Is HR 555 Really Good for Hams? p. 24

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COMMUNICATIONS & TECHNOLOGY

AUGUST 2017

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- Results: 2017 CQ WW 160-Meter Contest, p. 17
- Build the SWR Sweeper, p. 28

On the Cover: Guilio Scaroni, IK2DED, poses outside the CQWW 160-Meter Contest station of IK2CLB. The tower holds two full-size 160 dipoles and the wire along the canal is part of a Beverage receiving antenna. Details on page 68.

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announcements

AUGUST

CANTON, OHIO — The Canton Amateur Radio Club will a special event station from Thursday, August 3 through Sunday, August 6 to celebrate the Pro Football Hall of Fame Festival. Frequencies include 14.285, 21.320, 7.200, and 146.790 (PL 141.3) MHz. QSL to Canton ARC, P.O. Box 8673, Canton, OH 44711-8673. Contact: Dennis Moriarty, K8AGB, (330) 479-9722.

AUSTIN, TEXAS — The Austin Amateur Radio Club and the **Texas VHF-FM Society** will hold **Austin Summerfest 2017** and the **2017 ARRL South Texas Section Convention** Friday, August 4 and Saturday, August 5 at the Crown Plaza Austin, 6121 N. IH-35. Contact: Joe Makeever, 8609 Tallwood Drive, Austin TX 78759-8126. Phone: (512) 345-0800. Email: <w5hs@arrl.net>. Website: <www.austonsummerfest.org>. Talk-in 146.94 (PL 107.2).

SPOKANE, WASHINGTON — The Spokane DX Association and **Idaho DX Association** will hold the **62nd Annual Pacific Northwest DX Convention** Friday, August 4 and Saturday, August 5 at the Hotel RL by Red Lion Spokane, 303 W. North River Drive. Website: <http://pacificnwdxconventin.com>. DXCC card checking.

DAYTON, OHIO — Make it Dayton, **Carillon Historical Park**, and **Make Magazine** will hold the **Dayton Mini Maker Faire** Saturday, August 5 and Sunday, August 6 at the Carillon Historical Park, 1000 Carillon Boulevard. Phone: (937) 293-2841. Email: <makeitdayton@gmail.com>. Website: <http://dayton.makerfaire.com>.

MORGANTON, NORTH CAROLINA — The Lenoir Amateur Radio Club, **Western Piedmont Amateur Radio Club**, and the **McDowell Amateur Radio Club** will hold the **20th Annual C.V. Hamfest** Saturday, August 5 at the Burke County Fairgrounds, 145 Bost Road. Website: <www.cvhamfest.com>. Talk-in 147.150+.

ONALASKA, WISCONSIN — The Riverland Amateur Radio Club will hold its **Swapfest** Saturday, August 5 at the Onalaska Omni Center, 255 Riders Club Road. Contact: Greg Miller (608) 792-7841. Email: <k9lec@arrl.net>. Talk-in 146.970 (PL 131.8). VE exams, DXCC/VUCC/WAC/WAS/160M card checking.

TRUMANSBURG, NEW YORK — The Tompkins County Amateur Radio Association will hold the **Ithaca Hamfest**, Saturday August 5 at the Trumansburg Fairgrounds, NYS 96. Email: <ne2t@arrl.net>. Website: <http://tcara-ny.org/hamfest>. VE exams.

VINTON, VIRGINIA — The Roanoke Valley Amateur Radio Club will hold the **Roanoke Hamfest 2017** Saturday, August 5 at the Vinton Moose Lodge, 2127 East Washington Avenue. Contact: Nancy Wood, KG4ETP, (540) 330-7101. Email: <woodest2003@cox.net>. Website: <www.w4ca.us>. Talk-in 146.985- (PL 107.2). VE exams.

BERRYVILLE, VIRGINIA — The Shenandoah Valley Amateur Radio Club will hold the **67th Annual Berryville Hamfest** Sunday, August 6 at the Clarke County Ruritan Fairgrounds, 890 W. Main Street. Contact: John, WD4GEK, or Elizabeth, W4EHC Cottrell (540) 436-3818 or (540) 333-0837. Email: <berryvillehamfest@gmail.com>. Website: <www.shenvalarc.org>. VE exams.

CEDAR RAPIDS, IOWA — The Cedar Valley Amateur Radio Club will hold its **Hamfest 2017** Sunday, August 6 at the Teamsters' Hall, 5000 J Street SW. Contact: Tim Busch (319) 373-3971. Email: <n0ckr@arrl.net>. Website: <http://w0gq.org>. Talk-in 146.745. VE exams, card checking.

PEOTONE, ILLNOIS — The Hamfesters Radio Club will hold its **83rd Annual Hamfest** Sunday, August 6 at the Will County Fairgrounds, 17 S. West Street. Contact: Don Pointer, KC9EQQ, 550 W. 42nd Place, Chicago, IL 60609. Phone: (773) 426-1936. Email: <dpointer65@aol.com>. Website: <www.hamfesters.org>. Talk-in 146.52. VE exams.

ALBEQURQUE, NEW MEXICO — New Mexico Hamvention Inc. will hold the **Duke City Hamfest** and **2017 ARRL New Mexico State Convention** Friday, August 11 through Sunday, August 13 at the Sid Cutter Pilot Pavilion-Balloon Fiesta Park, 9401 Balloon Museum Drive, NE. Website: <https://dukecityhamfest.org>. VE exams, WAS/DXCC card checking.

FAYETTEVILLE, NORTH CAROLINA — The Cape Fear Amateur Radio Society will hold the **19th Annual Ole Fashioned CFARS SwapFest** Saturday, August 12 at the Cumberland County Shrine Club. 7040 Ramsey Street. Contact: David, KR4OE, (910) 624-1394. Email: <kr4oe@nc.rr.com>. Talk-in 146.910- (PL 100). VE exams.

FORT PIERCE, FLORIDA — The Fort Pierce Amateur Radio Club will hold the **Fort Pierce Hamfest** Saturday, August 12 at the Indian River State College, 3209 Virginia Avenue. Website: <www.fparc.net>. Talk-in 147.345 (PL 107.2). VE exams, DXCC card checking.

HUNTINGTON, WEST VIRGINIA — The Tri-State Amateur Radio Association will hold its **55th Annual Hamfest** on Saturday, August 12 at the New Baptist Church, 610 28th Street. Contact: Teresa Killen, KD8QIH, (740) 550-3811. Website: <www.orgsites/wv/taraclub>.

QUINCY, ILLINOIS — The Western Illinois Amateur Radio Club will hold its **Swapfest 2017** Saturday, August 12 at the Paloma Shelter House, 1895 East 1635th Street. Contact: Ralph, KC9VZD, <buddy_lightfoot@gmail.com>. Website: <www.w9awe.org>. Talk-in 147.03+ (PL 103.5). VE exams.

SHREVEPORT, LOUISIANA — The Shreveport Amateur Radio Association will hold the **2017 Shreveport-Bossier Hamfest** and **2017 ARRL Delta Division Convention** Saturday, August 12 at the Louisiana Fairgrounds, 3701 Hudson Avenue. Contact: Bruce Deville, KE5CPL, (318) 751-8596. Email: <bdeville@aol.com>. Website: <www.shreveporthamfest.com>.

ST. ALBANS, VERMONT — The Saint Albans Amateur Radio Club will hold the **STARC Annual HamFest** Saturday, August 12 at the St. Albans VFW, 353 Lake Road. Contact: Arn Benjamin, N1ARN, (802) 309-0666. Email: <n1arn@yahoo.com>. Website: <www.starc.org>. Talk-in 145.230- (PL 100). VE exams.

O'FALLON, MISSOURI — The St. Charles Amateur Radio Club will hold the **SCARC Hamfest 2017** Sunday, August 13 at the Elks Lodge, 1163 Tom Ginnever Avenue. Contact: Renee Simon, KDØOTG, (636) 978-8422. Email: <akaqb@charter.net>. Website: <www.wb0hsi.org>. Talk-in 146.67- or 145.33.

ALPENA, MICHIGAN — The Thunder Bay Amateur Radio Club will hold **Alpena's 4th Annual Swap Meet** Saturday, August 19 at the Alpena Mall, 2380 US 23 South. Contact: TBARC, P.O. Box 764, Alpena, MI 49707. Email: <w1up@thunderbayarc.org>. Website: <http://thunderbayarc.org>.

GREECE, NEW YORK — The Rochester Radio Repeater Association will hold the **RRRA Hamfest at Barnard** Saturday, August 19 at 360 Maiden Lane. Contact: RRRA, P.O. Box 92031, Rochester, NY 14692. Email: <2017.rrra.hamfest@gmail.com>. Website: <http://k2rra.org>. Talk-in 146.925- (PL 110.9). VE exams.

HUNTSVILLE, ALABAMA — The Huntsville Hamfest Association will hold the **Huntsville Hamfest** Friday, August 19 and Saturday, August 20 at the Von Braun Civic Center, 700 Monroe Street. Contact: Dave Givens, K5RSI, (256) 883-2760. Email: <dagivens@yahoo.com>. Website: <www.hamfest.org>. Talk-in 146.94 (PL 100) or 145.36 (PL 100). VE exams, DXCC card checking.

RINGWOOD, NEW JERSEY — The Ramapo Mountain Amateur Radio Club will hold the **RMARC 39th Annual Hamfest** Saturday, August 19 at St. Catherine Roman-Catholic Church, 112 Erskine Road. Contact: Kenneth Hansen, KB2SSE, (973) 907-6898 (before 9 p.m.). Email: <kb2sse@arrl.net>. Website: <www.qsl.net/rmarc>.

VANCOUVER, WASHINGTON — The Clark County Amateur Radio Club will hold the annual **Clark County Ham Fair** Saturday, August 19 at the Salmon Creek American Legion, 14011 NE 20th Avenue. Contact: Vanessa, KE7UBB, <clarkcountyhamfair@w7aia.org>. Website: <www.w7aia.org>.

WINDSOR, MAINE — The Augusta Amateur Radio Association will hold the **Windsor Ham Fest** Saturday, August 19 at the Windsor Fair Grounds, 82 Ridge Road. Website: <http://w1tlc.org>. Talk-in 146.70. VE exams.

CAMBRIDGE, MASSACHUSETTS — The Harvard Wireless Club, **The MIT Electronics Research Society**, the **MIT UHF Repeater Association**, and the **MIT Radio Society** will hold the **Flea at MIT**, Sunday, August 20 at the parking garage on Albany and Main Streets. Phone: (617) 253-3776. Website: <www.swapfest.us>. Talk-in 146.520, 449.725- (PL 114.8).

GOLDEN, COLORADO — The Denver Radio Club will hold the **DRC Hamfest** on Sunday, August 20 at the Jefferson County Fairgrounds, 15200 West 6th Avenue. Contact: Jason Smallwood, ACØUA, (303) 429-2536. Email: <drcfest@w0tx.org>. Website: <http://w0tx.org>. Talk-in 145.49- (PL 100) or 448.625- (PL 100). VE exams.

SALINAS, KANSAS — The Central Kansas Amateur Radio Club will hold the **2017 ARRL Kansas State Convention** on Sunday, August 20 at the Webster Conference Center, 2601 N. Ohio Street. Contact: Tom Blackshere, NØMOK, (785) 452-1873. Email: <salinahamfest@cox.net>. Talk-in 147.030 (PL 118.8) or 443.900 (PL 118.8). VE exams.

BARABOO, WISCONSIN — The Yellow Thunder Amateur Radio Club will hold the **21st Annual Circus City Swapfest** Saturday, August 26 at the Badger Steam & Gas Engine Show Grounds, S3347 Sand Road. Contact: Tom Harrison, N9PQJ, (608) 963-0762. Email: <n9pqj@yellowthunder.org>. Website: <www.yellowthunder.org>.

(Continued on page 69)

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Inching Closer on New MF/LF Bands

Access to our new bands at 630 and 2200 meters is one step closer, but not there yet. The FCC's *Report and Order* establishing a secondary amateur allocation on these bands and setting out the parameters for operating on them (such as power limits, etc.) has been published in the *Federal Register*, but the door is not yet open. According to the *ARRL Letter*, the next step will be for the FCC to work out the procedures by which amateurs will need to notify the United Technology Council of intent to operate on the bands. UTC represents power utilities that use these low and medium frequencies for power line communication (PLC) systems that control the power grid. Amateur operation on 630 and 2200 meters will not be allowed within one kilometer of transmission lines using PLC and notification to UTC will be required prior to going on the air. Once the procedures have been developed (and there is no timetable for doing so), the FCC will issue a Public Notice providing the details and announcing opening dates for the bands. Until then, general amateur operation is still not allowed.

Hamvention Reports Best Turnout in 20 Years

The new location of the Dayton Hamvention® appears to have been very good for attendance. General Chairman Ron Cramer, KD8ENJ, reported an official attendance figure for 2017 of 29,296, the best turnout since Hamvention's date was changed from late April to mid-May in 1996. Officials acknowledged some startup problems at the show's new location at the Greene County Fairgrounds in Xenia, Ohio, but said work is already under way to resolve as many of them as possible. (See our photo essay on page 10.)

FCC Appointments Announced

President Trump announced on June 13 that he intends to nominate former FCC Commissioner Jessica Rosenworcel to return to the commission for a second term. She had been renominated by President Obama in 2016 but the Senate did not act on the nomination before its session ended. Mr. Trump is expected to announce a nomination for the vacant Republican seat in the near future.

In addition, FCC Chairman Ajit Pai announced the appointment of Donald Stockdale as Chief of the Wireless Telecommunications Bureau (which regulates amateur radio), and of Rosemary Harold as Chief of the Enforcement Bureau. Stockdale is an attorney and economist and held various positions at the FCC between 1994 and 2011, when he left to work in the private sector. An attorney and former journalist, Harold served as deputy chief of the FCC's Media Bureau before joining a private law firm in 2011.

FCC and OHSA Publish "Best Practices" Guide for Communication Towers

Stating that "every tower climber death is preventable," FCC Chairman Ajit Pai announced in early June that his agency and the Occupational Health and Safety Administration (OSHA) have jointly published the *Communications Tower Best Practices Guide,* the outgrowth of two joint tower safety workshops held in 2014 and 2016. According to the *ARRL Letter*, the free guide is aimed primarily at people working on commercial towers, but also "offers information applicable to the amateur radio community and contractors working on amateur radio support structures." The 28-page guide may be downloaded in PDF format from the OSHA website at <http://bit.ly/2t5rvwj>.

USAF: No More Free Rides for Naval Academy Student Ham Satellites

The U.S. Air Force will no longer permit amateur radio student satellites from the U.S. Naval Academy to be carried to orbit aboard Defense Department rockets, according to Bob Bruninga, WB4APR, the developer of APRS and a senior research engineer in the academy's department of aerospace engineering. Bruninga's comment came in the context of a report on the AMSAT News Service in which he is seeking a launch host for a fully flight-qualified digipeater and DTMF transponder module. "Unfortunately," Bruninga wrote, "the Air Force (responsible for all DoD satellite launches) has unilaterally declared that they will not accept any more Amateur Radio student satellites from the Naval Academy for flight on DoD launches." No reason for the action was given.

Signals from Saturn… and a Satellite Rescue

The *ARRL Letter* reports that British ham Paul Marsh, MØEYT, has successfully received signals transmitted by the Cassini spacecraft from its current orbit of Saturn. Cassini was launched in 1997 and serves as an orbiting repeater for the European Space Agency's Huygens probe, which is transmitting from the surface of Saturn's moon Titan. According to the report, Cassini is currently making about two dozen dives through Saturn's rings and is expected to crash into the planet in September. Marsh monitored the 8.4-GHz signals with a 2.4-meter dish and a homebrew downconverter.

A ham in Australia is being credited with rescuing a satellite built by three universities in his country and launched as part of the European QB50 project. According to the AMSAT News Service, the I-Inspire-2 cubesat was successfully deployed from the International Space Station in May, but did not appear to come on the air. Engineers determined that the most likely problem was that its antenna did not deploy and that a stronger signal than they could generate was needed to send up new commands telling the satellite to wait until its batteries had recharged before trying again to deploy its antenna. They asked the amateur radio EME (Earth-Moon-Earth) community for help, and Rob Quick, VK1KW, came to the rescue. He was able to work with the satellite's ground controllers to transmit the new instructions, after which it appeared that the antenna was successfully deployed and the satellite came to life!

Finally on the satellite front, a constellation of five amateur radio cubesats built in five different countries was successfully launched to the International Space Station in early June. Once deployed later this year, the BIRDS-1 satellites will be part of an experiment in conducting VHF/UHF communications with amateur ground stations around the world. The challenge, according to the AMSAT News Service, will be to distinguish each satellite from the others — they're all on the same frequency — and to hand over satellite operation from one ground station to another. For more information, visit <http://birds.ele.kyutech.ac.jp>.

Milestones: Three Hams Honored for Looking Skyward

Swedish physics professor and radio amateur Asta Pellinne-Wannberg, SM3UHV, was honored recently by the International Astronomical Union, which named an asteroid for her! In recognition of her work using scattering radar to study meteors and as chair of the Swedish National Committee for Radio Science, *Newsline* says the IAU has designated a particular asteroid as Asteroid 11807 Wannberg, her very own celestial body.

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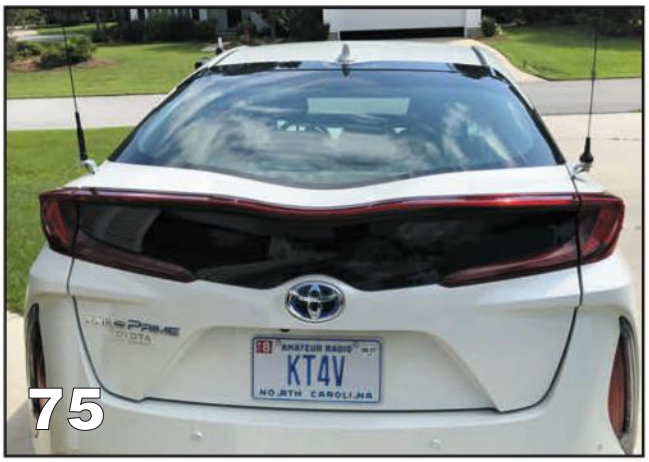

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zero bias – a CQ editorial

BY RICH MOSESON,* W2VU

The Hidden Value of Field Day

The ARRL likes to promote two major aspects of Field Day, but there is one other significant part of the event that is too often overlooked. I was reminded of it during my FD visit with K2MFF, the New Jersey Institute of Technology Amateur Radio Club. The parts that are well-promoted, of course, are the event's value as an emergency communications exercise (for which K2MFF's setup in a university parking deck — see photos — may have been more realistic than operating in a park or similar location); and its value as a public demonstration of amateur radio and our ability to communicate, both locally and nationally, without relying on the telephone/internet/commercial power infrastructure.

These are certainly both valid and important. At K2MFF, like at countless other stations, we operated various modes on various bands, using a generator, batteries, and solar panels for power, with antennas ranging from a G5RV to a rotatable dipole, homemade VHF quad, and a military surplus NVIS (near vertical incidence skywave) vertical, all set up on the roof of the parking deck. We also learned that one of the "safety features" on a 5-gallon gas can caused it to leak while pouring it, prompting us to improvise a new way to refill the generator's fuel tank. The operation also provided the club with an opportunity to strengthen existing relationships and build new ones with members of the university administration and its public safety department, the very people who might call on the group to provide backup communications in the event of an emergency. And if there ever was such a need, experience setting up and operating from the downtown setting of a parking deck would be much more valuable in this case than operating from a park or out in the woods.

Getting New Hams Active and Involved

But here is the third, equally important, and often-overlooked aspect of Field Day: It provides an opportunity, in a relatively relaxed setting (remember, Field Day is *not* a contest!) for newer hams to get some on-air experience, discover different modes and use a variety of radios, along with the community-building experience of simply shooting the breeze with a diverse group of hams. We have often pointed out in this space that one of our greatest challenges, as a group, is to reach out to "licensees" who may not be active on the air, help them get some on-air experience and encourage them to become part of the active ham community. This is at least as important as efforts to recruit new licensees but is frequently one of our communal points of weakness. Field Day provides a blueprint for one effective way to meet this challenge.

Roughly half of the hams who came out to K2MFF were relatively new licensees (KD2 callsigns); several are students at NJIT. It was the biggest group of under-40 hams I've been with in a very long time! For many of the newer hams, Field Day provided their first opportunity to make an HF contact, to try a new mode, or to get on the air at all. And it was the job of the older, more experienced hams in the group to encourage and guide them.

"I'm just a Tech," said one young ham when I asked him if he wanted to switch from logging to operating at the 40-meter phone station. "You're surrounded by Extra Class control operators," I replied. "It's perfectly fine." We switched seats and he took to it very quickly. The look of satisfaction on his face after completing his first contact suggests that his first HF QSO likely will *not* be his last.

There were also opportunities for sitting and chatting over a traditional college meal of cold pizza and warm Coke with more experienced members of the group. But as we discussed here a few months ago, the key was a core group of young hams inviting and encouraging other young hams to join in. We older folks were there primarily for support (and to help put up antennas!).

One More Lesson of Field Day

Many radio clubs complain about declining attendance at meetings and declining membership overall. Field

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

The "field" for K2MFF's Field Day operation was a parking deck at the New Jersey Institute of Technology in downtown Newark, NJ. K2MFF is NJIT's club station. This photo shows some of the group members on the air. From left, Rachel Umbel, KD2NDK (NJIT grad student); Chris Harrsch, KD2GYD (NJIT student); Trevor Summerfield, KD2KYC (NJIT alumnus); Nathaniel Frissell, W2NAF (NJIT Post-Doctoral Research Associate and club co-advisor); and club advisor Peter Teklinski, WW2I (NJIT Executive Director of Core Systems and Telecommunications).

K2MFF 2016-17 President Josh Katz, KD2JAO, helps NJIT Antarctic Program Research Engineer Andy Stillinger, WA2DKJ (hidden behind solar panel), set up a solar power supply on the roof of a parking deck at the New Jersey Institute of Technology.

Day, many club leaders say, is the only event that draws out otherwise inactive members and prospective members. Let's take a closer look and see what we can learn from that…

Here's the big difference between Field Day and a typical club meeting: It's an *activity!* There's stuff going on with plenty of opportunities for people to help out with different tasks, participate as operators or loggers (or ad-hoc networking specialists), cook meals or just watch, listen, and learn. Meetings generally feature a bunch of people talking at each other, issuing boring reports ("… and we spent $39 on postage and $140 for the phone line at the repeater…") and comparing notes on various medical conditions. Newcomers often are ignored or marginalized.

The most successful clubs take the lesson of Field Day and apply it to their meetings. Day-to-day business is left to the executive board to discuss and debate, the treasurer's report is published in the club newsletter and the bulk of each meeting is devoted to an *activity*, whether it's building a kit together; inventorying and inspecting club equipment before Field Day; getting it put away afterward; doing group code lessons (those who know, help teach); a fixit night with expert troubleshooters and professional-grade test equipment, etc. Clubs with regular activities have more active members. Clubs with more active members attract more prospective members. Active clubs grow. So take the lesson of Field Day and *do something* at your club meetings, every club meeting, then promote your activities among local hams and the general public. And be sure to welcome new attendees and get them involved in something right away.

Eclipse-Watching

Here's a great club activity for this month: Join the several groups of hams taking advantage of the total solar eclipse on August 21 to help conduct propagation research or just have fun! Maybe hook up with a local astronomy group to combine safe viewing with radio operating. The path of totality will sweep across the continental U.S. in a fairly narrow line from northwest to southeast, but most of the country will be in the 75%-90% zone (see map on page 27).

One of the lead organizers at K2MFF's Field Day was Nathaniel Frissell, W2NAF, who is also one of the leaders of HAMSci, Ham Radio Science Citizen Investigation, which is sponsoring both the Solar Eclipse Project research activity <http://hamsci.org/eclipse> and the Solar Eclipse QSO Party <http://hamsci.org/seqp>. We encourage you to check out both of these activities and see how you and/or your club can be part of the fun when "the lights go out" on August 21. And don't forget the Perseids meteor shower, which peaks on August 12. Get out there and do radio!

– 73, W2VU

For the first time in more than 50 years, the Dayton Hamvention® was not at Hara Arena. Despite first-year challenges, the new home of the world's largest hamfest – the Greene County Fairgrounds in nearby Xenia, Ohio – provided a breath of fresh air for the show's biggest crowd in 20 years.

Travels With *CQ*: Hamvention 2017 – Making the Xenia Connection

PHOTOS BY JOE EISENBERG,* KØNEB; RICH MOSESON,* W2VU AND TOM ROSCOE,% K8CX; TEXT BY W2VU

Imagine bringing a medium-sized town to the same location for the same event year after year for more than a half-century, then on short notice, having to pick up and move the whole town, essentially starting from scratch in a new location with new challenges and new opportunities. The task was huge and the challenge was generally well-met by the Dayton Hamvention® committee as it reinvented the Hamvention at its new home at the Greene County Fairgrounds in Xenia, Ohio. The move was made necessary by last year's closing of the long-deteriorating Hara Arena.

There were challenges, to be sure, but they were either overcome during the course of the show or are at the top of the Hamvention Committee's agenda for next year. All in all, we think the move was successful, and the committee reports an "official" attendance figure of 29,296, up nearly 4,000 from 2016 and the highest attendance number reported since the event's date was changed from April to May back in 1996.

Here's a look at what you missed if you couldn't make the show … or might have missed even if you were there, since exhibits and forums were spread out among multiple buildings and the flea market was in the infield of the fairgrounds racetrack (complete with horses doing morning workouts). We gathered up photos of this year's event from *CQ* Kit-Building Editor Joe Eisenberg, KØNEB; *CQ* Editor Rich Moseson, W2VU; and K8CX HamGallery administrator Tom Roscoe, K8CX.

** c/o CQ magazine*
% <www.hamgallery.com>

Greene County Fairgrounds

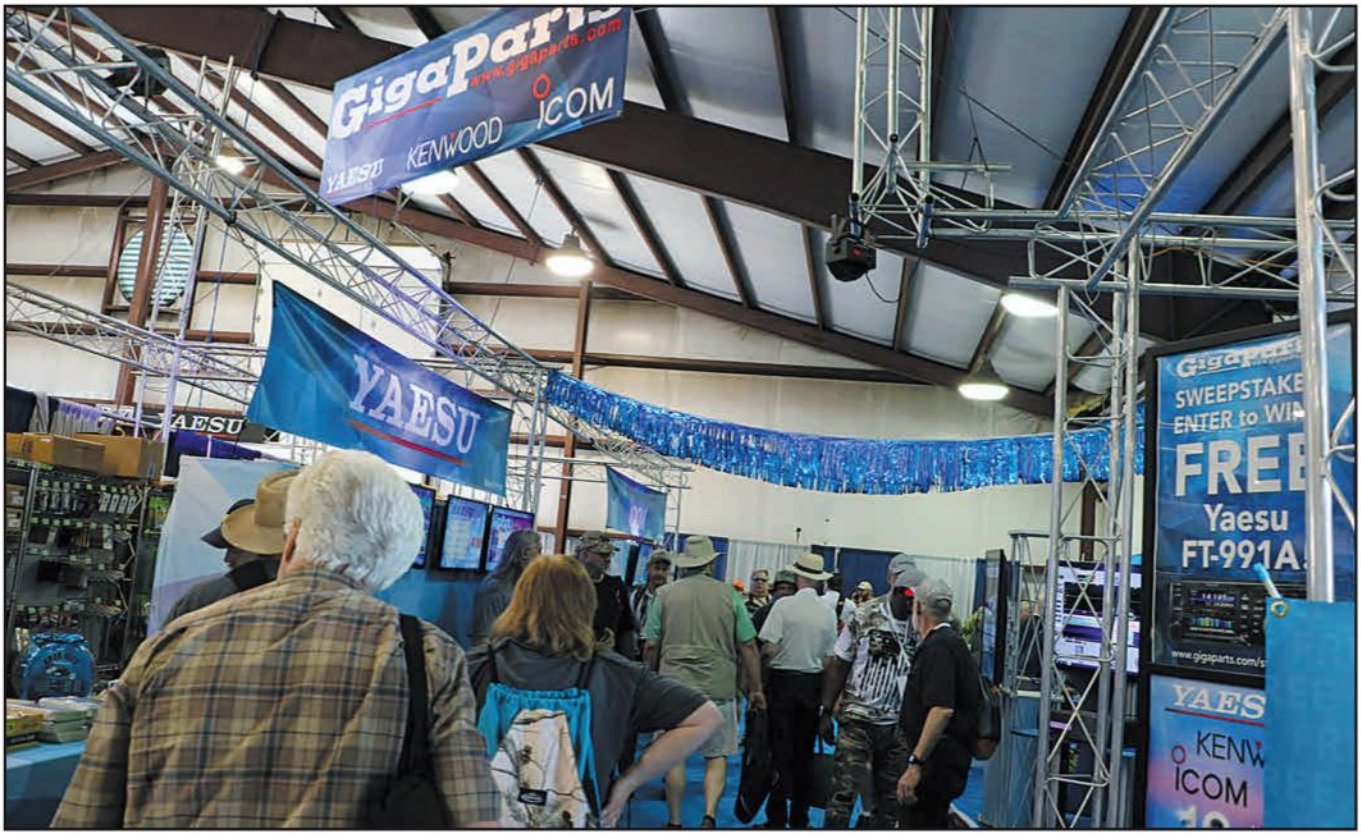
Hamvention General Chairman Ron Cramer, KD8ENJ, looks on as the Honor Guard from Wright-Patterson Air Force Base presents the colors. (KØNEB photo)

Exhibits were distributed among five buildings surrounding a central plaza with places to sit and lots of places to eat. There were also exhibitors in four tents (two large, two small), that did not face the plaza and were missed by many attendees. (K8CX photo)

Most of the parking was in remote lots or nearby fields like this one … which was great until the rains came! Area towing companies did very well on Friday, when it poured late in the afternoon. (K8CX photo)

Tractor-pulled wagons were a great way for hams to get a ride back to their cars or to the shuttle buses. (KØNEB photo)

Hams line up for a wide variety of food at Hamvention 2017. Universally, the food was the most often-mentioned improvement over previous Hamventions. (KØNEB photo)



Most of the exhibits were in buildings like this one — each named (temporarily) after a major figure in electronics and/or amateur radio. (KØNEB photo)

A view inside part of Marconi Hall, one of five commercial exhibit buildings. (KØNEB photo)

Not all the booths were indoors … this is the CQ booth right after we arrived, as Associate Editor Jason Feldman, KD2IWM (left) and CQWW VHF Contest Director/WPX Award Manager/Xenia resident Steve Bolia, N8BJQ, think about what to unpack first and how to set up the booth-in-a-tent for the best protection from rain and wind. (W2VU photo)

Hamvention is traditionally a place for manufacturers to introduce their newest goodies. For example, FlexRadio showed off its new Flex-6600M SDR transceiver with full-featured front panel controls integrated. (KØNEB photo)

ICOM displayed its new IC-7610, the successor to the popular IC-7600. The radio features direct sampling SDR technology. (KØNEB photo)

Not every exhibitor was selling a product. Among the many groups at the annual ARRL Expo area was HamSci, the Ham Radio Science Citizen Investigation <www.hamsci.org>. Pictured here, to the left and right of visitor Yamini Sadineni, VU2YAM, of Hyderabad, India (center), are HamSci team members (from left to right) Josh Katz, KD2JAO; Nathaniel Frissell, W2NAF; Xiaoyou Han, KM4ICI/BH3DBF; and Philip Erickson, W1PJE. (K8CX photo)

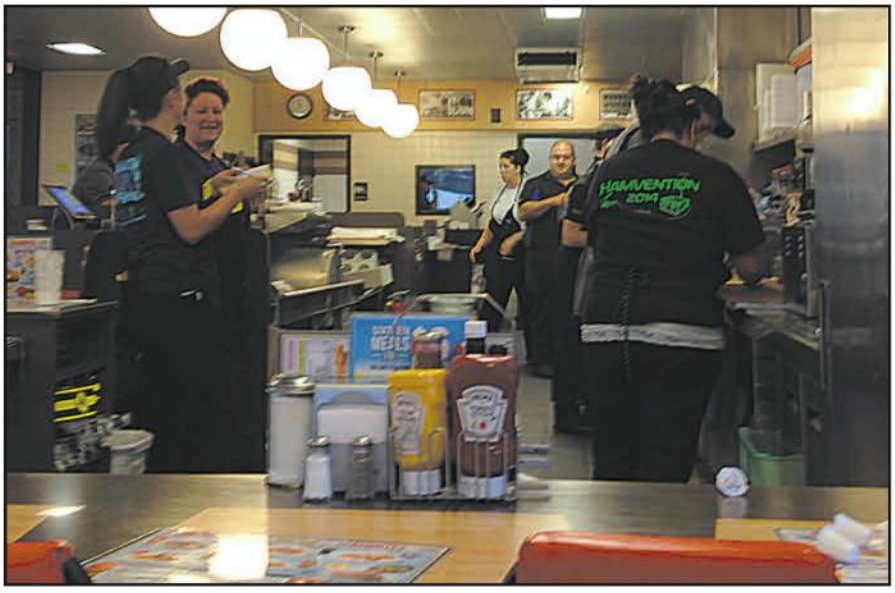
The Flea Market

Ralph Steinberger, KW8G displays his collection — which includes a couple of Zenith TransOceanics and a Collins R-390A — in the flea market. (KØNEB photo)

Powerfilm Solar was a very popular exhibitor in the flea market. (KØNEB photo)

Flea market vendors came from as far away as San Diego! (KØNEB photo)

Would it still be Hamvention without rain? Doubtful … This storm came through late Friday afternoon. (Screen shot of weather.com radar image)



(Upper Right) Would it still be Hamvention without Waffle House Hamvention t-shirts? Doubtful … new home, new Waffle House, but the t-shirt tradition continues! (W2VU photo)

(Middle) A Friday night tradition at the Contest Supersuite for nearly a decade is the Spurious Emissions Band, featuring various ham musicians. Here, from left, we have Scott Robbins, W4PA; Ward Silver, NØAX; Sean Kutzko, KX9X; and Kirk Pickering, K4RO. Their "hit single" this year was "Don't Cry for Hara Arena," sung to the tune of "Don't Cry for Me, Argentina." (K8CX photo)

(Bottom) Saturday night brings another Hamvention tradition — presentation of the Dayton Amateur Radio Association's annual achievement awards. This year's honorees included, from left, Jim Fenstermaker, K9JF, accepting the Club of the Year award on behalf of the Clark County Amateur Radio Club in Washington State; Technical Achievement award winner Rob Brownstein, K6RB, founder of CW Academy and co-founder of the CWOps club; Special Achievement honoree S. Ram Mohan, VU2MYH, who has helped raise the profile of amateur radio in India through his leadership of the National Institute of Amateur Radio in Hyderabad; and 2017 Amateur of the Year Frank Bauer, KA3HDO, Chairman of the Amateur Radio on the International Space Station (ARISS) program and a leader for four decades in making amateur radio an integral part of space travel. (W2VU photo)

One tradition that will not continue is that of Hamvention at the now-closed Hara Arena. Despite reports that the facility had been torn down, it was still standing as of Sunday afternoon, but looking very empty and lonely. Considering its deterioration over the past two decades, we'll echo the Spurious Emissions Band's suggestion: "Don't Cry for Hara Arena." (W2VU photos)

Young Ladies' Radio League, Inc. Since 1939

For 75 years the Young Ladies' Radio League, Inc. (YLRL) has helped women find their voice in Amateur Radio with members of all ages and interests.

The YLRL sponsors a number of certificates for both YLs and OMs. Members can earn special YL Certificates.

YL-Harmonics is our bi-monthly publication highlighting what women are doing in Amateur Radio.

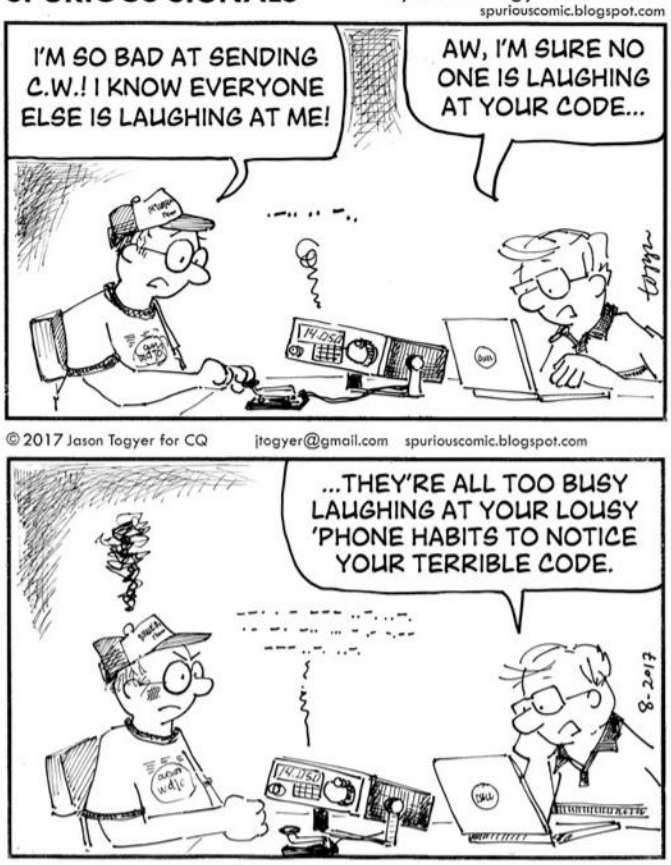
YLRL gives out scholarships to YLs each year.

For more information on the YLRL, the current dues amounts, weekly YL Net locations or how to join please go to our website at **www.ylrl.org** or contact the Publicity Chairwoman, Cheryl Muhr, NØWBV at n0wbv@earthlink.net. All Officer information is also listed both on the website and in each edition of the magazine and you may contact any Officer as well.

With thanks to the OMs who encourage and support us.

Visit us at www.ylrl.org

SPURIOUS SIGNALS By Jason Togyer KB3CNM
spuriouscomic.blogspot.com



Results of the 2017 CQ World Wide 160 Meter Contest

Plus, a New and Improved Website at CQ160.com!

BY ANDY BLANK,* N2NT

Aside from his duties as CQWW DX Contest Director until 2015, Randy Thompson, K5ZD, has also been the webmaster for all the CQWW major contests. Last year, he spearheaded the revamp of CQ160.com, which included a new score database that features results going back to 1960.

We asked for volunteers to type in score results, available only from old magazines.

Thanks to efforts of the many volunteers, the database is now complete and the following volunteers deserve special credit and accolades: MMØLID, KC1CWF, NN3W, W4AU, SV1DPI, OR2F, W0MU, K9GX, K1XX, K8FC, CT1EKD, and K9VV.

Please visit the new site and check out your past scores or compare them with other stations. You can also print a certificate for your operation, which will show your place both in your category and in your QTH.

2017 CW Results

The "Millionaires Club" was a bit of a challenge this year. Conditions on CW were pretty good, but SSB was more of a struggle. Congratulations to perennial winners Jeff, VY2ZM, and the crew at S51V for taking the combined CW/SSB trophies. That is true Top Band dedication.

Here are the Millionaires for 2017, with scores of more than one million points: VY2ZM, ZF9CW, CS2C, C6AGU, CN2AA, PJ2T, S51V, HG8DX, UA7K, EIØR, OL7M, TM6M, PI4DX,

director@cq160.com

Number 2 in Europe belongs to this fine station at GU4YOX, with Bob — the man himself — at the helm.

Ash, 3V8SS, operating 3V8CB on CW. Where is all the equipment?

Henning, OZ1BII/OU2I, operating the first night from the shack of OZ5E/OZ1ADL.

HB9CA, OL3Z, P4ØAA, P33W, HK1R, LX7I, G5W, 9A5CW, OM3GI, UW2M, OM7M, and UA2FZ. All the Millionaires were on CW, there were none on SSB. Congratulations to all.

There were 2,661 CW logs submitted, and the trend continues with single-op/low-power (SOLP) and SO-assisted the most popular. This was a jump of over 500 logs from 2016.

Meanwhile on SSB, 1,224 logs were submitted, with SOLP — by far — the most popular category. This was a mirror image of 2016. We have included many Top Boxes in the results this year. Any not shown will be available on the web in extended results.

Many thanks to perennial club win-

TROPHY WINNERS AND DONORS

World Single Operator Combined SSB/CW
Jeffrey T. Briggs, VY2ZM
Donor: Alex Tkatch, KU1CW

World Multioperator Combined SSB/CW
Silvo Knuplez, S51V
(S51V, S57DX, S57K, S57UN, S59A, S57DX, S58MU ops)
Donor: Top Band DX Club

CW

SINGLE OPERATOR

World
Jeffrey T. Briggs, VY2ZM
Donor: Bill Tippett, W4ZV-DJ8WL Memorial

U.S.A
Peter H. Briggs, K3ZM
Donor: Howard Klein, K2HK

Canada
Ron Vander Kraats, CG3AT
Donor: VE2XAA Memorial by Thor Stefansson, TF4M

U.S.A. - Zone 3
Glenn Rattmann, K6NA
Donor: Bruce Butler – W6OSP Memorial

U.S.A. - Zone 4
James F. S. Eppright, K5RX
Donor: Steve Schmidt, K4WA

U.S.A. - Zone 5
Kevin Stockton, N5DX
Donor: Paul H. Newberry, Jr., N4PN

Africa
Achraf Chaabane
Donor: James "Skip" Riba, WS9V

Asia
Yasar Gocet, TA3D
Donor: Missouri DX/Contest Club

Europe
Jiri Pesta (OK1RF), CS2C
Donor: Emir-Braco Memic, OE1EMS

South America
Bolmar Aguilar, HK1MW
Donor: John Rodgers, WE3C

Oceania
Kevin Smith, VK6LW
Donor: Robert L. Chortek, AA6VB

European Russia
Igor Avdeev, UA2FZ
Donor: UA2 Contest Club

Asiatic Russia
Sergey Moskaev,R8TT
Donor: UA2 Contest Club

Japan
Masaki Okano, JH4UYB
Donor: Alabama Contest Group

North America
Stan Stockton, ZF9CW
Donor: CQ Magazine – N4IN Memorial

Southern Hemisphere
Alexey Ogorodov, HC2AO
Donor: Robert Kile, W7RH

World Assisted
Mathias Kolpe (DL4MM), P4ØAA
Donor: Andy Chesnokov, UA3AB

Asia Assisted
Valery Zhilyaev, UN7LZ
Donor: Joe Iwakura, JA1LZR

Europe Assisted
Ron Schiltmans (DL3BPC), LX7I
Donor: Carsten-Tomas Dauer, DM9EE

U.S.A. Assisted
Dennis Egan, W1UE
Donor: Akito Nagi, JA5DQH

U.S.A. Assisted – Zone 3
Lee Finkel, KY7M
Donor: Larry Pace, N7DD

U.S.A Assisted – Zone 4
William D. Johnson, KVØQ
Donor: Pete Michaelis, N8TR

U.S.A Assisted – Zone 5
Jim Roberts (VE7ZO) op: NQ4I
Donor: Potomac Valley Radio Club

World Low Power
George Wallner (AA7JV), C6AGU
Donor: Ed Parish, K1EP

U.S.A. Low Power
Mark Bailey, KD4D
Donor: Rich Kennedy, N4ESS

Asia – Low Power
Mamuka Kordzakhia, 4L2M
Donor: Robert Kile, W7RH

Europe Low Power
Yuri Koltyrin, DF1MM
Donor: Petr Ourednik, OK1RP – DL1RK Memorial

Canada Low Power
Yuri Onipko, VE3DZ
Donor: Contest Club Ontario

World QRP
Milan Stejskal, OL4W
Donor: Wayne Mills, N7NG

U.S.A. QRP
Paul Stroud, AA4XX
Donor: Bob Raymond, WA1Z

U.S.A. QRP - Zone 4
Scott Mcleman, W5/MMØLID
Donor: Dale Putnam WC7S

Europe QRP
Bojan Sever, S57M
Donor: Gary Breed, K9AY

MULTI-OPERATOR

World
Dimitri E. Guskov (UA2F & RL3A Team), CN2AA
(RA3CO, RL3FT, RX3APM, UA3ASZ, UA4Z ops)
Donor: Hugh Valentine, N4RJ

U.S.A.
John Crovelli, W2GD
(K2SG, K2TW, KI4KWR, KU2C, N2HM, N2NC, N2OO, W1GD, W2CG, W2GD, W2NO, W2OB, W2RQ ops)
Donor: WØCD Memorial – K8GG W8UVZ

Europe
Silvo Knuplez, S51V
(HA8DJ, S51V, S57DX, S57K, S57UN, S59A ops)
Donor: Bob Evans, K5WA

ZONE 16
Andy Kazantsev, UA7K
(RA7KF, RW7K, UA7K, UB7K, UU5MS ops)
Donor: Vladimir Lesnichy, R7LV

ASIA
Serge Stikhin, RY9C
(RU9CK, RW9CF, UA8DX ops)
Donor: Nodir Tursoon-Zadeh, EY8MM

U.S.A - Zone 3
Al Van Buren, K7CA
(K7CA, N7JW, W7RH, WA7LNW ops)
Donor: Robert L Chortek, AA6VB

SSB

SINGLE OPERATOR

World
Jeffrey T. Briggs, VY2ZM
Donor: Nodir Tursoon-Zadeh, EY8MM

U.S.A.
Peter H. Briggs, K3ZM
Donor: W4PZV/W4SVO Memorial by Rick Dougherty, NQ4I

Canada
Brian Campbell, VE3MGY
Donor: Tom Haavisto, VE3CX

U.S.A. - Zone 3
Robert C. Lee, N7AU
Donor: Nate Moreschi, N4YDU

U.S.A. - Zone 4
Bryan M Bydal, W5MX
Donor: Alabama Contest Group

U.S.A. - Zone 5
John Lindholm, W1XX
Donor: Jim Monahan, K1PX

Africa
Manuel Angel Martin Brito (EA8DO), ED8W
Donor: Carl Henson, WB4ZNH

Asia
Andrey Ponomaryov, 4Z5LY
Donor: Ed Campbell, NX7TT

Europe
Rein Kolk, ES5RW
Donor: James "Skip" Riba, WS9V

European Russia
Igor Avdeev, UA2FZ
Donor: UA2 Contest Club

Asiatic Russia
Vladimir (Willy) Umanets, UA9BA
Donor: UA2 Contest Club

North America
John Barcroft (K6AM), ZF2AM
Donor: CQ Magazine – K2EEK Memorial

South America
Steve Telenius-Lowe, PJ4DX
Donor: John Rodgers, WE3C

ners Bavarian Contest Club and Potomac Valley Radio Club, which combined for over 37 million points. Their support is much appreciated, along with all the other radio clubs. The CQWW 160 Contest encourages club competition in order to promote activity. The rules for operating within club circles are relaxed, to allow for DX-peditions and guest operations. We greatly appreciate those who travel to activate rarer QTHs on the top band.

Special thanks to all the trophy donors who, year after year, donate to keep the winners happy. If you are one of the lucky winners, please take the time to thank the donors personally. It goes a long way.

Oceania
Massimo Zenobi (KH6ZM), KH6CC
Donor: Steve "Sid" Caesar - NH7C

Southern Hemisphere
Daniel Figueredo, YV6YV
Donor: John Rogers, WE3C

World Assisted
Petr Clupny, OK7K
Donor: Ray Sokola, K9RS

Asia Assisted
Igor Booklan, (RA3AUU) P33W
Donor: Robert Kile, W7RH

Europe Assisted
Maciej Wieczorek, SN2M
Donor: Bob McGwier, N4HY

U.S.A. Assisted
Vasily Voly, K3ZU
Donor: Mississippi Valley DX & Contest Club

U.S.A. Assisted - Zone 4
Paul Bittner (NM7X OP), WØAIH
Donor: Pete Michaelis, N8TR

World Low Power
Dave Jorgensen, WD5COV
Donor: Howard Klein, K2HK

U.S.A. Low Power
George Verciuc, W8CO
Donor: Tim Duffy, K3LR

Europe Low Power
Husein Gosic, E74R
Donor: Contest Club Ontario

Canada Low Power
Brian Campbell, VE3MGY
Donor: Rudy Bakalov, N2WQ

World QRP
Arman Destanoviç, E77CV
Donor: John Rodgers, WE3C

MULTI-OPERATOR
World
Adi Voh, 6Y1M
(RN5M, S55M ops)
Donor: Southeastern DX Club

U.S.A.
Krassimir Petkov, K1LZ
(K1LZ, K3JO ops)
Donor: Jerry Rosalius, WB9Z

Europe
Silvo Knoplez, S51V
(S51V, S57DX, S57K, S57UN, S58MU, S59A ops)
Donor: South Jersey DX Assocation, N2CW

Zone 3
Lee Finkel, NA7TB
(KC7V, KY7M ops)
Donor: Paulo, PV8DX

Asia
Activity Team, TC7C
(TA7K, TA7MHZ, TA7N, TA7OM, TA7Q, TA7SO ops)
Donor: Nodir Tursoon-Zadeh, EY8MM

A Few Words About Competition and Sportsmanship

There were many complaints from stations, especially in Europe, about key clicks and dirty signals. Many accusations were made, including intentional QRM, excessive power, self-spotting, and out-of-band operation.

There were many warnings issued, and in some cases disqualification or reclassification. It is up to the community to keep the contest field honest, as our resources are limited. We appreciate your help, and continue to strive for an accurate and honest result for all competitors.

All in the Family

If your surname is Briggs or Stockton, chances are you did pretty well in the contest. Jeff Briggs, VY2ZM, edged out Stan Stockton, K5GO, operating from his new beachfront QTH in the Cayman Islands as ZF9CW, to take the SOHP World top spot. A great job by Stan as his antenna is nothing special. It's just a short vertical but it proves that location and operating do the trick.

The other Briggs, brother Peter, K3ZM, took top honors in the U.S., edging out Stan's son Kevin, N5DX. Kevin has been operating remotely using the fine QTH of N2QV in upstate New York, which has been producing great scores.

The most amazing score from the CW contest comes from the combined crew of the UA2F and RL3A teams at CN2AA, which made nearly 1,000 more QSOs than runner-up PJ2T in the multi op category. CN2AA now holds the World Record score in the contest, beating the 2007 mark held by CN2A by 400,000. Congratulations, guys! In Europe, the crews at S51V and HG8DX slugged it out in a very close race, with S51V on top by only 50,000.

Once again in the U.S., the gang at West Creek led by W2GD topped the multi ops, with KØDI in second place.

In the world of low power, another great score was made by AA7JV, operating at C6AGU. George was able to surpass a million points! It looks like the Caribbean was a good place to be for this one. Congratulations to Yuri, VE3DZ, who managed to make number two in the world from Canada, with E74R and DF1MM close behind from Europe.

Mark, KD4D, edged out Greg, NA8V, in the U.S. low power.

What a race in Single-Op Assisted between P4ØAA, operated by Mathias, DL4MM; and P33W, operated by Harry, RA3AUU, and Jorge, HK1R. After log checking, the competitors were separated by only 100,000 points. SO Assisted is now the most popular category in the contest, with 10 stations making over 1 million points.

In Zone 4 U.S., where winning the contest overall is next to impossible, there was a very tight battle between

Here is Kostas, SV1DPI, operating from the fine club station at SZ1A, the beacon of Greece!

2017 CQWW 160M CONTEST TOP SCORES

CW

USA

K3ZM 862,916
N5DX 641,802
K1LZ 622,323
AA1K 592,620
K5RX 533,124
W9RE 476,856
WD5COV 462,330
K1LT 444,730
WD5R 399,816
W3BGN 376,704

VE

VY2ZM 1,893,002
CG3AT 658,130
*VE3DZ 531,700
VE9CB 459,000
VE3PN 350,888
*VE3MGY 311,448
VE3KP 226,884
*VE3VSM 219,714
VE6BBP 219,390
*VE2AWW 182,336

Zone 3

K6NA 218,631
NX1P 164,290
W7YAQ 155,142
KA6BIM 140,154
*N7IR 130,536
VE7JKZ 96,387
*W6JTI 82,688
N5ZO 79,084
*VE7SL 70,151
*AC7A 62,811

Zone 4

CG3AT 658,130
K5RX 533,124
*VE3DZ 531,700
W9RE 476,856
WD5COV 462,330
K1LT 444,730
WD5R 399,816
VE3PN 350,888
*VE3MGY 311,448
NØTT 306,100

QRP

**OL4W 183,820
**S57M 163,047
**LY5Q 143,676
**S52P 140,850
**F5VBT 139,919
**OK1FKD 133,008
**E77CV 124,600
**OK5WF 114,724
**OLØA 100,107
**S53Q 96,044

DX

CR2X 1,233,837
CS2C 908,694
HK1R 822,752
C6AGU 772,548
OZ7YY 729,864
OK2W 652,224
OHØTA 593,208
KP2M 536,360
DL1AUZ 519,095
HK1X 516,384

Zone 14

CS2C 1,218,780
GU4YOX 887,985
EI5KF 767,016
TM5X 650,839
DL1AUZ 627,105
G6M 605,500
DK9IP 571,650
M3I 488,808
EA1DAV 484,704
*DF1MM 460,460

Zone 15

OK7K 803,565
YL2SW 449,934
*E74R 448,092
SP3HLM 446,165
*HA4XH 435,003
OM7RU 422,484
HA8BE 397,012
*9A3JH 374,706
LY2NK 340,275
LY4T 337,415

Zone 16

R7NW 532,300
UX1UA 473,248
UA5C 469,392
UX2X 458,516
EU4E 438,600
RG6G 375,176
*EU2EU 353,476
*UX1UX 325,992
UY5VA 301,000
UYØZG 291,994

Russia

R7NW 532,300
UA5C 469,392
RG6G 375,176
RK3ZZ 291,252
UA9BA 277,750
UA3EDQ 273,520
UB3A 248,744
RD4A 246,180
UA6CC 239,936
R3ZZ 227,964

LOW POWER World

*C6AGU 1,103,556
*VE3DZ 531,700
*DF1MM 460,460
*E74R 448,092
*HA4XH 435,003
*ON7EH 432,180
*3V8CB 427,180
*DK2FG 401,871
*9A3JH 374,706
*EU2EU 353,476

LOW POWER W/VE

*VE3DZ 531,700
*VE3MGY 311,448
*KD4D 289,380
*NA8V 223,212
*VE3VSM 219,714
*K8FH 194,876
*K5KU 190,464
*VE2AWW 182,336
*WA5POK 178,785
*CF3FF 156,744

QRP W/VE

**AA4XX 87,788
**N4UA 83,655
**W5/MM0LID 54,693
**W2ID 51,116
**W8GP 45,024
**K4TO 37,140
**AA4GA 35,112
**N4AX 31,211
**K3TW 30,264
**W9CC 24,960

MULTI-OPERATOR WORLD

CN2AA 3,410,560
PJ2T 1,792,342
S51V 1,460,580
HG8DX 1,404,135
UA7K 1,257,249
EIØR 1,240,008
OL7M 1,205,986
TM6M 1,128,567
PI4DX 1,076,117
HB9CA 1,061,520

MULTI-OPERATOR W/VE

W2GD 879,174
KØDI 661,248
NR4M 633,000
K7CA 602,410
VE2OJ 519,936
NØNI 508,344
W5MX 501,387
N4XD 450,455
AA4V 438,380
K9CT 436,785

ASSISTED WORLD

*P4ØAA 1,609,902
*P33W 1,543,806
*HK1R 1,495,250
*LX7I 1,294,320
*G5W 1,211,707
*9A5CW 1,153,490
*OM3GI 1,132,038
*UW2M 1,065,927
*OM7M 1,052,674
*UA2FZ 1,006,200

ASSISTED W/VE

*VE3EJ 943,182
*VA2WA 867,840
*W1UE 754,130
*VE3JM 718,836
*VY2TT 675,792
*NQ4I 515,339
*AA3B 505,180
*KVØQ 482,676
*VE3CX 475,200
*K3WW 468,027

SSB

USA

K3ZM 339,618
W1XX 211,280
W5MX 194,396
W3BGN 193,557
W5PR 184,730
WF2W 179,958
*WD5COV 162,450
W3TS 160,688
K5RX 153,009
AF1T 147,096

VE

VY2ZM 847,560
*VE3MGY 117,000
VE3KZ 98,840
VE6BBP 66,024
*VA3KGS 47,775
*VA3KAI 40,986
VE3KP 36,450
*VA3WU 32,232
*VE3DZ 32,195
*VE3MW 30,038

Zone 3

N7AU 51,813
KD7UO 21,105
WA2BFW 19,823
*NS7K 15,190
K6ME 14,526
W7ZB 11,696
VA7IR 7,904
K7BHM 7,790
*N6LL 7,638
W6RKC 5,075

Zone 4

W5MX 194,396
W5PR 184,730
*WD5COV 162,450
K5RX 153,009
WS9V 134,217
*VE3MGY 117,000
WN8HCV 104,176
VE3KZ 98,840
*W8CO 98,464
K0IDX 78,585

QRP

**E77CV 45,120
**E74Y 33,920
**W7XU 30,914
**DK2LO 24,420
**SQ2BXI 19,890
**W1JCW 12,691
**UR5VAA 8,993
**CO8LY 5,070
**RW3AI 4,522
**RA2FB 4,437

DX

ZF2AM 326,735
ES5RW 237,015
F6GOX 217,740
DJ7WW 211,040
HA4XH 195,000
OM2VL 173,019
S57C 162,688
*E74R 157,080
DF2DJ 155,100
UT6UD 155,062

Zone 14

F6GOX 217,740
DJ7WW 211,040
DF2DJ 155,100
DJ5IW 113,870
OZ7AM 93,528
DK1NO 80,544
PA1NHZ 80,376
EA3QP 73,346
DL2SAX 68,698
DL1EKO 66,462

Zone 15

ES5RW 237,015
HA4XH 195,000
OM2VL 173,019
S57C 162,688
*E74R 157,080
*YT8A 152,090
LY4T 135,839
YTØW 133,574
SP9QMP 127,782
SN7D 117,171

Zone 16

UT6UD 155,062
EW6W 140,066
UYØZG 118,767
UT1XX 109,550
UX1UA 105,906
UT2AA 90,720
R7NW 73,287
*UR5WFJ 70,224
UR5TM 68,160
RC5Z 62,836

Russia

UA9BA 130,237
R7NW 73,287
RC5Z 62,836
R1AK 62,304
UA5C 38,924
*RZ3DW 33,210
*R7KR 30,384
*R7NP 28,860
*RA4CB 25,389
*RX3XA 24,660

LOW POWER WORLD

*WD5COV 162,450
*E74R 157,080
*YT8A 152,090
*VE3MGY 117,000
*W8CO 98,464
*SP5CJY 85,415
*3V8CB 81,770
*OK1DPU 75,060
*EK6SI 73,720
*SQ9ZAX 71,016

LOW POWER W/VE TOP SIX

*WD5COV 162,450
*VE3MGY 117,000
*W8CO 98,464
*W4ZAO 57,188
*N2HMM 47,880
*VA3KGS 47,775
*KB4OLM 47,190
*VA3KAI 40,986
*K3ZJ 40,200
*K5KJ 36,928

QRP W/VE

**W7XU 30,914
**W1JCW 12,691
**W8WTS 2,997
**W7BAK 2,967
**NNØQ 2,581
**KQ4KX 2,208
**N8OQ 1,782
**W1CEK 1,548
**K3TW 944
**KK7VL 112

MULTI-OPERATOR WORLD

6Y1M 637,330
KW7MM/VY2 543,348
C6ANA 543,345
S51V 519,988
HG8DX 448,200
HB9CA 427,800
RW2F 418,692
S56P 358,228
UA7K 350,060
K1LZ 337,792

MULTI-OPERATOR W/VE

KW7MM/VY2 543,348
K1LZ 337,792
N2CW 287,324
VE3VV 247,779
ND8DX 243,810
N2CEI 233,700
NA7TB 166,460
N3EB 141,015
VE7NY 140,901
NA5NN 126,920

ASSISTED WORLD

*OK7K 652,807
*SN2M 499,604
*LY4A 428,079
*UA2FZ 316,344
*VA2WA 310,899
*S53O 292,491
*P33W 281,856
*OK1W 272,156
*DK6WL 250,410
*SP9N 229,827

ASSISTED W/VE

*VA2WA 310,899
*VE3PN 208,620
*K3ZU 198,075
*K3WW 152,564
*WØAIH 114,264
*KVØQ 114,030
*K8PL 107,916
*WD5R 103,748
*W1CTN 79,496
*KØYR 77,760

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K5RX, W9RE, WD5COV, and K1LT. Mike, W9RE, reports he had the best EU opening ever from his QTH on the second night. Still Jim, K5RX, took top Zone 4 honors with his fine top-band station and dedication.

In Zone 3 U.S., where scores are limited due to propagation disadvantages, Glen, K6NA, stuck it out for over 750 QSOs to take top honors.

A few years ago, this author thought he would try QRP in a 160-meter contest. That was the first and last time! But still it remains a very popular category. We made an extra effort to check SDR and RBN archives, in order to keep power levels at the proper values and to level the playing field.

In Europe, OL4W took the top spot with his competitors - S57M, LY5Q, and S52P - all within 40,000 points. Congratulations to Milan, who went QRP for the sixth time since 2006, on his victory.

AA4XX and N4UA fought it out in the U.S., separated by only 4,000 points after log checking. It was Paul's fourth attempt at QRP, and first victory.

In the most popular Assisted category in W/VE, John, VE3EJ, used his fine station to edge out VA2WA for the number 1 score two years in a row. Dennis, W1UE, went SOA for the first time, piloting the Cape Cod station of W1KM to number 1 in the U.S.

Just how important is your QTH in a 160-meter contest? You need to be on the coast. Look at the gap in scores made by VY2ZM on Prince Edward Island, and CS2C in Portugal. Jiri, OK1RF, operating at CS2C, was 400,000 points past his nearest competitor in Zone 14, GU4YOX.

SSB

Conditions were quite challenging on SSB, confirmed by most every station's comments and soapbox.

Peter, K3ZM, who has gone Single Op on SSB every year except 2009 for the past 10 years, continued his winning streak but the score continued its downward trend. Of course, the score from Jeff at VY2ZM is so far above everyone else's, it is just amazing. The ZMs won 1 and 2 in the World Single

2017 CQWW 160M CONTEST CLUB SCORES

(Minimum of 3 three entries required for listing)

SCORE	#ENTRIES	CLUB
25,161,469	200	BAVARIAN CONTEST CLUB
12,012,955	141	POTOMAC VALLEY RADIO CLUB
9,808,422	74	UKRAINIAN CONTEST CLUB
9,516,689	76	FRANKFORD RADIO CLUB
8,737,027	55	RHEIN RUHR DX ASSOCIATION
8,510,784	76	YANKEE CLIPPER CONTEST CLUB
7,260,876	45	CONTEST CLUB ONTARIO
6,435,476	32	ITALIAN CONTEST CLUB
5,519,391	38	KAUNAS UNIVERSITY OF TECH. RADIO CLUB
5,242,946	85	SOCIETY OF MIDWEST CONTESTERS
5,008,813	21	RUSSIAN CONTEST CLUB
4,638,037	44	SP DX CLUB
3,846,133	40	ARIZONA OUTLAWS CONTEST CLUB
3,479,421	17	SLOVENIA CONTEST CLUB
3,396,618	18	MAD RIVER RADIO CLUB
3,272,490	13	CROATIAN CONTEST CLUB
2,655,873	14	HUNGARIAN DX CLUB
2,624,038	30	EA CONTEST CLUB
2,546,102	21	CONTEST CLUB FINLAND
2,486,292	14	BELARUS CONTEST CLUB
2,298,053	42	MINNESOTA WIRELESS ASSN
2,257,658	8	URAL CONTEST GROUP
2,241,327	14	VYTAUTAS MAGNUS UNIVERSITY RADIO CLUB
2,174,649	12	BELOKRANJEC CONTEST CLUB
1,952,360	27	FLORIDA CONTEST GROUP
1,881,190	8	UA2 CONTEST CLUB
1,681,286	7	CHILTERN DX CLUB
1,561,255	10	CONTEST CLUB SERBIA
1,485,367	5	WORLD WIDE YOUNG CONTESTERS
1,471,642	25	TENNESSEE CONTEST GROUP
1,416,231	17	NORTH COAST CONTESTERS
1,310,242	6	CONTEST GROUP DU QUEBEC
1,265,058	22	SOUTHERN CALIFORNIA CONTEST CLUB
1,213,392	6	BOSNIA AND HERZEGOVINA CONTEST CLUB
1,210,252	9	LATVIAN CONTEST CLUB
1,099,393	12	KENTUCKY CONTEST GROUP
1,041,208	8	ALRS ST PETERSBURG
1,037,364	9	GIPANIS CONTEST GROUP
1,032,528	33	NORTHERN CALIFORNIA CONTEST CLUB
1,023,317	8	NORTH TEXAS CONTEST CLUB
916,525	3	SHAKHAN CONTEST CLUB
875,807	10	DANISH DX GROUP
874,967	10	GEORGIA CONTEST GROUP
847,103	9	BLACK SEA CONTEST CLUB
792,495	5	CTRI CONTEST GROUP
753,373	7	MARITIME CONTEST CLUB
712,358	12	HUDSON VALLEY CONTESTERS AND DXERS
708,634	11	KANSAS CITY CONTEST CLUB
699,384	3	OKLAHOMA DX ASSOCIATION
697,636	5	WEST SERBIA CONTEST CLUB
680,708	14	SOUTH EAST CONTEST CLUB
633,725	4	SOUTH URAL CONTEST CLUB
624,833	4	RIIHIMAEN KOLMOSET
621,737	10	ALABAMA CONTEST GROUP
612,412	3	RCWC
610,766	6	CAROLINA DX ASSOCIATION
603,830	3	SRR
557,251	7	YO DX CLUB
553,091	7	LA CONTEST CLUB (NORWAY)
542,905	7	CENTRAL TEXAS DX AND CONTEST CLUB
526,083	7	BRISTOL (TN/VA) ARC
512,588	6	DONBASS CONTEST CLUB
487,550	4	S59ACP
464,012	6	NORTH CAROLINA DX AND CONTEST CLUB
460,446	5	BERGEN AMATEUR RADIOASSOCIATION
459,065	4	CENTRAL SIBERIA DX CLUB
454,580	4	SAUDI CONTEST GROUP
446,855	12	SHENANDOAH VALLEY WIRELESS ASSOCIATION
444,254	16	DFW CONTEST GROUP
411,619	8	WILLAMETTE VALLEY DX CLUB
408,312	11	WESTERN WASHINGTON DX CLUB
390,428	3	XE-DXERS
372,247	3	KIROVOGRAD REGION RADIO CLUB
368,731	9	GRAND MESA CONTESTERS OF COLORADO
368,707	11	VRHNIKA CONTESTERS
355,464	6	NIAGARA FRONTIER RADIOSPORT
338,279	3	GM DX GROUP
329,876	5	RUSSIAN CW CLUB
320,070	3	UR-QRP-CLUB
298,583	4	THRACIAN ROSE CLUB
288,413	11	ROCHESTER DX ASSOCIATION
270,113	3	TOP DX RADIO CLUB
264,500	3	TEXAS DX SOCIETY
263,940	7	BIG SKY CONTESTERS
254,044	7	RU-QRP
237,563	4	RADIO AMATEURS OF NORTHERN VERMONT
234,951	7	ORCA DX AND CONTEST CLUB
223,331	5	RADIOSPORT MANITOBA
223,176	7	SWAMP FOX CONTEST GROUP
216,578	7	DEUTSCH AMATEUR RADIO CLUB
196,183	3	MISSISSIPPI VALLEY DX/CONTEST CLUB
171,878	4	SPOKANE DX ASSOCIATION
171,861	4	CSM TIMISOARA
161,053	8	METRO DX CLUB
155,869	4	BAY AREA DXERS
151,359	3	LIPETSK RADIO CLUB
151,155	4	UKRAINIAN DX CLUB
150,181	8	WEST PARK RADIOPS
143,204	4	OMSK REGION RADIOCLUB
143,014	4	SUSSEX COUNTY ARC
135,993	3	PORTAGE COUNTY AMATEUR RADIO SERVICE
130,060	3	UTAH DX ASSOCIATION
106,743	3	RADIOCLUBUL QSO BANAT TIMISOARA
98,597	3	URE BAIX CAMP
96,829	4	R4F-DX-G
95,151	3	FALKOPINGS RADIOCLUB
88,772	5	YORK COUNTY CONTESTERS
54,867	7	KRIVBASS
54,021	3	HILLTOP TRANSMITTING ASSOCIATION
53,871	4	ARKTIKA
50,693	3	MOTHER LODE DX & CONTEST CLUB
50,390	3	VK CONTEST CLUB
40,060	4	PACIFIC NORTHWEST VHF SOCEITY
14,919	3	THE AKITA DX ASSOCIATION
5,952	4	RADIO CLUB VENEZOLANO
2,657	4	ARAUCARIA DX GROUP
581	3	YB LAND DX CLUB

Op, but the gap in score is 500,000 points. Peter even edged out John, ZF2AM, the top DX scorer, by 13,000.

The European battle was fierce between ES5RW, F6GOX, and DJ7WW. Only 25,000 points separated the trio. Low Power Single Op winners were perennials WD5COV, VE3MGY, and E74R.

I can't imagine the struggle of Single-Op QRP on SSB, but congratulations go to E77CV, E74Y, and W7XU with their fine effort. W7XU last appeared in the CQ 160 contest in 1998.

However, the real competitions occurred in the multi op category. The team of 6Y1M, operated by RN5M and S55M, operating at 6Y5LZ, took top honors. Krassy, K1LZ's, home station operated by the man himself and K3JO, also took top U.S. honors. A regular Petkov sweep.

KW7MM/VY2, operating at VY2TT, was a close second in world multi, but ended in a virtual tie with C6ANA. The two were separated by only 3 points after log checking!

S51V, HG8DX, HB9CA, and RW2F all had great scores over 400,000. In these challenging conditions, they were fine efforts indeed.

In the Assisted category, OK1BN piloted OK7K to a huge victory. It was Petr's first Single-Op effort in the SSB contest, and used his vertical and assorted RX antennas to his advantage. SN2M, LY4A, and UA2FZ came in second through fourth, respectively.

In Canada, the top score was VA2WA again, with 666 QSOs over the next competitor, VE3PN. In the U.S., Vasily, K3ZU, took top honors over K3WW and WØAIH.

In the western U.S., W5MX and W5PR duked it out for the Zone 4 top spot, with MX winning by a mere 10,000 points. N7AU was the leader on the west coast, with NS7K taking the low power spot.

Congrats to longtime friend and contester Willy, UA9BA, who took the top Russia spot (other than UA2FZ) all the way from Chelyabinsk.

Reminders About Contesting on 160

As in 2016, there were numerous complaints from contesters and others about the use of the spectrum during the contest. The main problem was the use of 1810 and below during the SSB contest in IARU region 1. We checked the logs for frequency violations, and warning letters were sent to the stations involved. QSOs were also removed if they were made out of the allocated band segments.

Additionally, there were some stations found to have signals with excessive bandwidth. Warning letters were also issued, and could result in future disqualifications. Look out especially for key clicks.

Some stations were also found to be self-spotting on the DX Cluster, and were reclassified or disqualified.

We encourage everyone to play by the rules, and the committee will do its best to keep the contest fairly adjudicated.

In closing, I would like to extend special thanks to all those assisting us to make the contest a success, including N6TR (log checking), K1DG (trophies), K5ZD (webmaster), and VE3MGY (records).

Certificates for everyone are available now for printing on our website at CQ160.com with trophies being mailed shortly.

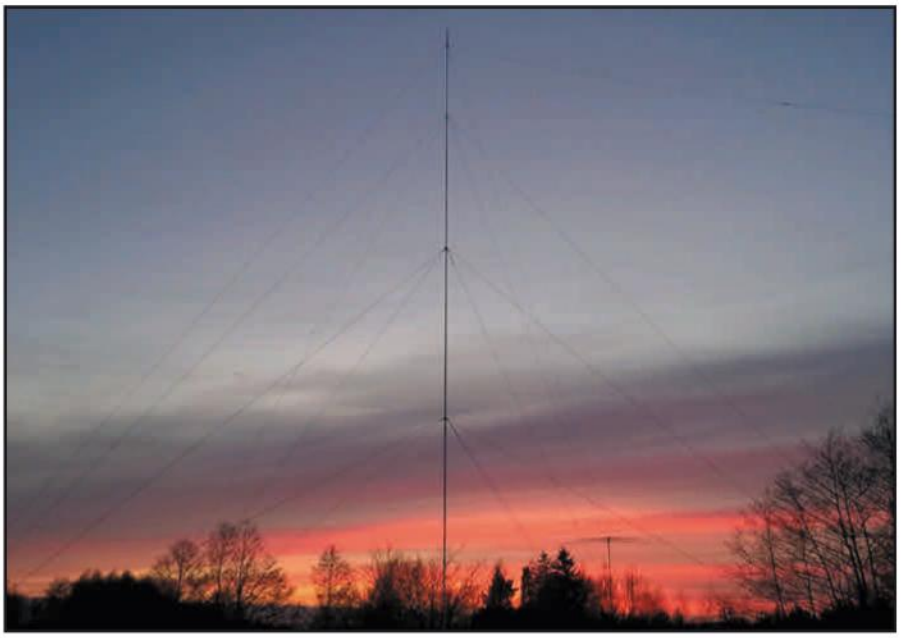
If anyone would like a Log Checking Report, send an email to me at <director@CQ160.com>. Please specify which mode you are asking for and the callsign used.

Thanks to all for participating and I hope to see you in 2018. Remember, all CQ Contests have a 5-day deadline for submitting logs. Check out the rules on CQ160.com for the latest information.

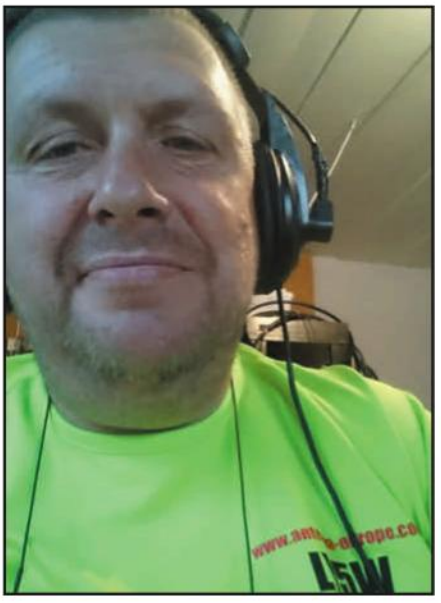
– *73, Andy, N2NT*

(Scores on page 101)

Val, N4RJ, made some QSOs at night, while looking for birds in the day.



Sunset on the vertical at SN2M.



Top low power in Lithuania was Sam, LY5W. I know it's him because it says so on the shirt.

Food for Thought

The author, a former FCC attorney, argues that the "Amateur Radio Parity Act," in its current form, may do hams more harm than good and urges a rewrite prior to Senate action.

Why H.R. 555 is Not Good (Enough) for Hams

BY JIM TALENS,* N3JT

Anyone who lives in a planned community knows that the community's Declaration of Covenants, Conditions and Restrictions (CC&Rs) is typically quite strict about erecting ham antennas of any kind. Some even prohibit the transmission of amateur radio signals from anywhere within the community, whether a private home or common community property. These CC&Rs are contractual in nature — the buyer of the property signed an agreement to abide by the HOA (Home Owner Association) or "community association" rules when the property was purchased. The amateur has had no recourse. Not until H.R. 555 appeared was there a first step toward change.

H.R. 555, the Amateur Radio Parity Act of 2017, passed by voice vote of the House of Representatives of Congress on January 24, 2017 (*An identical version of this bill passed the House in 2016, but was never acted on by the Senate –ed.*). It has been touted by some as real movement toward relief from the myriad CC&R restrictions against ham radio antennas. It would, its proponents argue, put licensed amateurs on essentially an even playing field with those living in private homes without CC&Rs. Indeed, Section 2, para. (7), of H.R. 555 expresses an intention to bring the equivalent of PRB-1 to deed-restricted communities. [*See* 101 FCC 2d 952, (PRB-1), and 47 C.F.R. Section 97.15(b)]

* *E-mail: <jtalens@verizon.net>*
The author is a former FCC attorney

Considerable interest has been expressed for the Senate to follow with a similar bill to complete the legislative action necessary to free us from the shackles of CC&Rs. But all this enthusiasm is overstated. The language of H.R. 555, if it becomes law, will *not* achieve its stated goal. The Senate must adopt different language if the process is to produce final legislation that helps radio amateurs in antenna-restricted communities achieve true parity with their fellow hams who do not live under CC&Rs. Let's take a look at some of the provisions of H.R. 555.

What bands? Section 1, Application of Private Land Use Restrictions to Amateur Stations, prohibits any HOA restriction that "precludes communications in an amateur radio service." This provision assures that the HOA cannot stop an amateur from using an indoor antenna, a prohibition that some HOAs included in their bylaws. That's a positive. But the provision also gives the HOA power to effectively limit what bands an amateur may use, even indoors, because the provision says that there can be no restriction that precludes communications "in an amateur radio service," not "in any licensed amateur radio band." This means an HOA could permit only operation on 2 meters because that's in the "amateur radio service" and on its face satisfies the Section 1 requirement. Moreover, for those with exclusive-use properties (private homes), the HOA will have an incentive for aesthetic reasons to limit the size of any outdoor antenna.

Section 2 prohibits restrictions against an "effective" outdoor antenna. What is an effective outdoor antenna? It may not be easily defined, but certainly a 2-meter whip is an effective outdoor antenna for communication in an amateur radio service. Combine it with Section 1 and you satisfy the two bill requirements: An effective outdoor antenna (it's long enough for 2 meters) in an amateur radio service.

"Put simply, H.R. 555 does little to help amateurs and risks permanently assuring… that many HOA dwellers … will not be able to erect useful outside amateur radio antennas."

The better approach would be for the bill to prohibit any HOA restriction that prohibits reasonable antennas for communications at any frequency authorized by an amateur radio license. This, at least, would remove a barrier to operation that might otherwise relegate an HF operator to 2 meters. The Senate bill should be written accordingly.

Prior Approval. Section 3, Application of Private Land Use Restrictions to Amateur Stations, Section (b)(1), requires an amateur licensee "to notify and obtain prior approval from a community association concerning installation of an outdoor antenna." Anybody who lives in a CC&R community knows that prior approval will not come readily, to say the least. Unlike a non-CC&R community, where PRB-1 assures up front that an antenna may be constructed subject to reasonable accommodation by state or local law, this bill would require that the CC&R resident must apply to the community for permission no matter how small the antenna — even a simple wire or mobile antenna affixed to the gutter.

Does the HOA have written rules regarding amateur radio antennas, and do its administrators understand the provisions of the federal law? In some cases, the HOA is merely an accounting tool for handling real estate taxes, maintenance, etc. It likely will not know a thing about the federal law or the standards under it, let alone procedures for redress. It is hardly equipped to respond to a request for prior approval of an antenna. What if there is no response at all to the

request, or the HOA has no standards for approving antennas? Is that tacit approval or tacit denial?

In any event, the requirement for prior approval constitutes a stark shift in burden because permission for even modest antennas, barely visible or not at all visible, must be affirmatively sought and given. For parity with PRB-1, the HOA should abide by default standards under the bill and then adopted by the FCC, presumably consistent with those set forth in Section 97.15(b). If indeed the goal of H.R. 555 is parity with PRB-1, why is there a burden to seek prior approval? Why is there no requirement that the FCC promulgate a rule like 97.15(b) for these community associations?

Federal Law Violation?

One legal consequence of H.R. 555 is that a deed-restricted resident who has been successfully using an outdoor stealth wire antenna for years without permission now moves from possible risk of contract breach to the realm of federal law violation. If there is failure to seek and obtain prior approval for an antenna through the HOA, the property owner would then be in violation of the statute and associated federal regulations (FCC rules). That is because federal law preempts HOA rules, meaning violation, enforcement, challenge, or compliance must be resolved in a federal venue, not in a local state court under contract law. (Note that a CBer caught doing the same thing is subject only to a contractual violation, not federal law, because only the Amateur Radio Service is included in the bill.)

Further, to add a bit of complexity and risk to this, an amateur radio license, when issued or renewed, carries a requirement for its holder to comply with all applicable FCC rules and regulations. An unapproved stealth antenna would be a violation of FCC regulations, for which there could be licensing consequences. (Maybe not likely, but possible.)

Whither a Dispute? Also lacking in the legislation is a procedure for the FCC to deal with disputes, as is the case the FCC's Over the Air Reception Devices (OTARD) rule under 47 C.F.R. Section 1.4000 that sets standards for requests for waivers and petitions for declaratory rulings. There is no such procedure provided in H.R. 555. Going to a federal court or dealing with a rule violation is not a ride in the park. The experience would likely be both protracted and costly. There should be a mechanism for FCC declaratory rulings or waivers, as in Section 1.4000.

Under H.R. 555 Section (b)(3), an HOA is permitted to establish reasonable rules concerning height, location, size and aesthetic impact of outdoor antennas. Going further, Section (b)(2) permits the HOA to prohibit installation of an antenna on common property not under the exclusive use or control of the licensee. Thus, an amateur cannot expect approval from an HOA to erect a wire antenna, let alone a beam, on the roof of a multi-story building; on the roof of a duplex condominium, or on a sliver of adjoining land to his stand-alone house in a deed-restricted community.

So how does H.R. 555 achieve its stated goal of establishing parity in terms of reasonable accommodation of amateurs with minimal practical regulation to communicate, and to provide, at their own cost, emergency communications? How does an HOA for 5-acre plots deal with an outdoor dipole antenna request? Can a townhouse owner put up a wire on his patio behind his house? The legislation should authorize and direct the FCC to parse out the needs for these and other situations, including multi-unit buildings, to provide a more equitable and meaningful parity to PRB-1 and Section 97.15(b) for amateurs living in all HOA communities.

Parity with PRB-1? Not quite! Most condominium owners reside in buildings that are exempt from the putative benefits of H.R. 555 because the bill's provisions address only those who have exclusive use or control of their properties. In other words, H.R. 555 may help only a minority of amateurs. It is quite evident that the Community Association Institute, which lobbies for real estate interests, was highly influential in crafting the language of this legislation to limit its benefits to a small segment of deed-restricted homeowners.

Even for those with HOA properties who might benefit from this legislation (single family dwellings), there are difficulties ahead. Cases decided by the FCC under the OTARD Rule illustrate the challenges because of similarities in much of the important language. 47 C.F.R. Section 1.4000 of the Commission's Rules (the OTARD Rule) prohibits governmental and private restrictions that impair the ability of antenna users to install, maintain, or use over-the-air-reception devices. It was adopted by the Commission to implement Section 207 of the Telecommunications Act of 1996. In one case, a homeowner in a deed-restricted community was denied permission to install a TV antenna on the side of his home near the roof peak. The HOA claimed he could get acceptable reception from a location in the back of the house below the roofline. Under the rule, a placement preference restriction is permitted provided it does not impair the antenna user's right to install, maintain, or use an antenna covered by the rule. A placement restriction impairs if it (1) unreasonably delays or prevents installation, maintenance, or use of the antenna, (2) unreasonably increases the cost of installation, maintenance or use of the antenna, or (3) prevents the antenna from receiving an acceptable quality signal. The burden was on the HOA to rebut the homeowner's assertion that he could not get adequate line-of-sight reception at the HOA's preferred location, but the HOA provided no technical support for its position and lost. [*See* Culver, <http://bit.ly/2rdPNCA>]

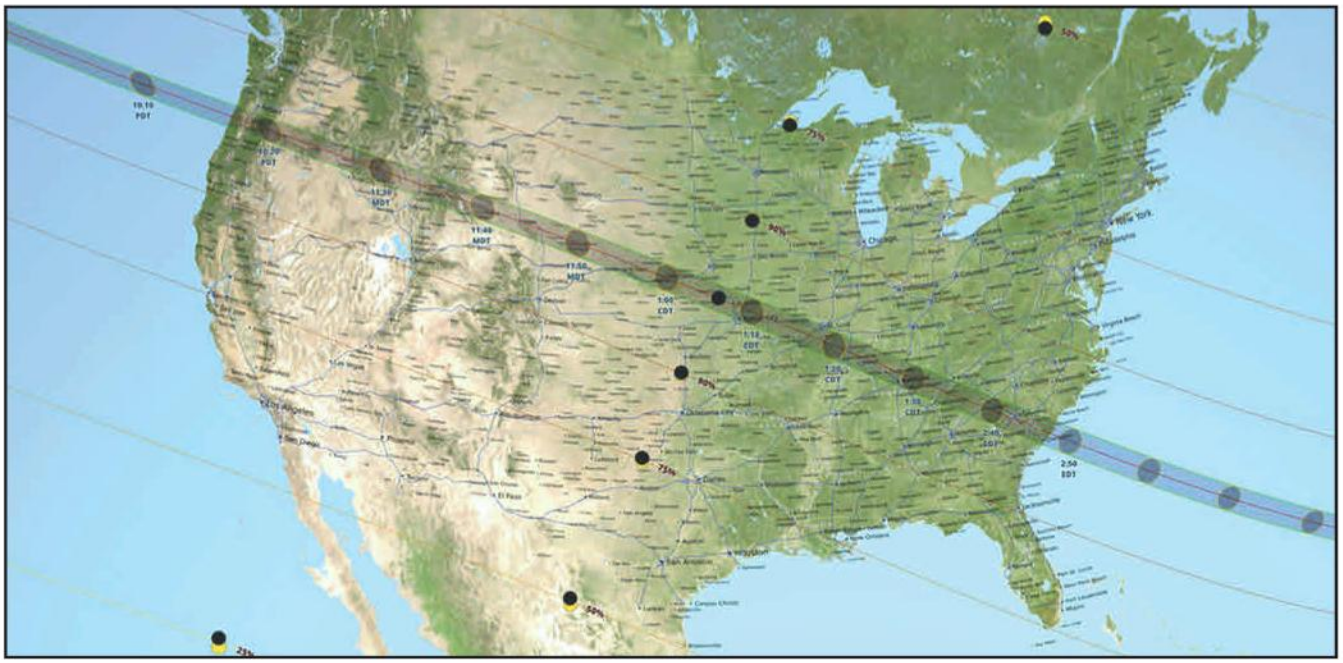
It is important to understand that the burden under the OTARD Rule is on the HOA to show that its restrictions comply with the rule's placement preference conditions. But under H.R. 555, the burden of securing prior approval for an antenna is entirely on the radio amateur, and there is no requirement that the FCC develop further rules to provide non-judicial means for those treated unfairly to seek declaratory rulings or waivers. In short, the considerations applicable to private land use and CC&R communities really are not so different, but H.R. 555 makes them very different.

Conclusion

If you are living in an HOA community or ever expect to live in a "community association" environment, you may want to become more active in correcting the version of parity that H.R. 555 purports to offer. Put simply, H.R. 555 does little to help amateurs and risks permanently assuring, with the imprimatur of federal law, that many HOA dwellers (especially those in high rises and townhouses) will not be able to erect useful outside amateur radio antennas. Exert whatever efforts you can toward helping the Senate pass a more ham-friendly conceived and drafted bill.

"Food for Thought" articles represent the opinions of their writers on topics of interest and/or importance to the ham community, and do not necessarily reflect the views of CQ magazine. They are published in the interest of promoting discussion of pertinent topics. Reasonable reader responses are encouraged and will be gladly considered for publication.

Where Will YOU Be During This Month's Solar Eclipse?



The path of totality (and near-totality) across the lower 48 U.S. states during the August 21 solar eclipse. Here's hoping for clear skies! (Photo credit: NASA/Goddard/SVS/Ernie Wright)

Many of our readers (and writers) have special plans for viewing the total solar eclipse whose path will cross much of the United States on August 21. If you take part in any special eclipse-related activities — especially if they involve ham radio (such as the HAMSCI eclipse experiment and/or QSO Party) — please send us a brief report about what you did, where you did it and how it turned out. Photos are welcome, of course (original resolution digital photos sent as individual file attachments) — but please observe the usual cautions about looking at the sun during an eclipse. We'll pick out the best stories and photos and share them with all of *CQ*'s readers. Please send your reports and photos to <eclipse@cq-amateur-radio.com>.

73, the editors

An inexpensive portable tool lets you scan the HF bands and wider frequency spans to measure and plot SWR for antennas and feed lines at home or in the field.

Build the SWR Sweeper

BY LEN BAYLES,* KA7FTP and JON TITUS,% KZ1G

The combination of an Arduino microcontroller module, a digital signal-generator IC, an LCD, and a few discrete components can create a small, portable SWR analyzer for shack or portable use. Low-cost standard components and a circuit board make it easy and economical to build this handy tool (*Photos A & B*). An inexpensive USB cable and module let you "flash" the open-source code into the Arduino module. Also, hams who feel at home programming with the C language may modify the thoroughly commented code for their own purposes. The analyzer covers the 10 HF ham bands individually as well as three frequency spans, 1 to 15 MHz, 15 to 30 MHz, and 1 to 30 MHz.

We love test gear and wanted a portable SWR analyzer in our arsenals of electronic tools. KA7FTP has a MFJ259B, but needed something a bit more "automatic" and easier to use. He looked at commercial and DIY analyzers, but only needed to measure antenna SWR over the bands he works, and equipment prices exceeded his budget. Internet searches often referred to the "$50 Antenna Analyzer" created by Beric Dunn, K6BEZ, who presented information about his design at Pacificon 2013, the ARRL Pacific Division Convention in Santa Clara, CA. Beric's design relied on an inexpensive microcontroller (MCU) module, a character-type liquid-crystal display (LCD), and PC based software[1].

For use outdoors during antenna setup, we wanted an instrument that operated independent of a PC. Internet research located a modified version of the K6BEZ analyzer created by Norbert Redeker, DG7EAO, which used a small thin-film-transistor (TFT) color LCD to plot results. This design looked inexpensive and portable...perfect. Although DG7EAO created documents in German, Donald Schwab, DC2WK, has posted English-language materials on his site[2]. For the prototype, KA7FTP purchased a 2.2-inch TFT LCD with a serial-peripheral interface (SPI), and an Arduino Pro Mini module. This module uses an Atmel ATMega328 MCU IC that includes 32 kilobytes of flash memory to store programs. It can control external SPI devices, includes a 10-bit analog-to-digital converter (ADC), and offers several digital input-output connections.

The Bridge

Finding an SWR value for an antenna or network requires the measurement of forward and reflected voltage on a transmission line or at a feed point. Many SWR meters use either a directional-coupler or a bridge circuit to provide this information. Analog or digital circuits then process the information to yield an SWR value. Both measurement techniques require a sine-wave signal source so we can relate SWR to a given frequency. The circuit described in this article uses a bridge and the voltages go to the ADC in the Arduino MCU that calculates and plots the SWR values.

This type of circuit relies on a Wheatstone bridge that uses three resistors of known value to measure an unknown resistance. According to Wikipedia, the bridge circuit "...was invented by Samuel Hunter Christie in 1833 and improved and popularized by Sir Charles Wheatstone in 1843[3]." (A discussion of a general Wheatstone bridge goes beyond the scope of this article. The *ARRL Handbook* and online references offer this information.) Unfortunately, most SWR-meter schematic

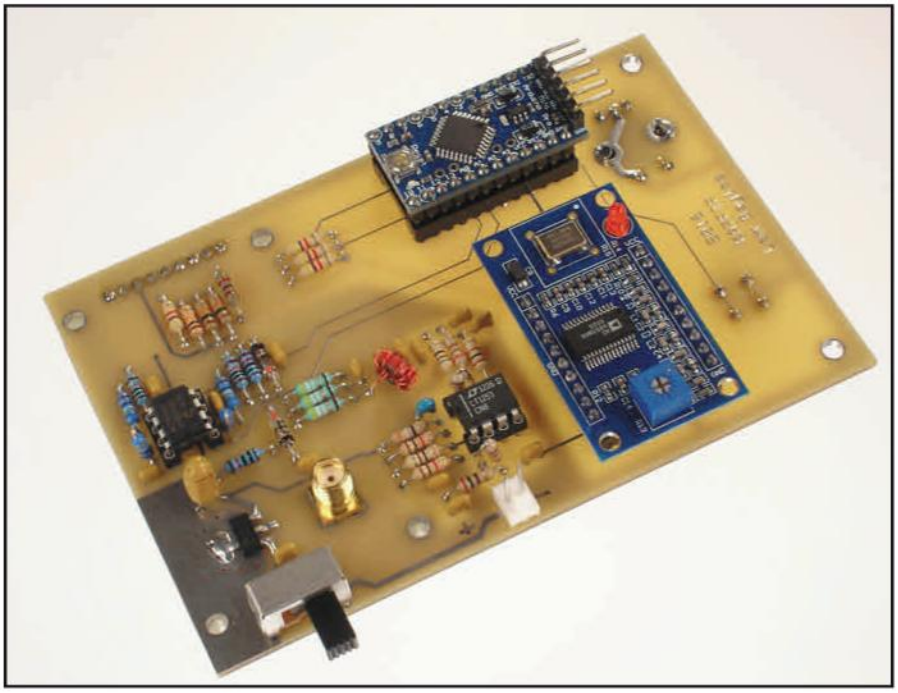


Photo A. The combination of an Arduino microcontroller module, a digital-frequency synthesizer, a display, and discrete components along with open-source software led to creation of a simple inexpensive SWR analyzer. This photo shows the component side of the board. (Photos by KZ1G)

** email: <lbay@isdi.com>*
% 5526 W 13400 South, Suite 105
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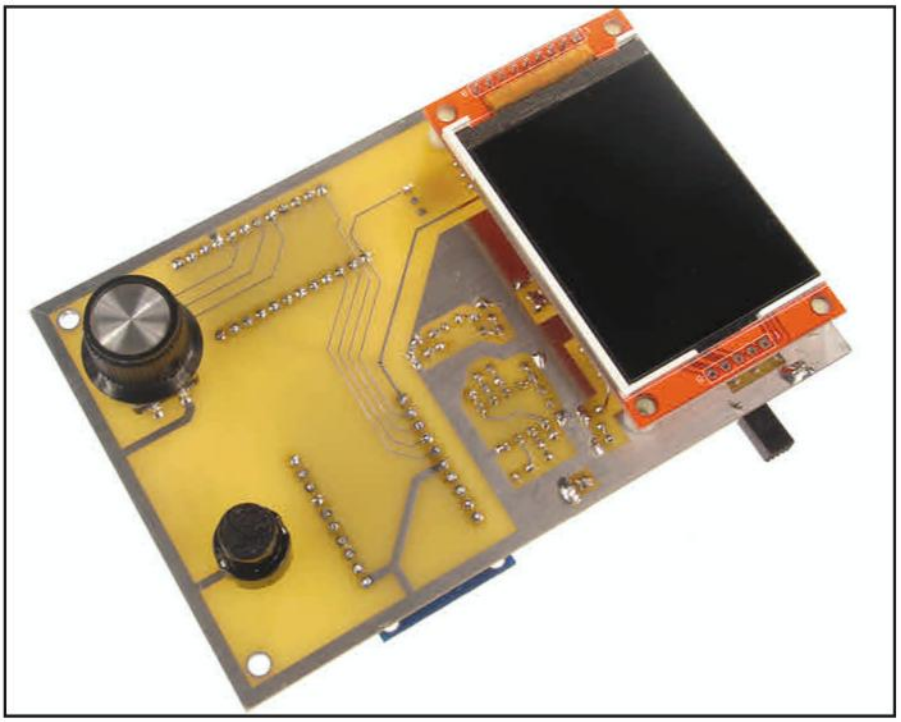

Photo B. The LCD display and a few other components mount to the bottom of the board, see text for details.

diagrams show a bridge circuit in ways that make it difficult to understand. *Figure 1* uses the Wheatstone-bridge format.

Measurements and Calculations

This circuit includes three 50-ohm resistors: R19, R24, and R25. An antenna or load attaches to form the fourth "leg" of the bridge. We apply a sine-wave signal at point A and measure it at point B. Diode D1 rectifies the signal that then goes to an RC low-pass filter. An op amp buffers the signal and applies it to the A1 pin on the Arduino MCU. That pin connects to an analog multiplexer and then to an ADC. The ADC digitizes the voltage that repre-

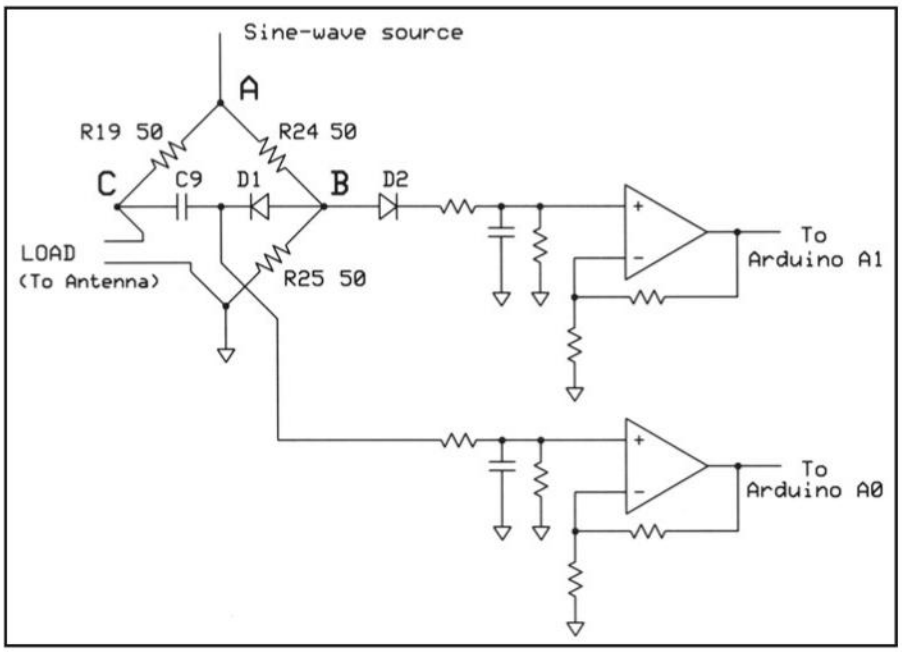

Figure 1. A Wheatstone-bridge circuit used to measure forward and reflected voltages. The "unknown" device-your antenna connects to the LOAD position. Some circuit details not shown for clarity.

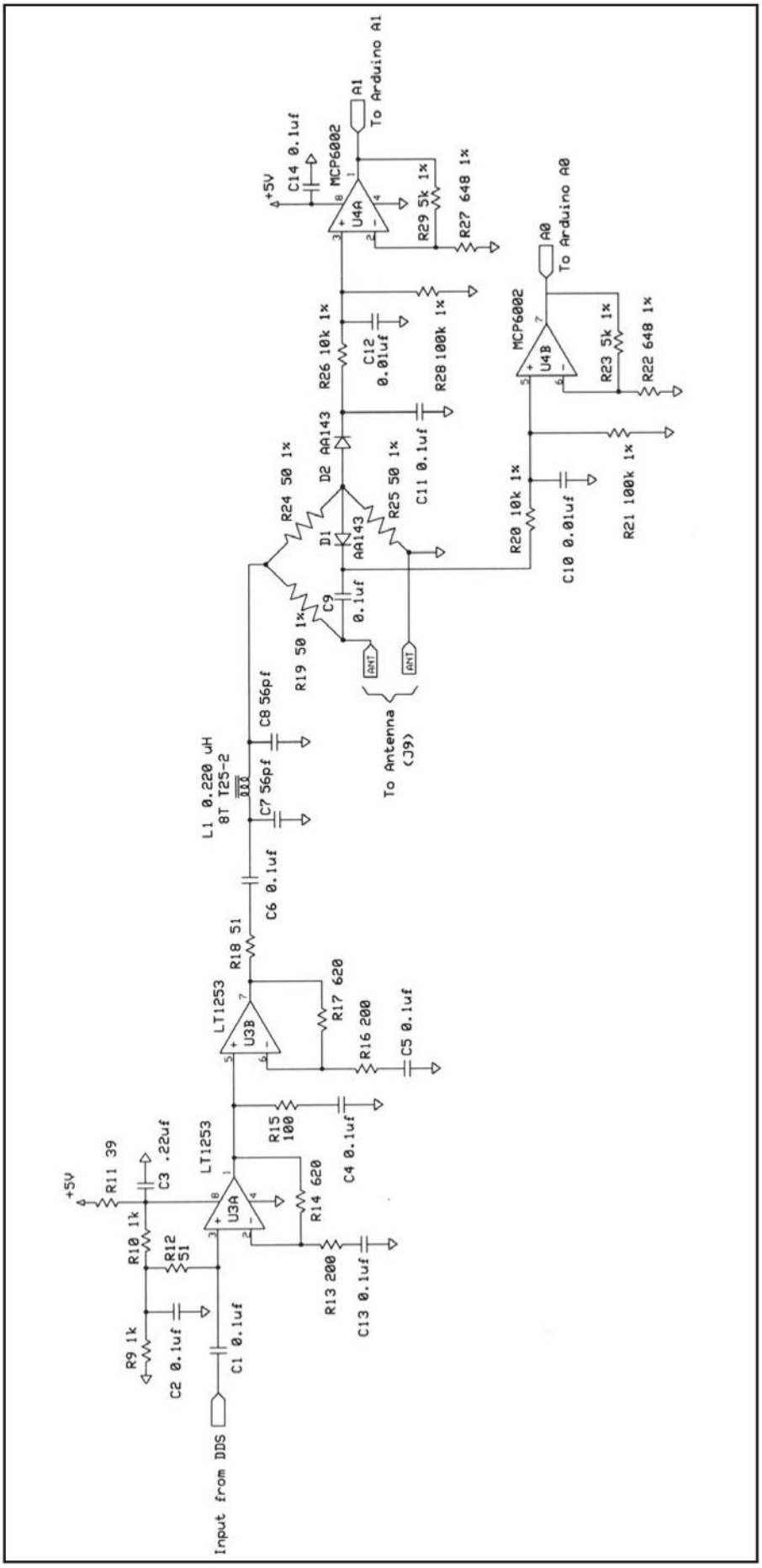

Figure 2. Schematic diagram of the analog portion of the SWR analyzer. Parts list is available on KA7FTP's website at <http://ka7ftp.com/SWR_Sweeper/BOM.pdf>.

sents the signal applied to a perfect 50-ohm load, or the forward voltage, V_{fwd}.

The second measurement occurs between C9 and D2 that connect to the bridge between points B and C. The voltage between the diode and capacitor represents the *imbalance*, or difference, between the 50-ohm resistance of R25 and the load, usually our antenna feed line. Capacitor C9 lets only the RF signal pass and diode D2 rectifies the "reverse" voltage, V_{rev}. These two voltages let the MCU calculate VSWR from the standard equation:

$$VSWR = \frac{Vfwd + Vrev}{Vfwd - Vrev}$$

The circuit uses AA143 germanium diodes to rectify the RF signals because manufacturers have optimized them for use at radio frequencies. You will find similar SWR-bridge designs with other diode types. *Figures 2 and 3* show the analog and digital portions of the analyzer circuit.

Create a Signal

An instrument that measures SWR over frequencies between 1 and 30 MHz requires a signal generator that can quickly scan those frequencies. Direct digital synthesis (DDS) techniques and IC-design capabilities have advanced over several decades to simplify digital creation of analog signals. The Analog Devices AD9850 IC, for example, accepts as many as 40 bits of data and provides a signal between 1 and about 60 MHz. When used with a 125-MHz reference clock, an AD9850 can create frequencies at steps as small as 0.03 Hz, and it can change frequency 23 million times per second. Modern transceivers use DDS circuits rather than crystals or LC VFOs to generate clean analog signals.

Several manufacturers sell DDS modules that provide an AD9850 IC and supporting circuits (*Photo C*) that include a serial-peripheral interface (SPI). It doesn't make sense to build your own. You need this specific type, which you can compare with those offered on EBay. Other module types might have different pinouts. Several references offer more information about DDS technologies[4,5,6].

Breadboard It

KA7FTP's first prototype showed good

results for a 50-ohm resistor (1.02:1 SWR) and a 100-ohm resistor (1.66:1 SWR). When connected to an 80-meter off-center-fed dipole, the analyzer "worked," but it produced poor results and inconsistent measurement-to-measurement values. A second prototype with a neater layout and 1% 50-ohm resistors produced consistent scan-to-scan data for the antenna. This prototype circuit included two op amps (an LT1253 dual op-amp IC) to boost the output from the DDS module, based on a design by James Kortge, K8IQY[7].

The original DG7EAO design used one pushbutton to change the frequency span and another to start an SWR scan. We wanted something more precise and added an inexpensive incremental rotary encoder and created a setup menu (*Photo D*). Now a push of the rotary-encoder knob displays the setup menu, and turning the knob lets you select an HF band, or a wider frequency range. Press the scan button and the analyzer sweeps through the selected range and plots the SWR (*Photo E*). The plot also shows the lowest SWR value and the frequency at which it occurred. The analyzer is neat, inexpensive, and works well. Power from a battery pack makes the device a handy tool for field use.

KA7FTP used a Tenergy Li-ion 18650 7.4-volt, 2200-mAh lithium-ion battery pack in his analyzer, while KZ1G used four AA-size 1.5-volt lithium batteries. The analyzer draws about 280 mA, so regular AA alkaline batteries don't pro-

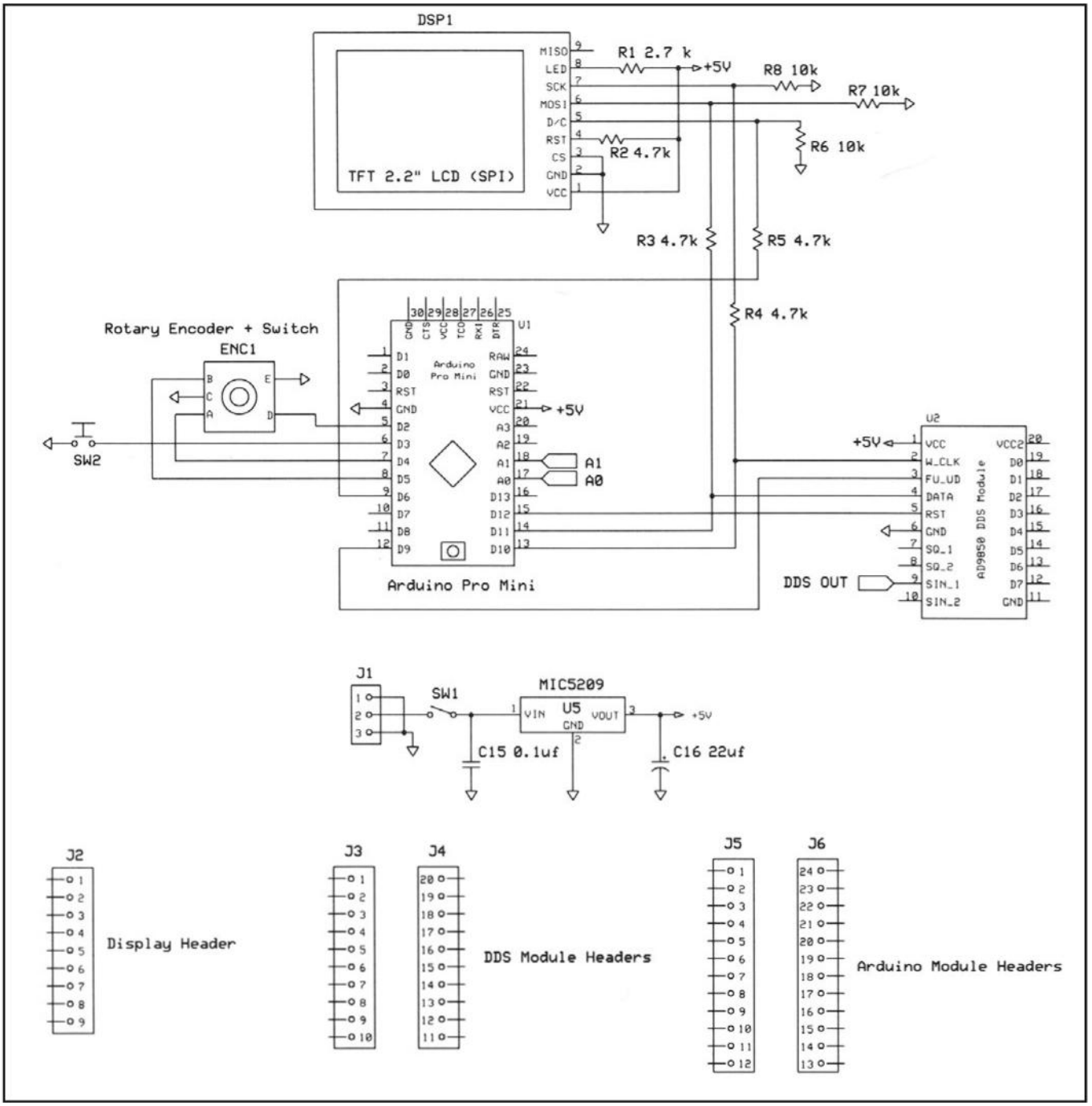

Figure 3. Schematic diagram of the digital and power-source portion of the SWR analyzer. Parts list is available on KA7FTP's website at <http://ka7ftp.com/SWR_Sweeper/BOM.pdf>.

vide enough life for field use. The MIC5209 low drop-out voltage regulator (U5) will operate with an input voltage as high as 16 VDC. The higher the voltage applied, the more heat the regulator must dissipate. KA7FTP added a small piece of angled aluminum to the PCB to dissipate heat. Because KZ1G operated his analyzer at a lower voltage, the regulator on his board warmed only slightly.

Hardware

The Arduino Pro Mini MCU controls the DDS module and the LCD. It also detects signals from the pushbuttons and the rotary encoder. The encoder shaft actuates a second pushbutton. The MCU includes a 10-bit multiplexed ADC that digitizes the forward and return voltages from the bridge. Lastly, the MCU controls a serial port that can communicate with a PC, but PC use is optional and discussed only briefly later. (The PC software was not part of this project.)

When you select a ham band or a preset frequency range, the MCU calculates the DDS control value for the starting frequency and sends it to the AD9850 IC via the SPI bus. The sine wave from the DDS module goes to two wide-band amplifiers (U3A and U3B, a dual op-amp LT1253 IC) and then into the 50-ohm resistive bridge. As the Arduino software and DDS module produce the frequency sweep, the MCU performs analog-to-digital conversions at equal frequency increments, and stores the calculated SWR measurements in an array. When the sweep ends, the MCU clears the LCD, draws grid lines, and plots the SWR values from the measurement array. The display also includes the lowest SWR value and the frequency at which it occurred. The analyzer SWR range tops out at 1:10.

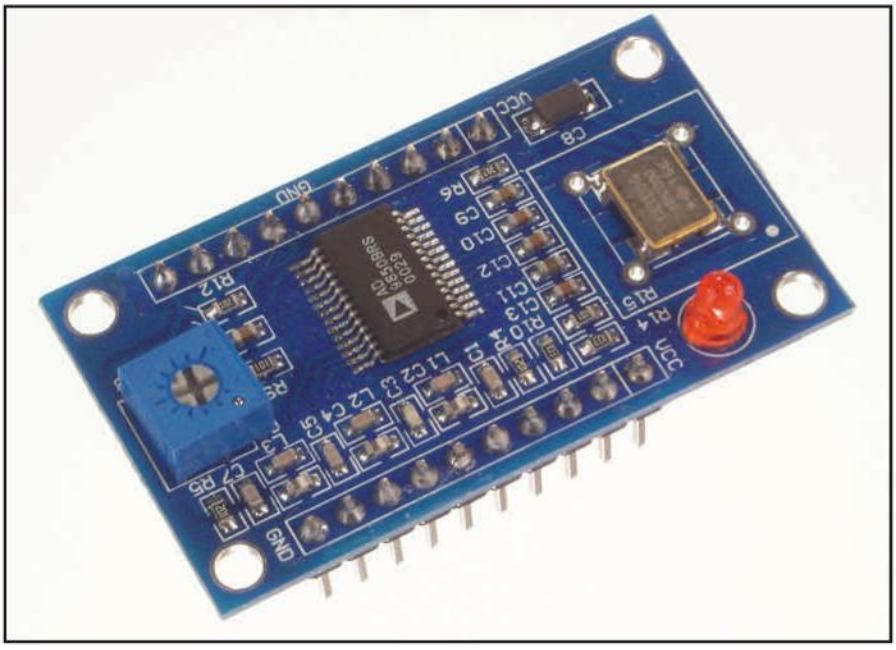

Photo C. This DDS module employs an AD9850 DDS IC and components that give us a complete signal generator with a range from DC to about 60 MHz.

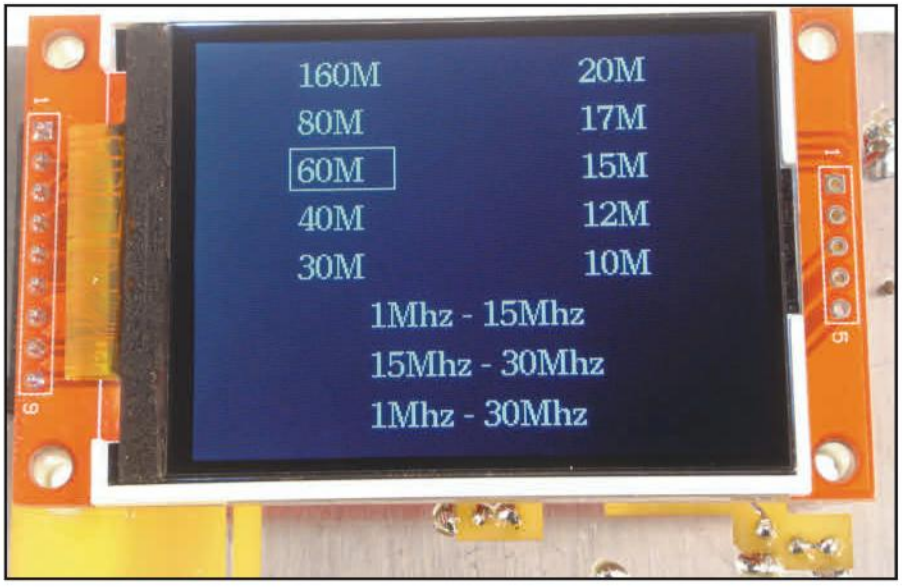

Photo D. The setup menu lets someone select any of the HF ham bands or three larger frequency ranges between 1 and 30 MHz.

Each band sweep goes from band edge to band edge. The wider sweeps are useful with multiband antennas, or when you have an antenna that might resonate outside the band you want to tune it for. You can easily change settings in the software and upload new code the Arduino's flash memory. (Changes require some knowledge of the C language.)

Construction

You may construct the analyzer any way you wish, although a PCB simplifies assembly and makes it easy to mount the analyzer in a case. The PCB for this project includes a solder mask and part-placement identifiers[8]. You could put the bridge, amplifier, DDS, and Arduino circuits on the PCB and then mount an RF connector, the two controls, the power switch, and the display nearby. The following explanation describes construction on a PCB. Except for the low-dropout voltage regulator (MIC5209) all components have leads for through-hole soldering.

To start, solder the surface-mount MIC5209 voltage regulator (U5) on the board. The large metal tab and the body of the regulator should lie flat against the PCB. Put a small amount of solder on one of the three small PCB pads for U5. Then hold the regulator on two sides with a pair of tweezers or small needle-nose pliers and align all three pins with the three PCB pads. Reheat the soldered pad and connect the regulator to it. Align the other two pins. If necessary, re-melt the solder and position the regulator as needed. After the soldered pin cools, solder the other two pins to their respective pads. Finally, solder the large tab to the ground plane of the board. This step requires more heat for the solder to flow onto the large ground plane that also serves as a heat sink.

Once you have the regulator soldered to the PCB, mount and solder all other

discrete parts. We recommend you "populate" boards in order of part height, so resistors and diodes get placed and soldered first. Then solder small capacitors, IC sockets, and female headers for module pins. Note: Resistors R14, R17, R23, and R29 stand upright-vertical to the PCB.

Purchased DDS and Arduino modules might require you to solder male-pin headers on them. If so, use a solderless breadboard as a template. Press the long ends of headers into the breadboard, place a module onto the pins and solder them. This technique ensures a right angle between the pins and the module. We recommend builders use low-profile multi-pin female headers for the DDS, Arduino, and LCD connections. You need headers that accept the 0.025-inch-square pins on the modules. Likewise we recommend 8-pin IC sockets (J2 and J3) for both 8-pin ICs (U3 and U4). The PCB includes space for an SMA connector (J2) of your choice, although you could connect to any connector type with a short piece of 50-ohm coaxial cable.

Caution: The LCD header, pushbutton, encoder, 3-pin power connector, and the RF connector mount on the solder side of the board.

You must wind one inductor (L1) that uses a T25-2 core with eight turns of 26 AWG insulated magnet wire. Remember, we consider a "turn" any wire that passes through the toroid. This inductor forms part of a low-pass filter that follows the DDS amplifiers. Wire with a heat-strippable insulation makes it easy to get bare copper for a solder connection.

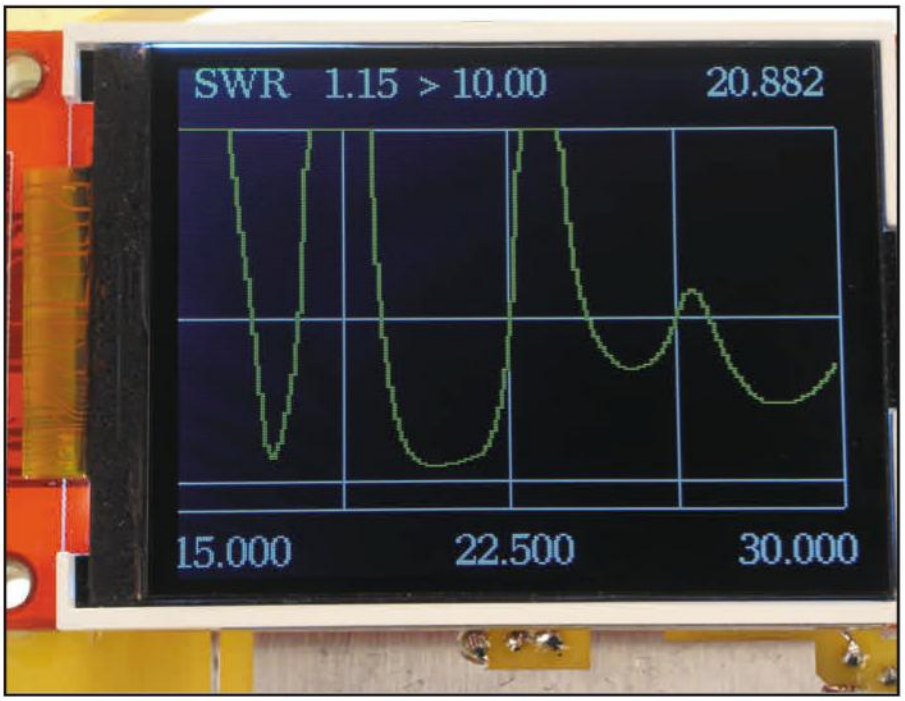

Photo E. An SWR plot for a 3-band Cushcraft R3 vertical antenna that employs a motor-driven capacitor at its feed point to adjust tuning. This plot shows the antenna set for 15-meter operation. A Rig Experts AA-170 measured an SWR of 1.28 at 20.882 MHz.

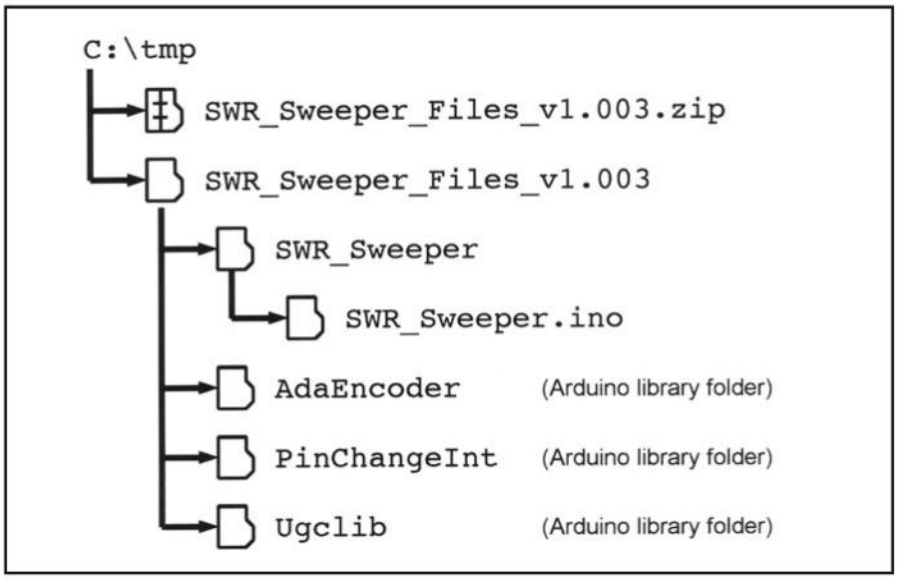

Figure 4. The contents of your C:\tmp for the SWR Sweeper sketch should look like this after downloading from the KA7FTP site and unzipping the SWR_Sweeper_Files_v1.003.zip folder in the tmp folder.

Software

All software for this project is freely available and open source[9]. The Arduino website offers free integrated development environment (IDE) software you may use to examine and modify source code, compile it, and download it to an Arduino module. Modify the software as you wish to add features, change the display, and so on. KA7FTP did all programming work with the Arduino IDE. KZ1G added comments, removed "dead" code and reformatted some statements. (The Arduino site offers newer IDE versions but we have not used them to compile the analyzer software.)

If you haven't used an Arduino MCU module, we recommend you download the Arduino IDE software which runs on Windows, Macintosh OS X, and Linux computers[10]. A tutorial from Sparkfun explains setup and programming for an Arduino Pro Mini[11]. KZ1G downloaded the arduino-1.0.6-windows.exe file and ran it to install the Arduino IDE into the Windows program folder: **C:\Program Files (x86)\Arduino**

After you install the Arduino code in a Windows computer, you should find the Arduino program near the top of the program list for your PC. Run it and click on the File menu word in the upper left of the Arduino window. The drop-down menu includes an Examples item. Put your cursor over it and you'll see a list of many examples you can try. Take time to go through some Arduino tutorials and simple program examples so you understand the code-compiling and -downloading steps. Examples include several types of LED-blink code you run on an Arduino Pro Mini board, which comes with an LED you control via soft-

Fishing for Information on a Marine Radio

Keeping Track of Ocean Action on a Standard Horizon HX300

BY JASON FELDMAN, KD2IWM

For the longest time, I would watch the boats cruise by in the New York State Boating Channel while I was fishing on the Jones Beach fishing piers. Although some of them were pleasure craft, a sizable fleet of fishing boats was also busy conducting their hunt for the bounty of the sea. Practically all of those boats contained a marine VHF radio that the crews use to brag about catches, report on sea conditions, monitor the Coast Guard, and get weather reports.

Even as a shorebound angler, I knew that the information that was put on the air would provide useful knowledge to me if only I had a radio. Luckily, I get to head to the Dayton Hamvention® to work in CQ's booth, so I would search the flea market for a used marine radio when I had a few spare moments and every year I would come up empty handed. After many fruitless searches, I finally bit the bullet and purchased a Standard Horizon HX300 handheld marine VHF radio that I could take with me on fishing trips to the pier.

The HX300 proved my intuition correct. Although most anglers usually maintain strict radio silence on prime fishing spots, there are a sizable number that cannot help broadcasting to everyone about their latest catches. Although they are careful to use slang for their spots, studying a nautical chart — especially by Captain Seagull — will tell you exactly where they are fishing.

Associate Editor Jason Feldman, KD2IWM, with his Standard Horizon HX300 handheld marine VHF listening to the action on channel 68.

Even when they don't reveal an exact location, there is still plenty of information to be gleaned from their general fishing reports and sea conditions. For example, on the first day of using the radio, I learned that fishing was slow in the ocean and the back bays of Long Island's south shore. So moving to a different spot would prove to be fruitless. In addition, since I knew that fishing was slow in the ocean, it would be a waste of money to board a party boat to head out to the ocean in the afternoon.

All of this information was learned by monitoring one channel. In my haste to utilize the radio, I very briefly skimmed the manual and only knew how to change channels and switch to NOAA Weather Radio. So the next week, I learned how to set up a scan of the channels I wanted to hear and was able to hear pretty much every boat and ship within the reception range of the rubber ducky antenna. I was listening to a harbor pilot boat trying to navigate toward a British ship so it could guide it to Newark harbor. I heard the Coast Guard report there was a navigational hazard to boats floating in Fire Island Inlet. Depending on the vagaries of propagation, I can sometimes hear reports of fishing boats near Port Jefferson on Long Island Sound and even from Manasquan Inlet in New Jersey.

I should note that I only monitor the VHF radio and do not transmit because FCC rules strictly limit the use of VHF marine channels by stations on land. Despite the FCC's regulations and even if you do not have a boat, get yourself a marine radio and listen to the action on the high seas. If you would like to know more about the HX300 and check out its features, visit <http://bit.ly/2u1EclQ>.

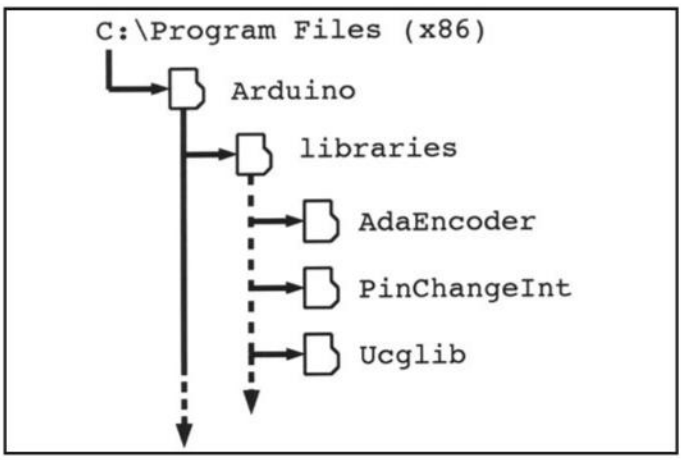

Figure 5. The Arduino libraries folder after you move the three library files into it. You will see other folders, too, in alphabetical order.

ware. In the Arduino world, programmers create "sketches," their jargon for programs.

Load the Code

To load a sketch into an Arduino Pro Mini module, you need a serial-programmer module and a USB cable. Adafruit (FTDI Friend!), Sparkfun (DEV-09873), and Ebay vendors sell inexpensive modules that connect to the 6-pin male header on the Arduino board. Ensure the *serial* programmer you select has a female header with six positions. KA7FTP prefers a programmer that includes a jumper so he may select either 5-volt power from the USB cable or power supplied to the Arduino from another source. Some programmer modules include a jumper that lets you select either +5 or +3.3 volt power for the Arduino. Either way, you need 5-volt power for the Arduino MCU. Connect the programmer to your PC via a USB cable and from within the Arduino IDE select the attached module type. Click on the **Tools** menu item and then choose **Board:** from the drop-down menu. Find Arduino Pro Mini (or other board type) in the list that appears and click on it. This step matches the IDE output to a specific MCU board.

For the SWR Sweeper project, we recommend you create a temporary folder such as C:\tmp into which you then download the SWR_Sweeper_Files_v1.003.zip folder for this project[9]. Next, unzip the contents of this folder. The extracted files will go into a new subfolder, **SWR_Sweeper_Files_v1.003**. The resulting "tree" (*Figure 4*) shows the contents of the .tmp folder after the unzip step. In the **SWR_Sweeper** folder you will see the **SWR_Sweeper.ino** file. This is the Arduino sketch you will run shortly.

The SWR_Sweeper folder also contains three Arduino *library* folders: **AdaEncoder**, **PinChangeInt**, and **Ucglib**, also shown in *Figure 4*. Library files let us incorporate software created by others in our programs. The Ugclib library, for example, handles functions that control the LCD. The Arduino IDE comes with libraries to control servo and stepper motors, communicate via Ethernet and WiFi, and perform other tasks.

Before you can run the **SWR_Sweeper.ino** program, you must move the three library files noted above into the Arduino libraries folder. You can copy them from the **.tmp** folder and paste them in the Arduino libraries folder, or drag and drop them into this folder. *Figure 5* shows the Arduino libraries folder after a successful move. (Library names appear in alphabetic order.)

After you have the SWR_Sweeper sketch and the three

libraries in their proper folders, simply compile the sketch and upload it to your Arduino Pro Mini module just as you did when experimenting with simple Arduino programs. You should see the message "Done compiling." in the blue-green bar beneath the Arduino code window. In the black window farther down, you should see the message, "Binary sketch size..." and a number.

Next, the message "Uploading..." appears in the blue-green area and a green "progress bar" appears to the right. Finally you will see "Done uploading" when your code has properly loaded into the Arduino's flash memory. If you have problems, search the Arduino Forum at: <https://forum.arduino.cc/>.

Measure SWR

Turn on the SWR Sweeper and the LCD should display a splash screen. Press the rotary knob and a menu lets you rotate the knob to select an HF band or frequency span to sweep. Press the button to the right to start the process. The word "Scanning" appears and a line moves up and down to indicate the process is underway. Soon you will see the SWR plot. Text at the top of the screen indicates the minimum and the maximum SWR (10.00), and the frequency of the minimum SWR.

As mentioned earlier, you may use the analyzer with PC software that displays SWR and other information. We did not create or use this software and simply make you aware of it. To use this software, you must connect your analyzer to your PC via the serial programming module and a USB cable. Visit: <http://bit.ly/2lTkg6O>.

Notes

1. Dunn, Beric (K6BEZ), "Build Your Own Antenna Analyser for under $50." <http://bit.ly/2kuUHfg> and <http://bit.ly/2kuYSro>
2. <http://bit.ly/2lc5c4g> and <http://bit.ly/2lY2LBp>
3. "Wheatstone Bridge" <http://bit.ly/20GsD4B>
4. "CMOS, 125 MHz Complete DDS Synthesizer" <http://bit.ly/2kDexjj>
5. "A Technical Tutorial on Digital Signal Synthesis," Analog Devices, 1999 <http://bit.ly/2lQimqI>.
6. Titus, Jon, "DDS ICs and IP Make Waves," ECN, October 2008 <http://bit.ly/2kOqP9C>
7. <http://bit.ly/2kOH5Y7>
8. PCBs and gerbers (PCB design files) are available from Oshpark.com at: <http://bit.ly/2lYRHEb>. The PCB files are open source and available - along with schematics, layouts and code - from KA7FTP's website at <http://bit.ly/2lmYFpP>.
9. Download the project code from KA7FTP at: <http://bit.ly/2lmYFpP>. You want the "SWR_Sweeper + All libraries" software.
10. Arduino IDE download: <http://bit.ly/1R2xniM> and <http://bit.ly/1Y8RV9q>.
11. Sparkfun has an introductory tutorial for the Arduino Pro Mini on its web site: <http://bit.ly/2lQhzG6>
12. Download Arduino libraries from:
    a. uicglib: <http://bit.ly/2kDc0G2>
    b. PinChangeInt: <http://bit.ly/2kOro3n>
    c. Adaencoder: <http://bit.ly/2lcfbpY> or <http://bit.ly/2kOxnF3>

What motivates hams to mount DXpeditions or other operations from rare locations and to put themselves on the receiving end of a pileup? WB1EEU examines the "Pileup Creators."

Addicted to the Pileup

BY C. FRANK RIDOLFO,* WB1EEU

Every amateur radio operator who has worked DX is likely familiar with the "pileup" — that notorious radio enterprise that generates chaos, hope, despair, joy, anger, a sense of victory, and a sense of defeat. For an amateur radio operator, the pileup is the gateway to all these things and more.

We all have read numerous stories regarding pileups that address a variety of topics, such as: Working through the pileup, pileup etiquette, establishing a "run rate," travel adventures, profiles of DXers, and the like. However, this article will present the pileup from a new and unusual perspective; one that has not been adequately addressed in the past.

Motivations of "Pileup Creators"

I have always been fascinated by what causes individuals to create a pileup in the first place. Over time, I became convinced that there was a hidden and unsuspected motivation behind the "Pileup Creators" — those individuals who travel afar via DXpeditions to rare and exotic locations; resident DX stations that attract a crowd whenever they are on the air; and even contesters who occupy a single frequency as they make a "run."

We may think we know what motivates someone to create a pileup — personal satisfaction, excitement, recognition, and the like — even satisfying the human ego. But there is something more to it than most people suspect. It is something so primal, so deeply embedded within the psyche, that it has eluded most of us throughout our lives.

I have been seeking it out for many years; exploring all the avenues to see where they may lead. Most were dead ends. In time, however, I was finally able to ferret it out.

My First Pileup

I had my first experience as a "Pileup Creator" in 1993 when I was a guest operator at 6K93XPO, a special event station celebrating an international exhibition being held in Taejon (now Daejeon), South Korea. The Communications Pavilion housed an amateur radio station and, as I always carry a copy of my amateur radio license whenever I travel, I was granted the privilege of being a guest operator at this very special station.

I was with several Korean engineering colleagues (none of whom was an amateur radio operator) who didn't quite understand my urge to operate the station, but politely left me to my Nirvana and said they would return in two hours to pick me up. So there I was, alone at the operating position of 6K93XPO, and suddenly feeling very insecure about what I was to embark upon.

I had never been in such a situation before. I was apprehensive and a bit intimidated. After composing myself, I tentatively and rather meekly put out a call.

"CQ CQ CQ, this is 6K93XPO in Taejon, South Korea. CQ CQ CQ ... CQ CQ CQ from 6 Kilo 9 3 X-ray Papa Oscar."

Nothing heard. Was this going to be my fate — being in Asia with an exotic callsign — and no one answering me?

I tried again. I called a little bit longer and a little bit bolder. In response, several stations called back. It took me by surprise, this being my first time as DX.

"QRZed – this is 6K93XPO."

After that, it was pandemonium. Stations all over Asia and the Pacific were calling me.

The first call I picked out of the resonating chaos was a station in China. I was stunned. China had only recently allowed ham radio operations — and only in a restricted manner. No radio licenses were issued to individuals — only to sanctioned clubs or universities. And here I was working a station in China. Good grief, this was exciting!

After that, I worked stations in Taiwan, the Philippines, Thailand, and Guam; all in rapid succession. Many other countries throughout Asia and the Pacific continued to call me. I soon found my rhythm, and was delightfully grinding through the pileup. These were stations from countries that I had never even heard on the air from my home QTH in Connecticut. It was astonishing. So many rare and wonderful DX stations, all calling *me* — almost pleading with me to recognize their callsigns.

Wow — what a rush!

I was so focused on the pileup that I didn't notice that my Korean colleagues had returned. One put his hand on my shoulder to get my attention. "Frank", he said, "We came back for you — it's time to go."

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Bloomfield, CT 06002

"Food for Thought" articles represent the opinions of their writers on topics of interest and/or importance to the ham community and do not necessarily reflect the views of CQ magazine. They are published in the interest of promoting discussion of pertinent topics. Reasonable reader responses are encouraged and will be gladly considered for publication.

I was confused. Why were they here so early? I said, "I thought you would be coming back in 2 hours." To which he replied, "It's been 2 hours, actually more than 2 hours." I was surprised. How quickly the time had passed for me. From my perspective, it seemed that I was operating for less than one hour, yet two full hours had passed. I now understood what the expression, "time flies when you're having fun," meant. Time really does speed up when you are enjoying yourself.

Reflecting on the "Rush"

Later, while reflecting on my first experience as DX, I became curious about that "rush" which I experienced. What was it about the pileup that generated such elation and a sense of pure satisfaction? I didn't know it at the time, but that experience planted a seed in me that would take me on a multi-decade quest to discover the true reason behind the lure of the pileup and why the "Pileup Creators" inevitably become so addicted to the pileup.

When I returned home to my QTH in Bloomfield, Connecticut, I began making occasional trips to the nearby headquarters of the American Radio Relay League (ARRL) in Newington, Connecticut to operate the Hiram Percy Maxim Memorial Station, W1AW.

All my operations at W1AW inevitably generated mini-pileups, which, in-turn, generated a corresponding sense of pleasure for me and seemingly increased my self-esteem. I recall after completing one session at W1AW, longtime station manager Joseph Carcia, NJ1Q, casually asked me how it went. I offered, "What a rush!" in response.

There it was again, that expression — What a rush.

Those who create pileups know the feeling well. It is often described as being in an almost euphoric-like state (at least at the beginning — as the pileup drags on sometimes that initial euphoria can be replaced by something less joyful — but no matter).

The Quest

It is undeniable that there is some sort of craving that the pileup satisfies. It is what keeps the Pileup Creators on the air, working station after station, even enduring personal discomfort, to obtain that unique satisfaction that only the pileup can provide. It is something that the Pileup Creators seemingly can't live without. It is something they constantly return to, over and over again. Creating one pileup, and then creating another in the future, and repeating the process over again and again. But why?

That question intrigued me so much that I set out on a quest, in earnest, to discover the reason behind the "rush." It was a pet project of mine. I worked on it, on-and-off, for many years.

At numerous ham radio conventions, I talked with many Pileup Creators, asking them the same question: "What motivates you to do it?" The answers I received were similar: Personal satisfaction, excitement, giving something back to the hobby, and the like — reasons that most people would consider to be "noble."

I also noted that Pileup Creators rarely claimed to do it to satisfy their egos. Our society associates doing something in order to "feed the ego" in a negative context. Individuals with "big egos" are generally regarded as being self-centered, conceited, and possessing an over-inflated sense of self-importance. No Pileup Creator wants to be known for that. Still, it is undeniable that creating a pileup puts one at the center of attention, and this clearly satisfies some deep-rooted need of the ego.

However, I instinctively knew that there was something more to it than simply being the center of attention. The real question was — why? Why was it important to be the center of attention? What was the ego craving that required so much attention? And why did it experience such fulfillment when it received it?

Examining the Ego

Before continuing, let's try to understand exactly what the ego is. The simplest and most fundamental definition for the ego is "the self" or the "concept of self," or "the I." In effect, for me, it is how my mind perceives me and my existence, and for you it is how your mind perceives yourself and your existence. It is fundamental as to why we humans are "self-aware" — we all have egos.

It was obvious to me that despite the efforts of the Pileup Creators to deflect consideration of the ego as a prime motivator, it was indeed heavily involved in some manner.

I struggled to find out what exactly was going on in the mind (with the ego?) of the Pileup Creator. Were we like puppets, being unknowingly manipulated by our egos — convincing ourselves that we were creating the pileup for some noble purpose when, all the while, we were unwittingly serving some unknown (and perhaps less noble) need of the ego?

I had a feeling, a vague idea, an intuition, as to what might be happening. But

I couldn't quite get it. I was skirting on the periphery of the matter for many years, but not moving any closer to the real cause of what motivates the Pileup Creators.

I have worked as a nuclear engineer for several decades and I am now a science advisor for a company located in South Korea. But the answer to this question of the ego was clearly outside the arena of technology and the physical sciences.

It was only when I became interested in philosophy and psychology that I finally grasped what it was all about. It was so fundamental that I am embarrassed to say that I overlooked it for so many years.

Do I Matter — and What Does it Matter?

So, what is the Pileup Creator — and indeed, what is each one of us — seeking? It is simply finding "validation" in life as an individual. That is, in this world that is inhabited by billions of people, how do *I*, as an individual, "matter?" If I can successfully find evidence that "I matter," then I will achieve a certain sense of satisfaction with life and with my role in it. My existence will have been "validated."

As others have explained, this human need to "matter" allows a pathway towards achieving an objective and satisfying meaning for, and purpose in, life. In fact, the entire topic of "mattering" has evolved into a formal discipline known today as *Mattering Theory*.

One of the strongest forms of human "mattering" (finding "validation" as an individual) is achieved by obtaining recognition from others. As philosopher and novelist Rebecca Newberger Goldstein notes, "... my existence and flourishing ought to claim the appropriate attention from others[1]."

Thus, when someone says, "I love you," it means that you "matter." When you are recognized for an achievement or milestone in life, it means that you "matter." When your boss says, "I won't trust this job with anyone but you," it means that you "matter." When someone says, "thanks for the help," it means that you "matter." These examples demonstrate how important an external input is to achieving "validation" in life.

Can one find this kind of existential "validation" in a pileup? Absolutely! In the pileup there are dozens or even hundreds of stations frantically calling you. They are all desperate to make a contact with you. You can hear it in their voices — pleading with you to recognize their callsigns. You can observe it in their behavior — as they talk over each other just to get your attention. It's an ugly battlefield in every sense of the word. And it is all because of you.

Surely you must "matter" as an individual to have attracted such attention and to have caused such irrational behavior in others. In the chaos of the pileup, you find your sense of "validation" in life. The fact that they are all calling you, fighting among themselves to get your attention, provides the ultimate affirmation that you have been seeking. You "matter" — and the proof is in the pileup.

From a certain perspective, the pileup can be viewed as no more than an artificially-created environment, contrived by the Pileup Creators to assure that they will receive the "validation" they seek in life. From this perspective, the pileup is actually a self-serving psychological ploy; masterfully designed to assure that the human need "to matter" is achieved. The ego seeks "validation," which causes the radio operator to create a pileup, which, in turn, provides the necessary affirmation that he/she "matters." How clever!

A pileup inevitably provides assurance that individuals will receive the necessary "validation" they crave in life; which explains why we witness the same individuals going on multiple DXpeditions. They are simply seeking continuous affirmation, throughout their lives, that they "matter." They are addicted to the pileup. It's human nature to be so.

Well-known DXer Martti Laine, OH2BH, has compared his exploits with being an actor on "the world's largest stage." As Martti notes, "Those, once on stage, will always want to appear again and again as the stars of the best show on Broadway ...[2]". Clear evidence that addiction to the pileup is irresistible — and that resistance is futile (okay, I admit it, I'm a *Star Trek* fan).

This helps explain why actors/actresses take the Oscar awards so seriously. By winning an Oscar, an individual obtains indisputable proof that they "matter."

Such insight into the human need to "matter" can allow us to better understand a wide range of human behavior. For example, this helps explain the behavior of the braggart, who is compelled to constantly retell stories of past glories; and the windbag, who endlessly talks on-and-on about things of little significance and no consequence. They are each desperately seeking affirmation that, somehow in life, they "matter."

Be Ye Not Judgmental

To assure that my conclusions were valid, I reviewed my logic and findings with a psychologist. The psychologist noted that it was important for individuals to be non-judgmental regarding the human need to "matter." It is a primal human need that we all experience in life.

In fact, it is undoubtedly one of the reasons I wrote this article. I'm looking for my own assurance that I — and I hope you — find yours as well.

—73 for now
and see you in the pileup.

Notes:

1. Rebecca Newberger Goldstein, "Mattering Matters", *Free Inquiry*, February/March 2017, page 16.

2. <www.qrz.com/db/oh2bh>

My thanks to Mr. Frank Kessler for his assistance with preparing this article. The author's new book, *Searching for the White Ghost – the Human Quest for non-Human Intelligence*, will be available later this year.

Announcing:

2017 CQ World Wide DX Contest

SSB: October 28-29 CW: November 25-26
Starts 0000 UTC Saturday; Ends 2359 UTC Sunday

Log Deadlines: SSB – 2359 UTC Nov. 3 / CW – 2359 UTC Dec. 1, 2017

Join more than 30,000 participants from over 200 DX entities and all 40 CQ Zones in the world's largest DX contest.

The CQ World Wide DX Contest (CQWW) offers 48 hours of non-stop DX chasing fun doubled. Whether you are competing for awards, looking for a few new band-countries, or simply filling the logbook, the CQWW offers something for everyone. Check out the Classic and Rookie Overlay Categories for even more chances to win a certificate.

Contest Basics

Each contest mode is a separate event that runs for 48 hours from 0000 UTC Saturday until 2359 UTC Sunday. SSB is the last full weekend of October. CW is the last full weekend of November.

Working stations is easy. Exchange and log signal report and your CQ Zone number, e.g., 59 05 on SSB or 599 05 on CW. (If you're not sure which zone you're in, visit <http://bit.ly/1BHtmsP>. Generally speaking, the U.S. west coast is in Zone 3, the east coast is in Zone 5, and the rest of the lower 48 is in Zone 4.)

Contacts are valid only on the 1.8-, 3.5-, 7-, 14-, 21-, and 28-MHz amateur bands. No WARC bands or 60 meters.

Scoring

Final score is based on QSO points earned for each contact times the number of multipliers worked.

Multipliers are the number of DXCC entities and Worked All Europe (WAE) countries, plus IG9/IH9, worked on each band plus the number of CQ Zones worked on each band.

Contacts with other continents count three points each. Contacts with the same continent, but different country, count one point (except in North America where they count two points). Same-country contacts earn zero points, but do count for multiplier credit.

Don't worry about calculating your score; the contest log checking software will do that for you when you submit a log.

Entry Categories

The competition is divided into Single Operator and Multi-Operator categories. Single Operator categories also offer two additional Overlay categories.

Single Operator (all bands or any single band) — only the one operator finds, makes, and logs all contacts.

- High power: Up to 1,500 watts
- Low power: 100 watts or less
- QRP: 5 watts or less

Single Operator Assisted (all bands or any single band) — the one operator may use the DX Cluster or other tools to help find contacts. Note that a CW decoder is considered assistance. The one operator must make and log all contacts.

- High power: Up to 1,500 watts
- Low power: 100 watts or less
- QRP: 5 watts or less

Classic Overlay — Allows the use of only one radio, no QSO finding assistance, and only counts the first 24 hours of operating time — off times are a minimum of 60 minutes during which no QSO is logged. Single Operator Assisted entries are not eligible for this Overlay category.

Rookie Overlay — Open only to operators who were first licensed as radio amateurs less than three (3) years before the date of the contest. Indicate date licensed in the soapbox field of your log.

Multi-Operator — More than one person is involved in operating the station.

Single-Transmitter: This category allows one transmitter to work any station. It may only change bands after 10 minutes on a band. Note: A second transmitter may be used to work multipliers only. This category has some very specific restrictions so please read the full rules carefully.

- High power: Up to 1,500 watts
- Low power: 100 watts or less

Two-Transmitter: Allows the use of two transmitted signals on two bands. Each station may change bands as many as 8 times per hour.

Unlimited: Allows the use of one transmitted signal on each band.

Awards

Electronic certificates will be made available for everyone who submits an entry. Plaques are awarded to top finishers in major categories.

Submitting Your Log

Electronic logs should be in the Cabrillo format. Upload your log on the Web at <www.cqww.com/logcheck/>. The website also includes a utility to convert your ADIF format log file if needed. See full rules for instructions regarding paper logs.

All entries must be sent **WITHIN FIVE (5) DAYS** after the end of the contest: No later than 2359 UTC **November 3**, **2017** for SSB and 2359 UTC **December 1**, **2017** for CW. Resubmitting an entry after the deadline will result in it being considered as a late log.

Only one entry is permitted for each callsign. Any log submission will replace any previous submissions.

Full Rules

The complete rules of the CQWW DX Contest are available in 16 different languages on the Web at <www.cqww.com/rules.htm> and in English only on the *CQ* magazine website at <www.cq-amateur-radio.com> (Look for link on home page or the CQWW DX Contest main page). Please review the rules and the frequently asked questions before the contest, especially for possible minor changes in some rule details. Questions may be submitted by email to <questions@cqww.com>.

BY IRWIN MATH,* WA2NDM

The Benefits of Old-Time Timers

If you are a homebrewer, you occasionally come up with a requirement to turn on a voltage or a control signal after some pre-determined period of time. The way this was done classically was with a time delay relay. Today, in our modern era of microprocessors and microcontrollers, this is usually done by software. Well, it was not always so and the methods used in the past are quite simple and do not need any software code to be written and debugged.

In the early 1950s, a time delay relay was made with a heater and a bi-metallic strip as shown in *Figure 1*. Current was applied to a heater, which was in close proximity to the arm of a relay. The relay arm was made of a bi-metallic strip composed of two different metals, bonded together, that expanded (and contracted) at different rates. The heat from the heater caused the arm to bend making the normally open contact close (or open). Relays of this type were available with time intervals of a second or two to about 30 seconds, or so I recall. These were housed in glass packages that resembled vacuum tubes and actually plugged into conventional vacuum tube sockets, which matched the rest of the vacuum tubes used then.

*c/o CQ magazine

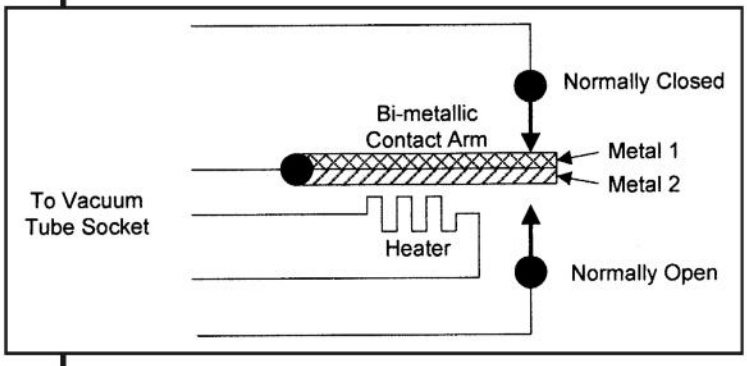


Figure 1. Basic Vintage Time Delay Relay

From "Hollow State" to Solid State

As solid-state components began to replace tubes, these devices soon gave way to the solid-state version using the unijunction transistor as shown in *Figure 2*. Here, a resistor/capacitor time constant determined when the unijunction transistor would fire. When power was applied, the capacitor slowly charged until the firing point of the unijunction transistor was reached. The unijunction then immediately conducted, rapidly discharging the capacitor across the 47-ohm resistor and the pulse that was produced triggered an SCR (silicon-controlled rectifier), which in turn applied power to the load, usually an electromechanical relay. By making the timing resistor variable in the form of a potentiometer, the time delay could be easily adjusted. To reset the timer, one simply disconnected the power using the normally-closed push button as shown. The circuit was quite simple, as you can see, with just a few parts, and worked fine.

The Classic 555

As integrated circuits became more common, next in line was the versatile 555 integrated circuit shown in *Figure 3;* and the resistor/capacitor time constant was still used. When power is first applied to this circuit, trigger pin 2 of the 555 is high since the capacitor is not charged and therefore presents a low impedance compared to the potentiometer portion of the circuit. As the capacitor charges, the voltage at pin 2 drops until the trigger point of the 555 is reached. At this point, the 555 fires and the relay turns on. Note that the SCR circuit can switch

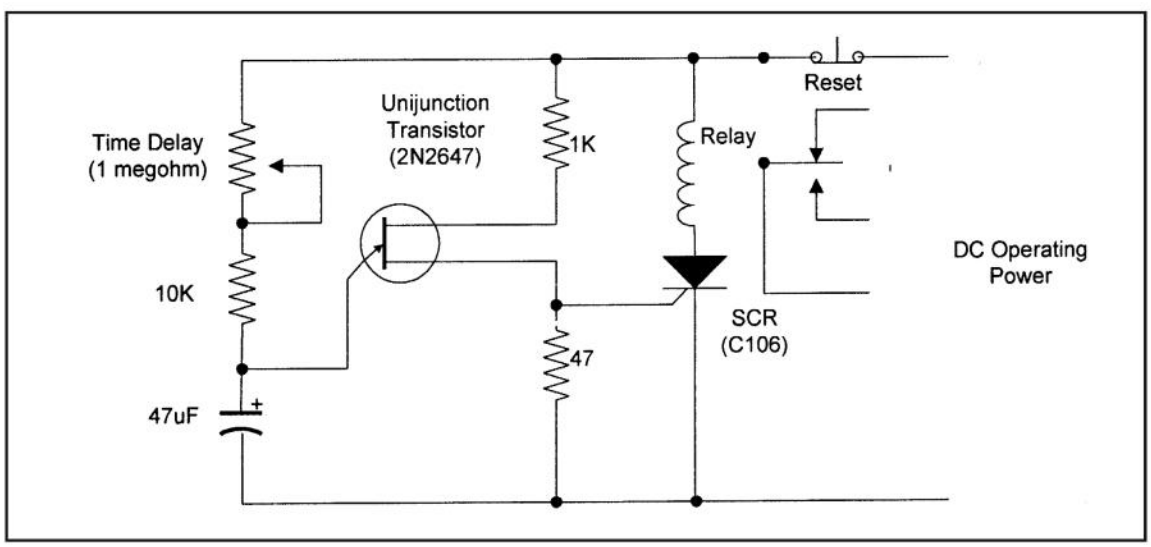


Figure 2. Unijunction Timer Circuit

Figure 3. LM555 Timer Delay Circuit

as much current as the SCR can handle and the load does not necessarily need to be a relay. The 555 circuit is limited to about 100 mA due to the circuit in the chip. To handle more power, one simply adds an external power transistor as shown in *Figure 4*. Again, to reset the timer, simply disconnect the power using the normally-closed push button as shown.

While neither of these circuits is exotic compared to a microprocessor, they both work quite well and are very inexpensive to implement. Although unijunction transistors are not too easily obtained today, you can still find them on the internet if you search; and they are interesting to experiment with. If you need such a feature as applying high voltage to a vacuum tube-based power amplifier after the filaments heat up, or some other timed application, you might wish to try these. The main point here is that the old is not necessarily "dead" and can still be useful in today's world.

– 73, Irwin, WA2NDM

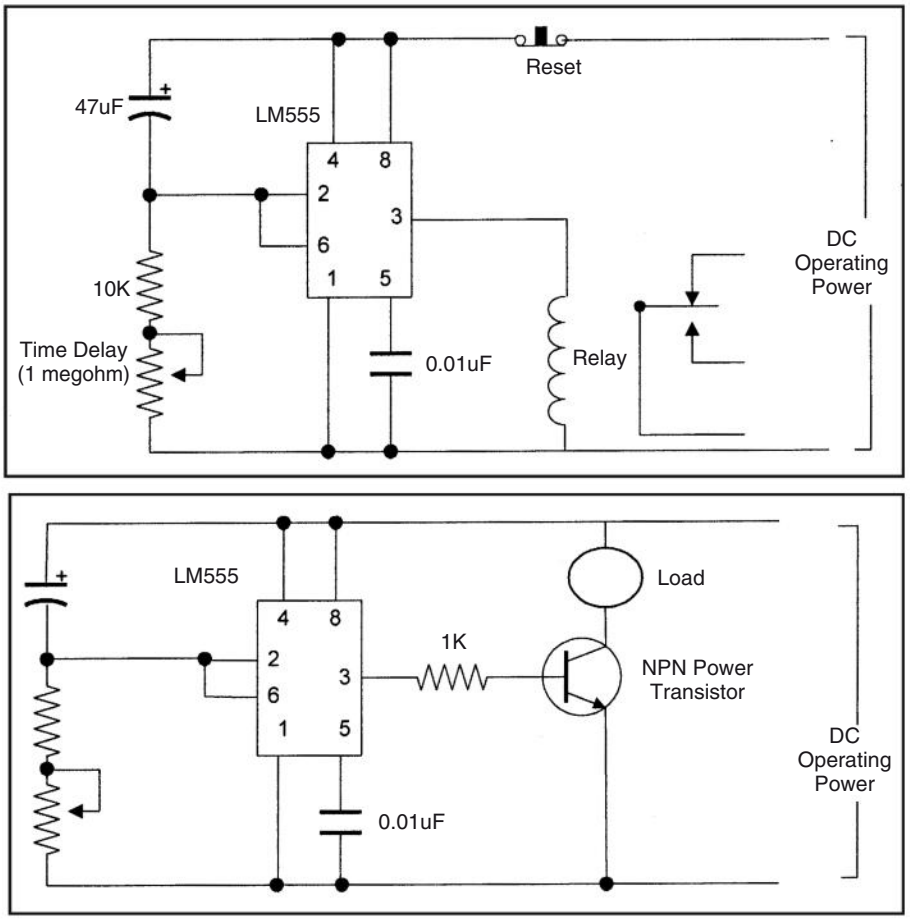


Figure 4. Power Output Stage for LM555 Timer Delay Circuit.

BY GERRY DEXTER*

New Australian Station Coming Soon

Plus a Mystery from Brazil

Let's get our feet wet with a few more shortwave-lets:

~ That new Australian, station 4KZ from Innisfail, will use 5055 from 0200-1900 UTC with 1.5 kilowatts. Don't bother going after this one anytime soon, as it's just been recently authorized and they all take time a-buildin'.

~ The Peruvian Radio Logos (4810) from Chazuta is active again.

~ In addition to Adventist World Radio, which has long broadcast via Moosbrunn (Austria), the station is now relaying the BBC and Radio Japan — in addition to the government-run Austrian Radio.

~ Apparently, there's a new Brazilian on the air from Sao Paulo on 5970, formerly occupied by Radio Itatiaia in Belo Horizonte. It may be just nothing but a name change for Scalla FM (94.9). The station is airing mostly classical music. Basically, the complete ID is still a mystery.

~ The Mighty KBC, based in the Netherlands but transmitting via Kostinbrod (Bulgaria), is adding a Saturday broadcast on 9400 from 1500-1600 UTC, in addition to similar hours on Sundays.

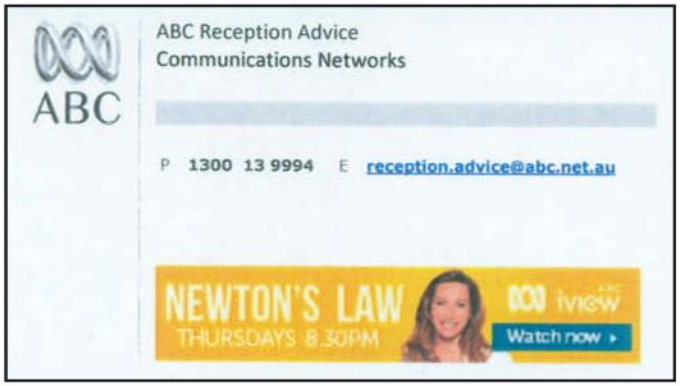
~ The Lithuanian site at Sitkunai has been closed down. Radio Japan was the last broadcaster to use Sitkunai.

~ The Sri Lankan Broadcasting Corporation has returned to 11905 from 0115-0230 UTC via Trincomalee.

~ WMLK, Bethel (PA), was severely damaged by fire back in March, causing unknown thousands of dollars worth of damage.

~ Radio Free Asia announces still another new, commemorative QSL card; this one saluting an apparent new relay at the IBB Kuwait site, so far unreported here.

*c/o CQ magazine



Rich D'Angelo snared a bit of recent history with this combo QSL covering reception of all three now-defunct ABC Northern Territory stations, Alice Springs, Katherine, and Tennant Creek.

Leading Logs

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

Here are this month's leading logs. All times are in UTC. If no language is mentioned English is assumed. Once you've checked the printed logs, you'll find more of them online at <http://cqplusliste ningpost.blogspot.com>.

Radio Japan's train of thought runs the relay race through Meyerton, South Africa, with this QSL to Rich D'Angelo.

ARGENTINA—RAE, Argentina to the World, 9395 via WRMI at 0100-0155* in English with domestic vocals, *DX'ers Special,* the usual P.O. address to get numbered QSL cards. (D'Angelo, PA) 15345 at 2306 with talks in Spanish. (Brossell, WI)

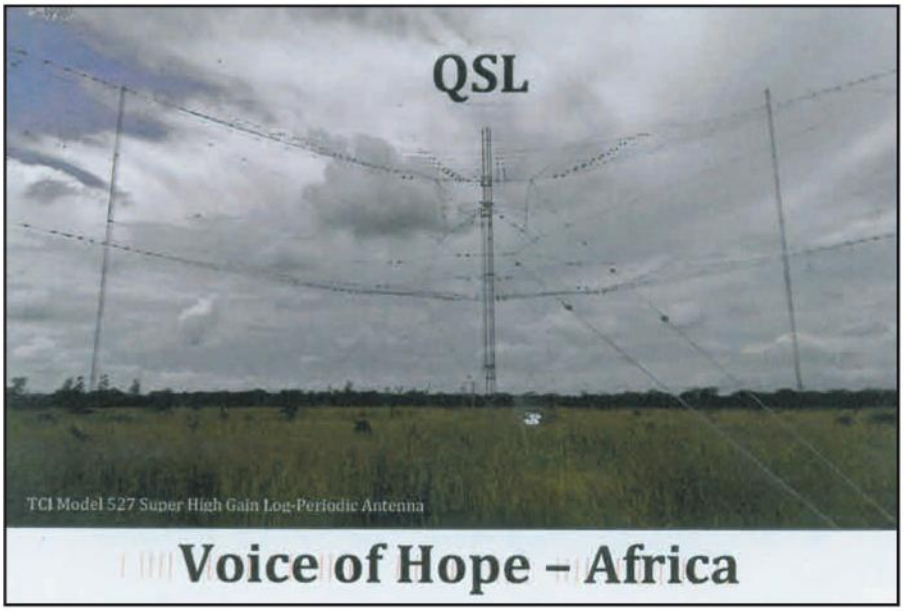
BOLIVIA—Emissora Pio Doce, Siglio Viente, 5952.5 at 0035 with woman speaking, then man speaking Spanish and ID at 0038. Some QRM from 5950. (Cooper, PA) 0105 with man speaking in Spanish with vocals and flutes. Closed with the Col. Boogey march. (D'Angelo, PA) 0222 with man speaking in Spanish, and guitar, later with woman speaking. ID at 0231, then man again speaking over instrumental music.(Taylor, WI)

Radio Santa Cruz, Santa Cruz, 6134.8 at 0053, man speaking in Spanish and male vocals. Man reading the news at 0100. (Cooper, PA)

ETHIOPIA—Voice of the Tigray Revolution, (p) Addis Ababa, 5950. Missed opening music, announcements, and features hosted by woman speaking possibly Tigrinya. Some were HOA, but most weren't. The usual news at 0330 was replaced by music this night. (D'Angelo, PA)

GUINEA—Radio Guinee, Conakry, 9650 at 2204 with man speaking in French and news with remote reports and brief instrumental music at 2215, then probably news-related features. (D'Angelo, PA) 2219. (Brossell, WI)

MADAGASCAR—World Christian Broadcasting, 9600 at 0205 with English pos and mentions of Jesus. (Sellers, BC) 11790-Mahajanga in Arabic at 2250 slow female vocal, woman announcer with ID and web address. Man speaking in Arabic prior to close at 2257. (Cooper, PA)



These are the towers of the Voice of Hope in Zambia on this D'Angelo QSL.

PERU—Radio Cultural, Amauta (p) 4955 at 2350 in Spanish. Man apparently reading news headlines followed by a different man speaking at 0000. (Cooper, PA)

SOMALIA—Radio Hargeisa, Hargeisa, 7120 (**Intruder**) with man speaking in Somali at 0340. (KB2DMD, PA)

SWEDEN—IBRA Radio/Radio Ibrahim, 9390.2 via Tashkent at 0022 in Bengali, male announcer and South Asian music. (D'Angelo, PA) 15510 in Fur language at 1812. (Brossell, WI)

ZANZIBAR—ZBC, Dole, 11735 at 2036-2059* with man speaking in Swahili hosting program of local vocals to closedown. (D'Angelo, PA) 2044 in Swahili. (Brossell, WI)

There are more goodies waiting at <cqpluslistening post.blogspot.com>.

QSL Quests

Ralph Perry checks in with an early QSL from RAE-Argentina to the World via WRMI promising that their numbered QSL will be his shortly. The nice letter from director Adrian Korol was in near-perfect English.

Rich D'Angelo reports replies from End Times Coming Ministries on 9400 via Bulgaria, which claims to be the only father/son Christian ministry in the UK (and possibly Europe). Rich also heard from Trans World Radio's Paochung site.

Who Goes There?

No unidentified reports this month. Maybe it's that Lamont Cranston guy shadowing me again!

Back in the Day

Ecos del Torbes, San Cristobal, Venezuela, 9640 at 1040 with its 10-kilowatt domestic service in Spanish on September 22, 1989. (Now the YVs can't even get their "International service" active!)

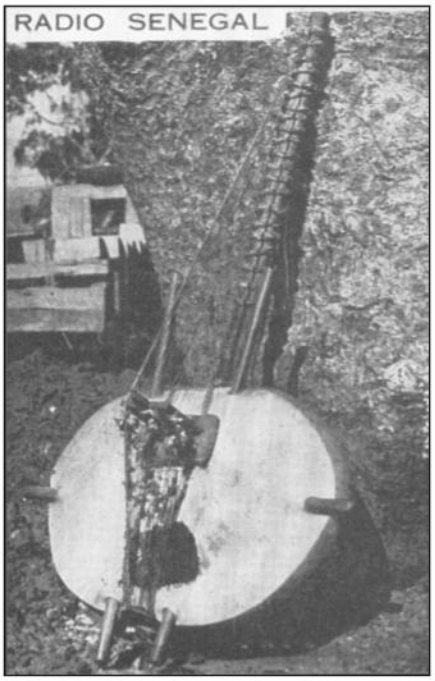
Just Sayin'

With this column, I close my 35th year of editing *The Listening Post*. I don't know how many countries and stations those years have covered, but it has to amount to quite a few. And, as I say every month, I'd welcome yours, too!

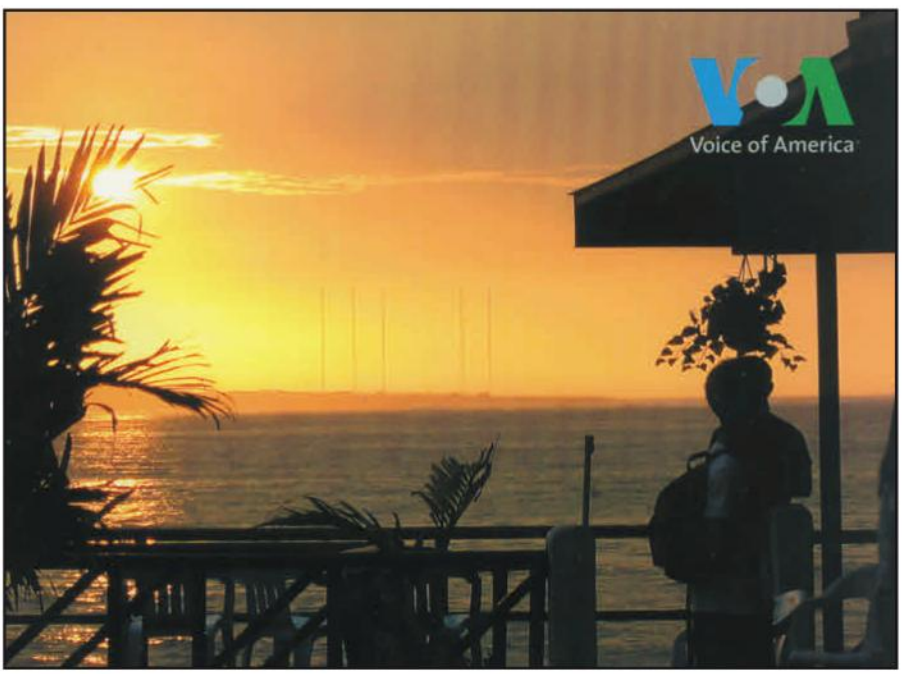
Thanks!

A gazillion thanks to all the good guys who hang in there with their contributions month after month: Mark Taylor, Madison, WI and LFP DXpedition (including Bill Dvorak and Carlie Forthsyth, both from Madison); Rich D'Angelo, Wyomissing, PA; John Figliozzi, Half Moon, NY; Fotios Padazopulos, Athens, Greece; William Hassig, Mt. Pleasant, IL; Rich Parker, KB2DMD, Pennsburg, PA; Dave Valko, Dunlop, PA; Harold Sellers, Vernon, BC; and Ralph Perry, Wheaton, IL. Thanks to all of you.

Until next month, good listening, celebrate shortwave, and — keep on keepin' on!



Here's a very old QSL from Radio Senegal.



The Voice of America's impressive QSL showing some of its (unidentified) towers. Maybe Northern Marianas, Sao Tome, or even Sri Lanka?

CORY GB SICKLES, WA3UVV

In the Loop With DV and ... Loops

There is a small town in Ohio with an interesting history that was invaded by more than 29,000 visiting radio amateurs and others – across the course of a few days — as the Dayton Hamvention® tried out its new home. Compared to the flood of 1886 or the tornado of 1974, this was small stuff for Xenia — home of the Greene County Fairgrounds and Expo Center.

While the traffic control on Friday morning was — in technical terms — a mess, the problems were quickly identified and resolved by later in the day. Saturday's traffic flow — by all accounts — was much improved.

Speaking of improvements, the food was better, the mold-free environment was better, the restroom facilities and "effluent control" were better, the forum room and building accommodations were better, and the attendance was better. Yes, the weather (too hot Friday with improved cooling needed and more rain and wind than anyone would have liked) did not fully cooperate, but that is a variable that no one can control. Lots of water and dirt do not make for a fun experience (especially if you left your boots and extra clean, dry, socks at home) but as things go, it was better than what we have been experiencing at our traditional venue. (*See "Travels With CQ" photo essay elsewhere in this issue. –ed.*)

Also, I think most of us were happy to return home without the respiratory or sinus issues that were brought on by the conditions found within Hara Arena. I know I was.

Are improvements to be made? Of course there are. While I am not sure what can be done about enhanced drainage in the parking and flea market areas, it is my understanding that the tents accommodating some of the exhibitors (like this fine publication) will be replaced by a new building — one that will be ready to go by next year's event.

I also understand that some improvements in minimizing the amount of outside dirt, grass, straw, etc. coming into the exhibit halls will be set up, as well. From major to minor items, there was a demonstrable effort in place that showed significant cooperation between DARA (the Dayton Amateur Radio Association), the Greene County Fair Board and the city of Xenia — both government officials and local businesses.

The local businesses — especially the restaurants — really went out of their way to accommodate the increase in traffic. If you didn't visit one or more (a good way to pass the time while outbound traffic settles down), please be sure to support them next year.

The name Xenia, by the way, is Greek for "hospitality." In my humble opinion, virtually everyone involved in Hamvention 2017 solidly demonstrated the spirit of hospitality.

*Email: <wa3uvv@gmail.com>

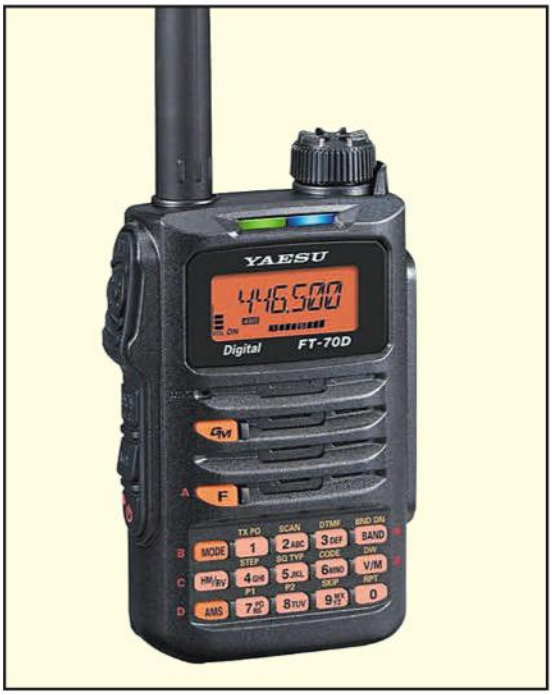


Photo A. The FT-70 dual-band portable should prove to be a cost-effective and popular way to encourage more hams to experience the enhanced features found in the System Fusion flavor of DV.

As most of the hotels in the area were still to be found in the Dayton area — those businesses, plus area restaurants and more — also benefited from our presence, as in years past. I am still not certain what the exact figures are regarding economic impact, but I have heard numbers ranging from $12 million to $18 million. Even on the low end of that, it is a significant inflow of money to the area — in just a few days.

If you missed out on the festivities of the first year in Xenia — well — you missed out. Not everything was perfect. Not everything ever will be. But I think everyone's efforts paid off to continue our May tradition of gathering in southwestern Ohio — for many more years to come.

One of the observations I took away from Xenia is that the state of amateur radio is pretty good. There was a sense of excitement and enthusiasm prevailing in the crowds. New hams (and not so new hams) were asking good questions of exhibitors and flea market vendors, with a "trip to the hip" to acquire items being offered — with some very good show deals.

Going back to the boots and socks reference I made earlier, there was an obvious difference in those who came prepared for inclement weather and those who did not. While those of us with an EmComm mindset may know to keep such items in our vehicles — as a part of or near to our Go Bags — it was clear that not all got the memo.

Perhaps one incentive for such preparation could be found in the facial expressions reflected. The "prepared for anything" folks had a much more relaxed body language.

New Gear of EmComm Interest

We always look for new things to be announced and many of those catch the eyes and ears of those interested in serving our communities, through amateur radio. While analog FM gear can certainly be used well, I have a particular interest in DV (digital voice) radio and have for some time.

ICOM announced and released its new ID-4100 D-STAR transceiver a little before Hamvention. The radio is an updated version of the venerable ID-880, with a monochrome screen and new networking features (usable if your local repeater is running the new G3 gateway software). Although D-STAR is not growing at the same pace as other DV methodologies, it remains the communications solution for a number of EmComm groups. It was good to see that ICOM is still invested in this technology and continues to support it.

Many expected Kenwood to reveal a tri-band D-STAR mobile — as a "companion" radio to its TH-D74 portable — featured at last year's Hamvention. Instead, the company had no new radios to demonstrate at its booth. Curiously, Kenwood is asking hams if they would buy such a transceiver, should one be manufactured. To many I spoke to, it seemed like an odd time to be asking such a question.

However, it does give them an opportunity to see what any interested hams would really like in such a rig. The D-STAR Yahoo! Group had a discussion only whether a 144/222/440 MHz or 144/440/1200 MHz band set makes more sense. The answer to that is going to be a personal, group, and regional choice. The 222-MHz band is exclusive to the Americas, while a 1.2-GHz allocation is found throughout all regions.

Further, support of the 222-MHz band falls in line with Kenwood's existing portable. Bridgecom furthers that support with a repeater that — with the UDRC from NW Digital Radio — supports D-STAR. ICOM's discontinuance of the ID-1 left 1.2-GHz users in a lurch, with no continued support of high-speed (128 kbps) data. If Kenwood decides to offer a 1.2-GHz option, then will its success be dependent on supporting the high-speed data option?

On the surface, it may look like Kenwood is being risk averse. However, it may simply be moving deliberately and looking for a consensus on what features to offer. Perhaps the answer will lie in the company going "back to the future" with an updated TM-742 offering. For those who don't remember, this was a popular transceiver that started off as a 144/440-MHz rig, with provisions for an optional band module. Modules for 29, 50, 220, and 1200 MHz were offered.

If Kenwood went back to this existing design (assuming all of the components are still available), then added D-STAR and APRS support to the mix (plus D-PRS, as many have lamented is missing from the TH-D74), this might make the most sense from a flexible manufacturing standpoint. Customers could start off with a "safe" dual-band radio, then add either 220 or 1200 MHz — as desired. If you are interested in such a radio, share your thoughts with the powers that be at JVC Kenwood by emailing them at <jkusa.amr@gmail.com>.

Yaesu showed off some new items in its expanding System Fusion line. The previously-announced FT-70 (*Photo A*) portable was being demonstrated by the booth staff. This dual-band, single VFO radio is built into a rugged case and offers the features that most users want, for a street price that is under $200.

Photo B. Don't let the diminutive size of the Shark RF openSPOT fool you. There is a lot of power in this small blue box — allowing you to explore more of System Fusion, D-STAR, and DMR connectivity — plus some assets that let you communicate from one DV made to another.

They also showed off the FTM-3207, which is a UHF (440 MHz) version of the popular FTM-3200 VHF (144 MHz) monoband transceiver. From the time the FTM-3200 was released, requests for a UHF version were enthusiastically expressed. Apparently, Yaesu listened. Since System Fusion is the most "FM friendly" flavor of DV, there is a fairly balanced mix of VHF and UHF repeaters — making such entry-level radios attractive for both bands. Shipments of the FTM-3207 are supposed to start by September.

In addition, the DR-2X repeater's pricing was announced, along with a generous trade-in program for those with DR-1X repeaters who are interested in upgrading. The new DR-2X offers a full-time 50-watt output power rating, second control and priority receiver and a new method of grouping and networking repeaters — known as IMRS (Internet-linked Multi-site Repeater System).

With IMRS and the new Digital Group ID and Digital Personal ID features (available through upcoming firmware upgrades for existing radios), Yaesu continues to expand and enhance the System Fusion environment — showing itself to be a "systems" producer — not simply a radio manufacturer.

While some are still waiting for that elusive "all methodologies" transceiver (hint: it's not coming anytime soon) or even just some dual-band DMR transceivers, the road has not been a smooth one. Around the time of the show, a limited shipment of dual-band DMR mobiles appeared. Early reports indicate that UHF performance was OK, but the VHF receiver was "deaf." By the time you read this, the situation may have changed.

However, it did bring back to my mind the words of Adam Osborne: "He who buys on the leading edge, will be sacrificed upon it." Leaning on his wisdom in the world of computers is why I have never purchased "point zero" of any operating system. I prefer to be conservative and let others work out the bugs first. That applies to radios that don't come from the "Big Three" manufacturers.

openSPOT Interface

Returning to the subject of multi-methodology radios, I believe an immediate (and evolving) solution can be found in the growing number of interfaces that allow us to access different methodologies than what our chosen radio natively supports.

Such a device is the Shark RF openSPOT (*Photo B*), which I picked up for $215. I have been experimenting with one for a while and I am very impressed with its feature set and performance.

Using one with my Yaesu FTM-400 — for example — I am able to connect to popular WIRES-X rooms, plus DMR talk groups. D-STAR is supported as well and I expect to find a System Fusion bridge to that methodology any day now.

One of the advantages of the openSPOT is that it is controlled with a webpage interface. In regular operation, no computer is required. It is a stand-alone interface. Many of these have been set up as a portable POP (point of presence) with a Wi-Fi interface and battery. By using your smart phone to link the Wi-Fi to your cellular network, you can connect to DMR, D-STAR, and System Fusion networks — pretty much anywhere. This is great for those of us who travel a good deal.

Also, it has proven to be a good way to network repeaters. Although the openSPOT produces a very QRPp output of 20mw, I was able to connect a quarter-wave antenna and use it to reliably link to a local System Fusion repeater seven miles away. From there, I can configure the openSPOT to connect to the CQ America, CQ UK, New Jersey, or a variety of other rooms. If they made a VHF version (hint hint), I could set up another openSPOT with my club's DR-1X that — through a UDRC — supports D-STAR and use a variety of reflectors there, too.

Photo C. Extremely portable and highly efficient, the AlexLoop Walkham is a magnetic loop antenna that reflects an investment of over 12 years of R&D. I highly recommend it for quick setup HF operations.

While I have been traveling with my openSPOT (I just ordered another one) Wi-Fi interface, Android smart phone (for control), and cables — plus an ID-31 and FT2DR (D-STAR and System Fusion, respectively) portables, it is way

past time to put the connectivity elements in a single box. For that, I ordered another Nanuk Nano watertight box from DX Engineering.

Although this setup has been just for fun, the experiments I have successfully conducted in establishing longer than expected connections tell me that such a package could be quite useful for emergency situations. Also, it can be a viable and inexpensive way to link DV repeaters into a statewide or regional network.

With a scheduler of some sort, the device could be set up to select different rooms/talk groups/reflectors at different times on different days, plus allow for non-networked times, as well. If they produced a set (still hoping for a VHF version) with that and built-in Wi-Fi, I'd be in line to buy some of those too.

While I am a fan of DV and the VHF+ spectrum, there are many times when the use of HF and appropriate gear is a better answer. However, one of the necessary aspects of using HF is needing a larger than VHF-sized antenna.

Yes, mobile antennas can be utilized — but typically — they are not very efficient, perhaps only 15% or so. Full-sized dipoles or verticals do a better job — but fairly high-end supports are needed or radials, in the case of verticals. Are there any alternatives to such situations?

One type of antenna not normally thought of is the loop. Full-size loop antennas for the lower bands are going to present the support challenges of a dipole. However, the smaller magnetic loop designs can reward us with versatile and effective radiators that are easy to carry and set up.

Staying In the Loop

For some time, I've been experimenting with portable magnetic loops of a homebrew philosophy. One of the downsides of the roll your own style concerns the acute need for low resistance connections and components, plus consideration of the high voltages that can develop in the tuning circuits when transmitting.

While I've been fairly happy with a wire loop — stretched around a PVC cross and MFJ Loop Tuner — I still wanted something better and more portable. PVC struts can be broken down into relatively small sections, the weight adds up, plus the complexity of set up and break down.

Over time, I kept looking back to the AlexLoop Walkham (*Photo C*), a highly portable and efficient design. Designed and produced by Alexandre Grimberg, PY1AHD, and refined over the course of 12 years, this magnetic loop has elicited enthusiastic accolades from QRP enthusiasts all over the planet.

While meandering through the exhibit halls in Xenia, I came upon Alex's booth and started to chat with him. After talking for a while, it seemed obvious that now was the time to take advantage of the special pricing being offered and finally get one of these for myself. It would be a few more days before I had the chance to take it out of the very professional and sturdy carrying bag to put it together.

Putting it on top of a light stand I had sitting around from my video production business, I hooked it up to my FT-817ND and adjusted the tuner for my favorite band, 17 meters. Soon, I was rewarded with QSOs from Europe. I didn't do a side-by-side comparison with my OCF (off center fed) dipole, but I was very happy with the performance.

In the weeks that have passed, I have been able to enjoy contacts with hams in many directions, on several bands. Except for 30 meters, all of my contacts have been SSB — demonstrating how well the AlexLoop works with 5 watts. I also tried it with my FT-991A — set to 15 watts. The AlexLoop is rated at 20 watts. Here again, the lower power was hardly noticed — including some contacts on 10-meter FM and System Fusion.

As I have some hills nearby, taking it into the woods with the FT-817 and a reasonable battery has proven to be a great way to work some DX and bring back the excitement of using a HW-7 with an end-fed antenna, back in the 1970s.

With the small size of the packaged antenna, FT-817 and battery pack, I'll be taking it with me on some upcoming trips to California, where I'll have some free time to try it at the beach. I have every reason to expect I'll be making some nice contacts in Asia and Australia, too.

If you want to try using a magnetic loop antenna for fun or in times of necessity, I feel the AlexLoop Walkham is an excellent investment. I highly recommend it.

By the way, while talking with Alex. I found out about a new product of his — the AlexMic. This is an amplified speaker microphone, designed for the Elecraft KX3 transceiver. I understand a version will be coming soon that supports my '817. I'm looking forward to adding that to my travel Go Kit.

Well, that's it for this month, but I will leave you with one final word on Xenia and the Hamvention. Actually, it's a set of lyrics — penned by Becky Shoenfeld, W1BXY, and performed by the Spurious Emissions Band — "Don't Cry for Hara Arena." <https://youtu.be/8OKd9pV5W7U>

what's new

bhi Introduces Audio Equalizer in Dayton

bhi Limited is bringing professional-grade audio equalization to the amateur radio world with the introduction of the ParaPro EQ20 Audio DSP product range at the 2017 Dayton Hamvention®.

Stuffed into the box are a modular audio power amplifier, parametric equalizer, dual-channel DSP noise canceling circuit, and Bluetooth. The ParaPro EQ20 lets users shape the audio to suit their hearing. It does this by letting users select and adjust the strength of specific parts of the frequency range instead of using only the mid-range adjustments you would find in a graphic equalizer.

The power amplifier is a Class-D type that is designed for maximum efficiency and eliminates the need for bulky heatsinking. The PowerPro EQ20 is rated for 10 watts audio per channel and operates off 12-volt DC power.

The ParaPro EQ20 is controlled with a microprocessor and features a signal-input overload circuit so you don't have to worry about overloading the device.

You can use with mono, stereo, or two separate audio channel inputs and it features a 4-millimeter banana plug or phono plug output connections. If you would like to use headphones, the ParaPro EQ20 also offers a 3.5-millimeter headphone jack. There is also an option to include Bluetooth, which can convert your wired speakers into Bluetooth speakers. Another optional feature is dual-channel DSP noise canceling. The product line will include four different models with or without various options.

For more information on the ParaPro EQ20, contact bhi Limited, 22 Woolven Close, Burgess Hill, West Sussex, RH15 9RR, England. Phone: +44 (0) 1444 870333. Email: <info@bhi-ltd.com>. Website: <www.bhi-ltd.com>.

A Novel Role for Hams in India

BY TOM SMERK,* AA6TS

Hams help with safety measures for commercial fishermen, Belize back in the IARU, changes in rules and band plans, hams to the rescue in Sri Lanka flooding, and more amateur radio news from around the world…

Indian Hams Help Fishermen Receive Weather Bulletins at Sea

Every year, the Bay of Bengal is prone to cyclones and heavy rains and the many fishermen who work its waters are constantly at risk. Last year, 39 fishermen from the West Bengal area went missing in a storm. Although every fishing vessel has a VHF radio, officials say that, due to lack of knowledge, they may not be maintained properly, and many fishermen apparently rely on medium wave (AM) and FM broadcasts for weather alerts.

There were reports that fishermen at sea in Bay of Bengal (Kolkata area) were not getting signals from All India Radio (AIR) in Kolkata for weather warnings. In response, on May 19-21, the West Bengal state government invited members of its Department of Disaster Management & Civil Defense and its Fisheries Department, as well as members of the Fisherman's Association, All India Radio and the West Bengal Amateur Radio Club (*Photo A*) to conduct a signal strength survey of AIR Kolkata.

The team departed from Haldia aboard a Coast Guard ship (*Photo B*) on May 19 and, for two days, regularly monitored different frequencies on various types of receivers (*Photo C*). It was found that they could receive clear signals of AIR Kolkata on MW and FM up to 292.3 kilometers (181.62 miles) from the transmitters. AIR was giving weather bulletins for the survey team on medium wave.

The team measured signal strength using the Potomac PI 4100, a precision survey instrument intended for the direct measurement of electromagnetic field strength in the 520-kHz to 5.1-MHz frequency spectrum. This instrument (*Photos D and E*) combines a laboratory-quality radio frequency voltmeter, a calibrated, balanced loop antenna, an internal GPS receiver, an internal calibration source, and data acquisition hardware and software.

AIR Kolkata had recently installed brand new transmitters on MW (200 kilowatts on 657 kHz and 100 kW on 1008 kHz) as well as a 1000-kilowatt transmitter at Chinsurah. There are also transmissions on two FM stations and it was observed that a lot of fishermen were tuning to these and other

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Photo A. Survey team members from the Department of Disaster Management & Civil Defense, Government of West Bengal, Fisheries Dept., All India Radio, West Bengal Radio Club, and Fishermen's Association aboard the Coast Guard ship. [Photos A-E courtesy West Bengal Radio Club]

Photo B. Ambarish Nag Biswas, VU2JFA (left) with Radio Officer of the Indian Coast Guard ship on which hams and others helped measure All India Radio's signal strength at various points in the Bay of Bengal. Their goal was to help improve the ability of fishing boat crews to receive storm warnings.

Photo C. VU2JFA checks the signals of All India Radio, Kolkata on the amateur radio HF transceiver installed aboard the ship.

FM channels rather than MW frequencies. However, no weather bulletins for fishermen are broadcast on these FM channels. AIR Kolkata discontinued SW transmission on 4820 and 7210 kHz last year due to an ailing old transmitter.

Cell phone reception extended to 65 kilometers (40.4 miles) away from the coast and some Echolink contacts were made as part of the tests.

The survey team has recommended to the AIR officials that they broadcast regular weather bulletins for fishermen in Bay of Bengal on FM channels of AIR Kolkata and on other private stations. A request was made to the government to require all fishermen to have proper radios to receive the bulletins and also seek permission to operate HF transceivers.

The participants hope that the Listening Survey will be helpful for the fishermen in the Bay of Bengal on the West Bengal Coast to help eliminate the weather bulletin reception problems they face.

[Ambarsih Nag Biswas, VU2JFA, and the West Bengal Radio Club and thanks to Jose Jacob, VU2JOS, from NIAR for sending this information to us]

Japan YLs Celebrate 60 Years

The Japan Ladies Radio Society, founded in 1957, will be celebrating its 60th anniversary this summer at a general meeting in Tokyo. The society was founded to help YLs in Japan share and enjoy the hobby because, according to a report from Yukiko Maki, 7K4TKB, who chairs the society's DX operations, when YLs in Japan started to call CQ, there were always pileups on top of heavy QRM, and it wasn't easy for them to have a conversation with other YLs in Japan. The group currently has 160 domestic and 40 DX members.

In addition to the festivities at the general meeting, the society is sponsoring special event station 8N6ØJLRS, which began operating in Japan on April 1 and will continue until March of next year.

[Amateur Radio Newsline]

International Repeater Group Links Canada and the USA

The International Repeater Group in New Brunswick, Canada, has grown from one ham 43 years ago to a system of 25 repeaters that can be linked across the province of New Brunswick. The system is also accessible from Nova Scotia, Prince Edward Island, Québec, and the state of Maine in the U.S.

The repeater network gets some financial and technical support from the Emergency Measures Organization of New Brunswick and CANWARN in addition to donations from the group's members.

The repeaters are home to a weather net that operates daily, November through April. The weather net collects data seven days a week from stations across New Brunswick and in northeastern Maine and sends it into Environment and Climate Change Canada where the information is used to help forecasters keep an eye on such conditions as snowpack, melting and potential flooding on some of the tributaries along the St. John River.

The system is also utilized for emergency communications, training, and various nets. What makes this repeater system special is that it is shared between hams in both Canada and the United States.

[Amateur Radio Newsline]

Belize Back in the IARU

We reported in this column a year ago that the International Amateur Radio Union (IARU) had determined that the Belize Amateur Radio Club (BARC) no longer existed because no communications had been received from the club since 1993. This opened the door for other organizations to apply to represent Belize radio amateurs in the international organization.

Recently, a group of hams formed a new organization with the same name

Photo D. VU2JFA checking the signals of All India Radio, Kolkata with Potomac Instruments 4100 Medium Wave Field Strength Meter.

Photo E. Close-up of the Potomac PI 4100 meter. This portable laboratory-grade instrument provides direct measurement of electromagnetic field strength in the MF and low HF regions of the radio spectrum.

as the old group and submitted a formal application to represent Belize with the IARU in Region 2 (the Americas). A vote by member societies this spring approved the application.

According to the IARU website, the new officers are: Emil Rodriguez, V31ER, President; Steven Harp, V31SH, Secretary; and Dr. Andre T. Scholz, V31DL, VP/IARU Liaison. The BARC website is at <http://barc.bz>.

There are now 167 IARU member-societies in as many countries and territories.

[IARU and Southgate Amateur Radio News]

Puerto Rico Celebrates Amateur Radio Day

May 9 was all about the 4,000 amateur radio operators in Puerto Rico and marked the 20th anniversary of the celebration of "Puerto Rico Amateur Radio Operator Day," which is observed each year on the second Tuesday in May.

A proclamation signed by Puerto Rico Governor Ricardo Rossello Nevares and Secretary of State Luis Marin Rivera, recognizes amateur radio's public service contributions and Puerto Rico's status as an ARRL Section.

The proclamation mentions Joaquin Agusty Ramirez y Arellano, 4JE (there were no KP4 calls until after the Second World War), a broadcasting pioneer and a radio amateur who co-founded the Porto Rico Radio Club in 1922 along with Jesus T. Pinero, 4KT. Pinero later went on to become Puerto Rico's first governor in 1948 and Agusty went to work at WKAQ, the first broadcast station in Puerto Rico and the fifth in the world.

[ARRL News and QSL.net]

South African License Exam Results Released

In some parts of the world, such as major U.S. cities, license exams are held as often as every week. In a few countries, exams may be several years apart. South Africa falls somewhere in-between with exams held twice a year in May and October, so the results are somewhat newsworthy!

The results of the May 20, 2017 Class A and Class B radio amateur exams have been released, with 81 people passing the 60-question exam for the Class A (1,000 watt) license and 11 passing the 30-question exam for the Class B (100 watt) license. In South Africa, the ZU prefix designates an entry level Class B license while Class A hams are assigned a ZS or ZR prefix. Interestingly enough, there is no requirement to pass the Class B exam before attempting the higher level Class A. Candidates for the Class B exam must be 25 years of age or younger.

Congratulations to the new or upgraded hams in South Africa!

[SARL, Southgate Amateur Radio News and Wikipedia]

Malta, UAE, Panama, and the Caribbean Netherlands Get on 60 Meters

The Malta Communications Authority's new national plan grants amateurs access to 5,351.5-5,366.5 kHz on the 60-meter band on a secondary basis using a maximum of 15 watts EIRP (Effective Isotropic Radiated Power). Hams in the United Arab Emirates also gained access to the same frequencies, following a similar allocation last December by Panama.

Netherlands telecoms regulator Agentschap Telecom (AT) has added a 60-meter band of 5,351.5-5,366.5 kHz to its frequency plan for the Caribbean Netherlands municipalities of Bonaire, Sint Eustatius, and Saba. Eligible licensees there may run up to 25 watts EIRP.

[ARRL News]

Hams in Kazakhstan Gain Additional 4-Meter Access for 5 Years

A letter from the Ministry of Information and Communications of the Republic of Kazakhstan grants amateurs there general access to the 4-meter band (70.0-70.5 MHz) on a secondary basis for the period from May 1, 2017 to May 1, 2022. This increased access within the 4-meter band allocation there was achieved through the efforts of the Association of the Amateur Radio Services of Kazakhstan.

[Southgate Amateur Radio Club]

Taiwan Drops Morse Code Requirement

According to an article in the *Taipei Times*, the National Communications Commission (NCC) of Taiwan has indicated that a regulation requiring that amateur radio operators take an International Morse Code test to obtain a license is soon to be abolished, stating that a Morse requirement "should not hinder the development of Amateur Radio."

Frequency and Resources Department Deputy Director Chen Chun-mu said that the commission has already approved the amendment, mentioning that many other nations have also removed the need for a Morse code test.

Other amendments include the use of frequencies between 432 and 440 MHz and extending amateur radio license terms from five years to 10. In addition, amateur radio operators would be able to start renewing their licenses five months before their licenses expire, rather than the current regulation of one month before the expiration date; other procedures to streamline the application process were put in place as well.

[Taipei Times and ARRL News]

Sri Lanka Hams Link Devastated Remote Area to Emergency Services

On May 28, torrential monsoonal rain caused flooding and mudslides in Sri Lanka, disabling communications and making roads impassable. Some areas were under 18 feet of water. The Radio Society of Sri Lanka (RSSL) immediately assigned 12 members to monitor their main repeater for 24 hours to handle any emergency traffic from members who might be affected.

The Chairman of the Urban Development Authority contacted RSSL President Jaliya Lokeshwara, 4S7JL, with a request to set up a communications link between Kalawana and Ratnapura. Kalawana was one of the worst affected areas and was cut off from the main government-coordinating center at Ratnapura some 28 miles away.

Four radio amateurs were airlifted in two military helicopters from Colombo to both locations to form a communications link. They were informed there was no power at Kalawana and they had to have their own power source and equipment. The station at Ratnapura had power and was the nerve center for relief operations in the region. An HF link was established and was used to coordinate rescue flights, movement of patients from Kalawana hospital to Ratnapura, and food drops.

The teams worked around the clock, eating only flood relief biscuits and occasional packets of rice; and when a little rest was possible, the volunteers slept on the floor because there was no space on the helicopter for a sleeping bag once the radio equipment was loaded.

Four additional hams arrived in Ratnapura the following day, which by then was accessible by road. They helped with antennas and passing traffic, among other tasks.

By Tuesday, the 30th, phone service was restored and the teams were released. The floods resulted in 151 dead and approximately 122 still missing as of this writing. In addition, 1,800 homes were damaged, affecting 442,000 people.

[WIA News, RSSL and Southgate Amateur Radio News]

Cuban Hams Participate in Readiness Drill

"Meteoro 2017," held on May 20 and 21 throughout Cuba, is an annual exercise to advance emergency readiness for disasters such as earthquakes, hurricanes, periods of intense and extensive drought, as well as other events. Exercises focused on reducing vulnerabilities in high-risk communities, educational centers, commercial centers, and factories.

Meteoro was led by the Civil Defense General Staff. The Federation of Radio Amateurs of Cuba (FRC), Cuba's national radio society, worked with hundreds of amateur radio operators from all localities. The Provincial Defense Council, firefighters, search and rescue teams, and other emergency personnel also participated.

The hams are part of the National Emergency Network (abbreviated REN in Spanish). Events such as Meteoro help to support the stability of communications in the Caribbean area.

Meteoro 2017 coincides with the start of the hurricane season in the tropical Atlantic basin, which is June 1st.

[IARU Region 2, Radio Mayabeque]

In Closing

I'm so happy to finally get my HF dipole back up in the air. It blew down about six months ago, and I was finally able to get some people to help get the pole back upright. (Yes, I know — I probably should redesign the mast with a tilt-up feature!) I also have a nice vertical, a GAP Titan DX, but there are still times when a wire works best!

We were pleased to receive a few stories and photos this month from hams, clubs and organizations. What would please me more than anything would be to see this happen every month!

I would be interested in hearing your stories and seeing your photos. Send me your stories, news, photos, and suggestions. Let us put you or your club "in the news" for all to share your experiences. Contact me at: <aa6ts@cq-amateur-radio.com>.

73 de AA6TS

Photo F. Amateur radio emergency station CO9DCN at Cuba's National Civil Defense building during the annual "Meteoro" exercise on May 20, 2017. Pictured here are Julio Hurtado Reyes, CO2HR (front), and Carlos Alberto Santamaría González, CO2JC (rear, on phone). [Photo courtesy of CO2JC and News Cuban Agency (ACN)]

BY RON OCHU,* KOØZ

Enveloped in Excellence (and Radio, of Course)

Whenever I find myself enveloped in excellence, I find myself humbled and awed. Last May, towards the end of the 2016-2017 school year, I found myself immersed among students who strive for nothing less than excellence, their hungry, eager minds anxious to absorb all the world offers. Their only limitations are the number of hours within a day.

Typically, at the end of the school year, students and faculty are shutting down and looking forward to a well-deserved summer break. Perhaps, Steve Bonser, NR9EM's (*Photo A*) students at Pana, Illinois, Middle and High School were as well (*Photos B and C*); however, I sure couldn't detect it because their energy level and enthusiasm were high. These dedicated students are in stride and eager to learn more.

Really?

You may think I'm exaggerating, but I kid you not. Steve Bonser's students are self-driven to learn, because learning is fun and they also see results. These young men and women are no different from any of their peers; however, they distinguish themselves by immersing themselves in STEM (Science, Technology, Engineering and Math). They are encouraged to do so because they compete on a national level with their peers. These young students bring home trophies they've earned through teamwork and collaboration (*Photo D*). Make room on the shelf, athletics; STEM is in the building.

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These young adults live to learn more by following the scientific method. Namely, they encounter a problem, research it, form a hypothesis, test, gather data, analyze the data, retest, and share results. What amazes me is how fluid these youngsters are in practicing the scientific method so that for them it is natural and they don't even give it a second thought about how to apply it. Although STEM is a big part of the program, other academic skills such as writing, communication, and graphic design are also integral components. Students are expected to write reports, present organized data along with supporting graphs and photographs along with the actual product such as a moon buggy or a submersible robot, their projects in the past school year.

Sharing

Many regard competition as "winner takes all," but in the competitive field of NASA's Human Exploration Rover Challenge (moon buggy) competition and the U.S. Navy's Sea Perch Remotely Operated Vehicle (ROV) program, collaboration is a key ingredient to success. NR9EM's students rely heavily on the internet to do research and to share their ideas, not only among themselves but with other teams as well. At first it may seem counter-intuitive to share "trade-secrets" with the competition, but students have learned that collaboration benefits everyone involved. Steve's students have helped other school teams solve a few engineering issues and, in turn, others have helped them.

Connor Hildebrand, one of Steve's students, likes that aspect of the curriculum. "I built it and it allows us to converse with our peers. Colleges and

Photo A. Student Andy Schloz and teacher Steve Bonser, NR9EM, next to one of the two 3-D printers in Bosner's classroom. (All photos by KOØZ)

high schools come together to help each other out. We can hear multiple languages during the competition such as Russian and German as well as English. Awesome to be in their company!" These young men and women are very much aware that there is a larger world out there and collaboration is a better and more productive method to solving problems.

Problem-Solving

Steve and his students made me feel very welcome and they were very happy to show me their projects. Each team member has a special skill to share, but every teammate is capable of filling in if necessary. Everyone sees the larger picture and one person's problem becomes everyone's problem.

It didn't take me long to realize that these students are quite adept at solving problems. Pundits are constantly looking for tests to measure "higher order thinking skills." These standardized tests are in the genre of a "one size fits all" exam of common core curriculum. Public schools are held accountable to these tests, but these pundits need only to observe what is going on in Steve Bonser's classes, along with those of his colleague, eighth grade science teacher Mark Schmitz (*Photo E*), to see higher order thinking skills practiced daily on a level of "par excellence."

Mark brings to the curriculum his love of high-level robotics and free build coding. He works with Steve's students to program Arduino® PCBs with free build coding and real-life applications. In other words, with their instructor's guidance, students research, develop, test, and engineer a program to perform a needed function. For example, for the SeaPerch competition students need to build a functional underwater ROV, or remotely operated submersible (*Photo F*). The students were using toggle switches to control ROV direction, but the rapid, repetitive stress placed on the toggles quickly wore them out. Not a good position to be in during a competition. Students Bradyn Hamilton and Alex Murray came up with a very viable solution. Why not use a PlayStation PS3 controller? But how do we make the controller work independent of the PlayStation? After doing some research, getting some coding to go along with the controller and a lot of trial and error with the coding to make it work with the Ardunio, these students developed a working device that now gives the team a controller that doesn't break, with an added bonus of a much higher degree of precision and control over their ROV. Now that is higher order thinking skills applied to real-life problem solving at its finest.

Another example of problem solving using the scientific method came about when Steve and Mike's students, trying to get a competitive edge, wondered if a three-blade propeller would be better than a two-blade one? Using designs from the internet, the students used the classroom's 3-D printer (*Photo G*) and from extruded plastic they developed various three- and two-blade propellers and tested all of them. Making sure to carefully record and analyze all the experimental data, students deduced that a two-blade propeller gave them more maneuverability and thrust. Showing me their data on the computer, they proudly told me that their research indicated that a three-blade propeller is better for moving vessels with larger mass. As a result, they refined and worked on a two-bladed

Photo B. Pana CUSD 8 Middle School STEM class from left to right: A.J. Chaurero, Gage Fitzgerald, Chase Sewell, Alexis Speer, and Katelyn Townsend.

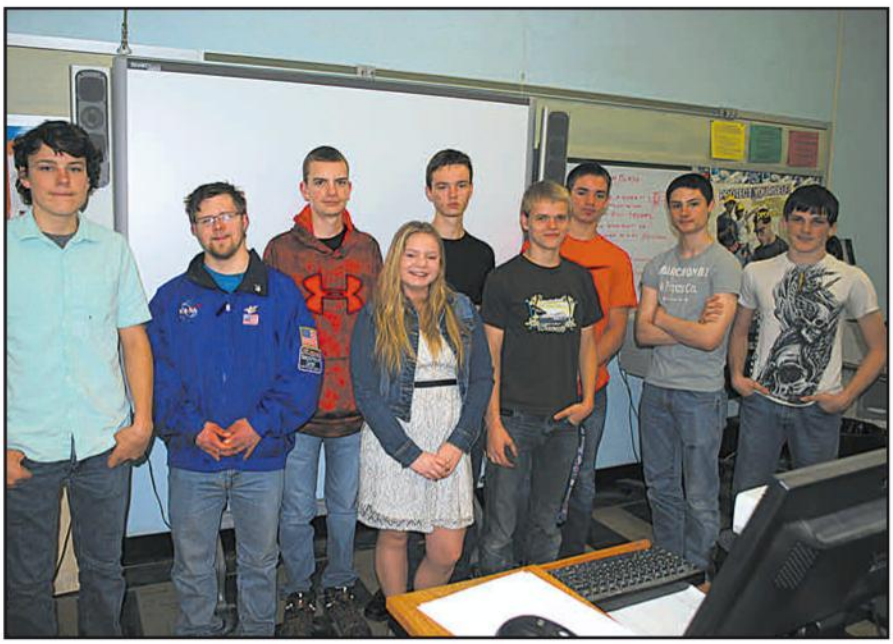

Photo C. The Pana CUSD 8 High School STEM class from left to right: Lucas Duduit, Andy Schloz, Connor Hildebrand, Fayth Stout, Dakota Hocq, Josh Merrifield, Ahsten Wallace, Charlie Davis, and Josh Hardy.

Photo D. STEM trophies earned by Bonser and Schmitz's students.

Photo F. This past school year's SeaPerch submersible ROV (Remotely Operated Vehicle).

Photo E. Eighth-grade science teacher Mark Schmitz specializes in robotics.

design for their ROV. Keep in mind that all these propellers were created in the classroom using the 3-D printer.

And Then There's the Moon Buggy…

ROV isn't the only challenging obstacle testing these student's problem-solving skills. NASA's Human Exploration Rover Challenge offers plenty of problems to overcome as well. This year, Bonser and Schmitz's students decided to power the buggy using direct, gear-driven, human propulsion as opposed to chain-gear driven (bicycle) propulsion. The course has sand, gravel, hills and embankments that the students and their human exploration rover (buggy) must overcome. Precious points are taken away for a team member stepping on the course, even for balance, crashing into obstacles or suffering mechanical breakdowns. No engineering pressure here. Safety is stressed and documentation needs to exist.

Charlie Davis and Ahsten Wallace used their writing/publishing skills and produced the team's winning safety report. Judges inspect for no sharp points, broken welds, appropri-

Photo G. The second 3-D printer in the Pana STEM classroom. The students designed and "printed" multiple propeller designs with the printer before settling on a 2-blade model for their SeaPerch ROV.

Photo H. The N9QP classroom station. The students routinely monitor the International Space Station's packet digipeater and occasionally operate HF as well.

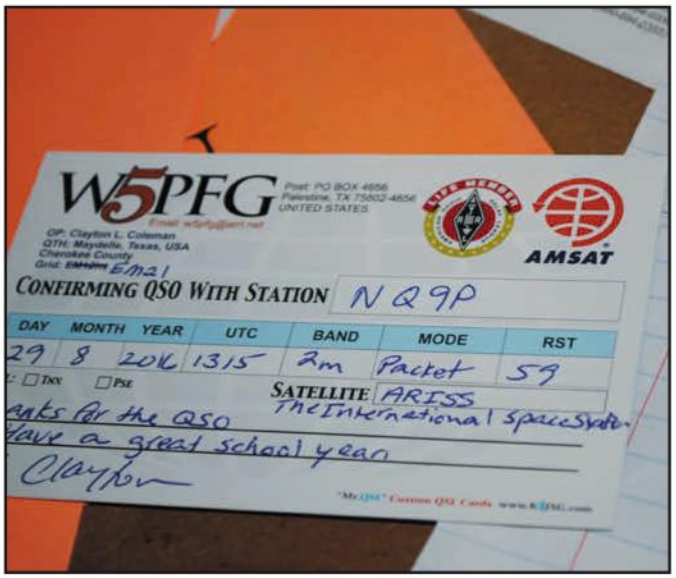

Photo I. A QSL proudly on display at Pana Middle School ham radio station N9QP. Note the notation that the QSO was made via the ISS digipeater.

ate safety stickers (such as "No Step") and for safety belts. Speaking of seats and seat belts, student Lucas Duduit recalled the trouble his team encountered the year before with their rover's seat failure. This year's version, Lucas told me, "will include durable, high-tensile polymer material." Unfortunately, at the time of the interview, the school's buggy was off campus, being readied for a community display, so I wasn't able to get any pictures of it for this article.

Competitive Component

A major incentive for these bright students to learn more is driven by their desire to build upon the prior year's success in the NASA Human Exploration Rover Challenge held in Huntsville, Alabama[1], and the U.S. Navy's SeaPerch program sponsored by the Office of Naval Research[2]. This year the SeaPerch Nationals competition was held in Atlanta, Georgia, where the "Pana Sea Dogs" took third place in the open class challenge, and seventh place for their report. The Pana Sea Dogs included 7/8th grade team Alexis Speer, Chase Sewell, Gage Fitzgerald, A.J. Chaurero, and Katelyn Townsend.

NASA's Human Exploration Rover Challenge (Moon Buggy) netted the Pana students 14th place nationally. Very impressive results, especially when you consider that these youngsters are competing not only with other high school students but with college students as well.

Change is Good…

Every year, in both competitions, the objectives and associated challenges change, requiring all competitors to start almost from scratch. In essence, the vehicles remain the same, but new course challenges and the problems associated with the changes that need to be overcome result in major vehicle engineering redesign and testing. These challenges keep everyone on their toes and help to raise the bar. Every year, the Pana students learn from past mistakes and build upon them along with their successes to meet the next year's challenges. Another benefit of change is that the current class can mentor the new, incoming class so that a spirit of teamwork and collegiality continues to grow with each new school year and keeps the program alive and healthy.

"PBL" and the Ham Connection

Steve Bonser believes that his students should be versed in PBL, *Project-Based Learning.* "If you don't have PBL, the kids don't get the background they need," Steve explains, adding, "Students think I try to make them think too much." Consequently, first-time students in the program are familiarized with PBL, computer-aided design, robotics, problem solving, research, publishing, programming, the scientific method and of course, amateur radio. The school's callsign is N9QP (*Photo H*). Throughout the day, the station monitors the International Space Station packet frequency (take a close look at the QSL card in *Photo I)*, but on occasion stu-

Photo J. N9QP's six-band HF Hex beam antenna on top of the middle school.

dents will get on HF with the school's six-band Hex-beam (*Photo J*) driven by a Yaesu 757.

It's Not Just Guys...

In the high school program, it's not hard to notice junior (now incoming senior) Fayth Stout, for she's the only female team member. Fayth doesn't mind being the only girl currently in the high school program. "Other girls listen to me," she says. Indeed, for Fayth has a lot to contribute to her classmates. This summer she is enrolling in a summer robotics program and during her senior year, she plans on applying to Purdue University's engineering program.

Fayth is not the only female involved with the program. In the middle school, Alexis Speer and Katelyn Townsend are applying their writing and STEM skills. Alexis enjoys learning new things which helps her with other stuff — "now I can program," she notes. Katelyn was never into robotics, but she likes to repair Chromebooks. A lot of her friends struggle with geometry, but "I love math and science!" Hands-on activities, building and modifying appeal to both young women. From what I could observe, the ladies blended in quite nicely with their male counterparts and a team spirit prevailed the entire time I was with these remarkable youngsters.

Quality Costs

Just like everything else, quality costs time, resources, and money. Fortunately, the Pana school district values the tremendous learning and value of this program and the district continues to offer it to the student body at a time when the state of Illinois is in a financial crisis and state educational appropriations are neither fully-funded or equitably distributed. Steve told me, "Many teams spend close to $100,000 on their rovers. We spent $2,500 on our rover and we came in sixteenth overall in a field of 81 ..." Like many public school teachers across our nation, Steve and Mike dig into their own pockets to further their students' education. Like many ham radio operators, Steve, NR9EM, brings in a lot of his own radio equipment into the classroom. However, this still isn't enough to fully fund his program. There is also the cost of tools, travel, and lodging to attend two national competitions.

Educators who are also hams are frugal, resourceful, and know how to beat the bushes! NR9EM raises business and community support for the program. The class needed a pool with an obstacle course for the SeaPerch program. Through donations, elbow grease, dedication, and perseverance a pool materialized in the classroom (*Photos K and L*). A lot of time goes into networking business connections to assist with educational funding and fortunately the community of Pana in rural central Illinois pays more than just lip service to help offset the costs. Whenever you hear a politician claim that public schools don't need more money, they may want to take a closer look at what is happening in Pana, Illinois.

Opening Doors

Steve Bonser, NR9EM, and Mark Schmitz share their talents and instill their love for leaning with their students. Their students collaborate with other students throughout the U.S. and in other countries. They are learning to use the scientific

method not just for moon buggies and underwater ROVs, but for life's many other challenges as well.

Both Steve and Mark will tell you that this article isn't about them; rather, it is really about their students. And they would be right in saying so. These young men and women are taking the lessons that they are learning and making them their own. They are largely self-dependent and eager to try out-of-the-box thinking. Point them in the right direction and magic begins to happen. A lot of new doors and potential careers are being opened for these students. The future looks bright for students coming out of Mr. Bonser's and Mr. Schmitz's STEM program.

Notes:
1. https://go.nasa.gov/1ozbACa
2. http://www.seaperch.org/what_is

Photo K. Pool constructed to test the SeaPerch submersible ROVs. The teachers raised funds in the community to cover its costs.

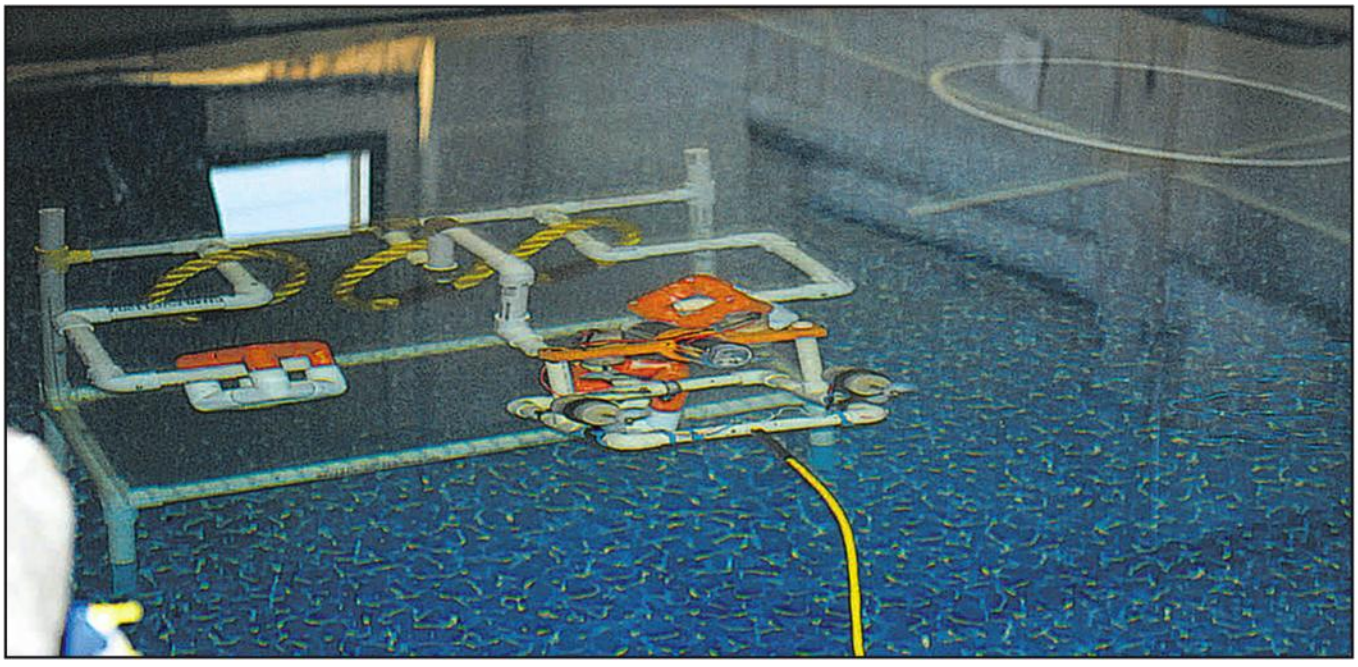

Photo L. One of the ROVs running the underwater obstacle course.

Dayton Becomes Crystal Clear

(But It's Not the Same Old Grind…)

BY JOE EISENBERG,* KØNEB

May 2017 brought my 37th trip to Hamvention® and the new venue at the Greene County Fairgrounds in Xenia looks like it will be its new home for some time to come (*See "Travels With CQ" photo essay elsewhere in this issue –ed.*). It was great seeing so many of my readers, especially at my kit-building forum. I promise not to let my USB drive slip out of my pocket again. We had a full room in my forum, which was amazing, and I thank all of you not only for being there, but also finding Forum Room 4! It was an air-conditioned oasis compared to past years and quiet as well. A welcome change from the noisy Room 5 I occupied at Hara Arena. I didn't get to explore the flea market for kits as much as I would have liked, but I look forward to the 2018 improvements I have heard are coming to that area of the Hamvention. Hats off to the hard working people of the Dayton Amateur Radio Association who make this annual event possible.

FDIM Buildathon

Friday evening brought the annual Buildathon at Four Days in May (FDIM), and a record 40 builders took part. Rex Harper, W1REX, put together a fun kit that lets you precisely measure the frequency of crystals. This is great not only for determining the exact frequency at which a known or unknown crystal resonates, but also helps in grinding crystals to bring them up in frequency. Grinding a crystal allows you to raise its frequency and bring an out-of-band rock into a ham band or move one from one frequency to another within the band.

The X-Checker kit Rex put together went together smoothly, and by the end of the Buildathon, most participants had working units. Unfortunately, there wasn't enough time or materials to spend a lot of time learning the grinding process, but Rex has put together a YouTube video to help in that process as well as a kit of materials needed for grinding.

The X-Checker kit consists of a crystal oscillator and a frequency counter. The counter circuit was part of a previous kit, so its reliability was known. Since Rex did not have enough CPU chips ready, one was used to test all the units. Rex mailed the CPU chips as well as test crystals very shortly after the Buildathon to all builders. Included with that mailing was a crystal of random frequency to be used for precise calibration. The method used is to take a random crystal Rex has measured precisely with one of these kits and an HP precision counter and using the trimmer capacitor to set the counter so it displays that same exact frequency. A precaution to be followed using this method of calibration is to ensure the supplied test crystal has plenty of time to get to room temperature for best accuracy.

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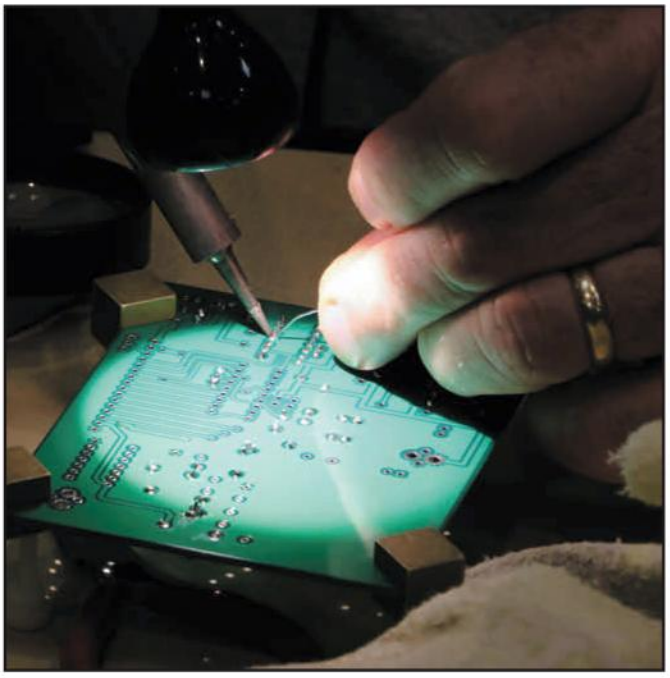
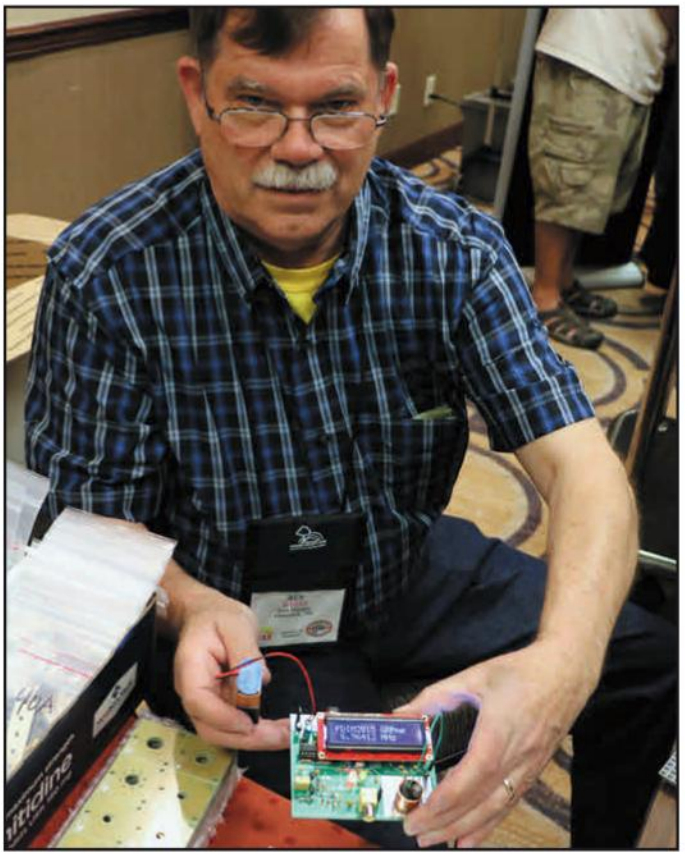
e-mail: <k0neb@cq-amateur-radio.com>

The 2017 Dayton FDIM Buildathon is underway!



Charlie, W3CHB, soldering his X-Checker with the aid of an LED spotlight.



Rex Harper, W1REX, holds up a finished X-Checker kit. →

Although this Buildathon took a bit longer than some in the past, it was a great opportunity to expose beginning builders to a wide variety of components and mounting procedures. I enjoyed helping out, and now have a useful tool for my bench. I always look forward to the next Buildathon kit and will plan on being a part of the 2018 FDIM Buildathon. To get one of these great kits, go to <http://www.qrpme.com>.

My Hamvention Haul – A Regenerative Receiver and a Mini Soldering Iron

It wouldn't be Hamvention if I didn't bring home some kits, and this year was no exception. In addition, I picked up some soldering tools that really come in handy. MFJ supplied an MFJ-8100K General Coverage Regenerative Receiver kit that is now on my bench and ready for assembly. This is a classic simple regen kit that brings the world of shortwave broadcasting as well as amateur radio to the kit builder. I will write about this receiver kit in the near future. A great tool I got comes from Seeed Studio. Seeed Studio was in one of the big tents at Hamvention and it was great to see them there.

The Mini Soldering Iron Deluxe Kit is a very slim and lightweight, temperature-controlled soldering iron. The kit also comes with a simple LED light kit to practice using your new soldering iron. The iron features a digital display of temperature built into the handle as well as up/down buttons to control it. The only drawback I have found is the fact that it only displays temperature in degrees Celsius. Just remember about 320° Celsius seems to be good for 63/37 solder, with higher temperatures needed for larger components such as plugs and jacks, for lead-free solder or for desoldering procedures. When I desolder using solder wick, I generally turn up my iron to maximum since the desoldering braid and the PCB are both taking away a lot of the heat, and I return the iron to normal temperature right after completing desoldering.

The Seeed Studio Mini Soldering Station kit in the box. The practice board is visible as are the handle and the two tips/heaters. The power supply and accessories are stored below.

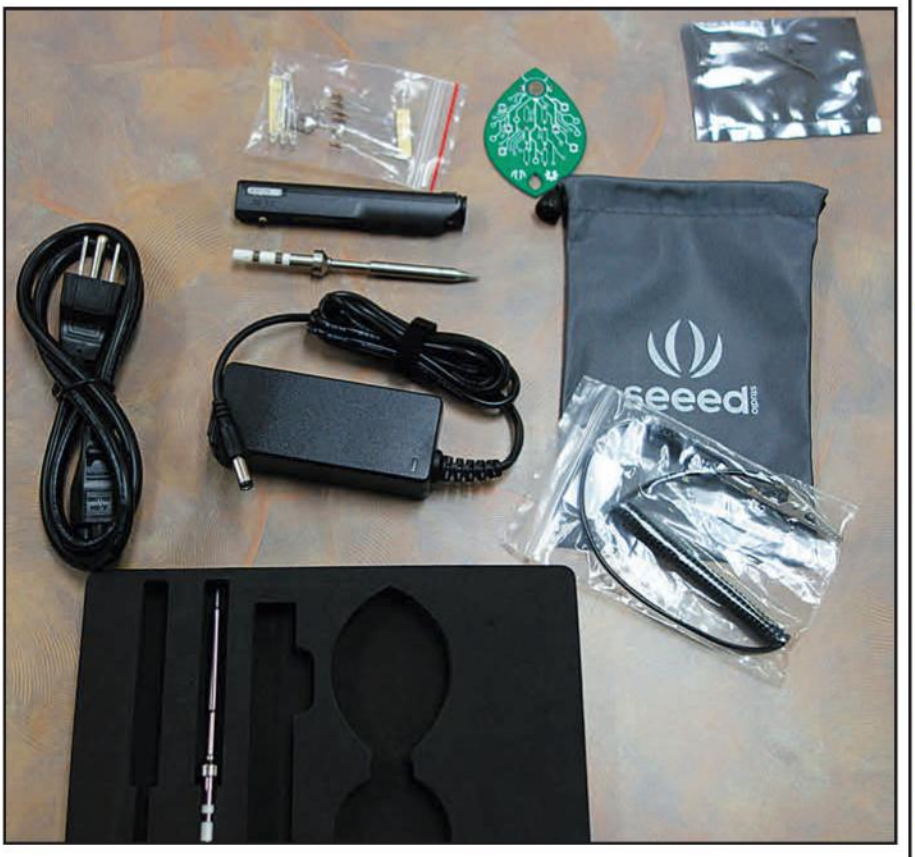
The Seeed Studio iron is very light and well-suited for traveling when size and weight are an issue. It is advisable to remove the iron tip before packing it into a carry-on bag when flying so it meets tool size restrictions for air travel. The Mini Soldering Iron comes with a power supply similar to those used for small laptops, so keep that in mind when packing for travel. There is also a grounding cable that is helpful if working with static-sensitive parts that allows you to positively ground your PCB to the iron itself. A stand with cleaning sponge is also packed into this small kit. The provided LED kit is a great way to learn how to use this iron and assembles easily. The PC board in the kit is not pretinned, so allow a little longer for solder to flow on each connection.

The Mini Soldering Iron kit comes with two removable tips along with a small travel bag to keep it all together. The Mini Soldering Iron is $99 from Seeed Studio at <http://bit.ly/2soEiwg>. Extra tips/heaters are $9.59, which is a great deal. You can also find Seeed Studio's helpful line of handheld spectrum analyzers and other useful items at the same website.

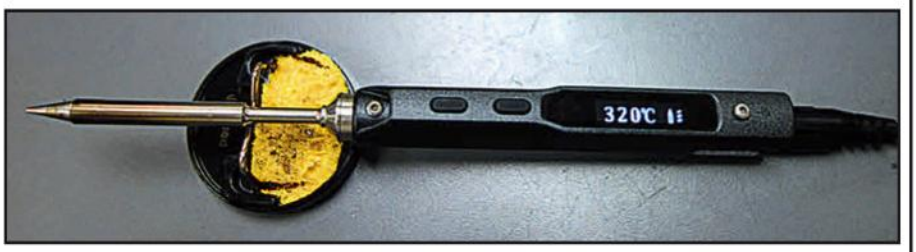
Playing in Peoria…

Finally, I plan on speaking at the Peoria Superfest in September and the new Great Lakes Hamcon in Michigan in October. I look forward to seeing my readers at these and other hamfests as always, and be sure to show me your latest kits!

– Until next time, 73 de KØNEB



Unpacking the box reveals a nice travel bag as well as all of the accessories, including the ESD grounding lead.



The soldering iron's digital display not only displays temperature, but also shows graphics when it goes into sleep mode, etc.

homing-in

BY JOE MOELL,* KØOV

New Tools for 80-Meter Foxhunting

When I went on my first mobile hidden transmitter hunt at age 12, the band of choice for Radio Direction Finding (RDF) contests was 80 meters. Dad and I put a big Hallicrafters SX-100 receiver on the car seat, powered by a home-built vibrator B+ supply. Our directional loop antenna came from the back cover of an old AM broadcast radio. We didn't win. Actually, we didn't even get close.

As years passed, 80-meter mobile T-hunting gave way to 10-meter T-hunting, and later to the VHF bands, particularly six and two meters. But 80-meter RDF is still alive and well around the world. Hams of all ages take part in all-on-foot international-rules foxhunting, also called radio-orienteering and ARDF (Amateur Radio Direction Finding). National and world championships now have four events, three of which are on 80 meters. So if you get involved in this sport, sooner or later you will need some gear for 80.

In classic ARDF competitions, times are almost always better on 80 meters than on 2 meters, because 80-meter signals don't reflect from trees, hills and buildings to cause false bearings as do 2-meter signals. Unless you're standing right under a long power line or within inches of a big metal fence, the bearing you get on 80 meters is almost always accurate. It doesn't matter if you're on a hilltop or deep in a canyon. Like daytime signals from AM broadcast stations, 80-meter groundwave signals follow the curvature of the earth and aren't reflected or scattered by terrain features. The vertical polarization of transmitting and receiving antennas minimizes the effects of near-vertical incidence skywave (NVIS) propagation.

Besides giving consistent bearing accuracy, 80-meter ARDF equipment is smaller and easier for young people to tote around, compared with 2-meter gear. If you haven't added 80 meters to your local on-foot hunts, it's time to try it.

Loops and Rods

Eighty-meter ARDF takes place in the bottom 150 kHz of the band, with CW transmissions. At these frequencies, a plate-sized loop of four or five wire turns, resonated with a capacitor of about 100 picofarads, is a sensitive and very directional receiving antenna. It couples to the magnetic component of incoming electromagnetic waves.

When held vertically, the loop has a "figure-8" directional pattern. Reception is strongest in the directions of the plane of the loop. Output is minimum (a null) when it is oriented such that the signal comes directly through the center of the loop.

A more compact magnetic antenna for 80 meters consists of about 40 turns of wire on a small rod of ferrite material. It looks and works just like the "loopstick" antenna in a modern AM broadcast receiver. There is a null when either end of the rod "points" toward the signal source. This is analogous to the air loop, because the signal is going through the center of the turns of wire in this orientation.

Photo A. The Compact 3.5F set sold by Jiri Marecek, OK2BWN, has a direct-conversion receiver and a short ferrite rod antenna inside the case. (Photos by the author, except as noted)

As you turn an air loop or rod antenna to get bearings, the signal peaks are broad and the nulls are deep. Foxhunters use the sharp nulls to determine the signal direction most accurately. There is no multipath to fill in the nulls as there often is with loop antennas on VHF.

Though very accurate, the "figure-8" loop and rod patterns are ambiguous. A null toward the north means that it's equally likely that the signal is coming from south. If you're starting from an edge of the hunt area, this isn't a problem but in the middle of the woods, you need a way to make sure that you haven't passed by a fox.

To resolve the ambiguity, 80-meter ARDF sets include a vertical sense antenna, such as a whip, a

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Photo B. Joseph Huberman, K5JGH, finishes an 80-meter ARDF course with the Superfox 3.5GX set by Jiri Marecek, OK2BWN. →

blade, or a dangling wire. It picks up the electric component of electromagnetic waves. When switched into the circuit, the sense signal combines with the signal from the rod in proper phase to alter the overall directional pattern, making one of the two signal peaks much stronger and the other much weaker. Depending on frequency and distance from the transmitter, the combination may not be so perfect as to create a precise cardioid (one peak, one null) pattern. However, it is good enough to easily tell which of the two figure-8 pattern nulls to follow.

For "maker" hams, building an 80-meter ARDF receiver/antenna set can be an enjoyable and educational project, with simple plans readily available online. The number of manufactured sets is also increasing. In "Homing In" for October 2016, I reviewed the classic PJ-80 beginner's set and the intermediate level RF80-C set from China.

Simple sets like PJ-80 have direct conversion receivers. The incoming signal goes through one stage of RF amplification, then is mixed with an on-frequency carrier. The result is an audio signal. Any frequency difference between that oscillator and the incoming signal is perceived as a tone, making the CW fox signals audible. A stage of audio amplification drives the headphones.

The PJ-80 will get bearings and find transmitters over a limited area, but it suffers from oscillator drift and low volume. A better direct-conversion set is available from OK2BWN Radio Sports Equipment in the Czech Republic. Jiri Marecek, OK2BWN, is a long-time, medal-winning radio-orienteer and Chair of the IARU Region 1 ARDF Working Group. He has been providing ARDF equipment for over 20 years. His Compact 3.5F training set (*Photo A*) sells for about $135 U.S., not including shipping[1].

Weighing only 8.9 ounces, the Compact 3.5F is excellent for beginner and intermediate radio orienteers. It has good sensitivity and directivity, considering that the ferrite rod is only 2 inches long. However, it isn't kid-proof. I lent mine to a youngster who dropped it, breaking the ferrite rod loose from its mount and causing the sense switch to fail. Fortunately, repairs were simple and the unit is now back in service.

Superhets are Better

Without high-gain intermediate amplifier stages, weak-signal performance of direct-conversion sets suffers and headphone volume can be low. Add audio amplification to bring up the headphone volume and you risk oscillations. Strong off-frequency signals can interfere. Care must be taken to keep the on-frequency oscillator signal from radiating through the antenna and causing interference in other participants' receivers. In some units, such as the PJ-80, the local oscillator is on 160 meters and the second harmonic is mixed with the incoming signal to minimize this effect.

Despite their shortcomings, direct-conversion sets are acceptable for training on short courses. However, world-class competitors want more sensitive sets with high-gain intermediate frequency (IF) stages. The Superfox 3.5GX from OK2BWN (*Photo B*) is a good example. In addition to its

Photo C. Vadim Afonkin, KB1RLI, carries his high-end 80-meter receiver as he nears the finish line at the 2016 ARDF World Championships in Bulgaria. He and his receiver captured a gold medal and a bronze medal in ARDF World Cup events there. (Photo by Lee Namkyu, HL1DK) →

Photo D. Vadim has built a lot of his 80-meter ARDF sets! (Photo by Vadim Afonkin, KB1RLI)

Photo E. Unlike most 80-meter ARDF sets, the FoxRex 3500 has two cardioid-pattern sense modes, each with its own pushbutton.

superheterodyne circuit with a sharp crystal filter, it has a wide-range gain control system that provides excellent directivity from weak signals at the hunt start to within inches of powerful transmitters. The ferrite rod antenna is much larger than the one on the Compact 3.5F and it is in a rugged mounting to prevent breakage. According to OK2BWN's English website[2], numerous championship medals have been won by competitors using this set, which sells for about $245 U.S.

New from Beantown

Beginning this year, there is a competition-grade 80-meter set made in the U.S. It is the brainchild of Vadim Afonkin, KB1RLI (*Photo C*). Now living near Boston, Vadim learned ARDF as a youth in his native Russia. He has been a perennial medal winner at the annual USA ARDF Championships, earning a position on Team USA for the ARDF World Championship. He won his first World Championship medal for U.S. in Croatia during 2012 and he has medaled in every World Championship since then. Over that time, he has perfected his 80-meter receiver design, which features a high-sensitivity superhet receiver with low-drift local oscillator.

Many ARDF experts prefer loop antennas over ferrite rods because their larger capture area increases sensitivity and the loop provides sharper bearing nulls. The rugged frame of Vadim's 8-1/2-inch diameter loop is made from a hollow arrow shaft, carefully bent into a circle. The receiver is in a 6-1/4 x 1-1/2 x 1-inch machined aluminum enclosure that is ideal for one-handed operation in the field. The only controls are RF/AF gain and frequency. Threaded holes are provided on the bottom for mounting a compass.

KB1RLI's set will operate for many hours from a 9-volt alkaline battery, but there is no battery hatch. Changing the battery requires removal of the tiny screws holding the front panel. Battery condition can be checked by measuring the voltage at the headphone jack. A low-dropout regulator allows operation down to 5 volts.

Vadim has made dozens of these sets (*Photo D*) and is offering them at $250 each, wired and tested. Battery and headphones are not included. To order, contact Vadim by email[3]. He will want to know if you prefer dual banana jacks for classic Russian headphones or a single 1/8-inch jack for stereo earbuds. With the second option, a charging connector for an optional rechargeable lithium-ion or lithium polymer battery can be included.

An Expert Set from Ukraine

The newest plug-and-play 80-meter ARDF set on the market is by far the most feature-rich. It comes from Rig Expert Ukraine, Ltd., a company best known for sophisticated antenna analyzers and digital mode interfaces. The FoxRex 3500 (*Photo E*) is based on the FJRX85 project by Dr. Nicolas Roethe, DF1FO (*Photo F*). Nick and his wife, Brigitte, have been frequent visiting competitors at the U.S. and IARU Region 2 Championships. It seems that every time they come to the U.S., Nick has built a new and better 80-meter ARDF set.

Nick has documented his 2-meter and 80-meter ARDF equipment projects on the web[4]. Some of his work is in English, but most is in German. Thanks to Google Translate, you can learn about his projects in the language of your choice.

Over the years, Nick has sold boards and circuit components for his projects. That became too time-consuming, so he stopped sales in 2011. Now with his premier 80-meter design licensed for production by Rig Expert, he will have more time to enjoy experimenting and competing.

Photo F. At the 2013 IARU Region 2 ARDF Championships, Nicolas Roethe, DF1FO, competed for Canada, the country of his birth. Nick designed the circuit and firmware used in the FoxRex 3500 ARDF set.

Rig Expert has done an excellent job of packaging Nick's receiver (*Photo G*). The two-color loop is slightly smaller than Vadim's but it is fully supported by the 9- x 1-5/8- x 7/8-inch enclosure. At 14.3 ounces, it weighs more than Vadim's set at 9.3 ounces, but it is very rugged.

FoxRex gets bearings in the same way as other loop sets with one important exception. Instead of one sense button, there are two. With the blue button pressed, the directional pattern is near cardioid with maximum signal in the blue direction. Pressing the green button moves the peak to the green direction. Having two buttons makes it faster and easier to solve the figure-8 ambiguity without turning the antenna all the way around.

FoxRex 3500 comes with traditional east European "clamp on" headphones, an orange carrying case, and a 12-volt battery charger that works on 120 or 240 VAC. Other headphones and earbuds will also work. Like most 80-meter sets, there is no on-off switch. Plugging in the headphones turns on the power. On this model, it also starts a timer that keeps track of the fox number and the transmission time remaining. Accidentally disconnecting the headset won't reset the timer because, unlike other sets, the control knob must also be pushed and held to turn off power. If you forget and just unplug the headphone after the hunt, the set will turn off automatically after a few minutes.

The manual encourages new users to head right to the forest with a transmitter to "play with your receiver" to learn how it works. You will learn a lot that way, but you might miss some useful new features. So I suggest reading through the 26-page manual first[5].

In addition to the two-line LCD in English or German, FoxRex has only one switch and one knob, which is a rotary

Photo G. Close-up of the FoxRex 3500 showing the dual sense pushbuttons and LCD readout.

encoder. On the hunt, turn this knob to adjust RF and audio gain. Based on this gain setting, an estimated distance to the fox appears on the display along with the fox number and time in seconds until the next fox comes on. Push and turn the knob to fine-tune the frequency. That should only be necessary if the transmitter is drifting, because the synthesized receiver is rock solid.

Classic ARDF events use two frequencies, one for the foxes and one for the finish line beacon. Sprint events have four frequencies, two for foxes and two for beacons. With this set, there is no need to tune up and down the band. Switching among up to four preset frequencies is a simple matter of double-pushing the knob.

FoxRex 3500 has some other features that have been in 2-meter sets, such as the popular VK3YNG Sniffer4, but are new to 80-meter sets. They include audio-tone signal strength indication, which Rig Expert calls the Acoustic S-Meter. An end-of-transmission alarm sounds as an alert that switching between foxes is imminent. Another tone sounds to indicate that the receiver is within a short distance of a fox. That alert threshold can be optimized in the settings menu to accommodate the different transmitter power levels used for classic events, sprints and foxoring.

Like other Rig Expert products, the FoxRex 3500 is available from Rig Expert Canada and sells for $299 U.S.[6] As the supply pipeline fills, expect it to be sold by other Rig Expert distributors[7], including Ham Radio Outlet.

You'll Still Need to Practice

If I were given the world's best and fastest race car, I couldn't win the Indy 500. Similarly, spending extra for a state-of-the-art 80-meter ARDF set won't necessarily get you a medal. But if you learn to use the features and get lots of practice in the woods with it, along with your map and compass, you can expect your finishing times to improve.

My next "Homing In" column will have results and stories from the 2017 U.S. and IARU Region 2 ARDF Championships in Ohio. We will see how many of these advanced 80-meter sets are on the course and how their users perform. Happy hunting!

NOTES

1. <http://www.ok2bwn.cz/prijimacee.php>
2. <http://www.ok2bwn.cz/uvode.php>
3. e-mail: <vadim.afonkin@gmail.com>
4. <http://www.df1fo.de/indexeng.html>
5. <http://bit.ly/2sHWhgE>
6. <http://rigexpert.net/>
7. <https://rigexpert.com/where-to-buy/>

BY KENT BRITAIN*, WA5VJB

Offset Feed Dishes

We got two letters from readers this time regarding offset feed dishes (*Photo A*), along with some rather interesting comments on how they *thought* these antennas worked.

So it seems like a good time for a column on the topic of this popular dish antenna.

We have all run into the millions and millions of these small dishes on houses, businesses, and apartments. I understand that if you are looking for a few of these dishes, the dumpsters at apartment complexes are often full of them at the end of the month when tenants are moving out.

So why the strange curvature and angle of the feed? Let's start with a prime focus feed dish, in this case, my 10-GHz EME dish in *Photo B*. In this type of antenna, the feed is located directly in front of the dish's focal point. There are a couple of issues with a prime focus dish: First are the supports. As you can see in *Figure 1*, the supports create three shadow areas where the feed supports block the signals. Making the supports out of plastic or fiberglass really doesn't help. Optically, you can think of what the supports would look like if made out of glass. The light goes through the supports, but it is bent and distorted. With radio waves, these distortions hurt gain and generate sidelobes. A radio astromomer friend of mine, Tom Clark, K3IO (ex-W3IWI), recommends taking the supports all the way out to the edge of the dish so that less of the dish area is shadowed. And, of course, if you can mechanically get away with using only one feed support, it's better still.

In *Figure 2*, we look at two other problems. First, the feed itself is blocking the very center, and hottest RF part, of the beam. Altogether, this makes it very difficult to get more than 50% efficiency out of a prime focus dish. Next is feedback into the pre-

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

Photo A. Offset feed satellite dish.

Photo B. Ten-foot dish with prime focus feed.

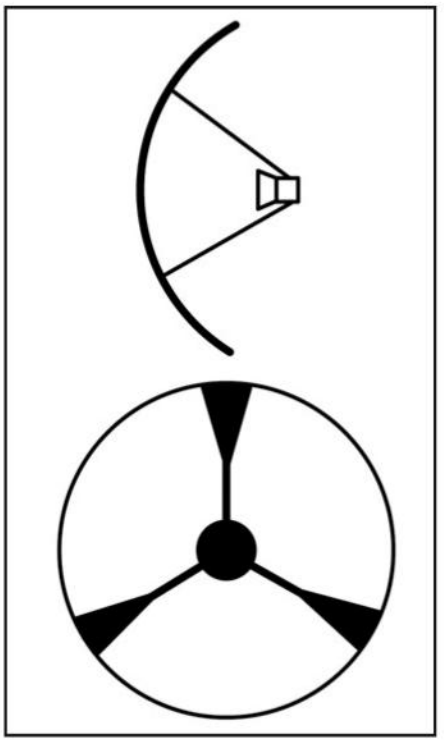

Figure 1. Shadow areas on a prime focus dish.

Photo C. Little dish from a big dish.

amp. In the early days of TVRO (TV receive only), we had a system that was extremely fussy about the position of the LNA's (low-noise amplifier's) focus. We could move the feed in and out a fraction of an inch and get a picture, or no picture. After a lot of frustration, we found that the LNA was oscillating, but only at certain distances. In a way, we were changing the SWR of the dish antenna and, at some points, the LNA would oscillate. I'll leave amplifier stability as the input is moved about the Smith Chart when using amplifiers with 40 to 50 dB of gain to other columnists!

So we need to get all that stuff out of the way of the front of the dish.

It was a good friend, Charles Suckling, G3WDG, who showed me a great way to visualize an offset feed dish. As you can see in *Photo C*, it is simply the edge section of a much larger dish. Now all the support structure, feed, and electronics are out of the way of the signals. Dish efficiencies in the 80-90% range are very common, making offset feed

On the Cover

Giulio Scaroni, IK2DED (pictured), and Marco Gorni, IK2CLB (behind the camera), are proof that antennas beat power nearly every time. Their contest station in Italy's Po Valley focuses heavily on antennas, especially for the low bands. The 80-meter (262-foot)-high tower in the background supports TV and internet antennas as well as two full-sized vertical dipoles for 160 meters and a vertical ground plane for 630 meters (already legal in Italy; still pending in the U.S.). In addition, the station has a 270-meter (886-foot)-long Beverage aimed west (to Giulio's left in the photo, running along the then-frozen irrigation canal) and a 170-meter (558-foot)-long Beverage facing east.

In the CW weekend of the 2017 CQ World Wide 160-Meter Contest this past January — when this photo was taken; thus the winter clothes and frozen canal — Marco put those antennas to work with only 100 watts from his ICOM IC-726, along with a Perseus software defined radio (SDR) on receive, and finished second in Italy (and first place low power), even though he operated only 16 of the contest's 48 hours. See the complete CQWW 160 Contest results in this issue, beginning on page 17.

Marco says the station near his home in Botticino Sera, Italy, is a joint project with his friend, Guilio, who is also a low-band enthusiast. "He helps me in placing Beverages and dipoles (the hard work!)," Marco tells *CQ*, "while I operate the contests (the very hard work!)."

In case you need more proof about the value of antennas vs. power, Marco managed to contact last year's VKØEK DXpedition to Heard Island on 160 meters with only 5 watts! *(Cover photo by Marco Gorni, IK2CLB)*

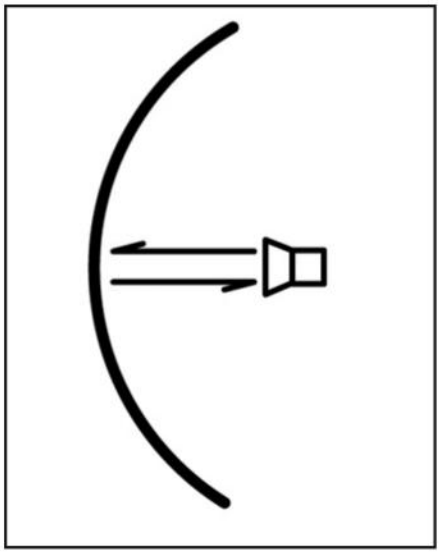

Figure 2. Feed blockage and LNA (low-noise amplifier) feedback.

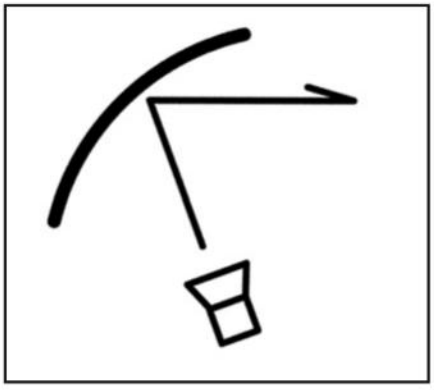

Figure 3. Dish with a clear view.

dishes very popular with commercial services. While complex to design, you have a much smaller dish with less wind loading, cheaper to make and cheaper to ship. The unusual geometry does make reverse engineering these antennas for amateur use somewhat difficult, but Paul Wade, W1GHZ, has done most of the hard work. I recommend <W1GHZ.ORG/Antbook/contents.htm> for simple techniques to use these antennas on ham bands.

Antenna Temperature

Now we will cover a somewhat more difficult topic and that is *antenna temperature*.

In *Photo D*, we have an infrared photo of my car. Note two things: The ground is warm and the sky is cold. Also note that the car windows use infrared reflective glass and are reflecting the cold sky. Thus, the windows look cold. That warm ground is also emitting long wave infrared radiation, that is, microwaves.

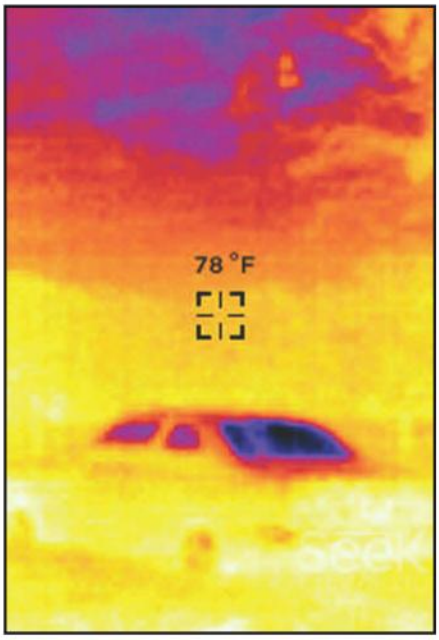

Photo D. Variations in antenna temperature — like those seen in this infrared photo of my car — can make a big difference in its noise figure and effectiveness.

If you take a sensitive microwave receiver and point it at the ground, then point it at the sky, you will see about a 6 dB difference in the noise floor. OK, for you guys with the 12-digit scientific calculators, yes, it depends on the noise figure of the radio, actual temperature of the dirt, and where you point in the sky, but 6 dB is typical and plenty for the next topic.

Back to that dish in *Photo A* ... When a prime focus dish is pointed upwards, the edges of the feed are looking at the ground/dirt/noise. With the offset feed dish, most of the edges of the feed pattern are looking at cold sky. The offset feed dish typically picks up less thermal and background noise. And for satellite TV viewers, the farther north you live, the more tilt the dish needs to have to view the Clark Belt of geostationary satellites.

Again, less noise and a smaller dish can be used. Of course all this has been worked out in the initial designs.

Questions? Suggestions?

As always, you guys are a great source of column topics. If you have any antenna questions or a possible column topic, you can use snail mail to my QRZ.COM address. For email use <wa5vjb@cq-amateur-radio.com>. For many additional antenna projects, have a look at <www.wa5vjb.com>.

JOPLIN, MISSOURI — The Joplin Amateur Radio Club will hold the **Joplin Hamfest** Saturday, August 26 at the Joplin Convention & Trade Center, 3535 Hammons Boulevard. Contact: JARC, P.O. Box 2983, Joplin, MO 64803-2983. Website: <www.joplinhamfest.org>. Talk-in 147.210+ (PL 91.5). VE exams.

SPENCER, INDIANA — The Owen County Amateur Radio Association will hold its **Hamfest** Saturday, August 26 at the Owen County Fair Grounds-Community Building, South East Street. Website: <www.owencountyara.org>. Talk-in 146.985 (PL 136.5). VE exams.

ADAMS, MAINE — The Northern Berkshire Amateur Radio Club will hold the **NoBARC Hamfest** Sunday, August 27 at the Adams Agricultural Fair Grounds-Bowe Field, 3 Orcutt Street. Contact: Eric (413) 743-9975. Website: <www.nobarc.org>. Talk-in 146.91 (PL 162.2). VE exams.

LAKEWOOD, NEW YORK — The Chautauqua Amateur Radio Service will hold the **CARS Hamfest** Sunday, August 27 at the Lakewood Rod & Gun Club Inc., 433 East Terrace Avenue. Talk-in 146.790 (PL 127.3). VE exams.

LEBANON, TENNESSEE — The Short Mountain Repeater Club will hold **37th Annual Cedars of Lebanon Hamfest** on Sunday, August 27 at the Cedars of Lebanon State Park, 5070 Murfreesboro Road. Contact: SMRC, P.O. Box 330914, Murfreesboro, TN 37133. Phone: (615) 787-7672. Talk-in 146.910-.

NEW KENSINGTON, PENNSYLVANIA — The Skyview Radio Society will hold the **2017 SRS Swap N Shop** on Sunday, August 27 at their club grounds, 2335 Turkey Ridge Road. Contact: John Italiano, WA3KFS, (724) 339-3821. Website: <www.skyviewradio.net>. Talk-in 146.640- (PL 131.8).

NEWTON, CONNECTICUT — The Candlewood Amateur Radio Association will hold the **Western CT Hamfest** Sunday, August 27 at Edmond Town Hall, 45 Main Street. Contact: Joe Morelli, W1JGM, (203) 417-0160. Email: <w1jgm@aol.com>. Website: <http://hamfest.cararadioclub.org>. Talk-in 147.300+ (PL 100).

STOW, OHIO — The Cuyahoga Falls Amateur Radio Club will hold its **9th Annual Tailgate Hamfest** Sunday, August 27 at the Tobert Pinn Armory, 4630 Allen Road. Website: <www.cfarc.org>.

SEPTEMBER

SHELBY, NORTH CAROLINA — The Shelby Amateur Radio Club will hold the **61st Annual Shelby Hamfest** and **2017 ARRL North Carolina State Convention** on Friday, September 1 through Sunday, September 3 at the Cleveland County Fairgrounds, 1752 E. Marion Street. Contact: Tom Forgas, KBØPD, <chairman@shelbyhamfest.org>. Website: <www.shelbyhamfest.org>. Talk-in 146.880-. VE exams.

BOXBOROUGH, MASSACHUSETTS — FEMARA Inc. will hold the **Boxboro Amateur Radio Convention** and **2017 ARRL New England Division Convention** on Friday, September 8 through Sunday, September 10 at the Holiday Inn Boxborough, 242 Adams Place. Contact: Mike Raisbeck, K1TWF, <k1twf@boxboro.org>. Website: <http://boxboro.org>. Special event station, W1A.

MENA, ARKANSAS — The Queen Wilhelmina Hamfest Association will hold the **48th Annual Queen Wilhelmina Hamfest** on Friday September 8 and Saturday, September 9 at Queen Wilhelmina State Park on Highway 88. Contact: Randy, KG5NE, (479) 461-1519. Email: <randykg5ne@gmail.com>. Website: <www.menahamfest.net>. VE exams.

LANCASTER, NEW YORK — The Lancaster Amateur Radio Club will hold the **Lancaster Hamfest** Sunday, September 9 at Bowen Road Grove, 3845 Bowen Road. Website: <http://w2so.org>. Talk-in 147.225 (PL 107.2).

SHEPHERDSVILLE, KENTUCKY — The Greater Louisville Hamfest Association will hold the **Greater Louisville Hamfest 2017** on Saturday, September 9 at the Paroquet Springs Conference Centre, 395 Paroquet Springs Drive. Website: <store.louisvillehamfest.com>. Talk-in 146.700 (PL 79.7) or 443.7000 (PL 79.7).

VIRGINIA BEACH, VIRGINIA — Tidewater Radio Conventions Inc. will hold the **Virginia Beach Hamfest** on Saturday, September 9 at the Virginia Beach Convention Center, 1000 19th Street. Contact: Bill Holland, WA4EUL, 833 Earl of Chesterfield Lane, Virginia Beach, VA 23454. Email: <wa4eul@arrl.net>. Website: <www.vbhamfest.com>. Talk-in 146.970 (PL 141.3). VE exams.

BALLSTON SPA, NEW YORK — The Saratoga County Amateur Radio Association will hold its **32nd Annual Hamfest** on Sunday, September 10 at the Saratoga County Fair Grounds, 162 Prospect Street. Contact: Jim Polewczak, KG2H, 231 Northline Road, Ballston Spa, NY 12020. Phone: (518) 703-9558. Email: <kg2h@arrl.net>. Talk-in 147.000 (PL 91.5) or 147.240 (PL 91.5). VE exams, fox hunt.

BUTLER, PENNSYLVANIA — The Butler County Amateur Radio Association will hold the **Radio, Computer, Electronics SwapFest** on Sunday, September 10 at the Unionville Fire Department, 102 Mahood Road. Contact: Joe Sciulli, N3WH, (412) 337-1687. Email: <n3whjoe@gmail.com>. Website: <http://w3udx.org>. Talk-in 147.36+. VE exams.

MULLICA HILL, NEW JERSEY — The Gloucester County Amateur Radio Club will hold its **39th Annual Hamfest** and **2017 ARRL New Jersey State Convention** on Sunday, September 10 at the Gloucester County 4-H Fairgrounds, 235 Bridgeton Pike. Website: <www.w2mmd.org>.

EARTH CITY, MISSOURI — Tucson Amateur Packet Radio will hold the **2017 ARRL/TAPR Digital Communications Conference** Friday, September 15 through Sunday, September 17 at the Holiday Inn Airport West, 3400 Rider Trail South. Phone: (972) 671-8277. Website: <www.tapr.org/dcc>.

NATIONWIDE — The East Coast Amateur Radio Service Inc. (ECARS) is offering to finance worthy amateur radio projects with an emphasis on youth-based projects. If you or your organization would like to apply, the application deadline for the quarter is Friday, September 15. For more information, visit <http://bit.ly/2sZoq2z>.

SCHAUMBURG, ILLINOIS — The 65th Annual W9DXCC Convention and Banquet will be held on Friday, September 15 and Saturday, September 16 at the Hyatt Regency Schaumburg, 1800 East Golf Road. Contact: Bill Axelrod, K3WA, <bill@axelrods.org>. Website: <www.w9dxcc.com>. DXCC/WAS/VUCC and CQ WAZ/WPX/CQDX card checking.

LITTLE ROCK, ARKANSAS — The Central Arkansas Radio Emergency Net will hold the **2017 All Arkansas Hamfest** on Saturday, September 16 at Catholic High School, 6300 Father Tribou Street. Contact: Mark Barnhard (501) 221-3909. Website: <www.carenclub.com>. Talk-in 146.940-.

RICHMOND, KENTUCKY — The Central Kentucky Amateur Radio Society will hold the **Richmond Hamfest** on Saturday, September 16 at the Madison County Fairgrounds, 3237 Old KY 52. Contact: Mike Rogers, KE4ISW, (859) 575-2199. Email: <hamfest2017@ckars.org>. Website: <www.ckars.org>. Talk-in 145.370 (PL 192.8). VE exams.

TOWAMENCIN TOWNSHIP, PENNSYLVANIA — WV2M will air special event station **W3L** Saturday, September 16 through Monday, September 25 to commemorate the 240th anniversary of the saving of the Liberty Bell. Frequencies include 14.240, 7.240, and 3.840 SSB; 14.030, 7.030 CW; and 14.070, 7.070 PSK. Website: <www.w3l.info>.

CAMBRIDGE, MASSACHUSETTS — The Harvard Wireless Club, **The MIT Electronics Research Society**, the **MIT UHF Repeater Association**, and the **MIT Radio Society** will hold the **Flea at MIT**, Sunday, September 17 at the parking garage on Albany and Main Streets. Phone (617) 253-3776. Website: <www.swapfest.us>. Talk-in 146.520, 449.725- (PL 114.8).

PENSACOLA, FLORIDA — The Five Flags Amateur Radio Association will hold the **Pensacola Hamfest** on Friday, September 22 and Saturday, September 23 at the Pensacola Interstate Fairgrounds, 6655 W. Mobile Highway. Website: <www.pensacolahamfest.com>.

PIGEON FORGE, TENNESEE — The Southeastern DX & Contesting Organization will hold **W4DXCC DX and Contest Convention** on Friday, September 22 and Saturday, September 23 at the Mainstay Hotel and Conference Center, 410 Pine Mountain Road. Website: <www.w4dxcc.com>.

BELVIDERE, ILLINOIS — The Chicago FM Club will hold the **Radio 2017 Expo** on Saturday, September 23 at the Boone County Fairgrounds, 8791 IL-76. Phone: (773) 614-4733. Email: <wa9orc@gmail.com>. Website: <www.chicagofmclub.org>. Talk-in 147.255+ (PL 114.8) or 147.150+ PL 107.2). VE exams.

COLOGNE, MINNESOTA — The Smarts Radio Club and **Sibley Emergency Radio Team** will hold **SMARTSFEST 2017** on Saturday, September 23 at the Cologne Community Center, 1211 Village Parkway. Website: <www.smartsfest.org>. Talk-in 147.165+. VE exams, all ARRL card checking.

LACOMBBE, LOUISIANA — The Ozone Amateur Radio Club will air a special event station on Saturday, September 23 to celebrate its 53rd Anniversary. Frequencies include 14.310, 7.210 SSB and 7.060 for CW. QSL a SASE to Michael White, KM5LS, 63128 Pine Acres Road, Lacombe, LA 70445.

MADISON, WEST VIRGINIA — The Coal Country Amateur Radio Club will hold its **Inaugural CCARC Hamfest** on Saturday, September 23 at the Madison Civic Center, 261 Washington Avenue. Contact: Ken Cregger, K8KDC, (304) 307-2216. Email: <kdcregger@gmail.com>. Website: <www.wv8ccc.org>. Talk-in 147.195 or 442.55. VE exams.

SPOKANE VALLEY, WASHINGTON — The Northwest Tri-State ARO, **Inland Empire VHF Radio Amateurs**, **PHARC**, **SDXA**, **UHSARC**, and **KBARA** will hold the **Spokane Hamfest** and **2017 ARRL Washington State Convention** on Saturday, September 23 at University High School, 12420 E. 32nd Avenue. Contact: Mike Grounds, KE7PG, (509) 924-6377. Email: <ke7pg@comcast.net>. Website: <www.n7cfo.com>. Talk-in 147.38. VE exams.

BEREA, OHIO — The Hamfest Association of Cleveland will hold the **2017 Cleveland Hamfest and Computer Show** on Sunday, September 24 at the Cuyahoga County Fairgrounds, 19201 W. Bagley Road. Contact: Hamfest Association of Cleveland, P.O. Box 81252, Cleveland, OH 44181-0252. Phone: (800) CLE-FEST. Website:<www.hac.org>. Talk-in 146.73. VE exams, DXCC/VUCC card checking.

HORSEHEADS, NEW YORK — The Amateur Radio Association of the Southern Tier will hold the **42nd Annual Elmira International Hamfest/Computerfest** on Saturday, September 30 at the Chemung County Fairgrounds, Grand Central Avenue. Contact: Elmira Hamfest, P.O. Box 614, Horseheads, NY 14845-0614. Phone: (607) 301-0040. Website: <www.arast.org>. Talk-in 147.360+ or 146.700-. VE exams, bunny hunt.

ham radio news *(from page 3)*

NASA's Frank Bauer, KA3HDO, is one of 14 space agency employees to receive this year's Distinguished Public Service Medal. According to the AMSAT News Service, the honors recognize NASA employees who have made "an extraordinary and indelible impact on the agency's mission success." Bauer is the longtime chair of the Amateur Radio on the International Space Station (ARISS) program. He was also honored in May as the Dayton Hamvention's 2017 Amateur of the Year (see photo on page 15).

Amateur radio astronomer as well as amateur radio operator Blair Heath, KD2EPA, has received his Gold certification from the International Astronomical League (IAL) for making at least 10 galactic observations. The *ARRL Letter* reports that Heath, who lives in Oceanport, New Jersey, made most of his observations using ham equipment and a 60-foot dish antenna. He is scheduled to make a presentation on "How to Use Ham Radio Gear to Do Radio Astronomy" at the IAL's international meeting next year.

FCC Cracks Down on RFI Testing, Pirate FM

The FCC has told foreign manufacturers of devices that generate RF energy that they must comply with equipment testing rules or face the possibility of being prohibited from selling their products in the U.S. According to *Newsline*, these products range from lighting equipment to devices for the so-called IoT, or Internet of Things. The notice follows enforcement action in May against a company whose lighting fixtures reportedly interfered with AM and FM broadcast signals.

In another enforcement action, the FCC has warned a New Jersey ham to stop making unlicensed transmissions in the FM broadcast band. According to the Commission, Winston Tulloch, KC2ALN, of Paterson, New Jersey was monitored by FCC officials illegally operating a broadcast station on 90.9 MHz. It noted that while FCC rules permit unlicensed signals on the band whose field strength does not exceed 250 microvolts per meter at 3 meters from the antenna, the signal strength its agent measured was 176,526 microvolts per meter at 231 meters. Tulloch was given 10 days from the date of the June 8 letter to respond "with any evidence that you have authority to operate granted by the FCC." It says further enforcement action will be determined in part by the nature of his response.

BY R. SCOTT ROUGHT,* KA8SMA

The All-In-One ... A Portable Antenna Tuner for the QRP Enthusiast

Since becoming the QRP columnist last August, I have explored a variety of topics, including QRP contesting, station efficiency, antennas, and other topics of interest (at least I hope they were interesting)! I have been itching to write a homebrew segment for the past year with a focus on something that would be useful for the QRP operator that is also inexpensive; incorporate readily-available parts; and, most importantly, something a first-time builder could construct in an evening.

After preparing June's column I was sorting through my "junk box" of parts and found a coil I had made many moons ago for an antenna tuner I had since forgotten about. The coil was wound on a small diameter piece of PVC pipe and contained a series of taps (pigtails) for use in an L-Tuner, one of the first antenna tuners I constructed for QRP use nearly 30 years ago. At that moment, my search for a homebrew project to write about was over…the L-Tuner, a simple and effective antenna tuner that could be constructed from easily obtainable parts and serve as a useful station accessory for the QRP operator.

The Classic L-Tuner with a Twist

Like other misnamed antenna tuners, the L-Tuner provides an impedance match at the transmitter; it does not magically tune the antenna. A good impedance match at your transmitter (50 ohms) provides a low standing wave ratio (SWR), thereby allowing your transmitter to deliver more power to the feedline/antenna. Inductance and capacitance are the two necessary ingredients for an antenna tuner to work properly. Inductance is achieved with a coil and capacitance is provided via a variable capacitor. The "classic" L-Tuner design employs a variable capacitor that can be salvaged from a vintage AM radio and a coil that is typically wound by hand. The coil can take many forms but is often wound on a piece of PVC pipe or similar object with a tap placed after a set number of windings for changing inductance. The L-Tuner is easy to use and obtaining a good match takes only a few seconds after a little practice. *Figure 1* is a schematic of the L-Tuner.

QRP and Homebrew: Perfect Together

QRP and homebrew projects never cease to amaze me. As soon as I believe I have seen it all, I see something else that gives me a "wow" moment. I recently had one of these moments while watching a You Tube video ("Variable Inductor Antenna Coupler Made from Corflute Material") by Peter Parker, VK3YE. VK3YE had constructed an L-Tuner for QRP operation but instead of using a traditional fixed coil with taps as an inductor, he wound

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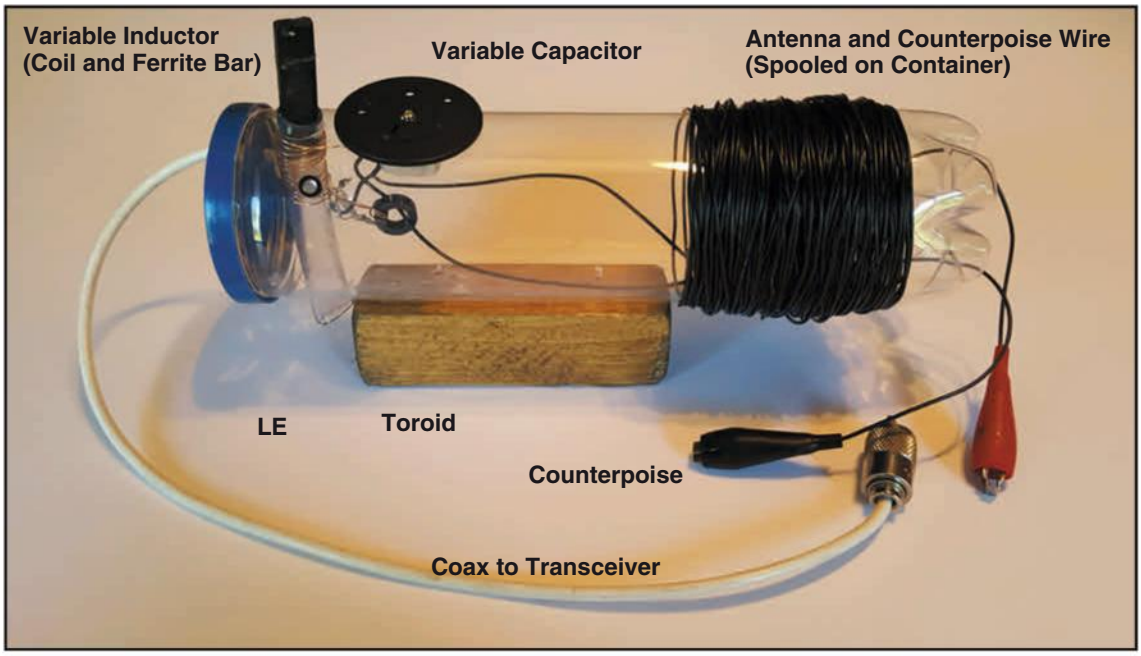


Photo A. The All-in-One Portable Antenna Tuner.

a small diameter coil and adjusted the inductance with a ferrite bar, creating a variable inductor. A neat twist to the classic design and one that I probably never would have thought of. Thanks, Peter! The coil contains several turns of wire and is less than two inches in length and about 5/8-inch in diameter. The ferrite bar slides in and out of the coil to change inductance. Sliding the ferrite bar toward the center of the coil increases inductance while sliding it outward from the center (or removing it from the coil altogether) decreases inductance.

I incorporated this idea into a simple antenna tuner based on the L-Tuner design – I call it the "All-In-One" as it also contains a half-wavelength, end-fed wire antenna and counterpoise for operation on 10-40 meters (*Photo A*). The All-In-One simplifies packing for a QRP outing since the tuner, end-fed antenna and counterpoise are all together as one unit — no more hunting for a spool of wire before I head into the field. Most importantly, the wire for the antenna and counterpoise can be wrapped tightly around the tuner's enclosure when I am finished operating in the field. One of my pet peeves is getting kinks in my antenna wire when I roll it up — wrapping the wire around the tuner's enclosure helps alleviate this problem.

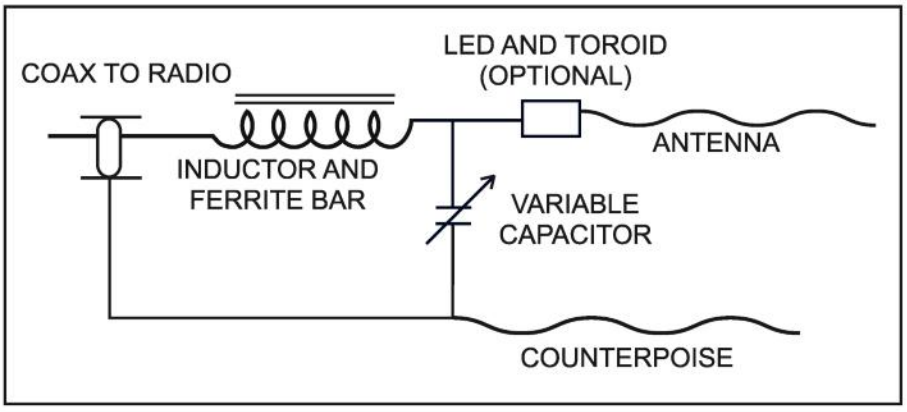


Figure 1. L-Tuner Schematic with a Twist

Parts List for the "All-In-One"

- Variable capacitor
- Ferrite bar
- Tygon® tubing (1/2-inch I.D. 5/8-inch O.D.)
- Magnet wire (24 gauge), or similar
- Hook-up wire
- Alligator clips
- LED (1.7 volt) – optional
- Snap-in LED mount - optional
- Toroid (No. 43 or similar) – optional
- Enclosure of your choice

Photo B. A $1.99 AM/FM clock radio supplied the needed parts.

I added an LED to the tuner to help indicate when maximum RF current is emitted to the antenna. If your QRP transmitter/transceiver does not have a built-in SWR meter, the LED is a helpful tool when adjusting the tuner to ensure a good match. When an acceptable match (low SWR) is achieved, more power is passed to the antenna thereby lighting up the LED. When a poor match is encountered, less power is passed to the antenna decreasing the LED's intensity. The idea is to adjust the tuner for maximum LED brightness.

It is important to note that the All-In-One uses a miniature variable capacitor. You could use a larger variable capacitor from a vintage AM radio; however, this adds weight and size. Since the tuner is designed for QRP operation, I used smaller parts. It should go without saying (after all, this is a QRP column), do not put more than 5 or 10 watts of power into the tuner.

The Hunt for Parts

See the Parts List for this project. Over the years I have let my junk box of parts dwindle and found myself at our local Goodwill store (second-hand store) purchasing a used AM/FM clock radio to acquire the variable capacitor and ferrite bar (AM loop antenna inside the radio) needed for this project (*Photos B* and *C*). In addition to the needed parts, I salvaged the radio's speaker and power cord for my junk box (I can never have too many replacement cords with prewired plugs) — not a bad deal for $1.99.

If you need to purchase a used radio for parts, I recommend using a higher wattage (45 watt) soldering (or desoldering iron) to remove the variable capacitor from the PC board. If using a soldering iron be sure to use a desoldering bulb or wick to aid in removing the solder (*Photo D*). A 45-watt soldering iron works well for this purpose and will quickly reheat the solder joint allowing you to remove the solder. Be cautious not to overheat the variable capacitor — it has a plastic enclosure and will

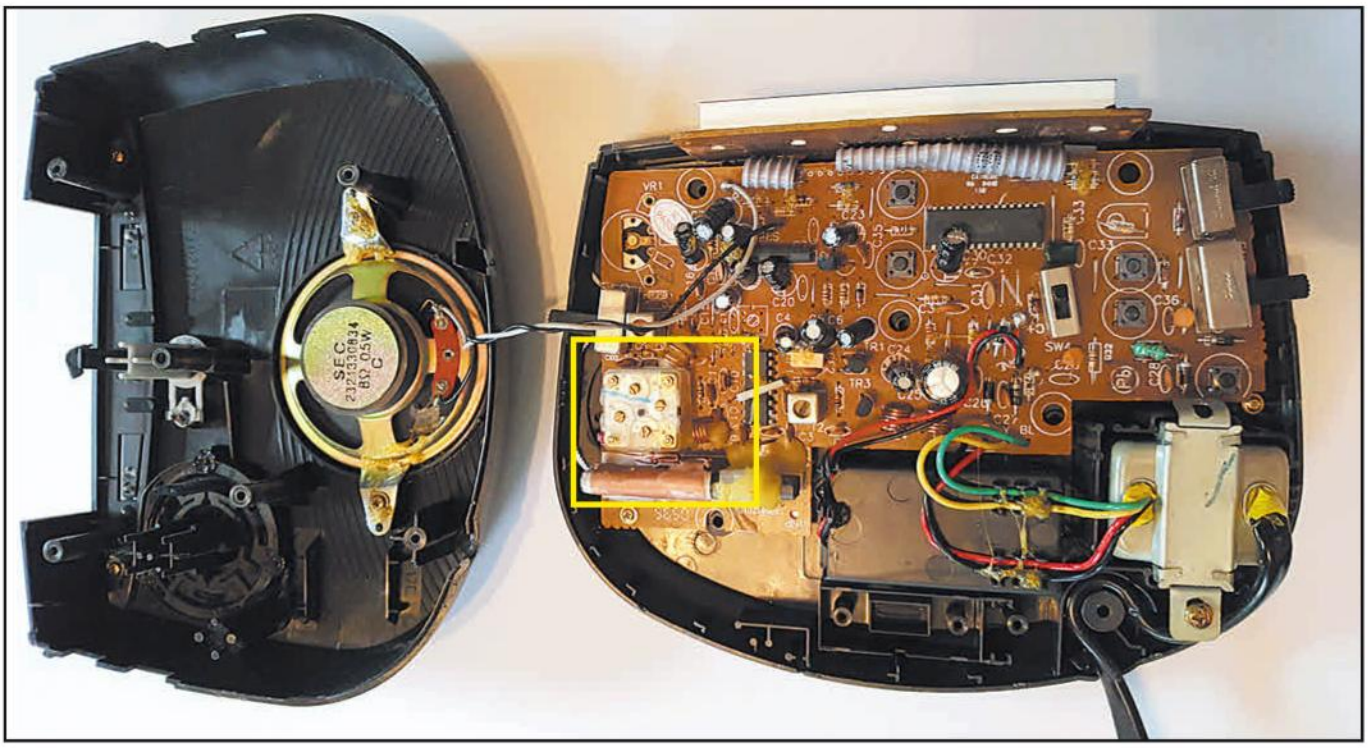


Photo C. Variable capacitor and ferrite bar inside the radio.

begin to melt if you apply too much heat. The ferrite bar can be easily snapped off the PC board — no desoldering required.

All the remaining items (magnet wire, alligator clips, and LED), including a toroid I had used several years ago for a homebrew transmitter project, were found in my junk box. I wrapped my coil around a scrap piece of Tygon® tubing (1/2-inch interior diameter 5/8-inch outside diameter) left over from a plumbing project. If you need to purchase Tygon® tubing, you can find it at your local hardware or home improvement store. The cost is generally less than $1 per foot. Toroids and LEDs can be ordered from online electronic supply stores if you don't have these in your goodie box.

Enclosures – Do What Works for You!

My prototype (*Photo E*) was mounted on a piece of 1x2 lumber I had in the scrap bin. I attached the variable capacitor to the 1x2 with double-sided tape and let the coil sit freely next to the capacitor. I could have beefed-up my prototype for permanent use but felt I needed to protect the capacitor and coil since the tuner would primarily be used in the field for portable operation. So, my hunt for a suitable enclosure began.

As I scoured the house from top to bottom, I found a container of tennis balls that belonged to my daughter. The container was approximately 11 inches long and three inches in diameter … a perfect home for my antenna tuner with room to boot for wrapping my end-fed wire and counterpoise around the container. After nearly 25 years of marriage and endless dealings with my XYL and two daughters, I have learned how to get what I want … I gave my daughter $5 and the container (minus the tennis balls) was mine!

There are endless options for an enclosure. Parmesan cheese containers (a short version of the tennis ball container), food storage containers, and plastic project boxes are just a few of the many options available. Bottom line: Be creative and design something that is right for you.

Bringing it to Life

Before you begin wiring the components together, you will need to identi-

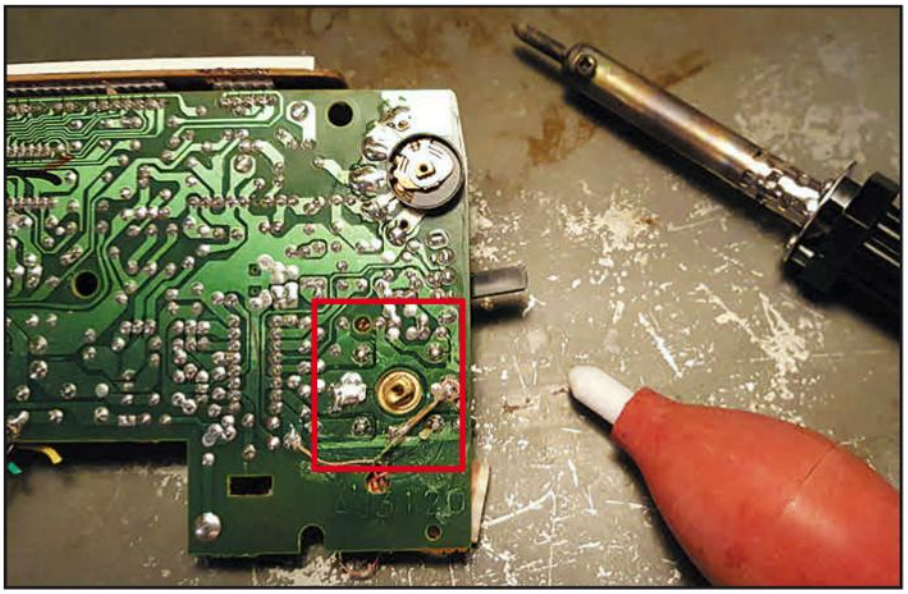


Photo D. Pins for variable capacitor on PC Board — use a desoldering bulb or wick to aid in removing the capacitor.

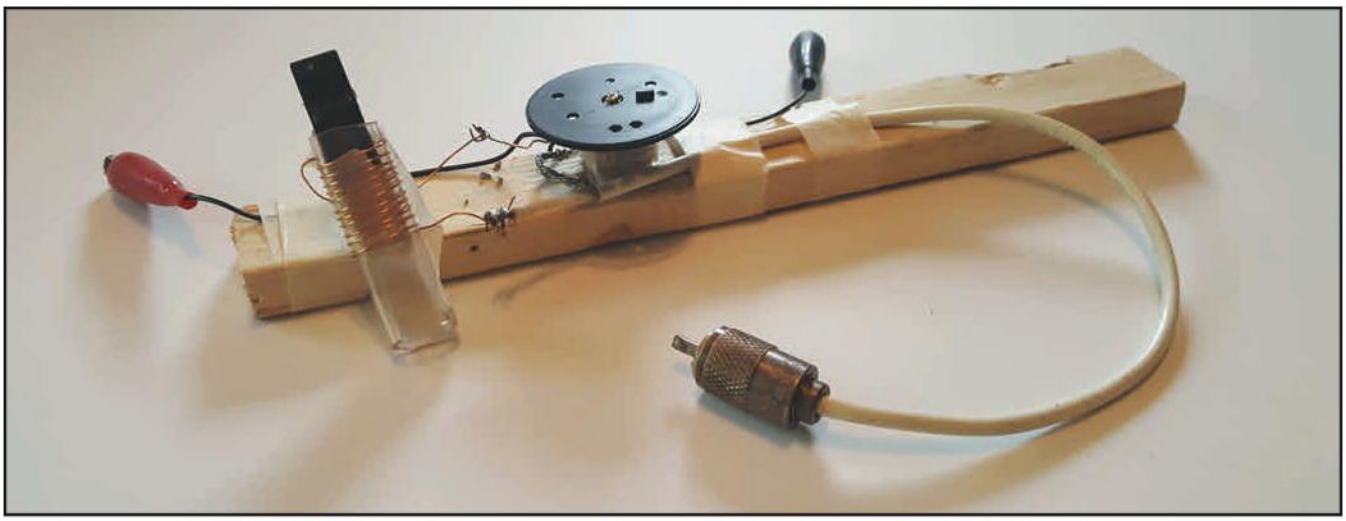


Photo E. The prototype…ugly, but it worked!

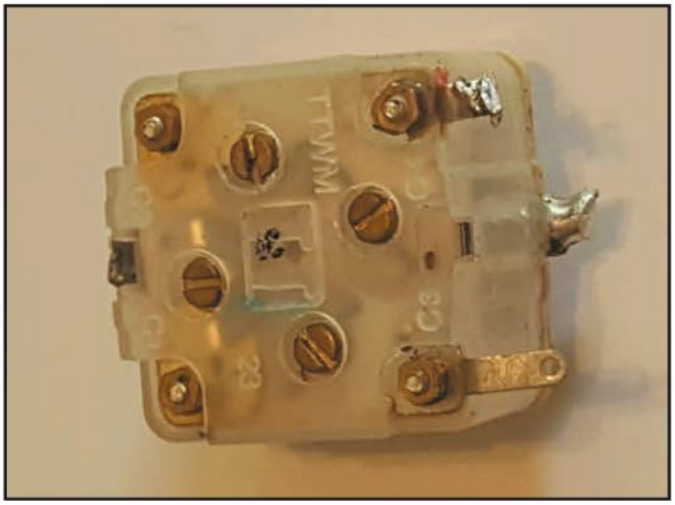


Photo F. Note the locations of the tabs (numbered 1-4) on the variable capacitor.

fy which tabs to use on the variable capacitor. In general, one side of the variable capacitor is for FM and has less capacitance (about 20 picofarads). The opposite side is for AM and has higher capacitance (around 200 picofarads). Most miniature variable capacitors identify each tab with a number (1 through 4) that is marked on the capacitor (*Photo F*). In my experience, tabs 1 and 2 are for FM and tabs 3 and 4 are for AM. The tabs on the AM side of the variable capacitor are the ones to use as they offer the most capacitance. I used tab 4 and the tab near the top of the capacitor (same side as Tab 4) for wiring in the variable capacitor.

The coil was wound using 24-gauge magnet wire. I placed 11 wraps of wire around a 4-inch piece of Tygon® tubing and wound each turn so they were less than one-quarter inch apart. My windings were far from perfect, so don't spend time trying to perfect the coil, just wrap the wire tightly and do your best to keep the windings neat and orderly. When I finished winding the coil, I placed a piece of masking tape over one side of the windings to prevent it from unwinding. Be sure the ferrite bar can move freely in and out of the coil as it will need to be adjusted (moved up and down) to find the proper inductance. A snug fit is desired so the bar will stay in place after you have found the "sweet spot". Wrap a piece of tape around the ferrite bar if it slips too easily through the tube.

The LED assembly was made by wrapping three turns of 24-gauge magnet wire around a #43 ferrite toroid and connecting each end wire end to a 1.7-volt LED. Remember, each pass of wire through the center of the toroid equals one turn. I used a red LED as this is what I had on hand. The antenna wire is slipped through the toroid before it is connected to the variable capacitor. As previously discussed, the LED/toroid is optional but is helpful in finding the best match when adjusting the tuner.

Prior to mounting the parts in an enclosure, I highly recommend you wire the parts together and test the tuner as some minor adjustments may be necessary. The number of turns on the coil may need to be changed and/or the spacing between each winding may need to be tweaked (moved closer together or farther apart). When I tested my prototype, the tuner provided a flat SWR on 20 meters but I had to move my windings closer together (for more inductance) to achieve a suitable SWR on 40 meters. After making this adjustment, I had an SWR of 2:1 (or lower) on 10-40 meters. You may find it necessary to experiment to obtain the desired result.

Installing the tuner in the tennis ball container was a challenge. If you use this type of enclosure, be sure to complete all wiring and soldering prior to mounting the parts. You may regret trying to solder inside the container after mounting the parts.

I used a 5/8-inch drill bit for placing holes in the top and bottom of the container for installing the coil (Tygon® tubing). Mounting the coil inside the container provides a degree of protection and gives it a sturdy foundation for sliding the ferrite bar in and out of the tube. I cut the Tygon® tubing longer than the diameter of the container so the tube would overhang the container's top and bottom. I did this to prevent the tube from slipping out of the container. As an extra precaution, I placed a dab of clear silicone caulk against the tubing and the top and bottom of the container to make a permanent connection.

A 1/4-inch diameter hole was drilled through the top of the container so the variable capacitor could be mounted inside the container. I positioned the capacitor so its shaft was protruding through the hole. Clear silicone caulk was used to adhere the capacitor to the container. The tuning knob (also salvaged from the AM/FM radio) was fastened to the shaft with

a small screw. The LED was installed in a similar fashion except I used a snap-in LED holder for mounting it. I could have let the toroid/LED dangle from the antenna wire inside the container, or fastened the LED to the outside of the container, but used the snap-in holder since it was in my junk box.

After mounting all the parts, I attached the container to a 2- x 2-inch wood base using silicone caulk. The 2x2 raises the container above the surface and prevents it from being lopsided after wrapping the end-fed wire antenna and counterpoise around the container. I soldered alligator clips to the antenna and counterpoise wires exiting the container for ease in connecting and disconnecting wires.

Tune-Up – As Easy as 1-2-3

Tune-up with the L-Tuner and an end-fed wire could not be easier. After connecting the tuner to your transceiver and hooking up the antenna and counterpoise, set your radio to receive. Listen to the receiver as you slide the ferrite bar in and out of the coil. Leave the ferrite bar set in the location where you hear the most noise (static). Next, while listening to the receiver, adjust the variable capacitor for maximum noise. Lastly, key the transmitter and adjust the variable capacitor for lowest SWR. You may also need to adjust the ferrite bar in the coil for the best match. If using the LED, tune for maximum brightness. Although my Yaesu FT-817 has a built-in SWR meter, I put my outboard SWR meter (Dentron SWR-1A) in-line between the 817 and the antenna tuner to verify the match. Under low SWR conditions, the LED was bright with maximum brightness achieved with an SWR of 1:1. The LED was dim (or did not light up at all) when SWR was high (greater than a 3:1).

When tuning up on the air, be considerate of others and find a clear frequency before keying the transmitter. Transmit for only a few seconds at a time when adjusting the tuner. It is better (in my opinion) to make several short transmissions to adjust the tuner rather than one or two long transmissions. Remember, the transmitter may encounter a high SWR while adjusting the antenna tuner and long transmissions in concert with a high SWR may cause havoc and damage your transmitter.

Saving the Best for Last – My QRP Achievement

I hate to gloat, but since no fellow QRPers have stepped up to the plate to be featured in this month's QRP Achievements section, I will share my achievement with everyone. My first contact with this tuner (in concert with my FT-817) was with IK4GRO in Italy on 20 meters (SSB). I heard a pileup on 14.270 and worked him on my first call beating out a very loud 5-lander! I made this contact from my kitchen table with my end-fed antenna (about 70 feet in length) strung through a sliding glass door to the outdoors where it terminated about 30 feet up in a tree. A few days later I contacted PB8DX (a club station in the Netherlands), also on 20-meter SSB. Since mounting the tuner in its enclosure I have made several CW and SSB contacts on 20 and 40 meters with no difficulty. Not bad for a hunk of wire, a few parts from a junk box and $1.99 spent at Goodwill. Oh, and the $5 I gave my daughter for the tennis ball container.

If you are in the market for a QRP antenna tuner, whether for use in the field or shack, please consider this simple, proven design. Also, let me know about your low-power achievements and how you operate QRP and I will do my best to work your story into a future column. – *Until October, 73,*

Hybrid Mania

BY JEFF REINHARDT,* AA6JR

Most of us learned about hybrids during our school days, probably in general science or biology classes. There we learned about cross-breeding certain plants and, in some cases, animal species to create a new entity that displays the best or most desirable traits of the original species. Of course, there was a lot of cross-breeding humor that followed, that went something like: "What happens when you cross a tiger with a parrot?" "I don't know what to call it, but when it talks, I listen!"

Hybrid cars have been with us for nigh on 20 years now and many hams have come to terms with this new breed of transportation that combines a conventional gasoline engine with a large high-voltage battery and a propulsion system that uses electric motors combined with mechanical power. Systems vary among manufacturers but the general upshot is better fuel economy and reduced emissions. As hybrid technology has evolved, more sophisticated systems have emerged and now there are regular hybrids, plug-in hybrids that recharge their batteries off the power grid and, in the case of the Chevy Volt, a plug-in car that also roughly emulates a diesel locomotive, using the engine primarily to generate electricity, if it's needed at all. Purists, please grant me some grace here, this is a high-level overview.

*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>

Hybrids and Hams

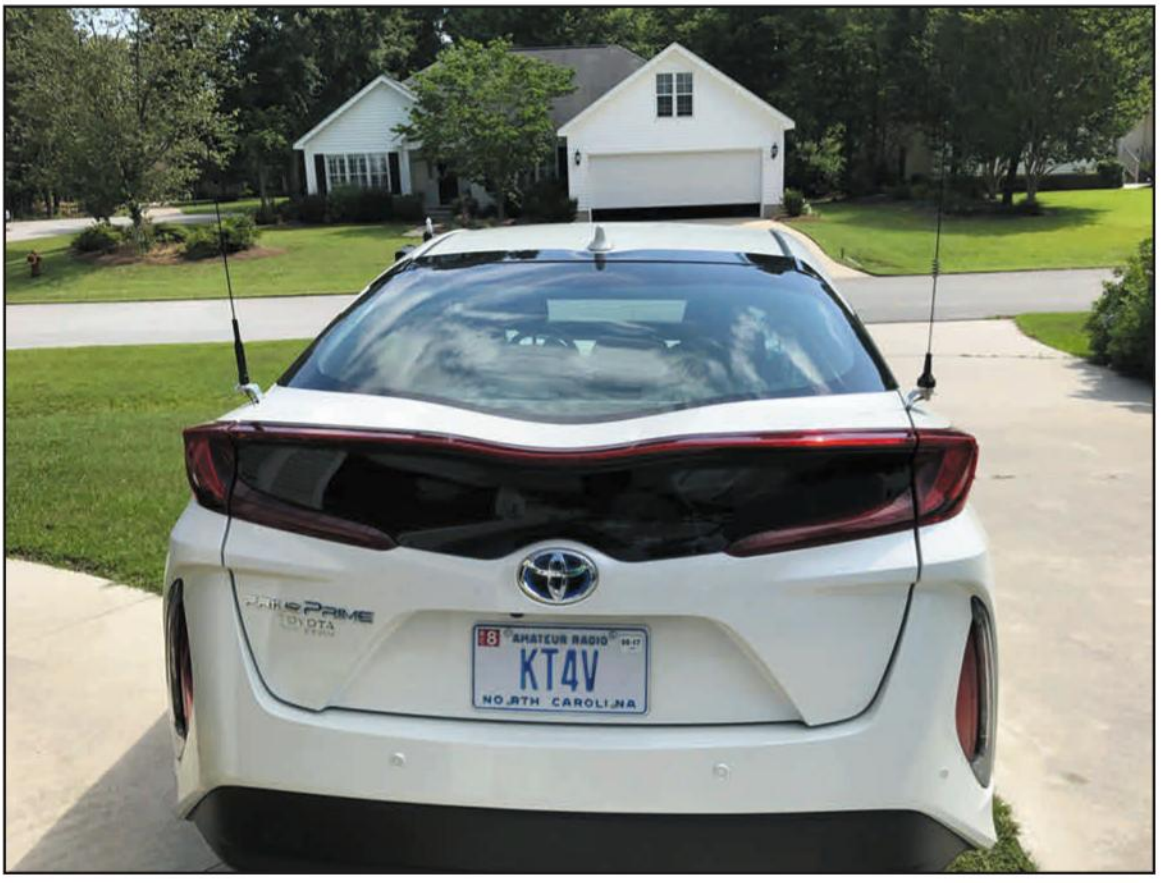
A few years back, APRS® pioneer Bob Bruninga, WB4APR, bought a few wrecked Toyota Prius models and combined them into one really loaded mobile. Since they were reclamation projects, he had no concerns with using metal screws to cover the thing with solar panels. It drew quite a crowd! What it lacked in style, it made up for in function.

Anyway, last December, I bought a plug-in hybrid Ford Fusion Energi. Even with its restricted "all electric" range (18 miles or so), with my relatively short commute, I barely use the engine and my electric bill has scarcely budged. But in our last column, I mentioned I'm a bit hesitant to install a mobile rig in the face of some dire warnings found in the owner's manual.

In the best spirit of ham radio, I received some helpful correspondence that I'll share with you.

County Hunter extraordinaire Bob Voss, N4CD, writes:

You made a comment about hooking up your radio to the battery. You do not want to take the ground lead to the negative side of the battery. New cars



KT4V's new Toyota Prius Prime sports a multiband array of antennas in a very clean presentation. (Photos courtesy Ken Zieleck, KT4V)

Note the rubber paint protection behind the sturdy, fabricated antenna mount.

While the Prius cockpit is compact, the windshield setback offers mounting opportunities that are functional and don't interfere with driver's sight lines.

have an IBS (Intelligent Battery System) that limits how much juice goes into the battery.

You'll note that NOTHING in the car is connected to battery ground. There's a big fat wire that goes to ground and it has a Hall Effect sensor on it that monitors current flow. The IBS tends to keep the battery voltage low and not charge it for long periods, as the alternator sucks engine power that reduces mileage. Every now and then, it will kick up the voltage to charge the battery.

You can connect (the radio) to the plus side of battery. Take your "ground lead" to a big fat ground point back by the radio. Every other accessory on the car goes to the chassis ground points.

If you take the negative lead to the battery negative side, the IBS doesn't realize that current is flowing out of the battery to your radio, and won't charge the battery. Eventually you'll run the battery dead even if the engine is running.

In the County Hunter News Online, we covered this a few issues ago with the trials and tribulations of N4CD's new 2016 Chevy Malibu, in which the battery voltage as you cruise on down the road is often 12.4 volts and the car is happy (but) the radio isn't.

I run a #10 wire to the radio and a #10 4-foot ground wire to body ground. The radio still either won't key or chirps badly at 12.4-12.7 volts.

You could add a voltage booster to solve that. The other solution I've found is to leave the headlights on. Then the voltage sits at 13.4-13.6 volts as the alternator has to work all the time with the increased load! Or if you go to parks and run only from there, turn on the lights two-to-three minutes before you start the run and the voltage kicks up slowly to the 13s.

Don't know what you bought, a Prius PHEV or the Chevy Volt; either is likely to be an RF noise nightmare. The older just hybrid Prius cars were impossible. RF flowing everywhere on the body/frame and no one ever got HF to work.

"They" say don't do this to power your radios — but, for KT4V it works!

Newer ones are better on VHF but no reports on HF attempts to use it. I haven't heard on the Volt.
Good Luck!

Thanks, Bob, I think I'll need it!

But Wait, There's More!

Consider this bit of "good news" from Ken Zieleck, KT4V, who writes from Morehead City, North Carolina to share this info:

I travel a lot and about the only time I get to play with radios is on the road so my car becomes my ham shack. I had an '06 Colorado before buying a Prius Prime in December. I scoured the War and Peace owner's manual as well, actually read the darn thing front to back looking for "gotchas." Additionally, I put the Prime on a lift and looked for a way to get power from the battery into the car. Short version is, I could not find an easy way top or bottom without a drill and I'm not ready for that. However, I have a fairly effective setup.

I noticed the cigarette lighter was rated at 120 watts. So, it's a big no-no but I didn't want to drill, etc. Plugged into cigarette lighter and went through a wattmeter to make sure I don't draw too much. I limit my setup to 50 watts HF and end up pushing about 30 watts sideband. I suspect I could go higher but have not found a need to yet.

At some point, I plan to put on a diplexer on the driver's side antenna connection to allow me to keep the ATAS 120 on (at) all times and the DMR will go to the passenger side antenna mount.

Bottom line is the results were shocking! I figured that I would never get to run HF in an electric. I actually constructed this setup for VHF/UHF-only ops but decided to test HF just for grins. Didn't have a power meter at the time so I just set it to 20 watts and made a QSO on 20 meters from eastern North Carolina to Italy under terrible band conditions. However, most remarkably, no noise while under way! Could not believe it. Only noise I heard was some minor engine noise when it kicked in but much less than my '06 Colorado or the '97 Jeep Wrangler I had before that. And, I did not do anything to reduce the noise, no bonding, etc.

I use the Yaesu FT-857 and Tytera MD-380. When a good mobile multi-platform digital radio comes out, I plan on incorporating that permanently in my car to replace the handheld DMR and try to buy (or fabricate if I have to) some sort of Bluetooth interface for both radios. North Carolina is trying to pass a hands-free law as well. We're trying to get ahead of the game for the amateur radio exemption but you never know.

Anyway, hope this gives you some ideas for your setup. I hope you have the Prime 'cause there are very few out there and it's quite daunting dealing with an electric car, particularly in eastern North Carolina where we have not had any of these until the Prime came out.

Thanks, Ken. As mentioned above, I don't have a Prius but hopefully, sharing this info will encourage others to help expand the knowledge base of "crossing a mobile with a hybrid car" to produce an even better mobiling experience!

Words of caution: Before poking around a hybrid car, be aware that there are substantial cables that carry hundreds of volts and lots of current. Drilling a hole without knowing what's behind that panel could be a *very dangerous* thing to do. High-voltage storage batteries are now often tucked into nooks and crannies, so caution is the byword.

As to my Ford, well, at the time this is written, the dealer is trying to work through an intermittent bug in the car's multi-function display. So until that's resolved, I'll just have to stick with my trusty HT.

73 and happy mobiling! – *Jeff, AA6JR*

what's new

Buddipole Introduces the POWERmini

At this year's Dayton Hamvention®, Buddipole® introduced a new power management system that is compact, lightweight, and operates via solar power and/or batteries. The Buddipole POWERmini® is a 12-volt DC power control system designed for portable operations and incorporates the functions of a solar charge controller, battery management system, power monitoring device, and power distribution in a 4.5-inch wide x 3.2-inch deep x 1.3-inch high, weather-resistant enclosure that weighs only 6.2 ounces.

With a maximum current-handling capacity of 25 amps, the POWERmini optimizes the life of the battery by protecting it from overcharging or excessive discharge by constantly monitoring the battery voltage and solar panel voltage and determining the state of charge for the battery.

To prevent an extremely low battery voltage, an alarm will sound and the POWERmini will automatically disconnect the battery to protect it. You can set the voltage at which this occurs. A replaceable 25-amp fuse protects the system from overcurrent situations.

All power connections use Anderson Powerpoles® with the right side containing two output ports enabling connections of power to a radio and an auxiliary device such as LED work lights, SWR bridge, or a small power amplifier.

On the front of the case, there are three buttons that control the settings of the POWERmini, an LED power/error indicator, and an OLED screen that provides a comprehensive overview of the 12-volt DC power system.

Buddipole says the POWERmini is available now and has a suggested retail price of $139. Fore more information contact Buddipole, 3028 SE 59th Court, #600, Hillsboro, OR 97123. Phone: (503) 591-8001. Email: <info@buddipole.com>. Website: <www.buddipole.com>.

Worldwide DX on the Magic Band

Plus, the Growth of JT65 as a VHF Mode

BY TONY EMANUELE,* K8ZR

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

VHF Plus Calendar

ARRL 222 MHz and Up Distance Contest:	August 5th & 6th
ARRL 10 GHz and Up Contest:	August 19th & 20th
Perseids Meteor Shower: Predicted peak	August 12th & 13th
ARRL September VHF Contest:	September 9th & 10th
ARRL EME Contest 2.3 GHz and above:	September 8th – 10th.
ARRL 10 GHz and Up Contest (2nd weekend):	September 16th & 17th
50 MHz BBQ Austin, TX:	September 29th & 30th

Late spring and early summer brought about a noticeable improvement in band conditions from 50 MHz into the microwave region. The first of these notable openings occurred on May 17th with a tropo opening along the east coast of the U.S. Stations as far north as New England worked into Florida including K1TEO in FN31, N3RG in FM29, N4HB in FM17, and NG4C in FM16 all at the northern end of the path, with K4KV EM81, KD4ESV EL87, and KK4HEP EL88 at the southern end, all on 2 meters with the best DX at ~ 1,600 kilometers (1,000 miles.) See *Figure 1*.

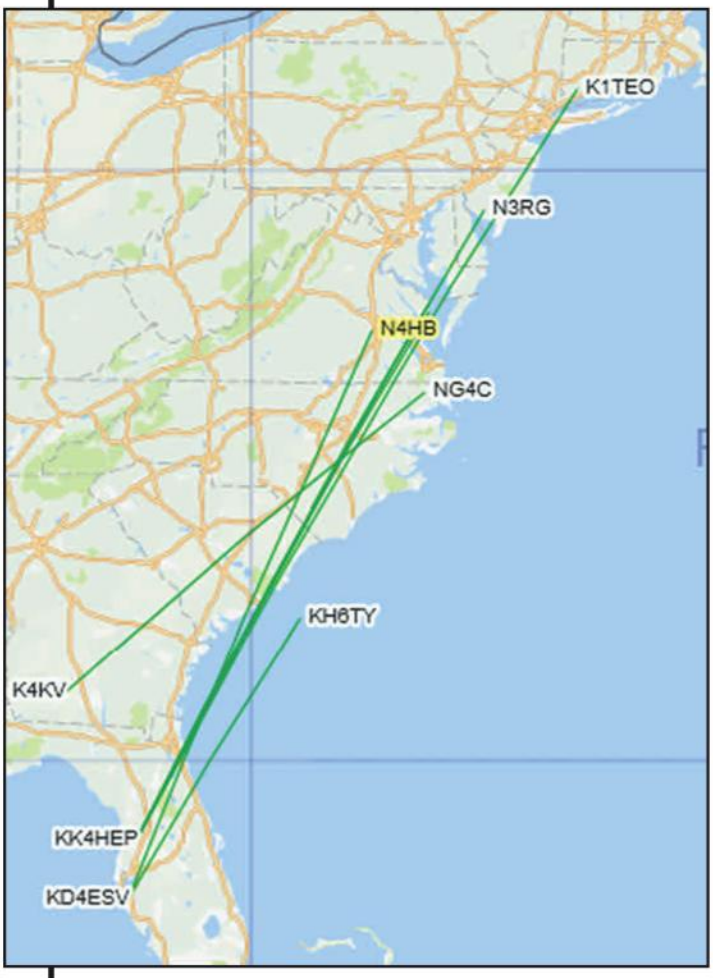


Figure 1. A May 17 tropo opening on 2 meters provided opportunities for 2-meter contacts up and down the U.S. east coast.

Memorial Day weekend got off to a good start with a widespread sporadic-E opening on six meters. On May 26th, most of the U.S. experienced sporadic-E on the Magic Band (see *Figure 2*). As the ionization intensified over Kansas, the MUF exceed 144 MHz, resulting in a widespread 2-meter sporadic-E opening as well (see *Figure 3*). Good conditions continued on 6 meters over the weekend with an opening into the Caribbean with stations in Cuba, Haiti, Jamaica, St. Lucia, Anguilla, Puerto Rico; and Colombia and Brazil in South America working stations in New England, the Midwest and the southeastern U.S. (see *Figure 4*).

A coronal mass ejection (CME) on May 23rd hit Earth's magnetic field on May 27th, resulting in the K index reaching 6 for two consecutive periods before peaking at severe storm level, K=7, on May 28th. The result was a decent 50-MHz aurora opening for those located in the northern latitudes of the U.S. and southern Canada (see *Figure 5*). As often happens after an aurora opening late in the evening local time, the rough-sounding aurora signals become clear and strong, evidence of an Auroral-E opening. Northern latitude east-west paths in excess of 2,500 kilometers (~1,500 miles) are possible and were worked by VE6TA to the west and K1TOL, WU1ITU, and VE1PZ, among others in the east.

For those few willing to stay on the band until the wee hours of the morning local time in the east, the reward was a band opening from Alaska to the upper Midwest and New England. KH7HBK BO49 was worked by N8CJK EN84, N1BUG FN55, and K1TOL FN44 around 0600z. Other Alaskans taking part in the opening were KL7HD BO49 and KL7NO BP54. The month closed out on the 31st with a notable opening between Asia and Europe with JE6AZU in PM51 working YO9HP in KN35 @ ~8,600 kilometers on SSB, BA4SI in PM01 working 9A4K in JN86 @ ~ 8,500 kilometers on CW and BU2BV in PL05 working UY7VV in KN58 @ ~ 8,000 kilometers via JT65.

The six-meter band stayed interesting into June with an opening between U.S. and Japan on June 5th.

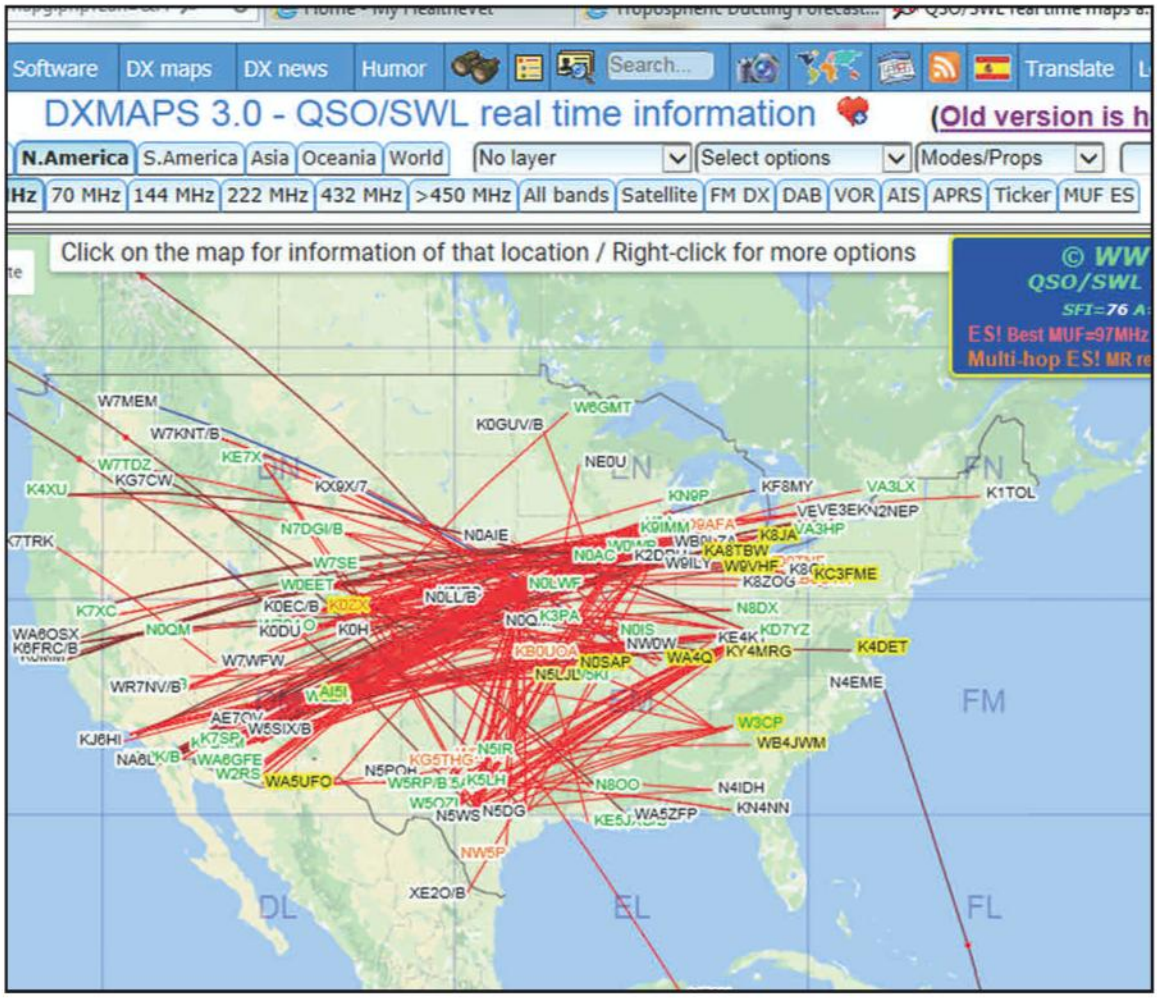


Figure 2. A strong sporadic-E opening on May 26 resulted in widespread DX opportunities on 6 meters.

K5NZ EM20, N5OMG EL49, XE2CQ DM12, and others worked the likes of JA7QVI and JG1TSG at distances in excess of 10,000 kilometers (6,000+ miles). On the 7th, KB8VAO in EN91 and others in the Midwest worked Japan for a new country and the band would open up again between Europe and Asia on June 11th, to the delight of many of our friends on the other side of the globe (see *Figure 6*).

A JT65 Explosion … with Growing Pains

The great start to the 2017 summer sporadic-E season was accompanied by what can be only called an explosive increase in the number of JT65 signals found on the Magic Band. Many may be familiar with this digital mode on the HF bands where it has proven to be very popular and effective for worldwide QRP[1] communications. Unlike the WSJT X MSK144 mode that has been discussed recently, JT65 is categorized as one of the "slow" modes in the WSJT X suite of protocols as it uses 1-minute timed sequences of alternating transmission and reception. Therefore, a minimal QSO takes four to six minutes — two or three transmissions by each station, one sending in odd UTC minutes and the other even. For more information about WSJT X JT65 details or the other modes/protocols, see the WSJT X user guide[2].

The 6-meter JT65 calling frequency is 50.276 MHz[3]. But unlike CW or SSB operation which is spread out generally between 50.080 MHz and 50.100 MHz for CW and from 50.125 MHz to above 50.200 MHz for domestic SSB and or CW QSOs[4], the vast majority of JT65 QSOs take place right on 50.276 MHz. As with the other WSJT X modes, JT65 requires that the transceiver is placed in USB mode. Most 6-meter transceivers are equipped with a 2.7-kHz bandwidth filter in this mode, which permits decoding of multiple signals with the program set to the recommended *Tx* frequency of 1,500 Hz and an *F tol* set at 1000 Hz. In and of itself, the ability for decode multiple signals within the passband is not necessarily a problem — quite the contrary. However, when the band is open and there is a plethora of signals, both DX (however you define DX) and locals, it can be a different matter.

Figure 7 is a screen capture of a JT65a program window and *Figure 8* is a screen capture of the Wide Graph. Notice that at both 1653z and 1655z, there are at least 10 signals present. Each vertical line represents the synch tone of a unique transmitting station. All 10 signals are within the receiver's USB bandpass.

The rapid increase in use of a new mode such as JT65 brings with it growing pains. There have been a number of problems experienced so far during the first month or so of the 2017 summer sporadic-E season. A few examples include:

• Calling the DX station on the wrong one-minute sequence and thus making it difficult, if not impossible, for others to decode the DX station;

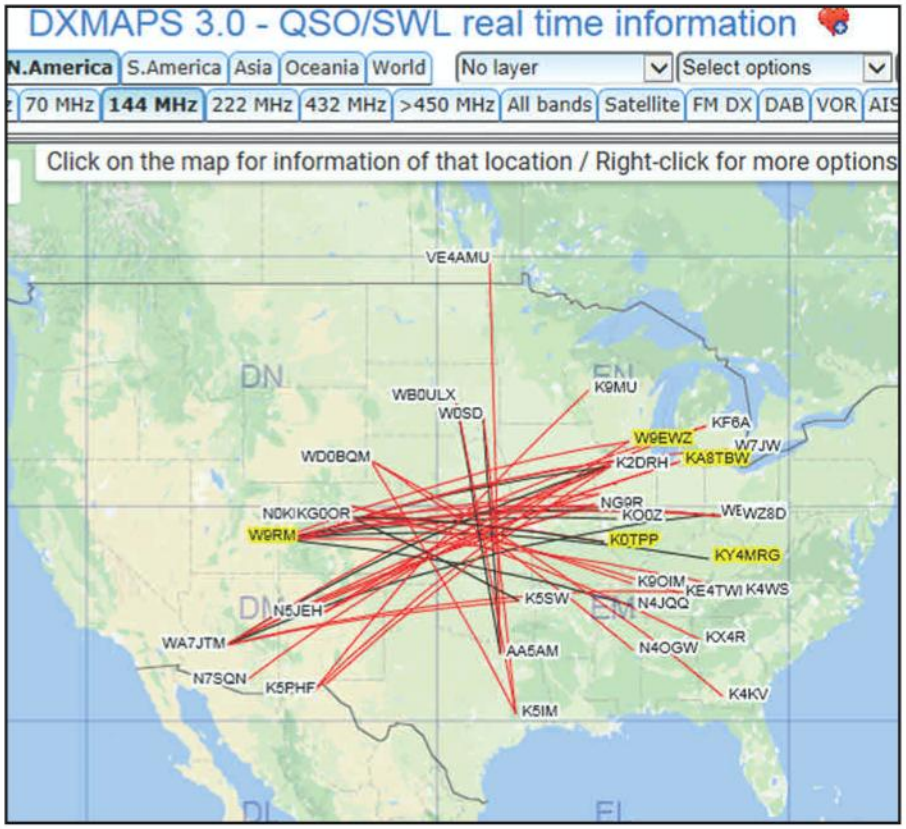


Figure 3. The same opening as in Figure 2 provided great 2-meter DX opportunities as well.

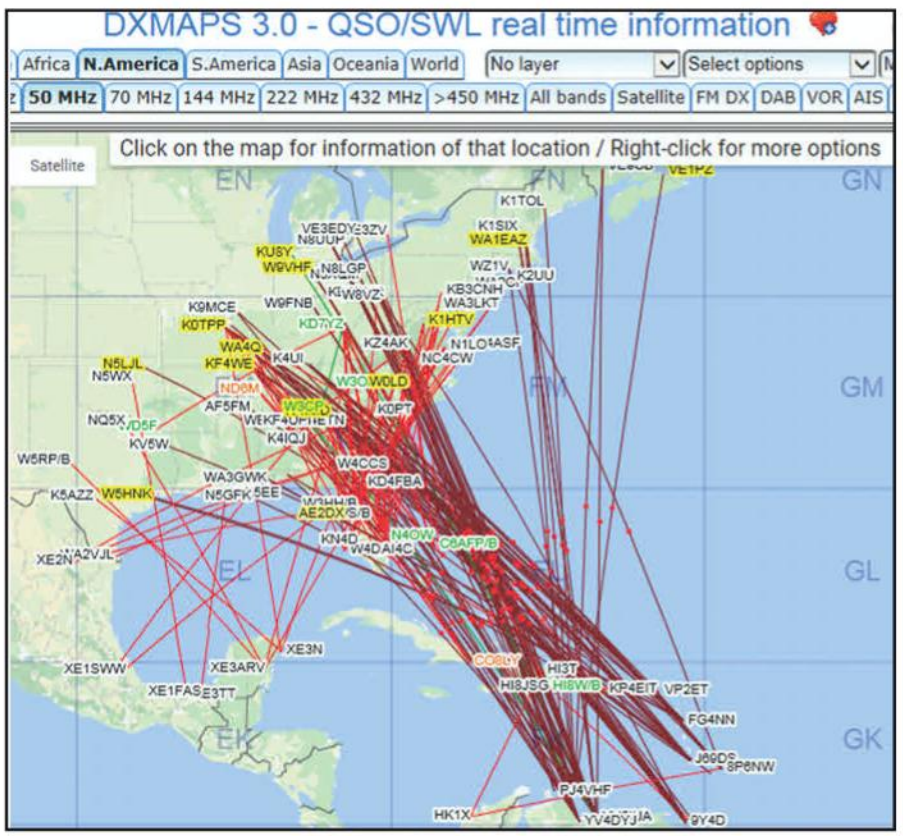


Figure 4. May 28 saw a 6-meter E_S opening from the eastern U.S. to the Caribbean and even South America.

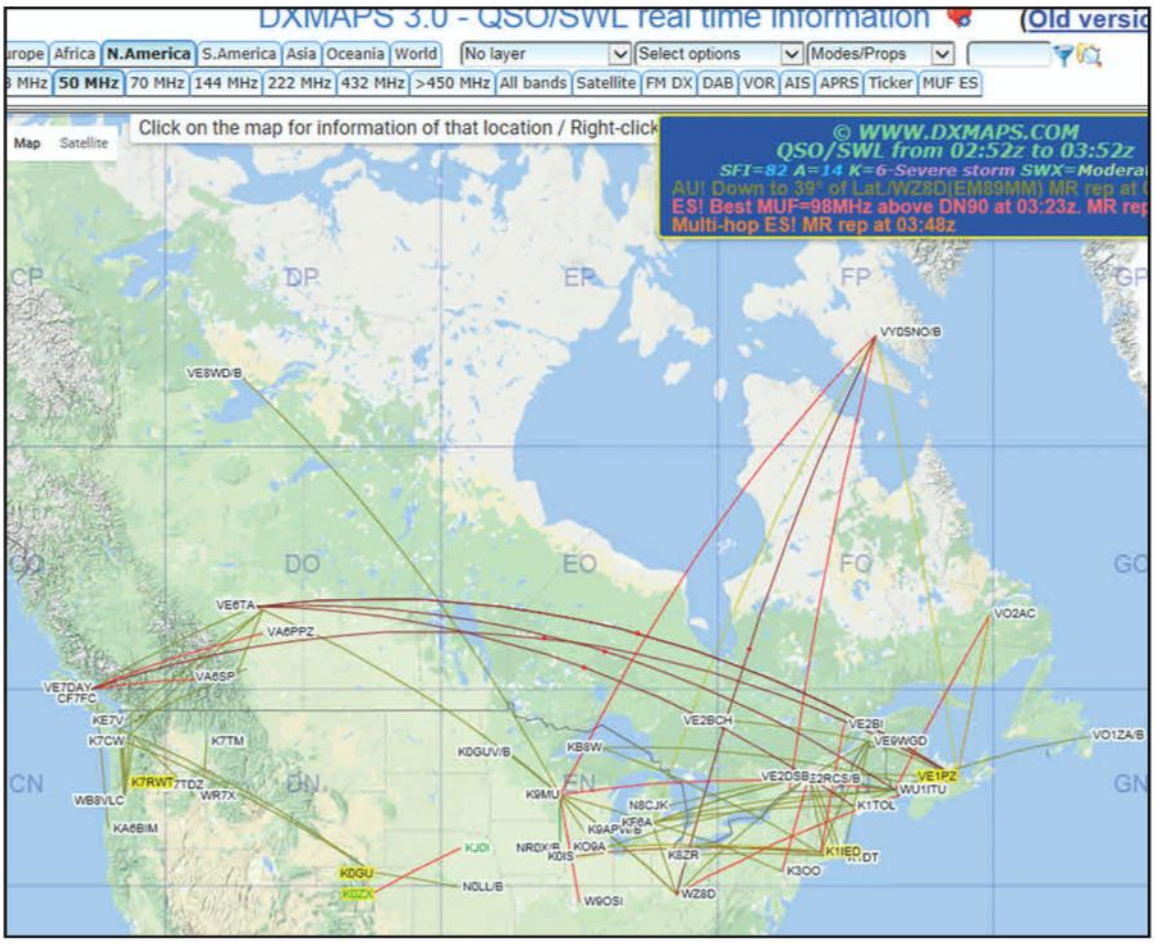


Figure 5. Six-meter ops also had an opportunity for widespread Aurora contacts on May 28.

• Sending the wrong message, causing confusion and increasing the time it takes to complete the QSO;
• Calling CQ seemingly endlessly when it is likely that rare DX is on the channel while failing to properly identify. Remember that FCC rules require an ID every 10 minutes[5].

There have been other problems observed and noted as well, including hum on audio or overdriving the transceiver, resulting in distorted audio and splatter. Then there is my favorite — audible music, newscasts, etc., transmitted unknowingly. As noted in the WSJT X User Guide, if the selected audio output device is also the computer's default audio device, turn off all system sounds; otherwise you, too, will be illegally broadcasting the news, music, or the .wav file that is played whenever you receive an email.

Questions for Discussion

In addition to how to best solve or minimize the problems encountered to date, there are a number of other open questions as well, including: Should 50.276 MHz be used for "cross town" QSOs? Is a DX window needed? Is some sort of general guide needed for transmitting sequences such as the practice used in meteor scatter where the westernmost station transmits the first sequence? Is 50.276 MHz the best choice of frequency for JT65 beacons? As an aside, students of propagation have taken notice of the potential impact JT65 beacons may have on our

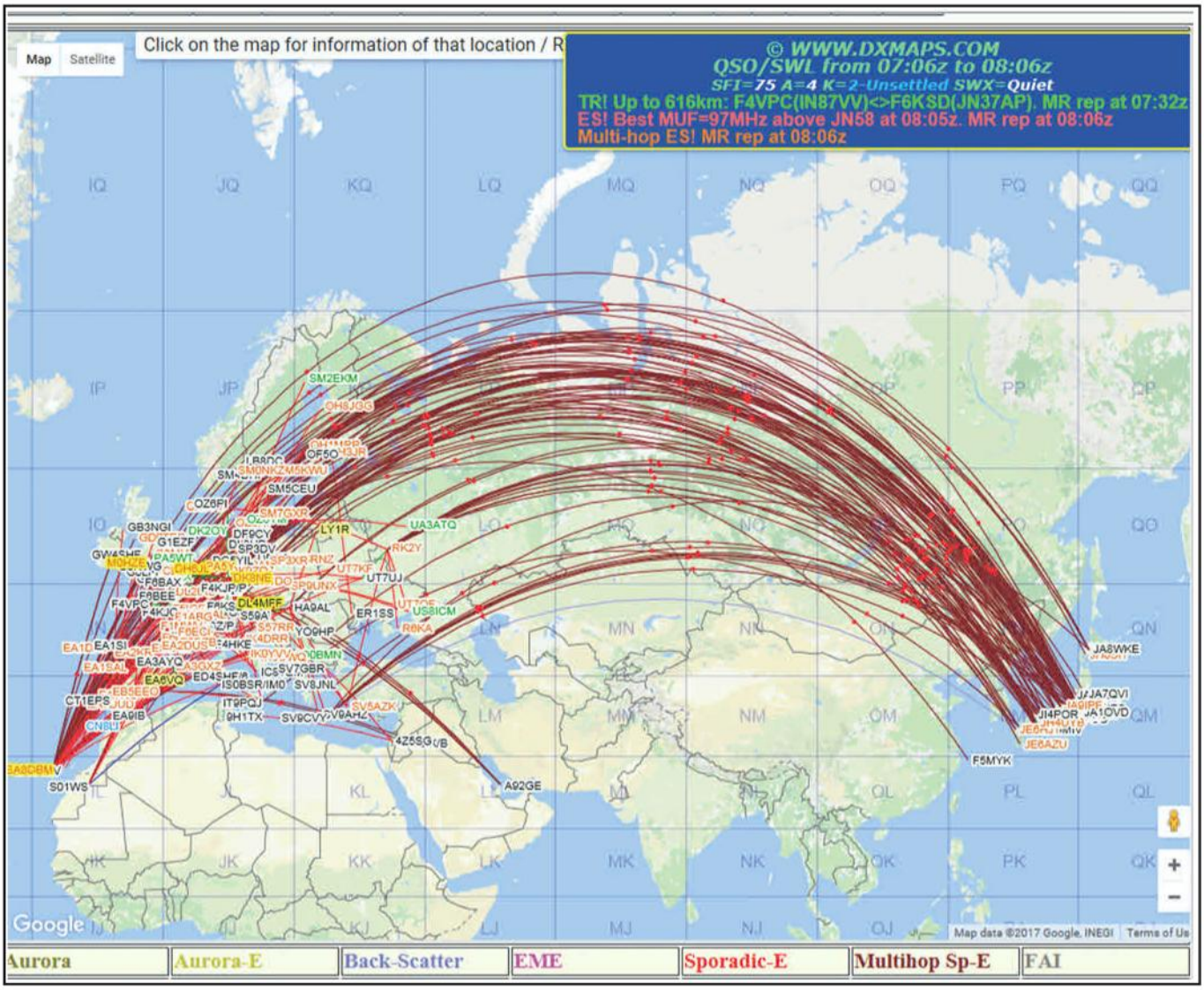


Figure 6. Band openings haven't been limited to the Americas. On June 11th, there was a widespread opening from Europe to Japan and other parts of Asia.

understanding of 50-MHz propagation in general, including communications paths thought to occur rarely, if at all.

Without a doubt JT65 has attracted many newcomers to the Magic Band. Clearly the mode has resulted in QSOs that would otherwise not have been possible. Because of JT65's weak-signal advantage over SSB and CW, many have been able to add to their Magic Band country total or work an elusive FFMA[6] grid. However, it is time to give serious consideration for some sort of band plan and further refinement of what will become the standard operating practices. It is doubtful that any significant changes will take place this sporadic-E season, but there is plenty of time to start the discussion, float trial balloons and formulate a plan that will serve us all in 2018 and beyond.

Speaking of band plans, the MSK144 digital meteor-scatter calling frequency has moved from 50.280 MHz to 50.260 MHz. Initially, 50.260 MHz was the calling frequency for the original digital meteor-scatter mode — FSK441. The variants considered "experimental" were tested on 50.280 MHz, including what would become MSK144, in order not to interfere with day-to-day meteor-scatter traffic. With MSK144 now the de facto meteor-scatter mode, it was decided to switch the MSK144 calling frequency to 50.260 MHz and use 50.280 MHz for testing other experimental digital modes.

The 6-Meter Barbecue

Changes are in store for this year's 6-meter BBQ as it will be co-hosted by DX Engineering and FlexRadio Systems. For many years, 6-meter enthusiasts from all over North America and elsewhere made their way to Austin, Texas to attend the annual event founded and hosted by Jimmy Treybig, W6JKV, and Dick Hanson, K5AND. As in the past, the two-day event will include presentations, demonstrations, social activities, and, of course, fine foods. The dates are September 29 and 30. More information will be posted in the News section of the DX Engineering website.

– 73 and CU on the bands, Tony K8ZR

Notes:

1. QRP is generally defined as 5 watts output or less.
2. <http://bit.ly/2s4Q6PG>
3. The calling frequency for the other JT65 sub-modes is also 50.276 MHz.

4. Please be mindful of the 50-MHz bandplan/gentlemen's agreement that reserves 50.100 MHz to 50.125 MHz for DX stations. In general, DX is defined as outside Canada and the Continental United States. CW is permitted anywhere in the band.

5. CW ID is customary and WSJT X can be set-up to automatically ID every 10 minutes as required by the FCC. Technically, identifying using SSB is legal as the operation is above 50.100 MHz, but would not be considered acceptable operating procedure.

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

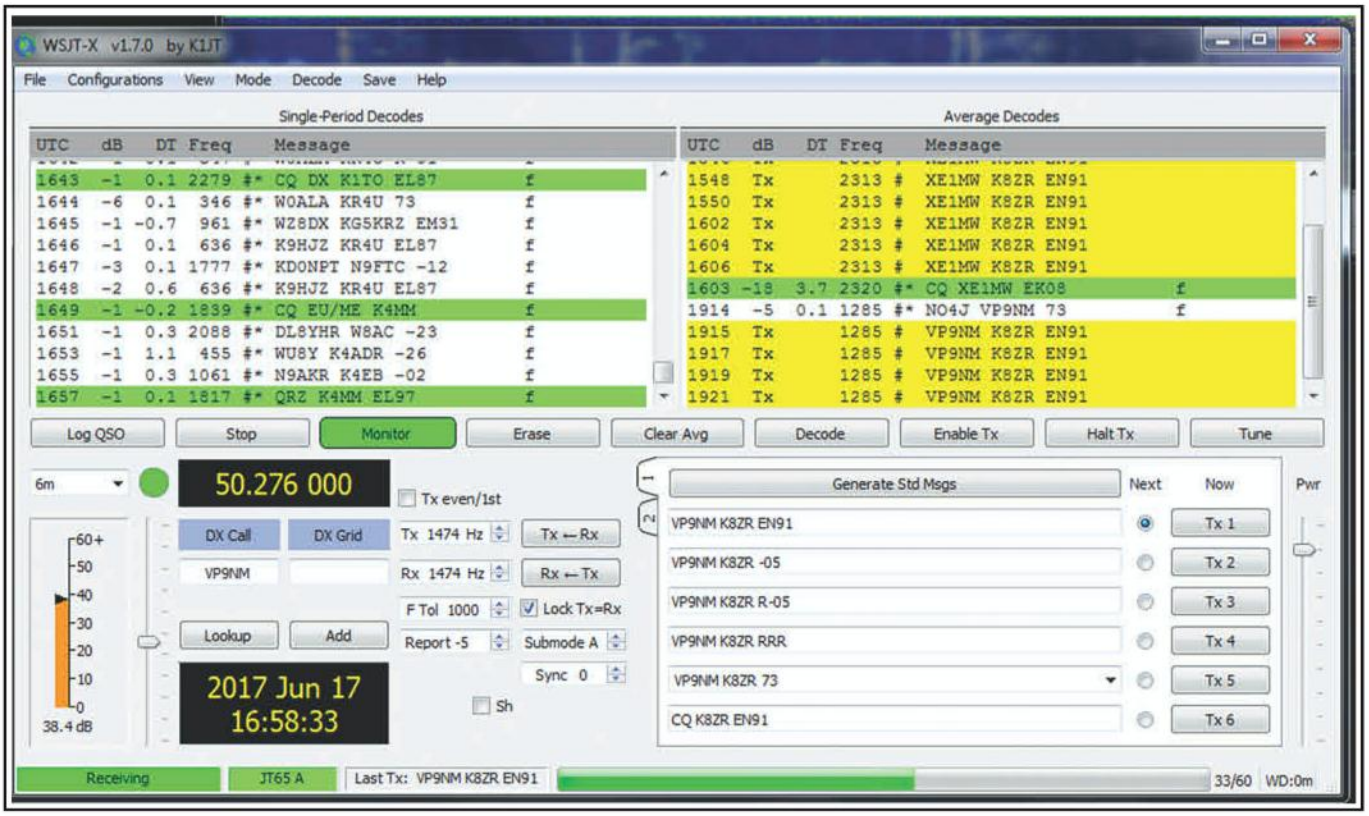


Figure 7. JT65 screen capture showing the explosive growth in use of the mode on VHF and UHF.

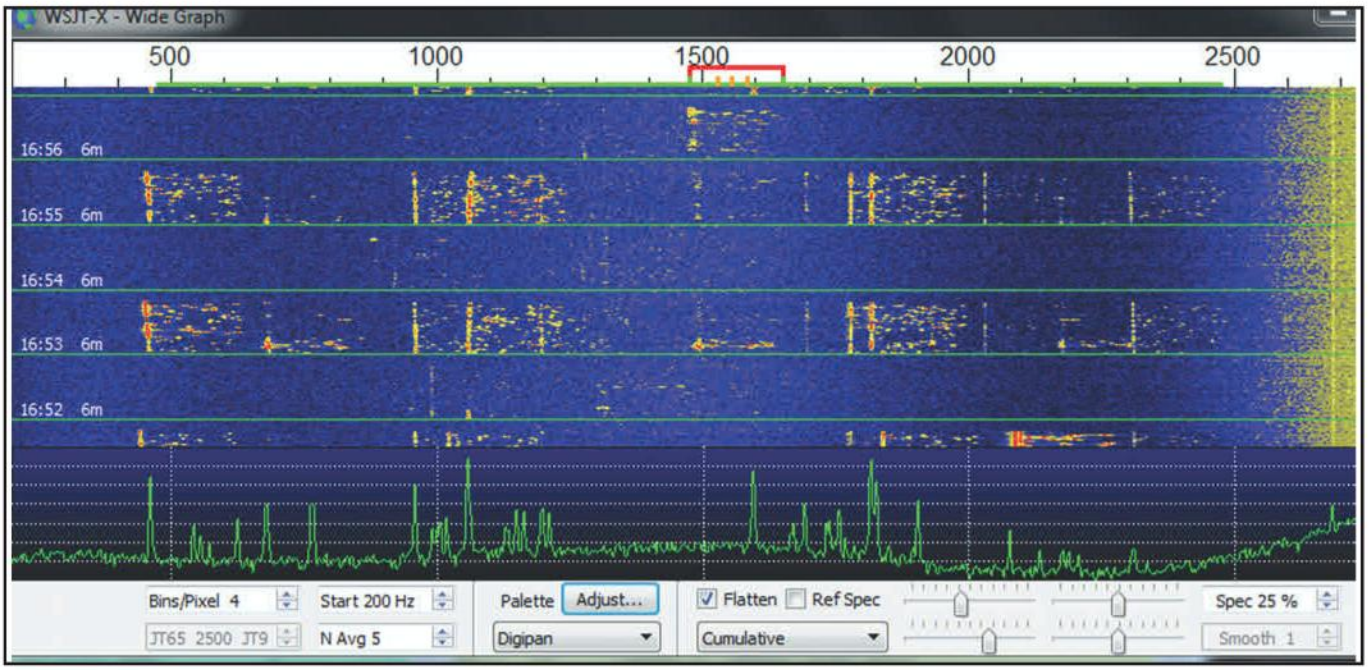


Figure 8. A wide view of JT65 signals on K8ZR's receiver. Note that at two points there are at least 10 signals on the air at the same time, on the same frequency.

BY DAVID SIDDALL,* K3ZJ

Late Summer Contests

Plus: WRTC2018 Qualification Period Ends and Participant and Referee Application Deadlines Set; N6TV and K1TTT are Inducted into CQ Contest Hall of Fame

In June, many amateurs — contesters and non-contesters alike — experienced worldwide openings on 6 meters. Some of these openings, however, were below the noise level for SSB and CW communications. Enter digital modes, and WSJT in particular. Operators in the continental United States reported receiving, and in some cases working, both Europe and Japan on 6 meters using digital. (*See this month's "VHF-Plus" column for more on these openings and the growing use of JT65 for VHF DX. – ed*)

These openings occurred tantalizingly close to the ARRL June VHF contest and generated genuine excitement across the contesting community. A number of veteran contesters (and others) have been observed asking how to get digital modes hooked up and working. I predict more digital activity in the future.

Below we look at the late summer contests. There are several VHF/UHF contests. The fall HF contest season kicks off with the JARL All-Asia DX Contest on Labor Day weekend (in the U.S., September 2-3), followed by the WAE phone weekend on September 9-10, and the Scandinavian Activity Contest (SAC) on September 16-17.

We also bring an update from the WRTC2018 organizers in Germany. The qualifying period has ended and operators desiring to compete in the WRTC must submit their applications by no later than August 15. The period for referee applications is open a little longer, until October 31. Meanwhile, fundraising for the event continues, with 80% of the goal having been realized as of the end of May.

Finally, at Dayton, I had the honor of inducting N6TV and K1TTT as the two newest members of

k3zj@cq-amateur-radio.com

Calendar of Events

All year	**CQ DX Marathon All Year**	**http://bit.ly/vEKMWD**
July 29-30	RSGB IOTA Contest	http://www.rsgbcc.org/hf/rules/2017/riota.shtml
Aug. 5	European HF Championship	http://bit.ly/H2eMg5
Aug. 5-6	10-10 Int'l Summer Contest SSB	http://www.ten-ten.org/
Aug. 5-6	North American CW QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 6	SARL HF Phone Contest	http://bit.ly/H0IqQf
Aug. 12-13	Worked All Europe CW Contest	http://bit.ly/JUUR1n
Aug. 12-13	Maryland-DC QSO Party	http://mdcqsoparty.w3vpr.org/
Aug. 19-20	ARRL 10 GHz and Up Contest	http://www.arrl.org/10-ghz-up
Aug. 19-20	SARTG RTTY Contest	http://bit.ly/JDCfaq
Aug. 19-20	North American SSB QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 20	ARRL Rookie Roundup RTTY	http://www.arrl.org/rookie-roundup
Aug. 20	NJQRP Skeeter Hunt	http://w2lj.blogspot.com/p/njqrp-skeeter-hunt.html
Aug. 20	SARL HF Digital Contest	http://bit.ly/H0IqQf
Aug. 26-28	Hawaii QSO Party	http://hawaiiqsoparty.org/
Aug. 26-27	Kansas QSO Party	http://www.ksqsoparty.org/
Aug. 26-27	Ohio QSO Party	http://www.ohqp.org/index.php/rules/
Aug. 26-27	SCC RTTY Championship	http://bit.ly/I6rx9O
Aug. 26-27	YO DX HF Contest	http://www.yodx.ro/en/english
Aug. 27	SARL HF CW Contest	http://bit.ly/H0IqQf
Sept. 2	AGCW Straight Key Party	http://bit.ly/1jKUszA
Sept. 2-3	All Asian SSB Contest	http://bit.ly/2pblU7P
Sept. 2-3	Colorado QSO Party	http://ppraa.org/coqp
Sept. 3	DARC 10 Meter Digital Contest	http://bit.ly/18gGDIM
Sept. 3-4	Tennessee QSO Party	https://tnqp.org/rules/
Sept. 4-5	MI QRP Labor Day CW Sprint	http://bit.ly/13fTkRo
Sept. 9	FOC QSO Party	http://www.g4foc.org/qsoparty
Sept. 9	OSPOTA Contest	http://www.ospota.org/ospota/index.php
Sept. 9-10	Worked All Europe SSB Contest	http://bit.ly/JUUR1n
Sept. 9-11	ARRL September VHF QSO Party	http://www.arrl.org/september-vhf
Sept. 10	North American CW Sprint	http://ncjweb.com/Sprint-Rules.pdf
Sept. 23-24	**CQWW RTTY DX Contest**	**http://www.cqwwrtty.com**

This information also appears monthly on the CQ website.

CQ's Contest Hall of Fame. Highlights of just some of their impressive achievements are below.

Summer VHF/UHF Contests

August kicks off with ARRL's new "222 MHz and Up Distance Contest." This contest replaces the ARRL's August UHF contest, which was discontinued after the 2015 event; and last year's independently-run "39th annual August UHF Contest" (see <http://augustuhf.com>).

The new contest features all new rules. It runs for a 24-hour period, from 1800 UTC on August 5 through 1800 UTC August 6. The objective is to work as many stations as possible on the 222 MHz and higher bands. Any mode is permitted. There are no single-band, limited-band, or power subcategories! Instead, categories are for single operator fixed; multi-operator fixed; and rover.

Scoring in this contest is unique. Points are calculated based upon the center-to-center distance (in kilometers) between the six-character sub-grid of each station (e.g., FN20vt) multiplied by the applicable band factor set out in the rules. The band factor varies from 1 for 432 MHz and 2 for 222 MHz to 20 for 24 GHz and up.

The geographic areas for competitive awards similarly are unique. There are 17 "contest regions" composed of defined U.S. states and Canadian provinces, plus one area for all other DX. The "contest regions" are defined in the rules. Note that logs are due no later than 1800 UTC on August 20, 14 days after the contest ends. Complete rules are at <http://bit.ly/2t4xCmY>.

There are two additional contests in the VHF or UHF range during the late summer. The annual ARRL September VHF contest has a loyal following. This year it will be held from 1800 UTC on September 9 through 0300 UTC on September 11. Notwithstanding its denomination as a "VHF" contest, all bands 50 MHz and above are used. For this contest, traditional four-character grid squares are employed as multipliers. Complete rules are at <http://www.arrl.org/september-vhf>.

The ARRL 10 GHz and Up contest is held in two sessions every year, on the third weekend in August and the third weekend in September. This year it will be held from 0600 local time on August 19 through 2400 local time on August 20. This repeats on the weekend of September 16-17. There is a 24-hour limit on operating time each session. The objective of the contest is for North American amateurs work as many amateur stations in as many different locations as possible in North America on bands from 10 GHz through Light. Amateurs are encouraged to operate from more than one location during this event! Rules are at <http://www.arrl.org/10-ghz-up>.

DX Entity	Prefix(es)
Svalbard and Bear Island	JW
Jan Mayen	JX
Norway	LA, LB, LG, LI, LJ, LN
Finland	OF, OG, OH, OI
Aland Islands	OFØ, OGØ, OHØ
Market Reef	OJØ
Greenland	OX, XP
Faroe Islands	OW, OY
Denmark	5P, 5Q, OU, OV, OZ
Sweden	7S, 8S, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM
Iceland	TF

Table 1. The above entities, followed by their prefixes, are all considered to be part of Scandinavia.

Geographic Area	Qualifying Operator
North America #1	K1LZ
	LZ4AX
	KE3X
North America #2	AD4Z, N4YDU
North America #3	W9RE
North America #4	N5AW
North America #5	K3PA
North America #6	N9AV
	K6XX
	K2PO
North America #7	VY2ZM
North America #8	VE7CC
North America #9	K9VV
Europe #1	LY9A
	ES5TV
	OH6KZP
	LY4L
Europe #2	F8DBF
	OR2F
	F4DXW
Europe #3	URØMC
	OM3BH
	OM2VL
	OK2ZI
	US2YW
Europe #4	EC2DX
	IZ3EYZ
	EA2OT
Europe #5	9A1UN
	E77DX
	S50A
Europe #6	RW7K
	UA2FB
	RW1A
Europe #7	DJ5MW
	DL1IAO
	DL2CC
Asia #1	R8CT
Asia #2	RC9O
Asia #3	5B4AGN
Asia #4	A65BP
Asia #5	E21EIC
Asia #6	JH4UYB
Oceania #1	N2NL (KH6)
Oceania #2	ZL3IO
South America #1	PY1NX
South America #2	CX6VM
Africa	5H3EE
+ Defending WRTC2014 champs:	N6MJ/KL9A
+ 5 Sponsored teams:	N6XI/AE6Y
	AA3B/W2GD
	K3LR/DL1QQ
	YO3JR/ ??
	E73A/403A
+ 3 (?) Youth teams	
+ 5 (?) Wild card teams	
TOTAL # of TEAMS:	63 maximum

Table 2. Above are listed the WRTC2018 geographic areas and the winners of team leader invitations for those areas. As noted in the text, additional applications are solicited from other qualified operators for a limited number of spots. There are an additional three spots reserved specifically for youth operators who will be under the age of 25 as of the July 2018 competition. All applications must be submitted by August 15.

Finally, VHF/UHF enthusiasts who use moonbounce can participate in the ARRL EME contest. This contest is to promote two-way communications via the earth-moon-earth path on any frequency above 50 MHz. Popularity is growing as digital modes permit the operators of modest stations to succeed in making contacts.

This contest takes place on THREE weekends for a full 48-hour period each weekend, but with one weekend dedicated to 2.3 GHz and above and the other two dedicated to 1296 MHz and lower. The contest periods run from 0000 UTC Saturday through 2359 UTC Sunday. This year, the dates and frequencies are: September 9-10, 2.3 GHz and up; October 7-8, 50-1296 MHz; and November 4-5, 50-1296 MHz. Rules are at <http://www.arrl.org/eme-contest>.

HF Contests Kick Off the Fall Contest Season

The Japan Amateur Radio League's (JARL) All-Asian (AA) DX Phone Contest will test the low-angle radiation capabilities of U.S. stations, especially those east of the Mississippi. The 2017 event utilizes 80-10 meters (no 160) and will take place for a full 48 hours, from 0000 UTC on September 2 through 2359 UTC on September 3.

The objective is for operators located outside of Asia to work those within Asia, and *vice versa*. Multipliers for non-Asian stations are the number of prefixes worked as defined by CQ's Prefix (WPX) rules. The exchange consists of signal report and one's age, with YLs and XYLs permitted to send "00" if they wish. There are no separate power categories for entrants from outside Asia. Categories consist of single-band and multi-band operations further defined by single or multiple operators. The complete rules are at <http://bit.ly/2pblU7P>.

The DARC's Worked All Europe (WAEDC) phone contest follows the next weekend, from 0000 UTC on September 9 through 2359 UTC on September 10. More details about this contest were discussed in last month's column in the context of the CW version. For the phone contest, competitors are reminded to follow the European Region 1 band plan and should *not* operate within the following frequency ranges: 3650-3700; 7050-7060; 7100-7130; 14100-14125; 14300-14350 kHz. Complete rules are at <http://bit.ly/2t4kyy4>.

Finally, the annual CW section of the Scandinavian Activity Contest (SAC), nicknamed "The Polar Battle," occupies its usual slot on the third weekend of September. It runs from 1200 UTC on September 16 through 1159 UTC on September 17 on 80-10 meters.

The aim of the SAC is to promote amateur radio activity by encouraging QSOs between Scandinavian and non-Scandinavian operators. The SAC sponsors e-publish a very complete 75-page results booklet in color. The booklet can be viewed and downloaded from <http://bit.ly/2s0ObQU>. Complete rules are at <http://bit.ly/2cb3WwW>.

Note that Scandinavian stations are more than just those in Finland, Sweden, Norway, and Denmark! See *Table 1* for a complete listing of entities and prefixes considered to be "Scandinavia."

World Radiosport Team Championship 2018 (WRTC2018)

Two years of fierce worldwide competition for operating slots at WRTC2018 in Germany were completed with the close of last November's CQWW DX CW contest. There were 32+ qualifying events over the 2-year period, of which a competitor's top 12 scores were counted. All told, the WRTC qualifying events included 30,814 different operators who submitted 141,787 scores.

A total of 49 competitors emerged at the top of 27 distinct geographic areas and now can claim team leader slots. Each competitor chosen as a team leader will select another competitor to operate with them in next year's IARU HF contest. The actual competition will be from identical stations located in tents on the fields surrounding the Wittenberg/Jessen area of Germany. The 2-person teams will operate multi-2 style under the watchful eye of a referee using rules specific to the WRTC.

Table 2 lists the 27 geographic competitive areas and the 49 operators who came out on top. The five sponsored teams also are included in the chart. The top 49 operators and all others interested in leading a team must select a teammate and submit an application to the WRTC organizers. Applications are available from <http://bit.ly/2s1hiUt>.

The strict deadline to submit the application is August 15.

The same application should be submitted by the deadline by all other competitors wishing to be considered for remaining slots, especially runners-up in each geographic area. If an area winner cannot attend for any reason, the next-high-

Photo A. From left to right are Ragnar, DL7URH; Mario, DG6IMR, and Andreas, DL8UAT, demonstrating the typical WRTC2018 operating set-up during the competition. Two competitors will operate in multi-2 format with a referee in the back between them monitoring both audio streams. This picture was taken during the 2016 site tests near Jessen, Germany. (Photo by DL6MHW)

est scoring operator will be considered for selection, *but only if* that operator submitted an application. There also are five "wild card" team leaders to be selected, as well as three "youth team" leaders (below age 25 in July 2018). All candidates for these slots must submit the team leader application by the August 15 deadline.

The window also is open for applications to be a referee. Referees must be experienced with both CW and SSB contesting, able to copy CW solidly at a minimum speed of 36 wpm, and have experience with SO2R operating since the referee monitors both operators simultaneously. I also suggest that an applicant have the physical stamina and mental capability to sit in a hot tent for 24 continuous hours listening to two concurrent high-speed CW or CW/SSB audio streams! See *Photo A* for what will be a typical WRTC2018 operating team set-up in Germany. This picture was snapped by Michael, DL6MHW, during on-site field tests in 2016. Referee applications are available at <http://bit.ly/2t0t9RQ>. The strict deadline to submit the application is October 31, and selectees are scheduled to be announced on December 1.

Fundraising for WRTC2018 is on target, with an estimated 80% of the budget raised as of May. It is worth noting that some tent sponsorships for WRTC remain available. These are a great way for clubs and groups to participate or to honor a Silent Key. Information is here: <http://bit.ly/2s10rkC> or contact Michael, DL6MHW, at <fundraising@wrtc2018.de>.

Two Honored by Induction into the CQ Contest Hall of Fame

As noted in last month's *CQ,* in May, Bob Wilson, N6TV, and Dave Robbins, K1TTT, were honored by being inducted into the CQ Contest Hall of Fame at the Contest Dinner in Dayton.

Each year since 1986, the CQ Contest Hall of Fame has recognized those in radiosport who go above and beyond in their contributions to contesting. Selectees for this honor have to earn the respect of their fellow contesters and give back to the sport.

Bob Wilson, N6TV (*Photo B*), is an enthusiastic advocate of new techniques and new technologies in ham radio, as well as a talented photographer and presenter. As a contester, Bob has numerous "top ten" wins, both individually and as a valued member of multiple contest DXpeditions. He also has competed in three WRTCs.

Bob has been a consistent presence and helper in developing SO2R operating techniques, SDR receivers, the CW skimmer, the Reverse Beacon Network, and Win-test logging. He has presented at Contest University in Dayton, Contest Academy at Visalia, and at other ham meetings and online sessions. He also has taken thousands of photographs at ham events that he shares widely.

Dave Robbins, K1TTT (*Photo C*), is an enthusiastic station-builder who for many years has mentored new operators and welcomed hundreds of hams from around the world to visit and operate his multi-multi capable station. Many weekends every year, his station is on the air in various competitions, large and small, often under the callsign of one of the visiting operators.

Dave has served as president of the Yankee Clipper Contest Club (YCCC) and made many educational presentations on various contest topics. He has helped countless new amateurs assemble their first stations and old timers with antennas and station repairs. He shares his station building experiences and expertise with the amateur community at large by means of his 700+ page downloadable book, *Building a Super Station – 30th Anniversary*. It is available free of charge at <www.lulu.com/spotlight/k1ttt>.

Nominations for the CQ Contest Hall of Fame are open at the beginning of every year. Look for the announcement in the December *CQ* magazine and on social media and consider nominating someone who you view as an outstanding contester in 2018. There always are more nominations of worthy competitors than the allotted two slots every year, and nominators are invited to resubmit nominees if their candidate was not selected in a past year.

– *Until next month, 73, Dave, K3ZJ*

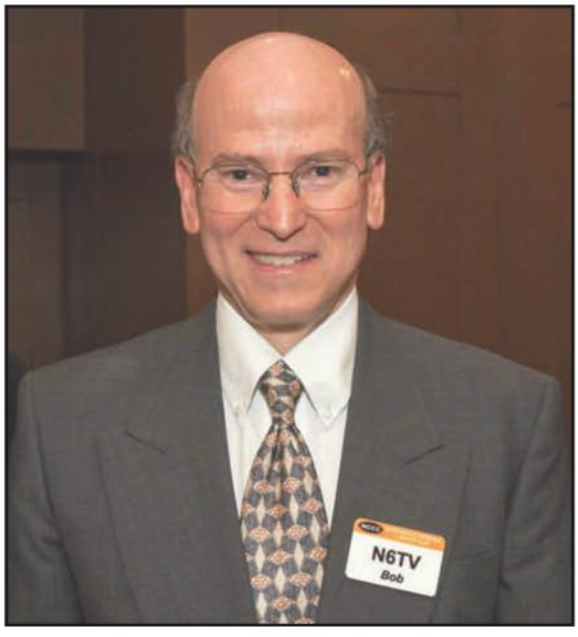


Photo B. Bob Wilson, N6TV. Bob was inducted into the CQ Contest Hall of Fame at the Dayton Contest Dinner in May.

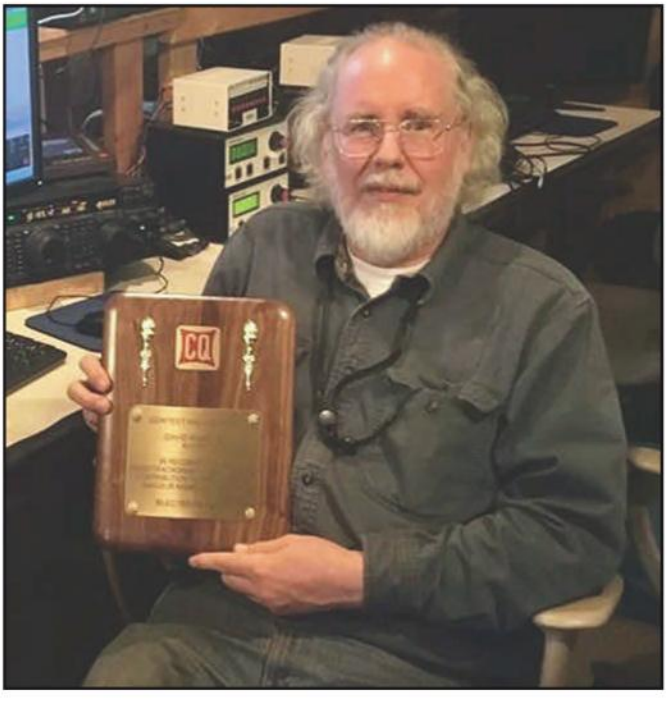


Photo C. Dave Robbins, K1TTT, was inducted into the CQ Contest Hall of Fame at the Dayton Contest Dinner in May. Here, Dave is shown with the plaque at his station.

awards

BY TED MELINOSKY,* K1BV

Amber, Museums and More...

During the year, I collect information on newly discovered awards in three categories. There are the very short-time anniversary or special event awards that might run from a week to about half a year. The second category is when you have over six months to a year to earn the award. Finally, there are "permanent" awards that have no expiration date.

The first two categories are best handled on the internet, as magazine publishing timetables preclude quick listing. The permanent award category is best handled by a magazine, and here are some of the best ones uncovered in the first half of 2017.

Ukraine: Burshtinovy Edge (Amber region)

Amber is fossilized tree resin, valued for its color and natural beauty. As a gemstone, amber is made into decorative objects of all kinds including jewelry. As an ingredient, it's used in perfumes, as well as a healing agent. One source of amber is the alluvial deposits in the Rivne region of Ukraine and adjacent areas of western Poland. This award is sponsored by the Rivne regional branch of the League of Ukrainian Radio Amateurs.

Requirements: Make a minimum of ten (10) two-way QSOs (or SWL monitoring) with different amateur radio stations located in the Rivne region (How to find stations located in Rivne: The first letter of their suffix will typically be "K." Example: UB4KAA, UX6KU, UT4KT). Repeated contacts OK for the award as long as they are carried out on different bands and different modes. (CW, phone, digital).

Contacts for the award must be made January 1, 2015 or later. The diploma is now issued in digital format and distributed for free.

The application for the award (in the form of a log extract) can be supplied in any computer text format. Be sure to include the name and surname of the applicant, callsign, and email or postal address. The application should be sent to the diploma manager: Tkachuk Vladimir, UT5KW, by regular mail to: Tkachuk VV, Mira St, House 40, Zdolbuniv, Rivne region, Ukraine, 35701, UKRAINE.

Email: ut5ktt@yandex.ru

Internet: www.qrz.ru/awards/detail/461.html

*12 Wells Woods Rd., Columbia, CT 06237
E-Mail: <k1bv12@charter.net>

The Rivne region of Ukraine is rich in amber, which lends its color to the Burshtinovi Edge award.

Italy: Diploma of Italian Museums

The award is designed to be a permanent diploma organized by the Conero Radio Team and AIRS Section Valli di Lanzo. The IMA Diploma was established in order to publicize Italian museums and enhance the cultural, historical, and architectural values that come from museums. Each museum has a collection, public or private, of objects relative to one or more fields of culture, science, and technology. Italian law defines a museum as "a permanent structure that acquires, catalogs, preserves, orders, and exposes cultural heritage for educational purposes and study."

The types of museums vary from those of larger size, often located in large cities, to those of smaller size. Types of museums include: anthropology. applied arts, botanical and zoological gardens, figurative arts, handicraft, history, military history, natural history, numismatics, philately, science and technology. Within these types, many museums specialize further, as for example: Modern art museums, local history, history of aviation, agriculture and geology.

Basically, the activator will set up a station to be located on or close to the museum and announce his/her presence at a museum site with a letter/number combination such as: MA-0148. The prefix will always be "MA" (Museum Award) and a four-digit code assigned to that location. They will give their data to the award sponsor who will add your QSO.

Award Rules:

1. The rules for stations that activate the museums are not included in this list of rules for "chasers." Activators should refer to website.

The Italian Logo Diploma Musei award celebrates Italy's museums that house its rich history of arts and culture.

2. Frequencies used: 80 to 10 meters
3. The following emission modes are valid: CW, SSB, RTTY, and PSK
4. The official list of museum references is published on the site: <http://bit.ly/2t2Rjfo>
5. QSL confirming the QSO is optional.
6. SWLs are eligible for the award under a separate classification.
7. The diplomas are free and are sent via email in digital format, ready to be printed directly from the applicant with a common printer. Printed paper diplomas are not supported.
8. The award is issued in levels as follows:
a. Italian hunter applicants must contact at least 20 different museum activators, with additional levels at 50, 100, 150, 200, and higher.
b. For other European applicants, minimum number of contacts is 10
c. **Applicants from all other countries need at least 5 museum references.**
9. A mailing list dedicated to this subject is available from the sponsor.

Email: musei@crt.red
Internet: http://bit.ly/2tMX91J

Poland: Warszawa Award

The Warszawa Award is sponsored by SP5KCR Club for the Defense League Communications and is available for all licensed amateurs and SWLs who conduct QSO/SWLs with amateur stations in the City of Warsaw on or after February 24, 1921. All bands and modes OK.

DX stations need three QSOs with stations from Warsaw. European stations outside Poland need 5 QSOs; SP Stations need 10.

A great opportunity to work multiple stations from Warsaw is to participate in the SPDX-Contest organized every year on the first full weekend of April.

Award fee is:
• for Polish stations: 10 zloty.
• for all others, 5 , $7 U.S. or 5 IRCs. You can make a deposit to the account of the WOT PZK VOLKSWAGEN BANK direct account no. 91 2130 0004 2001 0477 5524 0001 or by bank transfer to a PayPal account link below.

Application is required and may be downloaded from: <http://bit.ly/2t39KQB>

Apply using one of the following addresses:

SQ5WWK Warsaw Branch PZK, P.O. Box 3, 00-955 Warsaw, Poland 15, Poland.

SQ5WWK Wodzimierz Karczewski, P.O. Box. 9, 02-788 Warsaw 126, POLAND.

Internet: <http://bit.ly/2sJHbW0>

The Polish Warsawa Award certificate features architectural and historical sites throughout Warsaw.

Indonesia: Prefixes of Indonesia Award

The Prefixes of Indonesia Award (PX - INDONESIA) is issued to Radio Amateurs/SWL worldwide who can prove to have made 2-way HF amateur radio radio contacts (SWL OK) with stations in Indonesia on or after August 17, 1945 (Indonesian Independence Day).

Definition:

1. To identify a prefix, the same rules as used for the CQ WPX award apply.

For example, YB1, YB2, YC1, YC2, YD1, YD2, YE1, YE2, YF1, YF2, YG1, YG2 etc. are all different prefixes.

2. Special event callsigns such as YB2ØØT, YB71RI, 8A3B, 7AØK are also valid.
3. Domestic and foreign operators operating portable such as YB8RW/3 or YB8/DL3KZA are also valid.
4. Applicants must have made all of the QSOs /HRDs from same DXCC entity.
5. Contacts in "Free Band" or other non-amateur bands are not valid.

Award Levels:

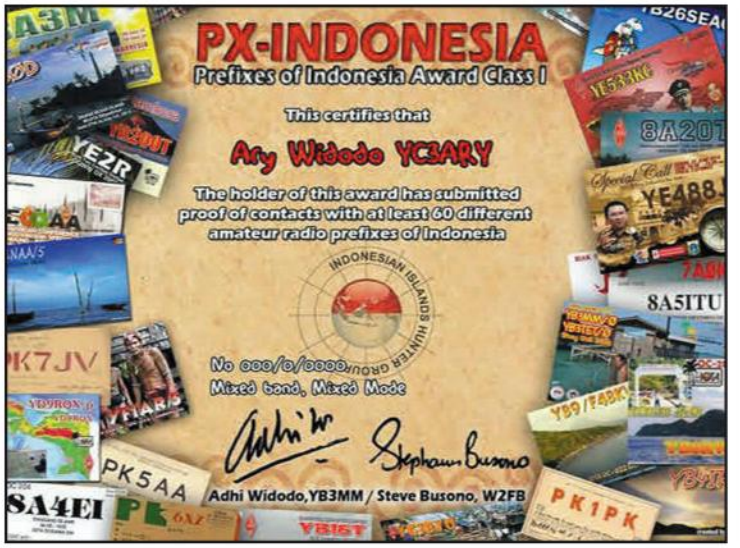
1. The PX-INDONESIA award is issued in three different classes according to the number of prefixes worked/heard:
a. Class 3: For having worked/heard at least 20 different prefixes
b. Class 2: For having worked/heard at least 40 different prefixes
c. Class 1: For having worked/heard at least 60 different prefixes
2. Endorsements may be requested for mode (mixed, CW, phone, digital) and bands (mixed and any single band). If not requested, the award will be issued in mixed modes and mixed bands.

Issuance of Award:

PX-INDONESIA is issued as a digital image in the PDF or JPEG format. (Please contact award manager by email if you are requesting a pre-printed paper award).

Procedures and QSO Crediting:

1. QSL cards are not required, but they must be in pos-



Work as many Indonesian prefixes as you can to earn this colorful certificate.

session of the applicant and must be produced upon the request of the award manager for inspection (by scanning the card and sending it via email).

2. The award claim must be accompanied by a QSL card list (GCR) furnished with the callsigns of stations worked, dates, times, bands, and modes. Alternatively, a list of stations worked with a copy of the QSL cards can be used. Applicants may attach the list of QSOs and scans of the QSL cards.

3. Electronic confirmation can be used: eQSL, LoTW, Clublog, and other.

Application

Depending on your location, the application should be sent via email or Postal Service to award managers as follows:

1. For DX: Stephan Busono W2FB, 3 Margaret Drive, Somerset, NJ 08873
Email: sbusono@gmail.com

2. For DX and Indonesia: Adhi Widodo YB3MM
Email: yb3mm@mdxc.org

3. For applicants without computer or internet connection, please send to Award Manager through air mail: Adhi Widodo, YB3MM, P.O. Box 23, Malang 65101 Indonesia

Cost

The PX-INDONESIA award is free, and is issued as PDF or JPEG file. (Please contact award manager by email if you are requesting a pre-printed award, and not a digital award.) The manager will tell you what the actual printing and postal charges will be.

Email: w2fb@njdxa.org
Internet: www.nusantaraaward.com

We're always looking for tips on new and interesting awards. If you run into any, please use my email address as shown in *CQ* Magazine, or my personal address which is <k1bv12@charter.net>.

what's new

Ameritron Updates ALS-600 to ALS-606

Ameritron, a wholly-owned subsidiary of MFJ Enterprises, has updated its solid-state ALS-600 amplifier to include the 6-meter band and automatic band switching directly from your transceiver.

The ALS-606 and ALS-606S cover the 160- to 6-meter bands and have an output of 600 watts/500 watts for CW, using solid-state technology. The 606S includes a switching power supply which weighs only 10 pounds, while the 606 includes a transformer power supply, which weighs in at 32 pounds. The amp itself weighs just over 14 pounds.

Ameritron says that the 600-watt amplifier's output is only 4 dB below the full legal limit of 1,500 watts. The solid-state amplifier has no tubes so there is no need to wait for the amplifier to warm up and with automatic band switching, users can select the band on their transceiver and begin operating.

The ALS-606 and 606S fit on your desktop with dimensions measuring 9-3/4-inches wide x 7-inches high x 14-1/2-inches deep.

MFJ says the 606 is very quiet, and that additional features include SWR/thermal protection, lighted peak reading cross-needle SWR/wattmeter, front-panel ALC control, operate/standby switch, and a multimeter.

Ameritron says the ALS-606/606S are available now with a suggested retail price of $2,275 for 606S and $2,375 for the 606. For more information, visit Ameritron's website: <www.ameritron.com>.

BY BOB SCHENCK, N2OO

Ham Radio Adventures on Palmyra Atoll

From time to time I turn over the keyboard to a guest columnist. This month, we have a wonderful story about one of the more unique entities on the DXCC and CQ DX lists, Palmyra Island. It is written by Jesse Johnson. Although Jesse does not have a ham license, he does have a keen knowledge about Palmyra. He is the curator of "The Palmyra Digital Archive" <http://palmyra archive.org> and has an entire portion devoted to ham radio DXpeditions going a long way back. Some of what he has written here is taken from his website postings. –N2OO

I came across the Palmyra Atoll 10 years ago while doing research for a novel. I was struck by how little collected information existed on the place, despite its being mentioned in so many places. A visit to the National Archives at San Francisco shortly afterward, to research declassified naval documents about Palmyra, began a casual, decades-long, slow and steady personal research project on everything related to Palmyra.

By that time, I had acquired dozens of newspaper articles and book excerpts, hundreds of photographs and several interviews with folks who had visited the atoll over the years. Still, to my surprise, there was no single collection focused on material for Palmyra, so I decided it was time someone created one, and the Palmyra Atoll Digital Archive was born. Since then, we've acquired quite a bit more material, some of it donated specifically to the archive for preservation, and our collection continues to grow!

*Email: <n2oo@comcast.net>

Ham Operators on the Palmyra Atoll

From as far back as 1916, radio operators have carried equipment to some of the most dangerous, exotic, and hard-to-reach parts of the planet. From Antarctica to the Arctic Circle, and everywhere in between, thousands of unique QSL cards carry the names and stories of those hams who dared travel wherever they could to make contact with their fellow amateurs.

The first documented trip to the Palmyra Atoll was in 1944, and since then, it has been visited by over 25 DXpeditions and counting. For those not familiar with Palmyra (*Photo A*), this lonely group of 52 small islets sits 1,000 miles southwest of Hawaii (though it is technically a suburb of Honolulu and in the same zip code). First found by westerners in 1798, it spent the first 200 years of its discovered history being visited by explorers, scientists, pirates, and every brand of sailor. The first man to

Photo A. Aerial view of Palmyra Atoll. (Photos and maps courtesy Palmyra Digital Archive <http://palmyraarchive.org/>, except as noted)

collectively own all of Palmyra was Judge Henry E. Cooper, in 1912. He would sell all but two of the islands to the Fullard-Leo family in 1922. Home Island, one of those islets, is today the property of Cooper's great-grandson, Richard Crouch, himself a ham radio operator.

During World War II, Palmyra was occupied by the U.S. Navy and used as a refueling station. Its physical shape was significantly altered, including the dredging of a channel through its impassible outer coral reefs and a series of roads built to connect many of the smaller islands. The two maps in *Figure 1* show just how different Palmyra looked after the war than before.

In 2000, all but two of Palmyra's islets were sold to the Nature Conservancy, and the islands now serve as one of the world's most unique locations for studying oceans, coral reefs, and the creatures that call them home. I've been

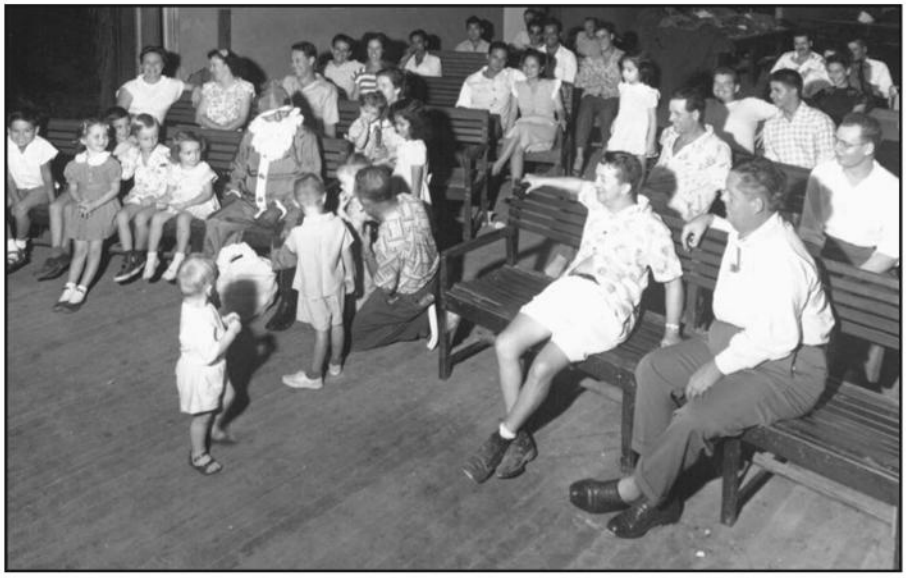


Photo B. After World War II, the only inhabitants of Palmyra were employees of the U.S. Civil Aeronautics Administration (CAA) and their families. The CAA is the forerunner of today's Federal Aviation Administration.

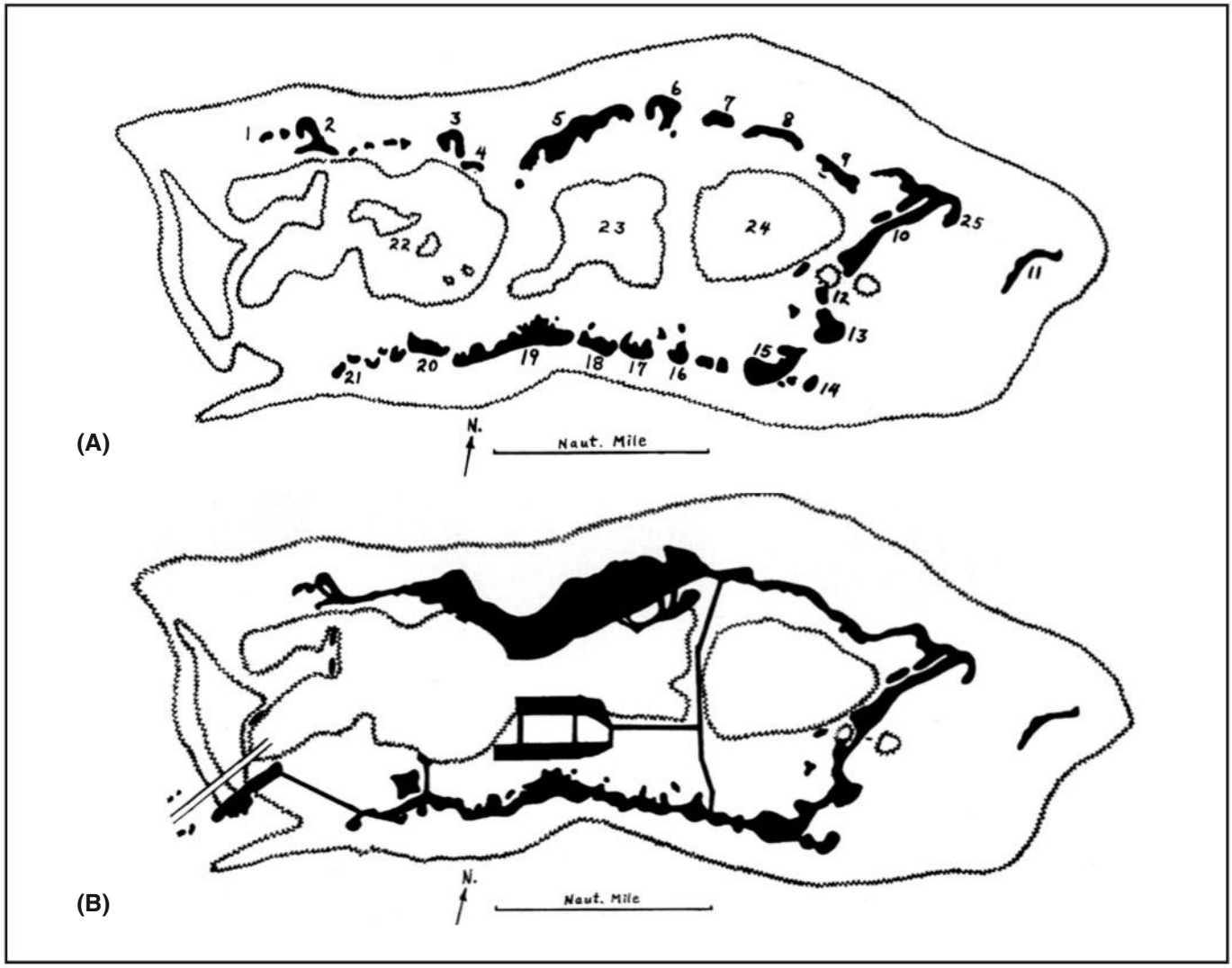


Figure 1a. Map of Palmyra Atoll in 1940, prior to World War II. Note the two dozen separate islets in the map. Figure 1b shows the atoll in 1945, after the U.S. Navy turned it into a refueling station.

honored to have the opportunity to research and record how hams have shaped Palmyra, and their time spent on the atoll. Below are just a few of the many tales I've come across.

A Life Saved from 6,000 Miles Away

During the years following World War II, Palmyra was still owned by the U.S. Navy, having been taken from its private owners in the early 1940s for military use. The owners, however, sued the government in 1945 to have ownership transferred back to them since the war was over (a case they would win by 1948). In July 1947, the atoll was primarily used as a stopover for fuel-thirsty American aircraft on their way back and forth across the Pacific, its only inhabitants a small village of CAA (Civil Aeronautics Administration)[1] employees and their families (*Photo B*).

One quiet evening, without warning, a military C46 cargo plane crashed on the reefs around Palmyra. Miraculously, there were no deaths, and only one crew member was injured, though his injuries were quite severe. Quoting from an article describing the incident, the injured soldier is reported as saying:

"I don't have any hand." Crawling from the shattered, burning plane into knee deep water, he stumbled twice and thought he was stepping into a hole; "then I found my leg was gone."

Had Palmyra been uninhabited, or had the weather been bad, this would have surely been a death sentence. Thankfully, his fellow crew members carried him nearly 100 yards to shore through the surf, and the staff stationed on the island got to work patching him up, though their experience and materials were limited. One of them, a registered nurse, sent out a call over the radio asking for help. A rescue plane was quickly dispatched from Honolulu but it would be hours before they could reach the isolated atoll.

Luckily for the injured airman, an amateur operator in New Jersey, 6,000 miles away (*Photo C*), heard the call and got a local doctor on the line to assist the nurse in bandaging and treating his wounds. When the rescue plane arrived, the crew found the man still

The WPX Program

CW

3813 . . . . . N4MM	3815 . . . . . R5AK
3814 . . . . . SV1RUX	3816 . . . . . 9H1AE

SSB

4027 . . . . . K6DLB	4034 . . . . . F4GVE
4028 . . . . . AF7EL	4035 . . . . . HI8RD
4029 . . . . . WA4JA	4036 . . . . . KX5U
4030 . . . . . N4MM	4037 . . . . . M$$TWB
4031 . . . . . KE4PLT	4038 . . . . . 9H1AE
4032 . . . . . 5T2AI	4039 . . . . . NS4F
4033 . . . . . AD2EE	4040 . . . . . K4SAW

Mixed

3412 . . . . . AF7EL	3421 . . . . . R2ZX
3413 . . . . . N4MM	3422 . . . . . 9H1AE
3414 . . . . . JI4WAO	3423 . . . . . NS4F
3415 . . . . . LZ1QN	3424 . . . . . W7AII
3416 . . . . . W5TZX	3425 . . . . . KB2FMH
3417 . . . . . K9SOL	3426 . . . . . MØTWB
3418 . . . . . K9KJ	3427 . . . . . K4SAW
3419 . . . . . HI8RD	3428 . . . . . RK3ARQ
3420 . . . . . KX5U	

Digital

622 . . . . . JI4WAO	627 . . . . . NØRQV
623 . . . . . N7XCZ	628 . . . . . R2ZX
624 . . . . . KN6Q	629 . . . . . AK7DB
625 . . . . . W7AII	630 . . . . . 9H1AE
626 . . . . . ADØQI	631 . . . . . NO1R

CW: 400: OH1LAR. **450:** K6UIP, K9KJ. **500:** K1TA. **550:** SV2BXA. **600:** SV2BXA. **800:** W3QT. **1250:** AG4W. **1600:** N4MM. **2550:** MDØCCE. **3650:** NN1N. **4000:** I3FIY.

SSB: 350: AF7EL, AD2EE, MØTWB, PY2ALC. **400:** K6UIP, MØTWB. K4SAW. **450:** KB2FMH. **500:** N7XCZ, N1TCH, 9H1AE. **550:** NØAZZ, NS4F. **700:** SV2BXA. **750:** WA4JA, HI8RD. **800:** AE4VJ, K8KHZ. **950:** 5T2AI. **1100:** N6PEQ. **1350:** MDØCCE. **1850:** N4MM. **2400:** AG4W. **3550:** NN1N. **3600:** SV3AQR.

Mixed: 450: K9KJ, KB2FMH, K4SAW. **550:** R2ZX. **600:** EB8AIU, JQ1CIV. **650:** K1TA, AB2DP, NS4F. **700:** K6UIP, N6DBF, OH1LAR. **750:** N7XCZ, KC9UNL, HI8RD, JF2OHQ. **800:** CT7ANG. **850:** K8KHZ, N1TCH, PY2ALC. **950:** AE4WG. **1000:** AE4VJ, JI4WAO, 9H1AE. **1050:** KH6SAT. **1150:** K5QR. **1500:** N6PEQ. **1600:** SV2BXA. **1650:** LZ1QN. **1700:** W3QT. **2700:** N4MM. **2900:** AG4W. **3150:** MDØCCE. **4750:** NN1N.

Digital: 350: MDØCCE, W7AII, R2ZX. **400:** N7XCZ, NO1R, W7AII. **450:** N6DBF, JQ1CIV. **500:** JI4WAO, CT7ANG. **550:** KC9UNL, N1TCH. **600:** EB8AIU, AE4WG, 9H1AE, PY2ALC. **700:** W3QT. **1000:** KH6SAT, JR3UIC, NN1N. **1150:** SV2BXA. **1250:** W2/JR1AQN. **1400:** N4MM. **1700:** AG4W.

80 Meters: SV2BXA, JR3UIC
40 Meters: K8KHZ, 5T2AI, CT7ANG, K5QR, SV2BXA, NØRQV, JR3UIC
20 Meters: K1TA, K8KHZ, WA4JA, 5T2AI, N7XCZ, AD2EE, SV2BXA, OH1LAR, KB2FMH
17 Meters: 5T2AI
15 Meters: 5T2AI, SV2BXA, PY2ALC
10 Meters: K8KHZ, SV2BXA

Africa: W3QT, SV2BXA
Asia: K5QR
Europe: K8KHZ, WA4JA, 5T2AI, EB8AIU, SV1RUX, F4GVE, MØTWB, SV2BXA, KB2FMH, MØTWB
Oceania: SV2BXA
North America: K6DLB, AF7EL, WA4JA, KE4PLT, 5T2AI, N7XCZ, KN6Q, K9KJ, W7AII, ADØQI, NØRQV, KX5U, N1TCH, AK7DB, NO1R, W7AII, KB2FMH, K4SAW
South America: SV2BXA

Award of Excellence: W3QT
Award of Excellence with 160 Bar: R9AB
30M Bar: R9AB
17M Bar: R9AB
12M Bar: R9AB
Digital Bar: W3QT

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.

5 Band WAZ

As of June 15, 2017
1956 stations have attained at least the 150 Zone level, and
964 stations have attained the 200 Zone level.

As of May 15, 2017
The top contenders for 5 Band WAZ (Zones needed on 80 or other if indicated):
CHANGES shown in BOLD

Callsign	Zones	Zones Needed	Callsign	Zones	Zones Needed
EA7GF	199	1	W9XY	199	22
H44MS	199	34	VE2TZT	199	23
HA5AGS	199	1	9A5I	198	1, 16
I5REA	199	31	AK8A	198	17, 22
IKØFVC	199	1	DK2LO	198	2, 19
IK1AOD	199	1	DM5EE	198	1,31
IK8BQE	199	31	EA5BCX	198	27, 39
IZ3ZNR	199	1	F5NBU	198	19, 31
JA1CMD	199	2	G3KDG	198	1, 12
JA5IU	199	2	G3KMQ	198	1, 27
JA7XBG	199	2	JA1DM	198	2, 40
JH7CFX	199	2	JA3GN	198	2 on 80 & 40
JK1BSM	199	2	K2EP	198	23, 24
K1LI	199	24	K2TK	198	23, 24
K4XP	**199**	**23**	K3JGJ	198	24, 26
K7UR	199	34	K4HB	198	24, 26
KZ4V	199	26	K4JLD	198	18, 24
N3UN	199	18	**K5FUV**	**198**	**18, 23**
N4NX	199	26	K6FG	198	17, 18
N4WW	199	26	KBØEO	198	22, 23
N4XR	199	27	KZ2I	198	24, 26
N8AA	199	23	N2QT	198	23, 24
RA6AX	199	6 on 10M	N4GG	198	18, 24
RU3DX	199	6	NS6C	198	17, 22
RW0LT	199	2 on 40M	OK1DWC	198	6, 31
RX4HZ	199	13	UA4LY	198	6 & 2 on 10
RZ3EC	199	1 on 40M	US7MM	198	2, 6
S58Q	199	31	W4UM	198	18, 23
SM7BIP	199	31	W5CWQ	198	17, 18
VO1FB	199	19	W6OUL	198	37, 40
W1FJ	199	24	W9RN	198	26, 19 on 40
W1FZ	199	26	WA2BCK	198	23, 24
W2LK	199	23	WC5N	198	22, 26
W3NO	199	26	WL7E	198	34, 37
W4DC	199	24	WO7R	198	21,22
W4LI	199	26	ZL2AL	198	36, 37
W6DN	199	17			

The following have qualified for the basic 5 Band WAZ Award:

5BWAZ #	Callsign	Date	# Zones
1953	RW7M	2017-05-16	200
1954	SP5TT	2017-05-22	173
1955	JA5AQC	2017-05-26	200
1956	N2RJ	2017-06-06	152

Updates to the 5BWAZ list of stations:

5BWAZ #	Callsign	# Zones
848	K5FUV	198
1838	NS6C	200
1858	EB3CW	180
1940	K4XP	199

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

5BWAZ #	Callsign	Date	All 200 #
1953	RW7M	2017-05-16	962
1955	JA5AQC	2017-05-26	963
1868	NS6C	2017-05-31	964

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

AUDUBON, N. J.—Joseph Bonsted, amateur radio operator who helped relay medical instructions to Palmyra Island, 6,000 miles from here in the Pacific, to aid a wounded soldier who was injured in a plane crash. A shipyard worker on vacation, Bonsted arranged for an Audubon Hospital surgeon to broadcast instructions while a physician was being flown from Hawaii, 1,000 miles from Palmyra. (AP Wirephoto)

Photo C. This newspaper article recounted the role that amateur radio played in helping to rescue an airman injured in a 1946 plane crash on Palmyra.

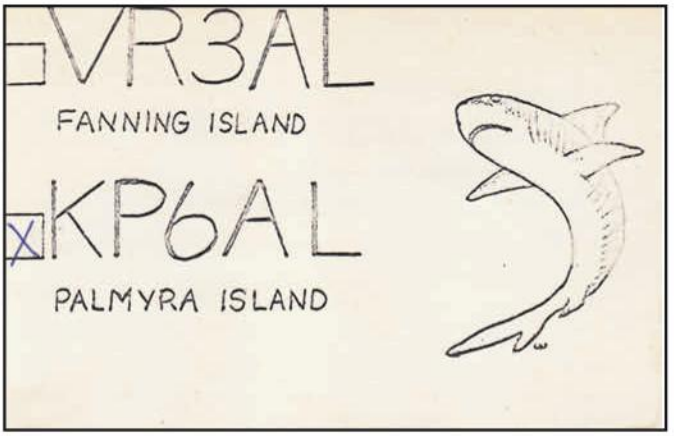


Photo D. QSL card from the 1974 KP6AL DXpedition to Palmyra, during which the visiting hams would cross paths with — in fact, rescue — people who would soon be involved in a double homicide.

Photo E. Members of the KP6AL DXpedition team on Palmyra in 1974.

alive and ready for transport. He survived the hours-long flight back to Hawaii, where he was given several blood transfusions, along with treatment for his other injuries.

With so many things that could have gone wrong, from his being carried 100 yards through shark-infested waters, to landing in such an isolated place, to the long flight back to get proper care, it's a wonder he survived. What's certain is, had the ham operator not been listening, the nurse on Palmyra would not have known the triage steps to take to keep him breathing until more help arrived. Thanks to the power of radio, even over 6,000 miles, the man lived to tell his harrowing tale.

Accidentally Helping a Killer

Outside of ham radio circles, Palmyra is perhaps best known for the tragic murder of a sailing couple in 1974. The story made national headlines, and to this day remains partially unsolved. The details of this event, and the following arrests and trials, are well documented in many places, but most notably in the book, *And the Sea Will Tell*, by Vincent Bugliosi, best-known for prosecuting Charles Manson and one of the defense attorneys in this case. Unfortunately for readers, this book is biased and over-dramatized. As a Palmyra historian, I simply cannot recommend it or its representation of the events. I would advise seeking other materials to learn about the trial and events surrounding it. That being said, here's a brief overview of what's now known as "The Seawind Murders."

A young couple wanted by the law for drug-related charges sailed in desperation from Honolulu to Palmyra, where they hoped to live for a while to avoid arrest by federal authorities. Unfortunately, neither of them had any knowledge of sailing or preparing for such a voyage. The average sailing trip to Palmyra from Hawaii should take no more than 9 or 10 days, even in bad weather. It took this couple nearly a month, and once there, they had no idea how to maneuver through the channel connecting the ocean to the inner lagoon, where it was safe to dock and come ashore. So, unwilling or afraid to ask for assistance, the man and woman remained stuck, with little to no food or water, unable to reach the shore. Rusty Epps (W6OAT), a member of the 1974 KP6AL DXpedition to Palmyra (see *Photos D and E*), picks up the story from there:

"It was a six-day sail for us from Hawaii to Palmyra and when we got there, Jack (Wheeler, head of the DXpedition) and his family were already inside the lagoon, yet there was another boat (that) had not been able to get through the cut (the opening from the ocean to Palmyra's inner lagoons), and it was just kind of anchored on the reef out there. We had no idea who these people were or why they were there but it was pretty obvious that they hadn't figured out how to get in through that cut or exactly where it was.

"On the third day that we were there, the day before we were to leave for Kingman Reef, the other boat — we saw it try to

sail through the cut and didn't make it. They ran aground on the reef ... We went out and took the dinghies from our boat and Jack's and were able to pull them off and finally tow them in and tie them up at ... a pier. So they got in safely ... our plan was to leave the next day to go on to Kingman Reef, which we did. Jack was going to stay there, all the time that we were at Kingman Reef, as the backup. But a day out from when we left Palmyra, we got a call from Jack on the radio saying, 'Guys, I'm sorry to change plans on you, but my family and I have already departed Palmyra and we're on the way back to Honolulu. Frankly, I am worried about being on Palmyra with those people that we pulled in.' And ... that was it, we did our thing at Kingman Reef and ... went on and ultimately back to Hawaii. Now what went on at Palmyra was a bit different."

What went on was a double homicide, the vandalism and theft of a very expensive yacht, and finally the capture of two people, one of whom would be convicted of murder and spend most of his life in prison. Rusty and his team did the right thing saving those folks, who might otherwise have starved, too proud to ask for help. Unfortunately for the victims, that generosity of spirit and valuing of life wasn't paid forward.

A Cursed Expedition

By 1980, Palmyra was in desperate need of a cleanup. In the 35 years since the Navy had abandoned the base (but not before bulldozing most structures and equipment right into the lagoons), a series of military and private scientific teams (along with less-than-responsible visiting yachties) had left the

Photo F. The QSL card from the K6LPL/KH6 DXpedition in 1980 featured the team's airplane, which crashed on landing and remains on Palmyra to this day.

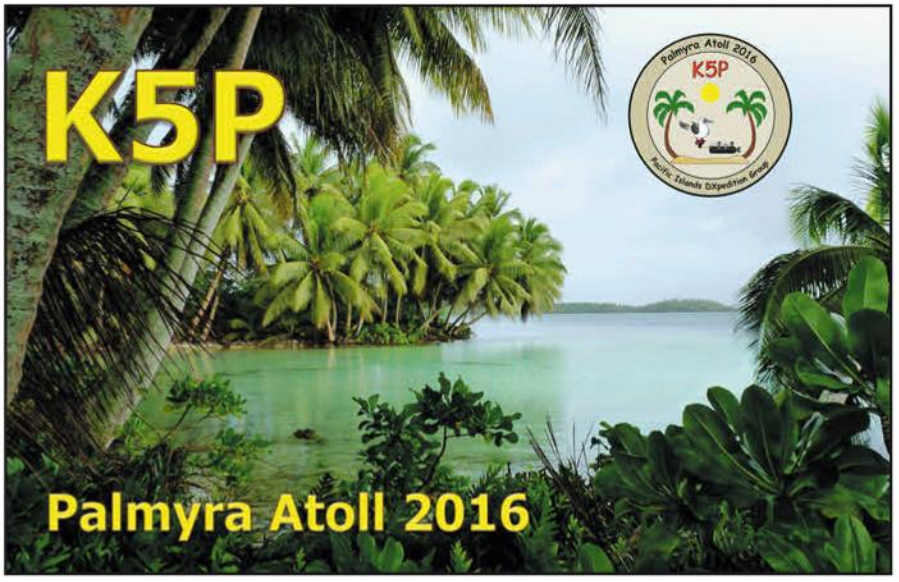


Photo G. K5P was the most recent DXpedition to Palmyra, just last year. Fortunately, there were no injuries or encounters with criminals. (Courtesy Lou Dietrich, N2TU)

The WAZ Program

ALL BAND WAZ

CW

835.....I2OGV 836 .....UR7KY

Mixed

9373 .....WB5QNA 9376 .....RG6G
9374 .....JE2EHP 9377.....RO7T
9375 .....R7HF 9378 .....RZ6FA

RTTY

265.....K4WW

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

CQ DX Awards Program

New Awards CW

N6PEQ.....1169

New Awards RTTY

K4IQT 82

Endorsements RTTY

K4IQT 290

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, self-addressed, 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.

islands a total mess. There had been no permanent residents since the 1960s, except for a small group hired to farm fish and coconuts in 1979. The owners had done little upkeep, only visiting Palmyra to occasionally entertain an offer on selling off the property. The once accessible 6,000-foot runway was overrun with plants, rubbish, and over one million birds that regularly nested on the atoll.

However, none of that dissuaded DXpeditions of amateur radio operators, who continued to visit the island throughout that whole period. In January 1980, a group arrived from Hawaii via chartered plane, with plans to travel on to nearby Kingman afterwards.

Photo H. K5P (2016) team member Lou Dietrich, N2TU, visits the wreck of the K6LPL/KH6 DXpedition's airplane, still where it crash-landed in 1980. (Courtesy N2TU) →

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 339
HB9DDZ 339
K4IQJ 339
K9MM 339
N4MM 339
WB4UBD 339
WS9V 339
EA2IA 339
F3TH 339
K2FL..... 339
K2TQC 339
K3JGJ 339
K3UA.....339
K4CN.....339
K4JLD 339
K4MQG 339
K5RT.....339
K7LAY 339
K7VV.....339
K8SIX.....339
N4AH.....339
N4CH.....339
N4JF.....339
N4NX.....339
N5ZM 339
N7FU.....339
N7RO 339
NØFW 339
OK1MP.....339
W3GH 339
W4OEL.....339
W5BOS 339
W7CNL.....339
W7OM.....339
W8XD.....339
WK3N.....339
WØJLC.....339
YU1AB.....339
K8LJG 338
KA7T 338
WA5VGI 338
W1DF 338
W9RPM.....338
G3KMQ 337
W7IIT 337
K8ME 336
W6OUL 336
JA7XBG.....335
F6HMJ.....334
K1FK 334
K9OW 334
PY2YP.....334
WG5G/ QRPp.....334
WD9DZV 334
K2OWE.....333
K5UO.....333
N6AW.....333
W4MPY.....333
KØKG 332
K6LEB 331
N7WO 331
K6YK.....329
W9IL 329
IKØADY.....328
OZ5UR 328
AB4IQ 326
K6CU.....326
KE3A 326
EA5BY 325
KA3S 325
N3RC.....324
N7W0.....324
YT1VM 322
4Z5SG 321
N2LM 321
ON4CAS 321
HB9DAX/ QRPp.....319
HA1ZH.....318
N6PEQ.....318
W6YQ 318
CT1YH.....316
EA3ALV.....315
K4IE 295
RA1AOB 313
WA4DOU.....312
YO9HP 312
W6WF 309
KT2C 307
W4ABW.....306
K7ZM 305
K8IHQ 301
HA5LQ.....301
RN3AKK 300
WA9PIE.....298
YU1YO 295
WA2VQV 290
K7CU.....282
PP7LL 282
WR7Q 282
N2VW.....280
K4EQ.....280
WB5STV.....277
YO6HSU.....275

SSB

AB4IQ.....340
DJ9ZB 340
DL3DXX 340
DU9RG.....340
EA2IA 340
EA4DO.....340
HB9DDZ 340
I8KCI 340
IK1GPG 340
IN3DEI.....340
K2FL.....340
K2TQC 340
K3JGJ 340
K4CN.....340
K4IQJ 340
K4JLD 340
K4MQG 340
K4MZU.....340
K5OVC.....340
K5RT.....340
K5TVC 340
K6YRA.....340
K7VV 340
K8SIX.....340
K9MM 340
KE5K 340
KZ2P 340
N4CH.....340
N4JF.....340
N4MM 340
N5ZM 340
N7BK.....340
N7RO 340
NØFW.....340
OK1MP.....340
OZ3SK.....340
OZ5EV 340
VE1YX 340
VE2GHZ.....340
VE2PJ 340
VE3MR.....340
VE3MRS.....340
VE3XN.....340
W3AZD.....340
W3GH 340
W4ABW.....340
W5BOS 340
W6BCQ 340
W6DPD 340
W7BJN.....340
W7OM.....340
W8ILC.....340
W9SS.....340
WB4UBD 340
WK3N.....340
WS9V.....340
XE1AE 340
YU3AA.....340
JA7XBG.....339
KØKG 339
K3UA.....338
K7LAY 338
K9HQM 338
N4NX.....338
W4UNP 338
W9RPM.....338
YU1AB.....338
4Z4DX 338
K1UO.....338
K8LJG 338
N7WR 338
WA5VGI 338
W2CC.....338
W2FKF.....338
W7FP 338
W9IL 338
IØZV.....336
K3LC 336
K8ME 336
EA3BMT 335
F6HMJ.....335
HB9DQD.....335
IKØAZG 335
IW3YGW 335
OE2EGL.....335
VK2HV.....335
W4WX.....335
WB3D.....335
AA4S.....334
EA5BY 334
K9OW.....334
PY2YP.....334
VK4LC 334
W8AXI.....334
XE1J.....334
CT3BM 333
IK8CNT.....333
K8LJG 333
N6AW.....333
OE3WWB 333
WD9DZV 333
AA1VX.....332
KE3A 332
N2VW.....332
N5YY.....332
K5UO.....331
SV3AQR 331
WØROB 331
W6OUL 331
XE1MEX 331
KD5ZD.....330
WA4WTG 330
WØYDB 330
ZL1BOQ.....330
AD7J 329
N3RC 329
VE7SMP 329
CT1AHU 328
N1ALR.....328
N2LM 328
AE9DX.....327
K7HG.....327
K6GFJ 326
KE4SCY 326
KF4NEF 325
W6WF 325
W9GD 325
VE7EDZ 324
F6BFI.....323
ON4CAS 323
W5GT.....323
N6PEQ.....322
VE6MRT 322
W4MPY 322
K8IHQ 321
KW3W.....320
TI8II 320
YO9HP 320
W1DF 318
XE1RBV.....317
IV3GOW 312
N8SHZ.....312
KU4BP.....310
W6NW.....310
I3ZSX 309
G3KMQ 308
KA1LMR.....308
RA1AOB 308
XE1MEX 308
IØYKN 306
XE1MW 305
K4IE 304
K4ZZR 304
K7ZM 303
4Z5FL/M.....302
K7SAM.....301
KA8YYZ.....301
4X6DK.....298
K2HJB.....295
F5MSB 293
IK5ZUK.....293
W9ACE.....291
N3KV.....289
W6MAC.....289
K7CU.....287
IZ1JLG 282
WA9PIE.....282
WD8EOL 281
IWØHOU 277
N5KAE.....276
WA5UA 276
NØAZZ.....275
SQ7B.....275

RTTY

NI4H. 338
WB4UBD . . . 338
WK3N. 338
N5ZM. 338
OK1MP 337
K4CN 334
K8SIX. 333
W3GH 333
K3UA 332
W9RPM 330
AB4IQ 317
K4IQJ. 290
K8ME 278
IN3YGW. . . . 275
N4MM 275

Unfortunately, they didn't anticipate the difficulty in landing on Palmyra. A combination of inadequate landing space and dangerous crosswinds resulted in the aircraft crashing and being too damaged to ever fly again (see *Photo F*).

Thankfully, only one member of the team was hurt in the crash, but her injuries were severe enough to require she be airlifted back to Hawaii for treatment. Things seemed to go smoothly from there, with operations a success over the next few days, and a trip over to nearby Kingman Reef by boat uneventful, until the team returned to Palmyra. Another team member, a neurosurgeon, fell while hiking around the island and injured his hand. He was airlifted back to Honolulu as well, and it seemed best the other team members travel with him, leaving Palmyra behind.

Tragically, the surgeon's injuries were such that he lost his ability to operate, eventually suing the island's owners for negligence and settling out of court. After this series of accidents, the Fullard-Leos were understandably reluctant to let anyone visit the island, and there would be no further DXpeditions until 1988, by which time a series of cleanup operations made the island much easier (and safer) to navigate.

In Conclusion…

Palmyra's history with ham operators is one marked by adventure and adversity, and is far from over. The most recent visit there was the K5P DXpedition in 2016 (*Photo G*), during which team member Lou Dietrich, N2TU, couldn't resist making a visit to the 1980 plane crash site (*Photo H*).

The last 80 years of visits include many other harrowing and historic events, showing just how far hams will go to send their signals. I want to personally thank the many operators who shared their stories, pictures, and other materials with me, helping grow the archive's collections and inform the world of how special a place Palmyra is. If you'd like to learn more about Palmyra and its history, please visit our archive, browse around, and feel free to reach out to us with your own stories, photographs, videos, or any other information you might have, that you'd like to share!

The ham radio page is at <http://bit.ly/2t84etb>.

Note:

1. The U.S. Civil Aeronautics Administration was the predecessor of today's Federal Aviation Administration (FAA).

propagation

BY TOMAS HOOD,* NW7US

The Summer Anomaly

A Quick Look at Current Cycle 24 Conditions
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, May 2017: 11
12-month smoothed, November 2016: 18

10.7 cm Flux (current):
Observed Monthly, May 2017: 74
12-month smoothed, November 2016: 81

A_p Index:
Observed Monthly, May 2017: 9
12-month smoothed, November 2016: 12

***One Year Ago:* A Quick Look at Solar Cycle Conditions**
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, May 2016: 31
12-Month smoothed, November 2016: 37

10.7 cm Flux (current):
Observed Monthly, May 2016: 93
12-Month smoothed, November 2015: 1

A_p Index:
Observed Monthly, May 2016: 12
12-Month smoothed, November 2015: 13

Are the daytime Maximum Usable Frequencies (MUFs) on signal paths spanning daylight regions higher during the summer than during the winter? With more hours of daylight, wouldn't the increased exposure to solar radiation cause greater ionization? The surprising answer is that, no, that is not generally the case. A look at many signal paths reveals that there are higher daytime peaks during the winter than the summer. However, during the summer night, those same paths may have higher MUFs than during the winter. This is known as the "Summer Anomaly."

It was believed that this anomaly was in part caused by temperature differences. This model held that during the Northern Hemisphere winter months, the atmosphere is cold and therefore denser, and that because the Earth is closer to the Sun, more intense daytime ionization occurs; thus, winter daytime critical frequencies are high. During the long hours of winter darkness, on the other hand, the ionosphere has more time to recombine, and nighttime critical frequencies fall to very low levels. Conversely, in the summer, the F_2 layer heats up during the daylight hours, causing it to expand. This results in a lower ionization density than is observed during the winter. This, it was believed, creates summer daytime F_2-layer critical frequencies that are lower than winter values. Moreover, because of the longer hours of daylight during the summer, recombination does not occur to the extent that it does in winter. This would mean that nighttime F_2-layer critical frequencies during the summer months are significantly higher than they are during the winter months.

As scientists continue to explore, our understanding of how the ionosphere works becomes ever more accurate and clear. Research has revealed that the reason summer MUFs are lower during the day is due only in part to temperature differences. The rest of the story lies in ion chemistry, not a thinning of the ionosphere.

In the lower part of our atmosphere below 100 kilometers, atoms and molecules are well mixed by wind and temperature. Above 100 kilometers, atoms and molecules are distributed vertically by gravity,

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for June 2017

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal:				
1-4,6-9,12-16,19-31	A	A	B	C
High Normal:				
5,11,17	A	B	C	C-D
Low Normal:				
10	B	C-B	C-D	D-E
Below Normal:				
18	C	C-D	D-E	E
Disturbed:				
n/a	C-D	D	E	E

Where expected signal quality is:
A--Excellent opening, exceptionally strong, steady signals greater than S9
B--Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C--Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D--Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E--No opening expected.

HOW TO USE THIS FORECAST

1. Find the ***propagation index*** associated with the particular path opening from the Propagation Charts appearing in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

2. With the ***propagation index***, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a propagation index of 2 will be good from August 1 through August 4, fair on August 5, and so forth.

3. Alternatively, the *Last Minute Forecast* may be used as a general guide to space weather and geomagnetic conditions through the month. When conditions are **Above Normal**, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as "**Disturbed**" will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these conditions. In general, when conditions are **High Normal** to **Above Normal**, signals will be more reliable on a given path, when the path is supported ionospherically.

according to their atomic weights. The heaviest atoms, argon, settle toward the bottom of the ionospheric layers, while the lightest atoms, hydrogen, extend to the greatest heights. The exact composition depends on temperature. In the winter, when atoms and molecules are colder, they move lower, in part causing the ionosphere to contain a greater density of oxygen atoms. During the summer, they move to greater heights as they warm up, and the ionosphere becomes dominated by a more even mixture of nitrogen and oxygen molecules. In this upper atmosphere, ionization is more affected by the geomagnetic field than by atmospheric turbulence.

Ionization is the creation of ions by atoms losing their electrons. This is caused by the energy of photons from sunlight breaking the electron away from the atom. In the absence of sunlight, these free electrons recombine with whatever nearby molecule or atom happens to be available.

Electrons do not always recombine with the relatively small number of positive ions available; they may also become attached to some of the far more numerous neutral molecules, forming negative ions. This is a great thing for those who DX the lower part of the HF spectrum, as these electrons are not disassociated from the negative ions very quickly during the morning sunlight. Since these negative ions are more massive than electrons and positive ions, they do not absorb radio energy. This makes a morning window for low-band DXing.

During the summer, then, the ratio of atoms to molecules is less than the ratio during the winter. The make-up of the ionosphere during the winter favors the production of electrons from oxygen atoms over the losses of electrons by recombination in molecular interactions. Since the summer ionosphere has a mixture of nitrogen and oxygen molecules, more recombination takes place, and the ionosphere loses some of its ionization. If one looks at a given summertime signal path and compares it with the same path during the winter, it is clear that the MUF will generally peak higher in the winter. However, the nighttime critical frequencies will generally be higher than in summer nighttime.

When I ran a series of different path analyses in ACE-HF Pro, using February and then again using August, with the same smoothed sunspot number for each month, the same general result proved that this summertime anomaly exists. I did note, however, that paths crossing the North Pole region did have higher MUFs in the summer (due in part to the lack of any darkness at the pole during the summer, as compared to no sunlight during the winter). It also appears that some paths that span the equator and exist in both the winter hemisphere and the summer hemisphere, averaging about the same for both months in question. (See *Figure 1* for an example side-by-side comparison from February and August).

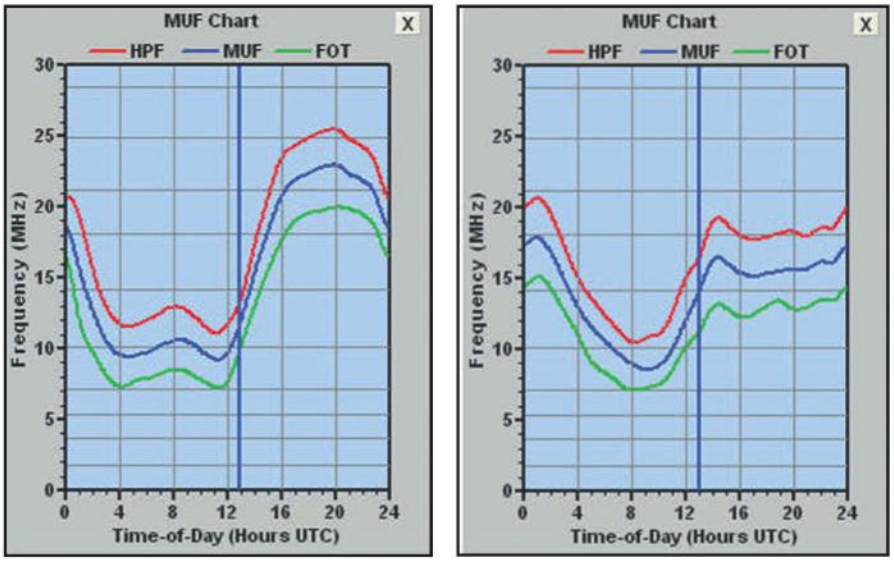

Figure 1. A comparison between Winter MUF (left) and Summer MUF (right) on the same path, with the same parameters (same sunspot number, antenna, power, and so on). On the propagation path (circuit) under analysis, the Summer Anomaly indeed exists. (Credit: NW7US, using Ace-HF Pro software)

August Propagation

At last. With August comes the beginning of a shift from summertime to wintertime ionospheric conditions in the Northern Hemisphere. While most days in August will exhibit summertime conditions, conditions will begin to conform more to a winter pattern of higher daytime and lower nighttime usable frequencies. Moving into August, summer conditions caused by the sun-baked and thinned ionosphere will prevail. But as we move toward September, with less sunlight over the North Pole, the MUFs should become higher, with longer windows on higher bands.

Being in mid-summer with low 10.7-cm flux numbers, 20 meters will be the most used DX band. The low bands are too noisy and experience a high amount of absorption. The higher bands (10 and 12 meters) are usually dead due to low summertime MUFs. Fifteen meters will become more usable in the morning and evening hours following the grayline, with peaks during the afternoon. But 20 meters is where August activity will be strongest.

Daytime: While the 15-, 17-, and 20-meter bands should be open for DX throughout the daylight hours, peak signals are expected during an approximately two-hour window immediately following sunrise and again during the late afternoon. Occasional fair openings might occur on 10 and 12 meters during the hours of daylight, particularly along an arc extending across central Africa, Latin America, and into the far Pacific area. Peak conditions should occur during the afternoon hours, but as we move into September, earlier and later windows will open.

Nighttime: Between sundown and sunrise, 20 meters is expected to be the best DX band. Openings should be possible to nearly all areas of the world, often with exceptionally strong signal levels. Until midnight, good DX conditions may be found on 15 and 17 meters for openings toward Latin America, the far Pacific, and into Asia. Fairly good nighttime DX conditions are also expected on 30, 40, and 80 meters despite the high static at times. Openings should be possible before midnight along an arc extending from northern Europe, through Africa, and into Latin America. By late August, it should be possible to work some DX on 160 meters during the hours of darkness. Conditions on this band, as well as on 40 and 80 meters, will tend to peak just

as the sun begins to rise on the light, or easternmost, terminal of a path.

Short-Skip Conditions

For openings over distances ranging between 50 and 250 miles, use 80 and 40 meters during the day, and 80 and 160 meters at night. Between 250 and 750 miles, the best bands should be 40 and 30 meters during the day, and 40 and 80 meters at night. For openings between 750 and 1,300 miles, the best bands should be 20 and 17 meters during the day, with some fairly good openings also possible on 15 meters. From sundown to midnight, try 40 and 30 meters. From midnight to sunrise, try 80 meters. Between 1,300 and 2,300 miles, the best daytime bands should be 20 and 17 meters, with some activity on 15. Try 30 and 40 meters during hours of darkness.

VHF Conditions

Sporadic-E (E_s) propagation usually tapers off during August, but it may offer fairly frequent opportunities on 10 meters. Some 6-meter E_s openings are expected during the month over distances of approximately 750 to 1,300 miles. Be sure to check the 2-meter band for an occasional E_s short-skip opening between approximately 1,200 and 1,400 miles. While E_s short-skip openings may occur at any time, there is a tendency for them to peak between 8 a.m. and noon, and again between 6 and 9 p.m. local daylight time.

Aurora? There is a high chance for aurora-mode propagation events this August. We expect coronal mass ejections (CMEs) this month, as well as the likely recurring coronal holes that will contribute to high-speed solar winds. The CME-related massive clouds of plasma will race toward the Earth on the elevated solar winds after an X-ray flare and will trigger aurora and geomagnetic storms. Auroral-scatter-type openings, on both 6 and 2 meters, can range from a few hundred up to about a thousand miles, and they are usually characterized by very rapid flutter and Doppler shift on SSB signals.

Also, this month, for the very patient, check the 6-meter band for possible trans-equatorial (TE) openings between 8 and 11 p.m. local daylight time. This type of propagation favors openings from the southern tier states into deep South America, with the signal paths crossing the magnetic equator at a right angle. TE openings during August are rare, but they can occur. Very weak signals and severe flutter fading usually characterize them.

If you use Twitter, you can follow @hfradiospacewx for hourly updates that include the K index numbers. You can also check the numbers at <http://sunspotwatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

The Royal Observatory of Belgium, the world's official keeper of sunspot records, reports a monthly mean sunspot number of 11.3 for May 2017, a significant drop from April's 19.6. The mean value for May results in a 12-month running smoothed sunspot number of 17.9 centered on November 2016. Following the curve of the 13-month running smoothed values, a smoothed sunspot level of 19 is expected for August 2017, plus or minus 14 points.

Canada's Dominion Radio Astrophysical Observatory at Penticton, British Columbia, reports a 10.7-cm observed monthly mean solar flux of 73.5 for May 2017, a drop from April's 80.9. The 12-month smoothed 10.7-cm flux centered on November 2016 is 81.1. A smoothed 10.7-cm solar flux of about 78 is predicted for August 2017.

Geomagnetic activity as measured by the Planetary-A index (A_p) for May 2017 is 9. The 12-month smoothed A_p index centered on November 2016 is 11.6. Geomagnetic activity this month should pick up a bit over the level seen in July. Refer to the *Last-Minute Forecast* for the outlook on which days might have degraded propagation (remember that you can get an up-to-the-day *Last-Minute Forecast* at <http://SunSpotWatch.com> on the main page).

Don't forget to check out this columnist's educational tweets on Twitter.com; you can follow @hfradiospacewx <https://Twitter.com/hfradiospacewx> for hourly updates that include the K index numbers, as well as @NW7US <https://Twitter.com/nw7us> which will provide the daily dose of educational tidbits about the Sun and propagation.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may email me, write me a letter, or catch me on the HF amateur bands.

If you are on Facebook, check out <http://www.facebook.com/spacewx.hfradio> and <http://www.facebook.com/NW7US>. Speaking of Facebook—check out the *CQ Amateur Radio* Magazine fan page at <http://www.facebook.com/CQMag>.

I'll be keeping my ears to the radio, hoping to hear you on the air. Happy DX!

– 73, Tomas, NW7US

Oops…

The table of contents for our June issue accidentally listed author Paul Signorelli's call sign as WØWR (for the second time in as many articles). It is correct in the article as WØRW. Our apologies to Paul and for any confusion to the rest of you.

Looking Ahead in CQ

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

- SSB Results: 2017 CQ WPX Contest
- Go Untethered: Operating with a Wireless Headset
- Build a Low-Band Variometer in a Bucket!

Upcoming Special Issues

October: Emergency Communications
December: Technology
February: QRP

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

Number groups after calls denote score, total QSOs, W/VE multiplier, countries worked. Total multiplier is the addition of the W/VE and countries. Multi-op scores follow single-op listings. An asterisk (*) denotes low power. State, province, and country certificate winners are listed in bold.

2017 CW RESULTS

SINGLE OPERATOR
NORTH AMERICA
UNITED STATES

CONNECTICUT

W1AN	170,610	541	54	40
K1KI	116,454	451	50	28
*W1QK	103,460	612	53	17
W1WEF	97,359	578	52	17
W1EQ	85,568	563	51	13
K1BUK	21,868	203	39	5
*KA1AL	20,492	172	40	7
*K1BV	19,912	222	34	4
*K1XS	6,642	105	25	2
*W3SM	5,568	101	24	0
*WA1JD	4,095	44	29	6
*KC1SA	2,300	53	20	0
*W1ZFG	1,785	39	17	0

MAINE

*N1CGP	24,017	207	42	5

MASSACHUSETTS

K1LZ	622,323	1207	59	58
K5ZD	230,660	726	55	40
W1TO	129,792	624	55	23
*N1DC	62,245	431	48	11
NB1N	62,036	506	44	8
*N2AN	46,726	287	48	13
*W1KM	28,469	218	39	10
*WO1N	26,411	218	40	9
*N1QY	25,709	224	40	7
*N1NN	8,265	120	28	1
*W1UJ	2,286	53	18	0
*W1MJ	1,036	28	14	0
*W1HFF	561	18	11	0

NEW HAMPSHIRE

K1TR	157,112	665	54	28
*N1IX	102,127	549	53	20
*N1GN	62,377	355	51	16
*K1OR	2,125	34	22	3
*K1PDY	1,008	27	14	0
*N1IMW	374	20	11	0

RHODE ISLAND

W1XX	311,746	886	56	50

VERMONT

W1SJ	177,671	883	58	21
AA1SU	41,004	347	47	4
K1VMT	40,425	338	42	7
KB1ODO	8,256	105	30	2

NEW JERSEY

K2TTT	109,573	633	56	17
*KE2D	80,724	558	52	10
*WK2G	58,590	473	48	6
*N2UU	35,955	287	43	8
*WA2ALY	16,687	164	36	5
*W2TT	8,246	109	29	2
*KD2JC	7,337	110	28	1
*W2CVW	4,440	75	23	1
*W3PR	3,618	55	24	3
*K2JT	2,814	58	20	1
KC2LST	8	2	2	0

NEW YORK

N5DX	641,802	1341	58	60
WF2W	331,602	1106	60	42
W2RR	141,150	789	58	17
K2NV	132,386	745	55	19
K2OS	82,929	354	54	23
K2UF	82,698	517	52	14
WA2CP	69,972	396	48	20
N2YB	67,535	371	46	19
*N2BEG	58,410	413	49	10
W2GR	53,406	424	47	7
*WA2JQK	41,448	245	52	14
*K2QB	18,734	215	36	2
*AC2IK	18,576	181	38	5
*NW2K	18,377	150	42	5
K2XA	17,168	92	45	13
*W2LC	14,555	147	39	2
*K2CS	13,200	141	38	2
*WS9M	10,304	95	43	3
WB2WPM	8,610	108	32	3
*K2NPN	7,194	94	33	0
*NW2I	1,890	27	29	1
*NN2NN	1,178	25	17	2
*AC2QH	470	16	10	0
*AA2SX	432	21	9	0
*AC2RJ	203	13	7	0

DELAWARE

AA1K	592,620	1339	59	60
*N8NA	68,055	435	51	14
*K3CWF	5,049	80	27	0
*W3ASW	4,239	68	26	1

MARYLAND

W3LL	291,486	1030	58	43
*KD4D	289,380	914	59	46
K3ZO	282,914	920	57	49
K3RA	154,352	671	57	31
K3TC	105,307	498	55	24
K8GU	50,691	320	46	15
*K3KU	45,315	372	46	7
W3PH	34,020	261	47	7
*AA3S	23,265	212	39	6
*N3XL	13,376	163	36	2
*N3TE	13,065	141	35	4
*W3FA	10,804	125	34	3
*W3SFG	9,695	112	33	2
W3MR	2,288	31	16	6

PENNSYLVANIA

W3BGN	376,704	1070	59	49
K3UA	337,120	794	58	54
W3TS	216,195	1009	59	28
K3UL	197,568	773	59	37
W3SO	96,380	462	55	24
*K3SWZ	72,002	357	52	22
NA3F	66,002	449	48	13
*KA3QLF	60,760	389	50	12
*K2LNS	58,590	381	51	12
*WW3S	55,610	318	52	15
K3PP	54,592	343	51	13
KW3A	50,924	368	49	9
*WS3C	33,696	263	44	8
KY3W	29,700	219	48	7
*N3LT	29,344	197	45	11
*W3KB	26,606	199	44	9
K3OO	7,020	48	13	17
WA3AAN	5,656	83	27	1
NF3R	1,275	35	15	0
*W3KM	468	15	13	0

ALABAMA

N4NO	125,846	461	55	34
*K4WI	115,514	648	53	21
*WA1FCN	82,276	511	49	18
*KC4TEO	41,496	307	48	9
*W4JSI	21,510	211	41	4
*K8AJX	16,641	170	38	5
*N4AU	9,994	118	35	3
*N4SDB	840	21	12	3

FLORIDA

N4OX	77,472	425	53	19
KM4HI	76,160	438	51	19
N8PR	59,760	226	53	27
WF3T	46,935	300	49	14
*N4EK	31,200	275	39	9
N1TO	24,168	184	45	8
*N4UM	16,744	152	39	7
*W4OEP	10,965	116	36	7
*WB4OMM	10,602	109	32	6
*W3USA	5,797	76	25	6
*NK4DX	5,550	78	25	5
*KN4Y	3,255	41	25	6
*K8MR	3,000	52	20	4
*K4FU	14	2	1	1

GEORGIA

KU8E	197,280	770	57	39
K4BAI	176,436	756	55	32
W5JR	124,640	566	52	30
*KM4F	38,860	268	46	12
WK4U	26,871	202	43	10
*AA4LR	18,081	143	41	8
*N9DFD	5,504	73	31	1
*ND4K	3,836	60	26	2
*N4WD	3,250	52	25	1
*AI4UN	1,323	26	19	2
*W4EMI	1,197	27	21	0

KENTUCKY

*KC4WQ	67,083	492	49	10
*KM4FO	28,860	241	46	6

NORTH CAROLINA

N4AF	163,152	663	55	33
N4CW	161,048	818	57	25
K2LS	130,088	462	55	37
*WG8Y	38,248	285	47	9
AD8J	33,456	274	40	11
*N4AA	21,855	200	42	5
*AI4GR	19,646	166	39	8
K4KAY	16,950	142	41	9
K4NC	14,080	107	34	10
*W2GDJ	9,735	131	32	1
*K4KZ	1,725	33	22	1
*N4CTT	1,368	38	18	0

SOUTH CAROLINA

K4HR	58,765	292	52	21
NJ4F	46,551	317	48	11
K7OM	43,380	286	48	12
*WA8OJR	25,248	216	40	8
*WU2T	16,598	158	38	5
*WA2EMF	12,240	110	40	5
N4UFP	2,525	35	21	4

TENNESSEE

KØEJ	226,135	920	56	35
*WA5POK	178,785	787	57	30
AC4G	122,144	424	53	35
*K3IE	94,462	516	55	18
W4UT	82,355	541	53	12
K1GU	76,296	424	51	17
AD4EB	72,954	504	52	11
WB4YDY	68,231	368	52	19
*W4DAN	50,787	384	48	9
*AA4NU	49,335	298	52	13
*N4ZZ	44,500	391	46	4
*NA4K	35,231	316	44	5
*K9JU	27,500	200	46	9
*AB4GG	23,079	192	41	8
AA4H	20,332	150	43	9
*WD8RYC	9,729	83	42	5
*W4JUU	7,722	108	31	2
W4NZ	3,654	51	27	2
*AA9K	2,112	42	22	0
*WD5DAX	1,184	37	16	0

VIRGINIA

K3ZM	862,916	1537	58	66
KØZR	292,500	1035	58	42
W4CB	204,776	878	54	34
N4DJ	129,591	703	56	21
*K4ORD	105,488	540	55	21
W4YE	62,511	363	53	14
*W4PJW	55,571	390	51	10
K4RDU	48,439	341	48	11
*W4PFM	38,998	239	48	14
W4WWQ	38,936	239	47	15
*K4FTO	29,520	255	42	6
*N4CF	26,588	258	43	3
N3JB	26,300	205	42	8
*W3TB	25,004	211	38	9
*K4FJW	24,794	210	42	7
*KR4V	24,745	192	40	9
N3KN	23,300	197	44	6
*K8SYH	22,231	192	39	8
W4AU	20,792	200	42	4
*K4IVF	19,494	136	44	10
*K4SO	16,732	138	40	7
NR4C	13,571	135	35	6
*KQ4LA	13,440	168	34	1
*K4GJF	11,800	118	37	3
N4MM	11,223	91	34	9
*KK4R	9,216	98	31	5
*N3CKI	8,773	122	29	2
*K4HQK	8,481	109	31	2
N8AID	8,170	65	26	12
*WM4I	8,155	99	32	3
AD4TJ	3,276	66	19	2
N3AO	3,250	53	23	2
*KN4KL	3,225	57	25	0
*W4GRC	2,737	52	22	1
*K4MIL	976	26	15	1
*W4ZYT	559	20	13	0

ARKANSAS

WD5R	399,816	1232	59	49
*KD5J	21,945	161	46	9
W5KI	224	10	7	1

LOUISIANA

*K5KU	190,464	772	57	36
*KV8S	28,938	231	46	7
KA5M	23,154	197	44	7

MISSISSIPPI

*KB5DJX	3,480	44	26	4
*KD5JHE	1,113	25	21	0

NEW MEXICO

WD5COV	462,330	1130	57	53
N5UL	166,880	687	55	25
N2IC	109,364	501	55	21
K7IA	63,829	331	52	19

OKLAHOMA

K5YAA	97,032	446	55	23
*N4IJ	56,696	264	54	22
N5OT	50,274	332	51	12
*N5UM	36,080	280	48	7
KK5JY	21,620	207	43	3
*N5XE	18,300	154	44	6

TEXAS

K5RX	533,124	1208	58	60
N5AW	177,300	466	56	44
WD5K	165,126	704	55	32
AK5X	155,376	760	55	28
K5NZ	79,804	447	53	18
*N5KWN	56,286	413	48	11
*NN5T	45,000	313	50	10
K5MXG	22,150	175	42	8
*K5SBR	14,350	108	43	7
*WB8FVB	8,460	107	32	4
*AE5P	4,608	63	30	2
*WA5PFJ	3,886	60	27	2
*AF5DM	2,375	43	22	3
*KY5M	2,064	40	23	1
W5XD	1,925	37	24	1
*WB5K	1,400	35	20	0

CALIFORNIA

K6NA	218,631	752	57	30
*W6JTI	82,688	482	54	14
N5ZO	79,084	453	55	13
N6KI	58,200	401	51	9
W6TK	46,760	262	45	11
N6XI	43,890	315	49	8
N6NF	42,448	285	46	10
N6TQ	41,838	268	46	11
NJ6P	40,235	221	52	13
*W8KA	34,884	239	48	9
W1SRD	29,484	211	45	9
KM6I	28,611	210	43	8
K1TKL	24,970	184	48	7
W6RKC	24,963	167	42	11
*N6LL	24,000	188	44	6
K6ME	20,706	127	47	11
WE6C	20,655	157	43	8
*WN6K	19,227	153	44	7
N6AA	18,447	178	39	4
*WA6URY	18,000	153	41	7
*AE6JV	17,901	145	45	6
*W6JK	16,752	142	42	6
*W6AWW	14,872	132	39	5
AI6O	14,742	158	35	4
*KG6AO	13,860	129	39	5
*KE6QR	12,903	165	30	3
*K6EM	12,742	118	41	5
*AA6EE	10,400	142	28	4
*N3RC	10,323	115	33	4
N6WM	8,745	116	31	2
*W6JBR	3,875	70	23	2
WØYK	2,806	31	16	7
KM6HB	1,936	52	13	3
*KA9A	1,218	42	12	2
*W6VNR	1,040	28	13	3
*W6ZE	840	27	14	0
K9JM	663	24	13	0
*K6CSL	222	17	5	1
K3TIM	6	3	1	0

ARIZONA

*N7IR	130,536	695	55	17
*AC7A	62,811	366	51	12
WA8WZG	36,992	181	49	19
*K7DXX	18,200	133	43	9
KE2VB	16,785	155	39	6
*KX6X	11,233	82	39	8
*WA7NWL	5,225	93	22	3
*NØUD	1,273	32	17	2
*W9CF	44	4	3	1

IDAHO

*K7ARJ	7,448	85	36	2
*K7JAN	4,325	76	24	1
*W7TX	792	30	11	0

MONTANA

*K7QA	101,046	598	54	12
K7BG	65,142	427	55	8
KS7T	46,648	349	51	5

NEVADA

NF7R	54,714	335	53	13
KM6JD	36,736	285	48	8

OREGON

NX1P	164,290	681	53	17
W7YAQ	155,142	658	55	23
KA6BIM	140,154	698	55	16
W7EW	57,218	296	55	12
*W7MTL	20,636	196	41	3
W7IXZ	17,576	133	47	5

UTAH

*AC7JW	34,874	282	48	5

WASHINGTON

W7WR	31,416	208	47	9
*K7QBO	30,184	220	50	6
*W7LD	19,404	191	42	2
AA7MI	18,460	128	43	9
N7QS	14,916	138	40	4
KB7N	13,662	117	39	7
AD7XG	13,243	123	37	4
KD7UO	12,550	104	45	5
K5TRI	9,398	98	34	3
*KX7L	3,213	52	26	1
*WA7AXT	2,898	60	21	0
KI7DG	1,245	34	15	0
*WN7T	1,220	29	20	0
*NC7U	1,170	33	15	0

WYOMING

*W7SE	95,728	682	53	9

MICHIGAN

*NA8V	223,212	980	59	30
W8CUB	198,708	879	55	32
*WA1UJU	89,487	655	55	6
W8WA	81,504	442	53	19
*N8LJ	66,990	497	49	9
W8CO	39,396	189	46	21
*K7DR	37,752	320	48	4
*K8SIA	35,164	251	51	8
*NF8M	31,683	215	49	10
*W8TWA	28,662	229	45	6
*W8DCQ	28,545	207	48	7
K8GVK	18,256	113	42	14
*KE3K	15,488	148	42	2
*AC8CE	15,400	124	44	6
W8YV	7,590	100	33	0
*KB8TL	4,564	68	28	0
*W8RU	1,330	29	17	2
*K8TS	323	10	18	1

OHIO

K1LT	444,730	1269	59	51
W8CAR	201,705	940	58	27
*K8FH	194,876	910	59	27
*WB8JUI	142,652	780	58	18
K8MP	99,712	506	55	21
*K8RYU	84,024	451	55	17
*K8AAV	82,800	599	51	9
W8MET	72,480	536	53	7
*W8PEN	70,560	513	53	7
*N8HP	44,415	284	50	13
*WA8RCN	30,422	237	48	5
*AB8OU	24,735	195	44	7
*W8IDM	23,556	262	36	3
N8IL	22,848	134	43	13
*W8KNO	21,070	226	40	3
*ND8DX	17,649	103	39	14
*K8SVT	16,952	128	44	8
*KD8BB	11,800	124	37	3
*K8GIB	11,427	124	37	2
K8ALM	7,080	55	33	7
*W8ASA	5,310	75	29	1
*K8AB	3,875	64	25	0
K8AJS	2,783	47	22	1
*WV8P	1,160	20	29	0
*AF8C	976	26	16	0

WEST VIRGINIA

*N8II	54,594	435	46	8
WA8KAN	23,349	233	40	3

ILLINOIS

K9NR	215,946	1008	56	30
WS9V	214,396	945	59	32
K9FO	107,310	606	57	16
*K9QVB	80,652	530	56	10
*K9PG	61,116	387	55	11
*K9CS	58,351	432	51	8
*WA9AQN	51,708	338	51	11
NJ9R	49,848	328	54	8
*K9NO	49,392	320	54	9
*N9TF	45,811	317	54	7
*WB9HFK	44,574	326	49	8
*K9CQ	42,720	295	51	9
*WT2P	37,948	317	50	3
N9TK	37,804	320	47	5
*K9OR	37,620	280	51	6
KG9N	35,712	332	45	3
*K9IJ	32,395	244	50	5
*K9CW	28,594	192	51	7
*WB8BZK	24,908	200	47	5
NØFCD	22,734	172	47	7
*KC9UJS	21,216	170	45	6
*W9NXM	12,000	131	38	2
*K9PMV	11,934	138	37	2
*KA9CAR	8,840	100	38	2
*W9SE	8,246	77	32	6
*W9IE	8,214	98	35	2
*K9PY	7,548	79	34	3
*W9ILY	7,363	78	33	4
*N9LYE	4,530	65	29	1
*N9GH	1,752	35	24	0
*KD9MS	1,224	27	14	3
*WB9AYW	270	12	9	0

INDIANA

W9RE	476,856	1412	60	51
W9IU	237,986	971	56	33
*WD8DSB	72,930	461	54	12
*K9WX	68,864	463	54	10
*WØZP	51,576	400	50	6
*W9TC	31,900	213	46	12
*NT9M	31,152	223	51	8
*K9KJ	21,761	203	46	1
*K9GX	14,625	132	41	4
*W9MRH	9,082	111	37	1
*K9JWI	8,785	109	34	1
N4TZ	3,942	64	26	1
*KJ9C	1,634	34	19	0
*KU9V	4	1	2	0

WISCONSIN

K9MA	140,697	666	56	25
*W9XT	97,980	577	56	15
W9OP	88,872	544	56	13
*WE9V	53,863	379	52	9
*K9DJT	41,184	246	54	12
WS9W	31,472	229	48	8
ND9Z	17,415	169	39	4
*WW9R	11,521	127	40	1
*W9KHH	7,920	95	35	1
*W9EAU	6,018	84	33	1
WQ5O	3,441	42	36	1

COLORADO

KEØUI	65,142	437	52	11
NCØB	54,656	337	53	11
WØKIT	44,225	287	52	9
*KØKE	25,970	224	45	4
*AKØMR	3,399	43	31	2
*KØKR	1,980	42	21	1

IOWA

WØODS	174,717	857	58	23
*NØDQS	34,596	223	51	11
KØSRL	14,357	127	45	4

KANSAS

ABØS	69,874	495	54	8
WØBH	34,320	296	50	2
*KØVBU	25,092	211	46	5
*ADØAB	2,392	49	22	1

MINNESOTA

KØTT	239,752	1040	58	34
NEØU	158,697	857	57	20
*WØSEI	59,630	356	55	12
*KNØV	35,695	261	54	5
*NØOK	35,402	221	53	9
*KØTC	35,056	266	53	3
*KØMPH	34,104	275	52	4
KIØF	27,342	248	46	3
*K9HWL	22,568	123	52	10
*KEØTT	19,215	194	43	2
*NNØQ	18,198	141	48	6
NØBUI	18,160	200	39	1
*KØHB	2,943	53	27	0
NUØW	1,428	33	17	0
*NØUK	286	13	11	0
*W6NF	250	11	10	0

MISSOURI

NØTT	306,100	1087	58	42
*WAØBJR	124,269	797	56	13
*NZØT	44,997	382	48	5
*NWØM	35,204	299	47	5
*WBØPYF	27,702	213	54	3
*NIØR	20,874	182	45	4
*WØHBH	19,311	215	37	4
WØVM	18,800	149	44	6
*KØKL	14,736	112	40	8
*KCØHPM	8,435	110	34	1
KØWB	4,930	68	32	2

NEBRASKA

*WNØL	22,605	175	50	5
NFØN	15,134	142	43	3

NORTH DAKOTA

KØIDX	196,690	938	59	26

SOUTH DAKOTA

KDØEE	31,506	214	50	9

CANADA

NEWFOUNDLAND

*VO1NA	530	11	7	3

LABRADOR

*VO2AC	328	10	8	0

NEW BRUNSWICK

VE9CB	459,000	792	57	45
VE9AA	113,764	323	47	21

PRINCE EDWARD ISLAND

VY2ZM	1,893,002	1811	58	84
VY2LI	72,157	242	42	17

QUEBEC

*VE2AWW	182,336	466	52	25
*VE2UMS	22,680	165	30	0
*VE2HLS	19,584	124	30	4

ONTARIO

CG3AT	658,130	1154	60	50
*VE3DZ	531,700	1053	60	40
VE3PN	350,888	713	55	37
*VE3MGY	311,448	835	57	19
VE3KP	226,884	640	55	18
*VE3VSM	219,714	690	57	9
*CF3FF	156,744	587	51	5
VE3KZ	150,008	461	56	12
VE3BR	120,960	397	51	12
*VA3ATT	108,702	369	51	10
*VA3KAI	103,005	337	50	13
*VA3EC	99,946	354	52	7
CG3KI	83,391	302	45	12
*VE3WG	78,650	301	50	5
*VE3MA	58,052	271	44	2
*VE3TW	52,875	245	39	6
*VE3SB	26,488	132	38	5
*VE3GFN	23,750	136	36	2
*VA3FN	22,104	130	36	0
*VE3HG	21,672	108	41	2
*VE3XL	19,775	116	31	4
*CF3ZNW	17,216	119	31	1
*VE3PJ	16,170	102	34	1

MANITOBA

VE4EA	83,190	300	53	6

SASKATCHEWAN

VE5UF	146,916	481	54	9

ALBERTA

VE6BBP	219,390	635	55	16
VE6KC	48,018	188	49	4
*VE6TK	16,440	91	38	2
*VE6UM	4,050	35	23	2

BRITISH COLUMBIA

VE7JKZ	96,387	344	48	9
*VE7SL	70,151	247	51	8

NORTH AMERICA

Alaska

*KLØS	2,080	16	1	15

Bahamas

*C6AGU	1,103,556	1464	59	64

Belize

*V31YN	261,000	530	52	38

Cayman Islands

ZF9CW	1,743,792	1980	59	77

Cuba

*CO2JD	90,475	322	46	9
*CO8ZZ	11,060	75	21	7

Dominican Republic

*HI3Y	18,690	84	34	8
*HI8A	16,796	81	24	14

Martinique

FM5BH	93,978	244	42	27

Mexico

XE2X	853,180	1226	57	59
*XE2MVY	17,797	97	33	4
*XE2OK	627	12	9	2
*XE1H	30	2	0	2

Puerto Rico

*KP3W	2,185	20	14	5

U.S. Virgin Islands

KP2M	861,120	1131	56	59
NP2J	368,300	648	56	44
*KP2BH	35,853	135	38	13

AFRICA

Canary Islands

*EA8BQM	1,067	11	1	10

Mali

TZ4AM	856	12	0	8

Tanzania

5H3EE	1,500	15	0	10

Tunisia

*3V8CB	427,180	822	6	46

ASIA

Asiatic Russia

UA9BA	277,750	540	0	55
RK9AX	204,912	465	0	48
RW9CD	130,416	321	0	44
UA9QM	130,080	363	0	40
R8CA	112,455	277	0	45
*RA9CCK	65,184	231	0	32
RW9SW	62,868	169	0	39
*UA9AB	33,046	123	0	31
*RK9AY	20,999	98	0	23
*R9AB	18,348	100	0	22
RU9CC	17,732	97	0	22
*RAØLQ/MM	16,050	98	0	30
*R9SS	14,991	90	0	19
*RJ9M	14,872	71	0	26
*UD8A	6,383	61	0	13
*RV9UDO	4,400	63	0	11
*UA9ADG	3,825	24	0	17
*RG8U	2,392	34	0	13
*RAØLMK	1,092	31	1	6
RAØL	828	28	0	6
*UA9NP	360	22	0	4
*RDØL	240	6	0	6

Asiatic Turkey

TA3D	864,652	1162	10	66
TA2SE	2,720	28	0	10

Azerbaijan

*4K6FO	61,380	178	0	36

Bahrain

A93JA	4,400	32	0	16

China

BD5XX	12,208	144	3	13
*BA4QO	1,606	25	0	11

Hong Kong

*VR2EH	2,695	43	0	11

Israel

4Z5LY	154,035	356	0	45
4X1IM	8,840	48	0	20
*4Z4KX	3,570	22	0	17

Japan

JH4UYB	320,292	511	22	60
JA5DQH	101,584	238	20	36
JI3KDH	66,144	218	17	31
JA7QVI	51,832	139	18	26
JA2IVK	36,297	162	13	24
*JR4CZM	27,336	153	13	21
JH6QFJ	26,810	95	6	29
JK1OPL	23,880	67	13	27
JA6LCJ	23,374	118	9	22
JA1DUH	20,596	64	13	25
JA7ACM	19,040	97	12	16
*JE1SPY	18,816	140	13	15
JH1QDB	18,600	70	9	22
JK1MZT	17,280	61	12	20
JA9FHB	16,920	72	12	18
*JA1SVP	13,832	80	13	15
JH1HDT	12,035	42	5	24
JO7KMB	10,695	97	8	15
JH7FMJ	10,500	43	10	18
JA1KVT	9,802	44	11	15
JN7FAH	7,986	67	4	18
JM3GXU	7,486	69	6	13
*7N1BHO	7,353	91	9	10
JA1IXY	6,930	49	8	14
JR2PMT	6,390	67	5	13
JA6FFK	6,100	43	8	12
*JQ1COB	5,382	43	8	10
*JH2KKW	4,750	45	8	11
*JR1MEG	4,608	113	5	7
JR2UBS	3,975	34	2	13
*JA1EMQ	3,859	31	6	11
JA1JAT	3,280	24	4	12
JE1KUC	2,870	26	4	10
*JA6FCL	2,587	48	2	11
*JH2GZY	2,366	36	5	8
JA1FNO	1,935	19	2	13
JA1ZGP	1,701	64	4	5
JA1GVM	1,586	15	4	9
JA1FGB	1,449	35	1	8
JHØGHZ	1,400	19	1	9
JR1IJV	1,265	15	4	7
*JA2FGL	750	11	3	7
JA1IZZ	640	10	2	6
*JA6CYL	636	37	1	5
*JH1XUM	595	11	0	7
*JA1UXV	553	16	1	6
*JH4FUF	511	21	1	6
*JK1THE	510	36	3	2
*JA2QVP	456	8	2	6
JI1AVY	420	14	3	4
*JA1HOM	390	8	3	3
*JA1CP	380	35	1	3
JA3ENN	240	5	0	6
*JA7KQC	240	5	2	4
*JF1KWG	228	31	0	3
JH1NXU	216	20	1	3
*JH2JNU	120	9	0	4
*JE4URN	100	5	0	4
*JA1BBC	96	24	0	2
JR1WJM	74	14	0	2
*JF1OPO	42	9	0	2
*JH1UES	20	10	0	1
JA6CDC	10	1	0	1
*JF2IWL	10	5	0	1
*JE1ILP	6	3	0	1

Kazakhstan

UN5J	13,580	80	0	20
*UN7CN	6,540	57	0	15
*UN7TW	2,475	20	0	15
*UN6TA	1,490	22	0	10
*UN7FW	1,092	28	0	6

Republic Korea

DS4EOI	7,600	145	2	8

Saudi Arabia

*HZ1TL	5,643	32	0	19

Taiwan

BV1EK	50,388	233	13	21

Thailand

*HS3XVP	190	8	0	5
*E21EIC	165	8	0	5
*HS3ANP	28	3	0	2

West Malayasia

*9M2/JE1SCJ	2,220	20	0	12

EUROPE

Aland Islands

OHØR	97,850	378	2	48

Albania

ZA/OH2BH	70,090	319	0	43

Austria

*OE2GEN	52,624	237	0	44
*OE1CIW	7,340	74	0	20
*OE6TTD	420	9	0	10

Azores

CU9AB	14,450	46	23	11

Balearic Islands

EA6VQ	207,846	755	1	53
*EA6ZS	376	9	0	8

Bear Island

JW2US	17,690	111	1	28

Belarus

EU4E	438,600	1123	12	63
*EU2EU	353,476	885	9	67
EU3AA	220,675	654	2	63
*EU1AA	204,568	780	1	51
*EU3AC	169,218	520	3	60
EW3LN	157,560	599	0	52
*EU8A	134,004	502	0	52
*EU1U	133,680	550	1	47
EW8OM	104,664	498	0	42
*EU8F	100,317	388	0	51
*EW8RR	89,640	319	3	51
*EW1TO	73,264	391	0	38
*EW8NB	61,737	320	0	39
*EW2ES	50,422	302	1	33
*EU6AA	47,838	286	0	34
*EU8R	38,988	204	0	38
*EW8Z	13,064	118	0	23
*EU1FQ	12,360	81	0	30
EW2DZ	11,644	51	0	41

Belgium

*ON7EH	432,180	959	24	60
OR3A	61,920	271	1	44

Bosnia-Herzegovina

*E74R	448,092	1059	15	66
*E74Y	118,972	479	0	49
*E77W	53,710	26	20	41
*E78T	44,320	218	0	40

Bulgaria

LZ1GU	107,749	395	1	52
*LZ4SU	315	7	0	7

Crete

SV9COL	18,886	97	1	37

Croatia

*9A3JH	374,706	880	16	65
*9A3B	224,620	805	2	53
*9A2XW	23,695	135	0	35

Czech Republic

OK7K	803,565	1337	37	68
*OK7Y	265,923	795	11	56
*OK1AXB	240,932	788	10	52
*OK2HBR	163,872	707	2	46
*OK1HFP	162,631	683	2	47
OK5ET	153,153	485	3	60
OK2EQ	152,874	574	3	51
*OK1DKR	151,960	536	8	50
*OK1FGD	146,115	679	0	45
OK2QA	144,828	549	3	51
OK1P	142,953	575	7	44
*OK2PVX	126,028	533	1	48
*OK1FMX	116,304	499	1	47
*OK3EQ	111,241	536	0	43
*OK1MMN	109,200	452	2	48
*OK2GG	102,800	428	2	48
*OK6Y	92,880	428	0	45
*OK1DPU	90,515	442	0	43
*OK2QX	82,328	427	0	41
*OK1GS	70,746	381	1	38
*OK2PBG	65,943	261	2	49
OK7GU	63,848	282	2	44
*OK1MKU	55,304	159	7	55
*OK1DST	46,600	246	0	40
*OK2R	45,584	261	0	37
*OK1UKV	43,602	238	0	39
*OK1XC	36,180	214	0	36
*OK2BME	33,626	201	0	34
*OK1MGW	31,208	126	1	46
*OK6N	21,708	121	0	36
*OK2VV	20,790	133	0	33
*OK1AUC	15,090	102	0	30
*OK2SGW	7,392	67	0	24
OK1DW	1,045	12	1	10
*OK2ABU	364	11	0	7

Denmark

OZ8AE	291,760	796	12	58
OZ3SM	244,260	811	8	51
OZ8SW	145,400	576	1	49
*OU2I	99,984	413	2	46
*OZ1AAR	71,274	340	1	41
*OZ6KS	15,631	108	1	28
OZ7YY	11,634	43	2	40
*OZ5UR	2,736	31	0	18

England

G6M	605,500	1047	38	62
M3I	488,808	917	38	55
G3OLB	290,763	538	38	51
*G3LET	202,410	441	33	45
G4AMT	196,794	341	38	49
G4KZD	141,050	569	4	46
*G2X	140,400	540	6	46
G3VGZ	135,675	379	17	50
*M4X	103,432	355	8	48
G4BUO	99,246	391	4	47
M7Z	94,846	403	2	45
*G3RLE	72,820	332	0	44
*G3RSD	47,418	228	2	40
*G3VYI	39,560	185	0	43
*G4DDL	33,263	186	0	37
*G3VIR	24,520	122	1	39
*G6GLP	9,280	44	2	38
G4BWP	10	1	0	2

Estonia

ES1BH	89,354	410	0	43

European Russia

R7NW	532,300	1011	19	81
UA5C	469,392	1102	6	78
RG6G	375,176	760	19	73
RK3ZZ	291,252	755	8	70
UA3EDQ	273,520	859	4	61
UB3A	248,744	750	2	66
RD4A	246,180	742	3	63
UA6CC	239,936	775	0	64
R3ZZ	227,964	711	2	64
*RA3Y	221,160	760	1	59
R3FX	203,348	736	2	56
RZ3MM	195,078	678	2	59
*RT3K	171,808	614	1	58
*R7KR	161,730	632	2	52
RG3K	158,804	563	1	57
*RV3A	152,817	554	1	56
*UA5F	147,628	610	0	52
RD4F	134,734	470	1	57
*UA1TAN	124,146	479	1	53
RZ3AV	116,840	548	0	46
R1NW	116,702	549	0	46
*R6CC	111,027	458	0	51
*RQ3M	95,535	361	1	54
RT2D	92,120	391	0	49
RK3DK	88,176	420	0	44
R3OM	81,915	424	0	43
*UA1CUR	80,440	433	0	40
*UA4AAC	76,685	337	1	48
*RW4HS	71,463	370	0	41
RW4NN	66,939	245	0	53
*RA3XCZ	65,480	350	0	40
RG4A	59,224	283	1	43
*UA6JQ	57,104	273	4	39
RA4HPI	56,674	271	0	43
*R7KX	56,440	308	1	39
RA3NC	51,402	290	0	39
*RK4S	50,654	245	0	43
*R3OQ	50,360	275	0	40
*RU4AA	41,551	242	0	37
UA9FGJ	40,521	196	0	39
*RD3R	38,808	188	0	44
*RZ3DW	36,989	163	0	47
UA4FER	35,700	222	0	35
*R7KH	35,280	223	0	35
*R2EA	34,077	183	1	36
*RV3WT	33,012	201	0	36
*RC5Z	29,750	190	0	34
RZ3AL	29,115	117	0	45
RA6XB	28,509	154	1	38
*RW7M	27,636	103	3	46
RM4HZ	25,004	194	0	28
RA3EA	24,462	200	0	27
*RX3VF	24,360	210	0	28
*UA4HBM	24,174	128	0	34
*UA3YDI	23,688	197	0	28
*RA6C	22,923	188	0	27
*RN3P	22,904	175	0	28
*RU6CO	21,792	150	0	32
*RN4W	19,406	140	0	31
*R2PT	16,096	103	0	32
*UA4CNJ	15,870	156	0	23
UA6J	14,769	126	0	27
*RX3AEX	14,625	132	0	25
RM7G	14,587	114	1	28
*RA4ACX	14,398	137	0	23
*R4FA	14,196	111	0	28
*RN4HAB	10,512	136	0	18
UC5G	9,775	93	0	23
RC2A	9,703	65	0	31
*UA6HFI	9,312	89	0	24
*UA3YGP	8,970	95	0	23
*RX3MM	5,206	54	0	19
*UA4NCI	4,606	73	0	14
*R2AHS	3,808	49	0	17
*RA4UAT	2,329	17	1	16
*R2DEM	2,280	33	0	15
*UA3NFI	1,989	45	0	13
*R9XS	1,896	37	0	12
*UG3G	1,876	31	0	14
*R1QE	1,210	28	0	11
*RU6B	1,170	13	1	12
*R3AQ	1,128	22	0	12
*RA6WF	968	27	0	8
R6AW	935	11	0	11
*UA4FDL	670	35	0	5
UA1CGS	513	10	0	9
*UA6AUA	416	9	0	8
*RD1D	369	10	0	9
*UA3LG	125	5	0	5
RU9F	105	4	0	3
*R4AJ	75	8	0	3
*R3XA	60	3	0	4
*UA4NC	58	4	0	2
*R7FL	30	2	0	2
*RA4UF	10	1	1	0
RV3FT	10	1	0	2
UA6LPY	1	-4	2	0

European Turkey

*TA1CM	1,955	22	0	17

Finland

OH2YL	300,948	953	4	58
OH8NW	228,513	790	3	54
OG2W	179,979	689	1	50
*OF2FUW	134,309	544	1	48
OG6N	122,907	455	1	52
*OH5TS	116,231	493	1	46
*OF1RX	101,150	408	1	49
OF5C	62,600	307	0	40
OH2XX	57,420	309	0	36
*OH2NC	52,950	205	0	50
*OH7GGX	44,240	258	0	35
*OH3KQ	41,548	248	0	34
OH2PM	33,370	132	0	47

France

TM5X	650,839	981	43	66
F6GOX	395,577	784	32	59
F/G4BJM	226,662	578	20	54
F5BBD	63,309	265	4	43
*F1FPL	47,432	186	4	45
*F6FTB	18,550	107	1	34
*F3WT	1,530	19	0	15

Germany

DL1AUZ	627,105	1246	33	64
DK9IP	571,650	1090	32	71
*DF1MM	460,460	1018	27	65
DK3WW	436,694	912	26	71
*DK2FG	401,871	840	27	70
DL1SMA	352,252	888	20	63
DM5N	259,630	803	14	56
*DJ7WW	257,460	621	24	60
*DL6KWN	224,768	766	11	53
DL2SWW	202,235	802	7	48
DK1NO	198,372	696	9	52
DL1GBQ	197,396	718	6	55
DJ8QP	190,380	740	10	47
*DLØMHD	188,356	660	11	51
*DK5AI	155,382	584	7	51
*DL1DXA	148,738	509	6	56
DK5AD	139,672	591	4	48
*DL2F	132,848	659	0	46
*DL4AUK	129,762	547	3	51
DM2TO	123,640	495	2	53
*DL4WA	120,054	534	2	49
*DD5M	117,676	497	6	46
*DJ3RA	116,266	399	13	48
*DL4ZA	106,428	496	2	47
*DJ9CN	103,290	397	5	50
*DL6UD	101,970	517	1	44
DKØSU	101,244	424	4	48
*DL1EKO	100,929	435	1	50
DJ6ZM	93,192	269	22	44
DL5YM	92,925	448	2	43
DL1DTL	91,851	392	3	48
DL2OM	91,238	405	3	46
*DL1DWR	85,652	407	2	44
DL1KWK	80,650	343	0	50
*DK5DQ	73,440	369	1	44
*DJ9SN	64,845	324	1	44
*DF5BM	64,739	359	0	41
*DH2URF	64,504	320	0	44
*DL6NCY	60,329	308	0	43
*DJ4MH	59,204	340	0	41
*DD7NT	58,032	252	3	45
*DL1MAJ	54,678	313	0	39
*DG7EE	52,302	247	0	46
*DF6RI	51,831	304	0	39
DJ1YF	51,800	293	0	40
*DL1AVA	49,950	248	2	43
*DL2AJB	49,488	221	0	48
*DL3AMI	46,658	248	0	41
DF6PB	46,481	164	5	48
*DL6ZBN	45,200	249	0	40
*DL9UJF	44,450	288	0	35
DL6SRD	39,380	192	1	43
DL8DYL	37,620	228	0	38
*DK3YD	36,852	221	0	37
DL1RNT	34,104	172	2	40
*DL1QQ	33,263	202	0	37
DM3ZF	31,948	130	4	45
*DM5JBN	31,278	183	0	39
*DL1HSI	30,560	171	0	40
DK3GI	30,205	194	0	35
DL1HUH	29,281	122	2	45

*DL2AWA	29,106	196	0	33
DL7LX	29,094	157	2	37
DLØDRL	27,291	183	0	33
*DL4SZB	25,828	129	1	43
*DL1ATZ	25,795	161	0	35
DFØSAX	25,377	171	0	33
*DF1XC	22,890	147	0	35
DLØFR	22,836	153	0	33
DQ5M	22,715	145	0	35
*DJ8EW	22,085	145	0	35
*DL2AL	20,640	147	0	32
DC9ZP	20,576	140	0	32
*DL6RBH	20,130	138	0	33
DL6ZXG	19,240	105	0	37
DK2WU	18,900	119	1	34
*DO2XX	17,876	100	0	41
*DKØMN	17,118	152	0	27
*DP5W	16,800	138	0	28
*DL7VMM	16,095	123	0	29
*DL2AXM	15,988	134	0	28
*DK7GH	15,120	90	0	35
*DL5CL	14,760	79	1	35
*DK6CS	14,663	105	0	31
*DL2ZA	14,490	101	1	29
*DJ7OQ	14,048	88	0	32
*DK3DUA	13,717	106	0	29
*DL7YAD	11,418	72	5	28
*DJ3CS	11,370	79	0	30
*DJ2YE	10,660	102	0	26
*DM3XI	10,621	44	1	42
*DK6SP	9,984	67	0	32
*DO2MS	9,773	83	0	29
*DL5JS	9,438	86	0	26
*DG7RO	7,514	67	0	26
*DD5MA	7,475	70	0	25
*DG7NFX	6,808	70	0	23
*DM2ORI	6,554	47	0	29
*DL3CB	6,258	74	0	21
DL9MRF	6,110	36	3	23
*DK9ZQ	5,302	65	0	22
*DL2GAN	4,318	61	0	17
*DL6GCE	4,284	53	0	18
*DL4SL	4,224	39	0	22
*DL8MAS	4,176	53	0	18
*DL1RPR	4,080	45	0	20
*DL4VAI	2,784	41	0	16
*DH6YAG	2,584	28	1	18
*DK6WA	2,430	32	0	18
DL5KVV	2,328	69	3	9
*DLØGEO	1,812	35	0	12
*DL1HBT	1,442	23	0	14
*DL6EZ	1,358	23	0	14
*DO5LW	414	11	0	9
*DLØNG	224	7	0	7
*DL5HP	124	8	0	4
*DF4MAA	36	3	0	3
*DJ8OG	36	3	0	3
*DC2CL	20	2	0	2
Greece				
*SV1NZX	2,397	29	0	17
Guernsey				
GU4YOX	887,985	1439	41	64
Hungary				
*HA4XH	435,003	985	27	56
HA8BE	397,012	996	11	66
*HG6O	157,029	623	0	51
*HA8WY	142,239	549	1	50
*HA4YF	122,010	504	1	48
*HA5MA	109,800	492	0	45
HA7LW	48,945	255	0	39
*HA3YE	16,940	125	0	28
HA7JQK	1,521	24	0	13
Iceland				
*TF3EO	5,060	47	0	22
Ireland				
EI5KF	767,016	1133	45	61
*EI5KG	16,948	83	2	36
*EI3CTB	117	9	0	3
Italy				
IZ2KXC	313,804	819	15	61
*IK2CLB	213,525	570	16	57
*IZ5ICH	185,808	675	2	54
*IV3AZV	144,081	458	3	60
*I2WIJ	133,574	461	3	55
*IV3CYT	93,168	393	1	47
IK4ZGO	62,156	298	0	41
*IV3BCA	57,408	272	2	44
*IK2AHB	53,621	251	2	41
*IK7MIY	40,964	172	0	49
IZ4OSH	38,272	174	0	46
IZ3GNG	37,842	147	4	47
IV3HAX	34,265	201	0	35
*IK3SSJ	26,145	154	0	35
*IW8FFX	24,200	120	0	40
*IV3EPO	19,762	97	0	41
*IZ2FME	15,570	111	0	30
*IZ1GLX	15,428	113	0	28
*IKØEIE	13,545	73	0	35
*IW2FUT	13,203	98	0	27
*IN3MNS	10,998	92	0	26
IZ3KIF	10,920	70	0	30
*I6FDJ	10,848	91	0	24
*IZ1WTO	3,060	36	0	17
*IK2IKW	2,376	27	0	18
*IK2SYK	2,064	26	0	16
*IZ2CSX	1,656	18	0	18
IZ8HUJ	975	9	1	12
IZ3BSU	690	10	0	10
IKØXEZ	378	6	0	9
*IK2AIT	68	4	0	4
Kaliningrad				
*RA2FB	76,692	358	0	42
RA2F	72,384	368	0	39
*RA2FX	33,728	220	0	31
*RN2FQ	13,891	97	0	29
Latvia				
YL2SW	449,934	1030	12	70
*YL2TD	134,326	556	1	46
*YL2GP	37,518	200	0	37
YL2SM	31,248	198	0	31
*YL3GAZ	29,886	174	1	33
Liechtenstein				
*HBØ/DL5SE	347,760	921	17	55
Lithuania				
LY2NK	340,275	1021	4	61
LY4T	337,415	1016	5	60
*LY4L	273,360	906	5	55
LY2IJ	136,360	471	1	55
*LY2OU	109,650	426	2	49
*LY2OM	99,311	427	0	47
*LY1FK	88,880	449	0	40
*LY2H	49,946	299	0	34
*LY4R	33,088	143	1	46
LY3BA	31,651	208	0	31
*LY2NZ	31,620	212	0	31
*LY2EW	27,090	189	0	30
*LY2ND	19,278	150	0	27
*LY7Z	11,472	100	1	23
LY9Y	7,587	54	0	27
*LY2TA	4,266	51	0	18
Luxembourg				
LX1NO	64,470	304	0	42
Netherlands				
PA5KT	260,400	588	25	55
PAØBWL	253,863	725	18	49
PAØQX	86,715	424	3	38
*PE2JMR	80,520	251	9	51
PA5TT	61,495	254	0	49
*PAØTCA	42,789	152	10	41
*PA2W	35,630	205	0	35
PAØWRS	30,973	122	8	39
*PA3BWK	17,794	114	0	31
*PA3I	13,257	100	0	27
*PAØINA	9,538	49	1	37
*PAØRBA	6,314	58	0	22
PA3AKE	1,284	12	3	9
Northern Ireland				
MIØBPB	70,596	247	13	40
Norway				
*LA3BO	189,210	730	1	50
LAØCX	90,601	420	0	43
*LA8OKA	18,570	125	0	30
*LA9DK	7,800	60	0	26
*LA6XI	4,640	46	1	19
*LA2WRA	30	2	0	2
Poland				
SP3HLM	446,165	1024	18	67
SP2LNW	320,991	878	12	59
SP9FKQ	208,278	719	2	56
*SN2K	192,940	698	2	53
*SP3JUN	147,100	604	2	48
SP5AUC	145,584	625	0	48
*SP9JZT	105,478	468	1	45
SQ1OD	104,156	402	4	48
*SP9DLY	87,480	394	1	44
SQ9V	83,899	303	8	45
SP6AEG	82,732	314	2	50
*SO7M	82,044	393	0	43
*SQ3WW	71,472	301	1	47
*SP9FMP	71,393	289	1	48
SP2XX	70,305	325	2	41
*SP2TMT	52,377	280	0	39
*SP4GHL	44,650	238	0	38
*SP9RI	41,580	242	0	35
*SQ9FMU	40,775	238	0	35
*SO3F	21,504	97	0	42
*SP3AMO	13,630	96	0	29
*SP1JRF	9,918	69	0	29
*SO1RE	5,904	50	1	23
*SP9EML	5,434	49	0	22
*SP6TRH	4,655	52	0	19
*SP2HMN	3,480	35	0	20
*SQ7LQJ	1,904	23	0	17
*SP6A	1,456	27	0	14
SN6A	30	2	0	2
Portugal				
CS2C	1,218,780	1497	48	74
CT1EAV	8,029	40	0	37
*CT1EXR	20	2	0	2
Romania				
YO5KLD	232,176	818	1	55
YO9AYN	176,165	631	1	54
*YO2NAA	121,662	444	1	53
*YO8AXP	89,775	396	1	44
*YO5DAS	75,600	362	0	42
*YO2BLX	66,486	315	0	42
*YO5NY	64,116	330	0	39
*YO3JOS	49,140	254	0	39
*YO2CEQ	48,204	246	1	38
*YO9RIJ	17,408	101	1	33
*YO6HSU	10,088	78	0	26
*YO8SAO	9,405	101	0	19
*YO4SI	5,833	64	0	19
*YO4MM	4,097	50	0	17
Scotland				
GM4Z	438,515	885	33	52
GM9N	21,156	93	0	43
Serbia				
*YT8A	336,311	896	8	65
*YT4T	146,880	567	5	46
*YU7AU	116,685	519	0	45
*YU1ED	70,034	368	0	38
*YU1JW	61,614	292	0	42
*YU1FG	56,088	273	0	41
*YT2U	5,865	49	0	23
YU1ZZ	1,216	17	1	15
Sicily				
*IT9PZM	60,113	253	1	46
*IT9RDG	30	2	0	2
Slovakia				
OM7RU	422,484	1063	11	65
*OM3ZWA	213,945	831	1	50
OM3IAG	205,740	672	6	54
*OM5WW	179,950	723	1	49
OM3PA	172,975	626	1	54
*OMØDC	144,228	561	2	49
*OM7AG	109,822	514	0	43
*OM2XA	106,000	413	2	48
*OM8LM	104,676	480	0	44
*OM8HG	96,554	419	0	46
*OMØCS	86,044	345	1	48
*OM3R	69,750	308	0	45
*OM2DT	53,300	207	2	48
OM5VS	40,992	190	1	41
OM7JG	17,784	89	0	39
*OM3CDN	17,712	136	0	27
*OM2MM	16,068	51	4	48
*OM3SX	10,370	54	0	34
*OM4AY	9,960	86	0	24
Slovenia				
S57C	285,480	936	10	51
*S51DX	230,472	860	3	51
S50A	158,256	419	15	57
S51RE	128,208	532	2	46
S53A	77,750	293	12	38
*S57NAW	70,515	316	0	45
*S57WJ	63,760	324	0	40
*S59D	14,016	93	0	32
*S51J	8,320	88	0	20
*S51VA	902	11	1	10
*S52TI	880	12	0	20
Spain				
EA1DAV	484,704	839	40	59
EA2LU	148,746	349	23	55
*EA3KU	61,318	267	0	46
EA5CI	22,896	70	4	49
*EE4A	9,773	70	1	28
*EA2SW	4,860	47	0	20
*EA5DFV	3,417	41	0	17
*EA1CM	30	2	0	2
*EA5IMM	14	2	0	2
Sweden				
SMØHRP	319,130	873	10	60
SM6CPY	254,843	662	15	58
SM5Q	46,395	200	0	45
SB3W	39,900	222	0	35
*SB7W	21,888	120	0	36
*SM5DXR	20,100	136	0	30
*SM6IQD	16,290	109	1	29
*SAØBXV	6,825	68	0	21
*SI5Y	2,955	40	0	15
SM7BHM	1,952	25	0	16
SM4OTI	252	6	0	6
Ukraine				
UX1UA	473,248	966	16	76
UX2X	458,516	1115	17	62
*UX1UX	325,992	963	5	63
UY5VA	301,000	835	4	66
UYØZG	291,994	670	19	64
US7VF	267,960	810	1	65
*UT5AX	213,850	662	2	63
UT3QU	192,930	659	1	58
*UR5MM	173,362	604	1	57
UT7NY	172,980	588	4	56
UR4LRG	150,180	525	0	60
*UT1US	142,274	501	3	55
*US0HZ	128,700	533	0	50
*UT8IM	125,200	515	1	49
*UX3HA	116,282	458	1	52
*UZ5UA	106,304	508	0	44
*UT5T	101,479	431	1	48
*US7IY	100,234	442	0	46
UT5VX	99,225	460	0	45
UT7VR	95,294	323	2	56
US0SY	94,450	385	3	47
*UY2UQ	94,080	481	0	42
*US4EX	87,256	344	0	52
US7IA	86,428	448	0	41
*UT5PY	84,280	445	0	40
UX1VX	81,926	363	0	46
*UT7KF	78,752	359	0	46
*UT1V	73,778	438	0	37
*UW2Q	69,540	400	0	38
*UT2QQ	62,648	315	0	41
*UT7QB	59,459	346	0	37
*UT4EK	58,065	370	0	35
*UT2WQ	57,798	321	0	38
*UT8MM	56,339	292	2	51
*UT7LW	54,405	292	0	39
*UR7CB	51,264	311	0	36
*UX3UV	50,694	333	0	34
*UTØCK	43,626	288	0	33
US7IM	34,884	184	0	38
UW2ZM	34,400	159	0	43
UR8GX	32,165	190	0	35
*US3IZ	30,944	204	0	32
*UT3IA	29,045	162	0	37
*UR5ZW	24,840	192	0	30
UR4MVJ	23,556	85	0	52
*UT5UQV	21,025	141	0	29
*UT5EPP	20,860	162	0	28
*UT7EL	20,460	126	0	33
*UT9EZ	19,401	147	0	29
*UT2EF	19,300	181	0	25
*US5ELM	18,340	100	0	35
UT3UV	17,100	120	0	30
*UT2AB	15,500	101	0	31
*UT7MR	12,892	119	0	22
*UTØEK	11,592	83	0	28
*UR5CML	11,100	55	1	36
*UT5URW	10,773	83	0	27
*UR1YAA	10,076	98	0	22
*UY5TE	7,714	95	0	19
*UR5AO	5,727	55	0	23
*US5EOI	5,589	37	0	27
*UR7ZO	5,434	48	0	22
*UW7CN	1,275	18	0	15
*UR3IQ	700	10	0	10
*US6IKF	140	4	0	4

OCEANIA

Australia				
VK6LW	47,804	132	12	26
VK3IO	15,314	89	8	11
VK2GR	2,550	20	4	13
Guam				
KG6DX	30	3	0	1
Hawaii				
*WH6YH	23,100	70	30	3
*NH6AH	1	-2	2	1
Indonesia				
*YB1UUU	180	9	0	4
*YB1CYD	164	7	0	4
*YC1COZ	90	6	0	5
Philippines				
*4F2KWT	420	7	1	5
Samoa				
5W1SA	280	9	1	3

SOUTH AMERICA

Brazil				
*PY2KC	57	4	0	3
Chile				
*XR2K	20	2	0	4
*CE2LML	1	-2	0	2
Colombia				
HK1MW	61,183	107	41	18
Ecuador				
*HC2AO	349,948	399	51	38
Paraguay				
ZP5DBC	1,300	12	4	9
Venezuela				
*YV6BXN	2,106	18	4	9
YV5IAL	1,742	17	4	9
*YV4BCD	343	8	1	6

QRP

NORTH AMERICA

UNITED STATES

MAINE				
W1CEK	442	14	13	0
MASSACHUSETTS				
W1TW	18,330	147	39	8
K1SX	15,429	170	34	3
W1RGA	3,800	80	20	0
NEW HAMPSHIRE				
KN1H	10,816	136	30	2
W1FMR	8,704	108	27	5
NEW JERSEY				
W2ID	51,116	420	46	6
W2JEK	6,264	101	25	2
DELAWARE				
AE3J	2,622	45	23	0
PENNSYLVANIA				
K3HX	12,402	136	36	3
ALABAMA				
N4AX	31,211	209	48	11
FLORIDA				
K3TW	30,264	231	41	11
AI2S	5,115	68	24	7
GEORGIA				
AA4GA	35,112	266	47	9
W4QO	8,960	99	36	4
NA4O	1,512	33	20	1
KENTUCKY				
K4TO	37,140	252	50	10
NORTH CAROLINA				
AA4XX	87,788	532	52	16
SOUTH CAROLINA				
K2XN	2,808	44	23	3
TENNESSEE				
WB4GHZ	18,000	175	41	4
VIRGINIA				
N4UA	83,655	537	51	14
W1IE	1,936	38	22	0
W7HJ	868	28	14	0
KC4ZA	680	28	10	0
TEXAS				
W5/MMØLID	54,693	383	51	8
N5OE	12,423	135	39	2
CALIFORNIA				
W6MZ	4,758	83	24	2
K2GMY	432	27	8	0
ARIZONA				
N6HI	100	10	5	0
OREGON				
KF7WNS	710	31	9	1
UTAH				
K9JWV	14,104	140	40	3
WASHINGTON				
W7DRA	1,862	56	14	0
MICHIGAN				
W8GP	45,024	351	51	5
N8LR	10,956	139	32	1
KT8K	3,726	63	27	0
OHIO				
AC8AP	5,704	80	31	0
WEST VIRGINIA				
K8OWL	4,272	74	24	0
ILLINOIS				
NN9K	20,629	191	48	1
W9QL	5,191	76	28	1
WO9S	4,400	76	25	0
INDIANA				
W9CC	24,960	223	45	3
WISCONSIN				
AF9J	3,013	58	23	0
COLORADO				
KIØII	1,760	41	19	1
KANSAS				
NSØR	50	5	5	0
MINNESOTA				
NØUR	11,324	125	36	2
CANADA				
ALBERTA				
VE6EX	6,003	57	23	0

ASIA

China				
BA4II	141	10	0	3
BA7CK	135	6	0	5
Japan				
JH4CES	1,036	42	1	6
JA6GCE	1,022	53	0	7
JR1UJX	828	54	2	4
7K1CPT	198	45	0	2
JK1TCV	75	3	2	1

EUROPE

Austria				
OE1XTU	675	15	0	9
Belarus				
EU6DX	38,488	229	0	34
EW1P	10,680	93	0	24
Bosnia-Herzegovina				
E77CV	124,600	491	0	50
Bulgaria				
LZ1ND	1,812	30	0	12
Czech Republic				
OL4W	183,820	733	1	51
OK1FKD	133,008	583	1	47
OK5WF	114,724	521	0	46
OLØA	100,107	422	1	48
OK2BYH	78,816	337	1	47
OK1ES	72,634	330	1	45
OL9R	33,559	193	0	37
England				
G3YMC	7,659	74	0	23
G4GIR	2,680	25	3	17
European Russia				
RN1CW	78,468	310	2	50
UA3DJG	48,322	288	0	37
RW3AI	13,202	132	0	23
R3XAA	13,133	136	0	23
RT4W	11,956	100	0	28
RA3DJA	6,678	98	0	18
RU6MO	4,932	66	0	18
R3EE	4,000	64	0	16

Germany

DL3TU	86,296	425	1	45
DL2TM	43,919	280	0	37
DJ1YFK	19,437	150	0	31
DL6YAO	18,112	140	1	31
DL8MBS	17,680	166	0	26
DJ3GE	11,280	109	0	24
DL6UKL	9,545	97	0	23
DJ2RG	5,784	53	0	24
DO4TP	2,415	23	0	21
DM5BB	1,386	24	0	14
DK7OG	648	18	0	8
DM4YWL	2	1	0	1

France

F5VBT	139,919	589	1	46
F5NGA	3,276	37	0	18

Hungary

HA5BA	5,187	59	0	19

Italy

IØZUT	17,940	126	0	30
IZØORT	4,788	46	0	21

Latvia

YL2QN	80,238	367	0	43

Lithuania

LY5Q	143,676	551	1	51
LY5AA	1,200	23	0	12
LY4O	6	3	0	1

Macedonia

Z35M	520	12	0	8

Netherlands

PA9CW	10,097	89	0	23
PAØRBO	3,408	45	0	16

Norway

LA1DSA	630	14	0	9

Poland

SQ2ICX	40,836	203	0	41
SN5V	16,965	119	0	29

Romania

YO2AQB	37,869	194	0	39
YO4AAC	5,576	68	0	17
YO2CMI	4,370	39	0	23

Scotland

GM4M	27,144	152	0	36

Serbia

YU8NU	34,816	221	0	32

Slovenia

S57M	163,047	643	1	50
S52P	140,850	572	0	50
S53Q	96,044	371	2	50
S53AR	90,144	380	1	47

Spain

EA5ICL	6,615	50	0	27

Sweden

SE4E	12,550	104	0	25

Ukraine

UX8IX	44,030	251	0	37
UX2MF	40,770	165	0	45
UZ5DM	37,686	251	0	33
USØMS	22,490	185	0	26
UV1IW	5,600	58	0	20

Wales

GW4W	21,917	141	0	31

OCEANIA

Hawaii

KH6KG	15,841	54	24	7

SOUTH AMERICA

Venezuela

YV6AF	96	4	0	4

ASSISTED NORTH AMERICA

UNITED STATES

CONNECTICUT

K1ZZ	270,729	679	56	55
N1MD	40,044	162	48	23
W1CTN	31,104	221	44	10
*N1EN	31,080	196	42	14
*W1ARY	19,032	198	36	3
KA1J	15,239	109	40	9
W1RM	1,332	27	17	1
N2GZ	1,278	24	14	4

MAINE

K1JB	118,179	431	48	33
K1ESE	51,597	291	46	17
*W1DYJ	4,806	63	24	3

MASSACHUSETTS

W1UE	754,130	1302	59	71
N2KW	436,195	1095	57	58
W1FV	82,680	246	38	40
W1EBI	61,573	340	50	17
KB1W	60,852	346	49	17
*K1NZ	42,456	304	48	10
K1RV	40,647	325	41	10
NF1A	21,120	153	37	11
W1KQ	12,844	140	34	4
W1HIS	9,840	123	27	3
*K1TH	7,252	110	28	0
K1VK	6,270	65	27	6
AA1O	4,917	59	29	4
WA1DRQ	3,192	61	21	0

NEW HAMPSHIRE

W1NT	172,040	603	54	34
WX1S	91,102	351	52	30
K1GQ	57,190	292	44	26

RHODE ISLAND

NB1U	7,080	90	26	4

VERMONT

K2LE	96,301	444	53	26

NEW JERSEY

N2NT	370,008	859	52	56
N2MM	127,073	589	56	27
W2LE	93,375	478	53	22
W2YC	81,721	472	55	16
N2WM	43,512	175	52	22
K2RET	40,297	255	45	14
AB2DE	34,450	171	48	17
AB2E	29,172	223	43	9
N2RJ	23,010	83	29	30
KC2LSD	19,620	107	46	14
N2VW	10,010	111	31	4
WX2S	6,567	38	14	19

NEW YORK

AB3CX	275,628	893	58	45
N2ZX	236,040	747	58	47
K8FC	187,068	585	57	45
N2GC	158,976	604	60	36
N2WK	73,130	406	55	16
K2EP	48,348	250	51	17
N2JJ	33,536	171	48	16
N2SQW	28,443	192	45	12
K2MK	25,560	142	46	14
K1PTF	22,572	153	45	9
N2CU	20,988	142	40	13
WA2MCR	19,227	140	42	9
WA3AFS	18,476	74	44	18
AA2DT	144	5	3	3

DELAWARE

K9RS	48,321	271	43	20

DISTRICT OF COLUMBIA

4U1WB	2,736	66	18	1

MARYLAND

N3QE	308,588	1002	59	44
NN3W	298,725	1037	58	47
K3AJ	219,220	781	58	39
*K3ZU	211,446	605	55	47
N3HEE	186,989	804	57	32
NA3M	180,310	638	56	39
AB3CV	158,760	492	57	41
K2PLF	103,649	393	54	37
W3EKT	101,007	363	53	34
NA1DX	72,488	328	54	28
K1BZ	50,116	270	50	18
N1SZ	42,098	263	48	14
N3AM	38,115	278	45	10
K3SX	36,783	177	48	19
W3NRJ	22,248	149	39	15
*K3NDM	15,695	141	36	7
K3AU	12,060	133	29	7
N3OC	7,680	76	23	9
*K3MAW	6,444	66	34	2
K3YDX	2,142	35	16	5

PENNSYLVANIA

AA3B	505,180	1281	59	57
K3WW	468,027	1131	59	60
KF3B	458,280	1056	60	60
N3RD	381,444	1054	59	55
NN3Q	317,255	931	59	48
N3RS	286,944	744	59	53
NO3M	239,103	891	57	36
W3FV	172,206	859	56	25
K3WJV	170,856	812	58	26
K3NM	108,576	342	56	40
K3UW	67,392	349	52	20
*NY3B	63,189	404	48	15
K3MD	58,860	384	44	16
W8CDX	53,592	416	50	6
WY3A	53,580	362	47	13
*N3LPJ	47,002	250	55	16
K3JGJ	44,943	201	52	19
*K2BB	43,090	268	47	15
K3ND	42,568	219	47	21
W3WH	36,900	239	48	12
KB3Z	34,086	223	44	13
W0BR	31,735	215	42	13
AB3AH	28,356	222	42	9
NG3J	14,574	131	37	5
N3ZA	11,193	94	30	9

ALABAMA

K4IQJ	112,344	339	54	39
KR4F	104,922	425	54	33
K4CWW	98,404	544	56	17
*AB4B	64,077	186	54	39
AG4W	14,760	44	3	37

FLORIDA

K9OM	316,480	859	59	56
N4WW	244,310	602	56	54
K5KG	220,304	803	58	40
WX4G	195,110	510	57	52
N4BP	131,463	637	56	25
NN4X	83,868	162	40	47
W4TAA	40,755	247	48	17
W9OY	33,768	143	44	23
KX4TT	18,180	71	39	21
K4LM	16,250	98	34	16
*K3KO	6,104	103	26	2

GEORGIA

NQ4I	515,339	1302	59	62
N4PN	286,638	1001	59	42
N4RJ	232,933	517	54	55
NO9E	133,848	577	54	34
ND1Y	52,788	441	48	5
K4ZRJ	19,943	106	30	19
*K4FDP	40	2	0	2

KENTUCKY

K4WW	101,360	590	54	16
N4QS	75,831	440	52	17
*KB7H	49,379	274	51	16
*ND4Y	42,944	292	52	9
AB4IQ	12,056	104	37	7

NORTH CAROLINA

N1LN	464,212	1158	58	60
K2AV	434,910	1192	59	50
K4SV	250,500	763	56	44
K8AC	195,888	858	57	31
WJ2D	168,560	510	55	43
K5EK	130,896	639	53	28
N4YDU	126,242	596	54	25
W3CL	77,472	414	51	21
W1AJT	76,664	396	54	20
N4GU	42,166	293	45	13
AB4Z	8,024	103	33	1
W3GQ	5,134	49	24	10

SOUTH CAROLINA

N4IQ	97,660	509	56	20
K4YYL	95,656	356	53	35
K2SX	49,290	319	48	14
*KG4IGC	22,034	188	39	7
W4MEL	20,944	131	42	14

TENNESSEE

K4RO	193,500	716	57	43
K4OWR	150,720	755	57	23
AA4DD	143,234	524	56	35
N4VV	87,480	389	55	26
*N4ARO	47,970	295	54	11
W6UB	47,676	352	48	10
*KS4X	39,936	239	51	13
*K4BX	33,687	238	48	9
K4AFE	31,350	228	50	7
*KA4R	16,128	147	42	6
N4NA	16,036	186	37	1
N1OKL	5,208	65	28	3

VIRGINIA

N4RV	247,063	732	58	49
KA4RRU	225,930	763	56	46
WA2BCK	177,660	663	57	33
W4NF	162,336	697	58	31
WS6X	153,090	755	55	26
KE4S	96,268	416	54	28
*N3UA	88,686	418	53	25
W4AAW	87,984	422	51	27
K1GG	87,635	325	54	31
W4VIC	50,592	258	48	20
K5VIP	49,288	320	49	12
W2YE	33,180	210	45	15
*K4MI	23,814	200	42	7
W4JVN	18,326	147	40	9
N4HB	16,464	144	39	9
W4JAM	9,600	102	36	4
N4FX	8,080	77	34	6
K4FJ	7,986	89	26	7
AB4SF	6,496	92	26	2
KK4VA	4,500	58	25	5

ARKANSAS

K5VR	21,175	139	46	9

LOUISIANA

AA5AU	7,527	57	29	10

MISSISSIPPI

N5CW	56,160	459	47	7
W2GS	17,424	166	38	6

OKLAHOMA

K5CM	187,050	855	57	30
K5UV	52,520	327	53	12

TEXAS

K5ZO	303,114	1041	56	42
K5NA	201,600	562	56	44
K5AX	160,455	609	56	39
*K5KJ	85,464	479	54	18
*W5PR	72,930	273	55	30
K5BG	60,078	402	50	12
AC5K	53,888	322	48	16
AC4CA	51,120	243	50	21
*KE5LQ	40,920	242	52	14
*N5PHT	33,872	242	51	7
*WA5LFD	33,814	236	47	11
N5XJ	9,006	100	36	2
W5AJ	1,365	18	8	7

CALIFORNIA

K9YC	119,939	512	55	18
K6NR	77,220	337	47	18
W6SX	56,978	365	51	11
K6RC	56,832	342	51	13
AJ6T	42,780	237	49	11
N2NS	41,846	207	45	16
N6IE	29,848	195	46	10
W6SR	29,250	152	51	14
K6MM	24,808	181	49	7
NC6B	18,179	118	44	9
W6YI	12,597	61	23	16
NC6K	10,935	95	38	7
W6GJB	7,385	68	28	7
N6GEO	2,192	61	14	2
KF6I	144	12	6	0
NE6I	40	2	0	2

ARIZONA

KY7M	353,298	1021	58	48
N7DD	352,591	968	57	44
N7AT	306,063	1081	56	37
K7WP	104,828	544	55	18
W6XI	91,246	305	54	32
N7RK	86,025	434	55	20
KF6HI	84,450	393	55	20
N9NA	83,993	481	56	15
WA7AN	83,648	499	53	11
W6RW	67,680	355	55	17
K6LL	48,258	303	52	11
K7HP	48,114	274	54	12
AD7ND	6,360	53	34	6
N6VR	1,975	30	22	3
*K3WYC	1,770	52	13	2

IDAHO

KG7CW	135,289	699	56	21
KA7T	36,600	235	50	10
W7MEM	11,040	111	44	2

MONTANA

KØSN	50,688	323	53	11
N7DXT	29,070	256	42	3

NEVADA

W7RN	81,405	410	53	14
K2RD	67,980	399	54	12
K7XC	19,550	154	44	6

OREGON

K4XU	121,737	510	54	23
KN7K	43,776	311	49	8
WS7L	38,130	229	52	10
*WA7SHP	2,163	47	21	0

UTAH

WF4U	55,543	321	52	15
K7UA	45,548	307	48	11
K7UT	28,969	179	49	10

WASHINGTON

K7OX	105,577	517	54	17
W6SZN	78,210	445	52	14
W7FI	71,196	382	54	14
K7CW	70,618	396	52	15
K7SS	46,980	309	47	11
N7BV	24,909	175	50	7
*K7BX	6,696	106	26	1
KK7PW	2,457	51	21	0

WYOMING

WC7S	9,640	116	38	2

MICHIGAN

W8MJ	314,384	1185	58	40
N8EA	140,116	387	50	42
W8/UT5UDX	87,570	521	54	16
K8BZ	71,321	367	54	19
NK8X	32,406	101	32	34
AA8R	24,076	198	47	5
KK9T	16,023	143	46	3

OHIO

K8AZ	340,046	1119	58	49
N8TR	207,900	593	57	48
W3HKK	107,360	414	55	33
N8BJQ	98,496	549	53	19
K8CX	80,582	303	53	33
*WD8KNC	60,030	458	52	6
*KA8G	49,042	305	49	13
K8ZT	30,316	250	46	6
KE8M	29,640	197	49	11
N9RC	27,816	146	46	15
*K8LY	18,032	168	43	3
N8DX	16,513	76	27	22
W8EH	8,244	97	33	3
NW8F	4,512	60	29	3
AC8E	700	19	14	0

WEST VIRGINIA

NW8U	28,249	213	46	7

ILLINOIS

K9MMS	177,560	729	58	34
N9CO	140,616	496	56	37
WM9Q	118,755	812	56	9
N9EP	95,964	632	57	9
N2BJ	84,594	503	57	12
N9LQ	84,184	520	55	13
*AB9YC	68,200	483	54	8
KEØL	52,602	317	53	13
AI9T	48,900	347	50	10
*K9WM	46,138	350	53	6
W9YK	45,258	344	53	4
NA9RB	42,000	209	54	16
N9LAH	33,925	234	48	11
W9DCA	18,659	168	43	4
NQ6N	12,169	71	26	17
AC9S	10,920	110	36	4

INDIANA

K9NW	266,362	1047	57	40
W9PA	246,186	998	57	37
NM9P	76,246	472	54	13
KK9V	47,905	252	47	20
K9SG	43,230	211	46	20
K9LA	38,659	213	52	15
KØTQ	36,135	261	45	10
KK9I	27,872	235	45	7
KT9L	18,921	159	48	3
*N9LF	17,748	138	44	7
*N9LJX	13,328	88	38	11

WISCONSIN

K9IMM	261,504	1012	56	40
W0AIH	229,908	1007	57	35
KK9K	112,590	519	55	26
NE9U	102,136	637	56	12
*N9CK	93,730	553	56	14
W9AV	65,455	417	54	11
K9GS	33,408	240	53	5
*N9UA	31,959	257	49	4

COLORADO

KVØQ	482,676	1260	59	55
WØMU	139,523	656	57	26
NØKE	70,518	386	54	15
*WØETT	55,044	325	54	12
WØCO	26,928	224	44	7
K5ZG	4,191	51	30	3
KBØYH	140	3	1	3

IOWA

WØFLS	205,470	878	57	33
WØMLD	33,660	174	51	15
WØGXA	33,157	143	50	21
WØGJ	29,478	260	45	6

KANSAS

K3PA	197,800	656	56	44
NJ8M	62,370	520	50	5
WØUY	24,060	142	47	13

MINNESOTA

KØKX	202,807	574	57	46
KØTI	140,700	774	56	19
KØPK	136,192	746	56	20
*KØRC	102,690	605	56	14
KØAD	101,728	635	56	12
K4IU	64,890	455	56	7
KØYR	56,225	342	56	9
WBØN	46,431	298	54	9
WAØMHJ	39,123	259	50	13
WBØCFF	35,706	188	51	15
WØDD	22,165	142	41	14
*WGØM	12,669	137	39	2
*KØEOO	8,022	64	36	6
WØAD	812	19	13	1

MISSOURI

KIØI	149,644	818	57	19
WØTT	112,480	630	56	18
W9MAF	100,932	488	56	22
NIØG	68,967	293	52	27
WØMB	30,408	225	50	6
WI4T	26,448	189	52	6
*WX5CW	4,020	65	27	3

SOUTH DAKOTA

KTØA	42,588	371	48	4

CANADA

NEWFOUNDLAND

*VO1HP	299,725	449	45	50

LABRADOR

*VO2NS	4,675	39	22	3

NEW BRUNSWICK

*VE9ML	68,259	214	43	18

PRINCE EDWARD ISLAND

VY2TT	675,792	920	57	60

QUEBEC

VA2WA	867,840	1293	58	62
VA2AM	99,958	210	42	40
VE2BWL	21,068	93	36	10
*VE2FK	2,130	32	15	0

ONTARIO

VE3EJ	943,182	1393	60	62
VE3JM	718,836	1209	59	52
VE3CX	475,200	1061	58	32
VE3RZ	405,180	900	56	34
VE3MM	213,974	517	56	27
VE3CV	163,324	436	55	21
VE3VV	95,336	285	48	20
*VE3XAT	15,543	99	31	2

MANITOBA

*VE4VT	27,664	111	48	4

ALBERTA

VE6SV	253,680	635	55	25
CG6LB	17,640	89	33	7

BRTISH COLUMBIA

VE7ACN	29,885	146	39	4
VE7XF	13,392	84	32	4
VE7IO	13,108	96	28	1

NORTH AMERICA

Alaska

KL7SB	14,100	84	24	6

Mexico

XE2S	300,202	661	57	25

XE2ST	56,151	216	42	9
*XE2FGC	1,212	21	8	4
U.S. Virgin Islands				
NP2X	433,116	710	51	55

ASIA

Asiatic Russia				
R8TT	593,134	913	2	69
RA9Y	499,824	784	1	71
RG9A	476,339	724	2	69
RW0AR	457,030	761	1	69
RT9S	209,804	391	0	59
RN9N	121,680	265	0	52
R9CM	121,626	231	1	57
RV9UP	120,428	323	0	46
RU9AC	117,957	319	0	41
UI8J	101,178	295	0	42
RW9QA	63,512	222	0	34
*RW9DX	54,336	192	0	32
RAØFF	42,141	221	10	23
RT8U	37,333	112	0	37
RV9CX	36,550	112	0	34
RW9WT	23,275	101	0	25
*UAØLHS	21,367	166	4	19
RDØA	12,749	119	0	19
RW0LT	6,740	42	0	20
RM9I	3,842	27	0	17
*UA9UX	3,120	53	0	10
RL9Y	1,440	13	1	11
RAØAM	1,141	26	0	7
R9IR	644	11	0	7
*RK9UE	592	31	0	4
RUØA	250	5	0	5
*RKØUT	81	6	0	3
*RA9MX	44	8	0	2
*R8UT	18	9	0	1
China				
*BA4DL	8,489	121	4	9
*BDØAAI	3,991	40	0	13
BA7QT	1,390	21	0	10
*BH4TXN	928	22	0	8
*BH7PFH	364	9	0	7
*BD4CRN	54	6	0	2
Cyprus				
P33W	1,543,806	1400	30	83
India				
*VU2ABS	312	7	0	6
Isreal				
*4Z5TK	6,640	36	0	20
Japan				
JR4OZR	177,936	365	17	49
JH2FXK	152,526	297	21	45
JA4CUU	59,800	151	14	36
JE1BMJ	44,896	115	14	32
JA6BZI	37,128	104	11	31
JF3LOP	28,675	136	13	24
JA1PTJ	20,100	76	11	19
7M4CLF	17,115	60	10	25
JH1RFM	15,372	66	10	18
JG1LFR	13,450	106	9	16
JH5MXB	13,216	59	9	19
JM1NKT	12,974	96	9	17
JA1LZR	12,324	57	13	13
JA7GYP	8,211	43	6	17
JH7XMO	8,056	72	9	10
JH1GNU	7,752	52	6	13
JN3TMW	6,920	67	5	15
JA7ZP	6,468	43	8	14
JR2AWS	6,341	84	7	10
JL4DJM	6,048	43	3	15
JA4CZM	5,166	52	4	14
JA3OOK	4,820	30	3	17
JA1RTX	4,300	26	8	12
JA2VQF	4,029	29	0	17
*JH9DRL	3,718	86	4	9
JM4WUZ	3,598	51	3	11
JI1ANI	3,440	26	7	9
JQ1TIV	3,376	35	5	11
JA2AXB	3,232	28	6	10
*JN1MSO	2,160	54	4	5
JG1EIQ	2,150	67	2	8
*JF3GFH	1,812	32	4	8
JA5FBZ	1,755	15	4	11
JH1CTV	1,350	50	3	6
JF7PHE	630	10	5	2
JH4UTP	570	38	2	3
*JN1RQV	420	7	1	6
*JAØBZY	360	10	0	4
JE4KQH	329	8	0	7
JR4VEV	270	13	0	5
JH1APK	250	5	5	0
JA1HGY	144	6	0	6
JAØGCI	60	3	0	3
*JQ1EPD	60	3	1	1
JH2XQY	51	3	0	3
JA2FSM	27	3	0	3
Kazakhstan				
UN7LZ	662,480	1050	1	69
Saudi Arabia				
7Z1SJ	428,238	601	8	66
Thailand				
HSØZEE	826	20	0	7
United Arab Emirates				
A65CA	16,120	73	0	26

EUROPE

Austria				
OE2S	585,611	985	33	74
OE8TED	185,196	539	9	57
OE1TKW	165,168	508	5	57
*OE2LCM	98,512	411	1	46
OE5CSP	76,560	312	1	47
Balearic Islands				
EF6T	767,454	1146	42	69
Belarus				
EU6AF	419,484	1012	16	62
EW8R	335,075	1001	7	58
EU5C	272,426	872	7	54
EW8DX	248,976	874	0	56
EU8U	213,378	783	1	52
*EU3A	128,400	508	0	50
*EU4T	113,339	378	4	55
EU1A	106,132	390	0	52
EW8W	75,510	330	3	42
*EW6F	1,918	28	0	14
EW7M	420	7	0	7
EW1TZ	400	10	0	8
Belgium				
ON4IA	397,761	776	26	67
OP5T	229,824	695	7	57
*ON5JT	14,400	95	0	30
Bosnia-Herzegovina				
E70T	477,260	832	36	62
*E72U	135,150	523	0	51
Bulgaria				
LZ3ZZ	166,367	612	1	52
LZ6Y	122,612	396	0	58
*LZ2ZG	67,800	266	1	49
*LZ1NG	35,264	183	0	38
Crete				
SV9DJO	107,588	399	2	50
*SV9GPV	30,702	110	0	51
Croatia				
9A5CW	1,153,490	1486	43	87
9A3XV	728,456	1203	33	74
9A2EU	76,356	227	5	58
9A2KD	18,473	125	0	29
Czech Republic				
OK1DX	592,673	1018	32	75
OLØW	333,949	863	13	64
OK1CRM	285,516	871	4	62
OK1T	283,162	930	3	58
OK2ZV	258,653	730	8	63
OL1M	210,780	706	4	56
OK1ATP	195,291	457	13	68
*OK6AA	126,352	483	3	50
*OK2BFN	119,621	460	2	51
*OK1AY	113,620	462	1	51
*OK1SI	87,840	409	1	44
OK6DJ	69,825	294	1	48
OK1AYU	1,105	13	1	12
Denmark				
OU2V	190,472	633	9	49
OZ1ADL	131,648	388	7	57
OZØB	125,125	444	6	49
OZ4O	80,997	273	4	53
*OZ1DJJ	41,993	157	4	45
OZ4MD	17,700	63	1	49
Dodecanese				
SV5DKL	75,250	338	0	43
England				
G5W	1,211,707	1554	47	80
G3U	713,155	1175	37	70
G3TXF	701,742	1110	40	71
G3P	471,750	816	38	64
G4RGK	461,088	859	37	59
G2NF	338,940	696	28	62
G3XTT	271,740	756	12	58
G8X	188,024	473	23	53
MØUKR	139,973	529	2	51
GØBNR	116,298	352	5	58
M7V	105,894	250	21	53
G3UHU	100,230	286	9	56
*2EØSDV	59,840	278	1	43
G3SVD	38,064	140	3	49
GØAZH	38,060	174	8	36
G4IUF	21,432	110	2	36
G4AFJ	13,494	67	2	37
Estonia				
*ES4NY	161,252	605	1	51
ES3BM	29,632	183	0	32
European Russia				
RK4FD	618,569	1129	14	83
RV1CC	412,296	991	13	69
RO5F	329,980	966	6	64
UA1OMS	313,128	866	1	71
R3LA	306,994	780	5	74
RK3ER	289,179	861	2	67
RY6M	284,515	728	8	69
RN3TT	268,670	811	1	66
R3KM	260,568	714	2	70
R1DX	243,777	730	4	65
R7AW	234,010	675	6	64
RZ3QS	203,553	669	1	62
RK3IM	194,870	624	3	62
*UA3MIF	189,805	717	0	55
R3ST	185,850	665	1	58
RA1QD	178,200	605	2	58
R4HC	177,236	603	0	59
RL4F	160,303	540	0	59
UA3QGT	159,216	535	3	59
R5DT	157,058	556	1	58
RK3T	151,563	540	0	57
RM7M	134,732	552	0	52
RU3FM	134,268	370	4	63
RL4A	133,686	430	1	62
R6AP	132,394	521	1	52
RV6ASU	132,132	305	12	65
UA1ANA	130,572	498	1	53
*RM3O	120,068	485	1	51
RO1B	115,232	482	1	51
UA6LCN	97,245	465	0	45
RT3N	91,392	469	0	42
RA3DNC	81,880	370	0	46
*R6KA	77,896	316	1	51
R4FD	74,683	343	1	46
RU4PU	67,257	203	0	53
R3VA	58,425	301	0	41
RM3DA	54,184	213	1	51
*R7CA	49,446	268	1	40
RN1ON	48,804	238	0	42
*RW4WA	46,371	254	0	39
*RZ3QM	44,496	276	0	36
RA4Y	41,492	216	0	41
*RK6AQP	39,546	220	0	39
*R3RR	38,124	119	1	53
RC7A	38,048	192	0	41
RA4PQ	32,198	163	0	34
*UA4W	24,675	149	0	35
*RA6DT	14,364	76	2	34
*R4WT	14,014	139	0	22
*RK2M	11,001	143	0	19
RK4PA	7,840	38	0	32
RC9F	7,623	73	0	21
*R6FY	5,560	56	0	20
RU3GF	4,202	38	0	22
*RA6AAW	3,828	38	0	22
*R1AP	2,877	24	0	21
*RW3WP	1,441	28	0	11
*RX7K	1,236	23	0	12
RD3K	630	9	0	9
UA6YW	330	6	4	2
R7GX	210	6	0	6
*UA3YCX	96	6	0	4
R7IA	66	3	0	3
Finland				
OH6MW	275,631	605	16	63
OH2BO	200,244	406	20	62
OH3OJ	187,833	725	3	48
OH3FM	182,580	696	0	51
OH6RE	133,950	565	0	47
OH2BV	118,160	404	2	54
OH5C	108,855	477	0	45
OH3EX	83,295	365	1	44
OH3AD	21,888	136	0	32
*OH5CZ	12,282	114	0	23
France				
F4HQZ	63,928	175	15	46
*F8CRS	30,550	128	0	47
F5VHJ	21,682	115	0	37
F4EUG	11,060	63	0	35
*F1TRE	7,644	58	1	25
Germany				
DL7ON	838,950	1369	36	83
DF7ZS	725,928	1235	40	76
DK6WL	640,440	1186	32	76
DP9Z	605,676	1170	29	73
DJØMDR	598,920	1135	32	73
DP4M	558,817	1176	30	67
DK2OY	532,475	1150	27	68
DL7URH	406,472	944	20	68
DK1KC	342,900	980	16	59
DL9YAJ	340,257	809	20	67
DLØSLG	337,200	878	18	62
DD2ML	325,322	866	15	64
DHØGHU	318,978	612	31	68
DL4CF	310,960	809	13	67
DL6MHW	308,812	775	23	59
DJ5MW	265,194	677	16	65
DH8BQA	260,002	788	16	55
DL5LYM	239,834	695	10	64
DJ5AN	229,258	586	13	66
DF3VM	215,861	632	13	60
DL5RMH	212,431	526	17	62
DJ7UC	208,160	496	20	60
DJ9IE	207,886	722	13	49
*DL3DTH	203,280	810	3	53
DG1CMZ	194,590	279	40	70
DF4PD	189,378	469	18	63
DK3UA	188,604	450	16	62
DL4ME	182,848	621	12	52
DK2CX	179,530	579	7	58
DK2LO	174,888	585	4	59
DL1RTL	174,420	617	7	53
*DL6RAI	172,962	713	2	52
DL1BUG	167,620	636	3	55
DF6QV	166,352	442	19	55
*DF8AA	165,760	447	15	59
DK1AX	161,572	565	7	55
DL8OH	159,036	301	23	64
DJ9AO	149,796	427	15	58
DL5KUT	149,058	501	9	54
DK7YY	145,200	449	9	57
*DF4XG	144,666	698	1	46
DKØXB	139,620	595	1	51
DL1NEO	139,552	553	3	53
DJ5IW	135,198	507	7	51
DK5TX	131,872	571	2	50
DK8ZZ	120,900	404	12	50
DJ7MH	118,402	499	1	52
DL6JF	113,022	373	5	58
*DJ9MH	111,496	452	8	48
DL1NKS	106,040	417	8	47
*DF1LON	104,304	439	4	49
*DF1LX	100,256	437	1	51
DJ4AX	97,971	112	30	83
DJ3WE	96,460	419	2	50
*DL6ON	93,295	454	1	46
DL2CC	93,208	325	5	56
DL4HG	86,811	327	10	47
*DL7ALM	77,691	372	0	47
DL7UPN	77,520	342	2	49
DL4HRM	73,692	357	1	45
DJØIF	72,879	307	1	50
*DL3HWD	72,324	316	1	48
*DL1TS	64,578	298	1	46
DL8UD	59,478	283	0	46
DL2OE	58,701	231	0	51
*DL8DWW	52,360	288	0	40
DL3YM	51,747	218	0	47
*DL8LBK	50,554	236	5	41
DL5ST	47,385	232	1	44
DK1FW	45,198	151	9	45
DK7VW	41,756	207	1	43
DL8OBF	41,160	177	2	47
*DL9SEV	40,770	200	0	45
*DL1II	39,285	194	0	45
DM4X	38,070	182	0	45
DF2RG	37,587	148	4	47
*DL5YL	36,898	227	1	37
*DO7CED	31,449	213	0	33
DJ6TB	30,888	169	2	37
DM5TI	30,294	129	2	49
DL5MEV	29,362	105	2	51
DL5ASK	29,172	161	0	39
*DL5RDP	28,224	147	0	42
DJ4MZ	23,345	150	0	35
DL5ME	22,389	85	1	50
*DL8ZAJ	22,085	135	1	34
DK1FT	21,672	134	0	36
DL8UNF	21,088	147	0	32
DL4RCK	20,336	104	0	41
DF5MA	18,632	115	0	34
DL9NDV	18,377	77	1	46
*DG8HJ	18,093	117	1	36
*DL7UGN	18,080	125	0	32
*DO4DXA	18,040	100	0	41
*DL4JLM	17,472	96	0	39
DK6BT	16,653	89	1	38
DL1DAW	16,422	75	1	41
DF1HF	15,741	52	4	49
*DL4DZ	14,178	101	0	34
*DL7AT	12,028	98	0	31
DD5ZZ	11,814	83	0	33
*DL9W	9,891	111	0	21
*DL5KW	9,842	52	0	37
DL9DRA	9,108	56	0	36
*DL6HH	7,557	45	1	32
DF9MV	6,440	36	0	35
DM3VL	4,950	26	6	16
DK2ZO	4,225	29	1	24
*DL5HF	3,768	29	1	23
DJ3AK	3,300	25	3	19
DL7BA	1,920	16	6	6
*DL2BQV	1,695	25	0	15
*DG1HXJ	1,326	24	0	13
DH1NBE	900	10	2	8
DL9GTB	576	16	0	9
DJ9BX	5	1	0	1
Greece				
SV2DSJ	481,094	1136	9	73
SV3RF	469,887	996	20	67
SV1DPI	427,367	990	11	72
*SV1JG	12,672	75	0	32
*SV1DOO	5,320	56	0	19
Hungary				
HA8BT	280,734	771	6	65
*HA6NL	277,332	825	12	54
HA8V	223,398	827	1	53
HA5UA	197,694	730	1	53
HA3LI	184,382	635	0	58
HG17EYOF	172,462	645	3	50
HA7GN	138,207	363	13	56
*HA6PJ	129,536	596	0	44
*HA3MG	70,182	344	0	42
*HA3PV	39,672	224	0	36
*HG5DX	13,473	102	0	27
HA2VR	13,048	93	0	28
*HA8TKS	8,610	59	0	30
*HA5TOP	2,415	31	0	15
Italy				
IKØYUT	705,685	1146	37	76
IK4DCX	166,374	624	0	54
IZ5NFD	142,884	446	8	55
IV3JCC	120,832	405	3	56
IZ8VYU	109,933	464	0	47
IK3ORD	92,820	295	6	54
IZ5MOQ	70,618	213	5	57
IK2SAU	70,096	261	1	51
IKØXBX	68,805	247	0	55
IK2TDM	54,097	228	1	46
IK2ANI	41,140	190	0	44
IK2GWH	25,262	152	0	34
IC8POF	9,504	49	0	36
IZ2EWR	6,275	50	1	24
*IZ5AGY	968	20	0	11
Kaliningrad				
UA2FZ	1,006,200	1470	35	85
Kosovo				
Z60A	396,585	1226	3	60
Latvia				
YL2VW	311,335	836	8	63
YL2PP	215,296	644	4	60
*YL1S	116,794	505	0	46
YL5T	27,004	122	0	43
YL2KO	18,873	135	0	27
Lithuania				
LY2MM	507,314	1097	15	71
LY2BKT	504,415	1229	10	69
LY7M	459,277	930	17	74
LY3BN	315,780	792	16	60
*LY5W	313,276	913	6	62
*LY3B	256,443	891	1	56
*LY2AJ	231,660	845	1	54
LY5R	209,484	583	6	63
*LY3X	168,685	616	4	51
LY2K	151,008	578	1	51
LY2BVB	134,895	363	8	61
LY5O	79,718	352	0	46
*LY2CO	78,645	321	0	49
LY2SA	30,788	146	0	43
*LY/RN5M	12,220	94	0	26
LY2NY	5,992	50	0	28
Luxembourg				
LX7I	1,294,320	1795	44	76
Moldova				
ER4A	66,785	352	0	37
*ER3DX	5,280	38	0	24
Netherlands				
PA3FYM	900,600	1304	43	77
PA9M	528,906	1000	30	68
PA3GVI	454,388	917	25	67
PI4CC	337,770	782	26	55
PA4VHF	231,886	621	18	53
PAØO	191,842	500	13	58
*PC5Q	189,864	494	21	51
PA8AD	189,189	590	8	55
PA5WT	135,700	545	1	49
PA3AAV	132,532	354	16	52
PA4N	131,130	411	8	54
PC2D	94,760	410	1	45
PA4M	90,630	324	14	39
*PA9CC	39,032	194	1	40
PI4D	31,688	190	0	34
PAØABM	25,543	121	2	39
PAØMIR	17,465	99	0	35
*PA1CW	14,471	103	1	28
PA1HR	13,761	82	2	31
PA1BX	7,348	68	0	22
*PA3MET	3,604	46	0	17
PA1T	2,032	26	0	16
PAØM	1,820	28	0	13
*PA8E	1,236	23	0	12
Northern Ireland				
*MI4I	45,312	182	6	42
GI5I	45,216	180	1	47
Norway				
LB8DC	195,855	698	3	52
LA7THA	173,728	548	10	51
*LA5LJA	72,568	301	1	46
LA7AFA	52,292	126	9	59
LA7XK	43,554	155	1	50
LA6TPA	24,256	152	0	32
*LA2HFA	18,880	117	0	32
LB2TB	1,936	19	1	15
Poland				
SN2M	944,892	1443	33	84
SN5X	675,062	1191	26	77
SP3GTS	434,970	927	20	70
SP4Z	432,905	980	11	74
SP4G	430,388	1104	10	66
*SQ5M	290,283	827	6	63
*SNØR	271,375	837	7	58
*SP4JCQ	245,572	848	1	57
SP5MXZ	190,176	683	0	56
*SP6NIC	188,892	728	1	52
SP6T	176,760	592	3	57
SN7O	150,043	561	1	52
SP5UAF	128,350	521	2	48
*SP6MLX	125,832	518	1	48
SP9JZU	105,920	312	4	60
SP4W	105,786	394	1	53
SN7Q	89,200	448	0	40
*SP5XOV	86,850	349	1	49
SP2MHC	67,520	349	1	39
*SP5TAT	65,565	292	1	44
*SP1DPA	63,597	299	1	42
*SQ5LTL	59,415	234	1	50
SP3QDM	56,672	187	3	53
SP5WA	53,382	262	0	42
SQ1X	51,092	186	0	53
*SP9CVY	48,739	202	2	45
SP3KRE	42,640	205	0	41
SP8K	41,616	160	0	51
SP9LAS	40,377	184	0	43
*SP8FB	34,437	180	0	39
*SP9GMI	26,949	138	0	39
*SP2DKI	24,640	162	0	32
SP5XO	21,870	149	0	30
SP9M	19,565	110	0	35
*SP2WGB	18,432	101	0	36
SP2MKT	17,610	120	0	30
SP5TT	15,330	105	0	30
*SQ3JPV	13,260	97	0	30
*SQ4AVD	8,625	75	0	23
*SP7IIT	6,072	55	0	22
SP9UOP	60	4	0	3
*SP3DOF	2	1	0	1
Romania				
YO3APJ	342,873	787	18	63

*YR7J	270,072	803	7	59
YR9F	141,873	496	1	56
YO2GL	127,350	506	6	44
YO9HP	111,595	397	1	54
YO3FRI	108,976	374	2	54
*YO9WF	107,961	405	0	53
YO8DOH	68,362	358	0	38
*YO4DW	58,045	241	1	46
YO2LSP	19,076	96	0	38
*YO7AWZ	16,988	111	0	31
YO8WW	6,970	38	0	34
*YO9GDN	1,080	18	0	12
YO2MFC	200	7	0	5
Scotland				
GM4AFF	254,692	564	24	58
Serbia				
YT8T	394,476	1077	5	66
*YT2AAA	124,644	527	0	47
YU1CC	41,711	147	0	53
Sicily				
*IT9RZU	82,560	341	0	48
Slovak Republic				
OM3GI	1,132,038	1573	41	81
OM7M	1,052,674	1503	40	79
*OM7LM	213,060	698	7	53
*OM7LW	99,636	435	0	46
*OM7YC	19,617	100	0	39
*OM7PY	16,200	125	0	27
OMØATP	7,458	69	0	22
OM3WZ	1,521	24	0	13
Slovenia				
S53O	670,773	1119	30	81
S50K	508,915	1005	21	74
S51YI	362,320	882	16	64
S53M	255,340	736	9	59
S53F	251,604	537	24	63
*S57KM	251,430	872	5	53
*S54X	226,800	722	4	59
S52A	209,220	628	5	61
S56A	166,750	674	1	49
*S53V	147,500	600	0	50
S53BB	103,635	431	0	49
*S51RJ	59,560	303	0	40
S52NR	32,224	213	0	32
Spain				
*EF3W	518,708	926	34	69
EF7X	436,774	697	36	71
EA2OT	214,256	310	43	69
EA1DR	178,712	360	27	62
EF1A	171,922	494	9	58
EA5KA	111,744	291	3	69
EA7TG	92,175	220	19	56
EA2AAZ	82,900	106	37	63
EA5GMB	28,480	143	0	40
EA1SA	28,341	120	0	47
EA3NP	26,047	69	0	61
EA3NN	15,712	101	0	32
*EA2AZ	7,194	65	0	22
*EA7MT	6,816	59	0	24
EC1KR	6,804	48	0	28
*EA5AER	5,355	51	0	21
EA1DFP	5,050	35	0	25
EA1AR	4,212	30	0	27
EA1FMD	4,104	28	0	27
*EB2RA	570	10	0	10
EF1N	480	12	0	8
*EC7KW	238	7	0	7
*EB5CS	120	6	0	5
Sweden				
SEØX	607,511	1156	24	73
SA4A	210,394	693	9	50
SM5EPO	171,248	595	4	52
SM4DHF	144,837	433	11	52
SM7PEV	98,294	394	2	47
SM5FUG	71,652	337	0	42
SM2EKA	12,936	112	0	24
*SM6BZV	11,488	69	2	30
*SE5E	3,408	44	1	15
Switzerland				
HB9DHG	252,056	890	1	55
HB9CVQ	220,385	789	0	55
HB9CRV	37,468	196	0	38
Ukraine				
UW2M	1,065,927	1396	34	95
UT6UD	511,875	1057	17	74
UW5ZO	502,550	1013	24	71
UT5C	420,112	1068	8	69
UT5EL	366,413	805	21	68
*UX5UN	245,752	721	7	61
*UT7QF	238,464	755	1	63
*UV7V	231,777	743	2	61
UT4XU	226,554	761	1	60
UXØLL	216,370	540	13	64
UT5ECZ	208,303	616	3	64
UR8RF	208,164	745	1	56
UY5ZZ	206,896	630	5	62
UR7EU	200,384	656	2	60
UR7R	197,780	746	0	55
UY3AW	189,865	585	7	58
UX4U	182,655	404	21	60
UXØFF	172,200	506	6	64
*UW1U	127,000	539	0	50
UR7EN	118,378	401	1	57
US2YW	113,088	411	0	57
*UW5Q	107,068	426	0	52
UW7LL	103,073	351	2	57
UR5MW	100,223	392	1	52
UT3N	98,992	457	0	46
*UT5UN	93,075	384	2	49
UR2VA	87,984	340	1	51
*UX7IW	83,306	384	0	46
URØIQ	82,224	346	0	48
UR5E	77,805	276	0	57
UX2VA	77,495	264	1	54
UT1QQ	75,905	336	0	47
UX5IZ	66,300	255	1	51
UW5SW	65,231	330	0	41
*UV7E	62,771	323	0	41
UT8IO	57,266	307	0	38
*UT4LW	55,640	292	0	40
US5WE	54,079	271	0	41
UX6IR	49,400	179	1	51
*UT1UL	45,880	250	0	40
US8ICM	30,730	179	0	35
UT8EU	27,940	125	0	44
*UZ5ZV	27,200	178	0	32
*UT4WA	22,059	103	0	43
*UY8IF	15,704	51	0	52
UR5SMS	14,619	92	0	33
UT5UGQ	10,550	86	0	25
*UT3C	9,599	70	0	29
UR1HM	5,904	48	0	24
*UY5QZ	5,126	54	0	22
Wales				
*MW5R	234,801	716	7	56
GW9J	98,658	350	8	46
OCEANIA				
Australia				
VK7CW	208	11	0	4
VK3GK	36	5	0	2
Hawaii				
KH6LC	519,375	701	53	22
KH6DX	153,373	216	49	24
Indonesia				
*YB1AR	399	7	0	7
YBØNFL	2	1	0	1
New Zealand				
ZM4T	47,232	137	25	11
South Cook Islands				
E51DWC	103,530	182	42	16
SOUTH AMERICA				
Aruba				
P40AA	1,609,902	1287	57	69
P40XX	389,472	411	53	43
Brazil				
PV8DX	3,610	20	10	9
PY2IU	880	10	3	8
Colombia				
HK1R	1,495,250	1205	57	68
Peru				
OA4DX	111,680	179	40	24
Uruguay				
CW5W	426,800	394	53	57
Venezuela				
*4M1K	625,500	635	51	49
*YV6CR	9	3	2	7
MULTI-OP				
NORTH AMERICA				
UNITED STATES				
MASSACHUSETTS				
K6ND	225,432	613	55	46
W1FM	43,513	338	45	8
RHODE ISLAND				
W1OP	142,071	554	58	29
NEW JERSEY				
W2GD	879,174	1564	60	74
MARYLAND				
NJ3I	204,039	781	58	41
K3CCR	133,980	536	56	26
KB3VQC	112,285	483	56	29
PENNSYLVANIA				
N3EB	397,540	1140	58	52
W3MF	110,290	492	56	31
K3MJW	64,532	370	55	13
FLORIDA				
KØDI	661,248	1454	59	69
AD4ES	224,540	772	57	46
KENTUCKY				
W5MX	501,387	1401	59	52
NORTH CAROLINA				
N4XD	450,455	1119	58	57
SOUTH CAROLINA				
AA4V	438,380	1166	58	57
VIRGINIA				
NR4M	633,000	1447	60	65
KC4D	334,430	1053	57	49
ARKANSAS				
W5ON	286,700	1109	57	43
MISSISSIPPI				
K5GDX	309,816	998	57	47
NEW MEXICO				
K5TA	69,720	502	50	10
OKLAHOMA				
K5KC	415,302	1085	57	57
CALIFORNIA				
N6DZ	206,968	727	56	26
ARIZONA				
W7FSL	88,476	471	55	18
OREGON				
K7JR	15,000	92	41	9
UTAH				
K7CA	602,410	1458	57	50
WASHINGTON				
N7QT	123,525	597	54	21
MICHIGAN				
W8RT	233,442	846	57	42
OHIO				
W8PR	153,032	697	56	32
AD8P	14,749	126	43	6
ILLINOIS				
K9CT	436,785	1361	59	52
COLORADO				
KØRF	322,146	1204	58	41
IOWA				
NØNI	508,344	1388	58	60
CANADA				
QUEBEC				
VE2OJ	519,936	1078	59	37
ONTARIO				
VE3MIS	244,550	759	56	11
VE3FAS	113,475	297	54	21
BRITISH COLUMBIA				
VE7NY	308,179	735	56	23
VE7SCC	69,309	288	47	4
CF7MM	22,272	143	29	3
NORTH AMERICA				
Dominican Republic				
HI1UD	105,042	329	45	16
AFRICA				
Morocco				
CN2AA	3,410,560	2341	54	92
ASIA				
Asiatic Russia				
RY9C	741,234	1020	3	75
RD8D	691,614	977	4	73
RK9LWA	103,560	280	0	40
RK9CYA	60,622	201	0	34
UIØL	8,300	168	1	9
China				
B1Z	72,760	334	1	33
Japan				
JA3YBK	310,473	486	25	56
JK2VOC	402	61	0	3
Oman				
A44A	437,184	681	2	70
Thailand				
HSØZIA	106,918	332	6	43
E2X	52,212	211	2	36
EUROPE				
Aland Islands				
OHØZ	470,568	1051	14	70
Austria				
OE6U	104,370	424	1	48
Belarus				
EU1WW	527,008	1112	16	70
Belgium				
OT6M	875,280	1263	42	78
Bulgaria				
LZ5R	755,106	1324	20	82
LZ7A	426,072	997	17	65
LZ2JE	354,508	879	11	66
Croatia				
9A5M	817,718	1382	34	75
9A5Y	793,198	1355	26	80
9A6V	100,656	416	0	48
Czech Republic				
OL7M	1,205,986	1645	41	90
OL3Z	1,007,811	1494	41	78
OK5Z	970,456	1524	34	82
OL1R	872,492	1351	35	83
OK2W	779,544	1337	30	78
OK5T	592,764	1196	24	70
OL1C	452,800	1110	18	62
OK2KWX	198,396	751	5	49
England				
G4AQG	639,612	1018	38	71
European Russia				
UA7K	1,257,249	1611	34	99
RU1A	930,580	1498	29	86
UA4M	768,231	1213	24	87
R7AB	613,530	1109	20	82
RK4FL	528,710	1063	9	82
RC3W	509,122	1163	5	78
UA3A	448,392	990	6	78
UA4S	415,646	960	4	73
RA3W	293,526	852	3	66
RM1Q	212,872	759	4	55
RY6Y	170,863	425	10	67
RT5G	139,708	559	2	51
RK3PWR	58,422	311	0	39
Finland				
OF5Z	407,559	1084	5	68
OG4T	237,582	677	2	65
France				
TM6M	1,128,567	1452	47	74
Germany				
DFØWRTC	831,796	1255	44	78
DM7C	758,796	1384	32	79
DR5L	618,353	1137	38	69
DM4TR	413,116	1066	24	58
DL5CW	409,409	920	24	67
DFØRW	320,144	718	26	62
DLØAC	213,652	758	11	51
DLØVW	105,621	379	8	49
Hungary				
HG8DX	1,404,135	1763	42	93
HG7T	778,994	1338	30	76
HG5A	526,050	1104	19	71
Ireland				
EIØR	1,240,008	1634	45	77
Italy				
IZ1LBG	766,818	1267	39	74
IK2YCW	564,746	964	32	75
IK3VUU	321,720	917	4	66
Lithuania				
LY2XW	585,249	1187	19	74
LY2TS	427,275	1103	7	68
LY2ZO	307,188	958	4	59
LY2FN	156,780	442	12	55
Netherlands				
PI4DX	1,076,117	1466	44	75
PI4COM	749,628	1269	36	72
Poland				
SN8B	842,380	1396	26	84
SN1D	380,640	926	16	64
SN1LH	100,984	384	1	51
Romania				
YR8D	530,992	1149	18	70
YR8V	134,460	493	1	53
Serbia				
YTØA	434,478	943	18	69
YT5W	347,386	1104	4	58
Sicily				
IQ9UI	894,000	1249	43	82
Slovakia				
OM6A	724,400	1317	31	69
OM4Q	312,914	994	6	56
Slovenia				
S51V	1,460,580	1880	41	91
S52ZW	466,140	1060	19	66
S54O	384,440	1090	7	63
S57W	102,396	452	0	46
Spain				
EA3AKA	419,805	784	32	63
EA5RS	150,281	423	13	54
EA2NS	31,095	136	0	45
Sweden				
SM7BCX	623,378	1164	31	67
Switzerland				
HB9CA	1,061,520	1570	43	77
Ukraine				
UZ3A	769,984	1314	22	84
UR7D	542,610	1205	22	68
UZ2I	196,240	730	2	53
UR6EA	193,088	716	1	55
UR4RWW	80,625	403	0	43
UT7E	56,784	283	0	42
UT4UXB	17,850	157	0	25
UT4UWC	483	18	0	7
OCEANIA				
Hawaii				
KH7M	549,100	732	54	22
Indonesia				
YE1K	119,380	260	2	45
YE1ZAL	52	5	0	2
Tonga				
A35W	81,400	211	28	12
SOUTH AMERICA				
Curacao				
PJ2T	1,792,342	1380	58	73

CHECK LOGS

4M5L, 8SØDX, 9M6YBG, AA7G, AC2OC, AD3Y, CT4NH, DK9BW, DL1ROJ, DL7CX, DM5DX, EA3AGB, EA3GHZ, EA3JL, EA5DY, EI7CC, EW2A, EY8MM, G3VDB, G3YSX, GU4EON, HAØIV, HA1DAE, HA3MY, HG8C, IK1YDB, IK2AOO, IK4MGP, IR9RW, IV3SKB, IZØAIS, IZ4MJP, JA5EXW, JY9FC, LA1U, LY5G, N3IQ, N8OO, OF7CW, OH6LI, OK1DMP, OK2BZ, OK2PAD, OK2PAY, PAØVAJ, PA4O, PY2RO, PY4HO, R2AB, R2PA, R6KX, R6YY, R7FK, RA3FH, RA3WDK, RA4AAT, RA9DZ, RK7T, RO7T, RU9CY, RWØCR, RW3DKK, RW3DW, RW3TN, RW5C, RW6AF, RZ1OA, RZ3AMW, S51CQ, S52WW, S53DIJ, S57XX, S58Q, S59DKR, S59EIJ, S59T, SM5ENX, SP2GJV, SP2HNF, SP5BYC, SP5OXJ, SP6NZ, SP6PYP, SP8FNA, SP8HKT, SP8MVC, SP9TPV, SQ5OVL, SV1PMQ, SV4FFL, TF3SG, UA1AIR, UA9FBC, UK9AA, USØTA, US1GCU, US5ECT, UTØEO, UT5EO, UT6EE, UT6UA, UX7VA, UY1HY, UZ9E, VU3DMP, WØVX, YO2KHK, YO4RDW, YT6W, YU9CF, ZL4AS

2017 SSB RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT				
W1AN	91,104	373	48	25
*WA1JD	33,600	252	46	10
*KA1VMG	7,755	108	32	1
*K1CSP	4,756	67	27	2
*KA1AL	3,692	62	24	2
W1WEF	161	7	7	0
MAINE				
K1WHS	2,002	23	14	8
K1OYB	1,575	30	20	1
*W2LP	1,248	30	16	0
MASSACHUSETTS				
W1EQO	129,276	565	54	27
*KB1VXY	4,140	60	28	2
*K1NZ	3,087	63	20	1
*KC1CRS	1,536	39	16	0
*W1RGA	1,350	39	15	0
*W1KU	969	24	17	0
*W1WH	407	14	11	0
W1PL	75	6	5	0
NEW HAMPSHIRE				
AF1T	147,096	637	55	26
W1NT	50,380	391	47	8
KA1QBO	9,945	109	35	4
*KG6CIH	4,758	71	24	2
K1TR	2,112	32	18	4
RHODE ISLAND				
W1XX	211,280	708	57	38
*W2DAN	16,560	191	34	2
*WA1BXY	10,240	133	29	3
*N1EYE	7,276	88	31	3
VERMONT				
AA1SU	13,098	153	35	2
W1V	5,790	67	26	4
*KC1SS	4,524	69	25	1
NEW JERSEY				
*N2HMM	47,880	311	44	13
K2TTT	37,980	223	47	13
N2ED	19,788	157	43	8
K2DLS	12,426	144	36	2
*N2WSY	8,970	78	40	6
*WA2ALY	4,928	59	28	4
*N2IVN	2,800	44	23	2
*KB2SDF	1,940	41	20	0
*W3PR	1,242	33	18	0
*W2JEK	387	20	9	0
KC2LST	120	7	6	0
NEW YORK				
WF2W	179,958	734	58	31
*W2CCC	21,340	148	45	10
*WA2JQK	16,218	131	43	8
*N2BEG	14,400	136	41	4
*K2SI	8,580	106	32	1
*KX1W	4,617	72	26	1
*WB2KLD	4,401	68	26	1
N2ZN	1,992	34	21	3
*WS9M	1,872	27	25	1
AC2MT	1,818	46	18	0
*AC2IK	728	22	13	0
*WB2NFL	714	24	14	0
*K2RYD	612	24	12	0
*NO2C	363	15	11	0
*K2KU	2	1	1	0
DELAWARE				
*KS3D	35,322	261	50	8
DISTRICT OF COLUMBIA				
4U1WB	1,344	48	14	0
MARYLAND				
K3ZO	102,372	518	52	24
K3RA	49,700	253	52	18
K1BZ	20,548	202	40	4
N3DUE	18,354	170	39	7

*NS3T	14,706	153	39	4
*W3MBC	12,306	120	38	4
K3AJ	6,235	97	29	0
*N3TE	5,673	78	29	2
K3MM	4,896	55	29	3
*K3KU	3,640	53	27	1
*K3DCW	1,919	43	18	1
*N3VOP	896	26	14	0
*W3CB	612	24	12	0
PENNSYLVANIA				
W3BGN	193,557	681	53	38
W3TS	160,688	742	57	26
K3PP	29,800	237	39	11
KY3W	17,756	169	42	4
*WS3C	12,642	126	39	4
K3SWZ	11,132	97	40	6
N3RJ	10,947	117	38	3
*KD3HN	7,683	82	37	2
*K3VED	6,660	72	33	4
NF3R	2,088	36	23	1
*K3UA	189	9	9	0
*N3ATE	40	5	4	0
ALABAMA				
WB4WXE	48,180	240	53	20
*K4WI	8,036	77	34	7
FLORIDA				
KM4HI	27,918	216	42	12
K9QLL	10,976	95	41	8
WX4US	4,096	52	27	5
*W4OEP	1,980	33	17	5
*N4LAK	1,554	31	18	3
GEORGIA				
K4WDR	50,386	366	52	9
KU8E	44,096	288	49	15
K4BAI	38,400	274	48	12
W4AMP	7,749	68	34	7
*KM4F	532	16	13	1
KENTUCKY				
W5MX	194,396	719	58	34
N4RZ	21,707	193	46	3
KY4D	2,268	36	28	0
NORTH CAROLINA				
NG4C	33,400	294	41	9
*KK4RV	8,814	101	36	3
NC3Z	8,640	62	35	13
*AI4GR	4,692	60	32	2
*K4KZ	3,810	49	28	2
*KE4YOG	3,591	56	25	2
WB7OND	1,968	35	23	1
SOUTH CAROLINA				
N4UFP	60,769	329	48	19
*WA4LDU	17,640	148	40	9
*WB5NHL	9,594	108	35	4
*KM4RK	3,892	55	24	4
WA2EMF	864	21	17	1
TENNESSEE				
W4KW	77,675	531	54	11
*N4ARO	18,105	152	46	5
NA4K	15,264	132	42	6
*N4AB	8,931	101	35	4
KS4X	8,316	84	39	3
VIRGINIA				
K3ZM	339,618	898	58	49
*W4ZAO	57,188	441	50	8
N4DSL	56,916	474	50	4
*KB4OLM	47,190	382	48	7
N4DJ	34,788	286	43	9
*W4PFM	13,680	124	39	6
W4WWQ	12,834	120	41	5
*K4FJW	10,374	116	34	4
*K4CGY	9,065	113	37	0
*WA4PGI	7,425	99	31	2
N3JB	6,112	82	30	2
N8AID	5,372	61	28	6
*KQ4LA	4,312	65	26	2
*K4FTO	3,332	55	26	2
*NN4RB	1,482	30	17	2
*KSØCW	1,476	38	18	0
*N4MM	1,460	29	18	2
*N4UA	1,121	25	18	1
*K4MI	840	25	15	0
KK4VA	700	22	14	0
*N4CF	663	24	13	0
*KJ4GYJ	264	12	8	0
*WB4KFO	40	5	4	0
LOUISIANA				
*KV8S	5,809	65	32	5
MISSISSIPPI				
KD5UVV	25,200	198	50	6
*N5KDA	14,664	134	40	7
KF5LBK	12,513	126	37	6
*KF4EWO	9,240	89	38	4
*K5XU	6,080	68	34	4
KF5BA	4,619	67	28	3
NEW MEXICO				
*WD5COV	162,450	713	58	32
AA5B	45,900	328	54	6
*K8OZ	15,300	132	45	5
OKLAHOMA				
WW5TT	9,280	98	36	4
*N5DJR	6,160	73	31	4
*N5UM	4,864	64	30	2
WD5AGO	663	21	12	1
TEXAS				
W5PR	184,730	751	57	34
K5RX	153,009	762	58	23
*K5KJ	36,928	251	55	9
*K5URU	7,600	88	34	4
*AJ4F	6,840	72	33	5
AK5DX	3,332	40	29	5
*N1CC	2,530	49	21	2
*NW5Q	2,470	40	23	3
*NN5T	2,136	37	22	2
KF5NRS	65	5	4	1
CALIFORNIA				
K6ME	14,526	104	46	8
*N6LL	7,638	84	36	2
W6RKC	5,075	52	29	6
K6MM	4,064	52	29	3
KE6QR	3,696	79	19	2
*K6MI	3,120	52	20	4
KW6S	3,100	53	23	2
*KG6AO	2,996	46	26	2
*AA6EE	2,652	41	24	2
N6NF	2,412	67	17	1
*W6VNR	2,054	32	22	4
*WA6URY	1,168	32	15	1
*K7XE	1,036	37	13	1
N6AA	741	24	11	2
*W6JK	360	16	8	1
*K6GHA	232	13	8	0
N6RO	176	11	8	0
*KQ6RS	144	12	6	0
*K6CSL	32	4	4	0
*W6JBR	30	5	3	0
*KJ6KK	2	1	1	0
ARIZONA				
K7BHM	7,790	82	34	4
KF6HI	4,851	53	29	4
*W7UPF	1,725	36	22	1
*AA7V	400	17	9	1
N7RK	44	4	3	1
*K3WYC	12	3	2	0
IDAHO				
*W7TX	572	19	13	0
MONTANA				
KS7T	15,664	150	42	2
*K7QA	5,320	63	32	3
*WB7MT	2,025	33	24	1
N9RV	1,050	33	12	2
OREGON				
W7ZB	11,696	108	38	5
*W7MTL	1,743	33	19	2
W7WVF	1,260	27	19	1
*W7CKW	944	28	15	1
UTAH				
*NS7K	15,190	142	47	2
*K7RFW	4,554	60	32	1
*KI7MD	3,480	52	29	1
WASHINGTON				
N7AU	51,813	394	51	6
KD7UO	21,105	190	41	4
WA2BFW	19,823	188	39	4
*N7ZUF	2,033	46	18	1
K7II	1,539	33	17	2
*K7CDF	1,414	43	14	0
*KG7P	1,120	29	15	1
*KE7ZAC	517	19	11	0
*KNØW	400	19	8	0
N7QS	352	16	7	1
MICHIGAN				
WN8HCV	104,176	679	58	10
*W8CO	98,464	630	56	12
KE8FT	59,708	443	53	6
WD8KDB	36,676	306	48	5
*NA8V	12,690	114	41	6
*K8MJZ	11,880	111	42	3
K8TLC	10,856	97	42	4
W8AB	4,248	47	33	3
*NF8M	1,911	35	21	0
*KC8VGG	868	25	14	0
*KE8BNE	234	10	9	0
*W8RU	115	7	5	0
OHIO				
N8BI	78,171	449	55	16
W8MET	43,434	326	51	6
*N8XTH	34,974	261	51	7
KD8BB	16,807	164	47	2
*AB8OU	16,170	141	45	4
*K8MJH	15,650	128	44	6
*K8AAV	15,337	131	43	6
N8HP	12,878	116	41	6
*K8SVT	7,527	77	35	4
*W8KNO	7,452	87	34	2
*WB8DC	6,468	83	33	0
*KD8KZG	5,883	72	36	1
NB8I	4,544	62	30	2
*NS8O	3,500	49	26	2
*K8AB	156	10	6	0
WEST VIRGINIA				
K8YYY	63,302	455	55	7
*K3ZJ	40,200	280	51	9
*KW8V	23,876	235	42	5
ILLINOIS				
WS9V	134,217	680	56	25
*K9FO	15,928	160	40	4
*W9WB	15,533	133	46	3
K9CQ	15,529	121	46	7
K9IDQ	14,575	112	47	6
*WB9HFK	12,240	118	43	2
*W9JXN	11,484	111	41	3
N9LYE	11,160	106	42	3
NI9H	9,706	98	43	3
*K9MMS	4,323	55	30	3
*WA9KIA	3,993	56	33	0
N9LAH	3,210	49	30	0
W9IIX	2,328	41	24	0
*WT2P	119	7	7	0
*KA9CAR	52	5	4	0
*W9EBK	2	1	1	0
INDIANA				
W9IU	56,463	426	53	6
W9PA	16,473	133	45	6
*W9MRH	11,684	112	42	4
K9LA	6,438	69	35	2
*W9TC	6,401	73	34	3
KB9OS	5,874	68	29	4
*WØZP	5,390	65	33	2
WA9FDO	4,488	58	31	2
*NG9M	2,940	42	26	2
*WB9NOO	2,024	40	22	0
N4TZ	1,560	30	19	1
*KB9OZI	1,260	29	18	0
WISCONSIN				
K9TY	31,232	223	57	4
W9AV	30,800	244	51	5
*WB9BWP	11,224	104	43	3
*WT9Q	3,528	54	28	0
COLORADO				
WØKIT	6,724	70	40	1
*AAØCW	1,716	33	21	1
*WØFRC	1,541	32	23	0
*AKØBC	1,296	36	18	0
*KØUK	342	19	9	0
*AKØMR	112	8	7	0
IOWA				
KØKT	48,256	321	54	10
WØWDF	35,598	313	49	2
ADØH	20,064	191	46	2
KØSRL	312	13	12	0
KANSAS				
NØUU	16,200	138	45	5
*WØKAN	8,346	98	38	1
*KBØMQX	2,349	39	26	1
MINNESOTA				
*NØUJJ	1,840	34	23	0
*KØTC	850	22	17	0
*NRØT	646	19	17	0
NØAT	98	7	7	0
MISSOURI				
*KFØF	12,150	99	47	3
KDØNEO	7,790	87	38	3
*NWØM	1,008	25	18	0
NEBRASKA				
WB9QAF	11,438	124	42	1
*KBØARZ	4,148	55	33	1
NORTH DAKOTA				
KØIDX	78,585	518	53	12
CANADA				
NEW BRUNSWICK				
VE9AA	16,796	101	28	6
NOVA SCOTIA				
VA1AVR	6,975	48	27	4
PRINCE EDWARD ISLAND				
VY2ZM	847,560	992	57	63
QUEBEC				
*VA2BN	10,336	72	32	0
*VE2HAY	9,831	72	29	0
*CF2MO	7,685	58	25	4
*VE2GT	2,788	37	17	0
ONTARIO				
*VE3MGY	117,000	403	53	7
VE3KZ	98,840	374	49	7
*VA3KGS	47,775	210	44	5
*VA3KAI	40,986	191	42	4
VE3KP	36,450	154	43	7
*VA3WU	32,232	132	43	8
*VE3DZ	32,195	148	43	4
*VE3MW	30,038	139	43	3
*VE3PJ	19,668	96	40	4
*VE3NQM	10,914	69	33	1
*VE3WG	10,710	75	29	1
VE3BR	9,827	67	30	1
VE3MT	7,182	58	27	0
*VE3CNA	5,060	52	22	0
*VA3FN	590	13	10	0
SASKATCHEWAN				
*VE5SKI	15,004	73	41	3
*VE5ZX	3,024	30	20	1
ALBERTA				
VE6BBP	66,024	251	50	6
VE6TK	3,938	40	22	0
BRITISH COLUMBIA				
VA7IR	7,904	64	25	1
NORTH AMERICA				
Cayman Islands				
ZF2AM	326,735	556	53	48
Mexico				
XE2S	34,075	147	41	6
XE1RF	11,349	58	29	10
*XE1H	4,775	40	21	4
*XE1AY	2,512	35	14	2
XE2N	20	2	2	0
U.S. Virgin Islands				
NP2X	126,480	287	48	32
NP2J	64,396	154	36	32
AFRICA				
Canary Islands				
ED8W	143,944	190	33	43
*EB8AYA	1,441	16	0	11
Tunisia				
*3V8CB	81,770	221	2	35
ASIA				
Asiatic Russia				
UA9BA	130,237	289	0	47
RU9CC	12,720	61	0	24
RW9CD	12,342	62	0	22
*RA9CCK	8,789	57	0	17
Asiatic Turkey				
*TA3D	43,616	141	0	32
TA2FE	32,396	128	0	26
*TA2OTT	2,470	19	0	13
Georgia				
4L2M	52,740	153	1	35
Isreal				
4Z5LY	79,280	205	1	39
Kazakjstan				
UP2L	68,835	182	0	39
Oman				
*A41ZZ	108	5	0	4
EUROPE				
Aland Islands				
OFØZ	61,910	296	1	40
Austria				
*OE3WMW	42,192	234	0	36
OE1HHB	37,468	196	0	38
*OE2KHM	29,196	161	1	35
*OE2E	24,750	152	0	33
*OE3DMA	2,775	37	0	15
*OE5RBO	1,365	21	0	13
*OE3TWA	1,196	19	0	13
Belarus				
EW6W	140,066	451	9	50
EW8OP	61,254	294	0	41
*EW8R	39,938	201	1	37
*EW8RR	36,062	182	0	38
*EW8Z	13,416	101	0	26
*EU3AA	3,940	36	1	19
Belgium				
*ON4AYM	7,182	54	0	27
*ON2PCO	3,978	46	0	18
Bosnia-Herzegovina				
*E74R	157,080	541	6	50
Bulgaria				
LZ9W	103,200	416	1	47
LZ2XF	16,983	123	0	27
Crete				
SV9COL	5,796	48	0	23
Croatia				
*9A1E	68,460	325	1	41
*9A1MM	49,970	259	1	37
Czech Republic				
*OK1DPU	75,060	338	1	44
OLØW	39,606	194	1	40
*OK2BRQ	38,998	215	1	36
*OK6Y	32,128	206	0	32
*OK2TS	27,472	165	0	34
OK7GU	23,625	137	1	34
*OK1XC	22,909	153	0	31
OK5N	20,340	111	3	33
*OK1LST	16,592	98	1	33
Denmark				
OZ7AM	93,528	333	4	50
OZ30EU	52,290	245	1	41
*OU7A	40,053	205	1	38
OZ1ADL	12,194	94	0	26
OZ4O	2,610	28	1	17
England				
G4AFJ	29,526	133	7	35
*G3VGZ	6,360	65	1	19
*G4DZL	3,726	41	1	17
*G4AYU	170	8	0	5
Estonia				
ES5RW	237,015	648	13	56
*ES4RLH	12,825	101	0	25
*ES5QD	7,155	46	1	26
*ES1ACS	3,616	47	0	16
*ES2IPA	3,553	38	0	19
European Russia				
R7NW	73,287	279	3	48
RC5Z	62,836	282	1	45
R1AK	62,304	295	0	44
UA5C	38,924	217	0	37
*RZ3DW	33,210	167	0	41
*R7KR	30,384	174	0	36
*R7NP	28,860	161	0	37
*RA4CB	25,389	135	0	39
*RX3XA	24,660	142	0	36
*UA1CUR	23,628	148	1	32
UA1CEI	15,064	114	0	28
RW4NN	14,229	92	1	30
*RK3E	13,824	102	0	27
R5ER	12,656	90	0	28
*R2PT	5,900	63	0	20
*RW3AJX	4,608	63	0	16
RM4HZ	3,944	47	0	17
UA4FER	3,468	41	0	17
*RZ5D	3,104	46	0	16
RA3NC	210	10	0	6
*UG3G	210	6	0	6
*RK2M	145	7	0	5
*UA4NC	36	3	0	3
European Turkey				
*TA1ED	60,840	256	1	44
*TA1CM	10,050	78	0	25
Finland				
*OH6ECM	19,980	133	1	29
OF5C	11,250	93	0	25
*OH8JIX	2,482	30	0	17
OH7MFO	936	15	0	13
France				
F6GOX	217,740	544	19	57
*F5CYS	3,723	45	0	17
*F1ULQ	1	0	0	1
Germany				
DJ7WW	211,040	536	22	58
DF2DJ	155,100	507	12	54
DJ5IW	113,870	408	12	47
DK1NO	80,544	381	2	46
DL2SAX	68,698	312	1	48
DL1EKO	66,462	240	7	50
*DL1DXA	63,300	262	5	45
*DO4OD	53,240	304	1	39
*DL6CT	49,960	280	1	39
*DO8CW	49,056	261	2	40
*DK8NC	48,087	289	2	37
*DL4ZA	47,804	304	2	35
DKØSU	34,632	195	1	38
DJ2YA	27,494	69	13	46
*DG5MEX	27,010	158	0	37
DJ7OQ	24,054	129	1	37
*DG5MLA	22,704	160	0	33
*DK1KC	22,464	165	0	32
*DM5SB	20,646	159	1	30
*DK7CH	17,130	133	0	30
*DFØBV	17,112	125	0	31
*DF5BM	15,540	119	0	30
*DL9IM	15,411	104	1	32
*DM4MN	15,392	101	1	31
DG9SEH	15,270	109	2	28
DGØLFG	15,156	82	2	34
*DJ9MH	14,848	100	2	30
*DL6NAL	13,195	105	2	27
*DLØLA	12,404	104	1	27
*DL2SWR	12,360	92	1	29
*DL6RBH	8,952	85	0	24
*DD2ML	8,528	77	0	26
*DL1ATZ	8,176	65	0	28
DAØT	7,452	73	0	23
DL7AT	6,447	71	0	21
*DL5AWE	6,182	64	0	22
DLØFTG	6,160	64	0	22
DF6PB	5,278	43	0	26
DK2BJ	5,148	54	0	22
DK1AX	4,800	53	0	20
*DJ9SN	4,644	62	1	17
*DH4PSG	4,580	56	0	20
DF6RI	4,473	48	0	21
*DO2MS	3,780	51	0	18
DK1FW	2,826	35	0	18
DL7LX	2,780	27	1	19
DN3CX	2,304	33	0	16
DC9ZP	2,240	31	0	16
*DK9HN	2,159	25	1	16
*DF2FM	2,070	30	0	15
DF5BX	2,044	34	0	14
*DO9SR	1,918	31	0	14
*DJ2YE	1,870	43	0	11
*DJ3HW	1,848	30	0	14
DL3BXX	1,410	17	2	13
*DFØWRTC	1,326	21	0	13
*DM5Z	1,080	30	0	9
*DB1EF	888	15	0	12
*DG5TF	803	17	0	11
*DK7MCX	696	21	0	8
*DK6SP	344	11	0	8
DJ8QA	288	12	0	6
*DQ5M	288	9	0	8
*DG2YCB	259	8	0	7
*DJ8OG	192	7	0	6
*DJ1YFK	88	5	0	4
*DL5JS	45	3	0	3
*DG7RO	20	2	0	2
Greece				
*SV8DTD	15,870	111	0	30
*SV1ONV	10,746	79	0	27
*SV1GRD	5,760	47	0	24
*SV2CUU	3,116	32	0	19
SV1ME	1,027	15	0	13
Hungary				
HA4XH	195,000	634	9	51

HA7JQK	4,554	51	0	18
HA3YE	4,220	44	0	20
Italy				
I3BUI	29,855	179	0	35
*IKØBAL	22,752	147	0	32
*IZ4VUS	22,506	138	0	33
*IV3KKW	13,978	98	0	29
IZ8HUJ	9,016	79	0	23
IK2AQZ	6,028	56	0	22
*IW2FUT	5,984	55	0	22
*IZ5IMD	4,650	38	1	24
*IZ1MHY	3,195	45	0	15
*IUØAPU	2,340	35	0	15
*IW1CBG	2,070	33	0	15
*IW4CNY	1,920	35	0	12
*IZ3NVR	710	16	0	10
*IK2IKW	558	13	0	9
*IZ2BVC	368	11	0	8
Kaliningrad				
*RA2FX	11,206	88	0	26
Latvia				
*YL3IR	6,300	58	1	20
*YL2PP	2,250	30	0	15
Lithuania				
LY4T	135,839	506	3	50
*LY1FK	55,599	256	1	42
*LY3DA	27,588	171	1	32
*LY2ND	8,646	86	0	22
*LY2BAG	2,002	34	0	14
Luxembourg				
LX1ER	52,632	188	7	44
Moldova				
*ER3CR	40,470	202	0	38
Netherlands				
PA1NHZ	80,376	309	9	42
*PE2JMR	34,944	180	1	38
*PA4AR	14,980	86	0	35
*PE1BSI	11,691	88	0	27
*PA3DTR	6,864	56	2	22
*PE1MAI	2,166	23	0	19
*PA1P	1,105	17	0	13
*PC2L	1,098	25	0	9
*PE4AD	270	9	0	6
Norway				
*LA1DSA	57,440	287	1	39
LB9RE	15,520	94	1	31
*LA3BO	13,132	94	0	28
*LA3BPA	7,602	73	0	21
*LA8OKA	6,240	62	1	19
*LB1LG	2,376	27	0	18
*LA4GMA	110	5	0	5
Poland				
SP9QMP	127,782	408	7	55
SN7D	117,171	503	1	46
SQ1OD	114,296	411	4	52
SQ9V	89,730	409	3	42
*SP5CJY	85,415	303	7	48
SP1MVG	77,572	360	1	43
*SQ9ZAX	71,016	333	1	43
*SO3F	52,624	239	1	43
*SQ2WHH	51,619	260	2	39
*SO7BIT	48,120	247	2	38
*SO5MAX	42,980	260	0	35
SP5UUD	40,303	212	0	41
*SP2TMT	39,442	223	0	37
*SP9FMP	25,024	148	1	33
*SP3JUN	24,737	185	0	29
*SP6A	21,087	138	0	33
*SQ3PMX	19,050	138	0	30
*SQ9PUW	13,552	107	0	28
*SQ5GVY	13,500	97	0	27
*SQ9PPT	10,912	107	0	22
SN6A	7,400	60	0	25
*SQ5EF	7,182	74	0	21
*SP4LVK	6,222	81	0	17
*SP3KOV	3,952	44	0	19
*SP6TRH	3,213	39	0	17
*SP5XOV	1,620	24	0	15
*SP1FRC	1,070	25	0	10
*SP5LCS	650	16	0	10
Portugal				
*CT1HIX	16,864	99	3	31
*CT1FDB	10,220	68	4	24
*CT1BXE	30	3	0	2
Romania				
*YO7CDB	68,670	325	3	39
*YO8RZJ	59,934	285	1	41
YPØC	54,871	288	0	37
*YO8SAO	20,057	128	0	31
*YO7FEY	16,175	130	0	25
*YO3GHM	10,584	82	0	27
*YO6HSU	9,000	77	0	24
*YO8RKP	4,352	53	0	17
*YO2LXW	2,618	32	0	17
*YO4BXX	486	12	0	9
Scotland				
GM9N	42,940	222	2	36
*GM1C	175	6	1	4
Serbia				
*YT8A	152,090	431	8	59
YTØW	133,574	538	0	49
*YT3TPS	20,230	117	0	34
Sicily				
*IT9DBF	4,002	33	1	22
Slovakia				
OM2VL	173,019	398	24	53
OM7RU	85,164	351	2	45
*OMØDC	40,584	212	1	37
*OM5WW	40,443	202	0	39
*OMØCS	36,260	193	0	37
*OM2DT	9,875	77	1	24
*OM3TLE	3,632	46	0	16
*OM3CDN	2,976	39	0	16
Slovenia				
S57C	162,688	510	7	55
S53M	57,880	286	1	39
*S57NAW	38,554	210	0	37
*S59D	12,740	92	0	28
*S51VA	352	9	0	8
Spain				
EA3QP	73,346	218	13	49
EA1BXJ	38,256	156	6	42
EA5JK	22,200	107	3	37
EA3ELZ	16,240	86	4	31
*EA4JR	15,953	66	9	34
EA5DFV	8,684	63	0	26
*EA5DM	4,224	37	0	22
*EA2XR	2,628	31	0	18
EA1DFP	1,430	14	2	11
*EB2ESS	432	12	0	8
*EE4A	246	9	0	6
Sweden				
SB6A	39,384	222	0	36
*SD7X	18,508	133	0	28
*SE4E	6,580	67	0	20
SB3W	5,434	50	0	22
*SG30	450	9	0	10
*SP3UCW	36	3	0	3
*SP2MGR/MM	10	0	0	2
Switzerland				
HB9EOU	30,710	165	1	36
Ukraine				
UT6UD	155,062	491	8	54
UYØZG	118,767	376	10	51
UT1XX	109,550	443	3	47
UX1UA	105,906	370	5	52
UT2AA	90,720	338	6	48
*UR5WFJ	70,224	351	1	41
UR5TM	68,160	288	2	46
*UY2UQ	56,200	296	1	39
US7IA	33,668	180	0	38
UXØFF	33,642	162	0	42
*UT1US	33,618	169	0	39
UX5IS	30,780	179	0	36
UT7NY	26,715	139	2	37
*UW1U	23,695	138	1	34
*USØMS	21,250	128	0	34
*UT8IM	20,336	140	0	31
*UX3HA	19,410	139	0	30
*UTØCK	17,023	127	0	29
UX1VX	15,870	111	0	30
*UT4EK	15,270	105	0	30
*UR2Y	14,715	112	0	27
*UTØNB	13,578	89	0	31
*UV5EEO	13,412	97	0	28
*UT5CB	12,609	101	0	27
*US6IKF	9,128	68	1	27
*UT7LW	7,392	70	1	21
*UT7KF	6,888	45	0	28
*USØAK	3,258	37	0	18
*UR1YAA	1,792	27	0	14
*US6IKV	1,782	39	0	11
*UT1V	1,260	27	0	12
*UT3UFH	1	0	0	0
Wales				
*GW4W	6,175	65	0	19
*GW1YQM	2,000	27	0	16
*GWØNVN	1,020	16	1	11

OCEANIA

Australia

*VK3IO	208	15	2	2
Hawaii				
KH6CC	49,115	105	39	8
*WH6YH	1,080	9	11	1
Indonesia				
YF3CYT	28	3	0	2
*YB1CYD	22	4	0	2
New Zealand				
ZL2OK	1,199	19	4	7
Samoa				
5W1SA	10	1	1	0

SOUTH AMERICA

Argentina

LU8DPM	700	8	5	5
Venezuela				
*YV6YV	4,123	23	10	9
YV6CR	1,485	12	4	11
YV5IAL	560	8	0	7
YV6BXN	135	4	0	5

QRP

NORTH AMERICA

UNITED STATES

MASSACHUSETTS

W1CEK	1,548	34	18	0
NEW YORK				
W7BAK	2,967	51	21	2
FLORIDA				
KQ4KX	2,208	35	19	4
K3TW	944	22	13	3
VIRGINIA				
N8OQ	1,782	45	18	0
N5SMQ	50	5	5	0
TEXAS				
W1JCW	12,691	128	43	6
CALIFORNIA				
K2GMY	8	2	2	0
W6MZ	4	2	1	0
WASHINGTON				
KK7VL	112	11	4	0
OHIO				
W8WTS	2,997	48	25	2
KANSAS				
NØJK	32	4	4	0
MINNESOTA				
NNØQ	2,581	40	28	1
SOUTH DAKOTA				
W7XU	30,914	232	54	4

NORTH AMERICA

Cuba

CO8LY	5,070	36	14	12
U.S. Virgin Islands				
KP2BH	1,635	20	5	10

EUROPE

Bosnia-Herzogovina

E77CV	45,120	217	1	39
E74Y	33,920	163	0	40
Croatia				
9A5M	4,400	42	0	20
9A8CV	2,205	30	0	15
European Russia				
RW3AI	4,522	50	0	19
RA3DJA	1,000	31	0	8
R7KO	44	4	0	4
Finland				
OH3KQ	2,896	38	0	16
Germany				
DK2LO	24,420	190	1	29
Greece				
SV1BJY	1,495	23	0	13
Italy				
IV3BCA	1,624	25	0	14
Kaliningrad				
RA2FB	4,437	54	0	17
Lithuania				
LY2NK	3,616	51	0	16
Poland				
SQ2BXI	19,890	141	2	28
Romania				
YO3FGO	1,530	20	0	15
YO4AAC	600	15	0	8
Spain				
EA5IDQ	20	2	0	2
Ukraine				
UR5VAA	8,993	83	0	23
US8AR	406	14	0	7

ASSISTED

NORTH AMERICA

UNITED STATES

CONNECTICUT

W1CTN	79,496	351	52	24
W1TJL	8,339	109	27	4
*W1ARY	638	23	11	0
MAINE				
K1JB	44,286	297	48	13
MASSACHUSETTS				
NC1I	49,302	273	50	16
KV1J	11,760	111	37	5
W1GD	3,920	58	24	4
NEW HAMPSHIRE				
N1KWF	28,991	227	47	6
WX1S	1,420	22	15	5
NEW JERSEY				
*KE2D	19,307	193	40	3
AB2DE	17,172	125	44	10
NEW YORK				
KN2M	62,720	433	56	8
WA2MCR	32,820	205	44	16
WC2L	29,848	199	40	12
KE1IH	26,659	196	43	10
*WX3P	11,070	102	38	7
W2BSN	2	1	1	0
DELAWARE				
AA1K	54,954	275	49	22
K3CNH	25,190	175	40	15
NW3Y	20,825	165	37	12
DISTRICT OF COLUMBIA				
KE3X	22,442	192	42	7
MARYLAND				
K3ZU	198,075	663	56	39
K3CCR	39,765	299	46	9
N3QE	28,968	244	44	7
N3HEE	23,817	198	45	6
N1SZ	8,568	104	32	2
W3LL	7,030	65	32	6
W3UL	6,358	77	31	3
N3YUG	3,068	50	23	3
AB3CV	845	28	13	0
NA1DX	387	20	9	0
PENNSYLVANIA				
K3WW	152,564	622	54	32
W3FV	47,058	300	48	14
N3LPJ	44,226	300	52	11
WØBR	24,528	171	47	9
WY3A	22,542	180	41	10
N3RS	13,040	54	16	24
N3RD	12,650	104	41	9
W3FIZ	10,101	112	31	6
*NY3B	7,170	100	26	4
W3MF	3,146	50	24	2
AA3B	3,021	69	19	0
FLORIDA				
WX4G	47,215	236	48	23
K4LM	20,691	125	42	15
GEORGIA				
N4PN	39,820	306	44	11
KENTUCKY				
AJ4A	38,478	226	53	13
K4WW	14,445	138	41	4
K4FT	846	22	17	1
KI4WCQ	180	3	0	5
NORTH CAROLINA				
N1LN	27,864	218	46	8
K4SV	11,800	78	36	14
SOUTH CAROLINA				
W4GE	59,427	302	48	23
AE4VJ	12,374	109	38	8
K4YYL	154	11	7	0
N4VZ	65	5	4	1
TENNESSEE				
K4RO	31,122	229	49	8
AA4DD	20,458	155	44	9
K4AFE	11,704	106	39	5
VIRGINIA				
W4ML	51,657	285	48	19
W4JVN	29,829	192	49	12
WB3D	22,790	178	43	10
K1GG	22,504	166	50	8
W4AAW	21,000	210	35	7
KK4ODQ	17,440	191	36	4
K4XL	12,328	103	39	7
K5VIP	10,200	108	34	6
W2YE	3,250	49	21	4
W4VIC	2,222	43	21	1
W4JAM	1,281	26	19	2
*W3TB	540	21	12	0
ARKANSAS				
WD5R	103,748	608	57	17
MISSISSIPPI				
W2GS	3,552	54	29	3
OKLAHOMA				
K5LAD	9,786	103	39	3
TEXAS				
WBØTEV	16,150	133	42	8
*KE5LQ	12,887	109	45	4
*WA5LFD	10,810	95	40	6
N5RMS	7,866	74	39	7
*AA5AM	3,616	46	28	4
CALIFORNIA				
KK6ZM	76,107	463	55	14
N6KI	29,786	251	46	7
WB6RJH	5,024	71	30	2
*W8KA	36	6	3	0
ARIZONA				
N7VF	19,533	161	47	4
K7WP	17,628	136	45	7
N9NA	13,570	120	39	7
K7HP	9,744	84	42	6
W0RIC	9,585	92	39	6
N6SS	7,380	66	33	8
K9DR	4,464	54	28	3
AD7ND	1,064	25	19	0
OREGON				
KA6BIM	47,458	327	53	8
*AF7NX	990	30	14	1
W7WHY	8	2	2	0
WASHINGTON				
KZ1W	32,050	269	45	5
K7SS	15,732	137	41	5
K7LFY	14,064	121	46	2
KE7SW	5,285	62	33	2
*K7BX	1,365	34	13	2
*N7BKS	832	29	13	0
MICHIGAN				
K8PL	107,916	693	58	10
KD8QYE	9,964	85	42	5
W8TE	9,950	79	44	6
W8/MMØLID	3,198	54	26	0
OHIO				
W8GNM	41,663	296	53	8
*WB8JUI	6,048	48	44	4
K8ZT	1,540	29	21	1
WEST VIRGINIA				
NW8U	9,389	101	39	2
ILLINOIS				
AC9S	17,200	145	46	4
K9ZM	952	19	15	2
*K9PY	918	24	17	0
INDIANA				
K9SG	69,940	469	53	12
K9NW	13,524	126	40	6
NM9P	9,320	103	40	0
*AC9EZ	736	20	16	0
WISCONSIN				
WØAIH	114,264	678	56	16
*WK9U	54,312	374	52	10
*KBØKFX	600	19	12	0
COLORADO				
KVØQ	114,030	697	56	14
K7SCX	32,130	209	54	9
WØDET	429	15	13	0
KANSAS				
KØVXU	73,968	473	54	13
K3PA	37,200	260	53	9
KØBJ	22,852	160	51	7
NØYET	2,673	45	27	0
MINNESOTA				
KØYR	77,760	520	57	7
KØKX	62,925	316	57	18
NEØU	26,760	188	53	7
*WØSEI	23,760	173	49	6
KØRJW	13,377	120	48	1
WAØMHJ	12,502	109	44	3
WBØN	5,460	58	36	3
KIØF	4,020	58	30	0
MISSOURI				
WØMB	72,954	514	54	9
KIØI	64,482	427	56	10
*N8GOU	465	14	15	0

CANADA

NEWFOUNDLAND

*VO1HP	42	4	3	0
*VE1ØØVIMY/VO	1	-2	1	0
NEW BRUNSWICK				
*VE9ML	16,422	102	31	3
VE1ØØVIMY/VE	272	8	8	0
QUEBEC				
VA2WA	310,899	643	55	38
ONTARIO				
VE3PN	208,620	558	53	23
VE3CX	29,070	123	46	5
VE3SS	26,532	129	40	4
*VA3TIC	16,344	98	34	2
VE3EJ	14,782	85	34	4
*VE3CWU	68	4	4	0
MANITOBA				
*VE4VT	31,458	138	46	3
BRITISH COLUMBIA				
CF7FC	12,648	80	30	4
VE7IO	222	8	5	1

NORTH AMERICA

Alaska

KL7SB	20,576	127	26	6
Dominican Republic				
*HI3CC	26,280	112	29	16
Mexico				
XE2X	194,398	517	53	21
XE2JS	666	16	8	1

ASIA

Asiatic Russia

RA9Y	54,560	146	0	40
R9MJ	21,120	79	0	30
RWØCF	11,960	47	10	16
Asiatic Turkey				
*TA7AFR	4,980	35	0	15
*TA4CS	96	4	0	3
*TA3MHA	10	1	0	1
China				
BA4DL	30	2	1	1
Cyprus				
P33W	281,856	450	8	56

5B4AIF	213,009	382	6	51
*H2X	21,870	81	0	27
Isreal				
4X1IM	7,620	40	0	20
Saudi Arabia				
7Z1SJ	20,370	63	7	28
*HZ1TL	329	7	1	6

EUROPE

Austria				
OE1TKW	67,868	277	6	41
*OE2LCM	12,200	100	0	25
OE5UAL	7,875	63	0	25
Baleric Islands				
EF6T	83,475	234	12	51
Belarus				
EW1I	61,834	282	2	41
*EU3A	31,122	154	0	39
EW7M	1	0	0	1
Belgium				
OO7P	36,585	156	4	41
*ON1TO	33,824	210	0	32
Bosnia-Herzogovina				
E73ESP	93,345	373	2	47
*E78T	52,600	260	0	40
E70T	34,040	184	1	36
Bulgaria				
LZ3ZZ	58,320	246	1	44
LZ8E	10,791	60	1	32
*LZ2ZG	6,096	48	1	23
LZ1UK	30	2	0	2
Crete				
SV9GPV	8,450	62	0	26
Croatia				
*9A2EU	31,122	138	1	41
Czech Republic				
OK7K	652,807	1049	36	71
OK1W	272,156	682	15	61
OK1T	159,831	536	8	51
*OK2BFN	84,231	342	1	48
OK6AB	36,855	216	2	33
*OK6AA	24,568	132	1	36
OK2ZV	6,916	52	0	26
OK1DXW	2,652	33	0	17
Denmark				
OZ4VW	90,100	322	7	46
OV90EDR	12,925	107	0	25
*OZ1DJJ	5,911	50	0	23
England				
G5K	113,960	409	7	48
G3UHU	3,840	37	1	19
Estonia				
ES5MG	104,250	405	1	49
*ES4NY	37,030	210	1	34
European Russia				
RZ3EC	96,320	337	3	53
RU1AB	87,822	339	5	46
R3ST	67,445	291	1	46
RD1AH	43,516	197	2	42
RN3OG	37,972	171	1	43
UA6AH	18,122	101	2	32
RO3G	17,408	96	0	34
RA1QD	14,592	96	1	31
*RK6AQP	12,431	75	0	31
*RY4F	7,280	79	0	20
RL4A	7,047	46	0	29
RL3BZ	5,712	49	0	24
*R3IAN	594	14	0	9
Finland				
OF1Z	89,488	305	5	51
OF6MW	16,164	86	1	35
OG6N	12,974	101	0	26
OH6FSQ	175	5	1	4
France				
*TM6M	81,900	260	10	50
*F5DRD	6,486	57	0	23
F4EUG	1,744	22	1	15
*F8CRS	682	13	0	11
Germany				
DK6WL	250,410	613	23	62
DJ7YP	227,700	641	18	57
DK2OY	220,020	606	15	61
DJ5AN	165,760	414	19	61
DL7URH	110,502	355	12	51
DL7ON	90,211	317	11	48
DM4KJ	87,700	371	5	45
DG1VL	85,278	280	12	49
DL7CX	72,332	304	7	45
DL1NKS	69,286	308	5	44
DL6MHW	65,050	286	5	45
DKØRX	60,662	256	7	42
DJ8QP	50,900	214	7	43
DL1GBQ	50,002	222	4	42
DL8OH	48,321	139	13	46
DL3ABL	47,089	202	6	43
DG8AM	43,952	223	2	39
DJ1AA	43,946	217	4	39
*DL6RAI	34,632	213	1	36
DK5AI	34,200	196	1	37
DL1DTL	25,340	165	0	35
DL8UD	24,707	192	0	31
*DH1TS	24,325	154	1	34
DK2TG	20,335	132	0	35
DL1A	19,380	157	0	30
DM5TI	19,350	152	0	30
DK8ZZ	17,748	145	0	29
DL5LYM	16,467	120	1	32
DG2NMH	14,560	98	0	32
*DJ7MH	14,355	119	0	29
*DF7RG	13,446	116	0	27
DF2TT	13,284	60	1	40
DO4DXA	13,076	105	0	28
*DF1LX	12,390	105	0	30
DK2CX	12,183	83	0	31
DL5ST	12,152	100	0	28
*DF1LON	11,648	100	0	28
DO4TP	11,367	95	0	27
DK5TX	7,248	69	1	23
DJ6TB	7,050	61	1	24
*DL8ZAJ	4,662	51	0	21
*DC2VE	4,104	51	0	19
DL1NEO	3,294	45	0	18
Greece				
SV2BXZ	76,230	339	0	45
SV2GJV	68,208	277	1	47
*SV2JAO	48,461	228	1	42
SV3GKU	22,308	135	0	33
SV3DVO	14,610	101	0	30
*SV1EJD	1,875	26	0	15
*SV3ICK	1,118	18	0	13
Hungary				
HA8V	97,776	400	1	47
HA5UA	70,004	326	1	42
*HA8AR	33,005	191	0	35
*HG8C	20,163	126	0	33
*HA6NL	17,075	138	0	25
*HA8FM	12,122	87	0	29
*HA5PP	6,371	58	0	23
Italy				
IK4DCX	93,812	409	1	46
IZ5ICH	56,064	225	3	45
IKØXBX	45,066	214	1	41
IK2TDM	29,876	127	2	42
IZ5MOQ	26,005	151	1	34
IZ3SQW	21,920	141	1	31
IU4CHE	3,792	32	0	24
IZ5NFD	3,454	25	3	19
*IZØDXD	2,499	30	0	17
*IZ5OQX	816	17	0	12
Kaliningrad				
UA2FZ	316,344	697	16	68
Lithuania				
LY4A	428,079	843	19	74
LY2OU	97,053	377	2	49
LY2BVB	89,694	316	5	49
LY5W	29,988	167	1	35
LY5R	25,668	138	0	36
LY5O	24,738	134	1	37
*LY2SA	19,292	142	0	28
LY3B	13,104	105	0	26
LY7Z	4,446	52	1	17
*LY4Z	4,208	58	0	16
Netherlands				
PA4VHF	133,114	409	12	50
PA1BX	9,300	74	1	24
*PE1EWR	7,452	64	1	22
*PA9CC	5,020	52	0	20
PA3AAV	4,617	49	2	17
*PA8KW	1,638	23	1	13
*PAØMJM	1,155	20	0	11
Norway				
LA5YJ	62,744	264	1	45
*LA9TY	16,492	117	1	27
Poland				
SN2M	499,604	941	30	68
SP9N	229,827	637	13	58
*SP3P	86,020	386	1	45
*SQ4JEN	42,180	235	1	36
*SP6NIC	38,360	193	3	37
*SP6MLX	33,192	193	1	35
*SP8FB	30,975	184	1	34
SP5GMM	29,939	113	2	45
*SP5NZA	26,037	163	0	33
SP1O	17,570	102	2	33
SP9HZW	9,074	71	0	26
SP3QDM	3,822	27	1	20
*SP2DKI	3,672	44	1	17
SQ2HL	1,040	16	0	13
Portugal				
CT2HKN	17,710	98	1	34
*CT2GSN	2,907	35	0	17
Romania				
*YO2LSP	87,467	364	2	45
YO3HOT	77,168	262	4	52
YO3APJ	59,878	247	3	44
*YO7LFV	8,487	75	0	23
YO7MGG	2,688	35	0	16
YO3GNF	5	1	0	1
Serbia				
YU3EEA	106,756	392	7	45
YT7R	28,197	137	1	38
*YT1T	27,434	192	0	29
YU1CC	2,806	22	0	23
Sicily				
IT9VCE	57,510	245	4	41
IT9ZZO	20,436	96	3	36
IT9CLN	8,399	37	1	36
IT9ZMX	5,888	53	0	23
IT9RZU	2,916	33	0	18
Slovakia				
OM4DW	31,894	167	1	36
*OM7LM	2,240	32	0	14
Slovenia				
S53O	292,491	683	19	62
S52WW	114,868	438	3	49
S51CK	110,736	458	0	48
*S52NR	77,916	367	1	42
S54O	49,413	258	0	39
*S57KM	34,704	197	0	36
*S56A	29,308	177	1	33
S51DX	22,605	140	0	33
Spain				
EA3PT	188,997	477	17	56
EA1DR	159,408	346	21	60
ED4AA	68,320	232	12	44
EA1SA	53,808	146	17	42
EF1W	16,416	105	0	32
EA2AAZ	14,664	65	5	34
EA2OT	14,220	50	8	37
EA1DVY	7,784	51	6	22
*EA1CDV	5,568	46	2	22
*EA4DE	2,052	28	0	18
*EA4LI	1,474	27	0	11
EA3XL	675	14	0	9
EB2RA	660	15	0	10
Sweden				
SM5EPO	58,917	286	1	40
*SM6WET	55,150	212	4	46
*SEØX	53,424	253	1	41
*SB7W	40,428	225	0	36
*SA6BET	30,459	185	1	32
*SM6MVE	9,542	74	0	26
Switzerland				
HB9DHG	82,156	351	1	45
HB9EYP	35,880	185	1	38
Ukraine				
UR7R	92,637	405	1	46
UT5C	91,392	386	2	46
UY3AW	78,438	313	3	48
UY5ZZ	70,890	285	3	48
*UV7V	55,255	271	0	43
UT4XU	48,330	217	1	44
UT5ECZ	47,104	203	3	43
*UT5RQ	42,230	213	1	40
UW5ZM	24,465	141	1	34
UR5E	16,695	91	1	34
*US5LOD	16,520	126	1	27
*EO3Q	1,020	25	0	10
UT3UFI	368	11	0	8
UW6E	102	10	0	3

OCEANIA

Indonesia				
*YC1COZ	32	4	0	2
South Cook Islands				
E51DWC	5	1	0	1

SOUTH AMERICA

Bonaire				
PJ4DX	81,510	127	38	28
Venezuela				
YV2IF	23,575	62	17	24

MULTI-OP

NORTH AMERICA

UNITED STATES

CONNECTICUT				
W1NRG	25,064	203	44	8
MASSACHUSETTS				
K1LZ	337,792	729	56	56
K1VR	102,147	411	49	30
N1SOH	15,080	160	34	6
NEW JERSEY				
N2CW	287,324	768	58	51
MARYLAND				
WG3J	72,562	395	53	18
WA3EKL	45,530	334	47	11
PENNSYLVANIA				
N3EB	141,015	629	57	28
FLORIDA				
N2CEI	233,700	812	58	42
AD4ES	9,520	115	27	8
N4SVC	6,084	63	34	5
VIRGINIA				
N4HB	64,448	423	51	13
MISSISSIPPI				
NA5NN	126,920	685	54	22
K5GDX	71,928	393	56	18
W5SGL	36,598	283	50	8
NEW MEXICO				
K5LRW	8,487	90	37	4

TEXAS				
WR5O	76,380	485	56	11
W5RTA	33,925	246	52	7
ARIZONA				
NA7TB	166,460	845	58	24
W7FSL	19,872	153	47	7
OREGON				
K7JR	20,550	170	44	6
K7BUY	7,912	79	40	3
UTAH				
N7JW	42,517	304	52	9
MICHIGAN				
W8CT	35,739	278	51	6
OHIO				
ND8DX	243,810	1042	58	32
MINNESOTA				
WBØVAK	62,118	441	54	9

CANADA

PRINCE EDWARD ISLAND				
KW7MM/VY2	543,348	834	57	51
ONTARIO				
VE3VV	247,779	748	57	12
VE3DC	14,730	110	30	0
MANITOBA				
VE4VJR	80,769	296	53	4
BRITISH COLUMBIA				
VE7NY	140,901	438	56	11

NORTH AMERICA

Bahamas				
C6ANA	543,345	823	57	54
Costa Rica				
TI1T	44,312	142	38	20
TI5M	2,329	27	9	8
Guadeloupe				
TO3Z	153,425	306	46	39
Jamaica				
6Y1M	637,330	897	57	58
Mexico				
XE1RCS	164,340	354	52	31

ASIA

Asiatic Russia				
RD8D	4,074	32	0	14
Asiatic Turkey				
TC7C	126,378	309	1	41
YM7KA	88,640	228	0	40

EUROPE

Belarus				
EU1WW	240,619	636	9	62
Belgium				
OT6M	288,117	666	22	59
OT5A	200,900	547	20	50
Bulgaria				
LZ5R	181,200	577	5	55
Croatia				
9A6V	29,120	168	0	35
Czech Republic				
OK2KYJ	81,270	392	1	41
Dodecanese				
SX5R	117,700	450	2	48
European Russia				
UA7K	350,060	713	20	72
RU1A	292,560	712	13	67
R3LA	103,235	375	3	52
RK4FL	82,610	295	4	51
France				
TM2F	8,937	68	0	27
Germany				
DKØIW	215,754	602	21	56
DFØSAX	168,220	567	11	54
DP7D	84,976	426	4	43
DR7B	56,000	330	1	39
DM4TR	47,592	319	0	36
DLØEB	21,714	149	1	32
DLØPS	20,757	148	0	33
Greece				
J43TR	179,740	655	2	53
J43P	41,940	237	1	35
Hungary				
HG8DX	448,200	930	24	66
HG5A	165,859	527	10	51
Italy				
IQ1CN	65,472	317	1	43
IQ7NK	39,811	192	1	40
IQ4DJ	351	9	0	9
Kaliningrad				
RW2F	418,692	822	26	66
Lithuania				
LY2ZO	116,016	478	2	46
LY2XW	111,564	404	3	51
LY4O	99,452	423	2	45
Netherlands				
PI4F	24,920	145	0	35
Poland				
SN8B	311,416	721	21	62
SN1D	240,648	633	12	62
SP2KDS	112,200	410	5	50
Romania				
YR8D	203,314	676	5	54
YR8E	106,704	355	9	48
YR5W	20,142	152	0	27
Serbia				
YU7ADY	46,692	259	0	36
Slovakia				
OM3KFF	47,519	225	0	41
OM6H	24,335	158	0	31
Slovenia				
S51V	519,988	958	28	70
S56P	358,228	819	19	64
S50L	61,392	246	6	42
Spain				
EA4GLI	68,730	214	14	44
Sweden				
SE$$X	147,950	521	3	52
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Switzerland				
HB9CA	427,800	862	26	67
HB9CXZ	215,040	586	15	55
HB9LB	147,028	490	11	48
Ukraine				
UZ2I	36,240	186	1	39
UT4UWC	17,820	142	0	27

OCEANIA

Indonesia				
YB3ZBD	28	3	0	2

SOUTH AMERICA

Uruguay				
CW5W	140	4	2	2

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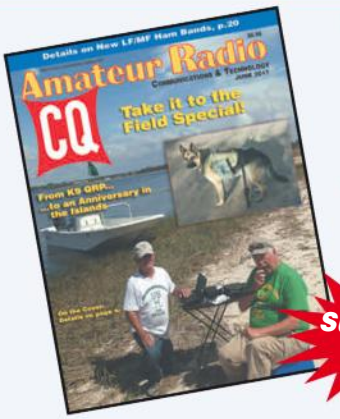

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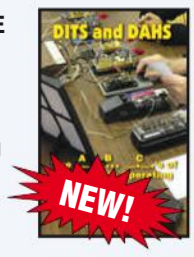

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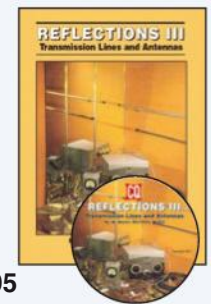

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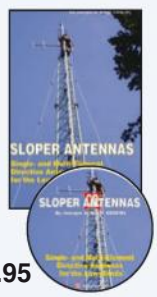

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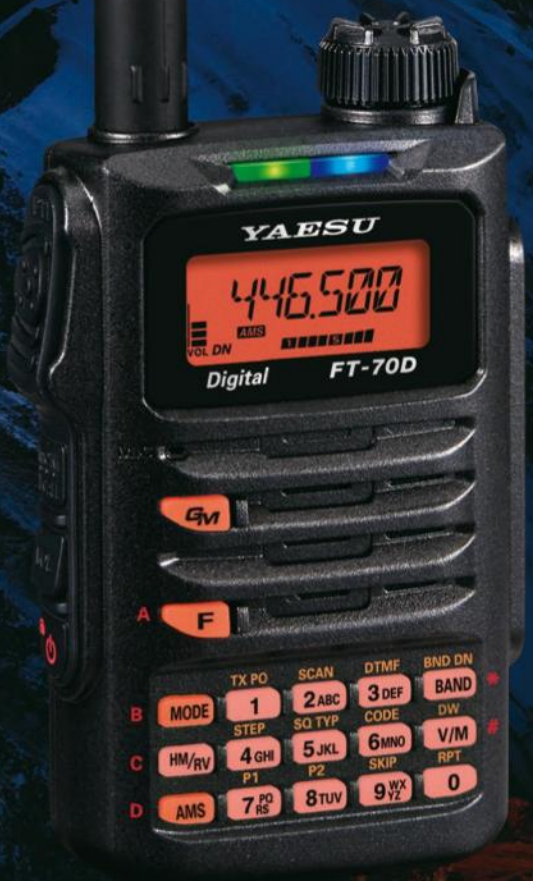

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