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Amateur Radio

COMMUNICATIONS & TECHNOLOGY
APRIL 2023

CQ

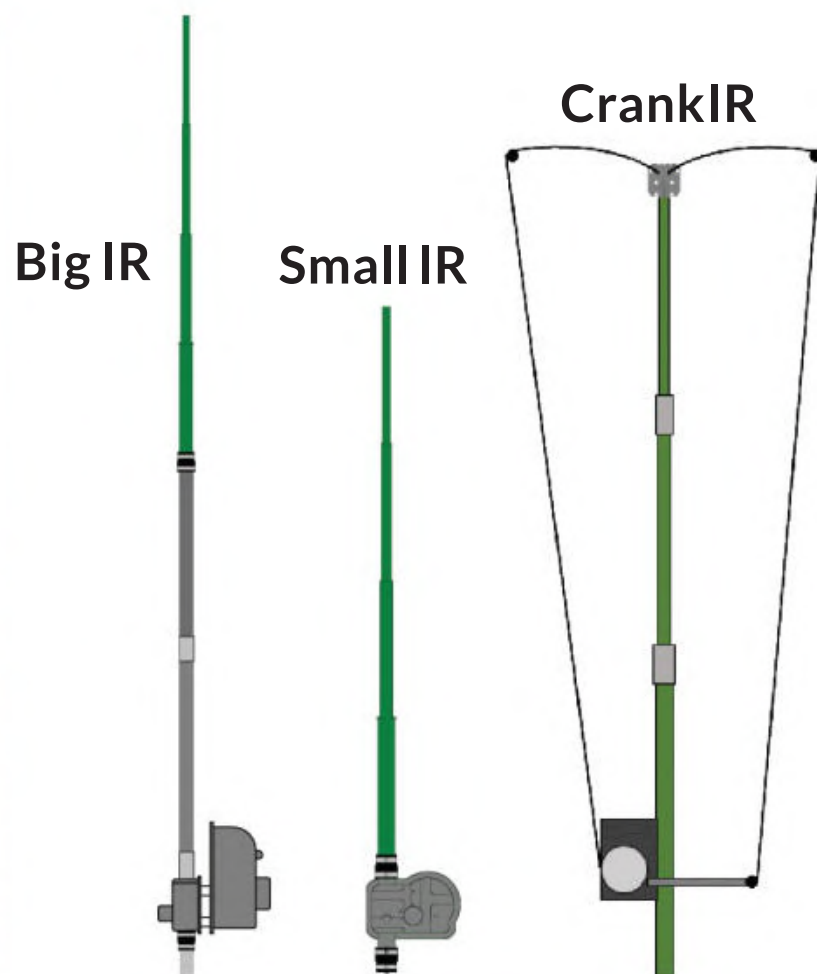
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- **Interview With ChatGPT, p. 12**
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On the Cover: ICOM America Senior Sales Manager Ray Novak, N9JA, shows off the brand-new IC-905 transceiver at the Orlando Hamcation in February. Details on page 85. First look at the IC-905 on page 72.

HIGH PERFORMANCE LOW VISIBILITY

Live on a small lot? Have HOA blues? Are the neighbors (or wife) not quite appreciating the “beauty” of a resonant, optimized amateur radio antenna as much as you do? :) May we suggest our SteppIR vertical series – the BigIR, Small IR and the ultra-portable CrankIR.

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However, when considering the required space, additional equipment and cost, the Yagi may be impractical consideration for some radio amateurs. At SteppIR, we offer small profile Yagis such as the very popular Urban Beam or the DB11, but sometimes having a Yagi is just not an option. The phased, vertical array, offers performance similar to a Yagi – gain, directivity and low angle radiation – all critically important factors for successful long distance (DX) communication. Combining two (or more) identical SteppIR verticals that are properly spaced and phased together, when coupled with the ability to adjust the vertical to optimum length required over an entire frequency range, can be a very effective solution for high quality DX communication.

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FTDX10 | HF/50MHz 100 W SDR Transceiver

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- 50W Output Power • Real Dual Band Operation • Full Color TFT Display • Band Scope • Built-in Bluetooth • WiRES-X Portable Digital Node/Fixed Node with HRI-200



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FTM-200DR | C4FM/FM 144/430MHz Dual Band

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FTM-3100R | Rugged 65W 2M FM Transceiver

- Rugged & Compact • Crystal Clear Front Panel Audio • 220 Memory Channels • Weather Broadcast Reception • Severe Weather Alert Feature

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- System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging



FT-5DR C4FM/FM 144/430 MHz Dual Band

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- All New User Operating Interface-E20-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset



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announcements

APRIL

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

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

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

LONGMONT, COLORADO — Longmont Amateur Radio Club will hold the LARCfest from 9 a.m. to noon, Saturday, April 1 at the Events Center – Boulder County Fairgrounds 9595 Nelson Rd. Longmont, CO 80501. Contact: Richard Paige, KE0VT. Email: <gwabi2@hotmail.com>. Website: <http://w0eno.org>. Phone: (720) 220-1931. Talk-in 147.270 MHz +, 100 Hz CTCSS tone. VE exams.

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

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

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

DADE CITY, FLORIDA — The East Pasco Amateur Radio Society, Inc. will hold the EPARS Talegate from 7 a.m. to noon., Saturday, April 8 at the Church Ave Parking Lot, 37746 Church Ave. Contact: Chris Bloxsom, AA4CB. Phone: (224) 221-5064. Email: <aa4cb@arrl.net>. Talk-in 146.880 PL 146.2 (-.600). VE exams.

HAMPTON, NEW HAMPSHIRE — The Port City Amateur Radio Club will hold the Seacoast Amateur Radio Flea Market from 8 a.m. to noon., Saturday, April 8 at the St. James Masonic Lodge 77 Tide Mill Road. Contact: Steve Roberts, KC1ILT, Phone: (207) 337-1512. Email: <kc1ilt@maine.rr.com>. Talk-in 145.150- PL 127.3. VE exams..

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

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

WINDSOR, CONNECTICUT — The North East Weak Signal Group will hold the Eastern VHF-UHF Conference and Microwave Update from Friday, April 14 to Saturday, April 15 at the Hilton Garden Inn, 555 Corporate Drive, 48 E. Bath Road. Contact: Mark Casey, K1MAP, Phone: (413) 777-9828. Email: <caseyhardware@gmail.com>. Website: <http://www.newsvhf.com>. Talk-in 144.200 usb.

BRAINERD, MINNESOTA — The Brainerd Area Amateur Radio Club will hold the Brainerd Area Hamfest Saturday, April 15 from 9 a.m. to 1 p.m., at the Brainerd National Guard Armory 1115 Wright St. Contact: Lyle Amundson, K0LFV, Phone: (218) 330-5110. Email: <k0lfv@arrl.org>. Website: <http://brainerdham.org>. Talk-in 147.225 No Tone. QSL Card Checking.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold its 67th Annual Hamfest from 8 a.m. to 1 p.m., Saturday, April 15 at the Emidio & Sons Expo Center, 48 E. Bath Road. Contact: Bruce Ferry, Phone: (330) 790-1680. Email: <hamfest2023@w8vpv.org>. Website: <www.w8vpv.org/hamfest>. Talk-in 147.270+ (PL 110.9) or 444.850+ (PL 110.9). Free VE exams.

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

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

ROSWELL, NEW MEXICO — The Pecos Valley Amateur Radio Club will hold the Second Annual PVARC Alien City Hamfest from 8 a.m. to 2 p.m., Saturday, April 15 at Beginnings, 3908 SE Main Street. Contact: Gerald Cox, W0COX, Phone: (575) 840-8586. Email: <w0cox@gmail.com>. Website: <www.pecosvalleyarc.com>. Talk-in 147.320 (PL 146.2).

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

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

(Continued on page 59)

KB3UJW Joins CQ Staff as Associate Editor

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



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

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

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

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

Hamvention Names 2023 Award Winners

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

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

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

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

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

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

Sohn Withdraws as FCC Nominee

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

3YØJ Wraps Up Weather-Shortened DXpedition

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

ARDC Releases 2022 Annual Report

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

Nominations Open for Young Ham of the Year

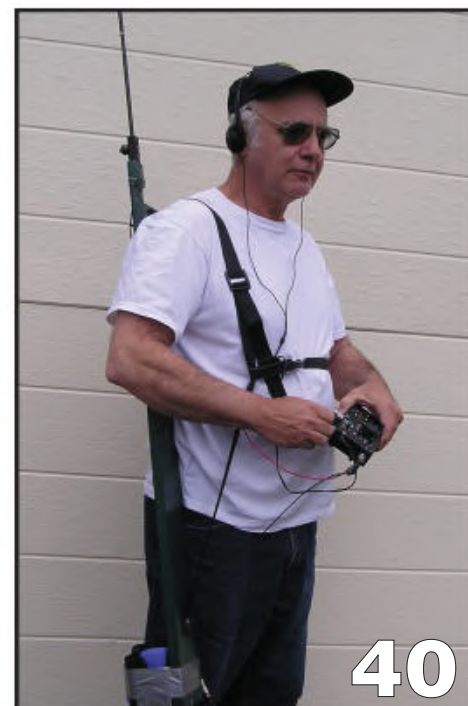
Do you know a young radio amateur, age 18 or younger, who is doing extraordinary things for his/her community or for amateur radio? If so, the Amateur Radio Newsline Bill Pasternak Young Ham of the Year Award committee wants to hear from you. Nominations for the 2023 YHOTY award are being accepted through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

Milestones: Former FCC Chief Engineer W4QAW Silent Key

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

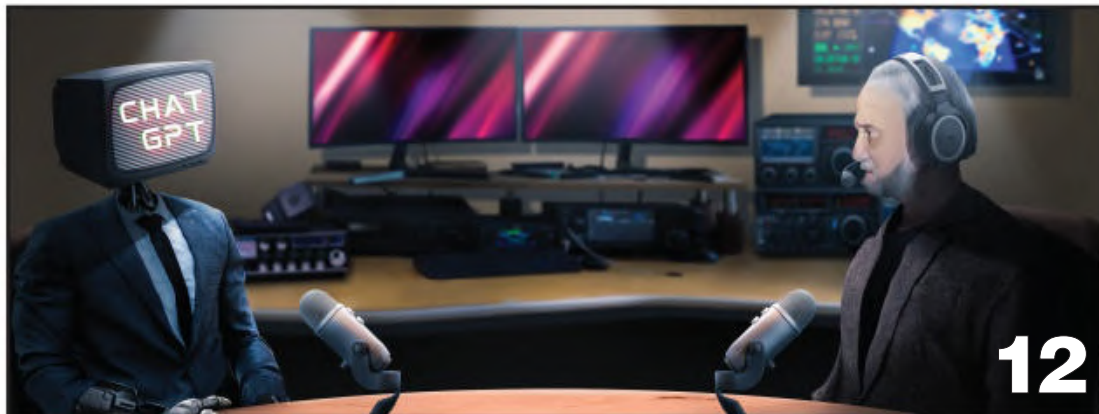
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ICOM America Senior Sales Manager Ray Novak, N9JA, brought the company's brand-new IC-905 transceiver to Florida's Orlando Ham cation in February. It is the first microwave-focused transceiver from a major ham manufacturer. Details on page 85. First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



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zero bias: a cq editorial

BY RICH MOSESON,* W2VU

The Next Revolution in Amateur Radio

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

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

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

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

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

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

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

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

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

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

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

73 to KD2IWM

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

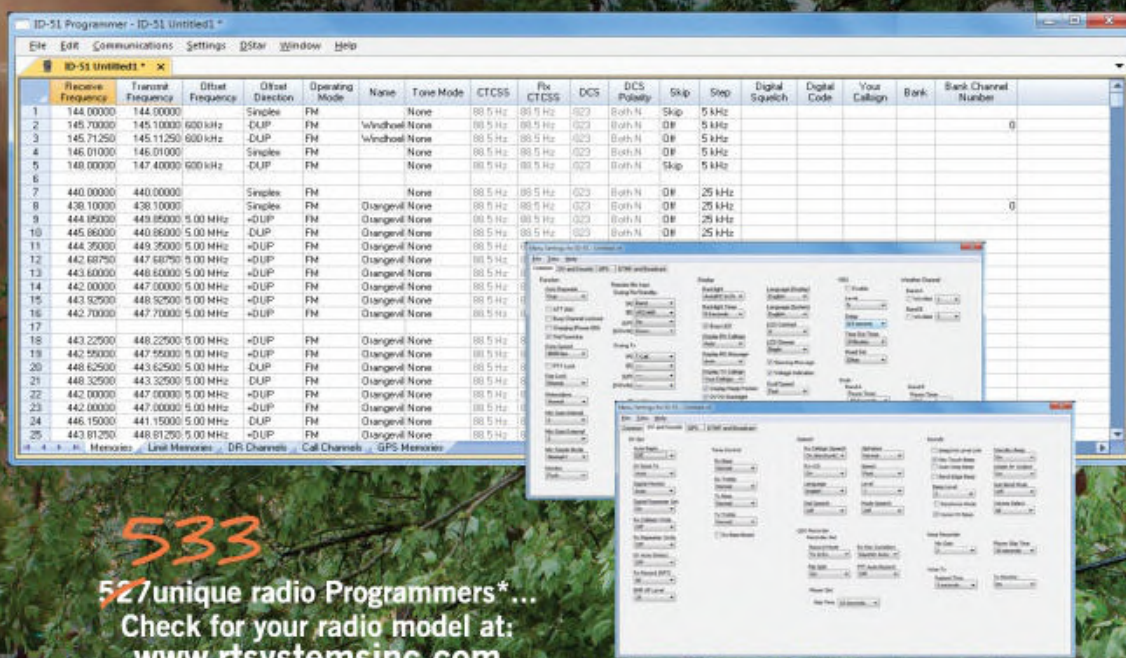
Spring is here! Go enjoy the great outdoors, and don't forget to take your QRP portable ham gear along!

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

73, Rich W2VU

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news bytes: Quartzfest Distance Challenge Winners

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

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

According to Distance Challenge Co-Chairmen Bob Wertz, NF7E, and Lou Arminio, W7KFT, the winners and runners-up (Photo A) were as shown in Table 1. Each of the winners received a commemorative hard hat and bag of goodies. NF7E pointed out that since KM6BIP was their first YL champion, "[W]e ran into Quartzsite and bought some pink ribbon, made a bow and placed that on her hat as we announced her being the winner."



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



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

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

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

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

The Bottlecap Balloon Brigade Mystery

BY RICH MOSESON,* W2VU

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

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

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

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

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

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



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

* Editor, CQ

E-mail: <w2vu@cq-amateur-radio.com>



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

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

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

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

Under the Hood

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



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

WB8ELK filled in some of the technical details for us:

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

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

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

First transmission example:

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

Second transmission example:

0a7bcd EM64 13 where

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

b = solar panel voltage

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

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

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

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

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

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

A Silver Lining

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

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

Notes:

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

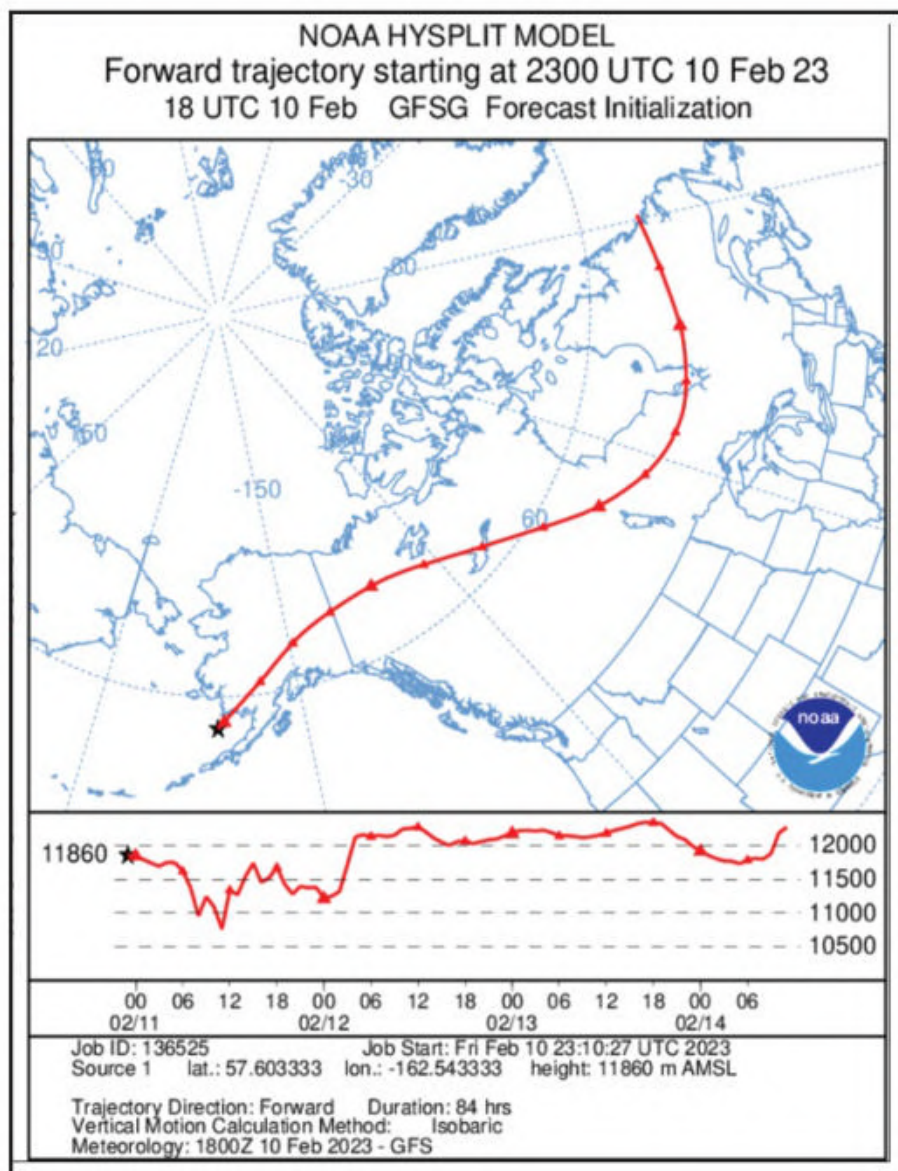


Photo D. NOAA HYSPLIT trajectory model predicting the path of the K9YO-15 balloon from the time it was last heard. The path places it in the area of the Yukon where a mystery object was shot down at approximately the same time as that occurred. (NOAA image)

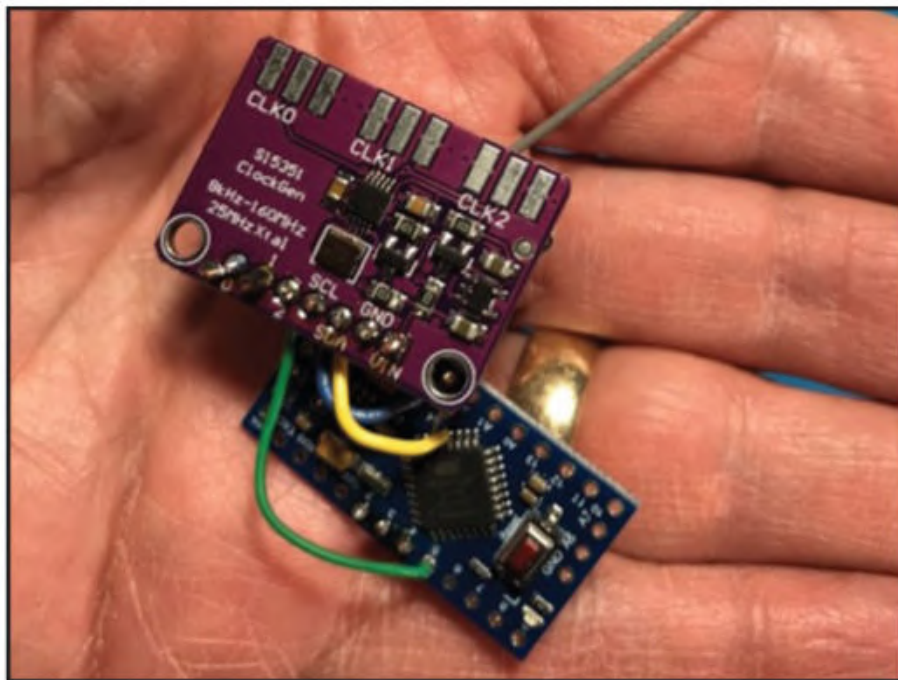


Photo E. The type of tracker transmitter used on the K9YO-15 balloon flight. It weighs 7.8 grams and can be assembled from parts purchased on Amazon.com. Both this and the tracker shown in Photo F are used in conjunction with solar panels made of a flat piece of Styrofoam® - like a party picnic plate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

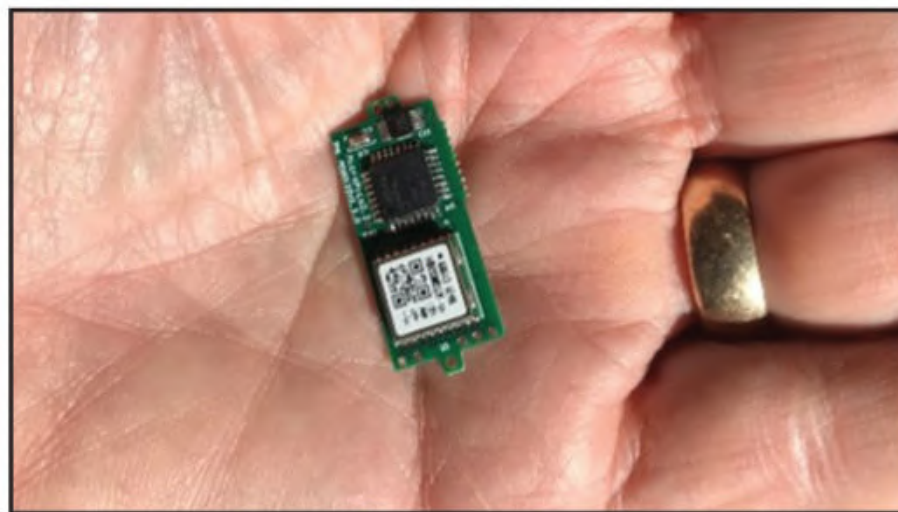


Photo F. An even smaller tracker is used on some flights. This custom-made board weighs only 1.7 grams, or 0.06 ounces. (K9YO photo)

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

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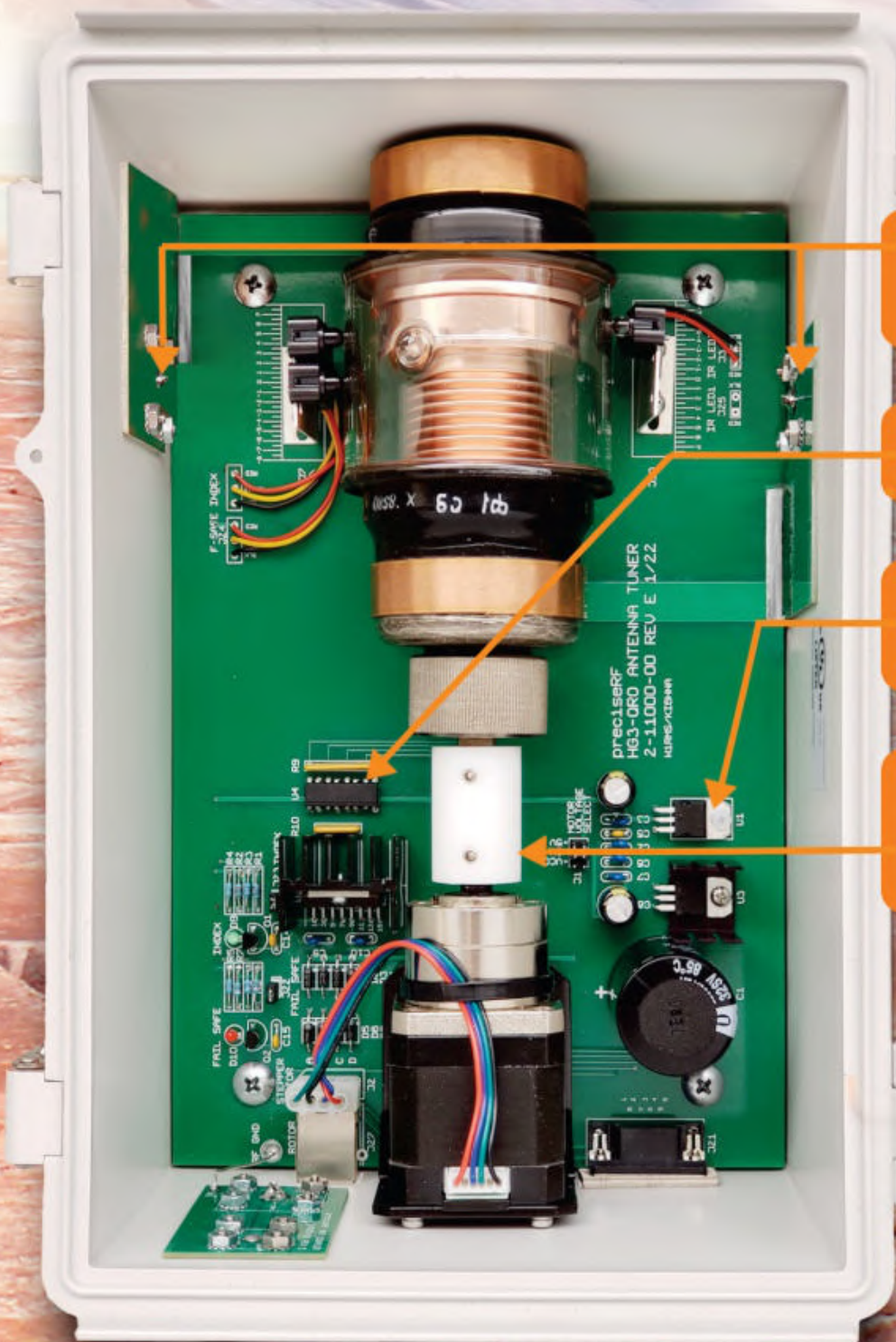
HG3 QRO-A Improvements:

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

An Interview With ChatGPT on the Future of Ham Radio

BY JIM MILLNER,* WB2REM

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

ChatGPT has been trained on a large dataset of text from the internet, including dialogues, conversations, and written text, to generate responses in a conversational manner. It

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

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

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

The Interview

WB2REM: *Is ham radio a dying hobby?*

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

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

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

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

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

WB2REM: What is the future of ham radio?

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

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

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

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

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

WB2REM: Why is there intentional QRM on ham radio?

ChatGPT: Intentional QRM (interference) on ham radio is considered a problem as it disrupts communication between ham radio operators and can prevent them from

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

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

1. Misuse of equipment: Some ham radio operators may not be familiar with proper operating procedures and may cause interference to other operators unintentionally.

2. Unwanted or illegal transmissions: Some individuals may intentionally cause QRM on the ham radio frequencies to interfere with legitimate communication.

3. Territorial disputes: In some cases, multiple ham radio operators may be competing for the same frequency and may intentionally cause QRM to assert their dominance over the frequency.

4. Technical issues: In some cases, technical issues, such as poorly designed equipment, can cause QRM, even if the operator does not intend to cause interference.

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

WB2REM: What can be done to improve ham radio?

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

1. Education and training: Ham radio organizations and clubs can offer education and training programs to help new and existing operators improve their skills and knowledge of the hobby.

2. Encouraging new enthusiasts: Ham radio organizations can work to attract new generations of enthusiasts by promoting the hobby to young people, schools, and other organizations.

3. Encouraging diversity: Ham radio organizations can work to encourage diversity within the hobby by promoting inclusivity and welcoming people from all backgrounds and cultures.

4. Improving equipment: Ham radio organizations and manufacturers can work to improve the quality and functionality of ham radio equipment to make it more accessible and user-friendly for new enthusiasts.

5. Encouraging responsible use: Ham radio organizations can work to promote responsible use of ham radio frequencies and educate operators on proper operating procedures to reduce the incidence of intentional QRM.

6. Encouraging emergency preparedness: Ham radio organizations can work to promote the use of ham radio as a backup means of communication in times of emergencies and disasters and encourage operators to be prepared to provide critical communication support.

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

WB2REM: What is the best amateur radio made?

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

1. Yaesu: Known for their high-quality, reliable, and feature-packed transceivers and accessories.

2. Icom: A trusted brand that offers a wide range of transceivers, handhelds, and accessories for all levels of amateur radio operators.

3. Kenwood: Known for their innov-

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

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

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

WB2REM: What do you like most about amateur radio?

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

1. Building a community: Ham radio operators form a tight-knit community, connecting with other enthusiasts from around the world to exchange ideas, share experiences, and provide support.

2. Developing skills: Ham radio offers opportunities to learn new skills, from technical knowledge to communication and emergency preparedness.

3. A connection to history: Ham radio has a rich history, dating back over a century, and many operators feel a connection to this history and the heritage of the hobby.

4. A love of technology: Ham radio is a technology-based hobby, and many enthusiasts enjoy learning about and using the latest equipment, software, and techniques.

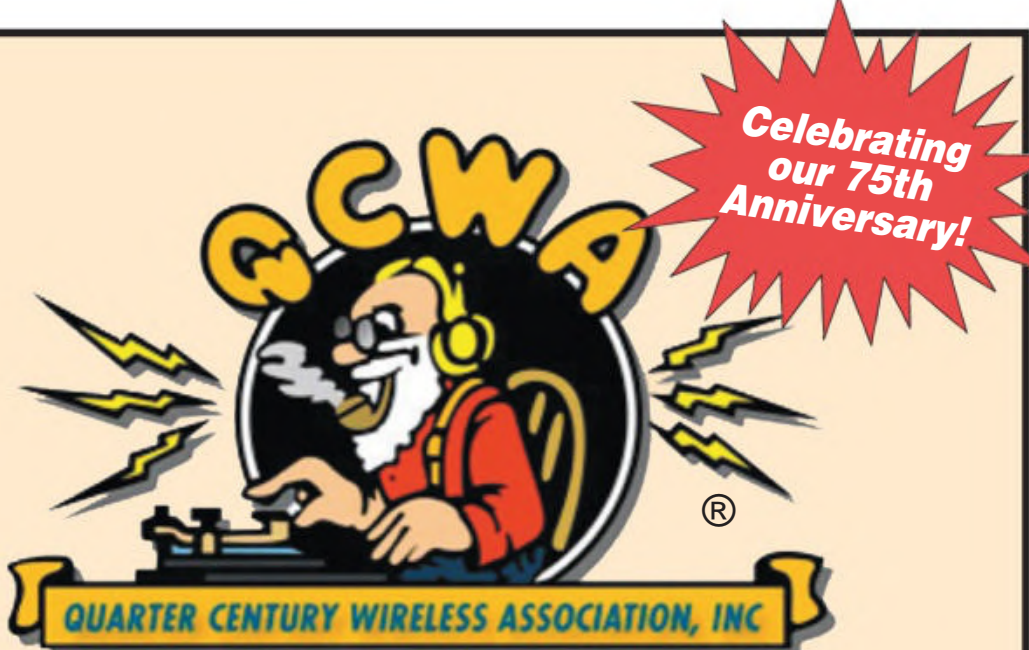
5. Providing emergency communication: Ham radio operators can provide critical communication support in times of emergency or disaster, offering a unique sense of purpose and fulfillment.

6. A connection to the world: Ham radio provides the opportunity to make contacts with people from all over the world, fostering a sense of community and connection that spans borders and cultural differences.

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

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

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



*Were you first licensed 25 years ago
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WB2REM: Thank you for the interview. Do you have any other things to say about ham radio?

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

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

Ham Radio, A Nostalgic Symphony

*In the quiet of the night, when all is still,
a voice echoes through the air, a distant thrill.
It's the call of ham radio, a hobby from the past,
a symphony of voices, a connection that will last.
A dance between man and machine, a connection pure and strong,
a bridge between the present and a bygone song.
The songs of ham radio, a rhythm in the air,
a connection that transcends time and space beyond compare.
The signals are a story, a tale of joy and pain,
a window to a world, a bond that will remain.
From city to city, from shore to distant shore,
ham radio is the voice that opens doors.
For in the world of ham radio, a bond is formed,
a connection that transcends, a friendship reborn.
The hands that hold the mic, the eyes that scan the air,
are the guardians of this legacy, the keepers of this rare.*

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

Summary

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

Notes:

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

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

Sherlock Investigates: Seismic Signals Below 1 Hz

BY "SHERLOCK"*

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

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

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

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

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

* c/o CQ magazine

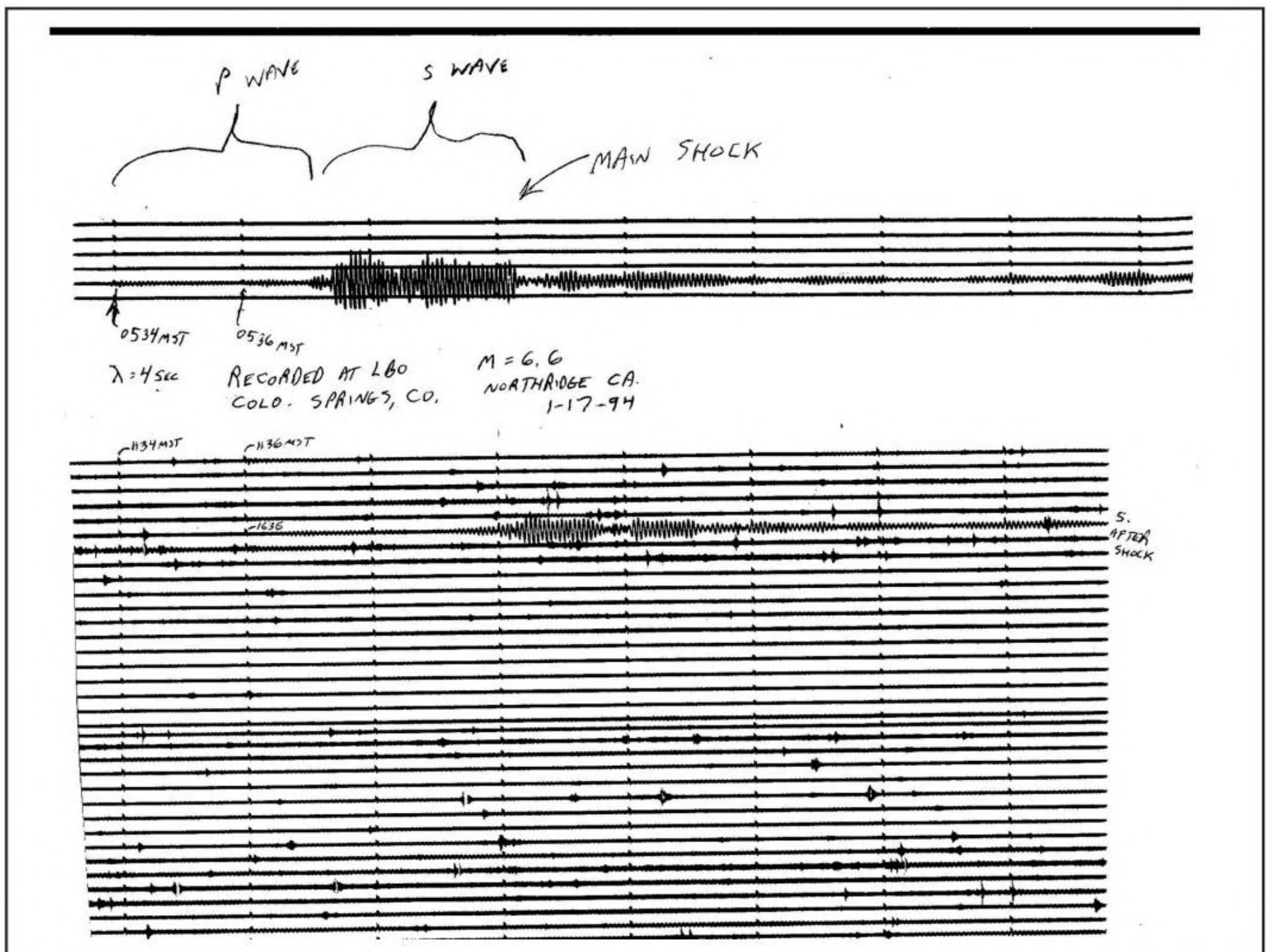


Figure 1. Sherlock's seismographic record of the magnitude 6.6 earthquake that rocked Northridge, California in 1994



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

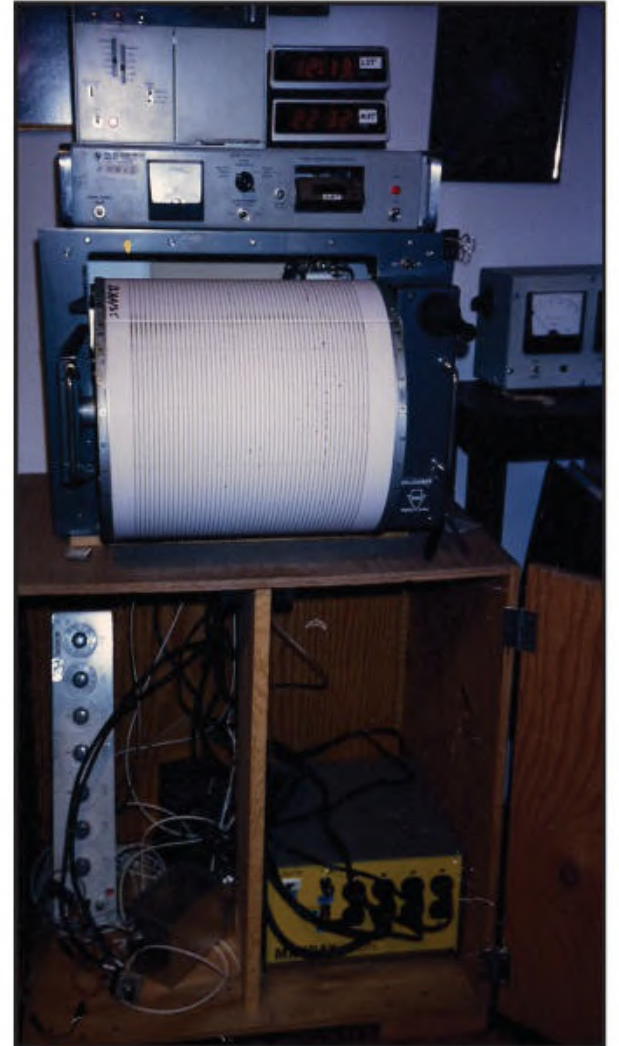


Photo B. A Geotech Helicorder records the seismic vibrations picked up by the detector.

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

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

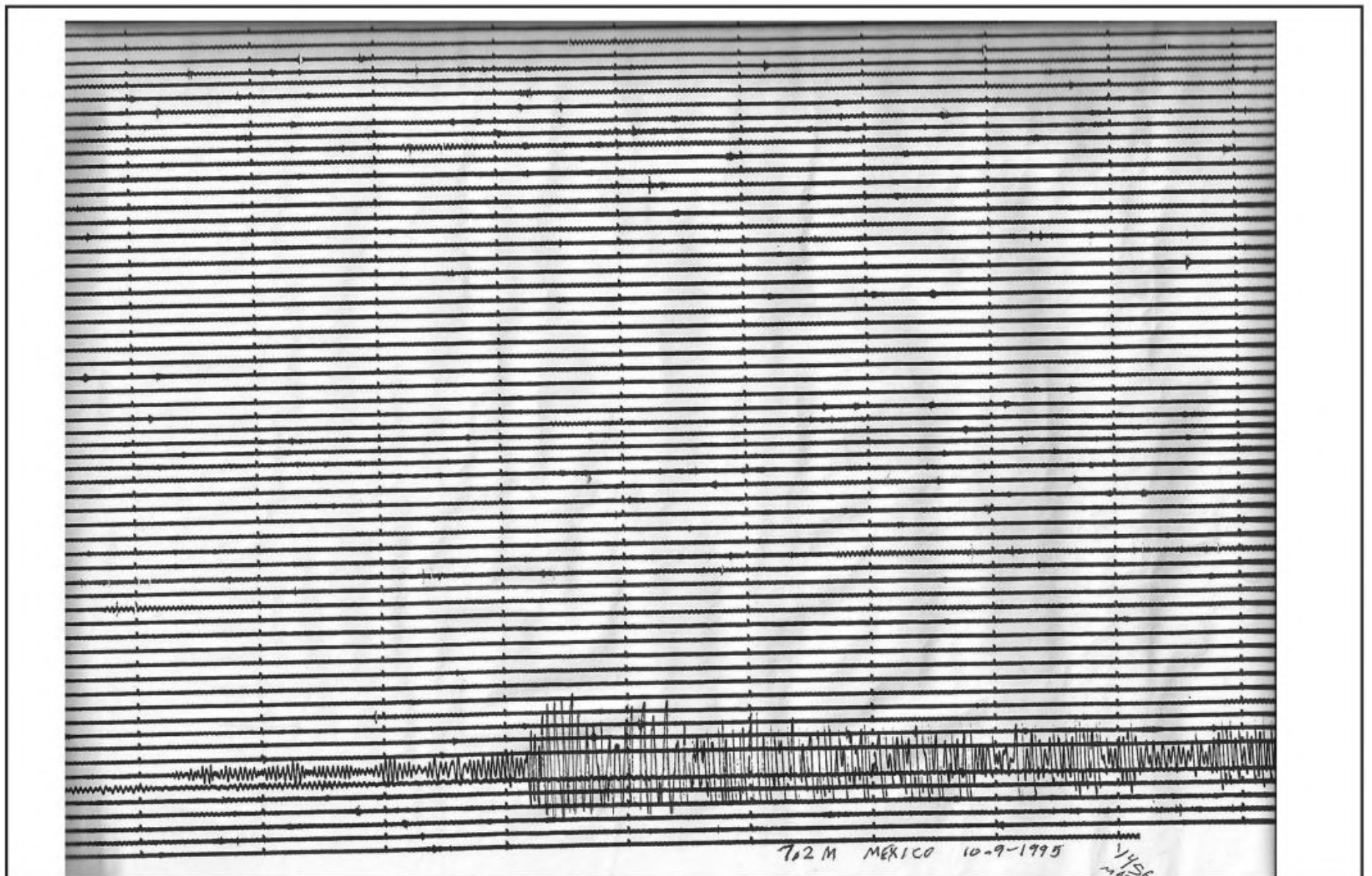


Figure 2. This recording shows the moment that a magnitude 8.0 earthquake rocked Mexico in 1995, causing massive damage in Mexico City and surrounding areas.

Results of the 2022 CQWW DX SSB Contest

“Amazing conditions this weekend ... I wish every contest was like this. –VE2HEW”

BY JOHN DORR*, K1AR

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

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

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

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

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

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

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

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

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

*Email: [<cqk1ar@gmail.com>](mailto:cqk1ar@gmail.com)



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



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

Spring is in the Air...

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by Carl Luetzelschwab, K9LA

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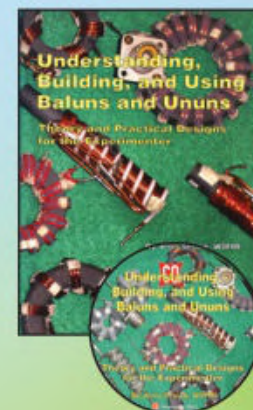
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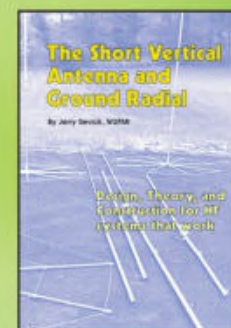
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by Walt Maxwell, W2DU

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

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

2022 CQWW DX SSB PLAQUE WINNERS AND DONORS

SINGLE OPERATOR, ALL BANDS

World

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

World – Low Power

Alfredo Velez, WP3C
Donor: Slovenian Contest Club

World – QRP

Anthony Luscre, K8ZT
Donor: Jeff Steinman, N5TJ

World – Assisted High Power

PT5J (Opr.: Sergio Almeida PP5JR)
Donor: Chick Allen, NW3Y

World – Assisted Low Power

TM3Z (Opr.: Dimitri Cosson, F4DSK)
Donor: Gail Sheehan, K2RED

U.S.A. – High Power

Ken Claerbout, K4ZW
Donor: Potomac Valley Radio Club – KC8C Memorial

U.S.A. – Low Power

Ed Sawyer, N1UR
Donor: North Coast Contesters

U.S.A. – QRP

Bill Parker, W6QU*
Donor: Pat Collins, N8VW

U.S.A. – Assisted High Power

Charles Fulp, Jr., K3WW
Donor: John Rodgers, WE3C

U.S.A. – Assisted Low Power

Lyle K. Ten Pas, WE9R
Donor: LA8W/LN8W & LA Contest Club

U.S.A. – Zone 3

ND7K (Opr.: John Colyard, W4IX)
Donor: Northern California Contest Club

U.S.A. – Zone 4

George Fremin, III, K5TR
Donor: Kansas City DX Club

Europe

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

Europe – Low Power

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

Europe – QRP

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

Europe – Assisted

OMØR (Opr.: Jozef Land, OM3GI)
Donor: Martin Huml, OL5Y

Africa

Ricardo Martins, CT3KN
Donor: Southborough Rod & Gun ARC – N1XS Memorial

Asia

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

Caribbean/Central America

V47T (Opr.: Randy Thompson, K5ZD)
Donor: John Rodgers, WE3C

Caribbean/Central America – Low Power

Ted Jimenez, HI3T*
Donor: Albert Crespo, NH7A

Oceania

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

South America

John Bartlett, HK3C*
Donor: Yankee Clipper Contest Club

Canada

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

Japan – High Power

Masa Okano, JH4UYB
Donor: Rush Drake, W7RM Memorial

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

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

SINGLE OPERATOR, SINGLE BAND

World – 28 MHz

CR3Y (Opr.: Branislav Panak, OM2KW)
Donor: Joel Chalmers, KG6DX

World – 21 MHz

CR3DX (Opr.: Tibor Ferenc, OM3RM)
Donor: John Rodgers, WE3C

World – 14 MHz

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

World – 7 MHz

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

World – 3.7 MHz

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

World – 1.8 MHz

Ljubo Pintar, S53O
Donor: OL7M Contest Group, QRO.cz, RemoteQTH.com

U.S.A. – 28 MHz

Jay Camac, N4OX
Donor: John Rodgers, WE3C

U.S.A. – 21 MHz

Peter Bizlewicz, KU2M
Donor: 11PM Dayton Pizza Gang

U.S.A. – 14 MHz

Dan Handa, W7WA
Donor: Yankee Clipper Contest Club – KC1F Memorial

U.S.A. – 7 MHz

Julius Gostel, Jr., K4SXT
Donor: Chuck Dietz, W5PR

U.S.A. – 3.7 MHz

Steven Sussman, W3BGN
Donor: John Rodgers, WE3C

U.S.A. – 1.8 MHz

Drew Vonada-Smith, K3PA
Donor: South Texas DX & Contest Club

Europe – 28 MHz

E7AA (Opr.: Slaven Galic, E77A)
Donor: John Rodgers, WE3C

Europe – 21 MHz

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

Europe – 14 MHz

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

Europe – 7 MHz

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

Europe – 3.7 MHz

Carlos Aragon, EE7L*
Donor: Friend of Klaus - DJ4PT Memorial

Europe – 1.8 MHz

Juris Seilis, YL3FT*
Donor: Robert Kasca, S53R

Caribbean/Central America (28 MHz)

KP2B (Opr.: David Lianez Fernandez, EB7DX)
Donor: Nate Moersch, N4YDU

Oceania (28 MHz)

VK1A (Opr.: Bernd Laenger, VK1IA)
Donor: Bruce D. Lee, KD6WW

Asia (28 MHz)

Alberto Annesi, VR2XAN
Donor: DFW Contest Group – W5PG Memorial

OVERLAY CATEGORIES

World – Classic

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

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

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

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

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



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

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

Japan – Classic
Tutomu Kubota, JK1OLT
Donor: Hajime Kato, JO1RUR

World – Rookie
Roberto Ursino, IU0OVV
Donor: Tim Duffy, K3LR – N8SM Memorial

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

Europe – Rookie
Zdeslav Cerina, 9A5RTW*
Donor: EA Contest Club

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

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

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

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

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

Asia – Youth
Jianang Zhu, BD4VGZ*
Donor: YOTA Japan

Oceania – Youth
Yoshiki Nakada, KH0UA
Donor: IARU Region 3

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

World Multi-Operator – Explorer
OT7T (Oprs.: ON4DS, OP4K, ON7TK, ON4AMX, ON5OO, ON7EQ, ON5RA, ON7MV, ON4ANN, ON5GM, ON4CHT, ON4CAU, ON4EC, ON4CJ, OR1X, ON9TT
Donor: World Wide Radio Operators Foundation

MULTI-OPERATOR, SINGLE TRANSMITTER

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

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

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

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

Africa
FR4KR (Oprs.: FR8TZ, FR8UA, FR4QT)
Donor: WRTC 2022

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

Europe
E7DX (Oprs.: 9A1TT, 9A2ZI, DJ2MX, DJ4MX, E7ØR, E7ØT, E74A, E74AW, E76C, E77C, E77DX, E77EA, F5SNJ, S55OO)
Donor: Gail Sheehan, K2RED

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

Oceania
AH2R (Oprs.: NH2C W13O KH2JU)
Donor: Junichi Tanaka, JH4RHF

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

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

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

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

MULTI-OPERATOR, TWO TRANSMITTER

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

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

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

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

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

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

MULTI-OPERATOR, MULTI-TRANSMITTER

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

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

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

CONTEST EXPEDITIONS
World – Single Operator
V85RH (Opr.: Hajime Kato, JO1RUR)
Donor: National Capitol DX Association - W2GHK Memorial

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

*Awarded to second place finisher

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

There's a lot that can be said about the single-band entries this year – the results speak for themselves. However, of particular note is this year's 10-meter achievements led by the winning result of Branislav, OM2KW, operating from CR3Y, with a final score of 1.9M points (including an amazing 4500

QSOs!), beating out the 1.7M+ efforts by PV2G (PT2IC op.) and CQ3J (CR3MD op.).

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

2022 CQWW DX SSB TOP SCORES

WORLD		SINGLE OPERATOR		HIGH POWER			
All Band							
PJ4K (N6KT)	16,224,072	P40T (VE3DZ)	9,398,793	CT3KN	9,193,977		
XL3T (VE3AT)	9,135,758	UPØL (UN9LW)	8,050,170	C4W (5B4WN)	7,784,250		
DM6V (DL7FER)	6,035,036	K4ZW	6,017,235	S53MM	5,834,028		
28 MHz							
CR3Y (OM2KW)	1,970,399	PV2G (PT2IC)	1,729,506	CQ3J (CT3MD)	1,710,060		
KP2B (EB7DX)	1,331,424	VR2XAN	943,795	A65BB	939,757		
7Q6M	882,024	E7AA (E77A)	757,568	IR9W	728,854		
LZ4TX	724,108	21 MHz					
CR3DX (OM3RM)	2,273,994	IY3A (IZ3EYZ)	1,030,002	LW1F (LU5FC)	1,018,026		
VK1A (VK2IA)	1,000,714	KU2M	903,650	OK7W	889,760		
UP2L	600,768	WP4WW (KP4JRS)	569,130	JA7QVI	513,024		
OG8M (OH8MCT)	507,122	14 MHz					
CR3A (OM3BH)	2,400,858	OH8X (OH6UM)	1,019,869	OZ7X (OZ5KF)	693,900		
W7WA	667,800	TI1T (TI2VVV)	623,952	DMØA (DK4EE)	498,400		
YT7B	494,700	HZ7C (7Z1SJ)	401,604	YB1DX	323,177		
CE3QY	292,905	7 MHz					
ED5R (EA5Z)	930,155	4L2M	924,189	CR6T (CT1ESV)	848,318		
S57AL	775,465	S51CK	388,798	OM5R (OM5WW)	365,560		
JJØVNR	256,743	YT5DXX	175,890	SP4LVG	120,524		
R4SA	81,699	3.7 MHz					
ISØ/OM2TW (OK8WW)	319,277	EE7L	151,892	OK5D (OK1DTP)	150,474		
W3BGN	59,013	VE9FI	50,304	W1FQ	21,229		
CT1EKD	19,520	W1HI	19,093	JAØJHA	16,215		
OK1KTW (OK1DEZ)	12,427	1.8 MHz					
S53O	65,284	UP7L (UN6LN)	38,308	YL3FT	28,500		
OK4U (OK1TP)	27,724	EI5GUB	6,525	SP9TPZ	4,000		
DL2DSA	1,947	LOW POWER					
All Band							
DL2VIW	1,920	DK3AX	88	K3PA	70		
28 MHz							
WP3C	4,528,710	N1UR	4,035,766	HI3T	3,397,464		
CR2B (EA1BP)	2,178,800	4XØT (4Z5FI)	2,152,332	K1BX	1,593,606		
IH9/IK5AEQ	1,558,025	FG5GP	1,336,504	WW4XX (LZ4AX)	1,303,932		
ED7R (EA7GX)	1,260,336	21 MHz					
PY2UD	761,118	PZ2YT	725,000	PZ5RA	417,938		
ED8B (EA8TR)	415,093	HZ1SK	405,840	EA1R	349,536		
N8II	326,960	CB6LR (CE6GDR)	308,454	STØHQ (ST2M)	301,920		
VR2T (VR2ZQZ)	281,175	14 MHz					
LZ2VU	575,811	EA9ABC	459,225	JA6WFM	285,219		
JF3BFS	207,252	FK8GM	200,408	7Z1VD	181,488		
ZW2T (PY2RKG)	170,430	PY2QT	167,918	L71D (LU7DUE)	140,448		
7K4XNN	134,200	7 MHz					
4Z5UN	244,881	IT9EWR	126,260	9W2JHZ	65,898		
ON8LX	47,346	YO3JW	36,921	S53MR	35,189		
UR5WCQ	35,105	RC7KY	33,666	YDØNHG	33,616		
Z35U	31,950	3.7 MHz					
SQ9MR	58,112	SQ8NGV	28,842	S53NW	25,288		
OM6TX	22,420	SP4SHD	22,176	EA4IS	21,608		
LY5GT	16,165	IN3HEZ	13,932	OK7R (OK1TNM)	13,160		
E74SL	12,561	1.8 MHz					
SP6LUV	26,255	SNØR (SQ9IAU)	19,822	YT8A	14,716		
SQ8MFM	12,691	RA7KX	8,003	LC9X (LA9XGA)	5,655		
OE3WMM	5,580	SINGLE OPERATOR ASSISTED HIGH POWER					
All Band							
PT5J (PP5JR)	11,807,370	KP3DX (NP4Z)	8,487,812	OMØR (OM3GI)	8,357,640		
V31XX	8,312,928	28 MHz					
Ti2YO	96,995	IZ4AIF	75,114	ZY6G (PY6GOE)	66,935		
K1WHS	51,624	IZ1ANK	46,221	F2CT	39,767		
KEØWPA	35,646	PY2VQ	33,165	JA2MWW	23,572		
SQ8MFB	22,752	21 MHz					
EY8BA	119,082	JR4DAH	83,040	F8AKS	78,987		
TA2IB	58,800	NDØC	47,229	SY1AEA	42,588		
JQ1NGT	34,992	LZ2RS	34,278	JR1NKN	23,374		
YC4SIZ	18,880	14 MHz					
YU1NR	63,546	G2X (GØDCK)	42,201	RT4W	30,644		
YO8RC	23,625	LA7WRA	20,631	SP9NSA	15,844		
IZ8EWD	15,123	YO4BEX	13,860	W2VRK	12,393		
ON4MGY/P	8,268	7 MHz					
IZ4VQS	23,858	OK6OK	18,496	HA3GC	9,760		
LY2NK	9,750	SV1DZB	6,765	G4Y (M6OXO)	3,772		
GM4J (GM4UBJ)	3,696	HG7J	2,925	E78CB	2,730		
ISØAGY	2,255	3.7 MHz					
OL4W (OK1IF)	8,159	PAØAWH	1,972	ES6KW	42		
UB4IIQ/UA6L/QRPP (UB4IIQ)	2	1.8 MHz					
UN9LDC	3,354	HA1TI	3,232	LY4T	2,880		
DL1AQB	1,568	UT4UBZ	108	SINGLE OPERATOR ASSISTED HIGH POWER			
All Band							
TM3Z (F4DSK)	3,736,488	9A2EU	2,591,238	UA9MA	2,241,680		
28 MHz							
CQ3W (DF7EE)	2,356,893	LU8DPM (LU7DW)	1,706,912	4X1MM	1,259,827		
TMØT (F4HQZ)	1,137,724	V55Y (V51WH)	1,135,136	PW2L (PY2MNL)	1,047,087		
TI2CC	874,208	EA8AM	852,561	HG3R (HA3NU)	848,056		
DR1D (DL8UD)	838,332	21 MHz					
DL2ARD	1,369,088	HA5JI	1,260,080	OM2VL	1,234,815		
CX7SS	1,182,613	RL3A (RL3FT)	1,145,088	S5ØK	1,141,554		
FJ/SP9FIH (SP9FIH)	1,124,052	HA8A (HA8DZ)	1,082,771	EE5K (EA5DF)	942,210		
S5ØR	934,719	14 MHz					
DL6FBL	1,588,020	SQ2A (SQ9UM)	1,336,704	OL9Z (OK2PVF)	1,184,448		
PY6BA	1,096,176	IB9T (IT9BLB)	1,055,544	9K9A (9K2OD)	1,054,356		
S57DX (VE3ZF)	754,290	HA1AH	644,716	F8DVD	631,625		
7 MHz							
SN3A (SP3GEM)	660,576	S51YI	538,720	YT1A	517,450		
EY8MM	391,952	JH7MQD	348,864	OH7K (OH8SR)	246,500		
G8X (G4FJK)	239,242	UK9AA	191,748	F4FJH	186,615		
9K9C	135,897	3.7 MHz					
IB3M (OE6MBG)	222,860	HA1TJ	203,796	IK2QPR	143,936		
Ti1K (Ti5CDA)	127,038	I1JTQ	116,748	SP2PIK (SP2MKT)	95,351		
YU1LD	91,430	W3NO	59,580	MI5K (MIØSLE)	40,328		
SQ7NSN	33,120	1.8 MHz					
S56X	48,709	IKØNMJ	21,924	LC5K (LA5YJ)	9,844		
DR3W (DL6MHW)	7,380	K5UR	4,510	OH2BO	2,795		
EA1HV	2,448	LY7M	210	K2KW	77		
LZ2ZG	45	LOW POWER					
All Band							
OK2FD	225,990	HG5O (HA5OB)	138,831	HF9CW	136,344		
SQ5CW	129,024	YU1LM	103,601	QRP			
All Band							
TA9J	92,416	SP9RQH	69,600	JK1TCV	55,510		
PE2K	53,298	YB2NDX	48,768	28 MHz			
AC5O	85,902	EF3O (EA3O)	48,222	PY9DM	28,764		
LX3AA	22,750	KO1H	21,294	8J6YAB (JA6VZB)	19,987		
QA4B (ON4BHQ)	17,818	N6MZ	13,456	PY2MDF	13,167		
S59GS	8,957	21 MHz		JA6GCE	127,050		
OMØRX	97,104	YBØSSF	86,204	IT9RJE	64,920		
JM1NKT	59,040	LY2OU	46,420	E73AA	34,020		
SV1NK	33,396	G1G (G4KIV)	15,180	BA4WI	11,628		
14 MHz							
MI1M (MIØLLG)	31,540	SP5PDA	18,673	PP1ZZ	7,350		
YT1BD	5,838	IZ2QKG	5,040	JF3KQA	1,276		
JM2RUV	80	OM6AS	35	7 MHz			
OE3MDB	3,588	YD8FLF	1,102	YF7RDM	864		
JH3DMQ	714	GW5P (GWØEGH)	560	VE3BFU	266		
9M2CDX	48	3.7 MHz		SP5FKW	13,167		
IO5K (IK5TBK)	12,210	SP5ES	11,820	EA5S	10,123		
SQ9SX	99	VA7IR	50	1.8 MHz			
S54ZZ	18,872	9A/IZ3NVR	2,904	9A4QV	576		
MULTI-OP SINGLE-TRANSMITTER HIGH POWER							
P33W	24,948,370	PJ4G	19,282,256	E7DX	15,649,472		
IR4X	15,237,992	TM6M	14,895,924	LZ5R	13,684,872		
EW5A	13,254,210	VE3EJ	11,834,130	IR4M	11,621,455		
IR6T	11,524,994	LOW POWER		FY5KE	13,951,476		
J68HZ	7,195,568	ED7O	5,900,622	VP5DX	4,417,865		
HZ1BW	4,339,212	ED1B	3,475,200	LX8M	3,399,088		
WW4LL	3,342,634	IO3F	3,311,885	TC7G	2,722,296		

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

Before moving on, we need to acknowledge our Rookie and Youth entries. Between the two overlay groups, we received 470 logs this year. The CQ WW is indeed attracting newer operators, which bodes well for the contest's future! Roberto, IU0OVB, led the Rookies with a fine score of 1.5M. There is some good contest mentoring going on in Italy. And, the Youth contingent was won by Andreas, 5B4AQT, with a

MULTI-OP TWO-TRANSMITTER	KH6CJJ.....1,060,811 OL5Y.....927,639 CO8NMN.....793,026 PZ2YT.....725,000 YO7SR.....619,440 WA3LXD.....524,210	3.7 MHz W3BGN.....59,013 W1FQ.....21,229 W1HI.....19,093 K2PM.....9,555 W6RKC.....2,001 K5IB.....36	WB3GBL.....6,624 W8IQ.....4,590 K0VK.....1,848 W4RLS.....1,035 KA7T.....704	KS1J.....1,486,660 N3AAA.....1,317,580 W3KB.....1,306,216 N4XL.....1,013,520 NS3T.....722,990 KA2KON.....695,980 K8LY.....670,542 NC1A.....651,130	W2MKM.....6,047,919 KM8Q.....4,197,402 AA4VT.....3,844,200 W4NF.....3,150,264 K8LX.....2,220,568 W2EN.....1,980,090	
	YOUTH HIGH POWER	1.8 MHz K3PA.....70	14 MHz W2VRK.....12,393 K4CUZ.....230 K1NLL.....80	28 MHz N1DG.....516,502 W4RN.....304,428 N3UA.....224,000 W9XT.....163,280 W6ZL.....67,080 WA2LMC.....45,630 KB3NJB.....42,930 K2ZR.....37,696 K2IW.....37,146 K4JPD.....35,178	MULTI-OP MULTI-TRANSMITTER	
		LOW POWER All Band	7 MHz WU2M.....1,333 WA2NYY.....60		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332	
MULTI-OP MULTI-TRANSMITTER		N1UR.....4,035,766 K1BX.....1,593,606 WW4XX (LZ4AX).....1,303,932 W6DVS.....791,336 K8ZM.....740,124 N1NQD.....725,637 K3SWZ.....682,348 K5FUV.....676,620 AC0W.....559,721 WA3LXD.....524,210	SINGLE OPERATOR ASSISTED HIGH POWER All Band	21 MHz N4IJ.....151,230 N9TGR.....146,727 WA1FCN.....130,438 WA5WFE.....77,998 WB9HFK.....40,940 W8TJM.....11,800 KE0ITC.....10,738 WV7S.....940	MULTI-OP MULTI-TRANSMITTER	
	YOUTH LOW POWER	28 MHz N8II.....326,960 K5OF.....254,562 N1WRK.....141,022 N3GB.....119,704 K4TMC.....114,814 WK2G.....110,016 W4RYW.....91,350 N8VV.....90,780 W8JGU.....76,845 WB0LQC.....70,196	21 MHz W1UE.....262,780 N6SS.....248,381 N1MM.....223,524 W8CZM.....170,240 W7RN (K5RC).....169,500 W1AJT.....161,379	28 MHz K3WW.....6,141,828 WB9Z.....5,813,697 AA3B.....5,674,212 N2IC.....5,410,368 N3RS.....5,085,948 K4AB.....5,004,090 N2SR.....4,869,000 AB3CX.....4,444,160 NN1SS.....4,209,824 AA1ON.....4,182,408		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
MULTI-OP MULTI-TRANSMITTER		21 MHz K4SXT.....19,440 K7BWC.....3,100 N1UMJ.....1,472 KM1NDY.....1,071 W8WJC.....903 N5QNS.....684 N5MKY.....391 KD5CMW.....360 N8TCP.....228 K6WBY.....187	14 MHz KB8VND.....27,335 KB0KFH.....5,412 K4QR.....5,085 KV4AC.....4,386 AA1F.....3,420 W3EH.....2,790 KE3O.....2,528 KG5TKF.....2,016 K65ZJNJ.....1,150 AB1J.....666	7 MHz W6KW.....65,508 W4PG.....31,995 N9LR.....31,125 KG1E.....18,291 N7RK.....15,561 KD4RH.....5,700 KB7QFE.....77		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
EXPLORER SINGLE-OP		7 MHz K9CJ.....7,436 AA8BV.....5,390 KK7DP.....3,774 W8SJS.....272 W6IA.....144	21 MHz K4ZM.....6,017,235 K5TR.....5,005,155 W9RE.....4,980,048 KQ2M.....4,467,840 K3ZO.....4,289,844 NR3X (N4YDU).....4,127,820 ND7K (@N6WIN).....3,007,544 N2QV.....2,785,321 K0EJ.....2,636,412 K7RL.....2,337,120	14 MHz W1QK.....1,168,790 WA1F.....1,020,992 W3ZGD.....958,500 KT4XA.....455,975 W1OP.....283,884 AA2MF.....281,162 KA8YNW.....166,192 W1JSR.....160,590 AD4XT.....114,264		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
EXPLORER SINGLE-OP	UNITED STATES SINGLE OPERATOR HIGH POWER All Band			28 MHz AC5O.....85,902 KO1H.....21,294 N6MZ.....13,456		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
	SINGLE OPERATOR HIGH POWER All Band			7 MHz K1IM.....18,292 KA9A.....3,570 AA4NP.....2,430		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
EXPLORER SINGLE-OP				3.7 MHz W1DYJ.....3,848 WZ6ZZ.....960		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				QRP All Band		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
ROOKIE HIGH POWER				28 MHz K2PI.....19,448 NO5V.....8,576		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				28 MHz K9RS.....7,117,835 K8AZ.....4,458,135 W7RM.....3,960,408 K4RM.....3,704,810 NA2U.....3,257,604 N4UU.....3,093,960 NJ4P.....2,591,512 N4SS.....2,565,640 K3AJ.....2,409,097 W1TJL.....2,221,032		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				MULTI-OP SINGLE-TRANSMITTER HIGH POWER		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				7 MHz W3NO.....59,580 K3MM.....22,400 KM2G.....16,897 W4TTY.....4,998 N2KA.....1,976		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				1.8 MHz K5UR.....4,510 K2KW.....77		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				LOW POWER All Band		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
				28 MHz K1WHS.....51,624 KE0WPA.....35,646		K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
CLASSIC HIGH POWER						K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
						K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
						K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
CLASSIC LOW POWER						K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332
						K3LR.....25,835,784 M6T.....21,693,672 K1LZ.....21,461,871 V26B.....20,092,748 LZ9W.....19,672,752 YT5A.....19,599,723 DF0HQ.....17,362,332

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

What's Your Favorite Category?

When reviewing this data from the 2022 contest (see *Table 1*), I had to do a double-take as it looked almost identical to last year's numbers. We certainly are set in our ways from

an operating point-of-view. Keeping in mind that this is solely all band data, the split between assisted and unassisted entries remains the most informative; the unassisted single operator entries far exceeded their assisted counterparts by 3277 to 2344. Interestingly, the unassisted low power group, in particular, led by over 2:1. It's clear, at least for the CQ WW, that the assisted and unassisted entry classes will be here to stay for some time to come.

Table 1

Category	AF	AS	EU	NA	OC	SA	ALL	% of total
SOAB High/Assisted	2	76	462	658	30	38	1266	20.7%
SOAB High/Unassisted	11	136	276	357	59	28	867	14.2%
SOAB Low/Assisted	3	76	537	343	40	46	1045	17.1%
SOAB Low/Unassisted	16	270	1047	733	153	72	2291	37.5%
SOAB QRP/Assisted		3	14	2	3	1	23	0.4%
SOAB QRP/Unassisted		14	66	23	8	8	119	1.9%
Multi-2	2	13	44	27	8	5	99	1.6%
Multi-Multi	2	6	21	18	5	4	56	0.9%
Multi-Single/High	1	16	114	42	9	18	200	3.3%
Multi-Single/Low		23	65	25	12	6	131	2.1%
Explorer/Multi		1	7		1		9	0.1%
Explorer/Single-Op			3	1	1		5	0.1%
ALL	37	634	2656	2229	328	227	6111	100.0%
% by Continent	0.6%	10.4%	43.5%	36.5%	5.4%	3.7%	100.0%	

*Single band entries not included in analysis.

Table 1. 2022 CQ WW SSB Logs by Entry Class

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

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

WORLD SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
PJ4K	130/10/17	524/22/64	1126/26/82	2226/33/84	2361/35/97	3019/27/100
V47T	41/6/14	613/17/71	1367/26/89	1992/34/98	2319/29/93	3071/25/97
P4ØT	11/5/10	399/15/59	568/23/63	1338/32/99	1619/27/86	2030/28/94
CT3KN	22/5/16	347/13/51	324/16/62	1157/29/88	1527/31/95	2457/31/100
XL3T	151/7/12	701/20/61	1017/27/90	1847/33/99	1263/26/95	1312/24/99

WORLD SINGLE OPERATOR ASSISTED ALL BAND

PT5J	8/4/5	130/17/53	613/32/99	1416/36/113	1637/35/121	2424/33/130
KP3DX	45/8/13	304/14/59	1102/25/89	1483/35/103	1174/31/105	1868/32/108
OMØR	210/10/51	577/18/76	846/30/107	1107/36/120	1273/36/124	1142/36/127
V31XX	34/5/7	428/21/65	897/27/88	762/33/96	1595/29/108	2143/31/114
VA2WA	148/9/17	370/16/59	366/22/69	1352/35/109	1408/29/107	1317/27/117

WORLD MULTI-OPERATOR SINGLE TRANSMITTER

P33W	202/10/56	499/19/78	1921/33/120	2435/39/149	1863/38/146	3183/39/151
PJ4G	38/9/16	498/23/79	1690/30/105	1540/36/124	2028/36/128	3205/34/129
E7DX	52/11/52	701/22/90	1832/34/132	1616/39/144	2013/35/141	2215/38/140
IR4X	48/9/48	515/20/80	1333/34/120	1700/39/140	2038/39/146	1943/37/141
TM6M	123/11/46	535/19/75	1382/33/114	1491/39/132	1808/37/143	2505/39/139

WORLD MULTI-OPERATOR TWO TRANSMITTER

EA8RM	193/11/47	893/21/83	2221/31/115	2979/39/143	4464/38/147	4692/38/155
P4ØL	72/8/18	576/23/75	2120/28/102	2656/38/115	3739/33/119	2972/32/113
ZF1A	97/6/14	784/20/75	2781/29/109	2897/38/116	4186/34/124	4021/33/126
CR6K	209/12/48	1098/20/84	1718/31/112	2177/37/133	3457/36/128	2978/38/136
EI7M	173/11/46	1196/16/80	1647/34/119	2257/40/123	3358/38/136	2530/36/127

WORLD MULTI-OPERATOR MULTI-TRANSMITTER

D4Z	209/15/54	1306/23/89	2856/35/119	4819/39/145	4850/37/144	5222/39/153
CN3A	313/12/53	1981/25/101	3150/32/124	4093/38/144	4328/36/142	4693/39/149
PJ2T	227/14/29	954/23/86	2656/30/118	3490/38/130	3973/33/115	4429/34/123
K3LR	340/14/37	903/23/86	2040/36/129	2767/40/158	3158/38/148	2727/33/142
M6T	581/11/57	1744/21/95	3377/36/131	2570/39/142	2823/38/144	1847/35/133

USA TOP SINGLE OPERATOR ALL BAND

Station	160	80	40	20	15	10
K4ZW	32/10/21	216/16/56	306/25/75	866/30/103	1048/29/106	1205/24/100
K5TR	26/10/16	83/18/48	793/30/77	514/32/84	1178/32/97	1289/32/97
W9RE	23/5/11	118/17/53	369/26/74	798/33/103	1025/33/103	991/30/90
KQ2M	18/8/13	201/15/51	92/17/47	595/29/82	1104/26/81	1402/22/89
K3ZO	10/6/6	255/13/49	387/24/72	501/29/81	1098/30/93	797/24/87

USA SINGLE OPERATOR ASSISTED ALL BAND

K3WW	32/9/18	173/18/59	432/27/89	701/33/105	888/30/111	1286/28/117
WB9Z	26/8/13	206/20/67	192/28/80	366/37/109	770/35/120	1586/33/131
AA3B	29/10/20	213/17/58	328/23/81	763/33/105	823/30/110	1106/28/118
N2IC	25/8/9	108/20/37	882/29/73	367/36/102	1045/33/112	878/32/115
N3RS	30/10/19	133/16/54	186/25/77	555/36/106	942/31/115	996/28/117

USA MULTI-OPERATOR SINGLE TRANSMITTER

K9RS	18/9/16	333/16/66	289/28/88	1164/38/123	1001/32/121	1150/28/120
K8AZ	21/10/19	68/16/51	192/28/84	394/34/112	623/31/119	1147/32/123
W7RM	17/7/7	165/22/35	686/31/73	541/36/107	880/35/111	381/26/74
K4RM	16/6/6	182/18/60	198/27/77	457/37/108	608/29/110	750/29/122
*WW4LL	3/2/2	122/13/53	174/24/77	383/32/100	404/27/102	1032/27/112

USA MULTI-OPERATOR TWO TRANSMITTER

W3LPL	34/12/28	481/22/81	1126/31/108	1481/39/131	2670/36/141	1822/31/138
K1CC	45/10/29	282/18/72	456/32/96	1380/38/125	1576/33/128	1456/31/126
K9CT	42/9/17	212/22/63	512/29/92	786/38/116	1497/35/126	1716/34/129
K2AX	20/8/10	162/13/55	250/26/75	658/34/101	1254/30/116	1432/28/120
W2MKM	18/5/6	153/14/49	193/27/78	888/34/113	1284/30/118	1042/28/119

USA MULTI-OPERATOR MULTI-TRANSMITTER

K3LR	340/14/37	903/23/86	2040/36/129	2767/40/158	3158/38/148	2727/33/142
K1LZ	178/16/50	729/23/83	1336/33/112	2361/40/145	2667/37/140	2472/33/137
WX3B	22/5/9	218/14/52	751/28/86	1927/38/117	2227/32/127	1855/30/123
K1TTT	178/12/33	397/21/74	828/28/95	1425/37/130	1713/34/130	1681/29/126
W3PP	16/9/10	120/18/56	170/25/75	1142/37/109	725/30/121	1278/28/119

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

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

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

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

Getting it Right in the CQ WW!

This is a list of callsigns that you want to be on – the lowest error rates! Each entry in *Table 3* worked at least 1000 QSOs, submitting logs with less than

1% mistakes (e.g., bad calls, not-in-log reports, bad exchanges). Imagine, in several cases, working 5000+ QSOs and having only ~50 QSOs identified as being invalid. These results demonstrate that delivering a winning log is more than simply delivering the highest raw score; it's also about accuracy.

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

Our CQ WW Youth Operators are Everywhere!

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

Table 2

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

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

EUROPE TOP SINGLE OPERATOR ALL BAND

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

EUROPE SINGLE OPERATOR ASSISTED ALL BAND

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

EUROPE MULTI-OPERATOR SINGLE TRANSMITTER

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

EUROPE MULTI-OPERATOR TWO TRANSMITTER

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

EUROPE MULTI-OPERATOR MULTI-TRANSMITTER

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



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

Remembering Fred Laun, K3ZO

BY KEN CLAERBOUT, K4ZW

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

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

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

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

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

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



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

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

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

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

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

RIP OM. It was a hell of a run.

SINGLE-OPERATOR TOP SCORES IN MOST ACTIVE ZONES

<p style="text-align: center;">Zone 3</p> ND7K (@N6WIN) .....3,007,544 K7RL .....2,337,120 K6XX .....2,272,739 K6NA .....1,478,655 W7WA .....667,800	<p style="text-align: center;">Zone 15</p> S53MM .....5,834,028 OM7K (OM7RU).....3,035,167 YT3D .....2,435,860 S57K .....2,283,131 OH5BM .....1,584,008
<p style="text-align: center;">Zone 4</p> XL3T (VE3AT) .....9,135,758 K5TR .....5,005,155 W9RE .....4,980,048 KØEJ .....2,636,412 VC3R (VE7VR) .....2,323,322	<p style="text-align: center;">Zone 16</p> *UA3BL .....543,968 R3RZ .....390,033 *RC5Z .....318,396 *R6KX .....293,917 *UT3EV .....287,421
<p style="text-align: center;">Zone 5</p> K4ZW .....6,017,235 VY2TT (K6LA) .....4,993,944 KQ2M .....4,467,840 K3ZO .....4,289,844 NR3X (N4YDU) .....4,127,820	<p style="text-align: center;">Zone 20</p> C4W (5B4WN) .....7,784,250 *4XØT (4Z5FI).....2,152,332 TA3DE .....1,992,144 YPOC (YO3CZW) ....1,779,138 YM7KA (TA7I) .....1,164,745
<p style="text-align: center;">Zone 14</p> DM6V (DL7FER) .....6,035,036 EB5A .....4,027,944 HB9TOC .....2,775,852 DL2CC .....2,677,106 EA5DFV .....2,543,590	<p style="text-align: center;">Zone 25</p> JH4UYB .....3,562,173 JF2QNM .....1,791,325 JF1NHD (N6VI) .....1,574,703 JH7QXJ .....1,259,760 HL2WA .....1,038,800

Table 3

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

*single operator, all band entries only
**99+% callsign accuracy with >1000 QSOs

Table 3 – Accuracy Winners for the 2022 CQ WW

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

A Few Words from the Director

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

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

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

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

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

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

Table 4

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

Table 4 – 2022 CQ WW Youth Entries by Geography

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



Youth Operators in Action

My First Contact, Andreas Tsiakkouris, 5B4AQT

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

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

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

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

Hello from Croatia, Josipa Vincetic, 9A3GVJ

My name is Josipa, 9A3GVJ, from



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

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

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

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

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

And, Finally...

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



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

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

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

Small Station, Youthful Operator, Joseph Bondi, VE3GKT

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

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

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

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Exploring the CQ WW Contest

BY FERNANDO, EC3A

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

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

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

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

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

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

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

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

K1DG, Doug Grant; K1EA, Ken Wolff; K3LR, Tim Duffy; K3WW, Charles Fulp; K3ZO, Alfred A. (Fred) Laun, III; K5ZD, Randy Thompson; KR2Q, Doug Zwiebel; LA6VQ, Frode Iglund; LU5DX, Martin Monsalvo; OH6LI, Jukka Klemola; PA3AAV, Gert Meinen; RA3AUU, Igor (Harry) Booklan; S50A, Tine Brajnik; S50XX, Kristjan Kodermac; UA9CDC, Igor Sokolov; VE3EJ, John Sluymmer; VK2IA, Bernd Laenger; YO3JR, Andrei (Andy) Ruse.

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

73, John, K1AR, CQ WW Contest Director

(Scores begin on page 92)

A Makeshift CQWW Yagi and Other Antenna Musings

BY BOB ELEK, W3HKK

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

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

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

Announcing:

The 22nd Annual CQ World Wide Foxhunting Weekend

Saturday, May 13– Sunday, May 14, 2023

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

For mobile "T-hunts," some groups prefer the formalities of carefully-crafted boundaries, specifications for signal parameters, time limits, and so forth. Others are content just to have one or more signals to hunt. No need for any regulations, they say. For on-foot hunts, use the international rules <www.homingin.com/intlfox.html> or make up your own. Talk it up on the local repeater and social media to find out what your friends have in mind.

Foxhunting teaches an important skill — the ability to find the source of signals from afar. RDF (radio direction-finding) is useful for public service and volunteer enforcement. It can even save lives. Most of all, it's fun. Give it a try, but ensure

your group has *safe* fun. See to it that no one can be injured by your hidden transmitter or by trying to get to it.

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

Afterward, write up the results and send them to me at <k0ov@homingin.com>. The list of information in a complete CQ Foxhunting Weekend report is posted on my website <www.homingin.com/joek0ov/report.html>. In addition to the details of date, location, hiders, and winners, CQ's readers also want to know what was unique about your hunt and what lessons (positive and negative) you learned from it. Don't forget to include some sharp action photos. The higher the resolution, the better.

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

Joe Moell, KØOV

what's new

Cobra Announces Production of AM/FM CB Radios

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

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

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

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



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

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

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

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

A Vintage Winter Field Day...

Keeping Warm With Vacuum Tubes

BY WILLIAM F. MINIKIEWICZ,* W4FSV

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

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



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

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



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

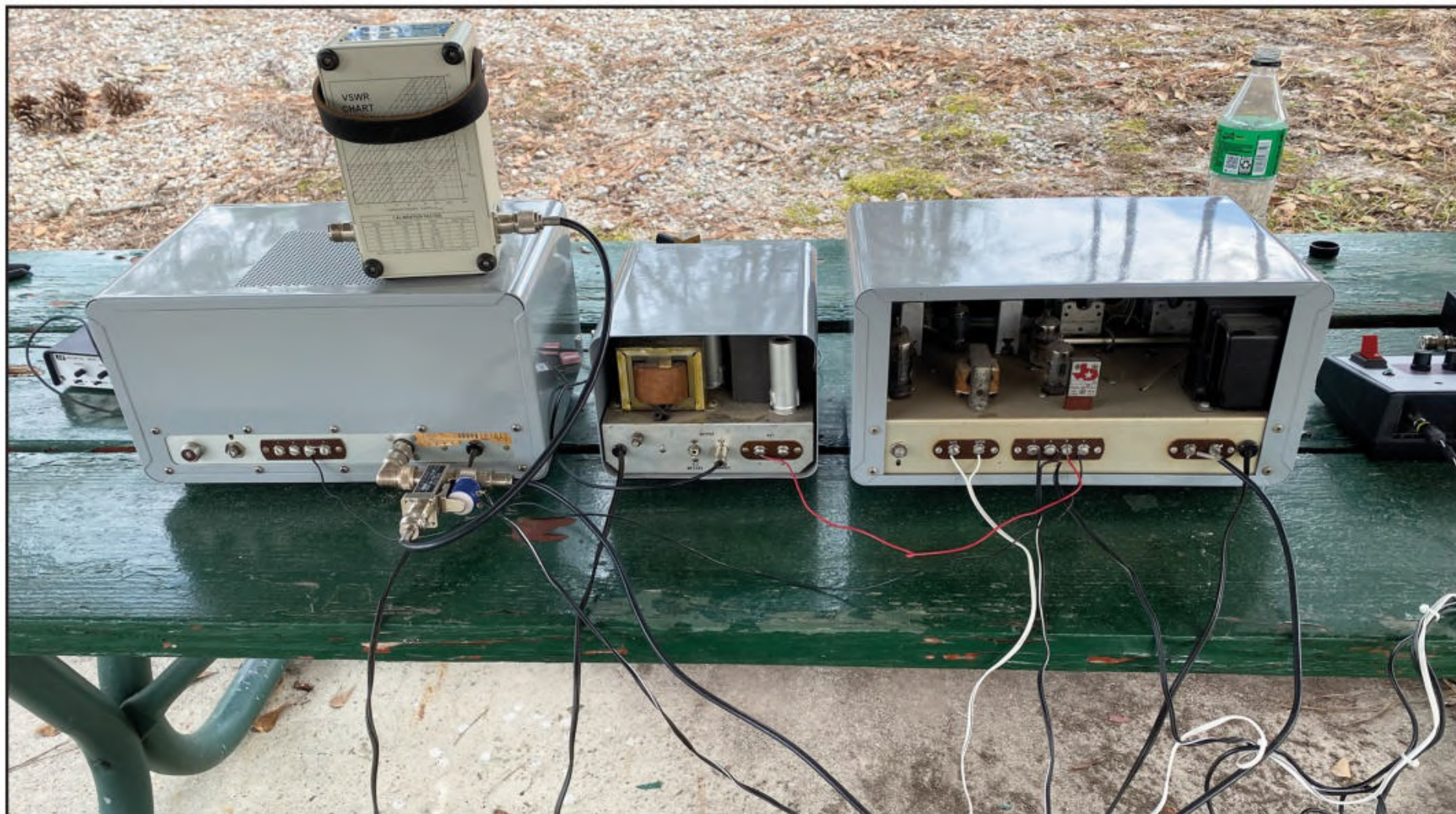


Photo C. Rear view of the vintage equipment. Even 60 years ago, “wireless” wasn’t really wireless!

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

You Gotta Love a Challenge

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

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



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

Living the Dream

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

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

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

A CQ Exclusive: Emergency Power Generation Systems Using Starchy Tuber Arrays

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

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

Introduction and Background

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

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

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

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

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

E-mail:
<heisseluft.emil@mashuga.orf.ar>



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

in *Photo A*, is located in a forested setting just outside Grossmaul an der Donau, Austria.⁴ The facility currently is treating five Radio Amateurs who recently formed a DX contesting club. The members anticipate erecting a rotating tower with Yagis for 160 through 6 meters at the peak of the mountain. Doctors and nurses are in attendance during all contests. The club will be using an all-tuber array of power supplies during the next DX contest to test its capability to function under emergency conditions.

Some Background on Starchy Tuber Electrical Generation Arrays

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

First Application to Amateur Radio

Dear readers, you are most fortunate that, with *CQ* at the forefront of developments in amateur radio, the first amateur-related application of potatoes to power generation has already been described in the pages of this august magazine. Specifically, Hiroki Kato, AH6CY, in the July 2022, issue, published a seminal article titled “‘Green’ Power for QRPp.”⁶

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

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

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

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

High-Power Systems

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



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



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

behind the bylines...

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

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

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

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



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

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

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

Summary

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

Notes:

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

The Gift That Keeps On Giving...

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



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

The Concentric Yagi

BY BRUCE VAUGHN, NR5Q

It was during the blizzard of '86, just five days before the big CQ DX contest, when my rotator failed. The old unit was replaced with one much larger and more expensive, with the hope that it would withstand the most severe ice storms. It did, only to be burned out by a lightning storm in July of '87. While waiting for the rotator to be returned by the repair facility, I started thinking of a way to avoid rotator problems.

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

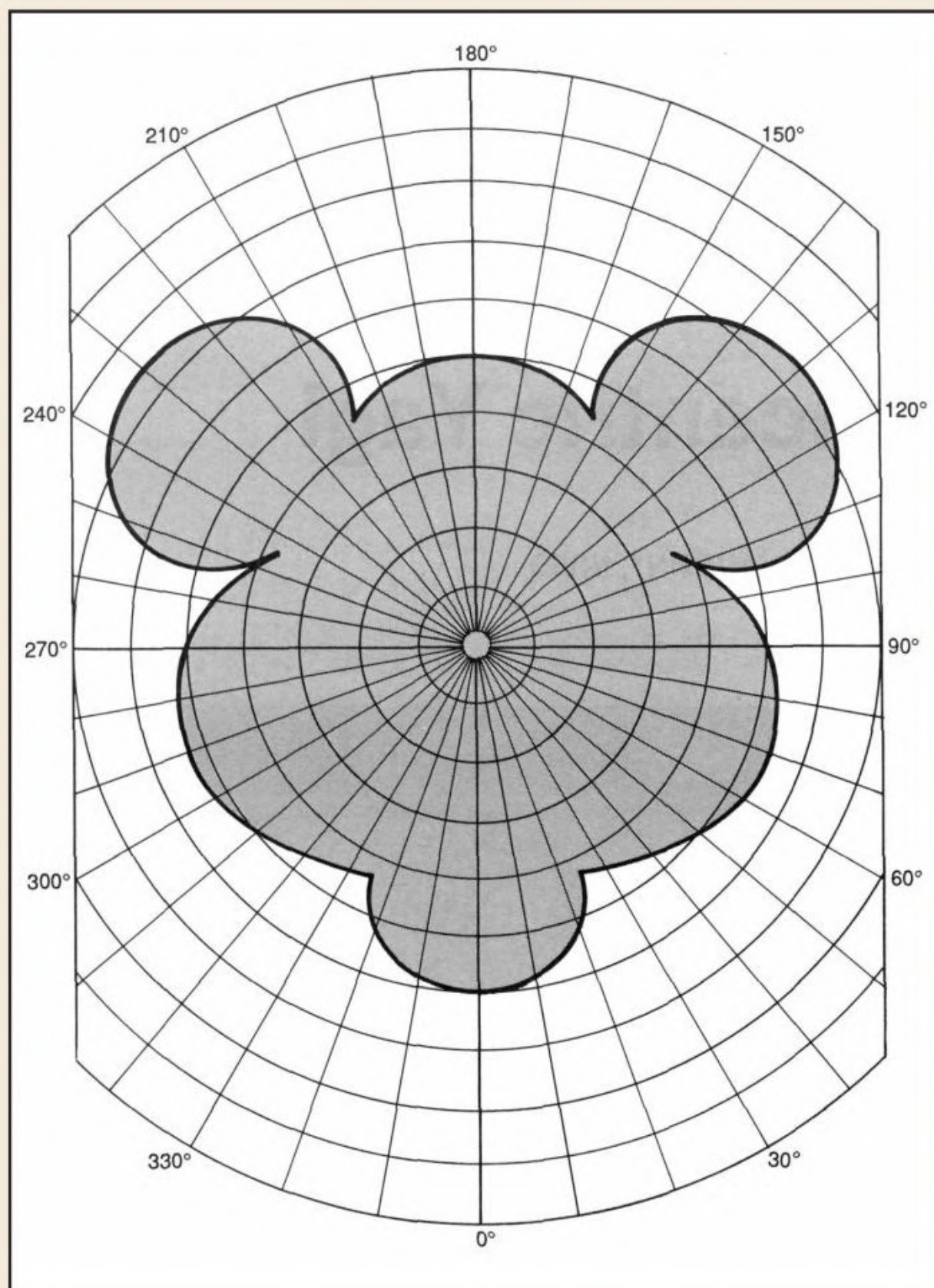


Fig. 1-A chart of the concentric Yagi's radiation pattern.

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

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

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

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

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

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

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

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

Looking Ahead

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

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

Plus...

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

Do you have a hobby radio story to tell? Something for one of our specials? *CQ* covers the entire radio hobby. See our writers' guidelines on the *CQ* website at <http://bit.ly/2qBF0dU>.

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

My Dumbest Portable Operation

BY PAUL SIGNORELLI,* WØRW

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

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

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

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

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

PM Setup, QSOs and ... Oops

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

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

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



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



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

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

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

Paul, WØRW/3/PM

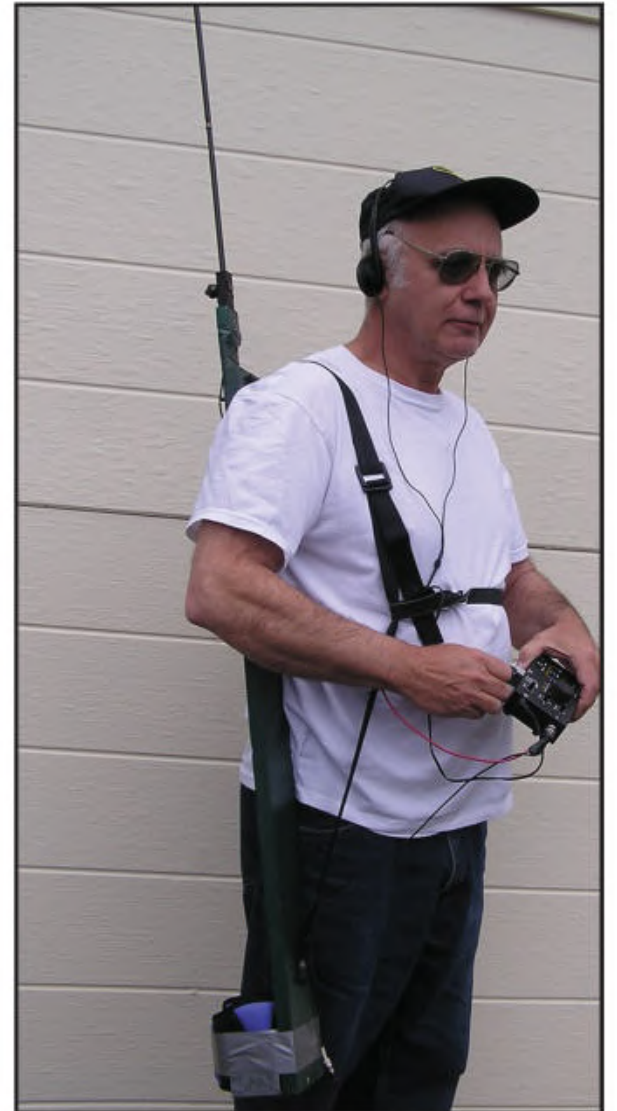


Photo D. Detail of the antenna setup, minus the vest. (WØRW photo)

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

Unusual Facts About Cable Loss

BY MARK PERSONS,* WØMH

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

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

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

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

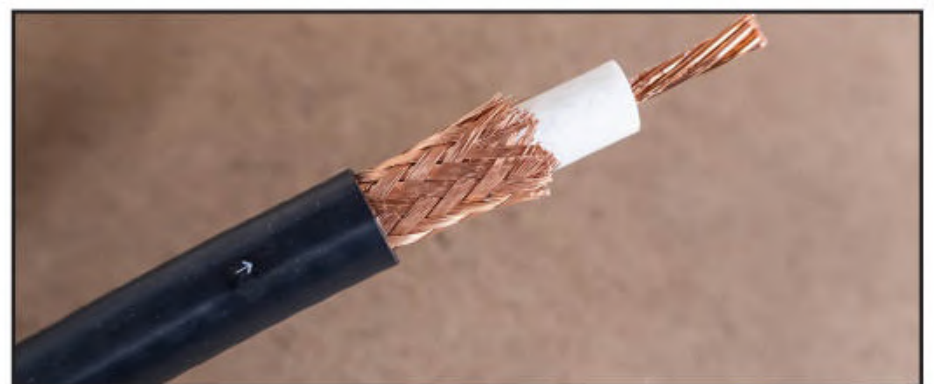


Photo A. RG-8 coaxial cable with arrow printed on outer insulation.

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

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

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

Learning Cyrillic Morse Code

BY KENNETH V. MILLER,* K6CTW

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

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

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

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

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Rancho Cucamonga, CA 91730
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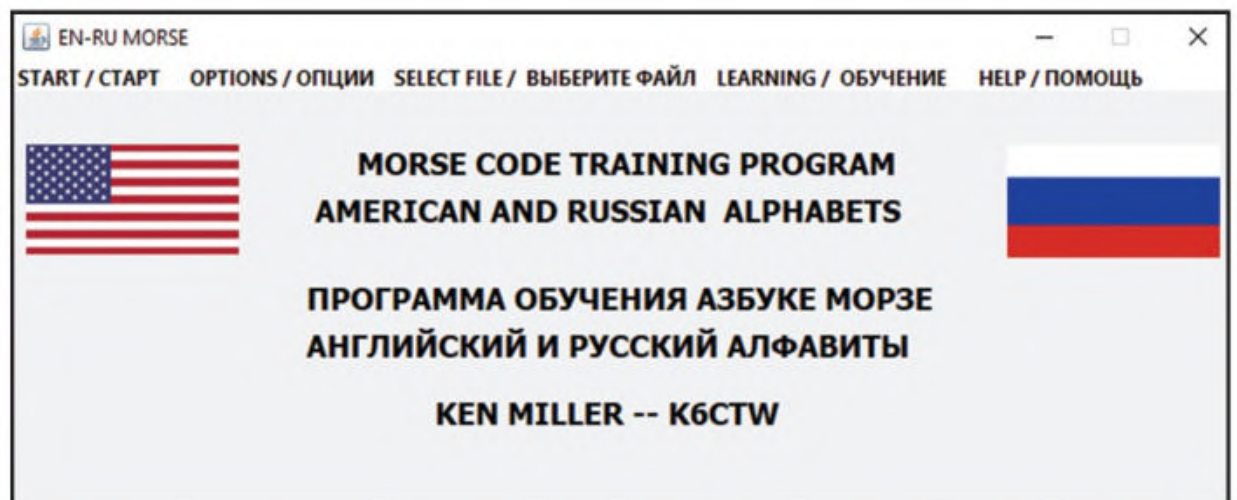


Figure 1. EN_RU_Morse Application Main Screen

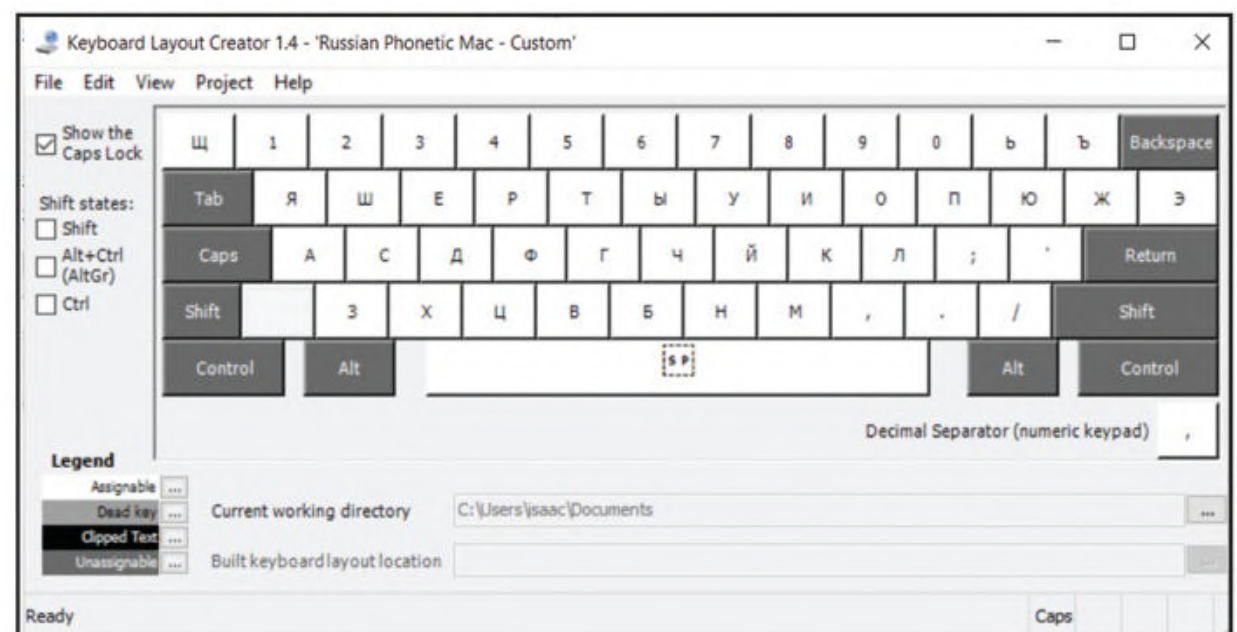


Figure 2. Russian Phonetic Keyboard Layout

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

The Application

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

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

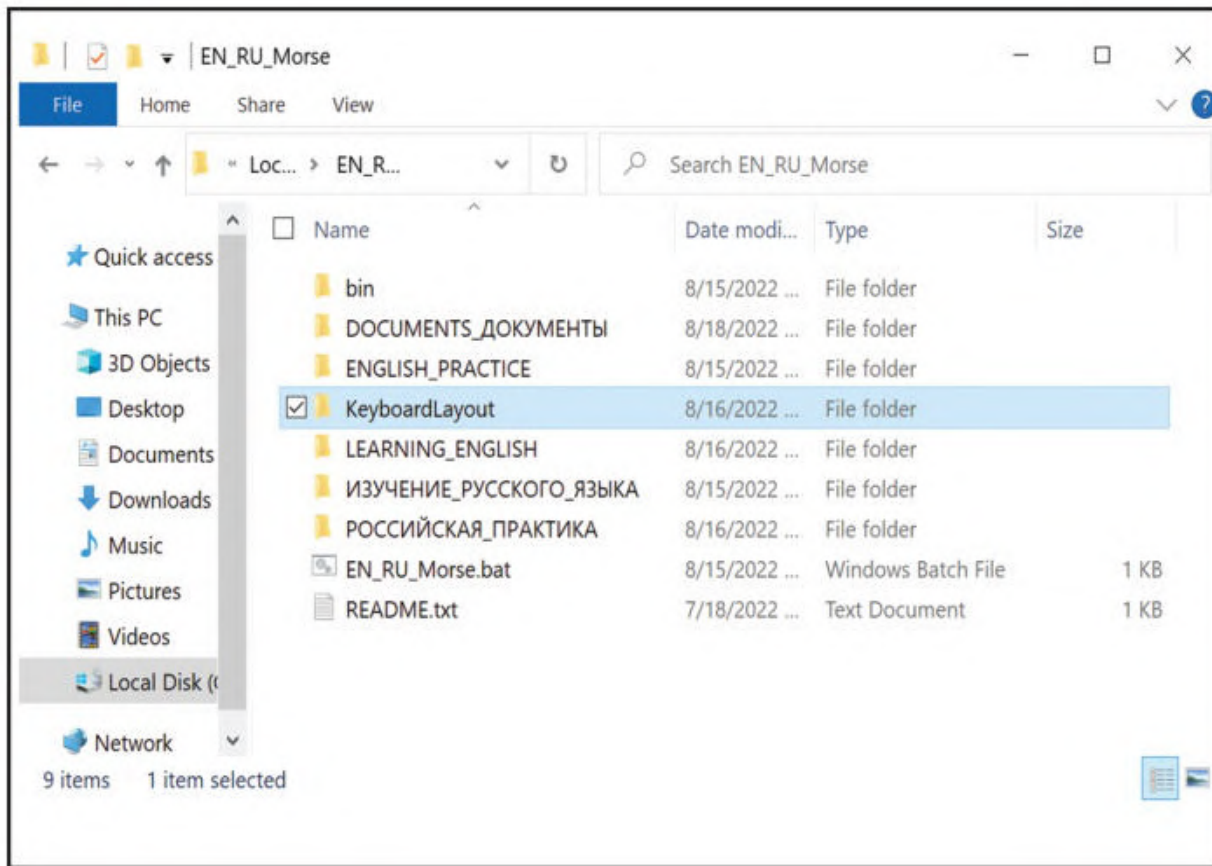


Figure 3. EN_RU_Morse Application Directory Structure

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

With thanks to the author, Isaac de la Pena, included with the *EN_RU_Morse* download is another application, *rus-mac²* that will re-map the keys on your keyboard to a "phonetic" Russian keyboard (Figure 2). This simply means that when you enable this mapping, and you "copy" a dah-di-dit character, and press the "D" key on your keyboard, what will be displayed in the word processor window you are using will be the Russian letter Д. This makes it easier for those touch typists who learned

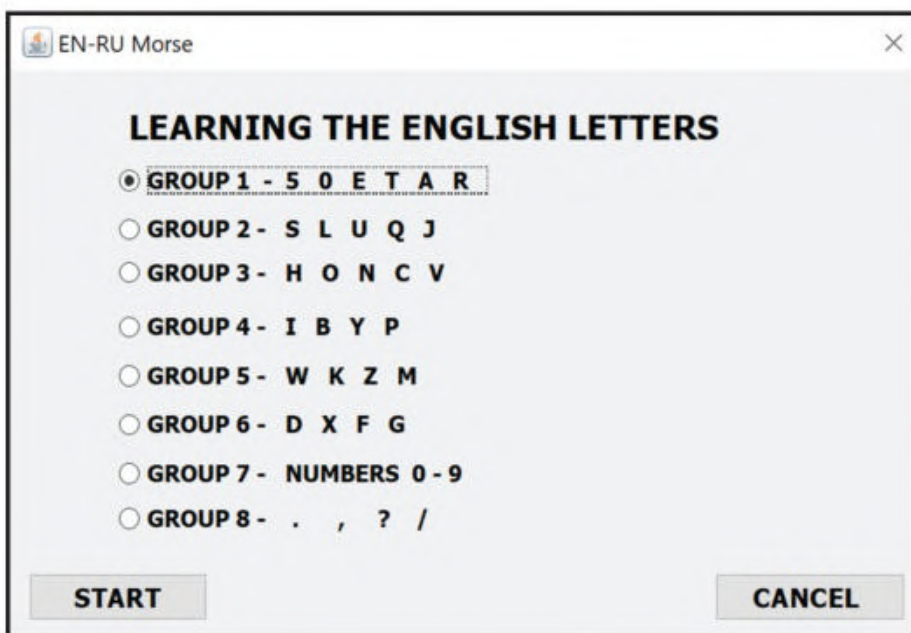


Figure 4. Learning English Symbols

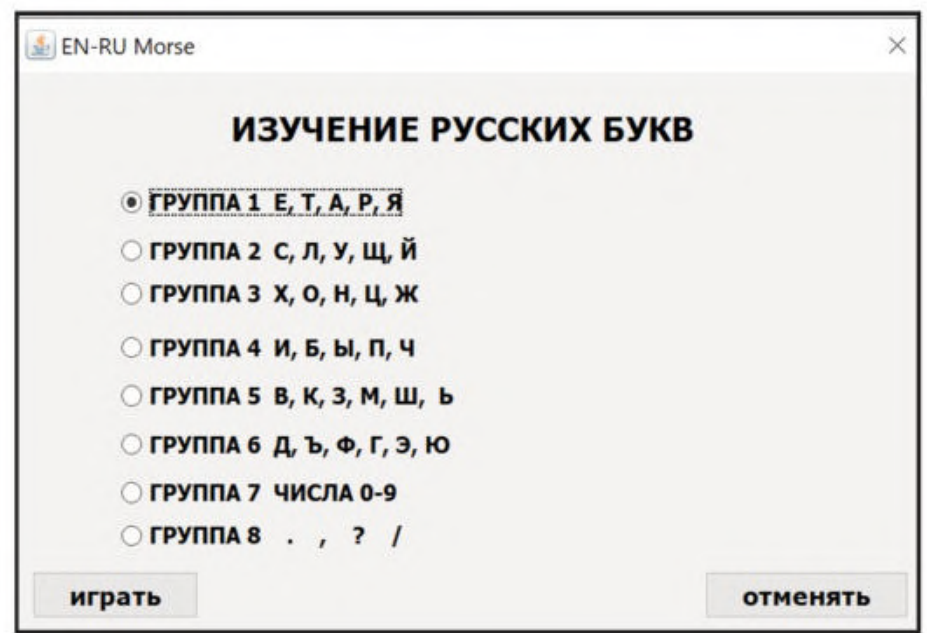


Figure 6. Learning Russian Symbols



Figure 5. Play File (English)



Figure 7. Play File (Russian)

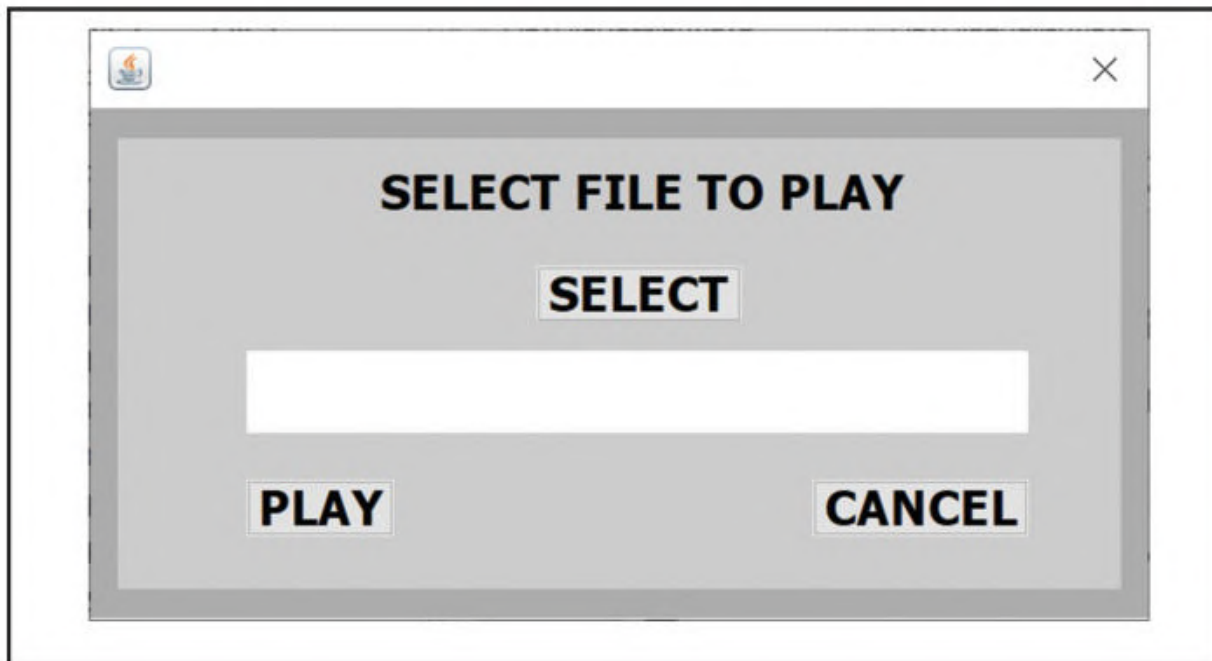


Figure 8. Select File (English)

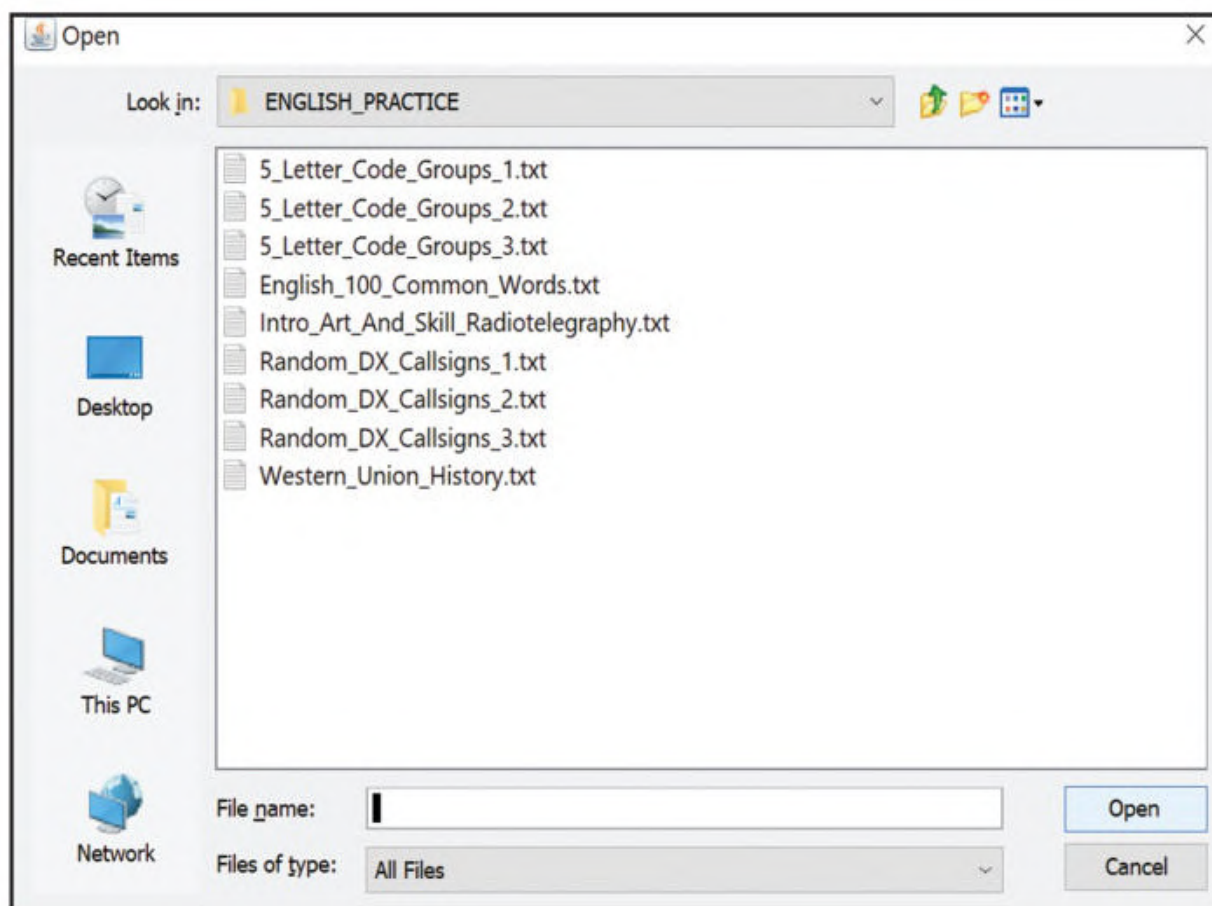


Figure 9. English Practice Files

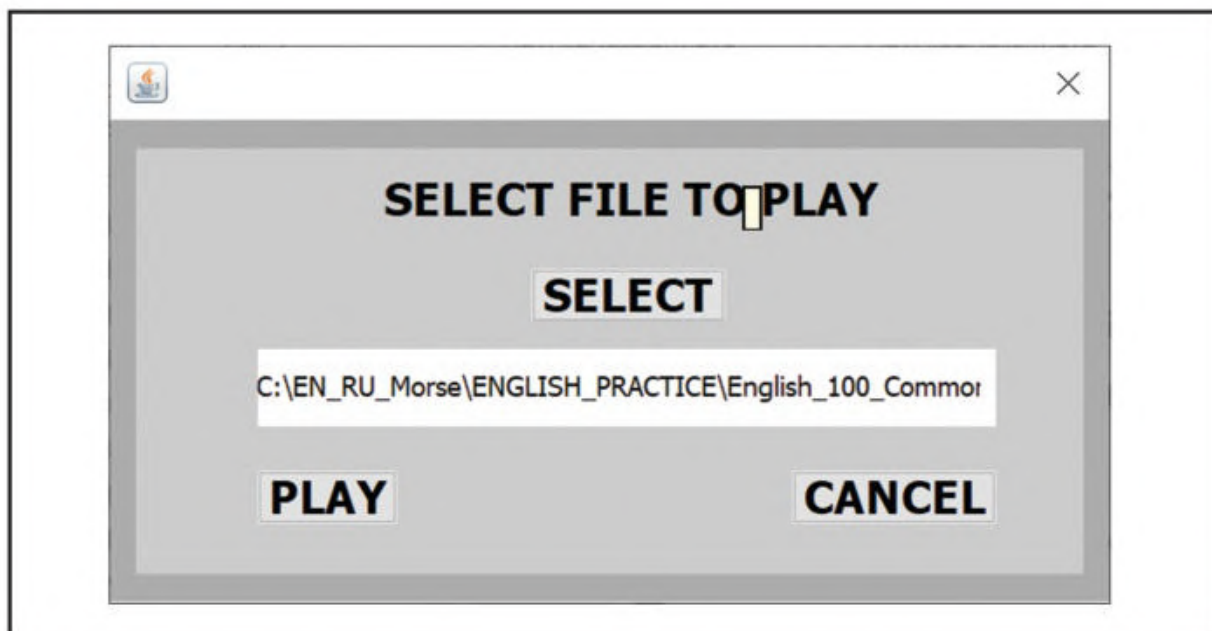


Figure 10. Play Selected File (English)

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

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

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

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

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

Additionally, there are the following folders:

- * ENGLISH_PRACTICE
- * ПРАКТИКА РУССКОГО ЯЗЫКА (Russian_Practice)
- * LEARNING_ENGLISH
- * ИЗУЧЕНИЕ РУССКОГО ЯЗЫКА (Learning_Russian).

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

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

Operation

To start the application, double click on

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

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

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

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

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

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

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

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

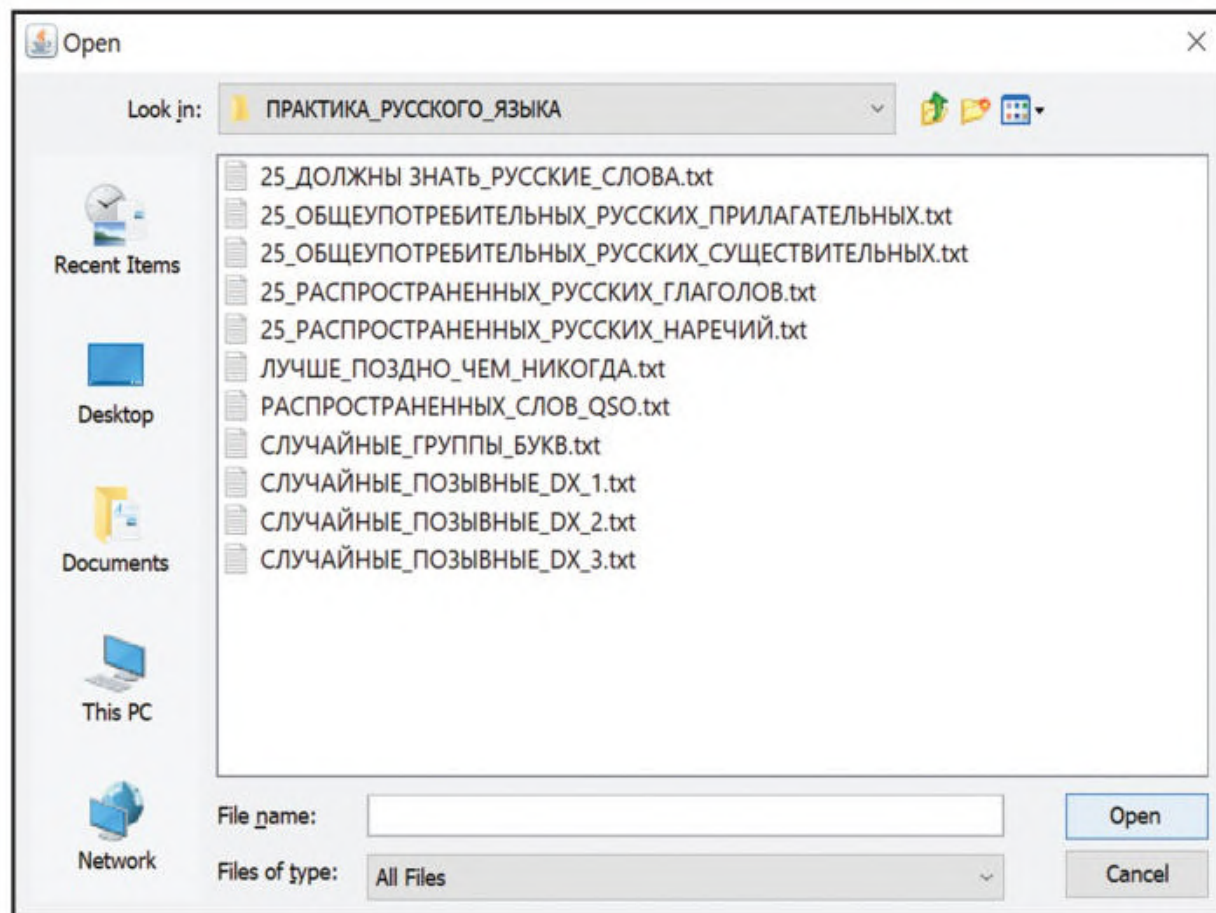


Figure 11. Russian Practice Files

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3CX1200D7	4CX10000A	845
3CX1200Z7	4CX15000A	6146B
3CX1500A7	4CX20000B	3-500ZG
3CX3000A7	4CX20000C	3-1000Z
3CX6000A7	4CX20000D	4-400A
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If the language selection is **РУССКИЙ** (Russian), then the **ИЗУЧЕНИЕ РУССКИХ БУКВ** (Learning Russian Letters) dialog box (*Figure 6*) will be displayed.

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

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

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

The files currently included in this directory are as follows:

- * **5_Letter_Code_Groups_1.txt**
- * **5_Letter_Code_Groups_2.txt**
- * **5_Letter_Code_Groups_3.txt**
- * **English_100_Common_Words.txt**

- * **Intro_Art_And_Skill_Radiotelegraphy.txt**
- * **Random_DX_Callsigns_1.txt**
- * **Random_DX_Callsigns_2.txt**
- * **Random_DX_Callsigns_3.txt**
- * **Western_Union_History.txt**

The names of the files are self-explanatory. Note that the Introduction to the Art & Skill of Radiotelegraphy contains the introductory paragraphs from the book.⁴ The Western Union History is an article from the internet that has been set up for long duration copy as it is quite a long file. Finally, the English 100 Common Words is really for typing practice, to assist in developing muscle memory for those most common words. Although not included in this version, the author also put together, in chapter files, the book, "A Princess of Mars," by Edgar Rice Burroughs which makes for great relaxing copy.

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

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

Conclusion

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

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

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

REFERENCES

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

DITS and DAHS

The **A B C**'s of Morse Code Operating

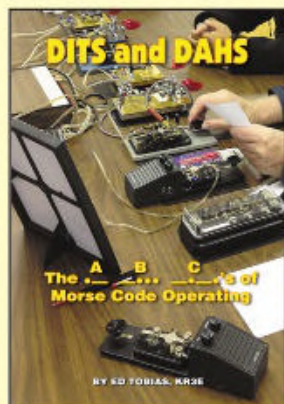
BY ED TOBIAS, KR3E

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A Universal AM Modulator

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

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

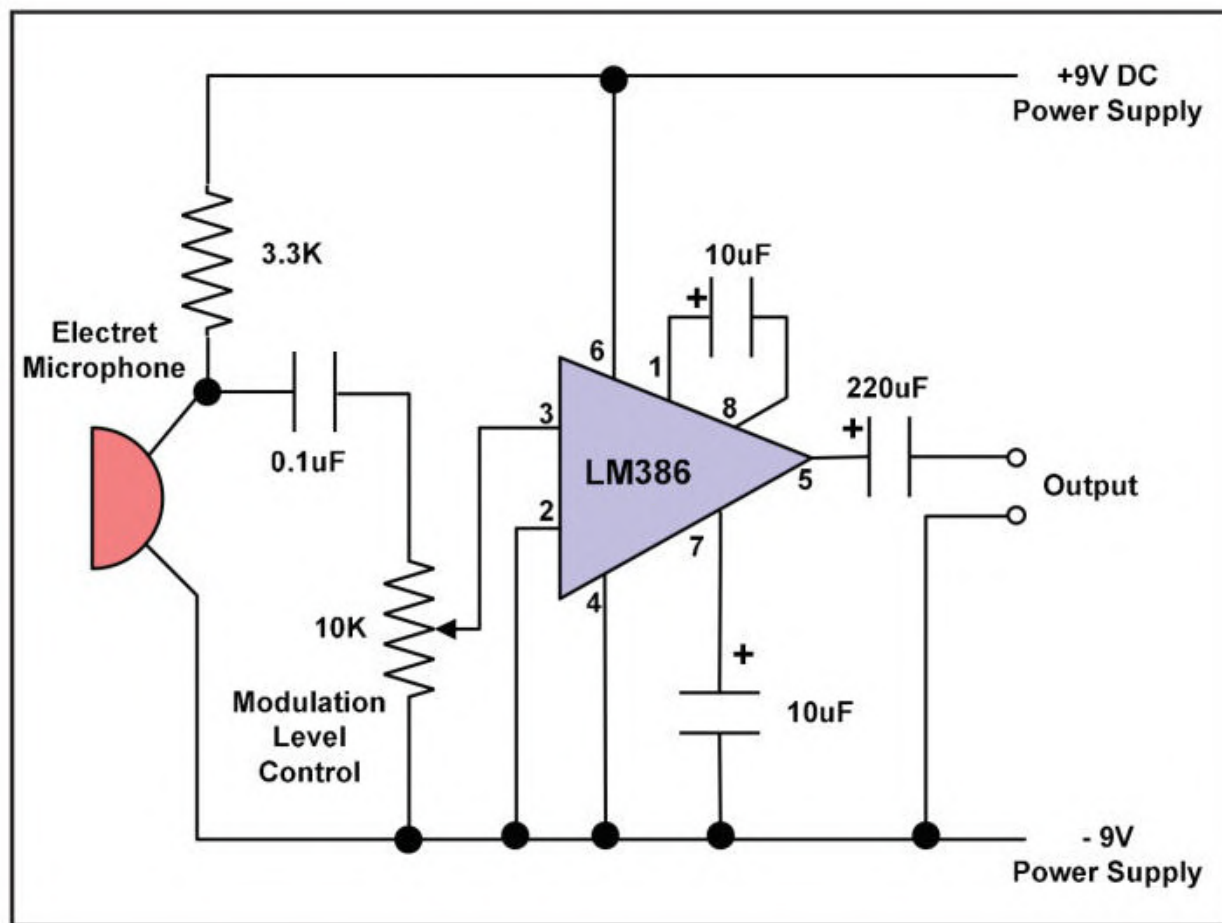


Figure 1. Universal AM Modulator

Application 1 - AM RF Transmitter

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

Application 2 - Ultrasonic AM Transmitter

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

Application 3 - Optical AM Transmitter

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

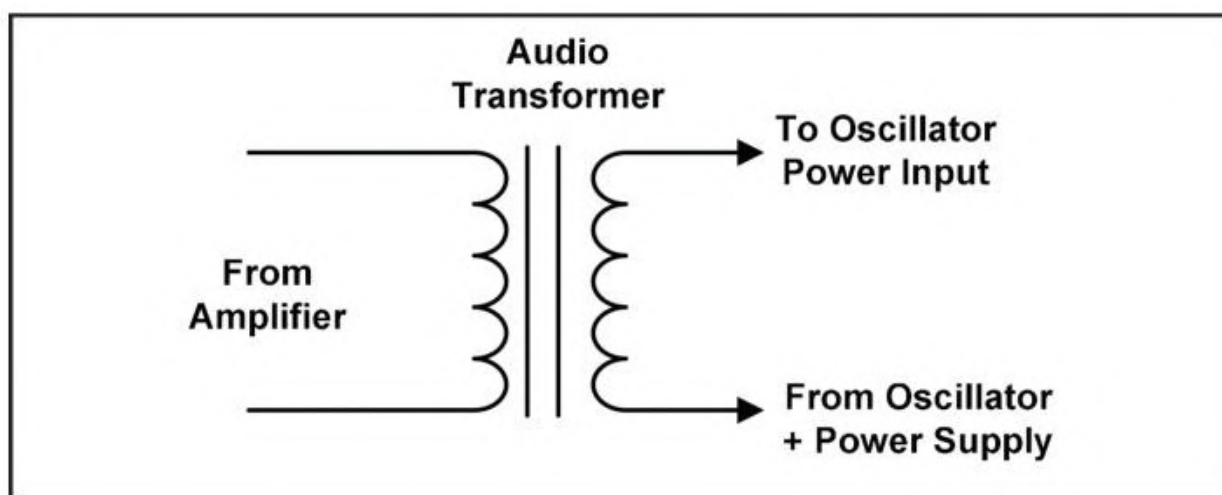


Figure 2. Applications 1 and 2

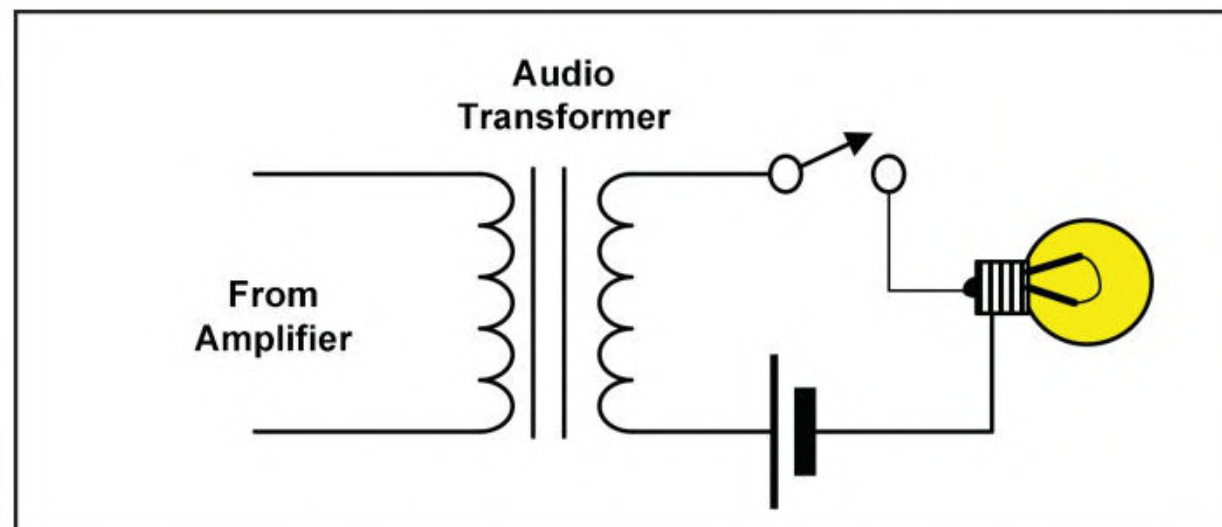


Figure 3. Application 3

*c/o CQ magazine

VHF Propagation

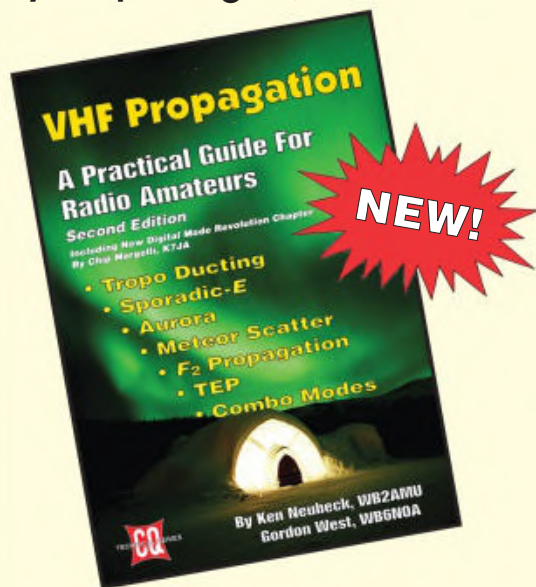
A Practical Guide for Radio Amateurs

Second Edition

By Ken Neubeck, WB2AMU,
Gordon West, WB6NOA

With New Digital Mode
Revolution Chapter

By Chip Margelli, K7JA



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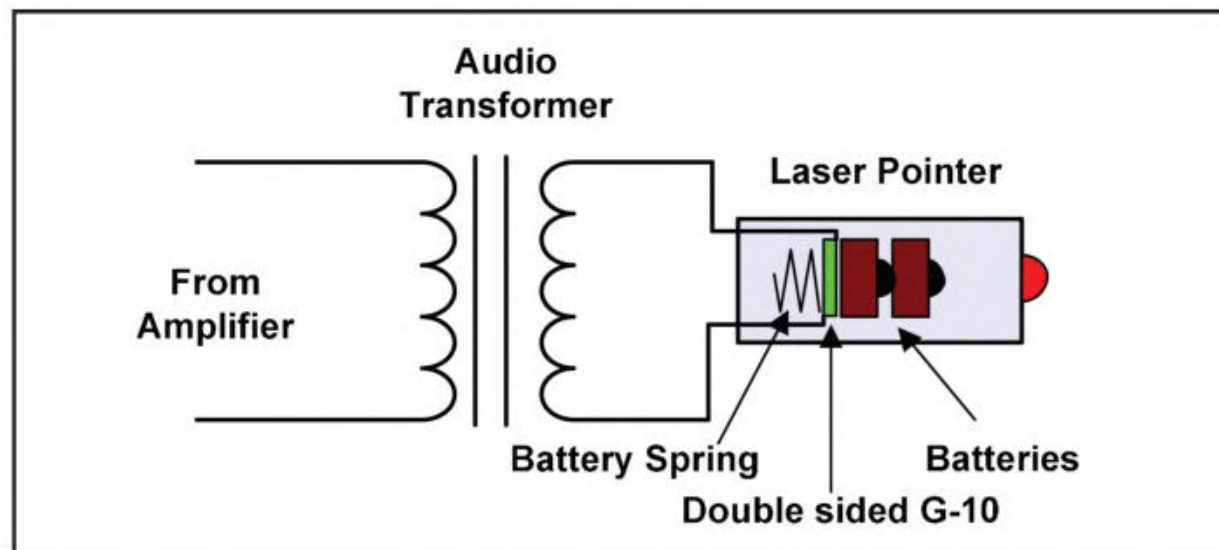


Figure 4. Application 4

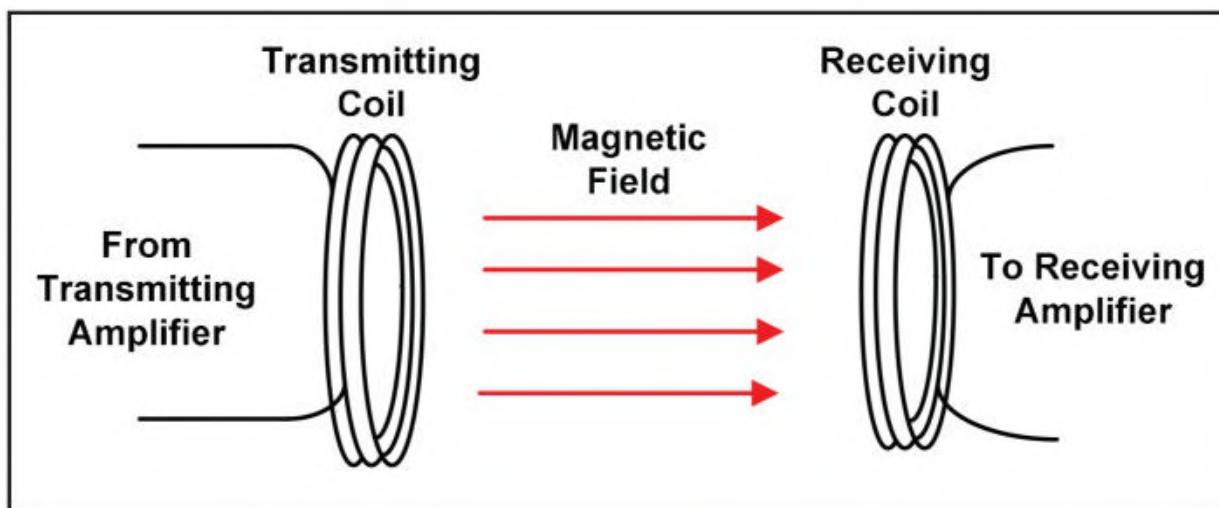


Figure 5. Application 5

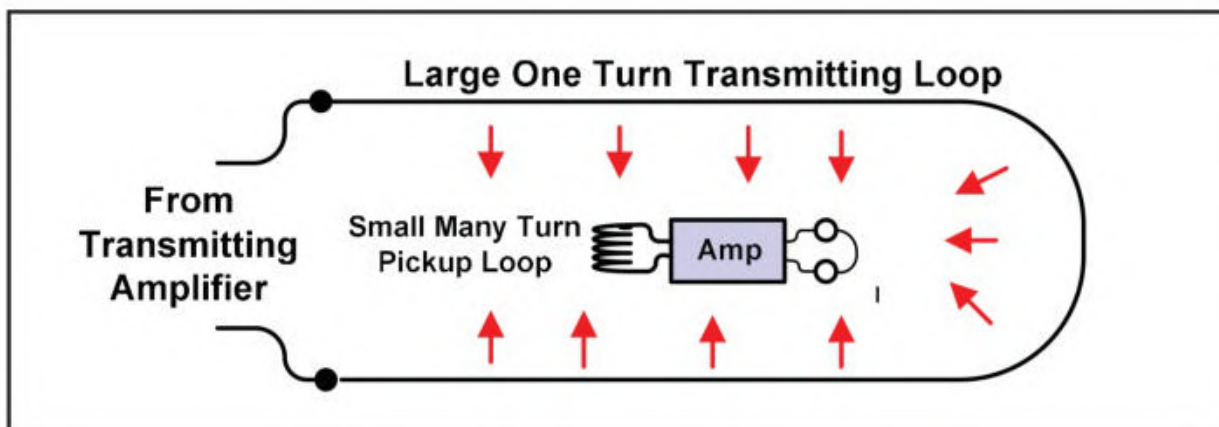


Figure 6. Application 6

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

Application 4 – AM Laser Transmitter

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

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

Application 5 – Magnetic Transmitter

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

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

Application 6 - Direct Audio Transmitter

If you connected the output of the modulator directly to a one turn loop of wire

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

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

Application 7 - Ground Wave Transmitter

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

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

- Regards, Irwin, WA2NDM

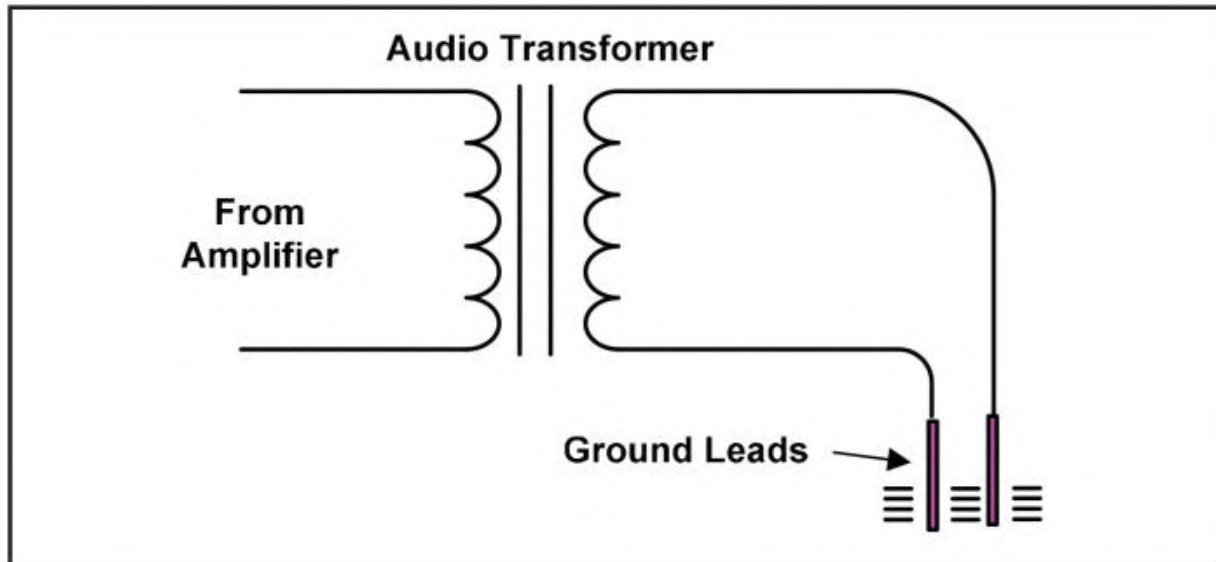
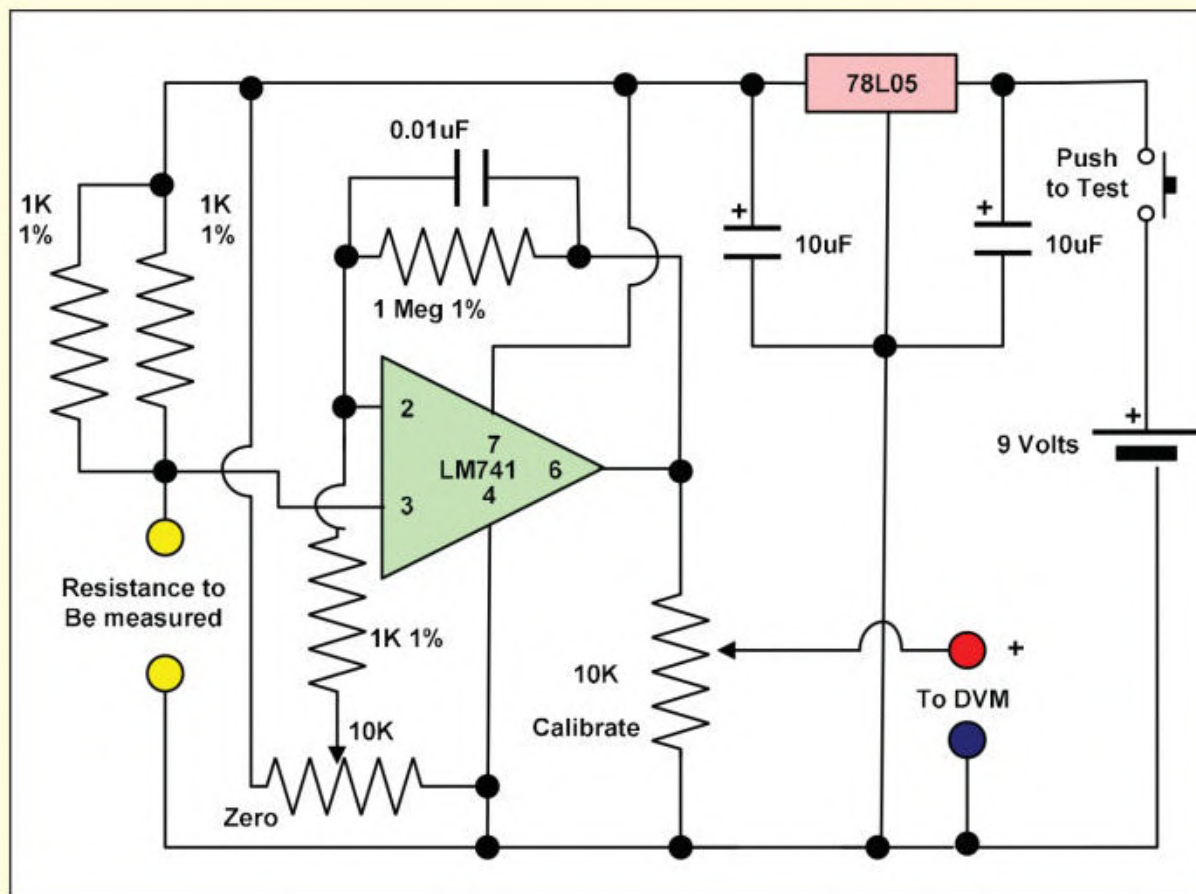


Figure 7. Application 7

Correction to January Column

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



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

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emergency communications

BY JOHN FERGUSON,* K3PFW

A Collaborative Effort

col·lab·o·ra·tive

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

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

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

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

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

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

to the national level. A group that is organized, by its very nature, has a plan, a framework it uses to function efficiently.



ARES

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

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

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

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

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

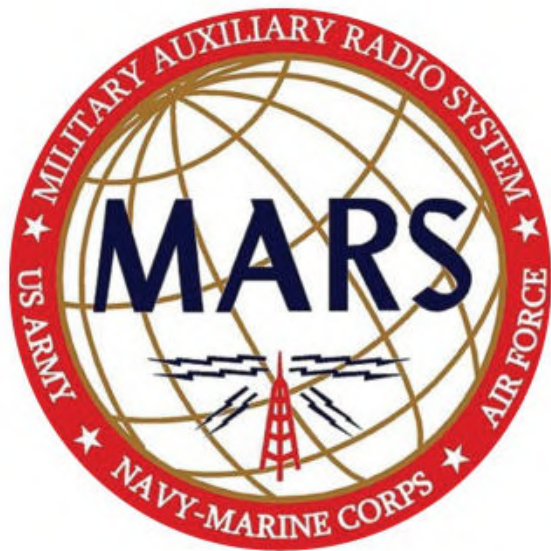


Skywarn and MARS

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

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

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

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



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

Faith-Based Organizations

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

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

RACES and AUXCOMM

No discussion of amateur radio emergency communications would be com-

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

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

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

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



References

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

ARRL – Home: <<https://www.arrl.org>>

ARES (ARRL): <<http://www.arrl.org>> ares>

SKYWARN <<https://www.weather.gov>> SKYWARN>

U.S. Army MARS <<https://netcom.army.mil>> mars>

U.S. Air Force MARS: <<https://www.mars.af.mil>>

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

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

REACT International: <<https://reactintl.org>>

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

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

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

On the Home Front

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

73, John K3PFW

kit building

BY JOE EISENBERG,* KONEB

Updates, Antennas and Tools, Oh My...

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

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

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

Wire Winders

While on the subject of 3D printing, I

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Hamfest Hotline #5855

have discovered a number of wire antennas popular with those who enjoy portable operating. Parks On the Air (POTA) as well as Summits On the Air (SOTA) operators often deal with the problem of storing and deploying these wires for end-fed antennas and dipoles which can also include counterpoise wires for vertical antennas. Adam Kimmerly, K6ARK, has designed a number of extremely compact wire antenna kits that I'll be reviewing soon. In addition, Adam also provides the 3D printing files to make winders for

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

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

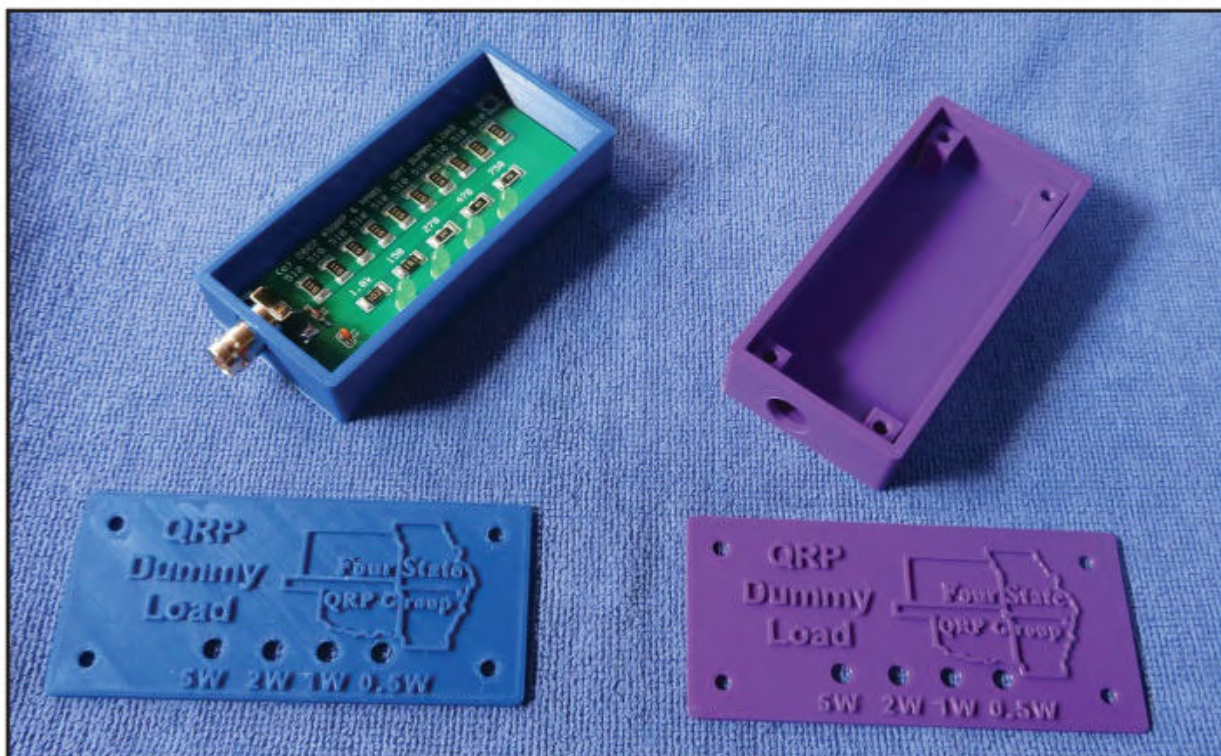


Photo A. The original 4-State QRP Group 4S Dummy Load mounted in the original version of the 3D printed case (left), and the new design case (right) made for having the BNC connector mounted on the bottom of the PC board.



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



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

Soldering Pen

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

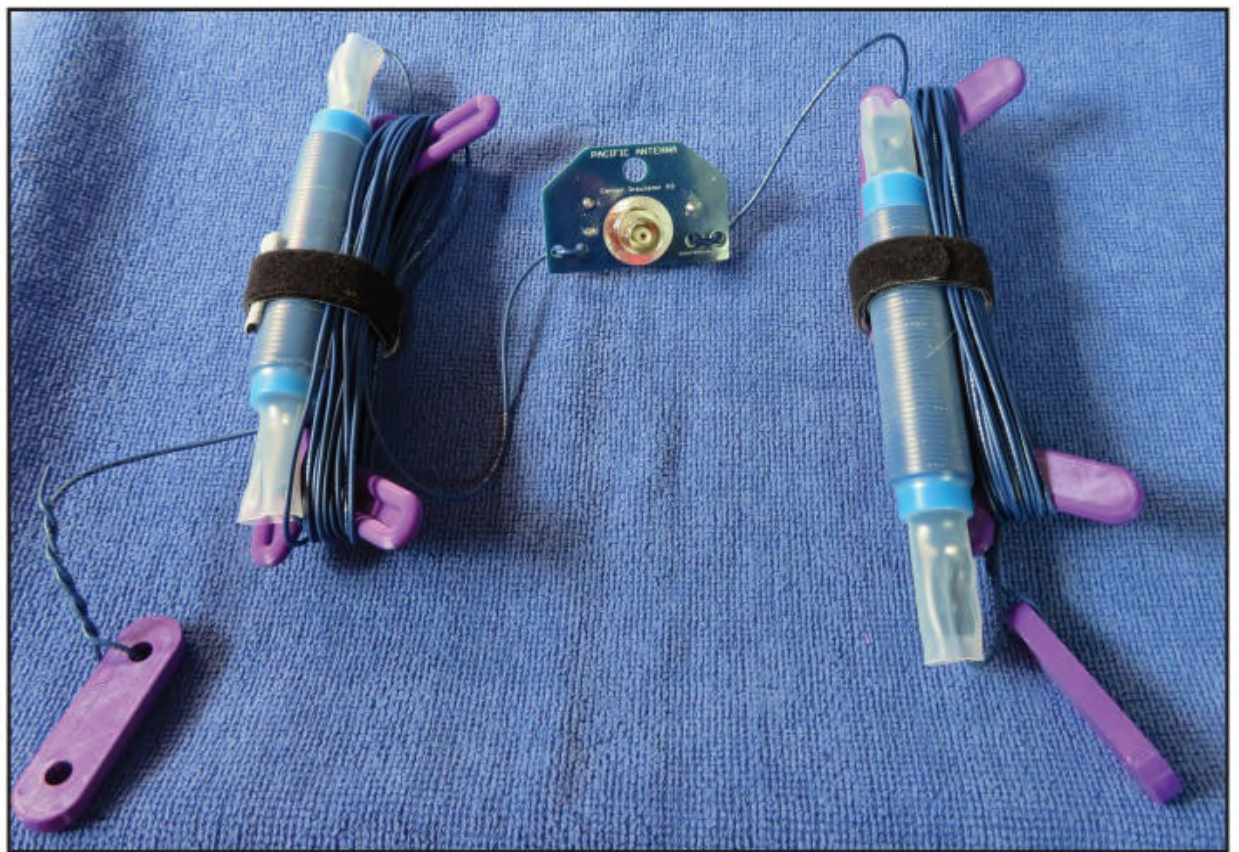


Photo C. A Pacific Antennas 20/40M trap dipole kit wrapped on two K6ARK-designed 3D printed winders.



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

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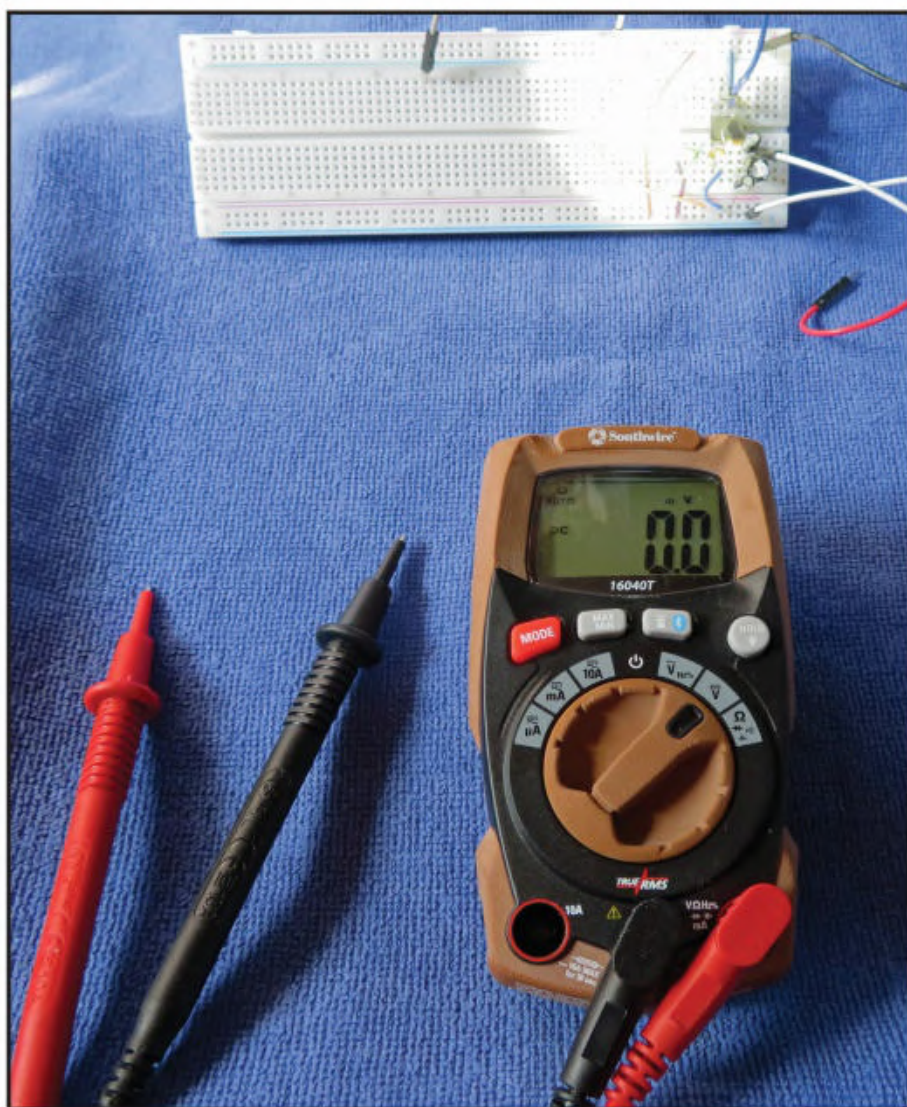


Photo E. A Southwire multimeter featuring a lighted display, Bluetooth connectivity, and an LED "headlight" to illuminate the circuit being tested.

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

Getting a Good Reading

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

Hamfests on the Horizon

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

Until next time,
73 de KONEB

magic in the sky

BY JEFF REINHARDT,* AA6JR

I Need a Bigger Antenna!

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

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

Road Trip

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

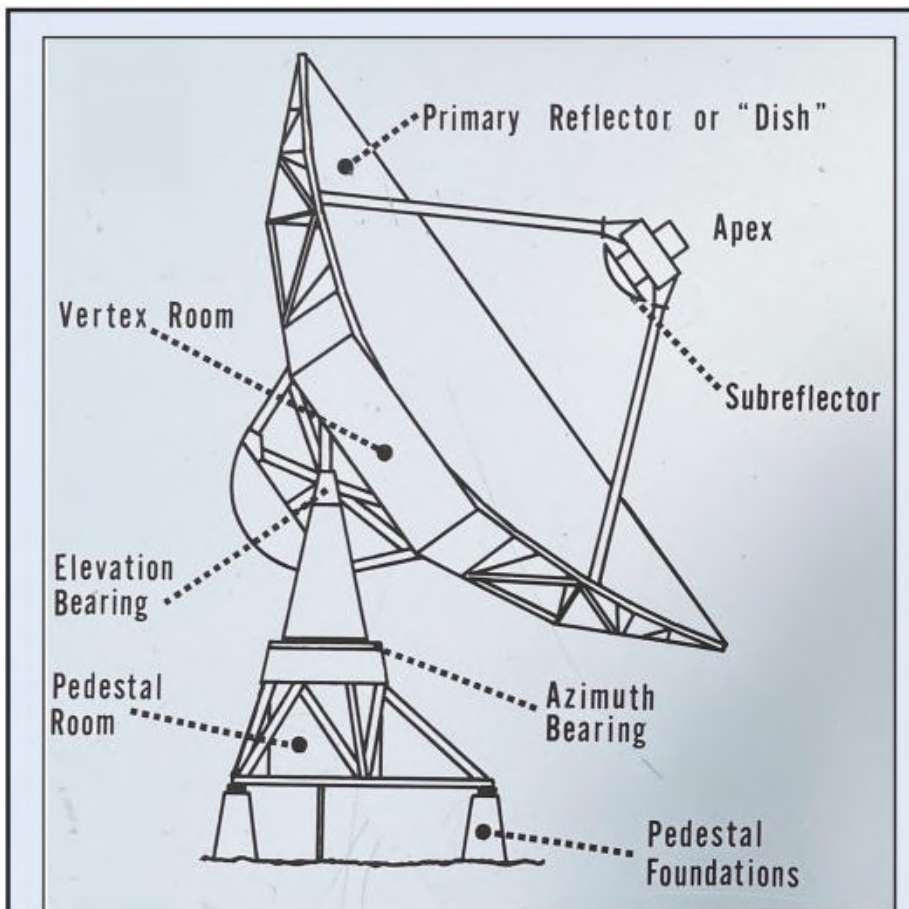
*5904 Lake Lindero Drive, Agoura Hills, CA 91301
e-mail: <aa6jr@cq-amateur-radio.com>



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



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



Antenna Specifications

Type: Offset cassegrain with asymmetric subreflector
 Mount: Altitude-Azimuth
 Focal Ratio: $f/.35$
 Total Weight: 235 Tons
 Total Height: 29 Meters (94 ft.) when pointed straight up
 Dish Diameter: 25 Meters (82 ft.)
 Drive System: 4 Electric motors (2 per axis)
 Range of Motion: 540 degrees azimuth, 120 degrees elevation
 Tracking Accuracy: 15 arc seconds in winds up to 18 mph
 Foundations: Height above track 1.9 Meters (6ft. 4in.)
 Depth below track 9.7 Meters (32ft.)

Technical specifications of the VLA radiotelescope dish antennas.



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

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

The Road Less Traveled

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

Do Your Homework

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

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

What You'll Experience

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

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



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

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

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

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

Just What's "Out There"?

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



No, these folks were not calling us through the VLA – but you can visit them in Roswell, New Mexico, about a 3½-hour drive to the east. And remember – this is the April issue!

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

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

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

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

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

antennas

BY KENT BRITAIN, WA5VJB

Care and Feeding of SWRs

For some years, there has been considerable speculation about those tiny SWRs crawling around on our antennas and soaking up RF energy. Do they have six legs? Do they have eight legs? Microscopic studies have shown that they are indeed related to arachnids and thus have eight legs. But they don't necessarily put them all down on your feedline at the same time. Get those radio waves going up and down the antenna and it burns their feet! They lift up one foot, then another, and when they have seven legs in the air and are standing on only one foot, your SWR is 1 and you get out best!

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

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

Late News Flash!

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

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



announcements (from page 2)

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

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

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

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

ODENTON, MARYLAND — The Maryland Mobileers Amateur Radio Club will hold the MMARC Spring Hamfest from 7:30 a.m. to noon, Sunday, April 23 at the Odenton Volunteer Fire Department, 1425 Annapolis Road (Rt. 175). Contact: Bruce McPherson, AB3AC, Phone: (410) 456-2500. Email: <bmcpherson73@verizon.net>. Website: <https://tinyurl.com/2p935p6k>. Talk-in 146.805- (PL 107.2).

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

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

MAY

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

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

BOONSBORO, MARYLAND — The Antietam Radio Association will hold The Great Hagerstown Hamfest from 7 a.m. to 1 p.m., Saturday, May 6 at the Washington County Ag Ed Center 7313 Sharpsburg Pike, Rte MD-65 South Boonsboro. Contact: Steve Struharik, WA8EIH, Phone: (240) 818-1248. Email: <struhariks@gmail.com>. Website: <http://W3CWC.org>. Talk-in 146.730- (PL 100). VE Exam and card checking.

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

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

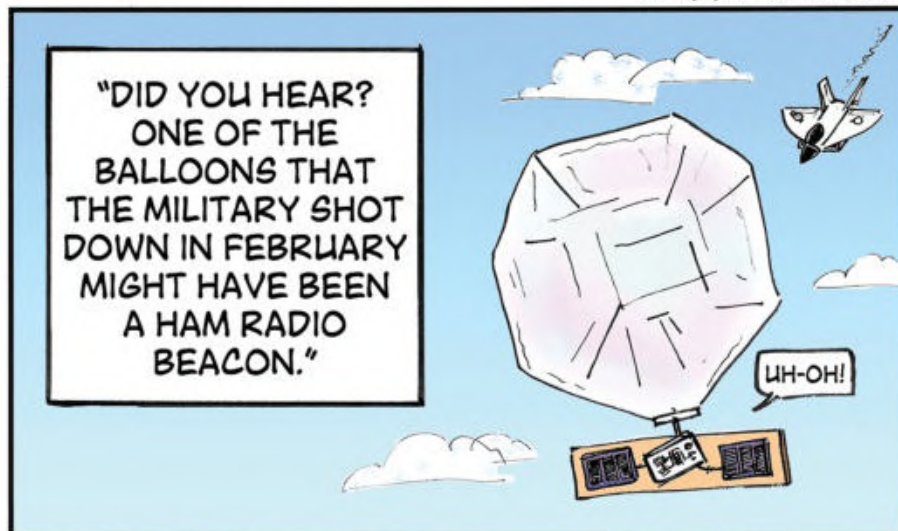
PRESCOTT VALLEY, ARIZONA — The Yavapai Amateur Radio Club will hold the 2023 Prescott Hamfest from 8 a.m. to noon, Sunday, May 13 at the Granville Elementary School, 5250 Stover Drive. Contact: John Stover, KT7P, <hamfest@w7yrc.org>. Website: <www.prescotthamfest.org>. Card checking.

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

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

SPURIOUS SIGNALS

By Jason Togyer W3MCK
www.jaythurbshow.com



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qrp: low-power communications

BY R. SCOTT ROUGHT,* KA8SMA

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

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

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

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

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

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

WFD 2023

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

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

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



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

*<ka8sma@cq-amateur-radio.com>



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



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



Photo D. Ooh la la! The finished shelter.

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

The Makeshift Shelter Revisited

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

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



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

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

Fun in the Woods

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

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

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



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

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

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

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

Update - The V Stands

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

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

Until June, 73

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learning curve

BY RON OCHU, KOØZ

DX Abides...

It's the Journey, Not the Destination!

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

Win Some, Lose Some

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

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

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



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

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

DXpeditions Are Exciting

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

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

All DX is Exciting!

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

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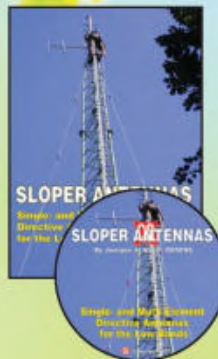
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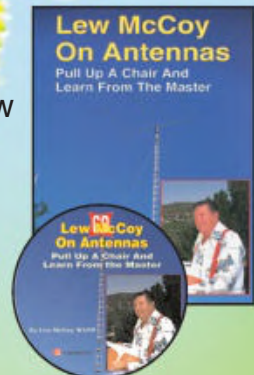
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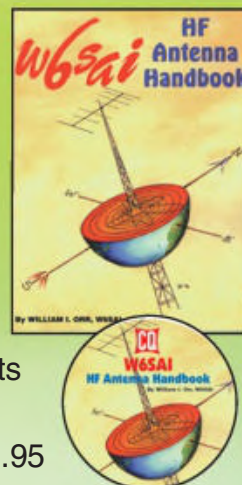
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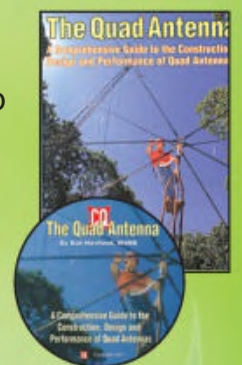
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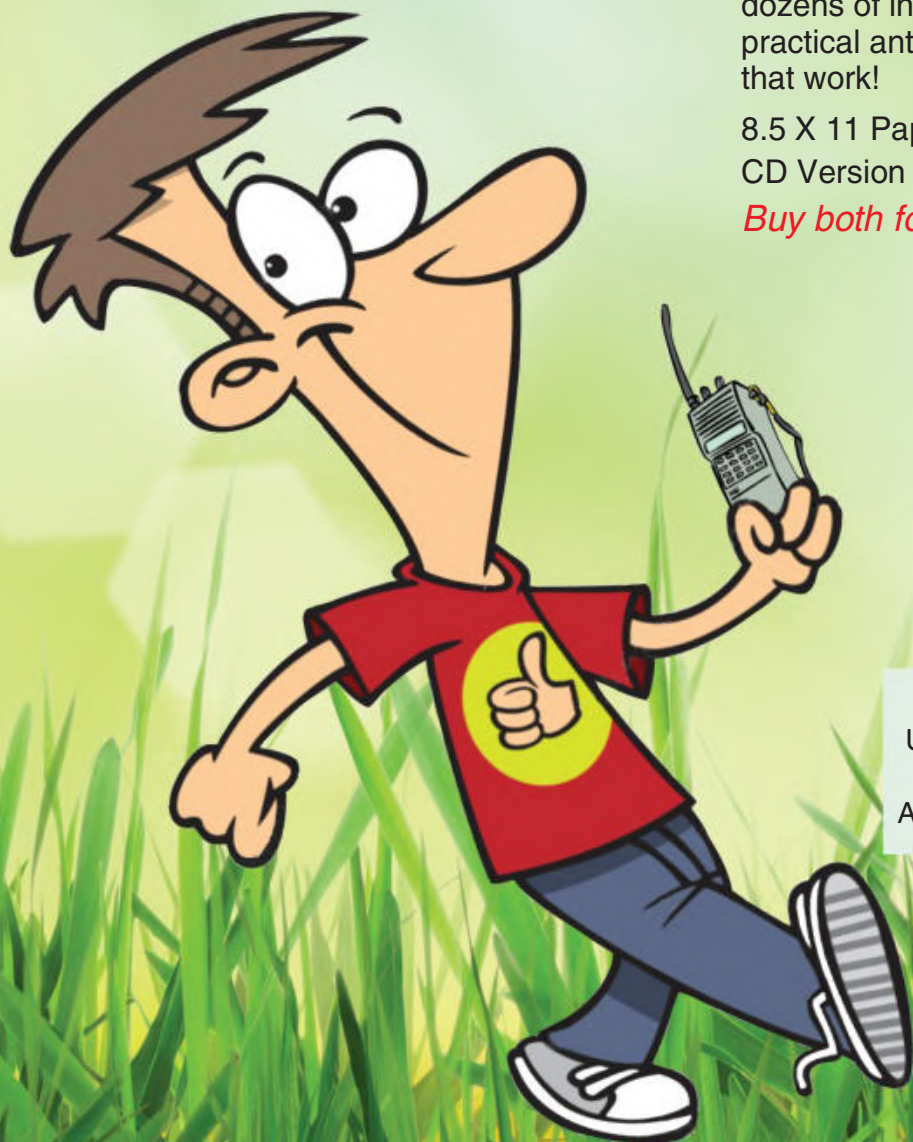


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someone on another continent is always exciting! For the most part, DXpeditions to rare entities tend to be seasonal. They tend to be operated around the months surrounding the fall and spring equinoxes when DX propagation is most favorable. Fortunately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

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

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

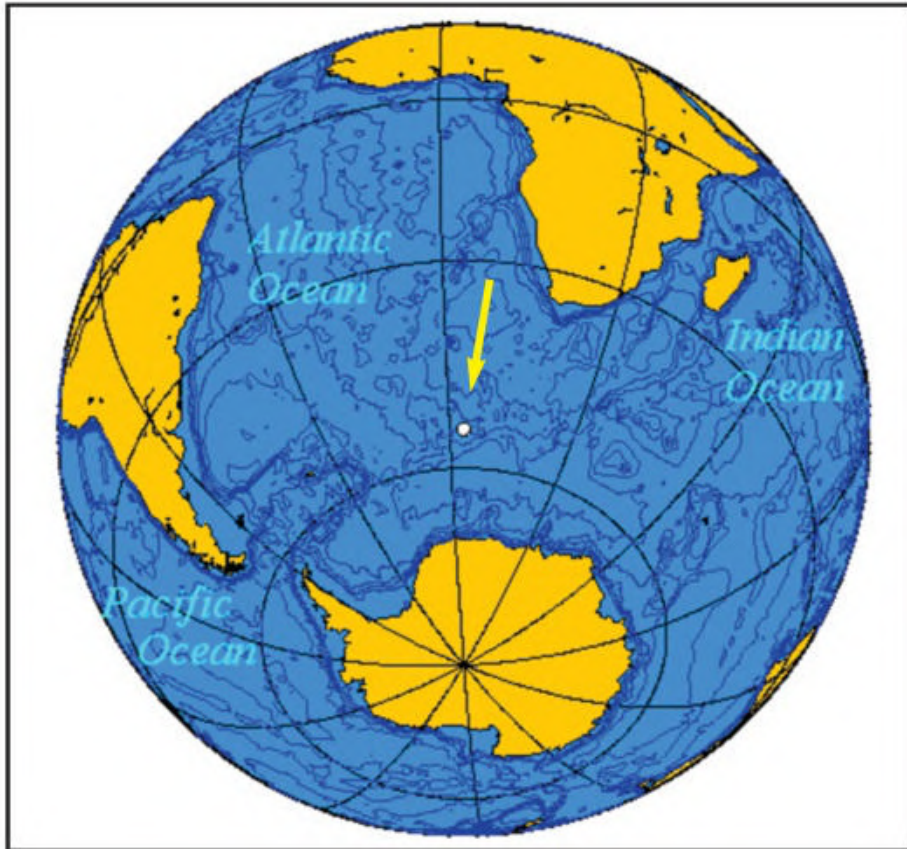


Photo B: Bouvet Island – the white dot on this map - is an extremely remote island in the South Atlantic Ocean between South America, Africa and Antarctica. (Source: Wikimedia Commons)

My Typical Radio Day

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

Signals Across the Pond

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

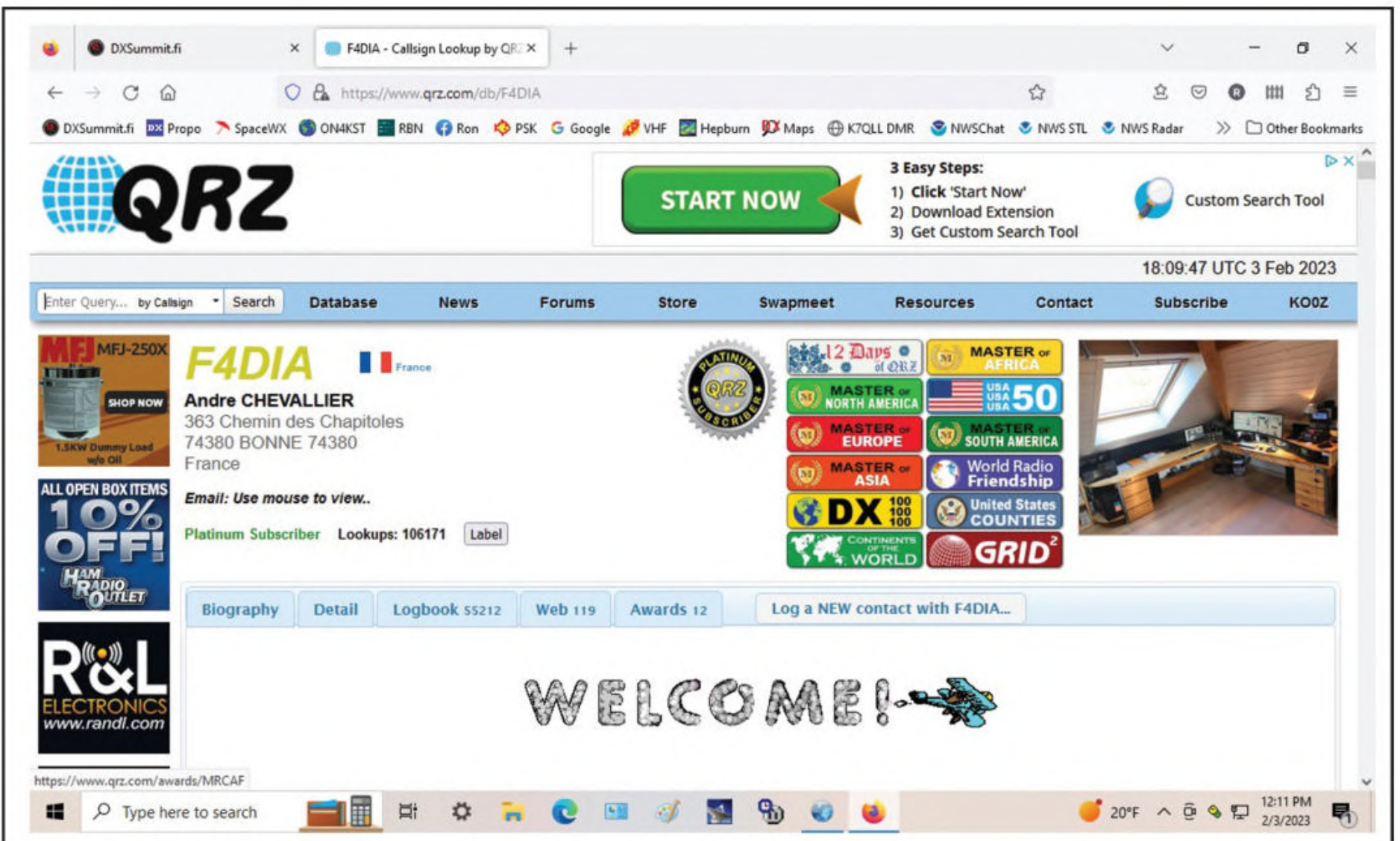


Photo C: Screenshot of Andy Chevallier, F4DIA’s, QRZ.com webpage. It was good catching up with Andy since our last QSO three years earlier.

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

Andy Chevallier, F4DIA

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

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

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

Time for Phone

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

Time for Lunch

While listening to M0SNB, I checked out their website and before I knew it, lunchtime arrived. I had promised my wife, Debbie, KC9ULA, that we'd go out for lunch. Since discretion is the better part of casual DXing (especially when it comes to lunch with your spouse), I



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

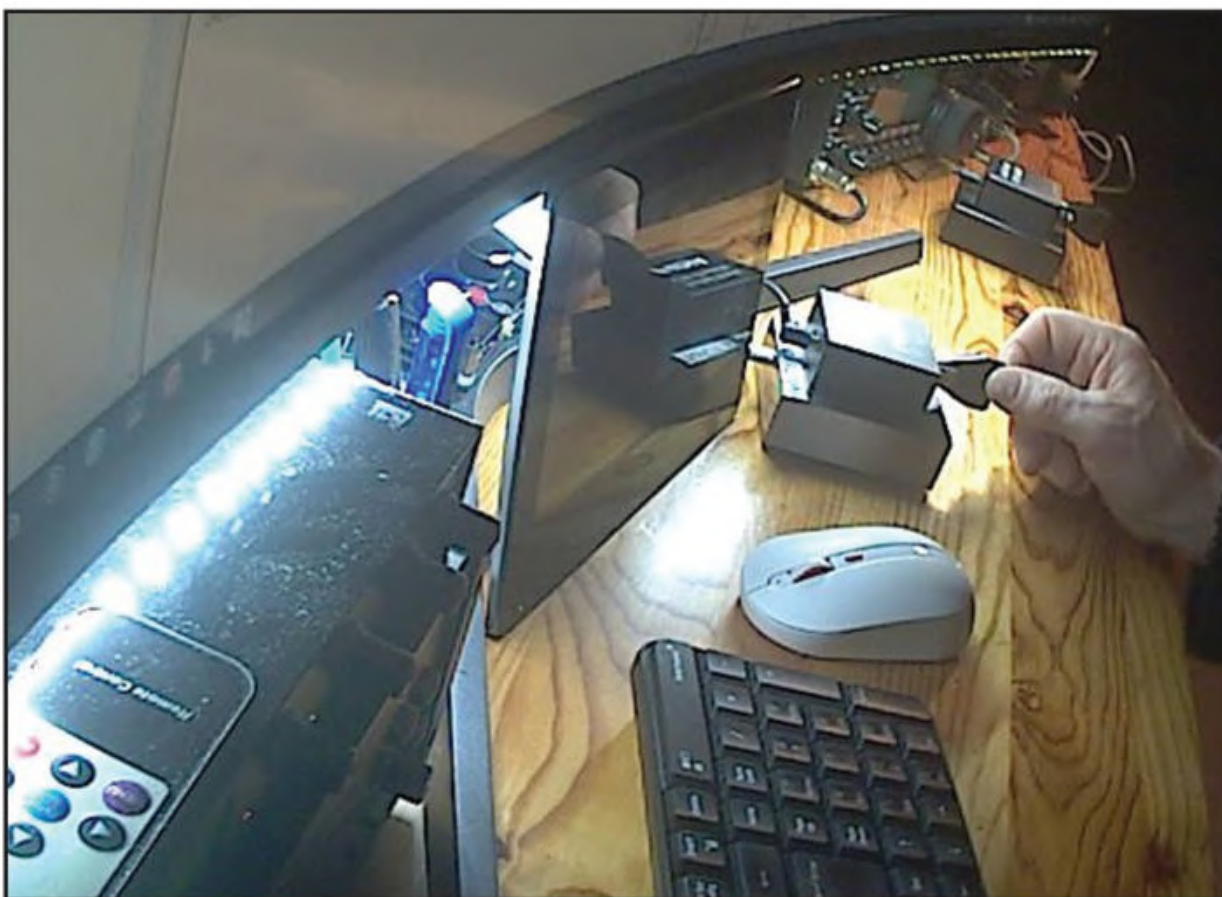


Photo E: When Andy is on the air, he transmits video from his shack. It is fun to listen to his transmitted Morse code and a few seconds later see his fingers working the paddles. BTW, F4DIA sends very copyable code.

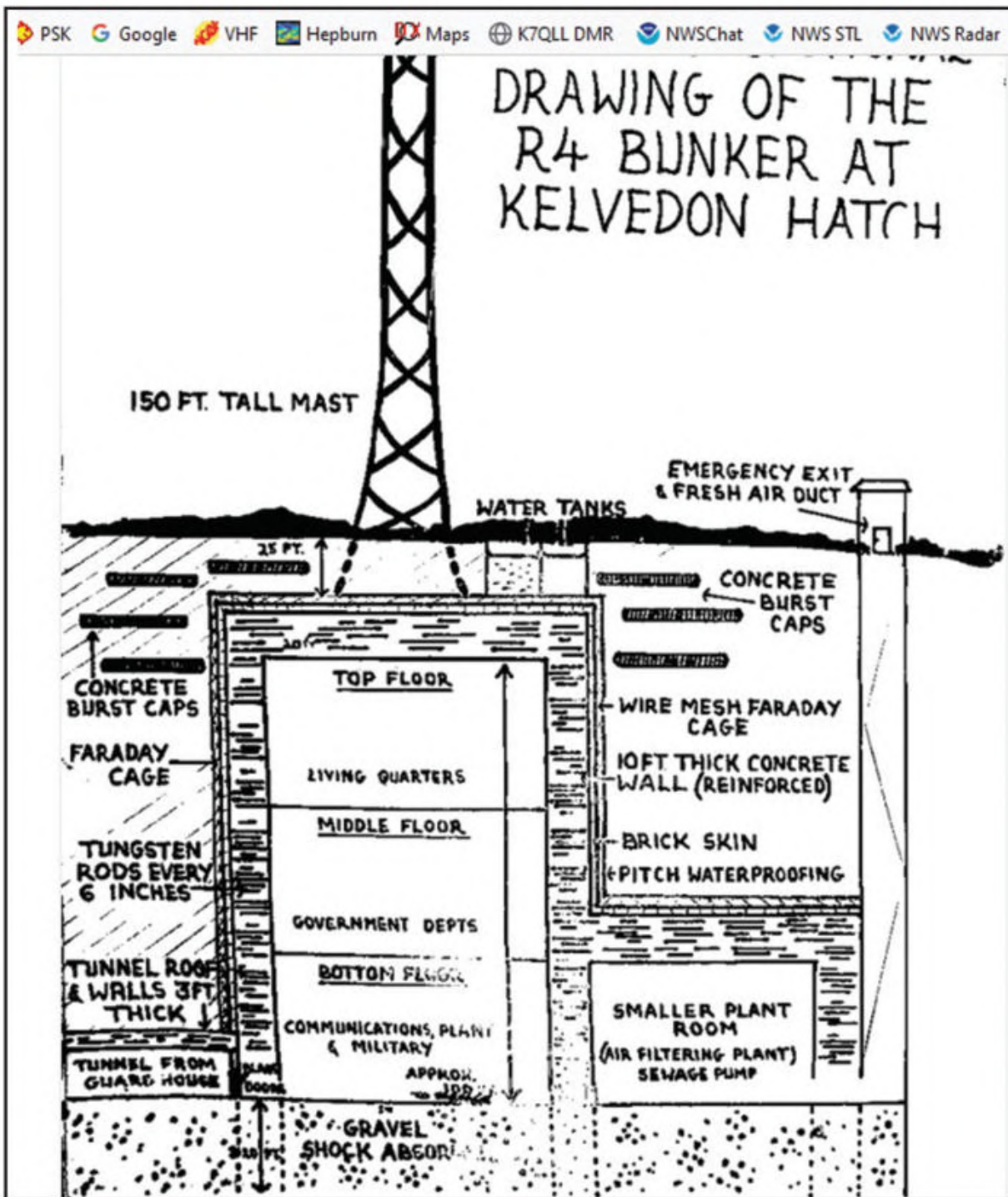


Photo F: Screenshot of England's Kelvedon Hatch Secret Nuclear Bunker ← and club station for M0SNB.

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

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

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



analog adventures

BY ERIC P. NICHOLS,* KL7AJ

Ye Olde Octopus Curve Tracer

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

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

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

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

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

In January 1975 *QST*, David Ludlow, W7QHJ, described a profoundly simple curve tracer adapter he dubbed “The Octopus.” I had a brief correspondence with Mr. Ludlow a couple of years ago, wherein he assured me that he was indeed the very same David Ludlow who invented the device. Not that I had any doubts, of course; it’s just that I don’t meet many famous hams. I’m easily impressed. *Figure 1* shows the circuit in all its glory, shamelessly gleaned from that *QST* article.

I only made a couple of small modifications to my particular specimen of the Octopus (*Photo B*). Since the Tektronix XY monitor has no input gain adjust, I added a pair of internal 10-megohm potentiometers in series with the vertical and horizontal input terminals to

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



Photo A. Tektronix 620 monitor scope



Photo B. KL7AJ Octopus

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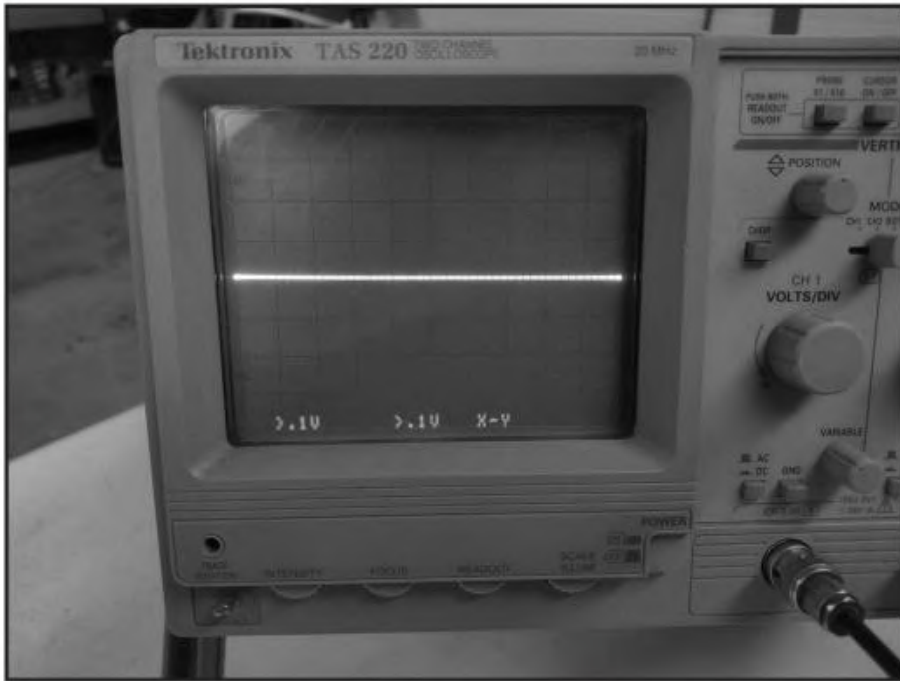


Photo C. Open circuit display

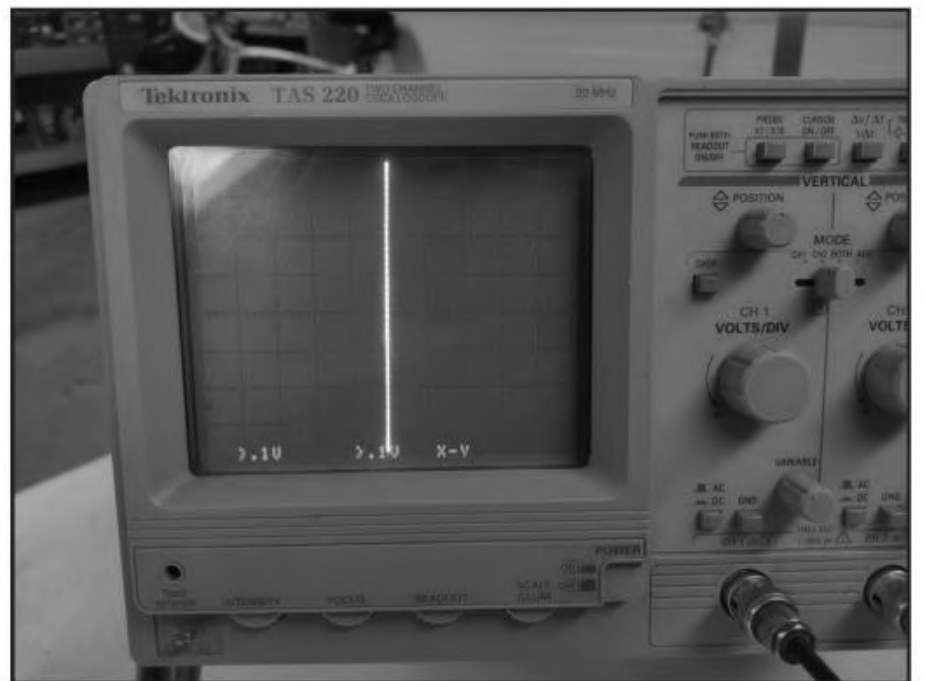


Photo D. Short circuit

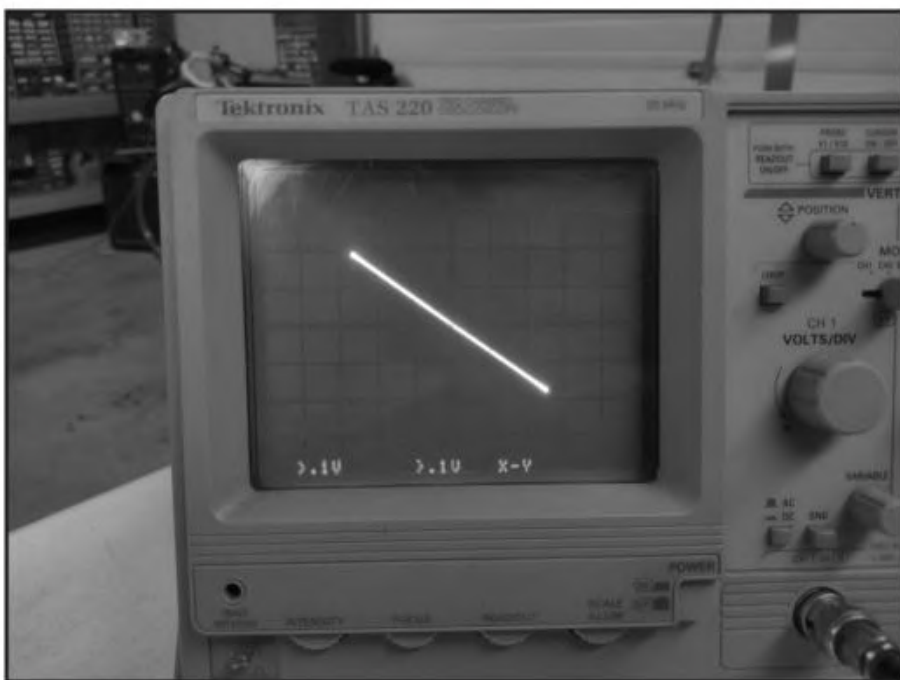


Photo E. Resistor

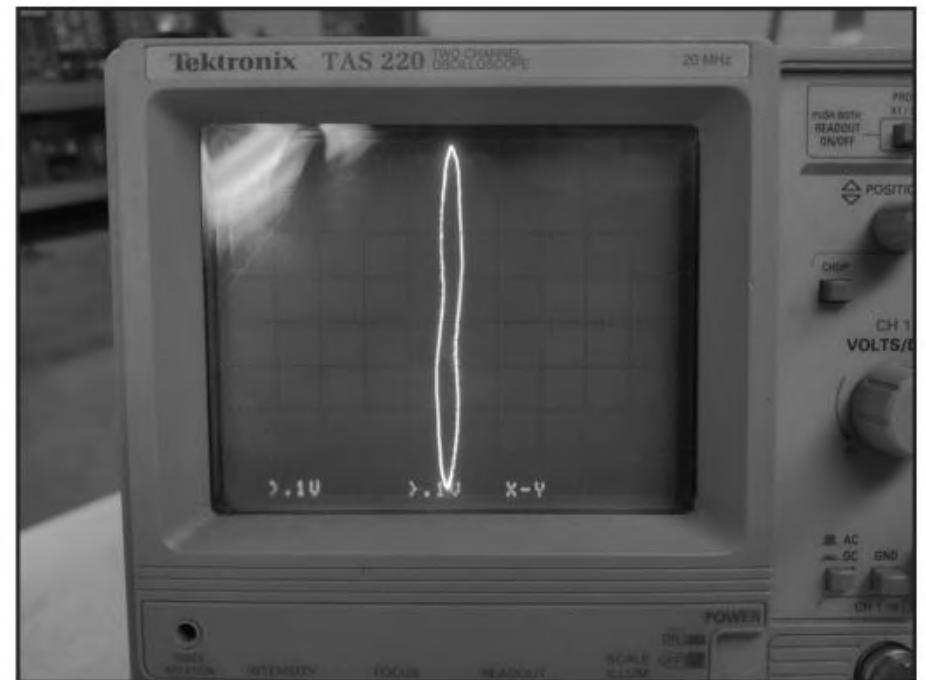


Photo F. Leaky electrolytic capacitor

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

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

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

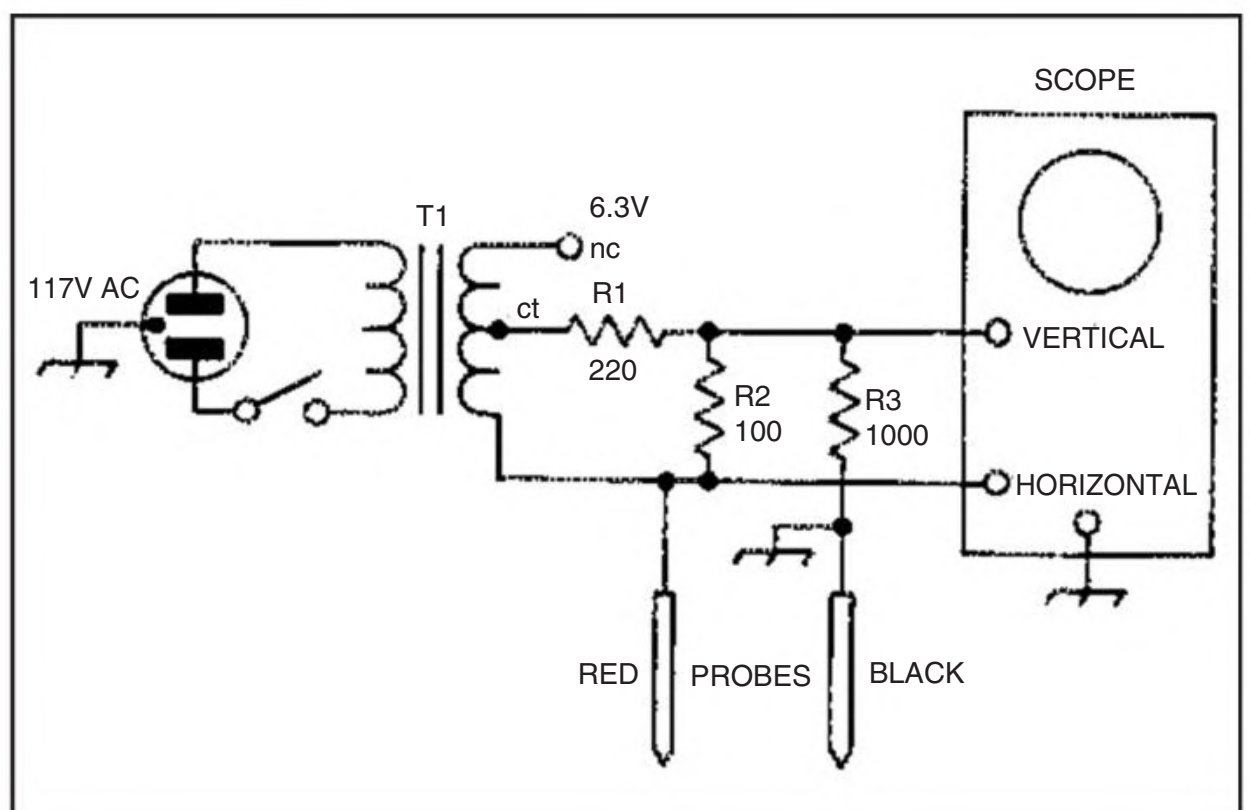


Figure 1. Schematic of the "Octopus" curve tracer adapter described in a January 1975 QST article by David Ludlow, W7QHX. (Courtesy January 1975 QST)

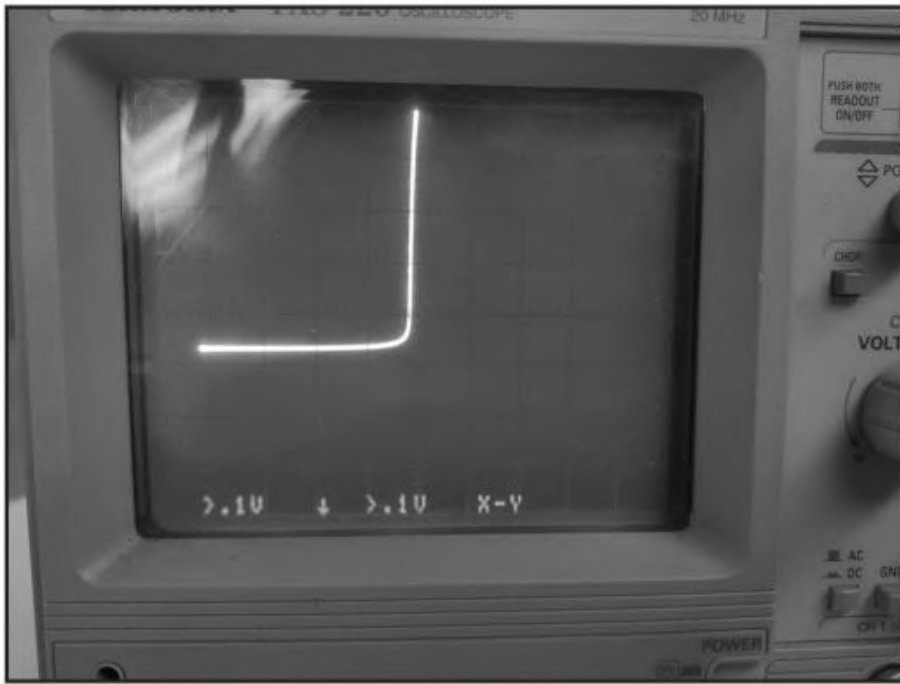


Photo G. Germanium diode

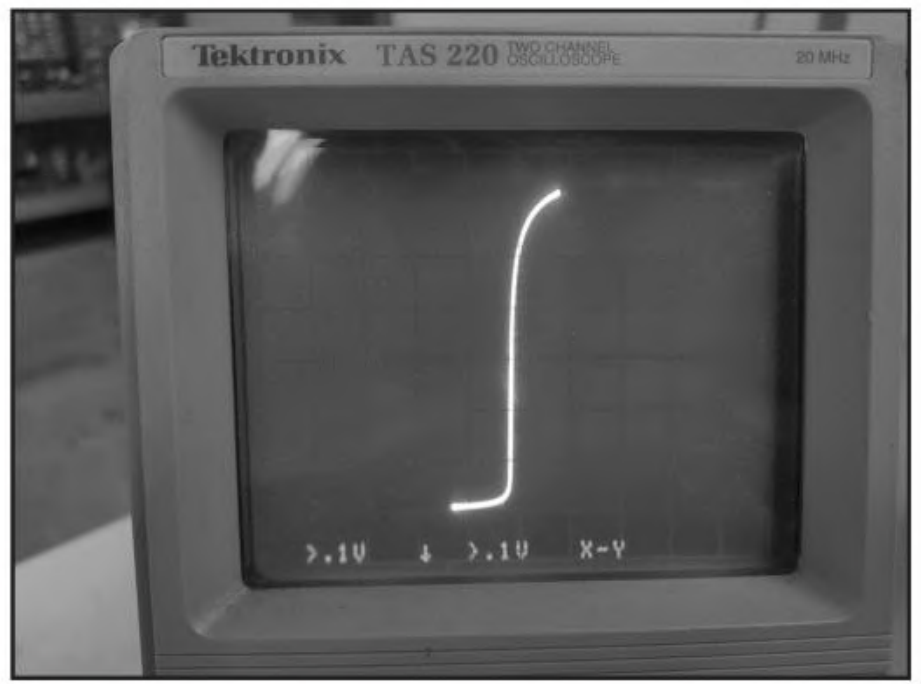


Photo H. Silicon diode and inductor in series

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

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

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

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

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

– 73! Eric, KL7AJ



2023-2024 calendars

We have two calendars to choose from this year.

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

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

These 15-month calendars (March 2023 to February 2024) include dates of important Ham Radio events, meteor showers, phases of the moon, and other astronomical information plus important and popular holidays.

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

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

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

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

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

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



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



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

* n4dtf@cq-amateur-radio.com

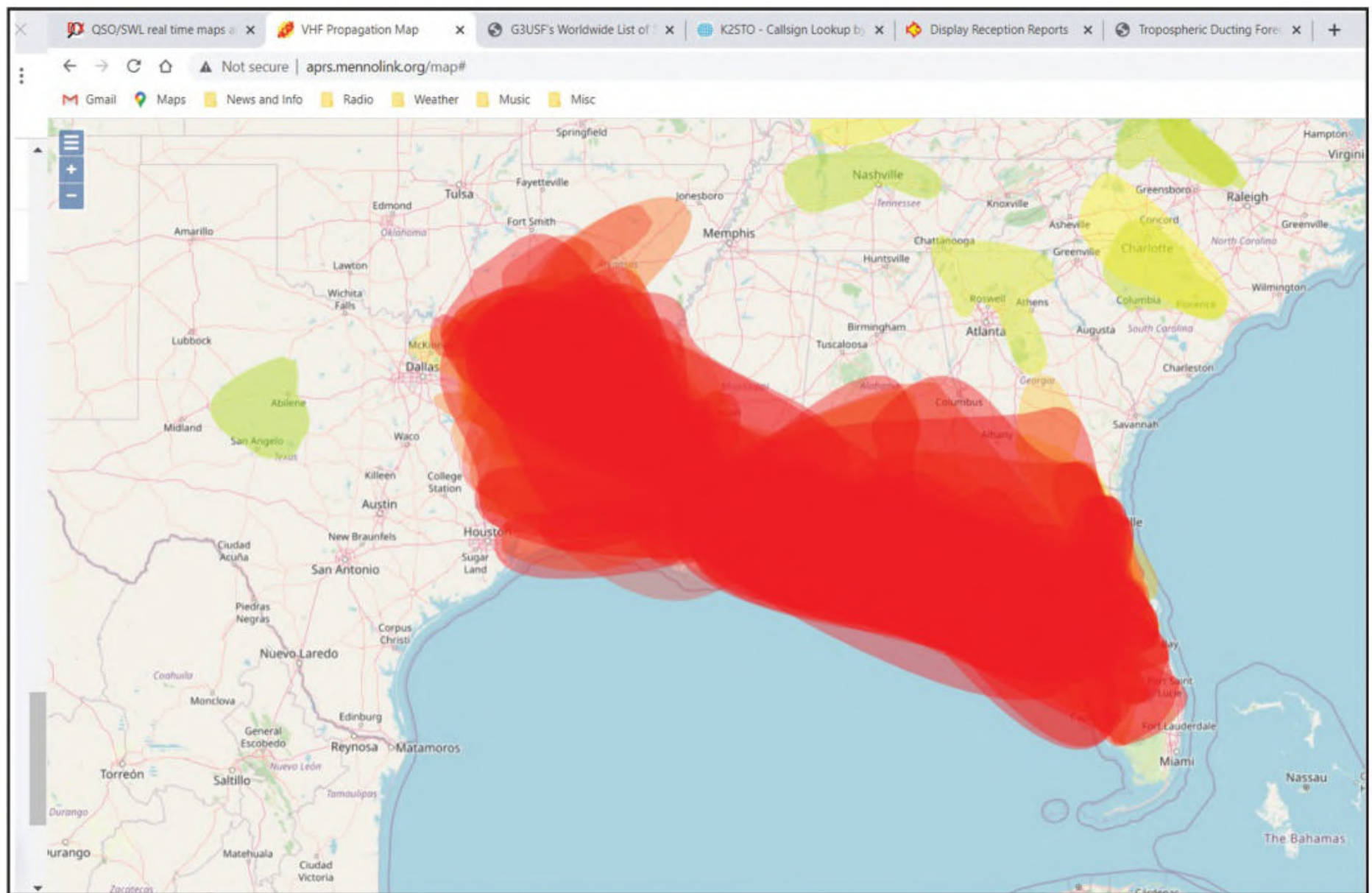


Photo C. Hepburn map of the southeastern US during the evening of February 14, 2023 showing the potential for tropospheric propagation.

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

On a positive note, Power over Ethernet (POE) is an exciting technology and it is nice to see a manufacturer implementing it. The potential to reduce or eliminate loss in transmission lines is very exciting to SHF enthusiasts. Finally, price point is going to be an issue, so we will have to wait and see on that one. Kudos to Icom for the effort to serve the microwave community!

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

On the Air

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

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

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

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

Six-Meter DX Ahead!

Thanks as always for the info on your contacts. As we discussed last month, higher sunspot numbers are producing F₂ propagation on 6 meters. This will likely be a great year for 6-meter contacts, especially if you want to work DX. Please keep me posted on your activities, and send along your questions, thoughts and project plans.

awards

BY STEVE MOLO,* KI4KWR

World Castles Award

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

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

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

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

1. International program "World Castles Award" (WCA) has been instituted by group of the Russian radiohams, members of Radioclub RZ1CWC, founders of "Castles On The Air-Russia" (COTA-Russia) award program.

2. The purpose of the program is joining of efforts of radiohams in different countries for activation and popularization historical objects relating to fortification (fortresses, castles, forts, etc.) and attract attention to historical and architectural heritage as well as visiting existing historical monuments all over the world.

3. Fortifications are military constructions and buildings designed for defense in warfare and military bases. Humans have constructed defensive works for many thousands of years, in a variety of increasingly complex designs. The term is derived from the Latin *fortis* ("strong") and *facere* ("to make").

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

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

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

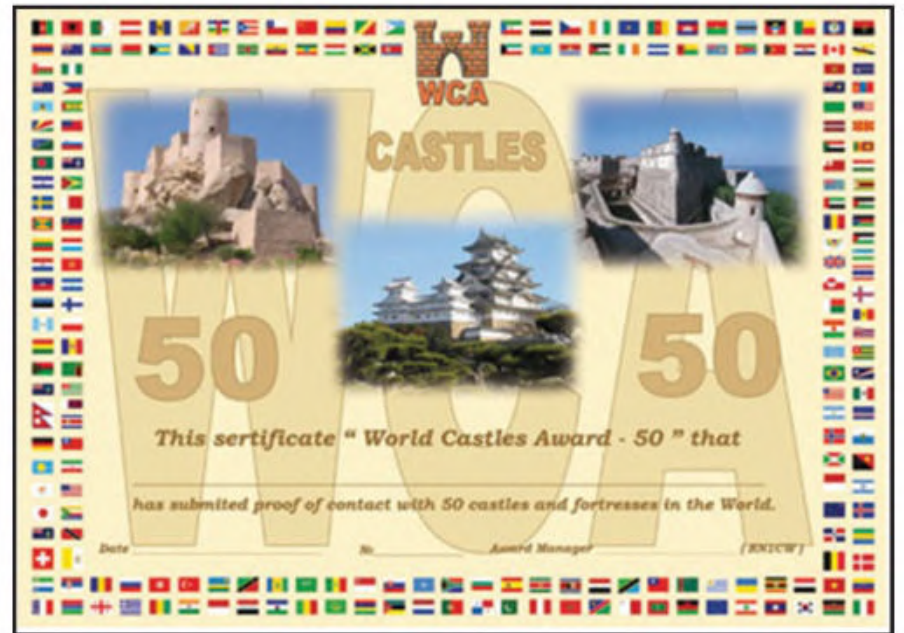


Photo A. This is the basic Worked Castles Award certificate, earned for confirmed contacts with at least 50 castles or fortifications around the world.

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

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

WCA 100 – for QSO/SWL with 100 objects in the world;

WCA 200 – for QSO/SWL with 200 objects in the world;

WCA 300 – for QSO/SWL with 300 objects in the world;

WCA 400 – for QSO/SWL with 400 objects in the world;

WCA 500 – for QSO/SWL with 500 objects in the world;

WCA 600 – for QSO/SWL with 600 objects in the world;

WCA 700 – for QSO/SWL with 700 objects in the world;

WCA 800 – for QSO/SWL with 800 objects in the world;

WCA 900 – for QSO/SWL with 900 objects in the world;

WCA 1000 – TOP Award – for QSO/SWL with 1000 objects in the world.

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

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

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

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

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

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

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

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

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

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

9. Recommended frequencies for work on the air during expeditions on fortresses and castles.

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

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

10. On the base of S50CLX Cerkno Linux DX Cluster <<http://s50clx.infrax.si>> was created WCA cluster to inform about expeditions on fortresses and castles.

11. WCA Committee has decided to institute a greeting code when working from fortification objects.

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

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

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

* It is permissible not to transmit superfluous zero during QSO to simplify transmission and receiving of identification numbers.

** Correspondence between identification numbers of national award programs (BCA, CASHOTA, CASHOTA-EI, CASHOTA-NI, CCA, COTA-9A, COTA-DL, COTA-NL, COTA-RU, COTA-UN, COTA-YL, CPBA, DCE, DCE 1.0, DCFP, DCI, DCS, DFCF, DMHP, HCS, IDES, RHO, S5-WCA, SCA, UCFA, ZWP) and WCA identifi-

cation numbers is in the WCA-List table.

13. Repeated QSOs are not valid. The object is valid only once regardless of bands or mode.

14. The same award rules are for SWL.

15. QSO/SWL are valid since January 1st, 1995 on any bands (including WARC) by any kind of modes.

16. Application for diploma is based on the received QSL cards according to the WCA application form and must be signed by two radio hams. Each QSL card must have identification number according to WCA-List.

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

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

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

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



Last Year, our members worked thousands of hours for

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

18. The award can be issued for separate MODE (optionally).

19. The application should be sent to the award manager by e-mail: wca11team@gmail.com or via post to the following: Andrey A. Petushkov, RN1CWul. Komsomolskaya, 12-49 Sosnovyj Bor, Leningrad oblast, 188540 Russia

20. – Since January, 1st, 2011 the order of issue of the “World Castles Award (WCA)” and “Castles On The Air – Russia – Award (COTA-RU)” will change. Awards will be issued by two means:

- in electronic form – JPG (free of charge);
- in print form, the fee of WCA and COTA-RU will be:
 - For Russia 200 Rubles, for the CIS countries – 7 EURO, 7 USD, 7 IRC.
 - For the others – 10 EURO, 10 USD, 10 IRC.
 - Fee for HONOR ROLL please ask Award Manager at the moment of application.

21. Award certificates “World Castles Activator Award – WCAA” and “WCA – Hunter” are free of charge. You can obtain them in electronic form – JPG files completely ready for printing in A4 format (297x240), which will be sent by e-mail.



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

WCA Honor Roll Plaque

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

The fee of WCA Honor Roll Plate is:

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

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

WCAA – World Castles Activator Award

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

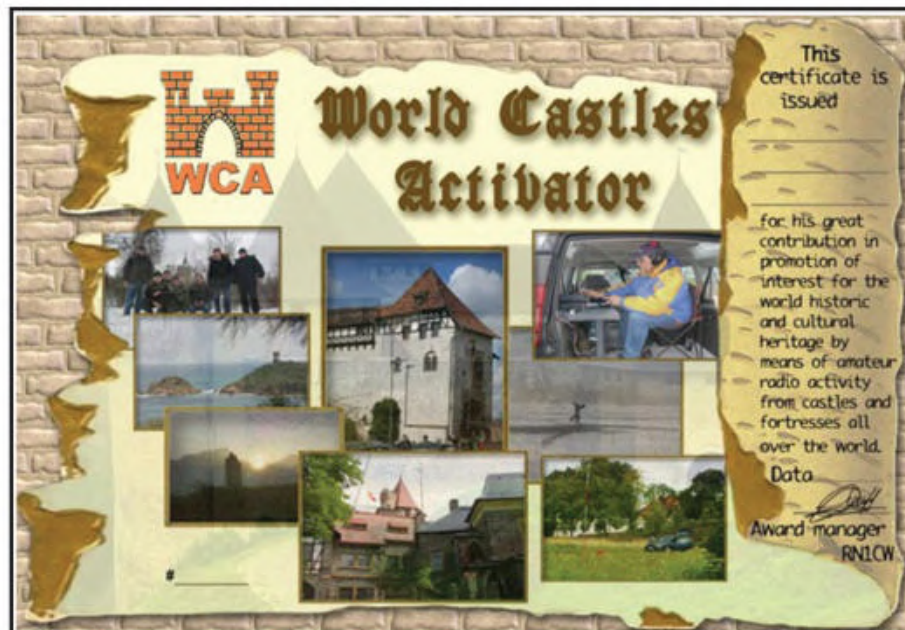


Photo C. The WCA Activator award is issued to hams who make a required number of QSOs from a minimum number of valid sites.

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

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

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

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

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

- 1) in electronic form – JPG file completely ready for printing in A4 format (297x240) will be sent by e-mail;
- 2) in paper form by post (need to pay the postage).

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

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

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

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

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

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

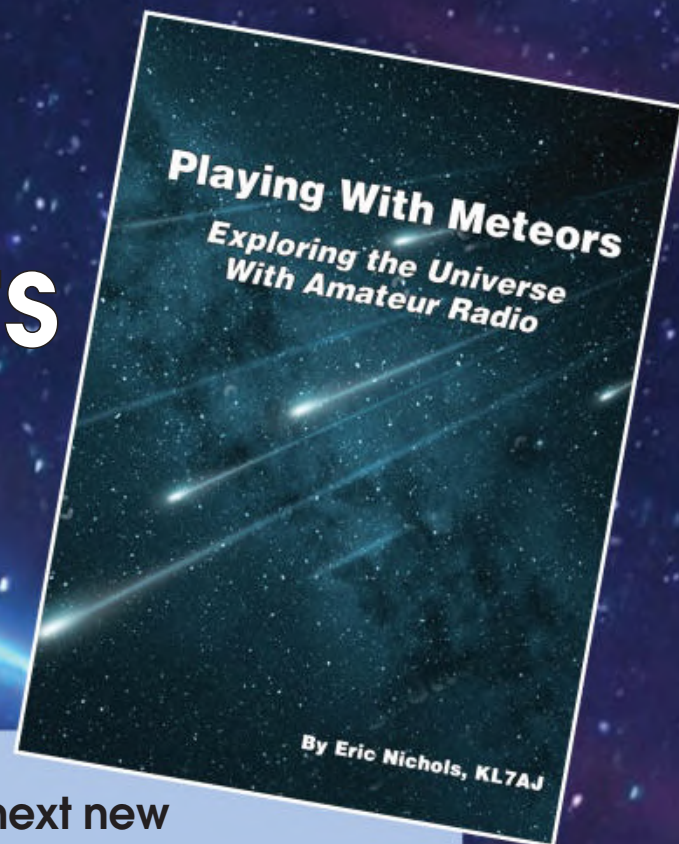
This award has a very strong base of organizers and partners from around the world and I congratulate them for creating and maintaining an award program that is strong and worldwide.



Playing With Meteors

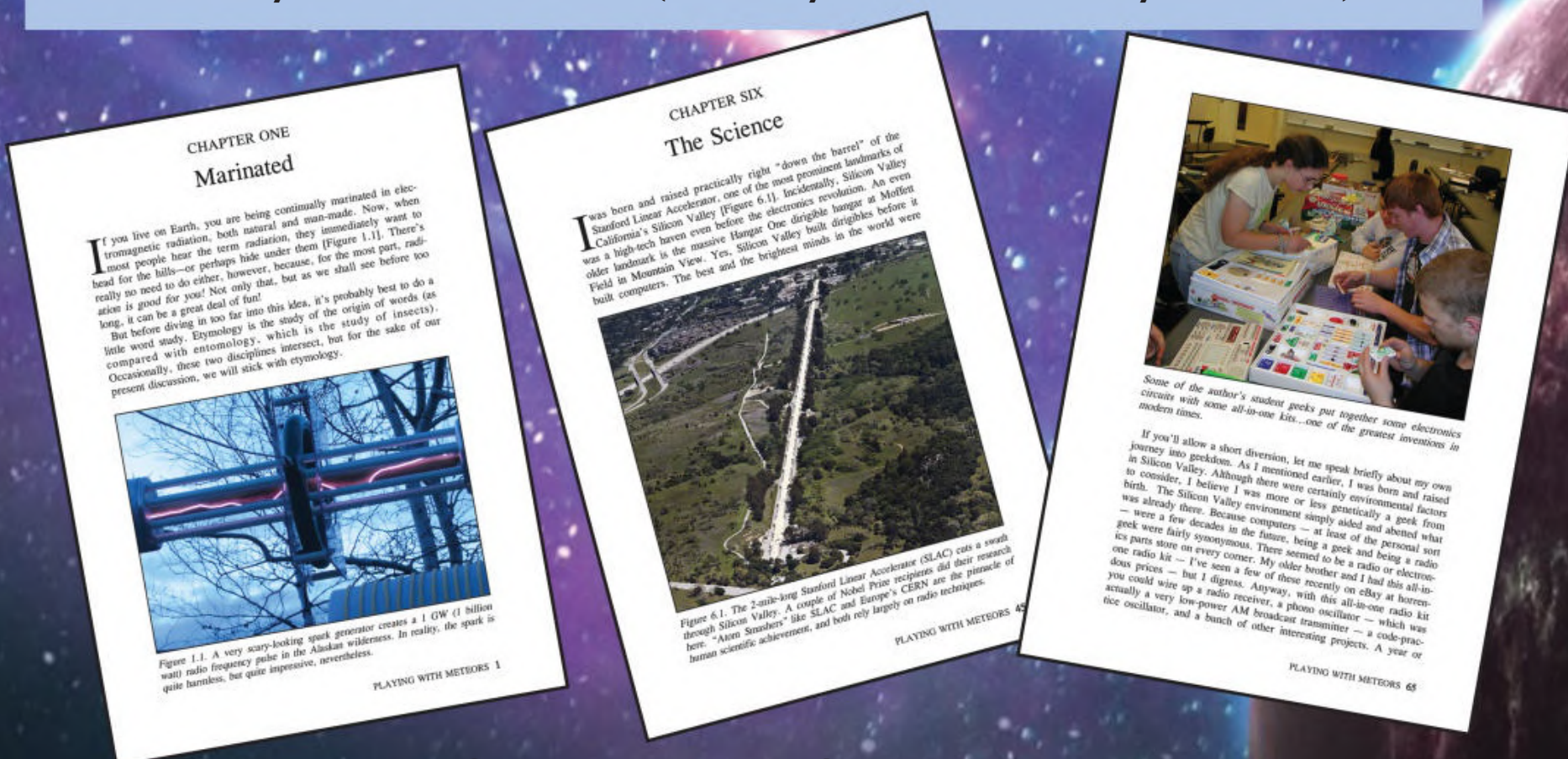
Exploring the Universe With Amateur Radio

By Eric Nichols KL7AJ



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

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



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BY BOB SCHENCK,* N200

Club Profile: The Carolina DX Association

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



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

For this month's DX column, I've asked Gary Dixon, K4MQG, and a couple of friends to introduce us to one of the premier DX clubs in the eastern US, the Carolina DX Association. – N200

Back in the 1970s and 1980s, a large number of DXers in North and South Carolina were very active on the bands. Many of them chatted and exchanged DX info on a 2-meter repeater in Fort Mill, South Carolina. The repeater was located on top of a multi-story hotel right on the state line. The Internet was not invented or in use at the time, so the repeater was the information link for spotting DX and other information.

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

*email: <n200@comcast.net>
email: <gdixon@comporium.net>

The group decided to form a new club and named it the Carolina DX Association, CDXA. Some years later, the repeater was actually donated to the CDXA and the call W4DXA was acquired. A packet network was used before the internet for members to spot HF and VHF DX. After the Internet became available in the early 1990s, CDXA used it for DX spotting



Photo B. AA4ZZ VHF antennas



Photo C. Drone view from AA4ZZ's VHF site

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

In 1983 the CDXA assumed management of the W4-K4-N4 Single Letter ARRL Incoming QSL Bureau. In 2022,

the bureau merged with the W4 two-letter bureau. Many CDXA members continue to be involved with the merged bureau. CDXA also has club members in other states who have been approved by the ARRL and CQ magazine for field checking of QSLs for DXCC, VUCC, WAS and CQ awards.



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



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

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DX World Guide

4th Edition!

By Franz Langner, DJ9ZB

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and SAVE!



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

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

Whether used as a desk reference for the DXer of any level of proficiency or as a "wish book" for DXers just starting his or her DXCC journey, the new *DX World Guide* is a worthy and pleasant companion!

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Photo F. CDXA's own AA4NN on Scarborough Reef



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



Photo H. CDXA fall barbeque at AA4NN's QTH



Photo 1. Annual CDXA Christmas party

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

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

The WPX Program

CW						
4075	.....WA1LAD	4545	.....OH7CBC	1877	.....N4EXO
4076	.....KG7YU	4546	.....AD2BO	1878	.....JK1VXE
4077	.....W9DCT	4547	.....KD5DDV	1879	.....W5MBG
4078	.....ISØAFM	4548	.....IW1PVT	1880	.....K4JIP
4079	.....NØJRN	4549	.....IUØRBE	1881	.....W2RLK
		4550	.....NU4H	1882	.....N3JIM
		4551	.....KD9TLI	1883	.....DL8MRE
SSB			4552NT4TN	1884IW1PVT
4461	.....KY4KP	4553	.....T9ODQ	1885	.....IUØRBE
4462	.....VE2HTC	4554	.....N8LFK	1886	.....NU4H
4463	.....W3CWT	4555	.....W9NC	1887	.....K6FXZ
4464	.....IT9ODQ	4556	.....WK9X	1888	.....NT4TN
4465	.....W9DCT	4557	.....HL5LX	1889	.....IT9ODQ
4466	.....K3YQA	4558	.....DL1OMP	1890	.....N8LFK
		4559	.....W9DCT	1891	.....WK9X
Mixed			4600N9AZZ	1892HL5XL
4538	.....K6DSP	4561	.....W8ASH	1893	.....KD9VQD
4539	.....W2TI	4562	.....SP5HHP	1894	.....DL1OMP
4540	.....KQ4ADO		Digital	1895	.....WB6EQK
4541	.....W5MBG	1873	.....WA1LAD	1896	.....W9DCT
4542	.....W2RLK	1874	.....K6DSP	1897	.....W4XED
4543	.....N3JIM	1875	.....JJ1NRX	1898	.....W8ASH
4544	.....DL8MRE	1876	.....JJ1SZA		

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

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

Mixed: 450 K6DSP. 500 N3JIM, NT4TN, WK9X. 550 NR6AM, KBØUGQ. 600 OH7CBC, DU1/NF00, HL5XL. 650 W2RLK. 700 KQ4ADO, NU4H. 800 NA7KR. 900 KF8QL, W1DNP, N4SV, W8KSC, JS1ERB. 950 WB8LEM. 1000 DL8MRE, N2TC, AD2BO. 1050 JHØEYA, N1HO, KV8P. 1100 N6DSC. 1150 NA5WH. 1200 WA1LAD, KM4VI, NA5WH. 1250 IZ4DPV. 1300 N4DJT. 1550 JK1VXE, KC1UX, W9DCT. 1600 WR7X. 1650 MØHIH. 1700 N8IK. 1850 IT9ODQ. 2250 F5VHQ. 2500 WA6KHK. 2550 JR3UIC

Digital: 350 W5MBG, K4JIP, KD5DDV, IUØRBE, WB6EQK. 400 JJ1NRX, IW1PVT, N8LFK, DL1OMP. 450 K6DSP, NR6AM, WB8LEM, WK9X, KBØUGQ. 500 N3JIM, NT4TN, HL5XL. 550 WA1LAD, W2RLK. 600 DU1/NF00. 650 IZ4DPV. 700 KQ4ADO, NU4H, JS1ERB, KV8P. 750 NA7KR. 800 N4SV, N1HO. 850 KF8QL. 900 W1DNP. 950 N2TC. 1050 JHØEYA. 1100 N6DSC. 1150 KM4VI, NA5WH. 1200 JK1VXE, N4DJT, NA5WH. 1300 N8IK. 1350 W9DCT. 1450 MØHIH. 1500 WR7X, KC1UX. 1600 F5VHQ. 1750 IT9ODQ. 2200 JR3UIC

160 Meters: WA1LAD, DL1OMP, N9DCT

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

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

30 Meters: W1DNP, N1HO, W9DCT

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

17 Meters: N4DJT, W9DCT

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

12 Meters: N8IK, W9DCT

10 Meters: WA1LAD, KQ4ADO, N2TC, N8IK, N4DJT, DU1/NF00, KD9TLI, KD9VQD, W9DCT, JS1ERB

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

Europe: WA1LAD, W1DNP, JJ1SZA, N4SV, JK1VXE, KQ4ADO, JHØEYA, W2RLK, DL8MRE, OH7CBC, AD2BO, IW1PVT, IUØRBE, NU4H, W3CWT, NT4TN, IT9ODQ, HL5XL, DL1OMP, KBØUGQ, W9DCT, ISØAFM, SP5HHP

Oceania: MØHIH, IZ4DPV, WR7X, JK1VXE, N9DCT

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

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

Digital Bar: N6PEQ

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

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

On the Air in Addis Ababa



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

CQ DX Awards Program

No Update

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

5 Band WAZ

As of February 15, 2023

2458 stations have attained at least the 150 Zone level, and 1123 stations have attained the 200 Zone level.

As of February 15, 2023

The top contenders for 5 Band WAZ (Zones needed on 80 or other if indicated):

CHANGES shown in BOLD

Callsign	Zones	Zones Needed
AK8A	199	17
DM5EE	199	1
EA5RM	199	1
EA7GF	199	1
H44MS	199	34
HAØHW	199	1
HA5AGS	199	1
I5REA	199	31
IKØXBX	199	19 on 10M
IK1AOD	199	1
IT9GSF	199	1
IZ3ZNR	199	1
JA1CMD	199	2
JA5IU	199	2
JA7XBG	199	2
JH7CFX	199	2
J14POR	199	2
JK1BSM	199	2
JK1EXO	199	2
K1LI	199	24
K3LR	199	23
K4HB	199	26
K5TR	199	22
K7UR	199	34
KZ4V	199	26
N3UN	199	18
N4NX	199	26
N4WW	199	26
N4XR	199	27
N8AA	199	23
N8DX	199	23
N8TR	199	23 on 10M
RA6AX	199	6 on 10M
RU3DX	199	6
RWØLT	199	2 on 40M
RX4HZ	199	13
RZ3EC	199	1 on 40M
S58Q	199	31
SM7BIP	199	31
SP9JZU	199	19 on 10M
USØSY	199	1 on 15M
VK3HJ	199	34
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W3LL	199	18 on 10M
W3NO	199	26
W4LI	199	26

Callsign	Zones	Zones Needed
W6DN	199	17
W6RKC	199	21
W6TMD	199	34
W9OO	199	18 on 10M
W9XY	199	22
9A5I	198	1, 16
AB4IQ	198	23, 26
DL6JZ	198	1, 31
EA5BCX	198	27, 39
F5NBU	198	19, 31
F6DAY	198	2 on 10M & 15M
G3KDG	198	1, 12
G3KMQ	198	1, 27
G4OWT	198	1, 27
HB9FMN	198	1 on 80M & 10M
I1EIS	198	1 & 19 on 10M
JA1DM	198	2, 40
JA3GN	198	2 on 80M & 40M
JA7MSQ	198	2 on 80M & 10M
JH1BNC	198	2 on 80M & 10M
JH1EEB	198	2, 33
KØDEQ	198	22, 26
K1BD	198	23, 26
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3WA	198	23,26
K3XA	198	23,34
K4JLD	198	18, 24
K9MM	198	22, 26
K11G	198	24, 23 on 10M
KZ2I	198	24, 26
LA3MHA	198	31 & 32 on 10M
N4GG	198	18, 24
NXØI	198	18, 23
ON4CAS	198	1,19
OZ4VW	198	1, 2
RL3FA	198	2 on 80 & 10M
UA4LY	198	6 & 2 on 10M
UN5J	198	2, 7
US7MM	198	2, 6
W5CWQ	198	17, 18
W7AH	198	22, 34
W9RN	198	26, 19 on 40M
WC5N	198	22, 26
WL7E	198	34, 37
Z31RQ	198	1, & 2 on 10M
ZL2AL	198	36, 37

The following have qualified for the basic 5 Band WAZ Award:

Callsign	5BWAZ #	Date	# Zones
TA2LG	2440	01/21/2023	192
W9WO	2441	01/22/2023	165
JE1FQV	2442	01/25/2023	200
KC1OPD	2443	01/25/2023	181

Callsign	5BWAZ #	Date	# Zones
JG1PUW	2444	01/25/2023	171
JF1UVJ	2445	01/27/2023	200
LX1JH	2446	01/29/2023	167
JE1SYN	2447	01/29/2023	200
AA8KY	2448	01/29/2023	151
K9NR	2449	01/29/2023	181
AA5NT	2450	02/03/2023	172
JH1GZE	2451	02/03/2023	200
JL1SAM	2452	02/04/2023	200
WO2T	2453	02/05/2023	184
JA4LKB	2454	02/11/2023	200
JR0QFA	2455	02/11/2023	175
DL6UAA	2456	02/11/2023	192
VK2HV	2457	02/11/2023	151

Updates to the 5BWAZ list of stations:

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

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

5BWAZ #	Callsign	Date	All 200 #
1078	JK1AJX	1/23/2023	1113
2442	JE1FQV	1/25/2023	1114
1877	N6PF	1/25/2023	1115
2445	JF1UVJ	1/27/2023	1116
1988	JA1QJI	1/29/2023	1117
2447	JE1SYN	1/29/2023	1118
2451	JH1GZE	2/3/2023	1119
2452	JL1SAM	2/4/2023	1120
1546	W2IRT	2/11/2023	1121
2454	JA4LKB	2/11/2023	1122
2358	JH3VWN	2/11/2023	1123

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and \$1.00 to: WAZ Award Manager, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. The processing fee for the 5BWAZ award is \$10.00 for subscribers (please include your most recent CQ mailing label or a copy) and \$15.00 for nonsubscribers. An endorsement fee of \$2.00 for subscribers and \$5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Jose Castillo. Applicants sending QSL cards to a CQ checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

*Please note: Cost of the 5 Band WAZ Plaque is \$100 shipped within the U.S.; \$120 all foreign (sent airmail).

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

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

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

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

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

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

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 340 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is \$1.00 each plus SASE. (Stickers for the 340 level and Honor Roll are available.) Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA.

CW

DL3DXX.....339	K7LAY.....339	W8XD.....339	K1FK.....334	OZ5UR.....328	W6YQ.....319	K4IE.....295
HB9DDZ.....339	K7VV.....339	WK3N.....339	K9OW.....334	AB4IQ.....327	HA1ZH.....318	YU1YO.....295
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On the Cover...

ICOM Icom America Senior Sales Manager Ray Novak, N9JA, shows off the brand new IC-905 transceiver at the Orlando HamCation® in Florida this past February. Ray has had a long career in the business of amateur radio. Starting out as a technician at MFJ Enterprises, Ray got his Novice license as KB5KCL while working there. Ray advanced at MFJ to become the Domestic and International Sales Manager before he went to work for Icom America in tech support. His 28 years at Icom America began with a change of call sign to KC7JPA and his career at Icom later took advantage of his sales expertise. Following the introduction of the IC-7800, Ray became an Extra and acquired the callsign N9JA.



After becoming the sales manager for amateur radio products and successfully marketing many innovative new products, Ray was promoted to Senior Sales Manager, covering the amateur, aviation and marine product lines. Having personally met Tokuzo Inoue, the founder of Icom, Ray was impressed with the founder's emphasis on technology and performance and is excited to be a part of introducing Icom's latest product, the IC-905.

Icom says the IC-905 brings VHF, UHF and microwave bands to the amateur radio community in a form factor that maximizes ease of use and optimizes reduction of feedline losses at microwave amateur frequencies such as 2.4, 5.6, and 10 GHz in addition to covering the 2-meter, 70-centimeter and 1.2 - GHz bands. The IC-905 builds on Icom's storied history of innovation including the IC-781 having the first built-in panadapter. Another huge stride forward at Icom was represented by the very successful introduction of the IC-7300, the first full featured SDR-based transceiver to not require an external computer.

Ray has taken his love of DX on a DXpedition to Mozambique as C82DX as well as another DXpedition to Bhutan. When Ray is not finding new innovations in his trunk to share with his fellow hams, he enjoys traveling in his motor home as well as riding on his motorcycle. Look for N9JA not only at major ham radio events but at major boat shows as well as the annual aviation extravaganza at Oshkosh, Wisconsin.

For more about the IC-905, see this month's VHF Plus column on page 72 and Zero Bias editorial on page 6. (Cover photo and "On the Cover" text by Joe Eisenberg, K0NEB)



Ray and Frank Lappin, KF5AHJ on YouTube Channel Tank Radio.

contesting

BY TIM SHOPPA,* N3QE

After the Contest

This month, let's look closely at the required after-contest activity of preparing and officially submitting your Cabrillo log to the sponsor. Then we'll discuss the many online tools available today for sharing your claimed scores with your local buddies, the members of your club, and the contest world at large.

The first action item is to collect any paper or electronic notes you may have made during the heat of the contest and correct/update your log to match what you heard and exchanged. Optimally you will make these corrections in the logging software itself and rescore the log to come up with your claimed score.

Note that any corrections must come from your on-air experience and notes during the contest. Sending emails to QSO partners to ask them to verify or updated an exchange is strictly forbidden. Checking DX clusters or Reverse Beacon Network skims for call corrections is also not allowed. If you made a recording of the contest, you cannot go back and listen to develop corrections to your log.

You might be tempted to look up callsigns in online databases, such as QRZ.com, to correct name and state exchanges, or to check DX newsletters for a confirmation or fill on a rare DX callsign. Not only are these strictly forbidden by contest rules, but any attempt to do so may lead to erroneous information, as many active contesters will remote to stations in different states, and name exchanges as used in the North American QSO Parties may vary to honor recent Silent Keys.

Immediately after the contest, it's a great idea to write a couple of sentences describing your contest experience. Was this the first contest in which you made a real attempt at calling CQ? Do you want to brag about any specific DX multiplier efforts that paid off? Maybe you made a recent station improvement that you'd like to share. Contest sponsors are specifically looking for succinct comments to include in their final published writeups, and you can pass these comments to the sponsor by putting them in the "Soapbox" section of your log file. With the popular N1MM+ logger, it's easy to type these on the same screen where you select your category.

Soapbox comments are not as popular as they once were. I quickly reviewed the CQ WW SSB public logs from 2005 and found that more than a third of contesters included more than one line of comments. In contrast, only 6% of 2022 CQ WW SSB entrants included more than a single line in their Soapbox. Contest article authors really appreciate these soapbox comments, and they are especially likely to appear in the "Full Articles" that appear on the *ARRL* Contest results website.

After you've applied the allowed corrections in your logging program, you generate your Cabrillo file, the log format the contest sponsors universally accept. The Cabrillo format consists of header lines, that you can carefully inspect for correctness at this point. The CATEGORY-ASSISTED: header line should show ASSISTED if you've used any Telnet Cluster or Reverse Beacon spots during the contest. CATEGORY-POWER specifies either HIGH, LOW, or QRP; note, for many events like the NAQPs, any log showing high power will be classified as a checklog.

email: <n3qe@cq-amateur-radio.com>

The OVERLAY field may be present if you are entering a special overlay category allowed by the contest sponsor. The CQ WW DX contests have CLASSIC and ROOKIE overlays, and the CQ WPX contest has the TB-WIRES overlay. *Carefully* read the contest-specific rules for any overlay you claim. The details of these overlay categories are very specific, and your logger does nothing to help verify that you've operated within those rules.

For multioperator, special-event and club entries, very careful attention must be made to the CALLSIGN and OPERATORS Cabrillo headers. The CALLSIGN field must show what was used on the air during the contest. OPERATORS may list only your callsign if you were a single-op guest of a station host. In a multi-operator entry, the OPERATORS line should show all operators, including the station owner if he/she was also an operator. You can credit the station owner by appending an "@" and his/her callsign at the end of the OPERATORS line.

Below the headers, you'll find a list of QSO lines in the Cabrillo. Quickly verify that the callsign and exchange you sent on the air appears correctly. Corrections here might be made in a text editor with a global search and replace, or you can go back to your logger, edit the exchange information, and re-export.

Contest sponsors do not want you to ever delete any questionable QSOs from your log. On review, you might note there's an obvious typo in the exchange you copied from the other station, or that the callsign cannot possibly be correct. If you delete these QSOs from your log, the other station will receive a *NIL* (Not-In-Log) penalty. You should keep these questionable QSOs in your log but change the "QSO:" prefix of the line to read "X-QSO:".

Note, all editing of Cabrillo files should be done in an ASCII text editor, such as the Notepad application in Windows, and saved as pure text. Copying your log file into a full-featured text editor and saving for example, in Microsoft Word format, will not be useful for submission, as the contest sponsors do not accept that file type. Opening a Cabrillo log file with Excel may look like it works, but you'll find that Excel auto-identifies fields such as dates and times and will reformat these into completely different internal formats. Exporting the QSO data as text may look like it works to the human eye, but the resulting dates and times will be incorrectly formatted for parsing by the contest logchecking software.

Submitting Your Log

For most contests, the best way to submit a log is via the web. For several years, CQ WW has accepted logs only via website submission. *ARRL* strongly encourages website submissions but will still take email submissions. As you fill out the web entry form, you'll likely find that you answer some questions regarding your entry category. For *ARRL* contests, you'll enter the grid square from which you operated; this is important for your log to count towards club competition, as the grid is used to compute whether you're in your contesting club's circle.

Every contest has a deadline for log submittal; for many HF contests sponsored by *ARRL* and CQ you have seven

days from the end of the contest to submit your log (*CQ contests have a 5-day deadline – ed.*). VHF contests and state QSO parties may allow more time – please always check the detailed rules. The best time to send your log in is immediately after the contest. I noted that in the February 2023 ARRL DX CW Contest, more than half of all logs were submitted by Monday after the contest.

Contest sponsors make use of early log entries to find callsigns that were active in the contest but have not yet submitted logs. A day or two before the deadline, many contest sponsors use these early entries to email any stragglers and remind them before the deadline.

If you're encountering a technical challenge getting your log prepared and submitted by the deadline, please reach out to the contact e-mail address in the contest rules to explain the details and request a special case extension of the log deadline.

What happens to late log submissions? For the ARRL and CQ contests, a late submission may be listed in the final result but will not be eligible for any awards. In printed or online score listings, late entries are shown in italics. Most notably, your contest club will not receive any credit for a late submission.

After submitting a log via the web, you'll see a confirmation page which will again echo back details such as your entry category for one more check. The sponsor may also provide a "raw score" at this stage; look for at least a rough agreement between the number of QSOs and mults your logger shows you, and the log robot's raw score calculation. Deviations between your logger and the robot by several percent are normal and can be ignored; if you see a drastic difference, there's something to investigate and correct.

Even after you've gotten a response from the log robot that your log was received, you might want to double-check that the sponsors have it in their computer system. All the major contests offer a logs received web page that is updated either continuously or at least daily in the days after the contest.

For the contests sponsored by CQ magazine, you'll find the link to the logs received report under the "Logs" tab on the home page of each individual contest. An alphabetical list of all log submissions will show. Note that for the CQ contests, details such as entry category, overlay, and club are shown.

To check your log's received status for ARRL-sponsored contests, you start with the ARRL Contest Portal at <<https://contests.arrl.org/>> and click on

the Logs Received tab at the top. The ARRL keeps the category hidden until after the log deadline, but you'll be able to cross-check your callsign and club credit for correctness.

After Submitting Your Log to the Sponsor

Here are a few recommendations for follow-up once your log has been submitted to the contest sponsor and you've confirmed that it's been received:

- * Submit log to Super Check Partial database.
- * Compare to past years.
- * Compare to your competition. What is your competition? SO2R vs single-radio. Big station vs home station. HP vs LP vs QRP. Your buddy across town.

3830

Historically, the very largest US stations would gather on 3830 kHz LSB in the minutes after the contest was over and share their scores and make qualitative

observations of activity and band conditions. Smaller stations would listen in as the giants of the airwaves shared their opinions. In the past few decades, the shift by contesters both large and small has been towards online sharing of claimed scores and comments. Posting to 3830, as the website <<https://www.3830scores.com/>> is commonly known, has become the common online platform worldwide not just for scores, but also for comments containing opinions, successes, and grievances.

For many on-air contest-type activities, notably including the Thursday night NCCC Sprint and the Wednesday CWOps events, there is no sponsor to send your logs to; instead, you simply post your claimed scores to 3830. Bruce Horn, WA7BNM, not only runs the 3830scores.com website – he also hosts the de facto international contesting calendar at <<http://contestcalendar.com>>. If you are organizing any kind of on-air contest-type activity,



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reach out to Bruce and get it listed on both his calendar and 3830scores.com.

How many hams submit scores to 3830? In CQWW SSB 2022, 1348 hams submitted 3830 reports vs. 9004 logs submitted. The bulk of 3830 score website reporting is done by North American hams; looking at a NA-centered event like NAQP SSB from January 2023, nearly half of those submitting logs also submitted to 3830.

The 3830 website is highly promoted by contest clubs to help track member activity. There is a tab at the top, labeled “Activity Tracker,” that allows you to see club standings. My regional contest club, the Potomac Valley Radio Club, collects claimed scores from all our members through the 3830 reporting system, and uses it for our own internal intramural activity award.

You might notice in the 3830 comments for the very biggest contests – ARRL DX, CQ WW, and CQ WPX – that several dozen of the most serious efforts have included very detailed by-hour, by-band, and by-country statistical breakdowns.

Even if you made a more modest effort, it’s worthwhile to run the same statistics on your own logfile and compare with the big guns. These detailed statistical reports are prepared by contest log analyzer software. The *CBS Cabrillo log analyzer* by Ken Adams (now a silent key, formerly K5KA) and Bob Wilson, N6TV, is a free log analyzer that produces such detailed output. You can download it at <<https://www.kkn.net/~n6tv/cbs>> and run it against your Cabrillo. By comparing your log analysis with other geographically nearby stations, you’ll learn key strategies for operating on the best band and the best hours in each contest. As we approach the peak of this solar cycle, specifically look at the band usage by the biggest stations.

Contesters are prolific users of ARRL’s *Logbook Of The World* – more than half of my contest QSOs are confirmed in LoTW. For digital and RTTY mode contests, the confirmation rate is over 65%. LoTW confirmations count towards the ARRL Worked All States (WAS), DXCC, and grid square-based awards. To sign up for LoTW, visit <<https://>

Calendar of Events

All year	CQ DX Marathon	bit.ly/3FyPiui
Mar. 31-Apr. 1	Sasquatch Stomp	https://www.pnwqrp.org/sasquatch-stomp
Apr. 1	RSGB FT4 International Activity Day	bit.ly/3TxCrxl
Apr. 1-2	EA RTTY Contest	http://concurso.ure.es/en/eartty/bases/
Apr. 1-2	Florida State Parks on the Air	http://flspota.org/
Apr. 1-2	Louisiana QSO Party	http://laqp.org/
Apr. 1-2	Mississippi QSO Party	http://www.arrlmiss.org/
Apr. 1-2	Missouri QSO Party	https://bit.ly/3rkAl87
Apr. 1-2	PODXS 070 Club 31 Flavors Contest	http://bit.ly/2SESbDg
Apr. 1-2	SP DX Contest	https://spxcontest.pzk.org.pl/2023/rules.php
Apr. 3	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
Apr. 5	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Apr. 5	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 6	SARL 80m QSO Party	http://bit.ly/H0lqQf
April 8	QRP Spring QSO Party	http://www.qrpcontest.com/
Apr.8-9	FT8 DX Contest	https://europeanft8club.wordpress.com/
Apr. 8-9	Georgia QSO Party	https://gaqsoparty.com/
Apr. 8-9	IG-RY World Wide RTTY Contest	https://www.ig-ry.de/ig-ry-ww-contest
Apr. 8-9	JIDX CW Contest	http://www.jidx.org/
Apr. 8-9	New Mexico QSO Party	http://www.newmexicoqsoparty.org/wp/
Apr. 8-9	OK-OM DX SSB Contest	http://bit.ly/3ioS3CI
Apr. 8-9	Yuri Gagarin International DX Contest	http://gc.qst.ru/en/section/32
Apr. 9	Hungarian Straight Key Contest	http://hskc.ha8kux.com/
Apr. 9	International Vintage Contest HF	http://www.iv3ehh.it/vintage.htm
Apr. 9	WAB 3.5/7/14 MHz Data Modes	http://bit.ly/31yE4kT
Apr. 10	144 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 10	DARC Easter Contest	http://bit.ly/3bOk9pd
Apr. 12	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 14-15	Holyland DX Contest	http://www.iarc.org/iarc/#HolylandContest
Apr. 15	ES Open HF Championship	https://www.erau.ee/en/es-open-contests
Apr. 15	QRP to the Field	http://www.zianet.com/qrp/qrpptf/pg.html
Apr. 15-16	CQ Manchester Mineira DX Contest	http://www.cqmmdx.com/rules/
Apr. 15-16	North Dakota QSO Party	https://www.ndarrlsection.com/index.html
Apr. 15-16	Michigan QSO Party	https://miqp.org/index.php/rules/
Apr. 15-16	Ontario QSO Party	http://www.va3cco.com/oqp/rules.htm
Apr. 15-16	Texas State Parks on the Air	https://www.tsqpot.org/
Apr. 15-16	Worked All Provinces of China DX Contest	http://www.mulandxc.com/index/index
Apr. 15-16	YU DX Contest	http://yudx.yu1srs.org.rs/
Apr. 16	ARRL Rookie Roundup, SSB	http://www.arrl.org/rookie-roundup
Apr. 18	222 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 19	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
Apr. 19	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
Apr. 22	YOTA Contest	https://www.ham-yota.com/contest/

www.arrl.org/logbook-of-the-world>. The best format for exporting to LOTW is the ADIF format, if your logger supports it. Cabrillos can also be up-loaded with an extra conversion step.

If you're chasing awards, DX, or working in the CQ DX Marathon, the Clublog website lets you upload all logs (including contest logs) to be included in your statistics. I found Clublog's "DXCC Leagues" and "Zone Leagues" to be particularly strong motivations to work *not* just contests, but *also* chase DXpeditions for counters in my CQ DX Marathon entries. Uploading all your logs to Clublog also makes it easy to process OQRS (Online QSL Requests) for DXpeditions. Learn more at <<https://clublog.org/>>.

April and May Contest Highlights

The 4-hour North American SSB Sprint is held Saturday night, April 22. (That's 0000-0359Z April 23 in UTC time). The required QSY rule mandates that every time you work a station calling CQ, he has to find a new frequency and you inher-

it his run frequency, at least briefly. The exchange is name, state, and serial number. You'll find full rules, along with operating and logging hints for the unique Sprint format, at <<https://ssbsprint.com/>>.

The 2023 Contest University is held May 18-19, right before the Dayton Hamvention®. Register for it at <<https://contestuniversity.com/>>. The Saturday evening of Hamvention also has the Contest Dinner, which features the induction of new members to the CQ Contest Hall of Fame. Reserve a seat via <<https://contestdinner.com/>>.

The weekend after Dayton, Memorial Day weekend in the US, has the CQ WPX CW Contest. Although we are all excited about the amazing DX openings likely on the 10-meter band, plan your operating time to get on the 40-meter band before dusk in order to take advantage of the unique WPX score table that gives you 6 points for each DX QSO on the low bands; see the rules at <<https://cqwpw.com/>> for full details. Single-operator entries may operate up to 30 hours of the 48-hour contest weekend starting at 0000Z May 27.

Apr. 22-23	SP DX RTTY Contest	http://www.pkrvg.org/strona,spdxrttyen.html
Apr. 23	BARTG Sprint75 Contest	http://bartg.org.uk/wp/contests/
Apr. 23	North American SSB Sprint	https://ssbsprint.com/rules/
Apr. 24	RSGB FT4 Contest Series	bit.ly/3TxCrxl
Apr. 26	432 MHz Spring Sprint	http://bit.ly/3XM4RpW
Apr. 26	UKEICC 80m Contests CW	https://ukeicc.com/80m-rules.php
Apr. 27	RSGB 80m Club Championship, Data	bit.ly/3TxCrxl
Apr. 29-30	10-10 Spring Digital Contest	http://bit.ly/1FrFeBc
Apr. 29-30	Florida QSO Party	http://www.floridaqsoparty.org/
Apr. 29-30	Helvetia Contest	https://www.uska.ch/
Apr. 29-30	UK/EI DX Contest, CW	https://www.ukeicc.com/dx-contest-rules.php
May 1	AGCW QRP/QRP Party	https://www.agcw.de/contest/qrp-qrp/
May 3	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
May 4-5	MIE 33 Contest	http://www.ztv.ne.jp/isoda/33/index-e.html
May 6	Microwave Spring Sprint	http://bit.ly/3XM4RpW
May 6-7	7th Area QSO Party	http://ws7n.net/7QP/new/Page.asp?content=rules
May 6-7	10-10 Spring CW Contest	http://bit.ly/1FrFeBc
May 6-7	ARI DX Contest	http://www.ari.it/
May 6-7	Delaware QSO Party	https://www.fsarc.org/qsoparty/rules.htm
May 6-7	Indiana QSO Party	http://www.hdxcc.org/inqp/index.html
May 6-7	New England QSO Party	http://www.neqp.org/rules/
May 6-7	SBMS 2.3 GHz and Up Contest and Club Challenge	http://www.n6nb.com/sbmsrules.htm
May 6-7	Veron SLP Contest	http://bit.ly/2L9eT1L
May 7	WAB 7 MHz Phone	http://bit.ly/31yE4kT
May 8	RSGB 80m Club Championship, SSB	bit.ly/3TxCrxl
May 10	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
May 13-14	Canadian Prairies QSO Party	https://cpqp.ve6hams.ca/
May 13-14	CQ WW Foxhunting Weekend	http://www.homingin.com/joek0ov/nfw.html
May 13-14	CQ-M International DX Contest	http://cqm.srr.ru/en/rules/
May 13-14	Volta WW RTTY Contest	http://www.contestvolta.it/
May 13-14	50 MHz Spring Sprint	http://bit.ly/3XM4RpW
May 17	RSGB 80m Club Championship, Data	bit.ly/3TxCrxl
May 17	VHF-UHF FT8 Activity	http://www.ft8activity.eu/index.php/en/
May 18	QRP Minimal Art Session	http://qrpsc.de/contestrules/mas/index.html
May 20-21	Arkansas QSO Party	https://arkqp.com/arkansas-qso-party-rules/
May 20-21	Baltic Contest	http://www.lrsf.lt/en/
May 20-21	His Majesty King of Spain CW Contest	http://concursos.ure.es/en/
May 20-21	NZART Sangster Shield Contest	http://bit.ly/3aviX6h
May 20-21	SARL VHF/UHF Digital Contest	http://bit.ly/H0IqQf
May 22	QRP ARCI Hoot Owl Sprint	http://www.qrpcontest.com/
May 22	RSGB FT4 Contest Series	bit.ly/3TxCrxl
May 25	RSGB 80m Club Championship, CW	bit.ly/3TxCrxl
May 27-28	CQ WW WPX CW Contest	http://www.cqwpw.com/

PROPAGATION

BY TOMAS HOOD,* NW7US

April Propagation Revisited

Quick Look at Current Cycle 25 Conditions:

(Data rounded to nearest whole number)

Sunspots:

Observed Monthly, January 2023: 144

12-month smoothed, July 2022: 87

10.7-cm Flux:

Observed Monthly, January 2023: 182

12-month smoothed, July 2022: 130

One Year Ago:

(Data rounded to nearest whole number)

Sunspots:

Observed Monthly, January 2022: 57

12-month smoothed, July 2021: 32

10.7-cm Flux:

Observed Monthly, January 2022: 104

12-month smoothed, July 2021: 83

NW7US was unable to produce his column this month, so we are reprising his April 2022 column, which offered a general look at what to expect on the bands in this month of “equinoctial” propagation. Sunspot numbers have been updated. For the Last-Minute Forecast, please visit Tomas’s website at <<https://SunSpotWatch.com>>. – W2VU

As we move into spring in the Northern Hemisphere, the Sun is mostly overhead above the equator this month. This creates equal day and night periods in both hemispheres, which leads to improved DX conditions around the world on HF.

The Vernal Equinox in mid-March marks the day when the hours of daylight and darkness are about equal around the world. This creates an ionosphere of similar characteristics throughout more of the world than is possible during other times when it is summer in one hemisphere and winter in the other, and there are extreme differences in the ionosphere.

This equalization of the ionosphere during the equinoctial periods (autumn and spring) is responsible for optimum DX conditions starting late in February and lasting through late April. The improvement in propagation is most noticeable on long circuits between the Northern and Southern hemispheres. During this season, conditions are optimum for long-path as well as short-path openings, and during gray-line twilight periods associated with sunrise and sunset.

DXers (those who seek out signals from across the world) love April because the seasonal change this month plays out on HF: Activity (propagation) moves up from the 40-meter band and down from the 10-meter band, with stronger, more stable openings on paths on frequencies from 30 meters through 17 meters. Propagation on the higher HF frequencies (20 through 10 meters) begins to suffer late in April and into the summer months due to lower MUFs (Maximum Usable Frequencies) in the Northern Hemisphere, but the mid-HF bands are very usable, especially late in the day when MUFs peak.

Summertime MUFs are lower due to solar heating which causes the ionosphere to expand. An expanded ionosphere produces lower ion density, which results in lower MUFs.

Short-path propagation between countries in the Northern Hemisphere will drop out entirely. Higher frequency propagation peaks in the fall, north of the Equator.

April and May are autumnal months in the Southern Hemisphere, resulting in enhanced long-path DXing. At the same time, short-path propagation from South America, the South Pacific, and other areas south of the equator to points in the Northern

Hemisphere will be strong and reliable when open. However, these do not happen every day on the higher frequencies—but do on mid-HF frequencies such as in the 20-meter band.

From April to June, excellent propagation occurs on both daytime and nighttime paths. The strongest propagation occurs on paths that span areas of both day and night, following the MUF. During April, peaking in May, and still in June, the 16-meter broadcast and the 15-meter amateur bands may offer 24-hour DX to all parts of the world, with both short- and long-path openings occurring, sometimes at the same time! If you hear a lot of echo on a signal, you might be beamed in the wrong direction. Try the opposite azimuth. Propagation on frequencies from the 30-meter band through 17 meters is more stable at night, with propagation following gray-line and nighttime paths.

Low-band propagation is still hot on 40 meters, with Europe in the evening and Asia in the mornings. Occasional DX openings will occur on 90 and 75 meters around sunrise.

VHF Conditions

The Lyrids meteor shower occurs in mid-April, peaking on the UTC night of April 21/22. The hourly visual meteor rate is expected to be low, with average meteor velocities of about 48 kilometers per second with broad outbursts. However, this shower’s peak lasts for several days.

The debris expelled by comet Thatcher as it moves through its orbit causes the Lyrids. It is a long period comet that visits the inner solar system every 415 years or so. Despite this long period, there is activity every year at this time, so it is theorized that the comet must have been visiting the solar system for quite a long time. Over this long period, the debris left with each pass into the inner solar system has been evenly distributed along the path of its orbit.

This material isn’t quite evenly distributed however, as there have been some years with outbursts of higher than usual meteor activity. The most recent of these outbursts occurred in 1982, with others occurring in 1803, 1922, and 1945. These outbursts are unpredictable, and one could occur this year. The best time to work this shower should be from midnight to early morning.

The unpredictability of the shower in any given year always makes the Lyrids worth watching, since we cannot say when the next unusual return may occur. If this year’s event is average or better, this should make possible meteor-scatter type openings on the VHF bands.

A seasonal increase in sporadic-E (E_s) ionization usually begins during April and continues through the spring and summer months. Expect an increase in short-skip openings on both the 15- and 10-meter bands during April, as well as a possible occasional opening on 6 meters. While sporadic-E openings may occur at any time, they tend to peak between 8 a.m. and noon, and again between 5 and 9 p.m. local time.

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Widespread auroral displays can occur during April, bringing with them unusual ionospheric short-skip openings on the VHF bands. Best times for these to occur are during periods of radio storminess on the HF bands.

For a detailed list of meteor showers, check out <<https://tinyurl.com/bdcptcw>> for a complete calendar of meteor showers in 2023.

If you use Twitter.com, you can follow <@hfradiospacewx> for hourly updates that include the K index numbers. You can also check the numbers at <<https://SunSpotWatch.com>>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <<https://fb.me/spacewx.hfradio>>.

Current Solar Cycle Progress

Solar Cycle 25 continues to significantly outperform most of the predictions. The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for January 2023 is

143.6, up considerably from 113.1 in December 2022. The twelve-month running smoothed sunspot number centered on July 2022 is 86.5, up from 80.9 in June. A smoothed sunspot count of 87, give or take about 6 points, is expected for April 2023.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 182.47 for January 2023, up from 148.46 for December 2022. The twelve-month smoothed 10.7-cm flux centered on July 2022 is 129.73, up from 119.74 for June.

For a look at geomagnetic activity levels this month, check out the *Last-Minute Forecast* at <<https://SunSpotWatch.com>> on the main page.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF Amateur bands. If you are on Facebook, check out <<https://fb.me/spacewx.hfradio>> and <<https://fb.me/NW7US>>. Speaking of Facebook—check out the CQ Amateur Radio magazine fan page at <<https://fb.me/CQMag>>. Also, please check out the new alternative social networking ham radio group at <<https://amateurhamradio.locals.com/>> and please share this with your amateur radio friends and clubs.

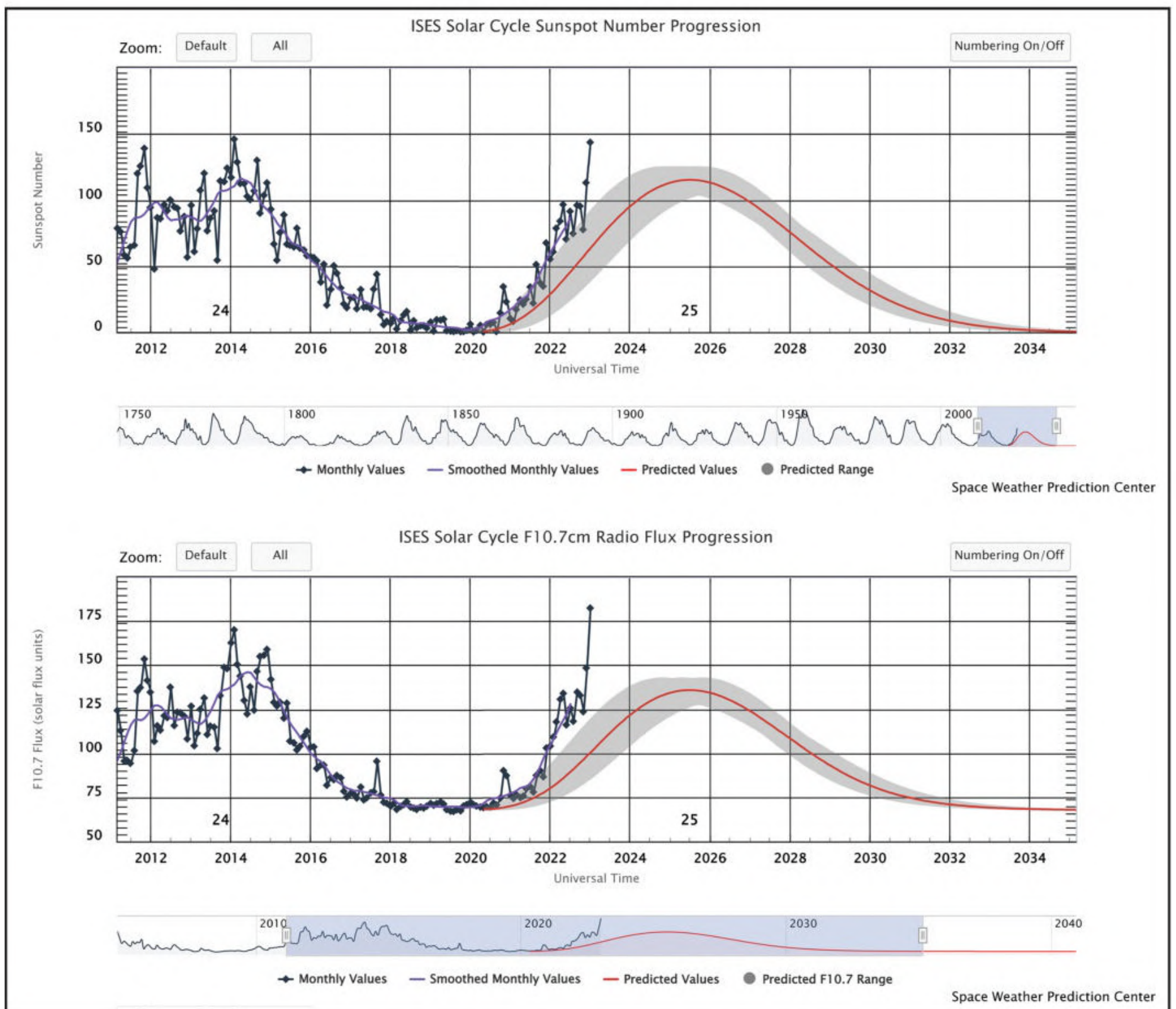


Figure 1. Cycle 25 continues to beat the “official” predictions by a huge amount, lending more and more credibility to Dr. Scott McIntosh’s “outlier” prediction that this could be one of the best solar cycles ever. (Graphs courtesy SWPC/NOAA)

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, Zones, and Countries. An asterisk (*) before a call indicates low power. An A after the band indicates an Assisted category. Certificate winners are listed in bold. Late logs are listed in italics. (All country terminology reflects the DXCC list at the time of the contest.)

2022 CQWW DX SSB RESULTS SINGLE OPERATOR NORTH AMERICA

United States

District 1

KQ2M	A	4,467,840	3412	117	363
W1JQ	"	1,281,267	1083	94	329
N1DD	"	994,444	951	93	295
NG1M	"	807,234	1019	71	220
W1WEF	"	624,987	723	80	241
N2ZA	"	405,996	535	66	210
N1JEZ	"	237,796	408	55	166
K1RO	"	234,080	373	55	169
N1SEP	"	207,518	312	69	185
NE1RD	"	116,571	238	57	126
K1BIF	"	110,940	238	46	126
W2TT	"	98,237	199	62	131
W1OHM	"	48,678	153	34	88
KF0INO	"	42,075	193	16	59
W01I	"	39,446	120	36	85
K1OFO	"	17,978	85	30	59
W1/PY1MX	"	13,410	99	30	60
N1NN	"	2,414	28	11	23
W1CS	"	1,643	23	11	20
N1PGA	28	467,200	1314	25	103
K1RM	"	235,524	741	24	90
W1NK	"	44,462	170	22	72
K1ALA	14	1,342	28	7	15
W1FQ	3.7	21,229	116	18	53
W1HI	"	19,093	121	14	47
*N1UR	A	4,035,766	2739	116	411
*K1BX	"	1,593,606	1402	92	307
*N1DC	"	393,666	527	67	206
*N1ALO	"	374,884	489	78	220
*KA1YQC	"	293,702	412	66	196
*W1JIM	"	215,031	366	62	167
*K1HT	"	166,662	303	58	139
*KR1A	"	164,101	314	50	147
*WA1HXH	"	121,638	241	63	131
*K1KL	"	117,696	248	50	142
*AF1R	"	104,912	243	44	122
*N1SFE	"	89,748	223	46	116
*WA1YZN	"	82,592	189	56	122
*KC1RET	"	65,412	178	33	105
*ND1T	"	56,832	161	32	96
*KC1QEM	"	56,574	173	34	92
*N1ADG	"	56,400	152	39	102
*N1OIG	"	42,066	135	32	82
*WB2ITX	"	39,445	125	32	83
*WA1K	"	38,958	137	39	90
*W1FWS	"	25,839	98	34	65
*KB1FX	"	25,760	110	28	64
*K1AV	"	24,541	109	30	67
*W1EYZ	"	22,654	106	29	65
*K17IG	"	22,506	89	33	60
*N1CEO	"	12,848	75	29	44
*W1VBX	"	11,814	79	22	44
*NV1P	"	11,040	68	19	41
*N1WEN	"	10,758	61	22	44
*K1RTO	"	9,664	59	22	42
*AB1XB	"	8,060	51	24	41
*N1MRI	"	6,844	62	21	37
*WA1N	"	6,816	51	15	33
*N1AM	"	6,608	44	22	37
*AI1G	"	6,380	45	17	38
*KC1FOZ	"	5,376	40	21	35
*K1NZ	"	4,452	36	21	32
*K5ATA	"	3,577	33	19	30
*N1YIS	"	3,234	32	21	28
*KC1NCN	"	2,926	31	12	26
*N1TAA	"	2,640	31	11	22
*AA1NK	"	2,590	28	15	22
*KC2TV	"	2,576	38	19	27
*KC1LM	"	2,006	28	13	21
*KB1ZAC	"	1,680	53	16	32
*N1ET	"	1,674	32	12	19
*KC1SA	"	800	16	10	15
*NV1Y	"	775	14	11	14
*W1ACB	"	440	13	11	11
*K1THE	"	16	2	2	2
*N1WRK	28	141,022	502	20	78
*ND1L	"	1,656	26	5	18
*KB1DMR	21	2,754	40	6	21
*AA1F	14	3,420	43	14	22
*AB1J	"	666	16	6	12
*NM1J	"	455	13	4	9
*KU1N	"	243	11	2	7
*N1UMJ	7	1,472	39	8	24
*KM1NDY	"	1,071	36	8	13
*W1HIS	1.8	18	3	2	1

District 2

N2QV	A	2,785,321	2410	111	316
KN2M	"	1,466,874	1149	120	334
W2XL	"	1,035,870	1121	80	250
KD2TT	"	698,679	784	80	259
W2OIB	"	525,252	621	88	250
WA2JQK	"	480,216	546	95	279
W2CN	"	465,885	550	83	232
KC2MBV	"	363,420	524	76	194
KC2G	"	332,555	415	80	213
WS9M	"	316,940	464	75	185
WA3AFS	"	303,831	395	84	213
W2AGOT	"	241,964	370	64	177
N2YG	"	220,298	355	58	171
N2J	"	209,397	347	57	166
W2KU	"	102,116	189	59	137
N2AXX	"	87,750	168	62	133
K2PLI	"	51,220	160	44	86
W2LC	"	43,700	148	24	76
KB2DX	"	25,990	89	42	73
AH2O	"	21,830	113	16	58
KC2BBI	"	14,364	68	24	52
AC2ZU	"	13,790	98	18	52
KC2KZJ	"	6,278	53	12	31
KN2U	"	3,645	36	16	29
K2XA	28	599,666	1498	28	114

N2ZN	"	29,172	198	8	43
KU2M	21	903,650	2096	34	121
*N1NQD	A	725,637	744	95	268
*N2MTG	"	216,648	357	70	166
*WB2KLD	"	203,451	344	57	162
*WA2CNV	"	179,078	334	63	166
*AB2TC	"	160,890	310	52	134
*KC2WUF	"	126,038	251	46	141
*KE2SD	"	125,660	247	63	143
*KA2FIR	"	124,600	251	59	141
*N2LDV	"	120,800	235	55	145
*KD2VSD	"	92,160	227	43	117
*K2WJL	"	83,980	206	50	120
*KI2D	"	67,781	171	50	111
*K2DD	"	66,776	183	37	99
*W2YW	"	65,664	199	32	96
*KA2ENE	"	60,345	169	44	91
*KD2WOZ	"	57,624	160	37	110
*AC2ZZ	"	57,057	163	39	94
*K2RSK	"	54,087	150	50	99
*KD2UTL	"	44,226	139	39	87
*N2PYH	"	42,978	143	32	82
*KD2GUD	"	40,194	132	39	87
*KD2QFI	"	39,558	143	43	71
*WA2VAM	"	34,650	132	34	76
*N3DRK	"	33,708	137	33	73
*KQ2N	"	32,490	133	27	68
*AI2U	"	30,636	121	35	76
*N2BZD	"	27,169	109	26	75
*K2YG	"	25,830	84	39	84
*N2LEB	"	21,204	85	30	63
*W2VU	"	12,994	67	27	46
*K2QGP	"	10,366	53	22	49
*N2TEV	"	10,248	61	15	46
*NV2K	"	5,610	38	23	32
*KB2GD	"	5,400	40	18	32
*WB2AIV	"	2,976	34	19	29
*KD2REH	"	2,668	38	19	27
*W2FTL	"	2,405	31	13	24
*KX1W	"	2,200	25	18	22
*KC2VPE	"	2,080	27	7	19
*WB2ZEX	"	1,953	26	13	18
*KD2FQZ	"	1,020	20	13	17
*KD2WDN	"	920	16	9	14
*N2NJW	"	825	14	11	14
*KE2AAK	"	552	13	11	12
*AA2TH	"	420	11	6	9
*W2JAT	"	130	10	5	8
*KD2TUD	"	63	9	4	3
*KD2ZEL	28	143,856	492	25	83
*K2CS	"	59,274	240	21	68
*N2EAB	"	16,017	117	14	43
*KC2JRQ	"	1,311	21	9	14
*N1MID	"	832	23	5	8
*K2HVE	"	682	21	6	16
*KC2SEK	"	108	5	4	5
*W2VJ	21	276	8	4	8
*K1TZT	14	4,212	41	10	26
*W3EH	"	2,790	33	9	22
*WA2WZT	"	12	2	2	2
*K2JF	"	12	2	1	2
*WB2BWU	"	8	2	2	2

District 3

K3ZO	A	4,289,844	3048	126	388
K3TC	"	1,010,724	895	100	318
NY3A	"	620,160	855	60	195
K3FF	"	382,382	498	68	218
W3KL	"	296,484	549	49	137
K3UL	"	276,675	497	59	158
N3LH	"	274,944	415	74	182
4U1WB	"	246,642	570	62	160
N8WXQ	"	160,550	314	51	139
WB3CJU	"	120,792	271	37	131
N3MWW	"	94,800	223	43	115
K3EJJ	"	49,786	163	45	101
K3CU	"	48,852	142	45	93
K3CWF	"	36,036	121	32	85
NA7L	"	31,354	100	36	86
AA3RC	"	11,550	76	27	43
KB3RCT	"	9,815	68	23	42
NC3Y	"	9,540	65	17	36
WW3HAM	"	8,778	65	17	40
K3ISH	"	3,160	31	15	25
W5EIM	"	2,944	45	26	38
WF3W	"	1,505	28	13	22
KB3RN	"	902	17	6	16
N3RW	28	8,225	76	11	36
W3PAX	21	60,885	248	24	75
KA3LKM	14	51,260	197	26	84
KC3RRF	"	18,288	123	20	52
KQBAK	"	40	3	2	3
W3BGN	3.7	59,013	392	15	64
*K3SWZ	A	682,348	701	97	261
*KD3HN	"	98,102	194	52	129
*KD9QS	"	82,082	341	41	102
*KR3L	"	80,842	194	47	119
*KC3I	"	76,200	238	28	92
*K3THS	"	55,176	183	41	91
*NH7TV	"	47,082	145	34	84
*AC5XK	"	44,928	145	33	84
*KQ3W	"	44,390	143	39	76
*AB3JF	"	41,344	134	43	93
*KB3LPE	"	38,571	117	42	87
*WM2Y	"	38,186	116	39	83
*WA3YZD	"	30,688	108	34	78
*W3AVP	"	25,564	110	21	62
*AC3EK	"	24,411	104	27	76
*KC3RKW	"	23,584	107	25	63
*WD8RYV	"	23,310	88	33	72
*NR3S	"	23,184	99	24	60
*N3BMX	"	21,335	96	26	59
*N3YHM	"	19,662	103	26	61
*KW3P	"	16,650	94	19	55
*KB3RKM	"	15,675	74	24	51
*K3ADA	"	12,975	64	24	51
*N3WAS	"	12,420	76	21	48
*NBURE	"	12,283	68	21	50
*KN1OLA	"	12,250	72	25	45
*WB3JAC	"	11,748	71	32	57
*KI4TXP	"	10,640	67	22	48
*N3VFK	"	9,558	61	32	49
*WB2FUE	"	8,816	59	18	40
*W3ATN	"	7,194	50	26	40
*NV					

*VE7YAH	"	20,564	98	43	54	*ED8B	28	415,093	1103	29	104	BI4SZP	"	35,526	216	29	64	VU2KIB	"	23,520	107	31	67	*JL1LOF	"	1,632	30	11	13
*VE7BGP	"	4,230	42	22	23							BG2VIA	"	2,394	42	18	20	VU2IBI	28	56,932	256	22	64	*JA1STY	"	1,540	21	15	13
*VA7UY	"	1,980	38	17	16	*EA8DHH	"	150,450	454	26	92	BG6SNJ	"	1,794	22	17	22	*VU2ABE	A	107,415	373	51	104	*JJ1UBX	"	1,300	26	12	14
*VE7GOG	"	888	21	13	11	*EA8DGZ	21	17,152	114	15	49	BG3KZJ	"	703	27	9	10	*VU2SMS	"	69,278	202	37	97	*JA1TZG	"	960	18	12	12
												BH4TKN	"	140	13	5	5	*VU2MGS	"	20,075	153	23	50	*JG1LZY	"	748	22	7	10
*VA7RYL	"	720	19	8	12							BG9N9J	28	19,987	114	19	60	*VU3IZJ	"	18,616	120	35	69	*JE1GWO	"	594	15	9	9
*VE7COR	21	12,810	132	17	25	*EA9ABC	21	459,225	1439	28	89	BH4SDT	21	242	8	4	7	*VU2GRM	"	14,800	95	34	46	*JG1LMT	"	480	14	10	10
												*BD4VGZ	A	256,795	527	58	145	*VU2BQN	"	9,513	65	21	42	*JA1EQO	"	294	11	6	8
												*BG8TFN	"	126,244	452	53	95	*VU3IBL	"	6,344	60	25	36	*JS1YGS	"	264	8	5	6
												*BG0DPG	"	65,040	243	31	89	*VU3IZV	"	1,178	20	14	17						
												*B18FRF	"	63,510	251	55	91	*VU2MCW	"	450	17	11	14	*JH1HHP	"	228	16	9	10
												*BH3PLA	"	57,387	203	46	95	*VU3SIO	"	368	14	10	13	*JJ1TQD	"	170	7	4	6
												*BD6JN	"	43,722	187	48	78	*VU2XJ	"	216	11	6	6	*JR1USU	"	130	11	5	5
												*BH2TVR	"	41,875	212	49	76	*VU3LMS	"	40	4	4	4	*JF1EPL	"	75	5	3	2
												*BA6KC	"	38,907	182	51	80	*VU3GDS	28	35,518	185	19	67	*JJ1LBJ	28	76,912	329	28	60
												*BG1WNU	"	30,734	215	47	74	*VU2OO	"	15,170	144	17	57	*JL1TVK	"	51,072	205	28	68
												*BG7TNB	"	28,080	157	33	71	*VU2RS	"	1,525	25	10	15	*7N2UQC	"	45,360	224	24	60
												*BH7CM	"	25,704	129	39	69	*VU3DXL	14	3,255	39	12	23	*JM1SMY	"	41,943	180	29	64
												*BH6AGG	"	23,625	140	36	69	*VU2JOS	"	240	15	6	10	*JK1CNL	"	9,720	87	18	36
												*BA7LRT	"	20,604	129	40	61	*VU2EKR	"	2	1	1	1	*JJ1KZZ	"	5,760	52	17	28
												*BA3NHN	"	18,032	124	33	59	*VU3RGB	7	403	19	6	7	*JA1CHY	"	2,310	27	15	20
												*BH1KTJ	"	16,796	158	31	45							*JL1WRV	"	2,117	37	10	19
												*BD4KM	"	16,318	102	27	55							*7K1BIB/1	"	525	19	6	9
												*BD4SVU	"	15,752	117	37	51							*JL1GCO	"	476	10	8	9
												*BD3OD	"	14,442	116	36	51							*7K4XNN	21	134,200	457	31	79
												*BH7FUC	"	12,744	88	27	45							*JP1XV	"	49,192	215	27	59
												*BH4TYL	"	10,688	115	27	37							*JR1AKD	"	31,275	171	22	53
												*BA3MC	"	10,164	98	26	40							*JG1UKW	"	30,149	165	24	49
												*BG8KI	"	10,082	75	30	41							*JE1RRK	"	26,530	155	21	49
												*BH4FSD	"	10,080	61	27	45							*JA1RYC	"	25,908	155	21	47
												*BA2BA	"	9,300	113	26	34							*JM1LAW	"	23,660	132	21	49
												*BA4IT	"	8,932	83	30	47							*JO1WQS	"	20,032	143	22	42
												*BH3ECQ	"	8,700	84	33	42							*JF1HAJ	"	14,560	111	19	37
												*BG6QAL	"	8,662	85	23	38							*JF1GZZ	"	13,833	109	17	36
												*B11JOT	"	7,497	69	23	40							*JH1NLF	"	13,039	95	21	38
												*BD6AHP	"	6,976	62	28	36							*7K4TKB	"	10,396	88	18	28
												*BG0BPF	"	6,790	84	26	44							*JP1LRT	"	6,804	58	15	27
												*BH1XEC	"	5,865	78	30	39							*JQ1VDJ	"	4,788	50	17	25
												*BG8FZ	"	4,794	54	21	30							*JA1DBG	"	4,636	59	14	24
												*BD2IAQ	"	4,773	73	17	26							*JO1KTD	"	4,026	54	12	21
												*BA7LCS	"	4,675	58	23	32							*JA1CTB	"	2,592	36	12	15
												*BG0DAP	"	4,656	60	18	30							*JJ1SVC	"	2,560	44	10	22
												*BH2UAE	"	4,590	59	18	27							*JA1JLP	"	2,244	42	14	19
												*BA7LYS	"	4,320	71	20	28							*JK1PDC	"	1,891	35	12	15
												*BD4TWZ	"	3,861	63	16	23							*JE1GZB	"	1,836	32	12	15
												*BG7SPN	"	3,526	43	17	24							*JM1XBD	"	1,638	23	10	16
												*B17LVU	"	3,393	50	17	22							*JJ1SWV	"	627	17	9	10
												*BA7LBM	"	2,923	40	14	23							*JA1LKY	"	304	21	8	8
												*B18EPI	"	2,419	61	15	26							*JH1VIX	"	273	9	5	8
												*BD8AQY	"	2,405	36	15	22							*JP1PEA	"	84	6	3	3
												*BG6LH	"	2,400	61	21	29							*7K1EAS	"	40	14	5	5
												*BG6SZD	"	2,318	50	27	34							*JF1TEU	14	17,214	105	20	37
												*BD4ULB	"	1,836	38	13	21							*JH1WHA	"	722	14	9	10
												*BG8KUQ	"	1,617	30	14	19							*J11DGW	"	228	11	5	7
												*BH4FCY	"	1,225	34	17	18							*J11GNL	"	60	4	2	3
												*BG5FOX	"	924	21	15	18							*JG1CMT	"	6	1	1	1
												*BH2SMF	"	816	50	11	13							*JH1RDX	7	1,798	28	14	15
												*BG2TAA	"	658	52	23	24							*JJ1BDX	"	36	3	2	2
												*BH3XZT	"	525	34	12	13							*JA1KJC	3.7	171	8	5	4
												*BD8AIS	"	506	26	10	13							*JE1SPY	1.8	160	44	5	5
												*BH6PKX	"	459	20	12	15												
												*BH5HFK	"	391	15	7	10												
												*BH6AOV	"	174	33	12	17												
												*BD7JQJ	"	135	11	7	8												
												*BG8KUV	"	117	8	4	5												
												*BD4VDA	"	48	7	4	4												
												*BH4JPA	"	14	5	3	4												
												*BA4SCP	"	10	9	5	5												
												*B11MCC	28	31,755	206	21	52												
												*BG7XWF	"	30,550	310	21	44												

*SV1JDY	"	5,427	53	23	44	*IZ7GLL	"	118,230	325	56	154	*IQ4JO	14	219,890	1417	27	83	*Z35K	"	67,424	212	48	148	*SO6MZ	"	13,200	87	30	70							
*SV2SKD	"	2,419	45	13	28	*IW1FFPK	"	117,465	415	50	141	*IU4DAF	"	28,107	242	18	63	*Z35O	"	60,164	198	49	120	*SP2TQQ	"	12,096	118	22	62							
*SV7CUD	"	2,385	33	18	27	*IU7EDX	"	114,680	324	51	137	*IV3ZNK	"	12,528	96	21	51	*Z34PEC	"	19,838	139	24	67	*SP5BYC	"	10,030	70	24	35							
*SV1EEM/8	"	2,035	51	17	38	*IW2NBL	"	109,616	414	43	165	*IZ0OVW	"	11,988	232	10	44	*Z32ZZZ	"	12,533	119	17	66	*SP8BOZ	"	9,918	99	24	63							
*SV4LOW	"	1,845	41	11	30	*IZ5CMC	"	105,094	347	42	145	*IU6AIG	"	4,263	77	7	42	*Z33F	21	9,519	99	15	42	*SP9TL	"	9,648	116	16	51							
*SV1MO	"	792	14	11	11	*IZ3XNJ	"	97,983	302	48	143	*IZ4XHG	"	2,993	43	10	31	*Z35U	7	31,950	253	17	73	*SN3N	"	9,600	99	19	56							
*SV1AGU	"	20	6	4	6	*IU3GJD	"	90,816	357	42	150	*IU3QNT	"	2,196	47	8	28	Northern Ireland										*SP4SAF	"	9,417	108	17	56			
*SV1AZL	28	6,952	70	17	27	*IK0ALT	"	87,087	298	48	155	*IN3GYK	"	1,890	46	7	28	MI1A	A	130,530	403	51	178	*SQ8MXC	"	8,811	90	21	68							
Guernsey					1,584	30	8	10	*IU5KRE	"	83,183	267	54	139	*IZ2GMT	"	476	20	5	12	(OP: MI0ULK)										*SQ5CZN	"	8,611	61	28	51
Hungary					766,035	825	102	333	*IW2ENA	"	79,348	244	50	116	*IU1JFH	"	460	17	5	15	*MI0JZZ	A	132,354	388	44	127	*SP2HSA	"	7,590	70	21	45				
HA1BC	A	766,035	825	102	333	*IW2LXD	"	77,264	235	53	123	*IK1ZNM	"	169	9	4	9	*GI7NKK	"	86,086	365	38	116	*SP4DIR	"	6,784	106	15	49							
HA2D	"	48,336	359	25	81	*IK2WXQ	"	69,870	214	48	122	*IZ7NMD	"	14,760	270	12	48	*MI0OBC	"	32,712	204	31	85	*SQ7NPA	"	6,336	35	29	35							
HA5MIG	14	21,186	191	23	76	*IK2JTS	"	67,584	341	42	134	*IU1MRG	"	11,375	134	14	51	*MI0DWE	"	4,750	53	18	32	*SP5ETS	"	5,246	80	16	45							
HA5EA	A	13,440	127	17	53	*IK2DJY	"	64,080	169	60	120	*IZ5MMK	"	1,288	36	7	21	*2I0WMN	"	988	28	8	18	*SP3MKL	"	4,410	58	14	35							
*HA7AVU	A	51,948	246	33	115	*IU1HGO	"	62,530	219	48	137	*IN3HEZ	3.7	13,932	249	7	47	Norway										*SP8VGA	"	3,776	77	13	46			
*HA3FHH	"	27,720	116	34	50	*IW0SAG	"	60,060	233	41	113	*IW5ECP	"	4,704	112	6	36	LA3BPA	A	476,354	802	78	304	*SP2UKG	"	3,172	49	14	38							
*HA5BMS	"	17,280	116	31	65	*IZ5VTJ	"	59,984	196	52	132	Kaliningrad										LC5C	"	171,587	743	35	162	*SP4HXV	"	2,964	49	15	37			
*HG1VN	"	4,484	58	19	40	*IK2OFS	"	58,674	204	45	82	RA2F	14	8,060	70	19	43	LA7VK	"	30,600	181	29	91	*SP9BB	"	2,790	42	14	31							
*HA8KM	"	2,250	38	14	31	*IU1PZX	"	58,512	210	46	113	*UA1OMX/2	A	2,457	35	16	23	LB3AG	"	6,400	43	28	36	*SP9ODU	"	2,115	29	19	28							
*HA3OOM	"	957	35	8	21	*IU1OPM	"	55,424	185	46	118	Latvia										LA1AAA	"	4,240	52	18	35	*SQ7WOJ	"	1,591	40	10	27			
*HG8CK	"	644	35	5	18	*IV3EHH	"	55,242	185	46	119	YL2PJ	"	97,152	299	51	141	LA6OP	21	52,750	245	27	98	*SP3UCW	"	1,470	26	13	22							
*HA0QLZ	28	12,720	87	21	39	*IU3OCN	"	54,776	192	48	116	YL3CW	"	8,388	107	12	24	LA0GE	14	36,764	296	20	71	*SP3FSM	"	1,240	22	14	17							
*HA0VI	7	11,658	184	11	47	*I5OYY	"	53,222	136	48	130	YL2SM	28	487,653	1429	35	124	LA09E	"	7,052	160	7	36	*SQ3BES	"	800	16	12	13							
*HA8MBM	"	735	53	4	17	*IZ5EYX	"	53,196	167	52	104	YL2CI	21	276,985	980	34	121	*LA2AB	A	256,688	807	59	204	*SP3OLO	"	575	23	7	16							
Iceland					2,281,500	3000	99	369	*IZ3ZLT	"	52,635	193	41	104	Lithuania										*LB0HI	"	4,560	42	24	36						
TF1AM	"	251,804	903	56	182	*IK3MLF	"	49,135	151	45	110	YL2PJ	"	97,152	299	51	141	*LA9TY	"	226,045	494	61	204	*SP3RAT	"	377	26	9	20							
TF8KY	"	151,488	499	46	146	*IW3AGO	"	47,278	225	41	113	YL3CY	"	91,517	378	36	137	*LA1XFA	"	222,031	493	59	180	*SP9EXE	"	144	10	6	6							
*TF2MSN	A	152,736	339	63	195	*IU8JPG	"	46,816	134	41	92	YL2SM	28	487,653	1429	35	124	*LA3RNA	"	46,664	219	35	117	*SP8IOV	"	30	3	3	3							
*TF3VS	"	41,720	259	29	120	*IW8EAS	"	46,575	175	37	98	YL2BI	21	276,985	980	34	121	*LA7TN	"	43,014	274	30	104	*SP8IMG	28	134,160	461	31	99							
*TF4WD	"	39,325	251	30	113	*IW4CXK	"	46,574	165	43	103	YL2BJ	"	187,128	831	31	107	*LB4YI	"	28,782	205	35	82	(OP: SP8BMG)												
*TF3JG	"	4,087	60	20	41	*IZ3PYR	"	46,001	192	41	116	YL3FT	1.8	28,500	489	9	51	*LB0HI	"	4,560	42	24	36	*SP6JOE	"	98,496	387	29	85							
Ireland					508,284	968	64	188	*IW0AEN	"	45,260	170	44	102	Poland										*LC7D	"	3,024	53	12	36	*SP3LWP	"	84,825	316	30	87
EI7HDB	28	154	6	5	6	*IK2AUK	"	41,734	215	36	118	LY2MM	A	520,367	935	87	292	*LA5ELA	"	680	24	14	20	*SP8UFT	"	71,980	235	31	91							
EI5GUB	1.8	6,525	158	6	39	*IZ8QPA	"	36,234	278	31	91	LY3CY	"	91,517	378	36	137	*LB4MI	"	660	22	7	15	*SP8UJZ	"	52,060	236	27	68							
*EI4GNB	A	697,340	1126	74	266	*IV3EAD	"	36,068	183	32	95	LY2BIS	14	14,960	274	10	45	*LB0GI	"	580	16	13	16	*SP9SSD	"	8,428	75	17	32							
*EI3ENB	"	150,096	443	51	185	*IU1OLR	"	34,362	159	37	101	LY1M	7	4,120	89	7	33	*LA9WDA	28	18,020	129	12	41	*SQ9MEE	"	7,546	72	17	32							
*EI4II	"	145,665	173	51	144	*IZ8CZR	"	33,981	169	44	97	*LY0NAS	A	58,720	318	32	128	*LB1R	"	1,566	34	9	20	*SQ5AAG	"	5,863	67	15	26							
*EI6IKB	"	40,136	148	41	75	*IK3XTT	"	32,144	144	38	60	*LY2EW	"	53,048	329	31	121	*LA8RTA	1.8	1,127	53	4	19	*SP9Z	"	3,180	42	13	17							
*EI5FQB	"	26,656	135	32	80	*IU3MEY	"	31,868	166	37	87	*LY4MP	"	8,658	97	21	53	*LC9X	1.8	5,655	163	5	34	*SP8D	"	2,970	41	14	16							
*EI7LC	"	22,464	143	32	85	*IK8ARF	"	31,696	143	39	73	*LY1LP	"	1,512	58	7	29	(OP: LA9XGA)										*SP7VVB	"	1,380	20	10	13			
*EI5HZB	"	4,988	57	18	40	*IK0VSY	"	29,211	136	38	69	*LY9A	"	8	2	2	*LY5GT	3.7	16,165	308	7	46	*SP7VVB	"	945	19	8	13								
*EI3LC	"	4,779	59	20	39	*IU7GRA	"	29,116	163	37	79	*LY3DA	"	12	3	2	*LY3NX	"	7,452	204	4	32	*SQ2EEQ	"	48	6	3	3								
*EI7INB	"	2,847	37	16	23	*IZ1DNQ	"	29,104	124	34	73	Luxembourg										SO5N	"	33,282	184	36	93	*SP3W	21	33,196	201	19	67			
*EI9IKB	"	1,850	42	10	27	*IK4XQT	"	29,082	165	32	79	*LX1GQ	A	155,232	466	58	173	*SP9SDR	"	63,954	237	46	125	*SQ9BDB	"	20,435	169	16	51							
*EI8IOB	28	6	1	1	1	*IN3ENN	"	28,438	147	36	82	Moldova										SP8BQ	"	10,147	79	24	49	*SP9HZW	"	19,368	127	18	54			
*EI2JIB	14	4,848	133	9	39	*IZ7VII	"	26,973	117	36	75	*ER1JA	A	145,886	636	35	146	SN8V	"	49,455	222	42	115	*SP8AR	"	9,782	70	19	48							
*EI9IDB	"	77	9	4	7	*IN3RWF	"	26,924	196	32	95	*ER1MM	A	3,744	42	20	32	(OP: SP8HPW)										*SP4MPA	"	8,925	85	13	38			
*EI9ITB	"	44	8	3	8	*IZ3GGR	"	24,921	97	42	75	Netherlands										SO5N	"	33,282	184	36	93	*SQ8AL	"	8,062	78	15	43			
Isle of Man					82,641	342	37	126	*IV3IPA	"	23,391	125	33	80	PC2T	A	1,096,980	1297	98	291	*LA9WDA	28	18,020	129	12	41	*SN7O	"	7,920	79	11	37				
Italy					1,020,740	1661	103	357	*IZ2XCK	"	21,808	166	29	82	PA3CJP	"	82,641	303	44	119	(OP: SP5BMU)										*SP6EUA	"	5,504	80	10	33
I4JED	"	588,924	781	106	263	*IN3IZO	"	20,424	158	29	82	PA0MIR	"	60,705	249	47	124	SP9CLO	"	43,307	259	28	99	*SP2GTJ	"	4,633	47	14	27							
IU1NKS	"	546,720	876	81	254	*IK3XTV	"	19,200	123	33	63	PA4DN	"	55,650	248	44	115	SO5N	"	33,282	184	36	93	*SQ5SSUL	"	3,154	51	10	28							
I1NVU	"	499,988	628	101	233	*IW5ELA	"	19,035	97	26	55	PE1LUB	"	36,059	138	40	67	SP8BRY	28	26,460	114	30	60	*SQ8MZW	14	34,000	345	18	62							
I26ERS	"	426,504	1033	74	238	*IU2JJD	"	19,005	145	25	80	PA9JO	"	27,621	179	29	70	SP7VTQ	"	5,088	36	20	28	*SQ8W	"	16,368	174	14	52							
IU5GBQ	"	379,600	1119	77	215	*1Y1GQ	"	17,368	108	31	73	PA1NHZ	"	3,388	53	13	31																			

*LA3CLA	"	13,563	121	24	75	CT1GFK	28A	30,954	106	31	103	*OM6AI	"	23,600	148	27	91	*EA4AFP	"	350	9	7	7	VK4L	"	134,044	260	62	126												
*LB4ZI	"	13,299	91	33	60	CT1ETX	14A	89,600	448	25	87	*OM1ST	"	21,424	175	20	84	*EA7Z	28A	579,320	2075	34	106	VK3Y	"	94,140	210	67	113												
*LB6UH	"	9,088	55	25	39	CT7AHV	3.7A	11,501	213	7	46	*OM1MJ	"	20,943	94	41	76	*EA2LMI	"	514,755	1314	36	119	VK6DW	"	27,025	93	42	73												
*LA9NKA	28A	57,600	238	22	74	*CT1BXT	AA	720,450	809	101	349	*OM1BCO	"	9,638	100	24	55	*EC3CVD	"	366,380	1078	33	107	VK3KE	"	8,512	64	26	38												
		Poland				*CT2GSN	"	183,556	617	54	164	*OM7PY	28A	11,948	96	20	38	*EE7E	"	307,457	1113	31	100	VK3ICM	"	1,050	18	11	10												
SN7Q	AA	6,590,200	4582	156	508	*CT7ABP	"	149,210	396	55	160	*OM5KM	3.7A	28,121	454	8	53	*EA2DMH	"	195,704	596	33	103	VK3X	21A	13,629	93	22	37												
		(OP: SP7GIQ)				*CT7ADQ	"	116,116	247	61	225	*OM4AQP	"	9,585	210	5	40	*EA4AA	"	179,672	614	35	113	(OP: VK3GK)																	
SN7D	"	3,461,302	3341	127	406	*CT7AWB	"	93,558	356	48	138	Slovenia												VK4DX	14A	158,619	524	28	83												
		(OP: SQ277)				*CT1BOH	"	34,884	120	45	69	S53M	AA	6,630,894	4136	167	611	*EA1ACP	"	172,620	500	35	105	VK6OZ	AA	181,076	380	69	154												
SN8K	"	1,212,903	1679	92	272	*CR7BCP	"	33,176	239	23	81	(OP: S53ZO)												*VK2AZ	"	18,810	86	36	54												
		(OP: SQ8ERS)				*CT1EXR	"	30,186	153	28	58	S52WW	"	1,073,904	1764	76	236	*EA1GY	"	129,888	463	32	91	*VK3YV	"	11,840	67	31	43												
SN7B	"	1,017,569	1186	111	392	*CT1BWU	"	11,310	68	33	54	S59AA	"	81,282	209	53	133	*EA7KOL	"	103,884	473	29	103	*VJ4G	"	2,989	30	24	25												
		(OP: SQ7BFC)				*CT5GOJ	28A	18,450	124	20	55	S55DX	"	71,340	157	53	111	*EC5KXA	"	78,897	313	27	92	*VK1NS	"	782	15	10	13												
HF1K	"	844,200	1286	97	372	Republic of Kosovo												S51DX	"	29,161	173	31	90	(OP: HK1A)												*VK5WU	14A	4,141	42	16	25
		(OP: SP1MGM)				*Z68XX	AA	142,494	652	47	140	S58D	28A	769,850	1822	37	136	(OP: EA3NO)												*VL2U	"	3,724	37	13	25						
SP3HLM	"	836,406	795	113	373	Romania												S56Y	"	498,630	1241	36	129	(OP: SM5AJV)												East Malaysia					
SP1NY	"	768,570	895	107	304	YO9HP	AA	2,565,696	2808	118	434	S58AT	"	10,508	52	33	38	*EB1ADD	"	21,090	124	17	57																		
SP9KDA	"	431,262	832	85	257	YQ6A	"	1,993,383	2099	131	466	S50K	21A	1,141,554	2676	39	144	*EA5JN	21A	73,696	459	24	88																		
SP3HRN	"	412,080	802	87	253	YO4NF	"	929,370	1998	82	308	S50R	"	934,719	2342	36	137	*EA5JDC	"	67,367	492	22	79																		
SQ8N	"	367,875	432	109	266	YO7OWI	"	240,759	393	87	246	S56B	"	239,355	905	31	104	*EA5IXO	"	42,456	240	20	67																		
SP2GWH	"	356,662	605	85	217	YO5AVN	"	193,800	397	68	217	S57DX	14A	1,004,640	3035	39	145	*EA4FJX	"	37,950	159	25	90																		
SO5L	"	291,951	648	71	226	YO4AR	"	101,016	384	46	161	S55G	"	63,099	304	31	92	*EC4TA	"	5,346	85	8	14																		
		(OP: SP5WIT)				YO2MFC	"	14,027	83	30	53	S51YI	7A	538,720	2322	31	117	*EA2EVC	14A	5,800	100	9	41																		
SP3A	"	271,700	481	68	207	YO8ERC	"	13,376	70	32	56	S57O	"	114,840	978	21	89	*EA2CE	7A	14,910	154	14	56																		
SP2XX	"	111,492	237	73	155	YO8BSE	"	756	18	12	15	S56X	1.8A	48,709	732	10	57	*EA3CN	3.7A	18,585	317	10	53																		
SO9P	"	102,300	239	66	154	YO8SSB	28A	99,416	338	31	105	*S55X	AA	987,852	1558	107	324	*ED3M	1.8A	10,300	226	8	42																		
SP5UGP	"	75,400	254	58	142	YO8RIJ	"	2,250	39	11	19	*S52BT	"	553,900	799	85	297	(OP: EA3FP)												Guam											
SP9IVD	"	56,270	219	41	129	YR8D	3.7A	21,868	387	15	62	*S56A	"	431,834	557	105	337	(OP: SM5XEN)												NH2DX	21A	462,314	1189	37	102						
SP2V	"	50,250	266	30	120	*YO9IAB	AA	111,150	431	38	157	*S52W	"	41,160	196	42	98	(OP: SM0MPV)												(OP: KG6DX)											
SP7V	"	23,001	128	34	89	*YOSQDI	"	108,480	416	41	151	*S59MA	"	40,103	182	34	85	(OP: SM5AJV)												Hawaii											
SQ6BOR	"	2,800	26	16	24	*YO7BGA	"	100,436	300	58	153	*S56VHR	"	11,648	110	24	67	(OP: SM5ISM)												WH6R	AA	118,300	367	58	72						
HF9R	"	2,444	31	17	30	*YO2DFA	"	46,035	187	43	112	*S55TZ	"	9,956	110	19	57	(OP: SM5OES)												AH7C	"	1,536	20	13	19						
SP3SC	"	936	14	12	14	*YO9GDN	"	8,208	59	24	24	*S51RBC	"	7,029	64	26	45	(OP: SM5NQB)												Indonesia											
SQ9RPX	"	440	17	6	14	*YO4FZX	28A	3,960	70	11	22	*S55BG	28A	106,449	387	32	79	(OP: SM5NQB)												SK7K	AA	621,746	1004	73	220						
SQ6LJV	"	147	7	4	3	*YO6CFB	21A	77,504	358	26	86	*S50B	21A	27,690	133	23	55	(OP: SM5OES)												SM5EPO	"	401,391	635	80	229						
SP2JMR	28A	74,865	304	28	77	*YO6LA	14A	7,599	133	8	43	*S52ZW	21A	31,862	164	24	65	(OP: SM5OES)												8S0C	"	262,496	323	99	317						
SP8K	"	45,661	229	21	56	Sardinia												*S51WU	7A	18,340	228	12	58	(OP: SM5OES)												SM6MVE	"	176,750	513	56	194
SP5GNI	"	30,452	138	27	65	IM0A	28A	226,941	832	33	110	*S57ZT	7A	18,340	228	12	58	(OP: SM5OES)												SM3YBP	"	172,750	463	51	199						
SP1O	"	16,640	109	24	56	IS0NHT	"	165,718	511	32	101	ED3X	AA	6,366,204	4734	145	524	(OP: SM5OES)												SM5VFE	"	113,634	308	59	155						
SQ6NEJ	"	7,656	68	15	29	IS0MHD	"	32,357	108	33	98	EA1L	"	4,096,648	3934	116	420	(OP: SM5OES)												SM6YNO	"	34,692	122	32	66						
SN2B	21A	914,205	2237	37	140	IS0HXX	AA	10,011	65	27	44	EA7DHT	"	1,453,098	2414	95	303	(OP: SM5OES)												SE5E	"	7,590	72	23	46						
		(OP: SQ2GXO)				*YO6LA	14A	7,599	133	8	43	EA7I	"	1,234,032	2030	92	284	(OP: SM5OES)												SK3W	28A	340,704	1110	32	124						
SN5X	"	827,159	1953	37	142	Scotland												EA1BNF	"	310,809	504	98	233	(OP: SM5OES)												SE5N	21A	5,544	60	14	22
		(OP: SP5GRM)				IM0A	28A	226,941	832	33	110	EA1AA	"	383,385	537	88	217	(OP: SM5OES)												7S9A	14A	61,610	502	23	78						
SQ9V	"	73,396	307	30	88	GM0V	AA	2,986,380	2976	105	365	EF1A	"	357,408	669	70	222	(OP: SM5OES)												SB7W	"	12,308	125	15	53						
SP9EML	"	43,470	206	28	77	GM0AZC	"	45,696	167	39	89	EA1OL	"	353,734	679	67	207	(OP: SM5OES)												SE4E	AA	324,900	832	65	235						
HF6R	"	15,768	91	23	50	GM0VMV	"	31,900	193	31	85	EC1T	"	341,136	510	84	225	(OP: SM5OES)												*8S8S	"	168,861	463	59	172						
		(OP: SP6FAF)				IS0HXX	AA	10,011	65	27	44	MM5AI	"	15,554	121	24	53	(OP: SM5OES)												SM3OMO	"	71,556	256	47	131						
SQ2A	14A	1,336,704	3552	40	152	MM0TFU	28A	230,736	618	31	107	EA1BNF	"	310,809	504	98	233	(OP: SM5OES)												SM7BHM	"	27,864	162	19	62						
		(OP: SQ9UM)				*YO6LA	14A	7,599	133	8	43	MM4D	AA	86,884	352	31	85	(OP: SM5OES)												SA3MGL	"	14,442	154	20	63						
SP7TEE	"	207,904	932	34	112	Serbia												EA2A	"	188,916	441	52	121	(OP: SM5OES)												SE5W	"	6,760	53	19	33
SP5DC	"	24	2	2	2	YT7R	AA	2,554,434	2706	129	444	EA2A	"	188,916	441	52	121	(OP: SM5OES)												*SF5O	"	600	10	10	10						
SN3A	7A	660,576	2678	37	131	YU7KW	"	816,704	1142	109	339	EA2A	"	188,916	441	52	121	(OP: SM5OES)												*SD0N	"	400	10	8	8						
		(OP: SP3GEM)				GM4Z	"	257,742	448	74	148	YU3DKO	"	90,729	303	47	106	(OP: SM5OES)												Switzerland											
SP1SR	"	11,210	175	10	49	GM0AZC	"	45,696	167	39	89	EA2A	"	188,916	441	52	121	(OP: SM5OES)												HB9DQL	AA	1,037,622	1104	99	339						
SP2PIK	3.7A	95,351	886	18	79	GM0VMV	"	31,900	193	31	85	EA2A	"	188,916	441	52	121	(OP: SM5OES)												HB9EHJ	"	533,871	837	85	266						
		(OP: SP2MKT)				GM0AZC	"	45,696	167	39	89	MM5AI	"	15,554	121	24	53	(OP: SM5OES)												HB9OAU	"	499,074	1055	81	292						
SQ7NSN	"	33,120	457	12	57	GM0VMV	"	31,900	193	31	85	EA3JIT	"	510	10	7	10	(OP: SM5OES)												HB9CVO	"	373,500	895	58	192						
SP5ELA	"	26,796	400	11	55	MM0TFU	28A	230,736	618	31	107	EC5K	28A	443,877	1165	37	124	(OP: SM5OES)												HB9BOI	"	355,338	503	89	253						
SP3GTS	"	21,600	219	13	62	MM0TFU	28A	230,736	618	31	107	ED4T	"	258,258	706	32	111	(OP: SM5OES)												HB9BTI	"	293,400	589	73	227						
SO4P	"	21,576	361	11	51	MM4D	AA	86,884	352	31	85	EA2A	"	188,916	441	52	121	(OP: SM5OES)												HB9HJ	"	243,880	623	63	205						

ZL1BBW	14A	63,936	236	25	71	*PU2USK	"	96,471	461	22	59	SO2U	"	125,292	395	49	163	SN5Z	"	7,176	94	12	34	PA0AWH	"	1,972	72	4	25	
ZL4YY	"	13,552	98	18	38	*PY2FRQ	"	83,172	348	21	66	SP9TKW	"	116,604	389	54	183	F8AKC	"	6,724	62	16	25	SN0E	"	400	29	4	16	
*ZL2MM	AA	1,320	20	10	14	*PS2B	"	61,523	500	18	29	PY2BN	"	111,706	418	32	69	WB3GBL	"	6,624	64	12	36							
Philippines																														
DU3T	AA	1,869,923	1820	116	273	*PU2OGQ	"	45,792	202	26	70	JK2VOC	"	107,520	301	66	94	YG3FAP	"	6,566	58	20	29	JH1APZ	"	65	5	3	2	
DV3A	"	555,864	945	75	153	*PY2HT	"	44,032	209	24	62	HA5BA	"	88,615	342	47	138	YO5OHY	"	6,468	67	15	29	ES6KW	"	42	4	3	4	
4E3X	21A	52,954	253	26	57	*PU1SKO	"	42,032	220	17	57	W3EK	"	77,355	228	35	100	SN5R	"	6,292	50	18	34	UB4IIQ/UA6L	"	"	2	1	1	
*4H1EBD	AA	735,804	1235	75	168	*PU5ABB	"	41,244	212	22	62	KA8SMA	"	72,695	182	50	105													
*4H1BNC	"	13,826	92	25	37	*PT9SS	"	37,730	231	17	53	M3RZO	"	61,577	305	37	102	PU5ALE	"	5,328	69	12	25	UN9LDC	1.8	3,354	43	5	21	
SOUTH AMERICA																														
Argentina																														
LV1D	AA	210,512	396	67	156	*PU2STZ	"	37,636	149	22	75	SP8DR	"	55,250	196	48	122	F6FTB	"	4,860	57	12	18	HA1TI	"	3,232	107	4	28	
LU7MT	"	55,031	203	42	71	*PU2VLTW	"	33,258	225	19	60	OH3KQ	"	48,900	195	40	123	W8IQ	"	4,590	41	15	30	LY4T	"	2,880	90	4	28	
LU9OZX	"	52,345	170	50	95	*PV2D	"	31,110	152	23	52	E77XL	"	46,810	222	36	119	IT9NAN	"	4,160	72	10	30	DL1AOB	"	1,568	61	3	25	
LU8DPM	28A	1,706,912	3692	37	127							M6KCI	"	46,472	266	35	113	IT9IRV	"	3,256	40	13	24	UT4UBZ	"	108	10	4	8	
LT6M	"	703,437	2000	27	102							I3MDU	"	40,755	198	33	110	DL5EC	"	3,224	50	9	17							
LU3WC	"	528,640	1734	25	87							IK3BVD	"	40,448	208	32	96	US5VX	"	2,886	34	15	22							
LU7YZ	"	482,328	1637	23	93							9A4OP	"	39,837	209	40	107	EA3FHP	"	2,686	39	12	22							
LU3MO	"	166,540	593	27	83							VE2ZL	"	39,298	185	34	64	EA2GM	"	2,584	50	10	24							
LU2D	21A	79,695	412	18	51							N7JI	"	35,805	152	47	46	PR1D	"	2,380	47	8	20							
L33M	"	50,840	225	24	58							PY2PLL	"	32,072	180	23	53													
*LU6ETB	AA	1,159,434	1385	92	214							SP5LCT	"	28,908	180	27	105	PY2UGO	"	2,068	56	8	14							
*LU1MAW	28A	112,765	492	20	75							EA2AFV	"	25,351	172	30	71	K0VK	"	1,848	32	12	16							
*LU7DV	"	50,869	216	19	72							LZ3AW	"	24,528	152	29	83	W4RLS	"	1,035	19	8	15							
*LU9EAE	"	4,154	73	11	20							M7BCE	"	23,064	150	26	67	PU3VRW	"	969	35	6	13							
*LU5ILA	21A	5,434	79	14	24							NF2L	"	22,892	94	34	63	JL1KLK	"	846	25	7	11							
Brazil																														
PT5J	AA	11,807,370	6228	157	521							PA7N	"	22,557	195	22	81	KA7T	"	704	17	11	11							
PY2WH	"	3,320,730	3222	96	282							N3CI	"	19,926	95	23	59	IW2ODC	"	703	23	9	10							
PY2KC	"	2,295,120	2215	93	300							EA3TJ	"	19,570	135	26	69	DV9IGT	"	672	18	6	8							
PP2CC	"	1,728,545	1703	97	280							R4FJ	"	17,649	97	37	74	CE3ERM	"	540	22	7	8							
PV2K	"	1,590,522	1624	86	268							G8AFN	"	17,574	118	29	72	BG3LTM	"	504	36	6	12							
PT1K	"	1,580,020	1957	70	225							DJ3HW	"	16,650	104	23	52	PP1JE	"	390	27	5	8							
PY5AMF	"	1,174,950	1241	95	255							EI3CTB	"	16,600	149	22	78	JA1GZK	"	250	11	5	5							
PY4RGS	"	550,539	778	77	172							M0KWK	"	14,355	125	23	76	YO8DHD	"	209	7	5	6							
PS2M	"	521,216	816	75	181							BH7JFR	"	14,025	113	28	47	JA5NSR	"	154	6	5	6							
PY1FI	"	344,805	713	50	131							SP3PDO	"	13,770	114	27	75	G4SGI	"	84	9	2	2							
PY3FOX	"	295,767	687	61	116							M7ELC	"	12,103	99	30	61	F4IVY/P	"	65	5	2	3							
PY3PA	"	263,865	664	57	90							KB4FUW	"	11,826	75	31	50	VK3KRL	"	60	6	2	3							
PT7BI	"	206,610	562	35	107							MM0INH	"	11,760	110	22	62	4F9AM	"	32	4	2	2							
PY3DX	"	118,104	294	54	114							DG3T	"	11,322	76	22	52	DM5QZ	"	6	1	1	1							
PY2VN	"	41,360	142	37	73							9M2SPN	"	11,270	104	20	29	EY8BA	21	119,082	498	20	69							
PY2TOP	"	32,802	181	20	46							DX4EVM	"	10,720	124	16	24	JR4DAH	"	83,040	338	28	68							
PY4ME	"	30,240	147	29	67							WC7S	"	10,296	65	28	38	F8AKS	"	78,987	323	28	85							
PY4LI	"	22,344	138	46	52							IU3MBY/3	"	9,975	106	26	69	TA2IB	"	58,800	264	17	67							
PT2AP	"	19,007	126	25	58							N8XA	"	9,600	64	19	41	ND0C	"	47,229	188	24	67							
PY3APY	"	16,905	116	27	42							DL6MDG	"	9,417	89	24	49	SY1AEA	"	42,588	364	21	70							
PY5KA	"	8,364	68	23	45							M7DAD	"	9,324	104	20	54	JQ1NGT	"	34,992	196	25	47							
PY5DK	"	5,684	42	21	37							K7FR	"	9,316	70	31	37	LZ2RS	"	33,278	234	20	67							
PT2NP	"	4,557	41	17	32							YB0OHG	"	8,208	63	19	38	JR1NKN	"	23,374	168	20	38							
PY2AE	"	3,237	54	16	23							EA4J	"	8,040	68	21	46	YC4SIZ	"	18,880	119	18	41							
PW2L	28A	1,047,087	2606	30	109							W1IG	"	7,923	50	21	36	HF5WIM	"	12,600	120	15	48							
PY5ZHP	"	456,565	1298	28	99							M7GGY	"	7,392	73	25	52	EA2BO	"	10,384	119	13	46							
PY2DY	"	398,208	1100	33	103							KD2RZW	"	7,375	48	19	40	JR2EKD	"	9,588	78	14	33							
PT4Z	"	216,999	975	19	62							JG6XYZ	"	7,228	67	21	31	J11NZA/1	"	8,880	94	15	25							
PY2TMV	"	103,253	553	23	56							IN3JRZ	"	6,993	101	14	49	SP4NKJ	"	8,085	101	15	40							
PY5IN	"	80,106	378	21	57							JE3AKU	"	6,783	73	22	29	M6W	"	7,399	98	11	38							
PY4DK	"	62,250	331	16	59							IZ0ZFK	"	6,723	75	24	57	SP4NJK	"	8,085	101	15	40							
PY2LC	"	40,716	181	25	62							KD2MU	"	6,612	55	21	37	G2W	"	7,399	98	11	38							
PY2EBD	"	17,528	139	13	43							CE3RIF	"	6,579	83	22	29	(OP: G3WV)												
PY2GZ	"	13,311	196	13	16							UA3OQ	"	5,963	83	17	50	7L1DST	"	1,728	30	10	14							
PY2NFE	"	1,342	34	11	11							SP9UA	"	5,917	76	17	44	JK1NWD	"	1,430	29	12	14							
PY8WW	21A	471,960	1274	31	107							M6IGE	"	5,640	80	17	43	J16NFX	"	1,254	34	10	12							
PY2PPZ	"	24,221	209	15	38							M6YIK	"	5,376	86	14	42	R7RBE	"	638	15	8	14							
PY6BA	14A	1,096,176	2358	37	127							N3WS	"	3,800	45	21	29	YU4ABP	"	468	20	5	13							
PY3LX	"	18,316	117	24	52							YB1TIA	"																	

AFRICA			TM1K 8,668,737 5922 157 536	District 7 141,966 293 65 133	EUROPE			*IU2OZU 6,666 87 16 50
EA8RM 38,749,256 15442 178 690	PI4CC 8,092,608 6242 160 586	ES3V 3,096,320 3638 138 518	N7RBL 132,258 279 77 124	Austria 127,379 395 50 167			*IUOPYH 1,566 20 11 18	
S79VU 329,058 613 63 139	EE4Y 2,356,925 2557 132 443	M0HFC 2,295,168 3279 110 406	*KC3OSK 18,480 106 40 40	*OE3EDS 60,188 236 49 115			*IU4PRA 1,248 29 13 19	
ASIA			*W7BKS 10,854 70 38 43	*OE1KSG 24,600 116 35 65			*IU7OTK 899 33 9 22	
4X7R 13,881,375 7185 140 535	LN2T 1,126,913 1985 94 345	G3V 756,448 1149 83 269	*KK7BWJ 5,148 50 22 22	*OE7KKNK/P 98 9 6 8			*IU4PRT 36 4 3 3	
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WANTED: OLD QSL CARD COLLECTIONS. Collector seeks US & DX cards. W2VRK, 5 Mohawk Trail, Branchburg, NJ 08876; e-mail: <tpllrs@comcast.net>.

TELEGRAPH KEY INFORMATION AND HISTORY MUSEUM: <<http://w1tp.com>>

FT243 AND HC6U CRYSTALS: www.af4k.com

OLD QSLs Available. 50's and 60's, DX and USA. Specify call, send SASE. W5SQA@arrl.net

RFI Filters <www.RFchoke.com>

QRP KITS: <www.breadboardradio.com>

FMTV ARTICLES: Comprehensive transmitter and receiver deviation calibration, standards, intermodulation, power amplifier calculations. WB9OQM, <http://mathison.freeshell.org>

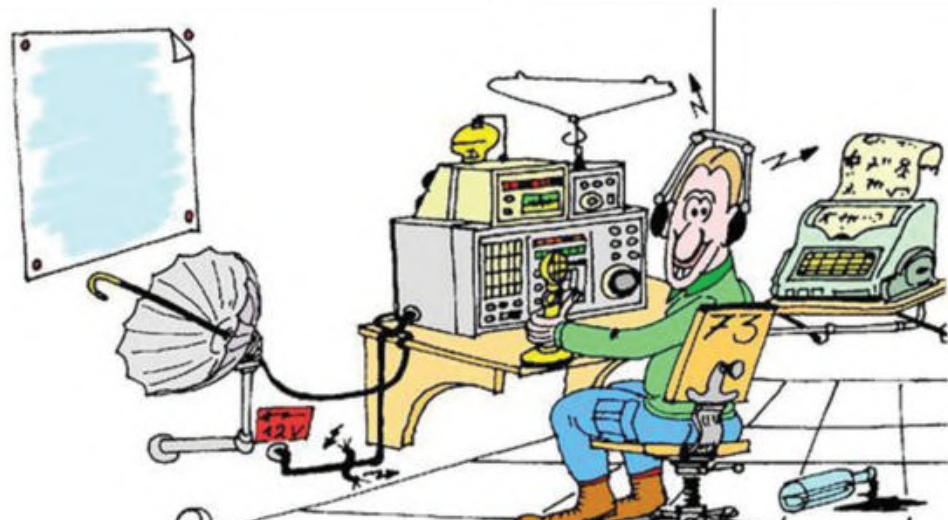
www.SecondHandRadio.com

HF Mobile or Fixed Virtual X Antenna Patent: For Sale or License. Request Free Power Point Presentation file. Shows design details, pictures, prototype tests. Design applies to a broad frequency range for mant antenna arrays/beams/verticals. <lgslay@sbcglobal.net>. Larry Slay, K5WUL

FOR SALE: Samlex Power Supply Model SEC 1223, 13.8V @ 25 amps. Not working. Includes operating manual and schematic. Price \$50 or best offer. Contact Harry, W9HRQ, at <harrygraziano@gmail.com> or phone 1-773-334-4492.

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