Propagaton: The Summer Anomaly, p. 92

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COMMUNICATIONS & TECHNOLOGY

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- A Cosmic Dance With the Ionosphere, p. 42

On the Cover: Sunset on Malpelo Island during the record-setting HK0NA DXpedition in 2012. K4UEE recalls the adventure in our DX column on page 78.

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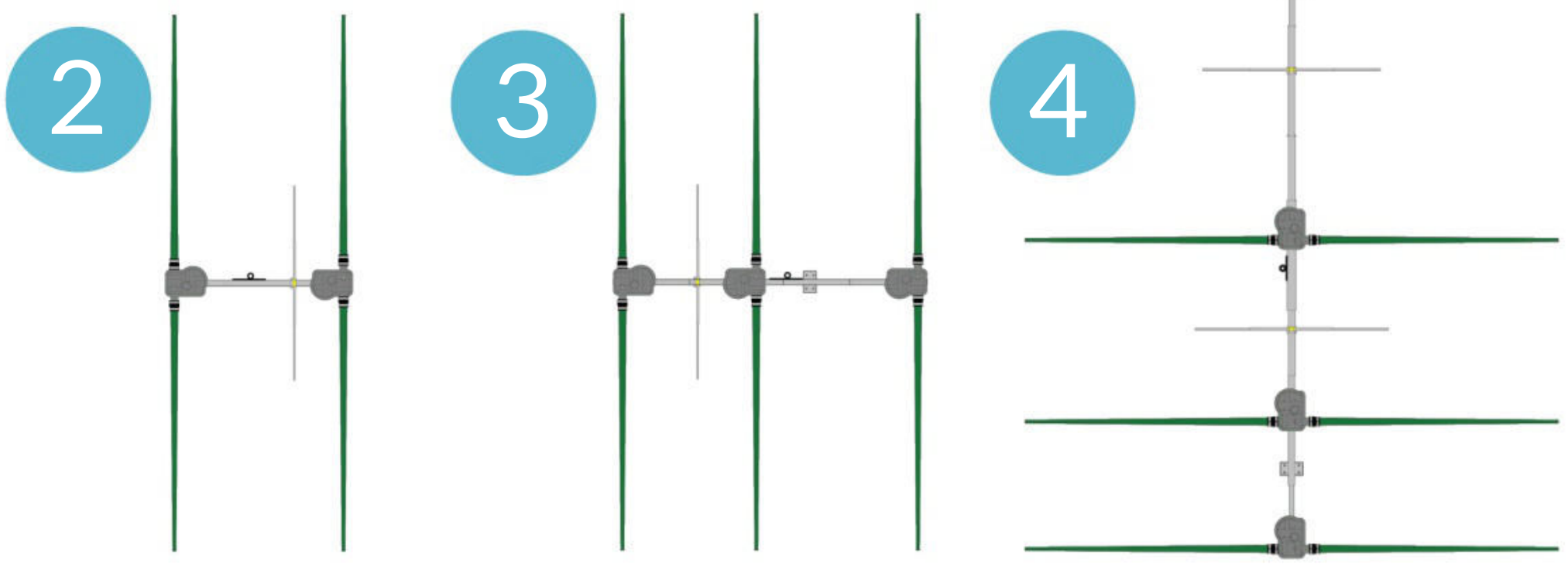

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Ralph Bolt – K0RO

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announcements

JULY

HARRISBURG, PENNSYLVANIA — The Murgas ARC will hold its **Firecracker Hamfest** starting at 8:00 a.m., Saturday July 1 at the Postal Employees Picnic Grounds, 1500 Roberts Valley Road. Contact: Terry Snyder, WB3BKN. Website: <http://www.W3uu.org>. Email: <wb3bkn1@gmail.com>. Phone: (717) 979-9515. Talk-in 147.075 (123).

PLAINS, PENNSYLVANIA — The Harrisburg Radio Amateurs Club will hold its **Murgas Hamfest and Computerfest** starting at 8:00 a.m., Sunday July 2 at the Polish American Veteran's Club, 2 South Oak Street. Contact: Herb Krumich, K2LNS. Website: <http://murgasarc.org>. Email: <wa2fgk@yahoo.com>. Phone: (570) 829-2695. Talk-in 146.61 PL 82.5. VE Exams.

CAMILLUS, NEW YORK — The Radio Amateurs of Greater Syracuse will hold its **Roger's RAGS Hamfest** from 7:30 a.m. to 12:30 p.m. on Saturday July 8 at the Camillus Elks Lodge, #2367, 6117 Newport Road. Contact: Jeryl Wright, NK2C. Website: <http://ragsclub.org>. Email: <wrightjk@aol.com>. Phone: (315) 727-2762. Talk-in 146.91/31 pl 103.5. VE Exams.

ERIE, PENNSYLVANIA — The Wattsburg Wireless Association will hold its **NW PA Hamfest** starting at 7:00 a.m. on Saturday, July 8 at the Greene Township Municipal Building, 9333 Tate Road Room 114. Contact: Larry Kemmler, KC3JBR. Website: <http://www.wattsburg-wireless.us/>. Email: <lkemmler@yahoo.com>. Phone: (814) 881-2689. Talk-in 147.315 CTCSS 186.2. VE exams.

MANSFIELD, OHIO — The Intercity Amateur Radio Club will hold its **Mansfield Trunkfest 2023** on Saturday, July 8 at the Richland Co. Fairgrounds, 740 N. Home Road. Contact: Danny Bailey, W8DLB. Website: <http://iarc.club>. Email: <w8dlb60@gmail.com>. Phone: (567) 899-3881. Talk-in 146.940 PL. 71.9.

MILTON, FLORIDA — The Milton Amateur Radio Club will hold its **2023 Milton Hamfest** starting at 3:00 p.m. to 8:00 p.m., on Friday July 7 and 8:00 a.m. to 1:00 p.m. on Saturday July 8 at the Santa Rosa County Auditorium, 4530 Spikes Way. Contact: Charles Tow, KN4VGY. Website: <http://miltonarc.org>. Email: <kn4vgy@gmail.com>. Phone: (850) 554-2109. Talk-in 146.700 CTCSS 100. VE Exams.

NORTH BEND, NEBRASKA — The Pioneer Amateur Radio Club will hold its **25th Annual Flea Market** from 8:00 a.m. to 12:30 p.m. on Saturday July 8 at the North Bend City Auditorium, 741 North Main Street. Contact: Richard Mehaffey, KBØARZ. Website: <http://www.k0sw.org>. Email: <4randjme@futuretk.com>. Phone: (402) 719-7342. Talk-in 146.67/07 MHz (100 Hz) or 443.900/+5 MHz. VE testing.

ORLANDO, FLORIDA — The Conway Baptist Church will hold its **K4KDI Summer Tailgate 2023** starting at 8:00 a.m. on Saturday July 8 at the South Conway Rd. Baptist Church, 6099 South Conway Rd. Contact: Jack Moyer, K4KDI. Website: <http://k4kdi.square.site>. Email: <k4kdi@hotmail.com>. Phone: (407) 443-1963.

OAK CREEK, WISCONSIN — The South Milwaukee Amateur Radio Club will hold its **WI9SM Swapfest** from 7:00 a.m. to 3:30 p.m. on Saturday July 8 at the American Legion Post 434, 9327 S. Sheppard Ave. Contact: Karen Burris, KC9WQJ. Website: <http://WI9SM.org>. Email: <kc9wqj@gmail.com>. Phone: (414) 578-0492. Talk-in 146.910 -offset PL 127.3.

ROSEVILLE, MINNESOTA — MAGIC will hold its **MAGIC Tailgate** from 8:00 a.m. to noon on Saturday July 8 at the Galilee Lutheran Church, 145 N. McCarrons Blvd. Contact: George Lavallee, NØSBU. Website: <https://tinyurl.com/4ptn3syb>. Email: <n0sbu@arrl.net>. Phone: (651) 429-5948. Talk-in 145.170 100. VE Exams.

SALISBURY, NORTH CAROLINA — The Rowan County Amateur Radio Society will hold its **Firecracker Hamfest** time TBA on Saturday July 8 at the Salisbury Civic Center, 315 S. Martin Luther King Ave. Contact: Ralph Mowery, KU4PT. Website: <https://rowanars.org/>. Email: <ku4pt@arrl.org>. Phone: (704) 279-4737.

TEXAS CITY, TEXAS — The Tidelands Amateur Radio Society will hold its **Texas City Tidelands Hamfest** from 8:00 a.m. to 2:00 p.m. on Saturday July 8 at the Charles T. Doyle Convention Center, 2010 5th Ave. N. Contact: Keith Bo Thomas, KT1AA. Website: <http://www.tidelands.org>. Email: <info@tidelands.org>. Phone: (409) 789-8160. Talk-in 147.140 tone 167.9, 442.025 tone 103.5.

ESSEX, MONTANA — GFAARC will hold its **Glacier Waterton International Peace Park Hamfest** time TBA on Friday July 14 to Sunday July 16 at the Glacier Meadow RV Park, 15735 US Hwy 2 East. Contact: Justin Carlson, KZ7A. Website: <http://www.gwhamfest.org>. Email: <justin@carlsonplace.net>. Phone: (307) 763-1907. Talk-in 146.52. VE Exams.

ALEXANDER, NEW YORK — The Lancaster Amateur Radio Club will hold its **Batavia Hamfest** from 6:00 a.m. onward on Saturday July 15 at the Alexander Firemen Grounds, 10708 Alexander Rd. Route 98. Contact: Luke Calianno, N2GDU. Website: <http://w2so.org>. Email: <luke48@gmail.com>. Phone: (716) 683-8880. Talk-in 147.285 PL 141.3.

ATHENS, TENNESSEE — The McMinn County Amateur Radio Club will hold its **19TH Annual MCARC Hamfest** from 7:00 a.m. onward on Saturday July 15 at the McMinn County Expo Center, Athens Regional Park Decatur Pike. Contact: Susan Ward, KO4TEN. Website: <http://mcminnarc.com>. Email: <ko4tenqso@gmail.com>. Phone: (423) 333-5388. Talk-in 147.820 (-) 141.3. VE Testing.

BANDON, OREGON — The Cary ARC will hold its **50th Annual Cary Mid-Summer Swapfest** from 8:00 a.m. to 1:00 p.m. on Saturday July 15 at the Ritter Park, 301 W. Lochmere Dr. Contact: Gary McElroy, N6BLU. Website: <http://www.coosradioclub.net>. Email: <n6blu@hotmail.com>. Phone: (530) 521-5091. Talk-in 146.610 (-) 110.9. VE Testing.

CARY, NORTH CAROLINA — The Coos County Radio Club and the Southwest Oregon Repeater Association will hold its **Coos County Radio Club Annual Hamfest and Swapmeet** from 10:00 a.m. to 2:00 p.m. on Saturday July 15 at the Home of N6BLU, 87450 Batson Ln. Contact: Don Hurlbert, KW4DON. Website: <http://caryarc.org/>. Email: <caryarcn4nc@gmail.com>. Talk-in 148.88 -.6 82.5.

CENTERVIEW, MONTANA — The Warrensburg Area Amateur Radio Club Inc will hold its **WAARCI Hamfest** from 8:00 a.m. onward on Saturday July 15 at the Johnson County Fairgrounds, 386 NW 145 Rd. Contact: Jason Snyder, WV3V. Website: <https://tinyurl.com/2cp3dca9>. Email: <meteorseeker@gmail.com>. Phone: (702) 526-4528. Talk-in 146.88 107.2 Tone.

ELYRIA, OHIO — The Northern Ohio Amateur Radio Society will hold its **NOARSFEST** from 9:00 a.m. to 12:00 p.m. on Saturday July 15 at Lorain County Community College, 1005 N. Abbe Road. Contact: Carl Rimmer, W8KRF. Website: <http://www.noars.net>. Email: <noarsfest@noars.net>. Phone: (216) 256-9624. Talk-in 146.70 (110.9). VE Testing.

SHELBY TOWNSHIP, MICHIGAN — The GM Amateur Radio Club will hold its **GMARC Trunk Swap** time TBA on Saturday July 15 at the Packard Proving Grounds, 45601 Fox Ln. W. Apt 106. Contact: Bobby Corr, N8CY. Email: <BobbyCorr@att.net>. Phone: (248) 346-2733.

SIOUX FALLS, SOUTH DAKOTA — The Sioux Empire ARC will hold its **SEARC Tailgate Hamfest and ARRL South Dakota Section Convention** from 8:00 a.m. to 12:00 p.m. on Saturday July 15 at the Westminster

(Continued on page 58)

ham radio news

Floods in Italy Cause Last-Minute Scramble for WRTC

WRTC-2022, the World Radiosport Team Championship already delayed a year due to Covid travel restrictions, will go on despite major flooding in the region of Italy where the competition is scheduled to take place. According to *Newsline*, several planned station sites were rendered unusable by the floods, but organizers say replacement sites have been found. At press time, the logistics for those new sites were still being worked out, but organizers were confident everything would be ready in time for the international competition on July 8-9. Additional donations were being sought to cover added expenses associated with these last-minute changes.

Hamvention® Reports Record Attendance

The Dayton Amateur Radio Association has released its official attendance figure for the 2023 Hamvention®, reported at 33,681. This is an increase of 2,000 over 2022, the show's first year back after two pandemic-prompted cancellations. It is also a record for the Hamvention's "new" site at the Greene County Fair grounds and Expo Center, eclipsing the 2019 record of 32,472.

Anna Gomez Nominated to FCC; Carr and Starks Renominated

President Biden has nominated telecommunications attorney Anna Gomez to fill a vacant seat on the FCC and break the long-standing 2-2 Republican/Democratic tie on the commission that has blocked significant action. According to *RadioWorld*, Gomez currently works for the State Department, leading preparations for U.S. participation in the World Radiocommunication Conference scheduled for later this year. She served previously as deputy administrator of the National Telecommunications and Information Administration (NTIA – which serves many of the same functions of the FCC relating to federal government spectrum usage) and spent 12 years as an FCC staffer, rising to Deputy Chief of the International Bureau. Her nomination is subject to Senate confirmation.

Mr. Biden also nominated current FCC commissioners Brendan Carr, a Republican, and Geoffrey Starks, a Democrat, to serve additional terms. Carr has been a commissioner since 2017; Starks since 2019. The five-member FCC is structured to have at least two members from each major political party, with the fifth position filled by a member of the President's party.

ARRL Cements Relationship with Federal Emergency Response Network

The ARRL has renewed a long-standing Memorandum of Agreement (MOA) with the Federal Emergency Management Agency (FEMA), which keeps amateur radio as part of the "response ecosystem" in FEMA's National Incident Management System (NIMS) Information and Communications Technology Functional Guidance document. According to the *ARRL: Letter*, the new MOA "emphasizes the importance of skilled amateur radio operators in times of crisis and the role of ARES (Amateur Radio Emergency Service) leadership within the emergency communications space."

The *ARRL Letter* also reports that the League has been invited to become a member association of SAFECOM, "a group of national thought leaders and officials within the emergency communications and response space that works to set (interoperability) standards at every level." SAFECOM is under the umbrella of the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency, or CISA. ARRL Emergency Management Director Josh Johnston, KE5MHV, will be the League's representative on SAFECOM <www.cisa.gov/safecom>.

Cass Awards Go to SP9FIH and TY0RU

In an effort to encourage DXpeditions to work as many different stations as possible (as opposed to working the same stations on multiple bands and modes), Club Log, DXLab, and the Northern California DX Club jointly award the Cass Awards each year to the single-operator and group DXpeditions which have worked the greatest number of unique call signs.

The sponsors report that the 2022 single-op winner, for the sixth year in a row, is Janusz Wegryzn, SP9FIH, who worked 10,771 different stations from St. Barthelemy Island during a two-week one-person DXpedition as FJ/SP9FIH.

The unlimited class, or group DXpedition, award for 2022 went to the team that operated TYØRU from Benin last October, contacting 33,553 unique call signs, a new record for the unlimited Cass award. The awards are named for the late Hugh Cassidy, WA6AUD, longtime publisher of the West Coast DX Bulletin. More information is available at <http://www.cassaward.com>.

California Ham Fined $24,000 for QRM

A ham in California has been hit with a $24,000 fine by the FCC for alleged interference with a net on 75 meters and failure to identify his station. The *ARRL Letter* reports that Philip J. Beaudet, N6PJB, of Burney, California, was cited for "willfully and repeatedly interfering with the radio communications of the Western Amateur Radio Friendship Association (WARFA) while it was attempting to hold a regularly scheduled net, and for failing to provide station identification on amateur radio frequencies." According to the report, FCC field agents monitored the transmission of recordings that caused interference and tracked the signals to Beaudet's home station.

Australian Goverment Gets Back Into the Ham Licensing Business

The Australian Communications and Media Authority – that country's telecommunications regulator – reportedly will resume direct licensing of amateur radio operators as of next February. According to the *ARRL Letter*, the agency had previously delegated amateur licensing to the Australian Maritime College, which decided not to renew the arrangement when it expires early next year. A corps of volunteer "assessors" (examiners) organized by the college will remain in place and will administer exams directly on behalf of the government.

Take Your Own Photos From Space?

A new satellite being developed by students at Stanford University will allow amateur radio operators to download specific photos taken by the satellite and, if all goes according to plan, direct the satellite to take a picture on command. Different modulation techniques for transmitting the images will be analyzed.

According to the AMSAT News Service, the Sapling Magnifica satellite's primary mission will be to prove several key technologies needed for future Stanford Student Space Initiative satellites to host scientific payloads. The International Amateur Radio Union has coordinated downlink frequencies of 437.400 and 2427.00 MHz. Launch is tentatively planned for later this year. More information is available at <https://github.com/stanford-ssi>.

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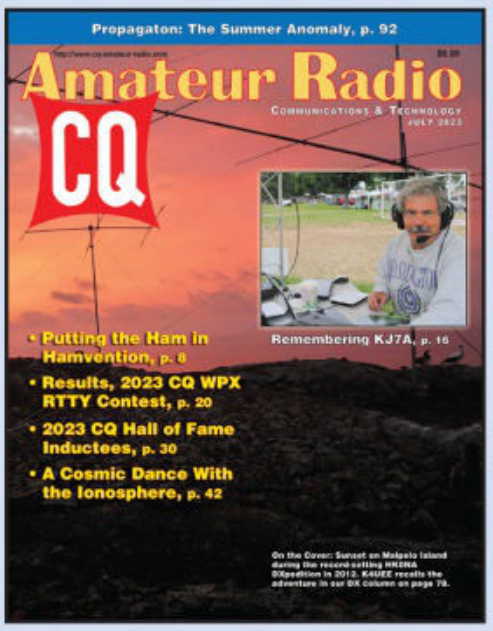

On the Cover:

Malpelo Island in the Pacific Ocean is a tiny dot of land with sheer cliffs right up to the shore and a mountaintop accessible only by rope-climbing (or a helicopter). So, of course, it's a beckoning location for a DXpedition! A trip there in 2012 set records for numbers of contacts made. The HK0NA story and more photos are on page 78. Inset: Well-known ham "Chip" Margelli, K7JA, became a Silent Key in late May. See our remembrance on page 16. (Main cover photo by Manu Siebert, LU9ESD; inset photo by Gordon West, WB6NOA)

features

FOCUS ON the 2023 Dayton Hamvention, held in Xenia, Ohio. We start out with a first timer's experience at the show (page 8), followed by a Hamvention photo essay (page 10) and AA6JR's account of putting together a road trip to Dayton from southern California (page 56) and the presentation of CQ DX and Contest Hall of Fame plaques (page 30). This Hamvention was the busiest since before the pandemic (more people than in 2019), so it was a great opportunity to get together and celebrate everything radio.

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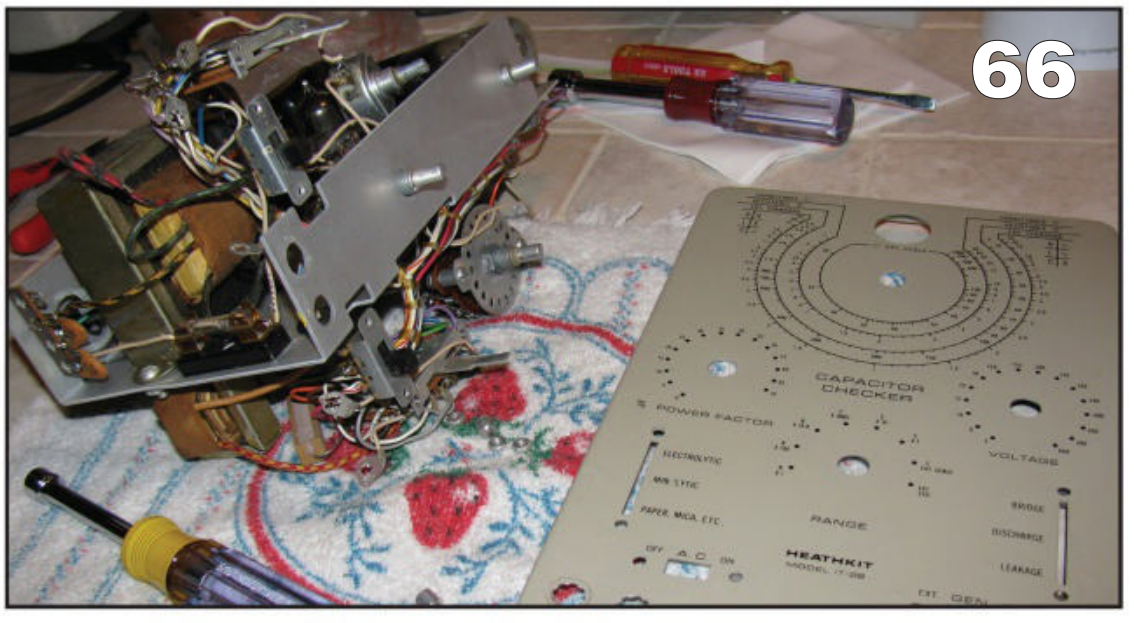

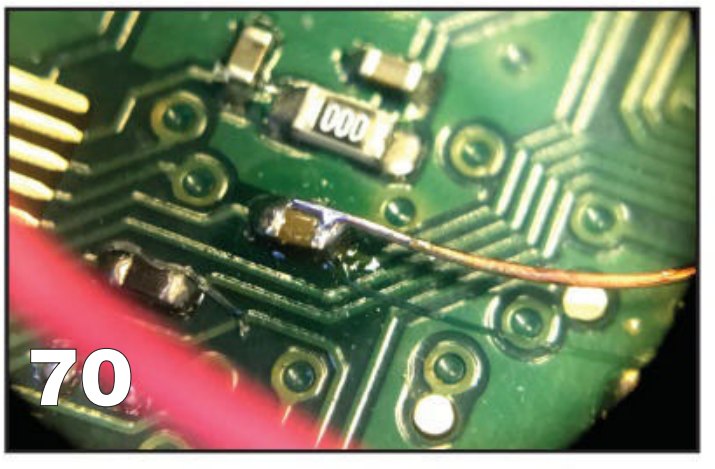

zero bias: a cq editorial

BY RICH MOSESON,* W2VU

The Ham Radio Family

It's summertime! Pack up your portable ham gear and enjoy some outdoor operating … and maybe some family fun as well...

This issue, at first glance, doesn't seem to have an overarching theme. We've got contest results, reports from Hamvention and the HamSCI workshop, Hall of Fame inductions, an island DXpedition, and more. But if you look a little bit under the surface, you'll see that there actually is an overarching theme, which is the people we get to meet through ham radio and with whom we share our radio adventures. This was brought home to me by the recent loss of three well-known hams, two of whom were former members of the *CQ* "family" (see News Bytes on the next page). In truth, we're all part of a big ham radio family, bound not by blood but by our common interest in what columnist Jeff Reinhardt, AA6JR, refers to as the "Magic in the Sky" and contributor Guy Immega, VA7GI, describes in his article (p. 42) as "a cosmic dance with the ionosphere."

Our two leadoff articles offer different perspectives from this year's Dayton Hamvention®, which gives some 30,000 of us (33,861 per the official count) the chance to get together in person, share experiences, learn from each other, see the latest gear, and scour the flea market for bargains. "Magic in the Sky" columnist AA6JR takes us along with a group of ham friends on a road trip to Dayton from southern California (p. 56). For contesters and DXers, their respective Dayton dinners provide a forum for recognizing the "stars" among each group with inductions into the CQ Contest and DX Halls of Fame (p. 30). And this month, some of the world's top contesters will be getting together in Italy for the World Radiosport Team Championship (WRTC) competition (p. 87). We also recall the teamwork and camaraderie involved in putting on a major DXpedition in this month's DX column (cover and p. 78).

In addition, the results article for the 2023 CQ WPX RTTY Contest (p. 20) takes a different approach from our typical contest articles, focusing this time more on the personal experiences of selected competitors in various categories than on simply recounting who had the top scores (those are in the various boxes and line scores).

Outside the world of contesting and DXing, the annual HamSCI workshop ("Forging Amateur-Professional Bonds," p. 32) provides another in-person networking opportunity, in this case reaching beyond the borders of ham radio to include professional scientists whose areas of research coincide with amateurs' areas of interest (the nature of the ionosphere, space weather, etc.). Amateur observations can provide the scientists with many more data points than they generally can acquire on their own, and of course, the hams can benefit from the greater understanding of various phenomena that will result from the scientists' research.

Finally among our people stories this month, VHF-Plus Editor N4DTF talks with Rob Sherwood, NCØB, about his performance ratings of various VHF/UHF+ receivers. Rob is typical of so many members of our ham "family," developing expertise in a certain area of the hobby and gladly sharing it with his fellow hams.

The fragility of those human connections also points up the importance of sharing our knowledge and experiences in a long-lasting format, such as a magazine or podcast. Our good friend Chip Margelli, K7JA, was a renaissance ham, involved in many different aspects of the hobby and extremely knowledgeable about most of them. He was always happy to share his knowledge, but more likely to do so verbally than in writing, so as a result, when we lost Chip in late May, we lost much of that knowledge as well.

We need to make sure to use the opportunities we have to really get to know each other, and not only in person. After all, we have an amazing social media tool at our fingertips, our radios. Just as I was getting started on this editorial, I was contacted by another "family" member – a reader and occasional author – who was asking for copy of my February editorial to post as a link from his column on <QRZ.com>. It was titled "The Lost (?) Art of Conversation," and encouraged readers to go beyond the brief information exchanges of contest, DX and FT8 contacts and take some time to also have real conversations with our on-air contacts, to make new friends or chat with old ones and learn more about and from each other than a signal report and QTH. I guess this month's editorial is kind of a continuation of that theme. We need to keep in mind that the primary purpose of all the technology with which we surround ourselves and learn about is to communicate, to make contact with other people in other places and to truly make the most of our "cosmic dance with the ionosphere" as we chase after the "magic in the sky."

Also in This Month's Issue…

Even though we have a focus on people in this month's issue, we don't ignore the technology. Look for K3MT's "cheat sheet" on estimating path loss without a scientific calculator (p. 37); WA2NDM's dive into ultrasonic communications (p. 46); KØNEB's look at a new transmitter kit and a charging module for the KX-2 transceiver (p. 52); KH6WZ's exploration of the value of surplus gear for hams, especially for microwave applications (p. 66); N2IRZ's guide to voiding the warranty on a mobile transceiver to let it efficiently operate high-speed packet (p. 70), and NW7US's explanation of the "summer anomaly" in HF propagation (p. 92). As usual, we've got something for everyone, whether your primary interest is communication or components!

It's summertime! Pack up your portable ham gear and enjoy some outdoor operating … and maybe some family fun as well, whether it's with your actual family or your worldwide ham family!

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

news bytes:

Passages… K7JA, DL6RAI, WB2D, Silent Keys

As we mourn the passing of these longtime leaders of the amateur radio community, we recognize the emergence of a new generation of leaders. Two examples are in this issue in the Hall of Fame article.

The ham radio community lost three well-known amateurs in about as many weeks in late May and early June. The best-known was Charles "Chip" Margelli, K7JA, who was a leader of the amateur radio industry for over 40 years. You'll find a full obituary and remembrances of Chip in this issue on page 16.

In mid-May, just before he was to be inducted into the CQ Contest Hall of Fame, Bernhard "Ben" Buettner, DL6RAI, died as a result of a tower accident at his contest station in Aruba. As you'll read in our Hall of Fame article on page 30. Ben was a leader of the contesting community in Germany, and indeed, worldwide. He served on the CQ World Wide Contest Committee and was a major part of the organizing team for the 2018 World Radiosport Team Championship (WRTC) in Germany. In 2014, he purchased the P49V contest station in Aruba from Carl Cook, AI6V/P49V (now an SK), and he was working on antennas there when his key was silenced by a tower accident.

Finally, former ARRL and *CQ* staffer Peter O'Dell, WB2D, passed away in early June. Peter and *CQ* columnist Wayne Yoshida, KH6WZ, were the ARRL's public relations team in the 1980s when Owen Garriott, W5LFL, took ham radio into space for the first time, and Pete was the founding editor of the *ARRL Letter*. At *CQ*, O'Dell was involved in a variety of special projects, including the launch of *CQ*'s long-running series of buyer's guides, and he authored "Ham Radio Horizons – The Book" to introduce new and prospective amateurs to the hobby. After leaving *CQ*, Peter launched his own business helping hams learn Morse code through hypnosis.

As we mourn the passing of these longtime leaders of the amateur radio community, we recognize the emergence of a new generation of leaders. Two examples are in this issue: in the Hall of Fame article, you'll also meet Adrian Ciuperca, KO8SCA, one of the newest members of the CQ DX Hall of Fame, and in a separate article, "Forging Amateur-Professional Bonds," you'll read about this year's HamSCI workshop, coordinated by Nathaniel Frissell, W2NAF, who is emphasizing the value of amateur radio citizen scientists to ionospheric research.

What happens when your first-ever hamfest is the world's biggest? Associate Editor KB3UJW took the plunge to find out!

Putting the Ham in Hamvention 2023

BY SABRINA HERMAN,* KB3UJW

Even though I've been a ham since 2010, I haven't really actively participated in the culture. Since I joined *CQ* magazine earlier this year, I've gained a lot of technical knowledge, but I still hadn't really immersed myself. That all changed this past weekend at the Dayton Hamvention® in Xenia, Ohio. I threw myself right into the deep end of amateur radio society, and I'm happy to say it was a great swim!

For those new to the practice, hams all over the world attend swaps/flea markets/conventions that are typically referred to as hamfests. The Hamvention in Ohio is the largest of such meetings in the world. There were thousands of attendees, all eager to browse the gigantic flea market, check out the multiple exhibit halls full of merchandise, and attend scheduled panels about the hobby. And there was also plenty of fair food – the real reason I decided to attend.

I spoke with Deanna Skapiak, N2GSB, and her husband John, K2SY, who have been attending Hamvention since the late 1970s between the two of them. Their flea market table was set up next to mine, and they were delighted to talk about their experiences at the show. Deanna told me, "It's a great opportunity to meet up with people I only see a couple times a year at hamfests – and a great way to get rid of some old equipment!" She, her husband, and their friend Tom Kissner, W8WGT, posed for a photo in front of their table for me early on Friday of the show (Photo A).

As I was wandering around the grounds, I met with Kathleen Wright, the Executive Director at Greene County Convention and Visitors Bureau. She and her crew were manning a welcome station. While she's not a ham herself, Kathleen told me that in the years since Hamvention has moved to Xenia, she's made a lot of friends in the amateur radio community. One of those friends, Ron Cramer, KD8ENJ (now a Silent

Photo A: Tom Kissner, W8WGT, John Skapiak, K2SY, and Deanna Skapiak, N2GSB, posed at their flea market booth.

Photo B: At the AMSAT booth, the all-ham Papay family – (L-R) Carrie, K8CLP; Grace KE8RJU, and Doug K8DP – posed with their purple Arrow satellite antenna.

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Photo C: Chris Gannon, KE8UGC, from the United States Coast Guard Auxiliary.

Key), inspired her to begin to study for the Technician exam herself. As of press time she hadn't taken the exam, but she assured me that by Hamvention 2024 she'd have her license.

There were a ton of different booths to look at during the show. The National Association for Amateur Radio (ARRL) had a giant booth full of things to buy and look at. The Young Ladies Radio League (YLRL) had a booth as well as a panel; both were busy and very well attended over the weekend. Icom and other brands were also in attendance with large displays and plenty of people to explain the newest tech, and possibly sell you a few things at the same time!

One exhibitor that was of particular interest to me was AMSAT, the Radio Amateur Satellite Corporation. I enjoy educational programming, and they had it in spades. One of the things they were showing off was their purple Arrow antenna (Photo B). It was situated in their beginner's section, so I knew I was in the right place. I spoke to the Papay family, all hams– dad Doug, K8DP; mom Carrie, K8CLP, and their daughter Grace, KE8RJU. Grace has been in and around amateur radio her whole life, and obtained her license in March of 2021. This was her second year attending with her license, and she told me, "I love the (youth) forum, I love seeing my fellow youth. It's great to see people I only have ever talked to over the air! I also like spending time with my mom and dad." Doug told me that both of his parents were amateur radio operators as well, so it is certainly a family tradition.

In between staring at all of different sizes of antennas, I also made time to talk to some of the government and government-affiliated groups that had a presence at the hamfest. One of the people I spoke with was Chris Gannon, KE8UGC, who was with the United States Coast Guard Auxiliary, the National Telecommunications Division (Photo C). He was hopeful about drawing more people into the Coast Guard Auxiliary, and said that the attendance at the Hamvention looked promising.

So far, I had managed to talk to flea marketers, regular attendees, staff, and the US government. All I needed to complete my set was to find an exhibitor to chat with. I was pointed in the direction of Ashhar Farhan, VU2ESE, who owns and runs HFSignals. Ashhar employs women from his home country of India to hand wind the toroids that go into his equipment. I've been told by several sources that toroids are almost impossible to assemble on a mass production scale, and thus the handwork is necessary. Ashhar showed off one of his machines, the sBitx. He told me that it is an open source, high performance Hybrid SDR for the 21st century radio amateurs. Powered by an internal Raspberry Pi 4, it has CW/RTTY/PSK31/SSB and FT8 capability with logging software, macros, and spotting built in (Photo D). While I personally don't know what a lot of that means, I dutifully wrote it down for reproduction in this article. I've been assured it's quite cool.

I wound down my day with a stromboli purchased by my friend Matt Canel, KE8NZR. He and David Kazdan, AD8Y, were kind enough to let me sleep over in their hotel room during the show, as well as feeding and watering me. All in all, it was a nice dip into the large pond that is amateur radio. I'm sure I'll be more prepared for my next show!

73, KB3UJW

Photo D: The sBitx transceiver from HFSignals.

Hamvention 2023 "Good Morning Sunshine"

PHOTO ESSAY BY JOE EISENBERG,* KØNEB

Every year, most hams dread the weather possibilities when planning a visit to Hamvention®. Heat, cold, wind, rain, sleet, and storms all add up to make it challenging at times. This year was probably as perfect as possible. The week started out rainy but by dawn on Friday it was sunny and nice. Highs got up to the mid 70s and it was sunny. The dreaded rain in the forecast held off until late at night, and was not heavy at all, so the parking areas were solid and less dusty on Saturday morning when the very light overnight rain stopped about an hour before the gates opened for the second day. Temperatures in the upper 60s prevailed on Saturday and Sunday was sunny and mid 70s again.

Visitors to Hamvention should plan on spending an extra day before or after Hamvention to tour the Air Force Museum at Wright-Patterson Air Force Base. There is no admission charge and for a first-time visitor at least 4 or 5 hours is recommended. I try to visit each year to see all the new exhibits. All previous Air Force One planes are on display and can be toured inside. There are lots of great old radios in each one. Eisenhower's Constellation even has a Hallicrafters shortwave radio next to his bunk!

For Hamvention 2023, there were plenty of food vendors and plenty to eat. The crowds seemed a lot larger this year to me, judging from parking and traffic and the number of people in line for food. Forum attendance and flea market shoppers seemed way up as well.

A long-missing exhibitor returned – as Kenwood was there showing not only the company's current products, but the new Analog/D-Star HT, the TH-

Photo A: Curtiss P-40E Warhawk at the National Museum of the Air Force. It's worth it to add an extra day to your trip to visit here – but plan a full morning or afternoon to get the full experience. (All photos by Joe Eisenberg, K0NEB)

Photo B: A B-52D Stratofortress in the Southeast Asia Gallery. And did we mention that admission to the Air Force Museum is free?

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Email: <k0neb@cq-amateur-radio.com>

Photo C: Free golf cart rides made getting to and from the Hamvention parking area a lot easier. A big thank you goes to the Golf Cart Committee!

D75, to be available soon. No word yet on the price. The Parks On The Air tent outside was always busy as the large number of hams who have embraced this fun activity gathered there. All the inside exhibitors were accommodated without using any parking lot tents and the number of visitors inside was steady throughout the weekend. Once again, the Dayton Amateur Radio Association held a "free entry" day on Sunday to bring in hams who could only attend on Sunday and that boosted the crowds Sunday morning. As to new kits, check out my upcoming column!

Photo D: There was no shortage of food or sunshine at the 2023 Dayton Hamvention.

Photo E: There were plenty of food choices this year and lots of hams enjoying a break.

Photo H: Kerry Turner, KB3KLT, does a lot of business selling supplies for the fast-growing Parks On The Air community.

Photo F: This nice-looking Johnson Viking Invader 2000 made its appearance in the flea market.

Photo I: Gary Hoehne, KB9AIT, and Terry Schilling, N9AOT, showing their latest Wolf River Coils antennas. These antennas have become popular among those doing Parks On The Air.

This year was probably as perfect as possible.

The crowds seemed a lot larger this year to me, judging from parking and traffic ...

Photo G: The Parks On The Air tent in the flea market was a very busy place.

Photo J: Kenwood returned to Hamvention with a new analog FM/D-Star HT, the TH-D75.

Photo K: Ray Novak, N9JA, was busy showing Icom's latest, including the IC-905.

Photo L: The new Yaesu FTM-500 made its Hamvention debut.

Photo M: Michael Kalter, W8CI, presents a Spirit of Amateur Radio award to Steve Morgan, W4NHO.

Photo O: Dr. James Breakall, WA3FET, was presented the Technical Achievement award from Hamvention.

Photo N: The Delaware Valley Radio Association accepts the Amateur Radio Club Of The Year award at the annual Hamvention awards banquet.

Photo P: Carsten Dauer, DM9EE, from Germany is the 2023 Dayton Hamvention Ham Of The Year.

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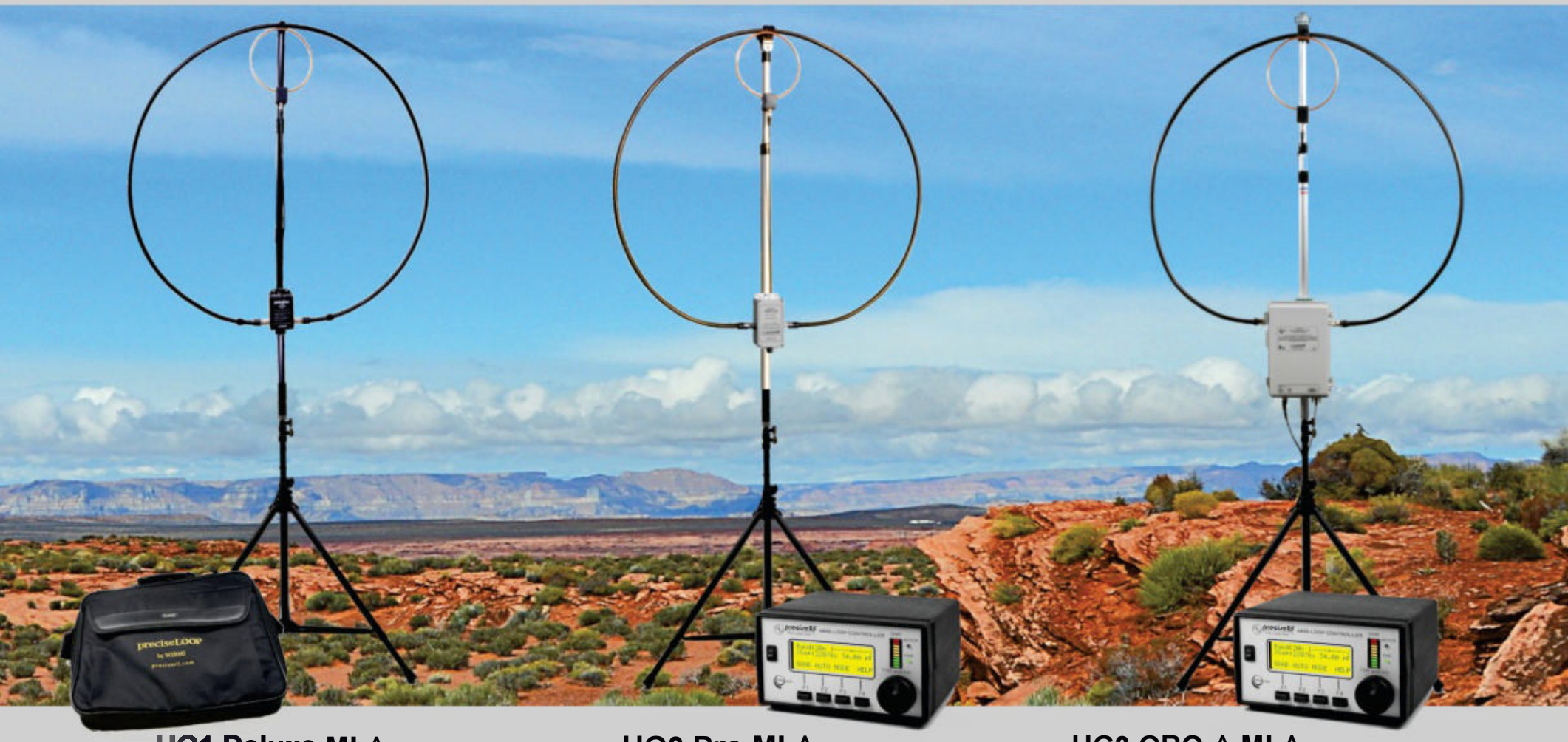

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Remembering
"Chip" Margelli, K7JA, SK

One of the best-known amateurs of the past 40 years has become a Silent Key. *CQ* joins the contesting and DXing communities in mourning the loss of Charles "Chip" Margelli, K7JA, to cancer in late May 2023. We first received the news from his close friend and *CQ* Contributing Editor Gordon West, WB6NOA:

"*Chip left us yesterday at 4:00 p.m., after spending weeks putting together Field Day station antennas and gear. That is all he would talk about – a great station on the air! He was ready for Field Day!*

He and Janet (KL7MF, Chip's wife of 45 years) fought this fast-spreading cancer for months, with never a word to most anyone about his heroic fight. He passed away peacefully, with dignity, at his home, with Janet and his cat at his side. He gracefully closed his eyes, with piles of Field Day equipment and cables he prepared, ready for deployment, right next to his chair.

Chip never complained, never let on to his fight, and always had a smile for the upcoming Field Day event. So professional. He was always total positive in all that he could do for ham radio operators.

What a gentleman - a true fighter to the end. We are all heartbroken."

Chip was a ham's ham, a contester (and frequent winner), DXer, DXpeditioner, moonbouncer, weak-signal VHFer, satellite operator, and more. He was part of an international team that operated from BY1PK in Beijing in 1984, helping to usher in a rebirth of amateur radio in China. Chip was also a member of the ZA1A team that reintroduced ham radio to Albania in 1991; he also twice traveled to Cuba for joint US/Cuban amateur operations.

Chip spent three decades as the "face" of Yaesu in the United States, attending hamfests, visiting dealers, and introducing new gear. After leaving Yaesu, Chip worked for Heil Sound, Innovantennas, and as *CQ* Advertising Manager before leaving the hamfest circuit and working behind the scenes at Ham Radio Outlet. He couldn't totally stay home, though, as he continued to be in high demand as a banquet speaker at conventions and hamfests.

Chip is perhaps best known among the general ham public for his 2005 appearance on "The Tonight Show with Jay Leno," in which he and partner Ken Miller, K6CTW, sent a message in Morse code faster than the reigning texting-speed champion could type on his phone. Chip was inducted into the CQ Amateur Radio Hall of Fame in 2008 and awarded Russia's E.T. Krenkel medal in 2021.

"In a hobby full of really nice and really knowledgeable people," recalled CQ Editor Rich Moseson, W2VU, "Chip was without question one of the nicest and most knowledgeable. He was experienced in nearly every aspect of amateur radio and was always happy to share that knowledge as well as his many ham radio adventures. While Chip was on the *CQ* staff for only a short period of time, he and Janet have been part of the extended *CQ* family for many years. More than that, he was always just a good friend. We will miss him greatly."

"OMG!" responded *CQ* Publisher Dick Ross, K2MGA, when he heard the news. "Chip was the picture of good

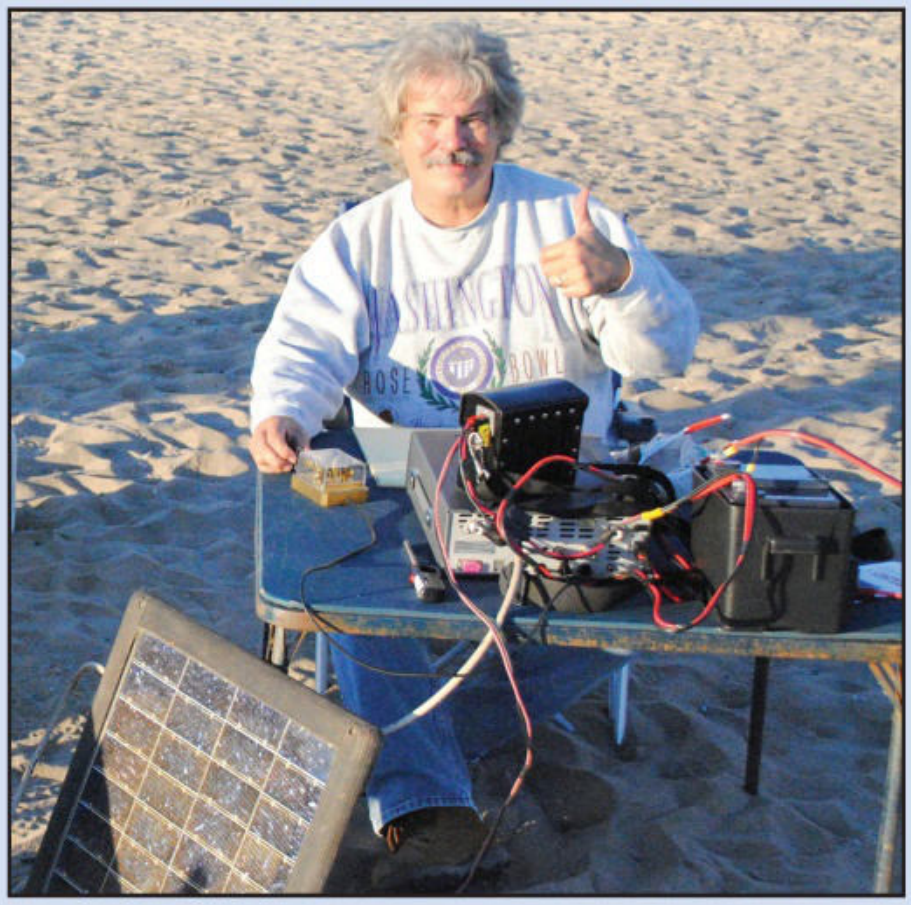


Photo A: Chip Margelli, K7JA, on the air from the beach in southern California. (Photos courtesy Gordon West, WB6NOA)

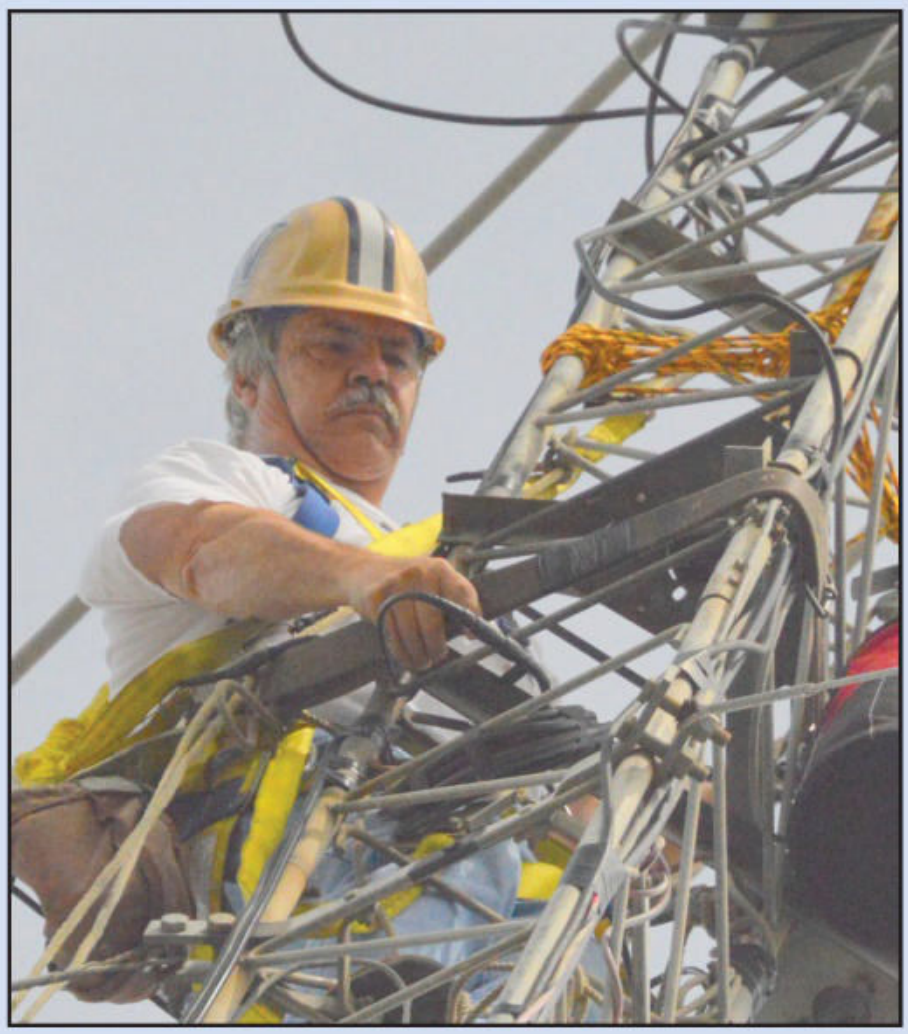


Photo B:Antennas and tower work were always high on Chip's ham radio priority list.

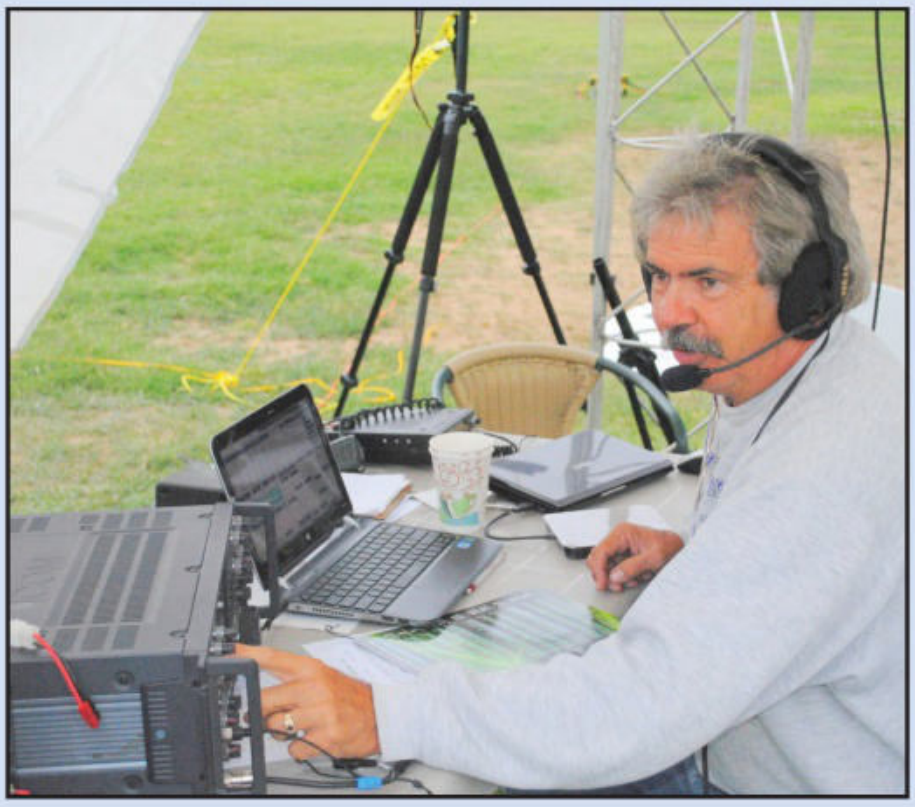


Photo C: ARRL Field Day was one of the highlights of the year for Chip. He was working on antennas for this year's running up until his final moments.

Photo E: Life was about more than just ham radio for Chip and Janet. Here, they join Gordon and Suzy West, WB6NOA and N6GLF, respectively, in a southern California tradition of deep-frying a Thanksgiving turkey on the beach!

Photo D: Chip – seen here with his wife, Janet, KL7MF – loved to dress up in a wide variety of outfits for various hamfests and conventions.

health! He used to go out running at shows. He and Arnie (Sposato, longtime CQ ad manager, also SK) would be out early on a Sunday to do a few miles together. And he had just retired from HRO after a lifetime at Yaesu. Another old friend gone ... Certainly, we all know of those who were very sick and who we expected to leave us, but too often (others have) left us with no warning and no time to prepare our minds for the inevitable."

Internet Tributes

In the days following Chip's passing, hundreds of messages were posted online from all over the world, either expressing condolences or recalling the influence that Chip had had on them. Here is a sampling from Facebook:

Oscar Morales, CO2OJ: Today is a sad day for the amateur radio community because we have lost someone who made it his reason for being and left his presence in practically every facet of it for several decades. I personally met Chip in 1994 when he, Janet, and other US radio amateurs visited us to be part of the CO0FRC, the first Cuba-USA contest station that went on the air from the Bello Monte elevations, east of Havana, as part of the ARRL VHF QSO Party that year. It was a unique and wonderful experience and the foundation of a friendship that has endured over time. We met again at the 1995 CSVHFS (Central States VHF Society) Conference in Colorado Springs, where I participated alongside Arnie Coro, CO2KK, and later Chip visited us again with Janet and other US radio amateurs to put CO0US on the air and participate in the 2003 ARRL Field Day.

Like Chip, I was a lover of the 6 meters – the "Magic Band" – but unfortunately, openings between the Caribbean and the US West Coast were not frequent. So when I heard amidst a pile-up or during a contest, "CO2OJ, K7JA... Hi Oscar," the joy was doubled.

I can proudly say that Chip was, is, and will always be my friend, and throughout all these years, we have shared the joys and sorrows that life has given us: personally, on the radio bands, and more recently through the internet. Rest in peace, K7JA, and good DXing wherever you are.

Former colleague and close friend Katie Allen, WY7YL: There are no adequate words right now to express our sadness. The four of us grew from friendship to family over all of our years together working hamfests and nearby spots for fun after work was done, we visited each others' homes, and the highlight was traveling the Highlands of Scotland together. For years now, Chip and I started every day with a GM text, which would continue with random chats and funny memes throughout the day. I have so many goofy memes saved on my phone which I'll look at when I want to smile…Chip was larger than life and is leaving a deep chasm in the lives of his family and friends left behind.

Former colleague Doug Wynn, WY6NN: OMG ... I am at such a loss ... my Elmer, friend, inspiration in all things radio…When I joined YAESU in 1990 I was a young aspiring radio amateur... Chip was absolutely the greatest mentor a young ham could have. I can't even begin to express how he solidified my passion for the love of ham radio hobby. The stories of DXing, contesting, DXpeditions, experiment-

Photo F: Just two days before cancer took him from us, Chip and Janet joined Gordon and Suzy at a California flower farm. On the wings of a butterfly…

ing with antennas, satellite radio, packet, giving me pointers, his humor of hams, and Japan and Japanese culture!

Champion contester and retired Admiral Scott Redd, KØDQ: Chip was a class act, an incredible operator and a faithful friend. He was a legend in transforming ham radio contesting. He will be greatly missed. Our prayers are with you.

ARRL Operations Director Bob Naumann, W5OV: Janet, I am deeply sorry to hear this. I have known Chip for 43 years. I had the great pleasure of working with him when he was doing advertising sales for *CQ* and he was really great at it. We crossed paths so many times I don't know where to start. I also feel a severe sense of loss and I am sure the global ham community will as well.

Teresa Gonzalez-White: One of my favorite Chip stories was watching him and my dear Jim, K4OJ (*also a Silent Key too soon – ed.*) and the other hams on the cruise using a toilet seat as a Morse code key. Wonderful memories!

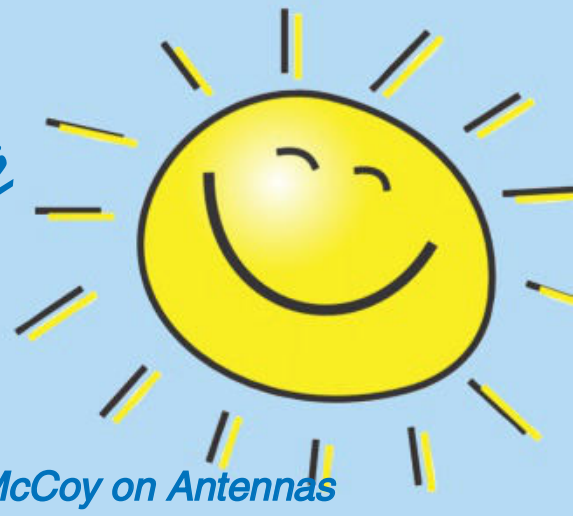
Doug Grant, K1DG: Chip was the ultimate ham, larger than life in many ways. I will never forget his domination of the Sweepstakes contest in the 70s. I can still hear his "63 Washington". It was always a treat to see how he would dress up for Visalia. Spock, cowboy, etc. And the tux when he emceed the banquet and breakfast.

His appearance on the Tonight Show (CW vs texting) was probably the single best PR event for ham radio ever. "How long have you been doing Morse code?" "43 years in ham radio". And of course, he delivered the goods, beating the texters handily.

Ham radio's Elvis has left the building. We are saddened by his early departure but we were enriched by having him in our lives.

All of us at CQ extend our deepest sympathy and condolences to Janet and their entire family.

Summer is Sizzling with Deals...



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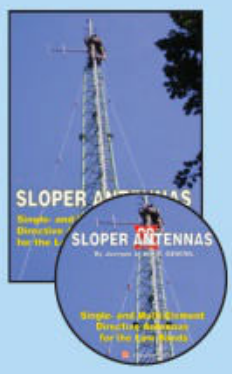

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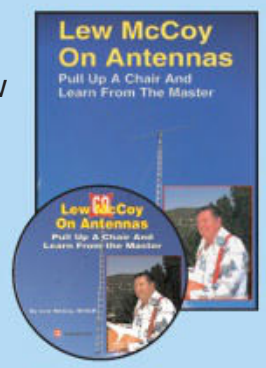
by Lew McCoy, W1ICP



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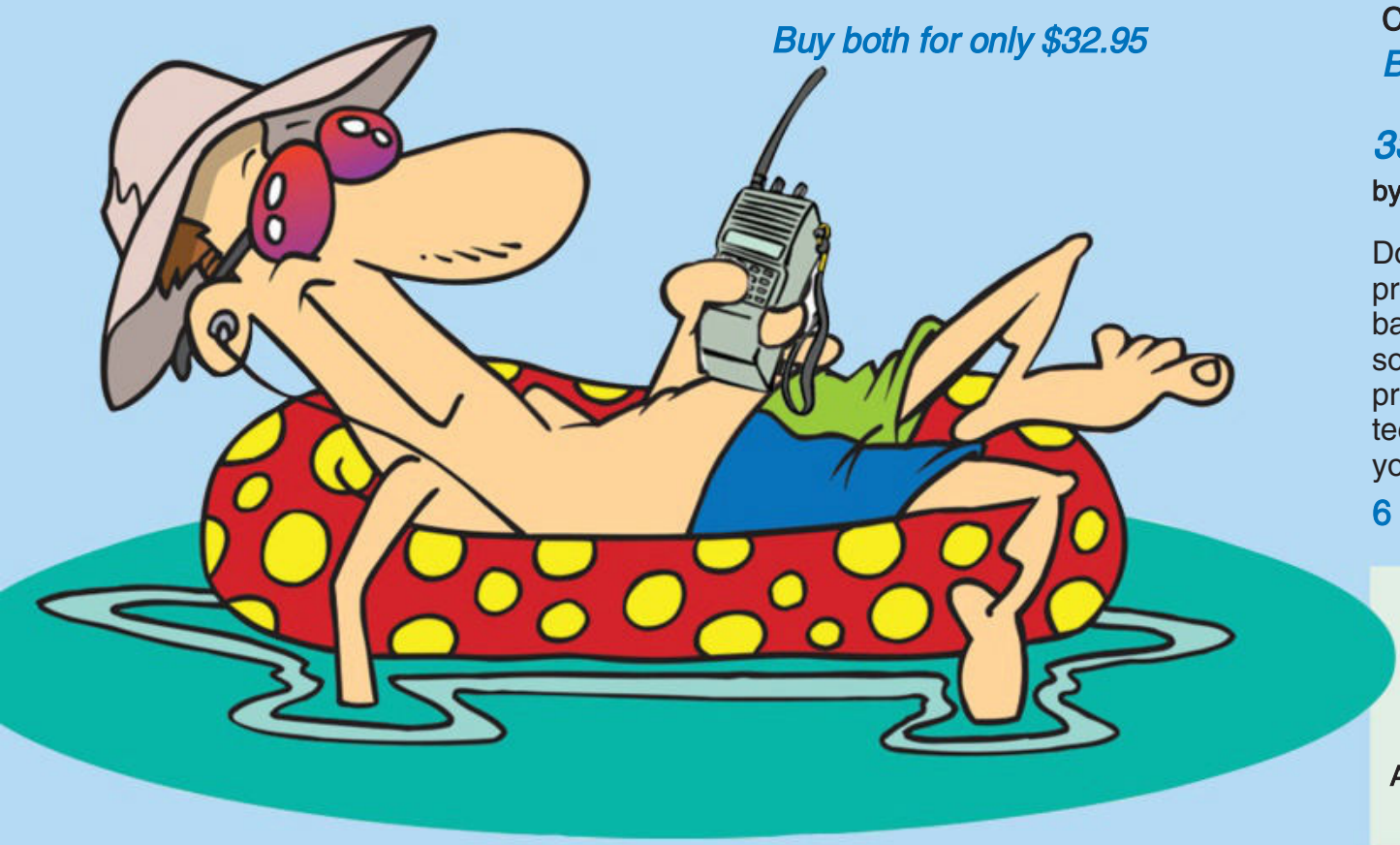

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Results of the 2023 CQWW WPX RTTY Contest

BY CHRIS TATE,* N6WM AND ED MUNS,# WØYK

In February 2023, RTTY contesters from around the world got on the air to celebrate a solid Cycle 25, with great upper band conditions, and the 20-meter band starting to change a bit. Thanks to it being winter, the low bands were not terrible so some great scores came in. Additionally, travel to DX locations seems to be getting more regular post pandemic, so there were lots of good prefixes from island locations and traveled-to destinations have stabilized and seem to be returning to normal.

This year we got an extensive amount of material from competitors and participants and we are grateful for that. We can only showcase some, so we appreciate all who submitted pictures and stories, and if we don't cover yours this go-round, there will be future opportunities, so keep the information coming!

This article we will showcase a few different types of efforts from around the world. You don't have to be a big gun to enjoy this contest! As always, comprehensive results are displayed in the included line scores, so be sure to check them out.

Alex, SA2SAA/7S2A – Sweden

Taking on a QRP effort can be quite a challenge for both sides of the QSO. Doing so from under the aurora adds an entirely new dynamic to the situation, as was the case for Alex Gromme, SA2SAA/7S2A who took on the challenge despite the well-lit auroral night in Sweden (Photo A). Alex passed on some of the pros and cons of this in the following statement:

"Good openings with Oceania and Asia at different times of the day, NA always present at night via Aurora-E, unfortunately no reflection for Pacific via North Pole at night as it happened to me out of contest... in any case a good opportunity to work new countries for my DXCC-DIGI run and Challenge."

Photo A: So beautiful – it's definitely something nice to look at during any radio blackouts. (Photo credit Alex Gromme, SA2SA)

Ali, HZ1ITT – Saudi Arabia

Ali, HZ1ITT was pleased to be on the air from the Kingdom of Saudi Arabia (Photo B). And we were pleased he was QRV. It's always good to get the HZ prefix in the log.

John, N4MMR – USA (FL)

John Black, N4MMR, was pleased to get some interesting DX in the log during his low-power effort in the contest (Photo C):

"I was excited to land some RTTY contacts for the first time, including LX1HD (Luxembourg), 9A5D (Croatia), XE1YL

Photo B: Ali, HZ1ITT, and his nice shack in Saudi Arabia.

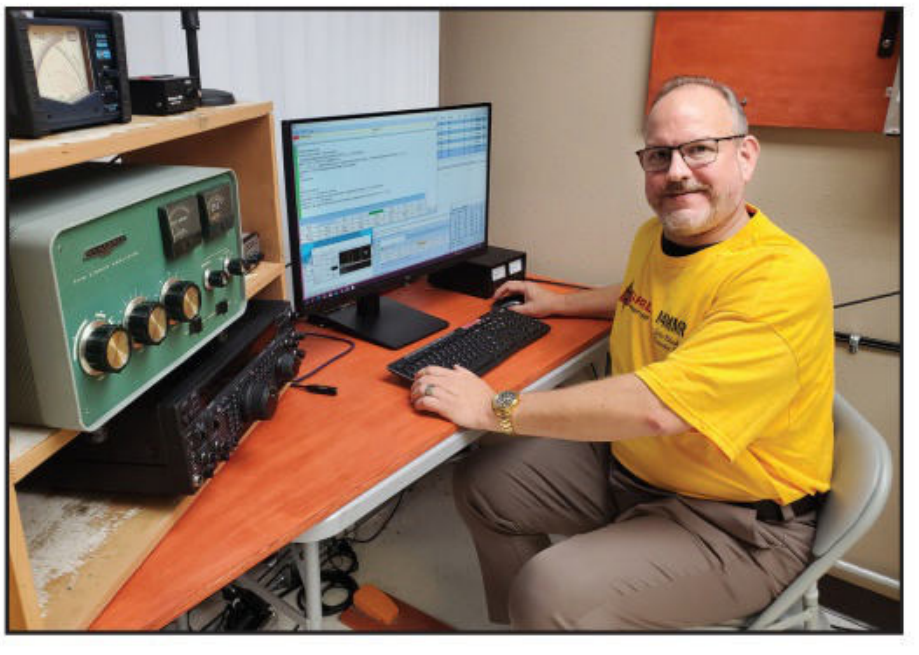

Photo C: N4MMR at his Florida QTH.

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(Mexico), CM6AW (Cuba), HA3DX (Hungary), and CJ2X (Québec).“

John spends lots of time optimizing his low-power setup and has become a very enthusiastic RTTY operator!

Oleh, I2/UY2ZA – Italy

Oleh Pohorilyi, UY2ZA, was operating from Italy as I2/UY2ZA after leaving the conflict in Ukraine, along with his family. He built a small transceiver to get on the air with 4 watts, and put up a dipole at 4 meters (13 feet). Despite these limited operating conditions, he managed to get quite a few QSOs in the log. We all wish Oleh and displaced operators like him the best.

A few additional soapbox comments from operators enjoying WPX RTTY:

MW9W(GWØKRL)

What a fantastic weekend! Of course, things didn't go to plan as I went down with “man-flu” two days before the contest. Still dosed up on meds, it wasn't too bad and at least it didn't matter that I'd almost lost my voice!

2023 WPX RTTY TOP WORLD SCORES

SINGLE OPERATOR
HIGH POWER
All Band

P49X (WØYK) 9,180,792
OK7W 8,876,820
AA3B 8,024,898
UW1M (UR5MW).....8,013,706
SN7Q (SP7GIQ).....7,803,612
AK1W (K5ZD).....6,330,405
KF3P (K3MM).....6,112,690
S53M (S51FB).....5,612,922
ACØC 5,285,436
EE4Y (EA4GOY) 5,240,620

28 MHz

PV2K (PY2KNK).....2,205,096
V55Y (V51WH).....2,013,736
DMØA (DK3DM).....1,754,294
Z35T 1,560,698
9N7AA (S53R).....1,337,856
WD6T (@N6RO) 1,319,094
KZ7X (K6LL).....1,301,016
D4L (IK2NCJ) 1,260,522
K4WI.....1,207,980
YT1X 1,186,740

21 MHz

SN2M (SP2XF).....2,212,028
MD7C (M5RIC).....1,687,770
EF5K (EA5DF) 1,641,384
HG1S (HA1DAE).....1,606,451
HG5D (HA8QZ) 1,601,782
NJ4U (K4EA).....1,543,668
A65DR (G7SLP).....1,448,208
CV7S (CX7SS).....1,101,388
SV2BXA 1,083,712
M5W (MØHMJ).....1,039,326

14 MHz

IQ1RY (IZ1LBG).....2,191,680
YT3X 2,077,682
IT9BLB 1,679,690
HG2DX 1,016,178
EA1B 898,986
YO4FPF 455,455
4Z5FI 371,490
DH6BH 253,300
HB9DOS.....76,475
UA3MCH 73,428

7 MHz

S52X.....3,333,024
KK9A 2,375,712
G8X (G4FJK).....2,312,024
IV3ZXQ.....2,090,952
W3LL 1,777,937
7S9A (SA6FOL) 1,452,680
YQ6A (YO6BHN).....1,053,360
LZ5K.....881,250
K8IA.....689,724
9A6KX 666,687

3.5 MHz

HA1TJ 1,314,588
S53X.....957,110
I1WXY 447,672
IZ3SQW.....343,916
DH8WR 241,774
OL7P (OK1CRM) 230,880
IV3RYP.....198,740
IV3VBM 166,348
LZ33E (LZ5XQ) 161,624
M2E (GØRPM) 42,570

LOW POWER
All Band

TM3Z (F4DSK) 6,546,037
IQ6AN (IK6VXO) 4,184,129
EF7N (EA7KHB).....2,716,049
CR5O (CT7AJL) 2,614,108
KU2M 2,524,608
SP2R 2,075,948
VE3MGY 2,020,150
V31MA.....1,808,256
N4SS (W5MX).....1,799,352
MW9W (GWØKRL) 1,669,393

28 MHz

EA8AH.....1,047,888
T77CX (IK4DCX).....1,045,296
SO25UM (SQ9UM) 608,688
PU1JSV.....566,605
JH6WHN 485,804
CO8NDZ.....432,972
CE1WGM 395,616
CX2AQ 385,612
IT9RZU.....315,576
K5QR.....296,102

21 MHz

JA6GCE 584,910
ED7B (EC7ZR).....546,270
NG1R (W1QK) 545,606
G9F (G4BVY) 533,280
IK5AMB 422,688
MWØCRI 421,124
WA1FCN 320,540
YL2CI 310,620
E77EA 290,088
EE7R 258,093

14 MHz

SV2AEL.....1,110,970
DL4FN 653,705
IW2MXY 574,002
SP8N 401,319
IW9FDD.....390,368
PY2NY.....376,292
PD2PKM.....338,661
HA4WQ 287,352
M5P (M5BIR).....272,349
YT7E 265,088

7 MHz

S51CK 1,694,712
EA3CI 1,574,816
IT9RJE 1,556,160
SP4TKR 1,156,400
LZ7X (LZ1UQ).....1,077,668
E7ØY.....971,740
OK2RU 833,272
I3PXN 760,320
OM3ZWA.....672,010
IW1PNJ 639,276

3.5 MHz

S51W.....553,280
EW7B 494,648
IK4RVG 469,386
OM5KM 394,000
OK2HBR.....302,900
IW2HUS 249,536
E79D 212,658
OK2VV 161,424
HA3GO.....143,040
G6N (GØGDU) 100,500

QRP
All Band

DK7HA 1,422,660
RM5F.....1,053,763
ON6NL 941,952
DF1MM.....868,968
KZØUS (W7RY) 646,990
KV2U (K2YG) 618,786
SP5ØUUU (SP2UUU) 406,560
EA1GT (EA1GT/QRP)....386,496
KO1H.....356,400
EA3F 285,975

28 MHz

7S2A (SA2SAA) 229,356
EA9E 222,780
CB3R.....131,726
YO8WW 75,795
N8URE 48,438
IZ2JPN 43,152
WE6EZ.....41,208
WD9FTZ.....34,969
CM3EFM 33,810
VE3BFU 25,000

21 MHz

UA3QJJ 201,188
HG3IPA (HA3JB).....148,764
CO2AJ.....119,280
SP4NKJ.....118,405
KD9MS 83,692
DJ3HW 80,960
TIØRC (TI2YO) 74,253
NØUR.....74,108
LY5G 73,513
HF2ØLVK 67,392

14 MHz

SFØA (SMØLPO).....286,124
YU1NR 59,130
ON3PAT 35,620
EA7JTP 28,290
TI2BSH.....26,104
OQ4B (ON4BHQ).....22,989
YO4BEW 21,008
OK7N.....9,039
LY4BF 7,503
9A5HZ 5,044

7 MHz

SP4LO.....147,420
I2/UY2ZA (UY2ZA).....62,976
MM7BWK 41,040
GM1J (MMØBQI) 36,860
SP6EIY.....29,920
YD3AMT 112
BH5HGI 32

3.5 MHz

UT3N (UT3NK).....159,698
SP3EMA.....119,184
M9N (G7WHI).....59,780
YL3FW 41,600
PAØAWH 5,112
EE2A (EA2SN) 3,472
JA5NSR.....50

MULTI-OP
SINGLE-TRANSMITTER
HIGH POWER
All Band

IQ4FC.....11,821,950
9A5D 6,384,930
LZ5R.....5,927,548
ND3D.....5,388,432
S51A.....5,369,270
TMØR.....5,276,502
HG7T.....5,100,113
DP6A.....4,772,598
OH2HAN 4,656,762
OK7O 4,375,764

LOW POWER
All Band

IT9RBW.....6,652,387
EA8DED 4,219,306
WW4LL.....3,057,244
DAØBCC 2,710,350
KA4RRU 2,582,580
DQ4W.....2,512,890
ES7A 2,279,892
NY6DX 2,084,914
9A7T.....2,070,852
Z66BCC.....2,048,704

MULTI-OP
TWO-TRANSMITTER
All Band

CR3DX 22,747,902
ED1R.....12,552,932
K9CT 10,810,878
DP7D.....10,698,840
DQ2C 9,426,468
WV4P 8,950,866
NCØDX 5,701,110
C37N 4,377,272
KT7E 3,709,321
LA1ØØK 2,374,344

MULTI-OP
MULTI-TRANSMITTER
All Band

9A1A.....20,431,824
DP9A 13,979,736
W3GH.....5,389,308
NW8S 4,555,968
DG4UF 4,426,311
DQ9Y.....3,941,613
OZ4GM.....2,465,528
WA3EKL 1,457,376
JA6ZPR 1,128,190
NW6P 323,609

MULTI-OP
MULTI-DISTRIBUTED
HIGH POWER
All Band

CJ2X.....5,638,320
IQ3ME 5,405,472
VK4SN.....3,684,765
DC6O 2,522,919
IQ8QX 46,500
7E3E.....10,304

ROOKIE
HIGH POWER

W9DCT.....1,008,807
EI6IKB 999,440
IUØPVM 762,354
M9B (MØLKW) 411,720
W3FR 225,280
EF5T (EA5JDN) 199,136
KC3TAU 174,563
KD2UBH.....151,466
KO6M 97,152
N3AML 32,994

LOW POWER

F4ITQ 573,447
KC1RET 560,986
IUØRBE.....523,973
ED4J (EA4HKF) 428,496
IV3IPA 366,885
DD5VL.....286,764
K3AK 215,433
G5ROB.....133,248
OM1HMI 132,475
F4IVC 129,090

CLASSIC
HIGH POWER

PJ2T (WI9WI).....2,889,831
YT3D 2,566,256
KI6DY 2,406,552
IZ2FOS.....2,347,884
N1RM 2,191,196
OZ5W (SM5SIC) 1,848,174
W3LL.....1,777,937
EU8U.....1,550,910
EW4A 1,166,316
R5AN.....1,023,984

LOW POWER

VA1XH.....1,301,916
LA5LJA.....930,225
VE3DZ.....912,576
GØFGI.....856,575
IW1CBG 779,145
I3PXN 760,320
IK1RGK 726,225
YO9BCM 667,550
IW1PNJ 639,276
DL5KUD 614,560

TRIBANDER/WIRES
HIGH POWER

9A2ZI.....4,071,354
DK8ZZ.....3,783,013
MM9I (GMØOPS).....3,337,873
N3QE.....3,260,544
NF3R.....3,172,580
ZW2N (PY2MNL) 3,030,035
DP8M (DL6NDW).....2,422,511
K9OM 2,082,417
AE1P 1,979,364
DL6JZ.....1,827,628

LOW POWER

EF7N (EA7KHB).....2,716,049
CR5O (CT7AJL) 2,614,108
VE3MGY 2,020,150
MW9W (GWØKRL) 1,669,393
OK2WY 1,486,446
UZ1WW.....1,485,200
PG7M 1,395,390
R7MM.....1,245,176
AH2O.....1,122,990
VE2BVV 1,117,464

YOUTH
HIGH POWER

DM7XX 4,571,248
IU1LCU.....1,190,601
OE9SEV 34,485

LOW POWER

DJ4MX.....1,605,065
BD4VGZ.....726,652
K5TRP.....224,264
DK1YH 124,898
EA2ESK 68,134
EI8KW 67,850
BH2SWB 57,771
DQ5M (DK6SP).....47,994
JQ7AXT.....31,200
KC1GDW.....15,939

G1N (GØURR)

"WOW! What a contest this was. My best-ever entry, with the SFI over 200. Ten and fifteen were incredible. Antennas were a Spiderbeam at 8 meters, my 40-meter phased verticals and a new 80-meter vertical over multiple radials. Great fun, loved it. Thanks to everyone that called me and to the organizers for putting it on."

KZ7X(K6LL)

"Conditions were great, with solar flux about 215 and K index 2 or less. It was lots of fun."

AJ6V

"Conditions were very good. With the high solar flux index, Europe was stronger on 15 meters than on 20, and Japan was stronger on 10 than on 15. We haven't seen conditions like that for a long time."

Ian Capon, MW9W/GWØKRL in Wales, (Photo D), also shared his excitement over this year's WPX RTTY contest:

"*Conditions from here seemed really good and I think for the first time my station 'felt loud.' I have been practicing using SO2V for a while but this year everything worked perfectly and I felt it really helped my score. It was also nice to have all 5 bands with propagation... even more fun!"*

From Japan, **JH4WBY** didn't send any comments, but he did share a photo (Photo E). He looks happy!

2023 WPX RTTY TOP EUROPE SCORES

SINGLE OPERATOR
HIGH POWER
All Band
OK7W 8,876,820
UW1M (UR5MW) 8,013,706
SN7Q (SP7GIQ) 7,803,612
S53M (S51FB) 5,612,922
EE4Y (EA4GOY) 5,240,620
DM7XX 4,571,248
9A2ZI 4,071,354
US2YW 3,827,281
DK8ZZ 3,783,013
MM9I (GMØOPS) 3,337,873

28 MHz
DMØA (DK3DM) 1,754,294
Z35T 1,560,698
YT1X 1,186,740
DL3BQA 1,137,648
HA1SN 1,112,127
LY5W 1,090,440
SP8K 635,390
RG4A 460,736
S57DX 445,195
J42R (SV2HXV) 395,975

21 MHz
SN2M (SP2XF) 2,212,028
MD7C (M5RIC) 1,687,770
EF5K (EA5DF) 1,641,384
HG1S (HA1DAE) 1,606,451
HG5D (HA8QZ) 1,601,782
SV2BXA 1,083,712
M5W (MØHMJ) 1,039,326
SN5X 920,138
SV3SCW 904,916
LZ4AE 881,280

14 MHz
IQ1RY (IZ1LBG) 2,191,680
YT3X 2,077,682
IT9BLB 1,679,690
HG2DX 1,016,178
EA1B 898,986
YO4FPF 455,455
DH6BH 253,300
HB9DOS 76,475
UA3MCH 73,428
IZ2BVC 61,304

7 MHz
S52X 3,333,024
G8X (G4FJK) 2,312,024
IV3ZXQ 2,090,952
7S9A (SA6FOL) 1,452,680
YQ6A (YO6BHN) 1,053,360
LZ5K 881,250
9A6KX 666,687
SX2K (SV2BXZ) 481,080
IZ7XUQ 476,418
SM5EPO 365,190

3.5 MHz
HA1TJ 1,314,588
S53X 957,110
I1WXY 447,672
IZ3SQW 343,916
DH8WR 241,774
OL7P (OK1CRM) 230,880
IV3RYP 198,740
IV3VBM 166,348
LZ33E (LZ5XQ) 161,624
M2E (GØRPM) 42,570

LOW POWER
All Band
TM3Z (F4DSK) 6,546,037
IQ6AN (IK6VXO) 4,184,129
EF7N (EA7KHB) 2,716,049
CR5O (CT7AJL) 2,614,108
SP2R 2,075,948
MW9W (GWØKRL) 1,669,393
DJ4MX 1,605,065
OK2WY 1,486,446
UZ1WW 1,485,200
RA3Y 1,484,964

28 MHz
T77CX (IK4DCX) 1,045,296
SO25UM (SQ9UM) 608,688
IT9RZU 315,576
UF5A 253,453
SV1JG 251,624
UR5LAM 233,448
GUØSUP 204,314
IT9MRM 195,569
SV3EXU 154,963
R2XM 151,863

21 MHz
ED7B (EC7ZR) 546,270
G9F (G4BVY) 533,280
IK5AMB 422,688
MWØCRI 421,124
YL2CI 310,620
E77EA 290,088
EE7R 258,093
LZ2JA 254,330
MØBLF 234,635
LY2PAD 178,688

14 MHz
SV2AEL 1,110,970
DL4FN 653,705
IW2MXY 574,002
SP8N 401,319
IW9FDD 390,368
PD2PKM 338,661
HA4WQ 287,352
M5P (M5BIR) 272,349
YT7E 265,088
DL3KVR 247,422

7 MHz
S51CK 1,694,712
EA3CI 1,574,816
IT9RJE 1,556,160
SP4TKR 1,156,400
LZ7X (LZ1UQ) 1,077,668
E7ØY 971,740
OK2RU 833,272
I3PXN 760,320
OM3ZWA 672,010
IW1PNJ 639,276

3.5 MHz
S51W 553,280
EW7B 494,648
IK4RVG 469,386
OM5KM 394,000
OK2HBR 302,900
IW2HUS 249,536
E79D 212,658
OK2VV 161,424
HA3GO 143,040
G6N (GØGDU) 100,500

QRP
All Band
DK7HA 1,422,660
RM5F 1,053,763
ON6NL 941,952
DF1MM 868,968
SP5ØUUU (SP2UUU) 406,560
EA1GT (EA1GT/QRP) 386,496
EA3F 285,975
OK4GP 272,952
IZ8JFL 228,589
YU1RH 223,139

28 MHz
7S2A (SA2SAA) 229,356
YO8WW 75,795
IZ2JPN 43,152
OM7PY 7,923
EA4DUT 4,704
PA2REH 2,464
GW5P (GWØEGH) 2,100
DL5SFC 1,725
DO4ADH 435

21 MHz
UA3QJJ 201,188
HG3IPA (HA3JB) 148,764
SP4NKJ 118,405
DJ3HW 80,960
LY5G 73,513
HF2ØLVK 67,392
YO3DAC 51,538
UR2Y (USØYW) 45,552
IZ2QKG 8,296
UT7AA 1,632

14 MHz
SFØA (SMØLPO) 286,124
YU1NR 59,130
ON3PAT 35,620
EA7JTP 28,290
OQ4B (ON4BHQ) 22,989
YO4BEW 21,008
OK7N 9,039
LY4BF 7,503
9A5HZ 5,044
DL7EDU 1,450

7 MHz
SP4LO 147,420
I2/UY2ZA (UY2ZA) 62,976
MM7BWK 41,040
GM1J (MMØBQI) 36,860
SP6EIY 29,920

3.5 MHz
UT3N (UT3NK) 159,698
SP3EMA 119,184
M9N (G7WHI) 59,780
YL3FW 41,600
PAØAWH 5,112
EE2A (EA2SN) 3,472

MULTI-OP SINGLE-TRANSMITTER
HIGH POWER
All Band
IQ4FC 11,821,950
9A5D 6,384,930
LZ5R 5,927,548
S51A 5,369,270
TMØR 5,276,502
HG7T 5,100,113
DP6A 4,772,598
OH2HAN 4,656,762
OK7O 4,375,764
OK1KSL 4,015,304

MULTI-OP SINGLE-TRANSMITTER
LOW POWER
All Band
IT9RBW 6,652,387
DAØBCC 2,710,350
DQ4W 2,512,890
ES7A 2,279,892
9A7T 2,070,852
Z66BCC 2,048,704
8S8ØAA 1,611,435
OL1Z 1,561,377
ED3D 1,088,481
IQ2DN 981,950

MULTI-OP TWO-TRANSMITTER
All Band
ED1R 12,552,932
DP7D 10,698,840
DQ2C 9,426,468
C37N 4,377,272
LA1ØØK 2,374,344
ES5G 993,711
OL7K 331,299

MULTI-OP MULTI-TRANSMITTER
All Band
9A1A 20,431,824
DP9A 13,979,736
DG4UF 4,426,311
DQ9Y 3,941,613
OZ4GM 2,465,528

MULTI-OP MULTI-DISTRIBUTED
HIGH POWER
All Band
IQ3ME 5,405,472
DC6O 2,522,919
IQ8QX 46,500

ROOKIE
HIGH POWER
EI6IKB 999,440
IUØPVM 762,354
M9B (MØLKW) 411,720
EF5T (EA5JDN) 199,136

LOW POWER
F4ITQ 573,447
IUØRBE 523,973
ED4J (EA4HKF) 428,496
IV3IPA 366,885
DD5VL 286,764
G5ROB 133,248
OM1HMI 132,475
F4IVC 129,090
IU3QEU 113,022
HA1NR 103,626

CLASSIC
HIGH POWER
YT3D 2,566,256
IZ2FOS 2,347,884
OZ5W (SM5SIC) 1,848,174
EU8U 1,550,910
EW4A 1,166,316
R5AN 1,023,984
DB1WA 940,043
DF8QB 804,063
LX1NO 794,555
IT9ODQ 735,902

LOW POWER
LA5LJA 930,225
GØFGI 856,575
IW1CBG 779,145
I3PXN 760,320
IK1RGK 726,225
YO9BCM 667,550
IW1PNJ 639,276
DL5KUD 614,560
IW2CDH 537,758
EA5HKZ 492,898

TRIBANDER/WIRES
HIGH POWER
9A2ZI 4,071,354
DK8ZZ 3,783,013
MM9I (GMØOPS) 3,337,873
DP8M (DL6NDW) 2,422,511
DL6JZ 1,827,628
Z35T 1,560,698
EI6LA 1,430,000
YO3RU 1,311,987
S5ØRY (S53K) 1,303,447
DK5MB 1,183,336

LOW POWER
EF7N (EA7KHB) 2,716,049
CR5O (CT7AJL) 2,614,108
MW9W (GWØKRL) 1,669,393
OK2WY 1,486,446
UZ1WW 1,485,200
PG7M 1,395,390
R7MM 1,245,176
ED7Z (EA7EQ) 1,018,104
EA4BAS 1,016,232
E7ØY 971,740

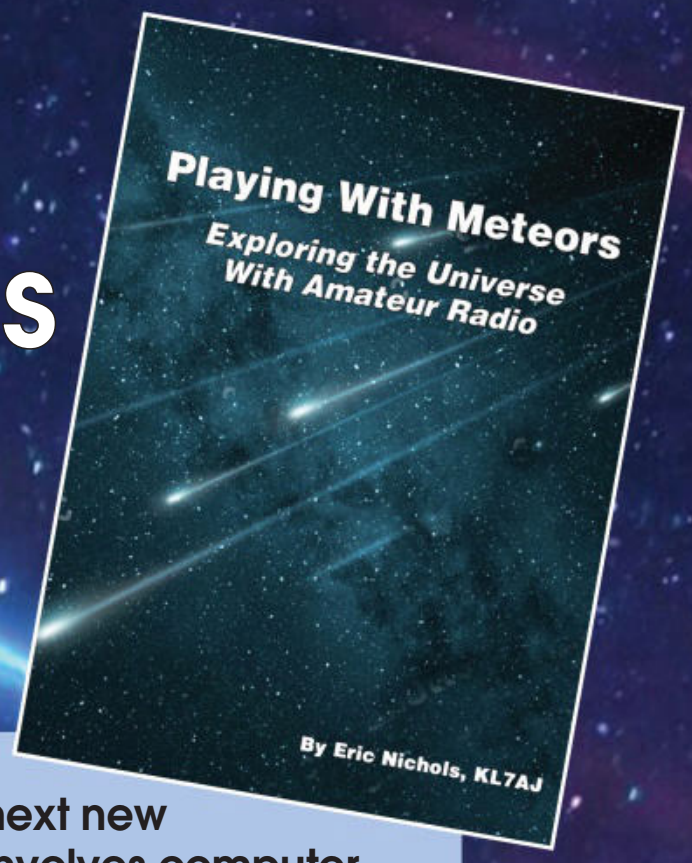
YOUTH
HIGH POWER
DM7XX 4,571,248
IU1LCU 1,190,601
OE9SEV 34,485

LOW POWER
DJ4MX 1,605,065
DK1YH 124,898
EA2ESK 68,134
EI8KW 67,850
DQ5M (DK6SP) 47,994
DK6SP 9,129
SQ8L 4,653
RX6N 4,116
SP9DLS 1,914
YO8OLY 40

Playing With Meteors

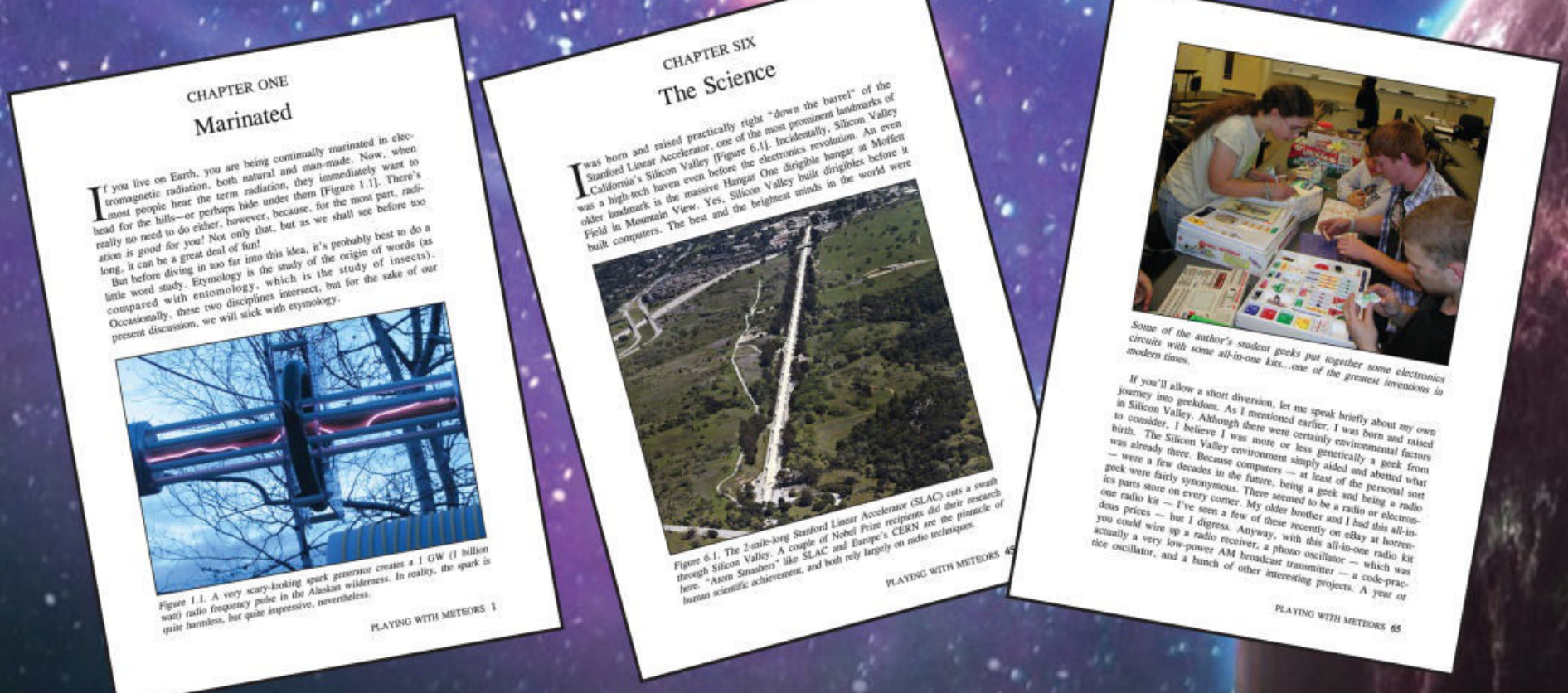
Exploring the Universe With Amateur Radio

By Eric Nichols KL7AJ



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

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



CHAPTER ONE

Marinated

If you live on Earth, you are being continually marinated in electromagnetic radiation, both natural and man-made. Now, when most people hear the term radiation, they immediately want to head for the hills—or perhaps hide under them [Figure 1.1]. There's really no need to do either, however, because, for the most part, radiation is good for you! Not only that, but as we shall see before too long, it can be a great deal of fun!

But before diving in too far into this idea, it's probably best to do a little word study. Etymology is the study of the origin of words (as compared with entomology, which is the study of insects). Occasionally, these two disciplines intersect, but for the sake of our present discussion, we will stick with etymology.

Figure 1.1. A very scary-looking spark generator creates a 1 GW (1 billion watt) radio frequency pulse in the Alaskan wilderness. In reality, the spark is quite harmless, but quite impressive, nevertheless.

PLAYING WITH METEORS 1

CHAPTER SIX

The Science

I was born and raised practically right "down the barrel" of the Stanford Linear Accelerator, one of the most prominent landmarks of California's Silicon Valley [Figure 6.1]. Incidentally, Silicon Valley was a high-tech haven even before the electronics revolution. An even older landmark is the massive Hangar One dirigible hangar at Moffett Field in Mountain View. Yes, Silicon Valley built dirigibles before it built computers. The best and the brightest minds in the world were

Figure 6.1. The 2-mile-long Stanford Linear Accelerator (SLAC) cuts a swath through Silicon Valley. A couple of Nobel Prize recipients did their research here. "Atom Smashers" like SLAC and Europe's CERN are the pinnacle of human scientific achievement, and both rely largely on radio techniques.

PLAYING WITH METEORS 45

Some of the author's student geeks put together some electronics circuits with some all-in-one kits...one of the greatest inventions in modern times.

If you'll allow a short diversion, let me speak briefly about my own journey into geekdom. As I mentioned earlier, I was born and raised in Silicon Valley. Although there were certainly environmental factors to consider, I believe I was more or less genetically a geek from birth. The Silicon Valley environment simply aided and abetted what was already there. Because computers — at least of the personal sort — were a few decades in the future, being a geek and being a radio geek were fairly synonymous. There seemed to be a radio or electronics parts store on every corner. My older brother and I had this all-in-one radio kit — I've seen a few of these recently on eBay at horrendous prices — but I digress. Anyway, with this all-in-one radio kit you could wire up a radio receiver, a photo oscillator — which was actually a very low-power AM broadcast transmitter — a code-practice oscillator, and a bunch of other interesting projects. A year or

PLAYING WITH METEORS 65

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2023 WPX RTTY TOP UNITED STATES SCORES

SINGLE OPERATOR
HIGH POWER
All Band
AA3B 8,024,898
AK1W (K5ZD).....6,330,405
KF3P (K3MM).....6,112,690
ACØC 5,285,436
AD4EB.....4,179,618
WK1Q
(K1MK @K1TTT).....3,966,795
K7RL 3,550,008
KU1CW 3,346,710
N3QE.....3,260,544
NF3R 3,172,580

28 MHz
WD6T (@N6RO) 1,319,094
KZ7X (K6LL).....1,301,016
K4WI.....1,207,980
KZ5MM (W5PR) 1,107,150
NS1L (N6SS).....641,348
W9ILY.....619,918
WX6V 337,120
WZ7ZR (W7ZR).....321,195
KSØAA 131,446
K7IU 118,197

21 MHz
NJ4U (K4EA).....1,543,668
WV6I (N6WM) 360,836
WF6C (N6XI).....60,480
WQ3U.....17,372
KFØIQ 779

14 MHz
W5TN 20,592
W3IK.....11,560
W4SSF 1,908
WA2PCN 930
AA5AU.....819

7 MHz
KK9A 2,375,712
W3LL 1,777,937
K8IA.....689,724
WX5S 316,250
NW2P 4,836
N3RC.....36

3.5 MHz
NA5NN (K2FF) 7,344

LOW POWER
All Band
KU2M 2,524,608
N4SS (W5MX).....1,799,352
AH2O.....1,122,990
W4RN.....1,122,987
N8CWU 915,875
WB2JVO (K2AL) 792,819
WA2DNI 770,628
W3KB 768,504
AC5XK.....722,294
KØRC 696,496

28 MHz
K5QR.....296,102
WO4O 254,040
KF6RY (W6ZL).....125,874
N9VPV.....117,912
AB9YC.....115,913
WB1AEL.....73,350
NK5G.....62,208
K7ULS 58,368
N9LJX.....48,786
K4FT.....37,908

21 MHz
NG1R (W1QK) 545,606
WA1FCN 320,540
WNØL.....132,009
KC7CM.....75,144
N7DB.....73,340

14 MHz
W4LC 111,776
K8VT 94,815
N1GDD.....22,672
N8GU 2,184
AC2IK 2,016
WØADL 1,144
WA1YGT 204
K3TW 156

7 MHz
W2VTV 226,380
WA3FAE.....205,110

NG6O (K6GHA).....152,096
W9AKS.....30,600

3.5 MHz
WZ6ZZ 84,280
KEØL.....1,450

QRP
All Band
KZØUS (W7RY) 646,990
KV2U (K2YG) 618,786
KO1H.....356,400
WU5K (K5NZ) 248,685
W6QU (W8QZA) 115,415
WQ6X.....67,144
K4SAA.....50,944
AI9K.....40,800
KG2U.....16,380
AA8OY 13,840

28 MHz
N8URE 48,438
WE6EZ.....41,208
WD9FTZ.....34,969
KE6GLA 10,906
N3MWQ.....2,774

21 MHz
KD9MS 83,692
NØUR.....74,108

MULTI-OP SINGLE-TRANSMITTER
HIGH POWER
All Band
ND3D.....5,388,432
KS9R 3,185,820
WM7A.....841,156
W4MLB.....598,662
AG6AU 389,991
KD9V 290,997
AK2S 238,810

MULTI-OP SINGLE-TRANSMITTER
LOW POWER
All Band
WW4LL.....3,057,244
KA4RRU 2,582,580
NY6DX 2,084,914
NC1CC 1,160,382
WB8SKP 469,880
AB7HP.....2,773

MULTI-OP TWO-TRANSMITTER
All Band
K9CT 10,810,878
WV4P 8,950,866
NCØDX 5,701,110
KT7E 3,709,321
K3CCR 2,022,744

MULTI-OP MULTI-TRANSMITTER
All Band
W3GH.....5,389,308
NW8S 4,555,968
WA3EKL.....1,457,376
NW6P 323,609

ROOKIE
HIGH POWER
W9DCT.....1,008,807
W3FR 225,280
KC3TAU 174,563
KD2UBH.....151,466
KO6M 97,152
N3AML 32,994

LOW POWER
KC1RET 560,986
K3AK 215,433
KI5RQG.....89,000
KN1OLA 59,502
NN6U.....32,592
W7VC 29,925
KN6SID 22,338
KQ4AAR.....20,910
KI5QPY 19,012
KB7SDM.....18,693

CLASSIC
HIGH POWER
KI6DY 2,406,552
N1RM 2,191,196
W3LL 1,777,937
NG1M 912,120
AJ6V 748,879
NØTA 667,320
W4CQE 597,702
4U1WB (AJ3M) 431,892
NN4NN (K3SV) 274,052
K7JQ 266,751

LOW POWER
NG1R (W1QK) 545,606
K7DR.....320,120
N3CKI.....258,266
W2VTV 226,380
W1DYJ 225,944
W3DQS 220,158
WZ4M.....192,660
W7TMT.....189,002
N7WLC.....182,850
AF1R 181,440

TRIBANDER/WIRES
HIGH POWER
N3QE.....3,260,544
NF3R 3,172,580
K9OM 2,082,417
AE1P 1,979,364
AD5XD 1,703,184
KZ7X (K6LL).....1,301,016
N6ZFO.....964,429
W1HS 943,056
WX2NJ (K2RET) 887,880
W6SX 844,770

LOW POWER
AH2O.....1,122,990
WB2JVO (K2AL) 792,819
AC5XK.....722,294
N5SMQ.....505,500
KW1X 436,800
WB8JUI 434,603
KC2WUF 414,636
K3RWN 330,620
WG1V.....328,042
NN5T 303,784

YOUTH
LOW POWER
K5TRP.....224,264
KC1GDW.....15,939

2023 CQWW RTTY WPX BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

Number groups indicate: QSOs / Prefixes on each band

WORLD SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
K7RL	96/18	334/122	313/121	783/291	654/196
PJ2T	0/0	301/211	233/56	468/138	449/166
N6AR	54/23	437/245	337/116	273/99	382/184
*CR5O	7/7	323/121	208/67	415/161	641/267
YT3D	187/120	363/152	181/64	167/74	365/206

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

IQ4FC	273/92	936/430	864/177	584/176	783/175
*IT9RBW	145/58	957/405	305/114	465/155	360/157
9A5D	284/79	631/241	575/200	480/201	393/149
LZ5R	221/71	770/371	276/62	414/160	440/150
ND3D	171/58	684/322	540/150	463/137	397/145

WORLD MULTI-OPERATOR TWO TRANSMITTER

CR3DX	307/67	1129/325	1229/240	1296/246	1418/271
ED1R	330/121	926/281	943/205	1111/245	682/205
K9CT	348/70	858/279	817/205	1028/250	838/250
DP7D	516/175	852/290	452/110	776/211	696/231
DQ2C	569/212	851/272	526/127	553/186	520/174

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	774/206	1355/321	1195/219	1124/225	852/197
DP9A	598/154	1165/344	909/207	848/202	662/154
W3GH	276/42	781/273	626/210	555/192	408/117
NW8S	288/82	577/210	568/150	626/204	364/132
DG4UF	330/123	625/251	387/124	394/165	235/108

USA TOP SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
K7RL	96/18	334/122	313/121	783/291	654/196
N6AR	54/23	437/245	337/116	273/99	382/184
KI6DY	121/37	376/226	402/118	277/93	338/117
N1RM	47/17	530/310	350/99	144/45	218/85
AE1P	154/104	281/74	434/169	262/121	261/119

USA MULTI-OPERATOR SINGLE TRANSMITTER

ND3D	171/58	684/322	540/150	463/137	397/145
KS9R	172/63	590/275	449/81	335/106	317/135
*WW4LL	70/15	687/377	374/97	317/133	228/96
*KA4RRU	164/56	505/262	183/46	308/126	376/155
*NY6DX	94/41	383/238	160/72	197/119	336/219

USA MULTI-OPERATOR TWO TRANSMITTER

K9CT	348/70	858/279	817/205	1028/250	838/250
WV4P	344/74	770/299	659/117	859/224	899/288
NCØDX	231/28	614/213	575/129	821/294	736/206
KT7E	117/24	493/161	341/99	759/269	599/184
K3CCR	100/33	295/177	326/178	297/133	203/101

USA MULTI-OPERATOR MULTI-TRANSMITTER

W3GH	276/42	781/273	626/210	555/192	408/117
NW8S	288/82	577/210	568/150	626/204	364/132
WA3EKL	141/60	256/167	214/111	211/112	194/114
NW6P	1/1	27/14	62/45	221/125	246/156

Photo D: MW9W/GW0KRL manning up his station in Wales.

Club Competition

CQ WPX RTTY in unique in its club competition as it is not combined with the CW and SSB versions but rather has a standalone club competition. We encourage you to get involved with your local contest club if you have not already. The key to a good club score is member participation, the more logs the better. This was demonstrated by the Potomac Valley Radio Club (PVRC) this year, with nearly double the logs of U.S. second-place Frankford Radio Club (FRC). A similar pattern was observed in Europe with the Bavarian Contest Club's win. Power in numbers. Congrats to both of these powerhouse contest clubs for their victory.

EUROPE TOP SINGLE OPERATOR ALL BAND

Station	80	40	20	15	10
*CR5O	7/7	323/121	208/67	415/161	641/267
YT3D	187/120	363/152	181/64	167/74	365/206
IZ2FOS	175/125	335/137	219/81	226/107	273/138
TF1AM	90/16	315/139	164/84	372/154	610/187
I4LCK	98/29	207/99	262/134	375/189	331/175

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

IQ4FC	273/92	936/430	864/177	584/176	783/175
*IT9RBW	145/58	957/405	305/114	465/155	360/157
9A5D	284/79	631/241	575/200	480/201	393/149
LZ5R	221/71	770/371	276/62	414/160	440/150
S51A	367/113	572/284	310/136	410/168	306/129

EUROPE MULTI-OPERATOR TWO TRANSMITTER

ED1R	330/121	926/281	943/205	1111/245	682/205
DP7D	516/175	852/290	452/110	776/211	696/231
DQ2C	569/212	851/272	526/127	553/186	520/174
C37N	102/54	603/235	550/169	457/153	288/108
LA1ØØK	74/8	352/190	404/116	563/209	179/65

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

9A1A	774/206	1355/321	1195/219	1124/225	852/197
DP9A	598/154	1165/344	909/207	848/202	662/154
DG4UF	330/123	625/251	387/124	394/165	235/108
DQ9Y	260/143	599/269	257/91	279/151	189/113
OZ4GM	340/153	403/118	240/127	289/145	110/61

2023 WPX RTTY CLUB SCORES

USA

Club	# Entrants	Score
POTOMAC VALLEY RADIO CLUB	66	41,805,515
FRANKFORD RADIO CLUB	37	32,155,470
YANKEE CLIPPER CONTEST CLUB	30	27,210,381
NORTHERN CALIFORNIA CONTEST CLUB	37	25,728,469
SOCIETY OF MIDWEST CONTESTERS	41	24,582,996
WILLAMETTE VALLEY DX CLUB	19	10,526,508
ARIZONA OUTLAWS CONTEST CLUB	22	9,048,324
KANSAS CITY CONTEST CLUB	5	9,038,419
MINNESOTA WIRELESS ASSN	18	6,490,499
SKYVIEW RADIO SOCIETY	5	5,755,684
SOUTH EAST CONTEST CLUB	7	5,571,452
FLORIDA CONTEST GROUP	16	5,300,402
TENNESSEE CONTEST GROUP	12	4,971,044
WESTERN WASHINGTON DX CLUB	12	4,792,417
NORTHEAST MARYLAND AMATEUR RADIO CONTEST SOCIETY	13	4,528,447
GRAND MESA CONTESTERS OF COLORADO	8	3,656,142
DFW CONTEST GROUP	12	3,116,210
ORDER OF BOILED OWLS OF NEW YORK	8	3,057,872
KENTUCKY CONTEST GROUP	4	3,008,768
SPOKANE DX ASSOCIATION	10	2,619,594
BRISTOL (TN/VA) ARC	5	2,411,067
NIAGARA FRONTIER RADIOSPORT	7	2,006,089
ALABAMA CONTEST GROUP	5	1,765,968
CENTRAL TEXAS DX AND CONTEST CLUB	7	1,716,675
HUDSON VALLEY CONTESTERS AND DXERS	4	1,627,886
ROCHESTER (NY) DX ASSN	5	1,573,999
NORTH COAST CONTESTERS	4	1,114,306
SWAMP FOX CONTEST GROUP	9	1,097,824
PORTAGE COUNTY AMATEUR RADIO SERVICE	4	583,196
CAROLINA DX ASSOCIATION	5	509,866
SOUTHERN CALIFORNIA CONTEST CLUB	7	482,774
DUPAGE AMATEUR RADIO CLUB	4	59,494

DX

Club	# Entrants	Score
BAVARIAN CONTEST CLUB	113	99,887,129
ITALIAN CONTEST CLUB	95	61,389,421
INTEREST GROUP RTTY	26	46,300,292
CROATIAN CONTEST CLUB	10	27,495,410
EA CONTEST CLUB	20	21,596,600
UKRAINIAN CONTEST CLUB	32	19,626,600
SLOVENIA CONTEST CLUB	7	14,066,119
CONTEST CLUB ONTARIO	241	0,992,315
RHEIN RUHR DX ASSOCIATION	39	10,303,718
BELARUS CONTEST CLUB	9	7,745,759
CONTEST CLUB FINLAND	6	7,696,295
ARAUCARIA DX GROUP	12	7,630,956
CONTEST CLUB SERBIA	6	6,458,582
CONTEST GROUP DU QUEBEC	5	6,104,314
ORCA DX AND CONTEST CLUB	6	4,250,506
VK CONTEST CLUB	7	4,103,753
RIO DX GROUP	17	4,066,497
CHILTERN DX CLUB	6	3,868,868
5NNDXCC	11	3,815,420
ARIPA DX TEAM	7	3,559,403
CATALONIA CONTEST CLUB	6	3,495,251
WORLD WIDE YOUNG CONTESTERS	5	2,754,756
SP DX CLUB	15	2,586,122
RTTY CONTESTERS OF JAPAN	11	2,168,823
YB-LAND DXING PASSION IS	76	2,024,876
RUSSIAN CONTEST CLUB	5	1,720,921
THRACIAN ROSE CLUB	8	1,477,651
CZECH CONTEST CLUB	4	1,290,266
ARCK	6	989,607
LU CONTEST GROUP	7	879,036
GMDX GROUP	6	844,428
RUSSIAN DIGITAL RADIO CLUB	4	841,267
DANISH DX GROUP	5	702,546
RDRC	5	632,151
LATVIAN CONTEST CLUB	4	602,484
CABREUVADX	9	555,973
CLIPPERTON DX CLUB	4	526,718
CONTEST CLUB BELGIUM	7	377,434
YB LAND DX CLUB	7	318,943
7A DX-CONTEST CLUB	9	310,018
ORARI LOKAL KEDIRI	5	91,904
RADIOFAROL DX GROUP	4	33,273

Club scores with **4 or more** entries.

2023 WPX RTTY PLAQUE DONORS AND WINNERS

SINGLE-OPERATOR HIGH POWER

World: Jeff Blaine, ACØC. Won by: **P49X (op. Ed Muns, W0YK)**
North America: Marty Sullaway, NN1C. Won by: **Kristoffer Kerce, AL2F**
USA: Abroham Neal Software by K3NC. Won by: **Bud Trench, AA3B**
USA 7th Call Area: Hank Lonberg, KR7X in memory of Bob Wruble, W7GG. Won by: **Mitch Mason, K7RL**
Europe: FlexRadio Systems. Won by: **Stanislav Kostal, OK7W**
Africa: Vlado Karamitrov, N3CZ. Won by: **Manuel Angel Martin Brito, EA8DO**
Asia: Mike Trowbridge, KA4RRU in memory of Steve Veader, N4DXS. Won by: **UP7L (op. Vladimir Dubinskiy, UN6LN)**

SINGLE-OPERATOR LOW POWER

World: Gerry Treas, K8GT. Won by: **TM3Z (op. Dimitri Cosson, F4DSK)**
North America: Wray Dudley, AB4SF. Won by: **Marc Missalla, V31MA**
USA: Gerry Treas, K8GT. Won by: **Peter Bizlewicz, KU2M**
Europe: FlexRadio Systems. Won by: **IQ6AN (op. Andrea Tonci, IK6VXO)**
Oceania: Doug Faunt, N6TQS. Won by: **Kent Carlson, KH6CJJ**

SINGLE-OPERATOR QRP

USA: Jeff Blaine, ACØC. Won by: **KZ0US (op. James Colville, W7RY)**
North America: FlexRadio Systems. Won by: **Osmany Gonzlez Escobar, CO2OQ**

SINGLE-OPERATOR SINGLE BAND

World 14 MHz: Steve "Sid" Caesar, NH7C. Won by: **IQ1RY (op. Filippo Vairo, IZ1LBG)**
World 14 MHz Low Power: Kenny Young, AB4GG. Won by: **Savas Pavlidis, SV2AEL**
North America 21 MHz High Score: Doug Faunt, N6TQS. Won By: **Alexei Joaquin Morejon Cohen, CO2XK**
World 28 MHz: Steve Booklout, NR4M, and the "Goat Farm Gang". Won by: **PV2K (op. Leonardo Zucon, PY2KNK)**

OVERLAY CATEGORY

Rookie – Europe: Sponsored by Bavarian Contest Club, Won by: **Mick Cahill, EI6IKB**

MULTI-OPERATOR, SINGLE-TRANSMITTER HIGH POWER

World: Rich Cady, N1IXF. Won by: **IQ4FC (ops. IK4DCW, IK4HVR, IK4MGP, IU4OMO, IU4BDX, IW4EGX, IZ4NIC)**
USA: John Lockhart, W0DC. Won by: **ND3D (ops. ND3D, K3AJ, N8IVN, K3WA, WT3K, W3MAM)**
Europe: Billy, GM6DX. Won by: **9A5D (ops. 9A3AW, 9A3FRD, 9A3ID, 9A3SMS, 9A3VM, 9A5DU, 9A7Z)**

MULTI-OPERATOR, SINGLE-TRANSMITTER LOW POWER

World: Ed Muns, WØYK. Won by: **IT9RBW (ops. IT9RBW, IT9RGY, IZ2WFL)**
USA: FlexRadio Systems. Won by: **WW4LL (ops. WW4LL, NN9DD, K4NV, W4BOG, K1ZZI) – New USA Record**

MULTI-OPERATOR, MULTI-TWO

World: Steve Bookout, NR4M, and the "Goat Farm Gang". Won by: **CR3DX (ops. CT3DZ, CT3EN, OM2KW, OM3RG, OM3RM)**
USA: CTRI Contest Group in memory of Chris, KA1GEU (SK). Won by: **K9CT (ops. K9WX, KM9SPL, KD9LSV, KT9L, WT2P, K9CT)**
Europe: FlexRadio Systems. Won by: **ED1R (ops. EA1V, EA1P, EA1TL, EC1KR, EA4AOC)**

MULTI-OPERATOR, MULTI-TRANSMITTER

World: Steve Bookout, NR4M, and the "Goat Farm Gang". Won by: **9A1A (ops. 9A5W, 9A9A, 9A6A, 9A7C, 9A7R, 9A8A, 9A7PP, 9A7EU, 9A7AS, 9A3BOX)**
USA: BeLoud.US. Won by: **W3GH (ops. KB3EYY, N3WMC, W3BUW, WC3O, AC3IE, NM3A, WQ3Q, K3WM, WA3GHW, KC3PXQ, WA3KFS, AC3Q, AC3GB, N2MA, K3STL, K3JAS, W3MLJ, AB3LS, AG3I, K3FAZ, AB3GY)**

MULTI-OPERATOR, MULTI-TRANSMITTER DISTRIBUTED

Canada: FlexRadio Systems. Won by: **CJ2X (ops. VE2CSM, VE2EBK, VE2FK, VE2NMB)**

CLUB COMPETITION

World: Potomac Valley Radio Club. Won by: **Bavarian Contest Club**
USA: Northern California Contest Club: Won by: **Potomac Valley Radio Club**

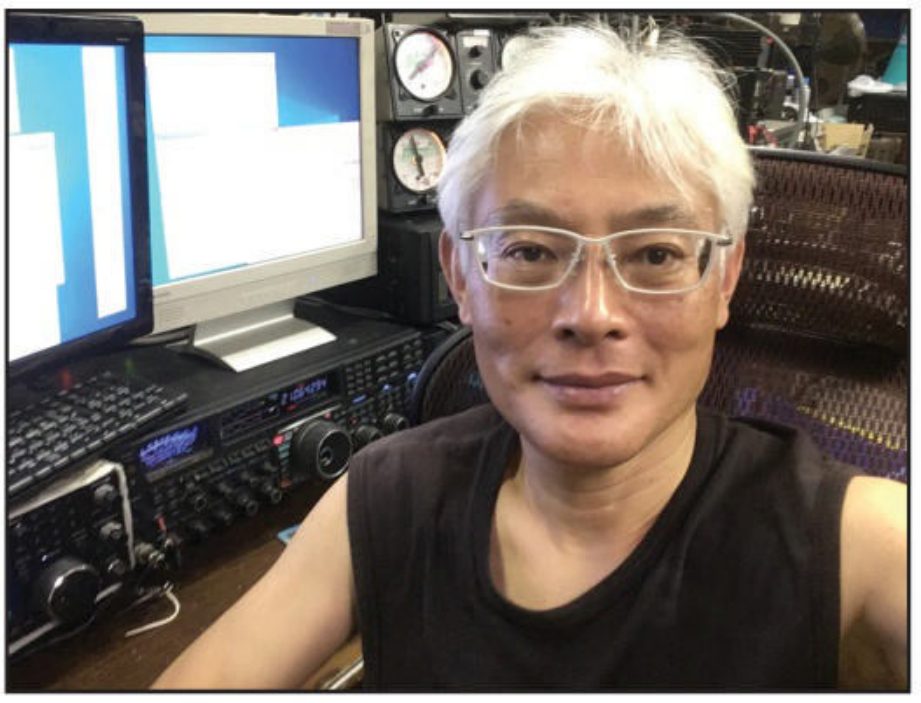


Photo E: JH4WBY enjoyed operating WPX SO2R from Japan.

Summary

Congrats to all the participants and plaque winners. And please view the complete results in the line scores. Conditions were good for this contest, with Cycle 25 starting to reach full swing. RTTY contesting can be fun, fast-paced and exciting!

Wall Hangings

Winning a plaque in a CQ WW contest is a great achievement, and often is one of the most coveted awards that one can hang on their shack wall. The opportunity to sponsor plaques is available, and can be great ways to establish regional excellence, or recognize a particular annual competition.

We would like to encourage you to review the plaques awarded in this competition and reach out to the management team if you would like to sponsor one in the future.

Thank you for all the stories and photos from around the world! Keep them coming as a picture speaks a thousand words, and really enhances our coverage of this major worldwide RTTY WPX competition.

Please keep that in mind as you participate in these contests. Pictures of operators or teams of operators are the best. Send us yours for a chance to get it published in *CQ* magazine!

That's all for this time…

On behalf of the entire CQ RTTY management team: Chris Tate, N6WM; Ed Muns, WØYK and Rich Cady, N1IXF.

(Scores on page 96)

TOP SCORES IN VERY ACTIVE ZONES

Zone 3

K7RL	3,550,008
N7GP	1,782,810
NF6A	934,570
VA7ST	896,104
W6EU	813,058

Zone 4

KI6DY	2,406,552
N7WY	1,768,200
NXØI	1,070,399
ABØRX	965,280
*N8CWU	915,875

Zone 5

N6AR	2,653,326
N1RM	2,191,196
AE1P	1,979,364
VE2GSO	1,978,470
W3LL	1,772,880

Zone 14

*CR5O (CT7AJL)	2,614,108
G1N (GØURR)	2,147,850
OZ5W (SM5SIC)	1,848,174
DLØHMK (DF2HN)	1,781,605
*DJ4MX	1,605,065

Zone 15

YT3D	2,566,256
IZ2FOS	2,347,884
I4LCK	2,234,194
*S51CK	1,694,712
HG2DX	1,016,178

Zone 16

EU8U	1,738,275
*RA3Y	1,484,964
UX5IO	1,339,737
EW4A	1,166,316
R5AN	1,023,984

Zone 20

YO3VU	1,346,080
YO3RU	1,311,987
*LZ7X (LZ1UQ)	1,077,668
*YO6HSU	736,568
*YO9BCM	667,550

Zone 25

JH7QXJ	887,692
JH7RTQ	614,384
JA2AXB	524,790
JR3NZC	410,696
JA3HBF	357,022

Announcing:

The 2023 CQ World-Wide RTTY DX Contest

September 23-24, 2023

Starts 00:00:00 UTC Saturday Ends 23:59:59 UTC Sunday

Log Submission Deadline: 2359 UTC September 29, 2023

I. OBJECTIVE

For amateurs around the world to contact as many other amateurs in as many CQ zones, countries, and W/VE QTHs as possible.

II. BANDS

Five bands only: The 3.5, 7, 14, 21 and 28MHz bands. Observance of established band plans is strongly encouraged.

III. CONTEST EXCHANGE

RST report plus CQ Zone (e.g., 599 05). Stations in the continental USA and Canada also send QTH (e.g., 599 05 MA). See IV.C.3. below.

IV. SCORING:

A. Score: The final score is the result of the total QSO points multiplied by the sum of zone, country, and QTH multipliers. Example: 1,000 QSO points * (30 Zones + 70 Countries + 35 W/VE QTHs) = 135,000 (final score).

B. QSO Points: Stations may be contacted once on each band. QSO points are based on the location of the station worked.

1. Contacts between stations on different continents count three (3) points.

2. Contacts between stations on the same continent but in different countries count two (2) points.

3. Contacts between stations in the same country count one (1) point.

C. Multiplier: There are three (3) types of multipliers.

1. **Zone:** A multiplier of one (1) for each different CQ Zone contacted on each band. The CQ Worked All Zones rules are the standard.

2. **Country:** A multiplier of one (1) for each different country contacted on each band. The DXCC entity list, Worked All Europe (WAE) multiplier list plus IG9/IH9, and continental boundaries are the standards for defining country multipliers. Maritime mobile stations count only for a zone multiplier.

3. **W/VE QTH:** A multiplier of one (1) for each continental U.S. state (48), The District of Columbia and each Canadian call area (14) contacted on each band. Please use only U.S. Postal Service abbreviations to identify U.S. states (e.g., Michigan = MI, Massachusetts = MA, Ohio = OH, The District of Columbia = DC). Note: Alaska (KL7) and Hawaii (KH6) are counted as country multipliers only and not as state multipliers. Canadian call areas (14 total) are as follows: NB (VE9), NS (VE1), QC (VE2), ON (VE3), MB (VE4), SK (VE5), AB (VE6), BC (VE7), NWT (VE8), NF (VO1), LB (VO2), NU (VYØ), YT (VY1), PEI (VY2).

V. ENTRY CATEGORIES:

A. Single Operator Categories: One person (the operator) performs all operating and logging functions. There is no limit on operating time or band changes. Only one transmitted signal is permitted at any time.

1. **Single Operator:** QSO finding assistance of any kind is prohibited (see VIII.2).

a. **High Power (All Band or Single Band):** Total output power must not exceed **1,500 watts**.

b. **Low Power (All Band or Single Band):** Total output power must not exceed **100 watts**.

c. **QRP (All Band or Single Band):** Total output power must not exceed **5 watts**.

2. **Single Operator Assisted:** Entrants in this category may use QSO finding assistance (see VIII.2).

a. **High Power Assisted (All Band or Single Band):** Total output power must not exceed **1,500 watts**.

b. **Low Power Assisted (All Band or Single Band):** Total output power must not exceed **100 watts**.

c. **QRP Assisted (All Band or Single Band):** Total output power must not exceed **5 watts**.

B. Single Operator Overlay Categories: Any Single Operator entrant who meets the requirements may ALSO enter one of the categories shown below by adding the appropriate CATEGORY-OVERLAY line in the Cabrillo log file header. Overlay category entries will be listed separately in the results; scored as All Bands; and grouped by High Power and Low Power (includes QRP).

1. **Classic Operator (CLASSIC):** The entrant will use only one radio, no QSO finding assistance, and may operate up to 24 of the 48 hours — **off times are a minimum of 60 minutes during which no QSO is logged**. If the log shows more than 24 hours of operation, only the first 24 hours will be counted for the overlay score. Receiving while transmitting is prohibited. Single Operator Assisted entries are not eligible for this category.

2. **Rookie (ROOKIE):** The operator was first licensed as a radio amateur less than three (3) years before the date of the contest. Indicate the date first licensed in the SOAPBOX field. Previous Rookie winners are ineligible for plaques in this category.

3. **Youth (YOUTH):** The operator was 25 years old or younger at the start of the contest. Indicate the birth year in the SOAPBOX field.

C. Multi-Operator Categories (all-band operation only): Any number of operators is allowed. QSO finding assistance is allowed. Only one transmitted signal per band is permitted at any time.

1. **Multi-Single:** Only one transmitted signal on one band permitted at any time (run station / signal). Exception: One — and only one — other transmitted signal (multiplier station / signal) may be used, if — and only if — it is on a different band from the run transmitted signal and the station worked is a new multiplier. The run and multiplier transmitted signals may each make a maximum of 8 band changes per clock hour (00 through 59 minutes). The log must indicate which transmitted signal (run or multiplier) made each QSO. The multiplier transmitted signal may not call CQ (solicit contacts).

a. **High Power:** Total output power must not exceed **1,500 watts** on any band at any time.

b. **Low Power:** Total output power must not exceed **100 watts** on any band at any time.

2. **Multi-Two:** A maximum of two transmitted signals may be used at any time, and they must be on two different bands. The log must indicate which station / signal made each QSO. Each station / signal may make a maximum of 8 band changes in any clock hour (00 through 59 minutes). Total output power must not exceed **1,500** watts on any band at any time.

3. **Multi-Multi:** The five contest bands may be activated simultaneously. Only one transmitted signal per band is permitted at any time. Total output power must not exceed **1,500 watts** on any band at any time.

D. Explorer: The Explorer category allows amateurs to participate in the CQWW contest while encouraging innovation in operating strategies, station design, and technology adaptation. For full Explorer rules, go to <cqww.com/explorer.htm>.

E. Checklog: Entry submitted to assist with the log checking. The entry will not have a score in the results and the log will not be made public.

VI. AWARDS:

A single-band log will be eligible for a single-band award only. A log containing more than one band will be judged as an all-band entry unless specified as a single-band entry.

A. Certificates: Electronic certificates will be made available for download for everyone that submits an entry by the log deadline.

B. Plaques: Plaques are awarded for top performance in a number of categories. View the current list of plaques and sponsors at <cqwwrtty.com/plaques.htm>. Only one plaque will be awarded per entry. A station winning a plaque will not be considered for a sub-area award; the plaque will be awarded to the runner-up in that area.

VII. CLUB COMPETITION:

The club score is the total aggregate score from logs submitted by members. There are two separate club competition categories.

A. USA Clubs: Participation is limited to club members residing within a 250-mile radius circle from the center of club area.

B. DX Clubs: Participation is limited to club members residing within EITHER the DXCC country where the club is located OR within a 400-kilometer radius circle from the center of club.

C. General club rules:

1. National organizations (e.g., JARL, REF or DARC) are not eligible for the club competition.

2. Single-operator entries may only contribute to one club. Multi-operator scores may be allocated to multiple clubs as a percentage of the number of club members participating in the operation. The log entry must spell out the full club name (and club allocations if multi-op).

3. A minimum of four logs must be received for a club to be listed in the results. Checklog entries are not counted for the club score.

4. The word “reside” shall be defined as: To dwell permanently or continuously or to occupy a place as a person’s fixed, permanent, and principal home for legal purposes.

VIII. DEFINITIONS OF TERMS:

1. Station location: The area in which all the transmitters, receivers, and antennas are located. All transmitters, receivers, and amplifiers must be within a single 500-meter diameter circle. Antennas must be physically connected by RF transmission lines to the transmitters and receivers.

2. QSO finding assistance: The use of any technology or other source that provides callsign or multiplier identification of a signal to the operator, other than a single-channel RTTY decoder. This includes, but is not limited to, use of a multi-channel RTTY decoder, DX cluster, DX spotting websites (e.g., DX Summit), local or remote callsign and frequency decoding technology (e.g., RTTY Skimmer or Reverse Beacon Network), or operating arrangements involving other individuals.

IX. GENERAL RULES FOR ALL ENTRANTS:

1. Entrants must operate within the limits of their chosen category when performing any activity that could impact their submitted score.

2. A different callsign must be used for each entry. Only the entrant’s callsign may be used to aid the entrant’s score.

3. Do not exceed the total output power limitation of the chosen entry category on any band. Total output power on any band at any time is measured at the output of the active amplifier(s).

4. Self-spotting or asking to be spotted is not permitted.

5. Remote operation is permitted if the physical location of all transmitters, receivers, and antennas are at one station location. A remotely operated station must obey all station license, operator license, and category limitations. The callsign used must be one issued or permitted by the Regulatory Authority of the station location.

6. Remote receivers outside of the station location are not permitted.

7. Only one signal on a band is allowed at any time. When two or more transmitters are present on the same band, a hardware device MUST be used to prevent more than one signal at any one time. Alternating CQs on two or more frequencies on a band is not permitted.

8. All requests for contacts, responses to calls, and copying of callsigns and contest exchanges must be accomplished during the contest period using the mode and frequencies of the contest.

9. Correction of logged callsigns and exchanges after the contest, by use of any database, recordings, email, or other methods, is not allowed.

10. Only 45.45-Baud, 170-Hz shift ITA2 mode is permitted.

X. LOG INSTRUCTIONS:

Electronic submission of logs is **required** for all entrants.

1. The log MUST show the following for each contact: Correct date and time in UTC, frequency (or band), callsign of the station worked, exchange sent, and exchange received. A log without all required information may be reclassified to Checklog. Contacts should be logged at the time they are completed. Stations competing for World and Continent awards must provide actual frequencies for all contacts in the log.

2. Single band entrants are required to include all contacts made during the contest period, even if on other bands. Only contacts made on the band specified in the Cabrillo header will be considered for scoring purposes. Logs with contacts only on one band will be classified as single-band entries.

3. The CABRILLO file format is the standard for logs. See <cqwwrtty.com/cabrillo.htm> for detailed instructions on filling out the CABRILLO file header. Failure to fill out the header correctly may result in the entry being placed in the wrong category or reclassified as a Checklog. Note: U.S. and Canada stations must indicate the station location in the CABRILLO header (e.g., LOCATION: OH); other stations indicate “DX” (e.g., LOCATION: DX).

4. Web upload is the only method of log submission. Web upload of logs is available at <cqwwrtty.com/logcheck>.

5. Instructions for NON-CABRILLO electronic logs: If you are not able to submit a CABRILLO format log, please contact the Contest Director for assistance with submitting another format.

6. Entry Confirmation: All logs received will be confirmed via email. A listing of logs received can be found at <cqwwrtty.com/logs_received.htm>.

7. Log withdrawal: An entrant may withdraw the submitted log for any reason within 30 days of the log deadline. Contact the Contest Director for instructions.

XI. LOG DEADLINE:

1. All entries must be sent **WITHIN FIVE (5) DAYS** after the end of the contest: no later than **2359 UTC September 29, 2023**. Resubmitting an entry after the deadline will result in it being considered as a late log.

2. An extension may be requested at <cqwwrtty.com/contact>. The request must state a legitimate reason and must be received before the log deadline. Extensions are granted only upon confirmation by the Contest Director.

3. Logs submitted after the deadline may be listed in the results, but are not eligible for awards.

XII. JUDGING:

The CQWW RTTY DX Contest Committee is responsible for checking and adjudicating the contest entries. Entrants are expected to follow the rules and best amateur radio practices. Violation of the rules of the contest or unsportsmanlike conduct may lead to disciplinary action by the Committee.

A. Unsportsmanlike Conduct: Examples of unsportsmanlike conduct include, but are not limited to:

1. Arranging or confirming any contacts during or after the contest by use of ANY non-amateur radio means such as telephones, internet, instant messaging, chat rooms, VoIP, email, social media, or websites.
2. Transmissions by the entrant on frequencies outside of license limitations.
3. Changing times in the log to meet band change or off time rules.
4. Taking credit for excessive unverifiable QSOs or unverifiable multipliers.
5. Signals with excessive bandwidth (e.g., splatter, clicks) or harmonics on other bands.
6. Running stations making more than three consecutive contacts without sending their callsign.

B. Audio Recordings: Any single operator entrant (see V.A.1) competing for a top five finish at the (a) World, (b) Continent, or (c) USA levels, including Classic Overlay, must record the transmitted and received audio as heard by the operator for the duration of the contest operation. The recording must be in a common format (e.g., mp3) and should include the audio to each ear as a separate channel. The recording must be a continuous recording (not a recording of individual QSOs). Time "off the air" (when not transmitting or receiving) does not have to recorded. The recording may be requested by the Committee within 90 days after the log deadline to help adjudicate the log. The recording files must be provided by the entrant within 5 days of the request. **Failure to submit a requested audio recording may result in the reclassification of a log entry or disqualification**.

C. Disciplinary Actions: In the event of a violation, the entrant is subject to disqualification at the discretion of the Committee.

1. Disqualified entries will be listed at the end of the published results and are not eligible for an award.
2. Notification of Committee actions will be sent by email to the address provided with the log submission. The entrant has five days to appeal the decision to the Contest Director. After that time, the decision is final.
3. The Committee reserves the right to change the category of any entry based on its examination of the log or other information.

D. Log Checking: All logs are checked using custom software and human-judgment.

1. Duplicate contacts are removed with no additional penalty.
2. Contacts with an incorrectly received exchange are removed with no additional penalty.
3. Callsign errors (bust) or callsigns not in the other log (NIL) are removed and receive a penalty of two times the QSO point value for that contact.

XIII. DECLARATION:

By submitting a CQWW RTTY DX Contest log, and in consideration of the efforts of the CQWW RTTY DX Contest Committee to review and evaluate that log, an entrant unconditionally and irrevocably agrees that he/she has: 1) read and understood the rules of the contest and agrees to be bound by them, 2) operated according to all rules and regulations that pertain to amateur radio for the station location, 3) agreed the log entry may be made open to the public, and 4) accepted that the issuing of disqualifications and other decisions of the Committee are official and final. If an entrant is unwilling or unable to agree to all of the foregoing, the entrant should not submit the entry or submit the entry as a Checklog only.

Questions pertaining to the CQWW RTTY DX Contest rules may be submitted through at <cqwwrtty.com/contact.htm>. Answers for many frequently asked questions can be found at <cqwwrtty.com/faq.htm>.

Announcing:

2023 Inductees to the CQ Amateur Radio, Contest, and DX Halls of Fame

CQ Magazine is pleased to announce the induction of two new members to the CQ DX Hall of Fame, three inductees to the CQ Contest Hall of Fame (one of whom tragically became a Silent Key just days before the induction ceremony), and four new members of the CQ Amateur Radio Hall of Fame.

The CQ DX Hall of Fame (started in 1967) and the CQ Contest Hall of Fame (started in 1986) were established to recognize those amateurs who have made major contributions to DXing and contesting, respectively. The CQ Amateur Radio Hall of Fame, started in 2001, recognizes those who have made major contributions to amateur radio as a whole, as well as radio amateurs who have made major contributions to society at large.

DX and Contest Hall of Fame inductees were announced at the respective Dayton DX and Contest dinners during Hamvention ® in May. Here are this year's inductees:

CQ Amateur Radio Hall of Fame

We have four new members of the Amateur Radio Hall of Fame this year, bringing the total number of honorees to 349. The 2023 inductees are:

Andrew "Andy" Andros, WØLTE (SK), and brother **Theodore "Ted" Andros, WØURN (SK)**, founders of Hy-Gain Corp. Their first antenna, the TH-3 triband trap beam, got the company off to a solid start. Hy-Gain went on to become a major antenna manufacturer for the amateur, CB, military, and diplomatic markets; later sold to Telex and then to MFJ Enterprises, which continues to produce Hy-Gain antennas, rotors, and accessories.

John G. "Jack" Curtis, K6KU (SK) – Revolutionized CW keying by developing circuitry for an iambic memory keyer and putting it on a chip. The chips were later integrated into many commercial transceivers featuring built-in electronic keyers.

Gerald "Jerry" Lawson, WA6LVN (SK) – Pioneer of home video games, leading the team that developed the first cartridge-based video game controller at Fairchild Semiconductor. This allowed users for the first time to switch between multiple games while using a single controller. He was also one of the few African-American engineers working in the computer industry as the first video games were developed.

CQ Contest Hall of Fame

The 2023 inductees to the CQ Contest Hall of Fame are:

Kirk Pickering, K4RO – A founding member, past president, and past vice president of the Tennessee Contest Group and webmaster of the TCG website, Kirk (Photo A) has hosted many new contesters at multi-ops from his home station. He is a three-time US winner in the ARRL Sweepstakes CW/QRP category and has been a regular top-ten finisher in multiple contests. He is also a past editor and columnist ("Contesting 101") for the *National Contest Journal*.

Ken Claerbout, K4ZW – An accomplished contester both domestically and as DX, Ken (Photo B) has operated from over a dozen countries around the world. He is also a driving force in the ongoing training and mentoring of students at ET3AA, the radio club at the Addis Ababa University School of Electrical and Computer Engineering in Ethiopia. On a recent visit, he helped students install one of the few HF skimmers in Africa to feed the Reverse Beacon Network. He has served in multiple positions for the YASME Foundation and is past president of the Potomac Valley Radio Club. In that role, he began a series of contesting-related webinars that has morphed into today's Contest University.

Photo A. CQ World Wide DX Contest Director John Dorr, K1AR, presents 2023 CQ Contest Hall of Fame plaque to Kirk Pickering, K4RO, at the Contest Dinner in Dayton, Ohio. (Photo by Bob Wilson, N6TV)

Photo B. K1AR presents CQ Contest Hall of Fame plaque to Ken Claerbout, K4ZW, May 20th, 2023, at the Dayton Contest Dinner. (N6TV photo)

Photo C. Philipp Springer, DK6SP, accepts CQ Contest Hall of Fame plaque from K1AR for Ben Buettner, DL6RAI, who tragically became a Silent Key just two days earlier in a tower accident in Aruba. (N6TV photo)

Bernhard "Ben" Buettner, DL6RAI (SK) – An avid contester and contest administrator who operated from 49 different DX entities over his long career in ham radio, Ben was a co-founder and past president of the Bavarian Contest Club (BCC) and helped develop and maintain the club's DX cluster, the first in Germany. He was also a past director of the Worked All Europe DX Contest (WAEDC). In that role, he spearheaded the conversion from paper to electronic logging and the introduction of electronic log checking. Ben was also a former member of the CQWW Contest Committee, served as IT manager for WRTC-2018 in Germany, and was a beta tester for Win-Test contest logging software. Ben tragically became a Silent Key just days before the Dayton Hamvention as a result of a tower accident at his P49V contest station in Aruba. His plaque was accepted at the contest dinner by Philipp Springer, DK6SP to take back to Ben's family (Photo C).

CQ DX Hall of Fame

The 2023 inductees to the CQ DX Hall of Fame are:

Arecio "Al" Hernandez, K3VN – Al (Photo D) has been deeply involved in DX expeditions to many rare and difficult to reach destinations. He has traveled to more than 100 countries, operated from at least 20 of them and has participated in close to a dozen award-winning expeditions. Al is a prolific public speaker and author. His first DX expedition article

Photo D. Arecio "Al" Hernandez, K3VN (right), accepts his CQ DX Hall of Fame plaque from CQ Awards Editor Steve Molo, KI4KWR, at the Southwest Ohio DX Association DX Dinner on May 19, 2023 (Photo by Hal Turley, W8HC)

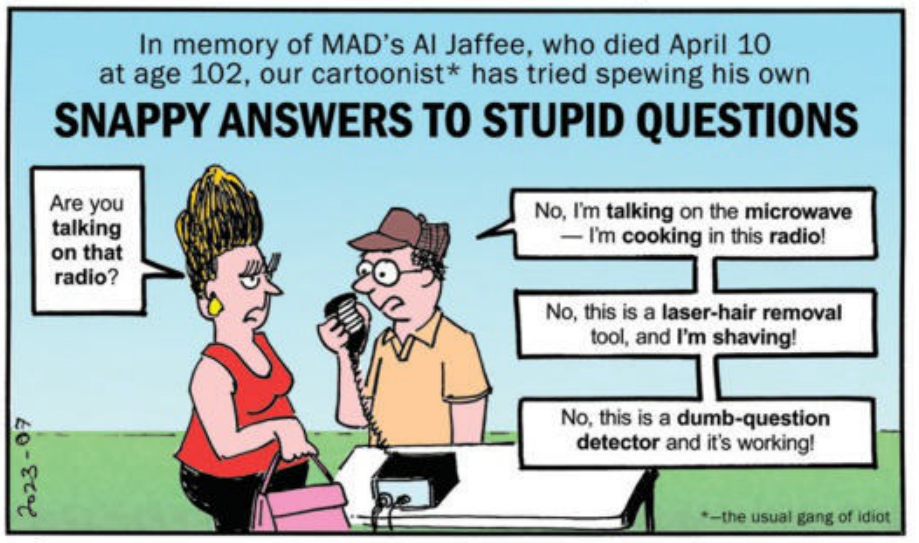
Phoro E. KI4KWR presents a 2023 CQ DX Hall of Fame plaque at the Dayton DX Dinner to Adrian Ciuperca, KO8SCA. (W8HC photo)

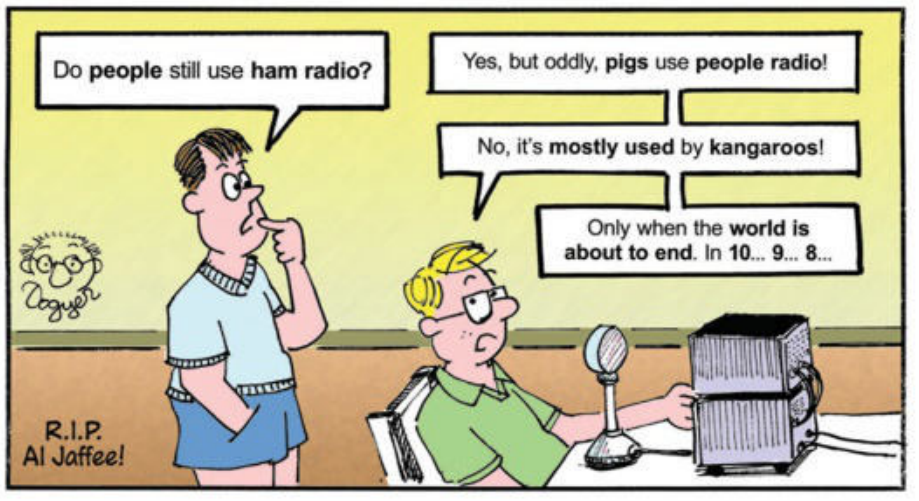
was published in *CQ* in 1976. He is an expert in electromagnetic interference and compatibility and holds seven patents in the field.

Adrian Ciuperca, KO8SCA – Adrian (Photo E) has been on 30 DXpeditions in just over seven years, including the recent 3YØJ expedition to Bouvet Island. He actively promotes amateur radio to young people in places that he visits (assuming it's a location with people!) and is frequently the voice or face of various trips to the amateur community, appearing on interview shows and writing about the adventures for *CQ* and other publications. Adrian is also the tech support person for 4U1UN, the amateur station at United Nations headquarters in New York City and can frequently be found operating there when he isn't traveling to some remote part of the world.

spurious signals By Jason Togyer W3MCK
www.jaythurbershow.com

RIP-OFFS ARE THE SINCEREST FORM OF FLATTERY DEP'T.:





A conference on the ionosphere and plans to learn more about it during two upcoming solar eclipses brought together ham radio citizen scientists and professional space scientists for a workshop in Pennsylvania. Even if you weren't there, you can take part in the research by getting on the radio.

"Forging Amateur-Professional Bonds"

An Overview of the HamSCI 2023 Workshop and the Upcoming Solar Eclipses

BY RON WILCOX,* KF7ZN

Photo A: The 2023 HamSCI workshop at The University of Scranton was well-attended by space scientists, college students and radio amateurs. (Photos by Nathaniel Frissell, W2NAF, except as noted)

HamSCI – the Ham Radio Science Citizen Investigation, a collaboration between the amateur radio and professional space science communities (see sidebar for basic information) – held its sixth annual workshop this spring at The University of Scranton in Pennsylvania.

This year was an outstanding success. It was hosted by The University of Scranton with major funding and support from the NSF (National Science Foundation), and ARDC (Amateur Radio Digital Communications). In addition, DX Engineering donated ten $100 gift certificates, an ICOM transceiver for door prizes and an ACOM 1010 HF amplifier to the W3USR campus radio club. ARRL also donated books for the door prizes and to W3USR. These grants, financial aid, and support were a major factor in the success of the workshop. This year's theme was "Forging Amateur-Professional Bonds." Organizations represented at the workshop included the ARRL, Youth on the Air Region 2 (YOTA), ARDC, NSF and NASA.

On Friday morning, the workshop received a warm welcome and introduction by Dr. Michelle Maldonado, Provost of The University of Scranton. One personal story she shared was how her grandparents and father would listen to the radio as it became a lifeline to their homeland, Cuba, and the importance of radio communication in their lives.

Presentations

There were different components to the two-day workshop. On Friday and on Saturday morning we were treated to a series of outstanding presentations (Photo A). In person presenters came from different countries including Canada,

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E-mail: <Rglogan73@gmail.com>

Poland, and England, as well as the United States, with multiple universities and science organizations represented. There were virtual presenters from Canada, England, and Egypt. These presenters came from diverse backgrounds, giving us a rich and rewarding experience. This included highly technical backgrounds, college students (both undergraduate and postgraduate), and citizen science ham radio operators. All the presentations are available at <hamsci.org/hamsci2023>. The breadth and range of topics, all related to space weather and ham radio, were amazing. For those attending, there was the option of in person or virtual for the presentations.

There were presentation updates on the HamSCI Personal Space Weather Station Project (PSWS), including the TangerineSDR, Grape Version 2, and ground magnetometers. While it is beyond the scope of this article to provide in-depth detail, here is a brief overview.

The Grape is a specialized HF radio receiver that measures Doppler shifts observed on the carriers of time standard stations such as WWV. The Grape is the low-cost version of the Personal Space Weather Station and is designed by John Gibbons, N8OBJ, an engineer at Case Western Reserve University. At the HamSCI workshop, John unveiled Grape version 1.12 and talked about progress with Grape Version 2, which will be able to monitor three simultaneous channels. While providing daily data for space weather research, they will be an important part of the research on eclipses. An excellent source with a more in-depth overview and explanation is Dr. Kristina Collins, KD8OXT's, paper at <https://tinyurl.com/389kcwka>, and the HamSCI Grape Website <https://hamsci.org/grape>.

The ground magnetometer module of the PSWS is used to monitor changes in Earth's magnetic field due to variations in currents in the ionosphere and space. Ground magnetometer measurements are an important part of HF radio propagation prediction, as it is this type of data that is used to generate the Kp index that is well known to the amateur radio community.

PSWS ground magnetometer kits were available for sale to the general public for the first time at this year's HamSCI workshop. The kits were on display at the TAPR booth, with magnetometer engineers and scientists on hand to demonstrate. People interested in fielding a ground magnetometer should have a relatively rural site away from power lines, metal, and other things that might disturb magnetic field measurements. For more information see <https://tinyurl.com/2ydj2z6u> and <https://hamsci.org/magnetometer>.

TangerineSDR is a modular software defined radio project from TAPR and HamSCI. It will incorporate a highly stable oscillator and accurate timestamping. The current status of the TangerineSDR project was presented by TAPR member/engineer Tom McDermott, N5EG.

Looking Toward (But Not AT) Future Eclipses

With upcoming solar eclipses a significant focus of HamSCI, there were multiple presentations on this topic. In "A Few Science Questions that HamSCI Can Help Address During the 2023 and 2024 Eclipses," Dr. Gareth Perry, KD2SAK, of the New Jersey Institute of Technology, outlined some of the significant science questions that these eclipses may answer. For example: will the different geometries of the 2023 and 2024 eclipses as well as the fact that they are annular and total eclipses, respectively, have a significant effect on the asymmetry of the bottomside evolution of the ionosphere during the eclipse?

In "Engaging the Amateur Radio Community with the Festivals of Eclipse Ionospheric Science," Gary Mikitin, AF8A, HamSCI Amateur Radio Community Coordinator, gave an overview of the components of the Solar Eclipse QSO Party and HamSCI's progress to date. Finally, in "Two Solar Eclipses and A Solar Max: The Heliophysics Big Year," Dr. Esayas Shume from NASA gave an invitation from NASA to the public and academic community to participate in sun science activities during NASA's Heliophysics Big Year, which runs from October 2023 to December 2024.

There were multiple presentations on TIDs (traveling ionospheric disturbances), which are wave-like variations in ionospheric electron densities. Amateur radio operators are likely

Photo B: Gamal Zayed from Egypt (virtual), Matthew Downs from England, and Marcin Lesniowski from Poland, were among the international presenters at the workshop.

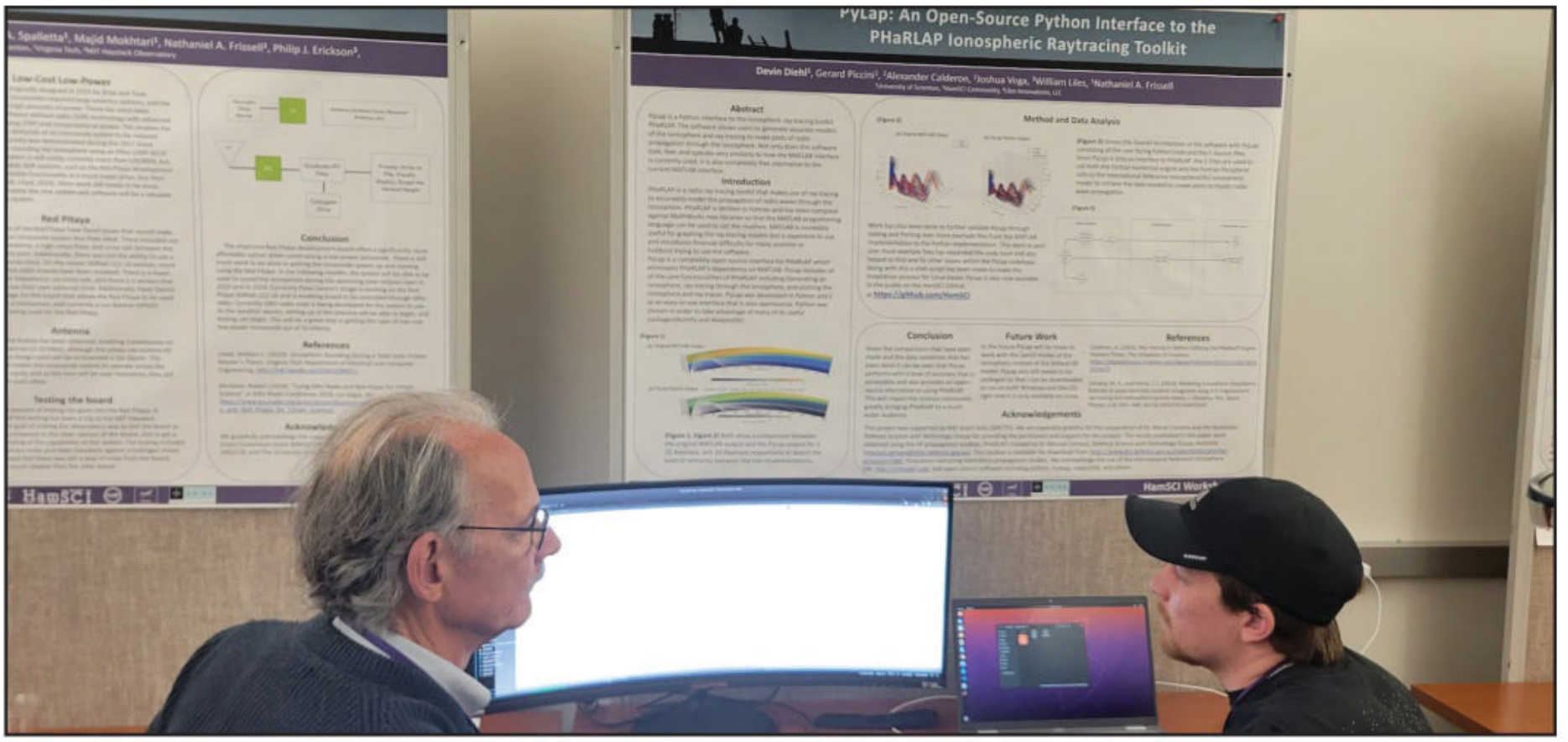


Photo C: Two of the posters from the workshop's poster session

most familiar with TIDs in that they are a typical cause of periodic HF fading (QSB). Visualizations and analysis of TID observations collected by WSPRNet, the RBN (Reverse Beacon Network), and PSKReporter amateur radio systems, as well as the professional SuperDARN ionospheric radar network, were a part of the presentations. Results suggested that sources of the TIDs include both energy from space (i.e., the aurora) and from the neutral atmosphere (e.g., the polar vortex). Presenters also showed effects of the Tonga volcano on the ionosphere, which was quite impressive.

Another presentation of interest was by Gamal Zayed from Egypt (virtual), Matthew Downs from England, and Marcin Lesniowski. from Poland (Photo B). Their project, "Evaluation of Global Ionospheric TEC Using Simultaneous Obser vations from Amateur Radio Networks, International Space Station, and NeQuickG Model for Space Weather Prediction" (*TEC stands for total electron content – ed.*) was recognized as a global finalist in the 2022 NASA International Space Apps Challenge. This is a very significant achievement, as it is awarded to only the top 35 teams out of over 3000 submissions.

Posters and Demonstrations

After lunch on Saturday we were able to view the posters, operate radio station W3USR, visit the display tables, and view the exhibits. The posters were not posters in the traditional sense that many might think of (put away the crayons and chalk), but meeting scientific inquiry with an abstract, introduction, method, data, analysis, and conclusion as appropriate. They were three by four feet, and their topics were fascinating. Like the presentations, they explored experiments and topics related to ionospheric research and citizen scientists. A few of them can be seen in Photo C, with the rest to be found on <hamsci.org/hamsci2023e>.

A poster by Elaine Kollar, K3VQR (Murgas Amateur Radio Club), entitled "The Radio Priest, Scientist, Inventor, Artist and Naturalist," was about Father Joseph Murgas. Father Murgas emigrated from Slovakia to the United States in 1896 and became the pastor of Sacred Heart church in Wilkes-Barre, Pennsylvania (~20 miles south of Scranton). In 1905,

What is HamSCI?

HamSCI is the Ham Radio Science Citizen Investigation, a group that aims to bring together the amateur radio and professional space science communities for mutual benefit. HamSCI has the distinction of being one of 34 official NASA Citizen Science Projects (see <science.nasa.gov/citizenscience>). These are projects teaming up scientists and members of the public, who are called citizen scientists. The NASA website defines a citizen scientist as a volunteer who collaborates with scientists. According to NASA, this has led to thousands of scientific discoveries covering a wide range of scientific topics which you can view on their website.

HamSCI brings together scientists, ham radio operators, and those with an interest in space weather and space science. Our lead is Dr. Nathaniel Frissell, W2NAF, an assistant professor in physics and electrical engineering at The University of Scranton.

There are many intriguing questions and phenomena associated with the ionosphere and radio propagation. The HamSCI website lists some of those questions and the goals we are pursuing:

- How does the ionosphere respond to inputs from space and from the neutral atmosphere?
- How does the ionosphere couple with the neutral atmosphere and with space?
- What are the sources of medium and large scale traveling ionospheric disturbances?
- What are the causes of Sporadic E?
- How do disturbances such as solar flares, geomagnetic storms, and traveling ionospheric disturbances affect radio wave propagation?
- How does ionospheric science help amateur radio operators improve communications?
- How can I use my existing radio equipment to help with science initiatives?

The sixth annual HamSCI Workshop examined these and other questions.

he successfully demonstrated the first multi-tone radiotelegraph system in front of the U.S. Navy, investors, scientists, and the public, over the twenty miles from Wilkes-Barre to Scranton.

A sampling of other topics included:

- "Low-Cost Low-Power Ionosonde," by Gerard Piccini, KD2ZHK (The University of Scranton).
- "Personal Space Weather Station Central Control and Database System," Anderson B. Liddle and Nicholas Muscolino (The University of Alabama)
- "SDRs in Time and Frequency Metrology," by Aidan Montare, KB3UMD (National Institute of Standards and Technology / NIST)
- "FDTD for Geophysical Applications," by Apoorva Pedgaonkar (University of Utah)

We were able to walk through "Amateur Radio Through the Ages," an exhibit of ham radio history with early to recent radios, testing equipment, QSL cards, and related gear from the early days of the hobby. Truly a fun stroll down memory lane. This was set up by Bill Gallagher WA3RA, and the Murgas Amateur Radio Club, K3YTL. Bill gave informative tours of these exhibits on Saturday afternoon (Photo D).

Banquet Keynote Address

Our keynote speaker at the Friday night banquet was Dr Patricia Reiff, W5TAR, from Rice University, speaking on "Forging Amateur-Professional Bonds" (Photo E). Dr. Reiff has a long and extensive history of involving students, lay people, and scientists in collaboration. Her background with NASA and the educational field was evident as she shared discoveries by ham radio operators in the fields of science and how to involve everyone interested.

W3USR Special Event Station, VE Session, and Concluding Events

W3USR was set up as a special event station and those licensed were able to get on the air and make contacts for the station. We were given a tour of the future location of where their radio station will be permanently based. The college has allowed them to use a nice room with a great view from the fourth floor looking out over the campus and downtown Scranton. A nearly $200,000 ARDC grant is providing for the construction of a high-end amateur radio station with HF, VHF, UHF, microwave, and satellite capabilities. Additional support for the station is provided by Dr. Mary Lou West, KC2NMC; Edward Hays, N6XEM, and DX Engineering.

For those wanting to get their ham radio license, there was a testing session put on by VEs from Scranton-Pocono Amateur Radio Club (SPARK) and the Murgas Amateur Radio Club.

Saturday night was our final dinner and goodbyes for many of us as we prepared to return home, looking forward to next year's workshop.

Getting Involved: 2023/2024 Solar Eclipses

In 2017, we had a total solar eclipse here in North America. I remember being in Oregon with no vacancies in local motels, lines at the gas station and heavy traffic on the mountain roads. Later, as we were driving home across the flat desert of Nevada we could see this shadow, behind us, covering

Photo D: Ham radio history display (Photo by Ann Marie Rogalcheck-Frissell, KC2KRQ)

Photo E: Friday night banquet keynote speaker Dr. Patricia Reiff, W5TAR.

everything in sight and rapidly overtaking us, hovering over us, and then moving past. What an experience. Where were you? What were you doing?

I did not know it at the time, but ham radio operators and scientists were teaming up during the 2017 Solar Eclipse QSO Party event <hamsci.org/seqp2017>. Why were they involved? An eclipse is not just an exciting and fascinating event, it is an important opportunity to study the ionosphere under rapidly changing conditions (daytime to nighttime and back to daytime). This has led to important discoveries in the past about the sun, with a promise of more to come. These changes and discoveries can lead to an increased understanding of the ionosphere and its impact on satellites, radio communications, and GPS signals. Data from ham radio operators on the air during eclipses is a valuable contribution to this knowledge and research. Many operators were on the air then, and now that same opportunity is coming twofold.

There are two eclipses coming up. There will be an annular solar eclipse on October 14th of this year, and a total solar eclipse next April 8th. They are going to cut a swath across the continental United States, and ham radio operators will be able to contribute. To celebrate this and add to our knowledge of the ionosphere, we are having another Solar Eclipse QSO Party. We are asking as many operators as possible to be on the air and active during the eclipses. As in 2017, this will create important data which will then be analyzed, with results made available for everyone to see and will aid in the knowledge of space weather. There will be something for everyone, including: 160-6 meters, all modes, WSPR, FST4W, and CW/digital beacons. Please see the HamSCI website, <hamsci.org>, for more information and details about the Solar Eclipse QSO Party. By going to the HamSCI website you will also find information about eclipses, space weather, HamSCI itself, past presentations, published papers, further sources and websites, and a speaker's bureau with topics that might be of interest or help. What we need and are asking for is operators on the air. Whether you are an avid contester or a newly licensed ham radio operator with little experience, this is the place for you.

Final Thoughts

My personal experience with this years' workshop/convention was extremely positive. There were topics, events, demonstrations, posters, presentations, and tours that covered so many facets of the ionosphere and space weather. This event was inclusive. Anyone with an interest in the science of space weather, wanting to be a citizen scientist or just contribute as a ham radio operator, was made to feel very welcome. There were many scientists involved as well. The theme of forging amateur-professional bonds was a total success. Thanks to everyone who aided in this accomplishment.

Acknowledgements

I would like to express my sincere appreciation to Dr. Nathaniel Frissell, W2NAF, for his help and guidance.

Sources

NASA Heliophysics <https://science.nasa.gov/heliophysics>

NASA Citizen Science <https://science.nasa.gov/citizenscience>

NSF Aeronomy Website (Provided ~$50k of funding for the workshop, plus is the major funder for the PSWS project, the Grape Eclipse Project, and the MSTID studies): <https://beta.nsf.gov/funding/opportunities/aeronomy>

ARDC Website <https://www.ardc.net/>

HamSCI website <https://hamsci.org/>

Roll your eyes skyward, mumble a bit, estimate the free space path loss between two antennas in half a minute while friends reach for their cell phones or calculators.

Free Space Path Loss Estimator

BY MICHAEL TOIA,* K3MT

Determining the signal loss in free space between two antennas involves just a bit of calculation, and estimating that loss (which is good enough for most ham radio purposes) can often be done in your head. Here's how to do it:

Loss, for isotropic antennas separated by

One wavelength:		22 dB
Distance doubles	add	6 dB
Ten times distance	add	20 dB

Next, subtract the gain of both antennas. Here's how:
We'll start with two 2-meter beams, 8 kilometers apart:

Separation Distance	Change	Loss
2 meters	Base	22 dB
20 meters	+20 dB	42 dB
200 meters	+20 dB	62 dB
2 kilometers	+20 dB	82 dB
4 kilometers	+6 dB	88 dB
8 kilometers	+6 dB	**94 dB**

Suppose antenna gains are: 5 dBi and 6 dBi, respectively.
Subtract 5 + 6 = -11 dB
Estimated Path Loss: 83 dB

Corrections

In real life, of course, antennas are not always a convenient distance apart. So a correction factor needs to be applied to compensate for variations from either double or ten times the distance. Here are a few to get you into the ballpark (remember, all of these are estimates):
± 12% ±1 dB ± 25% ± 2 dB ± 32% ±3 dB

Here are a couple of examples of applying the correction factors:

Path length is 12% **less** than 8 kilometers:
Path length = 8000 – 960 meters ~ 7000 meters
Estimated Path Loss: 82 dB

Path length is 25% **more** than 8 kilometers:
Path length = 8000 + 2000 meters = 10000 meters
Estimated Path Loss: 85 dB

Path length is 32% **less** than 8 kilometers:
Path length = 8000 – 2560 meters ~ 5500 meters
Estimated Path Loss: 80 dB

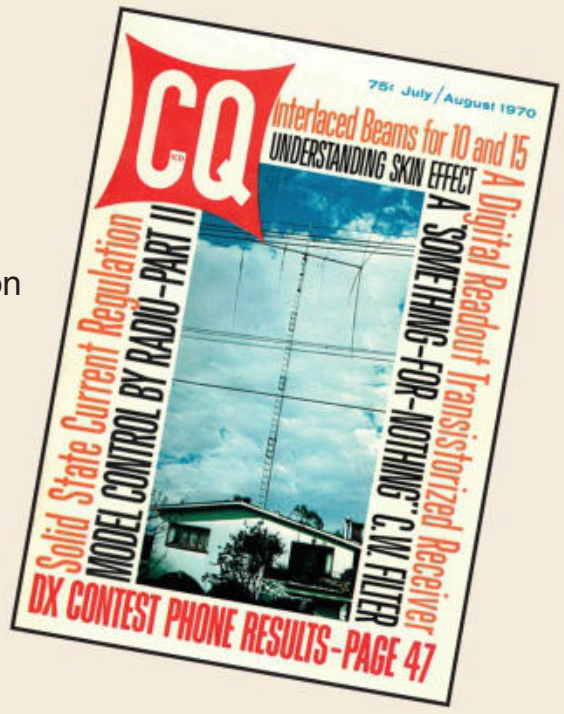
These calculations are scalable for various wavelengths and distances. Try plugging in some HF wavelengths (e.g., 20 meters) and international distances and see what you get. The results will be eye-openers!

* *E-mail: <k3mt@jokalympress.com>*

CQ CLASSIC:

Touching Lots of Bases…

This month's *CQ* Classic is a reprint of our July/August 1970 DX column, which touches on several bases covered in this month's issue. First, it introduces only the fifth member of *CQ*'s DX Hall of Fame, H. Dale Strieter, W4DQS (the DX Hall of Fame was started in 1967 and the first four members were Gus Browning, W4BPD; John Cummings, W2CTN; Dick Spenceley, KV4AA, and Danny Weil, VP2VB) – this year's inductees are introduced elsewhere in this issue. Among Dale's accomplishments were participation in the first two DXpeditions to Malpelo Island, which happens to be the geographic topic of this month's DX column! Plus, some timeless tips on keeping ham radio in the public eye! Enjoy!



DX

BY JOHN A. ATTAWAY, * K4IIF

"Unblemish'd let me live or die unknown;
Oh, grant an honest fame, or grant me none!"
—ALEXANDER POPE

This month we honor a new member to DX-dom's most prestigious group, the DX Hall of Fame. This man is probably the least publicized major DX figure in the United States. Although he played a prominent role in the organization and operation of seven major DXpeditions during the past 12 years, his name is relatively unknown except among the people most knowledgeable in DX affairs.

His initial effort was the first DXpedition in history to Navassa Island, the KC4AF operation, in March, 1958 when he was W8DJN. What a way to begin! Also in this group effort were Don Chesser, W4KVX, then DX Editor of *CQ*; Jake Schott, W8FGX, now police chief of Cincinnati, Ohio; and other members of the Ohio Valley Radio Association.

Navassa was pretty hard to.top, but for an encore he made an important contribution as an operator on the first DXpedition to Malpelo in March, 1961, when he, W6HAW, W9EVI, and W0NWX were guests of the Liga Columbiana Radio Aficionados. In 1962 he conceived and organized two DXpeditions by the Florida DX Club gang to Bajo Nuevo (HK0AB) and Serrana Bank (KS4BF).

For three years this man rested from firsthand participation in DXpeditions, but came out of retirement in 1965 to make a major contribution to the organization, procurement of gear, and actual operation of the first DXpedition to San Felix Island, CE0XA. In more recent time he has figured as an organizer and operator for the second HK0TU expedition to Malpelo in 1969, and the Ernie Hendry DXpedition to Navassa, also in 1969. Informed DXers know by now that this could be more than H. Dale Strieter, W4DQS, DX Hall of Fame.

In selecting Dale for this honor, your DX Committee took into consideration many contributions other than his activity in DXpeditions. Dale has always been a well-rounded DXer and overall amateur. Over the years, without publicity and fanfare, he has acquired, refurbished, and sent equipment into South America and Africa to help get new hams on the air. He served as QSL Manager for the 1961 HK0TU operation, and for ZD8J, HK1QQ, CE0XA, TJ1QQ, HK0AB, and KS4BF. He has been a section winner in many ARRL DX and Sweepstakes Contests, and finished in the top five nation-

Installation of Danny Weil, VP2VB, into the DX Hall of Fame at the West Gulf DX Club dinner on Monday, April 6, 1970. Left to right: Don Busick, K5AAD, West Gulf member of the CQ DX Committee; Danny himself; and Hal Sears, W5NC (ex-K5JLQ) a member of Yasme board during the "Danny days." (Photo by WA5LES).

Hal Whitaker, CT3AS. Photo by Edna Brannen, WA4EPM, during her recent visit to Madeira.

ally in the c.w. division on several occasions. Dale is a past president of the Florida DX Club, a member of the All Operator's Club and First Class Operator's Club, and is currently Director of the Southeastern Division of ARRL. Congratulations Dale!

De Extra

If you told some of your casual acquaintances that you were a DXer how would they react? Would they think it was your fraternity, or maybe that you were confessing to a mental illness or a social disease? Would they start avoiding you? They might know what you meant, but I bet 98% wouldn't. Two years ago a couple of senior citizens strolled by my house and silently contemplated the stacked 40 meter beam and tribander at 60 feet in the backyard. Finally breaking the silence one remarked "why does anybody in this neighborhood think they need a TV antenna that big." If you mentioned in a conversation that you had stacked beams at your house they would probably think you were bragging about your wife's figure. However, that's beside the point.

The point is that amateur radio in general and DXers in particular have fallen pretty far behind in educating the public. Every time you read of an injunction against somebody's tower or of an amateur being sued for some ridiculous sum of money because of TVI it drives that simple truth home. Unfortunately, since we DXers and Contesters usually have the tallest towers and highest power in a particular area its all too likely to be one of our soul brothers who's catching the static.

I had an eye-opener recently when taking a taxi to the airport of a large northwestern city. I asked the cabby what he thought of ham radio. His answer was that "hams were sorta radio pi'neers in the 20's and 30's that spearminted with shortwave and helped out the Red Cross during 'mergencies." He went on to say that "hams weren't around anymore. People like that repaired TV sets." Well brother it may come to that if we don't get busy.

What can you do? Plenty! First of all, never miss an opportunity to volunteer your station for public service. Mobile units can frequently be useful in crowd management and at many types of outdoor functions requiring communication between groups at separated locations. Use your imagination. On the spot talk-power is welcome in all kind of instances, some nobody has even thought of yet. Demonstration stations set up to relay messages and originate traffic at fairs, expositions, and large shopping centers get much favorable attention.

There is no finer use for your station than supplying communications for families of service men overseas, particularly those in southeast Asia. This can be done through MARS and through established nets. A note to ARRL should get you a listing of many other opportunities to help out J.Q. Public.

Service clubs are always seeking a fresh program and good presentations on amateur radio are very welcome. Over the years I've talked to Sertoma, Kiwanis, and Rotary clubs in at least 3 different cities, and have always been well received. All it takes is a dipole, a transceiver, and a little gab. A pre-arranged sked with a TG9, YV5, HK3, or KP4 is usually easy to arrange and a big hit. Encourage high school science teachers to become hams and set up stations in their schools. This is a very effective way to propagate the hobby.

No matter how you decide to proceed, don't be bashful about publicity. That's the name of the game! Write up your own press release if you have to. Type it dou-

Two top DXers pose on Tristan de Cunha. On the left is Andy, VE1 ASJ/HP9FC/H09FC/ZD9 - BP. On the right Ray, ZD9BP.

ble-spaced and your local paper will welcome it. They can't have a reporter everywhere all the time, and they need interesting items.

It's nice to sit back in the evening and admire the wall full of rare QSL cards and fancy certificates. Remember though, if we don't carry our weight, contemplating those cards and certificates may one day be the only activity still left for us.

DX Editor Away

If you mailed in your cards for WAZ during the month of June and they haven't been returned please stay cool. K4IIF was in Europe for most of the month and has a tremendous backlog of applications to process and letters to write. He hopes to have everything back to normal by mid-July.

Amateur Radio in India

Information for this article was sent to *CQ* by Mr. G. V. Sulu, VU2GV, well known Indian radio historian and chief promoter of amateur radio in India.

"Amateur Radio got it's start in India right at the very beginning of Wireless itself. The late Sir J. C. Bose, who investigated the quasioptical properties of very short electromagnetic waves during the interval 1890-1900, is considered to be the first ham of India. Bose was elected a Fellow of the Royal Society for his work on the response of plants to electric waves.

"No records of early conventional ham activities are available. However, we know that by 1923 a handful of VU hams were working DX stations in Australia and South Africa. By 1924 there were about 30 hams with a couple of small clubs, and by 1925 VU hams were communicating with all parts of the world.

"In 1924 when the Madras Presidency Radio Club transmitted programs through its station 2GR it was the beginning of broadcasting in India. In those days hams could broadcast music and other type programs as well. Club stations 2FV and 2BZ of Bombay and Calcutta followed Madras within a year. They broadcasted in the medium waves with 40-100 watts power. In 1925 the Radio Club of Bengal in Calcutta brought out the first monthly ham magazine entitled *Radio*. It was edited by G. Briggs, 2CZ, and included the Callbook.

"In 1927, the Indian Broadcasting Company was formed and took over commercial broadcasting. Consequently Indian hams were prohibited from broadcasting and the power of their transmitters was restricted to 10 watts. To protect he inerests of Indian amateurs during these difficult years the Indian Radio Society was formed in Bombay in 1929. It had about 100 members all over the country and published a monthly entitled *IRS Circular*. It also operated India's first QSL Bureau for 2 years, after which it was discontinued due to lack of interest in the part of the members. When World War II broke out in 1939 all ham activity was suspended.

"When licenses were reissued after the war, there were about 40 hams. In 1948 VU2BU collected a band of enthusiasts at the School of Signals in Mhow and formed the Amateur Radio Club of India (ARCI). ARCI was responsible for bringing in more hams, particularly from the Defense Services. It ran regular contests, issued certificates, and organized an SWL League and a QSL Bureau. However, in 1952 when VU2BU was transfered the ARCI came to a standstill. Three years later VU2-HM took over the work, shifted the club to Delhi, and registered it as a Society—the present Amateur Radio Society of India (ARSI).

"By the close of 1968 there were about 480 amateurs in India including 14 ladies— with four OM-YL teams. There are now about a dozen ham organizations big and small, but no ham organization is recognized so far by the government of India. For all official purposes, however, the ARSI, RESI (Radio & Electronics Society of India, Bombay) and BARC (Bangalore Amateur Radio Club) are regarded as the principal amateur organizations in India—a de facto recognition, though not de jure!

"The present ham activity in India is largely the result of World War II surplus equipment. The shortage of foreign exchange doesn't permit imports, and the very limited demand doesn't permit local manufacture. Receivers like the AR-88, HRO, Super-Pro, SX-28, and BC-348s are still going strong. Transmitters are assembled with surplus components, with power limited to 150 watts. We have no 160 Meter band and only 10 kc on 80 Meters. The 40 and 20 Meter bands have a lot of VU activity, but only a few get on 15 and 10 Meters. The 6 Meter band has been withdrawn and only 3 or 4 amateurs have any equipment for 2 meters. There is no VU activity above 2 Meters.

At a recent party given in honor of Susi, HB9- AOE/4, when she was in New York. Standing: George, ex-Y02BO, Seichi, JA2ENU, Tony, W2QL, Mamoru, JA1ANE, Alan, K2EEK. Sitting: Harvey, WA2GBF, Serge ex-Y03LM, Susi, HB9-AOE/W4 , Steve, WA2DHF, ex-GM5AHS.

"Out of the roughly 500 hams we have today, only about 150 are active with about 40 of them on s.s.b. using homebrew gear. Due to their simplicity, long-wire and wyndom antennas are popular though a few use dipoles fed with surplus coax. There are about 25 cubical quads. Only a handfull of hams have measuring or test equipment with the exception of multipliers. Some have the BC 221 frequency meter, but it is a luxury for most. Two enthusiasts, VU6VU and VU2BB, have amateur TV licenses but haven't taken it up seriously as of this date. VU2KV is the only RTTY operator, and so far there isn't any space communication—not even reception."

Next month—Amateur Radio in Czechoslovakia.

Preliminary Report from Aves Island

de YV5BPG/YV0BPG

The following letter was written by Pedro on May 5, 1970:

"Dear John,

"We are writing this at the San Juan airport during a stopover from Guadeloupe to Caracas.

"Our Aves Island operation started late because of many unexpected problems, like for example the seizure of the Air France plane which was supposed to carry most of the gang from Caracas to Guadeloupe. If that wasn't bad enough we ended up with a skipper who didn't know the first thing about navigation, and who lied to us about a few things like the true speed of his boat. As a consequence we had the unusual experience of guiding the ship via YV0AI/MM, with the help of a Venezuelan merchant ship skipper who gave us the necessary calculations by ham radio to enable us to find the island. Late but safe we landed at Aves and operated until Sunday noon, at which time we had to shut down in order to make it back to Guadeloupe on the slow boat.

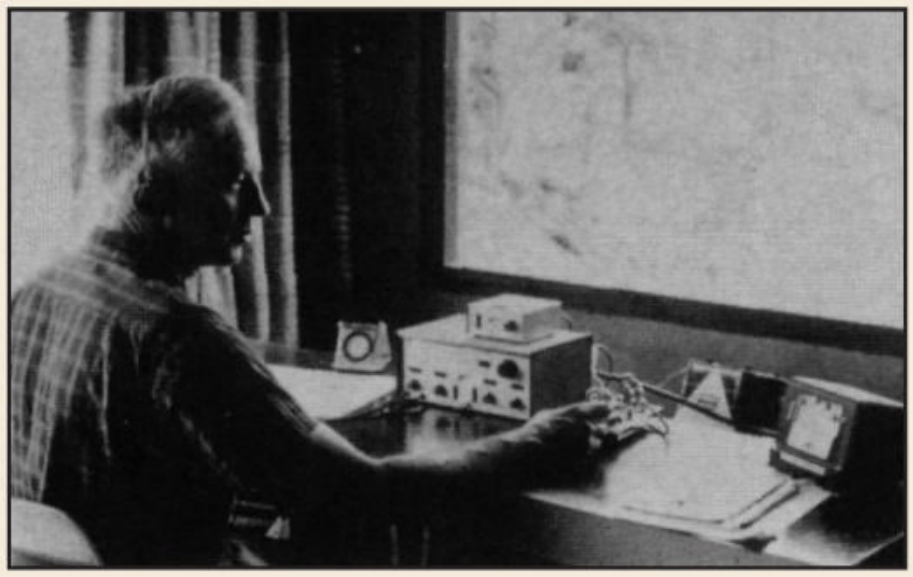
"Fortunately we had no technical trouble of major importance except some difficulty with our keyer and a certain degree of cross interference on some bands, as we were unable to separate the transmitters as much as would have been desirable.

"As of this moment it is only 12 hours after our landing on Guadeloupe after a sleepless week. Therefore we haven't yet evaluated our logs to determine the effectiveness of the expedition. We do know that several stations, including ON4UN, HK3WO, XE1KS, W2PV, W3AZD, W3SS, and others, told us that they worked us on 5 bands. Incidentally, we maintained a strict policy of no schedules, no QSO Managers, and no listening for friends.

"Please accept this as an advanced report, and we'll send a complete story with pictures, including an English transcription of the greeting to all amateurs from the President of Venezuela which was transmitted on 14195 kc.

"Unfortunately the trip was much more expensive than we had calculated. However we have covered the bills with considerable sacrifice. Because of this contributions sent with QSL cards will be gratefully accepted. YV5BPJ is clearing house for contributions. The callsigns and QSL routings are as follows:

Here is Antonio Gomez Sobrino, HI3AGS, one of our recent WPX winners. Antonio is now chasing WAZ and can be found around 14200 after 2330 GMT on weekdays. On weekends he frequents 21250 beginning at 1800 GMT. The gear includes an HT-37, 2-B and TA-33.



QRP'er John Thompson, W1BIH/PJ9JT operating from Curacao with his Ten-Tec, 5-watt transceiver. John QSO'd 300 stations in 32 countries on 20 and 40 meter c.w. These included VU via the long path, 6 VK/ZL's and 4X4. Sure the PJ9 call helped, but 5 watts!! That's A-OK.

YV0AI-Via W2GHK (operators were YV5's BPJ, BBU, BPG, & EL.)
VY0PP–To YVIPP (Leslie)
YV0LA–c/ o YV1LA (Janusz)
YV0BPG–Vi a YV5BPG (Pedro)

The other boys, that is our boss, Armando , YV5BPJ, YV5BBU, Jorge, and YV5EL, Migue, did not activate their YV0 calls.

"Never before has a DX Editor got the report before the operators had a chance to sleep in a bed.

73 es DX,
Pedro, YV5BPG;
Jorge, YV5BBU;
Armando, YV5BPJ

We all know that amateur radio is something very special. But why? And how is it different from other great hobbies? VA7GI offers some insights.

A Cosmic Dance With the Ionosphere

The Existential Joy of Amateur Radio

BY GUY IMMEGA,* VA7GI

Ham radio is the most diverse hobby in the world. No other pastime comes close. Radio amateurs erect experimental antennas, build electronic circuits, chat in Morse code, contact countries all over the globe, participate in radio contests, provide emergency communications, launch radio satellites into space, bounce signals off of the moon, and study sunspots. Hams run the gamut from geeky teenagers to Nobel laureates.

But diversity doesn't explain the unique appeal of ham radio. No creature on Earth can sense radio waves. Animals and plants respond to visible light. Sharks and platypuses detect electric fields. Some birds and foxes can detect the planet's magnetic field. But radio waves are too weak to be sensed. For millennia, humans dreamed of flying like birds, long before airplanes were invented. But nobody imagined invisible radio signals before Heinrich Hertz discovered them in 1886, when he used sparks to both generate and receive radio waves over short distances in his lab. At the time, Hertz rightly concluded that his radio had "no practical application." It was easy to make radio waves with sparks, but too difficult to detect them.

Guglielmo Marconi, among several experimenters building on Hertz's discovery, used a "coherer" (Photo A) to

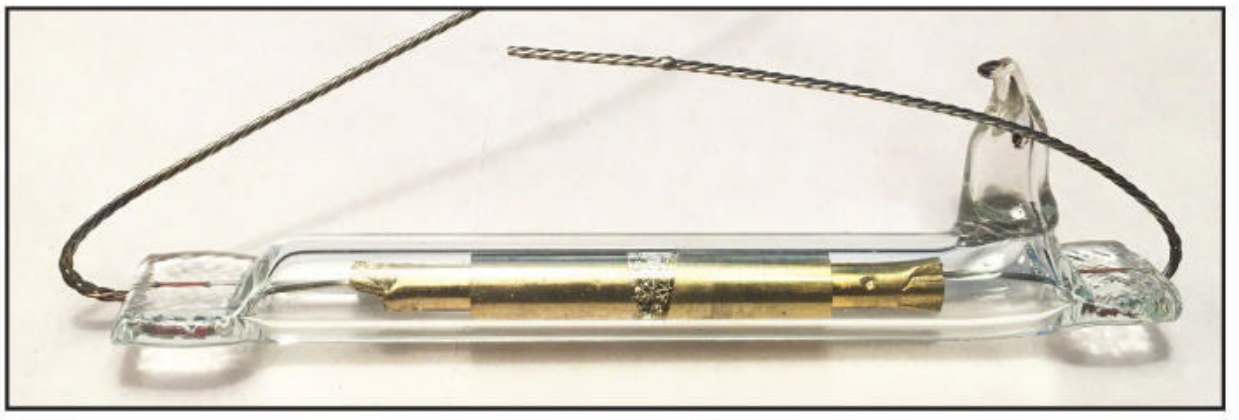


Photo A: Branly coherer with brass powder. (Photos by the author)

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Photo B: Cabot Tower on Signal Hill, St. John's, Newfoundland.

detect radio signals. Many bizarre coherers were invented. One form used a cup of mercury covered with a thin film of oil, with a small iron disk suspended above. A radio signal from an antenna broke down the insulating oil, activating a sounder. Another common coherer used metal powder that suddenly became conductive (cohering) when exposed to radio waves. Even today, nobody is sure how a coherer works. After the coherer, more-sensitive "cat whisker" crystal detectors were invented.

Imagine living in 1901, with many houses still lit by oil or gas lamps, messages sent overland by telegraph wires, and automobiles just beginning to be seen on our roads. Marconi had already shown that radio signals reached ships at sea. That year, at age 27, he climbed Cabot Tower on Signal Hill, a windswept promontory in Newfoundland (Photo B), and launched a kite tethered by a 500-foot antenna wire. Using a primitive coherer detector, he received the repeated Morse code letter S—*dit-dit-dit*—sent by a 10 kilowatt spark-gap transmitter in Cornwall, England. This was the first radio contact spanning the Atlantic Ocean. Although the demonstration was controversial, Marconi later proved the utility of radio and set up a regular transatlantic radio-telegraph service starting in 1907.

When Marconi received his Nobel Prize in 1909, he admitted that he didn't understand how radio worked. Not only did he not know how his coherer functioned, he thought that radio waves followed the curvature of the Earth. But we now know that electromagnetic radiation travels in straight lines—his radio signals should have been lost in space.

To explain transatlantic radio, Oliver Heaviside in 1902 theorized that ionized gas in space reflected radio signals. The ionosphere's existence was confirmed in 1923 and named in 1926 (it was originally referred to as the Heaviside Layer). Radio signals "skip" multiple times all around the planet, including bouncing off oceans.

Blind trial and error drove early radio progress. Inventors were motivated by a sense of wonder that invisible waves could carry messages over long distances. No imagined magic could match this power.

Today, radios use sensitive detectors and solid-state transmitters. Contacts are routine, but the skip is never certain. Signals travel at the speed of light beyond the horizon, even over the icy wastes of the North Pole, and are refracted and reflected back down to earth by a fickle ionosphere. These random connections still drive ham radio. DXing for rare countries excites many amateurs.

A Personal Dimension

Beyond the arcane wonders of radio waves, there is a deeply personal dimension to ham radio. An ordinary individual, with modest equipment and skills, can send whispered modulations skyward, which may be heard by another ham on a remote atoll halfway around the world. It doesn't matter if the exchange is just your call sign, a personal identifier shared by nobody else in the world. To receive a reply is an existential joy, a momentary confirmation that you've been recognized by another person—irrespective of gender, age, nationality, or ethnicity—and that you're both alive and aware.

The delight is addictive—an existence proof that you're not alone in the ether. The experience is enhanced because radio signals are invisible to all other forms of life. You've done a cosmic dance with the ionosphere, confirming godlike powers.

All of us should know that our cell phones, aka "mobile devices," are really two-way radios disguised as phones or computers or both. But before smart phones, or even dumb cell phones that could only be used for talking and texting, there was a generation of mobile telephones that really, really, were two-way radios with telephone handsets. WØRW takes us back in time…

My First 'Cell' Phone

BY PAUL SIGNORELLI,* WØRW

A long time ago, before today's cellular telephones, there were *mobile radio telephones* or *car phones*. In most cities, there was only one 'cell' (transmitter tower) per frequency so that frequencies (called channels) had to be shared by all users. That meant there could not be a whole lot of people on each channel. Cellular systems now reuse channels by using directional antennas and low antenna elevations so more people have access to the spectrum. Plus, digital technology makes it possible to share a channel without causing interference.

Back in the day, by which I mean the early 1960s, access to the mobile telephone system was very limited and the service was used mostly by doctors and lawyers who could afford the rental fees of $420 per month (*roughly $4200 monthly in 2023 dollars – ed.*), plus a monthly fee for service. The telephone company really liked those people who got the service and rented the radio telephone equipment. Anyone who wanted to use their own personal equipment was put on a long waiting list.

The FCC, however, made a special provision for people who wanted to use their own equipment, so the phone company had to give service to some of them. When you started this process of getting your own mobile telephone, you had to request an 'Intent to Provide Service' letter from your telephone company. That could take a year without being in a Priority Use Category, like being a doctor. A regular person got the lowest category, 7. Red Cross, doctors, etc. got Category 1. I was able to get a Red Cross authorization letter to qualify for Category 1. After I got my letter of intent from the phone company, I had to send it to the FCC to complete my application for a Domestic Public Land Mobile Radio Service license for my radio. There were also a few appli-

Photo A: Early mobile phones looked a lot more like two-way radios than their current-day descendants. (Photos by the author)

Photo B: The Motorola FHTRU was typical of the mobile phones available in the 1960s.

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Photo C: The Motorola HT-200 "brick" handheld could be tuned to operate on mobile phone frequencies. It didn't matter that you couldn't dial with it, as calls had to be placed through the mobile service operator.

cation and registration fees that went along with setting it all up. Another year could go by. My license was finally granted, KG6685, in 1963. That allowed me to operate on the telephone company frequencies of 43.38 MHz and 157.89 MHz (with two different units). The FCC called those the "ZM" and "YJ" channels (There were 10 low band channels, 11 VHF channels, and 6 UHF channels in 1964). The equipment (such as shown in Photo A) had to be "type accepted," tuned and labeled by an FCC-licensed commercial radio technician, narrow-banded and sometimes using crystal ovens. Now I could order the crystals.

Next, I had to send my FCC license back to the phone company with my final application and they then issued me my "telephone number," such as YJ 54321 or ZM 12345, You didn't use your FCC call sign.

After that, using the Mobile Telephone Service was easy. You would press the push-to-talk button and the "mobile service operator" would come on. You would give her *your* phone number. Then you would ask her to call the number of the person you wanted to speak to. She would dial, it would ring, and if answered, you would be connected. All that with 30-to-60 mile ranges for only $65 per month (in 2020 dollars, plus a little extra charge, $2.50 per minute if you exceeded the free 30 minutes of monthly air time). The elite users had the Improved Mobile Telephone Service (IMTS), with multiple channels and a 'rotary dial' control head. They could access the system and dial their own numbers without operator assistance.

I had two phones in my car (ZM & YJ), so I could say: "Hold on, my other phone is ringing.'' I was actually able to rent my 'Comm Car' out to an aerospace company for some communication links from Edwards Air Force Base. That helped pay the bills.

My First radio was a Motorola 140D for 43 MHz and a Motorola FHTRU Handi-Talkie for 157 MHz, 1/4 watt (Photo B). It was modified to make it full duplex by jumpering the receiver filaments 'on' so the receiver would be 'on' during transmit and just use one 17-inch whip antenna. When you have a full duplex radio on a repeater system like that, you can hear yourself so it becomes immediately obvious when you get into a bad location. Finding a 'hot spot" gave the system a 4X range improvement. I replaced that radio with a Motorola HT-200, 1-watt, all-transistorized Handi-Talkie (Photo C). It was called the "brick." It worked on the YJ channel in almost every city in the USA but it could not operate full duplex.

My regular vehicle radio telephone had a Western Electric 106A tone decoder. It used a delicate rotary relay to decode the ring-out tones that the telephone company used to call you. The AFSK tones were very slow and could easily be decoded by ear, which I did when using my handi-talkies. The Western Electric decoder could blow the auto horn or just display a 'call waiting' light on the control head. If you didn't answer, the mobile telephone operator would hold on to your call information when you called back.

If you wanted to call some mobile unit in a distant city, you had to call your operator and ask for the long-distance operator, then ask her to call the mobile service operator in that distant city. She would then call the mobile. It really didn't take very long. There was no nationwide calling, you had to know where your friend was to call him. There were never any robo calls.

When several of the Red Cross mobiles were active at the same time, they could all talk car-to-car, plus one connection to a landline if desired. These were mostly all amateur radio operators using the public telephone system for the Red Cross because there was only one VHF AM amateur repeater in the area at that time. For local disaster operations, we also used the Red Cross national frequency 47.42 MHz.

Generally speaking, we were assigned to make disaster assessments, see that a disaster shelter was opened and find the shelter manager, then make sure that he could communicate with headquarters. After an earthquake in 1970, 20,000 people were evacuated and about to be flooded by a dam break. The shelter I was at had 1000 people, but they had no drinking water. The National Guard brought in a "water buffalo" (water tanker). The evacuees slept in the school gymnasium but every aftershock woke them up.

The shelter had pay phones but they became inoperative because they were jammed with quarters. There were no smart phones then. We were not able to handle any welfare traffic then because we too busy. (See additional information about this story in *CQ* magazine, June 2010, p. 62-64.)

math's notes

BY IRWIN MATH,* WA2NDM

Ultrasonic Communications - Part 1

As amateur radio operators, most of us are familiar with the HF spectrum, plus VHF, UHF, and even microwaves, so what remains? As I mentioned previously, there are other areas that can be explored by our community. These can, perhaps, open areas that are not commonly used for routine communications, especially by experimenters who are not "locked down" with currently accepted limitations. One of these is communications via sound waves, and I don't mean by just talking! I mean by a method that – while similar to electromagnetic waves – is not RF and is a good method with which to experiment. I hope this two-part series will encourage those who like to look at and consider new endeavors. I am talking about ultrasonic audio signals.

The range of human hearing extends from around 10 Hz up to an approximate limit of 20 kHz. The audio spectrum does not end here, however, but continues upward. The ultrasonic region is, in fact, well above the normal range of human hearing and by using known radio techniques can be copied with such ultrahigh sound waves. The block diagram shown in Figure 1 will be familiar to "technical amateurs" but if you look closely, you will see that there is no RF circuitry at all. However, like RF, ultrasonic systems can use AM, FM, and even some digital techniques. Of course, there is a lot to learn and although there is some work in this area and even some systems and products that do actually exist, perhaps experimentation by those who think "out of the box" like us can come up with something quite novel and ultimately useful.

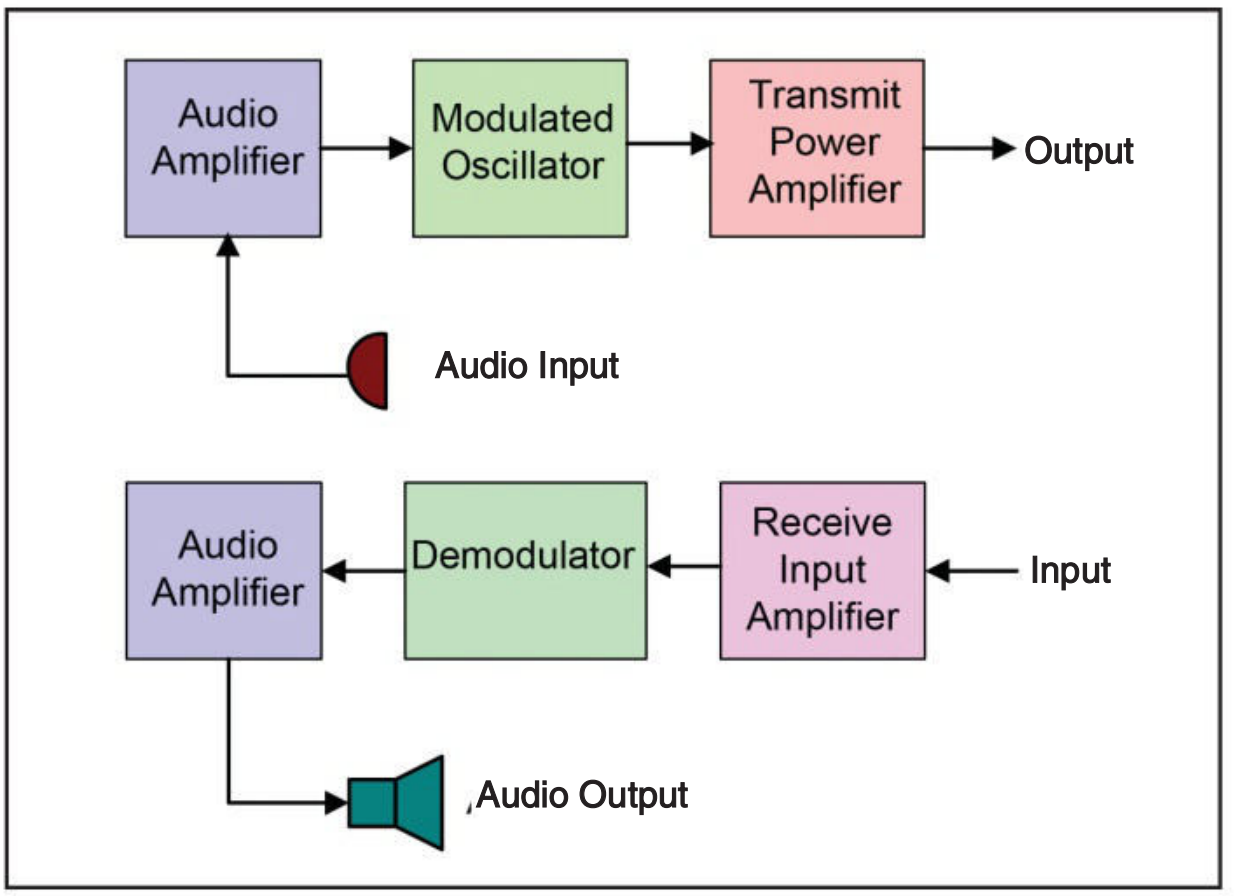

Figure 1. Basic Transmission System

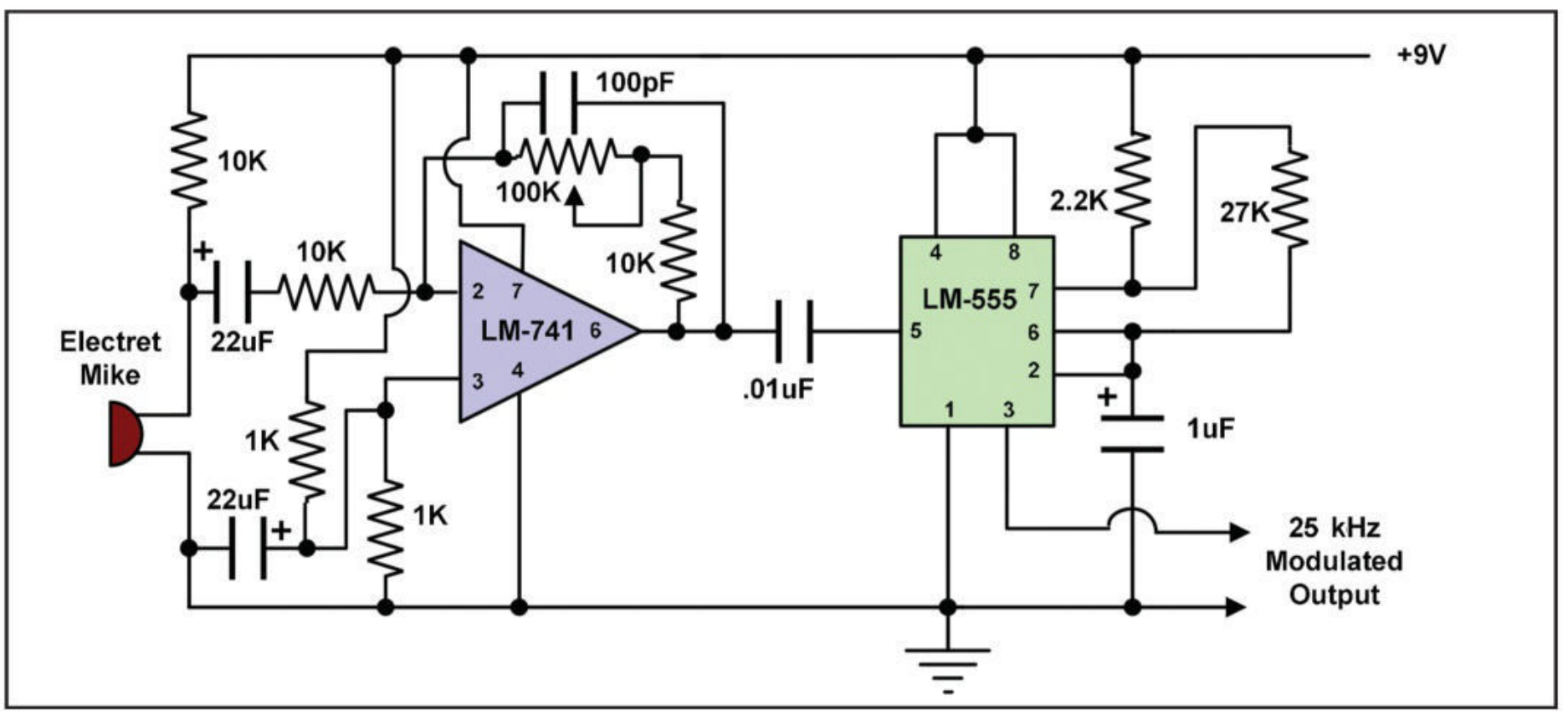

Figure 2. Audio Input Amplifier and Modulator System

*c/o CQ magazine

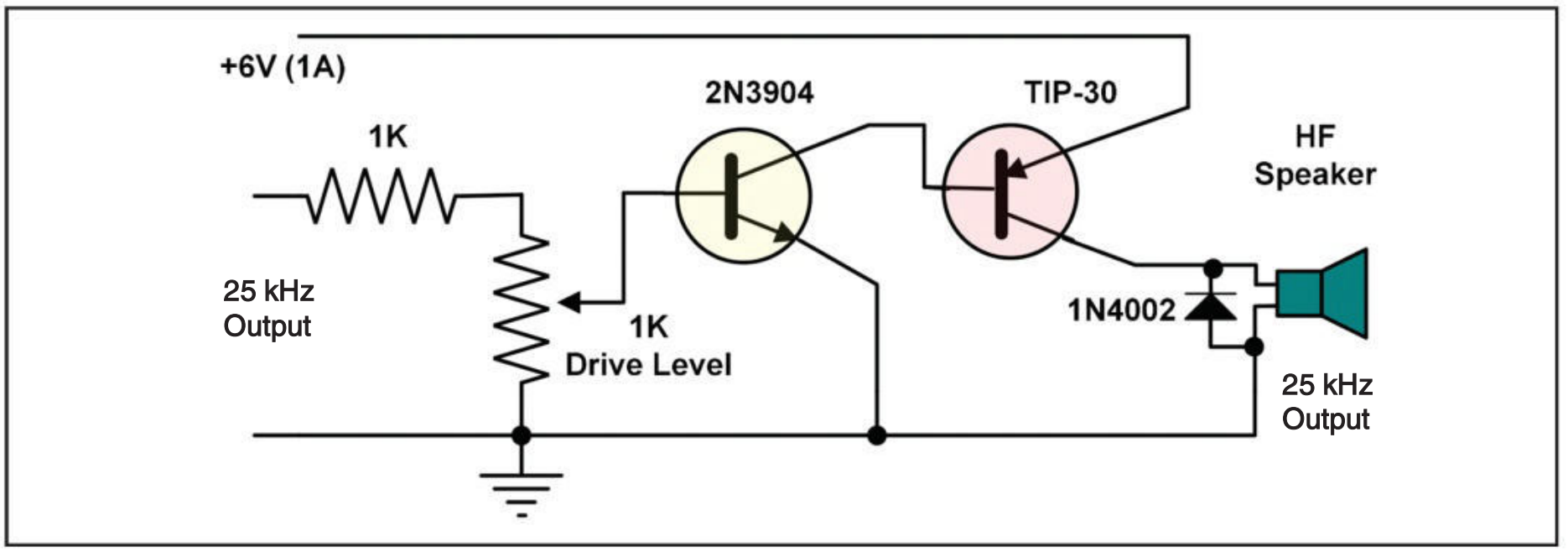

Figure 3. Ultrasonic Power Amplifier

Since this is a fairly complex system and probably somewhat new to our community, we will present detains of the transmitter portion this month and finish with the receiver portion next month. Please also keep in mind that many portions of circuits that are described have been used in one form or another for non-ultrasonic applications but elaborate expansion and integration for into a complete system has not been done too carefully, at least by me. I leave that up to you, but this should at least be a good starting point.

Transmitter Design

Referring again to Figure 1, the basic scheme that I propose is to start at a frequency of around 25 kHz. This is a frequency well beyond human hearing and uses common available components. The schematic of the audio amplifier and modulator is shown in Figure 2. A common op-amp is used as a gain of 1 to 10 to compensate for the amount of audio required for good modulation without excessive distortion. This audio is then applied to a pulse rate modulated LM-555 multivibrator which varies the pulse rate (frequency) around the 25 kHz region. The final result is a modulated pulse train which you can see if you have an oscilloscope and speak into the microphone. If you just try to listen to the transmitter with a pair of earphones at some part of the circuit, you should not hear anything.

Finally, Figure 3 is the schematic of the power output stage. This portion of the system will raise the level of the modulated pulse train to the proper level to drive the "antenna" or output transducer which will be a tweeter type speaker. Although above the level of general human hearing many of these devices will respond to 25 kHz and they can usually be "pushed" a little bit further if you are lucky. You will note that the circuit is not a linear amplifier, however, since the input signal is really just a series of pulses. It only has to be on or off during the proper portion of the input and provide a decent amount of power to the speaker "antenna." The diode shown across the speaker is to clamp back EMF voltages if present. This could be replaced with a small value capacitor to "round off" the pulses if desired. This circuit will require around 6 volts with a current of an amp or two. Depending on the actual high frequency speaker you choose, you may also have to adjust the drive voltage with the 1K potentiometer to be sure you do not draw too much current through the speaker and damage it. This can be calculated by subtracting the 0.7 volt transistor collector-to-emitter voltage drop from the 6-volt supply and dividing the resulting 5.3 volts by the impedance of the speaker you use.

When choosing suitable speakers for this system, you should check the frequency response specification of various potential devices to be sure that your choice does have some sort of decent response at 25 kHz. Lower frequency response into the normal audio range is not important here and response into the normal audio range is not an asset. In this case, it's possible some of the high fidelity "tweeters" available would better choices than common standard devices. When we describe the receiving portion of the system, we will discuss how one might choose to mount the two speakers.

Next month, we will complete the receiver circuit.

73,
Irwin, WA2NDM

emergency communications

BY JOHN FERGUSON,* K3PFW

My (New) Station: Part 2

In Part 1 of "My (New) Station", back in the March issue of *CQ*, I related some of the inspection and planning for the rebuild of the station here at the QTH as the multi-year renovation of my house is coming to an end. A lot has happened since then. I am back on the air with HF and V/UHF, going through a testing and evaluation stage. Everything tested so far is performing adequately. The rotor for the HF triband beam, which would turn but didn't indicate direction, has been replaced. I couldn't get the direct replacement for the T2-X, and at the recommendation of the tower contractor I hired, got the Yaesu G-2800. So far, I'm extremely pleased with the rotor and I love the preset and speed control features. The contractor's concern was the size and weight of the Telrex TB6EM, an 'oldie but a goody' tribander with a 24-foot boom, full-size reflectors (the longest – for 20 meters – at 36 feet), and a very sharp beam width.

The operating equipment (Photo A) is back in place, the Yaesu FT-736R V/UHF quad band is back from the repair shop, and good as new. The primary HF is an Icom IC-756 Pro II and the secondary HF is my trusty old Kenwood TS-870. The Icom 2710 dual band mobile for local repeaters and an Astron power supply round out the lineup. The Amp Supply LK-500ZA, although back on the operating table, is awaiting recapping (replacement of the hi-voltage electrolytics), due to its sitting around more than a few years now. Dry electrolytic capacitors, especially the older ones, don't handle sitting idle for years very well. So, rather than risk a catastrophic failure, I'll replace them. I will probably do the diode board, too, while it's apart. As I've said before, I'm not a fan of high power, but that 500+ watts will give me another S unit at the other end of the QSO.

The patch panel (Photo B) is now sporting labels and getting populated with cables. Labels and a color code system help reduce frustration when making changes. Flexibility is a must, in my opinion, if you are going to succeed in supporting emergency and disaster communications. Antennas and other resources are terminated on the panel. Flexible coax from the individual pieces of equipment can then be connected to a particular antenna or resource. The goal is to have two antenna resources available for each band.

Outside, the enclosure at the bottom of the tower is getting spruced up with some paint, a shelf, and ground bar (Photo C). A 2-meter linear and pre-amp are being added to improve coverage with the VHF vertical on the top of the mast at 100 feet. With nearly 180 feet of RG-8 type coax from the

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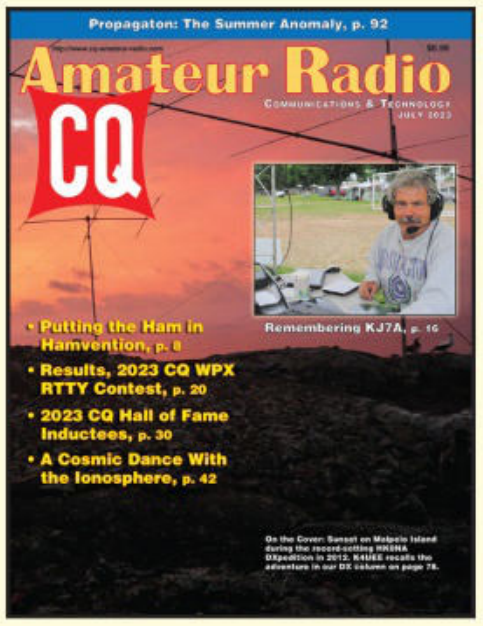
Photo A. Operating equipment now in place on the homebrew desk.

Photo B. Patch panel, tucked away in the closet, now populated with cables and labels.

station to the tower, there's a lot of signal loss. The feedline up the tower is half-inch hardline with an RG-8U foam pigtail up the mast to the antenna. The addition of the linear and pre-amp had not been planned. However, during the testing and evaluation phase, with the help of Bob Speakman, N3HPA, we found that the loss, as mentioned, was significant. The necessary power supply, a spare from the collection around here, did not have a three-wire cord, so a little modification was done to provide a chassis ground. Grounding in the enclosure itself has now also been reworked with the addition of a copper ground bar. The tower grounding, after isolating it from other ground connections, was tested and found to be approximately five ohms. Not having a fancy "Megger," I use a load in series with the ground to be tested and measure the current when connected to the "hot" side of the commercial power; then measuring the voltage at the ground rod back to power line neutral, I can calculate the ground resistance using Ohm's Law. **DO NOT TRY THIS** unless you are very comfortable working with the 120-130 volts on the average AC line, and understand the safety precautions necessary to prevent a serious accident. This is not a recognized standard test,

On the Cover



Sunset from the mountaintop on Isla Malpelo, a Colombian island in the Pacific Ocean that is really the peak of a 4000-foot volcano rising from the sea floor. This was the site of one of the two operating positions for the HK0NA DXpedition in 2012, recounted in detail in this month's DX column on page 78.

One aspect of the trip that we didn't have space for in the main article was the adventure involved in getting started on their adventure. Steve Wright, VE7CT, wrote in the original article in the INDEXA newsletter that the team met up in Colombia's capital city of Bogota, and then had planned to travel over land to the port city of Buenaventura, where they would meet their sea transportation, the *Sea Wolf*. But there was potential danger from rebels in the region so they decided to fly instead. But the Buenaventura airport is about 20 miles outside the city and the team had a hair-raising ride along jungle roads toward the city, only to be met by a protest (which had nothing to do with them) that blocked access to the only bridge to the port. They waited in a roadside café for a couple of hours and then got back into the gridlocked traffic to try to get to their hotel, since they'd been warned that the section of Buenaventura where they were stuck was very dangerous at night. Fortunately, everyone and everything made it OK but this was clearly a case in which getting there was not half the fun!

Our inset photo shows Chip Margelli, K7JA, who became a Silent Key in late May, operating Field Day. Chip was a prominent DXer, contester, and leader in the ham radio industry. Field Day was one of the highlights of the ham radio year for Chip, and he was working on antennas for this year's event until just before his passing. Our remembrance is on page 16. (Main cover photo by Manu Siebert, LU9ESD; inset photo by Gordon West, WB6NOA)

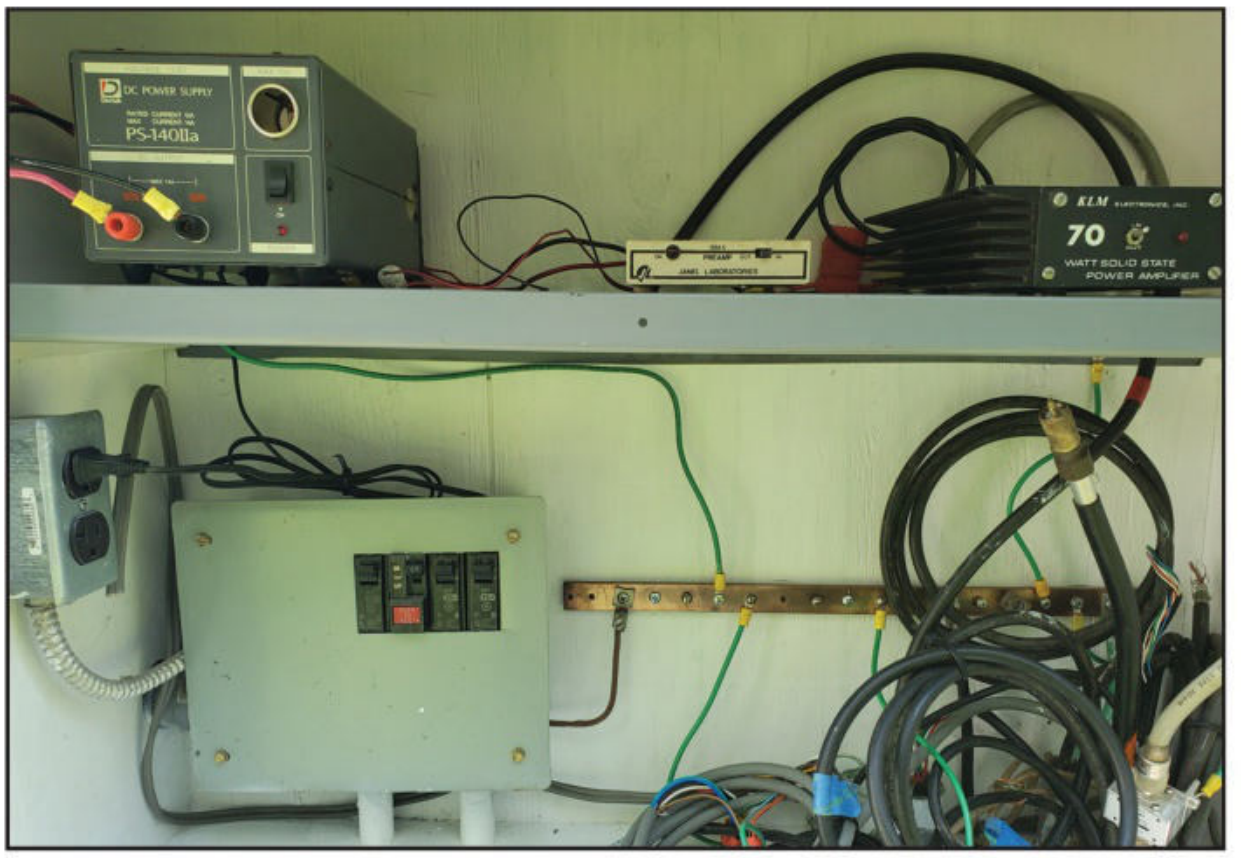


Photo C. Enclosure at the base of the tower, housing power panel serving sheds and dog pens, amp and pre-amp for VHF, and the cables from the tower connection to the runs to the station.

but if I get a low single digit value, I feel comfortable that the grounding is adequate. The tower has four ten-foot ground rods, and the four steel legs that are five feet in the ground, in concrete, effectively putting the eight "resistances" to earth in parallel. All feed lines are "broken" in the enclosure, allowing for testing and re-arrangement. Grounding pigtails were added to all connections, or in the case of the VHF vertical, a surge protector. The enclosure was also a convenient location for the electrical panel that supplies the dog pens and storage sheds, and there is a permanent weatherproof outlet at the top of the tower, really convenient when working up there.

The other "ethereal adornments," a Buckmaster off-center-fed (OCF) dipole and a B&W folded dipole, are getting some much needed attention also. They both tested well and will get new rope. In the case of the OCF, it will temporarily be relocated to the position that I originally planned for the inverted-L. The Comet tri-band U/VHF vertical will remain as is. The B&W folded dipole is used as a receive antenna on HF. Its inherent lower noise pickup is a real help on the lower bands. Yes, I've heard the arguments against "folded loaded radiating dummy loads." An example, that I use repeatedly: the 15 MHz signal of WWV comes in here during the day at about 40 dB, with a noise floor of about 30 dB. Use the B&W as a receiving antenna, the noise drops by about 20 dB, the desired signal only about 10 dB, and now it's 20 dB above the noise. Folded dipoles are somewhat immune to most types of man-made noise.

On the "to do" list was the rebuild of a classic Carolina Windom 160® that came down in a Nor'easter quite a few years ago. The Carolina Windom is patented by Jim Thompson, W4THU, and was produced by his company, Radioworks, for many years. It was a solid performer on 160 meters, a band I want to get back and active on. It will also provide coverage of the HF bands. A unique feature of the antenna is the 22-foot vertical section of feedline that terminates in a 1:1 unbalanced to unbalanced balun (*also known as an unun – ed.*), effectively stopping unbalanced currents from the dipole from propagating down the feedline (Photo D). I mentioned in Part 1 that, when testing the present dipoles, we terminated the feedlines in the surge protectors to prevent the measurements from being affected by stray currents on the outside of the coax. The grounded surge protectors took care of that.

In order to accomplish moving the current Buckmaster OCF and hanging the rebuilt Carolina Windom 160, two new "skyhooks" were needed. Luckily the two acres here at the QTH have a number of tall trees. Two in appropriate locations were selected and equipped with a novel device called the Wouff Hang, developed by Ray Lewallen, W7EL[1] (Photo E). Bob Speakman,

Photo D. Feed for the Carolina Windom 160® showing the OCF balun, the 22-foot vertical section and the 1:1 isolating balun for connection to the feedline.

N3HPA, was back to help move the OCF. A "spud gun" was used to get a fishing line over an appropriate crotch of the selected trees, and a line was pulled in place for one end of the antenna. The OCF dipole antenna and feed line were inspected while it was down. We got it back up in its temporary location without incident. The feed line now comes over the roof of the house and down to the surge protector enclosure. The Carolina Windom 160, at 265 feet in length, was a bit more of a challenge. It runs roughly north-south on the long dimension of the property. Being fed off center, the feedline for it will be conveniently near the tower, swing over to a leg, and come down the side to the enclosure at the bottom, where it will pick up an existing spare coax line to the surge protector enclosure and the patch panel. Yes, we pull spares when we can. I learned a long time ago, "material is cheap and labor is high, run extra when you can."

There will be continued changes and additions moving forward. The interfaces for the sound card modes will be brought back out of storage, installed, and software updated. Winlink is rapidly becoming the 'de facto' digital mode for emergency and disaster communication, with VARA coming on strong as well. The rebuild has given me a solid base on which to continue to building, with another antenna in the works, an all-band HF vertical, probably to be featured in an upcoming column.

Photo E: The "Wouff Hang" over the limb. These can be installed from the ground, no need to climb, and prevent the rope from growing in to the tree. (see note 1 for more information)

Here's a review of criteria for a station to be used in support of emergency and disaster communication that was used in planning this rebuild:

1. First and foremost is safety! Appropriate grounding and surge protection on all incoming lines to the station is an absolute must!

2. Power for the equipment must be adequate and fused properly.

3. Exterior structures for supporting antennas, towers, poles, etc., must be adequately grounded. The supporting structures themselves should be well designed to handle the loads presented by the antennas, feed lines, etc., in the expected severe weather for the area.

4. Flexibility. Can you easily reconfigure antennas and transceivers in the case of a failure or unusual need?

5. Do you have backup power, both short term (batteries) and long term (generator or solar)?

6. Is your station comfortable to work in? Can you reach all the critical equipment without moving from your chair – is it easily within an arm's reach, and can you see what you're doing when adjusting same?

7. Is the telephone in the station a POTS? (plain old telephone system). Your fancy IP phones and cell phones *will fail* in a disaster, as will the 'cordless' phones that require a wall wart to work. It's not a maybe! The telephone on the desk here is a POTS, on solid copper all the way back to the CO (central office), with most of the infrastructure underground.

As far as operating in severe weather such as thunderstorms, that's your personal decision. You alone are ultimately responsible for your own safety, and that of your family. If the station installation is safe and adequate, short of a tornado or flood, you should at least consider operating from there if there is a need, and you are comfortable doing so.

Until next month, 73, stay safe and enjoy this great hobby. And a little public service operating along the way wouldn't hurt.

Notes:

1. *QST* Oct. 2019 pgs. 20 - 23 Roy Lewallen, W7EL, "The Wouff Hang"

kit building

BY JOE EISENBERG,* K0NEB

A Couple of Quickies

The NS-80+ Transmitter and a Charger Module for the Elecraft KX2

I often get asked about the availability of a low cost beginner's level kit, and for this issue I will take a look at one, as well as look at a kit designed to go into a radio that was not originally a kit. The Four State QRP Group previously offered a very simple 5 watt CW transmitter kit as the NS-40. The NS-40 introduced the kit world to the idea of having inductors already part of the PC board, making for easier construction. Having no toroids to wind made this a very attractive kit (Photo A).

The NS-40 name is derived from the phrase "None Simpler." The original version did not have jacks for the con-

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Hamfest Hotline #5855

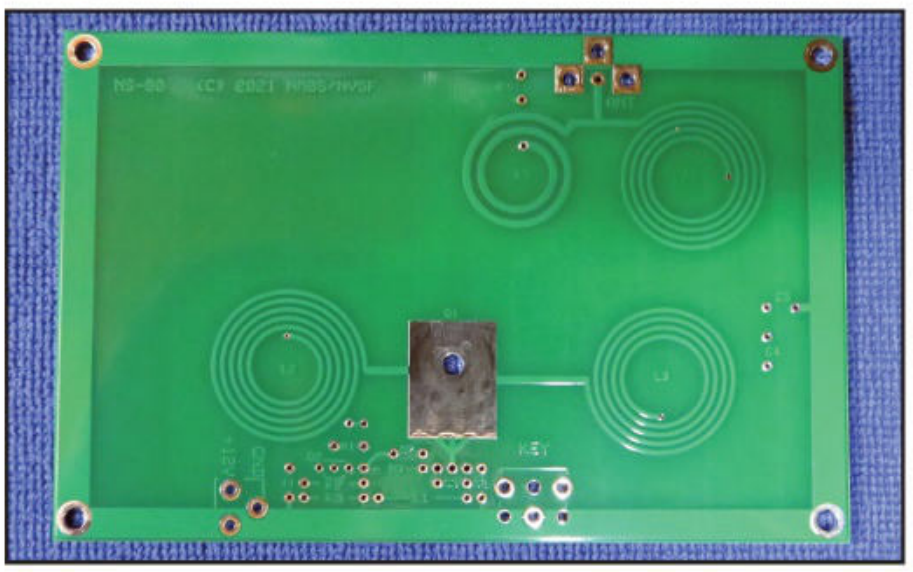

Photo A: The NS-80+ PC board front side. No toroids to wind as there are four inductors etched on to the board.

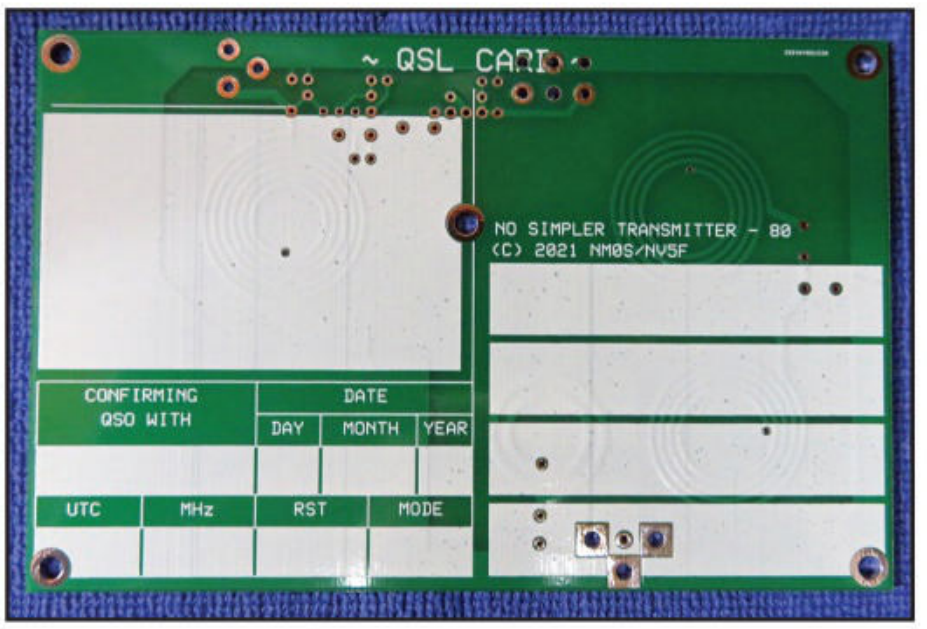

Photo B: The back side of the NS-80+ PC board has a QSL card form you can fill out with a Sharpie® to remember the very first QSO you make with this kit.

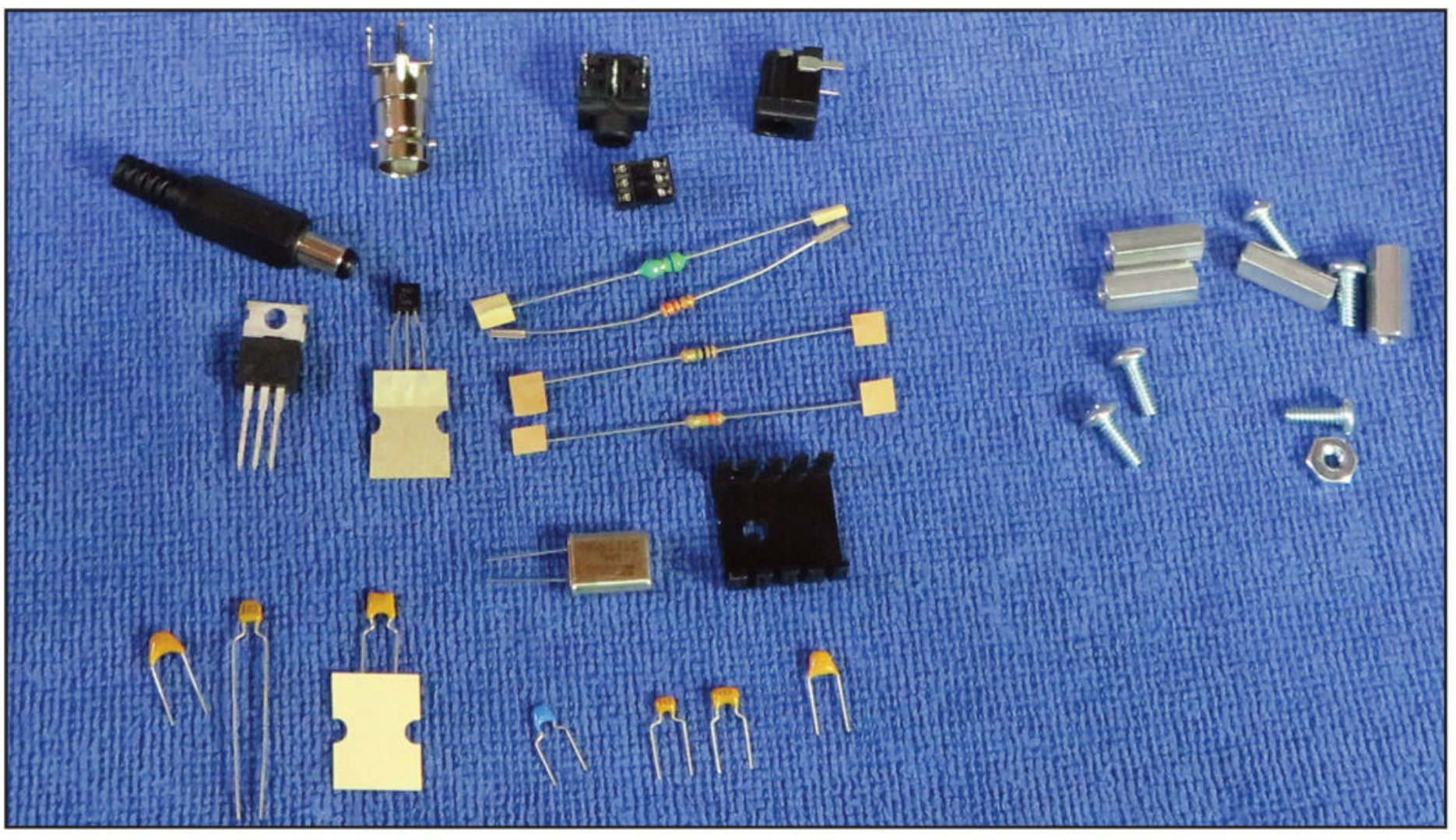

Photo C: There aren't very many parts, making this a great option for a beginning kit builder.

nections for power, RF output, and key (Photo B). Those inputs needed to be either directly wired to the board or "pigtails" made to connect inline type jacks. The newest version has those jacks on the board for convenience. After its long run with the Four State QRP Group, the designer, David Cripe, NMØS brought the NS-40 back as the NS-40+ and added the jacks to the board. The low component count and simple design makes this a great and low cost beginner's kit that actually puts a signal on the air (Photo C). There are only three resistors, seven capacitors, a small RF choke, and two transistors – as well as the three jacks and the crystal that make up the parts list. In addition, there is

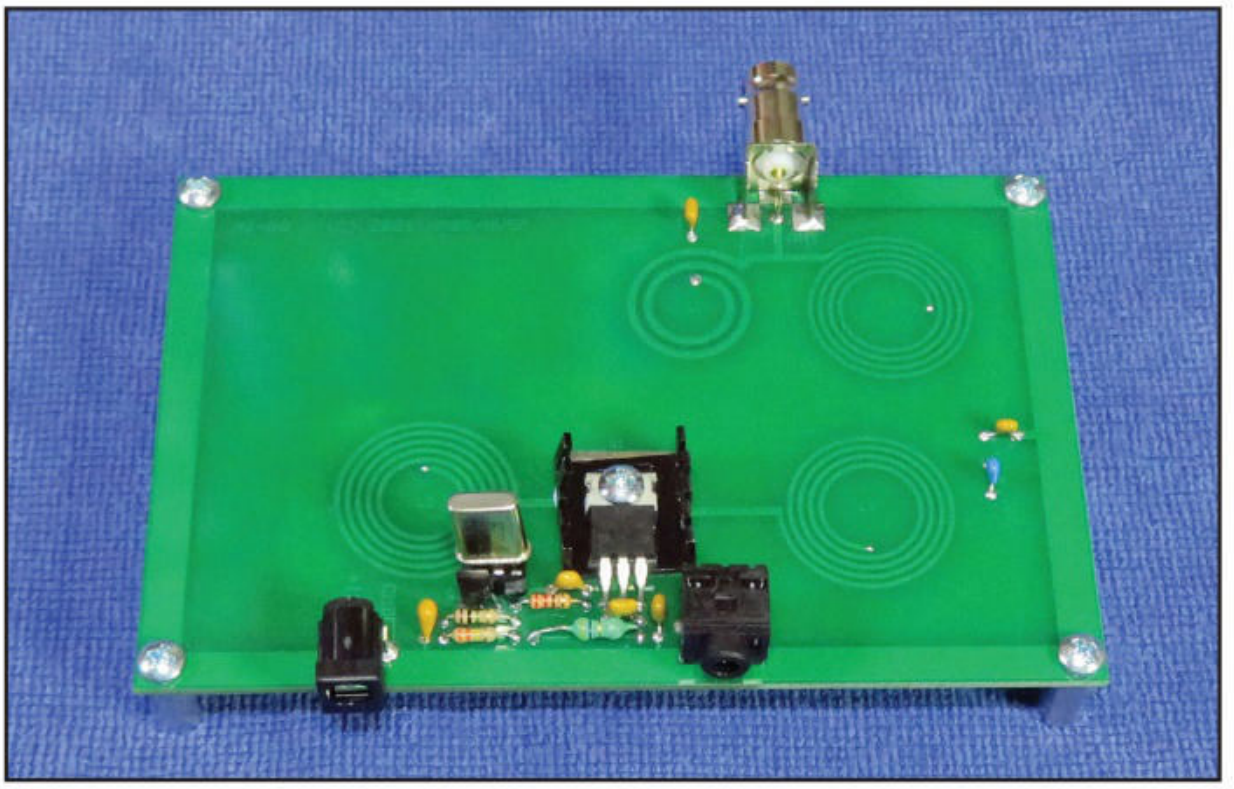

Photo D: When tested, this kit measured 5.5 watts output.

Photo E: After updating the firmware on the Elecraft KX2, the radio is now ready to be opened and the internal charging kit installed.

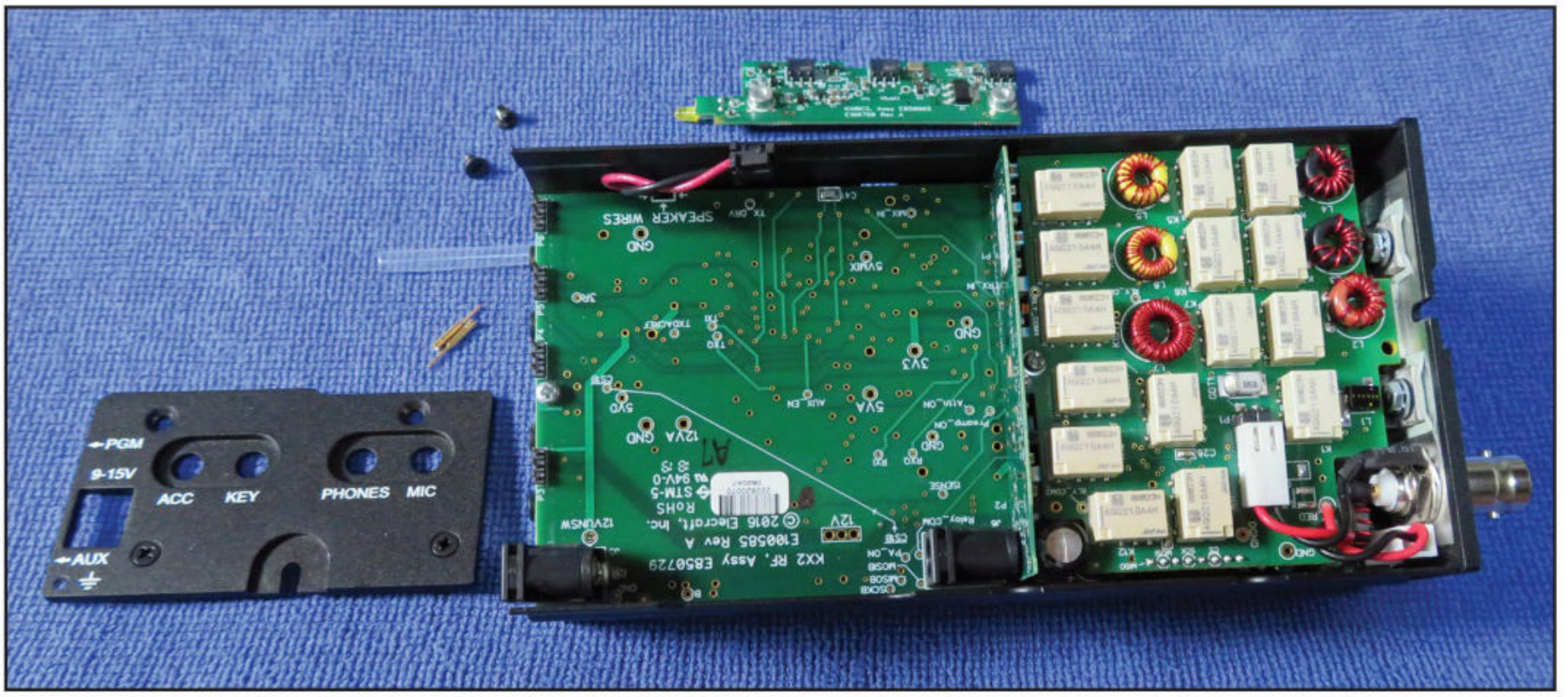

Photo F: Only the bottom and left side covers need to be removed.

some hardware that forms the legs to support the kit.

David has also released an 80-meter version of this kit, and that is the version I am assembling. Keep in mind that there is no T/R switching provided with this kit. There are a lot of very simple T/R switches you can build to perform that function and protect your receiver. The receiver is not part of this kit. The NS-80+ is almost identical to the 40-meter version save for certain band-specific component values and different numbers of spiral wound inductor turns etched on the PC board.

Assembly begins with installing the three resistors, followed by the seven capacitors. I highly recommend using a component tester to verify which capacitors you are installing as some are very difficult to read. After the capacitors are added, the choke is installed. The choke resembles a resistor but is green and thicker. The transistors follow the choke. It really can help heat dissipation if you add a dab of heat sink grease to the board where the large IRF-510 transistor is mounted. This helps evenly transfer the heat to the board and heatsink for the output transistor. I had some heatsink grease left over from replacing a computer CPU, which worked well.

A small IC socket is provided to fashion a crystal socket that allows you to use other 80-meter crystals besides the one provided with the kit. The kit is supplied with a "color burst" crystal, on 3.579545 MHz. These crystals are still very common and very inexpensive due to their use in television circuits and make for a QRP watering hole on 80 meters. You can find crystals for other frequencies from Expanded Spectrum Systems at <https://tinyurl.com/mwwd76pr>, or from Rex Harper at <www.qrpme.com>. When testing this or any other kit that is capable of transmitting, be sure to connect a dummy load to the output first to be sure to protect the final output stage in case it is keyed on power up. Testing my NS-80+ kit on the bench got me about 5.5 watts output (Photo D). I was impressed by the nice clean CW keying. Set aside an hour to build the NS-40+ or NS-80+ if you are a beginner and less if you are experienced. This kit also makes a great group or club kit building project. Order your NS-40+ or NS-80+ kits from NMØS Electronics at <https://tinyurl.com/2hskfe7r> for $25 plus shipping.

Charge!!

The highly successful Elecraft KX2 transceiver had a sought-after feature that was lacking until now. The problem was that in order to charge the internal battery pack, you have to open the case, carefully disconnect the battery pack and then plug it into a special charger.

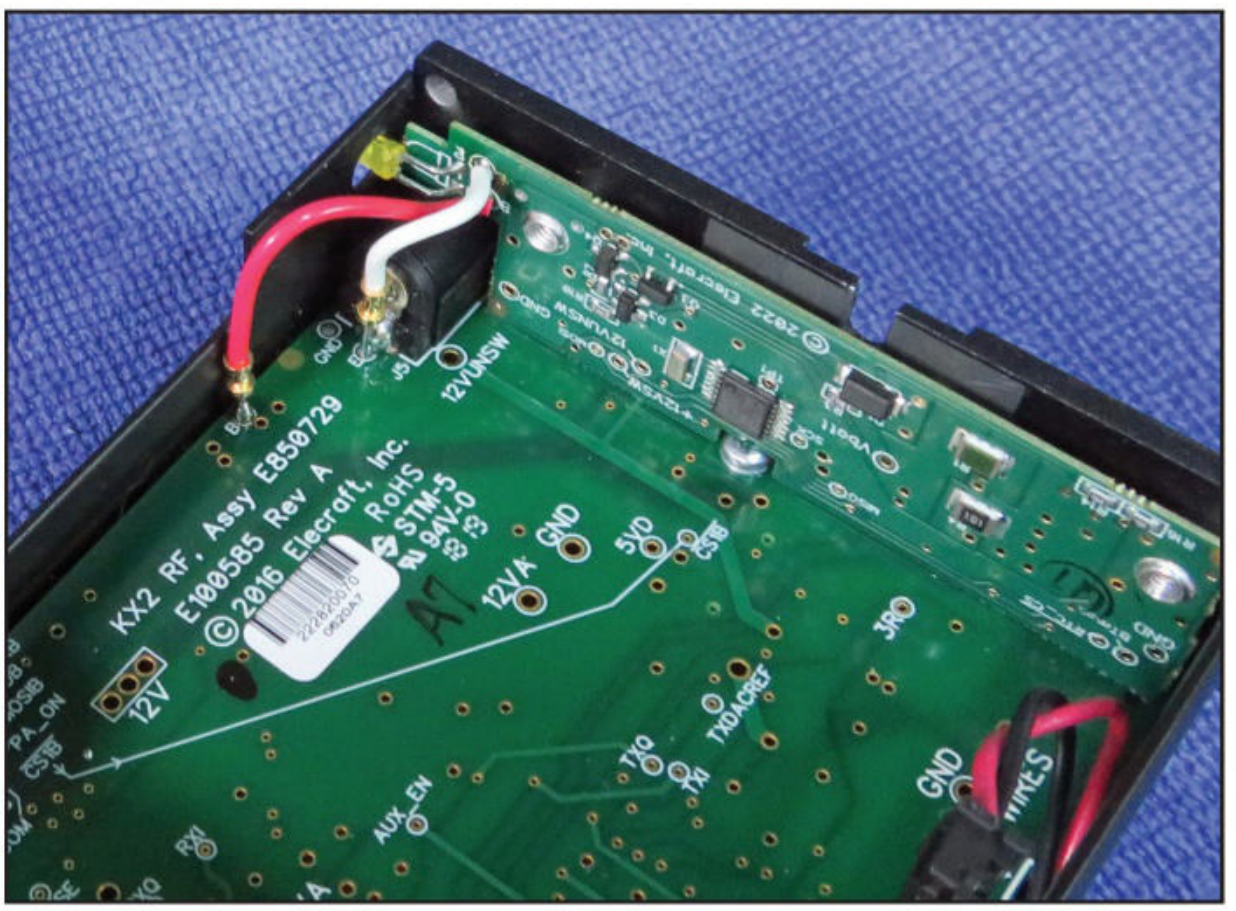

Photo G: The new charging option board is plugged in and wired to the main board.

The option to charge the battery internally from the external 12V source is now available and comes in the form of a module that replaces one that is not always present in the radio. The KX2 has the option of installing a module that enabled controlling remote coax switches or anything needing band change information. That module also has a real-time clock on it, a great thing to have on your radio's display while logging operations in the field. The newest option is the KXIBC2 module, which installs if the other option module is not already there, or installs after the other module is removed. This new module retains the real-time clock function, but eliminates the remote control functions of the older option board.

Since I never had the original option installed, I'll be gaining the internal charging feature and the real-time clock feature at the same time. Be sure to have the most recent version of firmware installed before beginning the installation. Check what is installed and update it if needed to the latest version using the Elecraft KX2 Utility software (Photo E). There are some parameters that should be set before beginning to be sure the radio finds and supports the new module. The whole process of installing this kit takes about 20 minutes at the most. One of the options involves simply soldering two wires to points on the main board. I found that by tinning the pin connectors on the two wires, the amount of time needed to make a good clean connection was a lot less (Photo F). One wire goes to the back of the power connector and by adding a little bit of solder to that part of the connector and tinning the pin, it goes together quickly and neatly. The other wire solders to a hole on the board. Caution is needed on this one to be sure not to poke it in too far. I simply tinned the hole and the pin and heated it up with my soldering tip and they bonded neatly together (Photo G).

The kit comes with a set of pins in case you want the board to be removed easily, but it is very rare that it would ever have to be removed. With the plug-in method being #2 and the solder-directly method being #1, I chose #1. The KXIBC2 kit for the Elecraft KX2 is available from Elecraft at <www.elecraft.com> for $139.95 plus shipping (Photo H).

Be sure to watch for me at hamfests this summer, including the Oklahoma Ham Holiday, Huntsville Hamfest, and the ARRL New England/Hudson HamXposition.

Until next time, 73 de KØNEB

Photo H: The radio is reassembled and the new real-time clock is activated as well as the internal charging function. The charging rate is a bit slower than using the dedicated outside charger, but you no longer have to open the radio to charge the battery.

magic in the sky

BY JEFF REINHARDT,* AA6JR

Road Trip – To Dayton!

The lead times required in publishing a magazine like *CQ* sometimes require the use of a time machine. Our ability (as writers) to travel forward is greatly limited, while your ability to look back (as a reader) is perfect. So as you read this, the entries below will be history; nevertheless, I ask you to go back in time to the days prior to this year's gathering at Dayton, or more accurately, Xenia, Ohio.

The ROMEO Club

Our ROMEO Club is a weekly gathering of ham radio friends where we enjoy a late breakfast, ergo the name: ROMEO as in **R**etired **O**ld **M**en **E**ating **O**ut. I can't attribute the origin of the name (it didn't begin with us) but I can vouch to some degree to its accuracy, although "old" is used in the context of ham radio, where everyone of the male gender is referred to as "old man."

It should be noted, we do not exclude YLs but so far, none has expressed any desire to join us. These weekly gabfests move around from restaurant to restaurant in our area of Southern California and over the many months have had a varying cast of participants, with perhaps a core of four, one of whom is your author. Most of the conversation revolves around our beloved hobby and the topics are many, including CW, lots of digital, EmComm, ARRL news, technical issues, operating events, and more.

So at a January meeting of this loose group, the topic of going to Dayton came up. Eyebrows were raised and various ideas were put forth. Some of us had been there before but all those visits were prior to the COVID era. We discussed the notion of flying in but then came the idea of a road trip. Four radio geeks spending just short of two weeks in a Toyota Avalon equipped with radios, suitcases, a few bags of Doritos, and maybe save some trunk space for purchases that may (or may not) be made while at the Ohio gathering. Across a few more meetings, schedules were checked, those with spouses obtained blessings and it was then agreed, this could actually happen. John, Rob, Greg, and Jeff were actually going to do it. (Call signs of the participants intentionally excluded to protect the innocent, however, one can be found at the header to this column.)

It Becomes Real

Greg then upped the ante. At a subsequent weekly meeting he announced that he had already obtained his HamVention® ticket in the mail. Even though the actual trip was still many weeks away, this raised the sense of urgency and the others soon followed. Then came the discussion about a car to use. A poll of those at the table produced only one viable option, John's aforementioned Toyota Avalon. It was an easy choice, as the other options included a pickup truck, a smaller SUV, a compact, and a two-seat sports car. The latter would have made for high comedy with four six-foot participants trying to climb in. Brings back memories of the old college prank of VW bug stuffing attempts of the 1960s. But I digress. John's Toyota has good leg room and some radios already installed. Adding HF for the trip is in the plan. Greg is an avid and accomplished CW operator. All I had to contribute was an ARRL Minilog book and a pen. Easy!

In the coming days, each of us promptly received our tickets from the event's organizers (kudos to the DARA folks for their efficiency) and a hotel accommodation on the east side of Dayton had been reserved for a three-day stay. We decided the hotels to and from the Dayton area will be "made up as we go along." Another meeting saw us spread a map of the USA across the table and plot our distances along the way. One-way distance, approximately 2,250 miles. (How lucky are you hams who live closer to Dayton??!!) To minimize hotel and road food costs, we figured we could do about 800 miles each day by sharing the driving duties. Ever the road warrior, last year I had driven solo coast to coast and back, so my "scouting trip" was of some value in terms of hotels, routings, and places of interest along the way. However, a target of 800 miles each day does not allow for extended days of touring museums and epicurean delights, at least not on the

Photo A: Even though Jeff's column was written before his trip to Dayton, this issue was put together the week after, so we were able to get you some photos! Here's the trunk of John's Toyota without much space for flea-market purchases (probably a good strategy, HI). (AA6JR photos)

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Agoura Hills, CA 91301
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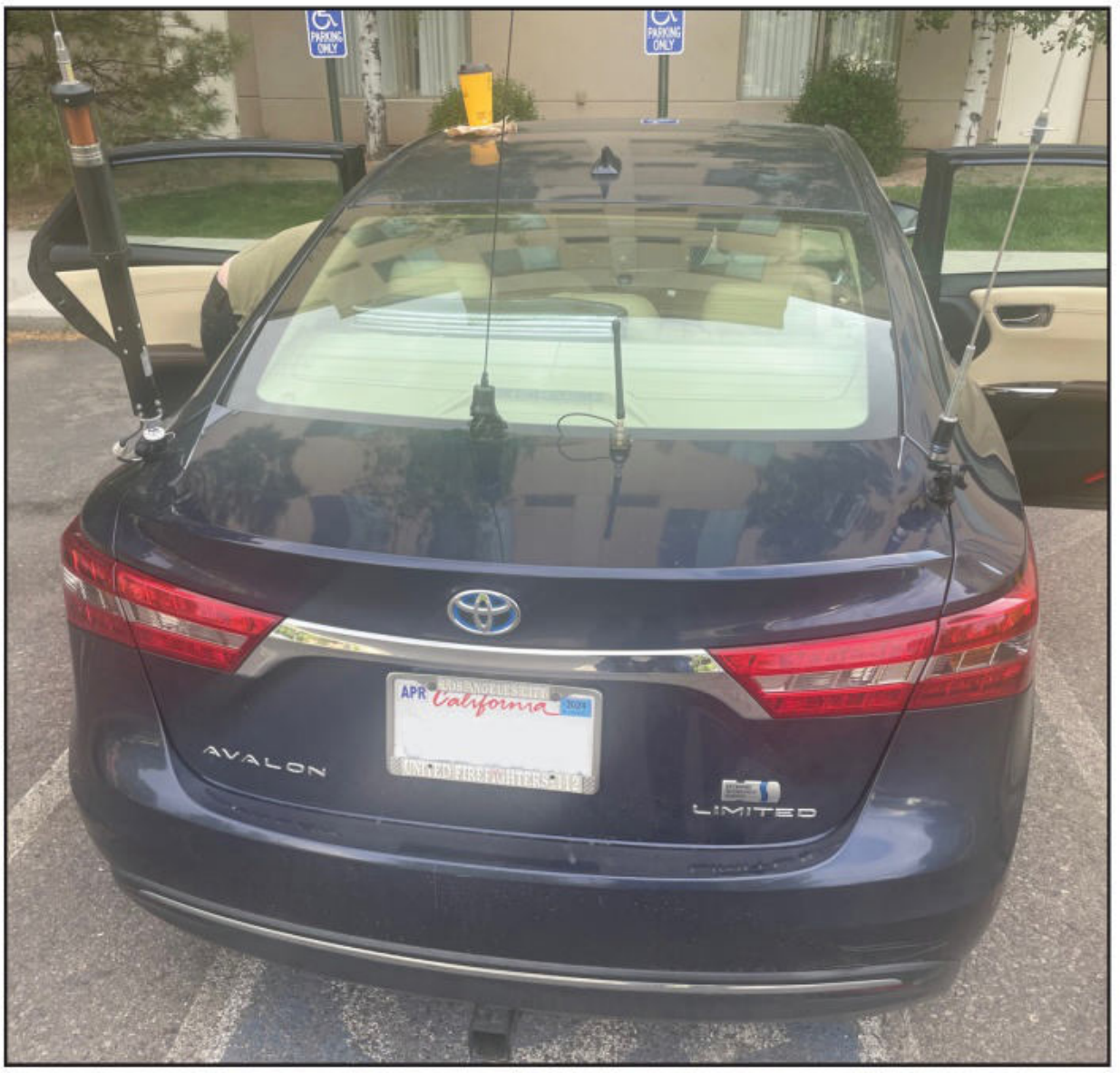

Photo B: Ready to work the world from the road – in addition to three hams, the car was loaded with radios for HF, VHF, and UHF.

way to the convention. There are also "wild cards" like construction and weather. One acquaintance warned us the new state symbol of Indiana is the orange and white construction barrel. The only person happy about that is the one who sold the barrels to the state. I'm guessing there must have been a great commission attached to that transaction!

The participants also agreed that travel costs would be split evenly, specifically gas and lodging. Each person is on his own for food (A ROMEO Club standard is separate checks) and any other incidental costs would be discussed.

Down One

A week prior to liftoff, we lost Greg to circumstances beyond his control. Family comes first and Greg's priorities are in the right place. It's a bummer in that we know he would have a great time at the convention, but he'll also miss also working CW contacts while in transit across the 5,000 estimated miles we'll cover over the better part of two weeks. His absence will also change the calculus of cost sharing, but such are the breaks. We can still do this. We'll also try to resell his admission pass at the Xenia fairgrounds.

The Lost Boys

Well, not really lost, just adrift across the Great Plains. We've been offered an after-Dayton invitation to overnight at the Indiana lake home of another ham, John and his gracious XYL Mary Ellen (also a ham). Their generosity gives us a chance to rest and recuperate before launching the return trip, not to mention saving a night's lodging. Their company promises to be delightful in best traditions of Hoosier hospitality. And Mary Ellen is gracious in playing the role of Wendy to the Lost Boys of California wandering home after a (hopefully) productive trip to Ohio. Hopefully, we will have no encounters with Captain Hook – I hear he operates a towing service these days.

On The Road

With apologies to Jack Kerouac, we're no match for Sal and Dean who hopped freight trains and rode their thumbs making their way across postwar America. But being in touch with the

announcements (from page 2)

Presbyterian Church, 3801 E. 26th St. Contact: Willis Gravning, KEØZ. Website: <http://w0zwy.org>. Email: <wgravning@yahoo.com>. Phone: (605) 961-8466. Talk-in 146.895 MHz PL 146.2 Hz.

PEOTONE, ILLINOIS — The Kankakee Area Radio Society will hold its **KARS-Fest** from 8:00 a.m. onward on Sunday July 16 at Will County Fair Grounds, 710 S. West St. Contact: Arthur Reis, K9XI. Website: <http://w9az.com/karsfest.html>. Email: <karsfest@gmail.com>. Phone: (815) 348-7752. Talk-in 146.94; 107.2 Hz. VE Testing.

AUGUSTA, NEW JERSEY — The Sussex County Amateur Radio Club will hold its **Sussex Hamfest** from 8:00 a.m. onward on Sunday July 16 at the Sussex County Fair Grounds, 37 Plains Road. Contact: Walter Murphy, N2WM. Website: <http://scarcnj.org>. Email: <n2wm@centurylink.net>. Phone: (973) 948-6489. Talk-in 147.300 +600 PL 151.4. VE Testing.

CHEHALIS, WASHINGTON — The Chehalis Valley Amateur Radio Society will hold its **Chehalis Valley Amateur Radio Society Tailgate Swap** from 9:00 a.m. to 1:00 p.m. on Saturday July 22 at the Lewis County Mall Parking Lot, 177 NE Hampe Way. Contact: Grant Gienger, W3SWT. Website: <http://www.cvars.org>. Email: <w3swt@arrl.net>. Phone: (360) 614-7926. Talk-in 147.060 110.9 and 146.520 simplex. VE Testing.

CLARK MILLS, NEW YORK — The Clark Mills Firehouse will hold **Radiocom 2023** from 8:00 a.m. to noon on Saturday July 22 at the Clark Mills Firehouse Grounds, 7705 County Rd. 19. Contact: Grant Bob Decker, AA2CU. Website: <https://www.uticaarc.org/>. Email: <tbd2626@yahoo.com>. Phone: (315) 797-6614. Talk-in 146.76 (-600) K2IQ. VE Testing.

EAST GREEWICH, RHODE ISLAND — The Massie Wireless Club, N1EPJ will hold its **Tune-Up Flea Market** from 9:00 a.m. to 3:00 p.m. on Saturday July 22 at the New England Wireless and Steam Museum, 1300 Frenchtown Road. Contact: Kenneth Carr, KE1RI. Website: <http://newsm.org>. Email: <ke1ri@yahoo.com>. Phone: (401) 491-9520.

LEBANON, TENNESSEE — The Wilson Amateur Radio Club, Inc. will hold its **Greater Nashville & Middle TN HamQuest** from 8:00 a.m. to 3:00 p.m. on Saturday July 22 at James E. Ward Agricultural Center, 945 East Baddour Parkway. Contact: Michael Wright, N4MAW. Website: <http://midtnhamquest.com>. Email: <info@midtnhamquest.com>. Phone: (615) 210-5581. Talk-in 147.105 TSQL 156.7.

PIERPONT, OHIO — The Amigos Radio Club Ashtabula will hold its **Ashtabula County Hamfest 2023** from 8:00 a.m. to 3:00 p.m. on Saturday July 22 at the Pioneer Picnic, 1809 Middle Rd. Contact: Andrew Walbridge, W8IJC. Website: <https://tinyurl.com/ym7mj5rc>. Email: <kc8oh.arca@gmail.com>. Phone: (440) 858-6370. Talk-in 146.895 MHz, PL-141.3.

PUEBLO, COLORADO — The PPRAA AND PARC will hold their **Megafest** from 8:00 a.m. to 3:00 p.m. on Saturday July 22 at the CSU Pueblo / Occhiato University Center, 2200 Bonforte Blvd. Contact: Derek Brown, KØATV. Website: <https://ppraa.org/megafest>. Email: <dbrown719@outlook.com>. Phone: (719) 306-7834. Talk-in 146.790 CTCSS 88.5.

AUBURN, INDIANA — The Northeastern Indiana Amateur Radio Association will hold its **Auburn Hamfest** from 9:00 a.m. to 2:00 p.m. on Saturday July 29 at the Auburn Cord Duesenberg Museum, 1600 Wayne Street. Contact: John Chalmers, W9GOO. Website: <http://w9ou.org>. Email: <w9ou@arrl.net>. Phone: (260) 927-5746. Talk-in 147.015 with 141.3 tone.

CHAMBERSBURG, PENNSYLVANIA — The Cumberland Valley Amateur Radio Club will hold its **CVARC 2023 Hamfest and ARRL Pennsylvania State Convention** from 8:00 a.m. to 2:00 p.m. on Saturday July 29 at the CVAEMA Showgrounds, 1501 Criders Church Road. Contact: Jim Stephens, KB3ICU. Website: <http://w3ach.com>. Email: <cvarcw3ach@gmail.com>. Phone: (717) 504-7684. Talk-in 147.120 + 100hz. VE Testing.

SUTTON, WEST VIRGINIA — The West Virginia State Amateur Radio Council will hold its **ARRL West Virginia State Convention and Ham Fest** on Saturday July 29 at the Flatwoods Days Inn and Suites and the Flatwoods Conference Center, 350 Days Drive. Contact: Kenneth Caplinger, WV8KDC. Website: <https://www.qsl.net/wvsarc/>. Email: <wv8kdc@arrl.net>. Phone: (304) 209-1778. Talk-in 145.290 PL 91.5. VE Testing.

WAYNESVILLE, NORTH CAROLINA — The Western Carolina Amateur Radio Society will hold its **WCARS Hamfest** starting at 8:00 a.m. on Saturday July 29 at Smoky Mountain Event Center (Heywood County Fairgrounds), 758 Crabtree Rd. Contact: Randy Harris, KI4VLW. Website: <http://wcars-club.org>. Email: <rtsp71@aol.com>. Phone: (828) 298-6685. Talk-in 146.910 PL Tone 91.5. VE Testing.

WINCHESTER, INDIANA — The Randolph County Amateur Radio Club, Whitewater Valley Amateur Radio Club, and the Jay County Amateur Radio Club will hold their **East Central Indiana Hamfest** from 8:00 a.m. to 3:00 p.m. on Saturday July 29 at the Randolph County Fairgrounds, 1885 South US Highway 27. Contact: Jeremiah Cromis, KD9CCW. Website: <https://tinyurl.com/mvb32zdc>. Email: <inhamfest@gmail.com>. Phone: (765) 238-7467. Talk-in 147.300+, PL 110.9. VE Testing.

WASHINGTON, PENNSYLVANIA — Washington Amateur Communications will hold its **WACOM Hamfest** from 8:00 a.m. to 1:00 p.m. on Sunday July 30 at the Washington Crown Center Parking lot, 1500 W. Chestnut Street. Contact: Tom Wright, N3WS. Website: <http://wa3com.com>. Email: <tom.n3ws@protonmail.com>. Phone: (412) 414-5627. Talk-in 146.790 (-shift) K3PSP repeater system.

Photo C: The "Lost Boys" of California stopped along the way at the Cadillac Ranch outside Amarillo, Texas.

actual surface of what many refer to as "the Flyover States" is a reconnection with the people and places that comprise America's heartland. While some things are much easier than they were in "On The Road," or even Steinbeck's "The Grapes of Wrath," some characteristics from those bygone eras are lost as well. On the plus side, financial resources, food and lodging are not a serious concern. But the days of rolling up to a Route 66 neon-signed motel with a "vacancy" sign are pretty much gone. Now you're basically forced into making advance reservations and paying in advance from a cell-phone. What's lost is much of the person-to-person interaction among locals and fellow-travelers, both of which were often the source of support and suggestions in bygone days. We hope to make some of that up by patronizing "mom and pop" eateries when possible and perhaps visiting some points of interest on the return route. Another advantage will hopefully be the radio contacts we make on HF and maybe even VHF if we find active repeaters. My last cross-country journey produced no such luck, but hope springs eternal.

More to Come

So as this is being written on the eve of our departure, the outcomes are not yet known, which of course, is the setup for you to "stay tuned" to the next installment of this column a few months from now. I promise the follow-up report will not just be a summary of the numbers of bags of Doritos consumed or a revue on the rest stops along the route. But all this adventure (or foolishness) has come about because of a few brainstorming radio aficionados seeking to have some fun and adventure in pursuit of "The Magic In The Sky".

gordo's short circuits

BY GORDON WEST, * WB6NOA

Are the New General Class Exams Tougher or Easier?

And talking to space!

A new pool of questions for the General Class license exam just rotated in on July 1st. Some people say the new tests will be harder than the old ones, others say they'll be easier. In fact, the new exams will neither be tougher nor easier than the old ones, just a little bit different.

The Question Pool Committee of the National Conference of Volunteer Examiner Coordinators (NCVEC), headed up by Roland Anders, K3RA, and Maria Somma, AB1FM, spent months working with their team of technical experts and educational teachers for a full blown "renewal" of the General Class question pool. In summary:

74 old technology questions were removed,

52 new technology questions were added, and

233 questions were updated, resulting in a net decrease of 22 questions in the pool, with about 430 to study

Roland commented on the process, "<ExamTools.org> provided us with statistics based on more than 5,000 exams administered."

For instance, when a distractor (wrong answer) was regularly chosen as a correct answer by the applicant, Maria and Roland examined it closely and, where necessary, edited or replaced it. They also deleted the too-easy and too-hard questions, based on the <examtools.org> statistics.

We can also thank Richard Bateman, KD7BBC, for all he has done with his hard work with his <HamStudy.org> site.

The 50+ NEW questions on the test bring in new technology Q & A test topics:

- Control operator in a foreign country
- Net management on HF
- Winlink and VARA
- FT8 operations & computer connections
- AREDN digital MESH operations
- Propagation A and K indices
- Ionospheric layers
- Hooking up amplifier ALC and DELAY circuits
- S-meter level changes in dB
- Solar panel regulation techniques
- Reactance and Impedance theory
- LC circuits and resonance
- Step up/step down transformer windings
- Power supply filter networks
- Impedance matching
- SDR overviews
- DMR, D-STAR, and system FUSION digital voice modes
- Random wire antenna topic & cautions on stray RF
- FCC RF exposure safety topics

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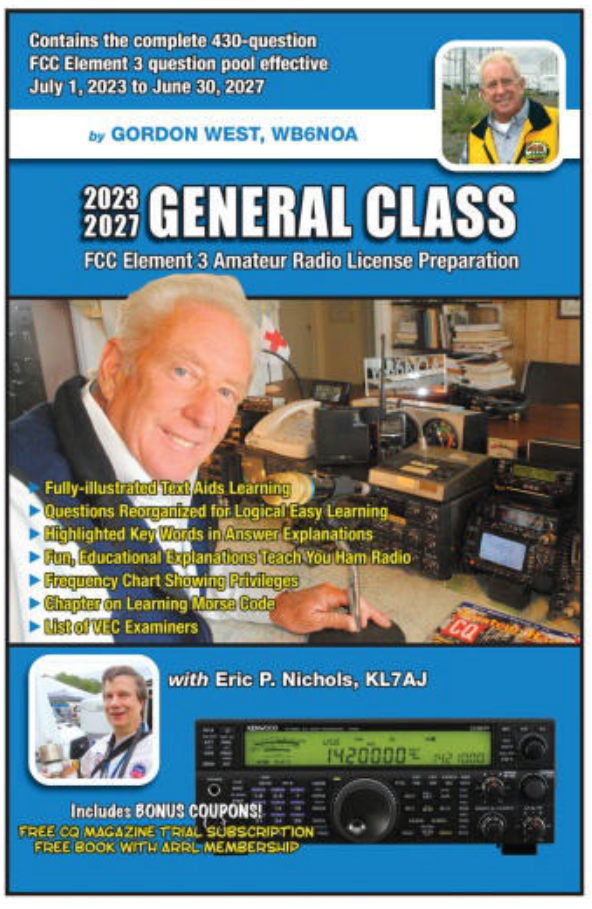

Photo A: Gordo's new General Class license manual covers the new question pool from which exams will be generated over the next four years.

Photo B: 437.810 MHz is where you will first hear signals coming up from the International Space Station's cross-band repeater as it begins a pass over your location.

Speaking about "anywhere in the world," the International Space Station continues to be a sensation in back yards and school rooms across the country, and around the world. The students can see it in the sky at dawn and dusk a couple times per month.

Don't be overwhelmed with these new topics – after I studied them, I saw that each new question would fit in nicely and logically with my reorganized question lineup, complete with full new explanations, in my new 2023-2027 General Class book (Photo A) and audio course for improved comprehension and actually less study time!

More good news - many VECs are now offering remote exams to students not near an in-person test session. Applicants can test on their own computer, via Zoom, right at home.

Hang on – you might think of these remote exams as a clever way to hide cheat-sheets on the wall, or split screen your computer to help find the correct answer – NO WAY! With as many as 20+ accredited examiners staring at your screen, staring at your desk and room, staring at your eyes, or checking for a pal giving you A B C or D in Morse Code, it'll be almost impossible to cheat. The VEs running these remote exams, and their team members, get special training to nab and halt any exam that looks suspicious.

You can be anywhere in the country – actually most anywhere in the world – and line up a remote test session to upgrade, or as an accredited VE, proctor a test session over the internet. Write Stephen Hutchings, WM7X, at <stephen@hutchings.net>, and take some training, as I did, to work with him on becoming a contact examiner or regular VE remote examiner.

Photo C: This simple Yagi is all you need to work other hams through the repeater on the space station.

ISS Cross Band Fun

Speaking about "anywhere in the world," the International Space Station continues to be a sensation in back yards and school rooms across the country, and around the world. The students can see it in the sky at dawn and dusk a couple times per month.

Students can *hear* the space station's packet transmissions easily, day or night, during a pass overhead, or a fleeting few seconds on a low elevation pass, every single day!

APRS packet is easily heard during a pass on 145.825 MHz, FM. APRS will also let you see who else is on, plus see the space station's ID, with a mobile radio or handheld with APRS message readouts. You can try and see yourself on APRS, through the space station, on SIMPLEX, 145.825.

Radio reception of the space station is easy, as the station is in a low earth orbit, up 230 to 290 miles in the thermosphere. It travels around our globe 15 times per day, at a speed of 17,000 miles per hour. The website <heavens-above.com> gives you lots of data on when it will travel over your station at dawn or dusk, when you can see it, and during the day or dead of night to actually hear it, and easily work it. Be sure and log into this fabulous site, to set your latitude and longitude when you first sign up for this free program. If you don't log in, the program will show your viewing position halfway around the world! You must log in to get the most of the website!

Now the fun and easy part about the on-board cross-band repeater. You will need a 2-band or dual-band 2-meter/440-MHz radio for this. Or splurge and use two radios, one for the VHF uplink, and one for the UHF downlink. The cheapest of HTs will easily hear and maybe work the space station.

If you have never tuned in to the space station with your FM handheld or mobile transceiver, here is how to get started. First, find a pass, day or night, with the Heavens-Above website. Again, make sure you are logged in with your approximate latitude and longitude location, and click on "ALL" for passes, not just visible. This site will first give you visible passes, at dawn or dusk. You want ALL of the passes during day and night, so check the "ALL" box that gives you every pass for your location. Next step, monitor 145.825 for the sound of packet, during a pass in your area. This will confirm you understand the <heavens-above.com> passes, a very few visible, but a lot more during daylight, not visible. Again, be sure you ask for all passes each time you sign in. With those instructions, you'll have heard the APRS digipeater signal on a 60-degree pass. Your HT rubber antenna and mobile whip or a base station antenna will hear it fine on 2 meters VHF.

Now it is time to hear the UHF cross band repeater output chatter, and the exchange of grid square numbers, and brief transmissions from hams, out as far as 1,000 miles away. First, check for a pass that will have an elevation of at least 25 degrees above the horizon. Tune to the ISS downlink UHF

Photo D: Schools are regularly scheduled to talk to the astronauts through the ARISS program – Amateur Radio on the International Space Station.

frequency. Downlink 437.800 MHz, +/- 10 kHz, or plink 145.990 with a tone of 67 Hz, APRS 145.825. Set your dual band radio for 5 kHz steps.

As the space station is just coming up at 17,000 MPH, Doppler shift will cause its UHF signal to be 10 kHz higher than when it is overhead. So first tune in 10 kHz higher as the ISS is coming up from the horizon, like 437.810 MHz (Photo B), then a minute later 437.805 MHz, then another minute later, 437.800 MHz at its peak elevation. When it begins to pass away from you, you will dial *down* in 5 kHz steps, like 437.795 MHz. So get several passes under your belt, hearing a single signal on UHF FM channel with lots of voices and their grid squares or city names.

When you look up the passes at <heavens-above.com>, and see one near overhead real late at night (when QRM is asleep), dial your HT or mobile to 2 meters, 145.990 MHz, with a 67 Hz CTCSS tone when transmitting. No Doppler shift needed for transmit on the 2-meter band.

Make sure your radio is transmitting on VHF, with tone encode ON, and your rig is *listening* to UHF. Double check you have your transmit tone encoding set at 67 Hz. Again, make sure you are transmitting on the 2 meter uplink frequency 145.990 MHz, T for tone on.

"WBX XXX , Delta Mike 13, listening". Then unkey. Wow, you could hear yourself going through the International Space Station.

"WBX XXX, this is Tony, KX XXX Dallas. Good copy 73"

"KX XXX SAN DIEGO, THANKS Tony....WBX XXX listening"

Then stand by for other stations wanting to work you, but let other hams share the fun, too – so don't hog the single space station channel, and don't hog this 4 or 5 minute pass! During evening passes, the receive frequency around 437.800 MHz is *packed* with signals. Hams are home from work, and want to hear their own echoes. Lots of stations doubling! You might get through and hear your own signal come back via cross band from the space station, if you are on a mobile VHF 50-watt rig.

Vertical fixed antennas will detect a sharp drop in signal strength when the space station is overhead. This is because tall multi-section vertical antennas have a sharp null off the tip end.

On a handheld, keep rotating your HT for best reception, sometimes horizontal!

A handheld Yagi directional antenna (Photo C) will make a big difference on uplinking with a handheld to the ISS on VHF. And to hear the ISS downlink on UHF, the signal will be so strong, a rubber duck antenna will be fine to get started!

After the pass, log in to <www.ariss.usa.org>. This will give you the Amateur Radio International Space Station news. Become a regular cross band communicator, using any simple FM dual band rig, and support ARISS with a donation for all they do to keep our hobby relevant to kids and school demos!

If there is a school demo planned in your area (Photo D), the ISS will pause the cross-band mode for the school contact, and you can eavesdrop on the ISS talk-back at 145.800 MHz.

Remember, the space station does the cross band repeating, so you don't need to own a cross band HT.

Again, get started with just a small HT with a rubber duck antenna, tune in 145.825 MHz to hear packet from the ISS when it is within "view," and then listen to voices on 437.800 +/- 10 kHz.

The Heavens-Above site also has maps to show the ISS footprint for cross band coverage of each pass.

Best DX from your little HT to the International Space Station, and to hams in its cross-band footprint!

learning curve

BY RON OCHU, KOØZ

Playing With Meteors

Summer is here! HF bands continue to provide DX contacts. Ole Sol keeps things interesting, ionospherically speaking, with periodic intense solar flares, CMEs, and increasingly higher solar indices as we continue towards Cycle 25's solar maximum. Occasionally, HF DX may temporarily suffer with disturbed ionospheric conditions over polar paths. Conversely, VHF propagation may improve with auroral propagation and tropospheric ducting. Accurately predicting HF and VHF propagation openings becomes tricky in terms of timing. When will these solar/ionospheric interactions occur? And will they have any impact on a contest weekend? Sometimes, HF bands of interest will not be open. Whenever the bands, HF or VHF, are not open locally, this could be a good time to go to the bench to work on a project. Or if you're more in the mood to relax in a comfortable chair to pursue your ham radio interests, then why not grab a good radio magazine or book?

May I Suggest?

If inclining to recline is more to your liking, and you're looking for a good ham radio book, may I suggest taking some time to read an entertaining, excellent, newly-released *CQ* publication, "Playing With Meteors, Exploring the Universe, With Amateur Radio" by Eric Nichols, KL7AJ (Photo A). Despite the title, Eric's book is not a primer on meteor scatter propagation; rather, it's the author's exploration of the importance of ham radio, its relevance to society in general, and people who become ham radio operators. Simply put, it's the author's hope that before the reader even finishes reading his book, he or she (if not already licensed) will feel compelled to join ham radio's ranks. It is an entertaining and non-technical book I just couldn't put down! I looked forward to discovering what each upcoming page offered. In my opinion, both newbies and experienced ham radio operators will benefit from Eric's observations and his perceptions in his latest book.

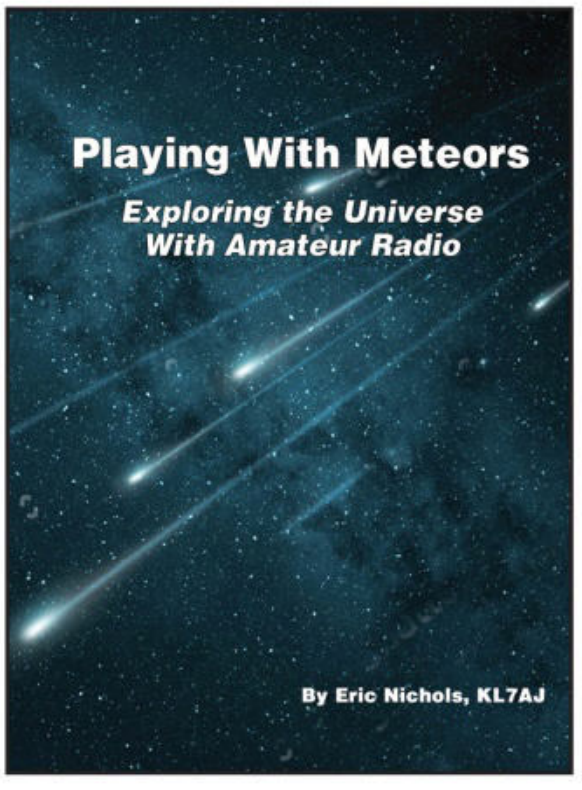

Photo A: Cover photo of Eric Nichols, KL7AJ's, latest book, "Playing With Meteors - Exploring the Universe With Amateur Radio"

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

Because You Can

Nichols asks readers, "Why would anyone become an amateur radio operator in the 21st century? Of what practical value is amateur radio?" Especially today, almost everyone has worldwide communications available to them. Generations X, Y, and Z communicate throughout the world and make friends via social media and various gaming platforms. Zoom allows us to connect with audio and video via the internet. For non-radio amateurs, it's not too much of a stretch for them to wonder what ham radio has to offer them, that they don't already have with cell phones and the internet? Even more so when you consider all this is available without having to earn a license. An interesting question, *n'est-ce pas*? A question I am sure all of us have encountered from time to time.

An interesting question indeed, and one that Nichols addresses in his book's introduction. "The simplest, perhaps *dumbest* answer would be, 'because you can'." He continues by pointing out, "countless human endeavors with no practical value are partaken in for no other reason than that they are possible: fly fishing, rock climbing, frag racing, bungee jumping, breaking boards with your forehead, etc." Good points to be sure, but best of all, he figuratively compares amateur radio to a technological baby. One never knows what ham radio is going to grow up into. Ham radio is over 100 years old – yet it continues to reinvent itself with new technologies that build upon the older ones! Nichols offers, "Think about any technology that you use [on] a daily basis … almost without exception it was first explored on amateur radio." He further notes, before cell phones existed, radio amateurs pioneered and proliferated autopatch on repeaters. I, personally, entered into ham radio during the autopatch era. "Older hams" – do you remember club meeting debates as to whether or not it was permissible under FCC rules to call a tow-truck via the autopatch if your car broke down? Would the FCC consider that call a business transaction? Back then, a lot of hams joined a radio club for autopatch privileges. Today, cell phones have replaced autopatches. Still, ham radio clubs persevered, and they still exist! Nichols further points out the radio and television broadcasting began as amateur radio activities. Even the internet itself is an outgrowth of ham radio involvement. According to the author, "Amateur radio has always been, and it will continue to be, a steppingstone into a technological or scientific career." Furthermore, Nichols continues, "There is no better way to learn countless avenues of science and technology than amateur radio." I totally agree! My personal involvement with ham radio allows me to explore the physical sciences. Getting into amateur radio and staying involved with it only requires willingness to learn and to be involved.

Staying Involved

Learning and staying involved with ham radio isn't the exclusive domain of getting on the air or reading scientific, technical literature. Although, I described "Playing With Meteors" as a non-technical book, that's not to say this book does not include technical concepts. Quite the contrary. Skillfully woven and written, technical concepts such as electromagnetic spectra, motivation, radio as a window to the universe, a brief history of radio, DC to Daylight, the scientific hobby of radio, maker culture, natural radio signals such as whistlers,

radio propagation and the impact of computers with radios unfold throughout the book in each subsequent chapter.

Personal Touch

Every writer strives to pen a page turner. Nichols accomplishes this precisely because his writing style is relaxed, entertaining, informative, and often humorous. Throughout his book, Eric gives readers personal glimpses into his ham radio life by narrating key moments. For example, in chapter two, "What is an Amateur?", Eric writes about playing neighborhood soccer in fourth grade with "shirts" and "skins" being their only uniforms, having a lot of fun and it only cost them a few skinned knees and egos. "There were no soccer moms. Just kids who liked kicking balls around and getting our noggins knocked in from time to time. Totally unorganized, unsubsidized, and uncompromised. Purely amateur." Therein lies Nichols' premise sustaining ham radio; namely, it purely being *amateur*. He goes on to reminisce, "We played with radios…or things that remotely resembled radios. We built scary-looking contraptions that either emitted or received radio waves of various sorts. We didn't spend a lot of time considering the legality of some of this thing called amateur radio. (The statute of limitations has long since lapsed on our miscreant radio activities, but nevertheless, don't tell anyone!)." He continues, "For the most part, they were motivated by insatiable curiosity, something that seems to be in somewhat short supply with many of our youth, despite the instant availability of all kinds of amazing widgets. But this is the very definition of an amateur, someone who pursues some activity for the pure pleasure of pursuing it." Reading this passage, I discovered Nichols was describing me as a youth, and unless I miss my mark, I bet he is describing you as well! I can relate. We can relate.

Not a Passing Fancy

Like Nichols' description of youths with insatiable curiosity, I was drawn to amateur radio. I saved my money, and my first rig was a Johnson Viking II transmitter and a Hallicrafters SX-111 receiver. At first, my parents thought my ham radio interest was a passing fancy. I wasn't able to get their permission to erect a dipole on top of our roof or to run coax cable into my bedroom. Instead, I would put up a dipole between two trees in the backyard and I would put a wooden door on concrete blocks to serve as a table. I would set up my transmitter and receiver and operate well into the night when weather allowed. My ham radio buddies would politely joke about my makeshift QTH by saying, "Every day is Field Day for you!" I was young

Photo B: A household telephone jack for a phone line's twisted pair of wires. (Photos B-F from Wikimedia Commons)

and I didn't mind the additional hassle. It didn't matter because I was on the air! Eventually, my parents gave me permission to finally erect a roof mounted dipole and to run coax inside. That was so long ago, but to this very day, thousands of QSOs later, I still get a thrill communicating wirelessly and meeting new people. By the way, and for the record, I don't miss the nighttime insect bites!

Wireless

I loved the notion of communicating with someone without the need for wires. When I was a kid, a telephone needed wires (Photo B) and it certainly wasn't portable like today's cell phones. As a kid growing up in the sixties, my dad worked part-time for a drive-in theater (remember those?) as an attendant and he had a walkie talkie. He'd let me chat with other radio equipped attendants working at the drive-in and that began my love affair with two-way communications. I bet you can guess what I wanted to get for my birthday. Back in the day, walkie-talkies transmitted and received on the CB band. Like many "senior hams" today, I had my start in two-way radio communications with CB. However, I also recall building a crystal radio receiver for the AM broadcast band. Later, I came across short wave radio broadcasts, collecting QSLs, and ham radio! Listening to ham radio operators communicate with each other around the world was pure excitement. Instead of just listening, ham radio allowed me to initiate a QSO! I made up my mind to earn a ham radio license and to get in on the fun. I left CB and never looked back. I was and I still am enamored with everything ham radio.

Enamored With Science

In chapter six of his book, Nichols shares with us some of his boyhood memories of growing up near the 2-mile-long Stanford Linear Accelerator in Silicon Valley and its nurturing environment for an inquisitive "radio nerd!" He realizes that not every budding radio amateur grows up with the resources offered in Silicon Valley, but he does realize, "anyone, anywhere can be a radio amateur! Amateur radio is still the most accessible pathway to a career or hobby in science." From my own personal experience, I most definitely agree with him! Throughout my tenure as a ham radio operator, I have met many influential individuals. Some of them are famous, but all of them mak-

Photo C: Aerial view of the particle accelerator at Fermilab outside of Chicago.

Photo D: The Very Large Array radiotelescope located outside of Socorro, New Mexico.

Photo E: Microwave Update Conference was held at Morehead State University in Morehead, Kentucky.

Photo F: One of radio station WWV's omnidirectional HF antennas near Ft. Collins, Colorado.

ing meaningful contributions. Some are astronauts, some are engineers, and others are scientists. Because ham radio stimulated my overall interest in science, I've toured the Fermilab near Chicago (Photo C), toured the Very Large Array near Socorro, New Mexico (Photo D), and attended a conference at a NASA deep space radio telescope at Morehead State University in Kentucky (Photo E), just to name a few remarkable locations. While on vacation, the family and I made it part of our itinerary to see United States National Institute of Standards and Technology radio station WWV (Photo F) near Ft. Collins, Colorado.

Ionospheric Stories

One of the things I like most about Nichols's book is the personal narratives that relate his professional experiences with his amateur radio ones. A case in point is the author's professional involvement with scientific, ionospheric research with HIPAS (High Power Auroral Stimulation) and HAARP (High-frequency Active Auroral Research Program). The research done at these observatories indicates our ionosphere can act like a frequency mixer, a signal generator, or even an amplifier. The author points out this research employs RF power levels far exceeding amateur radio power levels; nonetheless, radio amateurs provided and continue to provide countless diagnostic functions requiring minimal or no transmitter power. Ham radio is alive and well and it continues to contribute to science. One group that actively promotes this is the Ham Radio Science Citizen Initiative, or HamSCI. Check out HamSCI at <https://hamsci.org/> for yourself! (*Also see a report on this spring's HamSCI workshop elsewhere in this issue. – ed.*)

Nothing Left

I could go on and on sharing my favorite passages and insights into Nichols's book, but then I'd be guilty of robbing you, my readers, of your own discoveries with this intriguing book by leaving nothing left for you. A big takeaway for me is the many pathways ham radio offers us. I've told my ham radio students, "Ham radio will open many doors for you and offer you new horizons." This insight isn't only for amateur radio. When I taught literature, one of my lessons would be to ask my students to listen to a piece of classical music. I told them that instead of words and sentences, the instruments would tell a story. To bait their interest, I told them a major motion picture used the classical piece. Their job was to listen to the music, write down whatever emotion(s) they heard and how those perceived emotions contributed to the story's plot. I can assure you many a teenage eyebrow was raised with this lesson! I bet them that their paragraphs would be more similar than different. The piece I used was the composer John William's theme song for the motion picture "Apollo 13." Generally, the gals heard a story of romance, excitement, emotional turmoil, hardship, and eventually romantic equilibrium. Gents tended to hear a thrilling adventure, daring, challenges, battle, reversal of fate, perseverance, and overcoming adversity. Who was correct? Well, both! In the context of the movie, the astronauts looked forward to liftoff, they were excited riding the Saturn V rocket on its battle to overcome Earth's gravity, only to have an engine failure, but persevering to an orbital equilibrium. Metaphorically, the same is true with our collective ham radio experiences.

Reminiscence and Perspective

It's fun to reminisce and to gain perspective through sharing each other's insights into amateur radio. Our past shapes our present and our present becomes our future. Storytelling, whether in oral or written form, is still the way we learn. There is still so much to learn, so much to discover, so much to share.

Thank you for reading *CQ* and I hope to hear you on the air with your story to share. 73, Ron KOØZ.

the ham notebook

TEXT AND PHOTOS BY WAYNE YOSHIDA*, KH6WZ

The Wonderful World of Surplus - Revisited

I am lucky to live near the world famous "TRW Swap Meet" – it's something I have visited since my teenage years. The location is actually the Northrop-Grumman campus in Redondo Beach, California, but most folks around the world know it by the original name, TRW. More formally, it is called the W6TRW Amateur Radio Club Swap Meet. See <https://tinyurl.com/mrybxc8x>.

Since COVID restrictions have been lifted, I started going back to this event, seeing old friends and buying useful or interesting things. As I have said many times regarding surplus materiel, I almost never buy something for what it is, but rather for what it can become.

I must add one thing that I feel very strongly about: If your purchase turns out to be defective, please do not sell it to someone else without disclosing its true condition. Sometimes a non-functioning piece of gear is exactly what the buyer wants or needs, especially if the item is rare and difficult to find. An example of this would be a collector of a certain radio who may be looking for a mechanical parts or hardware, such as knobs and enclosure or chassis pieces, or components or sub-assemblies inside.

Over the years I have found many extraordinary treasures, and there is usually a great story behind each of these discoveries. I have several examples of these finds below.

Photo A: This Collins R-388/URR receiver is a classic collectable. Although not rare, it certainly looks nice and clean.

Going on a Surplus Safari: Wonderful Old Radio Sets and Components

As equipment technology evolves and advances, finished products become obsolete and are scrapped or disposed of in another way, and are replaced with new systems. Equipment from the 1970s and earlier includes many vacuum tubes, rather than solid state devices inside their cabinets. Some of the advanced sets were a hybrid combination of tubes and solid-state devices. Since many hams tend to keep their equipment for many years, it is not uncommon to see tube gear of some sort, even among the most modern station equipment.

The Collins receiver in Photo A is a good example of a nicely restored tube-based HF transceiver, seen at a local ham radio swap meet. The classic rigs and test gear contain many tubes and no transistors or microprocessors at all.

Some people say that vacuum tubes are difficult to find, but any surplus hunter will tell you this is not true. The box full of tubes seen in Photo B appeared at the same swap meet as the Collins radio mentioned above. The fellow selling these tubes has been coming to the same location every month for many years. I think 50 cents for an un-tested tube and a dollar for a tested and working tube are fairly good prices for replacement parts that may get those classic rigs going again.

Photo B: Vacuum tubes are still available in abundance if you know where to look.

email: <kh6wz@cq-amateur-radio.com>
Linkedin: www.linkedin.com/in/wayneTyoshida

Photo C: A US Army TV-7/U tube tester, purchased on eBay, is a great tool for testing old tubes.

Photo D: A capacitor and inductor tester should be in your tool kit if you build and test your own gear. This unit has been discontinued, but many modern multi-testers include a capacitance function.

Speaking of tubes, you may want to invest in a good tube tester if you have a lot of tubes in your collection. I purchased the military TV-7/U tube tester in Photo C on eBay several years ago. Although I don't use it often, a tube tester is the only tool that can test vacuum tubes. Other tube testers are available; check the websites mentioned in the References section for useful information.

Large air- or vacuum-variable capacitors and inductors, and multi-way, ceramic insulator wafer switches, all very useful for high power RF amplifiers and antenna tuners, are also frequently available as surplus, either as "new old stock" (NOS) or used. Many modern versions of these components are not the same as these precision devices. These units are easily inspected, since a "bad" one would show visible signs of arching or corrosion.

A capacitor tester, such as the one shown in Photo D, can verify capacitor and inductor operation, and an ohmmeter can verify whether or not switch contacts are working. Photo E shows an early stage in another restoration project, a Heathkit IT-28 capacitor checker. Although it is in pretty good shape as-is, I decided to un-build it and turn it back into a kit. I love the "magic eye" tube on the front panel and am looking forward to putting it into use.

Speaking of old parts and restoration projects, I use an ultrasonic cleaner, filled with a weak solution of Krud-Kutter and water, to make parts sparkle like new. Other cleaning detergents can be used but avoid using corrosive cleaning agents when washing electronic parts and aluminum pieces in the ultrasonic cleaner.

Amazingly Exotic Items

In some cases, converting surplus equipment is the only way to get on the air, such as microwave and millimeter wave station gear. Although kits and finished products to access these bands are available, they are not complete stations that can be put on the air right out of the box. Additional modules are necessary, such as transmit-receive change-over relays, reference frequency oscillators, and other assemblies. In addition, parts for these bands are extremely expensive if purchased new, if they can be found at all in small (one each) quantities.

Low loss cable assemblies and specialized connectors, RF relays, waveguide, and waveguide assemblies are just a few types of components needed to construct a microwave ham radio station.

Once one establishes a viable microwave band station at the one-watt level, a reasonable station upgrade would be to increase power. This requires transmit-receive sequencing, and a waveguide (rather than a coax cable) type relay. Just like vacuum tubes, some folks say waveguide relays are difficult to find, but a good microwave surplus hunter can find them at reasonable prices. A nice example of a surplus WR-90 waveguide relay can be seen in Photo F.

The 24-GHz solid state amplifier, shown in Photo G, is one of my best surplus-derived items. Simply unavailable several years ago, even as surplus, solid state, microwave, and millimeter-wave amplifiers in the 1-watt to 10-watt or more range are becoming available on the surplus market worldwide. This will definitely improve microwave frequency contest scores as hams discover and integrate high power into their systems.

Now take a look at Photo H. I found this large and heavy piece of surplus

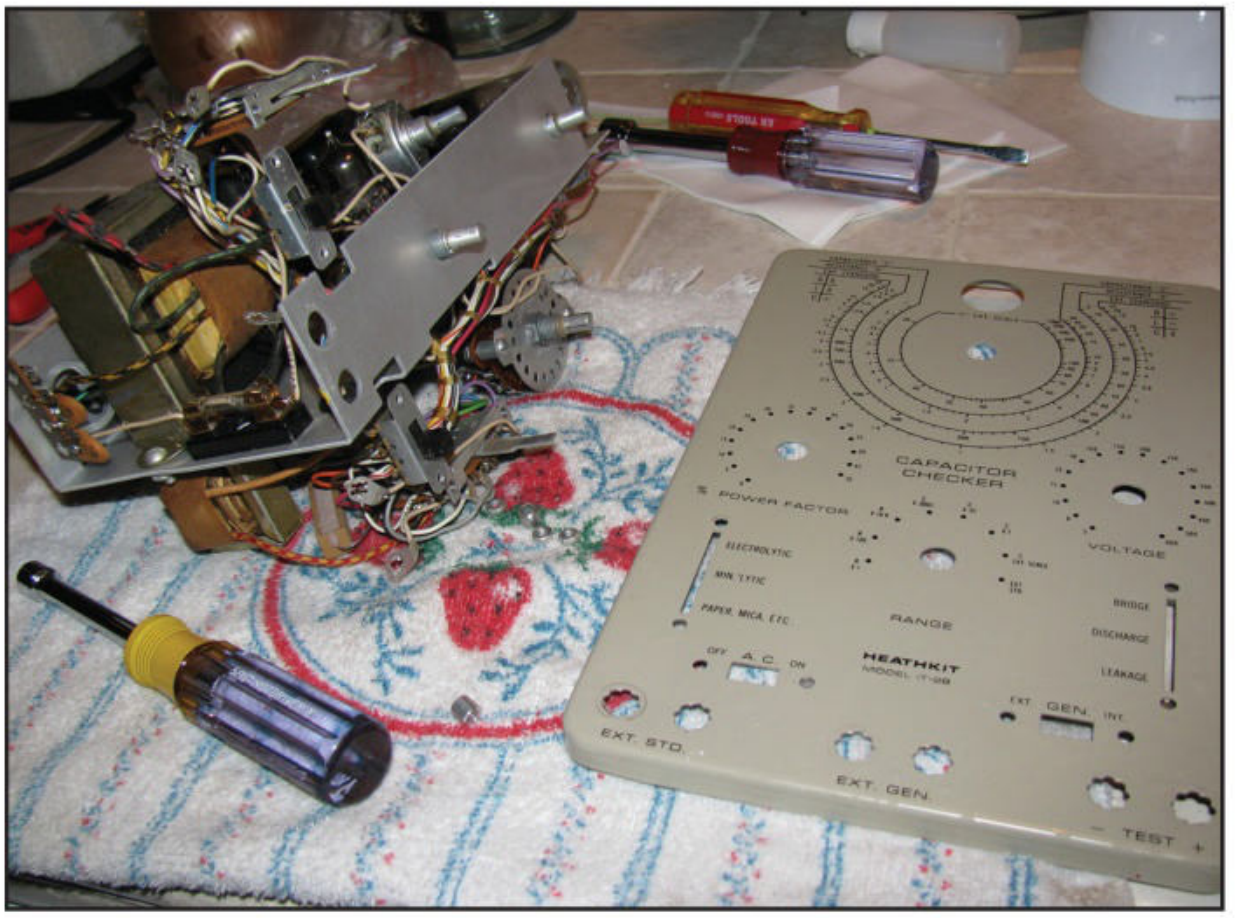

Photo E: I am restoring a vintage Heathkit capacitor checker. It should be a nice addition to my workbench.

test gear at a local industrial surplus store near my office one day. The price tag indicated it was $350. As you can see, the front panel is labeled "Microwave Noise Test Set" and drew my attention immediately. To me, $350 is a lot of money to spend on something in an unknown condition, and with a nothing-back guarantee. I peeked inside the cabinet, and to my surprise and delight, saw that the unit was not only very clean, it contained a whole lot of 10 GHz parts and assemblies. This was the first and so far, only time I violated my rule about buying an item I did not fully understand. However, in this case, I assessed what I could identify, and it was a great deal.

I asked a store employee about the unit, and he said it had just come in, and the $350 is just a suggested selling price. Trying to contain my excitement as best as I could, I offered $200 for the item, and he accepted the deal. It is truly an incredible find. Of course, the next step was to figure out how to get it home in my small coupe. I dragged the giant box out of the store and placed it onto the passenger seat and used the safety belt to secure it into place.

After examining my new Microwave Noise Test Set and admiring the construction, I began to take it apart. The unit included Simpson panel meters, two microwave detector assemblies, a multi-voltage power supply, six waveguide relays, and many cable and waveguide pieces.

Test Equipment

Surplus is not limited to parts. Perhaps the best deals in electronic surplus are the test instruments used for RF work, such as reference frequency standards, spectrum analyzers, signal generators, and frequency counters, especially units rated for use in the micro- and millimeter wave region. Other test instruments such as oscilloscopes and function generators are also great values on the surplus and used equipment market.

Here is a simple, but often overlooked thing to check for on just about all frequency-related test instruments – many instruments have a switch on the rear panel to select either an internal or external frequency reference source. If the "INT/EXT" switch is in the "EXT" position, the unit will not function properly. Flipping the switch to the "INT" position may "fix" a non-operating unit.

I have at least one friend who saw this on a very nice frequency counter, but the seller was not able to make the unit work, and so he was selling the unit in "Powers up, but as-is, no guarantees, non-functioning." The price was very good, especially since the unit was not working when the seller plugged it in.

When he got the unit home, he flipped the switch to the "INT" position, and the unit was fully functional.

Photo I shows the treasures I found at my most recent trip to the TRW swap meet. The temperature controllers will be turned into nice cabinets for my next

behind the bylines...

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

Ron Wilcox, KF7ZN ("Forging Amateur-Professional Bonds," p. 32), has been a ham twice! Originally licensed in 1984, he let his license lapse and then returned to the fold 30 years later, in 2014. He is currently vice president of the Utah DX Association, an active volunteer examiner and a member of both the ARRL and HamSCI speakers' bureaus. Ron has had a widely varied career, from mining underground while in college, to a long career in telecommunications and now, as a Registered Nurse Case Manager. Two of his sons are also hams.

Guy Immega, VA7GI ("A Cosmic Dance With the Ionosphere," p. 42), returned to ham radio in 2015 after a 45-year absence. Before his retirement, he ran a company that designed autonomous robots for the International Space Station. Guy is currently a science fiction author. His latest novel, "Super-Earth Mother", was published last month by Amazon.

Bob Allphin, K4UEE (Guest DX Editor, p. 78), is one of the most accomplished DXpeditioners of our time. He has led, co-led or participated in expeditions to eleven of the "top-ten" most-wanted DX entities and participated in eleven "DXpeditions of the Year." Bob is a member of the CQ DX Hall of Fame, past chairman of the ARRL DX Advisory Committee and is on the board of INDEXA, the International DX Association. According to his <www.QRZ.com> page, he has visited 131 different DX entities and operated from 85 of them.

microwave or Maker Faire projects. The vintage VIZ Senior VoltOhmyst (vacuum tube voltmeter or VTVM), complete with probes, is nice and clean. Even the power cord is fine and does not need replacement. There is no evidence of battery leakage inside. And best of all, it works. The big analog meter will be a great instrument to put on display at the next Maker Faire.

As communications and radio technology advance in the commercial and other markets, including government and military services, hams have a great opportunity to obtain, convert and adapt such equipment for use on the ham bands. This is one of ham radio's oldest and greatest traditions, and it is great to see this materiel going back into service in ham shacks rather than the landfill.

73, Wayne KH6WZ

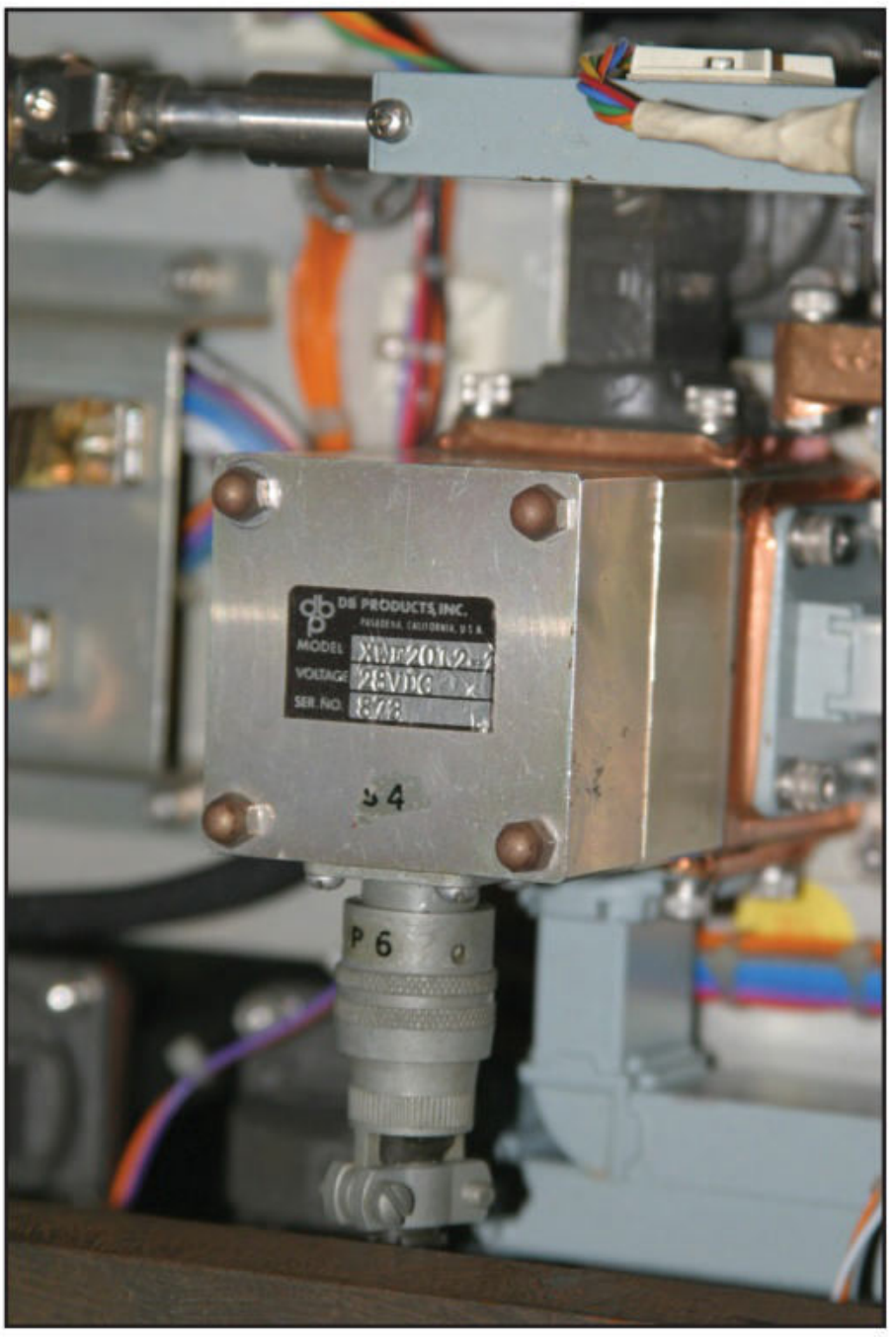

Photo F: One of the best places to find various microwave cables, connectors and waveguide is the surplus market. This WR-90 waveguide relay will be included in my next 10 GHz transverter system.

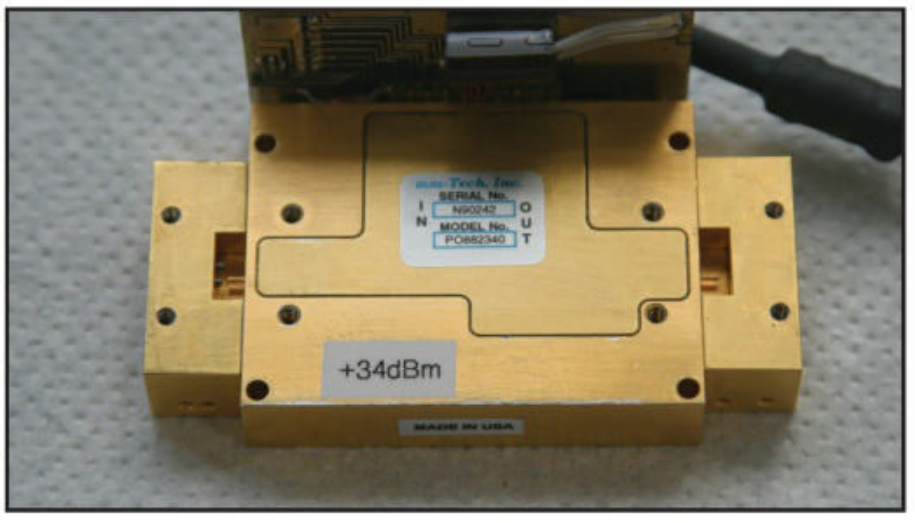

Photo G: This 24 GHz solid state amplifier is another example of a great surplus find.

Photo H: This "Microwave Noise Test Set," filled with tons of 10 GHz components and assemblies, is another one of my most amazing surplus discoveries.

Photo I: A look at some of the treasures I picked up at the swap meet. The Senior VoltOhmyst is a well-known, classic instrument. The giant meter will look nice at the next Maker Faire.

digital connection

BY DON ROTOLO,* N2IRZ

A Revamped Radio for Higher-Speed Packet

The Yaesu FTM-3100R goes under the knife

Just a year ago, in the July 2022 issue of *CQ*, I detailed what it takes to convert the Kenwood TK-762G to run 9600 baud packet. Since then, I've found the performance to be somewhat less than ideal. Oh, it works, but you need a stronger-than-average signal for reasonable performance. My conclusion is that even the 'wide' IF filtering is just a bit too narrow. I've since relegated these radios to run 2400 baud IL2P which really delivers excellent performance, especially for the price.

Continuing my search for radios to run 9k6, I found the Yaesu FTM-3100R, the little sister of the (now discontinued) FTM-3200DR C4FM digital voice transceiver, minus the digital voice capabilities. Built on what appears to be the exact same main circuit board, this 2-meter radio features true FM, 65 watts of RF and is designed to run higher-speed packet, with minor modification. The specifications are available on the Yaesu website at <https://tinyurl.com/FTM-3100R>. Released back in 2016, the FTM-3100R is not on Yaesu's list of models to be discontinued any time soon.

Being fortunate enough to live just a few minutes from the local Ham Radio Outlet (HRO) store in Atlanta, I went for a visit and bought two FTM-3100Rs for about $150 each, HRO's standard selling price <https://tinyurl.com/y2wn9uky>. Certainly not as inexpensive as those old Kenwoods, but still within reason, particularly for what they can do.

The first step towards voiding the generous 3-year warranty from Yaesu was to make sure both radios worked. I did not buy a programming cable, but with the excellent front-panel programming ability of the FTM-3100R, it turns out I really didn't need one. After a few minutes poking at the owner's manual, it was easy to set up the radio for packet. This included setting the desired frequency as the 'home channel', resetting the time-out-timer to 1 minute, and changing the power-on display to show my callsign. While in the menu mode, I also verified that the CTCSS subtones and Digital-Coded Squelch (DCS) were off, the wide IF filtering was active, and the repeater shift was set to simplex.

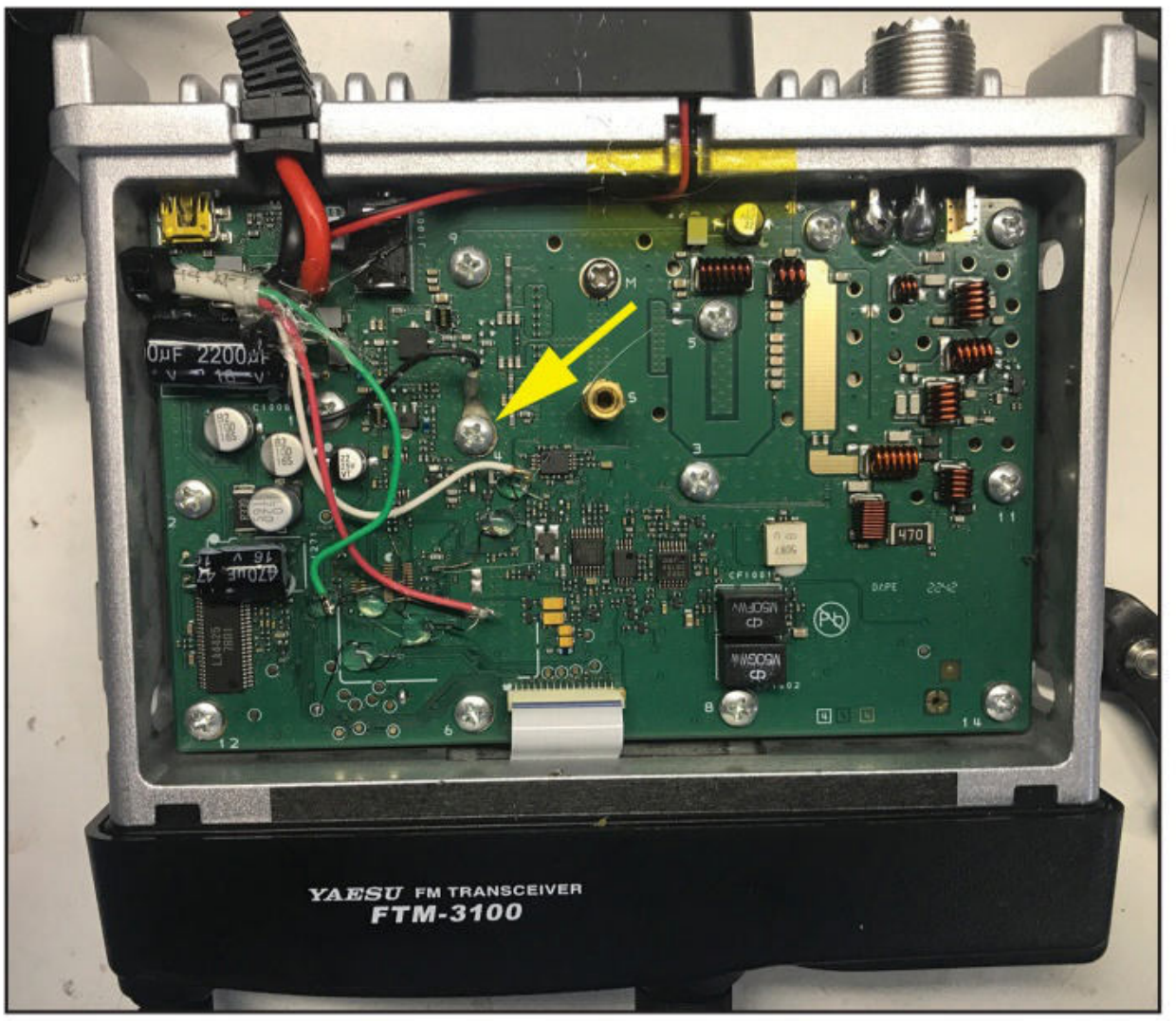

Photo A: The Yaesu FTM-3100R, my latest victim, after its recent surgery. The arrow points to the screw I used for the ground connection, and you can see the locations of the other connection points in Photos C and D.

Following instructions from Nino Carillo, KK4HEJ (of NinoTNC fame) on the TARPN website <https://tinyurl.com/TARPN-Yaesu-mod>, I opened up the radio and located the specified signal pick-off points (TXA, RXA, PTT, and Ground), which are all conveniently found on the top of the main board. Trust me, you do *not* want to have to access the bottom of this board.

To get the radio cover off, I removed the three screws and unclipped one side from the metal tabs on the side. The cover then lifted off. While this alone didn't void the warranty, these next few steps probably did.

Ground was the easy part, as it is found all over the radio – I picked it off from the screw highlighted in Photo A. PTT comes from a somewhat small but manageable gold-plated test point. Both TXA and RXA were supposed to come from specific vias, which are tiny plated-through holes in the circuit board used to pass signals from the top to the bottom and vice-versa. The original instructions called for removal of the green solder mask from each via and soldering to the little ring of exposed copper. I started with RXA.

My first attempt did not go well. I did manage to get a piece of solid 24 AWG telephone wire soldered to the via, but almost immediately tore it off (along with the copper circuit board trace), as seen in Photo B, which actually looks worse in person. And I was being extremely careful, as that via is only

*c/o CQ magazine
Email : <N2IRZ@cq-amateur-radio.com>

about 20 thousandths of an inch wide. The problem is that the signal comes up from the bottom of the board through this via, and now that I'd destroyed its connection to its plated-through hole, I was completely screwed. Thinking about that now-gone generous 3-year warranty and my clumsy hands, I put everything off for a night to think on it more carefully.

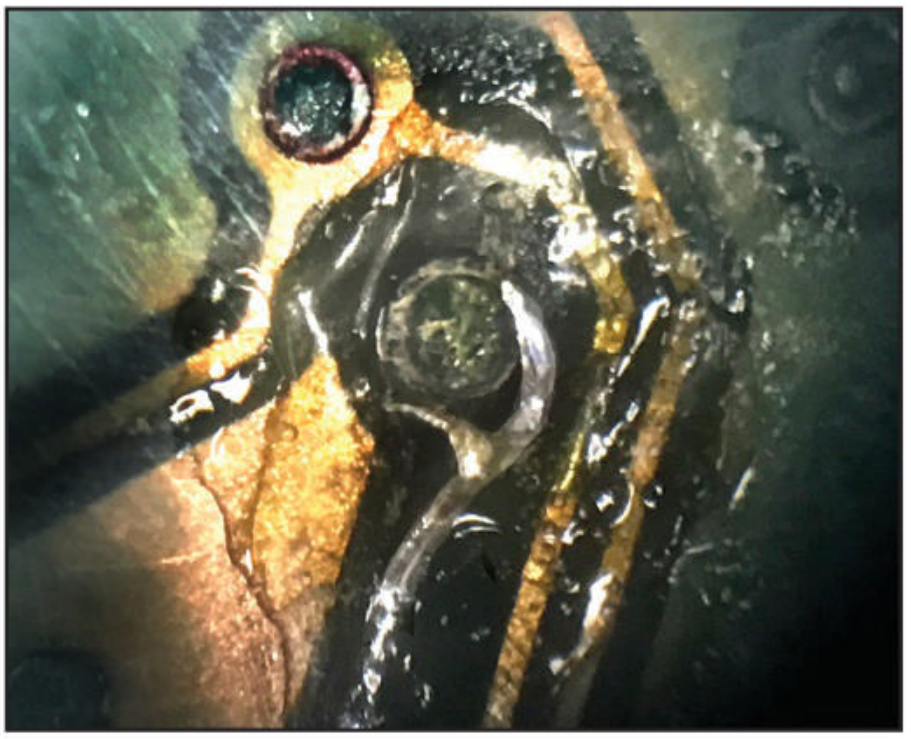

Photo B: This via pad carries the receive audio (RXA) signal directly from the radio's discriminator circuit out to the TNC. Despite extreme care and my 20x stereo microscope, this trace was badly damaged in the attempt, being broken and lifted from the board.

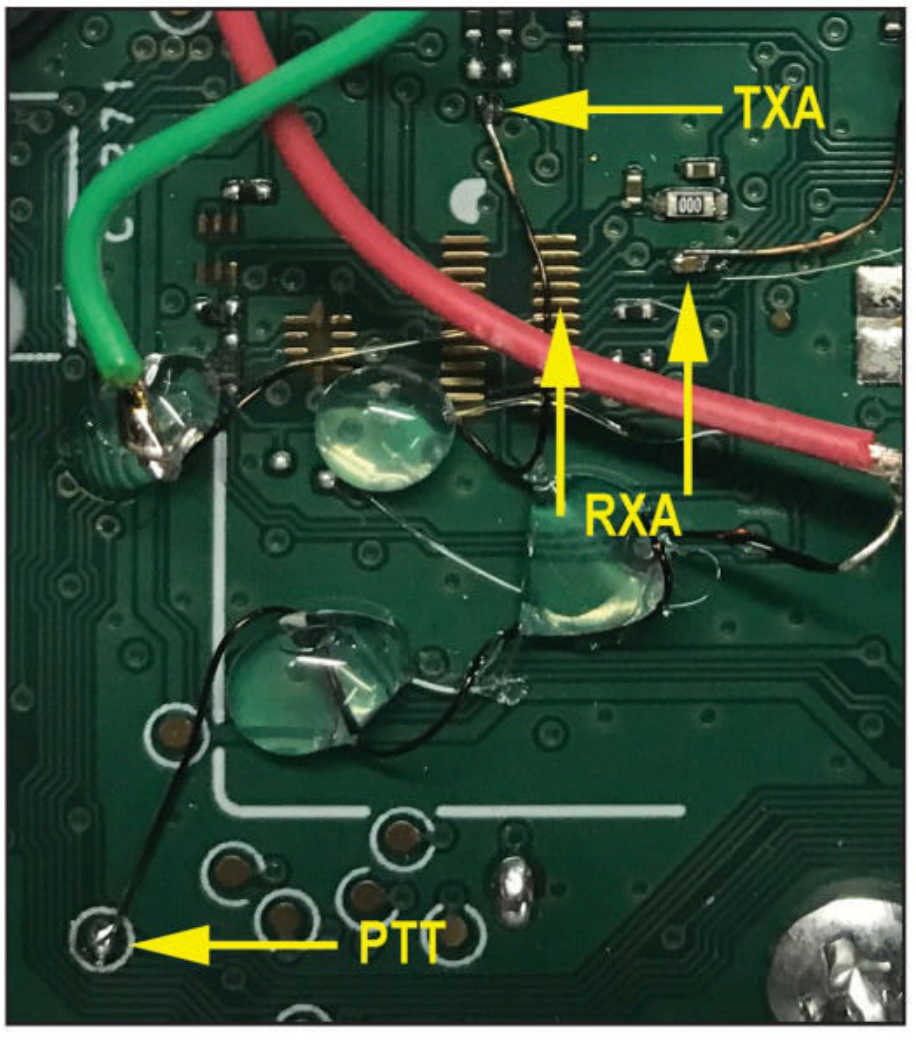

Photo C: A close-up view of the signal pick-off points. At top is TXA, taken from an unused pad for Q1051, center is RXA which can be either on the right side of C1353 or (if you bridge C1353 to short it out) the unused pad at pin 10 of J1006, and at the bottom PTT on TP1018. See Photo A for the ground point.

The next morning, with some coffee under my belt, I got a copy of the service manual (Yaesu sells them) to research my options. To make a long story short, I first identified a different location where I could still get that RXA signal despite the damage I caused. Then I came up with a completely new plan.

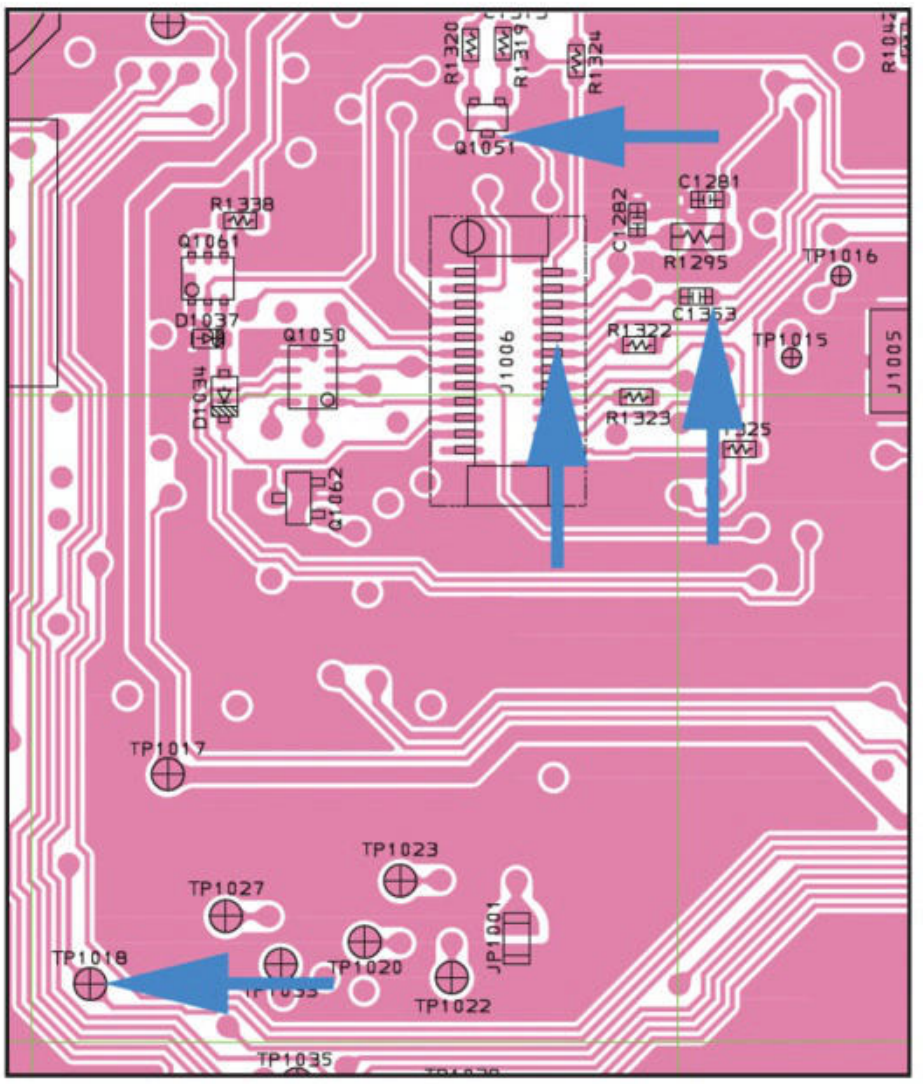

Photo D: The same view as Photo C, showing the circuit board component placement.

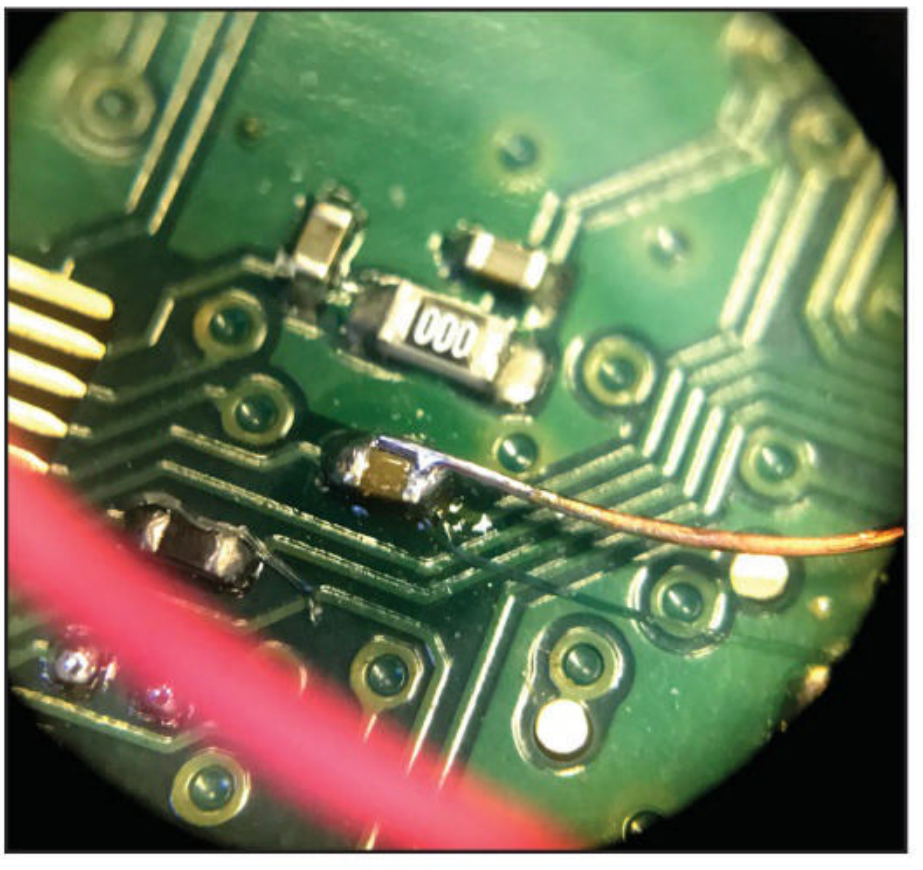

Photo E: A super close-up of my work at C1353 to pick off RXA, as seen through my 20x microscope. To understand the scale, consider that the 30 AWG wire seen is only 10 thousandths of an inch (0.010) wide.

Photo F: Some of the equipment I used to make the modification. Most important for me was the 20x stereo microscope, since the components are very small. If you are not experienced in surface-mount repair or rework, or don't have the right equipment, you should consider finding someone who can help.

The first thing was to find more robust connection points for RXA and TXA. After poring over the circuit board layout and schematic, and looking through my 20x stereo microscope, I found them, not far from the originally recommended locations. These are shown in Photos C and D.

To connect to these extremely tiny spots on the circuit board, the plan is to use very fine wires to make the circuit board connections, then solder these to the much larger stranded wires leading out of the radio to the TNC connector. I ended up using 30 AWG magnet wire that I had in the shop, although 30 AWG wire-wrap wire would also be a good choice, and easier to strip. I used a sharp blade to scrape off the magnet wire varnish, then learned that my butane torch and some fine steel wool worked better.

My process was to first strip and tin both ends of the fine wire, clip one end to leave about 1/16" of exposed wire, and use hot-melt glue to fasten each wire's midpoint to the circuit board. I positioned the wires to be able to reach the needed contact spot without getting in each other's way. With the glue cooled and hardened, I carefully bent the free end of the wire to rest on the signal contact point without my having to hold it there. It may take a little fiddling but the wire is stiff enough to make it work. Get this right and the soldering is far easier.

Using my temperature-controlled soldering iron with a needle tip, I added a speck of solder and heat to the connection point and quickly connected the wire to the board. It sounds easy, but in fact was quite a challenge. My first attempt used a 1/16" chisel tip for the soldering iron, and this turned out to

Photo G: The soldering tip on the left was far easier to use than the one on the right.

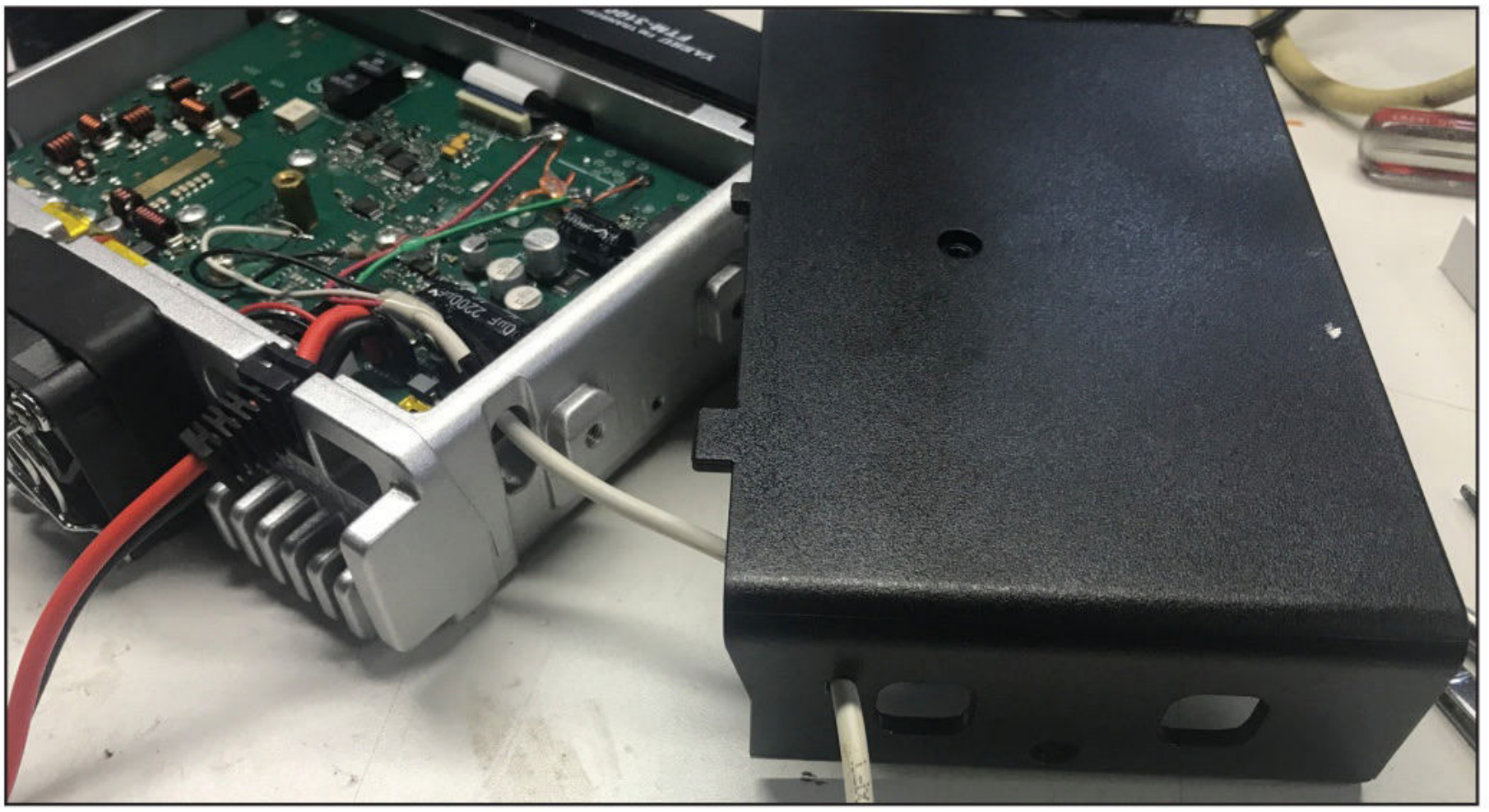

Photo H: Getting the wiring outside the radio case was actually quite easy: The hole in the plastic cover does not need to be precisely located, and is inconspicuous if you decide to undo the modification.

be way too large. Switching to the very fine needle tip made it easier, since now the tip was roughly the same size as the point being soldered. Even then, it was absolutely essential to have steady hands and a 20x magnifier (see Photo E).

I write this not to scare you, but to help you understand reality: These components are often the size of the period at the end of this sentence. Your unmagnified vision is simply not good enough to do this fine work, and neither is your typical soldering iron. Just a few seconds of excess heat on the board will lift off the copper and leave you with a fairly costly paperweight. If you have no experience with, and equipment for, SMD rework or repair, find someone who does. Some of the equipment I used is shown in Photos F and G.

Once the board connections are made, the other ends are soldered to the 24 AWG (or so) stranded four-conductor cable that will eventually connect out of the radio to the TNC. Don't use solid wire for this, as it will eventually break. A CAT-5 jumper cable has eight stranded wires in it (you need only four), or you can easily get something suitable elsewhere. Fasten this 4-conductor wire to the board with hot glue and run it through the hole in the side of the chassis, as seen in Photo H. I drilled a 3/16" hole in the plastic cover and carefully aligned things when reassembling the radio, including adding a zip-tie inside the radio case to provide strain relief. I did verify that the radio still worked normally before putting the screws back in.

I won't get into the TNC interface as I did with the Kenwoods, as this is really a function of the TNC. I expect to put these radios into service with NinoTNCs as I work to gain momentum for a TARPN network in Atlanta. I'm not quite there, but I'm not yet discouraged.

As I write this, Hamvention is just a few weeks away, and I hope it all goes well. I expect to scour the flea market for bargains and things I can write about for you. As always, If you think of something, drop me a line.

Vy 73, Don N2IRZ

vhf plus

BY TRENT FLEMING,* N4DTF

Talking With Rob Sherwood, NCØB

Plus a Surprise Encounter with MEARS

There exists a courtesy and camaraderie in ham radio that, at least for me, makes the hobby much more enjoyable. So many of our fellow hams have developed expertise in select areas of the hobby, and almost without exception are willing to share. Likewise, anyone at the other end of a QSO will have much in common with you, because of the shared experiences and interests that led both of you to an interest in ham radio, electronics, and related matters. This month, I am relying on the kindness of one of those hams who has developed great expertise in matters involving the performance of our beloved transceivers, to share with you some thoughts about overall shack performance.

One of the Ham Radio Workbench Podcast episodes that I've listened to a couple of times is the interview with Rob Sherwood, NCØB, on receiver performance. Watch his interview at <https://tinyurl.com/mr2w7u62>. As you may know, Rob, through Sherwood Engineering, has developed a reputation as an unbiased evaluator of receivers, and offers plenty of information at <http://www.sherweng.com>. Recently, Rob was kind enough to spend some time with me to discuss matters specific to the VHF and above spectrum.

Before talking to Rob, I viewed, at his suggestion, a presentation he did for a European group, the Sutton & Cheam Radio Society, viewable at <https://tinyurl.com/44ej78bh>. I took a lot of notes and developed some questions from both this presentation and his interview on Ham Radio Workbench podcast. A couple of things really stood out, so let's address them first. I asked Rob about improvements in newer rigs with VHF capabilities. Rob mentioned (and he's got the numbers to prove it) that there has been minimal improvement in VHF and above transceivers over the last 30 years. The

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Photo A: New operating position for N4DTF.

primary new rig to consider is Icom's IC-9700. According to Rob, functionally, the 9700 is a much better radio than its predecessors. It has more features, including the excellent band scope that makes hunting for weak signal contacts a lot easier. But in terms of dynamic range, an important measure of receiver quality, there's been no real improvement. Rob believes that using newer HF rigs, especially SDR-based units, with transverters is a much better solution. This is similar to the advice we received recently from Mike Walker at Flex Systems.

Another "wow" moment for me was Rob's assertion that the so-called "brick" amplifiers often used for VHF and above are not very clean on SSB transmit. According to Rob, the FM/SSB switch on these units only changes the time constant – how fast the amp drops out, not the linearity. The result can be tremendous splatter on your signal, whether digital or voice, so pay attention to what the output on your particular device looks like. Overall, tube amps still are much preferred for high power on VHF and above, although some of the newer solid-state amps will certainly do a good job, though not with their full rated power. Again, monitoring your output, both with test equipment and via reports from the "other end" of your QSO, is important.

I think (I certainly hope) that many of us are concerned with improving our stations. New radios and antennas are certainly the most fun to attend to, but it is often the details that help us to ensure the cleanest, strongest signal possible, both on receive and transmit. Feedlines are extremely important. Last month, I included some comments from David Buckwalter, K3SK, regarding his experience with various feedlines. The key here is to use the best components you can. The higher in frequency, the more important line loss is ... but why settle for any more loss than you must? Starting with 6 meters and up, work on installing the best feedline you can. Sherwood actually recommends hardline for all transmission lines. There is, of course, a cost associated with this, as well as the difficulty of working with stiffer cabling, but in the end the quality of the signal and the longevity of the materials will pay dividends.

I pressed for more detail on areas to address in improving your station. Often, a VHF-plus setup includes your radio, a transverter, an amplifier, an antenna switch, and perhaps a preamp in line. All these connections serve as potential points of failure. Rob made sure that I knew that using adapters on cables (converting that SO-239 to an N connector for example) introduced a lot of loss into your transmission line. After talking with Rob I gathered up all those adapters and put them away in a drawer for emergencies. I'm now in the market for jumpers with N connectors built in. He also recommends using "full sized" coax for your jumpers, sized like

Photo B: New workspace for N4DTF showing IC-9100 undergoing 432 MHz connector repair.

RG8, rather than the thinner coax that may be more attractive for short runs. One never has to look far for a real life example of the importance of each link in your transmission line. While I was working on this column, a friend inquired about borrowing a wattmeter suitable for 2 meters. Seems his transmission on FM was a bit flaky, an issue that I and others had noticed when he attempted to check in to our simplex net. He wanted to be sure that his existing wattmeter was accurately measuring power and not a part of the problem. Ultimately, he was able to trace the fault to a short jumper that connected his radio to an antenna switch. By the way, his wattmeter was working fine. Remember that every part of your transmission line presents a point of failure, and periodic review of their performance is an important part of maintaining a quality signal.

Finally, we discussed noise in the shack. I know that a lot of you, like me, have eliminated many, if not all, of your "wall wart" power supplies in favor of direct connections, via connection busses, to a more stable, less noisy power supply. This is a worthy effort. Rob mentioned that he has replaced his Cat 5 wiring for networking with fiber optic cable, to reduce router birdies and protect equipment from EMP type noise and damage. While this may not be something you do all at once, it is certainly worth considering. The complexity of equipment in our shacks can certainly lead to more noise.

Rob is a veritable fount of knowledge on all things amateur, and especially in the categories of receiver and transmitter performance. I am grateful for his time and expertise, and I encourage you to look into his work and try to improve your own station. In the coming months, I will write about more of the conversation I had with Rob, including some of my efforts to implement his suggestions.

In the Shack at N4DTF

As I've mentioned a couple of times, I'm doing some rearranging in the two-car garage that serves as office, workshop, and ham shack (Photo A). I've gotten all my radio equipment back in place and am enjoying having a larger operating desk. I've also oriented the desk and my radios so that I have permanent access to the rear of the equipment without moving things around. This was accomplished by leaving an "alley" between the operating desk and some bookshelves. Changing cables, or adding devices, has never been easier. I've also begun repopulating my working spaces with test equipment and power supplies and already have a project back on the workbench. Photo A shows my operating position, and Photo B shows one of my workspaces with a project on it. The 432 MHz connector on my 9100 was damaged when someone (?) tried to insert PL-259 connector into it (Photo B). So a new chassis mount N female is on the way from W5SWL.

ON THE AIR – Operating Awards

I'm pleased to report that Dana Shtun, VE3DS, has received VUCC #177 on 222 MHz. Dana is a regular on 222 and other VHF plus bands, and operates from FN03. Congratulations, Dana!

Howard Reynolds, WA3EOQ, reports that he's just had his QSLs counted/confirmed for 222 MHz, and also earned his VUCC on that band. According to Howard, his own grid, FM09, was the last card needed!

2M FM Simplex

On the evening of April 27, I was in a hotel in Abington, Virginia, doing what we consultants call "homework" to be prepared for meetings the next day. I had my Kenwood TH-D74 scanning the 2 meter band, and heard traffic on simplex frequencies, specifically 146.535. This caught my attention because, as you may remember, my local simplex group here in the Memphis area runs a net every evening at 7:30 p.m. local time on that same frequency.

As I stopped the scanning and listened, it was clear that a net was also in progress on this frequency. A number of hams from the Mountain Empire Amateur Radio Society (great name, huh?) hold a simplex net at 8:00 p.m. local time on the fourth Thursday of every month.

On this evening, Travis Dyson, KB4TAD, was close enough to my hotel to hear me direct and relay me to the net. I subsequently traded emails with Travis and several others. I also copied Shane Tilson, KN4RBS, and Bob Walker, KX4DX's, callsigns during that night. The group was friendly and welcoming and I enjoyed getting to participate in their net. Dyson reported that many in the group monitor 146.52 regularly, so if you find yourself along Interstate 81 in southwestern Virginia, put out a call and see who comes back. Find out more about MEARS at <https://www.swvamears.net>.

April brought some enhanced solar activity that resulted in spectacular aurora, both in terms of visible aurora and RF enhancement.

(More) Aurora

April brought some enhanced solar activity that resulted in spectacular aurora, both in terms of visible aurora and RF enhancement. Our friend Paul Kelley, N1BUG, reported on the activity of Sunday evening, April 23 (local time) from his QTH in FN55. The following is courtesy of Paul, from the NEWSVHF email reflector:

Bz went strongly southward (to better than -30) after 0100Z. It took a while for aurora to rebuild since we would have been in the natural evening weakness in the auroral oval around that time, but eventually it got going. I made a couple of QSOs on 6, three on 2 and 7 on 222! Best distance on 222 was not spectacular: K9MRI in EN70. But after such a long dry spell I will take anything I can get! It appeared to peak around 0300-0400Z but the drop off after that may have been just a lack of stations being on the air. I didn't try 432 since I only have 25 watts there.

It was also fun working K8RYU in EM99 on 2. My last QSO with him was in 2003, also on aurora. It sure was fun and I will be hoping for more!

Paul added some technical notes on his equipment:

*The good news is my 222 [MHz] stuff is working as it should. So is the 6 meter stuff. The 2 meter amp, however, is down to 900 watts for reasons unknown. I have never had what one might call a comfortable relationship with that amp. I am a tetrode guy. That is the first triode amp I have had in decades. I always seem to be at odds with it, as it wants to run very high grid current and low plate current when tuned for decent power out and reasonable efficiency. I don't *think* it's a bad tube as it will easily do 1.2 amps plate current under different loading conditions. Perhaps I am just not driving it hard enough with the available driver, or I am not tuning it correctly. Nevertheless it was previously managing 1200-1300W so something seems to have changed recently.*

That's it for this month. Keep me posted on your operating activities and projects.

awards

BY STEVE MOLO,* KI4KWR

Two Brand New Indonesian Awards Hitting the World Stage

Hamvention in Dayton, Ohio, is the best when it comes to awards to announce or pass along to the *CQ* audience. For the five days I was at the 2023 show, at least three times a day someone would provide me with an award from around the world that could be the next challenge for those who chase "wallpaper."

This month I will cover two from Indonesia, with one being a challenge for sure. The first is **Worked Indonesia Via Satellite** and all information is directly from the sponsoring Indonesian Islands Hunters Group (IIHG) webpage (Photo A). The rules are as follows (for all current information, go to <https://iihg.net/portfolio/wis-award>):

1. Award of Worked Indonesia via Satellite is issued to Radio Amateurs/SWL worldwide that can prove to have made 2-way radio contacts / heard with stations of Radio Amateurs situated on the Indonesian territory using amateur radio satellite.
2. All QSOs must be done on or after July 9, 1968.
3. must have made the QSOs /HRDs from same DXCC Entity.
4. Domestic and foreign operators operating portable such as YC2YIZ/0 or YB6/E21EJC are also valid.
5. Contact 10 stations working from Indonesia in 10 different call areas, using any amateur radio satellites.
6. Special Event Station of Indonesia (such as 7A~7I, 8A~8I, etc.) who worked on satellite communication can be used to replace missing call area. 1 SES for applicant from YB, and 2 SES for applicant from DX.
7. Same operator active from different call area will be counted as different stations. Example: YB8RW, YB8RW/5 and YB8RW/9 are different stations.
8. Different design of Worked Indonesia via Satellite will be issued to Radio Amateurs/SWL who are able to contact/hear 10 call areas of Indonesia using SAME one satellite only, such as IO-86, AO-91, SO-50.

Photo A: From the Indonesian Islands Hunters Group (IIHG) website, the cover image for the Worked Indonesia Via Satellite award.

YB YL Award

The second award is a Young Lady (YL) award for solely working YLs, the Indonesia YL Award (Photo B). Just as with the first award, the information is taken directly from the website at <https://tinyurl.com/4njn4m7n>. Something I have started to observe more frequently is the possibility of older awards getting updated and refreshed, so I strive to provide the most updated information possible.

Indonesia YL Award Rules

1. The Indonesia YL Award is issued to Radio Amateurs/SWL worldwide that can prove to have made 2-way radio contacts / heard in **Amateur HF bands** with stations of Radio Amateurs situated on the Indonesian territory.
2. All QSOs must be done on or after July 9, 1968.
3. Applicants must have made the QSOs /HRDs from same DXCC Entity.
4. Domestic and foreign operators operating portable such as YD1NAA/5 or YB7/JP3AYQ are also valid.
5. DX Station : Contact 5 YL stations working from Indonesia.
6. Indonesia (YB) station: Contact 5 YL stations working from Indonesia in different 5 call areas.
7. Special Event Station of Indonesia's Mother Day and Kartini Day are also recognized as YL stations, and can be used for joker of missed call area.

Photo B: From the IIHG website, the cover image for the Indonesia YL Award.

8. Same operator active from different places will be counted as different stations. Example: YD1NAA, YD1NAA/5 and YD1NAA/p are different stations.
9. Different design of Indonesia YL Awards will be issued to Radio Amateurs/SWL who are able to contact/hear 10, 15, and 20 YL stations working from Indonesia.

Application instructions for both awards may be found on their respective pages on the IIHG website.

New Awards

If you know of a new award in your area that could use a worldwide announcement, please pass it along. The next few months will be new awards that have been passed along to me via Hamvention and several other engagements I attended this year that I never heard of or simply are brand new. Now is the time to use Solar Cycle 25 to our advantage and add some wallpaper to the shack for a few QSOs. Good luck and see you on the air!!

Email: <KI4KWR@cq-amateur-radio.com>

BY BOB SCHENCK,* N2OO

HK0NA Malpelo Island DXpedition 2012

A Record Breaker and a Great Example of International Cooperation!

BY BOB ALLPHIN,# K4UEE

Greetings fellow DXers! This month, I asked my old friend Bob Allphin, K4UEE, to introduce a look back to the 2012 HK0NA Malpelo Island DXpedition. We included a very nice somewhat edited article on HK0NA originally written for the INDEXA newsletter by Steve Wright ,VE7CT. I hope you enjoy this look back at one of the more awesome efforts made in DXpedition history! Enjoy!! – N2OO

You may be wondering why I would choose this DXpedition as one of my very favorites. After all, I have been lucky enough to be involved in eleven DXCC "top ten-ers" over the last 30 years, but this one really sticks out!

This DXpedition to Malpelo was special in many ways. First, it fell into my lap. In 2010, I attended the SEDXC (Southeastern DX Club) Christmas party and met a visitor from Colombia, Bolmar Aguilar, HK1MW. He was attending as the guest of another member. During the evening we talked about DXpeditioning (what else?).

He said he had a good friend in Colombia who was planning a DXpedition to Malpelo Island. Of course, I was immediately intrigued because HK0/M had been on my radar for years since it was currently ranked DXCC #12 most wanted. He asked if I was available to assist him in his efforts. Fortunately, I was between projects, and I immediately agreed to join them.

I would need help and I contacted Gregg Marco, W6IZT, and George Nicholson, N4GRN (my go-to guys in Atlanta), and in October 2011, we attended a full planning meeting in Barranquilla, Colombia. The three of us each made presentations as part of the team and new co-leaders. We met with Colombian members of the team and other guests. Several important decisions were made. First, safety would be paramount. And, because we had a good chance of setting a new QSO record, we would establish two operating sites, including one at the top of the mountain. The team would be expanded to 20 members. More radios, more power, more antennas, and more funding support would be needed. Lastly, an advance team would go early to the island to set up the QTH infrastructure, antennas, power, and radios, etc.

Photo A: Sal Gechem, HK1T, one of the Fabulous Four, upon arrival! (All photos courtesy of the HK0NA team, via K4UEE)

Responsibilities were assigned … the Colombian team members led by DXpedition leader Jorge Prieto, HK1R, would oversee all arrangements in Colombia including permits, transportation, a recon trip, and finally sending a team to the island to set up the camp infrastructure, two operating sites, antennas, generators, sleeping tents, etc. This would allow the rest of the team to begin operating almost immediately.

This was perfect from our standpoint. A lot of the demanding work was already done or in process. And we had recruited top-notch teams, acquired radios, amps, antennas, and funding many times before. So, this was going to be a "piece of cake." And to the man, the Colombian guys were all nice guys and easy to work with. We rapidly became compadres. It was explained to us that being a compadre was a step above being called an amigo!

Recently-acquired equipment was shipped to Colombia. Then in November of 2011, three of the HKs spent six days in Malpelo to assess the challenge. While there, the small contingent of Colombian Marines stationed on the island showed them how to climb to the top of the mountain. No previous DXpedition had ever operated from that location. As a result, Japan, Pacific and

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email: <k4uee@comcast.net>

Photo B: Bob Allphin, K4UEE, climbing to the Op A position (with a little help!)

west coast USA that previously had difficulty making QSOs would finally get a good opportunity.

Christmas Day, 2011, the advance team, whom we dubbed "The Fabulous Four" – Bolmar, HK1MW; Jim, HK1N; Sal Gechem, HK1T, and Faber Mosquera, HK6F – were transported to the island by the Colombian Navy. They expected to be there for about 6 weeks total. Upon arrival, Navy personnel and a contingent of Colombian Marines on the island helped move everything and everyone up the steep, 60-degree, 300-foot incline to the base camp which we would call OP B. For the next nearly three weeks, they established the camp infrastructure and set up the two operating sites with six KW stations at OP B and four 100W stations at the top of the island. OP A was another 650 feet above the main camp – not an easy task. They also rigged climbing ropes to assist the remainder of the team upon arrival.

We knew that this DXpedition would be strenuous and difficult due to the almost vertical terrain. Lots of climbing in addition to the normal rigors of a DXpedition. This was not going to be so easy after all!

To tell the entire story and for you to get a different slant from another team member, my very good compadre, Steve Wright, VE7CT, has allowed me to use excerpts from a fabulous article he wrote just after the HK0NA DXpedition and published to all INDEXA

The WPX Program

CW

4090 ..... VE4GH
4091 ..... K5BRY

SSB

4488 ..... NA6MB
4489 ..... IZ7VII
4490 ..... DK7MM

Mixed

4611 ..... VA7USD
4612 ..... KK7ME
4613 ..... NA6MB
4614 ..... IZ7VII
4615 ..... HB9GVF
4616 ..... N5YT
4617 ..... KI5QPZ
4618 ..... KG5SSW
4619 ..... AD2AG
4620 ..... WD4ETU
4621 ..... W6MEW
4622 ..... LU6XQB

Digital

1943 ..... AJ4NN
1944 ..... VA7USD
1945 ..... KK7ME
1946 ..... NA6MB
1947 ..... AD2AG
1948 ..... JA3LVJ
1949 ..... N5YT
1950 ..... NØJDK
1951 ..... KN6RSY
1952 ..... KI5QPZ
1953 ..... KFØFTC

CW: 700 KB4DE. 1100 JH7CUO. 2100 HB9DHG

SSB: 350 K4NWX. 400 IZ7VII. 550 NA6MB. 1200 HB9DHG. 1300 ISØHXK. 1600 EA3EQT

Mixed: 450 IZ7VII, KI5QPZ, AD2AG. 550 VA7USD, K1EHT, W6MEW. 600 KK7ME, KFØFBK, KA1SAW. 650 KIØHA. 700 KB4DE. 850 NR6AM. 950 K4NWX. 1000 IU1HGN. 1050 N2YU. 1100 LU6XQB. 1200 W5BR. 1250 KM4VI. 1300 NA6MB, VK3PIA. 1350 NA5WH. 1500 JH7CUO. 2150 PU4MMZ. 2200 EA3EQT. 2850 HB9DHG. 4000 KB1EFS. 7350 IK6DLK

Digital: 450 K1EHT, KI5QPZ, KFØFTC, AD2AG. 500 VA7USD, KIØHA. 550 AJ4NN, W6MEW. 600 KK7ME, KFØFBK. 700 K4NWX. 800 NR6AM. 900 N2YU, JK1BIB. 1050 NA6MB, IU1HGN. 1100 LU6XQB. 1150 W5BR. 1300 VK3PIA. 1350 NA5WH. 1400 JA7PKV. 1950 HB9DHG. 2250 EA3EQT. 3100 KB1EFS

40 Meters: NA6MB, K1EHT, AD2AG, VK3PIA, W6MEW, HB9DHG
30 Meters: NR6AM, HB9DHG
20 Meters: VA7USD, NA6MB, JA7PKV, AD2AG, W6MEW, HB9DHG
17 Meters: NA6MB, ISØHXK, JK1BIB, KM4VI, HB9DHG
15 Meters: NA6MB, ISØHXK, JK1BIB, HB9DHG
10 Meters: KK7ME, NA6MB, NR6AM, VK3PIA

Africa: ISØHXK, HB9DHG
Asia: NA6MB, ISØHXK, JA3LVJ, NA5WH, HB9GVF, KIØHA. W6MEW, LU6XQB
Europe: AJ4NN, KK7ME, NA6MB, IZ7VII, JK1BIB, K1EHT, HB9GVF, KIØHA, KB4DE, KFØFTC, AD2AG, WD4ETU, LU6XQB
Oceania: NA6MB, AA8SW, JA3LVJ, NR6AM, W5UJ
North America: AJ4NN, VA7USD, KK7ME, NA6MB, VE4GH, K5BRY, AD2AG, K1EHT, KN6RSY, KI5QPZ, KIØHA, KG5SSW, KFØFTC, AD2AG, W6MEW, LU6XQB, HB9DHG, K4NWX
South America: NA6MB, NR6AM, JH7CUO, HB9DHG

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.

members in 2012 [*edited for space and reprinted here with permission from INDEXA (<www.indexa.org>) – ed.*]. Here it is:

Malpelo Island—Mind Over Mountain

BY STEVE WRIGHT, VE7CT

It was sheer accident that upon hearing of a proposed DXpedition to Malpelo Island in 2012, via 'The Weekly DX' publication that I decided to investigate via the internet to see who was involved. To my surprise, two of my friends' faces appeared as part of the team that originally was comprised of the Jumanji Contest Club of Colombia; Bob Allphin, K4UEE, and Gregg Marco, W6IZT, both previous DXpedition companions.

I immediately e-mailed Bob (with whom I had been on four DXpeditions in the past) to ask rather indignantly why I had not been apprised of this situation and (in a humbler manner) should the team be expanded for any reason that I be considered as a potential member of the team. 'Of course' said Bob, as if he were planning it all along.

That's where it all started and due to the very nature of Malpelo Island and the difficulties to be faced, it was decided that indeed the team should be expanded (at considerably more cost, of course) so that an all-out attempt be made to reduce the 'wanted status' throughout the world from #12 to 'off-the-charts' such that there would be no further requests for expeditions to the powers that be for many years to come.

In October of 2011, three members of the Colombian Contest Club headed by

CQ DX Awards Program

RTTY Endorsement

N9PA 89

Mixed Mode Endorsement

K8SIX 245

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, 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.

The WAZ Program

SINGLE BAND WAZ

6 Meter

215 .....ZL1RS 31 Zones
216 .....JH1NYM 27 Zones
217 .....F8CRS 25 Zones

10 Meter CW

226 .....ZL3CW
227 .....JA1GRM

10 Meter Digital

9 .....W7AH
10 .....K3EA
11 .....JA4FCV

12 Meter CW

117 .....AA6AA

12 Meter Digital

17 .....N5AO

15 Meter Digital

23 .....BD4VGZ
24 .....JA1GRM
25 .....K0DEQ
26 .....SP6TRX

15 Meter SSB

692 .....K0DEQ

17 Meter CW

145 .....SP6TRX

17 Meter Digital

43 .....JA7FVA
44 .....JA1GRM
45 .....N5AO
46 .....JF8QNF

20 Meter CW

695 .....N7TY
696 .....LZ3DX
697 .....NS3L
698 .....JF8QNF

20 Meter Digital

81 .....N0OB
82 .....JR3PKO
83 .....K4PKM
84 .....EA3AGY
85 .....OD5YA
86 .....LU1BDR
87 .....JF8QNF

30 Meter Digital

27 .....W1OPD
28 .....K0DEQ
29 .....N5AO

40 Meter CW

344 .....JA3RAR
345 .....N7TY

40 Meter Digital

33 .....OD5YA
34 .....SP6TRX
35 .....JF8QNF

80 Meter DIGITAL

8 .....JF8QNF

ALL BAND WAZ

CW

1261 .....KK7L
1262 .....JH1NYM
1263 .....W4TV
1264 .....W2KA
1265 .....IE2GAO
1266 .....OH2IS

Digital

487 .....N3NVA
488 .....WX3P
489 .....JA7FVA
490 .....N7TY
491 .....BD4VGZ
492 .....KC1RET
493 .....K1BJC
494 .....JH1NYM
495 .....AG5CN
496 .....KE7BMG
497 .....JR3PKO
498 .....K0TC
499 .....KB1FX
500 .....W4TV
501 .....AA8KY
502 .....VA2CY
503 .....JE2BSJ
504 .....N5MB
505 .....EA3AGY
506 .....K4MVM
507 .....JE3FOR

Mixed

10511 .....N5UWY
10512 .....W6ST
10513 .....K0JQZ
10514 .....VA3CW
10515 .....GM0SCA
10516 .....WE8L
10517 .....N7MGW
10518 .....LU9OZX
10519 .....N3NVA
10520 .....W9FG
10521 .....WS4C
10522 .....BD4VGZ
10523 .....N3QQ
10524 .....KC1RET
10525 .....DL8TV
10526 .....SP3JZI
10527 .....IK7LKK
10528 .....ND2O
10529 .....JH1NYM
10530 .....KE7BMG
10531 .....JR3PKO
10532 .....OM0ST
10533 .....OK1NYD
10534 .....W4TV
10535 .....TI2WMP
10536 .....W2KA
10537 .....N9MT
10538 .....F4HHL
10539 .....JE2BSJ
10540 .....N3ND
10541 .....N5MB
10542 .....EA3AGY
10543 .....G7VKK
10544 .....W4MLN
10545 .....OH2IS
10546 .....K4MVM
10547 .....JE3FOR

SSB

5566 .....K9PSN
5567 .....N3NVA
5568 .....SP3JZI
5569 .....W4TV
5570 .....ON4CHN
5571 .....VK4KX

RTTY

322 .....W4TV

SAT

84 .....SP5ULN 28 Zones
85 .....IW7DOW 30 Zones
86 .....W2GDJ 30 Zones
87 .....VE4AMU 40 Zones

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Jose Castillo, N4BAA. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

Photo C: Gregg Marco, W6IZT (top), and Jerry Rosalius, WB9Z (closest), with an avian friend.

Jorge Prieto, HK1R, were given the opportunity of visiting Malpelo Island courtesy of the Colombian Navy in order to determine whether it was possible to find a way to the top of one of the three peaks as well to see for themselves the facilities that had been offered to them concerning utilizing one of the two buildings used by the Navy Marine garrison. They were shown a route up to the top of the peak on which a shipping beacon was located and subsequently determined that it was indeed possible to set up a small station.

After being invited to join the Colombian team (no doubt due to his

5 Band WAZ

As of May 15, 2023
2505 stations have attained at least the 150 Zone level, and **1144** stations have attained the 200 Zone level.

As of May 15, 2023
The top contenders for 5 Band WAZ (Zones needed on 80 or other if indicated):
CHANGES shown in **BOLD**

Callsign	Zones	Zones Needed
AJ9C	199	23
AK8A	199	17
DF2GH	199	31
DM5EE	199	1
EA5RM	199	1
EA7GF	199	1
H44MS	199	34
HAØHW	199	1
HA5AGS	199	1
I5REA	199	31
IKØXBX	199	19 on 10M
IK1AOD	199	1
IT9GSF	199	1
IZ3ZNR	199	1
JA1CMD	199	2
JA5IU	199	2
JA7XBG	199	2
JH7CFX	199	2
JI4POR	199	2
JK1BSM	199	2
JK1EXO	199	2
K1LI	199	24
K3LR	199	23
K4HB	199	26
K5TR	199	22
K7UR	199	34
KZ4V	199	26
N3UN	199	18
N4NX	199	26
N4WW	199	26
N4QS	**199**	**18**
N4XR	199	27
N8AA	199	23
N8DX	199	23
N8TR	199	23 on 10M
RA6AX	199	6 on 10M
RU3DX	199	6
RWØLT	199	2 on 40M
RX4HZ	199	13
RZ3EC	199	1 on 40M
S58Q	199	31
SM7BIP	199	31
SP9JZU	199	19 on 10M
USØSY	199	1 on 15M
VE2EBK	199	26
VK3HJ	199	34
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W3LL	199	18 on 10M
W3NO	199	26
W4LI	199	26
W6DN	199	17
W6RKC	199	21
W6TMD	199	34
W9OO	199	18 on 10M
W8CZN	**199**	**24**
W9XY	199	22
ZL3CW	199	34
9A5I	198	1, 16
AB4IQ	198	23, 26
DL6JZ	198	1, 31
EA5BCX	198	27, 39
F5NBU	198	19, 31
F6DAY	198	2 on 10M & 15M
G3KDG	198	1, 12
G3KMQ	198	1, 27
G4OWT	198	1, 27
HB9FMN	198	1 on 80M & 10M
I1EIS	198	1 & 19 on 10M
JA1DM	198	2, 40
JA3GN	198	2 on 80M & 40M
JA7MSQ	198	2 on 80M & 10M
JH1BNC	198	2 on 80M & 10M
JH1EEB	198	2, 33
KØDEQ	198	22, 26
K1BD	198	23, 26
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3WA	198	23,26
K3XA	198	23,34
K4JLD	198	18, 24
K9MM	198	22, 26
KI1G	198	24, 23 on 10M
KZ2I	198	24, 26
LA3MHA	198	31 &32 on 10M
N4GG	198	18, 24
N5AO	**198**	**22, 23**
N7IR	**198**	**17, 22**
NXØI	198	18, 23
ON4CAS	198	1,19
OZ4VW	198	1, 2
RL3FA	198	2 on 80 & 10M
UA4LY	198	6 & 2 on 10M
UN5J	198	2, 7
US7MM	198	2, 6
W5CWQ	198	17, 18
W7AH	198	22, 34
W9RN	198	26, 19 on 40M
WC5N	198	22, 26
WL7E	198	34, 37
Z31RQ	198	1, & 2 on 10M
ZL2AL	198	36, 37

The following have qualified for the basic 5 Band WAZ Award:

Callsign	5BWAZ #	Date	# Zones
N3NVA	2492	04/20/2023	177
IZ0AEG	2493	04/20/2023	200
NO0B	2494	04/23/2023	175
WX3P	2495	04/23/2023	178
JA7FVA	2496	04/23/2023	155
JH1NYM	2497	04/24/2023	195
LZ3DX	2498	04/26/2023	200
OM0ST	2499	05/02/2023	181
W4TV	2500	05/06/2023	192
W2KA	2501	05/07/2023	170
KM3V	2502	05/07/2023	194
OD5YA	2503	05/10/2023	172
JE3FOR	2504	05/14/2023	178
JF8QNF	2505	05/14/2023	200

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
N4QS	2431	12/13/2022	199
W6WF	2213	5/10/2020	171
N7IR	1909	6/13/2015	198
W8CZN	2432	12/17/2022	199
WX3P	2495	4/23/2023	180
N7TY	2098	12/21/2018	196
KN7Y	2274	1/29/2021	184
N5AO	1934	6/2/2016	198
AA8KY	2448	1/29/2023	158
W4JS	2277	2/1/2021	188
N6PM	2254	11/4/202	193
EU3A	2019	5/18/2018	200
WI7P	2476	3/18/2023	180

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

5BWAZ #	Callsign	Date	All 200 #
2493	IZ0AEG	4/20/2023	1141
2498	LZ3DX	4/26/2023	1142
2019	EU3A	5/7/2023	1143
2505	JF8QNF	05/14/2023	1144

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Jose Castillo. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

CQ DX Field Award Honor Roll

The CQ DX Field Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 175 or more grid fields. Honor Roll lisiting is automatic upon approval of an application for 175 or more grid fields. To remain on the CQ DX Field Award Honor Roll, annual updates are required. Updates must be accompanied by an SASE if confirmation is desired. The fee for endorsement stickers is $1.00 each plus SASE. Please make all checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604.

Mixed

K2TQC....288	HA1RW....239	WI8A....219	KF8UN....205	ON4CAS....194	K2SHZ....182
W1CU....269	VE3XN....239	HA1AG....218	OM2VL....205	HB9DDZ....193	KJ6P....180
VE7IG....254	I6T....230	JN3SAC....217	K1NU....204	N4NX....192	W6XK....180
HAØDU....253	K8OOK....229	WA5VGI....216	K1NV....204	HA1ZH....190	W5ODD....177
OM3JW....253	N8PR....229	HA9PP....213	VE7SMP....204	BA4DW....188	NØFW....176
W6OAT....252	HA5AGS....228	IV3GOW....211	RW4NH....203	K2AU....187	WA9PIE....176
HA5WA....250	9A5CY....227	W4UM....210	HB9AAA....200	K8YTO....186	HB9BOS....175
IK1GPG....245	K9YC....227	N4MM....208	N5KE....200	WO7R....185	NKØS....175
OK1ADM....245	VE3ZZ....226	OK1AOV....208	W3LL....199	N3RC....184	
K8SIX....245	KØDEQ....221	F6HMJ....206	NIØC....196	W9RPM....184	

SSB

W1CU....249	VE7SMP....201	W4UM....198	N4MM....189	W3LL....187	DL3DXX....175
W4ABW....202	KØDEQ....198	JN3SAC....192	WA5VGI....189	NØFW....176	

CW

N3RC....326	DL6KVA....233	DL3DXX....210	OK1AOV....198	HB9DZZ....189	N4NX....177
W1CU....254	KØDEQ....214	DL2DXA....209	WA5VGI....197	N4MM....186	N7WO....175
HA5WA....234	JN3SAC....211	W4UM....201	NIØC....196	OK2PO....184	

Digital

W1CU....206	JN3SAC....178	HA5WA....177	KØDEQ....175

RTTY

WK3N....339 ..

reputation not only as an experienced DXpeditioner but also his capabilities as a good fund raiser), Bob decided it would be judicious to fly to Cartegena and meet with the organizers and to take along Gregg Marco, W6IZT, and George Nicholson, N4GRN, to determine the logistics that would be involved in creating a successful DXpedition. There it was decided to expand the team to twenty members. It was also decided that four of the Colombians (subsequently dubbed the Fabulous Four) would depart for Malpelo on Christmas Day to begin assembling antennas and station equipment that had already been shipped to Colombia from the US as well as to install safety lines to assist in climbing up from the shore up to the first staging area where the buildings were located (Op B). In addition, safety lines would be needed for the more dangerous areas on the way up to the mountain peak (Op A). Further attempts to install the antennas at OP A were thwarted by extremely heavy rains between Christmas and up to a week before the team was to arrive on the island. Nevertheless, the Fabulous Four … did a magnificent job while away from their families at a time when family is so important, to pave the way for the rest of the team to 'hit-the-ground-running' and to commence immediate operation.

The late arrivals consisted of team leader HK1R; Pedro Allina, HK3JJH; Pedro Claver Orozco, HK1X; Franz Langner, DJ9ZB; Manu Siebert, LU9ESD; Peter Sprengel, PP5XX; Bob, K4UEE; Gregg, W6IZT; George, N4GRN; Ralph Fedor, K0IR; Glenn Johnson, W0GJ; Jerry Rosalius, WB9Z; Bob Grimmick, N6OX; Gary Stouder, K9SG; Neil King, VA7DX; myself, VE7CT; our photographer, Gustavo Amórtegui, HK3ORE, and of course, Murphy himself! No DXpedition is ever complete without Murphy, who is a close friend of Robby Burns. You know ... 'The best laid plans of mice and men' ...

Photo D: Ready to hit the airwaves! From left, DJ9ZB, HK1R, LU9ESD, and PY5XX.

Our team assembled in Bogota, Colombia on the evening January 18th. The following day saw us all back at the airport to fly to Buenaventura, a port city on the west coast of Colombia where we would board the Sea Wolf to take us to Malpelo Island.

Once in Buenaventura, we checked into the beautiful colonial-type hotel, expecting to leave early the next day, only to be asked to meet at the boat around midnight for a very early morning (4:00 AM) start of our 28-hour trip

to arrive early morning in daylight at Malpelo a day and night later.

Malpelo Island lies some 240 miles off the west coast of Colombia and is only accessible by boat. It was formed volcanically some 18 million years ago and is basically the top of a mountain that stands some 4000 meters above the sea floor with about 300 meters above sea level projecting up almost vertically from the shore. There are several sharp craggy adjuncts next to the island that project upward to about 40 meters high. Some grasses are seen on these islets but we saw none on the main island itself, due mainly to the masses of omnivorous land crabs.

Previous DXpeditions were confined to the island's east side close to the water level being the only landing area and most certainly never more than 100 meters upward to where now stand two small buildings. This explains why it was difficult for areas west of the Midwest USA and Asia to make contact with previous DXpeditions due to the masking by the mountain to all signals in that direction. The buildings and an original *tangon* (a horizonal type of fixed gantry just above sea level for access via rope ladder to shore) were built about 1986 when the Colombian Navy established a small garrison to establish and enforce their sovereignty as well as to protect fishing rights in a 20-mile radius of the island and to connect the area to the Colombian territorial area off the coast of the mother country. A new tangon was constructed in 1999 and is the one existing today. Apparently a newer one still is planned with a hoist to lift a fast pursuit boat off the water and out of reach from the sea.

The Navy Marines number about eight and are rotated on a regular basis. A Navy vessel was in the area to constantly monitor and protect it from illegal fishing. Regular visitors are diving tours from Colombia, Costa Rica and Panama, but only 25 people at a time are allowed to go to the area in order to protect the marine environment. The boats on which these excursions travel must be totally self-sustaining as shore landings are not allowed except for dire emergencies. The island and surrounding marine environment is a UNESCO World Heritage Site and is administered by the Parques Nacionales de Colombia. We were accompanied by a representative from the Parks, a young man by the name of Columbo. It was his responsibility to protect the flora and fauna of the island, including the marine environment and he had police powers to arrest fishing violators—of course, with the accompaniment of the Navy Marines!

Murphy was to strike early and we were forced to operate our six stations at OP B (the lower and main operating site) and OP A (the mountain top with the capability of four stations) without the planned Wi-Fi networking system. Hence the logs had to be downloaded from each position on a daily basis before uploading them for analysis and submitting to Bob, N2OO, our QSL manager for the 'Club Log' online lookup. It also became apparent that our 160-meter antenna at OP A gave us some disappointing results, plus the fact that we had to contend with solar flares during the second week of operation that wiped out some of the high frequencies during certain parts of the day – making it difficult to continue a good run of contacts. All in all, however, when the dust settled following the DXpedition and Gregg had a chance to examine the logs to merge and fill a few small holes (which he did), we were blessed with breaking a world record for tent-and-generator type of operation to the tune of more than 195,000 contacts. It did appear to us that we were being heard perhaps better than we were hearing the 'deserving.' If this was so, I can only attribute that to the height above sea level and the steepness of the slope toward the ocean creating a lower angle of radiation for our antennas, hence a 'skip' or two less than the received signals, especially on the low bands.

This record would have been absolutely impossible if it were not for the young Marines and our boat crew faithfully doing the strenuous lifting, carrying of all drinking water, food,

QSL of the Month: AC4RF, Tibet

Robert Webster Ford, AC4RF (1923-2013), was a radio operator and British diplomat who worked in Tibet in the late 1940s and early 1950s. Tibet is now considered part of China, but was a separate DX entity until its deletion from the DXCC list on May 31, 1974.

In 1945, Ford joined the British Mission in Lhasa, Tibet's capital, as a radio officer. His contact in Lhasa was the legendary Reg Fox, AC4YN. After a year in Lhasa, Ford went to Chiamdo, capital of eastern Tibet (Kham) and established a radio link back to Lhasa.

In 1950, Ford was arrested by the advancing Chinese army, along with other Tibetan officials. The People's Republic of China accused him of espionage, spreading anti-communist propaganda, and causing the death of a Chinese official. Ford spent nearly five years in prison and was subjected to interrogation and "thought reform." He was eventually released and expelled in 1955.

In 1956, Ford began a series of new assignments for the British Diplomatic Service, serving in the Foreign Office in London, overseas in Vietnam, Indonesia, United States, Morocco, Angola, Sweden, and France; and as Consul-General in Geneva, Switzerland. The same year, he married Monica Tebbett, a childhood friend. They were married for 55 years and had two sons, Martin and Giles.

In 1957 Ford published the book, "Wind Between the Worlds," about his experience in Tibet. He retired in 1987 and was awarded Commander of the Order of the British Empire. After his retirement, Ford lectured in support of the Tibetan Government in Exile in various European countries, India, Australia and the United States. In 2013, he was given the International Campaign for Tibet's Light of Truth Award by the 14th Dalai Lama in Fribourg, Switzerland.

Robert Ford passed away at the age of 90 on 20 September 2013 in London.

73, Tom Roscoe, K8CX

This card from AC4RF was for a QSO made during his time working as a radio officer for the British Diplomatic Service in Chiamdo, eastern Tibet. "QSL of the Month" photos and information provided courtesy of the K8CX Ham Gallery <www.hamgallery.com>.

Photo E: Sunset at Op A, on top of the mountain. The photo was taken from one of three stations at the very top!

Photo F: Departure Day … Back to air conditioning on the boat!

generators, fuel, operating tables and chairs, antenna equipment and everything else that was needed up the 60 to 70 degree slope from the tangon and in the hot muggy weather to supply our meals from the boat at least three times a day. They allowed us to continue operating without skipping a beat. (Had we operators been required to do everything, by the time we got set up to operate, it would have been time to leave.) The pileups were indeed massive from all directions at the beginning and were still of decent size when the time came to disassemble the equipment in order to return to the mainland.

From the standpoint of degree of difficulty, Malpelo must be high on the list if not at the top from a physical aspect. Long before the expedition took place, we were advised by the MDs in our

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive. Visit <https://tinyurl.com/mrxuvwvv> for current listings.

MIXED

9676.....9A2AA	4757.....I2MQP	3077 .....K1PL	2391 .....WO7R	1746.....K6UXO	1422 .....I2VGW	1141 .....4F3BZ	1000 .....WB6IZG	661 .....AL4Y
8663.....9A2NA	4703.....IK2ILH	3028 .....IK2DZN	2391.....IZØFUW	1741.....N6PEQ	1408.....NH6T	1137.....YO5BRZ	999.....N3DF	633.....TI5LUA
8196 .....W1CU	4668.....JH8BOE	2992.....W2YR	2386.....JH1QKG	1711 .....NS3L	1398 .....ES4RLH	1136 .....KO9V	995.....PU2GTA	621 .....K4HDW
8188.....K2VV	4574 .....JN3SAC	2987 .....AG4W	2356 .....NE6I	1707.....K4WY	1361.....VA3VF	1116 .....YU7FW	966 .....W6WF	616 .....AC6BW
7059.....EA2IA	4461 .....K1BV	2968.....AB1OC	2225 .....JH1APK	1684 .....W1FNB	1333 .....AF4T	1112 .....N6MM	953 .....JP1KHY	605.....IW2FLB
6955.....KF2O	4423 .....N1RR	2963 .....N3RC	2203 .....KI1U	1672 .....WU9D	1322 .....AA4FU	1107.....PY2MC	919.....ON7MIC	
6139.....KØDEQ	4417.....WD9DZV	2697 .....AK7O	2176 .....V51YJ	1667.....AD3Y	1301 ....KB9OWD	1100 ....WA3GOS	908 .....N2YU	
5908 .....ON4APU	4342 ....WB2YQH	2651.....HK3W	2159.....VA7CRZ	1643 .....SV1DPI	1301.....K1DX	1109 .....KE8FMJ	889 .....WU1U	
5859 .....ON4CAS	4298 .....VE3XN	2642.....AA8R	2133.....KØKG	1639 .....N7QU	1301 .....KM5VI	1088 .....NJ4Z	866 .....K2KJ	
5715 .....S53EO	4241 .....N6QQ	2616 .....9A2GA	2113.....W2FKF	1616 .....TA1L	1299.....JA6JYM	1084 .....KG4JSZ	857.....R1AV	
5597 .....N4NO	4215.....W3LL	2591 .....IK2RPE	2056.....NKØS	1590.....JF1LMB	1295.....NIØC	1069.....IZ4MJP	835 .....K6RAH	
5511 .....N8BJQ	4201 .....YO9HP	2589 .....DG7RO	2046 .....YO8CRU	1570 .....PY5VC	1280.....WF1H	1058 .....N6DBF	803 .....AB1Q	
5482 .....VE1YX	3818.....K9UQN	2583.....PA2TMS	2016.....N2WK	1568 .....N3AIU	1260 .....UR6LEY	1036.....DL5KW	758 .....N4JJS	
5453 .....YU1AB	3793 .....AB1J	2583.....AE5B	1995 .....JR3UIC	1547 .....KC1UX	1219 .....K6HRT	1032.....DG5LAC	757.....WB3D	
5409 .....N6JV	3538 .....9A4W	2550 .....K6ND	1972 .....K3CWF	1524 ....NH6T/W4	1217 .....AB1QB	1023.....N4WQH	736 .....JA3MAT	
5387 .....W9OP	3459.....W9IL	2457 .....K5UR	1955 .....NIØC	1484.....FG4NO	1204 .....VA2IG	1016.....W9QL	711.....AG1T	
5215.....I5RFD	3130.....SV1EDY	2538.....K4HB	1945 .....N5KAE	1480 .....K4JKB	1201 .....K9BO	1012 .....NØVVV	695 .....W8WDW	
5172 .....W9OO	3109.....W6XK	2465 .....N6PM	1828 .....K7LV	1462 .....AC7JM	1167 .....WA9PIE	1010 .....VE3RZ	682 .....AI8P	
5018 .....WA5VGI	3151 .....NXØI	2420.....WA6KHK	1824 .....WF7T	1462 .....DL4CW	1153 .....N3CAL	1007.....AA4QE	678 .....WE8L	
4763.....KW9A	3099.....N6FX	2400 .....N7ZO	1821.....PY5FB	1447.....K3XA	1148 .....SP8HKT	1006 .....NØRQV	674.....N5JED	

SSB

7045 .....OZ5EV	3184 .....N1RR	2576 .....AA1VX	2129.....AE5B	1646 .....VE7SMP	1258 .....N1KC	1031 .....K4CN	854 .....K6HRT	700 .....JA1PLL
6334.....9A2NA	3174 .....I3ZSX	2568.....SM6DHU	2113.....W2FKF	1641 .....AE9DX	1222 .....YF1AR	1031 .....IK8OZP	833 .....DK8MCT	694 .....KG4HUF
6145.....K2VV	3172.....YO9HP	2515.....W9IL	2112.....WD9DZV	1622.....K5CX	1187 .....IZ1JLG	1022 .....NW3H	808 .....UR6LEY	690.....W6PN
5404 .....VE1YX	3141 .....DL8AAV	2483 .....AG4W	2094.....I8LEL	1611 .....W2ME	1183.....KI1U	1012 .....KU4BP	802 .....N6OU	684 .....KO9V
5149.....KF2O	3139 .....N8BJQ	2451.....EA3GHZ	2093.....W2WC	1587.....N3XX	1151.....W6XK	1006 .....NJ4Z	801.....K3XA	675 .....F1MQJ
4916.....EA2IA	3108.....I4CSP	2443 .....JN3SAC	2084 .....K5UR	1550 .....IK2RPE	1150 .....VE6BMX	1004.....K4HB	766 .....I2VGW	655.....VA3VF
4410.....I2MQP	3104 .....WA5VGI	2335 .....KG1E	2076.....K2XF	1449 .....N5KAE	1146 .....SQ7B	1004 .....WA5UA	763 .....K4JKB	647 .....YB8NT
4192.....KØDEQ	3067.....N6QQ	2327 .....K1PL	2048.....W4QNW	1442 .....DG7RO	1136 .....K3CWF	978 .....EA7HY	758.....IV3GOW	640 .....UA9YF
3723.....I8KCI	2990 .....KF7RU	2326 .....CX6BZ	1955 .....EA3NP	1389.....NKØS	1112.....NH6T	957.....W9QL	724.....WF1H	637.....K5WAF
3681 .....N4NO	2984 .....KI7AO	2209.....IK2QPR	1935.....SV1EOS	1386.....HK3W	1098 .....K4CN	934 .....PY5VC	724 .....W3TZ	630.....W6US
3585 .....SV3AQR	2946 .....PT7ZT	2201 .....NQ3A	1884.....WA6KHK	1386 .....IK4HPU	1096 .....JA7HYS	931 .....YB1AR	717 .....KØDAN	624 .....K6KZM
3535.....KW9A	2903 .....IN3QCI	2200.....N6FX	1879.....K3IXD	1371.....VE6BF	1093 .....N6MM	929 .....NS3L	717 .....N3JON	606 .....KJ4BIX
3456.....W9OO	2857.....4X6DK	2198.....AB1OC	1848.....AB5C	1338 .....NE6I	1089 .....IZ8FFA	919.....KA5EYH	714.....YB2TJV	604 .....GØBPK
3416.....W3LL	2650 .....IK2DZN	2183 .....NXØI	1825 .....KQ8D	1334.....EA3EQT	1089 .....IT9ABN	893.....W9RPM	713 .....JH1APK	
3348.....CT1AHU	2595.....EA1JG	2155.....K9UQN	1812 .....K6ND	1264.....N6PEQ	1042 .....IZØBNR	889 .....N3AIU	710 .....WA9PIE	
3274 .....YU7BCD	2582.....PA2TMS	2131 .....N3RC	1699.....W2YR	1262 .....K7LV	1032.....DG5LAC	875.....K7SAM	700 .....N4FNB	

CW

7543.....WA2HZR	4076.....I7PXV	2943.....N6QQ	2203 .....NXØI	1620 .....DG7RO	1210 .....DL4CW	891 .....DK8MCT	722 .....WA9PIE	
7200.....K2VV	3974 .....JN3SAC	2915.....KA7T	2022 .....AF5CC	1595.....PY5FB	1196 .....N3AIU	890.....NS3L	720 .....K4CN	
6024.....9A2NA	3804 .....W9OO	2811.....OZ5UR	1998 .....K5UR	1555 .....K1PL	1098.....LU5OM	889 .....N3AIU	652 .....IK2DZN	
5392.....EA2IA	3773.....KW9A	2679.....W9IL	1973 .....N3RC	1508.....W6XK	1088.....AE5B	864.....YO5BRZ	636.....NKØS	
5311 .....N6JV	3647 .....N1RR	2548.....EA2CIN	1905.....WA6KHK	1483 .....VE1YX	1062.....K3XA	848 .....PY5VC	629.....IV3GOW	
5261.....KF2O	3504 .....YU7BCD	2531.....I2MQP	1832.....N4YB	1480.....WO3Z	1036.....DL5KW	822 .....N5KAE	620.....AF5DM	
5160.....N4NO	3462.....K9UQN	2497.....W3LL	1762 .....K6ND	1458 .....AG4W	997.....N6PEQ	821.....HB9DAX	615.....JH6JMM	
5013.....W8IQ	3279.....IØNNY	2490.....N6FX	1744 .....NE6I	1443.....WA2VQV	992.....F5PBL	783 .....YB1AR	608.....W9RPM	
4916.....IZ3ETU	3220.....WD9DZV	2477.....VE6BF	1727.....K6UXO	1421 .....KN1CBR	968 .....K3CWF	752 .....K6HRT	600 .....NY4G	
4914 .....KØDEQ	3214.....SM6DHU	2424.....W2WC	1708.....NIØC	1389.....IT9ELD	962 .....K7LV	743 .....JA5NSR	600 .....IK2SGV	
4886 .....I3FIY	3041.....YO9HP	2357 .....W9HR	1691 .....KI1U	1342 .....VE6BMX	944.....AB1OC	738 .....NH6T/W4		
4769 .....N8BJQ	3031 .....EA7AAW	2291.....N3XX	1672.....W2YR	1235 .....JH1APK	908.....NH6T	732 .....SQ7B		
4164 .....WA5VGI	2948.....IK3GER	2212.....AC5K	1633.....W6XK	1220 .....AA4FU	897.....HK3W	727.....JF1LMB		

DIGITAL

3347 .....KØDEQ	2251.....EA2IA	1759 .....N7ZO	1426.....AB1OC	1108 .....KE8FMJ	1002.....NØRQV	866 .....SQ7B	750 .....ON7MIC	636.....W9RPM
3137.....KF2O	2242.....HK3W	1727.....W2YR	1378 .....K3CWF	1093.....KI1U	992.....N3DF	862 .....JP1KHY	750 .....NH6T/W4	611 .....KO9V
2996.....W3LL	2345 .....WA5VGI	1704 .....IK2DZN	1353 .....K1PL	1091.....VA3VF	992.....K9UQN	855.....R1AV	681 .....PY5VC	600 .....ADØFL
2978 .....N8BJQ	2308.....N6PM	1638 .....N1RR	1333 .....W1FNB	1089 .....AC7JM	983.....PU2GTA	812 .....UR6LEY	680 .....K2KJ	
2929.....WD9DZV	2217.....YO9HP	1643 .....N3RC	1308.....NKØS	1060 .....AF4T	966 .....NS3L	811 .....WF1H	672 .....K9AAN	
2628.....W6XK	1836 .....AG4W	1501W2/JR1AQN	1227 .....ES4RLH	1054.....KW9A	947 .....I2VGW	810 .....N3CAL	670.....IV3GOW	
2558.....NT2A	1818 .....W1EQ	1500 .....JH1APK	1189.....JF1LMB	1051 .....KH6SAT	917 .....K7LV	800 .....WA3GOS	668.....KA5EYH	
2518 .....K2YYY	1811 .....NXØI	1459 .....KC1UX	1149.....W9IL	1047 .....RW4WZ	881 .....NE6I	783 .....YB1AR	654 .....JA3MAT	
2345 .....WA5VGI	1790 .....JN3SAC	1461 .....WU9D	1112.....AB1QB	1009 ....GUØSUP	870 .....WB6IZG	758 .....N4JJS	640 .....WA9ONY	

REMOTE OPERATION

CW	MIXED	SSB	DIGITAL
7277.....K9QVB	4026 .....N1RR	2953 .....N1RR	671 .....N1RR
3292 .....N1RR			

Photo G: The tangon with the team's transportation, the Seawolf, in the background.

group to get into shape from a cardiovascular standpoint in order to meet the expected challenge as well as to keep well hydrated while there. I am lucky in that there are some challenging hills where I live and a two month daily power walk for 45 minutes a day vastly helped me to be able to meet Malpelo on its terms. In retrospect, the climb from the tangon up the first third of the slope to OP B was the most difficult due to steepness and the larger steps needed to get up (and down). The climb up to the mountain peak, while appearing to be tough, was not as difficult as we could take smaller steps and take our time. The most challenging aspect to reach OP A was a 60-foot rope climb to get on top of the mountain using what footholds on the rock face we could find and often wearing a backpack. Once on top, it was well worth the trip to see the wonderful vista on the other side of the mountain with its islets. In addition, signals all around were very strong and we only required 100 watts output from that location.

A high point of the DXpedition was a tour around Malpelo Island itself in the Sea Wolf's zodiac. The caves carved out by the waves are truly spectacular and could have been traversed right through to the other side had there not been a heavy swell that would have made it dangerous at the caves' narrowest points to even consider trying it.

Of course, all this would not have been possible without the Colombian government—especially the Navy, the Ministry of Technology, Information and Communications for the license and the Parques Nacionales de Colombia.

–73, Steve, VE7CT

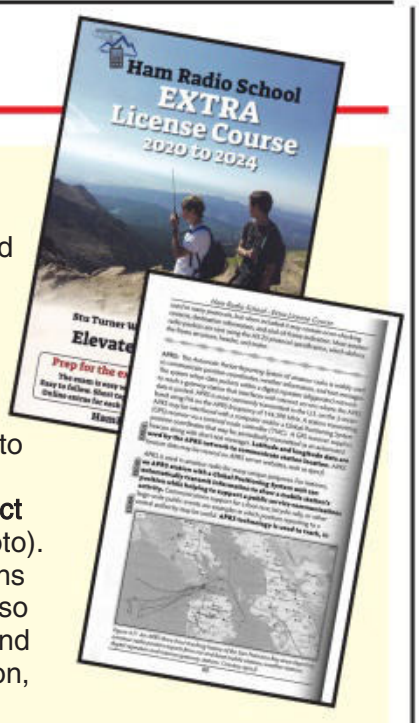
K4UEE Wraps Up

I would like to brag a little bit. After we were all safely home, we realized we had set a new world record for QSOs! There were 195,415 QSOs with an amazing 43,490 unique callsigns in our log. No one has ever made more QSOs on a non-fly-in, tent, and generator DXpedition. We are so enormously proud of this feat! Thanks to all the team and to our new Compadres in Colombia, S. A.

73, Bob Allphin, K4UEE

what's new

Ham Radio School Extra Class License Guide



Most ham radio license manuals take one of two approaches to presenting the material – either a textbook-style guide organized by topic, with relevant test questions at the end of each chapter or a question-by-question journey through the question pool, identifying the correct answer and explaining why it is the right choice. In the Ham Radio School "Extra License Course 2020 to 2024", co-authors Stu Turner, WØSTU, and Bob Witte, KØNR, take a different approach, and use a multimedia format to help the reader both pass the test and understand the material.

They organize the book by subject area, and include **the correct test question answers, in bold,** as part of the discussion (see photo). There is a tab referencing each question number but the questions themselves are not published. Neither are the wrong answers, also called "distractors," because, well, they're distracting! So your mind retains those correct answers, introduced as part of the discussion, and will recognize them when they pop up on the license exam.

After completing each chapter, the reader may go online to the <hamradiocshool.com> website and take a quiz using actual exam questions as well as links to additional resources. After finishing all of the chapters, the website offers practice exams, again using the actual questions and answers from the question pool. The authors encourage readers to repeat the practice tests until they are consistently scoring 85% or higher, and then go take the real license exam.

This book completes the Ham Radio School series of license manuals linked with online practice. It retails for $29.95 and may be ordered from the school website at <www.hamradiocshool.com/extra-prep>.

contesting

BY TIM SHOPPA,* N3QE

The IARU HF Championship Plus WRTC

The second weekend of July has an everybody-works-everybody contest: the 24-hour **IARU HF World Championship**. Not only are "regular" contesters on the bands working each other, but member societies of the International Amateur Radio Union (IARU) activate headquarters stations which count as multipliers. And to top it all off, there's a contest-within-a contest, the World Radiosport Team Championship (WRTC), made up of 63 M/2 (multi-two) teams on from Italy this year.

The deep origins of this July contest can be traced to a one-off predecessor, the 1976 ARRL Bicentennial Celebration. This 48-hour event was held in late July 1976. It was hugely popular, with 2500 logs submitted – US stations celebrated their history by using as their exchange a number corresponding to the order of their state's entry into the union. There were no multipliers, but action was livened up by allowing contacts on both voice and another mode (most commonly CW, but also allowed were SSTV and RTTY). US stations were encouraged to use their special bicentennial prefixes.

From 1977 through 1986, the IARU Radiosport Championship continued the lively July contest tradition, settling down on the second weekend in July. Stations operated for up to 36 hours of the 48-hour weekend and ITU zones (*different from CQ zones; see below – ed.*) were the exchange for all entrants. There were no multipliers, but DX activity was motivated by awarding 5 points for intercontinental QSOs, as opposed to just a single point for working stations in your own zone. VHF activity on both the 6-meter and 2-meter bands was also allowed.

A major revamp took place beginning in 1987. The new contest, called "The IARU HF World Championship," began the current 24-hour period, and introduced not just ITU zones but IARU HQ stations as multipliers. The IARU HF contest was one of the last to include a category for assisted operators using telnet clusters for spotting, finally adopting the "Single Op Unlimited" category in 2015.

email: <n3qe@cq-amateur-radio.com>

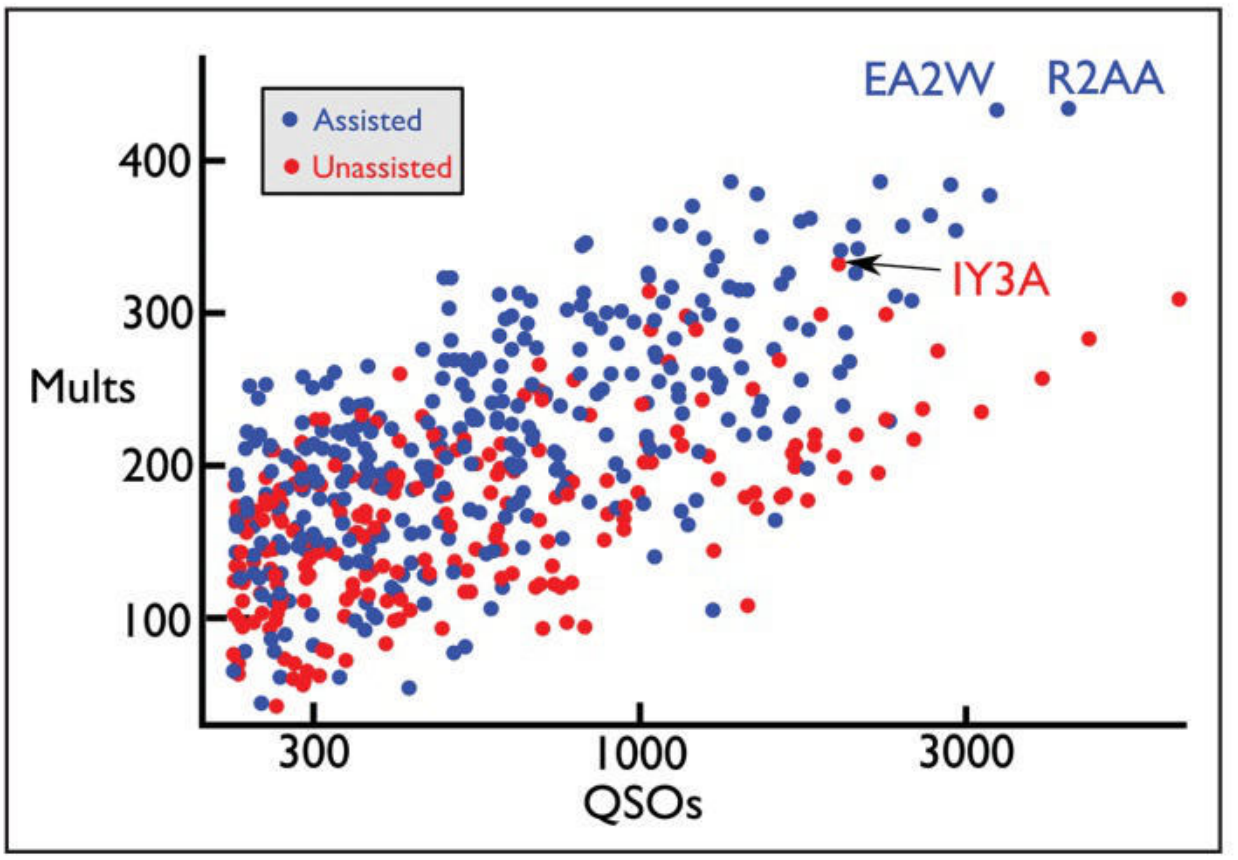


Figure 1. Multiplier vs. QSO cloud for single-operator entrants in the 2022 IARU HF World Championship contest. Assisted entrants (blue dots) have a substantial multiplier advantage over the unassisted (red dots), typical for any rich-multiplier contest.

IARU HF isn't the only contest using the ITU zone as the exchange and/or multiplier. Other contests using ITU zones include the Russian Club Cup Contest, the Russian Radiosport Team Championship, the Black Sea Cup, Gagarin Cup, the Ham Sprit Cup, and LZ DX Contest. Let's do a brief roundup of the ITU Zone scheme by starting with a map and trying to find the scheme behind these two-digit numbers.

The maps published by Tim Makins, EI8IC, at <bit.ly/43bdHR2> make clear that there's a pattern to ITU zones. ITU Zones 01 through 10 are in North America. Zone 05, Greenland, is the rarest of the NA zones. Zones 11 through 16 are in South America, with the rarest zone, Zone 16, containing extreme southern Chile and Argentina.

Zones 17-35 cover Europe (with the exception of Spain and Portugal), European Russia, and Asian Russia. Zone 28, Central Europe, is the most commonly worked zone by far with astoundingly high representation in the IARU HF contest. The zones in this group covering extreme Northern Russia – ITU Zones 22-26 and 35 – are hard to find.

Zones 36-40 cover Spain, Portugal, Atlantic African islands, Northern Africa, and Middle East/Turkey. Zone 37 (Spain and Portugal) is the most common of these. Zones 38 (Libya and Egypt) and 40 (Iran) are rarely activated.

Zones 41 is India, and Zones 42-44 are in China, and are at least somewhat active. Japan is ITU Zone 45 and is very active in the IARU HF contest.

Zones 46-48, 52, 53, and 57 complete the coverage of Africa; 57 (South Africa) is on regularly for the IARU HF contest. Zones 49, 50, 54, and 51 span central Africa, and Zones 49 and 50 are Burma, Thailand, Vietnam, and the Philippines.

Oceania coverage begins with zones 51 and 54, (Papua New Guinea, Indonesia, and Malaysia). ITU Zones 55, 58, 59 span Australia, Zone 60 contains New Zealand, and Zones 61, 62, and 63 cover the Hawaiian Islands, Guam, and Marshall Islands.

Zones 67 through 90 are rarely activated. If the staff of an Antarctic research station are on for IARU HF, you'll find them handing out the zone numbers between 67 and 74. Zone 75 is in the extreme Arctic. Zones 76-90

are ocean regions with little regular ham activity; a big activation by a maritime mobile station would certainly liven up the IARU HF hunt for new multipliers.

To further add to the multiplier count, individual ham members of the IARU and the three IARU regional executive committees send the "AC", "R1", "R2", and "R3" multipliers. In past years I've found that the best way to find these multipliers was to call CQ – the hams on the IARU Administrative Council and executive committees are not necessarily hardcore contesters and often are most comfortable being on the search-and-pounce side of the exchange.

Prepare for the IARU contest by downloading a call history file which has the HQ station exchanges prefilled. In the popular N1MM+ logger, select the "Associated Files" tab when you open the IARU HF contest module, click on the "Change" button next to the Call History section, and click "OK" to automatically download the default HQ history files. These are doubly valuable if you are entering the contest with spotting assistance ("Unlimited," as the rules category is called) as they'll let your logger highlight multipliers in the bandmap and available QSO windows as spots pour in through the contest.

The "reverse lookup" feature of your logger will be useful when a HQ station is giving out his exchange at each QSO but not necessarily identifying every QSO. For example, if I leave the callsign empty in the N1MM+ exchange field and type "RSGB" into the exchange portion, I'll see in my Check window that exchange belongs to GR2HQ station, and rapidly move past if I've already worked that multiplier on this band.

If you don't enter assisted, a bandscope is a valuable tool in finding multipliers. The largest HQ stations are like beacons, with continuous operation on all bands and both modes for the entire 24 hours of the contest. They will have pileups – especially by cheerleading locals – at times, but you can always come back and find them with less congestion later, as they work the bands to complete saturation. The smaller HQ stations, once they are found by the assisted contesters, will trigger "packet pileups" that are intense and clearly visible on a bandscope's waterfall display as a channel of intense activity. If the pileup is too thick, be sure to store them in your bandmap and come back to them periodically to see if you can grab them when the pileup is thinner.

To work the maximum number of mults, you'll want to be on both CW and Phone. In 2022, five of the IARU HQ stations were only available on SSB. These were RCCR, SARU, FMRE, RCD, and VRONA. Additionally, the R2 mult was only on SSB. Similarly, four IARU HQ stations were only on CW: MRSF, FRA, MARTS, and SARS.

With up to 55 HQ stations, potentially 90 IARU Zones, and AC and R1-R3 representatives counting as mults per band, the IARU HF certainly qualifies as an event with a rich field of multipliers. What does this mean for the gap between assisted and unassisted entries? Figure 1 shows a scatter

Calendar of Events

All year	**CQ DX Marathon**	**bit.ly/3FyPiui**
July 1	RAC Canada Day Contest	https://www.rac.ca/contesting-results/
July 1	Venezuelan Ind. Day Contest	https://bit.ly/3NDZghb
July 1-2	Original QRP Contest	http://www.qrpcc.de/contestrules/index.html
July 1-2	Marconi Memorial HF Contest	http://www.arifano.it/contest_marconi.html
July 1-2	DL-DX RTTY Contest	http://www.drcg.de/
July 1-2	NZART Memorial Contest	https://bit.ly/3wYqvx1
July 3	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
July 5	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
July 8-9	10-10 Int. Weak Signal QSO Party	http://bit.ly/1FrFeBc
July 8-9	IARU HF Championship	http://www.arrl.org/iaru-hf-world-championship
July 8-9	World Radiosport Team Championship (WRTC)	https://www.wrtc2022.it/
July 8-9	PODXS 070 Club 40 Meter Firecracker Sprint	http://bit.ly/2FUmeOL
July 8-9	Veron SLP Contest	http://bit.ly/2L9eT1L
July 9	QRP ARCI Summer Homebrew Sprint	http://www.qrparci.org/contests
July 12	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
July 12	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
July 15-16	**CQ WW VHF Contest**	**http://www.cqww-vhf.com/**
July 15-16	IARU Region 1 70 MHz Contest	https://bit.ly/3r1kqvT
July 15-16	North American RTTY QSO Party	http://ncjweb.com/NAQP-Rules.pdf
July 16	CQC Great Colorado Gold Rush	http://www.coloradoqrpclub.org/contests/gold.htm
July 16	RSGB International Low Power Contest	bit.ly/3TxCrxl
July 17	RSGB FT4 Contest Series	bit.ly/3TxCrxl
July 19	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
July 22-30	Maidenhead Mayhem Sprint	https://w9et.com/rules.html
July 22	YOTA Contest	https://www.ham-yota.com/contest/
July 27	RSGB 80m Club Championship, Data	bit.ly/3TxCrxl
July 29	WAB 144 MHz Low Power Phone	http://bit.ly/31yE4kT
July 29-30	RSGB IOTA Contest	bit.ly/3TxCrxl
July 30	ARS Flight of the Bumblebees	http://arsqrp.blogspot.com/
Aug. 2	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
Aug. 5	European HF Championship	https://euhf.s5cc.eu/euhfc_rules/

plot of the multiplier-vs.-QSO cloud for assisted stations vs. unassisted stations in the 2022 IARU HF contest. The blue dot in the upper right is R2AA, who, with the help of assistance, rounded up 422 multipliers between the six bands. EA2W was close behind in multiplier count, with 432 multipliers. Unassisted stations maxed out at 330 multipliers with IY3A's effort.

WRTC 2022 (A Year Late)

I won't be on for the IARU HF with my home call. You'll find me, my teammate Rich DiDonna, NN3W, and 62 other teams activating with special Italian callsigns in the **World Radiosport Team Championship.** WRTC 2022 (delayed a year because of Covid-19 shutdowns) takes place in the region around Bologna, Italy, and is a "contest within a contest" overlapping with the IARU HF. The Italian organizers have not yet announced the block of callsigns assigned to competitors, and you won't know which competitors are using which callsign until the 24-hour event is over. Please support this event on-the-air by searching out and working all WRTC competitor callsigns. You'll be able to watch the WRTC teams' scores as they rack up points in their own race among other top-tier contesters, on the leaderboard at the WRTC website, <https://www.wrtc2022.it/>. The WRTC organizers had a booth at Dayton (Photo A).

Get Ready For the WW Digi Contest By Practicing Your FT4 Contest Skills Every Thursday Night

The Northern California Contest Club has added a weekly FT4 contest to its Thursday night lineup which has long included half-hour RTTY and CW sessions. Peter Driessen, VE7AB, and Ed Muns, W0YK, introduced this event at the 2023 Dayton Hamvention® Digital Contesting session, and in its first week 25 hams listed their scores on 3830scores.com. Effective SO2R ops had almost 50 QSOs in the half-hour period; with my simpler single radio setup, I got 31 QSOs. The activity did fill out the whole hour. The propagation at the starting gun allowed at least a little activity on the 15-meter band; we rapidly moved to 20 meters, and the last ten minutes had plenty of activity on 40 meters and a bit of activity at the very end on 80.

The FT4 NS runs from 0100Z to 0130Z each Friday UTC (Thursday night in North America). If you follow the hints on the NCCC FT4 sprint website at <https://www.ncccsprint.com/ft4ns.html>, you'll be optimizing your exchange by reducing unnecessary acknowledgement cycles. The conventions of FT4 and FT8 contesting are a bit unusual for those used to making exchanges in non-WSJT modes; in particular, each QSO partner is sending their exchange in their first message. Ideally, this can shorten the entire QSO cycle to just two messages allowing for great on-air-efficiency and the high QSO rate that all contesters strive for. In their Hamvention presentation, Ed and Peter emphasized that any message you receive with a "R" or "RR73" constitutes a full acknowledgment, at which point you should log the QSO and move on to

Aug. 5-6	10-10 Int'l Summer Contest SSB	http://bit.ly/1FrFeBc
Aug. 5-6	ARRL 222 MHz and Up Distance Contest	http://bit.ly/2IJZcy9
Aug. 5-6	Batavia FT8 Contest	https://batavia-ft8.com/
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. 9	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
Aug 11-14	Olivia Digital QSO Party	https://groups.io/g/olivia
Aug. 12	FISTS Summer Saturday Sprint	http://www.fistsna.org/operating.html
Aug 12	Kentucky State Parks on the Air	https://k4msu.com/kypota/
Aug. 12	SARL Youth Sprint	http://bit.ly/H0IqQf
Aug. 12-13	Maryland-DC QSO Party	https://www.w3vpr.org/node/325
Aug. 12-13	Worked All Europe CW Contest	https://bit.ly/36ubggF
Aug. 16	VHF-UHF FT8 Activity Contest	http://www.ft8activity.eu/index.php/en/
Aug. 19-20	ARRL 10 GHz and Up Contest	http://www.arrl.org/10-ghz-up
Aug. 19-20	CVA DX Contest CW	http://cvadx.org/
Aug. 19-20	International Lighthouse Lightship Weekend – ILLW	https://illw.net/
Aug. 19-20	SARTG RTTY Contest	http://www.sartg.com/index.html
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	FISTS Summer Sunday Sprint	http://www.fistsna.org/operating.html
Aug. 25-27	Hawaii QSO Party	http://hawaiiqsoparty.org/
Aug. 26-27	ALARA Contest	http://www.alara.org.au/contests/
Aug. 26-27	CVA DX Contest SSB	http://cvadx.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	YO DX HF Contest	https://www.yodx.ro/en/
Aug. 26-27	World Wide Digi DX Contest	https://ww-digi.com/
Aug 26-27	W/VE Island QSO Party	https://usislands.org/qso-party-rules/
Aug. 27	SARL HF CW Contest	http://bit.ly/H0IqQf
Sept. 23-24	**CQ WW RTTY DX Contest**	**http://www.cqwwrtty.com**

Photo A. The WRTC 2022 booth at Hamvention 2023. From left to right: Fabio Schettino, I4UFH, vice-president of WRTC 2022; Tim Shoppa, N3QE, NA3 region competitor (and your columnist); Ted Edwards, W3TB, past president of Tennessee Contest Group sponsoring the NA3 site in Italy; and Rich DiDonna, NN3W, NA3 region Team Leader.

working your next station. If you're looking for someone to call, you'll note that the running station sending a "R" message, is also an effective solicitation – something like a "TU <MYCALL>" in a more traditional mode - saying that they are ready to be called by the next station, obviating the need for an explicit CQ.

The Thursday night FT4 sprints are not only a way to build your skills and advance the art of WSJT-mode contesting, they are also a great way to check out your station and software integration. If you're using the popular combination of WSJT-X digital mode software with the N1MM+ logger, carefully follow the instructions at <https://bit.ly/3qj2Aaj> to enable the decode list window that will help you select stations that will be new multipliers at each jump ball. I look forward to participating each week in all three modes of NCCC NS events.

July and August Contest Highlights

The IARU HF and concurrent WRTC competition in Italy start at 1200Z on July 8. Find full IARU HF rules at <https://tinyurl.com/jk44bx3u>. Note that while ARRL has allowed self-spotting for the ARRL contests since last fall, and the ARRL helps administer the IARU HF contest, the IARU HF isn't technically an ARRL contest and IARU HF rules still prohibit self-spotting (rule PROH.4.).

Sunspot numbers are going up which translates to plenty of action in the **CQ World Wide VHF Contest** from 1800Z July 15 to 2100Z July 16. Keep in mind that when the bands are wide open, you'll find much higher rates on CW or SSB than on the FT8 digital mode. Grid squares are multipliers on each of the 6- and 2-meter bands, so be sure to ask for moves between bands from the fully equipped VHF stations on for this event. Full rules are at <https://cqww-vhf.com/rules.htm>.

The fast-moving 12-hour **RTTY North American QSO Party** is on July 15, followed by the **CW** and **SSB NAQPs** on August 5 and August 19. States, provinces, and North American countries count as mults per band; calling CQ on the 80 and 160-meter bands to rack up multipliers there (despite summertime QRM) is worthwhile. For the rarer states you find on the 40-Meter band, be sure to ask for a move to 80 or 160. Operate up to 10 out of the 12 hours; if you want to find west coast states on the low bands, it makes sense to take some off time in the mid-day and be on for the very last hour 0100Z-0159Z after the summer sun has begun to set in the far west. Find the complete rules at <https://tinyurl.com/aaxhb47y>.

The 24-hour **World Wide Digi** contest uses both FT4 and FT8 modes and uses the first two characters (the "field") of the grid square as a multipler. The points are computed based on the distance between the two QSO partners, strongly rewarding activation of the longest paths on DX bands. It starts at 1200Z on August 26 and full rules are at <https://ww-digi.com/>.

Summer is Sizzling with Deals...

Two Calendars To Choose From - Still 10 Months of Viewing

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

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

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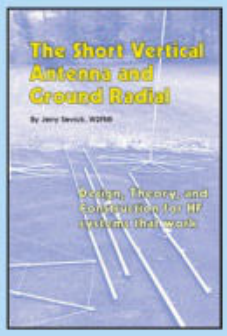
The Short Vertical Antenna and Ground Radial

by Jerry Sevick, W2FMI



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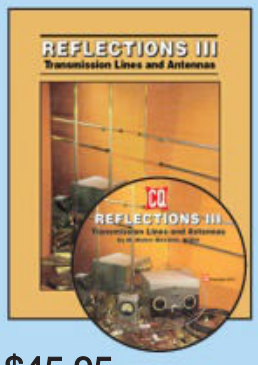

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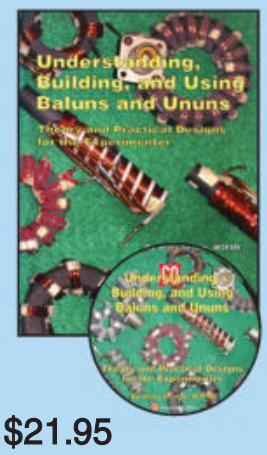

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propagation

BY TOMAS HOOD,* NW7US

The Summer Anomaly

Quick Look at Current Cycle 25 Conditions:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, April 2023: **96**
Twelve-month smoothed, October 2022: **99**

10.7 cm Flux:
Observed Monthly, April 2023: **146**
Twelve-month smoothed, October 2022: **140**

One Year Ago:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, April 2022: **76**
Twelve-month smoothed, October 2021: **45**

10.7 cm Flux:
Observed Monthly, April 2022: **131**
Twelve-month smoothed, October 2021: **93**

In the Northern Hemisphere, we are in the summer doldrums with lower MUFs (maximum usable frequencies) during the day, but higher MUFs (than winter) in the evening and night. In the other hemisphere, this is reversed.

With more hours of daylight during the summer, wouldn't the increased exposure to solar radiation cause greater ionization? The surprising answer is that, no, that is generally not the case. A look at many signal paths reveals that there are higher peaks during the winter daytime than during the summer daytime. However, during the summer night, those same paths may have higher MUFs than during the winter nights—*the Summer Anomaly*.

This seasonal variation is due to a change in the ionospheric chemistry with a shift towards more diatomic species and fewer monatomic ones (a species refers to the gas molecules which react to incoming solar energy). These molecules (diatomic species) are harder to ionize as they are more tightly bonded, leading to the lower levels of ionization, seen at <https://tinyurl.com/yxv99jsc>.

It was formerly believed that this anomaly was in part caused by temperature differences. This model held that during the Northern Hemisphere's 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, it was believed that the ionosphere has more time to recombine, and nighttime critical frequencies fall to very low levels. Conversely, in the summer the F2 layer heats up, causing it to expand during the daylight hours. This results in a lower ionization density than is observed during the winter. This, it was believed, creates summer daytime F2-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 clearer and more accurate. 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 the 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 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.

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for July 2023

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 1,5,8-13,20-21,23-26,28	A	A	B	C
High Normal: 2-3,7,17-19,22,29-30	A	B	C	C-D
Low Normal: 6,16	B	C-B	C-D	D-E
Below Normal: 4,15,27,31	C	C-D	D-E	E
Disturbed: 14	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. Using the Propagation Charts appearing in "The CQ Shortwave Propagation Handbook, 4th Edition," by Carl Luetzelschwab, George Jacobs, Theodore J. Cohen, and R. B. Rose.

a. Find the *Propagation Index* associated with the particular path opening from the **Propagation Charts**.

b.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 **4** will be excellent on July 1 through July 3, but fair on July 4, then good on July 6, and so forth.

2. Alternatively, you may use the *Last-Minute Forecast* as a general guide to space weather and geomagnetic conditions throughout the month. When conditions are *Above Normal*, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as *Disturbed* will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these geomagnetic conditions. In general, when conditions are *High Normal* to *Above Normal*, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at <https://SunSpotWatch.com> provided by NW7US.

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, but 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 makeup 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.

We'll continue diving into the science of the ionosphere and space weather, as well as using computer software tools that aid in understanding, analyzing, and predicting radio signal propagation. Stay tuned each month!

July Shortwave Propagation

Many DX hunters view July as the least exciting month of the year. With generally lower summertime MUFs, the highest of the amateur HF bands suffer some east-west paths that depend on the F-layer (the Summer Anomaly). When the 10.7 cm radio flux index climbs above 150, these paths open up, but remember that trans-polar paths suffer when the geomagnetic field is active or worse.

While F-layer propagation of the highest HF frequencies will be poor, radio signals near the Best Usable Frequency (BUF) will be stable over paths that could remain open for

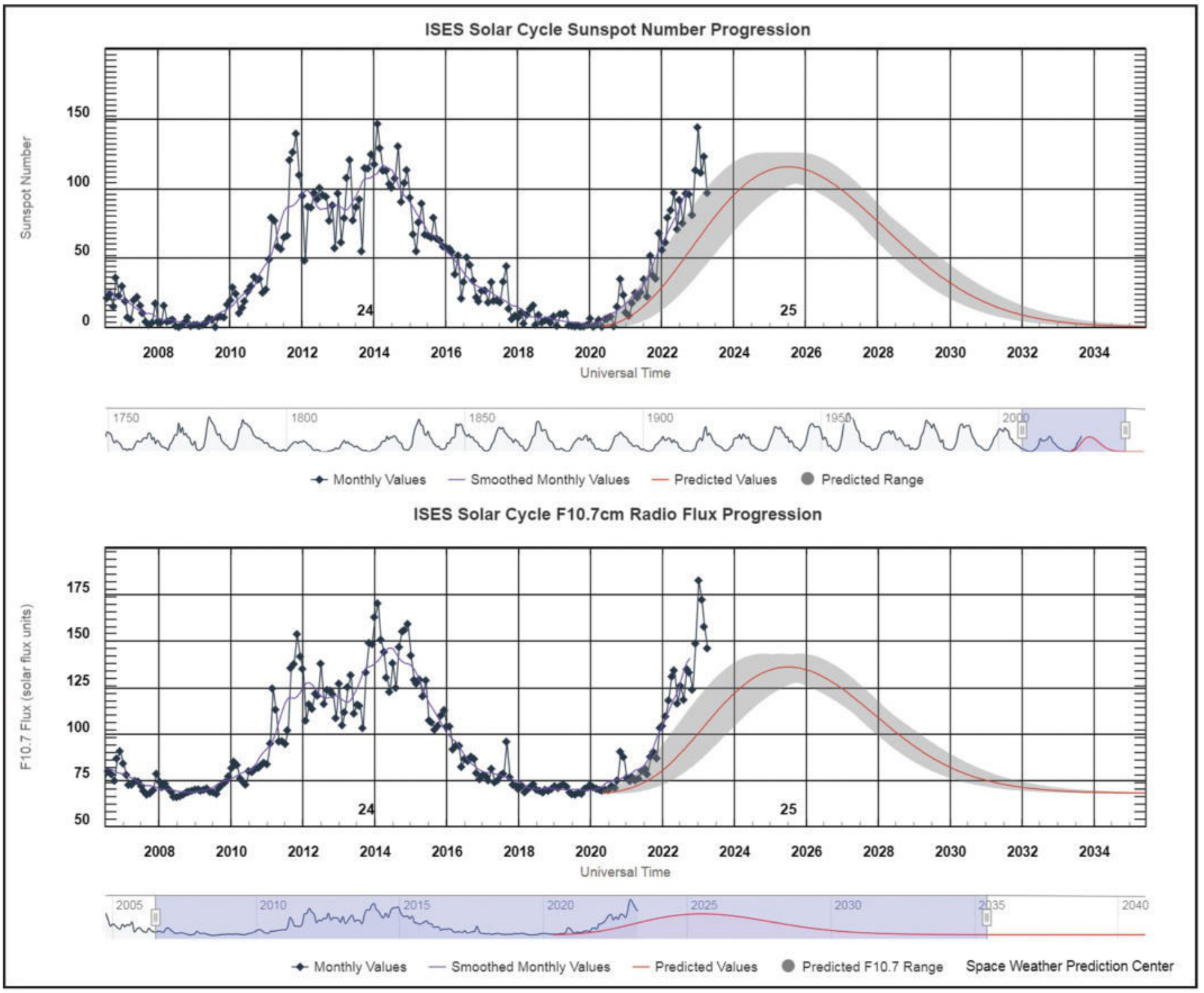

Figure 1: While the last few months were weaker in terms of solar activity, the first F10.7-cm peak of this Cycle 25 is higher than the first peak in Cycle 24. We can wish that the second peak in this current cycle will also exceed the peak of Cycle 24, a very likely scenario since most cycles have a double peak. Credit: SWPC/NASA

longer periods than during the winter and early spring season. In addition, July's sporadic-E ionization is near the year's seasonal peak. This should result in a considerable increase in short-skip openings on almost all high frequency amateur bands as well as the 6- and 2-meter bands.

Twenty meters should continue to be the best band for all-day (24-hour) DX propagation during the month. When conditions are at least Low Normal, the band is expected to remain open to one area of the world or another.

Peak conditions on 20 meters are expected for a few hours after local sunrise and again during the late afternoon and early evening, when the band should open in almost all directions. When conditions are at least Low Normal, expect 20-meter openings towards South America, the South Pacific, and Oceania until as late as midnight. When conditions are excellent, the band should also remain open to most other areas of the world past midnight.

Considerably greater F-layer DX openings are expected on 15 meters during July, many times the number of openings seen during the last several years. When conditions are at least Low Normal, 15 should occasionally open towards the south. Look for some short-skip openings into the Caribbean area and Central America as early as 10:00 a.m., with a peak expected to all areas of Latin America between 3:00 and 5:00 p.m. local daylight time. When conditions are High Normal or better, the band may also open to Africa during the late afternoon from the eastern half of the country, and to Australasia and the South Pacific area during the late afternoon and early evening from the western half of the country. Seventeen meters will act somewhat the same as 15, but openings will tend to be longer, and signals perhaps stronger and more stable.

Expect short-skip openings on 10 and 12 meters during July towards the Caribbean and possibly Central America as a result of sporadic-E ionization. When conditions are High Normal or better, an occasional opening deeper into South America may be possible, especially during the afternoon hours.

Overall, look for frequent short-skip openings on 10, 12, 15, and 17 meters between distances of 500 and 1300 miles. During the afternoon hours, skip may extend to beyond 2300 miles as a result of F-layer reflection. Short-skip openings should range between 250 and 2300 miles on 20 meters. Peak conditions are most likely to occur during the late morning and again during the late afternoon and early evening hours. Daytime openings on 40 and 30 meters should range

Figure 2 and Figure 3: Plan ahead! At 00:00, August 11, through 23:59, August 14, 2023 (UTC dates and times), the Olivia Digital DXers Club (ODDC on Clublog) is holding the annual August Olivia QSO party weekend. This is a sample certificate of participation available from the group (see <https://groups.io/g/olivia>), and a list of suggested calling frequencies on the HF bands. These are suggested starting frequencies, as we Olivia operators move up and down from these starting frequencies, based on band activity. Credit: Tomas Hood, NW7US, and ODDC

OLIVIA DIGITAL MODE HF *SUGGESTED* CALLING FREQUENCIES

The following are ONLY suggestions to aid in finding other Olivia signals

This listing shows **CENTER**, then **DIAL**, then the **number of tones** and **bandwidth**

CENTER	DIAL	# of Tones/Bandwidth
1.8390 MHz	1.8375 MHz	8/250 (ITU Region 1, etc; Primary International)
1.8270 MHz	1.8255 MHz	8/250 (ITU Region 2; Secondary International)
3.5830 MHz	3.5815 MHz	8/250
7.0400 MHz	7.0385 MHz	8/250 (Secondary International)
7.0725 MHz	7.0710 MHz	8/250 (Primary International)
10.1430 MHz	10.1415 MHz	8/250
10.1440 MHz	10.1425 MHz	32/1000 (Potential/If Legal)
14.0725 MHz	14.0710 MHz	8/250
14.1085 MHz	14.1070 MHz	32/1000 (International)
18.1025 MHz	18.1010 MHz	8/250
21.0725 MHz	21.0710 MHz	8/250
24.9225 MHz	24.9210 MHz	8/250
28.1225 MHz	28.1210 MHz	8/250

NOTE: **CENTER** is where you place *the center of the software's cursor* on the **waterfall**, and then *click to select* that *center frequency on the waterfall*. If you use the **DIAL** frequency from this list, then place your waterfall cursor center at the **1500-Hz offset** up the waterfall (to the right of the left margin of the waterfall), and *click to select* that **center frequency on the waterfall**. This results in the software and transceiver being correctly tuned for the listed, *suggested calling **CENTER** frequency*.

between 100 and 600 miles, increasing to between 250 and 2300 miles after sunset. Look for openings up to about 300 miles on 80 meters during the day, extending out to the maximum short-skip distance (one-hop F-layer reflection) of 2300 miles during the hours of darkness.

Nighttime openings into many areas of the world are possible on 20, 30, and 40 meters. But seasonally high static levels may often make DX reception difficult on both 30 and 40 meters. High static levels are also expected to result in somewhat poorer DX conditions on 80 meters, although some long-distance openings are forecast during the hours of darkness. One-hundred sixty meters is virtually shut down due to the high static levels of summer. The best bet for 40-, 80-, and 160-meter DX openings is an hour or two before midnight for openings towards the north and east, and just before local sunrise for openings towards the south and west. Expect some 160-meter openings between sunset and sunrise for distances up to approximately 1300 miles, if the seasonally high static levels permit.

VHF Conditions

Statistical studies show that a sharp increase in sporadic-E propagation takes place at mid-latitudes during the late spring and summer months. During July and August, short-skip propagation over distances ranging between approximately 600 and 1300 miles should be possible on 6 meters.

Openings may also be possible on 2 meters during periods of intense sporadic-E ionization, with stations up to 1300 miles away. While sporadic-E short-skip openings can take place at just about any time of the day or night, statistics indicate that conditions should peak for a few hours before noon and again during the late afternoon and early evening.

During July you can expect 6-meter sporadic-E on at least 3 out of every 4 days. Openings may last from a few minutes up to hours.

Check <https://tinyurl.com/mr3nfzkv> for a complete calendar of meteor showers in 2023.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for April 2023 is 96.4. The twelve-month running smoothed sunspot number centered on October 2022 is 98.7. A smoothed sunspot count of 94, give or take about 9 points is expected for July 2023.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 145.86 for April 2023. The twelve-month smoothed 10.7-cm flux centered on October 2022 is 140.4. The predicted smoothed 10.7-cm solar flux for July 2023 is 129, give or take 7 points.

Geomagnetic activity level this month is expected to range from quiet to stormy, resulting in occasional degraded propagation. Remember that you can get an up-to-the-day ***Last-Minute Forecast*** at <https://SunSpotWatch.com> on the main page.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF amateur bands. If you are on Facebook, check out <https://fb.me/spacewx.hfradio> and <https://fb.me/NW7US> — speaking of Facebook—check out the *CQ* Amateur Radio Magazine fan page at <https://fb.me/CQMag>. Also, please check out the new alternative social networking ham radio group at <https://amateurhamradio.locals.com/> and please share this with your amateur radio friends and clubs.

73, Tomas, NW7US

Number groups after call letters denote folowing: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. Late logs are listed in Italic. (Note that country names and groupings reflect the DXCC list at the time of the contest.)

SINGLE OPERATOR
NORTH AMERICA

United States - District 1

AK1W	**A**	**6,330,405**	**2559**	**885**
				(OP: K5ZD)
K1LZ	"	*5,860,030*	*2428*	*835*
				(OP: AC1NU)
WK1Q	"	3,966,795	1634	771
				(OP: K1MK @K1TTT)
AE1P	"	1,979,364	1392	587
KE1S	"	1,822,713	1029	573
				(OP: W1AN)
W1HS	"	943,056	858	432
NG1M	"	912,120	847	440
K2RB	"	840,598	800	418
K1AR	"	669,798	678	381
W1ARY	"	579,852	671	364
K1VW	"	451,647	553	321
K1SM	"	442,890	557	342
K1BZ	"	265,406	381	262
W1GD	"	259,656	310	248
W1TO	"	179,872	292	224
KX1X	"	151,641	310	203
N1KM	"	99,828	216	177
K1RO	"	68,202	206	162
KB1QU	"	32,776	166	136
WV1K	*28*	*1,361,073*	*1006*	*591*
				(OP: N1IXF)
NW2P	**7**	**4,836**	**31**	**31**
***KC1RET**	**A**	**560,986**	**643**	**358**
*KW1X	"	436,800	640	336
*WG1V	"	328,042	517	286
*W1DYJ	"	225,944	392	244
*N1MGO	"	220,590	388	258
*KI1U	"	197,036	347	217
*KA2KON	"	189,420	315	220
*AF1R	"	181,440	344	216
*N1DID	"	151,000	274	200
*KA1C	"	150,300	327	225
*WO1N	"	121,410	301	190
*KG1V	"	107,670	251	194
*WA1HXH	"	96,744	207	174
*W1CRB	"	77,922	231	162
*N1DCH	"	52,932	190	132
*KI1G	"	43,554	133	119
*KB1IKD	"	39,431	178	131
*N1RDN	"	21,560	105	98
*N1AAM	"	20,467	130	97
*KC1SA	"	17,472	115	91
*NA1S	"	17,370	101	90
*WA1LAD	"	17,177	98	89
*KC1GDW	"	15,939	99	77
*K1LHO	"	15,873	144	111
K1DCT	"	*12,024*	*78*	*72*
WB8IMY	"	*9,858*	*67*	*62*
*WA1N	"	7,140	62	60
*N1AM	"	5,225	60	55
*KQ4Y	"	273	14	13
***WB1AEL**	**28**	**73,350**	**183**	**163**
***NG1R**	**21**	**571,824**	**678**	**418**
				(OP: W1QK)
***N1GDD**	**14**	**22,672**	**152**	**109**
*WA1YGT	"	204	13	12

United States - District 2

AA2EQ	**A**	**1,432,229**	**1185**	**521**
K4RUM	"	1,281,550	991	475
N2WK	"	1,234,455	886	515
W2CG	"	1,078,980	765	490
WA2CP	"	1,055,020	817	428
				(OP: KC2GOW)
WT2J	"	981,387	842	431
WX2NJ	"	887,880	821	453
				(OP: K2RET)
NR2C	"	*728,700*	*661*	*420*
K2NV	"	710,208	670	411
AA2GF	"	654,500	690	374
WB2NFL	"	554,040	684	360
KE2D	"	486,105	427	345
KF2TI	"	475,066	554	358
K2QB	"	450,918	528	369
WB2PJH	"	312,995	358	295
WB2NVR	"	*277,877*	*445*	*269*
N2RC	"	215,064	299	261
WA2MCR	"	192,696	426	248
NE2V	"	174,981	294	219
WS9M	"	161,551	331	221
KD2UBH	"	151,466	350	217
KM2O	"	129,168	228	184
KA2K	"	124,440	195	183
KA2AEY	"	61,256	208	152
WO2Y	"	60,236	193	148
WA2VIU	"	47,388	157	132
WA3AFS	"	24,472	92	92
AB2E	"	22,356	120	92
N2YBB	"	*21,185*	*103*	*95*
AD2BO	"	6,966	47	43
KC2KZJ	"	1,008	17	14
WB2WPM	*14*	*3,250*	*54*	*50*
***KU2M**	**A**	**2,524,608**	**1422**	**648**
*AH2O	"	1,122,990	983	498
*WB2JVO	"	792,819	789	411
				(OP: K2AL)
*WA2DNI	"	770,628	873	431
*KC2WUF	"	414,636	552	317
*WB2COY	"	352,500	574	282
W2NO	"	*294,872*	*359*	*328*
*KS2G	"	258,075	394	279
*WA2QAU	"	234,011	402	241
*AC2XC	"	222,176	449	262
*NS2N	"	181,280	309	220
*W2JV	"	159,264	323	252
*W2RLK	"	104,340	275	185
AG2S	"	*101,376*	*246*	*176*
*NM2K	"	94,520	214	170
*KW2O	"	93,310	196	155
				(OP: KA2D)
*K2DAR	"	63,640	185	185
*K3WHD	"	56,330	179	131
*KG2F	"	39,183	149	111
*ND2K	"	36,160	145	113
*K2DD	"	31,624	148	118
*KD2SGM	"	15,433	65	61
*AC2OC	"	14,388	71	66
K1NY	"	*12,596*	*82*	*67*
*W2YK	"	8,410	66	58
*W2DXE	"	5,453	47	41
KA2WIK	"	*480*	*17*	*16*
*WA2CHV	"	65	5	5
***K2SI**	**28**	**1,128**	**24**	**24**
***AC2IK**	**14**	**2,016**	**40**	**36**
***W2VTV**	**7**	**226,380**	**311**	**231**

United States - District 3

AA3B	**A**	**8,024,898**	**2749**	**942**
KF3P	"	6,112,690	2272	877
				(OP: K3MM)
N3QE	"	3,260,544	1616	672
NF3R	"	3,172,580	1781	730
KA3GIK	"	2,028,696	1255	617
				(OP: W3FIZ)
K3WJV	"	1,768,536	1105	616
W3FV	"	1,689,050	1141	550
N3FJP	"	1,614,626	1118	562
K3WW	"	1,192,608	939	492
WC3N	"	1,123,474	937	458
WT3K	"	1,053,228	837	474
AA3R	"	764,736	665	448
KX2S	"	682,668	740	378
W2CDO	"	658,896	581	424
NY3B	"	557,784	579	366
KD3TB	"	555,396	585	372
K2LNS	"	479,950	569	331
K3TN	"	469,404	500	354
4U1WB	"	431,892	776	372
				(OP: AJ3M)
N3ALN	"	428,188	598	334
NT3U	"	424,396	515	322
AK3B	"	375,232	489	328
N3AM	"	291,276	315	279
N8WXQ	"	253,176	415	264
W3FR	"	225,280	386	256
KC3TAU	"	174,563	310	227
K3AU	"	173,706	333	221
				(OP: K2YWE)
KB3Z	"	160,928	270	214
W3MAM	"	150,285	324	215
NN3RP	"	149,935	276	191
N3BD	"	141,400	340	202
NG3R	"	128,060	226	190
				(OP: K9RS)
W3OU	"	126,633	271	191
N3DUE	"	123,656	254	164
KE3GK	"	123,516	380	292
K3RMB	"	104,160	268	186
KG4USN	"	95,120	222	164
K3MD	"	86,271	199	193
K3QIA	"	80,840	208	172
N3FCP	"	77,736	207	158
AA3S	"	76,000	174	152
N1EK	"	69,615	195	153
NA7L	"	65,685	207	151
W3RE	"	64,529	188	173
N3AML	"	32,994	128	94
WY3A	"	28,083	127	111
K3CY	"	20,736	94	81
N3RM	"	11,324	91	76
W3GVX	"	7,740	61	45
K3TEF	"	*475*	*19*	*19*
W3LL	**7**	**1,772,880**	**859**	**498**
NA3M	"	*1,278,576*	*736*	*468*
***W3KB**	**A**	**768,504**	**586**	**451**
*AC5XK	"	722,294	716	409
*KB3AAY	"	538,197	571	347
*K3RWN	"	330,620	565	305
*KQ3F	"	285,817	374	307
*N3FR	"	237,360	443	258
*K3AK	"	215,433	411	237
*AC3U	"	198,045	369	243
				(OP: W3UL)
*KC3SDJ	"	134,521	297	193
*K3LT	"	123,713	301	193
*K3QP	"	120,132	252	213
*N2MA	"	111,414	248	186
*N3MLB	"	95,200	236	175
*AI3KS	"	82,560	212	172
*KE3ZT	"	80,907	196	149
*KC2VON	"	66,456	192	142
*KN1OLA	"	59,502	183	141
*WB8YYY	"	54,020	177	148
*AB3SX	"	51,737	182	133
*W3TAS	"	35,964	138	111
*AB3GY	"	26,796	113	87
*N3JNX	"	21,420	108	84
N2LK	"	*21,297*	*110*	*93*
AD2L	"	*19,285*	*106*	*95*
*K2PMD	"	16,281	97	81
*AJ3DI	"	15,200	102	80
*N5TB	"	11,932	96	76
*KC3SVR	"	10,602	64	57
*KC3WX	"	9,660	62	60
*KA2JAI	"	6,840	66	57
*N3WAS	"	4,725	49	45
*N3HRO	"	4,050	54	50
*WB3JIS	"	4,012	36	34
***K3HW**	**28**	**546**	**14**	**14**
***WA3FAE**	**7**	**205,110**	**298**	**215**

United States - District 4

AD4EB	**A**	**4,179,618**	**2111**	**801**
N6AR	"	2,653,326	1483	667
N1RM	"	2,191,196	1289	556
K9OM	"	2,082,417	1066	653
NA4DA	"	2,054,225	1238	647
AA4DD	"	1,746,360	1178	567
W4TTY	"	1,240,442	887	502
N4QS	"	1,015,560	795	468
NQ4J	"	770,400	790	428
				(OP: K8LF)
N4TB	"	715,712	739	424
W4CQE	"	644,993	731	409
W4BBT	"	*579,244*	*724*	*358*
W4GKM	"	531,700	650	409
WJ2D	"	*525,980*	*580*	*340*
W1IE	"	519,792	687	392
K4XL	"	480,636	521	316
NC4S	"	449,280	570	351
W4UEF	"	399,657	523	303
NC4SW	"	385,671	597	319
WS6X	"	378,560	505	320
WW4R	"	358,792	457	301
				(OP: N4ZZ)
AI4WW	"	357,004	586	298
K7OM	"	344,318	538	323
W4UK	"	328,727	536	311
AI4WU	"	325,594	452	263
N4CF	"	301,041	415	279
NR4O	"	293,343	433	277
NN4NN	"	274,052	392	262
				(OP: K3SV)
AA4CF	"	260,389	386	289
AC6ZM	"	*237,236*	*401*	*254*
KW4CW	"	183,516	367	246
NS4X	"	173,340	309	214
K4LTE	"	166,850	384	235
KT4O	"	161,520	330	240
NK4I	"	159,341	283	221
W4GHV	"	126,690	289	205
W3CL	"	125,022	268	201
N4TL	"	121,176	258	204
WB4YDY	"	110,600	249	175
W4WWQ	"	109,611	236	171
ND4G	"	95,151	216	197
K5VG	"	89,356	237	178
KD4S	"	85,086	223	163
K9QJS	"	75,509	246	161
KG3V	"	72,822	199	159
K5WP	"	66,792	192	138
KØZR	"	60,606	148	126
K4REB	"	*56,392*	*206*	*152*
N3PV	"	55,074	196	137
KT4Q	"	48,364	143	113
AA4HG	"	42,350	167	121
KB4QZH	"	40,875	132	109
AA9HQ	"	*38,824*	*123*	*92*
K4QQG	"	29,952	137	117
NR3X	"	*29,792*	*137*	*112*
				(OP: N4YDU)
N4JOW	"	29,493	122	113
W5XB	"	*29,370*	*139*	*110*
K4KZ	"	29,274	119	102
K3DNE	"	27,280	101	88
KI4GGJ	"	*25,546*	*126*	*106*
KA8P	"	*24,929*	*117*	*97*
AF4T	"	18,942	98	82
N3KN	"	17,978	107	89
K4NWX	"	16,362	93	81
W4BCG	"	16,119	95	81
W4ZGR	"	12,560	96	80
N4FP	"	9,600	81	64
AA4NU	"	*9,387*	*72*	*63*
W3GQ	"	1,012	23	23
AD4ES	"	*455*	*13*	*13*
N4IDH	"	208	14	13
K9EZ	"	25	5	5
K4WI	**28**	**1,207,980**	**936**	**540**
NJ4U	**21**	**1,543,668**	**1068**	**644**
				(OP: K4EA)
W3IK	**14**	**11,560**	**99**	**85**
W4SSF	"	1,908	39	36
KK9A	**7**	**2,375,712**	**1121**	**584**
***N4SS**	**A**	**1,799,352**	**1101**	**603**
				(OP: W5MX)
*W4RN	"	1,122,987	779	453
*N5SMQ	"	505,500	624	337
*WW4SF	"	479,400	592	340
				(OP: KG4IGC)
*KK4R	"	450,606	524	327
*WA4EEZ	"	360,612	485	324
*N2ESP	"	271,005	387	267
*N3CKI	"	258,266	432	263
*AD4TJ	"	249,900	381	255
*N4DW	"	246,984	434	251
*W3DQS	"	220,158	369	243
*KS4S	"	217,260	391	255
*K4HXM	"	211,357	396	241
*N4MMR	"	209,294	324	227
*K7RB	"	196,736	324	232

*WZ4M	“	192,660	432	247
*K4DR	“	179,728	366	239
*K4FTO	“	179,469	343	207
*KD4ADC	“	179,118	393	214
*AA2MA	“	176,904	324	216
*WA3RWP	“	172,032	384	224
*W4PJW	“	156,562	361	211
*NK4T	“	141,050	347	217
*AA5JF	“	140,400	256	216
*NN4RB	“	139,499	280	199
*KT6D	“	139,256	307	206
*KM4F	“	95,976	263	186
*W4VIC	“	90,036	206	164
*KO4XB	“	85,848	238	168
*KM4FO	“	82,080	248	160
*N4QI	“	77,854	226	166
*K4FJW	“	76,475	220	161
*KN4PHS	“	71,592	196	157
W4TM	“	*71,050*	*240*	*175*
*AA8R	“	68,832	193	144
*KT3T	“	68,704	200	152
*KS4YX	“	62,015	198	157
*W4GO	“	54,656	152	128
*KO4ENU	“	52,640	295	188
*WN8Y	“	50,560	237	158
*W4EE	“	49,077	167	133
*N4AU	“	45,588	155	131
*K4YCR	“	45,250	157	125
*KW4J	“	42,240	174	132
*NQ4K	“	38,400	146	120
*AC4G	“	38,184	129	111
*KO4BWN	“	34,314	134	133
*WBØPOH	“	32,130	133	105
*KA3EHL	“	24,516	135	108
*NS9I	“	23,976	132	108
*W4IM	“	23,736	118	86
*K4LDC	“	22,542	112	102
WG4K	“	*22,464*	*130*	*108*
*KQ4AAR	“	20,910	106	85
*WB4MM	“	20,608	122	92
*W4SKB	“	20,580	135	105
N4MRM	“	*20,271*	*98*	*87*
*W1REP	“	19,092	95	74
*K1GU	“	18,837	102	91
K4HAL	“	*18,304*	*102*	*88*
*N4NTO	“	17,577	102	81
*KQ3K	“	14,400	82	72
*W9FFA/4	“	12,584	113	88
*KK4DZP	“	10,988	73	67
*K1NA	“	9,954	85	79
*K3WR	“	8,760	68	60
*N8AID	“	8,100	55	50
*W4YVA	“	7,936	71	62
*AK4AO	“	6,954	69	57
*KM4CRC	“	6,858	67	54
*K4LXX	“	6,667	66	59
*KM4RK	“	6,321	55	49
*NG4L	“	4,275	53	45
*KM4JLK	“	4,160	59	52
*K4MI	“	4,116	46	42
*K8PO	“	3,240	40	36
*KF4FMQ	“	2,652	36	34
*KC4OBX	“	2,508	35	33
*K4CGA	“	2,304	38	36
*WA8AHZ	“	1,860	33	30
*N4NP	“	798	21	21
*K4NXA	“	380	20	20
*KN4UOW	“	368	23	23
*N5VX	“	84	12	12
*AA4TE	“	3	1	1
***WO4O**	**28**	**254,040**	**357**	**290**
*K4FT	“	37,908	127	117
***WA1FCN**	**21**	**320,540**	**496**	**341**
***W4LC**	**14**	**111,776**	**303**	**224**
*N8GU	“	2,184	46	42
*K3TW	“	156	14	13
***KEØL**	**3.5**	**1,450**	**33**	**25**

United States - District 5

N5YT	**A**	**1,848,195**	**1326**	**603**
AD5XD	“	1,703,184	1381	592
W9DCT	“	1,008,807	898	489
K5XH	“	372,360	578	321
AA5H	“	339,108	404	308
N5XJ	“	273,702	394	286
WA9JBR	“	98,784	258	196
WØZW	“	72,522	204	158
AB8YZ	“	69,650	289	175
KØGEO	“	66,576	243	146
WV5Y	“	54,264	235	152
WA5LXS	“	43,956	152	132
AK5Y	“	38,740	186	130
N5RZ	“	32,523	144	111
K5CI	“	26,741	184	121
N5REL	“	7,938	62	54
K5TU	“	6,936	56	51
W5KI	“	1,127	27	23
W2GS	“	940	21	20
KZ5MM	**28**	**1,107,150**	**977**	**550**
				(OP: W5PR)
KD5J	“	1,247	29	29
W5TN	**14**	**20,592**	**142**	**104**
AA5AU	“	819	25	21
NA5NN	**3.5**	**7,344**	**59**	**51**
				(OP: K2FF)
***AD5LU**	**A**	**451,914**	**704**	**327**
*NN5T	“	303,784	484	254
*K5TXM	“	270,908	586	262
*K5TRP	“	224,264	399	289
*N5KWN	“	184,262	360	247
*WQ5L	“	136,656	295	208
*WB5JJJ	“	115,210	311	205
*N5JGE	“	106,191	297	171
*KI5RQG	“	89,000	304	178
*WDØGTY	“	82,064	289	184
*WB5K	“	77,688	278	166
*KF5VRD	“	69,913	241	151
*WA8ZBT	“	60,671	246	169
*N5XE	“	57,150	186	150
*KK5LO	“	56,398	194	163
*KF5RLL	“	52,514	213	154
*N3BUO	“	50,041	233	163
*WA5LFD	“	43,875	182	125
*N5PV	“	43,053	198	127
*K5WW	“	26,288	152	106
*WS5D	“	24,720	182	120
*AA5W	“	20,384	125	98
*KI5QPY	“	19,012	122	97
*KG5EIU	“	14,532	104	84
*WA9AFM	“	13,248	124	92
*WBØRUR	“	11,703	102	83
*N5AF	“	4,949	55	49
AG5S	“	*2,870*	*44*	*35*
*AC5AA	“	1,911	40	39
*K3KEK	“	690	27	23
*K5LGX	“	570	16	15
*K5IX	“	190	10	10
*KC6CNN	“	150	10	10
*KC5RGQ	“	36	9	9
***K5QR**	**28**	**296,102**	**415**	**314**
*NK5G	“	62,208	205	162
*AF5CC	“	1,104	25	24
*WØAMT	“	714	23	21

United States - District 6

KU6W	**A**	**1,307,250**	**1151**	**525**
				(OP: K9YC)
N6ZFO	“	964,429	1038	463
NF6A	“	934,570	867	455
K6TQ	“	905,580	1067	468
W6SX	“	844,770	1059	435
W6EU	“	813,058	910	446
AJ6V	“	748,879	939	409
WQ6Q	“	722,400	961	430
WQ6K	“	607,476	602	426
W1PR	“	289,191	477	293
K6NV	“	273,988	502	286
K6RC	“	*199,680*	*417*	*260*
NC6R	“	*199,104*	*480*	*272*
KN6MYI	“	184,623	276	237
AF6SA	“	175,274	374	257
KO6M	“	97,152	334	184
NK6A	“	91,532	292	196
W8GJK	“	77,989	252	167
W6TK	“	60,147	209	163
KE6QR	“	48,528	190	144
W6IA	“	44,544	161	128
AB1U	“	27,160	160	97
				(OP: W6RKC)
W6DR	“	20,240	106	88
K6ELE	“	17,184	112	96
W6JBR	“	15,470	95	85
K6NR	“	*13,345*	*105*	*85*
K6ZP	“	1,166	24	22
AA6MK	“	1,157	101	89
WD6T	**28**	**1,319,094**	**1075**	**609**
				(OP: @N6RO)
WX6V	“	337,120	458	344
WV6I	**21**	**360,836**	**500**	**343**
				(OP: N6WM)
WF6C	“	60,480	213	160
				(OP: N6XI)
WX5S	**7**	**316,250**	**366**	**253**
N3RC	“	36	6	6
***N7WLC**	**A**	**189,306**	**415**	**234**
*KE6SHL	“	188,276	486	242
*K6UF	“	84,132	268	171
*N6GEO	“	77,740	228	169
*K6BIR	“	49,140	234	135
K6FA	“	*46,854*	*173*	*137*
*WU6X	“	37,250	194	125
*NN6U	“	32,592	143	112
*KA5WSS	“	32,085	189	115
*KD6HOF	“	23,100	122	100
*KN6SID	“	22,338	165	102
*K6EI	“	21,756	98	84
*K4AOQ	“	19,090	93	83
*K6TLH	“	18,200	127	91
*KD6GWH	“	16,632	109	84
KN6EQQ	“	*13,760*	*127*	*86*
*KM6WCC	“	13,600	96	85
*KN6TZK	“	8,382	79	66
W6BSD	“	*6,464*	*79*	*64*
*AG6JA	“	5,376	55	48
*NF6R	“	4,365	53	45
*KG6YJ	“	2,847	43	39
*KN6OON	“	680	18	17
*N6EWG	“	490	14	14
*KE6MYA	“	130	10	10
***KF6RY**	**28**	**108,876**	**326**	**211**
				(OP: W6ZL)
*NO6ED	“	1	1	1
***NG6O**	**7**	**152,096**	**295**	**194**
				(OP: K6GHA)
***WZ6ZZ**	**3.5**	**4,816**	**54**	**43**

United States - District 7

K7RL	**A**	**3,550,008**	**2180**	**748**
KU1CW	“	3,346,710	1920	794
WK6I/7	“	*3,305,104*	*2223*	*712*
N7GP	“	1,782,810	1599	558
KA6BIM	“	1,504,457	1177	557
KC7V	“	1,038,345	1276	465
K7QA	“	999,327	1005	483
K7WP	“	946,070	926	445
AC7DC	“	807,729	900	417
KH7X/NZ7	“	688,884	789	417
				(OP: KH6ND)
AC7S	“	592,130	936	385
KN7K	“	528,984	815	372
WC7Q	“	*375,240*	*623*	*354*
AA7A	“	371,754	484	342
K7GS	“	360,255	452	365
KZ1W	“	*343,176*	*572*	*316*
N9NA	“	334,400	647	320
KD7PCE	“	323,856	645	312
K7JQ	“	266,751	492	277
N7DSX	“	230,202	493	261
W7LD	“	207,473	532	277
N1KEZ	“	190,452	408	269
N7VGO	“	177,888	329	218
K7VIT	“	151,216	375	208
KG7CW	“	149,160	385	226
KB7AZ	“	141,882	292	221
AD7XG	“	138,672	308	216
K7LFY	“	132,581	337	197
N7GR	“	130,410	341	230
WU7W	“	115,713	315	207
KF7F	“	110,292	232	182
KY7M	“	100,470	252	197
WA7DUH	“	92,217	233	177
WG7X	“	91,871	345	191
K7BVT	“	81,137	257	173
WB6JJJ	“	68,783	211	143
N7XCZ	“	56,265	271	155
KR7D	“	47,742	202	146
KT7G	“	46,035	189	155
W7VJ	“	45,750	145	122
KG7QXE	“	33,600	145	112
W7VXS	“	33,040	157	118
N7OMS	“	28,512	136	108
NK9I	“	19,176	155	102
W7UDH	“	13,248	134	92
WR7T	“	12,324	87	78
WN7M	“	10,695	86	69
				(OP: K7BTW)
W7GES	“	10,203	60	57
K7NT	“	8,235	65	61
NN7M	“	1,188	30	27
WA7TV	“	1,125	26	25
KZ7X	**28**	**1,301,016**	**1071**	**604**
				(OP: K6LL)
NS1L	“	641,348	660	446
				(OP: N6SS)
WZ7ZR	“	321,195	492	345
				(OP: W7ZR)
K7IU	“	118,197	314	207
KK7L	“	3	1	1
WQ3U	**21**	**17,372**	**121**	**101**
K8IA	**7**	**689,724**	**624**	**357**
***N7GCO**	**A**	**360,912**	**573**	**309**
*W7BOB	“	309,232	559	308
*N7UVH	“	292,456	572	278
*WZ8T	“	283,864	597	296
*WS7I	“	239,904	409	306
*N7ESU	“	209,062	430	274
*WAØWWW	“	201,745	344	257
*W7TMT	“	189,002	491	242
*K7HKR	“	172,912	365	214
*WN6W	“	171,570	426	258
*K7AZT	“	107,238	300	183
*AA4Q	“	106,790	329	181
*NA6JD	“	74,800	247	170
*KG7VIZ	“	70,470	267	162
*N7JB	“	61,056	224	144
*W7MTL	“	55,338	214	138
K7VAP	“	*54,663*	*219*	*137*
W7WSV	“	*51,570*	*187*	*135*
*N7EZQ	“	50,516	219	146
*W1DGL	“	47,360	246	148
*WA7LNW	“	42,159	231	141
*NW7D	“	32,480	169	116
*W7VC	“	29,925	173	105
*NQ7R	“	29,500	159	118
*N7XB	“	28,600	160	100
*KB7AK	“	24,486	153	106
*NY7N	“	23,999	139	103
N7VS	“	*23,970*	*140*	*102*
*KE7GKI	“	23,900	163	100
*WA7BRL	“	23,214	126	106
*WB7CYO	“	21,210	140	105
NU7F	“	*20,988*	*127*	*99*
*KB7SDM	“	18,693	140	93
*N7PWZ	“	16,791	116	87
*K7MK	“	16,770	96	86
*AB9BH	“	13,320	107	90
WØSX	“	*12,480*	*101*	*78*
*N7AME	“	10,220	89	73
*N6FC	“	8,662	97	71
*KF7GMV	“	6,944	75	62
*KI7YFP	“	4,640	65	58
*WB7QMR	“	3,478	54	47
*KI7DET	“	2,812	45	38
*KK7A	“	2,550	39	34
*KJ7DHY	“	1,386	45	42
*AC6DF	“	1,036	29	28
*AE7AP	“	1,020	20	20
*KD7GHZ	“	624	26	26
***K7ULS**	**28**	**58,368**	**182**	**152**
*N7EPD	“	7,134	60	58
***KC7CM**	**21**	**75,144**	**256**	**186**
*N7DB	“	73,340	274	193

United States - District 8

KI6DY	**A**	**2,406,552**	**1514**	**591**
K3GP	“	1,065,816	817	524

K8MM	"	594,456	652	376
W8JWN	"	454,914	588	381
K8JQ	"	412,221	653	313
KI8I	"	340,128	567	288
KB8ECG	"	334,280	577	305
KA8G	"	*267,862*	*395*	*266*
KD8FS	"	*252,702*	*442*	*278*
WA8LRW	"	213,248	365	238
K8BZ	"	36,580	187	124
W8EH	"	*29,870*	*127*	*103*
KA8HKC	"	*7,192*	*61*	*58*
W8CAR	**28**	**34,034**	**146**	**119**
***N8CWU**	**A**	**915,875**	**931**	**425**
*WB8JUI	"	434,603	576	331
*K7DR	"	320,120	497	302
*AD8FD	"	273,413	424	281
*NX8G	"	221,633	345	251
*ND3N	"	198,162	441	218
*K8RGI	"	194,484	404	228
*N8EA	"	150,756	289	204
*KB8TL	"	148,780	301	215
*N8WCP	"	147,840	324	210
**NE8O*	"	*144,768*	*310*	*208*
*W8TWA	"	101,606	295	202
*WS6K	"	100,470	230	197
*K8AJS	"	79,200	213	160
*W8DW	"	76,258	244	182
*NE3R	"	75,920	196	146
*N8VV	"	74,360	198	169
*K8VUS	"	74,235	210	147
**K8GIB*	"	*66,000*	*187*	*150*
*WA8YZB	"	59,584	240	152
*WB8JAY	"	53,504	177	128
*K8TJM	"	46,949	184	133
*N8KQ	"	45,792	182	144
*KC8R	"	40,833	150	117
*N8HHG	"	38,112	119	96
*AB8OU	"	37,278	137	114
*W8TB	"	32,760	136	105
*W3CRZ	"	28,815	139	113
**AA8EN*	"	*27,510*	*130*	*105*
*W5KBW	"	26,880	145	112
*AB8SF	"	25,365	117	95
*AA8MA	"	20,064	112	96
*WA8KAN	"	16,340	106	86
*N8EUI	"	11,659	100	89
**KB8ZYE*	"	*9,918*	*74*	*57*
*NN8UU	"	6,344	56	52
*N8TCP	"	2,541	33	33
*N8TFD	"	1,456	30	28
*WB8TDG	"	1,305	29	29
*W8KNO	"	475	20	19
K8VT	**14**	**94,815**	**291**	**215**
United States - District 9				
AI9T	**A**	**1,871,748**	**1212**	**654**
W9MR	"	342,300	430	300
W9PDS	"	315,744	561	299
KC9TZO	"	252,984	461	249
KØTQ	"	216,672	345	244
KC9EOQ	"	184,040	388	214
KC9K	"	175,665	304	239
N2BJ	"	117,096	267	204
W9YK	"	*94,320*	*259*	*180*
N9IO	"	68,400	192	144
AA9L	"	61,194	212	141
WA9IVH	"	22,088	106	88
N9EP	"	9,702	97	77
KA9BHD	"	8,905	88	65
WB9WHI	"	682	26	22
KN9P	"	340	17	17
W9ILY	**28**	**619,918**	**601**	**422**
W9PA	*21*	*797,094*	*745*	*509*
***KG9X**	**A**	**673,865**	**681**	**439**
*KYØQ	"	491,596	605	362
*N9SJ	"	421,480	610	328
*WU9D	"	331,932	549	278
*W9FY	"	274,176	559	256
*W9TD	"	188,293	398	259
*W9KG	"	163,520	404	224
*N9UA	"	145,173	331	217
*WB9B	"	122,815	277	203
*K9PW	"	99,093	226	201
*KD9NHZ	"	87,024	243	168
*N9SB	"	83,476	266	164
*KB9REV	"	82,896	285	176
*W9VQ	"	72,333	195	171
*KB9DVC	"	62,577	220	153
*KC9YL	"	53,055	194	131
*WB9VGO	"	45,630	186	135
*W9PI	"	39,750	146	125
*N9ID	"	35,588	162	124
*N9LYE	"	35,568	164	117
*AC9XV	"	24,479	118	91
*WB9WOZ	"	24,180	112	93
*N9TNT	"	22,080	111	92
*WA9LEY	"	20,160	129	96
*WB9BWP	"	17,019	122	93
*WB9UGX	"	15,879	103	79
**WE9R*	"	*11,592*	*74*	*72*
*AA9RK	"	11,431	83	71
*WT9U	"	11,088	75	63
*KC9JBU	"	10,530	104	78
*KEØYI	"	9,454	66	58
*KA9VLC	"	6,206	62	58
*K9DUR	"	5,460	59	52
*KD9DJB	"	3,864	56	46
*N9XX	"	2,925	45	39
*N9EDL	"	1,344	24	24
*K9QH	"	703	20	19
*AK9R	"	308	15	14
***N9VPV**	**28**	**117,912**	**252**	**204**

*AB9YC	"	115,913	212	203
*N9LJX	"	48,786	155	141
***W9AKS**	**7**	**30,600**	**116**	**100**
United States - District Ø				
ACØC	**A**	**5,285,436**	**2476**	**884**
N7WY	"	1,768,200	1380	600
KØAP	"	1,255,500	1078	540
NXØI	"	1,070,399	1179	473
ABØRX	"	965,280	953	480
WT7TT	"	919,836	1240	459
				(OP: WØZA)
KFØJBL	"	915,513	1120	453
				(OP: WØPR)
W5AP	"	693,880	855	418
NØTA	"	667,320	973	402
WØMB	"	624,771	796	423
W7II	"	551,628	721	396
KØTC	"	359,125	581	325
NFØN	"	160,797	334	217
KØTLG	"	119,808	310	234
NØKQ	"	117,390	340	195
NØAJN	"	84,597	272	173
ADØTR	"	*50,416*	*149*	*137*
WRØU	"	19,929	116	91
WFØGM	"	18,270	118	90
N6RSH	"	12,616	87	76
WAØTXJ	"	11,840	88	74
ACØE	"	10,191	100	79
ABØS	"	7,714	71	58
KØHB	"	5,850	54	50
WØIL	"	*4,335*	*58*	*51*
WØTY	"	2,166	43	38
KSØAA	**28**	**131,446**	**296**	**229**
KFØIQ	**21**	**779**	**19**	**19**
WA2PCN	**14**	**930**	**31**	**30**
***KØRC**	**A**	**696,496**	**677**	**431**
*WTØDX	"	428,496	681	339
*WØIZ	"	370,164	717	327
**AI6O*	"	*338,928*	*546*	*307*
*WBØN	"	298,074	503	302
*AAØAW	"	286,228	522	326
*ABØLR	"	269,656	577	296
*WO7U	"	210,483	428	257
*WZØW	"	171,825	382	237
*KFØUR	"	155,710	504	230
*KV5Y	"	138,880	428	224
*KDØZV	"	132,486	377	213
*NWØM	"	104,512	298	184
*AD1C	"	96,330	226	190
*WAØLIF	"	91,575	286	185
*WØUY	"	72,861	230	163
**KS9W*	"	*58,240*	*225*	*160*
*KBØGT	"	54,600	214	140
*WDØBGZ	"	48,180	135	132
*WAØLPV	"	47,158	246	146
*KØIL	"	37,878	181	118
*WCØWB	"	31,740	169	115
*WØZQ	"	27,639	154	111
**KNØL*	"	*27,438*	*126*	*102*
*WØDET	"	26,307	137	111
**KOØZ*	"	*22,310*	*124*	*97*
*KO9V	"	21,526	131	94
**WØCO*	"	*19,740*	*131*	*94*
*WBØWIV	"	19,475	95	95
*WØYJT	"	18,746	127	103
*WA2IVD	"	18,656	99	88
*KAØKVW	"	17,608	98	71
*WAØEJX	"	14,299	102	79
*KØMPH	"	14,000	99	80
**KØXU*	"	*10,290*	*102*	*70*
*WAØMHJ	"	8,208	63	54
*AIØY	"	6,666	86	66
*KØGMK	"	6,375	93	75
*NYØJ	"	6,136	79	59
*KØWRY	"	5,325	95	75
*KØTJT	"	4,900	56	50
*KEØITC	"	3,456	57	54
*NØLLH	"	1,829	32	31
*KJØP	"	1,564	34	34
*KFØADU	"	575	24	23
*KØVG	"	504	16	14
**W3ZF*	"	*4*	*2*	*2*
**KTØW*	*28*	*117,504*	*305*	*216*
KKØU	**"**	**24,196**	**102**	**92**
*NØUI	"	13,024	88	74
WNØL	**21**	**132,009**	**302**	**237**
WØADL	**14**	**1,144**	**27**	**26**

NORTH AMERICA

Alaska

AL2F	**A**	**741,152**	**844**	**368**
AL7LO	"	327,168	522	284
KL2R	"	63,920	202	136
				(OP: N1TX)
N6QEK/KL7	"	5,762	55	43
KL7SB	*28*	*446,355*	*613*	*327*
***KL7IWC**	**A**	**143,028**	**323**	**174**

Antigua & Barbuda

***V26OC**	**A**	**1,339,500**	**979**	**470**

Belize

***V31MA**	**A**	**1,808,256**	**1120**	**554**

Canada - District 1

VO1CH	**A**	**34,160**	**117**	**112**
***VA1XH**	**A**	**1,319,550**	**920**	**463**
*VY2LI	"	643,536	595	369
*VE1ANU	"	97,328	193	158
*VE1QY	"	45,276	119	98
*VY2DP	"	27,140	113	92

Canada - District 2

VE2GSO	**A**	**1,978,470**	**1332**	**534**
VA2QR	"	669,033	641	349
VA2CZ	"	336,856	451	328
VA2CST	"	328,810	420	251
VE2EZD	"	292,721	396	253
***VE2BVV**	**A**	**1,117,464**	**854**	**461**
*VE2HEW	"	320,276	455	251
*VA2SIB	"	102,065	226	149
*VE2QV	"	42,024	133	103
*VE2OWL	"	29,184	106	96

Canada - District 3

VA3LR	**A**	**1,071,600**	**769**	**456**
VE3CT	"	967,430	655	445
VE3TW	"	242,624	375	223
VE3EJ	"	237,250	330	250
VE3MZD	"	96,096	220	182
VE3SS	"	89,324	207	163
VA3IK	"	23,652	99	81
VE3SST	"	20,100	99	75
VE3NZ	**28**	**946,242**	**744**	**486**
VA3WW	**14**	**3,626**	**58**	**49**
***VE3MGY**	**A**	**2,020,150**	**1266**	**550**
*VE3DZ	"	912,576	670	392
*VE3PJ	"	818,748	670	399
*VA3SB	"	451,140	557	309
*VA3FF	"	353,872	434	272
*VA3PC	"	353,616	379	318
*VE3EY	"	208,035	306	201
*VA3EON	"	153,463	300	197
*VE3HG	"	101,286	222	153
*VE3GTM	"	93,483	200	153
*VE3CWU	"	93,279	237	177
*VE3EUS	"	84,624	205	172
*VA3OGG	"	60,208	199	142
*VA3WB	"	40,222	138	119
*VA3JHQ	"	18,225	89	75
*VA3FN	"	15,120	72	63
*VE3FZ	"	3,570	37	34
*VE3RUV	"	3,162	35	34
*VE3FR	"	1,416	29	24
***VE3TM**	**28**	**222,194**	**341**	**269**
***VE3HLS**	**7**	**20,064**	**75**	**66**

Canada - District 4

***VA4HZ**	**A**	**355,165**	**575**	**283**
***KØMKL/VE4**	**21**	**3,403**	**41**	**41**

Canada - District 5

***VE5KS**	**A**	**908,730**	**882**	**439**
*VE5SF	"	156,264	298	204
**VE5VG*	"	*9,966*	*70*	*66*

Canada - District 6

VE6BBP	**A**	**1,127,124**	**938**	**478**
VE6UM	**28**	**496,170**	**587**	**370**
				(OP: VE6BMX)
VE6AO	"	9,027	70	59
				(OP: VE6TC)
***VA6RCN**	**A**	**439,856**	**569**	**296**
				(OP: VE3RCN)
**VE6TN*	"	*136,068*	*302*	*174*
*VE6FRD	"	29,370	103	89
*VE6SPS	"	21,804	107	79
*VE6SYD	"	15,257	82	73

Canada - District 7

VE7LWW	**A**	**2,015,431**	**1441**	**583**
VA7KO	"	1,827,540	1306	572
VA7ST	"	896,104	936	374
VE7IO	"	4,590	37	34
VE7DX	**28**	**388,160**	**537**	**320**
***VE7HS**	**A**	**168,296**	**331**	**218**
*VA7ZM	"	56,525	187	133
*VE7BGP	"	10,080	71	63
*VE7AF	"	4,343	46	43
*VA7HZ	"	50	5	5
***VE7KAJ**	**28**	**8,680**	**68**	**62**

Costa Rica

***TI2OY**	**A**	**595,647**	**623**	**351**
*TI2WMP	"	460,752	544	348
***TI3DK**	**28**	**226,767**	**384**	**269**
***TI2ALF**	**21**	**16,770**	**96**	**86**

Cuba

***CO3JN**	**A**	**229,416**	**424**	**264**
*CM6AW	"	148,614	304	186
*CO3LC	"	37,944	120	102
*CO7HH	"	23,668	128	97
***CO8NDZ**	**28**	**432,972**	**548**	**342**
*CO6XE	"	72,450	225	161
***CO2XK**	**21**	**222,615**	**402**	**255**
*CO2GL	"	72,535	229	163
***CO2JD**	**7**	**185,802**	**264**	**179**
*CM8JFL	"	11,856	66	57

Dominican Republic

***HI3MM**	**A**	**842,037**	**976**	**397**
*HI3K	"	421,056	593	306

Greenland

OX3LX	**A**	**188,000**	**328**	**250**

Guatemala

***TG9ANF**	**A**	**727,776**	**783**	**399**
*TG9ADQ	"	287,850	439	285

		Honduras		
***K6VHF/HR9**	**28**	**33,109**	**140**	**113**
		Mexico		
4A5E	**21**	**26,677**	**131**	**103**
***XE1YL**	**A**	**438,144**	**640**	**326**
*XE2AU	"	140,490	323	210
*XE2YWB	"	77,556	226	138
XE2KJ	"	*72,790*	*272*	*145*
**XE2OK*	"	*40,845*	*130*	*105*
*XE2T	"	30,861	111	81
***XE1CL**	**28**	**65,144**	**232**	**136**
*XE1CT	"	30,024	124	108
		Panama		
HP1ELV	**A**	**17,100**	**108**	**95**
***HP1OIA**	**A**	**3,942**	**54**	**54**
***HP1DCP**	**28**	**6,496**	**62**	**56**
		Puerto Rico		
***WP3E**	**A**	**188,778**	**332**	**219**
				(OP: KP3B)
*WP3GW	"	120,741	234	167
***NP4TX**	**7**	**234,780**	**292**	**215**

AFRICA

		Canary Islands		
EA8DO	**A**	**816,678**	**658**	**354**
EA8ZS	"	*137,138*	*280*	*191*
***ED8L**	**A**	**969,516**	**655**	**382**
				(OP: EA8DHH)
*EA8AQV	"	263,750	315	250
*EA8OM	"	153,520	238	190
				(OP: DJ1OJ)
***EA8AH**	**28**	**1,047,888**	**812**	**456**
		Cape Verde		
D4L	**28**	**1,260,522**	**851**	**502**
				(OP: IK2NCJ)
		Namibia		
V55Y	**28**	**2,013,736**	**1126**	**604**
				(OP: V51WH)
		St. Helena		
ZD7BG	**A**	**148,590**	**258**	**195**
		Tunisia		
***3V8SF**	**3.5**	**11,088**	**46**	**42**

ASIA

		Armenia		
***EK3GM**	**21**	**89,090**	**209**	**151**
		Asiatic Russia - District 9		
RC9T	A	323,046	409	262
RG9A	28	599,918	565	407
RA9YE	"	*14,112*	*78*	*72*
*R9MJ	A	719,160	688	390
**UA9OEX*	"	*118,668*	*268*	*186*
*RA9SN	"	52,098	149	114
*UA9OV	"	11,000	53	50
*RA8AI	14	9,128	56	56
		Asiatic Russia - District Ø		
RWØSR	A	577,788	554	356
UAØOK	"	*446,555*	*549*	*335*
RAØACM	"	399,687	442	289
RWØUM	"	*117,467*	*297*	*173*
RAØFLP	28	526,110	536	355
RMØW	"	194,636	322	247
RDØA	*21*	*648,036*	*579*	*423*
UCØA	"	*335,997*	*392*	*333*
*RAØWHE	A	234,256	345	242
*RNØJT	"	77,430	199	145
**UAØJFD*	"	*53,874*	*180*	*123*
*UAØC	"	29,410	129	85
*RØJD	"	17,538	101	74
*RØUO	"	8,802	84	54
*RCØAJ	"	8,748	59	54
**RGØS*	*28*	*77,274*	*186*	*162*
*RCØL	21	27	3	3
		Asiatic Turkey		
***TA2EJ**	**A**	**603,850**	**574**	**325**
*TA7I	"	448,189	439	301
*TA2E	"	80,500	180	140
***TA4RC**	**28**	**192**	**8**	**8**
***TA2FT**	**7**	**134,384**	**169**	**148**
*TA4AU	"	1,440	16	16
		China		
BA4TB	*A*	*1,034,540*	*857*	*460*
BH4SCF	**"**	**276,351**	**440**	**251**
BA4AEO	"	*10,850*	*69*	*50*
BG2VIA	"	9,400	62	50
BD3CB	**28**	**294,624**	**390**	**288**
***BD4VGZ**	**A**	**726,652**	**673**	**389**
*BD7BW	"	114,924	339	157
*BD3GNI	"	90,850	213	158
*BD4QB	"	68,740	207	140
*BD4UN	"	67,135	202	145
*BH2SWB	"	57,771	175	131
*BG3GRU	"	49,686	177	147
*BG5BAA	"	27,918	117	99
*BH4UMN	"	300	12	12
*BG8PM	"	234	9	9
***BH8PHG**	**28**	**5,658**	**47**	**46**
*BG2KAJ	"	300	10	10
*BG8PC	"	264	11	11
*BA7LAC	"	108	6	6
***BA3AX**	**21**	**60,066**	**207**	**142**
*BI4VIP	"	14,616	97	72
*BG3HMQ	"	8,584	62	58
*BG9XD/5	"	4,440	53	40
*BH2UBD	"	2,046	41	33
*BD4QA	"	72	6	6
***BG8DIV**	**7**	**12,096**	**52**	**48**
		Cyprus		
P3X	**A**	**186,219**	**262**	**209**
				(OP: 5B4AMM)
H25A	"	112,338	182	158
		Hong Kong		
***VR2VRC**	**28**	**1,656**	**24**	**24**
		India		
***VU2IBI**	**28**	**36,850**	**120**	**110**
*VU2FGQ	"	34,965	119	105
		Israel		
4Z5FI	**14**	**371,490**	**441**	**290**
4Z1MS	**7**	**208,984**	**208**	**173**
***4X1ST**	**A**	**427,950**	**402**	**270**
*4X6FB	"	58,724	129	106
***4Z5MY**	**21**	**9,016**	**59**	**56**
		Japan - District 1		
JA1CSN	**A**	**2,172,852**	**1177**	**558**
JM1XCW	"	1,751,238	987	531
JI1LET	"	808,731	697	389
JN1THL	"	761,917	670	377
JF1LMB	"	337,698	417	257
JH1RFM	"	233,100	340	222
JR1NHD	"	222,984	345	228
JA1WSK	"	156,831	262	183
JG1LHB	"	145,340	275	172
JH1CTV	"	138,852	271	174
JJ1XBQ	"	37,800	125	100
JH1HIC	"	35,868	118	98
JK1BAB	"	864	19	18
JL1CNY	**28**	**140,273**	**260**	**203**
JA1FNO	"	42,939	130	117
JS1NDM	**21**	**20**	**4**	**4**
***JG1LFR**	**A**	**630,086**	**642**	**311**
*7N2UQC	"	477,750	545	294
*JG1XIO	"	196,301	334	203
*JH1BHW	"	154,755	304	171
*JA1SCE	"	103,272	232	156
*JF1WNT	"	96,135	204	145
*JK1NSR	"	93,240	222	148
*JI1FWH	"	80,656	238	142
*JR1EMO	"	76,734	181	147
*JA1IZ	"	54,168	152	122
*JK1HIY	"	49,020	136	114
*JA1ATM	"	42,224	148	104
*JA1MZM	"	40,071	138	111
*JG1UKW	"	39,636	138	108
*JA1IE	"	38,000	143	100
**JA1CJL*	"	*37,518*	*129*	*111*
*JE1RRK	"	20,817	99	81
*JR1AQI	"	20,412	91	81
*JS1KKY	"	19,050	92	75
*JK1JAS	"	18,504	83	72
*JK1ESR	"	18,368	71	64
*JI1AQY	"	4,477	43	37
*JA1OHP	"	3,540	38	30
*JA1OQJ	"	2,407	29	29
*JA1JNM	"	507	13	13
*JH1WOY	"	175	9	7
*JH1TJH	"	20	4	4
***JF1RYU**	**28**	**134,600**	**239**	**200**
*7J1YAD	"	47,610	141	115
				(OP: JF1TEU)
*JI1BBN	"	44,486	135	118
*JA1PCM	"	31,212	124	102
*JF1OVA	"	29,003	105	97
*JK1OLT	"	5,796	46	46
*JE1GZB	"	3,638	40	34
***JH1KYA**	**21**	**66,845**	**165**	**145**
*JA1RYC	"	30,300	126	101
*JH1JJV	"	9,680	62	55
*JA1DBG	"	6,048	54	48
*JK1XAY	"	70	5	5
*JF1WCK	"	3	1	1
		Japan - District 2		
JA2AXB	**A**	**524,790**	**553**	**343**
JA2HYD	"	208,208	320	208
JG2REJ	"	150,528	261	196
JR2PMT	"	117,603	224	179
JH2FXK	"	76,680	208	142
JF2FIU	"	33,124	123	98
JH2BTM	"	24,462	96	81
***JA2FXV**	**A**	**179,707**	**309**	**187**
*JA2GHP	"	89,996	222	149
*JH2LMH	"	73,220	185	140
*JE2BOM	"	68,834	170	127
*JI2IXA	"	330	11	10
*JO2XYK	"	80	5	5
***JH2RIH**	**28**	**14,766**	**74**	**69**
*JE2CPI	"	7,738	56	53
***JH2MYN**	**21**	**5,922**	**49**	**47**
		Japan - District 3		
JR3NZC	**A**	**410,696**	**493**	**286**
JA3HBF	"	357,022	460	274
JE3RMQ	"	68,952	178	136
JP3UBR	"	13,650	74	65
JA3VOV	"	9,588	71	51
JR3RIU	"	6,510	57	42
JR3UIC	"	2,378	35	29
JF3LOP	**28**	**49,343**	**148**	**133**
JA3BXF	"	3,774	39	37
JF3LGC	"	816	17	16
JR3RIY	**21**	**298,944**	**385**	**288**
JG3LDD	"	1,564	25	23
JA3GOJ	**14**	**250**	**12**	**10**
JH3FUK	**7**	**144,704**	**177**	**152**
***JA3MIB**	**A**	**98,196**	**226**	**167**
*JA3JM	"	94,227	228	147
*JH3WKE	"	89,090	205	151
*JO3QVT	"	77,935	204	143
*JJ3QJI	"	16,620	90	60
*JR3WXA	"	13,950	80	62
*JH3GMI	"	2,970	37	33
***JR3GPP**	**28**	**2,187**	**29**	**27**
***JA3RAZ**	**21**	**1,242**	**27**	**27**
		Japan - District 4		
JH4UTP	**A**	**1,951,002**	**1124**	**566**
JR4CTF	"	188,580	313	210
JI4WAO	"	4,641	46	39
JO4CFV	"	2,883	33	31
JA4CZM	"	1,311	19	19
JN4MMO	**28**	**787,097**	**623**	**449**
JR4VEV	**7**	**29,414**	**85**	**77**
***JE4MHL**	**A**	**317,312**	**405**	**268**
*JI4WHS	"	263,109	397	231
*JA4ENY	"	32,016	132	87
*JA4IAQ	"	2,025	26	25
		Japan - District 5		
***JE5HTN**	**A**	**66,435**	**203**	**129**
*JH5HDA	"	20,140	87	76
		Japan - District 6		
JA6FFO	**A**	**23,068**	**101**	**73**
JE6QQN	"	*11,387*	*69*	*59*
***JH6QIL**	**A**	**127,448**	**267**	**179**
*JG6QHE	"	45,032	149	104
***JH6WHN**	**28**	**485,804**	**481**	**362**
*JA6GMC	"	2,730	34	30
***JA6GCE**	**21**	**584,910**	**544**	**402**
*JE6TUP	"	66	6	6
		Japan - District 7		
JH7QXJ	**A**	**887,692**	**716**	**397**
JH7RTQ	"	614,384	625	376
JA7ACM	"	314,500	421	250
JM7OLW	"	247,292	383	211
JG7AMD	"	38,994	106	97
JA7ZP	"	13,629	65	59
JA7FTR	"	3,332	35	34
JF7PHE	**28**	**351,648**	**422**	**297**
JG7PSJ	"	74,025	182	141
JR7IWL	"	22,932	97	84
JO7KMB	"	19,199	91	73
JA7LLL	**14**	**5,781**	**48**	**47**
***JH7IMX**	**A**	**43,152**	**138**	**116**
*JH7VTE	"	33,271	117	97
*JQ7AXT	"	31,200	107	96
		Japan - District 8		
JA8KSF	**28**	**602,140**	**549**	**391**
JG8TDZ	"	3,168	40	36
JA8IDS	**21**	**113,035**	**215**	**185**
***JM8FEI**	**A**	**83,750**	**222**	**134**
*JE8UHY	"	18,288	98	72
*JH8IYN	"	5,014	50	46
***JK8PBO**	**28**	**156,769**	**257**	**223**
*JH8XVH	"	69,762	176	154
***JM8SMO**	**21**	**39,663**	**129**	**113**
***JA8UON**	**7**	**576**	**12**	**12**
		Japan - District 9		
JA9CCG	**A**	**21,996**	**101**	**78**
JH9CEN	**28**	**19,270**	**86**	**82**
JA9CWJ	**21**	**79,632**	**193**	**158**
***JA9LX**	**A**	**118,080**	**248**	**160**
*JA9EJG	"	5,850	49	45
		Japan - District Ø		
JHØMJY	**A**	**35,245**	**121**	**95**
JHØILL	"	30,495	112	95
***JJØPJD**	**A**	**185,076**	**310**	**194**
*JRØDZH	"	41,642	131	94
*JAØBZY	"	29,192	91	89
*JHØMUC	"	12,285	75	63
*JRØBNF	"	6,192	53	43
***JHØEPI**	**14**	**3,024**	**36**	**36**
		Kazakhstan		
UP7L	**A**	**2,174,526**	**1318**	**558**
				(OP: UN6LN)
***UN8PC**	**A**	**185,592**	**280**	**222**
*UN7ZO	"	720	17	16
***UN4PG**	**28**	**114,063**	**223**	**197**
*UN7CN	"	103,140	207	180
***UN7LV**	**14**	**62,856**	**174**	**162**
		Mongolia		
JT1CO	**28**	**237,384**	**351**	**252**
		Nepal		
9N7AA	**28**	**1,337,856**	**952**	**512**
				(OP: S53R)
		Qatar		
***A71AE**	**7**	**249,704**	**243**	**182**
		Republic of Korea		
***HL3AMO**	**A**	**3,570**	**40**	**34**

***HL1VAU**	**28**	**47,880**	**139**	**120**
***HL2ASZ**	**7**	**648**	**12**	**12**
		Saudi Arabia		
***HZ1TT**	**A**	**842,625**	**666**	**375**
		Singapore		
9V1YC	**A**	**25,578**	**121**	**87**
***9V1HY**	**A**	**1,920**	**29**	**24**
		Taiwan		
BV2LA	**A**	**319,056**	**402**	**272**
BV4VQ	**28**	**24**	**3**	**3**
BV1EK	**21**	**22,533**	**95**	**87**
BX4AG	"	12,596	72	67
***BU2BE**	**A**	**7,567**	**73**	**47**
		Thailand		
HS3NBR	**14**	**56,199**	**151**	**131**
***HS5NMF**	**A**	**145,544**	**268**	**184**
*HS4MLV	"	1,738	31	22
***HS5ZLD**	**28**	**741**	**20**	**19**
*E2ØXMG	"	448	14	14
		United Arab Emirates		
A65DR	**21**	**1,326,120**	**888**	**514**
				(OP: G7SLP)
		Uzbekistan		
**UK8FF*	*28*	*1,584*	*24*	*24*
		West Malaysia		
***9W2VGR**	**A**	**38,584**	**161**	**106**
*9M2HUS	"	9,800	79	49
*9W2FHG	"	4,030	43	31
*9M2MAD	"	2,838	30	22

EUROPE

		Austria		
OE1TKW	**A**	**246,000**	**338**	**246**
OE2LCM	"	84,875	216	175
OE9SEV	"	34,485	104	95
***OE2GEN**	**A**	**844,400**	**697**	**400**
*OE5CYL	"	308,990	390	265
*OE3NHW	"	178,641	265	207
*OE4EIE	"	157,528	256	203
*OE6ISP	"	41,724	142	122
*OE7BJT	"	31,588	123	106
***OE2IGP**	**28**	**145,544**	**256**	**226**
***OE5PEN**	**7**	**240,436**	**276**	**217**
		Balearic Islands		
EC6DX	**A**	**445,484**	**514**	**338**
***EA6ZS**	**A**	**52,216**	**175**	**122**
		Belarus		
EU4E	*A*	*2,194,829*	*1156*	*623*
EV1R	"	1,933,897	1063	641
EU8U	"	1,738,275	1183	539
EW4A	"	1,166,316	922	498
EW8DX	"	868,945	815	385
EU1ST	"	416,150	492	290
EW8OM	"	*339,729*	*472*	*281*
				(OP: EW8O)
EW1OW	"	228,034	307	226
EU1DX	21	494,935	541	395
*EW1P	A	292,864	420	286
*EU1FQ	"	126,087	246	183
*EW7B	3.5	494,648	434	292
*EW2ES	"	528	12	11
		Belgium		
ON5GQ	**A**	**1,592,332**	**1049**	**518**
OR3A	"	1,234,180	796	460
				(OP: ON6CC)
ON7ET	"	126,498	218	174
OR5T	**28**	**35,292**	**127**	**102**
ON4LDP	**7**	**172,398**	**220**	**177**
***ON6YYY**	**A**	**636,318**	**574**	**318**
*ON7KEC	"	414,369	460	309
*ON4CT	"	324,016	371	263
**ON4PJA*	"	*158,697*	*327*	*231*
*ON2AD	"	45,750	144	125
*ON4LY	"	20,181	101	93
*ON6FC	"	8,360	61	55
*ON6LR	"	980	20	20
***ON4AXU**	**28**	**41,760**	**141**	**120**
***OQ5M**	**21**	**13,725**	**80**	**75**
				(OP: ON5ZO)
***ON3UN**	**7**	**330,750**	**335**	**245**
***ON4CBA**	**3.5**	**62,594**	**142**	**119**
		Bosnia-Herzegovina		
E77DX	**A**	**430,056**	**475**	**297**
E72U	"	215,568	289	216
***E78T**	**A**	**243,024**	**365**	**244**
*E74HJ	"	170,156	279	206
**E7ØAW*	"	*24,236*	*94*	*83*
*E74SL	"	2,800	30	28
***E73KM**	**28**	**62,250**	**168**	**150**
***E77EA**	**21**	**290,088**	**400**	**306**
***E7ØY**	**7**	**971,740**	**617**	**385**
*E78CB	"	58,420	130	115
*E77D	"	43,800	114	100
***E79D**	**3.5**	**212,658**	**276**	**201**
		Bulgaria		
LZ6K	**A**	**1,944,228**	**1040**	**618**
				(OP: LZ2PL)
LZ1ZJ	"	578,614	554	386
LZ7A	"	68,529	217	159
				(OP: LZ1RF)
LZ1GE	"	61,350	189	150
LZ2ZG	**28**	**5,593**	**48**	**47**
LZ4AE	**21**	**881,280**	**752**	**510**
LZ5K	**7**	**881,250**	**598**	**375**
LZ33E	**3.5**	**161,624**	**239**	**178**
				(OP: LZ5XQ)
***LZ2YO**	**A**	**431,932**	**509**	**332**
*LZ5E	"	99,792	264	168
**LZ1QB*	"	*29,007*	*100*	*99*
*LZ3AW	"	3,780	39	36
***LZ5GM**	**28**	**15,554**	**83**	**77**
***LZ2JA**	**21**	**254,330**	**465**	**290**
***LZ2MP**	**14**	**76,109**	**219**	**187**
***LZ7X**	**7**	**1,077,668**	**614**	**419**
				(OP: LZ1UQ)
***LZ1MC**	**3.5**	**1,116**	**18**	**18**
		Crete		
***SV9FBP**	**28**	**72,996**	**210**	**158**
		Croatia		
9A2ZI	**A**	**4,071,354**	**1562**	**826**
9A3XV	"	3,248	32	29
9A4WY	**28**	**20,230**	**97**	**70**
9A6KX	**7**	**422,136**	**361**	**286**
***9A1DR**	**A**	**135,975**	**250**	**185**
**9A5ST*	"	*55,936*	*154*	*128*
*9A2EU	"	22,518	82	81
*9A5CC	"	6,890	55	53
***9A6KZH**	**28**	**149,177**	**264**	**211**
***9A2VX**	**21**	**8,432**	**65**	**62**
**9A4R*	*14*	*42,795*	*153*	*135*
***9A5BBV**	**7**	**3,360**	**37**	**35**
***9A9TT**	**3.5**	**95,328**	**185**	**144**
		Czech Republic		
OK7W	**A**	**8,876,820**	**2633**	**985**
OK2EA	"	856,044	732	387
OK6CX	"	278,445	413	285
OK2CMW	"	186,840	284	216
OK1PI	"	103,428	191	153
OK1FU	"	39,195	146	117
OK2BXW	**28**	**196,524**	**346**	**212**
OK1XC	"	155,400	279	210
OK1DOY	"	66,990	170	145
OK5M	**7**	**107,210**	**194**	**151**
OL7P	**3.5**	**230,880**	**292**	**208**
				(OP: OK1CRM)
***OK2WY**	**A**	**1,486,446**	**997**	**494**
*OK1TRJ	"	763,889	578	371
*OK2LC	"	622,332	604	354
*OK1HEH	"	506,910	536	305
*OK1PMA	"	363,424	434	277
*OK1CT	"	304,706	385	262
*OK2CLW	"	251,363	325	241
*OK7V	"	219,611	301	229
				(OP: OK1VRF)
*OK1MGA	"	168,705	310	207
*OK1DEZ	"	165,845	283	205
*OK1TK	"	123,630	242	195
*OK1SLA	"	108,750	207	174
*OK1ULL	"	68,740	183	140
*OK2PGJ	"	68,248	186	152
**OK1AUO*	"	*49,125*	*157*	*131*
*OK2AK	"	35,616	128	106
*OK2VIR	"	31,200	117	100
*OK1DLX	"	29,892	127	94
*OK1FIA	"	28,080	102	90
*OK4RQ	"	25,149	102	83
*OK1KKI	"	8,576	67	64
				(OP: OK7PY)
*OL8M	"	6,560	44	41
*OK1DRQ	"	1,064	21	19
*OK7SE	"	714	14	14
*OK5SWL	"	180	9	9
				(OP: OK2SWD)
***OK3SN**	**21**	**17,052**	**92**	**84**
***OK1BR**	**14**	**211,410**	**388**	**270**
***OK2RU**	**7**	**833,272**	**546**	**374**
*OK5TX	"	392,888	391	268
*OK1FWG	"	59,856	128	116
***OK2HBR**	**3.5**	**302,900**	**349**	**233**
*OK2VV	"	161,424	238	177
		Denmark		
OZ5W	**A**	**1,848,174**	**1124**	**534**
				(OP: SM5SIC)
OZØJD	"	1,251,625	985	475
OZ1LFI	"	103,700	218	170
5P1KZX	**28**	**50,407**	**151**	**133**
OZ6TL	**7**	**239,838**	**279**	**213**
***OZ1DAE**	**A**	**305,640**	**412**	**283**
**OZ6AGX*	"	*201,780*	*332*	*228*
*OZ1QX	"	119,190	236	174
*OZ7DK	"	99,176	212	154
*OZ1AOO	"	9,800	54	50
*OZ4HJ	"	8,585	96	85
***OZ1JVX**	**21**	**71,832**	**198**	**164**
		England		
G1N	**A**	**2,147,850**	**1135**	**645**
				(OP: GØURR)
M2G	"	1,416,744	983	504
				(OP: G4RCG)
M7T	"	1,044,908	852	478
				(OP: G3YYD)
GØHDV	"	873,664	790	374
M2J	"	861,619	624	407
				(OP: G4NBS)
M1X	"	620,576	567	328
				(OP: GØCKP)
M9B	"	411,720	510	292
				(OP: MØLKW)
G2U	"	343,962	434	291
				(OP: GØUGO)
G8GNI	"	323,400	408	264
G1SCT	"	303,210	396	270
G4VSZ	"	71,000	198	142
GØH	"	53,734	170	134
				(OP: GØHEU)
M5W	**21**	**1,039,326**	**835**	**498**
				(OP: MØHMJ)
G9D	"	154,112	302	224
				(OP: G6NHU)
G8X	**7**	**2,312,024**	**945**	**559**
				(OP: G4FJK)
M2E	**3.5**	**42,570**	**118**	**99**
				(OP: GØRPM)
***GØFGI**	**A**	**856,575**	**689**	**405**
*G4ENZ	"	644,726	589	347
*G3G	"	553,869	525	369
				(OP: G3XLG)
*G4OZG	"	499,590	544	305
*2EØINN	"	486,628	568	337
*MØKKM	"	387,053	461	293
*2EØCVN	"	349,160	478	290
*G8S	"	280,980	389	252
*MØYTT	"	253,000	380	275
*G4EBK	"	194,472	324	222
*G4JBA	"	177,424	300	208
*G4CXQ	"	176,571	291	207
*G5ROB	"	133,248	250	192
*GØOSK	"	124,424	232	206
*M3X	"	121,806	261	202
				(OP: MØIHT)
*G3ZNU	"	79,500	197	150
*G2E	"	68,552	174	152
*G4DDL	"	64,260	173	135
*M5ARC	"	61,490	162	130
				(OP: MØCHK)
*G7RTI	"	57,564	164	123
*2EØFHM	"	49,385	149	119
*G5C	"	39,162	147	122
				(OP: G4OGB)
*G3RTU	"	28,413	122	99
*G3L	"	21,756	98	84
				(OP: G3LHJ)
**M5M*	"	*21,372*	*93*	*78*
				(OP: G4BRK)
**G4PDF*	"	*19,437*	*93*	*93*
*2EØEBM	"	14,885	74	65
*G3ZBU	"	13,950	79	75
*MØMPM	"	11,025	66	63
*M7WFG	"	4,522	41	38
*2EØOBO	"	4,455	49	45
*MØIPU	"	4,318	44	34
*G7NJX	"	4,032	47	42
*G1HYD	"	2,046	34	33
*2E1LSI	"	1,848	23	22
				(OP: G5LSI)
***GØC**	**28**	**116,622**	**239**	**186**
*G4ZOB	"	90,246	213	169
*G4RQI	"	63,940	165	139
*2EØYAO	"	44,286	138	122
*G3XTZ	"	30,674	115	98
*GØORH	"	19,656	99	84
*GØMBA	"	15,225	86	75
*MØTQR	"	4,515	45	43
***G9F**	**21**	**533,280**	**583**	**404**
				(OP: G4BVY)
*MØBLF	"	234,635	374	281
*GX3RAT	"	172,692	325	246
				(OP: GØGQT)
***M5P**	**14**	**272,349**	**460**	**297**
				(OP: M5BIR)
*GØSNG	"	60,528	189	156
*G4WGE	"	55,918	185	146
***G4SJX**	**7**	**51,030**	**121**	**105**
***G6N**	**3.5**	**100,500**	**192**	**150**
				(OP: GØGDU)
		Estonia		
*ES3HEA	A	223,873	325	221
*ES1BH	"	149,760	286	208
*ES1QV	"	19,270	93	82
*ES1KSA/4	21	1,175	25	25
		European Russia - District 1		
RA1QFU	A	641,174	757	359
*RA1ALC	A	328,020	504	284
*RU1AT	"	130,935	279	203
**RN1AO*	"	*19,920*	*98*	*83*
		European Russia - District 3		
R5AN	A	1,023,984	897	468
RT2H	"	425,952	527	306
RA3NC	"	91,425	220	159
RD5R	"	*87,024*	*224*	*168*
RV3TG	"	8,320	61	52
RM3DA	*28*	*125,052*	*277*	*204*
UA3MCH	14	17,820	97	90
RC5Z	7	329,500	337	250
*RA3Y	A	1,484,964	1119	501
*R3AQ	"	458,400	489	382
*R3TE	"	441,136	549	349
**R2UZ*	"	*290,664*	*393*	*264*
*R2PU	"	276,353	396	259
**RX3VF*	"	*157,850*	*300*	*205*
*UA3UBT	"	102,416	241	173
**RK2M*	"	*83,312*	*202*	*164*
*R2YES	"	61,146	155	129

*RA3V	“	59,292	169	122
RW3DY	“	*43,673*	*146*	*119*
*RX3MM	“	36,424	145	116
*UC5D	“	35,105	155	119
*UB3SAR	“	24,300	108	90
*R3OR	“	22,204	107	91
*RV3ZN	“	14,532	92	84
*RU3XW	“	7,504	65	56
*UF5A	28	253,453	402	289
*R2XM	“	151,863	315	227
*RU5X	“	100,548	237	189
*RU3OZ	“	27,454	111	106
*UA3PI	7	96,768	182	144
R5DF	“	*8,944*	*43*	*43*
European Russia - District 4				
UF4S	A	2,007,387	1314	603
RW4HBG	“	1,009,356	986	466
RA4ZA	“	215,384	344	247
R4CI	“	35,380	140	116
RG4A	28	460,736	556	368
R4FCJ	*7*	*3,720*	*34*	*31*
RU4PH	*A*	*332,080*	*461*	*280*
*RT4W	“	148,741	303	223
*UA4WJ	“	114,576	257	176
*UC4I	“	71,766	199	162
*RA4L	“	64,232	204	148
*R4WZ	“	61,420	176	148
R4RB	“	*18,492*	*103*	*92*
*RN4HAB	“	16,560	79	69
*RK4NB	“	2,175	31	29
*UB4FFB	14	11,322	80	74
European Russia - District 6				
R7CD	*A*	*1,045,611*	*810*	*441*
UC6N	*21*	*517,951*	*578*	*427*
RU6YJ	“	*62,951*	*187*	*161*
*R7MM	A	1,245,176	990	491
*R6KX	“	314,290	394	265
*RQ7R	“	287,452	432	278
*RN6DR	“	143,244	269	207
*RX6N	28	4,725	48	45
*RA6LIS	14	200,943	386	269
*RT6DI	“	75,115	211	181
European Russia - District 9				
R9FE	*A*	*404,775*	*494*	*315*
*R8XF	“	295,812	473	297
*RA9XSL	“	9,238	69	62
Fed. Rep. of Germany				
DM7XX	**A**	**4,571,248**	**1712**	**836**
DK8ZZ	“	3,783,013	1651	733
DP8M	“	2,422,511	1207	637
			(OP: DL6NDW)	
DA3X	“	2,074,496	1087	608
			(OP: DL5JS)	
DF8XC	“	2,029,400	1226	584
DK9IP	“	1,839,936	999	592
DL6JZ	“	1,827,628	1048	569
DLØHMK	“	1,781,605	1111	545
			(OP: DF2HN)	
DJ3NG	“	1,750,881	1018	561
DQ1P	“	1,656,288	996	568
			(OP: DK1IP)	
DL5ØDAH	“	1,521,562	981	502
			(OP: DK1KC)	
DH8BQA	“	1,391,314	888	542
DJ9RR	“	1,257,578	772	602
DK5MB	“	1,183,336	784	476
DL7URH	“	1,134,112	703	488
DM5GG	“	1,078,480	756	442
DL1RTL	“	1,073,552	789	458
DF6QV	“	996,996	721	429
DB1WA	“	940,043	782	433
DF8QB	“	804,063	641	389
DK4VW	“	800,856	699	392
DJ8EW	“	776,050	640	415
DL1NEO	“	751,180	548	460
DL4ZA	“	748,753	682	419
DHØGHU	“	705,646	603	389
DK2LO	“	499,851	492	363
DL7VOG	“	473,280	506	320
DL5ST	“	454,463	491	331
DL5YM	“	453,876	529	327
DD7UW	“	326,150	406	275
DJ5MW	“	322,973	391	301
DL5AXX	“	278,806	383	253
DK6WL	“	274,932	336	252
DL1EHG	“	265,716	389	244
DF5BX	“	265,500	396	250
DK2AT	“	265,468	383	266
DJ5AN	“	259,210	324	245
DF8V	“	220,418	315	233
			(OP: DF8VO)	
DJ5IW	“	195,220	288	215
DF5MA	“	184,044	281	196
DK2TG	“	158,466	281	231
DL1STG	“	139,153	248	193
DK3GI	“	135,408	243	208
DL9UP	“	116,864	219	166
DJ6TB	“	115,857	218	189
DF4XX	“	*115,104*	*241*	*176*
DL7UGO	“	108,376	211	184
DK2CX	“	93,000	174	155
DL7AUO	“	87,040	197	160
DL1MGB	“	61,425	153	117
DL6TK	“	53,128	162	116
DF3VM	“	53,086	147	127
DM5JBN	“	51,336	139	124
DF8JK	“	51,188	177	134
DL5NDX	“	49,560	149	120
DGØKS	“	41,402	150	127
DL8DWL	“	40,940	131	115
DL1DBR	“	35,476	122	98
DL6DH	“	33,182	112	94
DL3XM	“	30,380	102	98
DL1DJH	“	29,606	130	113
DQØY	“	27,810	97	90
			(OP: DF2RG)	
DL2OE	“	18,966	101	87
DL8RDL	“	18,150	84	75
DP6K	“	17,394	91	78
			(OP: DM2WB)	
DL7CX	“	16,560	97	90
DL5DXS	“	16,170	86	77
DK2CC	“	6,860	53	49
DL1LOD	“	5,160	50	43
DC2VE	“	3,610	40	38
DMØA	**28**	**1,754,294**	**1048**	**661**
			(OP: DK3DM)	
DL3BQA	“	1,137,648	858	519
DM1T	“	585	16	15
			(OP: DL9SCO)	
DL1DTL	**21**	**337,212**	**437**	**342**
DH6BH	**14**	**253,300**	**401**	**298**
DM6DX	**7**	**139,548**	**193**	**174**
DL5SE	“	*2,756*	*28*	*26*
DH8WR	**3.5**	**241,774**	**315**	**221**
***DJ4MX**	**A**	**1,605,065**	**886**	**605**
*DL5RMH	“	1,091,316	790	457
*DL8TG	“	1,068,832	719	508
*DK2OY	“	969,165	788	405
*DL9IM	“	955,400	773	425
*DM5B	“	912,676	810	401
			(OP: DG6IMR)	
*DL164ØY	“	690,030	676	374
*DJ9MH	“	674,778	550	422
*DL5DTG	“	651,375	614	375
*DL5KUD	“	614,560	573	368
*DM7W	“	567,806	485	386
			(OP: DL8MAS)	
*DL1ZBO	“	534,314	586	326
*DL3DRN	“	484,968	569	334
*DJ5FS	“	424,875	523	309
*DL6SFR	“	408,401	460	287
*DL5ARM	“	386,208	459	288
*DG9OAY	“	336,377	439	263
*DO3PKE	“	335,814	412	291
*DL6EZ	“	311,616	457	288
*DHØHAN	“	298,627	408	259
*DD5VL	“	286,764	358	276
*DL1PSK	“	266,280	344	280
*DP5P	“	257,342	295	223
			(OP: DL1MHJ)	
*DJ4WM	“	256,470	351	249
*DD5M	“	231,894	330	234
			(OP: DJØZY)	
*DM4EAX	“	226,452	359	226
*DM2GG	“	200,396	313	238
*DB2WD	“	198,690	297	222
*DO2SBS	“	186,485	321	247
*DB8AH	“	156,400	294	200
*DL6MHW	“	152,856	271	193
*DL4HCF	“	148,390	277	209
*DL3YM	“	130,240	243	185
*DL2FK	“	128,469	237	187
*DC8YZ	“	126,480	237	204
*DL6DCX	“	125,928	273	216
*DM6EE	“	124,992	235	192
*DK1YH	“	124,898	290	197
*DL4KW	“	122,360	235	190
*DFØBV	“	120,714	218	177
			(OP: DL1MAJ)	
*DK65ERD	“	118,770	235	185
			(OP: DJ5CL)	
*DL4YDR	“	115,340	218	158
*DL8DWW	“	113,849	233	181
*DL1GWS	“	112,476	223	182
*DF7AT	“	111,276	219	198
*DL2ZA	“	100,275	217	175
*DC1YL	“	98,982	197	162
*DL1DAW	“	98,564	204	164
*DL9DX	“	96,824	221	152
*DL1EJD	“	94,792	229	164
*DJ3GE	“	94,240	218	155
*DL1ASA	“	91,512	204	164
*DJ2IA	“	89,474	209	166
*DL9GMC	“	87,156	216	162
*DG6ME	“	83,076	189	161
*DL6ES	“	81,305	204	161
*DG3NAB	“	80,964	196	156
*DL1EMA	“	78,570	200	162
*DL2LBK	“	74,104	161	157
*DL5MHX	“	69,136	187	149
*DJ9WJ	“	65,105	185	145
*DL2PK	“	62,967	175	139
*DL9FBF	“	59,850	170	133
*DL2AK	“	57,368	177	142
*DK4EF	“	54,000	150	125
*DF3EH	“	53,949	172	147
*DK7TY	“	50,544	142	117
*DM2DLG	“	49,625	167	125
*DK1GP	“	48,789	169	139
*DQ5M	“	47,994	146	114
			(OP: DK6SP)	
*DL6DJ	“	47,725	131	115
*DL9WJM	“	47,553	146	121
*DK2IP	“	41,471	131	113
*DL4APJ	“	40,817	144	119
*DF1LX	“	40,040	125	110
*DJ9SN	“	39,856	119	106
*DL4AO	“	38,739	125	111
*DK3PM	“	37,629	114	111
*DJ5CW	“	36,192	112	96
*DMØE	“	35,328	114	96
			(OP: DG1HXJ)	
*DJ2MX	“	34,814	112	103
*DM5MT	“	33,024	115	96
*DL1DXF	“	32,825	123	101
*DL1QW	“	32,438	107	98
*DH2WQ	“	30,996	134	108
*DL2NBU	“	30,600	116	102
*DL8ZAJ	“	30,432	117	96
*DL2LMS	“	28,314	105	99
*DL9PN	“	28,254	119	102
*DL7YS	“	27,416	107	92
DF1KA	“	*26,642*	*101*	*77*
*DL4SDW	“	26,442	112	78
*DL6FCK	“	26,187	109	87
*DL1JPF	“	25,996	121	97
*DL6RBH	“	25,098	98	89
*DF2ET	“	23,661	109	99
*DL9GCG	“	23,085	97	81
*DJ6MK	“	21,580	99	83
*DL4GBA	“	19,920	87	80
*DL4FAP	“	19,588	89	83
*DG3DJ	“	17,425	98	85
DL3EL	“	*14,520*	*74*	*60*
*DK1VY	“	14,352	92	78
*DL9ZWG	“	14,070	78	70
*DK1LRS	“	13,350	84	75
*DL1DWL	“	13,026	90	78
*DC8QT	“	12,474	88	77
*DF9VJ	“	11,956	67	61
*DL8MKG	“	10,492	62	61
*DL4DRG	“	9,345	96	89
*DK6SP	“	9,129	59	51
*DL2TM	“	9,028	70	61
DF2QZ	“	*8,607*	*58*	*57*
*DK9ZE	“	8,262	58	54
*DM7HB	“	8,134	55	49
*DF3CE	“	6,768	53	47
*DL25KYF	“	6,192	53	48
			(OP: DM2HEY)	
*DF6RI	“	5,096	52	49
*DC8SG	“	4,720	41	40
*DP7R	“	4,598	38	38
			(OP: DL1GWS)	
*DM4AB	“	2,790	34	30
DL6NEJ	“	*2,343*	*35*	*33*
*DLØRDG	“	2,336	33	32
			(OP: DL9GWA)	
*DM4KR	“	2,278	37	34
*DF6YC	“	1,564	24	23
*DKØVLP	“	360	10	10
*DL7UPN	“	330	15	15
*DO1TLP	“	16	4	4
*DG5EM	“	3	2	1
***DK9FEC**	**28**	**70,500**	**182**	**150**
*DHØGDS	“	69,921	178	153
*DF4WC	“	56,244	158	129
*DL9NEI	“	11,220	68	66
*DJ1MM	“	4,000	41	40
*DL1DWR	“	1,197	21	21
*DO8FX	“	275	11	11
***DJ7UC**	**21**	**98,952**	**233**	**186**
*DO2MOG	“	25,152	101	96
*DL8JKN	“	2,890	35	34
***DL4FN**	**14**	**653,705**	**662**	**445**
*DL3KVR	“	37,539	154	129
*DL1STV	“	1,428	30	28
***DL4ME**	**7**	**418,472**	**369**	**289**
*DJ5TT	“	359,040	353	264
*DM3M	“	271,440	307	234
			(OP: DM3XRF)	
*DF4ZL	“	257,712	296	236
*DK5PD	“	130,302	199	171
*DL8ZU	“	83,352	167	138
*DM2RN	“	35,696	105	97
*DM4OLC	“	22,752	78	72
*DL9TU	“	340	10	10
DO1ABW	*3.5*	*62,500*	*145*	*125*
Finland				
OH3FM	**A**	**1,924,128**	**1387**	**524**
OH3EX	“	838,034	665	446
OH7KBF	“	757,621	690	379
OG2P	“	*690,399*	*538*	*369*
OH3GLY	“	75,517	200	157
OG6N	“	*43,375*	*145*	*125*
			(OP: OH6NIO)	
OH1X	**28**	**23,128**	**101**	**98**
OH1NOA	**21**	**107,365**	**248**	**197**
***OG16M**	**A**	**559,875**	**685**	**375**
*OH2EUU	“	90,024	232	186
*OH2JIU	“	79,534	182	133
*OH9GIT	“	55,744	178	134
*OH5UQ	“	8,176	63	56
*OH1XX	“	6,075	49	45
***OH8KVY**	**28**	**141,474**	**299**	**219**
*OH6FSG	“	67,416	181	159
***OH1FFN**	**21**	**74,648**	**198**	**172**
France				
F5OAM	**A**	**858,753**	**738**	**387**
F4DXX	“	553,668	611	348
F1RHS	“	259,695	379	261
F5GFA	“	117,900	298	180
F1ADG	“	103,812	227	164
F4HRM	“	70,416	201	163
F6FLU	“	61,347	145	143
F5BMI	“	*41,472*	*113*	*96*
F8FUA	“	9,632	60	56
TM5T	**28**	**303,160**	**405**	**286**
			(OP: F5VKT)	

F5NBX	"	103,032	234	159
F6ITD	"	24,273	109	93
F8AOF	**21**	**58,500**	**164**	**156**
F4VSD	"	21,280	110	95
***TM3Z**	**A**	**6,546,037**	**1955**	**919**
				(OP: F4DSK)
*F4ITQ	"	573,447	582	329
*F5RD	"	347,214	428	294
*F4FDR	"	274,574	376	254
*F5PVJ	"	222,975	314	225
*F4EKH	"	207,792	293	216
*F4FHV	"	189,441	298	217
*F4IRV	"	142,354	291	218
*F4FRC	"	133,574	285	203
*F4IVC	"	129,090	275	195
*F4VVG	"	109,200	197	168
*F1IKA	"	98,596	182	157
*F6BQG	"	94,958	222	158
*F1TRE	"	92,208	189	136
*F4CZV	"	90,210	227	186
*F4GDI	"	86,416	212	176
*F5TYY	"	50,085	160	135
*F1IWH	"	35,192	131	106
*F5MMB	"	33,330	129	110
*F5OYC	"	28,690	110	95
*F/DF8DX	"	27,730	116	94
*F8CPA	"	19,680	97	80
*F1TEM	"	12,540	89	76
***F6KRK**	**28**	**110,780**	**238**	**191**
				(OP: F4AFQ)
		Greece		
SV8DCY	**A**	**499,106**	**575**	**326**
SV1ABB	"	162,681	319	211
J42R	**28**	**395,975**	**476**	**337**
				(OP: SV2HXV)
SV3GKU	"	177,320	311	248
SV2BXA	**21**	**1,083,712**	**829**	**574**
SV3SCW	"	904,916	797	538
SX2K	**7**	**481,080**	**400**	**285**
				(OP: SV2BXZ)
***SX68SF**	**A**	**281,415**	**461**	**257**
				(OP: SV1JFL)
*SV2SKD	"	208,656	363	216
*SV1CKZ	"	173,463	290	201
*SV4RNT	"	148,256	328	226
*SV1NZX	"	65,747	166	139
*SV1DOO	"	53,880	155	120
*SV2HJW	"	13,199	77	67
*SV1DPP	"	11,880	64	60
*SV7CUD	"	9,515	62	55
***SV1JG**	**28**	**251,624**	**389**	**284**
*SV3EXU	"	154,963	283	241
*SV3SKM	"	88,690	226	181
***SV2AEL**	**14**	**1,110,970**	**943**	**538**
		Guernsey		
***GUØSUP**	**28**	**204,314**	**311**	**251**
		Hungary		
HA1SN	**28**	**1,112,127**	**780**	**537**
HA5UX	"	66,150	171	150
HG1S	**21**	**1,606,451**	**969**	**673**
				(OP: HA1DAE)
HG5D	"	1,601,782	977	677
				(OP: HA8QZ)
HG2DX	**14**	**1,016,178**	**882**	**514**
HA8BT	**7**	**129,200**	**176**	**170**
HA1TJ	**3.5**	**1,314,588**	**723**	**433**
***HA6NL**	**A**	**974,594**	**751**	**419**
*HA8WY	"	503,451	422	331
*HA7UI	"	400,192	436	296
*HA3OU	"	212,352	290	237
*HA3FUP	"	41,451	147	123
*HA3HK	"	24,990	107	98
*HA2ETP	"	2,150	26	25
***HA5GF**	**21**	**58,032**	**175**	**156**
***HA4WQ**	**14**	**287,352**	**432**	**312**
*HA8TKS	"	200,674	369	269
*HAØMS	"	159,512	319	254
*HA1NR	"	103,626	260	202
*HA8BQ	"	89,388	243	191
*HAØHV	"	42,795	156	135
*HA1ZN	"	33,000	137	120
***HA1TIB**	**7**	**147,368**	**216**	**169**
*HA1TV	"	136,416	195	168
***HA3GO**	**3.5**	**143,040**	**225**	**160**
*HA8BE	"	30,960	96	86
		Iceland		
TF1AM	**A**	**2,288,680**	**1551**	**580**
TF3T	"	1,457,796	1073	492
***TF2MSN**	**A**	**144,072**	**252**	**207**
*TF3AO	"	81,289	229	169
*TF3VE	"	37,084	176	146
		Ireland		
EI6LA	**A**	**1,430,000**	**863**	**520**
EI6IKB	"	999,440	840	403
EIØW	"	299,184	354	271
EI3CTB	**28**	**1,856**	**29**	**29**
***EI8KW**	**A**	**67,850**	**162**	**115**
*EI3GRB	"	4,708	48	44
***EI5KO**	**14**	**13,552**	**78**	**77**
		Isle of Man		
MD7C	**21**	**1,687,770**	**1117**	**630**
				(OP: M5RIC)
		Italy		
IZ2FOS	**A**	**2,347,884**	**1228**	**588**
I4LCK	"	2,234,194	1273	626
IK3ORD	"	1,383,910	821	506
IV3WMS	"	1,232,322	897	427
IU1LCU	"	1,190,601	792	503
IV3IPS	"	877,013	707	391
I1JTQ	"	849,690	690	405
IX1CLD	"	845,952	625	384
I2SVA	"	793,224	640	414
IK7NXU	"	782,690	693	415
IUØPVM	"	762,354	690	369
I2DJX	"	721,000	595	412
IZ2LSP	"	647,140	584	380
IWØRLC	"	590,957	580	361
IW2ILQ	"	569,516	582	346
IK2SAI	"	565,326	613	361
IZ4FUE	"	516,636	539	339
I2BRT	"	480,562	497	337
I2WIJ	"	465,321	470	327
IK2XSL	"	412,344	505	332
IK5FKF	"	391,680	456	320
I2VXJ	"	*381,582*	*472*	*306*
IZ3XEF	"	375,069	415	327
IU1HHH	"	291,564	419	252
IZ2ZQP	"	277,875	422	247
IK8SVQ	"	269,637	380	289
4U13FEB	"	*238,164*	*408*	*267*
				(OP: 9A3A)
IØGIA	"	156,414	251	199
IK2AHB	"	148,454	258	199
IK5PWS	"	114,810	227	178
I1NVU	"	103,045	228	185
IW4ECF	"	102,312	207	174
IZ4UFB	"	94,870	236	179
IK4HPS	"	73,179	206	173
IW1CHX	"	67,196	171	157
IKØYUT	"	66,944	196	128
IK2LOL	"	35,030	128	113
IU1JCZ	"	34,093	122	103
IK2TDM	"	32,368	123	112
IK2IKW	"	31,993	121	107
IW2DOY	"	29,574	104	93
IKØXBX	"	23,848	98	88
IZ5EME	"	*22,464*	*82*	*78*
IK1VHR	"	10,584	62	56
IØWBX	"	5,355	53	51
IU4FKR	"	2,781	30	27
I1DXD	"	1,232	22	22
IU3BTY	**28**	**282,880**	**389**	**272**
IZ1PKV	**21**	**506,022**	**533**	**374**
IZ8BGY	"	406,330	540	358
IU4CSS	"	20,737	98	89
IWØHLZ	"	14,268	91	82
IK2QIN	"	8,784	63	61
IQ1RY	**14**	**2,191,680**	**1296**	**720**
				(OP: IZ1LBG)
IZ2BVC	"	61,304	198	158
IU4CHE	"	47,158	166	146
IV3ZXQ	**7**	**2,090,952**	**903**	**514**
IZ7XUQ	"	476,418	413	293
I1WXY	**3.5**	**447,672**	**436**	**276**
IZ3SQW	"	343,916	361	254
IV3RYP	"	198,740	277	190
IV3VBM	"	166,348	243	182
***IQ6AN**	**A**	**4,184,129**	**1535**	**769**
				(OP: IK6VXO)
*IZ4JMA	"	891,254	741	413
*IK1RGK	"	856,449	764	451
*IW1CBG	"	779,145	700	381
*IW2CDH	"	537,758	513	338
*I2XLF	"	525,632	571	344
*IUØRBE	"	523,973	546	331
*IK3SSJ	"	458,328	478	339
*IK8TEM	"	432,234	575	333
*IV3IPA	"	366,885	433	263
*IZ7NMD	"	350,808	409	282
*IU2JWF	"	345,060	422	284
*IW2FUT	"	306,540	403	262
*IKØALT	"	292,100	369	254
*IN3OWY	"	286,504	386	236
*IK2SAR	"	286,440	412	248
*IK4ZIF	"	284,328	312	264
*IK2VFQ	"	272,034	405	238
*IK3TCK	"	251,712	304	304
*IZ4OSH	"	243,236	301	238
*IK2GZU	"	215,550	285	225
*IZ6BXQ	"	211,302	359	234
*IU3QCC	"	187,956	325	227
*IK4XQT/4	"	167,466	301	226
*IKØCHU	"	159,258	243	209
IW8PQ	"	*139,860*	*296*	*222*
*IU1LAR	"	129,870	256	185
*IZ2XCK	"	115,005	233	165
*IU3QEU	"	113,022	244	189
IK3MLF	"	*110,330*	*214*	*187*
*I2BZN	"	100,215	203	153
*I1YGQ	"	99,360	233	184
*IK2AUK	"	98,272	228	166
*IK2MXM	"	96,104	206	164
*IK2ZJJ	"	94,518	229	178
*IK4RVY	"	91,142	229	199
*I2OGV	"	84,669	208	169
*IZ5FSA	"	77,865	176	145
*IK2OVT	"	60,863	142	121
*IZ5HQB	"	57,680	161	140
*IWØAEN	"	46,052	137	116
*IK6BSN	"	39,346	127	103
*IU8MOA	"	36,125	150	125
*IZ3ZOO	"	34,444	137	109
*IU4CHJ	"	32,301	125	111
*IK3BVD	"	28,993	95	79
IK2DKX	"	*28,314*	*108*	*99*
*IK8UND	"	24,795	101	87
*IK8ARF	"	24,700	117	100
*IU5ICR	"	23,016	96	84
*I2XYI	"	20,382	98	79
*IZ1PLH	"	20,007	95	81
*IK6SXQ	"	18,360	99	90
*IN3XWE	"	15,147	94	81
*IK2YSJ	"	14,774	86	83
*IZ5DKO	"	14,100	77	75
*IW2JRV	"	13,680	89	80
*IKØRMR	"	13,024	78	74
*IK2WYI	"	12,600	83	72
*IZ2ABZ	"	12,080	83	80
*IZØFVD	"	7,326	66	66
IK4RUX	"	*6,985*	*57*	*55*
*IU3GOA	"	6,435	61	55
*IZ3QFG	"	6,280	43	40
*IZ5CLJ	"	5,805	48	43
*IK1BPL	"	5,208	48	42
*IZ5PQT	"	4,400	48	40
*IUØRAU	"	3,735	48	45
*IN3MNS	"	3,104	35	32
*IZ3XNJ	"	3,024	37	36
*IZØZFK	"	2,856	37	34
*IK2REA	"	2,325	26	25
*IZ1FKS	"	2,262	30	29
*IZ2BHQ	"	2,106	26	26
*IU2CKU	"	1,633	23	23
*IZ8CLM	"	826	14	14
***IKØPEA**	**28**	**19,024**	**86**	**82**
*IV3HAX	"	11,088	68	66
*IZ5OQX	"	10,458	67	63
***IK5AMB**	**21**	**422,688**	**492**	**357**
*IK1NEG	"	85,164	213	188
*IZ6DWH	"	17,922	98	87
***IW2MXY**	**14**	**574,002**	**643**	**446**
*IK7DXP	"	186,068	396	257
*IZ7XNB	"	129,727	289	221
*IV3ZNK	"	121,338	259	214
*IK2UEX	"	47,348	176	133
*IU1FQQ	"	43,355	160	145
*IK4RQJ	"	544	17	16
***I3PXN**	**7**	**991,020**	**617**	**398**
*IW1PNJ	"	639,276	510	319
*II2V	"	534,576	456	296
*IZ1JJF	"	124,168	196	166
*IWØGYC	"	66,712	142	124
*IK2EBP	"	49,950	129	111
*IK4GNI	"	37,014	109	93
*IW5EIJ	"	33,582	100	87
*IZ3GYS	"	7,224	47	43
*IK8IOO	"	3,286	32	31
***IK4RVG**	**3.5**	**469,386**	**428**	**293**
*IW2HUS	"	249,536	303	224
		Kaliningrad		
RN2FQ	**A**	**31,800**	**130**	**100**
		Latvia		
YL2KO	*A*	*162,216*	*262*	*216*
YL2EA	**7**	**16,104**	**66**	**61**
***YL2NK**	**A**	**113,544**	**246**	**171**
*YL2LW	"	104,400	214	174
*YL2KF	"	4,403	39	37
***YL2CI**	**21**	**310,620**	**454**	**310**
		Lithuania		
LY2SA	**A**	**140,425**	**251**	**205**
LY5W	**28**	**1,090,440**	**808**	**520**
LY1R	**21**	**784,054**	**745**	**439**
***LY2TS**	**A**	**590,569**	**573**	**353**
*LY2J	"	315,252	428	278
*LY4K	"	242,128	298	296
***LY5T**	**28**	**42,229**	**133**	**121**
***LY2PAD**	**21**	**178,688**	**319**	**256**
		Luxembourg		
LX1NO	**A**	**794,555**	**698**	**367**
LX1TI	**28**	**145,507**	**281**	**227**
LX1HD	**7**	**187,590**	**232**	**185**
		Moldova		
***ER/UT1ZZ**	**28**	**1,120**	**21**	**20**
		Netherlands		
PA7LV	**A**	**582,435**	**622**	**387**
PA4G	"	433,650	481	294
PA3I	"	394,964	484	293
PAØVHA	"	250,580	387	268
PC4H	"	243,344	345	227
PA3GCU	"	139,128	251	186
PD9X	"	101,824	193	148
PA2A	"	48,994	143	131
PA3GVI	"	45,045	116	99
PA5KT	"	34,656	105	96
PI4VPO	"	*8,712*	*73*	*66*
				(OP: PE1NYQ)
PA5WT	**28**	**18,091**	**92**	**79**
PA6AA	"	*3,492*	*40*	*36*
				(OP: PB7Z)
PE1KL	**21**	**26,368**	**118**	**103**
***PG7M**	**A**	**1,395,390**	**743**	**579**
*PA3DUU	"	472,515	497	327
*PE1OYB	"	403,194	458	298
*PDØMHZ	"	302,808	373	248
*PA2JCB	"	275,504	391	257
*PAØALG	"	226,816	384	256
*PDØWVB	"	201,214	335	218
*PE1FTV	"	144,180	251	178
*PA3BUD	"	139,986	238	198
*PH3T	"	133,759	240	181
*PF4ØN	"	124,932	262	174
				(OP: PE1LDS)
*PA3DBS	"	111,056	237	176

*PA4DN	“	94,554	197	153
PDØJMH	“	*89,428*	*195*	*158*
*PE1LZZ	“	83,881	221	161
*PC1PM	“	82,560	200	160
*PAØCMF	“	75,047	203	151
*PC5D	“	70,477	190	149
*PA4GDR	“	66,417	152	131
*PAØGRU	“	41,520	142	120
*PA3EWG	“	36,456	116	98
PI4CG	“	*32,256*	*136*	*112*
				(OP: PD5GH)
*PA2VS	“	26,752	101	88
*PA3EVY	“	26,325	93	81
*PA3ARM	“	23,571	97	81
*PA7RW	“	20,086	100	83
PA3ADU	“	*18,568*	*96*	*88*
*PA3CXB	“	12,900	78	75
*PAØFVH	“	12,462	71	62
*PAØBOF	“	11,880	85	72
*PA3HGF	“	10,710	73	63
*PA8KW	“	1,325	25	25
*PA1BBO	“	1,272	25	24
***PD2PKM**	**14**	**338,661**	**501**	**333**
***PA3DTR**	**7**	**38,368**	**102**	**88**
		North Macedonia		
Z33B	**A**	**259,707**	**396**	**249**
Z35T	**28**	**1,560,698**	**1010**	**613**
***Z36W**	**A**	**1,481,348**	**992**	**514**
*Z33F	“	481,728	543	312
***Z36N**	**28**	**125,244**	**274**	**196**
***Z39A**	**7**	**291,392**	**300**	**232**
***Z35Z**	**3.5**	**91,936**	**175**	**136**
		Northern Ireland		
***MIØDWE**	**A**	**261,807**	**381**	**273**
GI4H	“	*47,232*	*135*	*123*
		Norway		
LC6C	**A**	**500,214**	**531**	**318**
				(OP: LA6VQ)
LA1TV	“	310,496	434	313
LC9S	**14**	**40,392**	**158**	**132**
				(OP: LA9GSA)
***LA5LJA**	**A**	**930,225**	**805**	**395**
*LA9TY	“	671,803	603	389
*LB2WG	“	309,288	438	263
*LA3BPA	“	269,748	354	254
*LB6VI	“	224,352	386	246
*LA2HFA	“	177,984	304	216
*LA4NL	“	20,640	103	96
*LB2WD	“	7,320	65	60
LC9T	“	*154*	*8*	*7*
				(OP: LA9VKA)
		Poland		
SN7Q	**A**	**7,803,612**	**2603**	**933**
				(OP: SP7GIQ)
SOØA	“	373,541	453	301
SP2TQQ	“	190,617	296	203
SN5N	“	106,470	230	169
				(OP: SP5KP)
SP3HRN	“	42,180	149	114
SP8BQL	“	18,396	93	84
SP8K	**28**	**635,390**	**595**	**406**
SP7IIT	“	180	10	10
SN2M	**21**	**2,212,028**	**1240**	**721**
				(OP: SP2XF)
SN5X	“	920,138	768	482
SO4M	*14*	*1,302,400*	*1018*	*592*
SQ9DXT	**“**	**59,625**	**181**	**159**
***SP2R**	**A**	**2,075,948**	**1129**	**604**
*SN6S	“	1,271,820	864	470
				(OP: SP6ZC)
*SP9DTE	“	855,848	715	406
*SP9DLY	“	782,082	694	378
*3Z9W	“	648,962	642	334
				(OP: SP9EZM)
*SP3LGF	“	577,155	579	353
*SP1TJ	“	441,840	486	336
*SO3O	“	403,522	449	287
*SP3GAX	“	387,688	474	301
*HF3A	“	335,404	429	284
				(OP: SP3IIZ)
*SP9KDA	“	332,575	446	265
				(OP: SP6GCU)
*SP1DOZ	“	290,244	398	268
*SP6NIV	“	255,013	332	239
*SP6JZP	“	224,192	331	248
*SP9GMI	“	223,560	319	230
SP2MKI	“	*211,754*	*289*	*239*
*SP3QDX	“	194,040	322	220
*SQ6PLE	“	192,640	293	224
*SP4BPH	“	188,340	314	219
*SP6SOZ	“	165,444	278	204
*SP5GNI	“	150,856	275	218
*SP5CMW	“	133,176	233	179
*SP9CTS	“	108,576	216	156
*SP6BEN	“	106,444	202	178
*SQ6ELK	“	103,716	191	172
*SP3MEO	“	103,104	216	179
*SP3CCT	“	92,568	216	174
*SP6FXY	“	79,156	191	154
*SP7Y	“	67,257	197	159
*SQ9FMU	“	55,917	150	109
*SP1DMD	“	55,120	155	130
*SQ7LQJ	“	50,673	155	133
SQ3KNL	“	*32,490*	*107*	*90*
*SP9IVD	“	29,165	106	95
*SP9EXE	“	26,208	102	91
*SP3MZ	“	24,940	94	86
*SP9IHP	“	19,096	87	62

*SP6OWA	“	10,140	58	52
*SP9ICU	“	9,563	79	73
*SN8K	“	8,201	61	59
				(OP: SQ8ERS)
*SQ8L	“	4,653	39	33
*SP2HHX	“	3,444	48	41
*SP9DLS	“	1,914	36	33
*SP3BBS	“	1,886	25	23
*SQ9DEO	“	1,560	24	24
*SP2V	“	200	10	10
*SQ2OMK	“	152	8	8
***SO25UM**	**28**	**608,688**	**545**	**432**
				(OP: SQ9UM)
*SP6IHE	“	90,896	211	184
*SP4GDC	“	24,570	100	91
*SP8EEX	“	5,480	50	40
*SP9KJU	“	5,368	45	44
				(OP: SP9MDY)
*SNØR	“	2,430	30	30
				(OP: SQ9IAU)
*SQ6A	“	1,702	25	23
***SP2FNC**	**21**	**62,832**	**187**	**154**
*SP9TDA	“	18,490	99	86
*SP9BGS	“	14,960	96	80
***SP8N**	**14**	**401,319**	**499**	**387**
*SP8CGU	“	205,618	381	266
*SP6DMI	“	49,192	170	143
***SP4TKR**	**7**	**1,156,400**	**712**	**413**
*SQ5CZP	“	262,404	294	222
***SP3AMO**	**3.5**	**26,892**	**92**	**83**
*SP5UFK	“	7,920	48	45
*SP3CMX	“	16	2	2
		Portugal		
CT7AIX	**28**	**44,764**	**137**	**124**
***CR5O**	**A**	**2,614,108**	**1594**	**623**
				(OP: CT7AJL)
*CT1BXT	“	607,560	548	366
*CT7AUP	“	249,498	392	249
*CT1FKN	“	245,618	316	254
*CT1FOQ	“	142,272	260	192
		Romania		
YO4NF	*A*	*1,903,356*	*1140*	*546*
YO3VU	**“**	**1,346,080**	**1004**	**470**
YO3RU	“	1,311,987	987	489
YO3GNF	“	508,305	583	329
YO9HP	“	*344,454*	*394*	*307*
YO2DFA	“	184,005	295	235
YO7CW	“	172,156	249	193
YO3IJ	“	110,400	245	184
YO3LW	**21**	**241,976**	**382**	**298**
YO4FPF	**14**	**455,455**	**623**	**385**
YQ6A	**7**	**1,053,360**	**589**	**399**
				(OP: YO6BHN)
***YO4DG**	**A**	**804,783**	**747**	**399**
*YO6HSU	“	736,568	676	392
*YO9BCM	“	667,550	597	338
*YO4SI	“	242,592	346	228
*YO3YV	“	174,894	293	206
*YO9CWY	“	123,830	283	203
*YO4CVV	“	84,456	206	153
*YO3JF	“	41,472	151	128
*YO3CEN	“	26,062	96	83
YO9WHI	“	*18,432*	*77*	*64*
*YO2LDU	“	11,388	69	52
***YO2IS**	**28**	**83,328**	**200**	**168**
*YO8DHA	“	42,350	163	121
***YO3JW**	**21**	**180**	**9**	**9**
***YO5AXF**	**14**	**165,620**	**342**	**245**
*YO8RC	“	26,904	128	118
***YO6BGT**	**7**	**10,600**	**52**	**50**
		San Marino		
***T77CX**	**28**	**1,045,296**	**808**	**504**
				(OP: IK4DCX)
		Sardinia		
ISØCAK	*A*	*9,342*	*54*	*54*
		Scotland		
MM9I	**A**	**3,337,873**	**1480**	**737**
				(OP: GMØOPS)
MM2T	“	519,564	538	348
GM2V	“	180,605	290	205
				(OP: GM3WOJ)
GM4ZUK	“	38,048	132	116
MM1E	**28**	**23,655**	**102**	**83**
				(OP: MMØGOR)
***GM3A**	**A**	**364,800**	**496**	**320**
				(OP: MMØJOM)
*GM4JKZ	“	136,528	274	184
*MMØCPZ	“	124,062	245	186
*MMØC	“	80,384	194	157
*GM4OSS	“	3,360	42	42
***GM5M**	**28**	**85,608**	**208**	**164**
				(OP: GM4ZNC)
*GM5BDX	“	493	17	17
***GM6DX**	**21**	**34,281**	**151**	**117**
***GMØKWW**	**14**	**73,017**	**211**	**171**
		Serbia		
YT3D	**A**	**2,566,256**	**1263**	**616**
YT4T	“	2,122,256	1153	632
YT1X	**28**	**1,186,740**	**831**	**570**
YT9A	**21**	**268,478**	**374**	**302**
YT3X	**14**	**2,077,682**	**1272**	**713**
***YT2U**	**A**	**594,980**	**564**	**355**
*YU1KT	“	376,257	441	287
*YU3TA	“	89,811	193	153
*YT2TNT	“	73,112	217	152
YT3H	“	*58,000*	*129*	*116*

*YU3EDI	“	10,260	55	54
***YU3A**	**28**	**128,077**	**248**	**211**
*YU7OM	“	1,680	26	24
***YU4SMT**	**21**	**5,994**	**59**	**54**
***YT7E**	**14**	**265,088**	**466**	**304**
*YT1BX	“	100,667	256	197
***YT5W**	**7**	**514,800**	**455**	**300**
				(OP: YT5DEY)
		Sicily		
IT9ODQ	**A**	**865,612**	**829**	**412**
IT9WKU	“	186,995	312	251
IT9VDQ	“	98,992	229	184
IT9SSI	“	47,291	160	131
IT9DKI	“	31,114	104	94
IQ9PA	“	13,320	81	74
IT9BLB	**14**	**1,679,690**	**1063**	**670**
***IT9VCE**	**A**	**1,276,904**	**994**	**458**
*IT9ESW	“	1,181,432	799	511
*IT9GHW	“	175,500	331	234
*IT9AJP	“	85,504	195	167
*IT9BGY	“	27,930	118	105
IT9MBZ	“	*18,316*	*92*	*76*
*IT9LKX	“	15,123	82	71
*IT9IVU	“	3,528	45	36
***IT9RZU**	**28**	**315,576**	**402**	**324**
*IT9MRM	“	195,569	317	253
***IT9ATF**	**21**	**99,715**	**267**	**185**
*IW9FI	“	25,272	121	104
*IT9STX	“	10,270	72	65
*IT9IMJ	“	2,201	38	31
***IW9FDD**	**14**	**347,415**	**497**	**345**
***IT9RJE**	**7**	**1,556,160**	**732**	**480**
IT9LIZ	“	*17,292*	*69*	*66*
***IT9XTP**	**3.5**	**43,650**	**112**	**97**
		Slovak Republic		
OM3CFR	**A**	**523,160**	**528**	**328**
OM5MX	“	278,460	381	260
OM7KW	“	145,314	249	207
OM4MM	“	38,961	136	111
OM3CW	**28**	**47,488**	**151**	**112**
OM2VL	“	28,569	115	89
***OM5JA**	**A**	**297,184**	**357**	**251**
*OM7AG	“	215,166	368	218
*OM1HMI	“	132,475	249	175
*OM5CM	“	90,190	178	145
*OM5NL	“	72,216	180	153
*OM3TLE	“	37,030	139	115
*OM8MF	“	11,592	68	63
***OM5NA**	**28**	**54,672**	**153**	**134**
***OM5TX**	**14**	**175,951**	**357**	**251**
*OM8JP	“	97,152	251	192
***OM3ZWA**	**7**	**672,010**	**486**	**335**
*OM5APP	“	43,680	119	104
***OM5KM**	**3.5**	**394,000**	**400**	**250**
		Slovenia		
S53M	**A**	**5,612,922**	**1922**	**837**
				(OP: S51FB)
S58M	“	2,609,088	1364	642
S53F	“	1,900,565	972	641
S5ØRY	“	1,303,447	841	449
				(OP: S53K)
S56EM	“	72,478	206	167
S57DX	**28**	**445,195**	**492**	**331**
S52X	**7**	**3,333,024**	**1094**	**652**
S53X	**3.5**	**957,110**	**633**	**385**
***S52W**	**A**	**647,514**	**582**	**378**
*S51I	“	353,510	444	290
*S57SWR	“	317,440	404	256
*S57AJ	“	274,740	355	228
*S52OT	“	70,700	209	175
*S51MM	“	56,870	161	121
S52WD	“	*15,405*	*83*	*79*
S5ØSL	“	*12,432*	*60*	*56*
***S57YK**	**14**	**91,455**	**227**	**195**
***S51CK**	**7**	**1,694,712**	**820**	**482**
*S54MI	“	410,220	384	265
*S57ZT	“	345,092	343	242
***S51W**	**3.5**	**553,280**	**471**	**304**
		Spain		
EE4Y	**A**	**5,240,620**	**2072**	**820**
				(OP: EA4GOY)
EA4Z	“	871,108	801	371
EA4FME	“	422,808	520	316
EF5T	“	199,136	277	196
				(OP: EA5JDN)
EA2A	“	193,116	296	228
EA1L	“	192,226	328	223
EA5O	“	150,540	232	193
EA5GIE	“	24,115	108	91
EA2DDE	“	19,980	96	74
EB1IC	“	*4,368*	*46*	*42*
EA3JW	“	2,640	24	24
EA5DFV	“	420	14	14
EA7Z	*28*	*670,351*	*673*	*409*
EF5K	**21**	**1,641,384**	**1097**	**648**
				(OP: EA5DF)
EF1A	“	97,173	229	177
				(OP: EA1X)
EA1B	**14**	**898,986**	**813**	**514**
EA1DA	**7**	**234,422**	**256**	**199**
***EF7N**	**A**	**2,716,049**	**1491**	**661**
				(OP: EA7KHB)
*ED7Z	“	1,018,104	871	472
				(OP: EA7EQ)
*EA4BAS	“	1,016,232	726	552
*EA2ESB	“	674,856	588	364
*EA3FZT	“	648,340	703	385
*EA5HKZ	“	492,898	568	323

*EA2BJM	“	444,852	485	324
*ED4J	“	428,496	574	339
			(OP: EA4HKF)	
*EA4FIT	“	386,232	469	308
*EA2EVM	“	366,201	547	297
*EA5HYJ	“	335,454	462	294
*EA1IYK	“	199,368	377	234
EC7YY	“	*150,104*	*298*	*232*
			(OP: EC7CC)	
*EA3HKA	“	117,600	292	200
*EE5O	“	116,820	219	180
			(OP: EA5ITJ)	
*EA7DUT	“	107,118	296	198
*EA1EWY	“	100,980	220	170
*EB5CUZ	“	99,876	228	164
*EF5R	“	95,830	281	185
			(OP: EA5GOR)	
*EA5KE	“	89,394	187	141
*EA2EVC	“	88,234	196	157
*EB5CS	“	88,000	224	176
*EA5LU	“	82,478	214	163
*EA2ESK	“	68,134	190	163
*EA2CCG	“	62,133	195	149
*EA3CFV	“	25,500	122	100
*EA3DNC	“	21,000	83	75
*EA7KGK	“	5,300	56	53
*EA5LN	“	4,408	41	38
*EA5ERA	“	2,451	67	57
*EA4AFP	“	1,139	17	17
***EE3Z**	**28**	**115,444**	**243**	**196**
			(OP: EA3NO)	
*EA7VJ	“	31,694	114	106
*EA3OH	“	8,732	61	59
*EA4TX	“	7,332	54	47
***ED7B**	**21**	**546,270**	**594**	**393**
			(OP: EC7ZR)	
*EE7R	“	258,093	413	297
*EA5MR	“	55,998	190	153
*EF5U	“	37,698	149	122
			(OP: EA5U)	
***EB3TR**	**14**	**70,666**	**218**	**178**
*EA1DP	“	20,661	111	97
EA3OW	“	*4,753*	*51*	*49*
***EA3CI**	**7**	**1,574,816**	**764**	**464**
*EA3IAZ	“	212,796	280	207
*EA3MR	“	59,438	148	113
EA1AAP	“	*33,616*	*98*	*88*
***EC5AN**	**3.5**	**29,584**	**91**	**86**
		Sweden		
SM2M	**A**	**2,260,576**	**1136**	**656**
			(OP: SM2LIY)	
SM7BHM	“	406,565	534	305
SB7A	“	399,051	501	303
			(OP: SA7LAK)	
SM6MVE	“	283,484	399	262
7S9A	**7**	**1,452,680**	**751**	**460**
			(OP: SA6FOL)	
SM5EPO	“	365,190	336	259
***SM5IMO**	**A**	**868,376**	**739**	**394**
*SE4E	“	619,993	646	359
			(OP: SM4DQE)	
*SE6K	“	613,700	672	340
			(OP: SM6FZO)	
*SM6I	“	374,920	492	280
			(OP: SA6CMO)	
*SM5GRD	“	363,562	498	289
*7S5S	“	310,254	419	267
			(OP: SM5CSS)	
*SI3A	“	161,784	344	216
			(OP: SM3LIV)	
*SM5MX	“	143,058	292	211
*SM5ILE	“	101,360	223	181
*SAØFIA	“	98,240	217	160
*SM5DXR	“	43,164	173	132
*SM7CIL	“	19,950	98	75
*SD1A	“	11,644	83	71
			(OP: SM1TDE)	
***SM6BZV**	**28**	**14,454**	**81**	**66**
		Switzerland		
HB9GFT	**A**	**62,678**	**186**	**154**
HB9DOS	**14**	**76,475**	**209**	**161**
***HB9CU**	**A**	**960,075**	**631**	**425**
			(OP: HB9VQQ)	
*HB9HQX	“	234,330	349	219
*HB9TZU	“	211,358	300	217
*HB9FXU	“	195,546	306	218
*HB9TSU	“	47,005	145	119
*HB9DAZ	“	34,068	116	102
*HB9CNY	“	31,031	118	91
*HB9EGA	“	23,716	92	77
*HB9HGD	“	4,107	44	37
		Ukraine		
UW1M	**A**	**8,013,706**	**3187**	**874**
			(OP: UR5MW)	
US2YW	“	3,827,281	1785	739
UX5IO	“	1,339,737	973	487
UT5ECZ	“	216,975	297	263
UY5ZZ	“	212,321	352	241
UT3UV	“	60,900	185	145
US5QUB	“	2	1	1
UT7ZM	**14**	**52,448**	**174**	**149**
UT2AU	“	33,512	147	118
***UZ1WW**	**A**	**1,485,200**	**1013**	**470**
*UT5EOX	“	596,754	607	387
*UW1WU	“	497,660	511	298
*UT3SO	“	444,481	508	293
*US6CQ	“	405,805	505	293
*UR7EC	“	353,065	451	293
*UR4CU	“	214,776	313	228
UX1VX	“	*191,840*	*299*	*220*
*UT5UML	“	180,375	324	195
*UR5WCQ	“	153,903	227	183
*UTØCK	“	48,972	163	132
*US5CDH	“	42,020	148	110
*US7UK	“	240	10	10
***UR5LAM**	**28**	**233,448**	**352**	**284**
*UW5U	“	15,600	99	75
			(OP: UY2UA)	
***UT2EF**	**21**	**147,744**	**302**	**243**
***USØMM**	**14**	**135,135**	**324**	**231**
***UW7LL**	**3.5**	**10,816**	**53**	**52**
		Wales		
MC2I	**A**	**657,915**	**603**	**345**
			(OP: GW5NF)	
GWØA	“	72,924	136	118
			(OP: GW4SKA)	
***MW9W**	**A**	**1,669,393**	**1063**	**517**
			(OP: GWØKRL)	
*GW4HBK	“	9,558	62	59
***MWØCRI**	**21**	**421,124**	**511**	**374**

OCEANIA

		Australia		
VJ5W	**A**	**767,852**	**639**	**388**
			(OP: VK5GR)	
VJ3A	“	253,773	347	241
			(OP: VK3JA)	
VK4AFU	“	10,664	65	62
VK2RT	“	10,092	63	58
VL2N	“	429	13	13
			(OP: VK2PN)	
VL4Y	**21**	**94,377**	**210**	**163**
***VK4ZP**	**A**	**223,492**	**339**	**236**
*VJ3U	“	3,960	44	40
*VK4XU	“	192	14	12
***VK4UC**	**28**	**132,733**	**256**	**199**
*VK5NIG	“	1,768	26	26
***VL3M**	**14**	**45,666**	**139**	**118**
			(OP: VK3UW)	
*VJ3O	“	27,260	111	94
			(OP: VK3TX)	
		East Malaysia		
***9W6AJA**	**A**	**1,014**	**15**	**13**
		Hawaii		
KH6ZM	**A**	**1,553,343**	**1081**	**457**
KH6TU	“	148,520	272	188
			(OP: AD6E)	
***KH6CJJ**	**A**	**806,465**	**761**	**341**
*KH6OO	“	2,349	31	29
		Indonesia		
YE1BON	**A**	**309,488**	**465**	**232**
YB2GBS	“	179,697	365	199
YB2MM	“	144,400	292	190
YCØSCZ	“	48,190	143	122
YB2IQ	“	38,850	139	105
YBØSAS	“	27,544	121	88
YC8DUL	“	20,916	97	84
YB7OO	“	15,480	74	60
YBØISE	“	8,250	63	50
YB9AOS	“	1,624	34	29
YB4DCE	“	1,395	38	31
YB7YDB	“	1,120	33	32
YC3AHD	“	1,100	21	20
YCØRFS	“	940	21	20
			(OP: YDØRFS)	
YE3FAX	“	180	17	15
YB3BLJ	**21**	**78,540**	**174**	**165**
YC2BST	“	24,932	106	92
YB1IUQ	“	17,622	102	89
YB3FTD	“	8,424	59	54
YF3FZR	“	1,674	27	27
YB7KE	“	286	11	11
YB7MP	**14**	**61,787**	**188**	**137**
YB3BX	“	312	16	12
***YB9ELS**	**A**	**449,280**	**524**	**320**
*YC1JGE	“	132,430	290	170
*YC2XCD	“	123,176	288	173
*YB2ECG	“	109,536	256	168
*YCØBAS	“	60,452	172	127
*YC1PZ	“	60,048	169	139
*YE3ESW	“	58,039	178	127
*YB8CMT	“	56,196	162	126
*YB7SKM	“	52,392	189	118
*YB8RVI	“	48,732	169	93
*YB1MIG	“	48,384	192	112
*YE9PBZ	“	44,840	166	118
*YB1BA	“	40,625	174	125
*YB9LCM	“	39,037	164	103
*YC1GDF	“	38,936	181	124
*YD8IKY	“	35,308	130	91
*YD9UBT	“	32,830	149	98
*YB1AM	“	23,821	114	83
*YC1CBY	“	19,578	114	78
*YB7NUS	“	16,717	102	73
*YC8FKN	“	15,572	100	68
*YE8DWC	“	13,888	97	62
*YB1BZV	“	13,764	91	74
*YC4GAS	“	11,830	91	65
*YB4KRZ	“	11,088	69	56
*YC8GPH	“	10,458	91	63
*YC6HRI	“	9,020	66	55
*YF7UFT	“	8,427	75	53
*YF1BMZ	“	8,364	55	51
*YC1CAR	“	7,632	103	53
*YD2UWF	“	7,540	54	52
*YC3TSJ	“	7,332	55	52
*YC1CKK	“	6,060	91	60
*YC1TCA	“	6,016	51	47
*YCØAOM	“	5,952	71	48
*YC4PSG/8	“	5,764	75	44
*YB1ICC	“	5,456	44	44
*YB2CTE	“	5,376	51	42
*YCØJOY	“	5,232	56	48
*YB7GRN	“	3,870	55	45
*YF2AIV	“	3,408	49	48
*YD1CZE	“	2,673	39	33
*YD2BIU	“	2,257	44	37
*YB9GDP	“	2,133	44	27
*YC7SQV	“	1,365	24	21
*YB1LRG	“	1,015	33	29
*YB3COY	“	731	20	17
*YB1DFF	“	325	23	13
*YF3AWZ	“	190	10	10
*YD3BWK	“	100	6	5
***YB1HR**	**28**	**155,043**	**270**	**207**
*YB2VYY	“	43,197	132	121
*YC1LIN	“	28,600	107	100
*YB1RKT	“	26,312	101	88
*YB3BGM	“	20,418	86	82
*YD3CZV	“	286	11	11
***YB1BML**	**21**	**165,834**	**285**	**222**
*YD3ASV	“	86,390	202	163
*YD1FRU	“	66,555	178	145
*YB9UA	“	47,328	190	136
*YB9GV	“	29,939	123	91
*YB4KAR	“	21,845	103	85
*YB3ATK	“	18,834	93	86
*YB8JEC	“	17,739	119	73
*YC1JEL	“	16,185	94	83
*YB2SLF	“	9,240	70	66
*YDØBCG	“	7,315	60	55
*YB1NIN	“	6,968	66	52
*YD1CHM	“	1,932	31	28
*YCØNAN	“	1,288	24	23
*YC2MPF	“	25	5	5
*YC4RWH	“	24	4	4
*YDØAWA	“	4	2	2
***YC2KJC**	**14**	**22,000**	**103**	**88**
*YB1JUS	“	4,592	50	41
*YE4IJ	“	1,890	28	27
*YBØMZI	“	1,624	37	28
*YC1IFR	“	646	21	17
***YD9MBM**	**7**	**7,752**	**49**	**38**
*YD9UW	“	3,024	27	27
*YF3FBV	“	1,332	18	18
*YC1RYX	“	1,326	17	17
*YC1JDW	“	720	19	18
*YB3RYX	“	550	11	11
*YBØOHG	“	506	13	11
*YF4IDW	“	396	12	11
*YC3BUE	“	364	13	13
*YC4SJA	“	252	12	9
		New Zealand		
ZL4NR	**A**	**34,680**	**124**	**102**
ZL3P	**28**	**60,571**	**173**	**119**
			(OP: ZL3PAH)	
ZL2RX	**21**	**11,214**	**70**	**63**
***ZL3VZ**	**A**	**149,553**	**249**	**191**
		Philippines		
DV3A	**A**	**149,694**	**294**	**183**
***4D3X**	**A**	**547,808**	**614**	**272**
*DV3TSJ	“	76,875	258	125
*DU1/NFØO	“	8,575	62	49
*DU1/N6HPX	“	3,192	45	38
***4I1BNC**	**21**	**6,300**	**57**	**42**
		Samoa		
***5W1SA**	**7**	**1,008**	**14**	**14**
		Vanuatu		
YJØA	**A**	**452,584**	**480**	**278**
			(OP: W7YAQ)	

SOUTH AMERICA

		Argentina		
LU1BJW	**A**	**350,594**	**419**	**307**
LU6ETB	“	149,940	263	196
LU7HN	**28**	**732,813**	**656**	**411**
LU8MHL	“	295,920	382	270
LU5DF	“	31,392	116	96
***LU4HK**	**A**	**34,441**	**126**	**101**
*LU7DLS	“	608	24	16
***LW3DN**	**28**	**172,920**	**292**	**220**
*LV1D	“	126,881	242	181
*LU7DW	“	800	21	20
***LT9H**	**21**	**193,344**	**309**	**228**
			(OP: LU3HY)	
*LV1E	“	2,211	34	33
		Aruba		
P49X	**A**	**9,180,792**	**3026**	**846**
			(OP: WØYK)	
		Brazil		
ZW2N	**A**	**3,030,035**	**1467**	**691**
			(OP: PY2MNL)	
ZV5M	“	2,030,364	1220	588
			(OP: PY5AMF)	
PY4EK	“	630,720	613	365
PY5ZHP	“	342,441	435	297
PY2GZ	“	97,614	211	174
PT7WM	“	84,402	189	162
PY2EU	“	46,540	151	130
PY2KDU	“	15,488	103	88
PS7DX	“	13,455	70	65

PY3TR	“	3,010	45	43
PV8DX	“	1,664	26	26
PV2K	**28**	**2,205,096**	**1156**	**661**
				(OP: PY2KNK)
PY2CX	“	965,740	764	436
PY2EBD	“	11,532	63	62
PY3LX	“	1,176	21	21
PY2QT	**21**	**301,500**	**400**	**300**
PY5QW	“	78,894	184	162
PR7ZAJ	**14**	**46,617**	**143**	**123**
PY2XJ	“	1,653	31	29
***PY1FI**	**A**	**759,774**	**686**	**417**
*ZX2V	“	370,880	453	304
				(OP: PY2XV)
*PY1ZV	“	254,826	385	242
*PU2USK	“	149,720	286	197
*PY2WLM	“	38,625	154	125
*ZX89L	“	30,502	107	101
				(OP: PY7XC)
*PY2ANH	“	24,273	102	87
*PP5ARF	“	19,624	95	88
				(OP: PP5TI)
*PP5DZ	“	17,933	86	79
*PY2MIA	“	10,912	70	62
*PY4ARS	“	7,506	57	54
*ZV2F	“	4,515	51	43
				(OP: PY2SFA)
*PR7KSA	“	667	27	23
*PU5KJN	“	168	12	12
***PU1JSV**	**28**	**566,605**	**535**	**379**
*PY2UD	“	279,491	357	269
*PU2WDX	“	267,566	385	251
*PT8DX	“	177,660	301	210
*PY1KB	“	95,480	227	155
*PP5FZ	“	45,000	148	120
*PY1SAD	“	43,896	164	118
*PY4XX	“	20,054	96	74
*PU3VON	“	18,530	90	85
*PU4BOT	“	15,408	78	72
*PU3POE	“	10,557	72	69
PU2XFF	*“*	*8,892*	*58*	*52*
*PY2ATR	“	8,848	62	56
*PY2VZ	“	5,060	46	44
*PU3LTA	“	1,007	19	19
*PY3CAD	“	656	16	16
*PY2TDB	“	8	4	4
***PU2UAF**	**21**	**124,740**	**253**	**210**
*PU8YPL	“	37,152	134	108
*PU7ASP	“	1,755	29	27
***PY2NY**	**14**	**376,292**	**437**	**302**
*PY3TD	“	25,830	115	105
*PY6TS	“	9,454	64	58
***PY2GTA**	**7**	**3,216**	**24**	**24**
		Chile		
***CB8E**	**A**	**278,133**	**389**	**249**
				(OP: CE8EIO)
*CE3GRU	“	60,320	173	130
*CE3KA	“	18,810	111	90
*CE3RIF	“	17,628	94	78
***CE1WGM**	**28**	**395,616**	**473**	**312**
*CA5GRF	“	188,100	323	209
***CE5AUC**	**14**	**1,071**	**21**	**21**
		Colombia		
***HK3CFM**	**A**	**19,080**	**98**	**90**
***HK4C**	**28**	**3,737**	**38**	**37**
		Curacao		
PJ2T	**A**	**2,889,831**	**1451**	**571**
				(OP: WI9WI)
		Ecuador		
***HC1JQ**	**21**	**217,620**	**325**	**234**
		Falkland Islands		
***VP8YLJ**	**A**	**123,228**	**260**	**189**
		French Guiana		
FY5KE	**A**	**4,250,594**	**1822**	**734**
				(OP: F5UII)
		Peru		
***OA4DOS**	**A**	**231,549**	**350**	**237**
		Uruguay		
CV7S	**21**	**1,101,388**	**777**	**502**
				(OP: CX7SS)
***CX9AU**	**A**	**45,548**	**149**	**118**
***CX2AQ**	**28**	**385,612**	**441**	**298**
		Venezuela		
***YV5AEP**	**A**	**1,675**	**27**	**25**

QRP

DK7HA	**A**	**1,422,660**	**848**	**524**
RM5F	**“**	**1,053,763**	**1158**	**421**
ON6NL	**“**	**941,952**	**719**	**446**
DF1MM	“	868,968	615	447
KZØUS	**“**	**646,990**	**658**	**485**
				(OP: W7RY)
KV2U	**“**	**618,786**	**705**	**378**
				(OP: K2YG)
SP5ØUUU	**“**	**406,560**	**481**	**308**
				(OP: SP2UUU)
EA1GT	**“**	**386,496**	**517**	**288**
				(OP: EA1GT/QRP)
KO1H	**“**	**356,400**	**529**	**297**
EA3F	“	285,975	381	279
OK4GP	**“**	**272,952**	**314**	**223**
WU5K	**“**	**248,685**	**460**	**295**
				(OP: K5NZ)
IZ8JFL	**“**	**228,589**	**308**	**227**
YU1RH	**“**	**223,139**	**351**	**251**
HB2QRP	**“**	**216,450**	**328**	**225**
				(OP: HB9BAS)
JH7UJU	**“**	**130,427**	**256**	**167**
RC1C	**“**	**126,485**	**265**	**205**
W6QU	**“**	**115,415**	**275**	**205**
				(OP: W8QZA)
DL2DCX	“	114,632	252	184
PY2PLL	**“**	**99,540**	**211**	**180**
UT2SQ	**“**	**97,760**	**195**	**160**
DL5CV	“	95,776	209	164
JA4XHF/3	**“**	**81,879**	**197**	**147**
RV3DBK	“	70,854	206	147
WQ6X	“	67,144	259	154
OK7PZ	“	66,430	172	130
OK1DMP	“	64,960	149	140
CO2OQ	**“**	**62,444**	**182**	**134**
EA4U	“	57,822	169	138
YO7BGA	**“**	**56,304**	**167**	**136**
K4SAA	“	50,944	152	128
DDØVS	“	43,930	130	115
9M2TDX	**“**	**43,890**	**172**	**114**
CO2KY	“	42,601	152	113
PD8DX	**“**	**41,688**	**134**	**108**
AI9K	**“**	**40,800**	**186**	**136**
F5MGD	**“**	**35,378**	**127**	**98**
EW8G	**“**	**34,594**	**123**	**98**
JK2VOC	**“**	**33,759**	**136**	**99**
SP3PDO	*“*	*26,602*	*104*	*94*
				(OP: SP3TYJ)
G4FPA	**“**	**25,761**	**107**	**93**
DL8LR	“	24,900	101	83
PE2K	“	24,541	109	97
JK1TCV	**“**	**23,604**	**101**	**84**
YB1PEF	**“**	**20,254**	**113**	**82**
DF5GO	“	18,091	95	79
SV1UH	**“**	**17,920**	**93**	**80**
KG2U	“	16,380	115	91
YU1LM	“	15,552	73	64
HF55ØMK	“	14,976	80	72
				(OP: SP9RQH)
YD6ROA	“	14,283	109	69
AA8OY	**“**	**13,840**	**89**	**80**
DL2BIS	“	13,575	89	75
YV6BXN	*“*	*12,296*	*62*	*58*
R7KO	**“**	**10,465**	**68**	**65**
CO6EC	“	10,192	63	56
DH4BM	*“*	*9,964*	*67*	*53*
IZ5IOM	“	7,191	52	47
BH6KWC	**“**	**5,750**	**52**	**46**
DF5EM	“	5,720	55	52
TF2CT	**“**	**3,456**	**37**	**36**
DL8MDW	*“*	*2,996*	*31*	*28*
YO4AAC	“	1,736	30	28
LU1KCQ	**“**	**1,113**	**25**	**21**
VE3JZT	**“**	**798**	**20**	**19**
DL7AU	“	700	14	14
K8ZT	“	616	23	22
N6HI	**“**	**600**	**26**	**20**
I/PE4I	“	434	14	14
DK2FG	“	288	8	8
OK2SWD	“	180	9	9
LW6EGE	“	56	5	4
K3GDS	**“**	**54**	**6**	**6**
YC1HBP	“	48	7	6
7S2A	**28**	**229,356**	**385**	**276**
				(OP: SA2SAA)
EA9E	**“**	**222,780**	**340**	**237**
CB3R	**“**	**131,726**	**241**	**194**
YO8WW	**“**	**75,795**	**186**	**163**
N8URE	**“**	**48,438**	**154**	**138**
IZ2JPN	**“**	**43,152**	**137**	**124**
WE6EZ	**“**	**41,208**	**166**	**136**
WD9FTZ	**“**	**34,969**	**147**	**121**
CM3EFM	**“**	**33,810**	**142**	**115**
VE3BFU	**“**	**25,000**	**106**	**100**
JA6WFM	**“**	**12,740**	**72**	**65**
KE6GLA	**“**	**10,906**	**97**	**82**
OM7PY	**“**	**7,923**	**61**	**57**
JH3DMQ	**“**	**7,150**	**57**	**50**
NP3V	**“**	**5,382**	**48**	**46**
EA4DUT	**“**	**4,704**	**50**	**48**
N3MWQ	“	2,774	40	38
PA2REH	**“**	**2,464**	**30**	**28**
GW5P	**“**	**2,100**	**32**	**28**
				(OP: GWØEGH)
DL5SFC	**“**	**1,725**	**26**	**25**
YD2UFR	**“**	**663**	**17**	**17**
DO4ADH	“	435	17	15
EF8BBM	**“**	**8**	**2**	**2**
UA3QJJ	**21**	**201,188**	**376**	**292**
HG3IPA	**“**	**148,764**	**303**	**231**
				(OP: HA3JB)
CO2AJ	**“**	**119,280**	**266**	**210**
SP4NKJ	**“**	**118,405**	**271**	**199**
KD9MS	**“**	**83,692**	**225**	**196**
DJ3HW	**“**	**80,960**	**198**	**176**
TIØRC	**“**	**74,253**	**218**	**159**
				(OP: TI2YO)
NØUR	**“**	**74,108**	**241**	**194**
LY5G	**“**	**73,513**	**216**	**163**
HF2ØLVK	“	67,392	197	156
YO3DAC	**“**	**51,538**	**162**	**146**
UR2Y	**“**	**45,552**	**166**	**146**
				(OP: USØYW)
JR1NKN	**“**	**19,812**	**99**	**78**
YC4SIZ	**“**	**11,926**	**77**	**67**
PY2CER	**“**	**11,856**	**87**	**76**
IZ2QKG	**“**	**4,171**	**47**	**43**
UT7AA	“	506	23	23
NH6O	**“**	**300**	**10**	**10**
YB8RAG	“	153	10	9
YB8LDK	“	153	27	17
YB2ERL	“	40	5	5
SFØA	**14**	**286,124**	**464**	**307**
				(OP: SMØLPO)
YU1NR	**“**	**59,130**	**179**	**162**
ON3PAT	**“**	**35,620**	**140**	**130**
EA7JTP	**“**	**28,290**	**132**	**115**
TI2BSH	**“**	**26,104**	**131**	**104**
OQ4B	“	22,989	116	97
				(OP: ON4BHQ)
YO4BEW	**“**	**21,008**	**112**	**104**
OK7N	**“**	**9,039**	**73**	**69**
LY4BF	**“**	**7,503**	**66**	**61**
9A5HZ	**“**	**5,044**	**53**	**52**
DL7EDU	**“**	**1,450**	**30**	**29**
IK2FTB	**“**	**1,326**	**27**	**26**
IU4PRA	“	1,222	29	26
IW2NRI	“	893	23	19
VK3GK	**“**	**833**	**18**	**17**
UV3RT	**“**	**72**	**6**	**6**
YO8OLY	“	40	4	4
DU7OK	**“**	**8**	**2**	**2**
SP4LO	**7**	**147,420**	**216**	**182**
I2/UY2ZA	**“**	**62,976**	**148**	**123**
MM7BWK	**“**	**41,040**	**105**	**95**
GM1J	“	36,860	102	97
				(OP: MMØBQI)
SP6EIY	“	29,920	102	85
YD3AMT	**“**	**112**	**9**	**8**
BH5HGI	**“**	**32**	**4**	**4**
UT3N	**3.5**	**159,698**	**241**	**187**
				(OP: UT3NK)
SP3EMA	**“**	**119,184**	**195**	**156**
M9N	**“**	**59,780**	**134**	**122**
				(OP: G7WHI)
YL3FW	**“**	**41,600**	**106**	**100**
PAØAWH	**“**	**5,112**	**40**	**36**
EE2A	**“**	**3,472**	**29**	**28**
				(OP: EA2SN)
JA5NSR	**“**	**50**	**5**	**5**

MULTI-OPERATOR SINGLE-TRANSMITTER HIGH POWER

NORTH AMERICA

	United States - District 2		
AK2S	**238,810**	**466**	**286**
	United States - District 3		
ND3D	**5,388,432**	**2255**	**812**
	United States - District 4		
W4MLB	**598,662**	**710**	**421**
	United States - District 6		
AG6AU	**389,991**	**697**	**343**
	United States - District 7		
WM7A	**841,156**	**934**	**446**
	United States - District 9		
KS9R	**3,185,820**	**1863**	**660**
KD9V	290,997	497	279
	United States - District Ø		
AK9D	*284,229*	*734*	*297*

NORTH AMERICA

	Canada - District 3		
VE3KTB	**1,224,876**	**940**	**412**
	Canada - District 7		
VA7MAY	**1,125,432**	**989**	**392**

ASIA

	China		
BH2RO	**514,206**	**609**	**318**

EUROPE

	Bulgaria		
LZ5R	**5,927,548**	**2121**	**814**
	Croatia		
9A5D	**6,384,930**	**2363**	**870**
	Czech Republic		
OK7O	**4,375,764**	**1662**	**788**
OK1KSL	4,015,304	1758	724
	England		
G3B	**2,335,320**	**1287**	**585**
	Fed. Rep. of Germany		
DP6A	**4,772,598**	**1809**	**807**
DL1T	283,550	432	265
DQ9M	280,830	376	253
DJ1XT	221,850	338	255
	Finland		
OH2HAN	**4,656,762**	**1922**	**811**
OG7ØAD	604,992	663	368
	France		
TMØR	**5,276,502**	**1956**	**846**
TM1D	929,673	769	477

	Greece			
J42L	3,939,612	1762	703	
	Hungary			
HG7T	5,100,113	2180	779	
HA3DX	3,408,440	1557	658	
	Italy			
IQ4FC	11,821,950	3440	1050	
IQ2ZY	1,477,782	910	522	
IQ2CJ	268,660	382	266	
	Poland			
SP3KRE	263,568	367	272	
	Slovak Republic			
OM5M	1,448,184	878	498	
	Slovenia			
S51A	5,369,270	1965	830	
	Sweden			
SD3T	1,389,342	1135	514	
SK6D	1,025,440	863	442	
	Ukraine			
UW4E	186,960	336	228	

MULTI-OPERATOR SINGLE-TRANSMITTER LOW POWER

NORTH AMERICA

	United States - District 1			
*NC1CC	1,160,382	861	534	
	United States - District 2			
*NY6DX	2,084,914	1170	689	
	United States - District 4			
*WW4LL	3,057,244	1676	718	
*KA4RRU	2,582,580	1536	645	
*WB8SKP	469,880	697	340	
	United States - District 7			
*AB7HP	2,773	48	47	
	United States - District Ø			
*WØPC	4,410	53	45	

NORTH AMERICA

	Dominican Republic			
*HI8SDR	81,082	165	142	
	Mexico			
*XE2N	1,196	28	26	

AFRICA

	Canary Islands			
*EA8DED	4,219,306	1635	679	

ASIA

	Asiatic Turkey			
*TA4/OH2KW	711,722	679	346	
	India			
*VU2DED	523,050	490	317	

EUROPE

	Austria			
*OE7XKJ	551,403	488	311	
	Bosnia-Herzegovina			
*E71FDE	36,668	100	89	
	Croatia			
*9A7T	2,070,852	1012	623	
*9A7B	368,626	456	298	
	Czech Republic			
*OL1Z	1,561,377	1030	489	
*OK1OFM	5,236	47	44	
	Estonia			
*ES7A	2,279,892	1203	626	
	Fed. Rep. of Germany			
*DAØBCC	2,710,350	1275	634	
*DQ4W	2,512,890	1344	615	
*DM3X	871,794	768	407	
	Italy			
*IQ2DN	981,950	780	479	
	Norway			
*LA2L	76,254	176	142	
	Poland			
*SP9ZPS	435,344	503	299	
	Republic of Kosovo			
*Z66BCC	2,048,704	1154	538	
	Scotland			
*MSØWSG	9,792	72	64	
	Serbia			
*YU5R	383,100	424	300	
*YU7KMN	155,792	298	214	
	Sicily			
*IT9RBW	6,652,387	2232	889	
	Spain			
*ED3D	1,088,481	932	471	
	Sweden			
*8S8ØAA	1,611,435	1105	515	
	Ukraine			
*US4EWY	134,860	330	220	

SOUTH AMERICA

	Brazil			
*PY2RH	142,506	274	203	

MULTI-OPERATOR TWO-TRANSMITTER

UNITED STATES

K9CT	10,810,878	3889	1054
WV4P	8,950,866	3531	1002
NCØDX	5,701,110	2977	870
KT7E	3,709,321	2309	737
K3CCR	2,022,744	1221	622

AFRICA

CR3DX	22,747,902	5379	1149

EUROPE

ED1R	12,552,932	3992	1057
DP7D	10,698,840	3292	1017
DQ2C	9,426,468	3019	971
C37N	4,377,272	2000	719
LA1ØØK	2,374,344	1572	588
*ES5G	993,711	926	417
*OL7K	331,299	422	281

MULTI-OPERATOR MULTI-TRANSMITTER

UNITED STATES

W3GH	5,389,308	2646	834
NW8S	4,555,968	2423	778
WA3EKL	1,457,376	1016	564
NW6P	323,609	557	341

ASIA

JA6ZPR	1,128,190	895	497
*JS1YDX	49,352	176	124

EUROPE

9A1A	20,431,824	5300	1168
DP9A	13,979,736	4182	1061
DG4UF	4,426,311	1971	771
DQ9Y	3,941,613	1584	767
OZ4GM	2,465,528	1382	604

MULTI-DISTRIBUTED

NORTH AMERICA

CJ2X	5,638,320	2371	820

EUROPE

IQ3ME	5,405,472	2254	822
DC6O	2,522,919	1327	629
IQ8QX	46,500	184	150

OCEANIA

VK4SN	3,684,765	1700	665
7E3E	10,304	61	56

ROOKIE

NORTH AMERICA

		United States - District 1		
*KC1RET	A	560,986	643	358
		United States - District 2		
KD2UBH	A	151,466	350	217
		United States - District 3		
W3FR	A	225,280	386	256
KC3TAU	“	174,563	310	227
N3AML	“	32,994	128	94
*K3AK	A	215,433	411	237
*KN1OLA	“	59,502	183	141
		United States - District 4		
*KQ4AAR	A	20,910	106	85
		United States - District 5		
W9DCT	A	1,008,807	898	489
*KI5RQG	A	89,000	304	178
*KI5QPY	“	19,012	122	97
		United States - District 6		
KO6M	A	97,152	334	184
*NN6U	A	32,592	143	112
*KN6SID	“	22,338	165	102
		United States - District 7		
*W7VC	A	29,925	173	105
*KB7SDM	“	18,693	140	93
		United States - District Ø		
*KFØADU	A	575	24	23

NORTH AMERICA

		Canada - District 6		
*VE6SYD	A	15,257	82	73

ASIA

		Japan - District 1		
JK1BAB	A	864	19	18
		West Malaysia		
*9M2MAD	A	2,838	30	22

EUROPE

		Czech Republic		
*OK3SN	21	21,627	92	84
		England		
M9B	A	411,720	510	292
				(OP: MØLKW)
*G5ROB	A	133,248	250	192
*M7WFG	“	4,522	41	38
*2E1LSI	“	1,848	23	22
				(OP: G5LSI)
		Fed. Rep. of Germany		
*DD5VL	A	286,764	358	276
*DL9DX	“	96,824	221	152
*DK1GP	“	48,789	169	139
*DM7HB	“	8,134	55	49
*DO1TLP	“	16	4	4
*DO4ADH	28	435	17	15
		France		
*F4ITQ	A	573,447	582	329
*F4IVC	“	129,090	275	195
		Hungary		
*HA1NR	14	103,626	260	202
		Ireland		
EI6IKB	A	999,440	840	403
		Italy		
IUØPVM	A	762,354	690	369
*IUØRBE	A	523,973	546	331
*IV3IPA	“	366,885	433	263
*IU3QEU	“	113,022	244	189
*IUØRAU	“	3,735	48	45
*I/PE4I	A	434	14	14
		Slovak Republic		
*OM1HMI	A	132,475	249	175
		Spain		
EF5T	A	199,136	277	196
				(OP: EA5JDN)
*ED4J	A	428,496	574	339
				(OP: EA4HKF)

OCEANIA

		Indonesia		
*YD8IKY	A	35,308	130	91
*YC6HRI	“	9,020	66	55
*YF7UFT	“	8,427	75	53
*YDØBCG	21	7,315	60	55
*YC3BUE	7	420	13	13
*YD3BWK	A	100	6	5
*YDØAWA	21	4	2	2
*YD2UFR	28	663	17	17

SOUTH AMERICA

		Brazil		
*PU4BOT	28	15,408	78	72

CLASSIC

NORTH AMERICA

		United States - District 1		
NG1M	A	912,120	847	440
*NG1R	21	545,606	678	418
				(OP: W1QK)
*W1DYJ	A	225,944	392	244
*AF1R	“	181,440	344	216
*N1RDN	“	21,560	105	98
		United States - District 2		
WO2Y	A	60,236	193	148
*W2VTV	7	226,380	311	231
*NM2K	A	94,520	214	170
*K3WHD	“	56,330	179	131
*K2DD	“	31,624	148	118
*W2YK	“	8,410	66	58
		United States - District 3		
W3LL	7	1,777,937	859	498
4U1WB	A	431,892	776	372
				(OP: AJ3M)
K3AU	“	173,706	333	221
				(OP: K2YWE)
N3BD	“	141,400	340	202
N3DUE	“	123,656	254	164
*KC3SDJ	A	134,521	297	193

*AI3KS	"	82,560	212	172
*AJ3DI	"	15,200	102	80
*KA2JAI	"	6,840	66	57
*N8URE	28	48,438	154	138
United States - District 4				
N1RM	**A**	**2,191,196**	**1289**	**556**
W4CQE	"	597,702	731	409
NN4NN	"	274,052	392	262
				(OP: K3SV)
ND4G	"	95,151	216	197
W5XB	*"*	*29,370*	*139*	*110*
K4NWX	"	16,362	93	81
W3IK	14	11,560	99	85
***N3CKI**	**A**	**258,266**	**432**	**263**
*W3DQS	"	220,158	369	243
*WZ4M	"	192,660	432	247
*K4DR	"	179,728	366	239
*K4FTO	"	179,469	343	207
*W4PJW	"	156,562	361	211
*KT6D	"	139,256	307	206
*W4LC	14	111,776	303	224
*AC4G	A	38,184	129	111
*W4IM	"	23,736	118	86
*W4SKB	"	20,580	135	105
*K3WR	"	8,760	68	60
*W4YVA	"	7,936	71	62
United States - District 5				
WA9JBR	**A**	**98,784**	**258**	**196**
WV5Y	"	54,264	235	152
W5TN	14	20,592	142	104
K5TU	A	6,936	56	51
***WQ5L**	**A**	**136,656**	**295**	**208**
*AA5W	"	20,384	125	98
*KC6CNN	"	150	10	10
United States - District 6				
AJ6V	**A**	**748,879**	**939**	**409**
***N7WLC**	**A**	**182,850**	**415**	**234**
*KF6RY	28	125,874	326	211
				(OP: W6ZL)
*WZ6ZZ	3.5	84,280	54	43
*K6TLH	A	18,200	127	91
*KD6GWH	"	16,632	109	84
*KM6WCC	"	13,600	96	85
*KN6OON	"	680	18	17
*KE6MYA	"	130	10	10
*KE6GLA	28	10,906	97	82
United States - District 7				
K7JQ	**A**	**266,751**	**492**	**277**
***W7TMT**	**A**	**189,002**	**491**	**242**
*K7HKR	"	172,912	365	214
*K7AZT	"	107,238	300	183
*KC7CM	21	75,144	256	186
*W7MTL	A	55,338	214	138
*KI7DET	"	2,812	45	38
United States - District 8				
KI6DY	**A**	**2,406,552**	**1514**	**591**
***K7DR**	**A**	**320,120**	**497**	**302**
*W8TWA	"	101,606	295	202
*K8AJS	"	79,200	213	160
*WA8YZB	"	59,584	240	152
United States - District 9				
***KC9YL**	**A**	**53,055**	**194**	**131**
*KD9DJB	"	3,864	56	46
*N9XX	"	2,925	45	39
United States - District Ø				
NØTA	**A**	**667,320**	**973**	**402**
WRØU	"	19,929	116	91
WFØGM	"	18,270	118	90
***KV5Y**	**A**	**137,984**	**428**	**224**
*NYØJ	"	6,136	79	59
*KØVG	"	504	16	14
*NØUR	21	74,108	241	194

NORTH AMERICA

Alaska

KL7SB	*28*	*446,355*	*613*	*327*
Canada - District 1				
***VA1XH**	**A**	**1,301,916**	**920**	**463**
Canada - District 3				
VA3WW	**14**	**3,626**	**58**	**49**
***VE3DZ**	**A**	**912,576**	**670**	**392**

Cuba

***CO2XK**	**21**	**222,615**	**402**	**255**
*CO6XE	28	72,450	225	161
*CO2OQ	A	62,444	182	134

Honduras

***K6VHF/HR9**	**28**	**33,109**	**140**	**113**

Mexico

***XE1YL**	**A**	**438,144**	**640**	**326**
*XE2YWB	"	77,556	226	138

AFRICA

Canary Islands

***EA8OM**	**A**	**153,520**	**238**	**190**
				(OP: DJ1OJ)

ASIA

Asiatic Russia - District Ø

RWØSR	A	575,100	554	356
*RAØWHE	A	234,256	345	242
*UAØC	"	29,410	129	85
*RCØAJ	"	8,748	59	54

Asiatic Turkey

***TA7I**	**A**	**448,189**	**439**	**301**
*TA2FT	7	134,384	169	148
*TA4RC	28	192	8	8

Hong Kong

***VR2VRC**	**28**	**1,656**	**24**	**24**

India

***VU2FGQ**	**28**	**39,072**	**119**	**105**

Israel

***4Z5MY**	**21**	**14,129**	**59**	**56**

Japan - District 1

JH1CTV	**A**	**138,852**	**271**	**174**
JA1FNO	28	42,939	130	117
***JI1BBN**	**28**	**44,486**	**135**	**118**
*JA1ATM	A	42,224	148	104
*JK1OLT	28	16,128	46	46
*JE1GZB	"	3,638	40	34

Japan - District 2

***JE2BOM**	**A**	**68,834**	**170**	**127**
*JO2XYK	"	80	5	5

Japan - District 3

JP3UBR	**A**	**13,650**	**74**	**65**
JR3RIU	"	6,510	57	42
JG3LDD	21	1,564	25	23
***JR3GPP**	**28**	**2,187**	**29**	**27**

Japan - District 7

JH7QXJ	**A**	**879,665**	**716**	**397**
JG7AMD	"	38,994	106	97

Japan - District 8

***JK8PBO**	**28**	**209,950**	**257**	**223**
*JM8FEI	A	83,750	222	134
*JM8SMO	21	39,663	129	113
*JE8UHY	A	18,288	98	72

Japan - District 9

***JA9EJG**	**A**	**5,850**	**49**	**45**

EUROPE

Belarus

EU8U	A	1,550,910	1183	539
EW4A	"	1,166,316	922	498

Belgium

ON7ET	**A**	**126,498**	**218**	**174**
***ON4CT**	**A**	**324,016**	**371**	**263**

Bulgaria

***LZ3AW**	**A**	**3,780**	**39**	**36**

Czech Republic

***OK1TK**	**A**	**123,630**	**242**	**195**
*OK1SLA	"	108,750	207	174
*OK7PZ	A	66,430	172	130
*OK7N	14	9,039	73	69

Denmark

OZ5W	**A**	**1,848,174**	**1124**	**534**
				(OP: SM5SIC)
OZ6TL	7	239,838	279	213
***OZ1AOO**	**A**	**9,800**	**54**	**50**

England

G8GNI	**A**	**323,400**	**408**	**264**
G9D	21	181,162	302	224
				(OP: G6NHU)
***GØFGI**	**A**	**856,575**	**689**	**405**
*G4JBA	"	177,424	300	208
*M3X	"	121,806	261	202
				(OP: MØIHT)
*G3ZNU	"	79,500	197	150
*G4DDL	"	64,260	173	135
*G5C	"	39,162	147	122
				(OP: G4OGB)

Estonia

***ES3HEA**	**A**	**223,873**	**325**	**221**

European Russia - District 3

R5AN	A	1,023,984	897	468
*R3AQ	A	458,400	489	382
*R2PU	"	276,353	396	259
RX3VF	*"*	*157,850*	*300*	*205*
*RU5X	28	100,548	237	189
*RA3V	A	59,292	169	122

European Russia - District 4

*R4WZ	A	61,420	176	148

European Russia - District 6

*RA6LIS	14	200,943	386	269
*R7KO	A	10,465	68	65

European Russia - District 9

R9FE	*A*	*404,775*	*494*	*315*

Fed. Rep. of Germany

DB1WA	**A**	**940,043**	**782**	**433**
DF8QB	"	804,063	641	389
DL1DTL	21	337,212	437	342
DL5DXS	A	16,170	86	77
***DL5KUD**	**A**	**614,560**	**573**	**368**
*DM2GG	"	200,396	313	238
*DB8AH	"	156,400	294	200
*DC8YZ	"	126,480	237	204
*DFØBV	"	120,714	218	177
				(OP: DL1MAJ)
*DG6ME	"	83,076	189	161
*DG3NAB	"	80,964	196	156
*DM2DLG	"	49,625	167	125
*DL4APJ	"	40,817	144	119
*DMØE	"	35,328	114	96
				(OP: DG1HXJ)
*DL8ZAJ	"	30,432	117	96
*DJ6MK	"	21,580	99	83
*DG3DJ	"	17,425	98	85
*DK1VY	"	14,352	92	78
*DL9ZWG	"	14,070	78	70
*DL4DRG	"	9,345	96	89
*DF3CE	"	6,768	53	47
*DLØRDG	"	2,336	33	32
				(OP: DL9GWA)
*DL8LR	A	24,900	101	83
*DL7AU	"	700	14	14

Finland

***OH2EUU**	**A**	**90,024**	**232**	**186**
*OH6FSG	28	67,416	181	159

France

TM5T	**28**	**303,160**	**405**	**286**
				(OP: F5VKT)
***F5RD**	**A**	**347,214**	**428**	**294**
*F5MMB	"	33,330	129	110
*F1TEM	"	12,540	89	76

Greece

***SV1CKZ**	**A**	**173,463**	**290**	**201**
*SV3SKM	28	88,690	226	181
*SV7CUD	A	9,515	62	55
*SV1UH	A	17,920	93	80

Guernsey

***GUØSUP**	**28**	**204,314**	**311**	**251**

Italy

IZ2FOS	**A**	**2,347,884**	**1228**	**588**
IZ2ZQP	"	277,875	422	247
IV3VBM	3.5	166,348	243	182
IK2AHB	A	148,454	258	199
IZ2BVC	14	61,304	198	158
IK1VHR	A	10,584	62	56
IK2QIN	21	8,784	63	61
***IW1CBG**	**A**	**779,145**	**700**	**381**
*I3PXN	7	760,320	617	398
*IK1RGK	A	726,225	764	451
*IW1PNJ	7	639,276	510	319
*IW2CDH	A	537,758	513	338
*IKØALT	"	292,100	369	254
*IU3QCC	"	187,956	325	227
*IU1LAR	"	129,870	256	185
*IZ1JJF	7	124,168	196	166
*IV3ZNK	14	121,338	259	214
*I2BZN	A	100,215	203	153
*IK4RVY	"	91,142	229	199
*IK1NEG	21	85,164	213	188
*IWØGYC	7	66,712	142	124
*IK2EBP	"	49,950	129	111
*IK2UEX	14	47,348	176	133
*IK4GNI	7	37,014	109	93
*IZ3ZOO	A	34,444	137	109
*IW5EIJ	7	33,582	100	87
*IK8ARF	A	24,700	117	100
*I2XYI	"	20,382	98	79
*IZ1PLH	"	20,007	95	81
*IK2YSJ	"	14,774	86	83
*IKØRMR	"	13,024	78	74
*IZ2ABZ	"	12,080	83	80
*IZØFVD	"	7,326	66	66
IK4RUX	*"*	*6,985*	*57*	*55*
*IU3GOA	"	6,435	61	55
*IK1BPL	"	5,208	48	42
*IK8IOO	7	3,286	32	31
*IZ3XNJ	A	3,024	37	36
*IZØZFK	"	2,856	37	34
*IK2REA	"	2,325	26	25
*IZ5IOM	A	7,191	52	47
*IK2FTB	14	1,326	27	26
*IU4PRA	"	1,222	29	26

Latvia

***YL2CI**	**21**	**310,620**	**454**	**310**

Lithuania

***LY2PAD**	**21**	**178,688**	**319**	**256**

Luxembourg

LX1NO	**A**	**794,555**	**698**	**367**

Netherlands

***PA2VS**	**A**	**26,752**	**101**	**88**

North Macedonia

***Z33F**	**A**	**481,728**	**543**	**312**
*Z35Z	3.5	91,936	175	136

Norway

***LA5LJA**	**A**	**930,225**	**805**	**395**
*LB2WG	"	309,288	438	263

Poland

SQ9DXT	**14**	**59,625**	**181**	**159**
***SP1DOZ**	**A**	**290,244**	**398**	**268**

*SQ5CZP	7	262,404	294	222
*SP6BEN	A	106,444	202	178
*SP1DMD	"	55,120	155	130
*SP3MZ	"	24,940	94	86
*SP2HHX	"	3,444	48	41
*SQ6A	28	1,702	25	23
*SP3CMX	3.5	30	2	2
		Portugal		
***CT1FOQ**	**A**	**142,272**	**260**	**192**
		Romania		
YO3GNF	**A**	**508,305**	**583**	**329**
***YO9BCM**	**A**	**667,550**	**597**	**338**
*YO5AXF	14	165,620	342	245
*YO3CEN	A	26,062	96	83
YO9WHI	"	*18,432*	*77*	*64*
*YO3JW	21	180	9	9
		Scotland		
***GM1J**	**7**	**36,860**	**102**	**97**
				(OP: MMØBQI)
		Serbia		
YT3D	**A**	**2,566,256**	**1263**	**616**
		Sicily		
IT9ODQ	**A**	**735,902**	**829**	**412**
***IW9FDD**	**14**	**390,368**	**497**	**345**
*IT9MRM	28	195,569	317	253
*IT9BGY	A	27,930	118	105
*IW9FI	21	25,272	121	104
		Slovak Republic		
***OM5KM**	**3.5**	**394,000**	**400**	**250**
*OM5CM	A	90,190	178	145
*OM8MF	"	11,592	68	63
		Slovenia		
***S52OT**	**A**	**70,700**	**209**	**175**
		Spain		
EA1DA	**7**	**234,422**	**256**	**199**
***EA5HKZ**	**A**	**492,898**	**568**	**323**
*EA5HYJ	"	335,454	462	294
*EA1IYK	"	199,368	377	234
EC7YY	"	*150,104*	*298*	*232*
				(OP: EC7CC)
*EA3CFV	"	25,500	122	100
*EA1DP	14	20,661	111	97
*EA3F	A	285,975	381	279
*EA4DUT	28	4,704	50	48
*EE2A	3.5	3,472	29	28
				(OP: EA2SN)
		Switzerland		
HB9DOS	**14**	**76,475**	**209**	**161**
		Ukraine		
UT5ECZ	**A**	**216,975**	**297**	**263**
UT2AU	14	33,512	147	118
***UT3SO**	**A**	**444,481**	**508**	**293**
*US6CQ	"	405,805	505	293
*UT5UML	"	180,375	324	195
*UR5WCQ	"	153,903	227	183
*UT7AA	21	1,632	23	23
		Wales		
MC2I	**A**	**657,915**	**603**	**345**
				(OP: GW5NF)
***GW4HBK**	**A**	**9,558**	**62**	**59**

OCEANIA

Australia

***VK5NIG**	**28**	**1,768**	**26**	**26**
		Hawaii		
***NH6O**	**21**	**300**	**10**	**10**
		Indonesia		
YB2MM	**A**	**144,400**	**292**	**190**
YC8DUL	"	20,916	97	84
***YC2XCD**	**A**	**111,222**	**288**	**173**
*YB9UA	21	65,540	190	136
*YB8RVI	A	48,732	169	93
*YC1LIN	28	28,600	107	100
*YB8JEC	21	21,888	119	73
*YB3BGM	28	20,418	86	82
*YB3ATK	21	18,834	93	86
*YC4PSG/8	A	5,764	75	44
*YB2CTE	"	5,376	51	42
*YB7GRN	"	3,870	55	45
*YD9UW	7	3,570	27	27
*YB9GDP	A	2,133	44	27
*YC1JDW	7	720	19	18
*YF3AWZ	A	190	10	10
*YB8LDK	21	153	27	17
*YD3AMT	7	112	9	8

SOUTH AMERICA

Argentina

***LU7DW**	**28**	**800**	**21**	**20**
		Brazil		
***PY2NY**	**14**	**376,292**	**437**	**302**
*PY2UD	28	279,491	357	269
*PY2TDB	"	8	4	4
		Curacao		
PJ2T	**A**	**2,889,831**	**1451**	**571**
				(OP: WI9WI)
		8Uruguay		
***CX2AQ**	**28**	**385,612**	**441**	**298**
*CX9AU	A	45,548	149	118

TRIBANDER/WIRES

NORTH AMERICA

United States - District 1

AE1P	**A**	**1,979,364**	**1392**	**587**
W1HS	"	943,056	858	432
W1TO	"	179,872	292	224
N1KM	"	99,828	216	177
K1RO	"	68,202	206	162
***KW1X**	**A**	**436,800**	**640**	**336**
*WG1V	"	328,042	517	286
*N1DID	"	151,000	274	200
*K4SAA	A	50,944	152	128

United States - District 2

WX2NJ	**A**	**887,880**	**821**	**453**
				(OP: K2RET)
K2QB	"	450,918	528	369
NE2V	"	174,981	294	219
AB2E	"	22,356	120	92
AD2BO	"	6,966	47	43
***AH2O**	**A**	**1,122,990**	**983**	**498**
*WB2JVO	"	792,819	789	411
				(OP: K2AL)
*KC2WUF	"	414,636	552	317
*KS2G	"	258,075	394	279
*NS2N	"	181,280	309	220
*KW2O	"	93,310	196	155
				(OP: KA2D)
*KG2U	A	16,380	115	91

United States - District 3

N3QE	**A**	**3,260,544**	**1616**	**672**
NF3R	"	3,172,580	1781	730
W2CDO	"	658,896	581	424
N3ALN	"	428,188	598	334
W3MAM	"	150,285	324	215
W3OU	"	126,633	271	191
N1EK	"	69,615	195	153
***AC5XK**	**A**	**722,294**	**716**	**409**
*K3RWN	"	330,620	565	305
*AC3U	"	198,045	369	243
				(OP: W3UL)
*N3JNX	"	21,420	108	84
*WB3JIS	"	4,012	36	34
*N3MWQ	28	2,774	40	38

United States - District 4

K9OM	**A**	**2,082,417**	**1066**	**653**
N4TB	"	715,712	739	424
W4BBT	"	*579,244*	*724*	*358*
NR4O	"	293,343	433	277
N4TL	"	121,176	258	204
KT4Q	"	48,364	143	113
K4QQG	"	29,952	137	117
K3DNE	"	27,280	101	88
***N5SMQ**	**A**	**505,500**	**624**	**337**
*AD4TJ	"	249,900	381	255
*K7RB	"	196,736	324	232
*AA5JF	"	140,400	256	216
*AA8R	"	68,832	193	144

United States - District 5

AD5XD	**A**	**1,703,184**	**1381**	**592**
AA5H	"	339,108	404	308
***NN5T**	**A**	**303,784**	**484**	**254**
*K5QR	28	296,102	415	314
*AF5CC	"	1,225	25	24
*K5IX	A	190	10	10
*WU5K	A	248,685	460	295
				(OP: K5NZ)

United States - District 6

N6ZFO	**A**	**964,429**	**1038**	**463**
W6SX	"	844,770	1059	435
W1PR	"	289,191	477	293
W8GJK	"	77,989	252	167
AB1U	"	27,160	160	97
				(OP: W6RKC)
***KD6HOF**	**A**	**23,100**	**122**	**100**

United States - District 7

KZ7X	**28**	**1,301,016**	**1071**	**604**
				(OP: K6LL)
K7VIT	A	151,216	375	208
WG7X	"	91,871	345	191
WR7T	"	12,324	87	78
***N7DB**	**21**	**73,340**	**274**	**193**
*WA7LNW	A	42,159	231	141

United States - District 8

K8MM	**A**	**594,456**	**652**	**376**
***WB8JUI**	**A**	**434,603**	**576**	**331**
*KC8R	"	40,833	150	117
*AA8OY	A	13,840	89	80

United States - District 9

W9ILY	**28**	**619,918**	**601**	**422**
WA9IVH	A	22,088	106	88
***N9UA**	**A**	**145,173**	**331**	**217**
*WB9B	"	122,815	277	203
*N9LJX	28	48,786	155	141
*WA9LEY	A	20,160	129	96

United States - District Ø

W5AP	**A**	**693,880**	**855**	**418**
WAØTXJ	"	11,840	88	74
***WZØW**	**A**	**171,825**	**382**	**237**
*KKØU	28	24,196	102	92

NORTH AMERICA

Alaska

AL7LO	**A**	**327,168**	**522**	**284**

Canada - District 1

***VY2LI**	**A**	**643,536**	**595**	**369**

Canada - District 2

***VE2BVV**	**A**	**1,117,464**	**854**	**461**

Canada - District 3

VE3SS	**A**	**89,324**	**207**	**163**
***VE3MGY**	**A**	**2,020,150**	**1266**	**550**
*VA3FF	"	353,872	434	272
*VE3TM	28	242,760	341	269
*VE3EY	A	208,035	306	201

Canada - District 6

***VA6RCN**	**A**	**439,856**	**569**	**296**
				(OP: VE3RCN)

Costa Rica

***TI2OY**	**A**	**595,647**	**623**	**351**

Puerto Rico

***NP4TX**	**7**	**234,780**	**292**	**215**
*WP3GW	A	120,741	234	167
*NP3V	28	5,382	48	46

ASIA

Asiatic Russia - District 9

RC9T	A	323,046	409	262
*UA9OV	A	11,000	53	50

Asiatic Russia - District Ø

RAØFLP	28	526,110	536	355

China

BA4TB	*A*	*1,034,540*	*857*	*460*

Cyprus

H25A	**A**	**112,338**	**182**	**158**

Japan - District 1

JR1NHD	**A**	**222,984**	**345**	**228**
JJ1XBQ	"	37,800	125	100
JH1HIC	"	35,868	118	98
***JG1LFR**	**A**	**630,086**	**642**	**311**
*7N2UQC	"	477,750	545	294
*JG1XIO	"	196,301	334	203
*JF1WNT	"	96,135	204	145
*JA1MZM	"	40,071	138	111
*JA1IE	"	38,000	143	100
*JA1PCM	28	31,212	124	102

Japan - District 2

JF2FIU	**A**	**33,124**	**123**	**98**
***JA2FXV**	**A**	**179,707**	**309**	**187**
*JA2GHP	"	89,996	222	149

Japan - District 3

JA3VOV	**A**	**9,588**	**71**	**51**
***JA3MIB**	**A**	**98,196**	**226**	**167**
*JH3WKE	"	89,090	205	151

Japan - District 4

***JE4MHL**	**A**	**317,312**	**405**	**268**

Japan - District 7

***JH7IMX**	**A**	**43,152**	**138**	**116**

Japan - District 8

***JH8IYN**	**A**	**5,014**	**50**	**46**

Japan - District 9

JA9CWJ	**21**	**79,632**	**193**	**158**
JH9CEN	28	27,993	86	82
JA9CCG	A	21,996	101	78

Japan - District Ø

***JJØPJD**	**A**	**185,076**	**310**	**194**

Kazakhstan

***UN4PG**	**28**	**114,063**	**223**	**197**

Saudi Arabia

***HZ1TT**	**A**	**842,625**	**666**	**375**

Singapore

***9V1HY**	**A**	**1,920**	**29**	**24**

United Arab Emirates

A65DR	**21**	**1,448,208**	**888**	**514**
				(OP: G7SLP)

EUROPE

Austria

OE2LCM	**A**	**84,875**	**216**	**175**

Belarus

*EW7B	3.5	494,648	434	292
*EW1P	A	292,864	420	286

Belgium

*ON6YYY	A	636,318	574	318
*ON4CBA	3.5	62,594	142	119

*OQ5M	21	13,725	80	75
				(OP: ON5ZO)
***ON6NL**	**A**	**941,952**	**719**	**446**
		Bosnia-Herzegovina		
***E7ØY**	**7**	**971,740**	**617**	**385**
		Bulgaria		
LZ4AE	**21**	**881,280**	**752**	**510**
		Croatia		
9A2ZI	**A**	**4,071,354**	**1562**	**826**
9A6KX	7	666,687	361	286
**9A5ST*	*A*	*55,936*	*154*	*128*
		Czech Republic		
***OK2WY**	**A**	**1,486,446**	**997**	**494**
*OK2RU	7	833,272	546	374
*OK1TRJ	A	763,889	578	371
*OK1PMA	“	363,424	434	277
*OK2CLW	“	251,363	325	241
*OK4GP	A	272,952	314	223
		Denmark		
5P1KZX	**28**	**50,407**	**151**	**133**
		England		
M5W	**21**	**1,039,326**	**835**	**498**
				(OP: MØHMJ)
M2J	A	861,619	624	407
				(OP: G4NBS)
***G3G**	**A**	**553,869**	**525**	**369**
				(OP: G3XLG)
*MØYTT	“	253,000	380	275
**G4PDF*	*“*	*19,437*	*93*	*93*
		European Russia - District 3		
RD5R	*A*	*87,024*	*224*	*168*
UA3MCH	14	73,428	97	90
**RW3DY*	*A*	*43,673*	*146*	*119*
		European Russia - District 4		
RW4HBG	A	1,009,356	986	466
		European Russia - District 6		
UC6N	*21*	*517,951*	*578*	*427*
*R7MM	A	1,245,176	990	491
		Fed. Rep. of Germany		
DK8ZZ	**A**	**3,783,013**	**1651**	**733**
DP8M	“	2,422,511	1207	637
				(OP: DL6NDW)
DL6JZ	“	1,827,628	1048	569
DK5MB	“	1,183,336	784	476
DM5GG	“	1,078,480	756	442
DJ8EW	“	776,050	640	415
DL1NEO	“	751,180	548	460
DK2AT	“	265,468	383	266
DL7AUO	“	87,040	197	160
*DL164ØY	A	690,030	676	374
*DL5DTG	“	651,375	614	375
*DM7W	“	567,806	485	386
				(OP: DL8MAS)
*DHØHAN	“	298,627	408	259
*DF4ZL	7	257,712	296	236
*DP5P	A	257,342	295	223
				(OP: DL1MHJ)
*DL3KVR	14	247,422	154	129
*DB2WD	A	198,690	297	222
*DF4WC	28	137,588	158	129
*DK5PD	7	130,302	199	171
*DL3YM	A	130,240	243	185
*DL6DCX	“	125,928	273	216
*DM6EE	“	124,992	235	192
*DL2ZA	“	100,275	217	175
*DJ3GE	“	94,240	218	155
*DHØGDS	28	69,921	178	153
*DF3EH	A	53,949	172	147
*DJ5CW	“	36,192	112	96
*DL2NBU	“	30,600	116	102
*DK1LRS	“	13,350	84	75
*DF6RI	“	5,096	52	49
*DC8SG	“	4,720	41	40
*DKØVLP	“	360	10	10
***DF1MM**	**A**	**868,968**	**615**	**447**
*DF5GO	“	18,091	95	79
*DL7EDU	14	1,450	30	29
		Finland		
OH1NOA	**21**	**107,365**	**248**	**197**
		Greece		
SV2BXA	**21**	**1,083,712**	**829**	**574**
		Hungary		
***HA4WQ**	**14**	**287,352**	**432**	**312**
*HA3OU	A	212,352	290	237
		Ireland		
EI6LA	**A**	**1,430,000**	**863**	**520**
EI3CTB	28	63,000	29	29
		Italy		
IX1CLD	**A**	**845,952**	**625**	**384**
I2SVA	“	793,224	640	414
IK7NXU	“	782,690	693	415
I2DJX	“	721,000	595	412
I2WIJ	“	465,321	470	327
IK5FKF	“	391,680	456	320
IZ3SQW	3.5	343,916	361	254
4U13FEB	*A*	*238,164*	*408*	*267*
				(OP: 9A3A)
IK5PWS	“	114,810	227	178
IU4CHE	14	47,158	166	146
IK2IKW	A	31,993	121	107
IZ5EME	*“*	*22,464*	*82*	*78*
IU4CSS	21	20,737	98	89
IWØHLZ	“	14,268	91	82
IU4FKR	A	2,781	30	27
I1DXD	“	1,232	22	22
***IW2MXY**	**14**	**574,002**	**643**	**446**
*IK8TEM	A	432,234	575	333
*IK2AUK	“	98,272	228	166
*IZ5FSA	“	77,865	176	145
*IK2OVT	“	60,863	142	121
*IK8UND	“	24,795	101	87
*IU5ICR	“	23,016	96	84
*IKØPEA	28	19,024	86	82
*IZ5DKO	A	14,100	77	75
*IU2CKU	“	1,633	23	23
*IZ8CLM	“	826	14	14
*IZ2QKG	21	8,296	47	43
		Latvia		
***YL2KF**	**A**	**4,403**	**39**	**37**
		Lithuania		
LY5W	**28**	**1,090,440**	**808**	**520**
***LY2TS**	**A**	**590,569**	**573**	**353**
		Luxembourg		
LX1HD	**7**	**187,590**	**232**	**185**
		Netherlands		
***PG7M**	**A**	**1,395,390**	**743**	**579**
		North Macedonia		
Z35T	**28**	**1,560,698**	**1010**	**613**
***Z39A**	**7**	**291,392**	**300**	**232**
*Z36N	28	125,244	274	196
		Poland		
SP2TQQ	**A**	**190,617**	**296**	**203**
***SP9DTE**	**A**	**855,848**	**715**	**406**
*SP9KDA	“	332,575	446	265
				(OP: SP6GCU)
*SP9GMI	“	223,560	319	230
*SP9CTS	“	108,576	216	156
*SQ6ELK	“	103,716	191	172
*SP3CCT	“	92,568	216	174
*SP7Y	“	67,257	197	159
*SP9IVD	“	29,165	106	95
*SP9KJU	28	5,368	45	44
				(OP: SP9MDY)
*SP5ØUUU	A	406,560	481	308
				(OP: SP2UUU)
*SP3EMA	3.5	119,184	195	156

		Portugal		
***CR5O**	**A**	**2,614,108**	**1594**	**623**
				(OP: CT7AJL)
*CT1BXT	"	607,560	548	366
		Romania		
YO4NF	*A*	*1,903,356*	*1140*	*546*
YO3RU	**"**	**1,311,987**	**987**	**489**
YO2DFA	"	184,005	295	235
***YO9CWY**	**A**	**123,830**	**283**	**203**
		Scotland		
MM9I	**A**	**3,337,873**	**1480**	**737**
				(OP: GMØOPS)
		Serbia		
***YT2U**	**A**	**594,980**	**564**	**355**
*YT5W	7	514,800	455	300
				(OP: YT5DEY)
*YU3A	28	128,077	248	211
*YT1BX	14	100,667	256	197
*YU3EDI	A	10,260	55	54
*YU7OM	28	3,990	26	24
		Sicily		
IT9SSI	**A**	**47,291**	**160**	**131**
***IT9RZU**	**28**	**315,576**	**402**	**324**
		Slovak Republic		
OM7KW	**A**	**145,314**	**249**	**207**
***OM8JP**	**14**	**97,152**	**251**	**192**
		Slovenia		
S5ØRY	**A**	**1,303,447**	**841**	**449**
				(OP: S53K)
***S52W**	**A**	**647,514**	**582**	**378**
*S57ZT	7	345,092	343	242
*S57SWR	A	317,440	404	256
*S51MM	"	56,870	161	121
S5ØSL	*"*	*12,432*	*60*	*56*
		Spain		
EA1B	**14**	**898,986**	**813**	**514**
EA4FME	A	422,808	520	316
***EF7N**	**A**	**2,716,049**	**1491**	**661**
				(OP: EA7KHB)
*ED7Z	"	1,018,104	871	472
				(OP: EA7EQ)
*EA4BAS	"	1,016,232	726	552
*EA2ESB	"	674,856	588	364
*EE5O	"	116,820	219	180
				(OP: EA5ITJ)
*EA2CCG	"	62,133	195	149
*EF5U	21	37,698	149	122
				(OP: EA5U)
*EA3OH	28	8,732	61	59
*EA5LN	A	4,408	41	38
*EA4U	A	57,822	169	138
		Sweden		
SM6MVE	**A**	**283,484**	**399**	**262**
***SE4E**	**A**	**619,993**	**646**	**359**
				(OP: SM4DQE)
*SE6K	"	613,700	672	340
				(OP: SM6FZO)
*SM5GRD	"	363,562	498	289
*SD1A	"	11,644	83	71
				(OP: SM1TDE)
		Ukraine		
***UZ1WW**	**A**	**1,485,200**	**1013**	**470**
*UW1WU	"	497,660	511	298
		Wales		
***MW9W**	**A**	**1,669,393**	**1063**	**517**
				(OP: GWØKRL)

OCEANIA

		Australia		
***VJ3O**	**14**	**27,260**	**111**	**94**
				(OP: VK3TX)
		Hawaii		
KH6TU	**A**	**148,520**	**272**	**188**
				(OP: AD6E)
***KH6CJJ**	**A**	**806,465**	**761**	**341**
		Indonesia		
YC2BST	**21**	**24,932**	**106**	**92**
YCØRFS	A	940	21	20
				(OP: YDØRFS)
***YB9ELS**	**A**	**449,280**	**524**	**320**
*YB2ECG	"	109,536	256	168
*YC1RYX	7	1,326	17	17
*YB1PEF	A	20,254	113	82
		New Zealand		
ZL4NR	**A**	**34,680**	**124**	**102**
***ZL3VZ**	**A**	**149,553**	**249**	**191**

Looking Ahead in CQ

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

- My $20 Transmitter
- The DK6ED Double Loop V3
- A Foxhunt in India

Plus…

- Results: 2023 CQ WW 160-Meter Contest
- The World's Great Literature … in Morse Code!

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		Samoa		
***5W1SA**	**7**	**1,008**	**14**	**14**

SOUTH AMERICA

		Argentina		
LU1BJW	**A**	**350,594**	**419**	**307**
LU6ETB	"	149,940	263	196
		Brazil		
ZW2N	**A**	**3,030,035**	**1467**	**691**
				(OP: PY2MNL)
PY4EK	"	630,720	613	365
PY3TR	"	3,010	45	43
PY3LX	28	2,349	21	21
***ZX2V**	**A**	**370,880**	**453**	**304**
				(OP: PY2XV)
*PP5FZ	28	47,875	148	120
*PP5ARF	A	19,624	95	88
				(OP: PP5TI)
*PU7ASP	21	5,265	29	27
*PY2VZ	28	5,060	46	44
*ZV2F	A	4,515	51	43
				(OP: PY2SFA)
		Chile		
***CB8E**	**A**	**278,133**	**389**	**249**
				(OP: CE8EIO)
*CB3R	28	131,726	241	194
		Colombia		
***HK4C**	**28**	**13,176**	**38**	**37**

YOUTH

NORTH AMERICA

		United States - District 1		
***KC1GDW**	**A**	**15,939**	**99**	**77**
		United States - District 5		
***K5TRP**	**A**	**224,264**	**399**	**289**

ASIA

		China		
***BD4VGZ**	**A**	**726,652**	**673**	**389**
*BH2SWB	"	57,771	175	131
		Japan - District 7		
***JQ7AXT**	**A**	**31,200**	**107**	**96**

EUROPE

		Austria		
OE9SEV	**A**	**34,485**	**104**	**95**
		Bosnia-Herzegovina		
E7ØAW	*A*	*24,236*	*94*	*83*
		European Russia - District 6		
*RX6N	28	4,116	48	45
		Fed. Rep. of Germany		
DM7XX	**A**	**4,571,248**	**1712**	**836**
***DJ4MX**	**A**	**1,605,065**	**886**	**605**
*DK1YH	"	124,898	290	197
*DQ5M	"	47,994	146	114
				(OP: DK6SP)
*DK6SP	"	9,129	59	51
		Ireland		
***EI8KW**	**A**	**67,850**	**162**	**115**
		Italy		
IU1LCU	**A**	**1,190,601**	**792**	**503**
		Poland		
***SQ8L**	**A**	**4,653**	**39**	**33**
*SP9DLS	"	1,914	36	33
		Romania		
***YO8OLY**	**14**	**40**	**4**	**4**
		Spain		
***EA2ESK**	**A**	**68,134**	**190**	**163**

OCEANIA

		Indonesia		
***YD2UWF**	**A**	**7,540**	**54**	**52**
*YD3CZV	28	666	11	11

Check Logs

7N4WPY, AAØAJ, AB5XM, BA4VE, BH4QBV, BU2BO, CO2AME, DF6QE, DJ6YX, DK8RE, DLØCK, DL1ET, DL2GMI, DL3FBB, DL6RG, DL7AOJ, EA1AKS, EA3CS, EA4KD, EA4WC, EA5HJO, EA5R, EA7HAB, EA7TG, EB1ADD, EB1DMQ, ED3E, EF1C, EI4KF, EXØDX, F/E72T, F4AIF, F6AGM, HA1YI, HA3HX, HA3IC, HA3MGA, HB9EP, HJ3SUA, I1HNU, I2GPT, IK1YDB, IK2SAU, IW1RLC, IW2DMO, IZØKBR, IZ5NFD, JF1UOW, JR6QFV, JS1IFK, K2MK, K6OK, K9ZXO, KB9JJA, KFØAIT, KG7MYX, KU5B, LY2BAA, LZ1JZ, LZ1QV, LZ1YF, LZ1YR, M1SDH, M4N, NØVT, N6FUB, N7IW, N9IVO, OH2JLN, OH8NW, OK1FAK, OK1FRD, OK1VVT, OK2NMA, OK2SG, OK2WMC, OM1BD, OM2FY, OM4O, P3AA, PU4YJS, PY8ZW, R3WA, RT6N, RV1OO, S51DX, S52WW, S59T, SM3PZG, SP4W, SP5GDY, SP5OXJ, SP6CES, SQ4NR, SV1DPI, SV1EMY, SV1GRB, SV3DCX, SV4FFL, SV9FBG, SZ7SER, TF3IRA, UC8U, UR5MW, UR5WCW, UT4LW, VA3WEB, VE3GMZ, W3SA, W6DGE, WA3FRP, WA7YAZ, WK9M, WV8A, WW3S, XE1H, YB1BX, YB4ECU, YC3GFN, YD9ABC, YG2BDN, YO4NA, YU4VBX, YU7OPQ, Z32U

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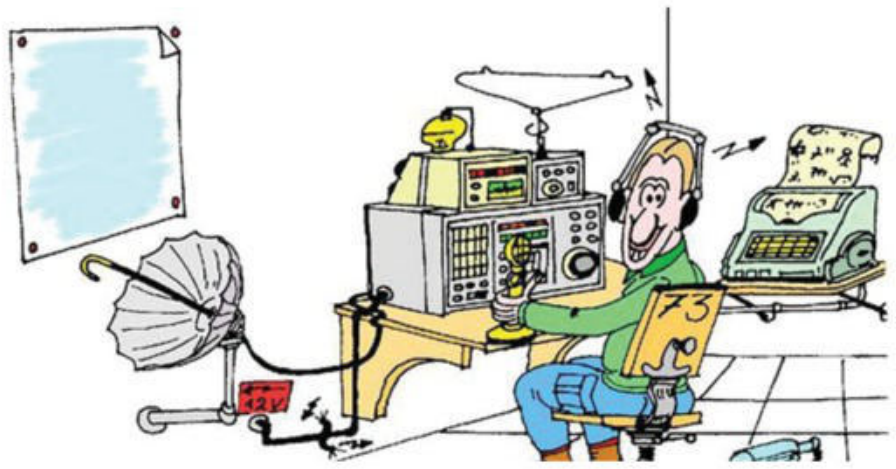

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