59 *S53NW 33 *S57WW 27 *S5ØBH	25,288 440 7 51 20,520 160 23 85 1,862 41 11 27 Spain
*LZ5PL *LZ/VA7BTE/F 16 *LZ3AW	(OP: LZ5 21,109 118 35	66 DH1UK DMØA	619,320 1033 90 300 561,260 771 89 291 498,400 1760 36 104 (OP: DK4EE) 409,596 621 85 234	*SV1RVI *SV7CUD *SV1AGU	7,381 2,385 20 Hungary	104 12 49 33 18 27 6 4 6	*MIØDWE	Northern Irela 4,750 Norway 476,354	53 18 802 78 3	EASDFV EA3CI EC7R	4,027,944 3507 127 425 2,543,590 3072 99 307 2,125,164 2464 100 333 545,904 1973 33 111 522,692 1327 37 112
<i>9A3DUH</i> *9A2KI	Croatia 620 13 8 9,344 122 18	DL4ABR DJ8FR 12 DF6RI 55 DB3FJ	188,436 530 55 191 126,801 361 49 144 97,608 260 46 122 58,050 252 39 111 21,600 260 13 62	HA1BC HA2D	766,035 48,336	(OP: HA9MDP)	LB3AG *LB1R *LA7WRA	6,400 1,566 20,631 Poland	43 28 34 9 243 13	20 56 EA3HJO	(OP: EA3ATM) 230,396 625 61 180 29 500 190 17 42
*9A1EA *9A2RZ *9A4OP	8,400 72 23 832 30 8 39,837 209 40 Ezech Republic	DKØSU DL6SBD DK1FW DL4JY	17,577 125 23 70 (OP: DF7SA) 7,526 63 26 45 6,050 47 19 36 3,150 38 15 20	HA5EA *HA5BMS *HA1TI	13,440 17,280 3,232 Ireland	127 17 53 116 31 65 107 4 28	SP5ICS SP9JBE *SP9DTE *SP5UFK *SP8CHI	84,711 11,016 415,373 339,480 160,716	284 44 1 83 19 720 78 2 706 74 2 422 59 1	49	(OP: EA2SN)
OK2ZDL OK1XC *OL5Y *OL2A	131,800 324 59 102,312 400 29 927,639 1010 96 143,424 434 50 (OP: OK2PI	41 DL2DSA 87 *DP5P 27 66 *DC2AN	1,947 82 6 27 417,544 816 72 256 (OP: DL1MHJ) 304,580 600 70 244 170,407 475 55 184	*EI4KU *EI2JIB *EI3LC *EI3CTB	385,776 14,608 4,779 16,600	743 69 235 180 21 67 59 20 39 149 22 78	*SP8IMG *SQ9ITH *SP5TE	134,160 131,556 131,250	461 31 (OP: SP8M 265 76 1 404 53 1	77 *EA3T 99 *EA3W G) *EA4GJT 52 *EB3AKL 57 *EA5AML	83,260 295 32 83 54,576 216 38 106 36,237 172 37 104 22,011 132 27 60 21,912 138 27 61
*OK7N *OK2BZE *OK1NYD *OK1DXW *OK1LO	129,800 328 67 62,832 328 29 62,328 209 42 21,301 150 31 16,701 134 16	69 *DL7VX 90 *DL2RPN	134,532 436 47 175 108,605 361 49 154 101,332 300 50 138	*GDØAMD	Isle of Mar 82,641 Italy		*SP2TMT *SP5DRE *SQ6POC *SP8UFT	98,078 95,996 71,980		% *EA5JDG M) *EA4ESM 33 *EA1BCK 56 *EA4WF 91 *EA4FIT	16,833 119 29 64 15,660 105 24 63 14,973 184 13 56 10,890 87 19 47 10,863 79 24 47
*OK3MAT *OK7R *OK3FLY *OK1TVL	16,296 148 18 13,160 351 5 (OP: OK1TI 9,504 94 28	66 *DK3YD 35 *DM6EE M) *DO1IBJ 60 *DL9HB	99,645 281 50 145 97,271 319 55 156 86,565 273 40 105 79,170 251 46 128	IZ1OSP I1NVU IZ6ERS IU5GBQ	513,166 499,998 426,504 379,600	1020 91 288 628 101 233 1033 74 238 1119 77 215	*SP4SP *SP1DMD *SP7LK *SP6LUV *SQ7OTK	61,242 39,431 32,184 26,255 25,625	226 22 467 9 139 39	89 *EB3A 86 *EA2AVN 50 *EA2XG 86 *EA2RS	10,296 79 21 45 7,535 67 18 37 1 6,273 75 12 29 960 27 6 18 324 16 11 16
*OL5G OZ11A	216 12 3 Denmark 982,464 1851 81	3 *DD3JN *DH9DX/F *DL1RTO *DKØBM	59,008 211 39 89 56,834 340 40 117	IZ2BVC IU8NKW IU1FSL IZ1SAI IK8NSR	257,853 167,170 152,964 145,530 89,420	600 47 163 241 58 112	*SP5TM *SQ8W *SQ8T *SP2AWJ *SQ3DQ		153 33 174 14 119 27 107 25 123 20	92 *EA3TJ 52 *EA4U 79 71 59 SEØDX	19,570 135 26 69 8,040 68 21 46 Sweden 204,765 401 69 186
OV1RR OZ1HHH OZ1D	9,800 68 17 (OP: OZ 2,376 36 8 (OP: OZ 1,222 25 8	14 *DM5CQ D) *DF9IX 18 *DL8ZAJ	(OP: DK7CH) 49,266 242 39 114 40,171 173 38 101 38,586 179 33 85 38,135 178 38 107	IZ8DSX IO4M IZ1HHT IU1QCW IK2IKW	67,496 45,540 31,137 30,744 15,345	236 30 88 201 43 89 148 35 72 100 44 78 87 31 68	*SO6MZ *SP2TQQ *SP2HSA *SP2GR *SP8D	13,200 12,096 7,590 6,762 6,448	118 22 70 21 118 9	70 SM3PZG 62 SFØD 45 SM6YEC 31 SD1A	47,082 228 40 93 30,345 285 19 86 (OP: SMØDSF) 28,380 172 30 80 14,472 126 16 51
*OZ4NA *OZ8ZN	England	58 *DO9YY 15 *DA9L *DHØGDS		IZ1HCS IU2JFG I6KIU IZ3GJL IU3KMF	13,923 7,300 6,858 6,604 304	179 17 74 142 9 41 51 20 34 137 10 42 24 5 14	*SQ5AAG *SP8VGA *SQ9PPT *SP9MUF *SO2U	5,863 3,776 315 77 125,292	77 13 26 3 8 5	26 SE3T 46 SE3T 12 *SJ7M 6 *SGØM	(OP: SM1TDE) 405 9 6 9 106,536 399 45 139 94,326 356 46 153 (OP: SAØAQT)
M4T G9D GØCNN	1,061,309 2089 83 (OP: MØBE 225,852 520 59 (OP: G6NI 169,970 491 50	W) *DG7AK 77 *DM3AW IU) *DO1FPT 80 *DL2RZG	28,184 152 31 73 25,404 150 33 83 25,056 127 30 66 22,338 143 28 74 21,560 129 21 49	IZ1DXG *IK7NXU *IUØDHV *IZ2BKA *IU7EDX	32 266,000 246,960 215,760 114,680	4 4 4 471 71 195 504 75 219 496 59 181 324 51 137	*SP9UA *SQ5SAA CT7AQS	5,917 1,440 Portugal 35,392	32 11	44 *SA6CCZ 19 *HB9FLX 45 *HB9GFF	20,904 174 22 82 Switzerland 27,480 137 39 81
G2C MØORH MØAQM MØDSK G4L	92,127 371 28 44,154 291 24 41,238 425 15 34,194 171 37 31,218 300 17	79 *DK8PL 75 *DM2DLG 64 *DL5KUD 86 *DL4SHE 69 *DG3NAB	21,120 153 31 89 17,985 160 27 82 16,456 126 17 51 15,747 93 32 55 15,576 164 19 69	*IW2NBL *IZ3XNJ *IU3GJD *IKØALT *IW2ENA	109,616 97,983 90,816 87,087 79,348	414 43 165 302 48 143 357 42 150 298 48 155 244 50 116	*CT2KNA *CT2HKY	277,405 616 Republic of Kos	1352 26 30 5	83 *HB3XAG 17 *UT3SO 7 *US6IKF	
MØLTE *MØPLX/M *G4DDL	(OP: G4L 22,351 150 27 289,044 708 63 (OP: MØPLX 220,704 581 57	76 *DC6GF 16 *DA9A M)	14,685 122 22 67 13,612 111 24 58 12,348 80 22 41 (OP: DO1NPF) 9,867 123 14 55	*IK2DJY *IWØSAG *IK2OFS *I5OYY *IZ3ZLT	64,080 60,060 58,674 53,222 52,635	169 60 120 233 41 113 204 45 82 136 48 130 193 41 104	YO3RU YO8BDW	Romania 775,376 446,224	(OP: DO2)	*UW8SM *US7UK *UR1HR 81 *UR5WC	77,264 283 47 129 50,616 188 53 118 43,624 124 49 84 Q 35,105 331 17 68
*G1K *M1VPN *MØYKS *MØJND	198,860 588 54 (OP: MØR' 161,394 561 48 154,000 364 52 135,218 394 49	Q) *DL9ZWG 74 *DL1WMF	9,317 98 20 57 9,184 88 22 60 8,162 82 21 56 7,038 46 22 29 6,887 52 28 43	*IZ8QPA *IU3MEY *IK8ARF *IU7GRA *IZ1DNQ	36,234 31,868 31,696 29,116 29,104	278 31 91 166 37 87 143 39 73 163 37 79 124 34 73	YO3GNF YO2AA *YO7SR *YO8/LZ4U *YO6EL	345,153 98,235 619,440	727 73 2 316 45 1 1127 81 2 726 53 1	49 *UR5UJ 36 *UT7NY 40 *UX3UU 67 *UT5UUV 90 86	•
*MØKPW *M4M *GØJDL *MØTQR *G8ZRE	132,354 448 42 111,864 344 42 98,452 359 38 54,426 220 38			*IU4DAF *IZ7VII *IK4MTF *IU7MEZ *IU3BPW	28,107 26,973 14,245 13,056 12,852	242 18 63 117 36 75 87 26 51 84 36 66 93 24 44	*YO4RST *YO5PUV/F *YO8TNB *YO3CIY *YO7PED	177,375	399 58 1 150 34 219 12 103 27	57 GW1W 74 55 *MW8R	Wales 50,634 332 18 69 (OP: EA1DDO) 130,848 655 27 89 (OP: GW4SHF)
*GØJLF *G4WQG *G8LNR *MØJHV *M5X	51,100 222 36 41,124 199 26 39,894 209 30 35,872 193 31 34,621 159 25	04 *DG7SCB 66 *DL7UN 92 *DB8SM 87 *DL1ZB 64 *DO1TOM	4,292 59 16 42 3,835 54 19 40 3,264 50 15 36 3,087 49 17 32	*IZ3ZOO *IB5R *IU1MRG *IK2YSJ *IK8RKH	12,320 11,534 11,375 10,455 8,122	108 23 65 168 18 61 134 14 51 107 22 63 83 19 43	*YO7MPI *YO2LTA *YO4CSL *YO7HBY *YO4GOU	11,954 7,695 7,260 7,105 4,608	97 28 140 11	55 *GW4HB 58 *GW4W 46 39 40 48	M 102,612 310 48 156 43,040 218 19 61 (OP: GW4EVX) OCEANIA
*G40ED *2EØEVM *GØDDZ *G3R	(OP: G3R 28,638 215 16 27,140 178 31 25,990 167 31 25,440 156 26	.E) *DL6DJ 58 *DB6YC 87 *DH1DH 82 *DO9ABC 70 *DJ3HW	1,147 35 11 26 935 20 8 9 100 10 4 6 24 3 3 3 16,650 104 23 52	*IK2OLJ *IN3HVL *IU1HJF *IU1MRH *IK1ZOE	6,208 5,472 <i>5,133</i> 4,130 4,080	67 20 44 87 17 55 43 24 35 58 20 39 97 17 51	*YO9HG *YO7HHE *YO8RZJ *YO9BNP *YO4BEX	3,290 1,476 1,352 700	65 12 49 8 57 5 20 10	35 28 VL2A 21 VJ3O 15 54 VK4QS	Australia 1,179,570 1829 82 164 66,708 232 29 80 (OP: VK3TX) 54,610 173 52 75
*GØWJK *MØACM *G3MXH *G4CTP	(OP: GØC 25,017 219 23 19,525 209 17 17,765 113 17 14,952 159 18	A) *DF7XR 70 *DF9HC 54 *DG2FDD 38 *DB7YI 66	3,381 45 16 33 3,015 45 17 28 216 20 2 10 30 3 3 3	*I2XYI *IZ6MPZ *IZ2KWV *IK6FHG *IU8LUM	3,905 3,796 3,648 3,404 3,348	47 19 36 48 16 36 54 14 34 30 19 27 56 16 38	*YO5OHY	13,860 6,468 Sardinia 6,222		29 VK5MK VL2G	11,826 74 33 40 2,760 48 11 13 (OP: VK2GR) 136,818 299 74 124 33,396 119 50 71
*GØRAH *G4AYU *G5TM *G4FFN *G8FRS	14,340 192 13 9,724 79 16 8,228 86 11 7,980 63 24 7,665 87 20	47 36 OH2PQ 23 OH1VR 52 OH2BA	Finland 909,030 1092 115 356 516,738 801 97 329 362,950 621 83 267 (OP: JK3GAD)	*IK1HZZ *IZ1CJZ *IU1FIB *IN3GYK *IN3EJM	3,145 2,048 2,001 1,890 1,330	33 17 20 22 15 17 29 9 14 46 7 28 30 11 24	GM2V MM3T GM2Y	Scotland 120,328 (48,438 8,480	379 37 1 OP: GM3W0 303 22 96 13	*VL6K 32	2,356 30 16 15 (OP: VK6WX) 1,311 28 8 11 646 16 9 10
*G5AKB *G4BYE *G4BEE *G3SAD	3,894 48 13 3,528 59 17 3,528 52 11 3,036 55 13 (OP: G4B	20 OG2X 32 OH6MSZ 33 OH1RX	194,916 614 55 167 (OP: OH2RM) 96,570 410 42 132 22,785 87 41 64 13,715 108 16 49	*IUØDUM *IW4CPU *IU1PZC *IK2LQT *IZ8PWN	1,260 665 630 528 513	17 13 15 13 9 10 14 9 12 11 8 8 12 9 10	*GM9C *GM3ZDH *GM7OAW	78,370 (0 17,024	OP: MMØDX 383 36 1 OP: MMØGH 216 12	H) *VK5UE	Brunei Darussalam 1,939,839 2264 108 211 (OP: JO 1RUR)
*G6MXL *M6KCI *M6W *M6IGE	2,911 39 14 46,472 266 35 7,399 98 11 (OP: G3W 5,640 80 17	27 13 38 W) OH3MHA	(OP: OH1ZAA) 3,276 65 9 30 (OP: OH1ZAA) 1,711 56 4 25	*IZ1FRM *IUØNHF *IZ8CLM *IN3JRZ *IZØZFK	384 80 24 6,993 6,723	8 8 8 6 5 5 2 2 2 101 14 49 75 24 57	*MMØXDG YT3D	Serbia 2,435,860	99 9 2711 121 3	34 WH7T 87	Hawaii 4,440,352 4438 117 227 (OP: WH7W)
*MØJBA *MØYJB *2EØTKO	3,492 113 6 1,776 36 12 110 10 3	30 25 8 OH9COG	(OP: OH1ZAA) 1,380 37 23 (OP: OH1ZAA) 450 19 5 13 (OP: OH1ZAA)	*IK3XTY *IW2EPE *IZ3NVR	2,091 1,485 266	38 17 24 50 5 28 22 2 12	*YTØW *YT2VP *YU7XW *YT2MDM	42,799 32,508 10,368	138 23	W) *KH6CJJ 91 *KH6XX 64 73	29,798 126 42 52 1,060,811 1659 88 135 48,675 264 34 41 Indonesia
ESØIA *ES6PA *ES1TAR	Estonia 39,984 153 50 76,860 297 43 45,800 339 24		30,680 210 30 88 18,515 146 26 89	YL7A YL2CI	Latvia 540,714 276,985	993 85 312 (OP: YL2GM) 980 34 121	*YU4PTL IT9DWF	5,368 Sicily 3,465		50 YB1AYO YB8UTI YC8DUL 44 YB2MM	106,470 217 66 116 105,076 395 38 71 79,902 223 43 95 47,988 193 23 70

YB4PE YB8RVI	24,738 23,925	117 3 181 3			266 93,730	18 3 559 23		*PU8PJG *PY2OF	319 169	61 7	10 6	19 7	*N8AJM *NC8R
YBØKXO YB9YKU	22,302 18,944	105 4 122 2	2 42	*DW7NDM	76,024 42,631	422 25 209 37	52	*PY2VTR *PY2BN	140 111,706	9 418	7 32	7 69	D
YB1RQX YB3BLJ YB8SHY	10,332 10,241 6,456	64 2 77 1 102 1	5 34	*DU1VNA	15,946 11,152 5,497	105 22 126 15 93 11	26	CB8E	Chile 1,374,720	2138	77	163	KD9V <i>K9ZN</i>
YB2SPP YB9YSS	5,159 2,438	94 2 59 1	4 43 0 13	*DU2R *DW2FCR	4,141 2,160	62 17 57 8	24 12	CE2LE	494,382	(OP: 1215	CE8 59	EIO) 99	*KEØWPA
YC2DMA YC1CUN YB2XDU	2,412 2,093 1,400	51 1 36 1 30 1	0 13	*4I1MVI	435 35 672	49 5 9 3 18 6	4	CE4PS XQ3SK CE3TL	307,165 232,824 18,350	776	28 49 18	87 60 32	Canad *VE3GKT
YC7LTE YB1EQI	1,232 861		8 13	Wallis	& Futuna	Islands		*CE1UGE *CE5UBR	85,790 <i>64,015</i>		18	68 <i>41</i>	*VE3OMV
*YB8RW *YB9GV *YC9DPO	87,048 79,776 73,359	370 4 423 2 220 5	2 50	*FW1JG	117,656	290 59	95	*CB3CE *CA2SLJ	32,883 26,455	167 (OP: C 260	E3K	56 (WA) 37	Asia
*YC3RJL *YC5NBY	61,656 26,208 20,398	307 2 104 4 104 3	6 58 1 71	SOL	JTH AME Argentina			*XQ5CIE *XQ5OS	26,398 25,550 17,370	174 170	19 24 41	48 49 49	D *UB8QBD
*YCØOXA *YB1KEL *YB3BGM	18,096 16,461	151 2 113 1	6 61 8 41	LU1VM LU9MBY	282,997 204,864	823 45 820 28		*CE4CBJ *CE6FYN *CA6NFR	7,869 2,544	118 114 82	16 19	27 29	Asia
*YB4NY *YC8FEE *YB1DUU	16,284 15,189 14,356	121 1 102 2 118 2	6 35	LQ5A	86,576 73,130 169,078		72	*CE2CFK *CE3PCG	2,146 1,400	62 28 (OP:		21 18	*TA7YLY (*BD4VGZ
*YB8JEC *YB3ATK	11,124 10,620	94 2 120 2	1 33 6 33	*LV1E	77.271	(OP: LU 271 50	19DA) 79		Colombia	,		ĺ	*BG7LDM
*YC2YWF *YD8CPZ *YB7JZ	9,744 9,630 7,950	72 2 79 1 89 1	6 29	*LU9LZR	47,005 13,416 9,520	260 24 120 40 105 17	46	*HK4CM *HK4RB	8,476 7,824		17 17	35 31	*BG5UZW *BD8AQY *BG5GDP
*YBØULI *YB6UAF *YC2BDZ	7,830 7,085	60 2 64 2 56 1	5 33 8 37	*LU9CSM *LU7AOW	4,560 2,144 752	102 20 57 16 40 7	28 16	*HC2TKV	Ecuador 69,036	564	16	28	*BH3XZT *BGØDFS *BH6AOV
*YB8XOB *YB2CTE	6,552 5,632 5,152	53 1 49 2	6 28 0 26	*LU1RAF *LV4V	364 20,916	33 5 151 15	8 48	OA4SS	Peru 1,228,766				*BG5VAR
*YC7LXI *YB5MB *YB8MJG	4,445 4,081 3,888	73 1 77 2 55 1	1 32		Aruba	(OP: Ll	J4VZ)	OA4DAG	545,532 Suriname	1266	47	122	5B4AQT 1,
*YB1HDR *YC3RNW	2,820 <i>2,160</i>	38 <i>32</i>	7 23 9 18	P4ØT	5,338,158	3913 118 (OP: VE		*PZ2YT	725,000	2218	27	89	*VU2EKR
*YB7VGB *YG8FX *YD9UAN	2,145 1,200 1,166		0 19 9 11 1 11		Brazil 1,360,072	1452 85	241	*CX9AU	Uruguay 82,288	310	53	86	, D
*YC2COM *YG1AWS	888 780	63 1 24	0 14 6 9	PY5WW PY2MM	403,192 201,300	1453 25 619 40	76 82	*YV1GIY	Venezuela 28,598	170	23	56	*JG1CMT
*YF9UBD *YB2YEN *YB1EIG	756 736 527	15 1	8 10 1 12 7 10		39,120 375,972	301 14 (OP: LU8 1165 32	EOT)		YOUTH				*JM8PSY
*YF8FY *YB5HPT *YB7CV	518 374 320	26 20	5 9 7 10 3 5	*PY2RSA *ZW2T	235,710 228,796 170,430	877 24 566 25	89	N	ORTH AMEI		١		*JJØTUC Di
*YD2HBF *YG3AJJ *YC8AKU	220 <i>49</i> 27	4	4 6 3 4 4 5	*PU2MIW	44,116 39,216	(OP: PY2 214 20 210 18	62	*N2NJW	District 2 825	14	11	14	EU
*YB1TIA *YD8SPY	3,600 <i>2,349</i>	37 1 <i>37 1</i>	6 24	*PY2YVN	38,236 37,060 22,968	199 29 221 36 138 33	50 73	*NR1K *NØJMP	District 4 144,504 36,366	255 125		158 83	OE8DDX OE9SEV
*AHØ/	Mariana Islan	ds		*PY2KO *PU2TNT	11,475 8,379	81 19 84 15	<i>32</i> 34	*K4IEY *W8QI	9,675 975	63 16	20 11	55 14	*OE6NOA/P
WA7WJR	30,420 New Zealan		21 24	*PY2BRP *ZV2F	7,052 4,284	76 10 54 24 (OP: PY2	27	*KQ4AKR	384 District 6	9	7	9	Bosnia- E7ØAW
ZL2ABK ZL2GD	1,113,372 38,918	1696 7		*PU3BAD	3,589 2,175	43 14 39 12	23 17	*KN6VGL	352	9	7	9	*E74CX
DU1IVT	Philippines			*PT2JAR *PP5DCM *PU2MCY	2,010 1,710 777	46 13 27 13 21 9	17	KE8HBV *KE8RJU	District 8 540,792 142,064	626 259			9A2U
	152,140	+01 4		I- OZIVIO I			12	, KLOI IJO	142,004	200		140	9A/DK7ON *9A3GVJ
													Czec



Oops...

is the *Loneliest* Number ... Especially When It's *Left* Out!

In K4HRK's March article, "A Collapsible Tri-Band Antenna for 6 Meters, 2 Meters, and 70 Centimeters with a 10-Meter Option," we accidentally overstated the SWR of his antenna at the various band edges (leaving out a very important "1."). Under "Performance," the first paragraph should read as follows:

Using my VNA, these are my standing wave ratios on different bands:

- 10 meters 1:1 center of band and 1.6:1 at the edges
- 6 meters 1:1 center of the band and 1.9:1 at the edges
- 2 meters 1.3:1 flat across the band
- 70 centimeters 1:1 flat across the band

We regret the error and hope this makes you feel even better about trying this antenna!

_											_
	*N8AJM *NC8R	29,972 14,630	104 121	41 32	77 45	DN4AN *DL2ALY *DM5TM	297 161,200 68,952	11 379 252	5 63 47	4 185 122	
	KD9V <i>K9ZN</i>	District 9 147,500 <i>9,936</i>	246 <i>73</i>	87 <i>23</i>	163 <i>49</i>	*DO8JL *DK1YH *DO2LYB *DL4XT	28,512 5,808 5,764 3,306	109 118 69 48	35 8 12 13	64 36 32 25	
	*KEØWPA	District Ø 35,646	173	23	55	*DO3OLI *DN2TN	2,898 550	60 22	12 6	30 16	
	Ca *VE3GKT *VE3OMV	anada - Distri 131,338 76,428	287 239	61 41	133 91	F4IDC	France 249,240	685	35	99	
		ASIA				*SV8SYK	Greece 19,602	120	30	51	
	*UB8QBD	Asiatic Russ District 9 1,254	24	4	15	*HA1BB *HA8MBM *HG8CK	Hungary 157,740 735 644	300 53 35	75 4 5	164 17 18	
	*TA7YLY	Asiatic Turke 70,875	212	30	95	*EI8KW	Ireland 14	4	3	4	
	*BD4VGZ *BG7LDM *BG5UZW *BD8AQY	China 256,795 12,012 2,775 2,405	527 266 45 36	58 18 17 15	145 26 20 22	*IN3HKZ *IU7QCK	Italy 130,830 1,224	<i>599</i> 31	<i>44</i> 9	<i>166</i> 15	
	*BG5GDP *BH3XZT *BGØDFS *BH6AOV	688 525 408 174	52 34 21 33	7 12 10 12	9 13 14 17	*LY5AX *LY3LB	Lithuania 167,014 216	385 18	58 3	168 9	
	*BG5VAR	70 Cyprus	15	5	5	LX7I	Luxembourg 757,520	1834		129 IWS)	
	5B4AQT	1,152,580 India			310	*PDØW	Netherlands 23,205	183	27	78	
	*VU2EKR	2 Japan	1	1	1	*SP3GTP	Poland 180,632	500		208	
	*JG1CMT	District 1 6 District 8	1	1	1	*SP3LM *SQ8NT *SP4DIR *SP9DLS	64,413 25,620 6,784 3,268	276 182 106 83	40 26 15 6	113 96 49 32	
	*JM8PSY	11,627 District Ø	91	33	44	*SQ9ALW *SQ9B	2,204 40	40 8	12 3	26 7	
	*JJØTUC	448	20	5	9	*YO2NWW *YO5DBM	Romania 22,268 5,775 Serbia	166 87	21 12	55 43	
	05057	EUROPE Austria				YT5DXX	175,890	1185	27	103	
	OE8DDX OE9SEV *OE6NOA/P	291,555 19,376 <i>2,805</i>	148 <i>35</i>	42 24 16	167 88 <i>17</i>	*EA2ESK	Spain 25,839	158	27	72	
	Bos E7ØAW *E74CX	snia-Herzego 943,236 27,064			307 100	*VK4OTZ	OCEANIA Australia 896	21	14	14	
	9A2U	Croatia 19,760	126 (OP: 9		57 WP)	*YC5AKO	Indonesia 4,440	69	16	24	
9	9A/DK7ON *9A3GVJ	3,402 594,392	54 1023	13 92	29 290	*YC1AUI *YD2UWF *YD3CZV	4,312 2,080 315	36 33 13	11 7	28 21 8	
	OK1LEV OK2HA	Czech Repub 154,744 624	436 20	60 5	172 11	*YG3ARL *YC1LJT	140 5,328 Mariana Islan	8 60 dc	3 14	4 22	
	*M7ELC	England 12,103	99	30	61	KHØUA	Mariana Islan	1501	69	150	
	Fed.	. Rep. of Ger			422	ZL1CAP	New Zealand 2,940		12	18	
	DK5AV DC2CL	386,884 216,800	816 371	72 73	239 198	S	OUTH AMEF Brazil	RICA	١.		
	DL7PIA DG5LW	95,918 41,021	316 221	57 29	142 98	*PY2POA	30,281	135	37	70	
	Check Logs										

Check Logs

Check Logs

2EØXSH, 3V8SS, 4X4LF, 4Z4AK, 4Z5ML, 9A2WB, 9A3WM, 9A5W, 9A6TT, 9K2NO, 9K2YD, 9K2YM, A41CK, AE8RN, AG7YX, BA5CW, BD4SDX, BD7OB, BD8ALD, BG2WV, BG3HJT, BG3IPT, BH1MCB, BH5HGI, CT1DVV, CT1EPC, CX2AQ, D44PM, DF3OL, DF4FR, DF5RF, DF7AT, DF9HI, DF9XI, DG8OBN, DJ4CW, DJ6TK, DJ6YX, DK1DSA, DK5OCE, DK7A, DLØFIS, DL1YAB, DL2DXA, DL3AG, DL5JAG, DL6MRM, DL7JV, DL8TV, DL8WJM, DL9YBI, DM1PL, DM4VPF, DM5JBN, DN4PSG, DP0POL, DU8ZN, E74O, EA11Q, EA1S, EA2QU, EA3BP, EA3D, EA3RR, EA4EER, EA4EM, EA4LU, EA5IYI, EA6SA, EA7DQH, EA7GTJ, EA7P, EA8DNF, EC7B, ED8W, E16KW, E17CC, E17KD, ER3DX, ES4RD, EU1FQ, EU1KY, EW11, EW4RF, F1UBA, F4EUG, F4ICR, F4IYB, F6HQP, F8FQJ, G3PXT, G4NXG, G5W, G6MSY, G7COU, GIØLDI, GU4EON, GW4BKG, HAØGK, HA1AG, HA2MM, HA7VK, HA8BE, HA8JV, HA8QZ, HA8TP, HB9DOS, HB9EYP, HB9H, HB9HRJ, HK3CJJ, HSØZDY, IØWBX, I3MTM, IIØI, IK1YDB, IK8NBE, IQ3TR, IT9AQR, IU2BHI, IU2LWL, IU8JLN, IV3IPS, IV3OKO, IW1ARB, IW1FRU, IW1GEU, IZ1KGK, IZ1UJE, J35X, JA6CNX, JH1BNC, JH4RUM, JA2VBK, JS6RTJ, JT1CS, JW7QIA, KØDS, KØGT, K3HW, K3SK, K4RSA, K6ZP, K9FW, KA2WGE, KC5QBG, KC7DC, KJ4QHL, KK7CJV, KM3T, KN6TTU, KO4YKW, LA2GKA, LA3T, LA5FBA, LA6VQ, LA9OI, LCSR, LU1VDF, LU7MCJ, LU8ADX, LY1LB, LY2BAA, LY5T, LZ1JZ, LZ1MC, LZ1ND, LZ1PUB, LZ1RGT, LZ1YF, LZ1YR, MØCVO, MØHFY, M6EAM, N1CFO, N2TPQ, N3IQ, N4EFS, N8BE, N8LLC, OE2E, OH1MIE, OH2IS, OH4SS, OH5BQ, OH7CW, OH8SE, OH9W, OK1CZ, OK1ES, OK1TA, OK1WCF, OK2BFN, PC3T, PG7V, PP5IP, PP5MGT, PU2KMM, PU2MBO, PU2XKK, PU3SDF, PY5DP, R2AA, R4KO, R7TJ, RA3TAR, RA3XDX, RA5AW, RA9AMO, RA9AU, RC3U, RM2A, RN3OG, RU3UR, RX3ASQ, RX3DTN, RX3XA, RX9WN, RZ2D, S5ØU, S52TW, S54E, S58WW, SA3OF, S99U, SP9EJA, SP9HW, SP9HAS, SP9WLC, SQ1BSY, SQ5AM, SQ5CZP, SQ5RTI, SQ7BFS, SQ8L, SQ9ANS, SQ9C, SQ9CXC, SQ9MZ, SQ9S, SV1ME, SV2HXV, SV2RSZ, SV4FFL, SV9QCF, SX5P, TI2/NSNU, TK5MH, UAØSR, UA5AGW, V16ACA, W16HY, W6YA, W70F, W8DON, W8QZA, W8GUIA, WCOM, WIOP, WO1Z, YB1ACM, VB1AM, YB1CMJ, YB8MGN, YB8OBM, YC1FGH, YC7HSL, YC2SLX, YC2ENO, YO2BCO, YO3IPR, YO4RDW, YO7EY, YO9DF, YU1DW, ZL1JLA, ZL1TM, ZL2AYZ YC9ENO, YO2BCO, YO3IPR, YO4RDW, YO7EY, YO9DF, YU1DW, ZL1JLA, ZL1TM,

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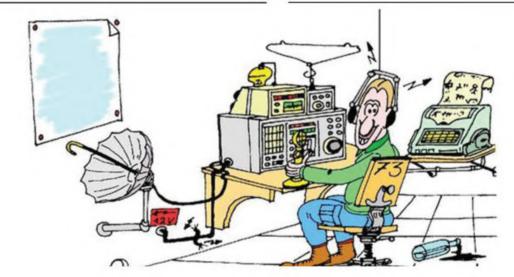
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