

# QST



DIGITAL EDITION

## Special Section: The Latest from HamSCI



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August 2025

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# HamSCI

### QST Reviews

**RigExpert MATCH** Upgradeable  
Antenna and Cable Analyzer

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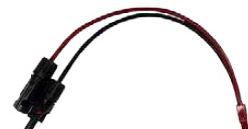


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### Our Cover

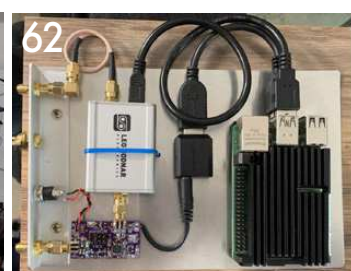
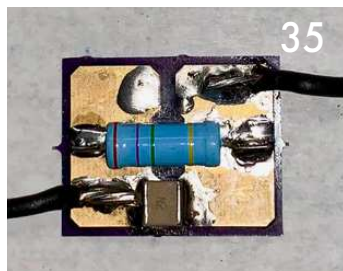
This issue shines a spotlight on HamSCI: The Ham Radio Science Citizen Investigation, featuring just some of the research that was presented at the 2025 HamSCI Workshop. This 10-year-old organization brings hams and professional scientists together to advance scientific research through amateur radio activities. The cover photo shows University of Scranton, W3USR, and New Jersey Institute of Technology, K2MFF, students and faculty meeting at the United Astronomy Clubs of New Jersey Observatory to service HamSCI Personal Space Weather Station (PSWS) instruments. HamSCI members are building a PSWS network to collect data — a citizen science project that you can get involved with, too. For more details, visit [hamsci.org](http://hamsci.org). [Nathaniel Frissell, W2NAF, photo]

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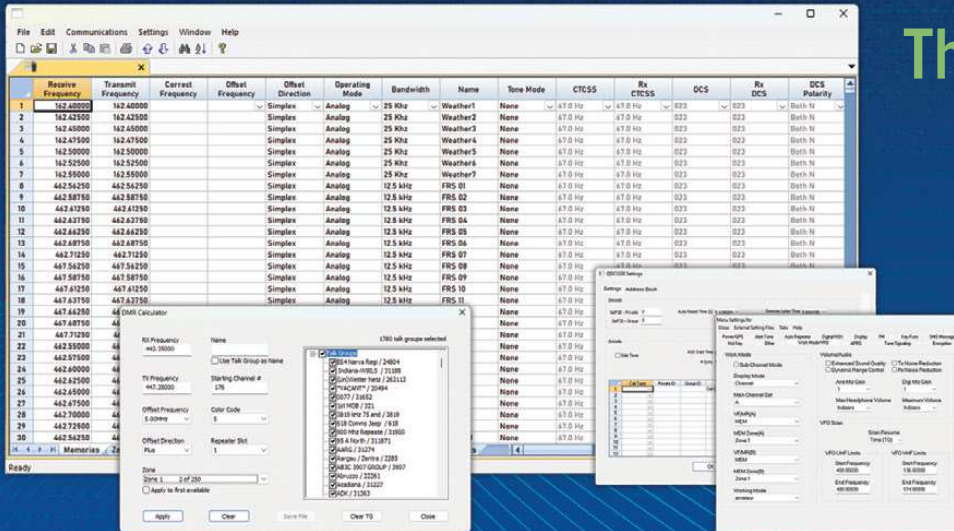


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| X510HD (3 Section)                             | 2m/70cm                       | 17.2          | 330/250            | UHF or N   |
| X300A (2 Section)                              | 2m/70cm                       | 10            | 200                | UHF or N   |
| X200A (2 Section)                              | 2m/70cm                       | 8.3           | 200                | UHF        |
| X50A (1 Section)                               | 2m/70cm                       | 5.6           | 200                | UHF or N   |
| X30A (1 Section)                               | 2m/70cm                       | 4.5           | 150                | UHF        |
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## Second Century

# IARU Restructuring

*In April, ARRL President Rick Roderick, K5UR; International Affairs Vice President Rod Stafford, W6ROD, and I traveled to Paris to celebrate the 100th anniversary of the International Amateur Radio Union (IARU). It was 1925 when ARRL Founding President Hiram Percy Maxim, W1AW, traveled to Paris to lead the formation of an international body focused on spectrum use and spectrum defense, building on the challenges his young organization faced in the United States. As we took in the presentations, the Eiffel Tower loomed large in the background, illustrating iconic, long-standing strength. IARU Secretary and Past ARRL President Joel Harrison, W5ZN, did a masterful job with a team in Paris, creating that historic celebration.*

The conversation at that event was dominated by a proposal IARU has been circulating about a restructuring of the organization. Today, IARU is divided into three regions. Region 1 is Europe, Africa, the Middle East, and Northern Asia; Region 2 is the Americas, and Region 3 is Asia-Pacific. ARRL represents members in both Region 2 and Region 3 (US Pacific territories and Minor Outlying Islands). ARRL also serves as International Secretariat (IS) of IARU, and has for the life of the organization. Over the past 100 years, no other organization within IARU has stepped forward to serve as IS — a role that carries both significant responsibility and financial commitment. ARRL is proud to continue our leadership role as IS.

The proposed restructuring to an international assembly dismantles the regional structure of IARU. This has serious implications, especially with regard to voting. ARRL would have its voting power diminished to that of any tiny island state with just a handful of members. Another key provision is the elimination of the role of International Secretariat. The leadership that ARRL takes as IS to ensure that a collaborative process to select and elect IARU officials, especially the Secretary, which is voted on by the ARRL Board of Directors, would go away. It would also not provide ARRL or any of the other large societies a permanent seat on the new Executive Committee to ensure that IARU continues to function or is properly funded. It is easy to see that this restructuring will need to be modified or completely rewritten within the coming few years, given its approach.

ARRL's position is that IARU needs to stick to its mission: working with the International Telecommunication Union, representing amateur radio at the World Radiocommunication Conference meetings (WRC, held every 3 – 4 years), and working with Regional Telecommunication Organizations. What appears to be a desire to recreate ARRL for Europe in the aggregate

through IARU should be rethought. IARU faces the very same existential threat that amateur radio does in the United States: the aging out of extremely talented and dedicated volunteers to lead clubs, organizations, and efforts in the regulatory space. So, what to do?

ARRL would like to see IARU abandon its efforts to restructure the organization and its focus on trying to expand or continue to support efforts around the world that fall outside its primary mission. IARU needs to develop training and development programs for emerging amateur radio licensed industry professionals in order to establish the next generation of volunteers to represent amateur radio with regulators — around the world.

What can you do as an ARRL member? Be radio active! Be a member! Be a volunteer! Help create the next generation of amateur radio leaders in your part of the hobby. Be a connector! Where you see smart, experienced leaders in your amateur radio life, ask them to consider volunteering for leadership roles in ARRL or IARU. See you at the Huntsville Hamfest this month.

David A. Minster, NA2AA  
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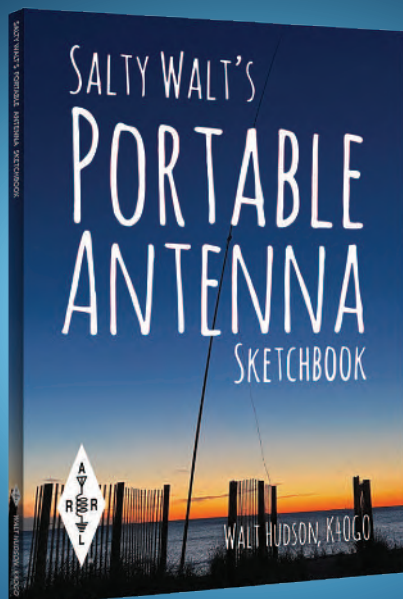
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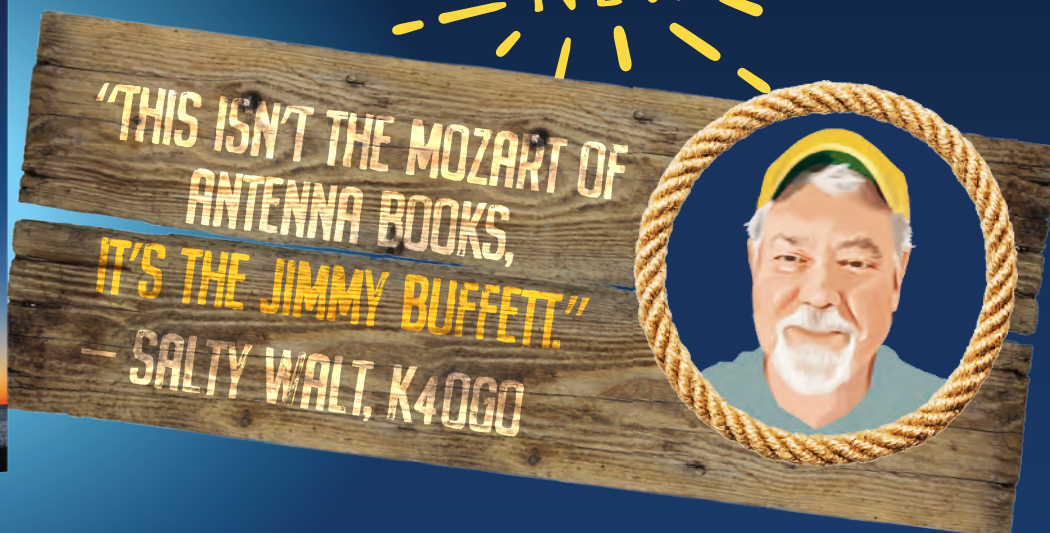
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## Member Spotlight

# Philip Gladstone, N1DQ

UK native Philip Gladstone's, N1DQ, career took off in the early 1980s, when he was working with X.25 networks to connect British universities together and remotely manage minicomputers. Through a subsequent string of jobs, Philip went from working with IEEE 802.5, to X.400 messaging systems, to internet firewalls, to endpoint security. His wealth of experience culminated in a later position as Distinguished Engineer at Cisco, followed by his current role at Bitsight.

### Long-Awaited License

Alongside his thriving path in computer science, a move to Massachusetts, creating the Weather Quality Reporter (<https://weather.gladstonefamily.net>), and his starting a family *and* a chicken farm/fruit orchard, was Philip's interest in amateur radio. It had been on the back burner because of the Morse code part of the exams — and the demands of fatherhood and farming — but it never wavered. After all, he had been a shortwave listener since the 1960s. "Then, the code requirement went away in early 2007, and I booked the first test that I could. I got my General, [Amateur] Extra, and vanity call sign, N1DQ," he said. Philip now works with a FlexRadio HF rig and assorted handhelds. However, he is also the creator and maintainer of PSK Reporter, so free time to operate is hard to come by.

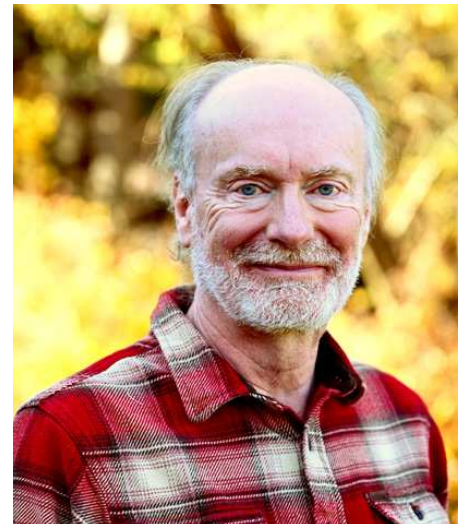
### PSK Reporter

The story behind PSK Reporter (<https://pskreporter.info>) comes

from that classic ham urge to fix a problem. Wielding his new license and ready to operate, Philip set up an Icom 706MKIIG and strung a 200-foot-long wire off the back of his house. "I'm a software person, with my main focus in communications and security, so it felt natural to try digital modes, starting with PSK31," he said. A common program used to run digital modes at the time was **DM-780**. He found that whenever he transmitted, he would rarely get answers. "It was unclear whether my cabling was bad, my radio was bad, my modulation was bad, my antenna was bad, or whether nobody wanted to talk to a US call sign in Region 1," he added.

So, in 2008, Philip made PSK Reporter. The early version had a client that hooked into **DM-780** to extract CQ messages, which were reported to a server that he had running in his basement. In essence, "this allowed me to see how well my receiver worked, as I could get a list of all of the CQs that **DM-780** had decoded." A few months later, others started running the client, and it became useful for testing transmitter performance, too — send a signal, and see where it had been heard within minutes.

Simon Brown, HB9DRV, eventually integrated the PSK Reporter client into **DM-780**. By the end of 2008, more than 1,000 hams were reporting decoded signals. **WSJT** made JT65 the new most-popular digital mode, and reports grew to 1 million daily in 2016. With FT8,



the number exploded to 7 million, and today, there is an average of 24 million spots. With such a huge dataset, PSK Reporter even garnered interest from the ionospheric research community ([www.hamsci.org/gssc-rules](http://www.hamsci.org/gssc-rules)). It's an ongoing project. Philip explained, "I want to move forward and keep more data online [and in real time], provide more analytics, and [implement] other user-requested features."

### Follow Your Curiosity

Philip's colorful background shows he wears many hats, but when it comes to ham radio, he feels it's important to find your niche(s) and stick with it. "This hobby has something for almost everyone. You just have to look around until you find what excites you," he said. This is precisely what he did with radio signals. "Get licensed. Don't think too far ahead. Treat the learning process as an adventure."



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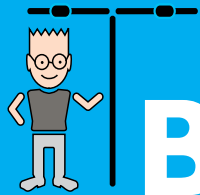
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# Up Front

## Amateur Radio Prom Night

When was the last time you went to a prom, complete with corsages and boutonnieres, flowing dresses and sharp tuxes, music, and dancing?

Arizona Science Center in Phoenix hosted a prom-themed evening soiree, “Science With a TWIST,” for adults last spring, and invited hams to activate the W7ASC exhibit station for guests.

Prom revelers were invited to try their hand at Morse code. The host hams put a few folks on 2 meters so they could introduce themselves by Morse code to a friendly ham, then pick up the microphone for some 20-meter action; they were even able to make contacts via satellite.

To see what’s happening at Arizona Science Center, check out their website at [www.azscience.org/visit/events](http://www.azscience.org/visit/events). Thanks to Sam Marshall, N7INV, for sharing this story.



Steve Warford, WB4ZSC (left), and Rusty Kinner, WA8ZID (right), are ready to greet guests at Arizona Science Center’s prom-themed soiree, “Science With a TWIST,” for adults. [Linda Kinner, photo]

## Pesky Birds

Even with two owls on his tower, Dennis Vernacchia, N6KI, still can’t keep pesky birds away! Dennis captured this photo during a Blue Angels flyover at the Miramar Air Show in San Diego, California.

## RST 59

On a recent trip to the Pro Football Hall of Fame in Canton, Ohio, Steve Terry, W4SLT, saw jersey number 59, belonging to Jack Ham, former professional line-backer for the Pittsburgh Steelers. The number was issued by chance. After retiring from football, Jack became a radio announcer, though there is no indication that he ever held a ham license. Although the Steelers have not retired number 59, it has not been reissued.



[Steve Terry, W4SLT, photo]



[Dennis Vernacchia, N6KI, photo]

If you see something ham-related out in the world, take a photo of it and send it to [upfront@arri.org](mailto:upfront@arri.org).

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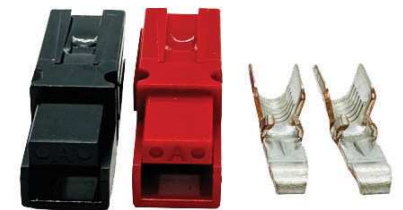
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## Correspondence

# Letters from Our Members

### Making Connections Through QST

In 1983, I brought an issue of *QST* on a long flight to Europe. I rarely read the “Silent Keys” column back then, but for some reason I felt inclined to check it. To my surprise, I saw Jim Ideker, W5FVM (SK), listed. Jim and I were good friends in high school but had lost touch after graduating in 1955 (I joined the US Navy, and Jim moved to Texas).

Flash forward 42 years, and I came across Jim’s name in *QST* again. I was reading the March 2025 issue and saw Bob Ideker, WB5BI, featured in “Member Spotlight.” The name jumped out at me and, to my surprise, Bob mentioned his father Art, W5CAM (SK), and older brother Jim, W5FVM (SK), in the first paragraph! I found Bob’s mailing address and sent him copies of photos of me and his brother from 1955. He called me about a week later, and we chatted about Jim and his life after high school. I couldn’t believe I was able to connect with Jim’s family after all these years.

**Paul Deveny, KV6P**  
Corona, California

### Finding New DXCC Challenges

After years of DXing and running up to 1 kW with Yagi antennas on hilltops, my move to a new mountain canyon location enticed me to re-achieve CW DX Century Club (DXCC) with my limited, HOA-approved station. I have had good experiences previously running low power to wires in apartment attics, so I had hope that I could continue to operate DX, despite my new limitations.

My new antenna system includes a homebrew 51-foot small G5RV inverted-V antenna for operation on 40 – 10 meters in the attic, a 25-foot Apex antenna, and a wide-range tuner, with 100 W of power to keep RFI in check.

After many repeat calls and reports, my first time participating in a CQWW contest with my new station yielded 74 countries and 25 CQ zones. Most contacts were made on 40 meters from dusk through dawn, contacting stations from various parts of the world. I heard many stations that couldn’t hear me, and there were layers of stations I couldn’t hear at all. But I stuck to it, and by the end of the ARRL 10-Meter Contest less than 1 month later, I was thrilled to have contacted more than 100 DXCC countries. Since then, the rise in Cycle 25, my use of a spotting website, and more contest activity have added to my totals. I’ve also added a stealth 87-foot doublet antenna (for operation on 80 – 10 meters) along my roofline, perpendicular to my attic antenna.

It can get frustrating being the last one heard, if at all, before the contact I want to make changes their frequency or stops transmitting, but more times than not, I don’t even notice the limitations. Starting over with DXCC using a more limited station has been engaging, and it has helped keep ham radio fun after 60 years in the hobby.

**Mike Ferguson, KØMF**  
Glenwood Springs, Colorado

### Painless Code Practice

I passed the 20 WPM code test on the first try at the FCC office back when it was required for your ham license, but I don’t recall ever making a CW contact. In the early ’70s, I read an article about getting to 2 meters, and I wanted to start as a Technician. I found a ham willing to give me the Technician-class exam, then started up the ladder.

I had to take the 13 WPM test five times to get my General-class license; I couldn’t understand how I passed the 20 WPM test without ever having operated CW. Listening to recorded practice was painful, but I read a suggestion somewhere to try reading text one letter at a time while sounding out the code in your head, so I began sounding out traffic signs and billboards on my drive to work. I sounded out letters every chance I had, and my recognition steadily improved.

While at a Rochester Hamfest, a code tape was playing over the noise of the crowd, and I could read the code. I found the source and asked what the speed was — 20 WPM! I was on my way to my Amateur Extra.

So, the next time you see a stop sign, sound it out and have fun!

**Denis Uminski, N2HP**  
Kenmore, New York

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# W1AW Schedule

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|--------------------------|-------------------------|-------------------------|--------------------------|-----------|------------------------|-----------|-----------|-----------|-----------|
| 6 AM                     | 7 AM                    | 8 AM                    | 9 AM                     | 1300      |                        | FAST CODE | SLOW CODE | FAST CODE | SLOW CODE |
| 7 AM-12 <sup>45</sup> PM | 8 AM-1 <sup>45</sup> PM | 9 AM-2 <sup>45</sup> PM | 10 AM-3 <sup>45</sup> PM | 1400-1945 | VISITING OPERATOR TIME |           |           |           |           |
| 1 PM                     | 2 PM                    | 3 PM                    | 4 PM                     | 2000      | FAST CODE              | SLOW CODE | FAST CODE | SLOW CODE | FAST CODE |
| 2 PM                     | 3 PM                    | 4 PM                    | 5 PM                     | 2100      | CODE BULLETIN          |           |           |           |           |
| 3 PM                     | 4 PM                    | 5 PM                    | 6 PM                     | 2200      | DIGITAL BULLETIN       |           |           |           |           |
| 4 PM                     | 5 PM                    | 6 PM                    | 7 PM                     | 2300      | SLOW CODE              | FAST CODE | SLOW CODE | FAST CODE | SLOW CODE |
| 5 PM                     | 6 PM                    | 7 PM                    | 8 PM                     | 0000      | CODE BULLETIN          |           |           |           |           |
| 6 PM                     | 7 PM                    | 8 PM                    | 9 PM                     | 0100      | DIGITAL BULLETIN       |           |           |           |           |
| 6 <sup>45</sup> PM       | 7 <sup>45</sup> PM      | 8 <sup>45</sup> PM      | 9 <sup>45</sup> PM       | 0145      | VOICE BULLETIN         |           |           |           |           |
| 7 PM                     | 8 PM                    | 9 PM                    | 10 PM                    | 0200      | FAST CODE              | SLOW CODE | FAST CODE | SLOW CODE | FAST CODE |
| 8 PM                     | 9 PM                    | 10 PM                   | 11 PM                    | 0300      | CODE BULLETIN          |           |           |           |           |

W1AW's schedule is at the same local time throughout the year. From the second Sunday in March to the first Sunday in November, UTC = Eastern US time + 4 hours. For the rest of the year, UTC = Eastern US time + 5 hours.

♦ Morse code transmissions: Frequencies are 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz.

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♦ W1AW Qualifying Runs are sent on the same frequencies as the Morse code transmissions. West Coast qualifying runs are transmitted by various West Coast stations on CW frequencies that are normally used by W1AW, in addition to 3590 kHz, at various times. Underline 1 minute of the highest speed you copied, certify that your copy was made without aid, and send it to ARRL for grading. Please include your name, call sign (if any), and complete mailing address. Fees: \$10 for a certificate, \$7.50 for endorsements.

♦ Digital transmissions: Frequencies are 3.5975, 7.095, 14.095, 18.1025, 21.095, 28.095, 50.350, and 147.555 MHz.

Bulletins are sent using 45.45-baud Baudot, PSK31 in BPSK mode, and MFSK16 on a daily revolving schedule.

Keplerian elements for many amateur satellites will be sent on the regular digital frequencies on Tuesdays and Fridays at 6:30 PM Eastern time using Baudot and PSK31.

♦ Voice transmissions: Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59, 50.350, and 147.555 MHz. Voice transmissions on 7.290 MHz are in AM double sideband, full carrier.

♦ Notes: On Fridays, UTC, a DX bulletin replaces the regular bulletins. W1AW is open to visitors 10 AM to 3:45 PM Monday through Friday. FCC-licensed amateurs may operate the station during that time. Be sure to bring a reference copy of your current FCC amateur license. In a communication emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW code practice and CW/digital/phone bulletin transmission audio is also available real-time via the *EchoLink Conference Server* W1AWBDCT. The conference server runs concurrently with the regularly scheduled station transmissions. The W1AW Qualifying Run texts can also be copied via the EchoLink Conference Server.

During 2025, Headquarters and W1AW are closed on New Year's Day (January 1), Presidents Day (February 17), Memorial Day (May 26), Independence Day (July 4), Labor Day (September 1), Veterans Day (November 11), Thanksgiving and the following day (November 27 and 28), and Christmas and the following day (December 25 and 26).





# The Legend Continues



TS-590S



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ADS#36419



# Multi-Vee: A Compact Rotary Antenna for 14 – 30 MHz

This design won first place in the 80 through 10 meters category of the 2024 QST Antenna Design Competition.

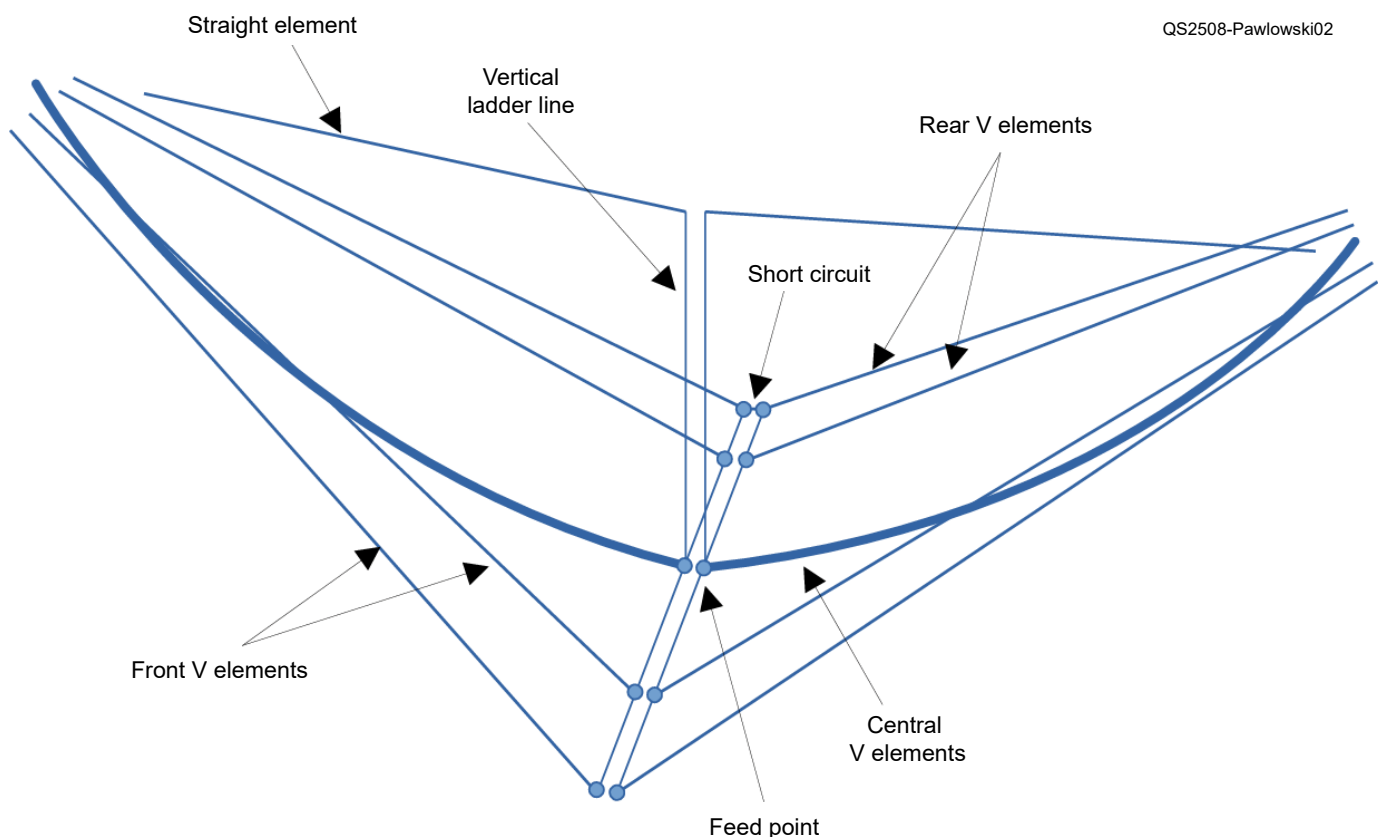
## Jacek Pawlowski, SP3L

The multi-vee antenna is the third rotary broadband antenna I've designed and built for the 14 – 30 MHz band. My earlier projects include the cat whiskers (see “Cat Whiskers’ — The Broadband Multi-Loop Antenna” in the March 2018 issue of *QST*), and the multi-loop doublet (see “Broadband multi-loop doublet for 14 – 30 MHz” in Radio Society of Great Britain's August 2019 issue of *RadCom*). I call this design *multi-vee*, because it features five V-shaped elements and one straight element.

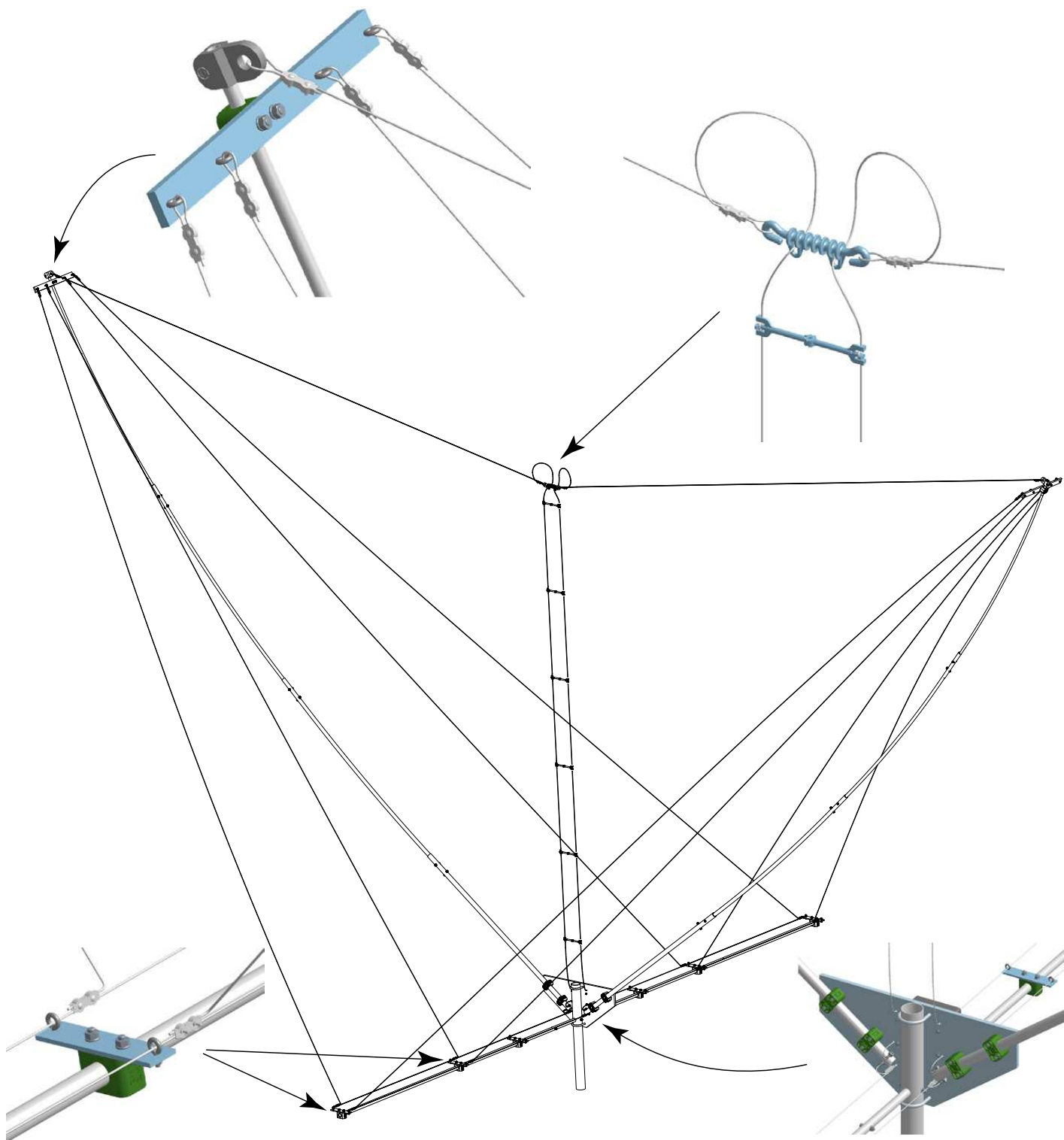


**Figure 1** — The multi-vee antenna mounted on its mast with a rotator.

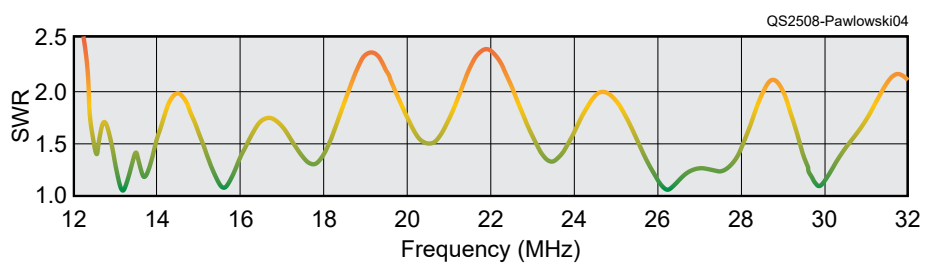
QS2508-Pawlowski02



**Figure 2** — Connection of the elements. Only the conductive parts of the antenna are shown.

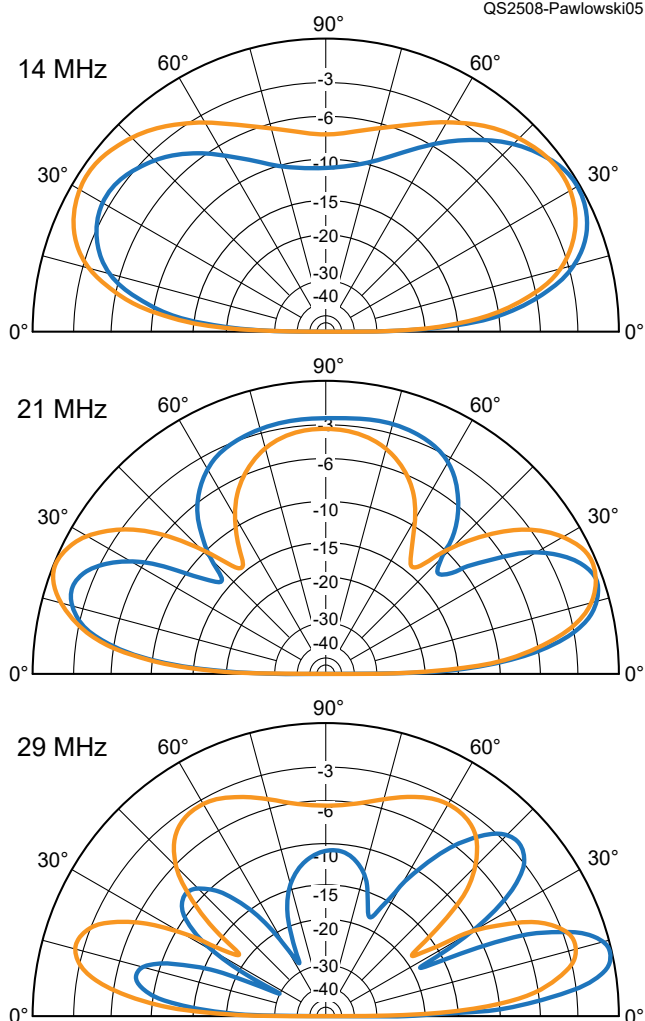


**Figure 3** — The fully assembled antenna showing all mechanical and electrical parts. The full mechanical details are available on the QST in Depth web page.

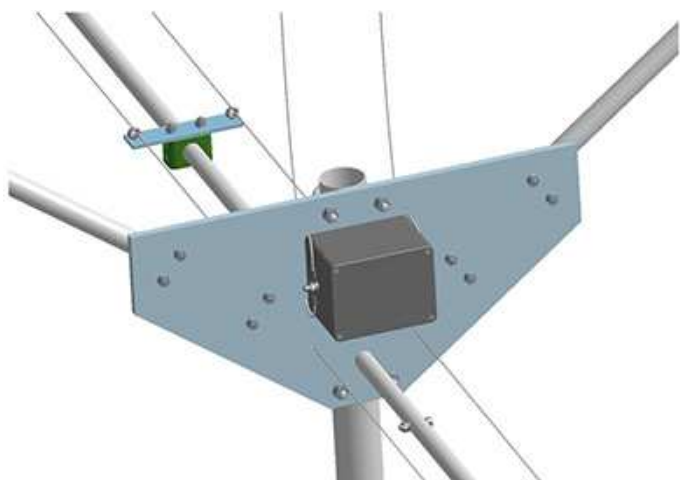


**Figure 4** — SWR vs frequency for the multi-vee antenna.





**Figure 5** — Elevation patterns. The blue curve represents the multi-vee antenna, and the yellow curve represents a dipole. The patterns are generated for a boom height of 30 feet. Maximum radiation is along the direction of the boom, broadside to the elements.



**Figure 6** — Mounting of the feed-point network inside a waterproof box.

## Advantages

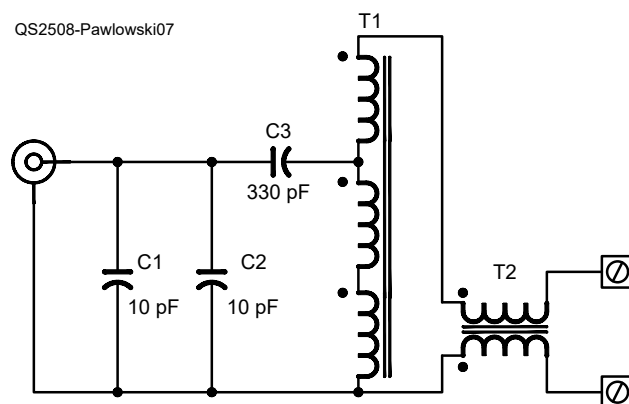
Although it won't match the performance of full-size, multi-element Yagi antennas, the multi-vee offers several benefits:

- At 11.5 feet tall, the multi-vee has a lower takeoff angle than a dipole mounted at the same height, and it has slightly more gain.
- It outperforms omnidirectional vertical antennas in gain (up to 1 S-unit higher) and noise reduction on receive.
- It operates across five bands with low SWR without trimming.
- It's lightweight (approximately 10 pounds).
- It has about a 30% smaller rotation radius compared to a half-wave dipole for the 20-meter band.

These features mean the multi-vee can be mounted on lightweight masts and used with lightweight rotators. Its rigid mechanical structure, with all element ends bound together by steel wires, prevents bending or wobbling even in strong winds — and, not to mention, it looks great (see Figures 1, 2, and 3).

## Performance

The antenna's feed point (where it connects to the matching network) is located at the bottom of the central V element. The other radiating elements are fed via different ladder-line sections. This creates a phase difference among their currents, resulting in a low SWR over a wide frequency range. When installed on a 30-foot mast, the multi-vee achieved the SWR characteristics shown in Figure 4. The SWR remains low from approximately 12.5 MHz to more than 32



**Figure 7** — Matching network diagram.



**Figure 8** — Unun (T1) and current balun (T2).

MHz, indicating the design tolerates minor dimensional deviations without needing adjustments.

Figure 5 compares the simulated radiation patterns of the multi-vee antenna with those of a standard half-wave dipole at 14, 21, and 29 MHz. At lower frequencies, it shows slightly higher forward gain and a modestly lower radiation angle compared to a dipole at the same height; its pattern is similar to that of a bidirectional dipole. At higher frequencies, its behavior becomes more unidirectional.

## Matching

A waterproof box at the feed point contains a matching network (see Figure 6). The purpose of the multi-vee antenna matching network is to match the impedance of a 50  $\Omega$  coaxial cable to the input impedance of an antenna of about 115  $\Omega$ . In addition to that, Figure 7 shows that this circuit matches an unbalanced feed to the balanced antenna. It uses a 9:4 voltage unun (T1) and a 1:1 current balun (T2). T1 and T2 have been wound with ribbon cable TLWY10/0.50. A three-wire ribbon was used for T1, and its winding had five turns on a 5961002701 ferrite core by Fair-Rite. This is a 61-material core with a 1.4-inch outside diameter. T2 was wound with a two-wire ribbon on a 5943002701 core by the same manufacturer. This core also has an outer diameter of 1.4 inches but is made of 43 material. T2 has 10 turns, with a crossover after the fifth turn. The winding methods of T1 and T2 are shown in Figure 8. Because the unun and the balun are not ideal elements, they introduce residual inductance into the network. This causes an increase in SWR at some frequencies. To counteract this, a parallel capacitance of 20 pF ( $C1 + C2$ ) and a series capacitance of 330 pF ( $C3$ ) have been added at the network input. Use capacitors dedicated for HF power circuits here, or at least ceramic capacitors with a high voltage rating (1 kV).

## Construction

Below is a snapshot of how to construct the multi-vee antenna. A comprehensive guide can be found on the

QST in Depth web page ([www.arrl.org/qst-in-depth](http://www.arrl.org/qst-in-depth)). Additionally, see Table 1 — Materials Needed for a complete list of supplies.

## Dimensions and Structural Elements

Each V-element arm is about 16.5 feet long — comparable to a classic 20-meter dipole. However, because these elements are raised at nearly a 45-degree angle, the antenna's rotation radius and overall height are only about 11.5 feet.

The antenna's boom, supporting the horizontal ladder line, is constructed from two 6-foot aluminum tubes. The bases of the V elements are 3 feet apart, while the distance between the top ends of the V elements is maintained at 2.5 inches.

## Mast and Boom Assembly

The mast is an aluminum tube with a 2-inch diameter and 0.120-inch wall thickness. Two perpendicular holes are drilled 8 inches below the top of the mast. The larger hole accommodates a 3/4-inch aluminum rod; over this rod, 0.875-inch outer diameter (OD) tubes are slid to form the boom. A 1/4-20 UNC screw is installed in the smaller hole to secure the rod, preventing it from sliding or rotating relative to the mast.

The matching network box, which is attached to the central plate, is made from UV-resistant polycarbonate and is available from suppliers like Mouser. Before mounting, you need to drill holes in the box for one SO-239 socket and two screws for connecting the antenna wires.

## Ladder-Line Supports

The ladder-line supports (mounted on the boom) maintain a constant 4.33 inch spacing between the wires. Each support consists of a 1/8-inch-thick high-density polyethylene (HDPE) sheet attached to a 0.875-inch tube clamp. Two routing eye bolts placed near the support plate edges guide the ladder-line wires.



**Table 1 — Materials Needed**

A complete bill of materials. Dimensioned drawings for each part can be found on *QST* in Depth.

| Qty  | Description                                                                          | Source                        |
|------|--------------------------------------------------------------------------------------|-------------------------------|
| 1    | Aluminum tubing, 6063-T832, 3', 2.000" OD, 0.120" wall                               | DX Engineering                |
| 2    | Aluminum tubing, 6063-T832, 6', 1.000" OD, 0.058" wall                               | DX Engineering                |
| 4    | Aluminum tubing, 6063-T832, 6', 0.875" OD, 0.058" wall                               | DX Engineering                |
| 2    | Aluminum tubing, 6063-T832, 6', 0.750" OD, 0.058" wall                               | DX Engineering                |
| 2    | Aluminum tubing, 6063-T832, 6', 0.625" OD, 0.058" wall                               | DX Engineering                |
| 2    | Replacement saddle clamp bolts, DXE-UBK-200B                                         | DX Engineering                |
| 1    | 3/4", 3' aluminum round bar 6061-T6511-extruded                                      | Online Metals                 |
| 1    | HDPE plastic sheet, 3/8" × 24" × 24", natural                                        | eBay                          |
| 1    | HDPE plastic sheet, 1/4" × 6" × 12", white                                           | eBay                          |
| 2    | HDPE plastic sheet, 1/8" × 6" × 12", natural                                         | eBay                          |
| 4    | Clamp body size 3 Ø25, 4 mm, 325.4-PP-H                                              | Stauff Corporation            |
| 6    | Clamp body size 3 Ø19 mm, 319-PP-H                                                   | Stauff Corporation            |
| 2    | Clamp body size 2 Ø16 mm, 216-PP-H                                                   | Stauff Corporation            |
| 2    | Clamp body size 3 Ø16 mm light series twin design, LNGF-316/16-PP                    | Stauff Corporation            |
| 300' | 5/64" (2 mm) 316 stainless-steel rope wire                                           | Amazon                        |
| 22   | M2 304 stainless-steel duplex wire rope clip cable clamps for wire cables            | Amazon                        |
| 4    | 4-40 × 3/8" Phillips pan head machine screws stainless steel                         | Marsh Fasteners               |
| 4    | 8-32 × 1" Phillips pan head machine screws stainless steel                           | Marsh Fasteners               |
| 2    | 1/4-20 × 7/8" Socket cap screws 18-8/304 stainless steel                             | Marsh Fasteners               |
| 4    | 1/4-20 × 1" Socket cap screws 18-8/304 stainless steel                               | Marsh Fasteners               |
| 12   | 1/4-20 × 1 1/4" Socket cap screws 18-8/304 stainless steel                           | Marsh Fasteners               |
| 18   | 1/4-20 × 1 1/2" Socket cap screws 18-8/304 stainless steel                           | Marsh Fasteners               |
| 8    | 1/4-20 × 1 3/4" Socket cap screws 18-8/304 stainless steel                           | Marsh Fasteners               |
| 1    | 1/4-20 × 2 1/2" Socket cap screws 18-8/304 stainless steel                           | Marsh Fasteners               |
| 26   | 8-32 Nylon insert hex lock nuts 18-8 stainless steel                                 | Marsh Fasteners               |
| 45   | 1/4-20 Nylon insert hex lock nuts 18-8 stainless steel                               | Marsh Fasteners               |
| 26   | #8 Flat washers 18-8/304 stainless steel                                             | Marsh Fasteners               |
| 45   | 1/4" Flat washers 18-8/304 stainless steel                                           | Marsh Fasteners               |
| 22   | Routing eyebolt, 316 stainless steel with bent-closed eye, 8-32 thread, 1 1/8" shank | McMaster-Carr                 |
| 1    | Isolator IS120                                                                       | dx-wire.de                    |
| 6    | Spreizer SP120                                                                       | dx-wire.de                    |
| 8    | Insulated ring screw terminal, 571-1377173-6                                         | Mouser Electronics            |
| 1    | Polycarbonate enclosure, 563-PTS-25310                                               | Mouser Electronics            |
| 1    | Fair-Rite toroid core, 5961002701                                                    | Mouser Electronics            |
| 1    | Fair-Rite toroid core, 5943002701                                                    | Mouser Electronics            |
| 1    | Multilayer ceramic capacitors MLCC leaded, 330 pF, 630 V dc                          | Mouser Electronics            |
| 2    | Multilayer ceramic capacitors MLCC leaded, 10 pF, 630 V dc                           | Mouser Electronics            |
| 1    | SO-239 panel mount UHF-female coaxial connector                                      | American Radio Supply         |
| 2 m  | Multicolor flat ribbon cable, TLWY 10 × 0.5 mm2                                      | Transfer Multisort Elektronik |

## See *QST* in Depth for More!

Visit [www.arrl.org/qst-in-depth](http://www.arrl.org/qst-in-depth) for the following supplementary materials and updates:

- ✓ Dimensioned drawings for individual parts
- ✓ NEC files
- ✓ Construction tips and details

All photos provided by the author.

Jacek Pawlowski, SP3L, is a retired electronics engineer with a Master of Science degree. He spent 15 years designing test and measurement circuits before transitioning to R&D management. Passionate about radio since primary school, Jacek was active as SP3LFV from 1978 to 1999, then took a 15-year break before resuming as SP3L in 2014. He shares his antenna designs on his website, <https://sites.google.com/view/sp3l-hf-antennas/home-page>. Jacek can be reached at [jacek.sp3l@gmail.com](mailto:jacek.sp3l@gmail.com).

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## Strays

### MIT Welcomes Visiting Scientist Dr. Ulrich L. Rohde, N1UL

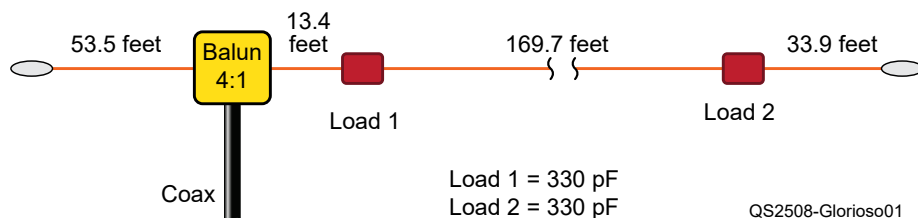
Dr. Ulrich L. Rohde, N1UL, is recognized for his expertise in microwave systems and radio frequency and is the MIT Microsystems Technology Laboratories (MTL) newest visiting scientist.

As a visiting scientist, Dr. Rohde will collaborate closely with MTL's Director, Professor Tomas Palacios, and other faculty members, advising MTL's students and supporting the MTL community. With his background in RF and microwave engineering, specifically in circuits and systems, and including his experience as an educator, Dr. Rohde looks forward to working with students at MIT as they develop world-class technologies, offering guidance on key parameters and the optimal applications of emerging innovations.

Dr. Rohde is a professor of Radio and Microwave Theory and Techniques at the University of Oradea, Universität der Bundeswehr in Munich, Brandenburg University of Technology Cottbus-Senftenberg, and an honorary professor at several other universities worldwide. Rohde has authored more than 400 scientific papers, co-written more than a dozen books with John Wiley & Sons, Inc. and Springer Nature, and holds more than 50 patents. He has received numerous awards and recognitions.

# An All-Band 160-Meter OCF Antenna

Careful balun and capacitor placement makes this antenna effective on non-WARC bands — and first-place winner in the 160 meters, LF or VLF category of the 2024 QST Antenna Design Competition.



The dimensions of the all-band OCF antenna.

## Bob Glorioso, W1IS, and Bob Rose, KC1DSQ

Many modern transceivers have built-in antenna tuners capable of tuning over a range of standing wave ratio (SWR) values up to 3:1. The goal of this antenna is to cover non-World Administrative Radio Conference (WARC) bands from 160 to 10 meters using the rig's internal tuner. An off-center-fed (OCF) dipole is employed to cover the harmonically related bands. The WARC bands are not harmonically related to the fundamental frequencies, but their SWRs are only slightly higher than 3:1, and some internal tuners can tune them successfully. In fact, this antenna has been successfully tuned and operated by a "stock" Icom IC-7300 on all bands from 160 to 6 meters. The layout of this antenna includes a 20% offset that allows for 15-meter operation (see the lead image). It has a 4:1 balun with more turns than a typical 4:1 to provide good coverage of 160 meters. Additionally, a 1:1 balun/choke (see Figure 1) reduces RF on the feed line from this unbalanced antenna. Mount the 1:1 in a large, waterproof box with the 4:1 balun, or in a separate waterproof box attached to the 4:1 balun box, and with a double SO-239 adapter.

## Design Details

The length of this antenna optimizes high-band coverage (20 – 10 meters) but is too long for 40, 80, and 160 meters. To move the frequency where the best SWR occurs into the 160-, 80-, and 40-meter bands, we placed capacitors in series with the wire at low-current points for the higher bands. This placement has little or no effect on the higher bands while raising the best SWR frequency for the lower bands. Specifically, a capacitor placed at the current null for

20 meters raises the best SWR frequency for 40, 80, and 160 meters. A capacitor placed at the current null for 40 meters raises the best SWR frequency for 80 and 160 meters. Placing 330 pF capacitors at both points moves 40-, 80-, and 160-meter SWRs to the middle of their respective bands, while the best SWR frequencies for 20 – 10 meters are not affected. See more information on this method by Serge Stroobandt,

ON4AA, at [www.hamwaves.com/cl-ocfd/en/index.html](http://www.hamwaves.com/cl-ocfd/en/index.html).

## What You'll Need

The key items needed to build this antenna are 275 feet of #14 AWG stranded, insulated wire (either thermoplastic high heat-resistant nylon-coated wire or Davis RF Flex-Weave), a 4:1 balun designed for 160 meters, a 1:1 choke/balun capable of 30 dB isolation on 160 meters, and two mounted 330 pF capacitors with 1 – 4.7 M $\Omega$  1 or 2 W non-inductive bleeder resistors. The 4:1 balun we used is a single-core Guanella



**Figure 1** — The 1:1 and 4:1 baluns. Additional details about these can be found in the QST in Depth files.



**Table 1 — SWR**

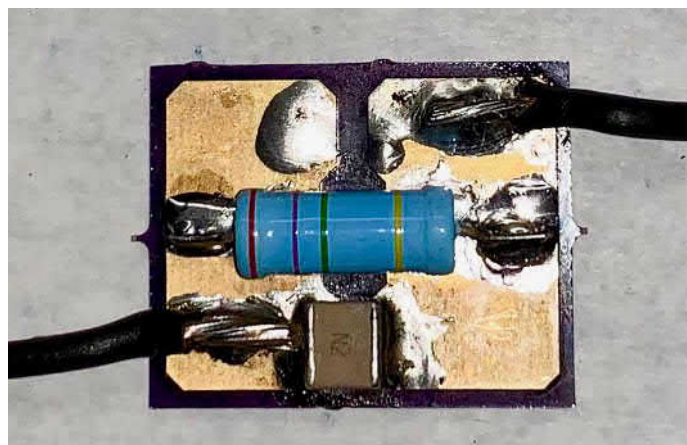
| Best SWR Frequency (MHz) | Data from Antenna |                         | Data from NEC Model |                         |
|--------------------------|-------------------|-------------------------|---------------------|-------------------------|
|                          | Best SWR          | SWR Below 3:1 Bandwidth | Best SWR            | SWR Below 3:1 Bandwidth |
| 1.89                     | 1.35              | 180 KHz                 | 1.45                | 150 KHz                 |
| 3.7                      | 1.8               | Whole band              | 1.8                 | 350 KHz                 |
| 5.4                      | 1.3               | Whole band              | 1.6                 | Whole band              |
| 7.14                     | 2.8               | 275 KHz                 | 1.5                 | Whole band              |
| 10.125                   | 3.2               | Close miss              | 4.3                 | None                    |
| 14.2                     | 1.15              | Whole band              | 1.4                 | Whole band              |
| 18.160                   | 3.2               | Close miss              | 3.3                 | Close miss              |
| 21.3                     | 1.05              | Whole band              | 1.15                | Whole band              |
| 24.94                    | 2.5               | Whole band              | 1.2                 | Whole band              |
| 28.5                     | 1.5               | Whole band              | 1.4                 | Whole band              |

on an FT140-43 ferrite core. A coil consists of 16 turns of a bifilar pair using #18 AWG Teflon-coated wire from Remington Industries. The bifilar pair forms a 100  $\Omega$  transmission line. Two such pairs are wound on the core. The two inputs are wired in parallel on the 50  $\Omega$  side, and the two outputs are wired in series on the 200  $\Omega$  side. The 1:1 choke/balun uses 16 turns of RG-316 wound on an FT140-43 core. Both cores are shown in Figure 1. If the two cores are mounted in the same box, they must be separated by at least 1 inch or oriented 90 degrees from each other to minimize interaction.

The 330 pF capacitors (Knowles Syfer 222523K00331JQTAF9LM/DigiKey 1608-1588-1-ND) and the bleeder resistor are mounted on a 1  $\times$  1-inch printed circuit board (PCB) with a slot cut with a hobby knife or Dremel tool (see Figure 2). After that, you can tape the PCB to an insulator for strain relief, and then you can solder the pigtails from the board to the antenna wires.

## Antenna Performance

The SWR values in Table 1 are from an *EZNEC* 6 simulation and from a real antenna measured with a RigExpert AA-600. The values were measured



**Figure 2** — The load capacitor and bleeder resistor — 1 W resistor for high power, ½ W for lower power.



**Figure 3** — The feed point of the 160-meter OCF antenna deployed 50 feet high.

using 100 feet of RG-8X feed line. The antenna was deployed 50 feet high, as shown in Figure 3. Note that we get excellent SWR on 60 meters, even though it is not a harmonic of 160 meters. The other WARC band SWR values are not as good, but they may be tunable. Plots of the full SWR curves can be seen at [www.arrrl.org/qst-in-depth](http://www.arrrl.org/qst-in-depth), along with other useful balun data, *NEC* files, and photographs. This OCF antenna, with the baluns and capacitive loads, can handle up to 600 W.

## See QST in Depth for More!

Visit [www.arrrl.org/qst-in-depth](http://www.arrrl.org/qst-in-depth) for the following supplementary materials and updates:

- ✓ The antenna's SWR plots for each band
- ✓ How to build the baluns/balun data
- ✓ *EZNEC* and *NEC* files
- ✓ More photos of the antenna

All photos provided by the authors.

Bob Glorioso, W1IS, was first licensed in 1955 as WN1EBW/W1EBW. After military service and college, where he earned his BSEE, MS, and PhD, he upgraded to Amateur Extra and became W1IS. A former US Army Captain, Professor at UMass Amherst, and Digital Equipment Corporation VP, Bob has authored technical books, and he's an ARRL Life Member and IEEE Fellow. He enjoys low-power operating, antenna design, music, flying, and family. Bob is also a member of the Police Amateur Radio Team in Westford, Massachusetts. He can be reached at [rglorioso@me.com](mailto:rglorioso@me.com).

Bob Rose, KC1DSQ, earned his BSEE at the University of Maryland in 1969. He holds an Amateur Extra-class license and enjoys working on HF antennas. Bob's career included Raytheon, Digital Equipment Corporation, and Intel (when the Alpha group was sold to Intel). He has published several papers and holds 15 patents. He enjoys working DX. Bob can be reached at [b.rose@comcast.net](mailto:b.rose@comcast.net).

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# A Ground-Independent Beverage on the Ground

An honorable mention in the 160 meters, LF or VLF category of the 2024 QST Antenna Design Competition, this antenna has improved signal-to-noise ratios on 80 and 160 meters.

## Jim Spaulding, WØUO

In 1995, I moved to a small acreage west of Fort Worth, Texas. It is a favorable location for 80- and 160-meter DXing. The rear of the house is centered on a 280 × 420-foot lot. My main 160-meter antenna is a shunt-fed tower with 120 100-foot radials. An 80-meter wire four square shares the ground system. My search for an effective receiving antenna for 160 and 80 meters was limited by my available front yard space of approximately 280 × 180 feet. The only choices seemed to be a K9AY Loop, some form of flag antenna, or a short vertical array. None of these options would be aesthetically appropriate for the front yard, so I began searching for alternatives. I decided on a Beverage, specifically a *Beverage on Ground* (BOG).

## Size Limit Considerations

A ground-independent Beverage antenna was first discussed by Tom Rauch, W8JI (Echelon-Log Beverages at [www.w8ji.com/echelon-log\\_beverages.htm](http://www.w8ji.com/echelon-log_beverages.htm)). As described, the antenna was too big for my location. Gary Breed, K9AY, suggested that I try a derivative of the W8JI design. He had modeled antennas as small as 350 feet and thought something similar might work as a BOG. I thought that this should be possible, as the velocity factor of the wave in the wire decreases as the wire approaches the ground. This would allow a smaller — though less efficient — antenna.

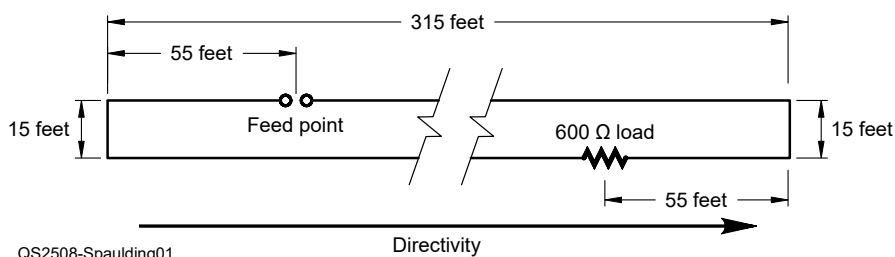


Figure 1 — A diagram of the antenna (not to scale).

## The Design and Necessary Parts

Figure 1 is a drawing of the antenna. The antenna is a rectangle that is 315 × 15 feet. It's fed 55 feet from one end on one side, and it's loaded with a 600 Ω resistor 55 feet from the other end on the opposite side. The wires are on top of the grass, about 1 inch above ground. No ground rods are necessary. NEC2 modeled the 1.825 MHz input impedance as 790.3-

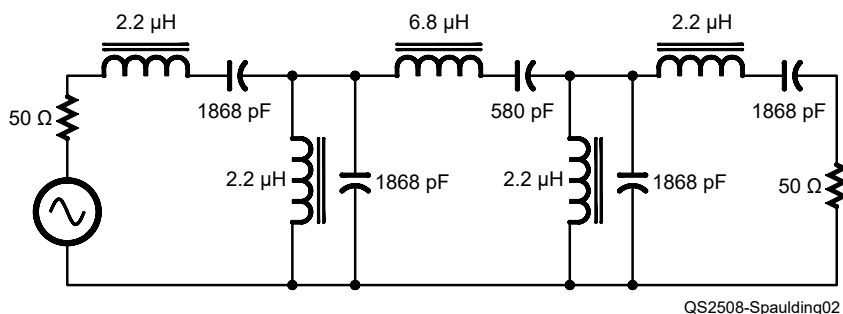


Figure 2 — The preselector filter covering 1.8 – 4 MHz.

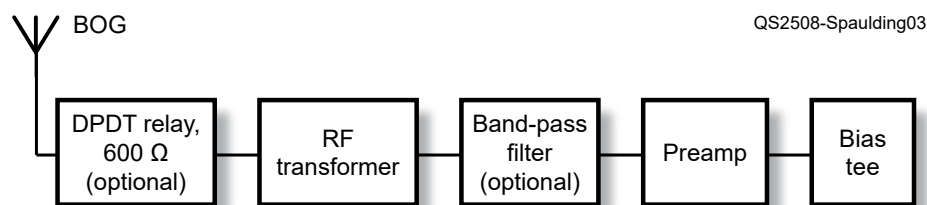
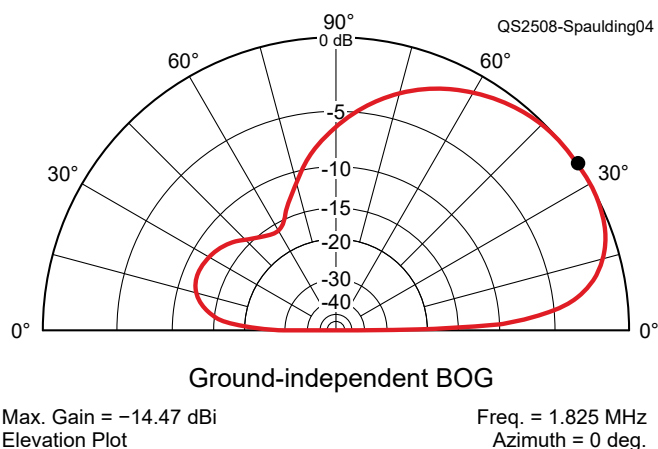
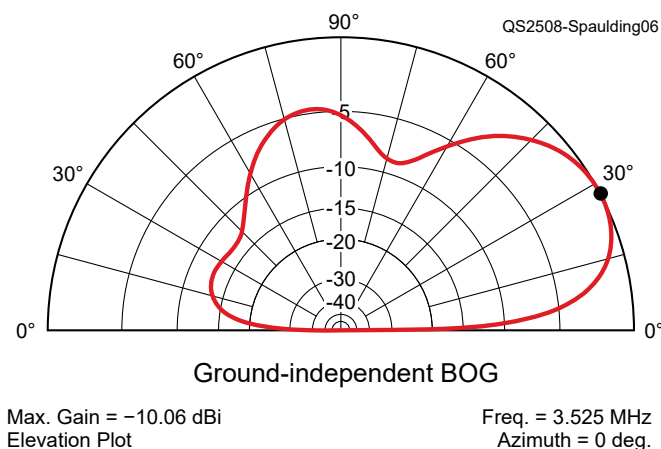


Figure 3 — The feed assembly block diagram.

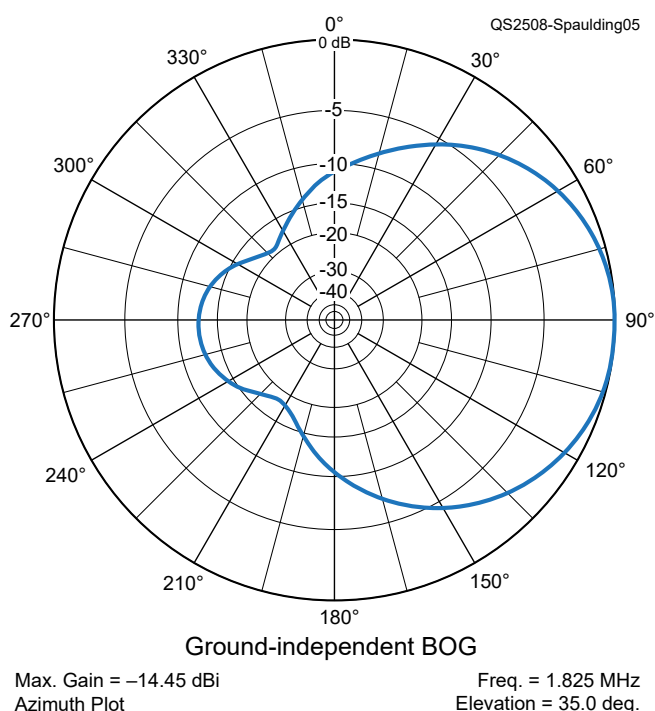




**Figure 4** — The 160-meter elevation pattern.



**Figure 6** — The 80-meter elevation pattern.



**Figure 5** — The 160-meter azimuth pattern.

j53.69  $\Omega$ , and as 867-j38.08  $\Omega$  at 3.525 MHz. These are both acceptable matches for a 16:1 RF transformer.

The antennas are directional, yet very inefficient, and common-mode currents on the shield of the feed line may compromise the pattern. To minimize this problem, I placed a preamplifier at the feed point and matched it to the antenna with a 16:1 transformer. This transformer consists of an FT50-61 ferrite toroid with a seven-turn primary and a 28-turn secondary.

The preamplifiers should be capable of at least 18 dB gain. K9AY Loop, W7IUUV, and Advanced Receiver Research preamplifiers would work for this project. I

used a 100 kHz – 2000 MHz amplifier ([www.amazon.com/Teyleten-Robot-0-1-2000MHz-WideBand-Amplifier/dp/B08THYZWNQ](http://www.amazon.com/Teyleten-Robot-0-1-2000MHz-WideBand-Amplifier/dp/B08THYZWNQ)) that I found at Amazon, and similar items are available at eBay.

You may need to provide filtering ahead of the preamplifier, depending on your location with respect to AM broadcast stations. Figure 2 shows an 80 – 160-meter band-pass filter designed with *Elsie*, a freeware program. The 1868 pF capacitors consist of 1800 and 68 pF capacitors in parallel. The 580 pF capacitor consists of a 560 pF capacitor in parallel with a 20 pF capacitor. Figure 3 is a block diagram of the feed-point assembly, and Table 1 is a list of the necessary parts.

**Table 1 — Required Parts for the BOG**

| Quantity | Description                                                                         |
|----------|-------------------------------------------------------------------------------------|
| 600 feet | #18 AWG insulated wire                                                              |
| 100 feet | RG-6 feed line                                                                      |
| 1        | Preamplifier (see text)                                                             |
| 1        | FT50-61 ferrite toroid core                                                         |
| 1        | Any 12 V dc DPDT relay                                                              |
| 2        | RF choke, 100 – 200 $\mu$ H, 100 mA minimum                                         |
| 2        | 0.05 – 0.1 pF capacitor, 25 V dc minimum                                            |
| 1        | 600 $\Omega$ resistor (parallel two 1200 $\Omega$ or three 1800 $\Omega$ resistors) |
| 1        | Enclosure (I used a section of 3-inch PVC pipe with end caps)                       |
| 4        | 2.2 $\mu$ H inductor, 100 mA minimum                                                |
| 1        | 6.80 $\mu$ H inductor, 100 mA minimum                                               |
| 4        | 1800 pF capacitor, 25 V dc minimum                                                  |
| 4        | 68 pF capacitor, 25 V dc minimum                                                    |
| 1        | 560 pF capacitor, 25 V dc minimum                                                   |
| 1        | 20 pF capacitor, 25 V dc minimum                                                    |
| Misc.    | #24 AWG magnet wire                                                                 |

**Table 2 — Measurements (Baseline Noise Measured in a 400 Hz Bandwidth)**

|                                       |          |                            |
|---------------------------------------|----------|----------------------------|
| 1.825 MHz transmit antenna            | −100 dBm | 21 dB receiver attenuation |
| 1.825 MHz preamplified BOG            | −115 dBm | No receiver attenuation    |
| 1.825 MHz noise level with preamp off | −125 dBm |                            |
| 3.525 MHz transmit antenna            | −106 dBm | 15 dB receiver attenuation |
| 3.525 MHz preamplified BOG            | −115 dBm | No receiver attenuation    |
| 3.525 MHz noise level with preamp off | −125 dBm |                            |

## Elevation, Azimuth, and Noise Floors

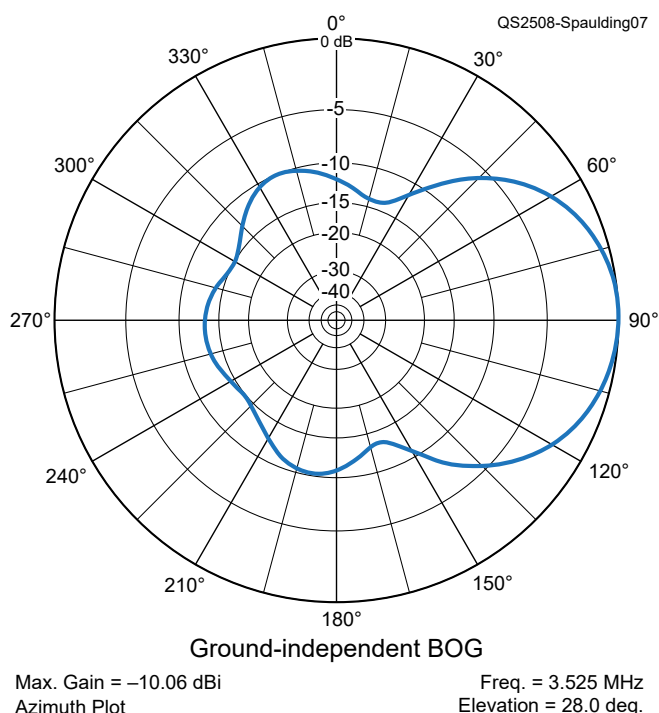
This loop antenna can be used in two directions when used with two preamplifiers and a double-pole, double-throw (DPDT) relay between the antenna and the matching transformer. When the

preamplifier is not powered, the relay selects a 600  $\Omega$  resistor as a load. When powered, the relay selects the matching transformer and powers the preamplifier.

In my station, I have two BOG loops placed at right angles — one oriented 30/210 degrees, and the other 120/300 degrees — to give me directivity in four directions. Figures 4 and 5 show the 160-meter elevation and azimuth patterns, and Figures 6 and 7 show the 80-meter elevation and azimuth patterns. Finally, Table 2 lists the receiver noise floors.

## BOG Performance

How well does it work? On 80 and 160 meters, I operate diversity with either an Elecraft K3 or K4. Before I had the BOGs, on 160 meters, I could work anything I could hear with 100 W. With the now-improved threshold due to the BOGs, sometimes I can't work stations that I hear, even when using 500 W! The ground-independent BOG meets my needs. It does not require ground rods, it fits in the available space, and it is not visible to passersby. I can also easily remove it to allow lawn maintenance.



**Figure 7** — The 80-meter azimuth pattern.

The feed assembly receives its power over the feed line via bias tees at each end. A bias tee consists of a capacitor to allow RF to move between the preamplifier and the feed line, and from the feed line to the receiver. A shunt choke at each end allows injection and removal of voltage from the feed line. The associated parts are the sixth and seventh items from the top in Table 1. The parts can be found at Amazon, Mouser, DigiKey, and other parts suppliers.

## Strays

### QST Congratulates...

Martin L. Kaiser, III, W3VCG, on the publication of his memoir *Help Yourself! ...A Story of FBI Corruption*. The book describes how his passion for amateur radio led to an early career at RCA, ultimately establishing him as a renowned expert in bomb detection and surveillance. You can purchase the book at Amazon.

For updates to this article, see the QST Feedback page at [www.arrl.org/feedback](http://www.arrl.org/feedback).

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## Product Review

# RigExpert MATCH Upgradeable Antenna and Cable Analyzer

Reviewed by Phil Salas, AD5X  
ad5x@arri.net

RigExpert offers a number of antenna analyzers, and the MATCH is the next generation of their analyzers. It is an upgradeable unit. The MATCH base model covers 100 kHz to 70 MHz. You can purchase an upgrade for the Advanced license, which covers up to 230 MHz, or a license for the Radio Field Engineer (RFE license), which upgrades the coverage to 500 MHz. These are all firmware upgrades.

### MATCH Description

The MATCH is a single-port vector network analyzer (VNA) that provides signed, complex impedance measurements of RF loads from 100 kHz to 70 MHz, 100 kHz to 230 MHz, or 100 kHz to 500 MHz depending on the license purchased. It has an excellent TFT LCD 4-inch color display. The measurement port is an N-female connector, so you may wish to purchase UHF/N and BNC/N adapters depending on your measurement requirements. A USB-A/USB-C cable is provided for computer interfacing and charging. Power is provided by an internal 2600 mAh

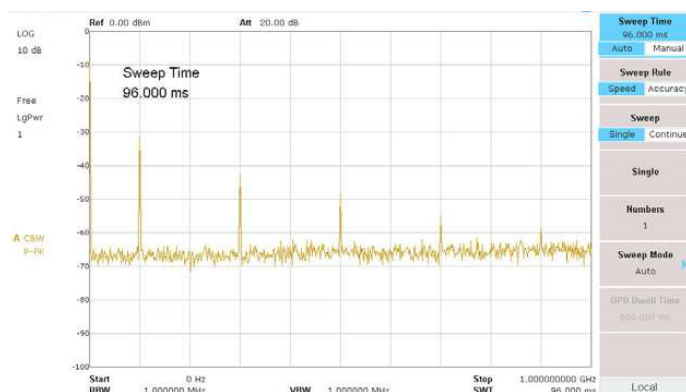


Figure 1 — A 1 GHz sweep of the 100 MHz output of the RigExpert MATCH.

### Bottom Line

The MATCH is a flexible and accurate antenna analyzer that will satisfy most antenna and component measurement requirements up to 500 MHz.

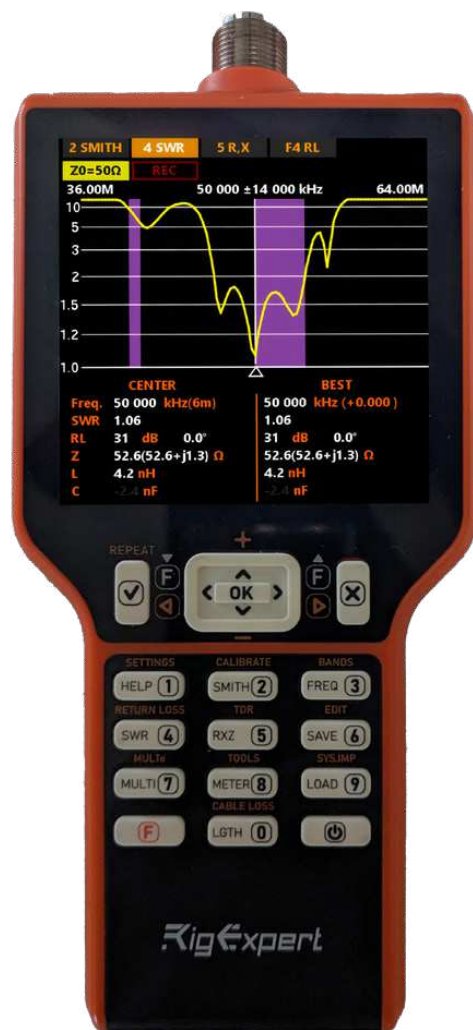


Figure 2 — The RigExpert MATCH broadband SWR screenshot.

**Table 1 — RigExpert MATCH Upgradeable Antenna and Cable Analyzer****Manufacturer's Advertised Specifications (not tested in the ARRL Lab)**

|                         |                                                                                    |
|-------------------------|------------------------------------------------------------------------------------|
| Frequency range:        | 0.1 – 70/230/500 MHz                                                               |
| Frequency resolution:   | 1 kHz                                                                              |
| Output Z:               | 50 $\Omega$                                                                        |
| Directivity:            | 43 dB                                                                              |
| Output power:           | –10 dBm into 50 $\Omega$                                                           |
| Output signal shape:    | Square wave                                                                        |
| Measurement systems:    | 25, 50, 75, 100, 150, 200, 300, 450, 600 $\Omega$                                  |
| SWR range:              | 100:1 numerical, 10:1 graphical; SWR of $\infty$ is indicated into an open circuit |
| RF connector:           | N-female                                                                           |
| Power:                  | ICR18650 2600 mAh lithium-ion battery                                              |
| Battery operating time: | Maximum 2 hours/40 minutes continuous measurement                                  |
| Interface:              | 480 × 480 color TFT 4.0-inch LCD display                                           |
| Waterproof keypad       |                                                                                    |
| Bluetooth:              | Advanced, RFE licenses                                                             |
| Dimensions:             | 93 × 207 × 37 millimeters (3.7 × 8.1 × 1.5 inches)                                 |
| Operating temperature:  | –10 to 60°C (14 to 140°F)                                                          |
| Weight:                 | 341 grams (12 ounces)                                                              |
| PC connection:          | USB type C                                                                         |
| Warranty:               | 2 years                                                                            |

Multilingual menus and help screens

**Display modes:**

SWR at single or multiple frequencies

SWR, return loss, R, X, Z, L, C at single frequency

SWR chart: 100 – 500 points

R, X chart: 100 – 500 points

Smith chart: 100 – 500 points

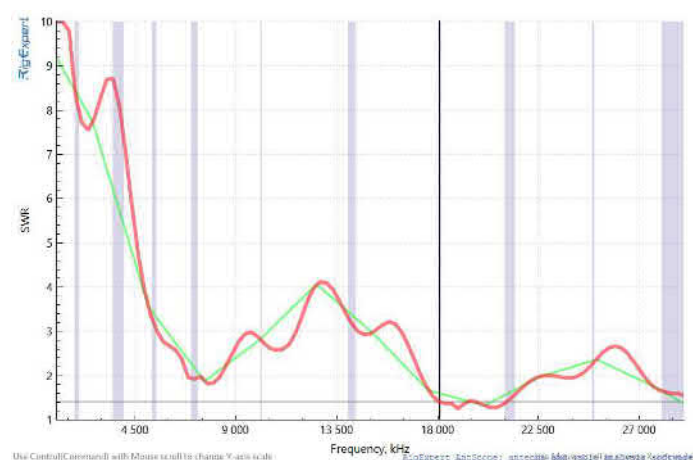
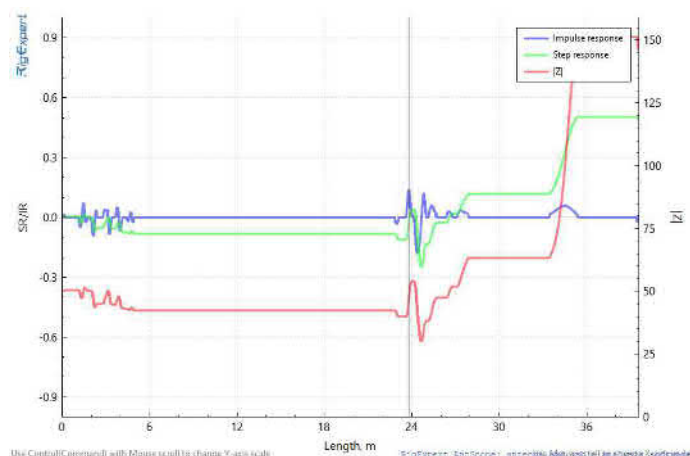
Return loss chart: 100 – 500 points

Time Domain Reflectometer (TDR) chart; RFE license

Cable tools (loss and characteristic impedance); advanced and RFE licenses

lithium-ion battery. A battery indicator on the main menu shows the battery status.

The MATCH base model covers 100 kHz to 70 MHz and permits measurements of SWR at single or multiple frequencies, return loss, R-X-Z-L-C at a single frequency, an SWR chart, an R and X chart, and a return loss chart. The Advanced MATCH license increases frequency coverage to 230 MHz, and adds stub tuner, length and velocity factor, cable loss, characteristic impedance measurement, Smith Chart display, and OSL open/short/load (OSL) calibration. Finally, the RFE MATCH license extends frequency coverage to 500 MHz, and adds TDR and LC Meter capabilities. With the OSL calibration capability of the advanced and RFE versions, the MATCH can provide specific calibrations, such as BNC and UHF interfaces, coaxial cable interconnects for accurate remote impedance measurements, and zeroing out any custom fixture stray impedances. There are 10 available OSL memories. For OSL calibration and remote measurements, you will need accurate open, short, and 50  $\Omega$  loads (see the sidebar, “Open/Short/Load Calibration Loads”).

**Figure 3 — AntScope2 broadband SWR display.****Figure 4 — The RigExpert MATCH TDR mode shows distance to the author's 43-foot vertical.**



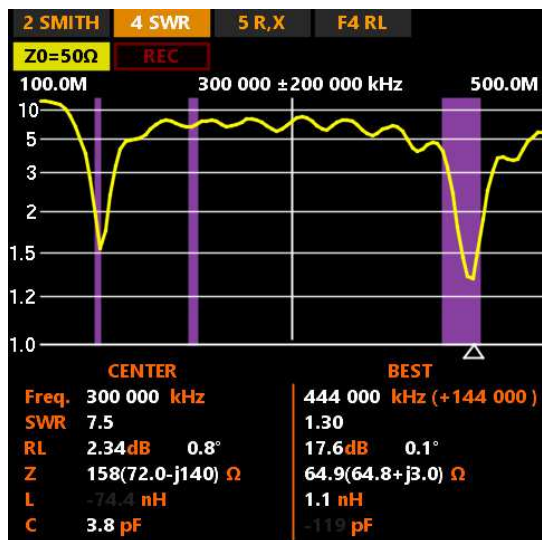


Figure 5 — 2-meter and 70-centimeter SWR response of the 2-meter ground plane.

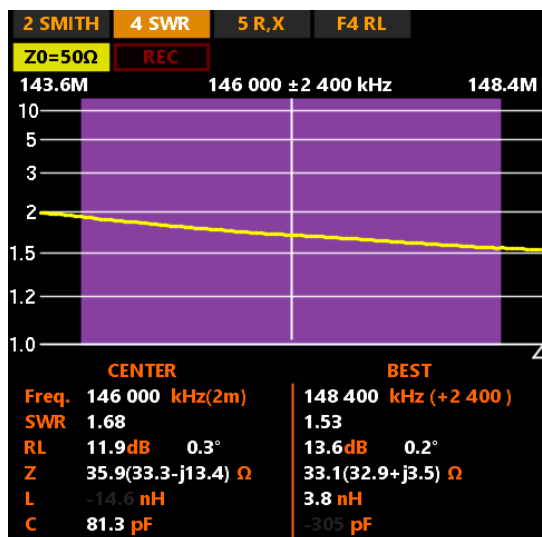


Figure 6 — Detailed 2-meter SWR response.

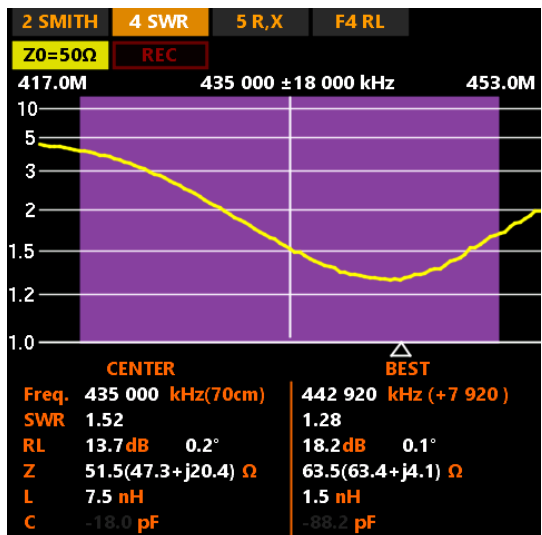


Figure 7 — Detailed 70-centimeter SWR response.

Table 2 — MATCH Open-Circuit Output Z

| Frequency | Output Z Measured | Impedance Measured |
|-----------|-------------------|--------------------|
| 1.8 MHz   | 2442 Ω            | 2440 – j102        |
| 3.5 MHz   | 2449 Ω            | 2448 – j60         |
| 7 MHz     | 2452 Ω            | 2452 – j12         |
| 14 MHz    | 2454 Ω            | 2449 + j149        |
| 28 MHz    | 2447 Ω            | 2408 + j433        |
| 50 MHz    | 2342 Ω            | 2198 + j809        |
| 146 MHz   | 1719 Ω            | 1173 + j1256       |
| 220 MHz   | 1319 Ω            | 642 + j1152        |
| 450 MHz   | 702 Ω             | 209 + j670         |

Finally, the MATCH may be connected to your computer to provide additional data recording and analysis capabilities. Internal memory provides for the storage and recall of measured parameters. Table 1 summarizes the specifications of the MATCH.

## Using the MATCH

The MATCH is very easy to use. The menus and keypad markings are self-explanatory, so you will rarely need to refer to the manual. The USB-C interface on the MATCH is nice, as this is becoming a standard interface. It matches my Google Pixel 7 phone, Kindle Fire 11, nanoVNA-F, tinySA Ultra, and the newest Apple iPhones. This helps with reducing the number of charging interface cables I've needed in the past.

Before using the MATCH for the first time, connect the supplied USB cable to a USB power source or your computer and charge the MATCH (the MATCH must be turned off to charge). Next, check that you have the latest firmware. This is a trivial process. Simply go to [www.rigexpert.com](http://www.rigexpert.com), select the MATCH tab, and then run the "Firmware Update Tool." This tool finds the MATCH connected to your computer and determines the current version of your firmware. If a newer version



Figure 8 — Component fixture and 49.9 Ω resistor.

of firmware is available, the update tool downloads and installs it.

Next, download and install *AntScope2* on your PC. *AntScope2* permits importing data from the MATCH memory, as well as providing for real-time control of the MATCH, and firmware and license updates. This MATCH, as provided to me by ARRL, was the basic unit. ARRL then sent me the upgrade for the RFE license. To upgrade, connect the MATCH to your computer using the supplied USB cable. Launch *AntScope2*, go to the *AntScope2* **SETTINGS**, choose **CONNECT ANALYZER**, press **CONNECT**, select **UPDATE LICENSE**, and then enter the 12-digit license key. The entire process is easy and takes just a few minutes. Incidentally, if you want to upgrade to RFE, you do not first need to upgrade to the Advanced license (i.e., the \$200 RFE upgrade price includes the Advanced upgrade).

I began by running a series of my standard tests. Table 2 displays the open-circuit measurement capability of

the MATCH. This gives an indication of the impedance magnitude you can accurately measure as a function of frequency.

Besides its measurement capabilities, the MATCH can also operate as a signal generator. However, its output waveform is a square wave, so this must be considered when making measurements. The output level is quite constant over the full frequency range, making the MATCH accurate enough for receiver sensitivity testing when used with a good step attenuator. However, because the output waveform is a square wave, if a broadband power sensor is used for measurements, the fundamental frequency will actually be 4 dB lower than that measured. Table 3 tabulates the output power level versus frequency as measured with a NIST-traceable Mini-Circuits PWR-6GHS+ broadband power sensor. This power meter has a frequency response out to 6 GHz.

Figure 1 shows the harmonic output levels of the 100 MHz MATCH output up to 1 GHz. This shows how

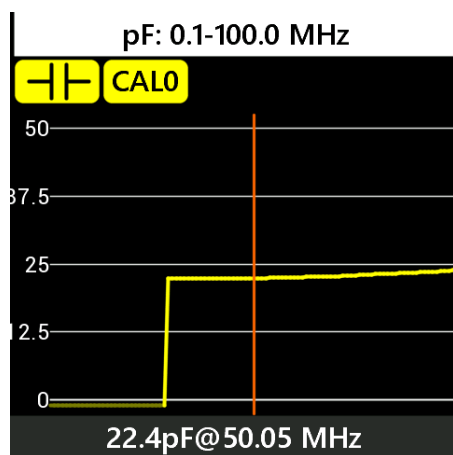


Figure 9 — Capacitor measurement.

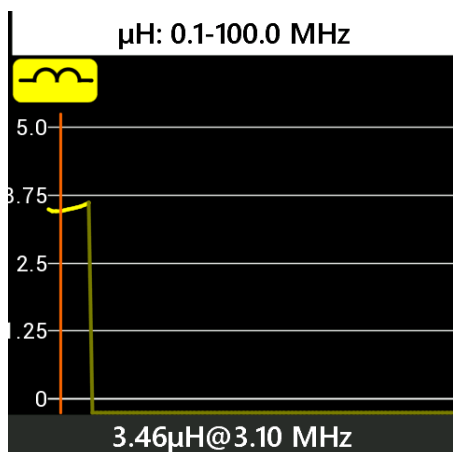


Figure 10 — Toroid inductor measurement.

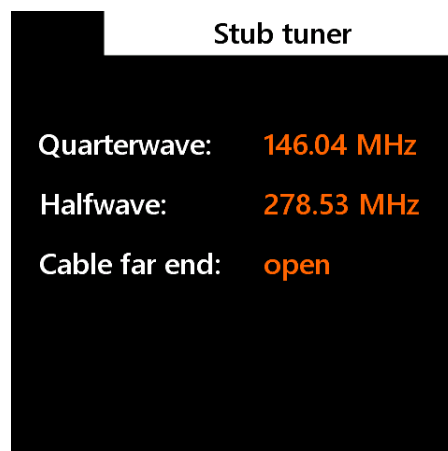


Figure 11 — Determining quarter-wave stub length.



Figure 12 — UHF and N adapters, and SMA 50 Ω load (upper left) and short (upper right).



**Table 3 — MATCH Output Power (dBm) vs Frequency**

This is a broadband measurement, so it includes the contribution of the harmonics.

| Spec'd Pwr | 160 M | 80 M | 40 M | 20 M | 10 M | 6 M  | 2 M   | 220 MHz | 440 MHz |
|------------|-------|------|------|------|------|------|-------|---------|---------|
| -10 dBm    | -9.7  | -9.7 | -9.7 | -9.7 | -9.7 | -9.8 | -10.1 | -10.3   | -10.1   |

**Table 4 — Return Loss Measurements**

| Frequency | Precision 50 $\Omega$ | 6 dB RL       | 12 dB RL        | 20 dB RL        |
|-----------|-----------------------|---------------|-----------------|-----------------|
|           | MATCH/VNA             | MATCH/VNA     | MATCH/VNA       | MATCH/VNA       |
| 1.8 MHz   | 51 dB/64 dB           | 5.7 dB/5.7 dB | 12.4 dB/12.4 dB | 20.4 dB/20.1 dB |
| 3.5 MHz   | 50 dB/64 dB           | 5.7 dB/5.7 dB | 12.4 dB/12.4 dB | 20.4 dB/20.1 dB |
| 7 MHz     | 50 dB/63 dB           | 5.7 dB/5.7 dB | 12.5 dB/12.4 dB | 20.4 dB/20.1 dB |
| 14 MHz    | 50 dB/63 dB           | 5.8 dB/5.7 dB | 12.5 dB/12.4 dB | 20.4 dB/20.1 dB |
| 28 MHz    | 50 dB/63 dB           | 5.8 dB/5.7 dB | 12.5 dB/12.4 dB | 20.4 dB/20.1 dB |
| 50 MHz    | 49 dB/62 dB           | 5.8 dB/5.7 dB | 12.5 dB/12.4 dB | 20.5 dB/20.1 dB |
| 146 MHz   | 44 dB/58 dB           | 6.0 dB/5.7 dB | 12.7 dB/12.3 dB | 20.8 dB/20.2 dB |
| 220 MHz   | 41 dB/54 dB           | 6.1 dB/5.6 dB | 12.8 dB/12.2 dB | 21.0 dB/20.0 dB |
| 450 MHz   | 37 dB/54 dB           | 6.2 dB/5.5 dB | 12.7 dB/11.6 dB | 21.7 dB/19.7 dB |

good the square wave output actually is. There are no observable even harmonics, and the odd harmonics closely follow the expected  $20 \log [2/(\pi n)]$  levels, where  $n = 1, 3, 5$ , etc.

Next, I made return loss measurement accuracy tests using a precision 50  $\Omega$  load, and shorted 3 dB (6 dB RL), 6 dB (12 dB RL), and 10 dB (20 dB RL) microwave attenuators. Because these attenuators are not perfect, they were also measured with an Array Solutions VNAuhf. Table 4 compares the MATCH return loss measurements to the Array Solutions VNAuhf.

Finally, Table 5 displays some MATCH complex load measurements at 50 MHz, 147 MHz, 220 MHz, and 440 MHz, as compared to the Array Solutions VNAuhf. As you can see, the MATCH provides excellent measuring capability. Note that the correct sign of the reactance is displayed.

There are many useful features available in the MATCH. Besides SWR, which will probably be the feature used by most hams, there is also the ability to measure cable length, cable loss, velocity factor, and characteristic impedance.

I began by measuring the SWR of a 50 MHz band-pass filter, as shown in the lead photo. While a photo of the display may be okay for some applications, you can also capture and export screenshots and plots using *AntScope2*. As examples, Figure 2 displays an SWR sweep of my 43-foot vertical from 1 – 29 MHz. This is a PNG screenshot exported by the MATCH using *AntScope2*. Figure 3 shows the direct *AntScope2* plot of the same thing. Note that the ham bands are highlighted.

The TDR function is useful for determining discontinuities in your antenna system. I used this to determine the physical length of coax from my operating position to my 43-foot vertical, which I estimated to be about 70 feet. The MATCH gave me the actual distance as just under 24 meters, or about 78 feet, as shown in Figure 4.

Next, I threw together a 2-meter quarter-wave ground plane antenna that I also wanted to work as a  $\frac{3}{4}$ -wave antenna on 440 MHz. Figure 5 shows the MATCH screenshot of SWR from 100 – 500 MHz. Figures 6 and 7 show the individual 2-meter and 70-centimeter bands. I trimmed the 2-meter dimensions slightly to

**Table 5 — MATCH Complex Load Measurements**

| Band    | MATCH |           | VNAuhf |           |
|---------|-------|-----------|--------|-----------|
|         | SWR   | Impedance | SWR    | Impedance |
| 50 MHz  | 1.92  | 47 – j32  | 1.96   | 48 – j34  |
| 147 MHz | 1.83  | 42 – j37  | 1.80   | 46 – j29  |
| 220 MHz | 1.77  | 39 – j23  | 1.75   | 43 – j25  |
| 440 MHz | 1.29  | 60 – j9   | 1.27   | 63 – j2.4 |

## Open/Short/Load Calibration Loads

Sometimes it is convenient to calibrate out the interconnecting coaxial cable so as to be able to make a remote antenna measurement. Or you may wish to recalibrate your MATCH if you suspect the calibration has been corrupted. To do this, you need to run through the OSL calibration routine. For calibrating at the end of the cable, the open, short, and load are placed at the end of the cable.

To make calibration loads, use SMA/N and SMA/UHF adapters, an Amphenol RF 132360 SMA 50  $\Omega$  load, and an Amphenol RF 132331 SMA shorting cap. The male UHF and N adapters are used at the MATCH's antenna port, and the female UHF and N adapters are used at the end of the coax. The adapters, load, and shorting cap can all be found at [www.amazon.com](http://www.amazon.com) and [www.mouser.com](http://www.mouser.com).

However, the adapters are less expensive at Amazon, and the load and shorting cap are less expensive at Mouser. Figure 12 shows the adapters, load, and shorting cap.

I measured the Amphenol RF 50  $\Omega$  termination on an HP/Agilent 8722D vector network analyzer and found that the return loss exceeded 40 dB through 1200 MHz. When the SMA termination was installed on the N/SMA adapter as a calibration load, the worst-case return loss was 32 dB at 1200 MHz (SWR  $\approx$  1.05:1), improving to better than 40 dB return loss below about 650 MHz (SWR  $\approx$  1.02:1). For the OSL calibration, leave the N or UHF adapter unterminated for the open, screw on the shorting cap for the short, and screw on the 50  $\Omega$  termination for the load. Because the adapters, SMA load, and short are not expensive, you may wish to create permanent standards for all of your different connectors.

raise the resonant frequency on this band. In this way, I was able to get a decent SWR in the repeater portion of the 70-centimeter band.

The next feature I looked at was the LC Meter feature in the **TOOLS** menu. This is only available on the RFE license. While you can determine inductance (L) and capacitance (C) by using impedance measurements with the basic version, the LC Meter function automatically scans the component from 100 kHz to 100 MHz, and then you can use the cursor to find the exact value at your frequency of interest. First, I built a component fixture, as shown in Figure 8.

When I first started measuring capacitors, I typically showed 5 pF more than what was labeled. It finally occurred to me that I needed to go through the OSL calibration with the fixture so as to eliminate the stray fixture capacitance. To calibrate this fixture, I used a 49.9  $\Omega$  0.1% precision resistor for the load, and just a shorting wire between the two alligator clips for the short. Once calibrated, all of the capacitors tracked very close to the labeled value. Figure 9 shows a 22 pF (as marked) capacitor. Figure 10 shows a toroid inductor. This is 26 turns on a T68-6 core. The calculated value was 3.2  $\mu$ Hy, and the measured value was 3.46  $\mu$ Hy.

Finally, I wanted to build a 2-meter turnstile antenna. For this I needed a quarter-wave 75  $\Omega$  matching line. A quarter-wave length on 2 meters is about 19 inches in free space. However, because of the velocity factor of coax, the actual length will be less. So to come up with the actual length, go to the **SETTINGS** menu and set the impedance to 75  $\Omega$ . Next, go to the **TOOLS** menu and select **STUB TUNER**. Because I knew the length would be less than 19 inches, I started with 19 inches and carefully trimmed the coax while checking the stub length on the MATCH. Once the MATCH showed that the stub was cut for 146 MHz (Figure 11), I measured the final stub length (including the connector) at 16 inches.

## Conclusion

The MATCH is an accurate antenna and component analyzer that can be an indispensable tool for most hams. It has a tremendous number of features and is very easy to use. You can investigate the MATCH further by viewing the manual on the RigExpert website.

*Manufacturer:* Rig Expert Ukraine Ltd., Solom'yans'ka Square, 2, 03035, Kyiv, Ukraine, [www.rigexpert.com](http://www.rigexpert.com). Available from several distributors in the US. Price: Basic, \$350; optional Advanced license, \$100; RFE license (includes the Advanced license), \$200.



# Long Island CW Club Haptic CW Decoder

Reviewed by Paul Danzer, N1II  
n1ii@arri.net

The Haptic CW Decoder is an effective vibrational CW decoding device (patented). There are many reasons that an individual's ability to hear may be deficient. This is not an uncommon situation as a ham gets older. After a while, simply turning up the volume is not enough, and many hams who use in-the-ear hearing aids often hear a word or phrase boosted to a good volume by the hearing aid mechanism but are not able to interpret the word(s).

This decoder was designed for those with hearing problems and who want to continue working CW. It is a haptic (relating to touch) device and was developed by Bob Leichner, WO6W, with the participation of the Long Island CW (LICW) Club ([www.longislandcwclub.org](http://www.longislandcwclub.org)).

The 1-pound unit (see the lead photo) can be placed with the control knobs facing either you or away from you. Placement depends on your comfort — choose a hand, arm, or even vibration reflected from the tabletop. The amplitude of the output vibration is adjustable (more on that later), and a little experimentation is probably in order. Dimensions are approximately 7 inches deep, less than 2 inches high (with all knobs and protrusions), and 4½ inches wide. Unfortunately, the engraved labels are not very visible. However, included is a stick-on colored label identifying the four control knobs.

## Straightforward Installation

The unit comes fully assembled. On the left side of the hardware are two identical audio jacks (see Figure 13) tied internally together. They act as a Y connection. The lead from your existing external speaker is disconnected from your rig, computer, or other CW training device and plugged into either one of the two audio jacks. A supplied cable is then plugged into the remaining audio jack and the other cable end back into

### Bottom Line

The Haptic CW Decoder can be a valuable way to allow those with hearing deficiencies to stay on CW or get back on it. A great deal of practice is needed to get the best results, but for CW enthusiasts this is surely worth the time investment.



the rig speaker output. Thus, no additional audio hardware is needed.

The power connection jack is also on the left side with a matching wall-wart power block supplied. This is the supply voltage for the unit. Because the audio connection is a simple Y when power is turned off, the speaker is directly connected to the rig and operation is normal with the speaker. Power is turned on by a small slide switch on the top surface just above the power supply input jack. With power on, a tiny green LED is illuminated near the slide switch and the speaker-to-rig connection is maintained, but received audio is also routed to the haptic CW unit. In addition to the supplied wall wart, the device can be powered from any external dc supply of 7 – 15 V. Included in the package is a single-page quick-start instruction sheet, which is most probably all you will need. There is, however, an online tutorial (more on that later).

## Behind the Panel

You can represent the circuit operation by looking at it as being divided into two sections. The first section processes the input signal and is controlled by the red and blue knobs. To prevent input overload, the red knob acts as a volume control for the input signals to the haptic processor; your rig's volume remains unaffected. The adjacent blue knob selects the tone frequency of the audio note you wish to copy; in other words, it is a single-frequency audio filter such as a phase lock loop (PLL) design would provide. More sophisticated filtering is left to the radio.

The output of the first stage keys an oscillator in the second stage. The oscillator output frequency is determined by the white knob and is set to a frequency you select for the output transducer — the large black vibration-producing component on the top of the unit surface. The final orange knob allows you to select the strength of the vibration (again, to your taste).

### Turning It On for the First Time

There is what may be a one-time adjustment. An audio signal is needed to set the input filter frequency. Most hams prefer to look for an incoming CW note identical to their rig's sidetone frequency; in this case, no external test equipment is needed. Either set your rig to a zero power level, or connect it to a dummy load, and then key down.

Next, adjust the blue knob for maximum output by turning it clockwise to increase the listening tone frequency, or counterclockwise to decrease it. By working both the blue and red knobs, you can set the input to a range of acceptable signal strength and frequency. These two knobs will be used when selecting an on-the-air signal.

The output circuit is controlled by the remaining two knobs — the white knob (frequency) and the orange knob (strength) of vibration. Generally, you will not have to touch these two knobs very often once you have set the vibration frequency and amplitude to a comfortable and usable level.

### Other Outputs

There are two jacks on the right side of the unit (Figure 14). The smaller one is connected to the contacts (isolated from ground) of a solid-state relay capable of safely switching 50 mA in sync with the incoming CW. When connected to the supplied wall-wart power cube, there is an extra 5 V capacity of 200 mA (at the larger jack) available for any external equipment you might want to power.



**Figure 13** — Either of the two identical jacks can be used for audio in or audio out. The remaining larger jack is the power input.

### One More Thing

We understand the world outside of our bodies by using one or more of the five senses: sight, hearing, touch, taste, and smell. Unfortunately, the ability to use one of these senses might not be as great as it should be, perhaps due to age, disease, injury, or other reasons.

Each of these senses has a common mechanism that includes a sensor and a path to the brain. Radio amateurs communicate by using hearing or sight or perhaps both. This device, aptly named a *haptic assist*, provides another path to the brain — utilizing the sense of touch. The word *haptic* is defined as pertaining to the sense of touch.

While radio amateurs might use this sense to communicate by encoding information in Morse code (using CW), other encoding could be used to make this another path. As a simple example, the output buzz could be changed (modulated) in frequency, amplitude, and time. Another approach would be to add a second output transducer. In other words, the possible use of this sort of device might be applied to other sensory and/or medical problems where either the sensor or part of the brain is not functioning properly.

### On the Air

Full disclosure — I have been using hearing aids for more than 10 years, and my primary operating mode is HF/CW. Therefore, I have more than a casual interest in this unit for the future. In addition, I have tested several code readers in the last few years. They have to perform the same task as this haptic code reader — copy signals with various amounts of noise and QRM, although their outputs have been visual.

Some published comments have claimed that the decoder will operate correctly up to 50 or 60 WPM. I could not test this, as I had no way to tell if it was operating correctly at those speeds!



**Figure 14** — The two auxiliary jacks are on the right side of the enclosure toward the back.



To start, I wanted to set the input tone frequency (using the blue knob) to the same frequency as the sidetone on my Icom IC-7300. The IC-7300 was set for paddles, so I switched the mode to straight key. Keeping one paddle pressed gave a constant tone. I adjusted the blue knob to center the output (including the three LEDs) in the band pass, reducing the gain (red knob) as far as possible. With the white and orange knob set to mid-position, there was a perfectly good response from the unit without further adjusting.

The first test was to tune a clean signal. My home station is about 60 miles from W1AW; their code practice and bulletin transmissions are a very handy test source. To get a copy, I did not have to touch the colored knobs; I just used the main tuning dial on the rig to center the tone and copied from there. Later, with other input signal amplitude, I used both the red control on the unit and the volume control on the rig. At no time in further tests did I have to touch the blue knob (input frequency).

I tried placing the haptic unit in three different positions — first, with the knobs facing me and the transducer farther away from me; next, with the knobs away from me; and finally, with the unit turned upside down on a 10 × 10-inch piece of acrylic (plastic). The result of trying these three positions? Do whatever is comfortable. Even upside down, the transducer output was enough for me if I wanted to select this position.

An additional concern was that I was not seeing the true performance of the haptic unit, because as I tuned around I could feel the transducer vibration and hear the audio output from the speaker at the same time. I put a switch in the line so I could substitute for the

speaker with an 8 Ω load. As a result, I heard/felt no difference with or without the speaker connected.

A DX contest proved to be a handy source of how well it would perform in a contest. Although a specific number cannot be given, there was no question that the haptic unit was very usable. Several unexpected effects were seen. When a strong signal (at the correct input frequency) covered up a weaker signal at the same input frequency, most of the time you could tell if a particular letter or word was coming from the stronger or weaker signal. The three red LEDs on top of the unit have not been discussed earlier. On a quiet band, the LEDs blinked as expected with a readable input signal. However, when there was no signal, the LEDs winked on and off, suggesting that noise of some sort was present. This reminded me that my receiver was working even though there were no stations at the current rig-tuned frequency.

### In Summary

There is definitely a learning curve and a need to try different settings to get the best results. Support is available through the LICW Club and a support group, LICW-Haptic groups.io (<https://groups.io/g/LongIslandCWClub>). In addition, support is available through Bob Lechner, WO6W. The device comes with a 30-day money-back guarantee if the unit is not of value for you. An online demo is at the CW for the Hearing Impaired — Long Island CW Club website. To get accustomed with a new way to do things, practice!

*Manufacturer:* Long Island CW Club, [www.longislandcwclub.org](http://www.longislandcwclub.org). Price: \$275. For order information, contact [info@longislandcwclub.org](mailto:info@longislandcwclub.org).

## SignalStuff Signal Staff Collapsible OSJ Antenna

*Reviewed by John Leonardelli, VE3IPS*  
**[ve3ips@gmail.com](mailto:ve3ips@gmail.com)**

The iconic J-pole antenna is a popular choice for operation on the 2-meter and 70-centimeter ham bands. It can be purchased as a roll-up version using ladder line or as a homebrew copper pipe design, or it can be made from solid aluminum rods. I have all of these in my antenna inventory, and each serves its purpose. The roll-up version fits in a backpack pocket, making it portable but requiring a place to hang it. The metal versions are nearly 5 feet long, making portability more challenging. I have had an aluminum J-pole outdoors for





**Figure 15** — The SignalStuff Signal Staff OSJ deployment at an evacuation shelter.

more than 10 years, and it continues to provide reliable coverage of local repeaters.

During several outdoor activities, including an ARES simulated emergency test session and past VHF contests, I used the J-pole for dedicated simplex FM contacts. However, its length made portability cumbersome, and its mast mount allowed deployment only on a pole or fiberglass mast. While this works well, I wanted a more compact version for easier transport to my signal hill location. I prefer carrying everything in a backpack, so I needed a more portable option.

While researching whether SignalStuff offered their Signal Stick whips with a Baofeng mount (they do), I discovered that they also offer a collapsible J-pole

### Bottom Line

The SignalStuff Signal Staff Collapsible OSJ provides a 5-foot-long antenna operable on two bands with a solution that fits in a 16-inch pouch for easy transport.

in partnership with S&K Antenna Systems. Richard, KD7BBC, takes pride in made-in-the-USA quality construction at competitive prices with an excellent warranty. The antenna consists of several threaded aluminum rods and a mounting bracket, all fitting into a 16-inch carry bag (not included). Now, I have a J-pole antenna that provides dual-band coverage while being easy to transport. The threading is precisely machined, ensuring no slope, binding, or sharp edges.

The antenna features a standard ¼"-20 tripod mount, similar to a camera mount, allowing for easy installation on a camera tripod. I have used camera tripods for antennas for years because they enable quick and simple deployments. My most recent tripod purchase collapses to just 16 inches, making it easy to pack in a backpack or a larger Pelican case.

For pole or mast deployment, an optional mast mount is available and highly recommended. Initially, the mast mount may seem confusing if you don't read the instructions, but it attaches to the existing bracket and is secured with the two-element coupling nuts. The top element includes a hole designed to accommodate a carabiner, eyelet, or Paracord loop, allowing for easy suspension from a structure when needed.

One drawback is that the kit does not include the actual mast-mount clamps. However, the mast-mount hole pattern suggests compatibility with different clamp sizes, depending on the mast diameter. This is a well-thought-out feature determined by real-world testing and will accommodate a painter pole, 1¾-inch TV mast, or 3-inch PVC pipe.

For assembly, I recommend hand-tightening all elements and nuts. If you plan to store the antenna in a long pouch, consider adding a small adjustable wrench (easily found at a dollar store), extra nuts, 25 feet of Paracord, electrical tape (to protect the mast from clamp damage), and a variety of mast clamps to your kit for maximum flexibility.

If you come across photographic lighting tripods, which typically extend from 6 to 15 feet, a ¼-inch threaded adapter would make them an excellent mounting option for the J-pole bracket.

The antenna bracket also features a mnemonic aid: one element at the engraved "1" mark and a total of five elements on the engraved "5" side. Each element is 12 inches long.

### Use Case 1: ARES Emergency Exercises

ARES emergency exercises typically rely on 2-meter FM simplex for communications, with some traffic



passed on 70 centimeters. The J-pole is ideal for this role and, when mounted on a tripod or lighting stand, offers an easy deployment solution with no additional equipment required. Additionally, a safety coordinator may suggest using a weighted grip bag to enhance tripod stability, and an orange cone underneath the mast enhances visibility. This setup presents a more professional appearance compared to a twinlead J-pole flapping in the wind. Coverage is broad, with low SWR across both bands. No duplexer is needed for modern handhelds and mobile radios.

### Use Case 2: ARRL VHF and Sprint Contests

ARRL VHF and sprint contest activity has been increasing in my area, with more 2-meter FM operators exchanging grids. These operations are line of sight, making height advantageous. My signal hill location provides 300 feet of elevation at the summit, significantly extending my contact range. Packing my Icom IC-705, a battery for 10 W output, RG-316 coax,

a tripod, and the collapsible OSJ antenna makes for an efficient deployment. During the recent contest, temperatures dropped to  $-20^{\circ}\text{C}$ , but being able to quickly deploy the antenna while wearing gloves made operations simple and effective. I was able to make contacts more than 100 miles away.

J-poles offer about 2 dB gain and are omnidirectional, making them ideal for my use cases.

### Conclusion

The SignalStuff Signal Staff Collapsible OSJ Antenna is an excellent choice for my VHF/UHF operations, providing a fast and easy-to-deploy solution regardless of conditions. My primary need for a packable antenna has been met. With its solid construction and strong performance, I expect years of reliable use, making this antenna a very worthwhile investment.

*Manufacturer:* SignalStuff, [www.signalstuff.com](http://www.signalstuff.com).  
*Price:* \$65.

## Venus DR-4020 QRP Digital Radio

*Reviewed by Michael Fluegemann, KE8AQW*  
[ke8aqw@arri.net](mailto:ke8aqw@arri.net)

The Venus DR-4020 QRP radio is a neat compact radio that's perfect for portable operation for digital modes. Small enough to fit in the palm of your hand, all you need is your antenna and a computer and you are set to go. Unlike other similar units, this radio is advertised for use with PSK modes and upper-sideband SSB with modification.

### Description

This radio is made for digital operation for the 40- and 20-meter bands. There are only four connection points on the back: antenna, power, audio in, and audio out. The front has a small LCD display to show the memory channel and frequency, band, battery voltage, and whether transmitting or receiving. There is a TX indicator LED, a power button, and a rotary pushbutton as the only control. It can be powered off a 12 V dc battery and puts out 4 W. It is an upper-sideband radio that uses VOX to send digital modes with a computer. See Table 6 for the Lab test results.

### Bottom Line

The Venus DR-4020 is an inexpensive digital-only QRP radio for 40 and 20 meters. Its small size makes it easy to throw into a laptop bag with a wire antenna and a battery for simple portable operations.



### Operation

The manual for the radio is available on the Venus website. It is very easy to set up. Simply connect the antenna and power to the radio. Connect **DATA OUT** to the computer's microphone port and **DATA IN** to the computer speaker port with the supplied I/O cables. The unit comes with the I/O cables and a USB sound card for convenience. On the computer, open the desired program like *fldigi*, and in the sound menu settings, select the correct audio streams. Use *fldigi*'s and the computer's volume/mic settings to provide the radio with proper audio levels for TX/RX.

To switch between bands, click the rotary button. Then rotate the knob to one of the five memory slots for

that band. The radio can also be used in VFO mode by holding the rotary button for 2 seconds. From there you can either save that frequency to the memory slot or return to memory mode without saving. Once you store the common frequencies in the memory bank, the operation is very quick. In VFO mode, the step size is 100 Hz, so selecting frequencies for memory storage took a bit of time when first setting it up.

## Going Portable

When I wrote this review, I spent a month with my uncle in California and took this radio, along with an end-fed wire antenna, with me. With the antenna strung up in the house, I was able to run a WSPR beacon with this radio. The unit worked as advertised. With the audio levels adjusted properly, the radio switched into transmit mode with the VOX functionality, and I was able to see online where I was received. I initially found that the wall-wart power supply I was using was causing a lot of interference in the receive waterfall, but when I ran the radio off a battery, the

**Table 6 — Venus DR-4020 Digital Mode Dual-Band HF QRP Radio, serial number K187066BSJH**

### Manufacturer's Specifications

Frequency coverage: 20 and 40 meters.

Power requirements: 10 – 14 V dc at 50 mA receive, 800 mA transmit (4 – 5 W RF output).

Modes of operation: Digital on USB mode, FT8, FT4, JT65, PSK31, SSTV, etc.

Receiver sensitivity: Not specified.

Power output: Up to 5 W.

Spurious-signal and harmonic: Not specified.

Transmit phase noise: Not specified.

Size (height, width, depth): In recommended wooden box, 1.5 × 3.46 × 4.88 inches.

Weight: 0.7 pound.

### Measured in the ARRL Lab

Receive, adjusted for 7.0 – 7.2 MHz; 14.0 – 14.35 MHz.

Transmit, as specified.

At 13.8 V dc: Receive, 65 mA; transmit, 720 mA max (5.3 W output).

As specified.

Noise floor (MDS): –99 dBm / 2.5  $\mu$ V.

At 13.8 V dc: 5.7 W with 14.02 MHz.

>44 dB (see Figure A).

Complies with FCC emission standards.

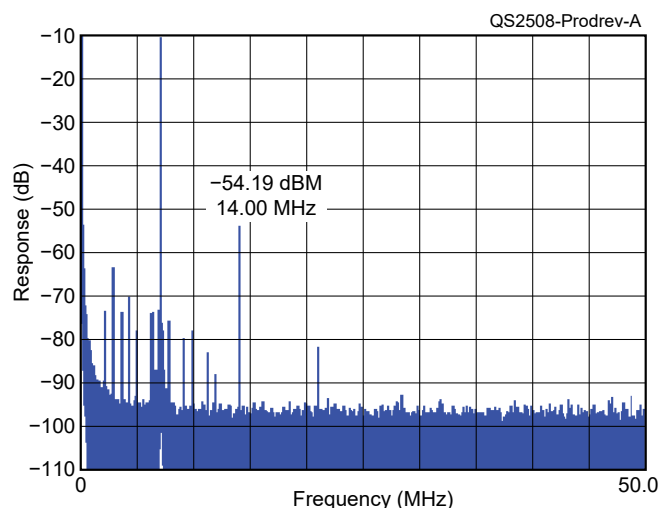
See Figure B.

issue went away. At one point I plugged an amplified speaker into the **DATA OUT**, and I was able to hear some SSB stations; however, I did not try to connect a microphone to the unit.

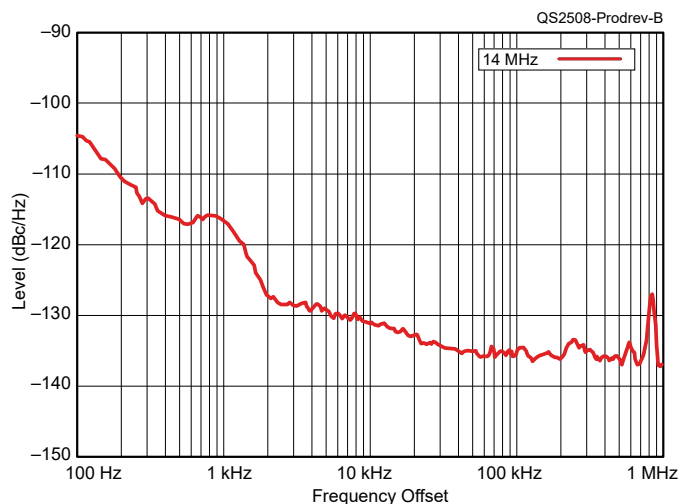
## Final Thoughts

For any hams who prefer digital operations but also like to go portable, I strongly suggest looking at this radio. Its small size makes it easy to throw into a laptop bag with a wire antenna and battery power supply, perfect for your next trip.

*Manufacturer:* Venus Information Technology Co., Ltd., 1890-1606 W. Taihu Ave., Wuxi, Jiangsu, 214000, China, [www.venus-itech.com](http://www.venus-itech.com). Price: fully assembled version, \$146; kit version, \$118.



**Figure A** — Spectral display of the DR-4020 transmitter output. Power output is 5 W on the 7 MHz band. This plot shows the output spectrum from 0 to 50 MHz. The second harmonic is down 44 dB from the carrier, and the third harmonic is down more than 70 dB. Close-in spurious emissions are down 52 dB. The vertical scale is 10 dB per division.



**Figure B** — Spectral display of the DR-4020 transmitter output during phase-noise testing. Power output is 5 W on the 14 MHz band. The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –90 dBc/Hz, and the vertical scale is 10 dB per division.



## Ask Dave

Get more information from the “QST: Ask Dave” YouTube playlist at <https://bit.ly/3z2MBMI>.

# Noise, Open Wire, and Salt Water

## HF Band Noise Due to Static

**Q** Tony Ling, G7TXU, asks: I often hear people complaining about noise on the HF bands when conditions are enhanced. Are they correct in attributing this to static, or is there a more accurate term to describe it?

**A** The term *static* refers to the RF noise resulting from a discharge of electrostatic charge, often in the form of a spark. It is used more broadly for many other forms of HF noise.

One feature that new General licensees encounter on HF is that the background noise is much higher than what is found on VHF or UHF. Three separate Q signals are used to refer to band conditions. QSB refers to a signal that fades in and out, often due to multiple propagation paths that interfere constructively or destructively. QRM refers to other stations interfering with the desired signal, often unintentionally. QRN refers to natural and man-made noise that raises the background noise level to the point where communications become difficult.

What you are referring to as static falls into the QRN category. The noise you hear on HF between stations comes from many sources. One of the most common is lightning discharges. Each lightning strike creates intense and powerful broadband RF noise, which creates the typical crackly noise you hear. No matter where a lightning strike occurs, this broadband noise, like any other HF radio signal, can be refracted by the ionosphere and heard around the Earth. Note that lightning strikes can last a few seconds, so the crackly noise can vary greatly depending on where it is from. QRN from lightning strikes around the world gets weaker the farther away they are. Static is worse in the summer because of frequent thunderstorms. The situation is reversed in the winter, when thunderstorms are more common in the other hemisphere. If the station you are contacting has a powerful signal, you may find it will be stronger than the static, so you can hear it clearly.

Many other sources can create RF noise, such as aurora in both hemispheres, appliances, the sun (which can create atmospheric white noise), powerlines

(which sometimes arc and create noise), etc. Because single sideband (SSB) is fundamentally an amplitude-modulated wave, atmospheric noise can interfere with communications or even make them impossible. Often, hams refer to all types of noise as static.

CW is also an amplitude-modulated waveform and therefore subject to atmospherics, but it is often easier to pick out a single-frequency signal against a broad background of constantly changing noise. FM was created specifically to avoid the effect of static on AM radio reception. FM usually has a much wider bandwidth than SSB, so its use on the ham bands is limited to 29 MHz and above. Digital modes, like FT8, have been created to get a signal through all the noise with good results. Your radio's noise reduction feature often works quite well on static.

## Open-Wire Line Less Lossy than Coax

**Q** Ken Slusher, N2DF, asks: Are open-wire line, window line, and twinlead lossless?

**A** They aren't, but they have a reputation for considerably less loss than an equal length of coax. The impedance of any two parallel wires can be calculated directly from rather difficult formulas that are a function of the diameter of the wires and the distance between them. But it also requires the permeability and permittivity of the insulating material, whether it is air or plastic. Hams do not often construct their own open-wire line, but rather use traditional open-wire line (called ladder line) at 600  $\Omega$  characteristic impedance, window line (often referred to as ladder line, which creates confusion) at 450  $\Omega$ , and twinlead at 300  $\Omega$ . Window line is by far the most frequently used and is readily available from ham radio suppliers.

Nearly all the coaxial cable used in ham radio has a characteristic impedance of 50  $\Omega$ . The impedance of a transmission line is the ratio of the root-mean-square (RMS) voltage to the RMS current. We often write about impedance using  $Z$  instead of  $R$  as a reminder that there is reactance at work as well as resistance. See Figure 1 for a comparison of window line and coax.



**Figure 1** — Two types of transmission line: coaxial cable (top) and window line (bottom). Window line has much less loss per foot than coaxial cable, but coax is much more commonly used in ham radio due to its convenience.

Losses in transmission lines include the ohmic resistance in the wires themselves, regardless of the type of cable. Loss due to ohmic resistance is a function of the current in a cable, not the voltage. Let's see how this works by using a 100 W radio, 100 feet away from the antenna, and a #16 AWG wire, such as the popular RG-8X cable. To compute the losses for comparison purposes, we need to know the current. Ohm's law states that  $E = I \times R$ , where  $E$  represents voltage,  $I$  represents current, and  $R$  represents resistance, and the power law tells us that  $P = E \times I$ , where  $P$  represents power.

We can substitute Ohm's law into the power equation to get  $P = I^2 \times R$  — in this instance,  $P$  is 100 W and  $R$  (or  $Z$ , if you prefer) is the characteristic impedance, 50  $\Omega$ . We can solve for current:  $P/R$  is 2, so current is the square root of this, or 1.414 A. The ohmic resistance of #16 AWG is  $\sim 0.004 \Omega/\text{foot}$ , so for 100 feet (one wire at a time) it is 0.4  $\Omega$ . Power lost to heat is then  $1.414^2 \times 0.4 \Omega$ , or 0.8 W. Note this is *only* the ohmic resistance; total transmission line loss is also a strong function of frequency.

Now, let's look at window line (one way), also made with #16 AWG wire.  $P/R$  is now  $100/450 = 0.2$ . So, the current is the square root of this, or 0.447 A, while power is  $0.447^2 \times 0.4 = 0.08 \text{ W}$ , or one-tenth that of the coax. Going through both lines doubles that loss, but still, at one-fifth that of coax, it's a serious improvement.

There are two scenarios in which window line becomes preferred. First is when the antenna is used in a multi-band scenario. Common antennas such as a G5RV or a Zepp are not often resonant by themselves,

requiring the use of a tuner. The tuner, transmission line, and antenna together form a resonant reactive circuit, and the circulating currents are quite high. These circulating currents create exactly the  $I^2 \times R$  power losses we've been discussing. Second is the situation in which the transmission line is quite long. There is significantly less loss in the window line than when using coax.

So, why isn't window line used universally? It's a bit awkward to deal with. If the RF currents are unbalanced, the line acts as an antenna. Bringing window line into the shack can create tough RFI issues, which I know from experience. Also, the RF power does not stay in the wires but rather surrounds the window line, so steps must be taken to keep the line away from everything that might affect it, such as metal masts. Coax keeps all the RF inside, so extra coax can simply be coiled up or taped to the mast.

### Using Coastal Salt Water as a Counterpoise

**Q** John Adragna, N2JPA, asks: I live on a metal house barge in salt water using a Comet multi-band vertical HF antenna. Do I connect a line to the feed braid and toss it over the side into the water, or is simply being over water enough to act as a ground plane? Can the salt water be used as an electrical ground?

**A** You have an enviable situation! Ground your radio to the metal hull, then ground your antenna to the metal hull. Also, you can connect as you suggest and toss one end of the bare wire into the water.

Think of the water as an infinite counterpoise rather than a ground, because your shore power likely isn't grounded to the salt water. Because the wire from the antenna to the water carries current, you will have corrosion. Also, beware the steel in the ship and copper in the water — dissimilar metals with a powerful dielectric between them (salt) can also create corrosion.

You may want to have your favorite welder create a small unpainted metal mesh from the same material as your barge — some sort of steel. Connect the copper to the steel above the water line using stainless-steel hardware. It's not perfect, but it can minimize dissimilar material corrosion. Salt water is a persistent corrosion agent, so check those connections frequently.

Send your questions to [askdave@arri.org](mailto:askdave@arri.org). I answer some questions here, and some via videos on my YouTube channel ([www.youtube.com/davecasler](https://www.youtube.com/davecasler)), or during my weekly livestream on Thursdays at 6:45 to 8:15 PM Mountain Time on my channel.



## Hints & Hacks

# Build Your Own Potentiometers; Create a Spool Holder

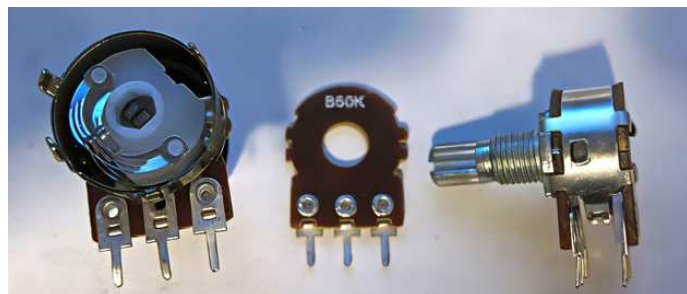
### Customized Asymmetrical Potentiometers

While designing a simple active high-pass filter (10 – 200 Hz, 12 dB/octave) for my nephew to use in a recording console, my first approach was to use a Sallen-Key design that I gleaned from an internet post. The operational amplifier configuration — while simple — employed the target chip, two capacitors of equal value, and two resistors with  $R$  and  $2R$  resistance ratios. I intended to use a two-pole, six-position make-before-break shorting switch to select between the resistors (a shorting switch is required in an active audio unit to prevent pops in the signal when the switch is used).

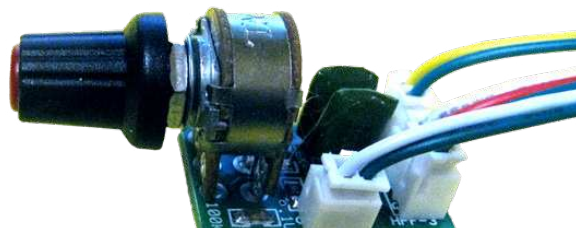
I didn't see a problem with this approach, until I discovered that finding such a switch was going to be a challenge. So, rather than switching between two fixed resistors, I opted to use a dual-section potentiometer (pot) instead. Not only would this offer more operator flexibility, but it would eliminate the popping issue.

To achieve this, however, I would need a dual pot with two resistive elements of differing values. These so-called asymmetrical dual pots, or **dual-gang** pots, exist but they are not common and can be expensive. My solution was to craft my own asymmetrical dual pots by swapping out the resistive elements.

My filter design called for a dual pot with 50 k $\Omega$  and 100 k $\Omega$  sections. I ordered a pair of Bourns pots from Mouser Electronics (a 100 k $\Omega$  dual unit and a 50 k $\Omega$  dual unit) and used them to build two asymmetrical pots for less than five dollars plus postage. The Bourns pots were ideal because their construction allowed me to easily remove their rear sections using a pocketknife



**Figure 1** — A Bourns dual potentiometer, disassembled to show the separate resistive elements. [Robert Miller, KE6F, photo]



**Figure 2** — The completed filter with the modified dual potentiometer. [Robert Miller, KE6F, photo]

(see Figure 1). Once I accomplished this, I was able to transfer the resistive elements from one to the other, thereby creating the desired asymmetrical pot (see Figure 2).

If you attempt this solution, consider whether the taper specifications of the pots you intend to use are linear or logarithmic (often referred to as an **audio taper**). I used linear pots in the active high-pass filter. However, if a pot were to be used as a volume or audio gain control, a logarithmic (audio taper) unit would be the better choice.

The logarithmic taper provides a minimal change in value during the first 50 percent rotation. This results in a gradual increase in audio volume for most listening levels, while the linear taper is more applicable to instrumentation requiring a one-to-one relationship between rotation and value change. — **73, Robert Miller, KE6F, millerke6f@aol.com**

### Make a Spool Holder

All of my wire spools are in drawers. Most of the time, this is not a problem because I tend to use relatively short pieces of wire. Recently, however, I was building several larger inductors that needed a yard or two of wire. I wanted a way to mount a spool of wire in order to simply wind it around the inductor form.

I've been trying my hand at building AM radio receivers using either simple diode circuits or, for more involved regenerative receivers, TA7642 integrated circuits. For both circuits, I needed to spool long pieces of wire around either a ferrite core or a cardboard toilet tissue roll.

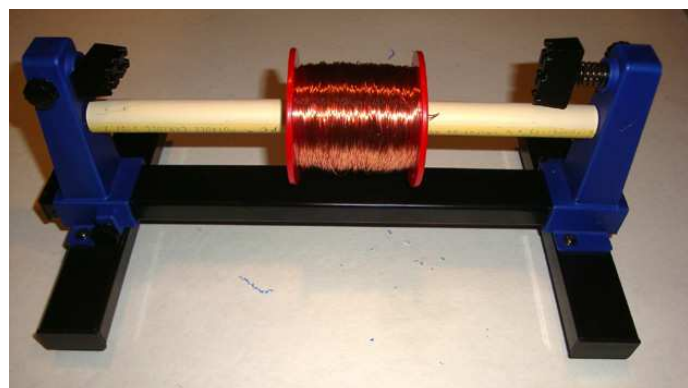


**Figure 3** — The white plastic nubs shown attached to the circuit board holder's arms. [Phil Karras, KE3FL, photo]

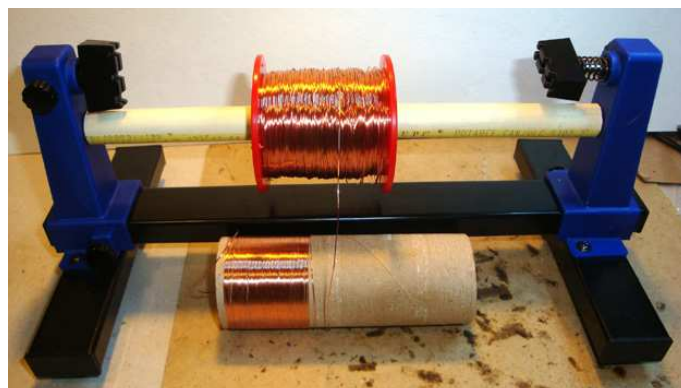
I ended up using my circuit board holder for the tasks, and I decided to modify it by adding a couple of small mounting nubs to the holding arms. This allows me to mount a PVC pipe onto the nubs when needed. The pipe and the nubs can be quickly removed when necessary.

I went searching through my junk drawer for small pipes and located exactly what I needed. I also found a few small plastic items, about the size of standoffs for a printed circuit board. I then located two matching screws that would fit through these standoff-sized items and be able to screw into the vertical arms of the circuit board holder. These would become the nubs that hold the pipe.

I drilled holes for the nubs, taking care to select points where the nubs would not interfere with the circuit board holder (see Figure 3). Of course, the nubs must



**Figure 4** — The wire spool slips over the short PVC pipe, and the nubs hold the pipe in place. Now the spool can rotate freely. [Phil Karras, KE3FL, photo]



**Figure 5** — For my AM diode radio project, I easily wrapped 80 turns of #26 AWG magnetic wire around a cardboard form. [Phil Karras, KE3FL, photo]

be mounted so that the PVC pipe will be as close to horizontal as possible when it is in position.

When I'm ready to roll wire, it is easy to install the spool onto the pipe and then secure the pipe onto the nubs (see Figure 4). There is also enough room for two spools of wire, which will come in handy if I ever have a project requiring two different colors or sizes of wire. This is not intended to replace those wire-spooling stands that hold many spools of wire.

For my AM diode radio project, I needed to build a coil consisting of 80 turns of #26 AWG magnetic wire. This went much quicker than I expected with the new spooler (see Figure 5).

To take this apart, all I have to do is loosen one of the set screws holding one of the vertical arms in place and push it out a bit until the PVC tube comes off. Then, I can use the circuit board holder as originally intended. — **73, Phil Karras, KE3FL, ke3fl@arrl.net**

"Hints and Hacks" items have not been tested by QST or ARRL unless otherwise stated. Although we can't guarantee that a given hint will work for your situation, we make every effort to screen out harmful information. Send technical questions directly to the hint's author.

QST invites you to share your hints with fellow hams. Send them to **hh@arrl.org**. Please include your name, call sign, complete mailing address, daytime telephone number, and email address on all correspondence. Whether you are praising or criticizing an item, please send the author(s) a copy of your comments.

## Feedback

In the June 2025 issue, Figures 1 and 4 in "XRAI-1 External Receive Antenna Interface" contain errors. The positive side of C1 should be connected to the NC terminal of RY1, as shown in the Figure 1 schematic. Although the XRAI-1 will operate with C1 incorrectly installed, the protection to the RX antenna will be lost if the key line isn't connected. The connection from the left side of SW1 to RY1's dc+ terminal is also missing in Figure 1. Both have been corrected in the digital edition.



# ARRL Activities at Hamvention® 2025

This year's event boasted packed forums, book signings, youth engagement, and more.

## Rich Moseson, W2VU

For 3 days in May, in Xenia, Ohio, a corner of one of the exhibit halls at the 2025 Dayton Hamvention® turned into a mini-ARRL Headquarters, ARRL expo, where members had the opportunity to interact with staff, officers, Directors and Vice Directors, book authors, and Field Organization volunteers from around the country. ARRL CEO David Minster, NA2AA, and First Vice President Kristen McIntyre, K6WX, talked with a nearly endless stream of members at the meet-and-greet area. Engineers from the ARRL Lab checked handhelds for compliance with FCC standards. ARRL VEC Manager Maria Somma, AB1FM, answered questions from Volunteer Examiners about the transition to an all-digital exam system and helped members renew their licenses. Member Services staff made it easy to join ARRL or renew memberships, and to purchase books and ARRL swag.



ARRL's corner of the expo hall saw a great deal of traffic. Many were excited to leaf through ARRL's recent publications. [Greg Sulla photo]

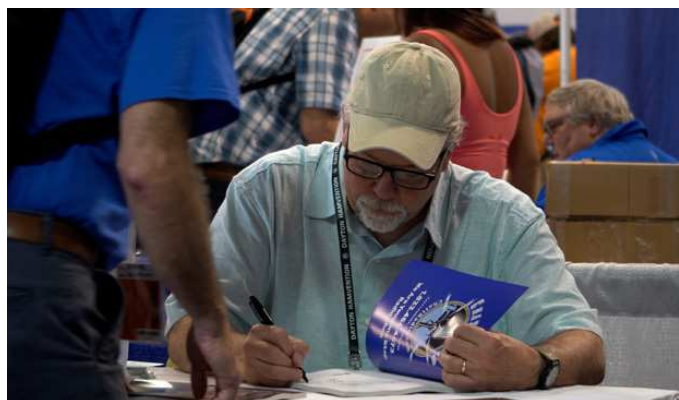
## Iconic Ham Authors Pay a Visit

Several ARRL-related forums were held throughout the weekend, starting on Friday with Walt "Salty Walt" Hudson's, K4OGO, standing-room-only portable antenna forum, which was built around his ARRL-published book, *Salty Walt's Portable Antenna Sketchbook*, which debuted at Hamvention. Salty Walt was also on hand at the ARRL expo area to sign books and chat with readers. He said:

Hamvention 2025 was one of the most amazing experiences of my life. Starting off with my forum on Friday morning, I didn't expect to see [that] amount of people in the room. My thoughts were that there would be maybe 50 attendees, tops. It sure gave me some nerves when I looked out and saw the room was packed and standing-room only. It was so great to see how well my presentation was received. Immediately after that, I went over to the ARRL expo area for the book signing and was once again overwhelmed by the number of people purchasing my book and asking me to sign it. I thought to myself, "I'm just a guy [who] likes to draw antennas, sit on the beach, and play radio. These people are making me feel like a rock star."



Walt "Salty Walt" Hudson, K4OGO, addressed a standing-room-only crowd at his forum on portable antennas. [Greg Sulla photo]



Salty Walt was also available to autograph copies of his ARRL-published book, *Salty Walt's Portable Antenna Sketchbook*, back at the ARRL expo area. [Greg Sulla photo]



ARRL CEO David Minster, NA2AA, spoke at the “ARRL Member Forum” about the new DXCC Trident award and the current threat to HF ham bands from high-speed data transmissions by stock traders. [Greg Sulla photo]

Throughout the weekend, meeting so many people who wanted to take a selfie with me or talk about me and my YouTube channel made my entire Hamvention 2025 complete. Hanging out with everyone from ARRL topped it off. I felt like part of the crew, and I’m so grateful to have been in the company of some of the most amazing people in ham radio. I can’t wait for next year! See you at Hamvention 2026.

Arduino authority and ARRL author Glen Popiel, KW5GP, also had a full house for his forum on the basics of using microcontrollers in amateur radio projects, followed by a book signing for his two recent books, *Best of Arduino Projects for Ham Radio* and *More Arduino for Ham Radio*.

## Announcements, Awards, and Forums

Before the event, the 23rd annual ARRL Donor Recognition Reception was held on Thursday evening. Keynote speaker Dr. Ed Snyder, W1YSM, shared his plan to reinvigorate struggling amateur radio clubs by pairing them up with active groups in their areas to act as club-level mentors ([www.arrl.org/marconi](http://www.arrl.org/marconi)). Following Snyder’s address, the Mary Hobart, K1MMH, Medal of Distinction was awarded by ARRL to Amateur Radio Digital Communications founder and past president Phil Karn, KA9Q. Karn was honored for his work with the foundation, which has made grants to amateur radio organizations of some \$30 million since 2020.

The “ARRL Membership Forum” on Saturday featured updates on various ARRL activities and programs from CEO David Minster, NA2AA. He discussed the new DX Century Club (DXCC) Trident Award and the current threat from stock-trading businesses that want to send high-power, high-speed data transmissions on frequencies adjacent to HF ham bands. This forum was moderated by Great Lakes Division Director Scott Yonally, N8SY, and updates were presented by First Vice President Kristen McIntyre, K6WX, and Director of Marketing and Innovation Bob Inderbitzen, NQ1R, who focused on the need to increase the visibility of young people in amateur radio. “The next

generation of amateur radio is already here and active,” said Inderbitzen. At the forum, Yonally presented former Great Lakes Division Director Dale Williams, WA8EFK, with the Division’s George S. Wilson, III, W4OYI, Lifetime Achievement Award.

Sunday’s forums included “FCC Update,” led by ARRL Volunteer Monitor Program Administrator and former FCC Special Counsel Riley Hollingsworth, K4ZDH; “ARRL Youth Outreach Through Amateur Radio STEM Education,” led by Education and Learning Manager Steve Goodgame, K5ATA; the “ARRL Radiosport Forum — Level Up!” led by Radiosport and Regulatory Information



ARRL honored Phil Karn, KA9Q (right), with the Mary Hobart, K1MMH, Medal of Distinction, which was presented by Director of Development Kevin Beal, K8EAL (left), and CEO David Minster, NA2AA (center). [Josh Ohms Photography photo]



Manager Bart Jahnke, W9JJ, and “ARES — Building Relationships in Public Service,” presented by Director of Emergency Management Josh Johnston, KE5MHV.

## The ARRL Youth Rally Returns

Beyond Steve Goodgame’s, K5ATA, forum on youth outreach, ARRL further appealed to young hams at the event with the Youth Rally and Youth Lounge. Goodgame said:

The ARRL Youth Rally and Youth Lounge were huge hits. Approximately 70 kids built Morse code keys and sent sample messages to other attendees. The Youth Rally had 22 young people participate in several activities, such as working a parachute mobile station, working with [the Radio Amateur Satellite Corporation] to get on the air for a satellite pass, participating in an FM Sprint, and more.

On Sunday morning, the young participants launched an automatic packet reporting system-equipped pico balloon, W1AW-11, which was still in flight a week later, riding the winds around the world.

Youth Rally parent Drew Mortenson, AC3DS, said the Rally was a big hit with his daughter. “Hannah loved the Youth Rally, meeting other teens, and learning more about ballooning,” he said. “Hannah can be a tough critic, and she was all smiles and excitement the whole time and [the whole] way home. Thank you for helping her see that she has a place in a hobby that she enjoys,” Mortenson added.



One of the many activities in the ARRL Youth Rally was a classic foxhunt for a hidden transmitter. [Greg Sulla photo]

In addition to the Youth Rally, the well-networked community of college and university amateur radio clubs was also represented at the event by students supporting the ARRL Collegiate Amateur Radio Program.

## The 2025 Hamvention is a Wrap

The rest of Hamvention featured multiple other forums, contest and DX dinners, exhibits by manufacturers featuring new gear, emergency communication van displays, and the legendary Dayton flea market, held on the infield of a horse track. Tables and car trunks were filled with classic ham gear among other items that vendors hoped would find a home elsewhere.

The general feeling of Hamvention was summed up by First Vice President Kristen McIntyre, K6WX. “So many people,” she said, “so much enthusiasm.”



A number of students represented the ARRL Collegiate Amateur Radio Program (CARP) at Hamvention. Pictured (left to right) are Zhemín “Hisen” Zhang, KD2TAI, from Rensselaer Polytechnic Institute; Aaron Bilow, W3WAM, from Case Western Reserve University; ARRL Southeastern Division Vice Director Andy Milluzzi, KK4LWR, and Tony Milluzzi, KD8RTT, both CARP Co-Advisors, and Dayton 2025 CARP leader Eddie Rodríguez, NM3OW, from Case Western Reserve University. [Josh Ohms Photography photo]



A group photo of ARRL Youth Rally attendees, who were engaged in a variety of hands-on ham radio activities. [Josh Ohms Photography photo]

# New Products at Hamvention



FlexRadio launched a new series of transceivers called Aurora, which the company says represents a major architectural change in power amplifiers since the shift from tube to solid state in the 1970s. Four different Aurora models cover 160 – 6 meters and feature built-in ac supplies and 500 W amplifiers (200 W on 6 meters) with 80% efficiency, plus antenna tuners, all in an 18-pound package. The radios are fully software defined — transmit and receive — and work with FlexRadio's current Maestro remote-capable control console. The first production run is anticipated to be in the fourth quarter of 2025. <http://flexradio.com/aurora>. [Greg Sulla photo]



Acom has a new amplifier called the 1400S. It provides 1200 W of output power on 160 – 6 meters and features a touch screen remote control unit. It also has a built-in Ethernet interface for remote control via the internet. As of press time, availability is pending FCC certification. [www.acom-bg.com/products/amplifiers/acom-1400s-solid-state-18-54-mhz-linear-amplifier](http://www.acom-bg.com/products/amplifiers/acom-1400s-solid-state-18-54-mhz-linear-amplifier). [Greg Sulla photo]



DX Engineering wants to help you connect your radios to your antennas with their Window Feed-Through Panel for up to five feed lines using PL-259 connectors. The cedar wood panel is naturally resistant to insects and decay, making it virtually maintenance free. It is available now. [www.dxengineering.com/search/product-line/dx-engineering-window-feed-through-panels/part-type/coaxial-connector-panels?fr=part-type](http://www.dxengineering.com/search/product-line/dx-engineering-window-feed-through-panels/part-type/coaxial-connector-panels?fr=part-type). [Greg Sulla photo]



RigExpert has introduced the Shackmaster Power 600 dc power distribution system. It can supply a total of 40 A across all of its outputs, which includes four Anderson Powerpole® ports and five USB jacks. Input voltage is 80 – 264 V, and output voltage may be set in software within the range of 12 – 15 V. It is available now. <https://rigexpert.com/products/power-supply/shackmaster-power-600>. [RigExpert photo]



Buddipole's newest product is the PowerPro dc power management system, with a built-in solar panel support and separate charging circuits for lead acid and lithium ion batteries. It also features a USB-C charger port and extensive system monitoring through front-panel readouts. This product is expected to be available in mid-July. [www.buddipole.com/powerpro.html](http://www.buddipole.com/powerpro.html). [Buddipole photo]



Carlson Roof Towers introduced its high-strength aluminum 25G adjustable wall bracket. Available now, it is 53 inches wide and extends up to 38 inches from the wall to which it's attached. [www.rooftowers.com/wp-content/uploads/2025/05/Carlson-Heavy-Duty-25G-Adjustable-Wall-Bracket-7.pdf](http://www.rooftowers.com/wp-content/uploads/2025/05/Carlson-Heavy-Duty-25G-Adjustable-Wall-Bracket-7.pdf). [Carlson Roof Towers image]



RT Systems added YPS-M510 to its lineup of programming software and cables. This product is specific to the Yaesu FTM-510D transceiver and lets you use your PC to program memories and other settings on the radio. It is available now. [https://rtsystemsinc.com/FTM-510\\_c\\_2584.html](https://rtsystemsinc.com/FTM-510_c_2584.html). [RT Systems image]



# HamSCI: The Future of Ham Radio is Here

**Nathaniel A. Frissell, W2NAF**

Since the beginning of amateur radio, amateurs have significantly contributed to the advancement of technology and radio science. This is no accident, as the people who make up the amateur radio community are driven by a profound curiosity and passion. Equally

passionate, the professional radio science community consists of scientists and engineers working to advance our understanding of the world around us. These communities share many common goals and interests, but each group has unique capabilities, resources, cultures, and perspectives. HamSCI combines these strengths.



HamSCI gathering at the 2025 Dayton Hamvention.

## What is HamSCI?

Founded in 2015 in preparation for the 2017 Solar Eclipse QSO Party, the Ham Radio Science Citizen Investigation, or HamSCI, was created to bring the amateur and professional communities together for mutual benefit. HamSCI has three primary objectives. First, to advance scientific research and understanding through amateur radio activi-

ties. Second, to encourage the development of new technologies to support this research. Third, to provide educational opportunities for the amateur community and the general public. Today, the HamSCI community is engaged in multiple publicly funded projects and is recognized as an official NASA Citizen Science project.

## Who Makes Up HamSCI?

HamSCI is a cooperative forum spanning both the amateur and professional communities. A number of academic institutions are represented along with amateur radio organizations (see the Acknowledgments at the end of this article). The real power of HamSCI is the ability for any individual, licensed or not, to join the community. Participation ranges from joining the group to learn something new, to helping collect and analyze data, to presenting at conferences. Participants might contribute to papers, design and build instrumentation, or even propose scientific campaigns.

## Where HamSCI Data Comes From

Currently, the primary source of HamSCI data comes from real-time, global, amateur radio observing networks, such as PSKReporter, WSPRNet, WSPR-Daemon, and the Reverse Beacon Network (RBN). As an example, Figure 1 illustrates how space weather can be observed in this data. Here, a solar flare-induced HF radio blackout was observed by the RBN and WSPRNet. Figure 1a shows the 15-minute period before the flare, while Figure 1b shows the 15-minute period after. An 82% decrease in the number of HF communications paths was observed!

HamSCI members are also building a network of Personal Space Weather Stations (PSWS). A complete PSWS includes an HF receiver, a VLF receiver, and a ground magnetometer. The radio receivers utilize GPS disciplined oscillators (GPSDOs) to allow for precision frequency measurement. This capability allows the PSWS receivers to observe HF Doppler shifts.

Figure 2 illustrates one mechanism that can cause HF Doppler shift, using the 10 MHz signal from WWV in Colorado. Ionospheric processes cause the ionosphere to lower and rise in height. As the ionosphere lowers (as it does at dawn), the path length decreases causing a positive (blue) shift. As the ionosphere rises (as it does at dusk), the path length increases, causing a negative (red) shift. HamSCI PSWS HF receivers are designed to measure these shifts, which are often on the order of  $\pm 5$  Hz or less.

PSWS HF receivers were developed at Case Western Reserve University's Case Amateur Radio Club, W8EDU, including the single-channel GRAPE 1 (See Figure 3a) and the more sophisticated three-channel

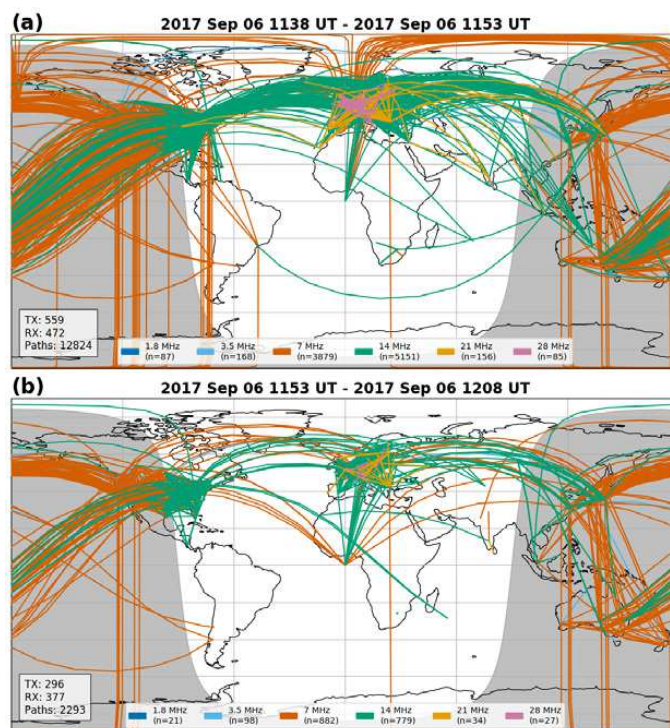


Figure 1

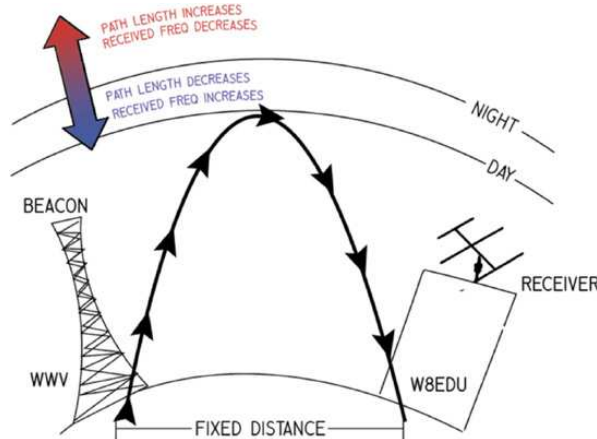


Figure 2

**Figure 1** — An HF radio blackout observed by the RBN and WSPRNet on September 6, 2017. From *Frissell et al.* (2019, <https://doi.org/10.1029/2018SW002008>).

**Figure 2** — A drawing showing one mechanism for HF Doppler shift. Blue indicates a positive shift and red indicates a negative shift. HamSCI PSWS HF receivers are designed to measure these shifts routinely. From *Collins et al.* (2022, <https://doi.org/10.1109/LGRS.2021.3063361>).





Figure 3a



Figure 3b

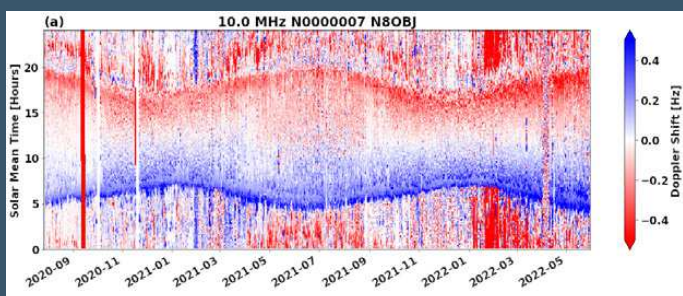


Figure 3c



Figure 4a



Figure 4b

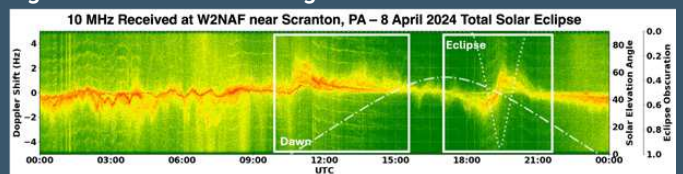


Figure 4c

**Figure 3** — The (a) GRAPE 1 and (b) GRAPE 2 are receivers designed to measure the Doppler shift of signals received from stations such as WWV and CHU. (c) Two years of data from N8OBJ showing the Doppler shift of the 10 MHz signal produced by WWV near Fort Collins, Colorado received using a GRAPE 1. From *Collins et al. (2023, <https://doi.org/10.5194/essd-15-1403-2023>)*.

**Figure 4** — (a) An SDR-based Personal Space Weather Station consists of a Leo Bodnar GPSDO, a RX-888 SDR receiver, and a Linux computer running the *KA9Q-radio* and *WSPRDaemon* software. (b) The *KA9Q-web* interface allows the system to simultaneously be used as a general-coverage SDR receiver operating from 0.1 to 60 MHz. (c) 10 MHz observations at W2NAF on April 8, 2024, a day with a total solar eclipse traversing North America.

GRAPE 2 (See Figure 3b). Figure 3c shows almost 2 years of continuous 10 MHz Doppler observations from N8OBJ in Ohio.

HamSCI has adopted SDRs for newly deployed PSWS HF receivers, as shown in Figure 4a. This system uses the *KA9Q-radio* software by Phil Karn KA9Q, the *WSPRDaemon* data collection software by Rob Robnett, AI6VN, and the RX-888 SDR. The Linux-based system can decode WSPR/FT8 spots and observe HF Doppler shifts simultaneously across all relevant bands and channels from 0.5 – 60 MHz. The system can also be used as a web-based general coverage SDR receiver, thanks to the *KA9Q-web* interface (See Figure 4b). Figure 4c shows 10 MHz Doppler observations made using a RX-888-based PSWS receiver at W2NAF as part of the HamSCI Festivals of Eclipse Ionospheric Science (FoEIS).

## How to Get Involved

First, visit [hamsci.org](https://hamsci.org) and click the big, blue “Join HamSCI” button. From there, you can join the HamSCI Google Group, an open forum that facilitates discussion between the amateur and professional communities. That web page also gives links to multiple open, weekly Zoom telecons HamSCI hosts to support its various projects. You can join HamSCI on the air by participating in events such as the Meteor Scatter QSO Party ([hamsci.org/msqp](https://hamsci.org/msqp)), or help collect data by installing a Personal Space Weather Station ([hamsci.org/psws](https://hamsci.org/psws)).

## Acknowledgments

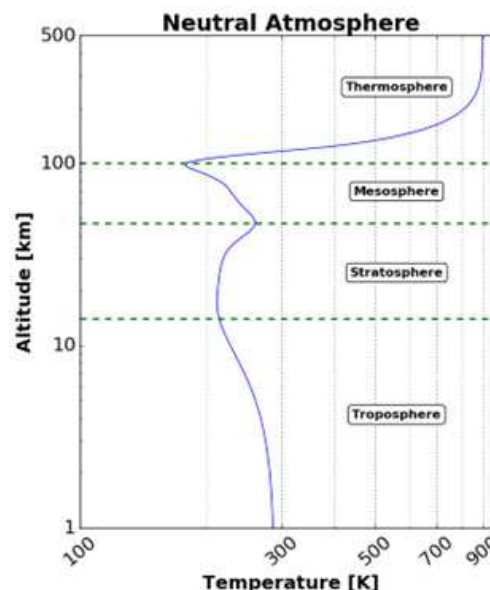
HamSCI gratefully acknowledges the support of the following government and academic institutions and organizations: National Science Foundation (NSF), NASA, Amateur Radio Digital Communications (ARDC), University of Scranton (W3USR), New Jersey Institute of Technology (K2MFF), Case Western Reserve University (W8EDU), University of Alabama, Massachusetts Institute of Technology Haystack Observatory, Dartmouth College, Andrews University/ Princeton Plasma Physics Laboratory, and Virginia Tech. HamSCI also collaborates with amateur radio organizations, including TAPR, Frankford Radio Club (FRC), Yasme Foundation, Radio Society of Great Britain (RSGB), and ARRL.

## About Traveling Ionospheric Disturbances

Ethan Miller, K8GU, and  
Nathaniel A. Frissell, W2NAF

On the basis of publicly available ionosphere maps, one might conclude that the ionosphere is relatively smooth in space and time. However, if you have spent much time operating on the HF bands, you know that reality is quite different — the bands are constantly changing where the openings are, fading causes signals to come and go. This article is about the science behind a common source of short-period (15-minute to several-hour) variability observed in the ionosphere: the *traveling ionospheric disturbance*, or *TID*. TIDs are an important source of variability, particularly for HF propagation, and they represent a larger source of variability that is often overlooked: the (neutral) atmosphere. (Hines 1974, <https://doi.org/10.1029/GM018p0014>)

To understand TIDs, we need to review the processes that govern the state of the ionosphere and radio wave propagation through the ionosphere. Scientists divide the neutral atmosphere into four different regions (see Figure 1). The region boundaries are defined by the temperature profile inflection points; each region has several characteristic physical properties. For example, the *troposphere*, the region closest to the surface of the Earth, is warm, moist, and subject to convective instabilities. The *stratosphere* above it is cold, dry, and very stable. The *mesosphere* above the stratosphere is still well-mixed like the layers below it — for example, in the troposphere, the relative concentrations of



**Figure 1** — Neutral atmosphere temperature profile generated using the MSIS (Emmert et al. 2020, [www.doi.org/10.1029/2020EA001321](https://doi.org/10.1029/2020EA001321)) model for 1200 UTC 21 Jan 2013, 40°N, 80°W. Atmospheric regions are defined by the inflection points of the temperature profile.

nitrogen, oxygen, and carbon dioxide are relatively constant no matter where you are in the layer. As the atmosphere transitions from the mesosphere to the *thermosphere*, this mixing transitions to stratification (layering) by the mass (density) of the molecules, with larger molecules at low altitudes transitioning to atomic (single) hydrogen at the highest altitudes as the atmosphere transitions into space.

### Introducing Hams to the TID Phenomenon

HamSCI is interested in any physical process that impacts radio wave propagation. Amateur radio operators typically hear about the sun and space weather impacts, including those caused by solar cycles, solar flares, coronal mass ejections, geomagnetic storms, auroras, and more. In this

article, we highlight the ionosphere's connection to the neutral atmosphere and discuss a propagation phenomenon likely less familiar to amateur radio operators: *traveling ionospheric disturbances*, or *TIDs*.



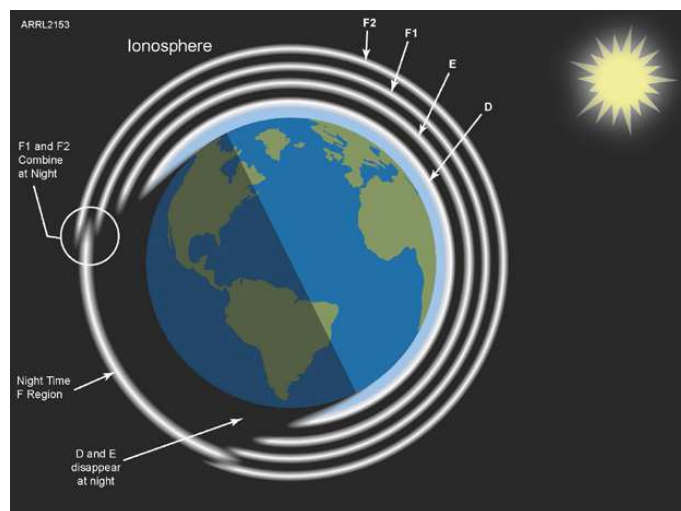


## The Role of Ionospheric Plasma

None of the foregoing discussions has treated the key parameter for skywave radio propagation: the ionospheric plasma. The ionosphere, illustrated in Figure 2, coexists alongside the mesosphere and thermosphere at altitudes from 70 km to over 700 km. A small fraction (about 3%) of the neutral atmosphere is ionized by solar EUV (extreme ultraviolet) radiation that has such high energy that it knocks loose one electron (usually, sometimes more) from the gases in the mesosphere and lower thermosphere. Unlike a neutral gas, the plasma also has electrical conductivity and behaves like a circuit, in addition to behaving like a gas. This enables skywave propagation because the index of refraction (parameter that controls the bending of a radio wave's path) in the plasma becomes a function of plasma density and radio frequency. The 14 MHz ray trace simulation shown in Figure 3 illustrates how ionospheric refraction can enable communications of 1500 km or more. (Davies 1965, [www.nvlpubs.nist.gov/nistpubs/Legacy/MONO/nbsmonograph80.pdf](http://www.nvlpubs.nist.gov/nistpubs/Legacy/MONO/nbsmonograph80.pdf))

The amount of plasma at a given location in the ionosphere is governed by a balance or continuity equation. The continuity equation for the ionosphere states that the change in electron density at a point is increased by production (ionization from the sun), decreased by loss (recombination — electrons and ions coming back together), and either increased or decreased by transport (motion of plasma from place to place).

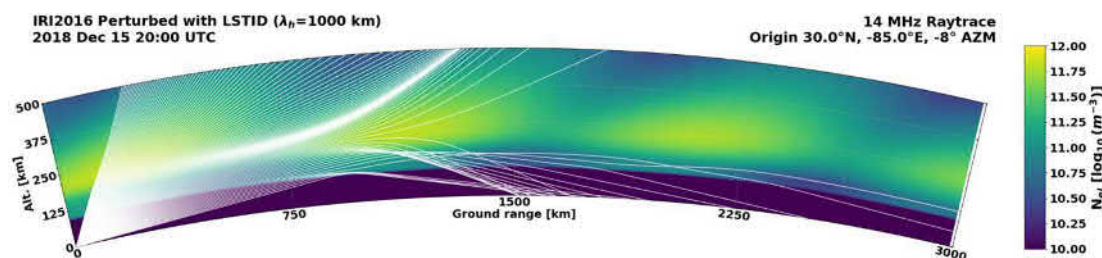
Most of the literature available to radio amateurs focuses on the production (ionization) term because it controls the maximum amount of plasma available



**Figure 2** — The ionosphere, created primarily by a balance between photoionization, recombination, and transport, coexists alongside the mesosphere and thermosphere at altitudes from 70 km to over 700 km. It is separated into several regions of ionized particles at different heights above the Earth. At night, the D and E regions disappear and the F1 and F2 regions combine to form a single F region. While illustrations like this one make the ionosphere look smooth and stable, reality is quite different.

and, therefore, the peak maximum usable frequency (MUF) for a specific path. Production is driven by solar EUV emissions for which the smoothed sunspot number (SSN) and 10.7-centimeter solar radio flux index (SFI) are easily observed proxies. Recombination is a more complicated function of local ion and electron densities and recombination rates (essentially probabilities) of plasma loss for different kinds of ions. Introduction of recombination into this discussion serves two purposes: 1. awareness of the process; 2. recombination produces weak light emissions (similar

to the auroras, but much lower energy and much weaker) from the ionosphere that may be used as tracers for ionospheric structures. These “airglow” emissions are not shown in this article, but they are a popular way to study nighttime TIDs.



**Figure 3** — Illustration of the mechanism in which Traveling Ionospheric Disturbances can cause HF fading (i.e., QSB). This simulation shows 14 MHz radio waves transmitted through an International Reference Ionosphere (IRI) model run perturbed with a TID (Bilitza et al. 2022, [www.doi.org/10.1029/2022RG000792](https://doi.org/10.1029/2022RG000792)). The ionospheric variations caused by the TID will either focus rays (i.e., strong signals, as seen around 1500 km ground range) or defocus rays (i.e., weak signals, as seen between about 1700 and 3000 km ground range). The TID will move overhead with time, causing stations on the ground to experience periodic fading as the skip focusing distance moves with the TID.

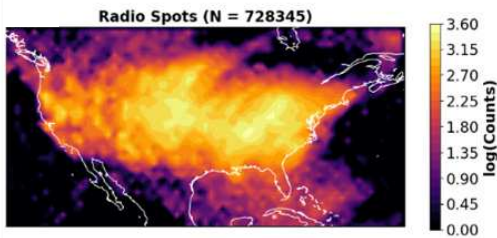


Figure 4a

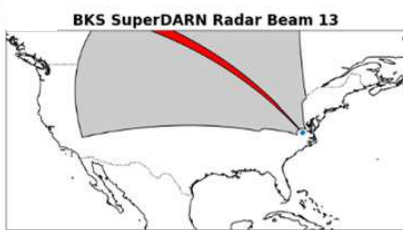


Figure 4b

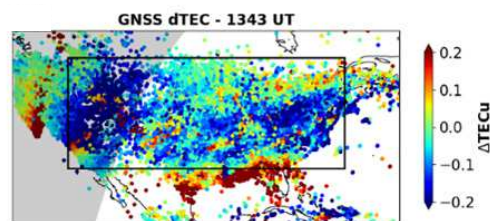


Figure 4c

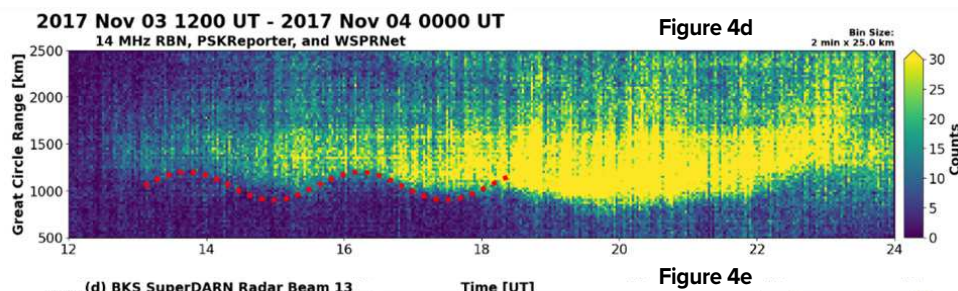


Figure 4d

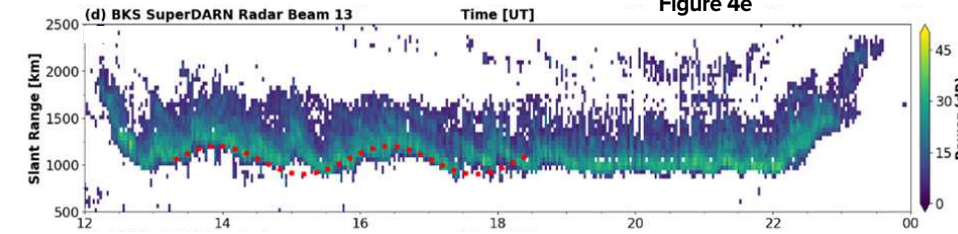


Figure 4e

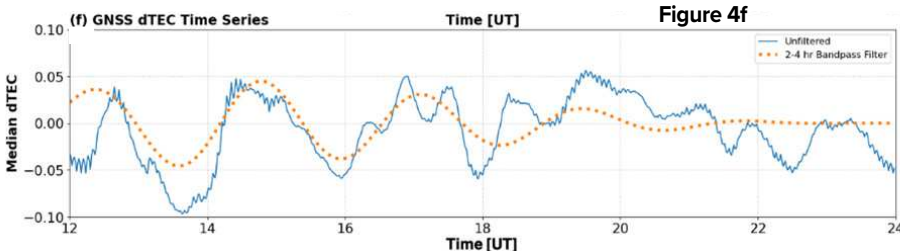


Figure 4f

**Figure 4** — Example of Large Scale Traveling Ionospheric Disturbances (LSTIDs) observed using (a & d) amateur radio networks, (b & e) the Blackstone (BKS) SuperDARN radar, and (c & f) Global Navigation Satellite System (e.g., GPS) differential Total Electron Content (dTEC). Dots overlaid on (d) and (e) show a sinusoidal 2.5 hr oscillation in skip distance common to both the amateur radio and SuperDARN observations. (From Frissell et al., 2022, <https://doi.org/10.1029/2022GL097879>).

## The Matter of Transport

The final term of the continuity equation is transport. As we discussed previously about the atmosphere, the layers of the ionosphere also have key physical characteristics: the D region (70 – 90 km) is dominated by collisions between ions and neutral atoms — this is what produces the absorption we observe on lower frequencies during daylight; the E region (90 – 120 km) is dominated by collisions between electrons and ions, as well as electrons and neutrals; the F region (above 120 km) transitions from the E region properties to being almost completely collision-less at altitudes above the F-region peak density around 300 – 350 km. Collisions between plasma constituents (ions and electrons) result in recombination described previously; collisions between the neutral constituents and the plasma result in one form of transport: neutral wind. Winds in the mesosphere and lower thermosphere “push” plasma around. In the D and E regions, the collision rates are great enough that the plasma follows the flow of the wind faithfully. In the F region, the collision rates are lower, and the plasma tends to move easily only along the geomagnetic field.

## Atmospheric Gravity Waves

Revisiting the neutral atmosphere (no charged particles) for a moment, the atmosphere is a fluid; so, like bodies of water, it supports buoyancy waves — a displacement of the fluid is restored by gravity, for example, a rock thrown into a calm pond or puddle. Likewise, for the atmosphere, tropospheric winds blowing over a mountain range, for example, produce buoyancy waves in the atmosphere. These are called “atmospheric gravity waves” because gravity is the restoring force. (These should not be confused with “gravitational waves” produced by black holes, which are a completely different and unrelated process.) Like waves at the beach, many gravity waves produced in the lower atmosphere “break” as the atmosphere becomes “thinner” (less dense) in the stratosphere and mesosphere. Breaking gravity waves are responsible for wind shears thought to





contribute to the formation of sporadic-E layers. Gravity wave breaking can occur at multiple different altitudes in the atmosphere, each time creating new, higher-order gravity waves that continue propagating upward. Ultimately, these gravity waves can reach the thermosphere and interact with the plasma of the lower F region via the collisional process described previously.

The gravity waves in the thermosphere appear in the ionosphere as a TID that produces observable effects on HF skywave communications channels. This is illustrated in the Figure 3 ray trace. Because more than one path frequently connects stations communicating by skywave, and each path's length is affected differently by the passage of the TID, constructive and destructive interference between the waves on multiple paths produce potentially strong peaks and deep fades on some paths. Furthermore, the orientation of TID wavefronts with respect to the geomagnetic field introduces gradients that focus and defocus bundles of waves. This can also control whether the waves penetrate into the ionosphere at all. This produces the spotlight effects contest operators experience while running population centers (for example, Europe, Asia, or even parts of the US during a 160-meter contest).

## The Study of TIDs

Professional instrumentation, such as the Super Dual Auroral Radar Network (SuperDARN, <http://vt.superdarn.org/>) often used to study TIDs, and climatological studies can sometimes produce new insights into underlying mechanisms. For instance, Frissell et al. (2016, <https://doi.org/10.1002/2015JA022168>), used a climatology of SuperDARN MSTID observations to show that midlati-

tude medium scale TIDs (MSTIDs) primarily occur when the polar vortex is strong, which is typically during the late fall and early winter. MSTIDs are less likely when the polar vortex is weak, such as following a Sudden Stratospheric Warming (SSW) and during the spring and summer. For amateur radio operators, this means that 15- to 60-minute HF QSB (fading) is more likely in the fall and winter months.

It is possible to see TIDs affect amateur radio communications. Figure 4 shows a large-scale TID, which can have a period of 1 to 3 hours, observed in RBN, PSKReporter, and WSPRNet data. This observation is corroborated with independent measurements by a SuperDARN radar and Global Navigation Satellite System (e.g., GPS) differential Total Electron Content (dTEC). This figure introduces amateur radio as a novel method for studying TIDs that is not only complementary to traditional techniques, but also directly shows the impact of TIDs on real communications systems. A major HamSCI effort is under way to automate the detection of these amateur radio-observed TIDs and see what their climatology tells us. Current progress was presented at the 2025 HamSCI Workshop by Diego Sanchez, KD2RLM (see "Amateur Radio as a Scientific Tool for Understanding the Climatology of TIDs" below for more information).

While this article barely scratches the surface of the deep and complex subject of TIDs, the authors hope that readers now have a better appreciation for what the ionosphere is doing when they experience deep QSB or a long run of German stations that slowly moves to Poland and the Czech Republic.

## Amateur Radio as a Scientific Tool for Understanding the Climatology of TIDs

At the 2025 HamSCI Workshop held in March, Diego Sanchez, KD2RLM, a graduate student in software engineering at University of Scranton, presented "Climatology of Large-Scale Traveling Ionospheric Disturbances Observed with 14 MHz Amateur Radio Using a Novel Automated Detection Technique." This oral session described how KD2RLM and his colleagues used data from WSPRNet, the Reverse Beacon Network, and

PSKReporter, as well as ham radio data from 14 MHz to detect phenomena of ionospheric variability and magnetosphere-atmosphere coupling processes. The oral session, which can be viewed at <https://hamsci.org/publications/climatology-large-scale-traveling-ionospheric-disturbances-observed-14-mhz-amateur>, presents a multi-year climatology of Large Scale Traveling Ionospheric Disturbance period oscillations.

## 2025 HamSCI Workshop: Oral Sessions Sampler

### Expanding the HamSCI PSWS Network

Gary Mikitin, AF8A

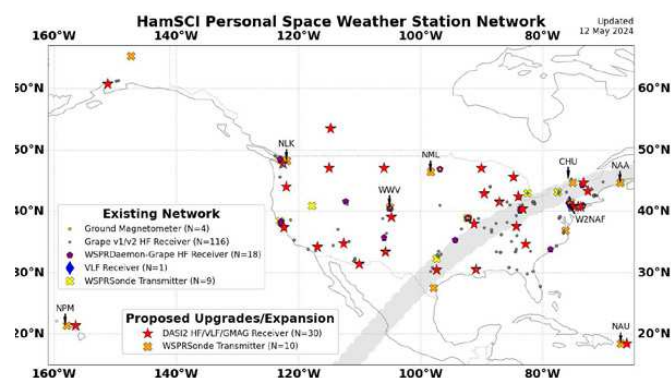
HamSCI has long studied the ionosphere using data collected during rare events such as solar eclipses. However, data collection also occurs daily, thanks to volunteers hosting Great Radio Amateur Propagation Experiment (GRAPE) receivers, monitoring standard frequency stations such as WWV ([hamsci.org/GRAPE-science](https://hamsci.org/GRAPE-science)). Today, over 50 GRAPEs are operating a network of receivers — formally known as a Distributed Array of Small Instruments (DASI), aka the HamSCI PSWS network ([hamsci.org/psws](https://hamsci.org/psws)).

HamSCI hopes to use data collected by the PSWS to gain a better understanding of the local-, regional-, and global-scale processes influencing the ionosphere and how radio waves propagate over great distances. This may lead to improved propagation predictions, new tools to predict radio wave behavior during solar storms, and new insights into solar cycles and other heliophysical phenomena.

Increasing HamSCI's research efforts requires a more capable PSWS network, with broader geographic coverage and greater technical capabilities. HamSCI seeks hams to host DASI2 stations, consisting of an

SDR for recording the HF spectrum, a VLF receiver, and a ground magnetometer for monitoring changes in the Earth's magnetic field. Planning for 30 new PSWS sites is under way (see Figure 1).

You can learn more about the site selection process, determine if you might be a candidate, and join the mailing list at [hamsci.org/site-search](https://hamsci.org/site-search).



**Figure 1** — A map displaying the existing HamSCI PSWS Network, as well as proposed points for DASI2 receivers and WSPR transmitters to further enhance the current network.

### HamSCI Solar Eclipse QSO Party (SEQP): Observations & Modeling on Ionospheric Effects

Kuldeep Pandey, PhD, New Jersey Institute of Technology, et al.

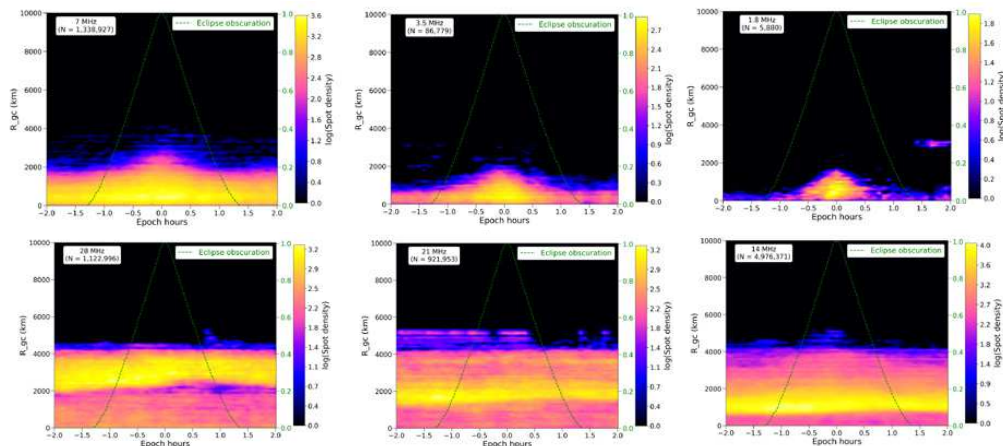
Ham radio volunteers across the contiguous United States reported over 52 million spots during the April 2024 Great American Solar Eclipse. For this study, we obtained those logs from PSKReporter, WSPRNet, and RBN, including timestamps, frequency, transmitter and receiver grids, transmitter-receiver midpoints, and transmitter-receiver great circle distances. Using this dataset, we investigated how the solar eclipse affected radio wave propagation and ionospheric conditions.

The data show that the eclipse increased the range of radio communications across the contiguous United States, though not uniformly — frequencies up to

7 MHz showed a symmetrical response, with the increase in communication range peaking around the time of totality, while frequencies above 14 MHz exhibited an asymmetrical response, with increased range occurring about 45 min after totality. These observations suggest that the ionospheric D and E regions responded symmetrically to solar obscuration, while the F region had a delayed response (see Figure 2).

The results from the 2024 solar eclipse are similar to those from the 2017 eclipse, reported by Nathaniel, W2NAF, et al. (2018, <https://doi.org/10.1029/2018GL077324>), save for one key





**Figure 2** — Epoch analysis showing radio wave propagation across the contiguous US during the April 2024 solar eclipse — frequencies up to 7 MHz (top row) showed increased propagation range peaking around the time of totality, while frequencies above 14 MHz (bottom row) showed increased propagation range about 45 minutes after totality.

difference: the 14 MHz band weakened during totality in 2017, but not in 2024. This difference likely stems from the eclipses occurring during different phases of the solar cycle — solar minimum in 2017 and solar maximum in 2024. The denser ionosphere in 2024, driven by higher solar flux levels, supported continued communication at the higher frequency of

14 MHz. These findings improve our understanding of how solar eclipses affect radio propagation and the ionosphere and can aid in future planning for ham radio contests. For the slide deck of this session, visit <https://hamsci.org/publications/hamsci-solar-eclipse-qso-party-seqp-observations-and-modeling-ionospheric-effects>.

## Analysis by Citizen Scientists of Doppler Radio Observations of the April 2024 Solar Eclipse

**Mary Lou West, PhD, KC2NMC, Montclair State University, et al.**

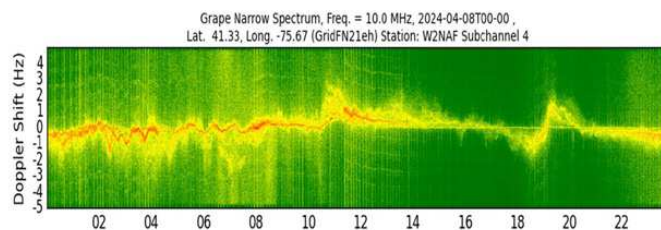
This project to evaluate Doppler radio observations of the April 2024 solar eclipse has three goals: visually categorize the solar eclipse radio data from the PSWS, identify correlations within the data set, and train five citizen scientists as data analysts. The first goal is completed, the others still in progress.

On eclipse day, 46 receiving stations uploaded 24-hour spectrum files to PSWSNet ([pswsnetwork.caps.ua.edu](https://pswsnetwork.caps.ua.edu)). Eighteen stations heard eight different frequencies from WWV in Fort Collins, Colorado (5, 10, 15, 20, and 25 MHz) and CHU in Ottawa, Canada (3.33, 7.85, and 14.67 MHz), providing 139 files (see Figure 3).

We measured or estimated the maximum Doppler shift (Hz) at ingress (when the moon started to cover the sun), the maximum shift at egress (when the sun started to become visible again), the number of multi-path modes (one, two, or more hops), and the observation's symmetry. Demographic and midpath data were also determined.

We found that the Doppler shifts were primarily dependent on the sun's obscuration at the midpoint, but also on the carrier frequency and the distance between the transmitter and the receiver. At closer distances, radio waves measured a greater change in the path length as the bottom of the ionosphere retreated skyward, then returned at egress.

We are currently investigating correlations between the spectrum outputs and radio frequency, distance



**Figure 3** — 10 MHz Doppler observations using the PSWS receiver at W2NAF during the April 2024 solar eclipse — the Doppler shift occurring between 18:00 and 21:00 UTC represents the duration of the eclipse.

from transmitter, time of day, midpoint location, depth of obscuration, and direction. Five CHU observations and one WWV observation proved invaluable because they probed path midpoints that experienced totality. Discussion of the science behind Doppler

observations can be found on the HamSCI website ([hamsci.org/GRAPE-science](https://hamsci.org/GRAPE-science)). For the slide deck of this session, visit <https://hamsci.org/publications/analysis-citizen-scientists-doppler-radio-observations-april-2024-solar-eclipse>.

## Amateur Radio as a Scientific Tool: Ionospheric Observation and Atmospheric Coupling Studies Through HamSCI

Diego Sanchez, KD2RLM, University of Scranton, et al.

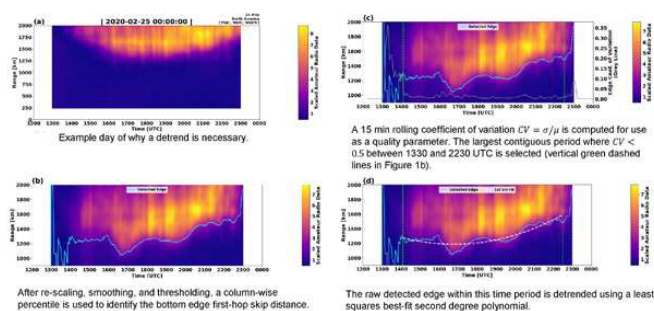
Amateur radio networks provide a powerful, distributed platform for studying ionospheric variability and magnetosphere-atmosphere coupling processes. We present a multi-year climatology of Large Scale Traveling Ionospheric Disturbance (LSTID) period oscillations observed using 14 MHz amateur radio data. LSTIDs affect radio communications and serve as indicators of energy transfer across the coupled magnetosphere-ionosphere-atmosphere system.

To detect these phenomena, we used data from WSPRNet, RBN, and PSKReporter, all of which rely on voluntarily operated automated systems logging radio contacts. Each contact includes time, frequency, and transmitter and receiver geographic coordinates, geofenced within the continental US. These were assumed to reflect once off the ionosphere directly above the midpoint between transmitter and receiver. Contacts were binned into 25-kilometer spatial pixels at a 1-minute cadence, yielding a 720-minute by 120-pixel image representation of communication activity from 12 – 24 UTC.

We developed a novel, fully automated, deterministic detection method to identify LSTIDs. This approach applies median absolute deviation rescaling and Gaussian blurring to enhance edge detection in the contact density plots. Subsequent thresholding isolates minimum skip distances, and sinusoidal curve fitting to these extracted boundaries identifies periodic TID structures with wave periods of 1 – 5 hours. Key LSTID parameters such as amplitude, period, and skip

distance were derived from these sinusoidal fits (see Figure 4).

Daily values were visualized and smoothed with a rolling average to highlight seasonal trends. We constructed climatologies for the period from 2016 to 2021, organized by wave period, amplitude, and season. The data show a consistent seasonal trend: enhanced LSTID activity during winter, decreased activity in spring and fall, and occasional increases during summer. Additionally, data from 2015 to 2022 reveal a gradual increase in minimum RF skip distance, aligning inversely with solar flux levels, and thus tracking the decline toward solar minimum. This highlights the influence of solar activity on ionospheric propagation characteristics. For the slide deck of this session, visit <https://hamsci.org/publications/climatology-large-scale-traveling-ionospheric-disturbances-observed-14-mhz-amateur>.



**Figure 4** — Slide illustrating how Sanchez, KD2RLM, and colleagues used a novel automated detection algorithm to identify periodic LSTID structures with wave periods of 1 – 5 hours.

### More Oral Sessions

The 2025 HamSCI Workshop featured additional oral sessions, as well as several invited tutorials and a poster session. Visit <https://hamsci.org/publications> to browse the full list, with links, under the “2025” heading.



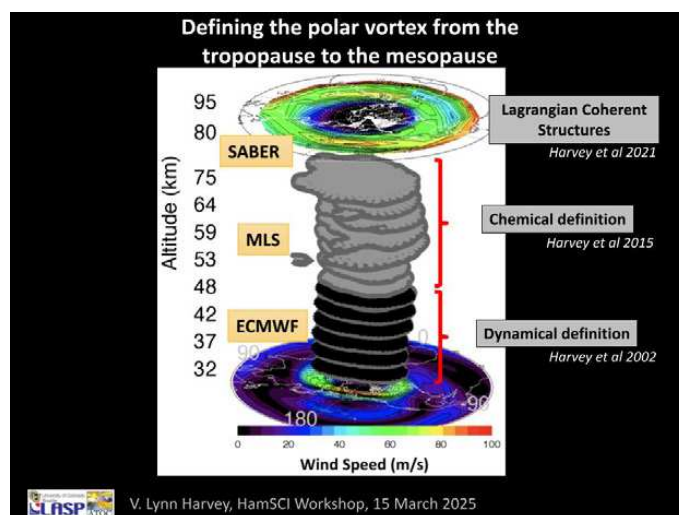
# An Invited Tutorial: The Role of the Polar Vortex in Atmosphere-Ionosphere Coupling

**Dr. V. Lynn Harvey**

In this talk, presented at the 2025 HamSCI Workshop, I provided a comprehensive overview of how the polar vortex contributes to atmosphere-ionosphere coupling, with a focus on “bottom-up” processes that begin in the lower atmosphere and extend upward to affect geospace. The talk began with a tutorial on the polar vortex itself — what it is, why it forms, and how it varies across different spatial and temporal scales (see Figure 1). The wintertime polar vortex is a fast-flowing jet stream that forms in the stratosphere and mesosphere, encircling a region characterized by confined descent. While often discussed in the context of meteorology, the polar vortex is also a critical driver of space weather variability.

Next, I introduced key atmospheric wave phenomena that interact with or are influenced by the vortex, including planetary waves (PWs), tides, and gravity waves (GWs). In particular, I highlighted how the breakdown of the polar vortex during sudden stratospheric warmings (SSWs) — typically triggered by upward-propagating PWs — can have dramatic impacts on the upper atmosphere, including changes in temperature, wind, and tidal patterns throughout the mesosphere and lower thermosphere (MLT), and even into the ionosphere.

Importantly, while SSWs (see Figure 2) are known to cause strong variability in the thermosphere-ionosphere system, recent findings suggest that strong polar vortex events cause anomalies of the opposite sign. These include reversed signatures in MLT temperatures, wind patterns, and the distribution of tides. This duality provides a pathway for improved predictability in upper atmospheric conditions, which has clear implications for space weather forecasting and systems like ham radio.

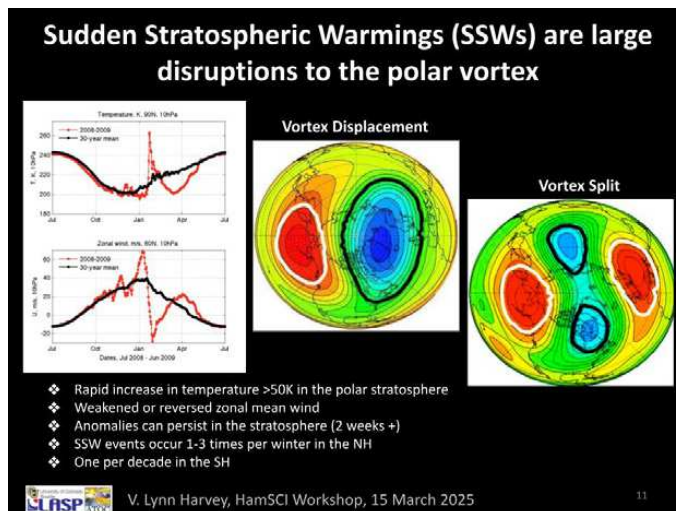


**Figure 1** — A 3D perspective of the Arctic vortex in the stratosphere (black) and mesosphere (gray). The view is toward the North Pole from the Pacific. The vertical axis is altitude. The colored map on the bottom is MERRA-2 wind speed. The colored map on the top is SABER wind speed. In the stratosphere, the vortex is defined dynamically (see Harvey et al., 2002). In the mesosphere, the vortex is defined chemically (see Harvey et al., 2015). [V. Lynn Harvey, photo]

I then explored how the vortex influences GWs in two major ways. First, it modulates their propagation by altering the background wind field. GWs generated in the lower atmosphere must navigate these wind fields as they travel upward, and the vortex can filter or amplify different wave modes. Second, the vortex itself — particularly at its edge and in jet cores — acts as a source of GWs. Observations show enhanced GW activity at the vortex edge, and wave hotspots in the stratosphere have been linked to traveling ionospheric disturbances (TIDs) observed thousands of kilometers away.

This connection between the vortex, GWs, and TIDs is especially important for the ham radio community. While TIDs are often thought to originate from processes in the upper thermosphere or beyond, results show that many are “forced from below” by lower atmosphere dynamics. For example, GW hotspots in the polar stratosphere can initiate TIDs that propagate far from their origin, impacting communications unpredictably.

The talk concluded with a discussion of predictability and remaining research questions. The improved understanding of vortex-driven variability — both from strong vortex states and from SSWs — offers a path toward better forecasting of upper atmospheric conditions. However, many open questions remain, particularly regarding the quantification of GW sources and their spatiotemporal impacts on the ionosphere. As such, continued work is essential to further unravel the full extent of atmosphere-ionosphere coupling driven by the polar vortex. To view the slide deck for this tutorial, visit <https://hamsci.org/publications/role-polar-vortex-atmosphere-ionosphere-coupling>.



**Figure 2** — A time series of 90°N (left), 10 hPa temperature and 60°N (top), 10 hPa zonal wind (bottom) during the 2009 SSW (red) compared to a 30-year climatology (black). NH polar map (middle) of MERRA-2 geopotential height at 10 hPa with anticyclone (bold white contour) and polar vortex (bold black contour) boundaries on a day during a displacement-type SSW. The figure on the right is the same as the middle panel, but on a day during a split-type SSW. [V. Lynn Harvey, photo]

### Dr. V. Lynn Harvey

Dr. Harvey received her doctorate in atmospheric and oceanic sciences from the University of Wisconsin in Madison in 2001. Her PhD focused on the numerical identification of stratospheric vortices, thus her scientific expertise is rooted in the neutral atmosphere. She did a postdoc at NASA Langley and for over 20 years she has been a Research Scientist at the Laboratory for Atmospheric and Space Physics at the University of Colorado in Boulder, where she is a world expert in studies of the polar vortices. She has published 120

peer-reviewed manuscripts on topics covering the general circulation, wave dynamics, and transport of trace gases in the stratosphere, mesosphere, and lower-thermosphere. Her recent work focuses on how the polar vortex acts to couple the sun-Earth system from the top down via the descent of nitrogen oxides produced by energetic particle precipitation, and from the bottom up via the upward propagation of waves that drive variability in the thermosphere and ionosphere.



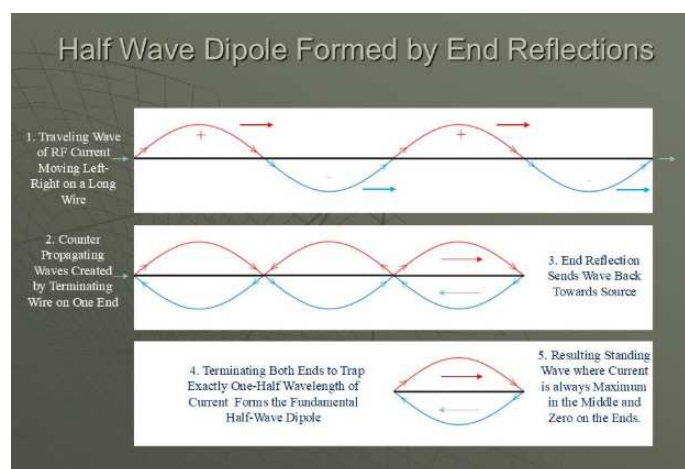


# An Invited Tutorial: Radio Wave Propagation and Antenna Fundamentals

**Steve Cerwin, WA5FRF**

Since approximately 2005, I have conducted hands-on, week-long antenna courses for field teams, scientists, and engineers tasked with resolving ad hoc radio communication challenges in the field. The course emphasized intuitive understanding reinforced by numerous classroom demonstrations and hands-on building activities. The following is a summary of selected course topics presented at the 2025 HamSCI Workshop.

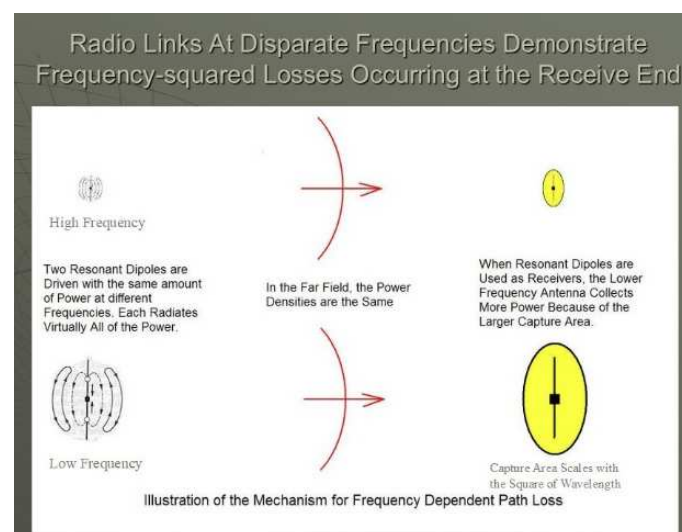
A propagating electromagnetic (EM) wave consists of electric and magnetic fields oscillating in a plane facing the direction of propagation. Examples of EM waves at increasing frequencies are radio, light, X-rays, and gamma rays. Once power is bound in an EM wave, it can propagate indefinitely until it encounters absorption. An example is the infrared light that has been on a 13-billion-year journey to now enter the James Webb Space Telescope to give us images of the early universe.



**Figure 1** — A resonant half-wave dipole is the exact length to congruently overlap half-wave current distributions from end reflections. [Steve Cerwin, WA5FRF, photo]

At communication frequencies, a radio wave can be launched into space by an antenna. Figure 1 illustrates the formation of a resonant half-wave dipole by converting a radio wave traveling along a wire into a standing half-wave by creating end reflections exactly one half-wavelength apart. Each reflection produces a half-wave current distribution that congruently lies on top of all others. Electric charges accelerate continuously along the antenna, converting applied radio frequency power into a radio wave.

Once launched, only two parameters control free space path loss: distance and frequency. The losses scale with the square of each: doubling either distance or frequency requires four times the transmit power (6 dB) to achieve the same signal at the receiver. The distance-squared losses occur because the radio wave is expanding spherically away from the antenna. Doubling the distance spreads power over a four times larger area, diluting power density. The frequency-squared losses can be understood by visualizing the

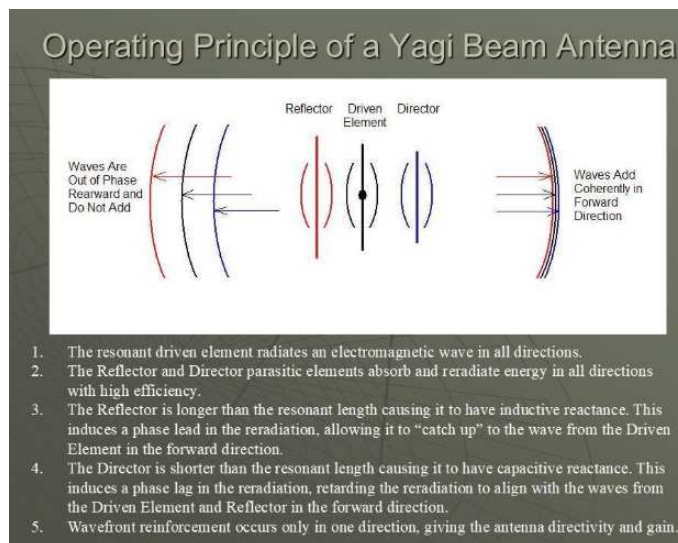


**Figure 2** — Frequency-squared path loss visualized by the capture area of the dipole at the receive end of a radio link. [Steve Cerwin, WA5FRF, photo]

height-by-width capture area of the receive dipole, as shown in Figure 2.

An antenna cannot radiate more power than what is applied, but it can concentrate power in one direction at the expense of others. This is called directivity and it is how an antenna can enhance a signal link by increasing gain. Numerous antenna types are gain makers, including Yagis, helical beams, arrays, horns, reflector antennas, and large traveling wave antennas. In general, gain comes from coherently increasing the aperture of the antenna in one or more spatial dimensions. The price of gain is directivity: the higher the gain, the narrower the beamwidth.

Yagi operation is illustrated in Figure 3. A three-element Yagi consists of a central resonant driven element, a longer reflector element behind it, and a shorter director element in front. A signal applied to the driven element is absorbed and reradiated with high efficiency by the parasitic reflector and director. The longer reflector element has an inductive reactance with a phase-lead characteristic, and the shorter director element has a capacitive reactance with a phase-lag characteristic. This causes their reradiation



**Figure 3** — Operating principles of a Yagi antenna. [Steve Cerwin, WA5FRF, photo]

to appear to come from the same location as the driven element. Wavefront alignment occurs in the forward direction and diverges in all others to create directivity. To view the slide deck for this tutorial, visit <https://hamsci.org/publications/radio-wave-propagation-and-antenna-fundamentals>.

### Steve Cerwin

Steve Cerwin, WA5FRF, is an experimental physicist with over 45 years of experience in designing and building custom instrumentation systems spanning a wide range of disciplines. He spent 38 years at Southwest Research Institute, retiring as an Institute Scientist in 2008. While at the Institute, he also taught Advanced Electronic Design and the associated lab at St. Mary's University as an evening

course for 15 years. He is still a Technical Advisor for the Institute, operates his own consulting business, and teaches week-long, hands-on antenna courses. He attributes his career in science to an early start in ham radio. Steve's hobbies include ham radio, scuba diving, and flying both full-scale and RC model aircraft.

### More Invited Tutorials

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# A Glimpse of the Workshop Poster Session

## Effect of Near Total Solar Eclipse on Radio Propagation of HF, Weak-Signal Propagation Reporter (WSPR) Transmissions

Mindy J. Hull, MD, KM1NDY

This study investigates the variations in propagation across HF amateur radio bands during the duration of the April 2024 solar eclipse. Solar eclipses cause disruptions in the ionosphere. Citizen scientist amateur radio operators have explored this phenomenon using Weak Signal Propagation Reporter (WSPR), and researchers have relied on amateur radio operator transmissions during QSO parties for solar eclipse radio wave propagation analysis.

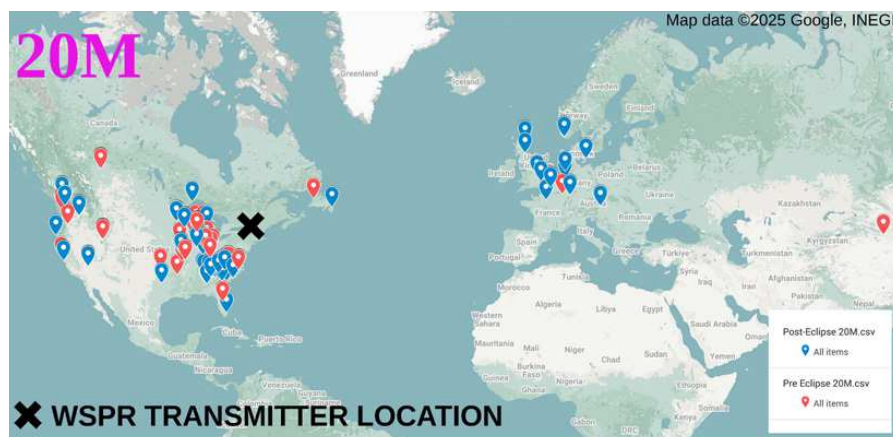
WSPR is a digital communication mode characterized by a 6 Hz, upper-side band, time-synchronized, four-tone, multi-frequency-shift-keying (MFSK) with forward error correction signal that can be accurately detected and decoded in low signal-to-noise situations. WSPR is a low-power amateur radio mode that demonstrates real-time propagation on specific 200 Hz band segments of frequencies ranging from 136 kHz – 1296.5 MHz. WSPR transmission data — including call signs of receiving and transmitting stations, grid square locators, time of transmission, signal-to-noise ratios, and transmission power output — are automatically uploaded to the internet, accessible at **WSPRnet.org**. Many entities utilize this data for various

purposes, including WSPR Rocks! ([wsprrocks.com](https://wsprrocks.com)), which repackages WSPR data in a more accessible format.

Set up in a semi-rural New York field with a predicted 97.6% maximum sun obscuration, a Zachtex WSPR Desktop Transmitter outputted 200 mW WSPR transmissions cyclically on 80- through 10-meter amateur radio bands before, during, and after the eclipse. Twelve multi-band transmission cycles, or “time slots,” were completed during the experiment. Spot distances were obtained from the WSPR Rocks! online repository. For each band, propagation distance was compared between all time slots.

The data suggest that there are changes in propagation of 20- and 30-meter WSPR signals correlating to the obfuscation cycle of a near-total solar eclipse — particularly in the period before and leading up to maximum coverage, distances between the transmitting station within the eclipse path and receiving stations are shorter compared to the time of maximum coverage and later. While more work needs to be done on a larger controlled scale, this research suggests a solar eclipse nearing totality may cause

transmissions around 20 and 30 meters to be received at greater distances at the peak of an eclipse and afterwards compared to those received prior to maximum solar obfuscation, as shown in Figure 1. To view the full poster, visit <https://hamsci.org/publications/effect-near-total-solar-eclipse-radio-propagation-hf-weak-signal-propagation-reporter>.



**Figure 1** — A map illustrating WSPR transmission spots at 20 meters, before and after the April 2024 solar eclipse.

## Development of a Contesting and DXing Dashboard for the HamSCI Personal Space Weather Station

Owen Ruzanski, KD3ALD, University of Scranton, et al.

This project aims to develop a dashboard display specifically for amateur radio HF contesting, DXing, and general operations using data from the HamSCI Personal Space Weather Station (PSWS), as well as other local and remote real-time data. The HamSCI PSWS is a multi-instrument system designed to measure space weather for scientific research and amateur radio operations. The core of the PSWS is the RX-888/KA9Q-radio WSPRDaemon-GRAPe HF software-defined radio (SDR), capable of capturing and analyzing signals across the 0.3 – 30 MHz range. While most PSWS development efforts thus far have focused on scientific objectives, this project aims to make data available to amateur radio operators with a dashboard designed to enhance real-time HF propagation assessments. By decoding WSPR spots and integrating with external space weather observations, the dashboard will offer propagation insights on an individual-station basis while contributing to a larger understanding of localized and global HF conditions. This should allow amateur radio operators to optimize transmissions based on real-time ionospheric conditions, improving contesting efficiency and DXing success.

This project aims to have a working prototype by the end of August 2025. Research and learning are being conducted on the HamSCI PSWS by experimenting with lab stations set up at the University of Scranton Amateur Radio Club, W3USR (see Figure 2).

To better understand the PSWS system, I will be setting up a PSWS at my home QTH. I started designing the dashboard with a basic implementation

of a web mapping program for discovered WSPR spots uploaded to the web database. The next step is to utilize WSPRDaemon software to store discovered WSPR spots in a local database hosted on a PSWS system, then rewrite the web-mapping software to show those spots. After that, it will be critical for the dashboard to display band openings worldwide — showing band openings is one of the most important parts of the project, as it will improve contesters' and DXers' experience and efficiency by providing specific, localized information on changes to expected propagation, which may not be available from other sources. To view the full poster, visit <https://hamsci.org/publications/development-contesting-and-dxing-dashboard-hamsci-personal-space-weather-station>.



**Figure 2** — The connections and basic layout of the HamSCI PSWS System. The core of the PSWS is the RX-888/KA9Q-radio WSPRDaemon-GRAPe HF SDR.

## HamSCI's Meteor Scatter QSO Party 2025

McKenzie Denton, KO4GLN, Old Dominion University

The 2025 Meteor Scatter QSO Party (MSQP) is an innovative on-the-air experiment exploring the untapped potential of HF meteor scatter propagation using the digital mode MSK144 in **WSJT-X**. Organized by HamSCI and timed with the Perseid and Geminid meteor showers, this event invites amateur radio operators to contribute to cutting-edge ionospheric research while enjoying the thrill of meteor scatter

communication. While some may think meteor scatter is an exotic mode, requiring expensive equipment or large antennas, the opposite is true — if you can transmit and/or receive FT8 on the 6- or 10-meter band, your station has what it takes to participate.

When meteors enter Earth's atmosphere, they create brief, ionized trails that can reflect radio signals, enabling contacts over distances of 1,000 – 2,000





**Figure 3** — PSK Reporter map illustrating MSK144 reports across the US and Europe ([pskreporter.info/pskmap](http://pskreporter.info/pskmap)).

kilometers. While this phenomenon is well studied on VHF bands, such as 2 meters, its behavior on HF frequencies (below 30 MHz) remains poorly understood. The MSQP aims to fill this gap by generating a dense dataset of 10- and 6-meter contacts during peak meteor activity. Topics for investigation may include:

- How long do meteor scatter band openings last on 6 versus 10 meters?
- Which geographic regions experience meteor scatter propagation during these showers?
- Does the Hourly Zenith Rate (visible meteors per hour) affect the distance between stations making QSOs? Is there a noticeable difference between 6 and 10 meters?

Participants will operate MSK144 for two 48-hour windows: August 11 – 12, 2025 (Perseids), and December 12 – 13, 2025 (Geminids). Stations will log contacts, recording QSO time, grid squares, and signal metrics. Data will be analyzed to map propagation patterns and compare HF/VHF performance. Websites such as **PSKReporter.info** and **DXMaps.com** can provide real-time visualization of QSO signals and reception reports, as illustrated in Figure 3.

Unlike traditional contests, the MSQP focuses on scientific discovery. Each logged contact may help future researchers map the geographic extent of

meteor scatter effects, analyze the differences between 6- and 10-meter meteor scatter propagation, and develop predictive models for future operations.

If you want to participate, follow these steps:

1. **Prepare Your Station:** Familiarize yourself with **WSJT-X's** MSK144 mode, check your 6- and/or 10-meter antenna, and synchronize your computer's clock to an internet time server.
2. **Operate:** Call CQ on 6 or 10 meters during the event.
3. **Monitor:** Receive-only stations are welcome to contribute data to the event through uploads to **PSKReporter.info**.
4. **Log & Submit:** Upload ADIF logs to HamSCI for scoring and analysis. Bonus points are available for station photos or astronomy club collaborations!

Visit **HamSCI.org/msqp** for guidelines and registration details. Whether you're a seasoned contestor or new to digital modes, your participation will showcase amateur radio's capacity to enhance our understanding of the ionosphere and help write the next chapter in the science of radio propagation. By turning our antennas skyward during these meteor showers, we're not just making contacts — we're making history! To view the full poster, visit <https://hamsci.org/publications/hamsci's-meteor-scatter-qso-party-2025>.

## The IP400 Networking Project

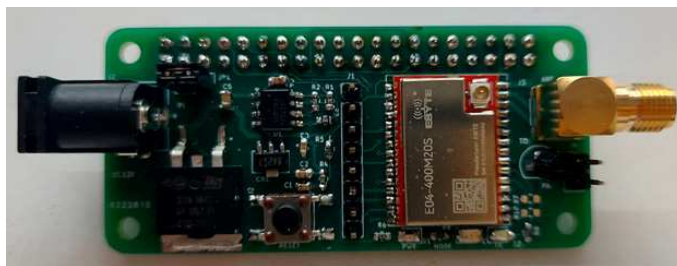
**Steve Stroh, N8GNJ, and Martin Alcock, VE6VH**

The goal of the IP400 Network Project — created and primarily developed by Martin Alcock, VE6VH, and sponsored by the Alberta Digital Radio Communications Society (ADRCs) — is to develop a next-generation data communications system, “by Amateur Radio, for Amateur Radio.” The initial IP400’s capabilities were made possible using highly integrated radio chipsets designed for data communications rather than voice communications. Prototype IP400 units have been distributed to developers, and production units became available in summer 2025 (see Figure 4).

The IP400 Network Project made its public debut at the HamSCI 2025 conference. At that time, the project was about 2 months old, but it has advanced considerably since then. Features of IP400 (released or in development) include:

- Higher data speeds (minimum 100 kbps)
- Robust modulation and forward error correction
- Automatic node discovery and routing to form peer-to-peer mesh networks
- Ability to transport widely varying data types, from short text messages to digital voice and video, including AX.25 and TCP/IP
- Pushing as much functionality as possible into a dedicated Raspberry Pi computer to allow the use of already developed networking, protocols, etc.
- Development of a Supernode for repeaters to allow interoperation with IP400 user nodes

During summer 2025, I hope to submit a Special Temporary Authority (STA) or Part 5 Experimental License application to the FCC to permit full speed testing and development of IP400 in the US. The current US Amateur Radio regulations (Part 97) limit data modes in the 420 – 450 MHz band to a maximum



**Figure 4** — Pre-production IP400 Radio HAT for Raspberry Pi. [Martin Alcock, VE6VH, photo]

of 56 kbd and a maximum bandwidth of 100 kHz. At its full potential, IP400 can considerably exceed those limits. Canada (where IP400 is being developed and deployed) and most other countries do not have such limits. The alternative to updating Part 97 regulations for advanced modes such as IP400 is to implement a SAFAUSR (Silly Accommodation for Arcane US Regulations) mode.

The IP400 Network Project will be discussed, with working demonstrations, at the first Zero Retries Digital Conference in Everett, Washington, on September 13, 2025 ([www.zeroretries.org/pi/conference](http://www.zeroretries.org/pi/conference)). We also plan to demonstrate IP400 at the Pacificon Conference in San Ramon, California, October 10 – 12, 2025.

To learn more about ADRCs and IP400, go to [adrcs.org/adrcs/ip400-network-project](http://adrcs.org/adrcs/ip400-network-project). Significant developments on IP400 are reported in my newsletter, *Zero Retries*, at [www.zeroretries.org](http://www.zeroretries.org). You can view the full poster at <https://hamsci.org/publications/ip400-networking-project>.

### Browse the Poster Session

The 2025 HamSCI Workshop featured a varied poster session, as well as oral sessions and invited tutorials. Visit <https://hamsci.org/publications> to browse the full list, with links, under the “2025” heading.



## Happenings



# Amateur Spectrum Addressed in US House Reconciliation Bill

Early in the morning on May 22, 2025, the US House of Representatives passed a massive reconciliation bill with the following spectrum provisions relevant to amateur radio:

- Within 2 years, not less than 600 MHz must be identified from between 1.3 and 10 GHz for reallocation to commercial use for broadband services.
- The identified spectrum must be auctioned by the FCC for such services on an exclusive, licensed basis as follows: not less than 200 MHz within 3 years (mid-2028) and the remaining spectrum (at least 400 MHz) within 6 years (mid-2031).
- Excluded from spectrum that could be reallocated for these purposes is 3.1 – 3.45 GHz (which includes the temporary secondary amateur band at 3.300 – 3.450 GHz) and 5.925 – 7.125 GHz.

With regard to amateur spectrum, the bands that potentially could be subject to consideration for reallocation under this legislation are 13 centimeters (2300 –

2310 and 2390 – 2450 MHz) and 5 centimeters (5650 – 5925 MHz). At this time, a number of bands have been mentioned informally for consideration, none of which include amateur spectrum. But the bands under consideration could change, and ARRL will closely monitor the evolving situation.

Additionally, some government operations may be required to consolidate in current amateur secondary spectrum that is already shared with those government uses. In select instances, this might constrain amateur operations if such consolidation occurs.

These provisions have been passed by the House, but key US Senators have not agreed to some aspects and have stated their intention to modify these provisions as the bill moves through Senate consideration. As of press time, the stated goal for final enactment is by July 4, 2025.

## ARRL Renews Defense of the 902 – 928 MHz Amateur Band

In a recent filing, ARRL encouraged the FCC to listen to industry stakeholders about the detrimental impacts that changes to the 902 – 928 MHz band would have for current users.

The FCC is considering a petition by NextNav, Inc., a licensee in the 900 MHz Location and Monitoring Services (LMS), to reconfigure the 902 – 928 MHz band. The reconfiguration would lead to NextNav obtaining more spectrum for itself and replacing the LMS with high-power 5G cellular and related positioning, navigation, and timing (PNT) services that would supplement GPS. ARRL filed comments opposing NextNav's proposal in September 2024 ([www.arrl.org/news/arrl-defends-902-928-amateur-radio-band](http://www.arrl.org/news/arrl-defends-902-928-amateur-radio-band)).

ARRL's latest filing ([www.arrl.org/files/file/Regulatory/ARRL25110Reply.pdf](http://www.arrl.org/files/file/Regulatory/ARRL25110Reply.pdf)) was submitted on May 13, 2025, by its Washington Counsel. It responds to an inquiry initiated by the FCC to consider, more broadly, ways to improve and harden GPS. ARRL's response echoes the concerns of many others, and it underscores the need to improve and harden the current GPS system in a manner that doesn't impact radio amateurs and other users of the 902 – 928 MHz band.

The band supports an extraordinary number of unlicensed consumer devices, used by consumers both inside and outside the US, with which radio amateurs coexist.



ARRL agrees with many parties that point out that one of the FCC's primary goals should be ensuring that existing services in the spectrum, such as those in the crowded 902 – 928 MHz band, should not be disrupted by complementary PNT if equal or better means are available. Billions of unlicensed devices are in use to provide hundreds of applications to the American public, and the number of devices and the functions that they provide continue to grow.

These devices coexist with amateur radio operations in the 902 – 928 MHz band, but they — as well as amateur radio operations — would be displaced if a 5G-like PNT service is authorized to use this spectrum.

In the instant proceeding, the FCC addresses GPS concerns that also are being addressed by multiple other federal government agencies under the direction of the President. ARRL emphasized the FCC's exper-

tise and role in making the best use of the spectrum resource.

We commend the FCC for initiating this proceeding to take a holistic approach to the problem. The FCC is the civilian spectrum expert among the collection of agencies addressing this issue. We rely on the FCC to make clear the value of each MHz of spectrum, as well as the trade-offs in designating any particular band for the purpose of complementary PNT.

ARRL's filing is intended to emphasize the public interest in protecting amateur and others' access to the 902 – 928 MHz band, and to highlight that less disruptive options are available for PNT. ARRL will continue to defend amateur access to this and other threatened amateur allocations.

## 2025 Yasme Excellence Award Recipients Named

This year, the Yasme Foundation has awarded the Yasme Excellence Award to four amateurs: George Cutsogeorge, W2VJN; Eric Nichols, KL7AJ; John Portune, W6NBC, and Tomasz "Tom" Ciepielowski, SP5CCC. Each honoree is an active ARRL member. The Yasme board weighs a ham's technical, operating, or organizational achievements for these awards. Nichols and Portune are frequent contributors to ARRL publications. Cutsogeorge has been active in amateur radio for nearly 80 years, and Ciepielowski has been instrumental in promoting amateur radio in Poland. For more information about the Yasme Excellence Award and the 2025 recipients, visit [www.yasme.org/yasme-excellence-awards](http://www.yasme.org/yasme-excellence-awards).

## Johns Hopkins University to Hold ARRL Teachers Institute

A session of the ARRL Teachers Institute on Wireless Technology is being hosted this summer by the Johns Hopkins University Applied Physics Lab in Laurel, Maryland. This marks the first time a major research university will host the ARRL program.

Working with Johns Hopkins University is a result of ARRL Education and Learning Manager Steve Goodgame, K5ATA, exhibiting the program at the National Science Teaching Association Conference in Philadelphia this past March. Representatives from the university saw Goodgame's presentation on the impact amateur radio can have on science, technology, engineering, and mathematics curricula. "This is a huge win to have a name like Johns Hopkins interested in the work we are doing," said Goodgame. "We are hoping to partner with them frequently to hold more sessions, license teachers, and inspire kids," he added.

## Section Manager Nomination Notice

To all ARRL members in Alabama, Alaska, Delaware, East Bay, Kansas, Michigan, New Mexico, Santa Barbara, Tennessee, and Western Massachusetts. You are hereby solicited for nominating petitions pursuant to an election for Section Manager (SM). Incumbents are listed on page 16 of this issue.

To be valid, a petition must contain the signatures of five or more full ARRL members residing in the Sections concerned. It is advisable to have a few more than five signatures on each petition. A sample nomination form is available on the ARRL website at [www.arrl.org/section-terms-nomination-information](http://www.arrl.org/section-terms-nomination-information). Nominating petitions may be made by facsimile or electronic transmission of images, provided that upon request by the Field Services Manager, the original documents are received by the manager within 7 days of the request. It is acceptable to submit signatures that have been sent via email or mail under the following guidelines: The petition copies must be made from the original form supplied by ARRL or downloaded from the ARRL website. The form must be exactly the same on both sides (i.e., autobiographical information should appear exactly the same on all copies). All forms/copies must be submitted together.

Candidates may use any of the available electronic signature platforms such as DocuSign, Dropbox Sign, and Signed PDF. Candidates who use an electronic signature platform to be nominated, as described above, do not have to send the original paper copies of the nominating documents. The packet that is sent to ARRL Headquarters must be complete. Multiple files or emails for a single petition will not be accepted.

We suggest the following format:

(Place and Date)

Field Services Manager, ARRL

225 Main St.

Newington, CT 06111

We, the undersigned full members of the \_\_\_\_\_ ARRL Section of the \_\_\_\_\_ Division, hereby nominate \_\_\_\_\_ as candidate for Section Manager of this Section for the next 2-year term of office.

(Signature \_\_\_\_\_ Call Sign \_\_\_\_\_ City \_\_\_\_\_ ZIP \_\_\_\_\_)

Any candidate for the office of Section Manager must be a resident of the Section, an amateur radio licensee of Technician class or higher, and a full member of ARRL for a continuous term of at least 2 years immediately preceding receipt of a nominating petition. Petitions must be received at Headquarters by 4:00 PM Eastern Time on September 5, 2025. If more than one member is nominated in a single Section, ballots will be mailed from Headquarters no later than October 1, 2025, to full members of record as of September 5, 2025, which is the closing date for nominations. Returns will be counted November 18, 2025. Section Managers elected as a result of the above procedure will take office January 1, 2026.

If only one valid petition is received from a Section, that nominee shall be declared elected without opposition for a 2-year term beginning January 1, 2026. If no petitions are received from a Section by the specified closing date, such Section will be resolicited in the January issue of **QST**. A Section Manager elected through the resolicitation will serve a term of 18 months. A Section Manager vacancy occurring between elections is filled through appointment by the Field Services Manager. — **Mike Walters, W8ZY, Field Services Manager**

Because no nomination petitions were received for the New Hampshire Section Manager election by the nomination deadline of March 7, 2025, nominations are hereby resolicited. See above for details.



# Call for Nominations for ARRL Director and Vice Director

Attention: Full ARRL members in the Pacific, Rocky Mountain, Southeastern, Southwestern, and West Gulf Divisions. You have the opportunity to choose a Director and Vice Director to represent you for a 3-year term beginning January 1, 2026.

ARRL is governed by its Board of Directors. A voting Director is chosen by ballot by the full (licensed) ARRL members in each of its 15 Divisions. Vice Directors who serve in the absence of the Director at a Board meeting and succeed to the position of Director should a vacancy occur are chosen at the same time. Elections are held in five Divisions per year. It takes only 10 full members in a Division to nominate a candidate for either office.

## Qualifications

The eligibility of nominees for the positions of ARRL Director and Vice Director will be reviewed by the Ethics & Elections Committee, composed of three Directors not subject to election this year: Scott Yonally, N8SY; Brent Walls, N9BA, and Tom Frenaye, K1KI. A nominee must be at least 21 years old and must have been licensed and a full member of ARRL for a continuous term of at least 4 years immediately preceding nomination. Each nominee must provide information concerning their employment, ownership, investment interests, and other financial arrangements to ensure compliance with the Conflict of Interest Policy (see Article 12 of the ARRL *Articles of Association and Bylaws* 18 – 24), available at [www.arrl.org/general-information](http://www.arrl.org/general-information). The qualifications for Director and Vice Director are identical. All the powers of the Director are transferred to the Vice Director in the event of the Director's resignation, recall, move outside the Division, inability to serve, or death.

## Nomination Procedure

*Step 1: Obtain official nominating petition forms.* Starting July 1, any full member residing in a Division where

there is an election may request an official nominating petition package in writing, either by letter or via email, to [execadmin@arrl.org](mailto:execadmin@arrl.org). The request must reach the ARRL Secretary *no later than noon EDT on Friday, August 8, 2025*. If you are seriously considering running or nominating someone to run, please don't wait until the last minute to request the forms; the deadline for submitting a completed petition form is just 1 week later.

*Step 2: Complete the questionnaire and obtain signatures. Only the official form may be used.* The candidate must complete the questionnaire, provide the information required to determine eligibility, certify its accuracy, and agree to assume the office if elected and to abide by all ARRL Articles of Association, Bylaws, and Governing Documents. To be valid, a nominating petition must name the candidate and must bear the wet (non-electronic) signatures of 10 full members of the Division.

*Step 3: Submit the petition form.* The completed form must reach the Secretary *no later than noon EDT on Friday, August 15, 2025*. The submission may be made by electronic transmission of images (i.e., a PDF or JPEG attachment to an email) or facsimile provided that upon request, the original documents are received by the Secretary within 7 days of the request. A person who is nominated for both Director and Vice Director may choose to decline the nomination for Director; otherwise, the nomination for Director will stand and that for Vice Director will be void.

## Balloting

If there is only one eligible candidate for an office, he or she will be declared elected by the Ethics & Elections Committee. If there is more than one eligible candidate for an office, the full members in that Division who are in good standing as of September 10, 2025, will have the opportunity to cast ballots. Official voting documents will

be mailed and emailed to members who are eligible to vote no later than October 1, 2025. Votes must be electronically cast, or completed paper ballots must be received at the designated PO Box in the envelope provided, by noon Eastern Time on Friday, November 21, 2025. The candidate receiving the most votes will be declared the winner that day.

## Absentee Ballots

A full member who is residing temporarily outside his or her home Division, including overseas, may arrange to vote in the home Division by notifying the Secretary before September 6, 2025, giving their current mailing address as reflected in the ARRL membership records (i.e., QST mailing address) and the reason that another Division is considered home. Members with overseas military addresses should take special note of this provision; in the absence of information received to the contrary, ballots will be sent to them based on their postal addresses.

## The Incumbents

The incumbent Directors and Vice Directors, respectively, in the five Divisions in which elections will be held this year are:

**Pacific:** John Litz, NZ6Q

**Rocky Mountain:** Jeff Ryan, KØRM, and Dan Grady, N2SRK

**Southeastern:** Mickey Baker, N4MB, and Andy Milluzzi, KK4LWR

**Southwestern:** Dick Norton, N6AA, and Ned Stearns, AA7A

**West Gulf:** John Robert Stratton, N5AUS, and Lee Cooper, W5LHC

## Public Service

# Reading the Mail: How to Grow the ARES Community

Reports, essays, newsletters, opinions, plaudits, and criticisms cross my desk each month — and that is a good thing. I try to read them all. I have learned a lot, and as a result, I can hopefully share some lessons learned and ideas for the future of amateur radio public service, especially the venerable Amateur Radio Emergency Service® (ARES®), a major ARRL program, members of which are the principal readers of this column. This month, I'll share some recent thoughts from the field.

Reid Tillery, K9RFT, of Melrose, Florida, asks why we would want to grow the ranks of amateur radio licensees. He answered his own question: "In my view, the primary reason is we need more hams to provide public service and safety, primarily via emergency communications and secondarily for supporting events such as bike races, parades, and so on, with radio-communications to facilitate logistics and public safety."

It is worth noting the very first rule in Part 97, the FCC's regulations for the amateur service: "Recognition and enhancement of the value of the amateur service to the public as a noncommercial communication service, *particularly with respect to providing emergency communications* [emphasis added]."

Tillery observes, "There are quite a number of hams keen to volunteer for an incident or event as long as (1) they can be made to feel needed, (2) we can show them exactly how they can fit in, and (3) we train them from start to finish." He believes the first part of that training involves helping students attain their initial license: "This means we need to continually offer classes in our area."

### Recruitment and Training

How do we recruit students? Tillery recommends appeals on social media: "Starting a month or so

ahead of the class, I post periodic announcements on Facebook." Other students will come just because they hear about it somewhere else — club meetings, for example, Tillery indicates.

Once students are licensed, ARES leaders — Emergency Coordinators, Assistant ECs — help them become part of the local team by assisting them with putting together a good 2-meter FM fixed and/or portable/mobile station — the bedrock of an emergency communicator's assets — with an efficient antenna mounted as high as possible and encouraging them to join in on weekly ARES nets. "We encourage them to register in ARES and join the area club(s), where they will meet dynamic, enthusiastic practitioners and become part of the emergency service community,



Fred Lewis, KO4YOL, Gilchrist County Emergency Coordinator at the helm of the county EOC's amateur radio station in Bell, Florida. [Rick Palm, K1CE, photo]



learning even more as they go,” says Tillery. With these approaches, “we’d expand the ranks with more volunteers for EmComm’s basic functions and service at the EOC and shelters.”

## A Larger Array of Skills

Gordon Gibby, KX4Z, a regional and nationally recognized leading light, says while there has been progress on these objectives, “a very small percentage of licensed hams are willing to participate in ARES.” And “an even smaller percentage are both able and willing to leave their homes to participate and serve the greater county — we typically have only six to eight volunteers — barely enough to support the missions requested by the Emergency Manager.”

Gibby says that an assignment/deployment service can often mean you are on your own wherever you are assigned. So merely knowing how to press a mic button is not sufficient for efficient, effective response. As a result, “I concluded that the mission of ARES training has to be far broader to include just about every niche of amateur radio, so that the team is competent at a much larger array of skills, since they could easily find themselves on their own to troubleshoot a variety of issues on a deployment.”

“In our large county, we teach a zillion different skills to foster a wider knowledge base. We get people into radiocommunication exercises, contests, and many more things,” he says. “As a result, the team has grown together in skills and knowledge, and most importantly, in having a good relationship with each other, a chal-

## Ideas for ARES Groups

- Develop a robust 6-meter net and practice with it to send messages not only around the county but also out of the county by interfacing with HF operators.
- Help new and veteran hams alike develop effective portable/mobile EmComm field stations by teaching what to procure and train on to be a field operator. Hold antenna parties to help them erect efficient, high-gain antennas.
- Through nets and other outlets, assist hams at becoming competent at traffic handling. For example, learn to reliably relay messages county-wide by 2-meter simplex. Have more hams with HF capability to deliver messages out of the area — by Winlink, for example.
- Practice interfacing with General Mobile Radio Service and Family Radio Service operators to get their messages out of their areas and on to the destinations.
- Have ARES work with all county fire stations to place 2-meter antennas, install radios, and have several individuals assigned to operate them when needed. These types of activities foster cooperation, team spirit, and camaraderie that are so critically important to any successful endeavor.
- Reach out to your county ARES net, as it is an indispensable center of activity, especially during hurricanes or other significant weather events.

lenge under the duress of deployment in an incident or disaster response,” Gibby continues. “Also, we spread leadership skills and responsibilities around as much as people are willing to take; there are open slots for leadership at almost every one of our events.”

Tillery suggests a priority is imparting basic emergency communications service skills, focusing on backup capabilities for the large county. ARES members have served well both at the EOC and in the field. The county is serving the community by giving its citizens more ways to call for help and to pass ground truths to county staff and officials.



The Shelby County, Ohio, ARES Mobile Communications Unit on display at Dayton Hamvention 2025. With gorgeous weather, the Hamvention exhibit halls, forums, and flea market were packed with exhibitors, speakers, audiences, buyers, sellers, and flea marketeers. [Rick Palm, K1CE, photo]

## Life Members

**Elected May 8, 2025**

Daniel W. Abbott, N7DWA  
Joshua Andrews  
Jose G. Ayala, K4JGA  
John D. Ball, KN4OLA  
Michael E. Bassett, KE8YIL  
David P. Behrend, KB5FNK  
Harry V. Bryant, AA2WN  
Christopher E. Canton, AJ6RP  
James E. Carvalho, AE6TQ  
Edward A. Cienki, N2EAC  
James S. Clarke, IV, K7JSC  
Richard J. Constantine, G3UGF  
Brian P. Crawford, KL7JDQ  
Brian E. Daley, WM8G  
Andrew D. Dasher, N1ER  
Karl D. Diekevers, NM0H  
Jeffrey M. Egan, KB1EJB  
Daniel D. Elliott, AC1KS  
James T. Gaetjen, KO4QKL  
Diann R. Gentile, KD2BND  
Florian Gutzwiller, HB3XPA

Jeffery L. Harlan, KW4YG  
David A. Henebry, KB9HOX  
Harold R. Hepner, AD7QJ  
Rick Hillstead, N4RAH  
Scott B. Howard, N9SBH  
Juarez Johnson, Jr., K1REZ  
Robert Kincaid, AI6P  
Dan Koloski, KD3AUN  
Gregory A. Krantz, NT7Q  
Kenneth L. Laughman, KF1DD  
Kevin S. Long, KC3WAY  
Marc Phillip Lulkin, K9TOE  
Michael F. Maher, KD2MUI  
Michael K. McKay, W7OCM  
Lynn A. Nelson, W0ND  
Eric R. Nolen, KG7FAD  
Devin J. O'Brien, KC2IBE  
Michael P. Olbrisch, KD5KC  
Louis Paulerio, AK6MV  
Mark Pereira, G6PMN  
Lloyd S. Quail, KK7ZNU

Mark S. Rich, AE4LW  
Arlen J. Ross, KQ4MVL  
John W. Springman, III, KB3AWQ  
James A. Stoner, K3JAS  
Kevin Sulonen, N7KV  
Kevin S. Sumner, KQ4YBZ  
David Tcheng  
Michael F. Tyner, KB3DQI  
Christopher J. Vanek, AC3Q  
Andrew S. Walker, Jr., KI5ZQS  
John Francis Yeager, NZ7W



# Congratulations





# Certificate of Code Proficiency Recipients



This month, ARRL recognizes merit and progress in Morse code proficiency on the part of the following individuals, who have achieved proficiency at the following rates, in words per minute.

## January 2025

|                         |    |
|-------------------------|----|
| Ronald M. Bell, KG5CWH  | 10 |
| Luke A. Sandell, KN4FVR | 10 |
| Freddie O. Cruz, AA2QL  | 15 |
| Forrest Phillips, AEØQH | 15 |
| Ron Kinney, KCØZPS      | 30 |

## February 2025

|                            |    |
|----------------------------|----|
| Michael R. Meadows, KEØFFT | 10 |
| James J. Werth, KD1AO      | 15 |
| Barry G. Fluxe, W4LSV      | 20 |
| Dominick F. Golino, NR2Z   | 20 |
| Roger L. Burkhart, N3GE    | 25 |

## March 2025

|                               |    |
|-------------------------------|----|
| Richard L. Eilers, Jr., K4RLE | 10 |
| Horacio S. Falciglia, KA8TVY  | 10 |
| Sherrick A. Slattery, KA6NZB  | 15 |
| Brian A. Bayani, KT3X         | 20 |

## April 2025

|                             |    |
|-----------------------------|----|
| Scott A. Fronius, N1HQZ     | 10 |
| Simpson A. Huston, N8UZF    | 10 |
| Steven M. Johnson, WB4WBO   | 10 |
| Clifford R. Cantrell, N5GWU | 15 |
| Joseph L. Kelly, N9SV       | 15 |
| Steven M. Johnson, WB4WBO   | 15 |
| Michael A. Kramer, N5XTH    | 30 |
| Michael A. Kramer, N5XTH    | 35 |

## May 2025

|                             |    |
|-----------------------------|----|
| Bruce A. Smith, W4DPI       | 10 |
| Jeremy L. Wallace, NR9I     | 10 |
| Kenneth F. Robinson, K8SCA  | 15 |
| Thomas P. Stelmach, NØQBX   | 15 |
| Vincent L. DeCaprio, KD2VLQ | 15 |
| Barry G. Fluxe, W4LSV       | 25 |

Congratulations to all of the recipients.

## August 2025 W1AW Qualifying Runs

W1AW, the Hiram Percy Maxim Memorial Station at ARRL Headquarters in Newington, Connecticut, transmits Morse code Qualifying Runs to assist ham radio operators in increasing and perfecting their proficiency in Morse code. Amateur radio operators can earn a Certificate of Code Proficiency or endorsements by listening to W1AW Qualifying Runs.

August Qualifying Runs will be transmitted by W1AW in Newington, Connecticut, at the times shown on 1.8025, 3.5815, 7.0475, 14.0475, 18.0775, 21.0675, 28.0675, 50.350, and 147.555 MHz. The West Coast Qualifying Runs will be transmitted by K6KPH on Saturday, August 23, at 2 PM PDT (2100 UTC on August 23) on 3581.5, 7047.5, 14047.5, 18077.5, and 21067.5 kHz. Unless indicated otherwise, sending speeds are from 10 to 35 WPM.

Amateur radio operators who participate in Qualifying Runs may submit proof of 1 minute of the highest speed they have copied in the hope of qualifying for the Certificate of Code Proficiency, or an endorsement to their existing certificate.

Legibly copy at least 1 minute of text by hand, and mail the sheet to: W1AW Qualifying Runs, 225 Main St., Newington, CT USA 06111.

Include \$10 (check or money order) if this is a submission for your initial Code Proficiency certificate; \$7.50 if you are applying for an endorsement (available for speeds up to 40 WPM). Your text will be checked against the actual transmissions to determine if you have qualified.

Members of the North Fulton (Georgia) Amateur Radio League (<https://nfarl.org>) are offering to

subsidize the total cost of a Code Proficiency certificate or endorsement submission for any individual age 21 years and younger, and who reside in either the US or Canada. Participants who wish to make use of this offer should indicate on their Qualifying Run submissions they are age 21 or younger, and certify as such via their signature. Eligible participants are not required to send any fee with their Code Proficiency submissions.

For more information about Qualifying Runs, please visit [www.arrl.org/qualifying-run-schedule](http://www.arrl.org/qualifying-run-schedule)

For information about how to qualify for the Certificate of Code Proficiency, please visit [www.arrl.org/code-proficiency-certificate](http://www.arrl.org/code-proficiency-certificate).



## W1AW Qualifying Run Schedule – August 2025

(All times are in Eastern Daylight Time.)

| Monday                                                      | Tuesday                                    | Wednesday                                                   | Thursday                                   | Friday                                     |
|-------------------------------------------------------------|--------------------------------------------|-------------------------------------------------------------|--------------------------------------------|--------------------------------------------|
| <b>8/4</b><br>4 PM – 2000Z<br>10 – 35 WPM                   |                                            | <b>8/6</b><br>7 PM – 2300Z<br>35 – 10 WPM                   |                                            | <b>8/8</b><br>9 AM – 1300Z<br>10 – 35 WPM  |
| <b>8/11</b><br>4 PM – 2000Z<br>10 – 35 WPM                  | <b>8/12</b><br>7 PM – 2300Z<br>10 – 40 WPM |                                                             | <b>8/14</b><br>9 AM – 1300Z<br>35 – 10 WPM |                                            |
|                                                             | <b>8/19</b><br>7 PM – 2300Z<br>10 – 35 WPM | <b>8/20</b><br>10 PM – 0200Z<br>(8/21 – UTC)<br>35 – 10 WPM | <b>8/21</b><br>9 AM – 1300Z<br>10 – 35 WPM |                                            |
| <b>8/25</b><br>10 PM – 0200Z<br>(8/26 – UTC)<br>10 – 40 WPM | <b>8/26</b><br>9 AM – 1300Z<br>10 – 35 WPM |                                                             |                                            | <b>8/29</b><br>7 PM – 2300Z<br>10 – 35 WPM |

# Contest Corral

# August 2025

Check for updates and a downloadable PDF version online at [www.arrl.org/contest-calendar](http://www.arrl.org/contest-calendar).

Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

| Start - Finish<br>Date-Time Date-Time |      |    |      | Bands            | Contest Name                                        | Mode      | Exchange                                              | Sponsor's Website                                                                                              |
|---------------------------------------|------|----|------|------------------|-----------------------------------------------------|-----------|-------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| 2                                     | 0001 | 3  | 2359 | 28               | 10-10 International Summer Contest, SSB             | Ph        | Name, mbr or "0," SPC                                 | <a href="http://www.ten-ten.org">www.ten-ten.org</a>                                                           |
| 2                                     | 1200 | 2  | 2359 | 1.8-28           | European HF Championship                            | CW Ph     | RS(T), 2-digit year first licensed                    | <a href="http://euhf.s5cc.eu">euhf.s5cc.eu</a>                                                                 |
| 2                                     | 1800 | 3  | 0559 | 1.8-28           | North American QSO Party, CW                        | CW        | Name, state/DC/province/country                       | <a href="http://www.ncjweb.com">www.ncjweb.com</a>                                                             |
| 2                                     | 1800 | 3  | 1800 | 222 MHz and up   | ARRL 222 MHz and Up Distance Contest                | CW Ph Dig | 6-char grid square                                    | <a href="http://www.arrl.org/222-mhz-and-up-distance-contest">www.arrl.org/222-mhz-and-up-distance-contest</a> |
| 3                                     | 0600 | 3  | 1359 | 144              | Hemus VHF Contest - 144 MHz                         | CW Ph     | RS(T), 6-char grid square                             | <a href="http://radioclub-troyan.bg">radioclub-troyan.bg</a>                                                   |
| 3                                     | 1400 | 3  | 1700 | 3.5-14           | SARL HF Phone Contest                               | Ph        | RS, serial                                            | <a href="http://mysarl.org.za">mysarl.org.za</a>                                                               |
| 5                                     | 0000 | 5  | 0200 | 3.5-28           | ARS Spartan Sprint                                  | CW        | RST, SPC, power                                       | <a href="http://ars-qrp.com">ars-qrp.com</a>                                                                   |
| 5                                     | 0800 | 5  | 0929 | 3.5              | ZL Sprint                                           | CW Ph Dig | CW/SSB: RS(T), outside temp; FT4: 4-char grid         | <a href="http://www.nzart.org.nz">www.nzart.org.nz</a>                                                         |
| 6                                     | 1700 | 6  | 2100 | 144              | VHF-UHF FT8 Activity Contest                        | Dig       | 4-char grid square                                    | <a href="http://www.ft8activity.eu">www.ft8activity.eu</a>                                                     |
| 7                                     | 0000 | 8  | 0300 | 7                | Walk for the Bacon QRP Contest                      | CW        | Max 13 WPM; RST, SPC, name                            | <a href="http://qrpcontest.com/pigwalk40">qrpcontest.com/pigwalk40</a>                                         |
| 7                                     | 1800 | 7  | 2200 | 28               | NRAU 10m Activity Contest                           | CW Ph Dig | RS(T), 6-char grid square                             | <a href="http://nrau.net/nrau-contests-in-general">nrau.net/nrau-contests-in-general</a>                       |
| 9                                     | 0000 | 10 | 2359 | 3.5-28           | WAE DX Contest, CW                                  | CW        | RST, serial                                           | <a href="http://www.darc.de">www.darc.de</a>                                                                   |
| 9                                     | 0000 | 9  | 2359 | 3.5-28           | FISTS Saturday Sprint                               | CW        | RST, first name, mbr or "0," SPC                      | <a href="http://fistsna.org">fistsna.org</a>                                                                   |
| 9                                     | 1200 | 10 | 1159 | 3.5,7,28         | YB Bekasi Merdeka Contest                           | Ph        | RS, YB section or "DX"                                | <a href="http://bmc.orari-kotabekasi.com">bmc.orari-kotabekasi.com</a>                                         |
| 9                                     | 1400 | 10 | 0400 | 1.8-28           | Maryland-DC QSO Party                               | CW Ph     | MDC county/city or SPC                                | <a href="http://www.w3vpr.org">www.w3vpr.org</a>                                                               |
| 9                                     | 1400 | 9  | 2200 | 3.5-28           | Kentucky State Parks on the Air                     | CW Ph Dig | KY park abbr, SP or "DX"                              | <a href="http://k4msu.com/kypota">k4msu.com/kypota</a>                                                         |
| 9                                     | 1800 | 9  | 2200 | 50               | 50 MHz Fall Sprint                                  | CW Ph Dig | 4-char grid square                                    | <a href="http://packratvhf.com">packratvhf.com</a>                                                             |
| 10                                    | 1300 | 10 | 1600 | 3.5-14           | SARL HF Digital Contest                             | Dig       | RST, serial                                           | <a href="http://mysarl.org.za">mysarl.org.za</a>                                                               |
| 11                                    | 0000 | 11 | 0200 | 1.8-28           | 4 States QRP Group Second Sunday Sprint             | CW Ph     | RS(T), SPC, mbr or pwr                                | <a href="http://www.4sqrp.com">www.4sqrp.com</a>                                                               |
| 11                                    | 2200 | 13 | 2159 | 144              | MMMonVHF/DUBUS 144 MHz Meteorscatter Sprint Contest | CW Ph Dig | Signal report                                         | <a href="http://www.mmmmonvhf.de">www.mmmmonvhf.de</a>                                                         |
| 12                                    | 0800 | 12 | 0929 | 3.5              | ZL Sprint                                           | CW Ph Dig | CW/SSB: RS(T), outside temp; FT4: 4-char grid         | <a href="http://www.nzart.org.nz">www.nzart.org.nz</a>                                                         |
| 12                                    | 1900 | 12 | 2029 | 3.5              | DARC FT4 Contest                                    | Dig       | RST, 4-char grid square                               | <a href="http://www.darc.de">www.darc.de</a>                                                                   |
| 13                                    | 1700 | 13 | 2100 | 432              | VHF-UHF FT8 Activity Contest                        | Dig       | 4-char grid square                                    | <a href="http://www.ft8activity.eu">www.ft8activity.eu</a>                                                     |
| 16                                    | 0000 | 17 | 1600 | 3.5-28           | SARTG WW RTTY Contest                               | Dig       | RST, serial                                           | <a href="http://www.sartg.com">www.sartg.com</a>                                                               |
| 16                                    | 0000 | 17 | 2359 | 2.3 GHz and up   | ARRL EME Contest                                    | CW Ph Dig | See rules                                             | <a href="http://www.arrl.org/eme-contest">www.arrl.org/eme-contest</a>                                         |
| 16                                    | 0800 | 17 | 0800 | 1.8-28           | Russian District Award Contest                      | CW Ph     | RS(T), RU district code or serial                     | <a href="http://rdaward.org/rdac1.htm">rdaward.org/rdac1.htm</a>                                               |
| 16                                    | 0900 | 18 | 0759 | 10 GHz to light  | ARRL 10 GHz and Up Contest                          | CW Ph Dig | 6-char grid square                                    | <a href="http://www.arrl.org/10-ghz-up">www.arrl.org/10-ghz-up</a>                                             |
| 16                                    | 1200 | 16 | 1300 | 7                | SARL Youth QSO Party                                | Ph        | RS, age                                               | <a href="http://mysarl.org.za">mysarl.org.za</a>                                                               |
| 16                                    | 1600 | 16 | 1759 | 1.8-28,50        | Feld Hell Sprint                                    | Dig       | See rules                                             | <a href="http://sites.google.com/site/feldhellclub">sites.google.com/site/feldhellclub</a>                     |
| 16                                    | 1200 | 17 | 1200 | 1.8-28,50        | Keyman's Club of Japan Contest                      | CW        | RST, JA prefecture/district code or CQ zone           | <a href="http://kcj-cw.com">kcj-cw.com</a>                                                                     |
| 16                                    | 1800 | 17 | 0559 | 1.8-28           | North American QSO Party, SSB                       | Ph        | Name, state/DC/province/country                       | <a href="http://www.ncjweb.com">www.ncjweb.com</a>                                                             |
| 16                                    | 1800 | 17 | 2100 | 1.8-28           | CVA DX Contest, CW                                  | CW        | RST, PY state, continent or "MIL"                     | <a href="http://cvadx.org">cvadx.org</a>                                                                       |
| 17                                    | 0000 | 17 | 2359 | 3.5-28           | FISTS Sunday Sprint                                 | CW        | RST, first name, mbr or "0," SPC                      | <a href="http://fistsna.org">fistsna.org</a>                                                                   |
| 17                                    | 1700 | 17 | 2100 | 3.5-28           | NJQRP Skeeter Hunt                                  | CW Ph     | RS(T), SPC mbr or power, "W"                          | <a href="http://www.qsl.net/w2lj">www.qsl.net/w2lj</a>                                                         |
| 17                                    | 1800 | 17 | 2359 | 3.5-28           | ARRL Rookie Roundup, RTTY                           | Dig       | Name, 2-digit year first licensed, SPC or XE province | <a href="http://www.arrl.org/rookie-roundup">www.arrl.org/rookie-roundup</a>                                   |
| 17                                    | 2300 | 18 | 0100 | 1.8-28           | Run for the Bacon QRP Contest                       | CW        | RST, SPC, (mbr/pwr)                                   | <a href="http://qrpcontest.com/pigrun">qrpcontest.com/pigrun</a>                                               |
| 19                                    | 0800 | 19 | 0929 | 3.5              | ZL Sprint                                           | CW Ph Dig | CW/SSB: RS(T), outside temp; FT4: 4-char grid         | <a href="http://www.nzart.org.nz">www.nzart.org.nz</a>                                                         |
| 20                                    | 1700 | 20 | 2100 | 1.2 GHz          | VHF-UHF FT8 Activity Contest                        | Dig       | 4-char grid square                                    | <a href="http://www.ft8activity.eu">www.ft8activity.eu</a>                                                     |
| 21                                    | 0000 | 22 | 0300 | 14               | Walk for the Bacon QRP Contest                      | CW        | Max 13 WPM; RST, SPC, name                            | <a href="http://qrpcontest.com/pigwalk20">qrpcontest.com/pigwalk20</a>                                         |
| 21                                    | 1900 | 21 | 2000 | 3.5-14           | NTC QSO Party                                       | CW        | Max 25 WPM, RST, mbr or "NM"                          | <a href="http://pi4ntc.nl">pi4ntc.nl</a>                                                                       |
| 23                                    | 0400 | 25 | 0400 | 1.8-28           | Hawaii QSO Party                                    | CW Ph Dig | RS(T), HI district, or SP                             | <a href="http://www.hawaiiqsoparty.org">www.hawaiiqsoparty.org</a>                                             |
| 23                                    | 1200 | 24 | 1200 | 3.5-28           | YO DX HF Contest                                    | CW Ph     | RS(T), YO county, or serial                           | <a href="http://www.yodx.ro">www.yodx.ro</a>                                                                   |
| 23                                    | 1600 | 24 | 0400 | 1.8-28           | Ohio QSO Party                                      | CW Ph     | RS(T), OH county, SP or "DX"                          | <a href="http://www.ohqp.org">www.ohqp.org</a>                                                                 |
| 23                                    | 1800 | 24 | 2100 | 1.8-28           | CVA DX Contest, SSB                                 | Ph        | RS, PY state, continent or "MIL"                      | <a href="http://cvadx.org">cvadx.org</a>                                                                       |
| 24                                    | 1400 | 24 | 1700 | 3.5-14           | SARL HF CW Contest                                  | CW        | RST, serial                                           | <a href="http://mysarl.org.za">mysarl.org.za</a>                                                               |
| 26                                    | 0800 | 26 | 0929 | 3.5              | ZL Sprint                                           | CW Ph Dig | CW/SSB: RS(T), outside temp; FT4: 4-char grid         | <a href="http://www.nzart.org.nz">www.nzart.org.nz</a>                                                         |
| 29                                    | 2200 | 31 | 2359 | 1.8-28           | SCRY/RTTYOps WW RTTY Contest                        | Dig       | RST, 4-digit year license first issued                | <a href="http://rttyops.com/index.php">rttyops.com/index.php</a>                                               |
| 30                                    | 0000 | 30 | 2359 | 1.8-28,50        | Feld Hell Sprint                                    | Dig       | See rules                                             | <a href="http://sites.google.com/site/feldhellclub">sites.google.com/site/feldhellclub</a>                     |
| 30                                    | 0600 | 31 | 0559 | 3.5-28           | ALARA Contest                                       | CW Ph     | RS(T), serial, name                                   | <a href="http://www.alara.org.au">www.alara.org.au</a>                                                         |
| 30                                    | 1200 | 31 | 0300 | 1.8-28,50        | U.S. Islands QSO Party                              | CW Ph Dig | RS(T), island designation or SPC                      | <a href="http://usislands.org">usislands.org</a>                                                               |
| 30                                    | 1200 | 31 | 1200 | 1.8-28           | World Wide Digi DX Contest                          | Dig       | 4-char grid square                                    | <a href="http://ww-digi.com">ww-digi.com</a>                                                                   |
| 30                                    | 1300 | 31 | 0400 | All, except WARC | Colorado QSO Party                                  | CW Ph Dig | Name, county or SPC/DX prefix                         | <a href="http://ppraa.org/coqp">ppraa.org/coqp</a>                                                             |
| 30                                    | 1400 | 31 | 2000 | 3.5-28,50        | Kansas QSO Party                                    | CW Ph Dig | RS(T), KS county, SP or "DX"                          | <a href="http://ksqsoparty.org">ksqsoparty.org</a>                                                             |

There are a number of weekly contests not included in the table above. For more info, visit: [www.qrpfoxhunt.org](http://www.qrpfoxhunt.org), [www.ncccsprint.com](http://www.ncccsprint.com), and [www.cwops.org](http://www.cwops.org). All dates and times refer to UTC and may be different from calendar dates in North America. Contests are not conducted on the 60-, 30-, 17-, or 12-meter bands. Mbr = Membership number. Serial = Sequential number of the contact. SPC = State, Province, DXCC Entity. XE = Mexican state. Listings in blue indicate contests sponsored by ARRL or NCJ. The latest time to make a valid contest QSO is the minute listed in the "Finish Time" column. Data for Contest Corral is maintained on the *WATBNM Contest Calendar* at [www.contestcalendar.com](http://www.contestcalendar.com) and is extracted for publication in QST 2 months prior to the month of the contest. ARRL gratefully acknowledges the support of Bruce Horn, WA7BNM, in providing this service.



# 2025 ARRL International DX CW Contest Results

This year's ARRL DX CW Contest was held February 15 – 16, 2025.

The next ARRL International DX CW Contest will be held February 21 – 22, 2026.

## Top Ten — US and Canada

|                                              |           |                                                          |         |                                                         |         |                                                         |         |                                                         |            |
|----------------------------------------------|-----------|----------------------------------------------------------|---------|---------------------------------------------------------|---------|---------------------------------------------------------|---------|---------------------------------------------------------|------------|
| <b>Single Operator, High Power</b>           |           | <b>Single Operator, High Power, 160 Meters</b>           |         | <b>Single Operator Unlimited, Low Power, 40 Meters</b>  |         | <b>Single Operator Unlimited, High Power, 15 Meters</b> |         | <b>Single Operator Unlimited, High Power, 10 Meters</b> |            |
| N2NT                                         | 7,444,008 | N4XD                                                     | 18,048  | AA4NP                                                   | 62,196  | KD2RD                                                   | 435,411 | VE3EJ                                                   | 515,778    |
| K5GN                                         | 6,186,048 | N4TZ                                                     | 10,800  | KM4CH                                                   | 30,429  | WW3S                                                    | 434,304 | K6LL                                                    | 342,186    |
| AA1K                                         | 5,508,204 | KQ2I                                                     | 75      | KT3T                                                    | 28,080  | WU6P                                                    | 415,188 | K3EST                                                   | 319,479    |
| NN7CW                                        | 5,335,440 | <b>Single Operator Unlimited, High Power, 160 Meters</b> |         | K8TS                                                    | 17,010  | K1JB                                                    | 343,392 | W6PH                                                    | 317,205    |
| AA4NC (N4YDU, op)                            | 5,223,915 | W3LL                                                     | 8,514   | WB8K                                                    | 16,215  | VA7RR                                                   | 293,646 | K0AP                                                    | 306,900    |
| N9RV                                         | 4,759,272 | K5UR                                                     | 4,464   | KY6AA                                                   | 8,241   | W9ILY                                                   | 289,710 | K2LE                                                    | 276,570    |
| VY2TT (K6LA, op)                             | 4,690,497 | WN9O                                                     | 3,150   | W2XX                                                    | 1,800   | K0VBU                                                   | 228,690 | WF4DX (WB9Z, op)                                        | 268,974    |
| NA8V                                         | 4,636,152 | K3PA                                                     | 1,458   | WV4E                                                    | 672     | AA0FO                                                   | 218,610 | VE7ZO                                                   | 223,407    |
| W9RE                                         | 4,469,580 | N4DE                                                     | 624     | VA3HYM                                                  | 105     | N3UA                                                    | 150,600 | W6YI                                                    | 211,830    |
| N1UR                                         | 4,377,177 | N4RA                                                     | 216     | <b>Single Operator, High Power, 20 Meters</b>           |         | VE3UZ                                                   | 137,865 | W7RG                                                    | 192,096    |
| <b>Single Operator, Low Power</b>            |           | <b>Single Operator, High Power, 80 Meters</b>            |         | KC9OP                                                   | 10,692  | <b>Single Operator Unlimited, Low Power, 15 Meters</b>  |         | <b>Single Operator Unlimited, Low Power, 10 Meters</b>  |            |
| K0EJ                                         | 3,572,100 | W3BGN                                                    | 101,640 | W4JKC                                                   | 9,288   | KG9X                                                    | 343,620 | K2SG                                                    | 344,736    |
| N2MF                                         | 3,239,214 | W1HI                                                     | 30,720  | <b>Single Operator, Low Power, 20 Meters</b>            |         | AI1TT (W1WBB, op)                                       | 277,851 | W9XT                                                    | 224,532    |
| WW4XX (LZ4AX, op)                            | 2,837,688 | AC8Y                                                     | 26,244  | K5RX                                                    | 119,232 | K2PO                                                    | 270,936 | NE8P                                                    | 191,250    |
| WC1M                                         | 2,745,120 | NS8O                                                     | 5,832   | VE2IR                                                   | 32,835  | VE1ANF                                                  | 227,358 | K0XF                                                    | 170,814    |
| N8II                                         | 2,471,478 | <b>Single Operator, Low Power, 80 Meters</b>             |         | NG3Q                                                    | 32,634  | VA3FF                                                   | 172,143 | W2UP                                                    | 149,352    |
| K6XX                                         | 2,032,671 | WB2AMU                                                   | 7,770   | N3EA                                                    | 17,172  | N4IJ                                                    | 159,084 | KB3AAY                                                  | 101,574    |
| K1VUT                                        | 1,942,380 | N3GE                                                     | 297     | N4AKV                                                   | 15,000  | AB1J                                                    | 73,416  | KH7X/W7                                                 | 93,192     |
| AD5A                                         | 1,840,800 | <b>Single Operator Unlimited, High Power, 80 Meters</b>  |         | N8CWU                                                   | 3,564   | WU8T                                                    | 68,040  | K8NVR                                                   | 92,460     |
| NA0N (@W0ZT)                                 | 1,098,603 | K4AEN                                                    | 15,015  | K3GG                                                    | 504     | KR2H                                                    | 65,250  | K4FT                                                    | 68,142     |
| VA3OKG                                       | 988,545   | WC4E                                                     | 41,322  | AE0EE                                                   | 297     | WT9Q                                                    | 55,269  | AA5AU                                                   | 66,126     |
| <b>Single Operator, QRP</b>                  |           | <b>Single Operator Unlimited, High Power, 80 Meters</b>  |         | <b>Single Operator, QRP, 20 Meters</b>                  |         | <b>Single Operator Unlimited, QRP, 15 Meters</b>        |         | <b>Single Operator Unlimited, QRP, 10 Meters</b>        |            |
| K2DM                                         | 909,216   | K9RO                                                     | 19,836  | K4PQC                                                   | 4,320   | K3TW                                                    | 108,114 | WU4G                                                    | 9,072      |
| W1FJ                                         | 792,792   | AC8CE                                                    | 9,933   | K2GMY                                                   | 1,197   | KC1DVT                                                  | 189     | <b>Multipointer, Single Transmitter, High Power</b>     |            |
| N7IR                                         | 488,376   | NA6JD                                                    | 1,020   | <b>Single Operator Unlimited, High Power, 20 Meters</b> |         | <b>Single Operator, High Power, 10 Meters</b>           |         | W2FU                                                    | 8,346,429  |
| NY3A                                         | 445,617   | WC4E                                                     | 41,322  | WA4JUK                                                  | 85,008  | K1TO                                                    | 581,616 | K3WW                                                    | 7,490,574  |
| W6JT                                         | 382,512   | K9RO                                                     | 19,836  | KK7PW                                                   | 48,384  | WA3A                                                    | 404,580 | N4WW                                                    | 6,947,805  |
| ND0C                                         | 348,492   | AC8CE                                                    | 9,933   | N7TU                                                    | 39,825  | K2PS                                                    | 404,496 | N4RV                                                    | 6,849,216  |
| K4SAA                                        | 210,684   | NA6JD                                                    | 1,020   | W2JV                                                    | 10,836  | N4OX                                                    | 376,377 | WW4LL                                                   | 4,350,654  |
| WB2CPU                                       | 205,524   | <b>Single Operator Unlimited, Low Power, 80 Meters</b>   |         | N9TTK                                                   | 2,730   | K2UA                                                    | 290,304 | KQ3F                                                    | 4,347,801  |
| W6QU (W8QZA, op)                             | 190,785   | KB3WD                                                    | 346,026 | WJ1R                                                    | 1,020   | K6AR                                                    | 258,912 | K3AJ                                                    | 3,923,856  |
| N9KT                                         | 180,576   | N2PP                                                     | 228,780 | KT4O                                                    | 432     | K3GW                                                    | 100,464 | K1RX                                                    | 3,398,184  |
| <b>Single Operator Unlimited, High Power</b> |           | WF2W                                                     | 191,505 | W6OUL                                                   | 363     | W7EW                                                    | 72,900  | KD1MC                                                   | 3,260,892  |
| K5ZD                                         | 8,770,113 | N0TT                                                     | 146,661 | <b>Single Operator Unlimited, Low Power, 20 Meters</b>  |         | K1EEE                                                   | 38,016  | VE7UF                                                   | 3,113,208  |
| AA3B                                         | 8,209,674 | K9CJ                                                     | 57,228  | KM4FOC                                                  | 122,760 | W7RN (KX7M, op)                                         | 29,304  | <b>Multipointer, Single Transmitter, Low Power</b>      |            |
| K1ZZ                                         | 6,985,704 | N7RK                                                     | 14,700  | NW4V                                                    | 13,944  | <b>Single Operator, Low Power, 10 Meters</b>            |         | N4SS                                                    | 3,992,721  |
| N2IC                                         | 6,254,805 | W4WWQ                                                    | 3,870   | KC4LZN                                                  | 1,728   | W0UO                                                    | 277,368 | W4TG                                                    | 1,779,246  |
| N3RS                                         | 5,918,544 | N2KA                                                     | 2,046   | AA1SU                                                   | 1,653   | WB4TDH                                                  | 234,624 | KT4XA                                                   | 1,754,976  |
| W8FJ                                         | 5,894,784 | <b>Single Operator, Low Power, 40 Meters</b>             |         | VA2NW                                                   | 1,254   | VY2OX                                                   | 98,472  | W1FM                                                    | 1,244,985  |
| K1AR                                         | 5,698,674 | K0KT                                                     | 51,660  | WA4IPU                                                  | 1,152   | K6AAM                                                   | 87,750  | W3ZGD                                                   | 974,118    |
| NN1SS                                        | 5,063,436 | WA3FAE                                                   | 39,501  | VA3RXB                                                  | 90      | N3ATQ                                                   | 73,629  | VE3EID                                                  | 245,367    |
| WY3A                                         | 4,920,120 | K9UIY                                                    | 17,316  | <b>Single Operator Unlimited, QRP, 20 Meters</b>        |         | KJ6MBW                                                  | 60,840  | <b>Multipointer, Two Transmitter</b>                    |            |
| AB3CX                                        | 4,731,210 | W8UE                                                     | 16,023  | NU4F                                                    | 75      | WA1ONB                                                  | 59,280  | K1LZ                                                    | 14,961,345 |
| <b>Single Operator Unlimited, Low Power</b>  |           | W6RKC                                                    | 14,652  | <b>Single Operator, High Power, 15 Meters</b>           |         | KN7T                                                    | 51,264  | W3LPL                                                   | 12,842,769 |
| K1G                                          | 4,538,400 | N2JNZ                                                    | 12,936  | KU2M                                                    | 513,540 | W8WA                                                    | 45,954  | VA2WA                                                   | 9,853,020  |
| K1XM                                         | 3,934,242 | KG9Z                                                     | 7,659   | W6YA                                                    | 314,184 | N0UI                                                    | 45,795  | K9CT                                                    | 9,814,650  |
| N4UU                                         | 3,603,312 | WB7FJG                                                   | 2,916   | N7CW                                                    | 248,778 | <b>Single Operator, QRP, 10 Meters</b>                  |         | VE3JM                                                   | 9,369,402  |
| VE9AA                                        | 3,093,792 | W9RN                                                     | 2,829   | N2ZN                                                    | 38,160  | K7SS                                                    | 69,300  | KB4DX                                                   | 8,562,015  |
| W3KB                                         | 1,903,752 | NG4L                                                     | 840     | W4ZGR                                                   | 14,382  | K4WY                                                    | 52,920  | W4NF                                                    | 8,285,415  |
| N1RM                                         | 1,881,558 | <b>Single Operator, QRP, 40 Meters</b>                   |         | <b>Single Operator, Low Power, 15 Meters</b>            |         | N8LJ                                                    | 19,800  | K2AX                                                    | 8,064,000  |
| WJ1U                                         | 1,628,184 | NN1DX                                                    | 4,368   | K1TR                                                    | 344,253 | W5GAI                                                   | 19,647  | N2AA                                                    | 8,063,712  |
| WE9R                                         | 1,621,644 | W3SI                                                     | 867     | W1QK                                                    | 208,080 | N6AN                                                    | 13,986  | K8AZ                                                    | 7,519,497  |
| K3QP                                         | 1,579,824 | <b>Single Operator Unlimited, High Power, 40 Meters</b>  |         | VA3SP                                                   | 172,521 | N4NM                                                    | 9,594   | <b>Multipointer, Multitransmitter</b>                   |            |
| NJ3K                                         | 1,420,497 | KA1IS                                                    | 454,857 | K7HBN                                                   | 50,589  | KQ1P                                                    | 7,371   | K3LR                                                    | 16,052,640 |
| <b>Single Operator Unlimited, QRP</b>        |           | K7NJ                                                     | 234,090 | N3GD                                                    | 43,884  | N3CI                                                    | 7,200   | NR4M                                                    | 11,763,150 |
| K6JS                                         | 330,270   | WX5S                                                     | 190,380 | W7TMT                                                   | 34,596  | N0JK                                                    | 4,743   | K1TTT                                                   | 11,453,253 |
| AC2YD                                        | 305,442   | K1EP                                                     | 98,472  | KM9R                                                    | 34,020  | KO6FLP                                                  | 3,675   | N3RD                                                    | 8,217,063  |
| KR4AE                                        | 254,916   | W5TM                                                     | 95,310  | WX2N                                                    | 29,106  | <b>Single Operator, QRP, 15 Meters</b>                  |         | K0RF                                                    | 7,544,736  |
| K2YAZ                                        | 230,580   | W3US                                                     | 74,358  | K1WAT                                                   | 28,743  | KD9MS                                                   | 68,256  | K1KI                                                    | 5,893,308  |
| WM0G                                         | 219,072   | K9YC                                                     | 70,902  | VE2/UR7QC                                               | 27,612  | N7ITU                                                   | 1,953   | W7RM                                                    | 4,217,760  |
| WQ6X                                         | 209,520   | K3SV                                                     | 49,776  | <b>Single Operator, QRP, 15 Meters</b>                  |         | <b>Single Operator, QRP, 15 Meters</b>                  |         | K1KP                                                    | 2,319,450  |
| NA2AA                                        | 205,320   | VA1RST                                                   | 41,580  | KD9MS                                                   | 68,256  | <b>Single Operator, QRP, 15 Meters</b>                  |         | N3DPB                                                   | 1,296,405  |
| KA1ZE                                        | 105,501   | W6XI                                                     | 8,748   | N7ITU                                                   | 1,953   | <b>Single Operator, QRP, 15 Meters</b>                  |         | WA2DNI                                                  | 1,237,452  |
| WD4OHD                                       | 43,560    |                                                          |         |                                                         |         | <b>Single Operator, QRP, 15 Meters</b>                  |         |                                                         |            |
| W2JAZ                                        | 39,618    |                                                          |         |                                                         |         | <b>Single Operator, QRP, 15 Meters</b>                  |         |                                                         |            |

## Top Ten — DX

### Single Operator, High Power

|                   |           |
|-------------------|-----------|
| TO4A (VE3DZ, op)  | 5,880,114 |
| CR3DX (OM3GI, op) | 5,839,092 |
| EF6T (EA3M, op)   | 4,208,370 |
| WH7T (WH7W, op)   | 4,084,335 |
| CR2X (K08SCA, op) | 4,018,545 |
| NH7T              | 3,638,625 |
| EI7M (EI6JK, op)  | 2,748,384 |
| OK7W              | 2,658,369 |
| ISØZOD            |           |
| (OM3RM, op)       | 2,460,759 |
| G6XX (G4FAL, op)  | 2,291,121 |

### Single Operator, Low Power

|                  |           |
|------------------|-----------|
| KP2B (NP4Z, op)  | 3,644,964 |
| V47Y (KØYA, op)  | 1,576,638 |
| CT7BJG           | 1,428,990 |
| PY2NY            | 1,249,992 |
| S52NR            | 1,084,821 |
| TI2OY            | 1,062,531 |
| OL5Y             | 825,930   |
| 4U1UN            |           |
| (HB9HDV, op)     | 778,710   |
| EI8X (EI5KF, op) | 743,214   |
| XE1AY            | 733,764   |

### Single Operator, QRP

|              |         |
|--------------|---------|
| YV5KG        | 263,670 |
| DK7HA        | 244,416 |
| DK5DD        | 229,266 |
| LY9A         | 188,538 |
| JH1OGC       | 166,860 |
| YW6CQ        |         |
| (YV6BXN, op) | 92,628  |
| JQ1NGT       | 80,535  |
| JH7UJU       | 71,280  |
| JR4DAH       | 64,500  |
| HA5BA        | 64,260  |

### Single Operator Unlimited, High Power

|                   |           |
|-------------------|-----------|
| II2Q (IK2PFL, op) | 3,665,328 |
| OM2VL             | 3,340,962 |
| TM2Y (F6BEE, op)  | 2,848,815 |
| 9A5Y (9A7DX, op)  | 2,699,316 |
| EA8RM             | 2,517,765 |
| S57AL             | 2,494,764 |
| HG3N (HA3LN, op)  | 2,341,854 |
| OQ5M (ON5ZO, op)  | 2,012,040 |
| DL3DXX            | 1,911,300 |
| 9A3XV             | 1,876,560 |

### Single Operator Unlimited, Low Power

|                   |           |
|-------------------|-----------|
| WP3C (N2TTA, op)  | 2,783,046 |
| VP2ECV (KG9N, op) | 2,405,634 |
| 5K4X              | 2,030,316 |
| ED1R (EA4AOC, op) | 1,544,676 |
| HA3NU             | 1,450,008 |
| EA3DZ             | 1,199,748 |
| PY2WH             | 1,115,979 |
| VE4GV/6Y          | 1,108,809 |
| MI5I (GIØRQK, op) | 1,077,480 |
| PY2SNX            | 1,017,756 |

### Single Operator Unlimited, QRP

|                  |           |
|------------------|-----------|
| P44W (W2GD, op)  | 1,957,950 |
| DM2M (DK3WE, op) | 534,570   |
| SQ6MIH           | 260,463   |
| OMØRX            | 156,009   |
| EA5ICL           | 124,200   |
| DL1EFW           | 117,558   |
| F8AOF            | 109,173   |
| DF1MM            | 79,608    |
| AH7RF            | 52,731    |
| PAØRDT           | 44,550    |

### Single Operator, High Power, 160 Meters

|        |       |
|--------|-------|
| EA5C   | 8,667 |
| UYØZG  | 1,350 |
| YO3APJ | 828   |
| DJ3TF  | 390   |

### Single Operator, Low Power, 160 Meters

|        |        |
|--------|--------|
| XE2X   | 21,672 |
| ON7EH  | 1,785  |
| JE1SPY | 759    |

### Single Operator Unlimited, High Power, 160 Meters

|              |        |
|--------------|--------|
| 9A3JH        | 11,970 |
| OMØM         |        |
| (OM3CGN, op) | 8,970  |
| DL7AT        | 4,902  |
| 9A2KD        | 4,158  |
| S56X         | 4,140  |
| JF1AMX       | 1,638  |
| PR1T         | 1,326  |
| OZ4MM        | 1,215  |
| DL5KVV       | 576    |

### Single Operator Unlimited, Low Power, 160 Meters

|        |       |
|--------|-------|
| OL1A   | 2,508 |
| JH1BBT | 105   |
| HAØNAR | 90    |

### Single Operator, High Power, 80 Meters

|                   |        |
|-------------------|--------|
| IPØA (ISØJHQ, op) | 65,001 |
| US6EX             | 16,416 |
| YU2M              | 12,558 |
| ON5WL             | 4,278  |
| R3PJN             | 3,780  |
| SV2JAO            | 3,762  |
| JH7XMO            | 1,440  |
| JE1PMQ            | 540    |
| JH2KKW            | 378    |
| JA8DNV            | 297    |

### Single Operator, Low Power, 80 Meters

|        |        |
|--------|--------|
| CO2AN  | 90,312 |
| E79D   | 7,344  |
| SQ6ABC | 4,554  |
| WP3A   | 3,528  |
| SQ9I   | 2,538  |
| HF5WIM | 1,755  |
| JJ1VRO | 1,326  |
| JA1SVP | 870    |
| JA3BXF | 540    |
| JE1TSD | 378    |

### Single Operator, QRP, 80 Meters

|        |    |
|--------|----|
| JE3AKU | 36 |
|--------|----|

### Single Operator Unlimited, High Power, 80 Meters

|                   |        |
|-------------------|--------|
| 9A5M              | 81,291 |
| HA1TJ             | 72,312 |
| 9A8M              | 68,715 |
| EA1DAV            | 57,000 |
| S51YI             | 54,384 |
| S53X              | 50,697 |
| OM5AW             | 41,151 |
| MU5E (GU4YOX, op) | 35,793 |
| LY7M (UX6IZ, op)  | 29,526 |
| SP3GTS            | 11,160 |

### Single Operator Unlimited, Low Power, 80 Meters

|                   |       |
|-------------------|-------|
| GW9J              | 7,056 |
| OM5KM             | 5,244 |
| G5Q (G3SVL, op)   | 4,350 |
| SN5J (SP5JXK, op) | 3,648 |
| 4Z4KX             | 3,135 |
| DK2GZ             | 2,376 |
| SP8GNF            | 1,920 |
| DM7CW             | 1,275 |
| SO7NA             | 684   |
| SP2WGB            | 561   |

### Single Operator, High Power, 40 Meters

|                   |         |
|-------------------|---------|
| MW4R (GW4XUM, op) | 172,929 |
| S57Q              | 145,152 |
| R7NW              | 120,897 |
| II2T (IZ2EWR, op) | 101,550 |
| LZ1MS             | 95,625  |
| EA5SBQ            | 84,396  |
| P3C (5B4AOF, op)  | 81,300  |
| OK5D (OK1DTP, op) | 59,616  |
| YT4W (YU1DW, op)  | 52,170  |
| YU1RA             | 40,560  |

### Single Operator, Low Power, 40 Meters

|                   |         |
|-------------------|---------|
| J8AA              | 135,576 |
| CO2JD             | 110,505 |
| IO8T (IC8JOH, op) | 95,784  |
| YV4ABR            | 58,065  |
| VK2IG             | 49,920  |
| IV3EAD            | 26,568  |
| HA9RP             | 18,840  |
| F5NLY             | 8,568   |
| E7ØY              | 8,175   |
| SV2DSJ            | 6,237   |

### Single Operator, QRP, 40 Meters

|                     |        |
|---------------------|--------|
| DK1VD               | 19,479 |
| YO4BEW              | 5,175  |
| OK6OK               | 4,158  |
| JA6SHL              | 3,978  |
| VP5/K3STX           | 2,193  |
| JR1ABS              | 1,521  |
| YO3FFF              | 1,440  |
| 7L3SQL (JH3LCU, op) | 75     |
| IO4A (IZ4AFL, op)   | 48     |
| JG3DHN              | 18     |

### Single Operator Unlimited, High Power, 40 Meters

|                  |         |
|------------------|---------|
| S52AW            | 162,120 |
| OK1Z             | 158,895 |
| LZ5G (LZ5ET, op) | 153,120 |
| 9A4V (9A2VR, op) | 141,240 |
| HA8IB            | 124,152 |
| HA7A             | 120,999 |
| HA7RY            | 118,455 |
| OR7K (OP4K, op)  | 111,078 |
| HA2KMR           | 108,108 |
| HA8FK            | 101,088 |

### Single Operator Unlimited, Low Power, 40 Meters

|                    |        |
|--------------------|--------|
| M5W (MØHMJ, op)    | 63,063 |
| IO5I (IK5TBK, op)  | 28,638 |
| OK2BFN             | 21,420 |
| OM/UT2WW           | 18,582 |
| DL4UNY             | 16,074 |
| R6CC               | 14,700 |
| HA8WY              | 14,454 |
| OK1AY              | 14,319 |
| DLØTUM (DL3ON, op) | 8,787  |
| PS7MA              | 7,254  |

### Single Operator Unlimited, QRP, 40 Meters

|        |        |
|--------|--------|
| S52P   | 31,020 |
| S58R   | 18,900 |
| G4BUE  | 4,290  |
| GØW    | 1,836  |
| LZ2AF  | 1,728  |
| IZ5ILK | 1,035  |
| S57EA  | 720    |
| JH3DMQ | 513    |

### Single Operator, High Power, 20 Meters

|                  |         |
|------------------|---------|
| OH8L (OH8LQ, op) | 164,079 |
| IZ8GUQ           | 47,520  |
| ON4ZD            | 36,750  |
| YT1T             | 36,036  |
| SP9RCL           | 27,945  |
| DJØSP            | 18,240  |
| SP5SA            | 16,080  |
| JA9CJW           | 11,556  |
| R7KW             | 11,556  |
| SQ5LNU           | 8,232   |

### Single Operator, Low Power, 20 Meters

|                   |         |
|-------------------|---------|
| TF2R (OZ2I, op)   | 106,920 |
| EA9ACD            | 76,500  |
| RWØAJ             | 24,444  |
| RØQAW/9           | 12,810  |
| DL9ZP             | 11,433  |
| ZZ7ZZ (PR7AR, op) | 11,400  |
| RØRG              | 10,488  |
| IK5ØJB            | 8,910   |
| RZ3Z              | 7,722   |
| E25CRF            | 5,580   |

### Single Operator, QRP, 20 Meters

|           |        |
|-----------|--------|
| S51Z      | 10,500 |
| EA2CAR    | 1,530  |
| DH9NAD    | 18     |
| UAØSBQ    | 3      |
| VK2/DG5CW | 3      |

### Single Operator Unlimited, High Power, 20 Meters

|                  |         |
|------------------|---------|
| TM4W (F4DXW, op) | 196,380 |
| HGØY (HA7GN, op) | 176,220 |
| UA9YBA           | 156,240 |
| HG5E             | 149,625 |
| YT1A             | 135,774 |
| JJØPKS           |         |
| (JH7PKU, op)     | 99,354  |
| G4IYI            | 80,514  |
| SP1NY            | 69,984  |
| EA1WH            | 59,211  |
| SP1R             | 44,496  |

### Single Operator Unlimited, Low Power, 20 Meters

|                 |        |
|-----------------|--------|
| IK6PTH          | 45,360 |
| OM7LW           | 35,550 |
| F4IXM           | 21,528 |
| SP4JFR          | 18,204 |
| M2O (G1GEY, op) | 14,022 |
| 9H1PI           | 9,831  |
| G4C (GØIBN, op) | 5,040  |
| OK3GU           | 4,536  |
| DL3LJ           | 3,366  |
| PA5CT           | 3,243  |

### Single Operator Unlimited, QRP, 20 Meters

|                  |       |
|------------------|-------|
| HG5O (HA5OB, op) | 2,565 |
|------------------|-------|

### Single Operator, High Power, 15 Meters

|                    |         |
|--------------------|---------|
| J75A (W6NV, op)    | 354,354 |
| EF3W (EA3CX, op)   | 212,829 |
| G4A (G4TSH, op)    | 203,019 |
| F6ARC              | 166,518 |
| WP4WW (KP4JRS, op) | 164,430 |
| 9A9R               | 162,168 |
| E77EA              | 157,416 |
| OM5R (OM5WW, op)   | 156,078 |
| 9A4W               | 142,854 |
| SN5X (SP5GRM, op)  | 137,460 |

### Single Operator, Low Power, 15 Meters

|                   |         |
|-------------------|---------|
| KH6AQ             | 166,896 |
| KP4NZ (WØEAS, op) | 150,480 |
| FR8UA             | 108,864 |
| ISØJXO            | 48,516  |
| GM8U (MMØDFV, op) | 45,504  |
| PY2OP             | 45,216  |
| DL5ME             | 44,043  |
| DL1CW             | 42,450  |
| PA5MW             | 41,004  |
| IT9ZZO            | 39,432  |

### Single Operator, QRP, 15 Meters

|                   |        |
|-------------------|--------|
| LZ2RS             | 22,968 |
| I3BBK             | 15,561 |
| HG6C (HA6IAM, op) | 15,000 |
| JM1NKT            | 12,852 |
| DL2TM             | 11,556 |
| EA2BD             | 2,583  |
| US3EW             | 2,451  |
| UI4F              | 2,448  |
| LZ3AW             | 2,337  |
| UX7UN             | 1,440  |

### Single Operator Unlimited, High Power, 15 Meters

|                   |         |
|-------------------|---------|
| TM6M (F1AKK, op)  | 252,933 |
| HA5JI             | 194,760 |
| SN3A (SQ2GXO, op) | 186,702 |
| HB9FAP            | 186,354 |
| 9A7V              | 181,956 |
| S5ØK              | 176,784 |
| OM8CW             | 175,407 |
| IO4M (IK4MGP, op) | 166,026 |
| XQ1KZ             | 147,552 |
| EI6FR             | 141,462 |

### Single Operator Unlimited, Low Power, 15 Meters

|                   |         |
|-------------------|---------|
| FY5KE (F6FVY, op) | 305,679 |
| ZW8T (PS8HF, op)  | 96,690  |
| HG9X (HA9AX, op)  | 90,720  |
| SP9XCN            | 75,492  |
| JE1CKA            | 62,532  |
| HB9AMO            | 55,491  |
| PY8WW             | 53,760  |
| G7D (G3XTZ, op)   | 48,018  |
| HAØHV             | 46,170  |
| PP5RT             | 39,468  |

### Single Operator Unlimited, QRP, 15 Meters

|                   |        |
|-------------------|--------|
| HG1S (HA1DAE, op) | 57,627 |
| GW4W (GW4EVX, op) | 11,760 |
| IK3SVT            | 8,811  |
| GW5P              | 4,524  |
| HA5OB             | 3,510  |
| HA6QU             | 270    |

### Single Operator, High Power, 10 Meters

|                   |         |
|-------------------|---------|
| PW2E (PY2ZEA, op) | 316,620 |
| V31DJ             | 289,926 |
| CS2C (OK1RF, op)  | 239,127 |
| AH6KO             | 181,656 |
| LU7HN             | 143,028 |
| S5ØC (S53RM, op)  | 135,072 |
| EC5K              | 131,868 |
| S53WW             | 128,535 |
| JØVNR             | 126,087 |
| F5OGL             | 123,444 |

### Single Operator, Low Power, 10 Meters

|                        |         |
|------------------------|---------|
| VP2MMT (KW8N, op)      | 342,495 |
| J35X                   | 193,836 |
| PY2EX                  | 169,998 |
| KH6CJJ                 | 168,948 |
| HC2GRC                 | 149,688 |
| WP4TZ                  | 135,912 |
| HK1A                   | 112,056 |
| NP3X (WP3A, op)        | 83,985  |
| HI3R                   | 63,036  |
| TI5/VA3RA (VE3IKV, op) | 60,144  |

### Single Operator, QRP, 10 Meters

|                   |         |
|-------------------|---------|
| 6Y/AI5IN          | 184,440 |
| FJ/DK6AS          | 48,384  |
| LW9EKA            | 35,550  |
| JK7DWD            | 13,440  |
| XE1KK             | 13,338  |
| PQ8RS             | 13,335  |
| JK1CNL            | 8,505   |
| 4F3OM             | 8,001   |
| SP7M (SP5EWX, op) | 7,308   |
| US5VX             | 6,399   |

### Single Operator Unlimited, High Power, 10 Meters

|                    |         |
|--------------------|---------|
| CN3A               | 316,299 |
| LT3E (LW8DQ, op)   | 296,640 |
| F5MUX              | 230,631 |
| KH7M               | 226,914 |
| EA8KR              | 226,029 |
| TM1W               | 205,320 |
| PY2RX              | 187,758 |
| 9A3TR              | 172,434 |
| HB9NE (HB9CAT, op) | 163,734 |
| II9P (IZ8JAI, op)  | 160,080 |

### Single Operator Unlimited, Low Power, 10 Meters

|                  |         |
|------------------|---------|
| 9Z4Y             | 195,924 |
| PY4XX            | 101,244 |
| EA3NO            | 93,537  |
| HA5PP            | 85,860  |
| EA3AKY           | 83,961  |
| HA8TKS           | 62,169  |
| ON6NL            | 59,454  |
| ZX9X (PT9DX, op) | 55,566  |
| PU2UAF           | 47,400  |
| 7L4MDM           | 46,440  |

### Single Operator Unlimited, QRP, 10 Meters

|                 |        |
|-----------------|--------|
| LT7D            | 79,704 |
| ED3Q (EA3O, op) | 65,448 |
| G4ZFE           | 36,294 |
| YU1LM           | 7,128  |
| BD7JIR          | 1,365  |
| GWØEGH          | 1,080  |
| JR1UJX          | 1,008  |



## Continental Winners

### Africa

|                                                  |                    |           |
|--------------------------------------------------|--------------------|-----------|
| Single Operator, High Power                      | CR3DX (OM3GI, op)  | 5,839,092 |
| Single Operator, Low Power                       | EA8/DK1AX          | 58,752    |
| Single Operator Unlimited, High Power            | EA8RM              | 2,517,765 |
| Single Operator Unlimited, Low Power             | 9J2FI (DL2RMC, op) | 20,550    |
| Single Operator Unlimited, QRP                   | D4DCX              | 855       |
| Single Operator Unlimited, Low Power, 40 Meters  | EA8RY              | 6,750     |
| Single Operator, Low Power, 20 Meters            | EA9ACD             | 76,500    |
| Single Operator, Low Power, 15 Meters            | FR8UA              | 108,864   |
| Single Operator Unlimited, High Power, 15 Meters | EA8ZS              | 53,550    |
| Single Operator, Low Power, 10 Meters            | FR8TZ              | 44,748    |
| Single Operator, QRP, 10 Meters                  | EA8AQM             | 4,956     |
| Single Operator Unlimited, High Power, 10 Meters | CN3A               | 316,299   |
| Multioperator, Two Transmitter                   | ED8X               | 6,354,810 |

### Antarctica

|                                        |                    |        |
|----------------------------------------|--------------------|--------|
| Single Operator, High Power, 15 Meters | DP1POL (DL5XL, op) | 21,546 |
|----------------------------------------|--------------------|--------|

### Asia

|                                                   |                     |           |
|---------------------------------------------------|---------------------|-----------|
| Single Operator, High Power                       | JE6RPM (JH5GHM, op) | 1,006,407 |
| Single Operator, Low Power                        | JA1BJI              | 482,850   |
| Single Operator, QRP                              | JH1OGC              | 166,860   |
| Single Operator Unlimited, High Power             | JR2GRX              | 1,482,741 |
| Single Operator Unlimited, Low Power              | JH1EAG              | 392,544   |
| Single Operator Unlimited, QRP                    | JH4CES              | 29,574    |
| Single Operator, Low Power, 160 Meters            | JE1SPY              | 759       |
| Single Operator Unlimited, High Power, 160 Meters | JF1AMX              | 1,638     |
| Single Operator Unlimited, Low Power, 160 Meters  | JH1BBT              | 105       |
| Single Operator, High Power, 80 Meters            | JH7XMO              | 1,440     |
| Single Operator, Low Power, 80 Meters             | JJ1VRO              | 1,326     |
| Single Operator, QRP, 80 Meters                   | JE3AKU              | 36        |
| Single Operator Unlimited, High Power, 80 Meters  | JJ1LET              | 924       |
| Single Operator Unlimited, Low Power, 80 Meters   | 4Z4KX               | 3,135     |
| Single Operator, High Power, 40 Meters            | P3C (5B4AOF, op)    | 81,300    |
| Single Operator, Low Power, 40 Meters             | JA2YKA              | 1,188     |
| Single Operator, QRP, 40 Meters                   | JA6SHL              | 3,978     |
| Single Operator Unlimited, High Power, 40 Meters  | JN4MMO              | 30,096    |
| Single Operator Unlimited, Low Power, 40 Meters   | JJ1AEB              | 2,688     |
| Single Operator Unlimited, QRP, 40 Meters         | JH3DMQ              | 513       |
| Single Operator, High Power, 20 Meters            | JA9CJW              | 11,556    |
| Single Operator, Low Power, 20 Meters             | RW0AJ               | 24,444    |
| Single Operator, QRP, 20 Meters                   | UA0SBQ              | 3         |
| Single Operator Unlimited, High Power, 20 Meters  | UA9YBA              | 156,240   |
| Single Operator Unlimited, Low Power, 20 Meters   | BD1IJ               | 429       |
| Single Operator, High Power, 15 Meters            | 7K4XNN              | 76,479    |
| Single Operator, Low Power, 15 Meters             | JF3BFS              | 29,832    |
| Single Operator, QRP, 15 Meters                   | JM1NKT              | 12,852    |
| Single Operator Unlimited, High Power, 15 Meters  | JF9JTS (JA0TEA, op) | 74,412    |
| Single Operator Unlimited, Low Power, 15 Meters   | JE1CKA              | 62,532    |
| Single Operator, High Power, 10 Meters            | JJ0VNR              | 126,087   |
| Single Operator, Low Power, 10 Meters             | JF3IYW              | 29,520    |
| Single Operator, QRP, 10 Meters                   | JK7DWD              | 13,440    |
| Single Operator Unlimited, High Power, 10 Meters  | JH3AIU              | 64,512    |
| Single Operator Unlimited, Low Power, 10 Meters   | 7L4MDM              | 46,440    |
| Single Operator Unlimited, QRP, 10 Meters         | BD7JIR              | 1,365     |
| Multioperator, Single Transmitter, High Power     | JH4UYB              | 1,295,805 |
| Multioperator, Single Transmitter, Low Power      | 8J1FC/1             | 180,072   |
| Multioperator, Two Transmitter                    | JH8YOH              | 1,324,323 |
| Multioperator, Multitransmitter                   | JA3YBK              | 2,554,740 |

### Europe

|                                                   |                   |           |
|---------------------------------------------------|-------------------|-----------|
| Single Operator, High Power                       | EF6T (EA3M, op)   | 4,208,370 |
| Single Operator, Low Power                        | CT7BJG            | 1,428,990 |
| Single Operator, QRP                              | DK7HA             | 244,416   |
| Single Operator Unlimited, High Power             | II2Q (IK2PFL, op) | 3,665,328 |
| Single Operator Unlimited, Low Power              | ED1R (EA4AOC, op) | 1,544,676 |
| Single Operator Unlimited, QRP                    | DM2M (DK3WE, op)  | 534,570   |
| Single Operator, High Power, 160 Meters           | EA5C              | 8,667     |
| Single Operator, Low Power, 160 Meters            | ON7EH             | 1,785     |
| Single Operator Unlimited, High Power, 160 Meters | 9A3JH             | 11,970    |
| Single Operator Unlimited, Low Power, 160 Meters  | OL1A              | 2,508     |
| Single Operator, High Power, 80 Meters            | IP0A (IS0JHQ, op) | 65,001    |
| Single Operator, Low Power, 80 Meters             | E79D              | 7,344     |
| Single Operator Unlimited, High Power, 80 Meters  | 9A5M              | 81,291    |
| Single Operator Unlimited, Low Power, 80 Meters   | GW9J              | 7,056     |
| Single Operator, High Power, 40 Meters            | MW4R (GW4XUM, op) | 172,929   |
| Single Operator, Low Power, 40 Meters             | IO8T (IC8JOH, op) | 95,784    |
| Single Operator, QRP, 40 Meters                   | DK1VD             | 19,479    |
| Single Operator Unlimited, High Power, 40 Meters  | S52AW             | 162,120   |
| Single Operator Unlimited, Low Power, 40 Meters   | M5W (M0HJM, op)   | 63,063    |
| Single Operator Unlimited, QRP, 40 Meters         | S52P              | 31,020    |
| Single Operator, High Power, 20 Meters            | OH8L (OH8LQ, op)  | 164,079   |
| Single Operator, Low Power, 20 Meters             | TF2R (OZ2I, op)   | 106,920   |
| Single Operator, QRP, 20 Meters                   | S51Z              | 10,500    |
| Single Operator Unlimited, High Power, 20 Meters  | TM4W (F4DXW, op)  | 196,380   |
| Single Operator Unlimited, Low Power, 20 Meters   | IK6PTH            | 45,360    |
| Single Operator Unlimited, QRP, 20 Meters         | HG5O (HA5OB, op)  | 2,565     |
| Single Operator, High Power, 15 Meters            | EF3W (EA3CX, op)  | 212,829   |
| Single Operator, Low Power, 15 Meters             | IS0JXO            | 48,516    |
| Single Operator, QRP, 15 Meters                   | LZ2RS             | 22,968    |

|                                                  |                   |           |
|--------------------------------------------------|-------------------|-----------|
| Single Operator Unlimited, High Power, 15 Meters | TM6M (F1AKK, op)  | 252,933   |
| Single Operator Unlimited, Low Power, 15 Meters  | HG9X (HA9AX, op)  | 90,720    |
| Single Operator Unlimited, QRP, 15 Meters        | HG1S (HA1DAE, op) | 57,627    |
| Single Operator, High Power, 10 Meters           | CS2C (OK1RF, op)  | 239,127   |
| Single Operator, Low Power, 10 Meters            | DJ9KH             | 36,864    |
| Single Operator, QRP, 10 Meters                  | SP7M (SP5EWX, op) | 7,308     |
| Single Operator Unlimited, High Power, 10 Meters | F5MUX             | 230,631   |
| Single Operator Unlimited, Low Power, 10 Meters  | EA3NO             | 93,537    |
| Single Operator Unlimited, QRP, 10 Meters        | ED3Q (EA3O, op)   | 65,448    |
| Multioperator, Single Transmitter, High Power    | EA5RS             | 3,768,885 |
| Multioperator, Single Transmitter, Low Power     | YL73R             | 265,020   |
| Multioperator, Two Transmitter                   | ED7W              | 4,681,773 |
| Multioperator, Multitransmitter                  | 9A1A              | 5,021,379 |

### North America

|                                                  |                   |           |
|--------------------------------------------------|-------------------|-----------|
| Single Operator, High Power                      | TO4A (VE3DZ, op)  | 5,880,114 |
| Single Operator, Low Power                       | KP2B (NP4Z, op)   | 3,644,964 |
| Single Operator, QRP                             | CO6EC             | 14,742    |
| Single Operator Unlimited, High Power            | T17W (N3KS, op)   | 691,200   |
| Single Operator Unlimited, Low Power             | WP3C (N2TTA, op)  | 2,783,046 |
| Single Operator, Low Power, 160 Meters           | XE2X              | 21,672    |
| Single Operator, Low Power, 80 Meters            | CO2AN             | 90,312    |
| Single Operator, Low Power, 40 Meters            | J8AA              | 135,576   |
| Single Operator, QRP, 40 Meters                  | VP5/K3STX         | 2,193     |
| Single Operator Unlimited, High Power, 40 Meters | V31MA             | 13,728    |
| Single Operator, High Power, 20 Meters           | WP3R              | 663       |
| Single Operator, Low Power, 20 Meters            | NP4FW             | 72        |
| Single Operator, High Power, 15 Meters           | J75A (W6NV, op)   | 354,354   |
| Single Operator, Low Power, 15 Meters            | KP4NZ (W0EAS, op) | 150,480   |
| Single Operator Unlimited, High Power, 15 Meters | K16RRN/KL7        | 64,476    |
| Single Operator Unlimited, Low Power, 15 Meters  | XE2F              | 7,560     |
| Single Operator, High Power, 10 Meters           | V31DJ             | 289,926   |
| Single Operator, Low Power, 10 Meters            | VP2MMT (KW8N, op) | 342,495   |
| Single Operator, QRP, 10 Meters                  | 6Y/AI5IN          | 184,440   |
| Single Operator Unlimited, Low Power, 10 Meters  | HP11BF            | 5,400     |
| Multioperator, Single Transmitter, High Power    | ZF1A              | 5,984,568 |
| Multioperator, Single Transmitter, Low Power     | V3T               | 4,652,883 |
| Multioperator, Two Transmitter                   | T48K              | 5,832,708 |
| Multioperator, Multitransmitter                  | ZF5T              | 9,314,028 |

### Oceania

|                                                  |                   |           |
|--------------------------------------------------|-------------------|-----------|
| Single Operator, High Power                      | WH7T (WH7W, op)   | 4,084,335 |
| Single Operator, Low Power                       | YB1CDA            | 38,982    |
| Single Operator Unlimited, High Power            | ZM4T (ZL3IO, op)  | 1,493,280 |
| Single Operator Unlimited, Low Power             | VK3GF             | 16,677    |
| Single Operator Unlimited, QRP                   | AH7RF             | 52,731    |
| Single Operator, High Power, 40 Meters           | DU1EV             | 1,833     |
| Single Operator, Low Power, 40 Meters            | VK2IG             | 49,920    |
| Single Operator, QRP, 40 Meters                  | YB2CTE            | 3         |
| Single Operator, QRP, 20 Meters                  | VK2/DG5CW         | 3         |
| Single Operator, Low Power, 15 Meters            | KH6AQ             | 166,896   |
| Single Operator Unlimited, High Power, 15 Meters | VK4M (VK4SN, op)  | 75,366    |
| Single Operator, High Power, 10 Meters           | AH6KO             | 181,656   |
| Single Operator, Low Power, 10 Meters            | KH6CJJ            | 168,948   |
| Single Operator, QRP, 10 Meters                  | 4F3OM             | 8,001     |
| Single Operator Unlimited, High Power, 10 Meters | KH7M              | 226,914   |
| Single Operator Unlimited, Low Power, 10 Meters  | ZM4G (ZL2IFB, op) | 25,785    |
| Single Operator Unlimited, QRP, 10 Meters        | YB2NDX            | 6         |
| Multioperator, Two Transmitter                   | ZL3X              | 3,096,525 |

### South America

|                                                   |                    |           |
|---------------------------------------------------|--------------------|-----------|
| Single Operator, High Power                       | 3G2AID (XQ3SK, op) | 1,321,650 |
| Single Operator, Low Power                        | PY2NY              | 1,249,992 |
| Single Operator, QRP                              | YV5KG              | 263,670   |
| Single Operator Unlimited, High Power             | ZP6/N3BNA          | 1,742,076 |
| Single Operator Unlimited, Low Power              | 5K4X               | 2,030,316 |
| Single Operator Unlimited, QRP                    | P44W (W2GD, op)    | 1,957,950 |
| Single Operator Unlimited, High Power, 160 Meters | PR1T               | 1,326     |
| Single Operator Unlimited, High Power, 80 Meters  | PY1ZV              | 8,064     |
| Single Operator, High Power, 40 Meters            | LT5A (VE3AP, op)   | 756       |
| Single Operator, Low Power, 40 Meters             | YV4ABR             | 58,065    |
| Single Operator Unlimited, High Power, 40 Meters  | LT5V (LU8VCC, op)  | 1,512     |
| Single Operator Unlimited, Low Power, 40 Meters   | PS7MA              | 7,254     |
| Single Operator, High Power, 20 Meters            | PY3LX              | 60        |
| Single Operator, Low Power, 20 Meters             | ZZ7ZZ (PR7AR, op)  | 11,400    |
| Single Operator Unlimited, High Power, 20 Meters  | PY4LH              | 24,030    |
| Single Operator, High Power, 15 Meters            | LU1EUD             | 9,990     |
| Single Operator, Low Power, 15 Meters             | PY2OP              | 45,216    |
| Single Operator Unlimited, High Power, 15 Meters  | XQ1KZ              | 147,552   |
| Single Operator Unlimited, Low Power, 15 Meters   | FY5KE (F6FVY, op)  | 305,679   |
| Single Operator, High Power, 10 Meters            | PW2E (PY2ZEA, op)  | 316,620   |
| Single Operator, Low Power, 10 Meters             | PY2EX              | 169,998   |
| Single Operator, QRP, 10 Meters                   | LU9EKA             | 35,550    |
| Single Operator Unlimited, High Power, 10 Meters  | LT3E (LU8DQ, op)   | 296,640   |
| Single Operator Unlimited, Low Power, 10 Meters   | 924Y               | 195,924   |
| Single Operator Unlimited, QRP, 10 Meters         | LT7D               | 79,704    |
| Multioperator, Single Transmitter, High Power     | PJ4A               | 5,352,480 |
| Multioperator, Single Transmitter, Low Power      | P40L               | 5,213,034 |
| Multioperator, Two Transmitter                    | HC8M               | 5,958,120 |
| Multioperator, Multitransmitter                   | PJ2T               | 8,116,482 |

## Full Results Online

You can read the full results of the contest online at <https://contests.arrl.org>. You'll find detailed analysis and more play-by-play, along with the full line scores. Improve your results by studying your log-checking report, too.

# 2025 ARRL RTTY Roundup Results

This year's ARRL RTTY Roundup was held January 4 – 5, 2025.

The next ARRL RTTY Roundup will be held January 3 – 5, 2026.

Following a significant surge in the number of logs received in 2024, 1,833 logs were submitted in 2025, representing a decrease of 120 logs compared to 2024. Let's examine the logs received by category over the last 3 years, and perhaps we can determine what happened.

Participation in Multi-Operator categories remained relatively flat because multi-op stations tend to stay in those categories year after year. In the Single Operator Unlimited categories, the log total hasn't changed much since last year. However, we observed an interesting shift between high power and low power, with 43 more logs in low power and 39 fewer logs in high power compared to last year. It's in the Unassisted categories where we see the most significant change, mainly in the number of Single Operator Low Power logs. There was a decrease of 111 logs in the category in 2025.

Many comments from the ARRL contest Soapbox and 3830scores.com noted that the band conditions during the RTTY Roundup weekend were poor. A strong solar storm and coronal mass ejection greatly affected all bands. This raised the planetary A index into the 30s and the planetary K index to 4, which likely caused "terrible" conditions for most of the world. As a result, many operators may have chosen not to turn on their radios this time.

In 2025, 558 logs were submitted in the Limited Antenna Overlay — that's 30 percent of all logs and the same percentage as 2024. A Limited Antenna is defined as "a single-element antenna such as a single vertical, end-fed wire, or a single dipole antenna no more than 50 feet above ground at its highest point. The antenna(s) may cover multiple bands, as in the case of multiband verticals and dipoles with fan or trap constructions." Using modest antennas does not mean you can't do well. According to Steve Clements, MW1B, (G1YBB, op) in Wales's website, g1ybb.uk; he operates portable with a 50-foot vertical. With this setup, he set a new DX Single Operator Unlimited QRP record!

## Full Results Online

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## Logs Received by year: 2016-2025

| Year | Number of Logs Received | Mode        |
|------|-------------------------|-------------|
| 2016 | 1,757                   | RTTY Only   |
| 2017 | 1,733                   | RTTY Only   |
| 2018 | 1,620                   | RTTY Only   |
| 2019 | 2,642                   | RTTY and FT |
| 2020 | 2,087                   | RTTY and FT |
| 2021 | 2,353                   | RTTY and FT |
| 2022 | 2,350                   | RTTY and FT |
| 2023 | 1,793                   | RTTY Only   |
| 2024 | 1,953                   | RTTY Only   |
| 2025 | 1,833                   | RTTY Only   |

## Logs Received by Category

| Category                                      | 2024         | 2025         | Change      |
|-----------------------------------------------|--------------|--------------|-------------|
| Single Operator, High Power                   | 274          | 256          | -18         |
| Single Operator, Low Power                    | 826          | 715          | -111        |
| Single Operator, QRP                          | 45           | 56           | 11          |
| <b>Total Single Operator</b>                  | <b>1,145</b> | <b>1,027</b> | <b>-118</b> |
| Single Operator Unlimited, High Power         | 379          | 340          | -39         |
| Single Operator Unlimited, Low Power          | 346          | 389          | 43          |
| Single Operator Unlimited, QRP                | 18           | 15           | -3          |
| <b>Total Single Operator Unlimited</b>        | <b>743</b>   | <b>744</b>   | <b>1</b>    |
| Multioperator, Single Transmitter, High Power | 28           | 27           | -1          |
| Multioperator, Single Transmitter, Low Power  | 23           | 20           | -3          |
| Multioperator, Two Transmitter                | 8            | 10           | 2           |
| Multioperator, Multitransmitter               | 6            | 5            | -1          |
| <b>Total Multioperator</b>                    | <b>65</b>    | <b>62</b>    | <b>-3</b>   |
| <b>Total</b>                                  | <b>1,953</b> | <b>1,833</b> | <b>-120</b> |

## Sponsored Plaque Winners

| Plaque Category                                               | Winner           | Plaque Sponsor                 |
|---------------------------------------------------------------|------------------|--------------------------------|
| DX Single Operator High Power                                 | P49X (WØYK, op)  | Yankee Clipper Contest Club    |
| DX Single Operator Low Power                                  | PJ4R (N4RR, op)  | Rich Cady, N1IXF               |
| DX Single Operator Unlimited Low Power                        | TM3Z (F4DSK, op) | Dimitri Cosson, F4DSK          |
| Atlantic Division Single Operator Low Power                   | N3FR             | Mike Jacoby, N3MA              |
| Central Division Single Operator High Power                   | AI9T             | Society of Midwest Contesters  |
| Central Division Single Operator Low Power                    | N9CK             | Society of Midwest Contesters  |
| Central Division Single Operator Unlimited High Power         | K9CT             | Society of Midwest Contesters  |
| Central Division Single Operator Unlimited Low Power          | WT9U             | Society of Midwest Contesters  |
| Dakota Division Single Operator High Power                    | AIØY             | Minnesota Wireless Association |
| Dakota Division Single Operator Low Power                     | WØAAE            | Minnesota Wireless Association |
| Dakota Division Single Operator Unlimited High Power          | WØRX             | Minnesota Wireless Association |
| Dakota Division Single Operator Unlimited Low Power           | WØPI             | Minnesota Wireless Association |
| Roanoke Division Single Operator Low Power, Limited Antennas  | KS4YX            | Larry Dennis, KS3H             |
| Roanoke Division Single Operator Unlimited Low Power          | NØYY             | Larry Dennis, KS3H             |
| Roanoke Division Multioperator, Single Transmitter, Low Power | KA4RRU           | Sheila Blackley, K4WNW         |



| Top Ten - US & Canada                                |         | Top Ten — DX                                         |         | Affiliated Club Competition      |              |                |
|------------------------------------------------------|---------|------------------------------------------------------|---------|----------------------------------|--------------|----------------|
| <b>Single Operator, High Power</b>                   |         | <b>Single Operator, High Power</b>                   |         | <b>Club</b>                      | <b>Score</b> | <b>Entries</b> |
| AA3B                                                 | 311,860 | P49X (WØYK, op)                                      | 364,780 | <b>Unlimited</b>                 |              |                |
| NN1SS                                                | 275,400 | OM2ADM                                               | 147,804 | Society of Midwest Contesters    | 2,919,421    | 62             |
| W7RN (WK6I, op)                                      | 231,990 | PW2L (PY2MNL, op)                                    | 124,865 | Potomac Valley Radio Club        | 2,778,921    | 74             |
| ND7K (K6JO, op)                                      | 193,942 | KH6ZM                                                | 101,340 |                                  |              |                |
| AI9T                                                 | 169,840 | EA8DO                                                | 94,347  | <b>Medium</b>                    |              |                |
| K5XH                                                 | 158,555 | DL3BQA                                               | 90,792  | Frankford Radio Club             | 1,871,233    | 37             |
| AD5XD                                                | 141,882 | PZ5RA                                                | 84,133  | Yankee Clipper Contest Club      | 1,859,820    | 34             |
| AIØY                                                 | 132,240 | OZ11A                                                | 81,696  | Minnesota Wireless Assn.         | 1,564,750    | 49             |
| W1SJ                                                 | 126,654 | CE6CGX                                               | 60,160  | Arizona Outlaws Contest Club     | 1,447,931    | 20             |
| NØAT                                                 | 124,950 | IK2OWX                                               | 50,666  | Florida Contest Group            | 1,225,994    | 25             |
| <b>Single Operator, Low Power</b>                    |         | <b>Single Operator, Low Power</b>                    |         | Tennessee Contest Group          | 1,156,188    | 24             |
| N9CK                                                 | 119,295 | PJ4R (N4RR, op)                                      | 189,033 | Northern California Contest Club | 1,034,976    | 24             |
| K9WX                                                 | 116,857 | UB7K                                                 | 136,104 | Contest Club Ontario             | 869,527      | 23             |
| N1IXF                                                | 115,440 | HI3T                                                 | 129,096 | Mother Lode DX/Contest Club      | 648,128      | 18             |
| WØAAE                                                | 101,376 | CT7BJG                                               | 61,732  | Deep Dixie Contest Club          | 645,278      | 5              |
| KU2M                                                 | 96,859  | F5BEG                                                | 59,094  | Central Texas                    |              |                |
| WA1FCN                                               | 96,425  | KH6CJJ                                               | 56,721  | DX and Contest Club              | 601,052      | 8              |
| AC6ZM                                                | 79,055  | TI2OY                                                | 47,150  | 599 DX Assn.                     | 402,634      | 6              |
| N4TB                                                 | 78,750  | NP3YL (KP4JRS, op)                                   | 42,140  | DFW Contest Group                | 388,982      | 11             |
| K8ARY                                                | 78,728  | LZ2HA                                                | 40,420  | Western Washington DX Club       | 352,308      | 8              |
| K9UC                                                 | 69,888  | RA1M                                                 | 40,281  | Niagara Frontier Radiosport      | 337,152      | 13             |
| <b>Single Operator, QRP</b>                          |         | <b>Single Operator, QRP</b>                          |         | Great Places Contest Club        | 315,627      | 4              |
| WDØT                                                 | 57,891  | DL3SYA                                               | 22,330  | Willamette Valley DX Club        | 304,443      | 14             |
| NØUR                                                 | 40,092  | YO4BEW                                               | 16,409  | Grand Mesa                       |              |                |
| K2YG                                                 | 37,736  | SP4LO                                                | 15,424  | Contesters of Colorado           | 304,390      | 6              |
| K5NZ                                                 | 34,048  | PY2PLL                                               | 12,489  | Kansas City Contest Club         | 284,889      | 8              |
| K4SAA                                                | 33,352  | SP4NKJ                                               | 12,432  | Spokane DX Assn.                 | 282,442      | 9              |
| WA3LXD                                               | 31,734  | IZ3NVR                                               | 10,285  | Louisiana Contest Club           | 281,002      | 3              |
| WQ6X                                                 | 20,119  | EA1GT                                                | 9,116   | Carolina DX Assn.                | 266,828      | 6              |
| AA5KD                                                | 19,530  | JK1OLT                                               | 7,897   | Northeast Maryland Amateur       |              |                |
| KG2U                                                 | 9,063   | G5N (GØSBN, op)                                      | 5,809   | Radio Contest Society            | 258,109      | 10             |
| VE1RSM                                               | 8,721   | IV3LNQ                                               | 5,586   | Orca DX and Contest Club         | 251,341      | 7              |
| <b>Single Operator Unlimited, High Power</b>         |         | <b>Single Operator Unlimited, High Power</b>         |         | Southern California Contest Club | 207,863      | 11             |
| N6WM                                                 | 254,504 | EA4GOY                                               | 206,976 | Kentucky Contest Group           | 207,230      | 7              |
| K9CT                                                 | 238,203 | D4L (IK2NCJ, op)                                     | 177,636 | Heartland DX Assn.               | 185,242      | 3              |
| K16DY                                                | 226,548 | SN7Q (SP7GIQ, op)                                    | 146,190 | Swamp Fox Contest Group          | 178,013      | 11             |
| N5RZ                                                 | 204,006 | YT3D                                                 | 145,080 | Big Sky Contesters               | 174,695      | 3              |
| K9OM                                                 | 190,190 | ZF2SS                                                | 138,240 | Alabama Contest Group            | 154,536      | 6              |
| N3QE                                                 | 186,620 | EA8BW                                                | 135,923 | South East Contest Club          | 136,802      | 4              |
| W2FU                                                 | 183,808 | PV2K (PY2KNK, op)                                    | 119,893 | New Providence ARC               | 135,300      | 3              |
| NF3R                                                 | 180,531 | DQ9Y (DF2SD, op)                                     | 117,215 | Arkansas DX Assn.                | 115,292      | 3              |
| W5MX                                                 | 162,745 | IK3ORD                                               | 106,116 | Maritime Contest Club            | 107,076      | 5              |
| ABØS                                                 | 158,620 | T77CX                                                | 93,024  | North Coast Contesters           | 89,215       | 3              |
| <b>Single Operator Unlimited, Low Power</b>          |         | <b>Single Operator Unlimited, Low Power</b>          |         | Hudson Valley                    |              |                |
| AA5AU                                                | 272,664 | TM3Z (F4DSK, op)                                     | 207,879 | Contesters and DXers             | 74,676       | 4              |
| K11G                                                 | 225,806 | UW1M                                                 | 153,331 | Valley Amateur Radio Assn.       | 64,033       | 3              |
| WT9U                                                 | 136,850 | EA4AOC                                               | 126,549 | Rochester (NY) DX Assn.          | 52,255       | 4              |
| W7CXX (WA7LNW, op)                                   | 136,431 | EA4BAS                                               | 93,520  | Oklahoma City Autopatch Assn.    | 44,755       | 3              |
| K1DC                                                 | 103,411 | EA4HPY                                               | 86,480  | Skyview Radio Society            | 30,326       | 3              |
| VE3NE                                                | 89,024  | OK2WY                                                | 85,884  | Mad River Radio Club             | 25,110       | 3              |
| KW1X (N1W, op)                                       | 80,333  | UT4LW                                                | 74,320  | Portage County                   |              |                |
| W3KB                                                 | 71,831  | TI1I (TI2VVV, op)                                    | 72,653  | Amateur Radio Service            | 23,227       | 3              |
| AB5SE                                                | 70,755  | EA1ACP                                               | 64,108  | Edmonds Woodway ARC              | 11,764       | 3              |
| N8HRZ                                                | 70,560  | SP2EWQ                                               | 61,845  | <b>Local</b>                     |              |                |
| <b>Single Operator Unlimited, QRP</b>                |         | <b>Single Operator Unlimited, QRP</b>                |         | Pizza Lovers 259                 | 728,549      | 7              |
| W7RY                                                 | 65,400  | MW1B (G1YBB, op)                                     | 47,808  | Orleans County                   |              |                |
| K5ND                                                 | 11,895  | LZ7X                                                 | 37,168  | Amateur Radio Club               | 609,294      | 9              |
| WØKI                                                 | 6,946   | G4ZFE                                                | 29,546  | Bristol (TN) ARC                 | 77,477       | 5              |
| K8ZT                                                 | 90      | JA6GCE                                               | 12,672  | Metro DX Club                    | 75,982       | 3              |
| <b>Multioperator, Single Transmitter, High Power</b> |         | EN6ØNK (UT3NK, op)                                   | 11,360  | Hilltop Transmitting Assn.       | 72,362       | 3              |
| WØSD                                                 | 226,080 | M1D                                                  | 7,958   | Silver Springs Radio Club        | 36,028       | 3              |
| KY7M                                                 | 213,440 | PE2K                                                 | 6,816   |                                  |              |                |
| AB5EB                                                | 194,760 | PU2TWZ                                               | 2,730   |                                  |              |                |
| N7AT                                                 | 193,914 | OH8KA                                                | 1,104   |                                  |              |                |
| K3AJ                                                 | 173,635 | ZL3TE                                                | 950     |                                  |              |                |
| AD4ES                                                | 166,254 | <b>Multioperator, Single Transmitter, High Power</b> |         |                                  |              |                |
| NA4DA                                                | 132,825 | EI7M                                                 | 228,340 |                                  |              |                |
| NØMA                                                 | 117,192 | OK7O                                                 | 170,538 |                                  |              |                |
| W6DR                                                 | 105,266 | OH5Z                                                 | 150,912 |                                  |              |                |
| KM4OQO                                               | 96,334  | DAØWWA                                               | 137,875 |                                  |              |                |
| <b>Multioperator, Single Transmitter, Low Power</b>  |         | DM4X                                                 | 45,756  |                                  |              |                |
| W9SN                                                 | 149,400 | SD3T                                                 | 38,850  |                                  |              |                |
| KA4RRU                                               | 100,909 | S58W                                                 | 34,776  |                                  |              |                |
| NX3A                                                 | 85,120  | SB7A                                                 | 25,728  |                                  |              |                |
| WA1F                                                 | 67,947  | OK1KKI                                               | 19,920  |                                  |              |                |
| W3ZGD                                                | 62,370  | RMØW                                                 | 1,562   |                                  |              |                |
| KOØZ                                                 | 40,527  | <b>Multioperator, Single Transmitter, Low Power</b>  |         |                                  |              |                |
| NJ1F                                                 | 28,269  | ZV1T                                                 | 73,371  |                                  |              |                |
| N1SOH                                                | 19,008  | 9A925T                                               | 56,144  |                                  |              |                |
| KM4ND                                                | 14,981  | UR2Y                                                 | 46,944  |                                  |              |                |
| KK5OV                                                | 2,232   | IQ2DN                                                | 39,933  |                                  |              |                |
| <b>Multioperator, Two Transmitter</b>                |         | YU7KMN                                               | 20,002  |                                  |              |                |
| NJ4P                                                 | 472,787 | PR4C                                                 | 17,952  |                                  |              |                |
| ND2T                                                 | 257,172 | HF3ØPJY                                              | 16,897  |                                  |              |                |
| K4EA                                                 | 251,750 | SN9A                                                 | 6,930   |                                  |              |                |
| AG4TT                                                | 246,870 | PY2ZR                                                | 4,935   |                                  |              |                |
| K7RU                                                 | 178,800 | OK1OFM                                               | 576     |                                  |              |                |
| NW8S                                                 | 174,800 | <b>Multioperator, Multitransmitter</b>               |         |                                  |              |                |
| W4MLB                                                | 128,441 | DP9A                                                 | 308,992 |                                  |              |                |
| N1RR                                                 | 109,074 | OZ4GM                                                | 67,200  |                                  |              |                |
| WB9TFF                                               | 60,996  |                                                      |         |                                  |              |                |
| W4TA                                                 | 37,130  |                                                      |         |                                  |              |                |
| <b>Multioperator, Multitransmitter</b>               |         |                                                      |         |                                  |              |                |
| NA5NN                                                | 172,438 |                                                      |         |                                  |              |                |
| KØOO                                                 | 88,508  |                                                      |         |                                  |              |                |
| NR4M                                                 | 37,506  |                                                      |         |                                  |              |                |

| Top Ten Overlay Scores US & Canada           |         |       |       | Top Ten Overlay Scores — DX                  |         |       |       | Continental Winners                           |  |  |  |
|----------------------------------------------|---------|-------|-------|----------------------------------------------|---------|-------|-------|-----------------------------------------------|--|--|--|
| Call                                         | Score   | QSOs  | Mults | Call                                         | Score   | QSOs  | Mults | Africa                                        |  |  |  |
| <b>Limited Antenna Overlay</b>               |         |       |       | <b>Limited Antenna Overlay</b>               |         |       |       | Single Operator, High Power                   |  |  |  |
| <b>Single Operator, High Power</b>           |         |       |       | <b>Single Operator, High Power</b>           |         |       |       | Single Operator, Low Power                    |  |  |  |
| ND7K (K6JO, op) (Youth)                      | 193,942 | 2,032 | 98    | DL1SWB                                       | 19,734  | 297   | 69    | Single Operator Unlimited, High Power         |  |  |  |
| AD5LU                                        | 65,860  | 745   | 89    | EA6SK                                        | 12,980  | 250   | 55    | <b>Antarctica</b>                             |  |  |  |
| K5TA                                         | 60,900  | 703   | 87    | CT7AIX                                       | 11,635  | 180   | 65    | Single Operator, High Power, 15 Meters        |  |  |  |
| WF4W                                         | 45,724  | 514   | 92    | EU1DX                                        | 8,624   | 155   | 56    | <b>Asia</b>                                   |  |  |  |
| W4UK                                         | 43,212  | 558   | 78    | DF5BX                                        | 8,262   | 166   | 51    | Single Operator, High Power                   |  |  |  |
| K7JQ                                         | 31,552  | 496   | 64    | F6CAX                                        | 5,848   | 138   | 43    | Single Operator, Low Power                    |  |  |  |
| W3TB                                         | 27,761  | 400   | 71    | DG1YBN                                       | 4,995   | 114   | 45    | Single Operator, QRP                          |  |  |  |
| K1BZ                                         | 25,972  | 304   | 86    | IV3NVB                                       | 4,738   | 111   | 46    | Single Operator Unlimited, High Power         |  |  |  |
| K4QQG                                        | 25,840  | 409   | 68    | I2Z2QP                                       | 4,410   | 130   | 35    | Single Operator Unlimited, Low Power          |  |  |  |
| VE3BR                                        | 21,459  | 316   | 69    | PA4G                                         | 3,528   | 101   | 36    | Single Operator Unlimited, QRP                |  |  |  |
| <b>Single Operator, Low Power</b>            |         |       |       | <b>Single Operator, Low Power</b>            |         |       |       | Multioperator, Single Transmitter, High Power |  |  |  |
| K9WX                                         | 116,857 | 1,171 | 101   | F5GKW                                        | 33,620  | 414   | 82    | <b>Europe</b>                                 |  |  |  |
| NN1D                                         | 68,816  | 814   | 88    | F4CVO                                        | 33,408  | 396   | 87    | Single Operator, High Power                   |  |  |  |
| N9TF                                         | 63,072  | 661   | 96    | HA7MB                                        | 32,311  | 418   | 79    | Single Operator, Low Power                    |  |  |  |
| WB8JUI                                       | 59,856  | 697   | 86    | DJ1OJ                                        | 25,461  | 372   | 69    | Single Operator, QRP                          |  |  |  |
| AA8R                                         | 58,560  | 620   | 96    | SP6JZP                                       | 22,896  | 322   | 72    | Single Operator Unlimited, High Power         |  |  |  |
| KM4FO                                        | 57,408  | 638   | 92    | US7KC                                        | 22,410  | 426   | 54    | Single Operator Unlimited, Low Power          |  |  |  |
| VE3FH                                        | 53,781  | 592   | 91    | SP8CGU                                       | 21,760  | 322   | 68    | Single Operator Unlimited, QRP                |  |  |  |
| KM9R                                         | 52,288  | 700   | 76    | IU3MDI                                       | 19,800  | 306   | 66    | Multioperator, Single Transmitter, High Power |  |  |  |
| W0IZ                                         | 51,120  | 650   | 80    | F4IVC                                        | 19,560  | 343   | 60    | Multioperator, Single Transmitter, Low Power  |  |  |  |
| KF0UR                                        | 49,166  | 803   | 62    | EA7/VE3NZ                                    | 18,224  | 279   | 68    | Multioperator, Multitransmitter               |  |  |  |
| <b>Single Operator, QRP</b>                  |         |       |       | <b>Single Operator, QRP</b>                  |         |       |       | <b>North America</b>                          |  |  |  |
| K5NZ                                         | 34,048  | 451   | 76    | DL3SYA                                       | 22,330  | 325   | 70    | Single Operator, High Power                   |  |  |  |
| K4SAA                                        | 33,352  | 387   | 88    | SP4NKK                                       | 12,432  | 225   | 56    | Single Operator, Low Power                    |  |  |  |
| WA3LXD                                       | 31,734  | 393   | 82    | I3NVR                                        | 10,285  | 189   | 55    | Single Operator Unlimited, High Power         |  |  |  |
| AA5KD                                        | 19,530  | 318   | 62    | I2/UY2ZA                                     | 2,490   | 88    | 30    | Single Operator Unlimited, Low Power          |  |  |  |
| KG2U                                         | 9,063   | 175   | 53    | E78CB                                        | 2,375   | 97    | 25    | <b>Oceania</b>                                |  |  |  |
| KO3T                                         | 7,884   | 146   | 54    | 9A5HZ                                        | 2,232   | 76    | 31    | Single Operator, High Power                   |  |  |  |
| N0LMQ                                        | 6,674   | 143   | 47    | DO3OI                                        | 770     | 39    | 22    | Single Operator, Low Power                    |  |  |  |
| NN1DX                                        | 5,220   | 118   | 45    | YF3AWZ                                       | 432     | 25    | 18    | Single Operator, QRP                          |  |  |  |
| N6HI                                         | 3,168   | 106   | 33    | JR1NKN                                       | 200     | 21    | 10    | Single Operator Unlimited, High Power         |  |  |  |
| KZ9V                                         | 1,696   | 58    | 32    | YO4AAC                                       | 200     | 20    | 10    | Single Operator Unlimited, Low Power          |  |  |  |
| <b>Single Operator Unlimited, High Power</b> |         |       |       | <b>Single Operator Unlimited, High Power</b> |         |       |       | Single Operator Unlimited, QRP                |  |  |  |
| K9OM                                         | 190,190 | 1,484 | 130   | ZF2SS                                        | 138,240 | 1,170 | 120   | <b>South America</b>                          |  |  |  |
| WA3AAN                                       | 110,334 | 1,010 | 111   | YO4NF                                        | 68,224  | 837   | 82    | Single Operator, High Power                   |  |  |  |
| W6SX                                         | 76,072  | 1,039 | 74    | DK8ZB                                        | 48,866  | 470   | 106   | Single Operator, Low Power                    |  |  |  |
| K0TG                                         | 62,475  | 742   | 85    | UZ1WW                                        | 44,560  | 564   | 80    | Single Operator, QRP                          |  |  |  |
| W1ARY                                        | 59,640  | 572   | 105   | YT0W                                         | 40,014  | 502   | 81    | Single Operator Unlimited, High Power         |  |  |  |
| AA4R                                         | 58,860  | 554   | 108   | PA6AA (PB7Z, op)                             | 39,648  | 418   | 96    | Single Operator Unlimited, Low Power          |  |  |  |
| NC4S                                         | 55,143  | 583   | 99    | DL7AUO                                       | 30,222  | 421   | 73    | Single Operator Unlimited, QRP                |  |  |  |
| N1MGO                                        | 53,190  | 601   | 90    | F5TLF                                        | 26,240  | 330   | 80    | <b>Africa</b>                                 |  |  |  |
| N9EP                                         | 44,376  | 521   | 86    | HA5GF                                        | 20,559  | 277   | 77    | Single Operator, High Power                   |  |  |  |
| W4BBT                                        | 43,650  | 490   | 90    | LC6A (LA3LJA, op)                            | 20,532  | 353   | 59    | Single Operator, Low Power                    |  |  |  |
| <b>Single Operator Unlimited, Low Power</b>  |         |       |       | <b>Single Operator Unlimited, Low Power</b>  |         |       |       | Single Operator, QRP                          |  |  |  |
| VE3NE                                        | 89,024  | 845   | 107   | EA4BAS                                       | 93,520  | 861   | 112   | Single Operator Unlimited, High Power         |  |  |  |
| VE3MGY                                       | 67,320  | 677   | 102   | SP2EWQ                                       | 61,845  | 658   | 95    | Single Operator Unlimited, Low Power          |  |  |  |
| N0YY                                         | 67,130  | 702   | 98    | S53K                                         | 50,544  | 642   | 81    | Single Operator Unlimited, QRP                |  |  |  |
| K9PW                                         | 65,484  | 619   | 107   | DN4TG                                        | 46,248  | 574   | 82    | <b>South America</b>                          |  |  |  |
| W13W                                         | 61,374  | 581   | 106   | DA0BCC                                       |         |       |       | Single Operator, High Power                   |  |  |  |
| KY0Q                                         | 57,602  | 698   | 83    | (DL2JRM, op)                                 | 35,112  | 427   | 84    | Single Operator, Low Power                    |  |  |  |
| W4TM                                         | 57,552  | 660   | 88    | G0FGI                                        | 25,272  | 315   | 81    | Single Operator, QRP                          |  |  |  |
| W9TD                                         | 54,223  | 564   | 97    | DG8M                                         |         |       |       | Single Operator Unlimited, High Power         |  |  |  |
| AD1C                                         | 54,080  | 678   | 80    | (DL6NDW, op)                                 | 20,232  | 285   | 72    | Single Operator Unlimited, Low Power          |  |  |  |
| K4IU                                         | 47,385  | 595   | 81    | G4DBW                                        | 19,260  | 217   | 90    | Single Operator Unlimited, QRP                |  |  |  |
| <b>Single Operator Unlimited, QRP</b>        |         |       |       | DF4ZL                                        | 17,080  | 283   | 61    | Multioperator, Single Transmitter, Low Power  |  |  |  |
| K5ND                                         | 11,895  | 199   | 61    | EA5XA                                        | 16,640  | 268   | 64    | <b>South America</b>                          |  |  |  |
| W0KI                                         | 6,946   | 157   | 46    | <b>Single Operator Unlimited, QRP</b>        |         |       |       | Single Operator, High Power                   |  |  |  |
| K8ZT                                         | 90      | 11    | 9     | MW1B (G1YBB, op)                             | 47,808  | 501   | 96    | Single Operator, Low Power                    |  |  |  |
|                                              |         |       |       | EN60NK (UT3NK, op)                           | 11,360  | 291   | 40    | Single Operator, QRP                          |  |  |  |
|                                              |         |       |       | M1D                                          | 7,958   | 179   | 46    | Single Operator Unlimited, High Power         |  |  |  |
|                                              |         |       |       | PU2TWZ                                       | 2,730   | 80    | 35    | Single Operator Unlimited, Low Power          |  |  |  |
|                                              |         |       |       | OH8KA                                        | 1,104   | 48    | 23    | Single Operator Unlimited, QRP                |  |  |  |
|                                              |         |       |       | ZL3TE                                        | 950     | 39    | 25    | Multioperator, Single Transmitter, Low Power  |  |  |  |
|                                              |         |       |       | CD6SNT                                       | 168     | 14    | 12    |                                               |  |  |  |

## Youth Overlay Scores - US and Canada

SOHP= Single Operator, High Power; SOLP= Single Operator, Low Power; SOUHP= Single Operator Unlimited, High Power; SOULP= Single Operator Unlimited, Low Power

(Listed by Score, not Category)

| Call                    | Category | Score   | QSOs  | Mults |
|-------------------------|----------|---------|-------|-------|
| ND7K (K6JO, op) (Youth) | SOHP     | 193,942 | 2,032 | 98    |
| W0AAE                   | SOLP     | 101,376 | 1,033 | 99    |
| KE2AIZ                  | SOULP    | 19,404  | 233   | 84    |
| KG5XR                   | SOULP    | 8,294   | 148   | 58    |
| KO6GMZ (N6ZZ, op)       | SOUHP    | 7,900   | 159   | 50    |
| WX8S (KF8CEB, op)       | SOULP    | 7,560   | 138   | 56    |

## Youth Overlay Scores - US and Canada

(Listed by Score, not Category)

| Call                     | Category | Score   | QSOs  | Mults |
|--------------------------|----------|---------|-------|-------|
| OM2ADM                   | SOHP     | 147,804 | 1,339 | 113   |
| IU0SDC                   | SOLP     | 12,540  | 294   | 44    |
| YU4BIR (Limited Antenna) | SOULP    | 7,535   | 143   | 55    |
| OE3TEC                   | SOULP    | 5,980   | 133   | 46    |
| BI3XGJ (Limited Antenna) | SOLP     | 3,675   | 150   | 25    |
| SP3LM                    | SOULP    | 980     | 49    | 20    |
| BI1MHK                   | SOULP    | 36      | 6     | 6     |



Jack Reed, WA7LNW, operated the W7CXX station at the Collins Aerospace Radio Group club station remotely from his home in southwestern Utah. He completed 1,484 contacts to take first place in the Rocky Mountain Division in the Single Operator Unlimited, Low Power category. [Jack Reed, WA7LNW, photo]



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# The 2025 ARRL September VHF Contest

1800 UTC Saturday, September 13 – 0259 UTC Monday, September 15

The ARRL September VHF Contest is an opportunity to take advantage of the enhanced propagation on the VHF and UHF bands that late summer can offer. With good conditions, stations hundreds of miles away can be worked via tropospheric ducting and sporadic E. All amateur bands 50 MHz and higher can be used in this event. The exchange is your four-digit Maidenhead grid square. To find your grid square, visit [www.arrl.org/grid-squares](http://www.arrl.org/grid-squares).

The contest allows all legal modes, including CW and SSB/phone, as well as digital modes such as FT4 and FT8. Be sure to check the *WSJT-X* website at <https://wsjt.sourceforge.io> for the latest software updates.

Use our web app to submit your Cabrillo-formatted log at <http://contest-log-submission.arrl.org>. Paper logs can be submitted to ARRL September VHF Contest, 225 Main St., Newington, CT 06111.

**10-day deadline:** All logs must be submitted or postmarked no later than 0259 UTC September 25, 2025.



Scott Dantis, AA2SD, used this three-band loop antenna setup for his rover operation in the 2024 ARRL September VHF Contest. He stated that he was experimenting with different antennas during the contest. Scott placed third overall in the Limited Rover category. [Scott Dantis, AA2SD, photo]

A complete list of rules, entry forms, and entry categories can be found at [www.arrl.org/september-vhf](http://www.arrl.org/september-vhf).

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# The 2025 ARRL International EME Contest

There are four weekends of activity for this year's contest, occurring on 0000 UTC Saturday – 2359 UTC Sunday each weekend.

2.3+ GHz: August 16 – 17

2.3+ GHz: September 13 – 14

50 – 1296 MHz: October 11 – 12

50 – 1296 MHz: November 8 – 9

Long-distance DX contacts can be made on VHF, UHF, and above with 100 – 200 W and a medium- to long-boom Yagi antenna. Using CW, phone, or digital modes, you can bounce your signal off the lunar surface and work DX.

Spotting assistance is allowed in all categories, including but not limited to DX-alerting nets, reflectors, email, or even telephone.

Logs must be submitted or postmarked no later than 2359 UTC, December 9, 2025. Send electronic log submissions via our web app at <http://contests.arrl.org/arrlemescoresubmission.php>, or send paper logs to ARRL EME Contest, 225 Main St., Newington, CT 06111 USA.

Complete rules and entry forms can be found at [www.arrl.org/eme-contest](http://www.arrl.org/eme-contest).

# The 2025 ARRL 10 GHz and Up Contest

Held each year on the third full weekend of August and September.

Weekend 1: August 16 – 18, 2025

Weekend 2: September 20 – 22, 2025

Each weekend begins at 0900 UTC on Saturday and runs through 0759 UTC on Monday. Participation is limited to 42 hours of operating time in each of the two contest weekends. Participants are reminded to log all contacts in UTC time, not in their local time zone.

The microwave bands 10 GHz and above will be active again this year during the 2025 ARRL 10 GHz and Up Contest. The objective is to work as many stations as possible from different locations, using frequencies ranging from 10 GHz to light. Because contest scores increase over greater distances, taking your station portable will give you an advantage — the greater the distance, the higher your score. With distance point multipliers, contacts on bands higher than 10 GHz can accrue even greater distance points!

Scheduling contacts is not only permitted but encouraged in this contest. Consider getting in touch with one of the many VHF+ or microwave clubs to arrange contacts with them. To locate a club, enter the term “VHF” on the ARRL club search page at [www.arrl.org/find-a-club](http://www.arrl.org/find-a-club).

When the event is over, be sure to upload your Cabrillo log to our web app at <http://contests.arrl.org/arrl10gscoreresubmission.php>, or send paper logs to ARRL 10 GHz Contest, 225 Main St., Newington, CT 06111. All logs must be received or postmarked by 2359 UTC on October 22, 2025.

Complete rules and entry forms can be found at [www.arrl.org/10-ghz-up](http://www.arrl.org/10-ghz-up).

## This Month in

*QEX* magazine is a forum for the free exchange of ideas among communications experimenters. All ARRL members can access the digital edition of *QEX* as a member benefit ([www.arrl.org/magazines](http://www.arrl.org/magazines)). Print subscriptions are available and sold separately; see [www.arrl.org/qex](http://www.arrl.org/qex).

Coming up in the July/August 2025 issue of *QEX*:

- José Luis Giordano, CE4TW, discusses key aspects of hysteresis, ferrites, and permeability.
- Gunnar Wieking, DL5BO, shares the conveniences and extended options available for the IC-7300.
- Jed Marti, KI7NNP, describes his experimentation in creating accurate inductance for tuned radio frequency circuits.
- Claudio Facciolo, K0FC/IU0BNG, discusses software designed to efficiently compute the voltage, current, impedance, SWR, power, and loss along a transmission line and other circuits.
- In his essay series, Eric Nichols, KL7AJ, examines how to measure the frequency response of a classic filter using a vector network analyzer.

Would you like to write for *QEX*? We pay \$50 per published page for full articles and *QEX* Technical Notes. Get more information and an Author Guide at [www.arrl.org/qex-author-guide](http://www.arrl.org/qex-author-guide).

### Write for QST

*QST* looks for material that appeals to a broad cross-section of readers within the diverse amateur radio community. Feature articles published in *QST* fall into one of two broad categories: *technical* and *general interest*.

Technical articles outline a construction project or a technical concept. General interest articles are “everything else”: recaps of DXpeditions, grid expeditions, or public service activities, or personal accounts of trying a new mode or style of operating — anything relating to operating or the ham radio avocation.

Regardless of your manuscript’s topic, a strong “how-to” component will make it stand out.

General interest submissions should be 1,200 – 1,800 words with 3 – 5 high-resolution images. Technical article submissions may be longer and include more images as the subject matter requires (for example, step-by-step instructions for a project). Please submit images as separate attachments, and include captions for all images at the end of your manuscript. Send manuscript materials to [qst@arrl.org](mailto:qst@arrl.org).

For even more information, see our Author Guide at [www.arrl.org/qst-author-guide](http://www.arrl.org/qst-author-guide).



## Club Station

# Generate International Collaborations with an E-Newsletter

*Shortly after its incorporation in 2022, the Society of Dominican Radio Amateurs Inc. (SDRA, also known as Dominican Society of Radio Amateurs, Inc.) in the Dominican Republic began fostering partnerships with various clubs around the world, thanks to their e-newsletter, SDRA RX/TX. In this month's column, SDRA President Santiago Mejia, HI8O, shares how the e-newsletter has helped the club successfully extend their network on an international scale.*

The first steps toward broadening SDRA's collaboration reach were to establish a newsletter that could be shared globally, and to build an editorial and production team to work on it. We chose *SDRA RX/TX* as the masthead and agreed to produce it in Spanish and English as a bimonthly publication. Vice President David Lama, HI8D; Treasurer Annabel Hiraldo, HI8AN; Eduardo Sturla Ferrer, HI8ESF, and I volunteered to be the designated production team, but all members are welcome to contribute content. *SDRA RX/TX* has helped us collaborate with clubs around the world because it has a solid foundation that readers can rely on, it's offered in a bilingual format, and we've developed sound distribution practices.

### Production, Content, and Expenses

*SDRA RX/TX* is produced internally. We develop drafts in a shared document so that team members can work simultaneously, making the process easier, faster, and more team-oriented. The e-newsletter is then created via Canva ([www.canva.com](http://www.canva.com); an online graphic design tool), exported as a PDF, and turned into an interactive flipbook using Heyzine (<https://heyzine.com/feature/canva-flipbook>).

When preparing each issue, the editorial team discusses trending topics in the amateur radio community, from major contests to new software. Article topics and sections are then selected, and we work with operators who have knowledge of the chosen subjects to create the content. We've had the privilege of working with *WSJT* developer Joe Taylor, K1JT; ARRL Education and Learning Manager Steve Goodgame, K5ATA, and ham radio YouTuber Josh Nass, KI6NAZ, who have all selflessly contributed content.



The cover of *SDRA RX/TX* Volume 2, Number 3. [Santiago Mejia, HI8O, photo]

We hold weekly reviews and discussions, and once we feel the draft is ready, club members translate it from Spanish into English. Both versions are then distributed to *SDRA RX/TX* subscribers using the email marketing platform MailChimp ([www.mailchimp.com](http://www.mailchimp.com)).

HI8D and Edgar Pons Leighton, HI8T, are the newsletter's main contributors because of their ability to generate a steady flow of content. HI8AN manages her column, "YL on the Air"; I write the newsletter's editorial and "From the Shack," both of which focus on operating, and HI8D writes the "POTA Section." We also include various news columns. Typically, an issue spans less than 20 pages, depending on the number of contributions.

We have a special section called “Q&A With” that details interviews with notable hams from around the world. This column was inaugurated with K1JT and has since featured KI6NAZ and K5ATA, among others.

As a digital newsletter, *SDRA RX/TX* incurs no direct production costs for the club. We use our personal subscriptions for services like Canva, MailChimp, and Heyzine, but it may be of value to purchase them using club funds. For example, we regularly use Canva to make flyers and ads for club activities, create presentations, design ID cards and promotional items, and construct in-house logos, among many other projects. MailChimp is also used to share important information with members, send invitations to activities, deliver reminders, etc.

The e-newsletter is free for everyone, and we don’t have any plans to begin charging for a subscription. However, a paid subscription model could help to offset funds needed for other club activities. Keeping it free for only members, and charging nonmembers, could be an attractive benefit. Additionally, paid advertisements could generate revenue.

## Fostering International Connections

In addition to using MailChimp to distribute the newsletter to subscribers, we upload a PDF to our website and various social media platforms, such as WhatsApp, Facebook, and Instagram. This way it can be viewed by any ham around the world, not just its subscribers in the Dominican Republic. Our use of Instagram has exponentially grown our network — we collaborate with other accounts on the app by jointly posting the same messages (such as the promotion of *SDRA RX/TX*) to reach a bigger audience.

The bilingual format allows us to engage with the amateur radio community on a much greater level, because its readers aren’t limited to only Spanish-speaking hams. While some clubs might not have members with the ability to translate their newsletter into another language, there are numerous tools that can be used for this purpose, such as **TRANSLATE** within Microsoft *Word* and [www.deepl.com](http://www.deepl.com), among others. Most of these tools are free or come at an incredibly minimal cost.

*SDRA RX/TX* has helped the club facilitate partnerships with clubs in India, Chile, Colombia, Venezuela, Panama, and the United States that include but aren’t limited to promoting and supporting each other’s

activities, allowing for large-scale participation in club happenings and sharing best practices. For example, STEM Amateur Radio Club, N4TVV, in South Carolina shares their best practices with us and helps us to strengthen presentations and projects for local schools in the Dominican Republic.

## In Conclusion

The e-newsletter has more than 100 global subscribers, *SDRA* has recruited more than five international members because of it, and collaborating with others during the newsletter’s preparation has strengthened the club’s standing as a well-established institution.

*SDRA RX/TX* has helped *SDRA* become the most prominent Dominican club on the international stage, allowing for endless possibilities. Offering a newsletter has also proven to be invaluable for internal cohesion, helping members work together on a common project, fostering teamwork, and developing friendships.

## ARRL Special Service Clubs



ARRL offers the Special Service Club (SSC) program for clubs that demonstrate that they’re working to improve the amateur radio community by completing special projects, holding license classes, and working with local groups on events, among other activities. Visit [www.arrl.org/ssc-application](http://www.arrl.org/ssc-application) for more information about this program. Below is a list of new and renewing SSCs as of May 21, 2025.

### Renewing SSCs

|                                        |                   |
|----------------------------------------|-------------------|
| Monroe County Radio Comm. Assn., W8DWL | Dundee, MI        |
| Fort Herkimer ARA, W2FHA               | Dolgeville, NY    |
| Phil-Mont Mobile Radio Club, W3QV      | Warminster, PA    |
| Falmouth ARA, K1RK                     | West Falmouth, MA |

### New SSCs

|                       |                |
|-----------------------|----------------|
| Schaumburg ARC, N9RJV | Schaumburg, IL |
| Wiregrass ARC, W4DHN  | Dothan, AL     |

## Sign Up for ARRL Club News

Read the monthly *ARRL Club News* e-newsletter to find out more about what clubs are doing to advance amateur radio in their communities and within the hobby. To opt in to monthly email delivery of *ARRL Club News*, log in to [www.arrl.org](http://www.arrl.org) and select “E-Newsletters and Notifications” on your account web page.



## How's DX?

# PJ6Y — October 2025 Remote DXpedition to Saba

*In this month's column, guest author Gregg Marco, W6IZT, recalls the Pacific Island DXpedition Group's past successes and teases an upcoming operation that will emphasize young hams and remote technology.*

In July 2023, George, AA7JV; Mike, KN4EEI; 34 remote operators, and I had recently completed a successful DXpedition to Ducie Island as VP6A, which showcased George's Radio in a Box (RiB). While returning to Mangareva, I began to think of other applications for RiB technology. I envisioned a smaller and lighter package designed for different purposes, such as remote operating that complements a conventional DXpedition. Work shortly began on what would be termed the **NexGenRiB**. We completed the prototype in January 2024 and deployed it for the February 2024 CBØZEW DXpedition to the Juan Fernández Islands. The 32 remote operators made almost 16,000 contacts, and every one of them had an exciting time! My wife, Wendy, suggested that operating DXpeditions remotely might be a terrific way to get young hams involved in DXpeditioning.

After CBØZEW, we set our sights on a destination in the South Pacific: Rotuma, 3D2/R. We located a beachside homestay (operated by Lillian and Vama Atalifo) that could support a team of six operators, and more planning for the trip ensued.

### A Partnership with YOTA

At the 2024 Dayton Hamvention®, I had the opportunity to meet with Neil, WB9VPG, camp director for Youth on the Air. I shared that we were planning a November – December DXpedition to Rotuma, and that we could take three young operators on the adventure. We also discussed how, by leveraging the NexGenRiB, we could create a virtual DXpeditioning experience for dozens of young hams worldwide. A 15-minute meeting evolved into a partnership between Youth on the Air and the Pacific Island DXpedition Group. We posted a press release about it 3 days later.

Three young DXpeditioners came with us to Rotuma for 3D2Y: Jamie, MØSDV; Connor, KD9LSV, and Lukas, LY7J. We were faced with many challenges,

but they performed at a remarkably high level and needed little — if any — guidance. The off-island team was always on the go, making about 30 percent of our contacts. We arrived home in early December, and shortly after the New Year, discussions focused on where to go next.

### PJ6Y October 17 – 29, 2025

We want to involve a larger team of young hams somewhere safe and relatively economical. We also want the trip to offer a wide range of experiences, like what one would see in a faraway and rare location. I called longtime friends Jeff, NM1Y, and his wife, Shelley, while they were vacationing at their winter home on Saba and discussed our plans for a youth-oriented DXpedition. They shared my excitement, and we began the planning stage.

One of our overarching goals is to have some of our off-island team become on-island team members on subsequent trips. Four of the young operators on the PJ6Y team going to Saba were remote operators on Rotuma!

Our Saba DXpedition dates will be October 17 – 29, 2025. We plan to operate from two locations. One site will have two local stations, and the other site will have a single local station. Both will have a single remote station. Both sites are located on the north side of the



Jamie Williams, MØSDV, working the CW pileup during the 3D2Y team's November – December 2024 DXpedition to Rotuma. [Gregg Marco, W6IZT, photo]

island, about 0.6 mile apart, with exceptional takeoff to Europe, North America, and Asia. Our antenna complement consists of an inverted L for 160 and 80 meters; verticals for 40 and 30 meters; a three-element Yagi for 20, 15, and 10 meters; a five-band hexbeam, and a five-element, 6-meter Yagi. Band-pass filters and multiplexers will be used to minimize interstation interference. Lastly, we plan on having an Icom satellite station. We will upload contacts in real time and utilize a leaderboard. There will be no unattended operation.

There are no stations or antennas currently in place, as we will be building the DXpedition from the ground up. The team will participate in the SSB portion of the CQ World Wide DX Contest; the young operators will define our strategy. Although a world record has already been set from this location, I have no doubt that we will do quite well.

The young operators will host a number of Zoom calls with our donors and supporters so that they, too, can participate in the experience. They'll also pen the post-trip articles and reports for our sponsors.

## Helping Young Operators

There is no doubt our young hams will have the experience of a lifetime on Saba. But what did it take to get them to this point? After all, we cannot enable the next generation of DXpeditioners if they do not understand the effort involved in planning a successful DXpedition. Roughly 95 percent of the work takes place before we depart. I am pleased to share that we will be conducting a series of DXpedition planning workshops for our on-island team. Hosted on Zoom, the presenters include a list of very accomplished DXpeditioners: Glenn, WØGJ; Gerben, PG5M; Gene, K5GS; Ralph, KØIR, and myself. These presenters will cover a comprehensive range of topics, addressing the many complexities that make up the planning phase. Typically, work begins many months or several years before the DXpedition team makes their first contact, and it doesn't end until months after they upload the final log. We've scheduled these workshops for late July and early August 2025. We will record the sessions and make them available to our sponsors and donors upon request.

We are in the process of raising funds for our trip to Saba. Our funding model is structured to remove the financial barriers that make it difficult for young operators to participate in DXpeditioning. The first target of our fundraising efforts is to offset the costs of airfare for the young operators; I am pleased to share that we



Lukas Bartkus, LY7J, who traveled from Lithuania to Rotuma for the 3D2Y DXpedition. Here, he is describing the big pileup from Europe on 20-meter SSB. [Gregg Marco, W6IZT, photo]

have met this goal. Additional funding will be allocated to cover their remaining costs. The more experienced operators on the trip will pay for their airfare and approximately 50 percent of the remaining costs associated with their participation. For more information, visit the PJ6Y website at [www.pj6y2025.com](http://www.pj6y2025.com).

## Going Forward

After PJ6Y, we anticipate having our next DXpedition in summer 2026. We have no idea where it will be yet, but we'll try to add a different twist. I am hopeful that we can continue to recruit operators for our off-island teams. Perhaps some of our young team members will venture out and plan their own trip.

Do you know of a young ham who would enjoy being a team member on our next adventure, or someone who would like to participate on the off-island team? If so, please contact me at [gregg.w6izt@gmail.com](mailto:gregg.w6izt@gmail.com).

## Thanks to Our Supporters

This opportunity would not be possible without the support of our sponsors and donors. As of press time, the following organizations have contributed to our success: Northern California DX Foundation, DX Engineering, *The Daily DX*, European DX Foundation, Twin City DX Association, GMDX Group, Southeastern DX Club, Oklahoma DX Association, CDXC: The UK DX Foundation, Southeast Michigan DX Association, Madison DX Club, Middlesex Amateur Radio Society, International DX Association, Western Washington DX Club, North Alabama DX Club, Low Band Systems, and G3TXQ Hexbeam.

Thank you for your support — 73, and we'll see you in the pileups!



## The World Above 50 MHz

# XE1YY Makes DXCC History; Austral Islands and Rare Grid DL88 On the Air

In April 2025, Verónica Morales, XE1YY (formerly XE1YYG), became the first woman in Mexico to achieve 6-meter DX Century Club (DXCC). On her success, she reflected:

I started 30 years ago in ham radio. I am the first YL from Mexico to obtain 6-meter DXCC (only eight on XE land) and 50 MHz [VHF/UHF Century Club]. My first experience with the Magic Band was in March 2023. [I learned] very fast that you must be present, even if you do not copy anything, because a new country or a new grid can surprise you in just a few seconds on a “dead” band. I learned the magic of backscatter, long path, and short path. My modest station consists of an IC-7300. In my first year [of working toward DXCC, I used] a Hentenna on 10 meters with 50 W and [worked] 48 countries and 250 grids. [In my] second year, [I used a] JK65 Yagi [and worked] 578 accredited grids and 106 countries; I applied for 6-meter DXCC in 2 years, with 104 countries worked and confirmed.



Verónica Morales, XE1YY. [Verónica Morales, XE1YY, photo]

### TX9A Austral Islands DXpedition on 6 Meters

The TX9A DXpedition team put the Austral Islands on the air on April 25 – May 7, 2025. Team member Zrinko Zibert, DK8ZZ, said:

The TX9A team wanted to be active on all bands, including 50 MHz. Originally, the activity was planned

with a six-element Yagi; however, due to luggage [considerations] and weight, [we] decided to downsize and bring the four-element Yagi ([homebrewed by] 9A3MR).

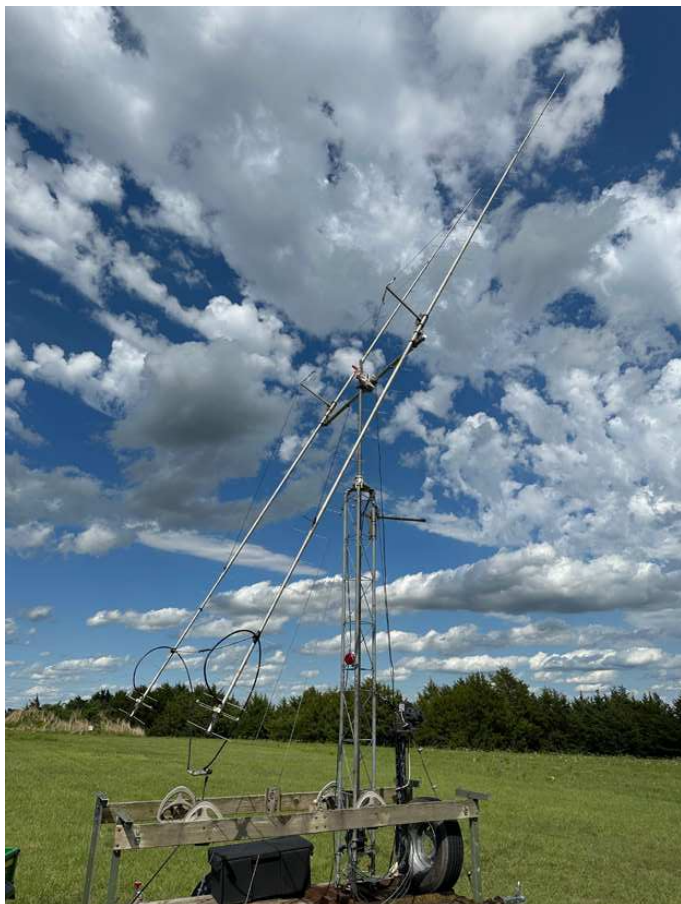
Although we were QRV with three stations at the same time, 50 MHz was tricky because we couldn't spend the whole day on RX monitoring with one station. So, we relied on DX cluster and the ON4KST chat, as well as occasional RX.

We certainly did not expect this result: 1,000+ FT8 [contacts], as well as over 400 contacts in CW and SSB. [We worked] 36 DXCC [entities], and the highlight [was] four contacts with stations from Kuwait. [There was] amazing [activity] from the South Pacific! [We contacted] US stations from the East Coast to the West Coast. The ACOM I2005 amplifier did a great job on 50 MHz, no matter if it was FT8 or CW/SSB. We tried as much as possible to be active on 6 meters, although, sometimes this would mean a smaller number of contacts on HF. We hope that we have succeeded in satisfying the 50 MHz community with a new DXCC country.

On May 4, there was sporadic E along the southwest states and the Midwest to Mexico. AAØMZ (EM29) and I, NØJK (EM28), had XE2SSB (DL97) in at 0205 UTC. The E<sub>s</sub> cloud drifted west, and at around 0300 UTC, it lined up for an E<sub>s</sub> link from the TX9A team's location to Colorado and the Midwest. Mike, WØMU, logged TX9A at 0257 UTC. NØLWF (EN10) worked TX9A for his DXCC #100 on 6 meters! KCØY (EM17) logged TX9A on FT8 at 0311 UTC, and AAØMZ (EM29) worked them on both CW and SSB. Trey, N5KO, picked up TX9A on May 5. On May 7, the last day of the TX9A DXpedition, the team caught an afternoon 6-meter opening to North America and logged John Lock, KFØM (EM17), and others on FT8.

### K7BWH and N7PHY Activate DL88

Of the 488 grids needed to earn the Fred Fish Memorial Award (FFMA), DL88 is considered to be one of the rarest and most difficult to activate. Barry, K7BWH, and Ed, N7PHY, set up in Big Bend National Park on May 17 – 23. Barry covered 6 meters, and Ed covered 144 MHz. They emphasized Earth-moon-Earth (EME), and Barry operated moonsets on Q65A. On May 20, he worked JA7QVI via EME. On May 18, Hal, N7NW, worked K7BWH via E<sub>s</sub> for his last FFMA grid. Hal



Greg Cerny's, WQØP, portable setup for 432 MHz. [Greg Cerny, WQØP, photo]

is now FFMA #60, and he's the second operator to achieve the award in the Pacific Northwest.

## On the Bands

**50 MHz.** On May 1, sporadic E appeared for Mike Downing, KCØY (EM17), and he worked stations in the VE2 call sign region and the FN02 grid area. On May 4, KQØJ worked 13 Brazilian stations. Rich, K1HTV (FM18), said that May 6 was an "interesting day," as he worked 16 countries on FT8 via E<sub>s</sub> and E<sub>s</sub> to transequatorial propagation. May 7 started with an all-day E<sub>s</sub> opening and E<sub>s</sub> links. KCØY (EM17) logged 18 stations in Brazil. Matt Trott, K7BG (DN94), worked 42 South American stations. That evening, 3D2AG worked stations from the W6 region to the W1 and W2 regions. Tyler, N5UC, was active from DN21 on May 9, and then DN20 on May 10. I, NØJK (EM28), picked up AD7OV (DN50) via early E<sub>s</sub> at 1318 UTC. 3D2AG was into the Midwest on May 18, and he worked AAØMZ (EM29), KCØY, KFØM (EM17), and others at around 0120 UTC. On May 22, K1HTV worked D2UY at 2055 UTC, followed by MMØAMW at 2200 UTC.

On May 24, Larry Lambert, NØLL, copied D2UY for around 20 minutes, starting at 2000 UTC, and he saw

D2UY work KØTPP (EM48). At 2040 UTC, he worked CE2SV. I logged rare station 4U1UN at 2205 UTC. The Canary Islands were in to much of North America. I saw EA8DOX work KA9FOX at 2215 UTC. John Lock, KFØM, operated from EM06 on May 27, making contacts with 88 unique call signs. On May 30, Jim, K5ND (EM12), worked Otis, FJ/NP4G, at 1612 UTC. Otis was running only 40 W into an 80-meter dipole.

**144 MHz.** Tropospheric propagation occurred across the southeast states on May 15. Sam Whitley, K5SW (EM25), worked K4KV (EM81), N4TUT (EL98), AC4TO (EM70), WA3GWK (EM60), WA4GPM (EM90), WB2FKO (EL89), W4CIU (EM70), and KZ4TT (EM60) on SSB and CW. Via MSK144, WQØP (EM19) logged N7PHY in grid DL88 on May 17. WB4OMG (EL98) worked XE2KK (DL96). AA4ZZ (EM96) worked K5TR (EM00).

**222 MHz.** Greg Cerny, WQØP, worked Tyler, N5UC/P (DN21), via MSK144 meteor scatter on May 10. Greg noted that Tyler also worked ACØRA/P (EN32) via meteor scatter at a distance of 1,770 kilometers; that contact took 20 minutes to complete. Greg also worked ACØRA on FT8 via tropospheric propagation.

**432 MHz.** On May 30, Greg, WQØP, worked David, G4YTL, on 432 MHz, giving David his 50th state for the Worked All States (WAS) Award. He also worked PA2V, who now needs only Alabama and New Mexico for 70-centimeter WAS. With assistance from WAØARM, Greg set up two M2 Antenna Systems 38-element Yagis on a trailer, with an AM-6155 amplifier at 150 W output.

**5760 MHz.** On May 14, Buddy Morgan, WB4OMG (EL98), worked Al Ward, W5LUA (EM13), on Q65-30A via tropospheric propagation. W5LUA also worked K4VJ (EL98).

## Here and There

Martin, XE2ML, said:

We recently activated grid DL86 using the special call sign 4A1RBM from April 25 to 27, 2025. This special event was a joint initiative of the Radio Club Guadiana and the Amateur Radio Club of Universidad Nacional Autónoma de México.

Our operating site was located in the heart of the renowned "Zone of Silence" in northeastern Durango, Mexico. As a 6-meter operator, I had the chance to make numerous contacts using FT8 and MSK144. We worked stations from the W, XE, CE, CO, LU, TG, and VK regions.



# Convention and Hamfest Calendar

**A** = AUCTION  
**D** = DEALERS / VENDORS  
**F** = FLEA MARKET  
**H** = HANDICAP ACCESS  
**Q** = FIELD CHECKING OF QSL CARDS  
**R** = REFRESHMENTS  
**S** = SEMINARS / PRESENTATIONS  
**T** = TAILGATING  
**V** = VE SESSIONS

## Abbreviations

*Spr* = Sponsor  
*TI* = Talk-in frequency  
*Adm* = Admission

## ARRL ALABAMA STATE CONVENTION

**August 16 – 17, Huntsville, Alabama**

**DFHQRSV**

Sat. 9 AM – 4:30 PM, Sun. 9 AM – 3 PM. *Spr*: Huntsville Hamfest, Inc. Von Braun Center South Hall, 700 Monroe St. SW. *TI*: 146.94 (100 Hz). *Adm*: \$12 Advance, \$15 door. [www.hamfest.org](http://www.hamfest.org)

**Arkansas (Mena) — Sept. 5 – 6 F H R T V**

10 AM – 2 PM. *Spr*: Queen Wilhelmina Hamfest Association. Queen Wilhelmina State Park Lodge, 3877 Hwy. 88 W. *TI*: 146.79 (100 Hz). *Adm*: Free. [www.menahamfest.net](http://www.menahamfest.net)

**Colorado (Brighton) — Aug. 24 D F R V**

9 AM – 1 PM. *Spr*: Rocky Mountain Ham Radio. Adams Co. Fairgrounds, 9755 Henderson Rd. *TI*: RMHAM DMR System Talk Group 700. *Adm*: \$6. [www.rmham.org](http://www.rmham.org)

**Florida (Tampa) — Aug. 23 F H R T V**

7 AM – 1 PM. *Spr*: Tampa ARC. 7801 N. 22nd St. *TI*: 147.105 (146.2 Hz). *Adm*: \$5. [www.hamclub.org](http://www.hamclub.org)

**Georgia (Dalton) — Sept. 6 F T**

Daylight until 11 AM. *Spr*: Dalton ARC. North Georgia Fairgrounds (southeast corner of parking lot), 500 Legion Dr. *TI*: 145.23 (141.3 Hz). *Adm*: Free. [www.qrz.com/db/w4drc](http://www.qrz.com/db/w4drc)

**Iowa (Davenport) — Aug. 23 D H T V**

8 AM. *Spr*: Davenport Radio Amateur Club. Iowa Army National Guard, 5300 W. Kimberly Rd. *TI*: 146.88 (77 Hz). *Adm*: \$8 Advance, \$10 door. [www.drac.club/drac-hamfest](http://www.drac.club/drac-hamfest)

**Kentucky (Shepherdsville) — Sept. 6 F H R T V**

8 AM – noon. *Spr*: Greater Louisville Hamfest Association, Inc. Paroquet Springs Conference Centre, 395 Paroquet Springs Dr. (aka 395 N. Joe B. Hall Ave.) *TI*: 146.70 (79.7 Hz). *Adm*: \$8 Advance, \$10 door. [www.louisvillehamfest.com](http://www.louisvillehamfest.com)

**Kentucky (Whitesburg) — Aug. 9 F H R T V**

8 AM – noon. *Spr*: Letcher Co. ARC. Mountain Shrine Club, 95 Maryland Dr. *TI*: 145.35 (186.2 Hz). *Adm*: \$5. [www.lcarcky.com](http://www.lcarcky.com)

**Massachusetts (Adams) — Aug. 17 D F H R T V**

7 AM – noon. *Spr*: Northern Berkshire ARC. Adams Agricultural Fairgrounds, 371 Old Columbia St. *TI*: 146.91 (162.2 Hz). *Adm*: \$10. [www.nobarc.org](http://www.nobarc.org)

## ARRL NEW ENGLAND DIVISION CONVENTION

**August 21 – 24, Marlborough, Massachusetts**

**DFHQRSTV**

Thur. 7 PM – 10 PM, Fri. & Sat. 9 AM – 10 PM, Sun. 9 AM – 1 PM. *Spr*: FEMARA, Inc. Best Western Marlborough, 181 Boston Post Rd. W. *TI*: MMRA linked repeater system. *Adm*: \$18 Advance, \$20 door. [www.hamxposition.org](http://www.hamxposition.org)

**Michigan (Wyoming) — Sept. 6 F H R T V**

8 AM – noon. *Spr*: Grand Rapids ARA. Home School Building gym, 5625 Burlingame Ave. SW. *TI*: 147.26 (94.8 Hz). *Adm*: \$8. [www.w8dc.org/grand-rapids-area-hamfest](http://www.w8dc.org/grand-rapids-area-hamfest)

**Minnesota (Rush City) — Sept. 6 H R T**

9 AM – noon. *Spr*: East Central Minnesota ARC. Rush City High School, 51001 Fairfield Ave. *TI*: 145.33 (146 Hz). *Adm*: Free. [www.qrz.com/db/k0ecm](http://www.qrz.com/db/k0ecm)

**Missouri (Joplin) — Aug. 22 – 23 D F H Q R S V**

Fri. noon – 7 PM, Sat. 8 AM – 2 PM. *Spr*: Joplin ARC. Joplin Family Worship Center, 5290 E. 7th St. *TI*: 147.21 (91.5 Hz). *Adm*: \$10 Advance, \$12 door. [www.joplinhamfest.org](http://www.joplinhamfest.org)

**Nebraska (Omaha) — Sept. 6 D F H R**

9 AM. *Spr*: Ak-Sar-Ben ARC. Metro Community College South Omaha Campus Room 120, 2709 Edward Babe Gomez Ave. *TI*: 146.94. *Adm*: \$5. [www.aksarbenarc.org](http://www.aksarbenarc.org)

## ARRL SOUTHERN NEW JERSEY SECTION CONVENTION

**September 7, Mullica Hill, New Jersey**

**DFHQRSTV**

8 AM – 1 PM. *Spr*: Gloucester Co. ARC. Gloucester County 4-H Fairgrounds, 275 Bridgeton Pike (Rte. 77). *TI*: 147.18 (131.8 Hz). *Adm*: \$10. <https://hamfest.w2mmd.org>

**New Jersey (Spring Lake) — Sept. 6 D F H R T V**

7:30 AM – 1 PM. *Spr*: Ocean Monmouth ARC. Spring Lake Heights Volunteer Fire Company Number One, 700 6th Ave. *TI*: 145.11 (127.3 Hz). *Adm*: \$5; kids under 12, free; spouses, free. [www.n2mo.org](http://www.n2mo.org)

**New Mexico (Alamogordo) — Aug. 30 D F H Q R S V**

7 AM – 3 PM. *Spr*: Alamogordo ARC. Otero Co. Fairgrounds, 401 Fairgrounds Rd. *TI*: 146.80 (127.3 Hz). *Adm*: Free. [www.qsl.net/k5lrw/hamfest.htm](http://www.qsl.net/k5lrw/hamfest.htm)

**New York (Ballston Spa) — Sept. 6 D F H Q R S T V**

7 AM – 1 PM. *Spr*: Saratoga Co. ARA. Saratoga Co. Fairgrounds, 162 Prospect St. *TI*: 147.00 (91.5 Hz). *Adm*: \$10. [www.k2dll.org](http://www.k2dll.org)

## ARRL NORTH CAROLINA SECTION CONVENTION

**August 29 – 30, Shelby, North Carolina**

**DFHQRV**

8 AM – 5 PM. *Spr*: Shelby ARC. Cleveland Co. Fairgrounds, 1751 E. Marion St. *TI*: 146.88 (67.0 Hz). *Adm*: \$10. [www.shelbyhamfest.com](http://www.shelbyhamfest.com)

**Ohio (Athens) — Aug. 30 F H R T V**

10 AM – 2 PM. *Spr*: Athens Co. ARA. Athens Masonic Lodge, 12 W. Carpenter St. *TI*: 145.15. *Adm*: Free. [www.ac-ara.org](http://www.ac-ara.org)

**Ohio (Cortland) — Aug. 17 F H Q R T V**

8 AM – 1 PM. *Spr*: Warren ARA. Trumbull Co. Fairgrounds Commercial Building, 899 Everett Hull Rd. *TI*: 146.97, 443.00. *Adm*: Free. [www.w8vtd.com/hamfest](http://www.w8vtd.com/hamfest)

**Ohio (Findlay) — Sept. 7 D F H R S T V**

8 AM – 1 PM. *Spr*: Findlay Radio Club. Hancock Co. Fairgrounds, 1017 E. Sandusky St. *TI*: 147.15 (88.5 Hz). *Adm*: \$10. [www.w8ft.org](http://www.w8ft.org)

**Ohio (New Boston) — Aug. 16 D H R V**

8 AM – 1 PM. *Spr*: Portsmouth Radio Club. New Boston Village Community Center, 3982 Rhodes Ave. *TI*: 147.36, 145.39 (136.5 Hz), 444.60, Echolink N8QA-R. *Adm*: \$5. [www.portsmouthradioclub.com](http://www.portsmouthradioclub.com)

**Ohio (Owensville) — Aug. 9 D F H R T V**

8 AM – 2 PM. *Spr*: Milford ARC. Clermont Co. Fairgrounds, 1000 Locust St. *TI*: 147.345 (123.0 Hz). *Adm*: \$10. [www.cincinnatihamfest.org](http://www.cincinnatihamfest.org)

## PACIFIC NORTHWEST DX CONVENTION

August 15 – 17, Clackamas, Oregon

QRS

Fri. 5 PM – Sun. 11 PM. *Spr:* Willamette Valley DX Club. Monarch Hotel and Conference Center, 12566 SE 93rd Ave. *Tl:* 147.14 (107.2 Hz). *Adm:* See website. [www.pnwdxconvention.com](http://www.pnwdxconvention.com)

**Pennsylvania (Butler) – Sept. 7 DFHQRTV**

8 AM – 1 PM. *Spr:* Butler Co. ARA. Unionville Fire Hall grounds, 102 Mahood Rd. *Tl:* 147.36 (131.8 Hz). *Adm:* \$5. [www.w3udx.org](http://www.w3udx.org)

**Pennsylvania (New Kensington) – Aug. 24 FQRT**

8 AM – 2 PM. *Spr:* Skyview Radio Society. Skyview Radio Society clubhouse, 2335 Turkey Ridge Rd. *Tl:* 146.640 (131.8 Hz). *Adm:* \$5. [www.skyviewradio.net](http://www.skyviewradio.net)

**Pennsylvania (Phoenixville) – Aug. 10 DFHQRTV**

8 AM – 2 PM. *Spr:* Mid-Atlantic ARC. Kimberton Fire Co. Fairgrounds, 762 Pike Springs Rd. *Tl:* 145.13 (131.8 Hz). *Adm:* \$10. [www.marc-radio.org/hamfest2.htm](http://www.marc-radio.org/hamfest2.htm)

**Tennessee (Lebanon) – Aug. 23 DT**

8 AM – 1 PM. *Spr:* Short Mountain Repeater Club. Cedars of Lebanon State Park, 328 Cedar Forest Rd. *Tl:* 146.91. *Adm:* \$5. [www.smrclub.com](http://www.smrclub.com)

**Wisconsin (Baraboo) – Aug. 23 DFHRTV**

8 AM – noon. *Spr:* Yellow Thunder ARC. Badger Steam and Gas Engine Club Property, S3347 Sand Rd. *Tl:* 147.315 (123.0 Hz). *Adm:* \$5. [www.yellowthunder.org](http://www.yellowthunder.org)

**Wisconsin (Cedarburg) – Sept. 6 FHRT**

6 AM – noon. *Spr:* Ozaukee Radio Club. Firemen's Park, W65N796 Washington Ave. *Tl:* 146.97 (127 Hz). *Adm:* \$5; under 12 years old, free. Email: [teruhlmann@wi.rr.com](mailto:teruhlmann@wi.rr.com)

## To All Event Sponsors

Before making a final decision on a date for your event, you are encouraged to check the Hamfest and Convention Database ([www.arrl.org/hamfests-and-conventions-calendar](http://www.arrl.org/hamfests-and-conventions-calendar)) for events that may already be scheduled in your area on that date. You are also encouraged to register your event with HQ as far in advance as your planning permits. See [www.arrl.org/hamfest-convention-application](http://www.arrl.org/hamfest-convention-application) for an online registration form. Dates may be recorded up to 2 years in advance.

Events that are sanctioned by ARRL receive special benefits, including an announcement in these listings and online. Sanctioned conventions are also listed in **The ARRL Letter**. In addition, events receive donated ARRL prize certificates. Once the form has been submitted, your ARRL Director will decide whether to approve the date and provide ARRL sanction.

The deadline for receipt of items for this column is the **1st of the second month preceding publication date**. For example, your information must arrive at HQ by **September 1** to be listed in the **November** issue. Information in this column is accurate as of our deadline; contact the sponsor or check the sponsor's website for possible late changes, driving directions, and other event details. Please note that postal regulations prohibit mention in **QST** of games of chance, such as raffles or bingo.

Promoting your event is guaranteed to increase attendance. As an approved event sponsor, you are entitled to special discounted rates on **QST** display advertising and ARRL web banner advertising. Call ARRL's toll-free number at 1-800-243-7768, or email [ads@arrrl.org](mailto:ads@arrrl.org).

## Field Organization Reports – May 2025

### Public Service Honor Roll

This listing recognizes radio amateurs whose public service performance during the month indicated 70 or more points in six categories. Details on the program can be found at: [www.arrrl.org/public-service-honor-roll](http://www.arrrl.org/public-service-honor-roll).

|                       |                        |                         |                         |                        |                         |                       |                       |                       |                       |                       |                      |
|-----------------------|------------------------|-------------------------|-------------------------|------------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----------------------|
| 425<br>AC8NP          | 221<br>W9RY            | 155<br>KD0HHN<br>N1ILZ  | 133<br>W3YVQ<br>WD8USA  | 120<br>WA4VGZ<br>N5RH  | 101<br>AE5MI<br>K8RDN   | 95<br>WB5EDL          | 86<br>KF7GC<br>KM4BRQ | 82<br>KB4OLY          | 78<br>KG5VSR<br>W2ARP | 75<br>WB3FTQ          | 71<br>K1STM          |
| 415<br>N9VC           | 220<br>WD8SDH          | 151<br>KD8ZCM           | 132<br>KE5YTA           | 120<br>W2AH<br>WC4FSU  | 100<br>W1KX<br>KT4WX    | 92<br>N3STP<br>KT4WX  | 81<br>K2PHD<br>W5WMC  | 81<br>W3PHD<br>W5WMC  | 77<br>WJ3P<br>AJ7B    | 74<br>W5XX<br>W3ZR    | 70<br>AA3SB<br>N8RWF |
| 405<br>AD8CM          | 215<br>K7OED           | 151<br>W0PZD            | 131<br>N0JAR            | 120<br>NA7G<br>N7IE    | 100<br>KA5AZK<br>W4EDN  | 91<br>W4TTO<br>WB2VUF | 85<br>K6RAU           | 80<br>KG5AOP<br>KR4ST | 76<br>N6NKO<br>AA3N   | 72<br>AF9SC<br>KB0DTI |                      |
| 310<br>KD2LPM         | 200<br>KV2J            | 150<br>KR4PI<br>KW1U    | 130<br>KY2D             | 116<br>N2DW            | 100<br>K2MTG<br>K3YAK   | 91<br>W4TTO<br>WB2VUF | 84<br>WB4ZDU          | 80<br>KG5AOP<br>KR4ST | 76<br>N6NKO<br>AA3N   | 72<br>AF9SC<br>KB0DTI |                      |
| 307<br>KE8BYC         | 194<br>KD2NMG          | 149<br>K3EAM<br>N12W    | 130<br>KF5OMH<br>KY2MMM | 115<br>W2OOD<br>KO4OL  | 100<br>KB2QO<br>KB2YAA  | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 306<br>W7EES          | 190<br>ND8W            | 147<br>WM2C<br>KO4KUS   | 130<br>N2JBA<br>KD8UUB  | 114<br>K1YBO           | 100<br>KB2PQP<br>KZ8Q   | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 300<br>WM5N           | 180<br>KT5SR           | 147<br>WM2C<br>KO4KUS   | 130<br>N8SY<br>KE4RS    | 114<br>K1YBO           | 100<br>WB4RJW<br>N8MRS  | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 284<br>KC8YVF         | 177<br>W9EEU           | 145<br>WA3QLW<br>AG9G   | 129<br>KT5EM            | 113<br>KM4WXX<br>W8MAL | 100<br>KB8GUN<br>WB8SIQ | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 274<br>W7PAT          | 175<br>N2LC            | 143<br>K9LGU            | 128<br>K3JL             | 112<br>K5OB            | 100<br>KC1KVV<br>W1TCD  | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 255<br>KE8ANW         | 170<br>N4CNX           | 143<br>KC9FXE<br>WB8YYS | 127<br>W4CMH            | 110<br>WV5Q<br>N1IQI   | 100<br>KC1SLQ<br>KB8PGW | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 250<br>NW3X           | 165<br>KN4QJ<br>KC8PBU | 141<br>K5ANP            | 125<br>W5RFY<br>W2PAX   | 100<br>W1RVY<br>WB8TQZ | 100<br>K8ED             | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 245<br>KT2D           | 161<br>KE8CYC          | 140<br>AC0KQ<br>KC8T    | 124<br>W9WKO<br>N1LAH   | 104<br>W9GRG<br>KE8HKA | 100<br>K8ED             | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 232<br>KE8DON         | 160<br>W4DNA           | 140<br>AC0KQ<br>KC8T    | 124<br>AD3J             | 103<br>K9SX            | 100<br>K8ED             | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |
| 225<br>KA9IKX<br>W02H |                        | 140<br>AC0KQ<br>KC8T    | 121<br>WZ0C             |                        | 100<br>K8ED             | 90<br>KB9GO<br>KC9UC  |                       |                       |                       |                       |                      |

The following stations qualified for PSHR in April 2025, but have not been recognized in this column yet: KK6AIZ 198, KC8T 187, N3GE 130, NA7G 120, NW3X 115, N7UWX 90, N3RPB 80, W3ZR 74.

### Section Traffic Manager Reports

The following Section Traffic Managers reported: AL, AR, AZ, CO, CT, DE, EMA, ENY, EPA, GA, IA, IL, IN, KY, MDC, ME, MI, MS, NC, NFL, NLI, NM, NNJ, NNY, NTX, OH, OR, RI, SD, SFL, SJV, SNJ, STX, TN, UT, WCF, WI, WNY, WWA, WY.

### Section Emergency Coordinator Reports

The following Sections submitted ARES Activity Reports for April: AR, CT, ENY, EPA, GA, IN, MI, MN, MO, NC, ND, NFL, NLI, NNY, NTX, NV, OH, OR, PR, SC, STX, TN, VA, WCF, WTX.

### Brass Pounders League

The BPL is open to all amateurs in the US, Canada, and US possessions who report to their SMs a total of 500 or more points or a sum of 100 or more origination and delivery points for any calendar month. Messages must be handled on amateur radio frequencies within 48 hours of receipt in standard ARRL radiogram format. Call signs of qualifiers and their monthly BPL total points follow.

KY2D 1,704, NX9K 1,549, W2AH 1,263, N9CK 712, KW1U 678, KB9GO 604, WB9WKO 594, WA3QLW 582, KC1KVV 506. Originations plus Deliveries: W3OJO 110.



## Special Event Stations

**Working special event stations is an enjoyable way to help commemorate history. Many provide a special QSL card or certificate!**

**July 18 – July 29, 1400Z – 2200Z daily, and July 20, 1800 – 2200, W4L**, Antioch, IL. Wisconsin and Illinois Radio Enthusiasts, WI9RE. **Vietnam Veterans Memorial Wall Replica**. 7.250 14.250. QSL will be sent via FCC ULS or send QSL to 25395 W. Richmond Ave., Antioch, IL 60002.

**July 20, 1330Z – 1900Z, K2CAM**, Garden City, NY. Long Island Mobile Amateur Radio Club. **Apollo 11 Celebrated**. 7.240 14.240 15.350. QSL. Digital QSL, send information to [k2knb@limarc.org](mailto:k2knb@limarc.org), or send QSL to LIMARC, P.O. Box 392, Levittown, NY 11756. [www.qrz.com/db/k2cam](http://www.qrz.com/db/k2cam)

**July 31 – Aug. 10, 0000Z – 2359Z, W8LKY**, Alliance, OH. Alliance Amateur Radio Club. **W8LKY Special Event – Birthplace of Ohio's State Flower, the Scarlet Carnation**. 7.045 7.220 14.045 14.250. Certificate. Alliance ARC, P.O. Box 94, Maximo, OH 44650, or email information to [ses@w8lky.org](mailto:ses@w8lky.org). [www.w8lky.org](http://www.w8lky.org)

**Aug. 1 – Aug. 3, 1300Z – 2359Z, W9R**, Beaver Dam, WI. Rock River Radio Club. **Antique Power Show**. 7.275 14.275 21.275 28.375. Certificate\* & QSL. Rock River Radio Club, P.O. Box 26, Juneau, WI 53039. [www.dcaclub.org](http://www.dcaclub.org)

**Aug. 1 – Aug. 4, 0400Z – 0400Z, W8AL**, Canton, OH. Canton Amateur Radio Club. **Pro Football Hall of Fame Enshrinement Festival**. 7.260 14.260 21.320 28.400. Certificate. Canton ARC, P.O. Box 8673, Canton, OH 44711-8673. *On-air times, bands, and modes subject to operator availability. Watch for spots and digital modes.* [www.w8al.org](http://www.w8al.org)

**Aug. 1 – Aug. 17, 0000Z – 2359Z, W9ISF**, Indianapolis, IN. Indiana State Fair Amateur Radio Club. **Indiana State Fair**. 7.240 14.240 21.300. QSL. Ken Bandy, 7405 E. County Road 900 N., Brownsburg, IN 46112. [www.indianastatefair.com/p/state-fair](http://www.indianastatefair.com/p/state-fair) or [www.qrz.com/db/w9isf](http://www.qrz.com/db/w9isf)

**Aug. 2, 1200Z – 2000Z, KD3KA**, Wexford, PA. Allegheny Valley Radio Association and Skyview Radio Society. **KDKA Shortwave Network Centennial**. 7.040 7.240 14.040 14.240. QSL. AVRA, P.O. Box 24, Wexford, PA 15090. [www.qrz.com/db/kd3ka](http://www.qrz.com/db/kd3ka)

**Aug. 2, 0130Z – 0830Z, W6P**, Vacaville, CA. Vacaville Amateur Radio Club, W6VVR. **Alcatraz**. 7.200 14.250 28.500. QSL. Art Aronsen, 7319 June Bug Ln., Vacaville, CA 95688. [www.w6vvr.net](http://www.w6vvr.net)

**Aug. 7 – Aug. 17, 1400Z – 2000Z, N3G**, Levittown, PA. Penn Wireless Association, W3SK. **General Nathanael Greene Birthday Commemoration**. 7.055 7.255 14.055 14.255. Certificate & QSL. Penn Wireless Association, P.O. Box 925, Levittown, PA 19058. E-certificate available at [www.pennwireless.org](http://www.pennwireless.org). [www.qrz.com/db/n3g](http://www.qrz.com/db/n3g)

**Aug. 9, 1400Z – 2200Z, K8BF**, Ravenna, OH. Portage County Amateur Radio Service. **Portage County Amateur Radio Service 20th Anniversary Celebration**. 7.220 20.260 28.320. Certificate & QSL. Tom Parkinson, KB8UUZ, 9992 State Route 700, Mantua, OH 44255. [www.portcars.org](http://www.portcars.org)

**Aug. 9, 1600Z – 2300Z, N16IW**, San Diego, CA. USS *Midway* Museum Ship. **US Coast Guard Birthday**. 7.250 14.070 14.320; PSK31, D-STAR on PAPA System Repeaters. QSL. USS *Midway* Museum Ship COMEDTRA, 910 N. Harbor Dr., San Diego, CA 92101. [www.qrz.com/db/n16iw](http://www.qrz.com/db/n16iw)

**Aug. 14 – Aug. 16, 0000Z – 2359Z, WB9AET**, Summit Argo, IL. Western Area FM Amateur Repeater Club. **Remembering Saint Maximilian Kolbe**. 10.136 14.245; SSB and FT8. QSL. WAFAR, 7326 West 57 St., Summit Argo, IL 60501. [www.sites.google.com/view/wafarchicago/home](http://www.sites.google.com/view/wafarchicago/home)

**Aug. 16, 1000Z – 2030Z, W2GSB**, Babylon, NY. Great South Bay Amateur Radio Club. **Fire Island Lighthouse US0019/International Lighthouse Lightship Weekend**. 7.245 14.246 21.250 28.340. Certificate. Great South Bay Amateur Radio Club, P.O. Box 1356, West Babylon, NY 11704. *IOTA and POTA station*. [www.gsbarc.org](http://www.gsbarc.org)

**Aug. 16, 1300Z – 1800Z, K8L**, Eagle Harbor, MI. Keweenaw County Repeater Association and Copper Country Radio Amateur Association. **International Lighthouse Weekend – Historic Eagle Harbor Lighthouse**. 14.270. QSL. Jeffrey Stricker, W9GY, 59624 Dextrom Rd., Calumet, MI 49913. [www.kcra-mi.net](http://www.kcra-mi.net) or [www.ccraa.net](http://www.ccraa.net)

**Aug. 20 – Aug. 26, 0000Z – 0000Z, K2D**, Melville, NY. Caryn Eve Murray, KD2GUT. **International Dog Day 2025**. 7.045 14.050 21.030 28.050. Certificate. Caryn Eve Murray, 2 Wallingford Dr., Melville, NY 11747. *After August 1st, chasers may look to see where K2D and our international partners are by visiting* <https://hamlog.online/idd>. [www.dogdayradio.org](http://www.dogdayradio.org)

**Aug. 23, 1300Z – 2200Z, K9P**, Angola, IN. Land of Lakes Amateur Radio Club. **Pokagon State Park Centennial Celebration**. 7.180 7.280 14.240 14.340. Certificate. Mark Tritch, 4340 S. 1000 W., Hudson, IN 46747. [www.qrz.com/db/k9p](http://www.qrz.com/db/k9p)

**Aug. 23, 1330Z – 2100Z, K3S**, Port of Baltimore. Nuclear Ship *Savannah* Amateur Radio Club. **NS Savannah Maiden Voyage Anniversary**. 7, 14, 18, 21, 28. QSL. Ullis Fleming, 980 Patuxent Rd., Odenton, MD 21113. *Check spotting networks*. [www.qrz.com/db/k3s](http://www.qrz.com/db/k3s)

**Aug. 23 – Aug. 27, 1400Z – 1800Z daily, W1A**, York, PA. Wally Byam Caravan Club International Amateur Radio Club, WB8RC. **Commemorating the 68th Annual International Airstream Rally and 62 Years of the WBCCI ARC.** All bands, all modes, as available based on conditions. QSL. WBCCI Amateur Radio Club, c/o Jim Cocke, P.O. Box 1307, West Jefferson, NC 28694, or via **QRZ**. *Please check spotter pages.* [www.qrz.com/db/wb8rc](http://www.qrz.com/db/wb8rc)

**Aug. 23 – Sep 1, 0000Z – 2359Z, W3B**, Hermitage, PA. Mercer County Amateur Radio Club. **Buhl Farm Park Celebration.** 7.074 7.185 145.350. QSL. Mercer County Amateur Radio Club, P.O. Box 996, Sharon, PA 16146. *Operating various times as conditions permit; scheduled times on website and QRZ.* [www.w3lif.org](http://www.w3lif.org)

**Aug. 24 – Sep 6, 0000Z – 2359Z, K9A**, Auburn, IN. North-eastern Indiana Amateur Radio Association. **Auburn Cord Duesenberg Festival Special Event Station.** 7.180 14.250 28.360. Certificate\* & QSL. K9A/NIARA, P.O. Box 145, Auburn, IN 46706. *No Logbook of The World or eQSL.* [www.w9ou.org](http://www.w9ou.org)

**Certificates and QSL cards:** To obtain a certificate from any of the special event stations offering them, send your QSO information along with a 9 × 12-inch self-addressed, stamped envelope (3 units of postage) to the address listed in the announcement. To receive a special event QSL card (when offered), be sure to include a self-addressed, stamped business envelope along with your QSL card and QSO information. \*Some clubs may request a nominal fee for QSL cards or certificates. Requests will be made on the air during the event.

**Special Events Announcements:** For items to be listed in this column, use the ARRL Special Events Listing Form at [www.arrl.org/special-events-application](http://www.arrl.org/special-events-application), or email information to [events@arrl.org](mailto:events@arrl.org).

Submissions must be received by ARRL HQ no later than the 1st of the second month preceding the publication date; a special event listing for **November QST** would have to be received by **September 1**. In addition to being listed in *QST*, your event will be listed on the ARRL Web Special Event page. Note: All received events are acknowledged. If you do not receive an acknowledgment within a few days, please contact us. ARRL reserves the right to exclude events of a commercial or political nature.

You can view all received Special Events at [www.arrl.org/special-event-stations](http://www.arrl.org/special-event-stations).

## Volunteer Monitor Program Report

The Volunteer Monitor (VM) Program is a joint initiative between ARRL and the FCC to enhance compliance in the Amateur Radio Service. This is the May 2025 activity report of the VM Program.

◆ Technician operators in Arizona and New Mexico received advisories concerning 15-meter FT8 operation; Technicians are authorized to operate only CW on that band.

◆ An advisory was issued to a Technician-class operator in Kansas concerning FT8 operation on 40 meters; Technicians have only CW privileges on that band.

◆ A Technician-class operator in Nebraska was issued an advisory for operating on 20-meter FT8, a band on which Technicians have no privileges.

◆ Advisory notices concerning improper wide signals were issued to stations in Washington, North Carolina, and Texas. Section 97.307(a) of the Commission's rules states, "No amateur station transmission shall occupy more bandwidth than necessary for the information rate and emission type being transmitted, in accordance with good amateur practice."

◆ A commendation was issued to an operator in Illinois for his work with the local emergency manage-

ment agency on the W9ANL repeater on 146.970 MHz, assisting in efforts to restore damaged power lines and remove downed trees.

◆ Two operators in New Hampshire received commendations for building a system of 2-meter and 70-centimeter nodes across mountainous terrain in New Hampshire. Before their installation, all communications had to be relayed.

◆ A station in Illinois was issued an advisory for retransmitting communications from a repeater to 146.520 MHz without identification.

◆ An operator in Virginia was issued an advisory notice for transmissions on 3.933 MHz after being asked to cease interference on top of existing communications and continuing the interference with unsolicited comments.

◆ There was one FCC meeting.

The totals for April 2025 monitoring were 1,550 hours on HF frequencies, and 1,953 hours on VHF frequencies and above, for a total of 3,503 hours.

— *Thanks to Volunteer Monitor Program Administrator Riley Hollingsworth, K4ZDH*



# 100, 50, and 25 Years Ago

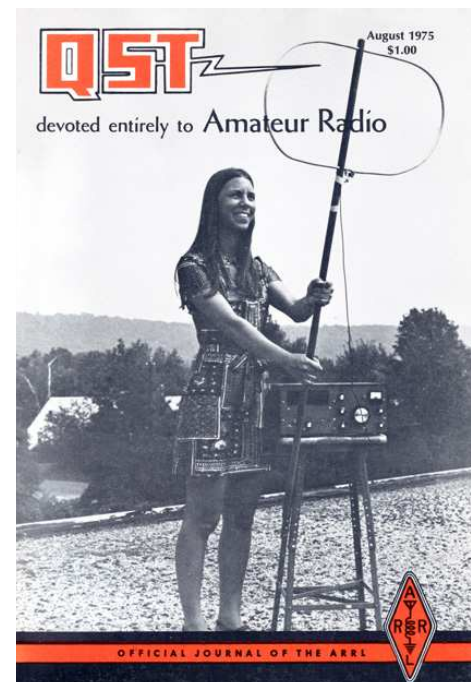
## August 1925

- The cover features three hams smiling and walking, with the man in the center holding a sign that reads: "QRD Chicago! Third National ARRL Convention August 18-21." A wrap-up of this huge ham event is covered in "Come to Chicago!"
- In "Editorials: 150-200," Kenneth Warner, 1BHW, reports on broadcasting congestion that has prompted discussions about extending the broadcasting band to 150 meters.
- T. S. McCaleb explains how the Hamilton Rice Expedition carried a radio transmitter along the Upper Amazon River to research tropical diseases in "The Mysterious WJS."
- Radio noise is highlighted during a radio interference demonstration, presented by W. J. Williams in "The Interference Muddle."
- A convenient method of variable air condensers and other parts of radio frequency receiving circuits is explained in "Loss Comparisons" by W. L. Seibert.
- E. G. Watts, Jr., 4FM, suggests improvements for traffic handling between different stations, noting that incomplete preambles are a common fault in daily message handling in "The Traffic Department: Improving Our Traffic Handling."



## August 1975

- The cover shows ARRL Staffer Gail Machowski demonstrating how to find a signal.
- Some theoretical and practical aspects of direction-finding art appear in "Radio Direction-Finding Techniques" by Tony Dorbuck, W1YNC.
- Hal Steinman, K1FHN, describes some things the League is doing to promote amateur radio in "It Seems to Us."
- R. P. Haviland, W3MR, details the construction of the first radio telescope in the world, built by Grote Reber in the backyard of his Chicago home, in "Interstellar Communication."
- Doug DeMaw, W1CER, emphasizes the importance of a field-strength meter, an instrument that serves numerous useful purposes during antenna experiments and adjustments, in "A Simple Field-Strength Meter and How to Calibrate It."
- "YL News and Views," by Louise Ramsey Moreau, W3WRE, shares major upcoming meetings, the Canadian Division ARRL Convention and the YL meeting at the ARRL Convention.



## August 2000

- The cover features the K1BQT RF-survey meter, an affordable and easy-to-build meter. Rick Littlefield, K1BQT, shares details in "A Wide-Range RF-Survey Meter."
- David Sumner, K1ZZ, shares that there have been multiple conferences to address the issue of the 40-meter band's upper two-thirds containing broadcasting stations in what should be the ham band in "Fixing 40 Meters."
- Grote Reber's original 31.4-foot-diameter parabolic dish antenna becomes a historical display at the National Radio Astronomy Observatory grounds in Green Bank, West Virginia. Dave Finley, N1RZ, shares in "Ham Radio and the World's Largest Fully-Steerable Antenna."
- In "Digital Television: Bigger, Wider, Sharper," Peter H. Putnam, KT2B, explains how television as we know it has been transformed with high-definition technology.
- Ray Soifer, W2RS, shares that UoSAT-OSCAR 14 operates 24 hours a day worldwide and is very compatible for those operating simple equipment and antennas in "UO-14: A User-Friendly 'FM Repeater in the Sky.'"



# Silent Keys

It is with deep regret that we record the passing of these radio amateurs:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                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| <b>▼KC1A</b><br>KB1CHW<br>K1DNZ<br>N1FMZ<br><b>▼WB1FVY</b><br><b>▼K1GE</b><br>AF1I<br><br>KA1IMP<br>N1ISS<br>NS1L<br><b>▼N1TEV</b><br><b>▼K1TLV</b><br>N1TUJ<br><b>◆W1TUM</b><br><b>◆KA1ZZW</b><br><b>▼W2AJY</b><br>W2ANL<br>KE2BXQ<br><b>◆N2CGN</b><br><b>▼N2DJL</b><br>WB2DUC<br><b>▼N2GVR</b><br>KC2JRI<br>WA2JUM<br>KD2PIV<br><b>◆KB2SQ</b><br>KA2UPT<br>WB2YXK<br><b>▼W3DA</b><br><b>▼W3EQF</b><br><b>▼K3EYL</b><br>K3FLG<br><b>▼W3GY</b><br>K3IG<br><b>▼K3NWM</b><br><b>▼KB3QBB</b><br><b>▼K3RKW</b><br>K3UEZ<br><b>◆K3VCV</b><br><b>▼W3VHY</b><br>K3VV<br><b>▼WN3X</b><br><br>KB3YYC<br>K4BWT<br>W4CCO<br><b>◆W4CP</b><br><br>W4ENC<br><b>▼KD4EPG</b><br><b>◆KQ4F</b><br><b>◆KI4FON</b><br><b>◆W4GMS</b><br><b>▼KK4GXZ</b><br><b>▼N4IAT</b><br>KD4IQ<br>WA4IVD<br>K4JAD<br>KA4JJL<br>N4JLS<br><b>▼W4JUS</b><br><b>▼K4KC</b><br>W4KCK<br>WD4LIO<br><b>▼W4LOB</b><br>NQ4N<br><br><b>▼AA4NN</b><br><b>▼WA4ONO</b> | <b>McSweegan</b> , Richard J., Madison, CT<br><b>Coombs</b> , John R., Jr., Scituate, MA<br><b>Mac Kenzie</b> , Steve, Natick, MA<br><b>Taylor</b> , Allan F., Charlton Depot, MA<br><b>DiMarino</b> , James, Rowley, MA<br><b>Edson</b> , Glenn C., Weeki Wachee, FL<br><b>Poniatowski</b> , Robert A., Portsmouth, RI<br><br><b>Whiting</b> , David E., Townsend, MA<br><b>Sullivan</b> , Mark S., East Weymouth, MA<br><b>Pfister</b> , Jim N., Summerfield, FL<br><b>Kitchin</b> , Charles B., Billerica, MA<br><b>Diefenbach</b> , John A., Lancaster, MA<br><b>Phelps</b> , Eileen N., Vernon, CT<br><b>Wheeler</b> , Dexter R., Wakefield, MA<br><b>Hays</b> , Marcia, Westerly, RI<br><b>Magness</b> , William C., Clemmons, NC<br><b>Lang</b> , Michael W., Murrells Inlet, SC<br><b>Rura</b> , James P., East Windsor, NJ<br><b>Powell</b> , Dale F., Middletown, NY<br><b>Caziarc</b> , Louis B., III, Butler, NJ<br><b>Brown</b> , Jeffrey L., Jackson, NJ<br><b>Fidler</b> , Steve W., III, Clementon, NJ<br><b>Partyka</b> , Stanley J., Bordentown, NJ<br><b>Piccirilli</b> , Anthony P., Waldwick, NJ<br><b>Duckworth</b> , Jack H., Long Valley, NJ<br><b>Morton</b> , Paul V., Sr., New York, NY<br><b>Morgan</b> , John W., Albany, NY<br><b>Coyer</b> , Ann E., Bradenton, FL<br><b>Levy</b> , Abe, Greenwood, DE<br><b>Diener</b> , Walter M., Jr., Wyomissing, PA<br><b>Fasick</b> , Harry M., York Springs, PA<br><b>Ott</b> , Mary E., Blue Bell, PA<br><b>Mc Cann</b> , John J., Danville, PA<br><b>Bedard</b> , Robert, Plum, PA<br><b>Donio</b> , Michael A., York, PA<br><b>Rycek</b> , Ronald J., Sr., Erie, PA<br><b>Sadler</b> , Daniel C., Saint George, UT<br><b>Tucker</b> , William M., Lavale, MD<br><b>Tonecha</b> , Joseph J., Venetia, PA<br><b>Ransom</b> , Frank W., Fredericksbrg, VA<br><b>Rice</b> , Ken, Pembroke, VA<br><b>Midgett</b> , Donald R., Sr., Virginia Beach, VA<br><b>Misiewicz</b> , Connie F., Belle Vernon, PA<br><b>Thomas</b> , Barry W., Sr., Eight Mile, AL<br><b>Johnson</b> , Brian L., Soddy Daisy, TN<br><b>Phillips</b> , William C. 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The July 2025 Silent Key column listed Donald Johnson's, KØQMU, hometown incorrectly. The listing should read: Donald Johnson, KØQMU, Eden Prairie, MN.

- ◆ARRL Life Member
- ◆Current Diamond Club
- ▼Veteran
- Former call sign

For information on how to list a Silent Key in QST, please visit [www.arrl.org/silent-key-submission-guidelines](http://www.arrl.org/silent-key-submission-guidelines).

**Note:** Silent Key reports must confirm the death by one of the following means: a copy of a newspaper obituary notice or death certificate, or a letter from the family lawyer or executor. Please be sure to include the amateur's name, address, and call sign. Allow several months for the listing to appear.



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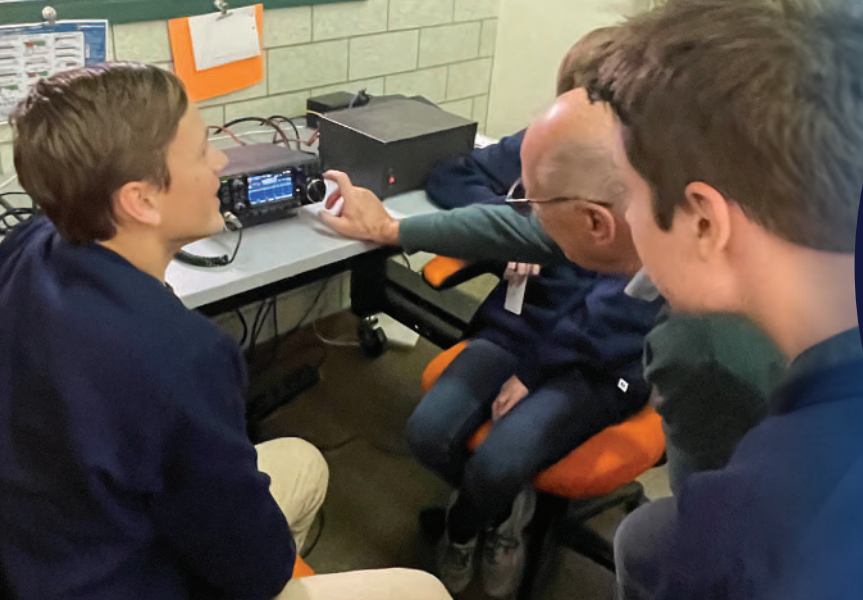
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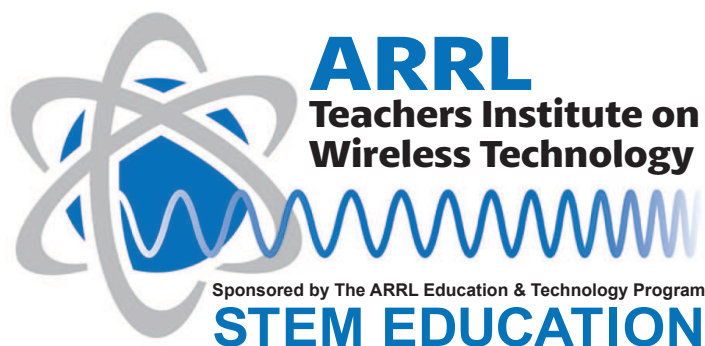
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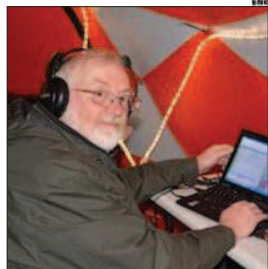


## Thursday Night Comedy Kick-Off



Featuring Comedian Juston McKinney  
Thursday, August 21, 2025

## Friday Night DX/Contest Banquet



Featuring Ned Stearns, AA7A  
Friday, August 22, 2025

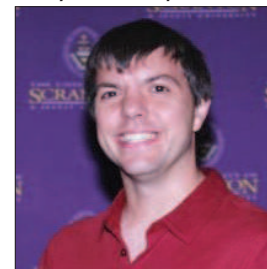


## Convention Keynote Address



Featuring Thomas Witherspoon, K4SWL  
Saturday Morning, August 23, 2025

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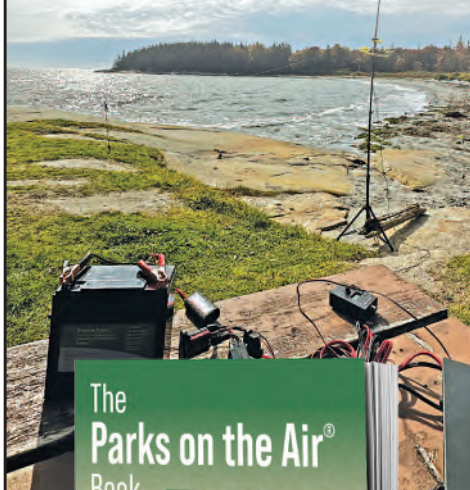


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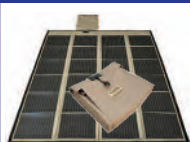
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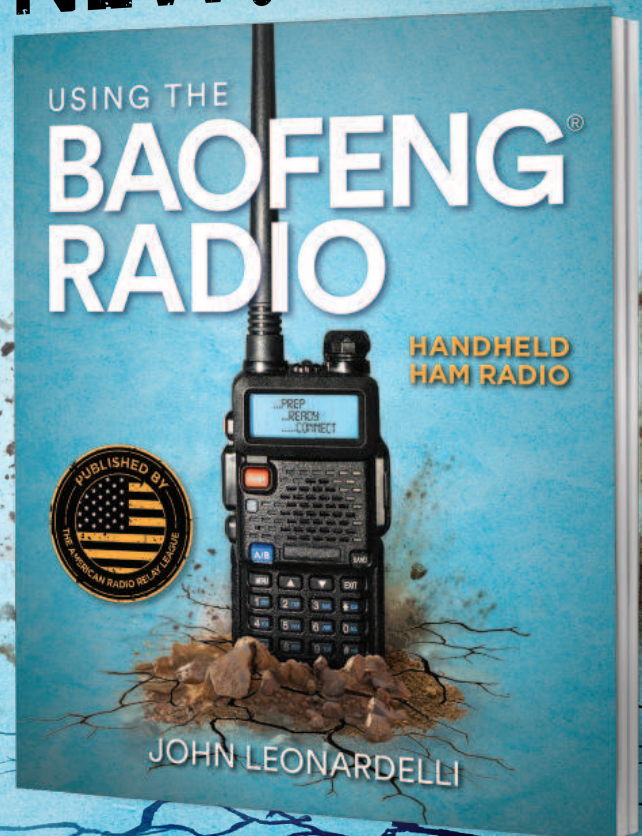
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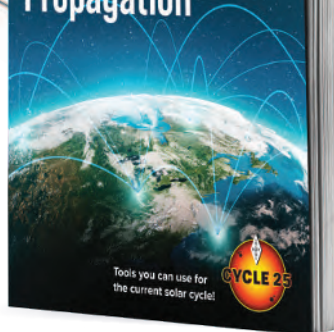
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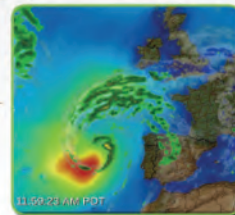
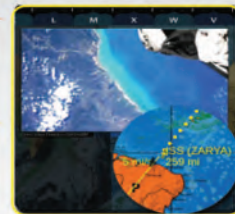
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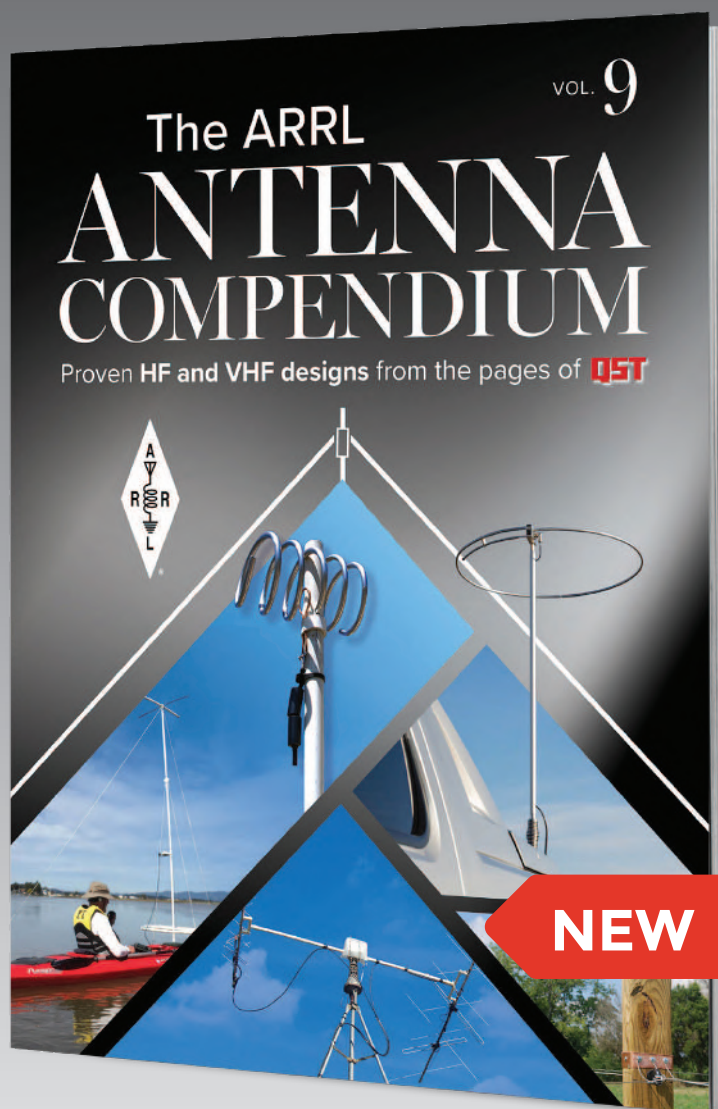


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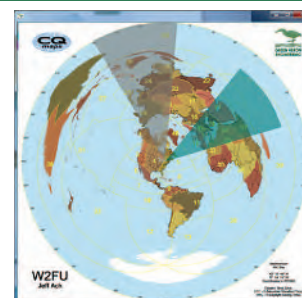
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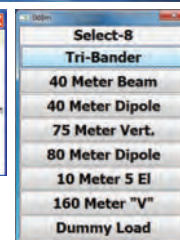
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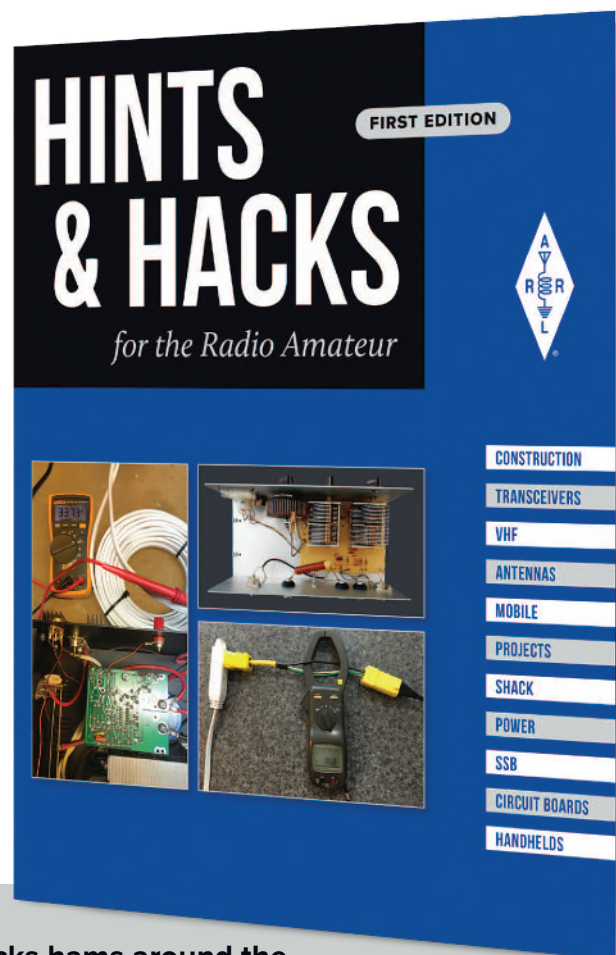
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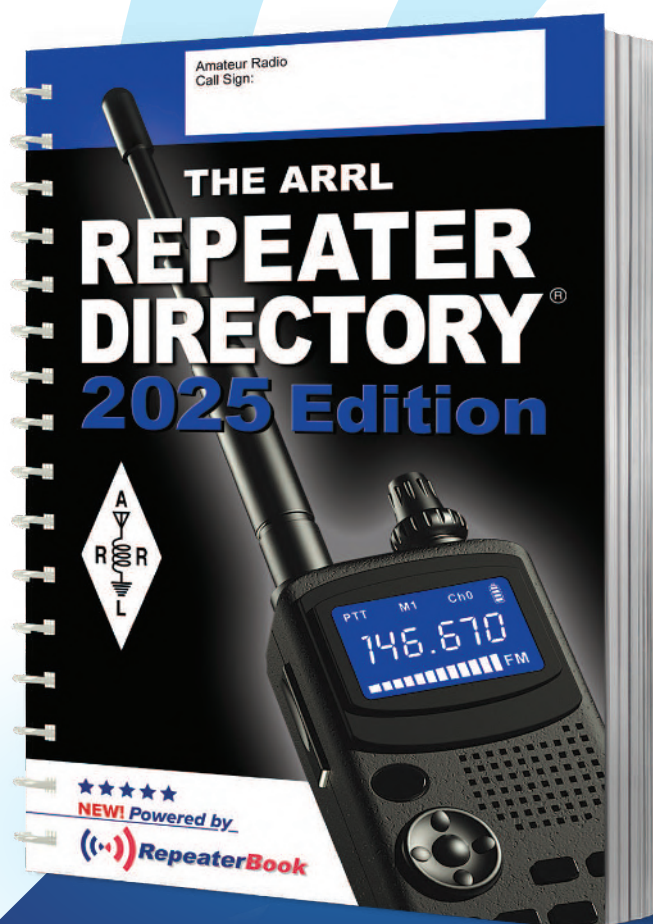
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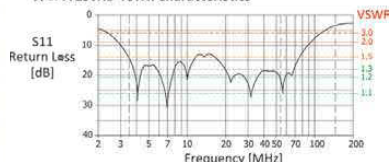
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★ C-A-250HD VSWR Characteristics



**CHA-250HD - No Antenna Tuner Needed!**

The Comet CHA-250HD is the updated version CHA-250B. The top aluminum section has been replaced with a solid whip for greater flexibility and less strain on the lower 4 aluminum sections in high winds.

1

2

3

4

5

6

**CTC-50M Window Gap Jumper**  
No more drilling or open windows!



7

## Base Antennas

### 1 **COMET CHA-250HD BROADBAND 80M THROUGH 6M VERTICAL ANTENNA**

A newly designed broadband vertical with NO GROUND RADIALS. EXTREMELY easy to assemble, requires no tuning or adjustments and VSWR is under 1.5:1 from 3.5-57MHz! • TX: 3.5MHz – 57MHz • RX: 2.0– 90MHz • VSWR is 1.5:1 or less, continuous • Max Power: 250W SSB/125W FM • Impedance: 50 Ohm • Length: 23' 5" • Weight: 7 lbs. 1 oz. • Conn: SO-239 • Mast Req'd: 1" – 2" dia. • Max wind speed: 67MPH

### 2 **COMET GP-3 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 146MHz 6/8 wave • 446MHz 5/8 wave x 3 • Gain-146 MHz: 4.5dBi / 446 MHz: 7.2dBi • Max Pwr: 200W • Length: 5'11" • Weight: 2lbs. 9ozs. • Conn: Gold-plated SO-239 • Construction: Single-piece fiberglass

### 3 **COMET GP-6 DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 5 • Gain-146 MHz: 6.5dBi / 446 MHz: 9dBi • Max Pwr: 200W • Length: 10'2" • Weight: 3lbs. 8ozs. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

### 4 **COMET GP-9 / GP-9N DUAL-BAND 146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 146MHz 5/8 wave x 3 • 446MHz 5/8 wave x 8 • Gain-146 MHz: 8.5dBi / 446 MHz: 11.9dBi • Max Pwr: 200W • Length: 16' 9" • Weight: 5lbs. 11ozs. • Conn: GP-9 Gold-plated SO-239 • GP-9N Gold-plated N-type female • Construction: Fiberglass, 3 Sections

### 5 **COMET CX-333 TRI-BAND 146/220/446MHZ BASE REPEATER ANTENNA**

Wavelength: 146MHz 5/8 wave x 2 • 220MHz 5/8 wave x 3 • 446MHz 5/8 wave x 5 • Max Pwr: 120W • Length: 10'2" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • Construction: Fiberglass, 2 Sections

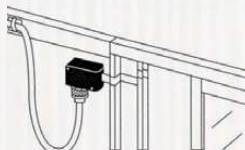
### 6 **COMET GP-15 TRI-BAND 52/146/446MHZ BASE REPEATER ANTENNA**

Wavelength: 52MHz 5/8 wave • 146MHz 5/8 wave x 2 • 446MHz 5/8 wave x 4 • Max Pwr: 150W • Length: 7'11" • Weight: 3lbs. 1oz. • Conn: Gold-plated SO-239 • 2MHz band-width after tuning (6M) • Construction: Single-piece fiberglass

### 7 **COMET CTC-50M WINDOW GAP JUMPER**

Avoid drilling holes or leaving windows open/unlocked. Flat coax easily forms to window frame. Low loss SO-239 on each end, 15 inch length.

• Max Pwr: HF 100W PEP / VHF 60W FM / UHF 40W FM / 900-1300 MHz 10W FM



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