DXpeditions to São Tomé (p. 25) and "Love Island" (p. 32)

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CQ Amateur Radio

COMMUNICATIONS & TECHNOLOGY

FEBRUARY 2022

QRP Special

On the Cover: Robert Williams, N0QLR, operates a Summits on the Air (SOTA) station atop Mt. Herman, Colorado with "mountain goat" Steve Galchutt, WG0AT. Story on page 16, details on page 30.

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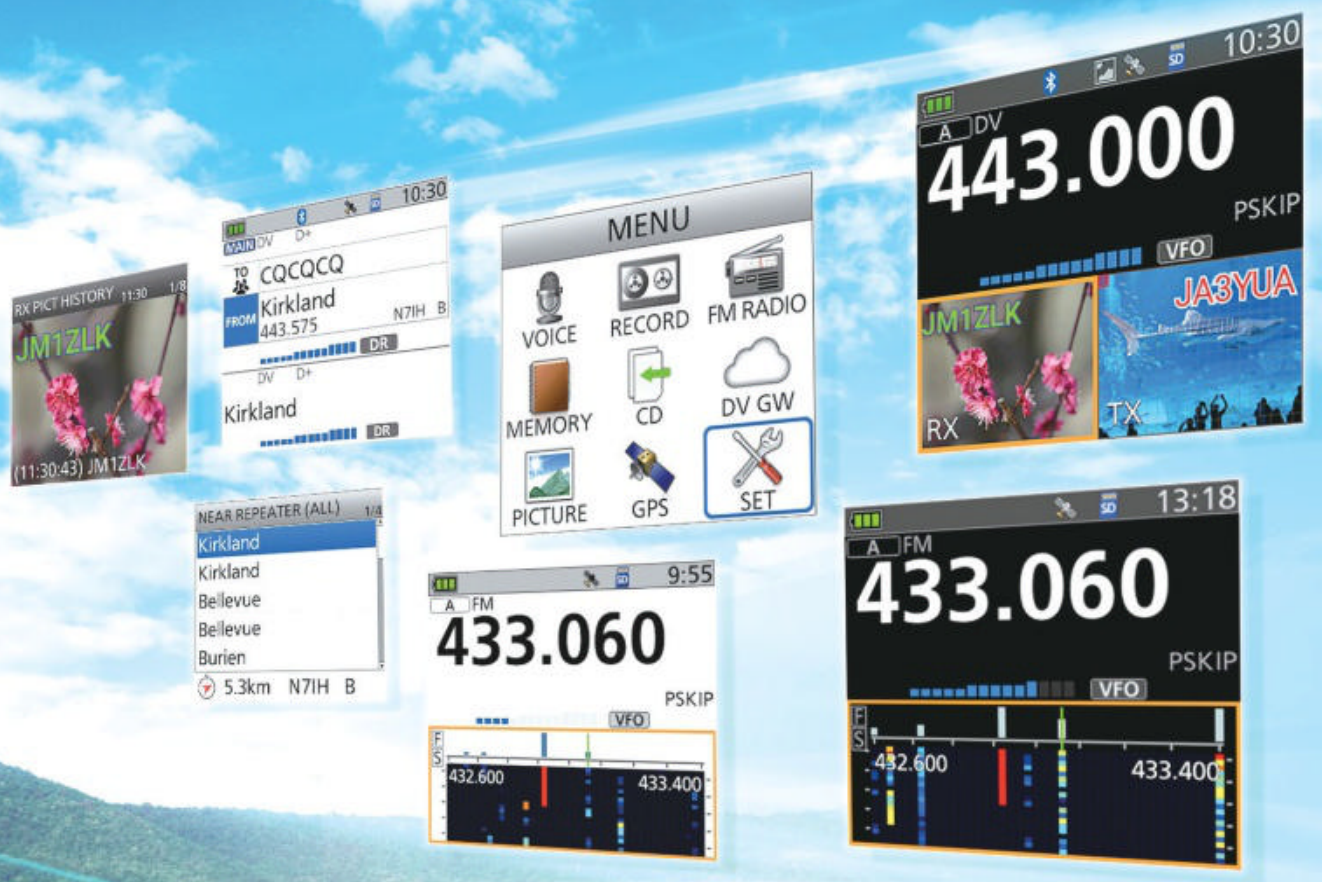

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ANNOUNCEMENTS

FEBRUARY

ORLANDO, FLORIDA — The Orlando Amateur Radio Club will hold the Orlando HamCation and the 2022 ARRL National Convention from 9 a.m. to 5 p.m., Friday, February 11; 9 a.m. to 5 p.m., Saturday, February 12; and from 9 a.m. to 2 p.m., Sunday, February 13. At the Central Florida Fairgrounds and Expo Park, 4603 West Colonial Drive. Phone: (800) 214-7541 or (407) 841-0874. Email: <info@hamcation.com>. Website: <www.hamcation.com>. Talk-in 146.760- (PL 103.5) or 443.050+ (PL 103.5). Free VE exams, special event station K1AA.

SAINT CLOUD, MINNESOTA — The St. Cloud Amateur Radio Club will hold the Covid Fever Reliever – 2022 from 9 a.m. to 1 p.m., Saturday, February 12 at the St. Cloud Armory, 1710 Veteran's Drive. Website: <www.w0sv.club/ham-fest>. Talk-in 147.015+ (PL 100). VE exams, DXCC / VUCC / WAC / WAS / WAX card checking.

TRAVERSE CITY, MICHIGAN — The Cherryland Amateur Radio Club will hold its 48th Annual Swap-N-Shop from 8 a.m. to noon, Saturday, February 12 at the St. Francis High School Gymnasium, 123 E. 11th Street. Contact: Joe Erlewein, N8CN, (231) 668-4223. Email: <swap@cherrylandarc.com>. Website: <www.cherrylandarc.com>. Talk-in 146.860- (PL 114.8). VE exams.

YUMA, ARIZONA — The Yuma Hamfest and 2022 ARRL Southwest Division Convention will be held from noon to 5 p.m., Friday, February 18 and from 8 a.m. to 5 p.m., Saturday, February 19 at the Yuma County Fairgrounds, 2520 East 32nd Street. Email: <info@yumahamfest.org>. Website: <www.yumahamfest.org>. VE exams, DXCC card checking, Transmitter Hunt, Balloon Launch, W1AW/7 special event station.

SEBRING, FLORIDA — The Highlands County Amateur Radio Club will hold the Sebring Hamfest from 8 a.m. to 1 p.m., Saturday, February 19 at the First Baptist Church, 111 Lake Josephine Drive. Contact: Rick, KF4Y, <rbg695@hotmail.com>. Website: <www.highlandsamateurradio.com>.

BRIGHTON, COLORADO — The Aurora Repeater Association will hold its Swapfest from 9 a.m. to 1 p.m., Sunday, February 20 at the Adams County Fairgrounds, 9755 Henderson Road. Contact: Wayne Heinen, NØPOH, (303) 699-6335. Email: <in0ara.info@gmail.com>. Website: <www.n0ara.org>. Talk-in 147.15+ (PL 100). VE exams.

WINTER HAVEN, FLORIDA — The ARRL West Central Florida Section will hold the 8th Annual TechCon from 1-5 p.m. Friday, February 25 and beginning 8 a.m., Saturday, February 26 at the Polk County Emergency Operations Center, 1890 Jim Keene Boulevard. Website: <www.arrlwcf.org>. Talk-in 146.985, 443.900, 444.625, or 444.950 (all PL 127.3).

BISMARK, NORTH DAKOTA — The Central Dakota Amateur Radio Club will hold the CDARC 2022 Hamfest from 7:30 a.m., to 12:30 p.m., Saturday, February 26 at the Bismark State College Career Academy, 1221 College Drive. Contact: Lorne Campbell (701) 319-7390. Email: <lorne@bis.midco.net>. Website: <http://cdarcnd.com>. Talk-in 146.25-. VE exams.

ORANGE, TEXAS — The Orange; Jefferson County; and Beaumont Amateur Radio Clubs will hold the Orange Hamfest 2022 from 7:30 a.m. to 2 p.m., Saturday, February 26 at the Orange County Convention & Expo Center, 11475 FM 1442. Contact: Rocky Wilson, N5MTX, (409) 988-8906. Email: <n5mtx@gmail.com>. Website: <www.qsl.net/w5nd>. VE exams.

PERRY, IOWA — The Hiawatha Amateur Radio Club will hold its 13th Annual Winter RF Fest from 8 a.m. to noon, Saturday, February 26 at the Perry National Guard Armory, 2930 Willis Avenue. Contact: KEØSTT, (641) 740-7526. Email: <hamfest@harciowa.org>. Website: <www.harciowa.org>. VE exams.

REDFORD, MICHIGAN — The Livonia Amateur Radio Club will hold its Annual Swap and Shop from 9 a.m. to 1 p.m., Saturday, February 26 at the VFW Post 345, 27345 Schoolcraft. Email: <swap@livoniaarc.com>. Website: <www.livoniaarc.com>. Talk-in 145.350 (PL 100).

MARCH

CAVE CITY, KENTUCKY — The Mammoth Cave Amateur Radio Club will hold its 46th Annual Cave City Hamfest beginning 7:30 a.m., Saturday, March 5 at the Cave City Convention Center, 502 Mammoth Cave Street. Contact: Larry Brumett, KN4IV, (270) 651-2363. Email: <lbrumett@glascow-ky.com>. Website: <http://ky4x.org>. Talk-in 146.34+. VE exams.

IRVING, TEXAS — The Irving Amateur Radio Club will hold the Irving Hamfest from 8 a.m. to 2 p.m., Saturday, March 5 at the Betcha Bingo Hall, 2420 W. Irving Boulevard. Email: <president@irvingarc.org>. Website: <http://irvingarc.org>.

PUNTA GORDO, FLORIDA — The Peace River Radio Association will hold the Charlotte County Hamfest beginning 8 a.m., Saturday, March 5 at 30337 Cedar Road. Contact Dave Beck, WB4GVZ, <a1steel@verizon.net>. Website: <www.prra.club>. Talk-in 147.255 (PL 163.5). VE exams.

BRAZIL, INDIANA — The Wabash Valley Amateur Radio Association will hold its Spring 2022 Hamfest & Computer Expo from 8 a.m. to noon, Saturday, March 12 at the Clay County 4-H Fairgrounds, 6550 North State Road 59. Email: <hamfest@w9uuu.org>. Website: <http://w9uuu.org>. Talk-in 146.685- (PL 151.4). DXCC / VUCC / WAS card checking.

CONCORD, NORTH CAROLINA — The Mecklenburg Amateur Radio Society will hold the Charlotte Hamfest from 3-7 p.m., Friday, March 11 and from 8:30 a.m. to 4 p.m., Saturday, March 12 at the Cabarrus Arena & Events Center, 4551 Old Airport Road. Phone: (704) 948-7373. EMAIL:- <info@charlottehamfest.org>. Website: <www.charlottehamfest.org>. Talk-in 146.655 or 146.940 (PL 118.8).

PUYALLUP, WASHINGTON — The Mike & Key Amateur Radio Club will hold its 40th Annual Mike and Key Electronics Show & Swap Meet from 9 a.m. to 3 p.m., Saturday, March 12 at the Washington State-Pavilion Exhibition Hall, 110 9th Avenue SW. Phone: (253) 631-3756. Email: <n7wa@arrl.net>. Website: <www.mikeandkey.org>. Talk-in 146.82- (PL 103.5) VE exams.

TULLAHOMA, TENNESSEE — The Middle Tennessee Amateur Radio Society will hold the 2022 Tullahoma Hamfest from 8 a.m. to 2 p.m., Saturday, March 12 at the First United Methodist Church, 208 West Lauderdale Street. Contact: Michael Glennon, KB4JHU, (931) 588-0302. Email: <kb4jhu@arrl.net>. Website: <www.mtars-ham.org>. Talk-in 146.700- (PL 114.8). VE exams.

ELRYIA, OHIO — The Northern Ohio Amateur Radio Society will hold its NOARS Winter Hamfest 2022 from 9 a.m. to 1 p.m., Sunday, March 13 at the Loraine County Community Center-John A. Spitzer Conference Center, 1005 N. Abbe Road. Contact: Carl Rimmer, W8KRF, (216) 256-9624 (before 9 p.m.). Email: <winterhamfest@noars.net>. Website: <http://noars.net>. Talk-in 146.70- (PL 110.9).

FORT WALTON BEACH, FLORIDA — The Playground Amateur Radio Club will hold the 52nd Annual PARC Hamfest from 4-8 p.m., Friday, March 18 and from 8 a.m. to 2 p.m., Saturday, March 19 at the NWF Fairgrounds, 1958 Lewis Turner Boulevard. Phone: (850) 359-9186. Website: <www.w4zbb.org>.

BUFFALO, MINNESOTA — The Maple Grove Radio Club will hold its 39th Annual Midwinter Madness Hobby Electronics Show from 8 a.m. to noon, Saturday, March 19 at the Buffalo Civic Center, 1306 County Road 134. Phone: (763) 537-1722. Website: <http://k0ltc.org>. Talk-in 147.000+ (PL 114.8). VE exams, ARRL card checking.

KALAMAZOO TOWNSHIP, MICHIGAN — The Southern Michigan Amateur Radio Society will hold the 60th Almost Annual Michigan Crossroads Hamfest & Radio Swap from 8 a.m. to noon, Saturday, March 19 at the Wings Event Center, 3600 Vanrick Drive. Phone: (269) 815-8007. Email: <smarshamfest@gmail.com>. Website: <www.w8df.com>. Talk-in 147.000+ (PL 94.8). VE exams.

LOOMIS, CALIFORNIA — The Sierra Foothills Amateur Radio Club will hold the Loomis Hamfest 2022 beginning 8 a.m., Saturday, March 19 at the Loomis Historic Train Depot, 5775 Horseshoe Bar Road. Website: <www.w6ek.org>.

STUART, FLORIDA — The Martin County Amateur Radio Association will hold the 47th Annual Stuart Hamfest from 8 a.m. to 2 p.m., Saturday, March 19 at the Martin County Fairgrounds, 2616 SE Dixie Highway (A1A). Contact: Hamfest Chairman (561) 309-8138. Email: <hamfest@mcaraweb.com>. Website: <www.stuarthamfest.com>. Talk-in 145.150- (PL 107.2). VE exams.

(Continued on page 52)

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HAM RADIO NEWS

Visalia Cancelled; Dayton Cautious

Covid-19 and its variants continue to disrupt in-person ham gatherings. The organizers of the International DX Convention in Visalia, California, announced in January that this year's event — normally held in April — had been cancelled "in response to the current … virus threat."

The Dayton Hamvention® is still on as of now, but General Chairman Rick Allnutt, WS8G, said in a statement that the Hamvention would follow state guidance, which he expects to include recommendations (but not requirements) for masking and social distancing at large events. "It has become obvious," he said, "that the State of Ohio is very unlikely to call a halt to large gatherings anytime soon." As of now, Allnutt added, there are no plans to offer onsite Covid testing during the Hamvention and he does not anticipate checking vaccination status at the show. He says updates will be posted online at <www.hamvention.org>.

ARDC Makes More Than $1 Million in New Grants

Amateur Radio Digital Communications, the organization that administers the AMPRNet internet domain and sold some 4 million unassigned addresses in 2019, continues using the proceeds from that sale to support amateur radio and communications networking research. Its most recent grants, according to the *ARRL Letter*, include nearly $900,000 to the Internet Archive to establish the "Digital Library of Amateur Radio and Communications," which would be a freely-accessible repository of publications, movies, software, and more that is related to amateur radio.

ARDC also made a $318,000 grant to the Society of Women Engineers to fund 30 scholarships and help with programs that encourage women to choose careers in engineering and showcase their achievements. In addition, ARDC gave $500,000 to the ARRL Foundation to fund a new club grants program. Starting in April, amateur radio clubs will be able to apply for grants of up to $25,000 to support programs or projects that "will advance amateur radio in the grantee's community."

An example of such a project is one directly funded by ARDC — some $34,000 to the Fauquier 4-H Ham Radio Club in Virginia to equip a Youth Station and Outreach Trailer for use by young members at meetings, public gatherings, and special events.

HamSCI Workshop Gets NSF Grant

The Ham Radio Science Citizen Investigation group, or HamSCI, has received a $50,000 grant from the National Science Foundation to support its 2022 in-person and virtual workshop. The workshop, to be held at the U.S. Space and Rocket Center in Huntsville, Alabama, on March 18-19th, will focus on connections between space weather and terrestrial weather, according to the *ARRL Letter*. It will also host a team meeting of HamSCI's Personal Space Weather Station project, which is also being funded by a much larger NSF grant.

"Low Power" in Contests Now a Uniform 100 Watts

The ARRL has redefined what constitutes "low power" in its contests, reducing the maximum power level for the category from its long-standing 150 watts to the 100-watt level used by most other major contest sponsors, including CQ. According to *Newsline,* the League made the change both to standardize its categories with other contests and in recognition of the fact that 100 watts is now the most common "barefoot" output power of current HF transceivers.

New Tech Question Pool Released

The National Conference of Volunteer Examiner Coordinators (NCVEC) has released its updated question pool for Technician Class license exams to be used from July 1, 2022 through June 30, 2026. The ARRL reports that the new Element 2 exam pool has 11 fewer questions than the one currently in use, based on the addition of 51 new questions and the deletion of 62 current ones. Over 250 current questions were modified "to improve wording or to replace distractors" (wrong answer choices). The new question pool may be downloaded from the NCVEC website <ncvec.org> in either PDF or Word format.

2022 Youth on the Air Camp Scheduled

Up to 30 young hams will once again be gathering this year for a week of ham radio fun and learning at the National Voice of America Museum of Broadcasting in West Chester, Ohio. The second running of the Youth on the Air, or YOTA, Camp has been scheduled for the week of June 12-17th, according to Camp Director Neil Rapp, WB9VPG. He says future plans call for alternating the camps between June and July every other year, with locations rotating to different locations in North, Central, and South America beginning in 2023. Rapp notes that participants will be notified as far ahead as possible if any changes in scheduling are made necessary by new Covid outbreaks. For more information, visit <youthontheair.org> or contact Rapp at <director@youthontheair.org>.

Young Hams Wax Eloquent on Keeping the Hobby Relevant

The Intrepid DX Group, working with ARDC (Amateur Radio Digital Communications), recently announced the winners of its annual "Dream Rig" essay contest for young hams. The topic was keeping ham radio relevant in the age of the internet and the winner was 10-year-old Silas Davis, W3SED. Silas wrote that ham radio will always be relevant because it "inspires and creates community," can help save lives and … it's fun! Second and third place recognition went to Olivia Lee, KD2UYX, and Isaac Schmidt, K6IAS, respectively. Each of the three won radios donated by ICOM and Yaesu. The essays are posted on the ARDC website <ampr.org>.

U.S. Forest Service Seeks Fees for Wireless Facilities on its Lands

The U.S. Forest Service is accepting comments through February 22nd on a proposal to charge fees to owners of permanent wireless installations on the lands it administers. These fees would apply mostly to commercial wireless service providers but could also impact owners of amateur radio repeaters located on Forest Service land. According to *Newsline*, the fees would cover the Forest Services costs in maintaining and managing the sites and are required by the Agriculture Improvement Act of 2018. They would not apply to temporary operations by visiting hams.

Comments are being accepted through February 22nd via the Federal Rulemaking Portal. They should reference "RIN 0596-AD44." We recommend, as always, that you read the actual proposed rules before filing comments.

Hams Help in Wildfire and Bombing Response

Ham radio operators were part of the response to the late December wildfire that consumed more than 1,000 homes in Boulder County, Colorado, and separately, helped police in Washington State following a bombing at a local bank.

According to the *ARRL Letter*, members of Boulder County ARES provided communications support between evacuation centers and the Emergency Operating Center. In Centralia, Washington, ARES members helped police search for evidence after two men allegedly blew up the automated teller machine at a local bank branch. According to the report, Centralia ARES members had received training in how to search for evidence and worked in teams of 3-5 hams, each led by a detective, to search an estimated 10,000 square feet around the crime scene.

CONTENTS

FEBRUARY 2022 • VOLUME 78 NUMBER 2

16 COVER: QRP QUICKIES
By Various Authors

Getting high on QRP! Robert Williams, NØQLR, activates a Summits on the Air (SOTA) operation from the peak of Mt. Herman, Colorado, along with Steve Galchutt, WGØAT. Their story is on page 16; more about SOTA is on page 30. (Cover photo by Steve Galchutt, WGØAT)

FEATURES

QRP SPECIAL ISSUE: Special things happen when you turn the power down less than 5 watts. Find out what happens on pages 8, 10, 16, 19, and 22. Plus ... love is in the air on pages 32 and 38.

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ZERO BIAS: A CQ Editorial

BY RICH MOSESON,* W2VU

Little Things (and One Big One)

Welcome to our annual QRP Special, in which we focus on one of the "less is more" aspects of our hobby — shining a spotlight on the amazing results you can achieve with a peanut-powered transmitter. As usual, our articles reflect not only some of these success stories but the variety of ways in which we hams put QRP to work for ourselves and for each other. We start with WB9HDH's story of returning to active hamming after a 40-year absence and determining that QRP CW was his best way to get back on the air from a house on a small lot in a densely populated suburb. K5PA shows us how he operates FT8 from the field, and QRP Editor KA8SMA highlights the ways in which a small number of watts have energized small businesses in the kit market (see photo).

Our cover story is a "QRP Quickie" in which WGØAT describes introducing a relatively new ham to activating mountain peaks for the Summits on the Air (SOTA) program. Speaking of SOTA, we've just received word from South America that LU8MZO set a SOTA altitude record last month by operating from the summit of Mount Aconcagua in Argentina, the highest peak in the western hemisphere. We'll be bringing you details of that adventure in an upcoming issue.

One of the many things I love about QRP is the way in which it brings together so many different strands of the ham radio universe. The relative simplicity of low-powered gear encourages building, which in turn creates a market for kit-makers. The small size and light weight of QRP radios make them ideal for outdoor hamming (or mountaineering!), and the ability to carry a completely self-contained station just about anywhere improves our ability to provide emergency communications in times of need. And of course, the ability to make DX contacts and compete in contests with flea-power builds up general operating skills.

QRP is not unique in this regard, of course. High-altitude ballooning brings together several other strands, including packet (APRS), telemetry, digital video / photos, and amateur radio direction-finding (ARDF). On the topic of ARDF, KØOV has the results of last year's USA ARDF Championships in his "Homing In" column this month. Serious DXing and contesting challenge our technical skills in terms of station design and antenna optimization. And our broad willingness to share what we've learned — through these pages and other media — means that we all benefit in the long run.

"These pages" bring us to …

… The Elephant in the Room

It's no secret that we've been having a very difficult time in recent months with our print edition. Many of our loyal readers have been asking what's going on and what we plan to do moving forward. I'll do my best to explain the situation without boring you with too many details. The Covid pandemic and its fallout have certainly been factors — making existing challenges even more difficult — but as several of you have correctly pointed out, our difficulties extend back to BC (before Covid).

The entire publishing industry has been in a state of flux for nearly a decade now, as publishers, advertisers, and readers adapt to the always-in-motion digital landscape. With a significant number of consumers getting more of their information from digital media, advertisers now must divide their budgets among a wide variety of print and digital outlets. Here in the ham radio universe, a manufacturer or retailer who used to split the year's advertising budget between two or three magazines now must add a variety of podcasts, websites, and more to the landscape in order to reach the greatest possible number of potential customers. That means a smaller share for traditional print media. Apply that to virtually every advertiser and each traditional publication has a significant reduction in ad revenue over time. The balance between advertising and subscriber revenue has shifted but we can't add too much more of a burden onto our subscribers, who are already dealing with sharply rising prices in their essential purchases.

Now, overlay the Covid pandemic, workplace disruptions, staff shortages and supply chain issues, and what had been an annual squeeze toward the end of each year has turned into a major economic challenge. Our business staff has been working diligently to keep things going and we've managed to stay current with our digital edition but the resources just have not been there to get the last several print issues off the press and into the mail. We are continuing to do absolutely everything we can to get our publication schedule back to normal as quickly as possible.

Small rigs with small power have created big opportunities for small businesses selling QRP kits, such as QRP Labs and the 4-State QRP Group.

A couple of other notes: Some readers are speculating that we're trying to get everyone to switch from print to digital because of reduced costs for printing and mailing. NO. We're not. Despite the world's current infatuation with all things digital, print publications continue to have more impact than digital ones, for readers, writers, and advertisers alike. Print is "real" and tangible while digital is "virtual" and ethereal. For us, like many other publishers, a digital-only model is not sustainable. We must have both print and digital to effectively communicate with our audience and have no plans to drop our print edition.

We also recognize that we have an obligation to provide print magazines to print subscribers and are extending all print subscriptions by the number of missed or significantly delayed print issues. We are also making PDFs of those issues available on request to any print subscriber who asks.

The long-term solution lies in greatly expanding our subscriber base to rebalance the advertising / subscription revenue distribution without overburdening our current subscribers. Your input is welcome on innovative ways to reach potential new readers. Meanwhile, we are very thankful for your collective patience and understanding as we navigate these uncharted waters together.

– 73, W2VU

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

NEWS BYTES

Dick Fijlstra, PAØDFN, Named Carole Perry Educator of the Year

The Orlando Hamcation® has selected Dutch amateur Dick Fijlstra, PAØDFN, as the 2022 Carole Perry Educator of the Year. A retired public school principal, Dick continues working with young people by organizing exhibitions at different schools to make students aware of the radio hobby and inspire them to pursue careers in science and technology.

Dick is also heavily involved in amateur radio direction-finding (ARDF) — also known as foxhunting — and uses hidden transmitter hunts as one method of introducing young people to amateur radio. He is the representative of VERON, the Dutch national ham radio association, to the International Amateur Radio Union's Region 1 (Europe, Africa, and the Middle East) ARDF committee. One of the committee's activities is the European Youth ARDF Championships, in which young people ages 14-19 from all over Europe compete to find hidden transmitters. Dick builds many of the foxhunting transmitters and receivers used in the events that he coordinates.

The Carole Perry Educator of the Year award is named in honor of its first recipient, noted ham educator Carole Perry, WB2MGP. The award will be presented at this month's Orlando Hamcation® hamfest in Florida. (Full disclosure: *CQ* Editor Rich Moseson, W2VU, is on the judging committee for this award)

2022 Carole Perry Educator of the Year Dick Fijlstra, PAØDFN, uses amateur radio direction-finding as his favorite way to introduce young people to ham radio. (Photo courtesy Orlando Amateur Radio Club)

QRP Special:

There is an "invisible" growth area in amateur radio — hams who have maintained their licenses but haven't been on the air getting active again. WB9HDH is an example, returning not only to ham radio but also to CW and QRP.

Five Watts and a Dipole: My Return to Ham Radio

BY JAMES E. GREEN,* WB9HDH

In December 2020, I became an active ham again — after a 40-year absence from the hobby. And I am enjoying it more than I could ever have imagined.

My "ham history" dates back to the late 1960s, when I received my two-year, nonrenewable Novice Class license. My Novice call was WN9ZVL. When that license expired, I was off the air.

But in April 1971 — when I was a senior in high school — I took the General Class license exams (code and theory) in Milwaukee, Wisconsin. At that time, you had to take the General Class exams in front of an FCC license examiner. The examiners came up to Milwaukee (from the Chicago office) four times a year. You needed to make an appointment in advance, which I had done.

I passed the code and written exams, and was awarded the callsign WB9HDH. As a Novice — and as a newly-licensed General Class ham — I mostly worked 40-meter CW, and then some 2-meter FM. I stayed active until 1980, when I permanently moved out of my parents' house and into a series of apartments. None of the apartments offered room for a station or an antenna. I renewed my license regularly and I read *CQ*. But I was (mostly) inactive. I sold or gave away all of my ham gear and accessories. Even after I got married and bought a house, I still didn't seem to have the time, or interest, for ham radio.

Things began to change when, after a 43-year career as a technical writer, I retired in the summer of 2018. I found that I suddenly had a lot more time on my hands. What gave me the impetus to become active in ham radio again was the review of the Xiegu G1M transceiver that appeared in the December 2019 issue of *CQ*. Per the review, "The G1M is a 16-bit software-defined radio (SDR) with 5 watts of output on 15, 20, 40, and 80 meters. The transceiver covers CW and SSB and can run digital modes using an aftermarket soundcard."

What appealed to me was the low cost of the transceiver (a couple hundred dollars) and the fact that it was small. Any of my pre-1980 Novice or General

Photo A. The "antenna farm" at WB9HDH … a 20-meter and a 15-meter dipole. As of now, only the 20-meter antenna is hooked up.

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Photo B. WB9HDH station layout, featuring a Hi-Mound HK-708 telegraph key, with the Xiegu G1M QRP transceiver, power supply, and SWR meter in the background.

"I attached the feedline to the BNC connector on the back of the G1M, connected the 13.8-volt DC power supply, plugged in the code key — and I was a ham again!"

Class stations used up the space of a table; you can easily hold the Xiegu G1M in the palm of one hand.

So, during the Fourth of July weekend in 2020, I went online and bought a G1M for $249.99 (including shipping). Of course, I also had to get a regulated 5-amp, 13.8-volt DC power supply, a hand key, a wattmeter, SWR meter, a dummy load, as well as a few coaxial jumper cables … I was completely starting over.

I had thought that lack of space for any antenna would restrict my hamming. Our house is in an older suburb. It is a very densely populated area, and our house is on a small lot. No chance of a beam or antenna tower. Whatever antenna I used, it would have to be simple. And unobtrusive.

With the G1M now in-hand, I got out the measuring tape, went outside, and started taking measurements. I found that there was just enough room in the front of our house for a 20-meter dipole (*Photo A*). Not an ideal location — the dipole would be only 15 feet or so up in the air, and it would pass under and through the branches of a very large ginkgo tree.

But there was enough space. And if a 20-meter dipole would fit, then obviously there was enough room for a 15-meter dipole as well. (The Xiegu G1M does not cover the 10-meter band.)

I ordered a 15-meter and a 20-meter dipole on eBay. And one day last year in December, when the XYL wasn't home, I got the ladder out of the garage, went up, and strung the two dipoles … without incident.

Earlier on, I had gotten a 25-foot run of RG-58A/U coaxial cable for the feedline — the short feedline length is a real asset with QRP. I attached the feedline to the center connector of the 20-meter antenna, and ran the coax through a service door and into the house. (A feedline for the 15-meter dipole, and my being active on 15 meters, would have to come later.)

I attached the feedline to the BNC connector on the back of the G1M, connected the 13.8-volt DC power supply, plugged in the code key — and I was a ham again!

The Xiegu G1M is an excellent radio. The receiver is incredibly hot. And with the 5 watts of RF output and my dipole, I have worked stations in France, Switzerland, Puerto Rico, and throughout the mainland U.S., all from my Wisconsin location and all on 20 meters (*Photo B*).

I regularly work into New England and New Brunswick with good RST signal reports — including some 599 reports.

I don't use any of the SDR features of the radio. And I don't use the SSB option or the digital modes — only CW.

And I work only on 20 meters — that is due to my antenna situation.

Like everything else, ham radio has changed in the past 40 years. Maybe because I'm retired, and I operate during the daytime on 20 meters, but in many QSOs, people now include their age and a brief summary of their ham career. When I was a young ham, we didn't mention our age in QSOs — maybe that's because we were all so young at the time. And we were mostly all Novice Class, too.

Also, there seems to be a lot more contest activity now, especially on the weekends. This may well be due to the Covid situation, with people being home more often and having time on their hands.

But it's great to be an active ham again. Brings back memories of my Novice days,

But it's great to be an active ham again. Brings back memories of my Novice days, and the very first time that I tapped out a "CQ" on the key, and listened, and then heard my own call letters coming back to me …

It's that good.

QRP Special:

Yes, we know that February isn't outdoor operating time for many of us. So if you don't live in a warm-winter zone, hold onto this story and read it again when your world begins to thaw out!

QRP FT8 to the Field

Strategies on Operating Outdoors

BY GENE HINKLE,* K5PA

I have enjoyed building and operating QRP radios and enjoy the minimalist aspect of QRP. My QRP exploits began in the '70s with the Heathkit HW-7 QRP radio and culminated with the Elecraft KX3, a fully featured software-defined (SDR) transceiver. This last year, I had the opportunity to purchase the Icom IC-705 all-mode radio that features portability and operates over most ham bands (1.8-450 MHz). I figured the radio would serve as a very nice QRP CW transceiver to take to the field (*Photo A*), but could also provide SSB, FM, and data communications.

I also enjoy FT8 / FT4 modes due to the homeowner's association (HOA) restrictions in our neighborhood. With a stealthy antenna and low power, I have found it easy to work the world on the HF bands. The combination of QRP power and FT8 seemed obvious and led to taking the Icom to the field. What I learned from my experiences can easily be applied to other transceivers in current production and some on the horizon.

There's Power in Signal Processing

QRP is normally rated in terms of RF output power. It is obvious through our experience that the greater the power is at the transmit end, the stronger the signal is heard at the receiving station. Thus, it is easier to make contacts using higher power. The QRP enthusiast, however, strives to use lower transmitter output power, such as 5 watts or less.

There are advantages in using digital coding techniques to increase the effectiveness of the communications using dig-

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Photo A. QRP FT8 in the field (Photos / diagrams by the author except as noted)

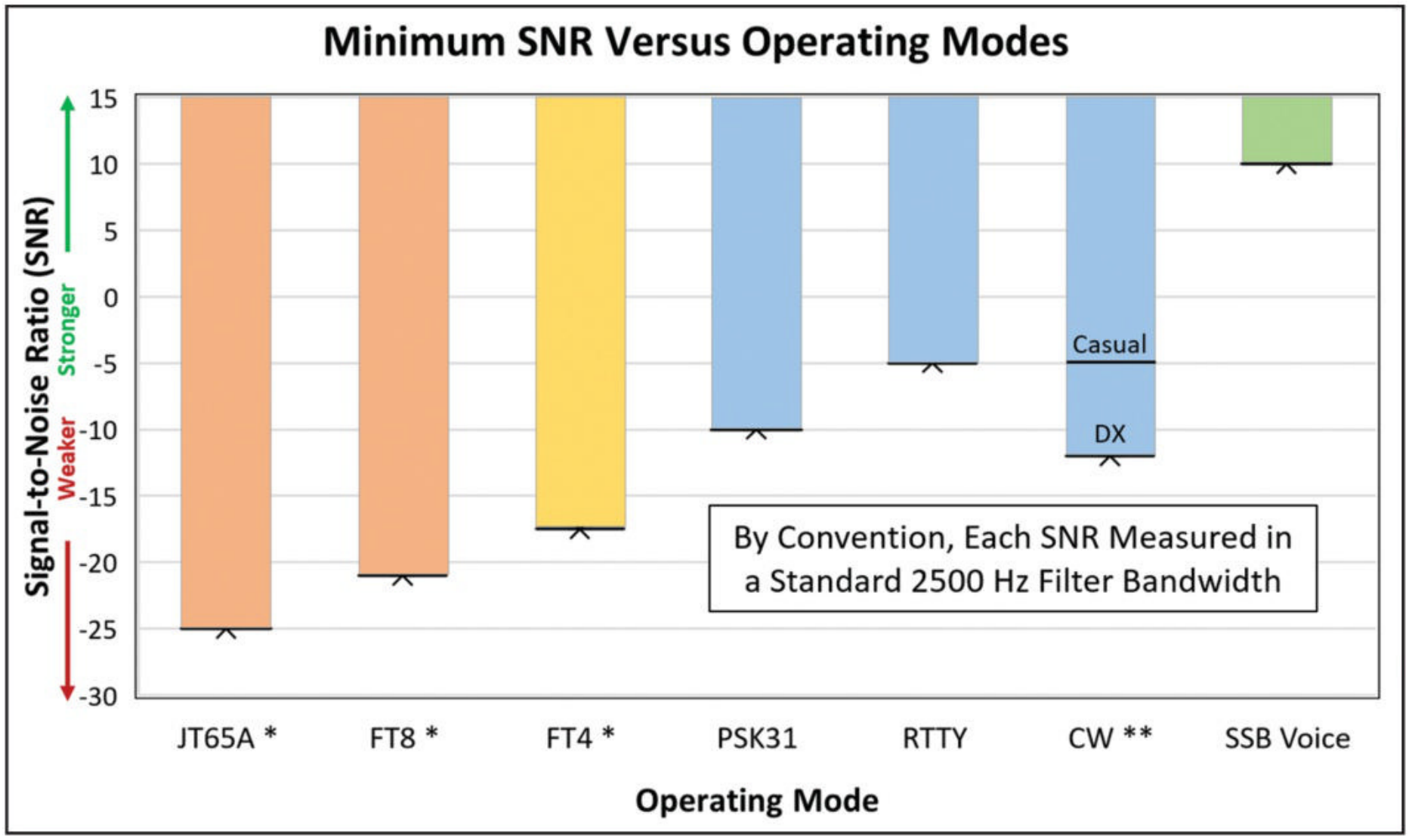

Figure 1. Minimum signal-to-noise ratio (SNR) thresholds versus operating modes [K5PA graph based on data from References 1, 2 (*), and 3 (**)]

ital signal processing (DSP). Interestingly, Morse code can be copied easily by ear but with the inherent limitations of the signal's power and background noise. Applying DSP techniques, this limitation can be extended to lower RF power levels, because it can lower the required signal-to-noise ratio (SNR) for communications. These DSP and coding techniques can make our communications more reliable, making them as effective as transmitting with higher RF power. Therefore, I say there is "real" power in signal processing.

The chart shown in *Figure 1* describes the minimum SNR necessary to communicate within a 2500-Hz filter bandwidth.[1,2,3] This represents the typical bandwidth of SSB filters for voice communications, 300-2800 Hz. The received desired-signal power when compared with the noise within this bandwidth defines this SNR. To the far right in the chart is single sideband (SSB) voice communication that shows the SNR needs to be higher than +10 dB for effective communications. On the far-left side is JT65A, where the SNR threshold for communications is -25 dB. FT8 (-21 dB) and FT4 (-17.5 dB) are also listed, along with CW, PSK31, and RTTY. The takeaway from this chart is recognizing the decrease in signal power that is needed to establish communication varies by operating mode.

What this means to the QRP enthusiast is communications can be readily made at lower RF transmit power if signal processing and coding are employed when using these different operating modes. For example, FT8, with a threshold of -21 dB SNR, when compared with working DX using CW, with a threshold of -12 dB SNR, requires a *9 dB* difference in necessary RF power given the same noise level. Think about that, a 100-watt CW transmitter at its threshold for communication would only need 12.5 watts if FT8 was being transmitted instead. To further explain how this is calculated, the 9-dB difference is equivalent to a factor of eight such that a 12.5-watt FT8 transmission would be equivalent to a 100-watt SSB transmission (8 x 12.5 watts = 100 watts). The difference in the RF power required is a direct result of the power of DSP and coding, all else being equal.

The story does not stop with raw RF power. For example, think about the amount of concentration that is needed to copy weak CW signals at the lowest SNR thresholds. The receiving station would normally want to copy stronger signals that provide a higher SNR approaching the causal CW copy level of about -5 dB. Digital modes such as FT8 provide weak-signal decoding improvements and they do not fatigue. They will produce the same result now or an hour from now. The operator becomes the conductor of the orchestra for selecting the decoded FT8 callsigns based on their location and measured SNR levels as measured by the FT8 program. This can add to the enjoyment of the operating session and can complement QRP CW operation.

Taking FT8 to the Field

I am using the Icom IC-705 portable transceiver as the center of a portable QRP operating station. It is capable of CW, SSB, FM, and digital modes such as FT8, FT4, D-Star, etc. The IC-705 is a SDR that uses DSP to convert the radio frequency energy into demodulated signals for speech and data. It also operates over most of the ham bands from 1.8-450 MHz. It includes a GPS receiver that can show satellite position, geo-location, and time display and it can transmit its decoded data to other software applications.

The transceiver has several wired and wireless interfaces to provide radio control and signal interfacing. It has a serial CIV radio control interface and audio sound card built into the architecture. This means that external software programs

that use a sound card interface can access the transceiver's built-in sound card for data communication modes. This is identical to how other Icom transceivers, the IC-7300 and IC-7610, operate for interfacing to digital modes.

Figure 2 shows the simplified connections from the IC-705 to the computer, external antenna tuner (optional), and battery power. There are just a few cables needed to carry the signals. A USB cable is used for data and digitized audio, a coaxial cable for the radio's antenna connection to the Elecraft tuner, and one battery cable. The built-in GPS antenna and receiver provide satellite position and time data that is displayed on the transceiver's front panel. There is also time and position data generated by the GPS receiver that can be sent to the station computer for adjusting the computer's time-of-day clock to within milliseconds. This is useful when operating software programs, such as WSJT-X FT8, that require time data to be accurate within a fraction of a second.

I use the Elecraft T1 as my tuner when using a non-resonant antenna. If your antenna already provides a 50-ohm match to the transceiver, then the tuner can be omitted. However, I find it is best to still include either an automatic or manual tuner in my go kit to address any antenna tuning problems when in the field.

Table 1 includes the equipment list organized by name, function, and a web link URL for gathering additional information.

The computer listed uses the Windows 10® operating system and all software is selected to run under it. *Table 2* lists the software programs I use by name, function, and where to find additional information. The basic program functions for my QRP FT8 operation are to run WSJT-X FT8 or FT4 modes, provide JTAlert to assist in keeping track of contacts by location, time syncronization, and contact logging. Since there are numerous other software programs that can be used for other modes (CW, RTTY, etc.), these can easily be integrated into the overall system. I also include a program called TimeFudge, which provides an easy way to nudge (fudge) the computer's time clock in fractional seconds (plus or minus) for synchronizing to within a split second while using digital modes. This is useful if the GPS signal is weak, such as when operating under a metal

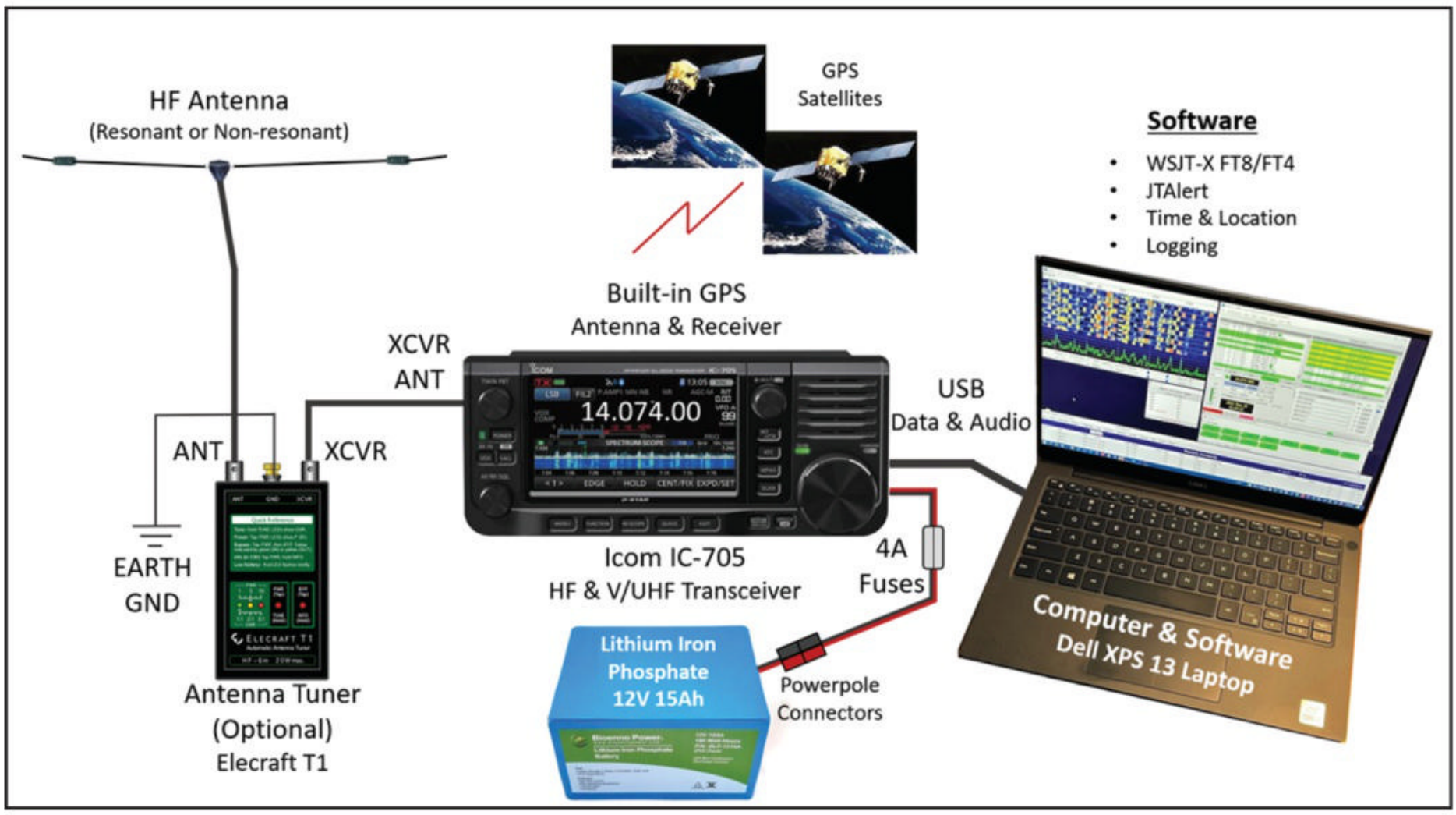

Figure 2. Connection of the IC-705 transceiver to other equipment.

Table 1

Name	Function	Download & Comments
Icom IC-705	Transceiver, HF & V/UHF, USB audio, GPS, sound	<https://tinyurl.com/2p8498sn>
Bioenno Power BLF-1215A	Power source, 12-volts DC, 15-Ah capacity	<https://tinyurl.com/4f4vzax8>
Elecraft T1 autotuner (Optional)	Tune antenna to 1:1 VSWR	<https://tinyurl.com/yc3kz6hy>
HF antenna	80-10 meters or ither	Wire antenna, dipole or longwire, homemade
Dell XPS13 computer	Radio control, DSP, time, Logging, etc.	<www.dell.com/en-us/shop>

Table 1. The author's portable QRP FT-8 setup. Your details may vary depending on your available equipment.

Table 2		
Name	Function	Download
WSJT-X v2.5.3 or higher	FT8, FT4 DSP	<https://tinyurl.com/26ft27rs>
JTAlert v2.50.9 or higher	Assist with contact goals	<https://hamapps.com>
NMEATime v2.2.1	GPS time and location	<https://tinyurl.com/4cxrjh5m>
N3FJP ACLog v.7.02	Logging contacts	<www.n3fjp.com/index.html>
TimeFudge v1.4.1	Time adjustment w/o GPS	<https://tinyurl.com/yckmr5j3>

Table 2. Software used at K5PA

roof or indoors, and alternate means must be used to provide time sync.

Use GPS for FT8 Time Sync

Software such as NMEATime can use the IC-705's internal GPS receiver to synchronize your computer clock to within a fraction of a second. But first, the menu settings of the IC-705 must be set so the radio can send position and time information to the computer using its built-in virtual serial com port. *Figure 3* lists the steps necessary to adjust the radio menus to have the GPS set the radio's time display, set up a data com port USB (B), and select data time transfer over the com port to your computer. At the computer, the GPS program NMEATime can connect to this virtual com port to read the GPS data sentences and then manage the computer clock to within a fraction of a second. The NMEATime program can provide a more accurate time sync when compared with using the GPS time of day clock.

Alternate Strategies

There are other solutions to operating QRP FT8 that merit discussion beyond the Icom IC-705. One of my favorite QRP transceivers, capable of 10-15 watts of RF power, is the Elecraft KX3 shown in *Figure 4*.[4] There is also its newer cousin, the KX2. These transceivers can be brought into service by interfacing them to the computer through their radio control interface. My KX3 was used for FT8 in earlier days and it was a joy to operate. Since the transceiver requires transmit and receiver audio, a sound card must be provided. There are numerous USB sound card solutions that can be put into service or the computer's internal sound card might be usable. Select one that can provide both input and output and provides a sampling rate of 48k samples / seconds. External sound cards are very affordable and easily interface to the computer and radio using the USB and 1/8-inch (3.5-millimeter) phone jacks.

New on the scene is the very affordable QDX (QRP Labs Digital Xcvr) transceiver also shown in *Figure 4*.[5] This design uses a unique interface to convert the FT8 audio tones to synthesized RF frequencies following the same data sequence patterns. The QDX is currently in high demand, but I am hopeful to have one assembled and fielded this year. The price point for this 4-band capable QRP transceiver is less than $100 U.S. The QDX includes a built-in sound card and radio control interface that should work as well as the Icom IC-705 interface. (*See this month's QRP column for more on the QDX – ed.*)

Another strategy is to use the Raspberry Pi 3 (RPi 3) computer board using the LINUX (Raspbian) operating system that runs WSJT-X FT8 and FT4.[6,7] During my early days of FT8, I integrated the Raspberry Pi computer as my FT8 proof-of-concept platform and found it worked rather well. There is a host of LINUX software programs available to serve the same functions as I have fielded with my IC-705. The beauty of this approach is the price declines significantly for building and fielding an FT8 QRP transceiver.

Lessons Learned Along the Way

I have found the simplified interfaces to the IC-705 for FT8 in the field make this rig a joy to use. The setup and takedown are very fast and easy due to the low number of cables and devices. As with most fielded systems, there can be challenges for successful operation.

1. Pay attention to RFI – The first challenge is to pay attention to cable routing and grounding. The IC-705 and the Elecraft T1 external tuner have grounding screws that should be bonded together and connected to a ground. This will help with static buildup and discharge from the antenna system or human contact. The IC-705 uses a plastic case (no EMI protection here) with the GPS receiver with antenna located under the case.

The plastic case of the IC-705 does not provide adequate shielding for keeping your transmitted RF from entering your transceiver. This can interrupt USB data communications

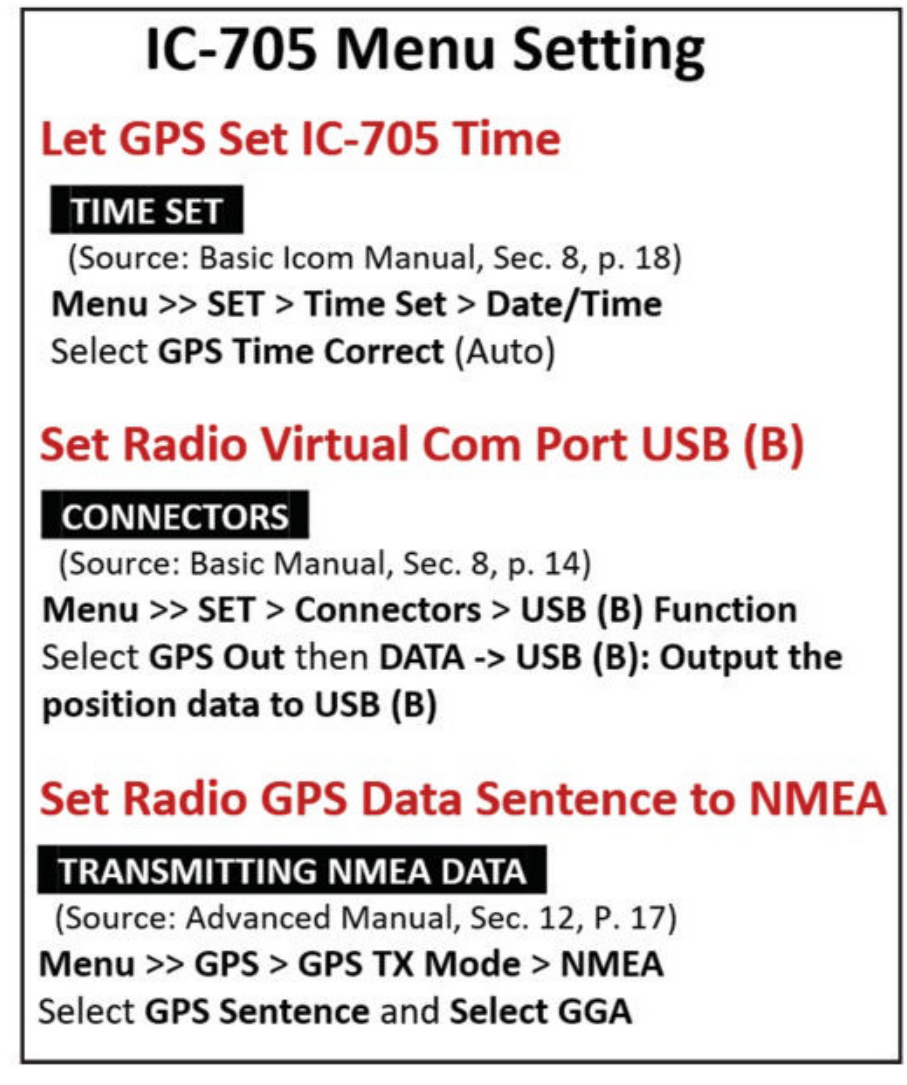

Figure 3. IC-750 menu settings for using internal GPS

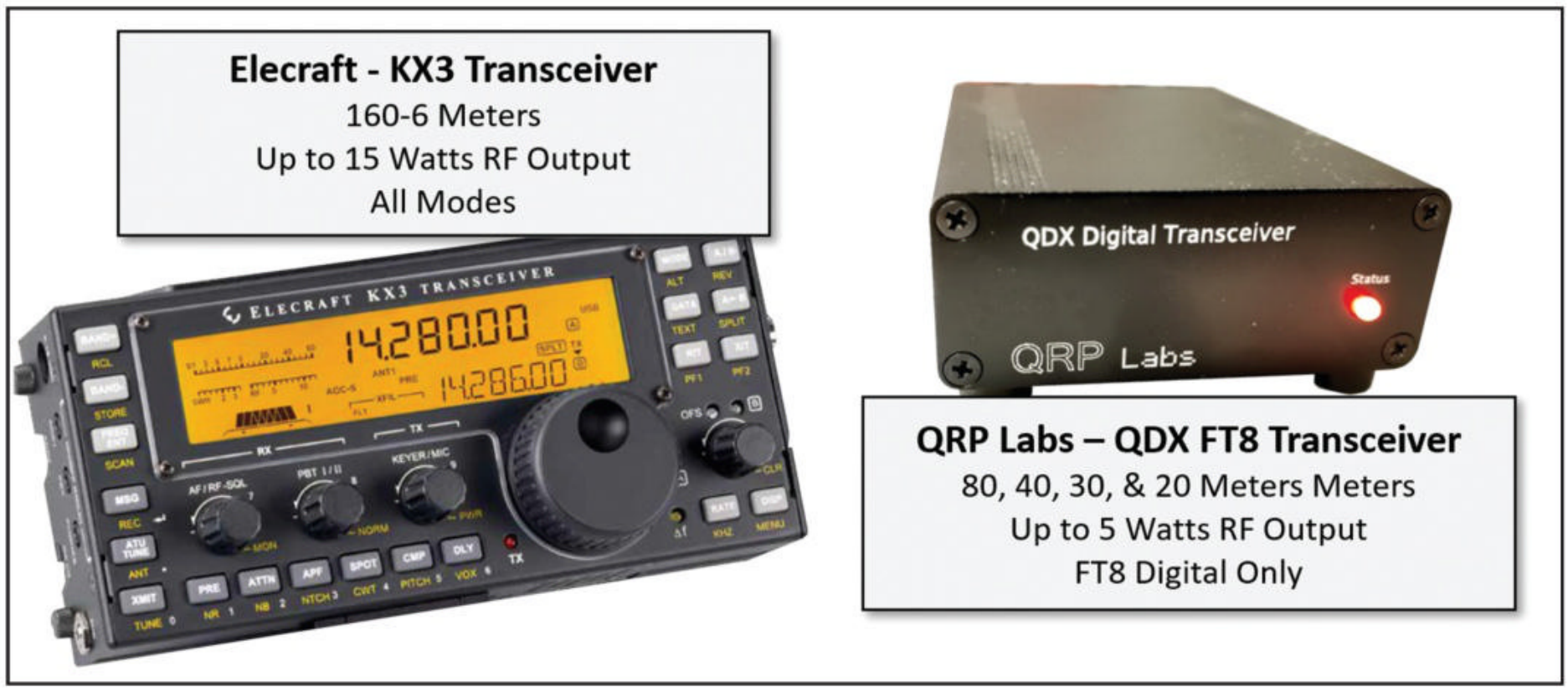

Figure 4. The Elecraft KX3 and QRP Labs QDX digital transceivers.

between the radio and the computer. I have found it sometimes necessary to use clip-on ferrite cores to reduce RF coupling across the connections. The other mitigation technique is to keep the transmit antenna away from the IC-705 and your computer system. This will help reduce noise picked up by your receiver plus reduce the coupling of RF back into your equipment (*as well as minimizing potential exposure to RF – ed.*). The adage to keep your antenna away from your computer and equipment is certainly correct. For that reason, I usually have a roll of coaxial cable available to add an additional length if necessary.

2. GPS and Time Sync Methods – The GPS antenna requires a clear view to the sky for successful satellite acquisition. In my case, I also use the TimeFudge program to adjust the computer's clock for time synchronization with the decoded FT8 signals. I can achieve less than ±0.2 seconds DT error (Differential Time value in WSJT-X FT8) using TimeFudge and watching the DT time decrease. But it helps to know the approximate time of day at the start of operating so signals are decoded showing their DT values. At first, it may be helpful to provide a sky view for GPS to set the computer clock and then use TimeFudge if the sky view cannot be maintained. Once TimeFudge has the proper correction value, it is easily tweaked in small intervals (plus or minus) to keep excellent synchronization. If the sky view is always present, then the time synchronization software, such as NMEATime, can be left running. One added benefit with NMEATime is that your current grid square is always calculated based on your latitude / longitude coordinates.

3. Manage Your Energy – The IC-705 transceiver transmitting 10 watts of RF power draws about 2 amps from your battery. I use the Bioenno Power Lithium Iron Phosphate battery (12 volt, 15 Ah) and I find it useful to manage the battery energy consumption by watching the energy drawn from the battery during operating sessions. A small energy meter with Powerpole connections is readily available for measuring the amp-hour usage.[8] You can watch the energy consumed and keep it below the rating of your batteries.

4. SNR is Not Bilateral – I find it interesting to monitor the sent / received SNR report during the FT8 / FT4 contacts. There are many factors that create the reports at your station and your QSO partner's station. Realize that the report consists of both your received signal level and your noise level. If your local interference level is high due to other transmitters (QRM) or atmospheric noise (QRN), the received noise power, which is measured during the dead period in the FT8 / FT4 cycle, will be high. Your QSO partner has his / her own received signal level and local interference or noise level. You should not expect both your SNR and his / her SNR to be equal. I do follow the trends between my different contacts to judge the

performance of my station and the effects of propagation. It is fun to watch the bands open during the day by monitoring the SNR reports sent to and received from various geographic areas.

5. Where are the Watering Holes? – Another question to consider is "what frequencies should be used for WSJT-X FT8 and FT4?" Considering the difference in RF power levels used by some home stations, you may be tempted to go outside the normal "watering holes" currently established. However, except for being on the edges of each sub-band, I would not recommend you do that. Most of the ham population you will be working will be in the established frequency sub-bands. You should keep to the sub-bands already established for FT8, FT4, Fox / Hound (a mode I do not recommended for QRP), or FT8 / FT4 contesting.

6. Call or Be Called? – Should you "call CQ" or "search & pounce" other stations? Running CQ on a specific frequency is best done when the bands are not fully populated to limit being interfered with. But on quiet bands, the Run CQ mode will draw out those who are monitoring. Of course, if you have been spotted on a certain frequency and are expecting callers, you could stay there and make your calls.

Search & Pounce is likely most successful in the general sense because those stations are calling CQ and listening for callers. You do not need to make the call on their frequency, however, for that is where many others might be calling. Instead, offset your call from the other callers to increase the odds that you will be decoded on the other end. You may want to call a few cycles to allow the current QSO to be completed and for you to become a tailgater to the current contact finishing up.

Summary

Taking FT8 QRP to the field has been very enjoyable and worthy of consideration. Over the last year, I assembled my station in various phases to provide the portability and capability presented. I am looking forward to new variations of operating FT8 using the new QDX radios currently under development. Since my current setup allows for new modes simply by changing software programs, I think it will serve me well into the future as a test bed for digital modes in the field. Plus, I still maintain my CW operating capability with the addition of support programs as they become updated and available.

The author would like to thank Tom Parish, KB5RF, for his insight into operating in the field on his recent trip to New Mexico. His exploits while in the field provided a fresh look at overcoming obstacles while operating outdoors and the focus needed during the planning phase.

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1. Signal/noise ratio of digital amateur modes, <https://tinyurl.com/n4a4anyh>
2. * WSJT-X User Manual, <https://tinyurl.com/yffzv8vp>
3. ** A Comparison of Common Digital Modes for Weak Signal VHF Communications, <https://tinyurl.com/2a9cj66y>
4. Elecraft KX3 SDR Transceiver, All Band, <https://tinyurl.com/bdh84ufj>
5. QDX Digital FT8 Transceiver, 80-20 Meters, <http://qrp-labs.com/qdx>
6. <https://tinyurl.com/3ys7fc4x>
7. <https://tinyurl.com/2p89n38b>
8. <https://tinyurl.com/ysrm7fe5>

QRP Special:

QRP Quickies

We have once again collected short stories from several QRP enthusiasts about their adventures in low-power operating. Well-known QRPer Steve Galchutt, WGØAT, starts us off with a trip up a nearby mountain to demonstrate low-power Summits on the Air (SOTA) to a newly interested ham. John Paul Keon, AB4PP, keeps fellow members of the Knightlites QRP Society in North Carolina updated on group activities, leading the members to designate him as their "scribemeister." He shares two such stories with us here. Howard Kraus, K2UD, recalls working the only station he could hear on 10 meters with 5 watts, back at the peak of the last sunspot cycle, despite questions about the call's authenticity. Mike Dooley, N5BGZ, also got a pleasant surprise on 10 meters; and Gordy Davis, NWØY, proves that a radio doesn't have to be pretty to make a pretty good contact! – W2VU

A Great Introduction …

BY STEVE GALCHUTT,* WGØAT

Robert Williams, NØQLR, operates a Summits on the Air (SOTA) station with Steve Galchutt, WGØAT, atop Mt. Herman, Colorado. (Photos by WGØAT)

A selfie of Steve, WGØAT, dressed for the weather atop 9,000-foot Mt. Herman, above Monument, Colorado.

Today I had the pleasure of demonstrating SOTA (Summits on the Air) HF SSB to friend on Mt. Herman, Colorado. Robert Williams, NØQLR, who's recently become SOTA-active on VHF / UHF, is now inspired to push forward with his General license and learn the code so he can do HF/CW SOTA! Our second chaser contact on 20-meter SSB was Chris, F4WBN, in southwestern France … demonstrating that 5 watts to a piece of wire on a mountaintop can reach across the pond to Europe! Yeah Baby! You can listen to Chris' audio at <https://tinyurl.com/2p86c6s7>.
[Note: This was originally a post by Steve on Facebook and is used here by permission – ed.]

HF "rig of the day" for Steve and Robert's moutaintop adventure, an Elecraft KX-2.

* *Email: <goathiker@gmail.com>*

35,000 Miles Per Watt

BY JOHN PAUL KEON,% AB4PP
SCRIBEMEISTER, KNIGHTLITES QRP SOCIETY

I was operating in a QRP contest at 180 milliwatts on a beam mounted on a 75-foot tower. I heard a T32A (East Kiribati) and he was working a pileup. I put my call in several times (WQ4RP – the club call of the Knightlites QRP Society in North Carolina) and he heard me. I answered and told him my power level. He gave me a fairly good report at the time and I got a QSL for the attempt. Yes, it does work sometimes!

Paul Stroud, AA4XX, was sitting there and heard me make the contact, and I got one of those 1,000 miles per watt awards in the mail as a result (see below). I was totally surprised when I got it.

Another story …

Did I Mention It Was Raining?

We were at Falls Lake State Park in northern Raleigh for the QRPARCI QSO Party. We had set up at one of the campsites and had a tarp over a picnic table. We had tents set up for sleeping. It was raining, I mean raining.

We were gathered around the table and making contacts in the storm as best we could. The ops with me were Derek Brown, WF4I; Paul Stroud, AA4XX; and Dick Hayter, N4HAY. I was on the key and working my shift and plugging away. It was late and the middle of the night. I got a loud contact, a Florida station. I started working him to put him in the log. The noise on the rig was bad from the weather … and did I mention it was raining?

Derek was poking the tarp which had turned into a swimming pool over my head and it sprung a leak so I had to move the rig to keep from getting soaked. Did I mention it was raining?

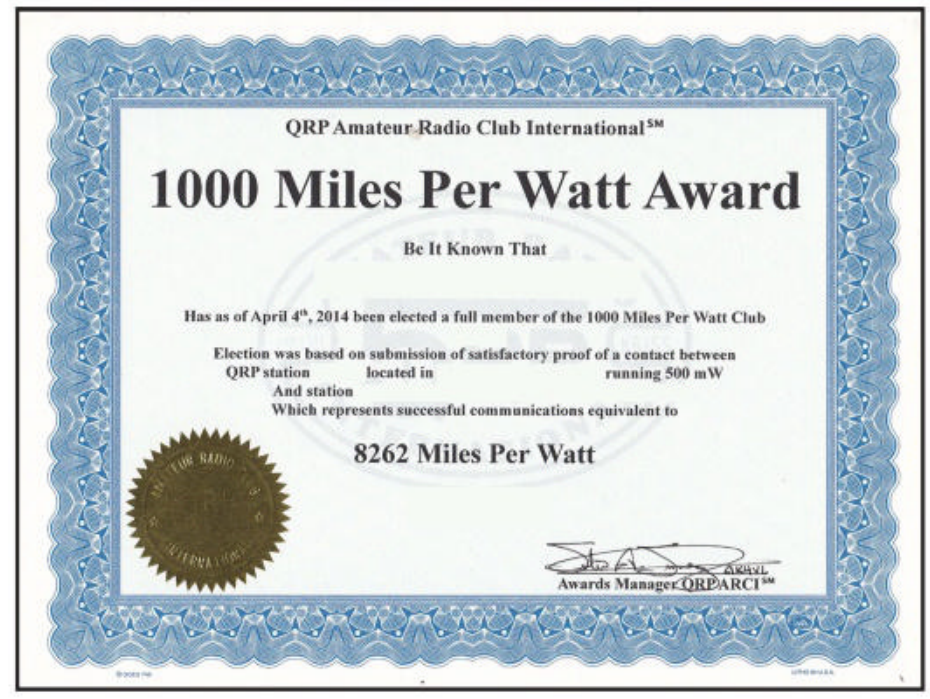
Anyway, this guy on the other end, the Florida station, was booming in. I asked him about his power; he told me 100 watts. I told him we were running 180-mW in a QRP contest. WOW, he says, you are strong with 180 watts. NO, NO, NO! I told him 180 *milliwatts*, you know like 1/10 of a watt and he said wow, you are strong 559 or something like that in Florida.

So I got him to reduce his power in his motorhome in the nice weather he was having (did I mention it was raining?) and he finally got down to 50 watts and was afraid we would not hear him. He was still 599.

He asked about the weather and I kept telling him it was bad and we were under a tarp in a park. He finally got that part, and then he wanted to know how bad it was raining and I told him, "The frogs are lined up on the side of the tent wearing life jackets and we are waiting for Noah to come and get us!"

It was a fun night as usual. The smoker with the ribs and chicken and sausage was under the tarp and never got rained out. We had a great time and at the end of the contest we turned in our scores and I wrote a short story for the rest of the "Knightlites" to share our adventure.

CW4EVER



The 1,000 Mile-Per-Watt award is issued by the QRP Amateur Radio Club International. See <http://qrparci.org/awards> for details.

% Email: <jpkeon340@gmail.com>

A Ten-Meter Surprise

BY MIKE DOOLEY,@ N5BGZ

My surprise adventure also occurred on 10. I was tuning a RadioShack 11-meter mag mount to 10. It was sitting on the bed of the truck with my K2 on a box beside the truck, running off a SLAB (sealed lead-acid battery). Ten was dead as usual, but I tuned around after getting the antenna set up and heard a station calling CQ. It was JA7OWD and he was in some kind of contest. So, I listened and figured out the exchange, then gave him a call. He came right back and I got him in the log. The K2 at 10 watts and a CB mag-mount all the way to Japan. Best DX on 10 for me so far!

Oh ... and I did send in my log to the JIDX contest (all of one contact). Didn't win anything, but what the heck!

@ Email: < msdooley@yahoo.com>

The Only Signal on the Band ...

BY HOWARD KRAUS,# K2UD

During the absolute peak of the last sunspot cycle, I was listening to 10-meter CW in my backyard. The setup was an Elecraft KX-3 transceiver, 5 watts, mounted on the handlebars of my bicycle, feeding a Super Antennas MP-1 adjustable vertical on the rear luggage rack.

Tuning 10-meter CW, I heard nothing until I found a solitary station calling CQ. It was a V73 prefix. He was loud. A second signal popped up sending "SLIM SLIM SLIM." [*"SLIM" is ham slang for a station using an unauthorized call sign or falsely claiming to be in a rare location. – ed.*] I paid that station no never mind and returned to answer the V73. At the moment, I was not riding the bike but sitting on a bucket next to it and had no clue where V73 was. Work first, worry later.

Email: <QRP5W@roadrunner.com>

The V73 returned to me with a quick "599 73." Wondering who I worked (or might have worked), I headed inside to look it up. It was Kwajalein Atoll in the Marshall Islands! I began to wonder if it might have been a SLIM after all. We were the only two signals on the band at that time.

Weeks later, I read a post on a website that caters to taking pictures of transmitter sites. One poster indicated his location in his signature ... Kwajalein Atoll! I asked if he might be a ham. He answered in the affirmative and included his callsign. It was the same one I worked! "Would you mind checking your log for me?" I asked. Yes indeed, we DID work that very nice day at the peak of the cycle.

It was the farthest I have worked with minimal power and a minimal antenna. The next time I hope to be riding the bike while working DX.

"I Think That Would Really Look Strange on a Piece Of Wood ..."

BY GORDON DAVIS, SR., ** **NWØY**
(AS TOLD TO RICH MOSESON, W2VU)

When I was first licensed in 1984, I had already built an HW8 and was already having fun with ham radio. I saw the Tuna Tin 2 in *QST* magazine and said "I think that would really look strange on a piece of wood." So I built one on 3/4-inch thick plywood using nails as solder connect points and a 9-volt transistor radio battery for power. My coax was spliced in three places so it could reach my wobbly 18 AVT vertical antenna in the backyard. I was using a TS 520S as a receiver, and when I tuned in my signal, I thought it was amazing that it actually worked.

One day in 1985, my friend Keith came over and we were listening to a guy calling CQ on 7040 kHz. I keyed down with the little peanut whistle and, son of a gun, he came back to me. His name was Ron and he was in Boulder, Colorado (I'm in Omaha). It was amazing that he heard me. Keith said this can't be possible, but I did get a QSL card from him and made a note in my logbook that I worked him on 1/10th of a watt. It really gave me such a shock that I've been on QRP CW ever since. Maybe that QSO is still traveling through space somewhere.

** Email: <nw0y@cox.net>

The Tuna Tin 2 QRP transmitter was built into a variety of enclosures in addition to the tuna tin shown in this photo from our August 2000 QRP column, including a beer can (emptied first, of course!) and, in NWØY's case, a piece of plywood using nails as solder points! Gordy has no photos, noting, "I never thought about it being a nostalgia item that anyone would want to remember!"

QRP Special:

QRP: Low-Power Communications

BY R. SCOTT ROUGHT,* KA8SMA

Less is More – for Suppliers as Well!

It is a cold and blustery winter day here in northern Michigan as I write this month's column. Yesterday, I had a huge grin on my face after the postman delivered my latest order from the Four State QRP Group (4SQRP), the Soup'er Up'er accessory kit which adds a sidetone, audio filter, and fine-tuning control to my 4SQRP Bayou Jumper CW transceiver (featured in last October's column). Rest assured, as soon as I press the send button to email this month's column to Rich, Jason, and the rest of the gang at *CQ*, I will be firing up my soldering iron to assemble this kit. Nothing beats working on a QRP kit while listening to the serenade of CW and clutching a warm cup of joe on a cold winter's night.

As part of this month's QRP Special, we recognize some of the smaller suppliers and kitters of QRP transceivers and accessories available in the marketplace. Without smaller "ma and pa" type companies, the QRP community would not be what it is today. These companies fill a niche and provide the building blocks for hams to experiment and modify kit-built transceivers to the limits of their imaginations, without emptying their pocketbooks — amen. The connection these companies have with the QRP community is special and they adapt quickly to their customers' needs. What I especially like about these smaller companies is the ability to correspond directly with the kit designer when I have a question, need assistance, or just want to fly an idea by a knowledgeable person, regardless of how crazy my idea may be. Getting responses to questions from the larger commercial manufacturers of amateur radio equipment can be challenging at times. Last fall, a representative at one of the larger companies told me he would need to contact their engineering department to get an answer to my question. Several months later, I am still waiting for a response — yikes!

Below is a smidgen of the many small companies that provide transceiver kits and accessories to the QRP community. Hopefully this month's column will make you aware of some of the neat and interesting products (in my opinion) they offer. If you are aware of a small company or organization that offers a QRP-related kit that you would like to share, please let me know so we can showcase the company and its product in a future column.

Photo A. The QCX+, a very popular CW transceiver offered by QRP Labs. (Photo from <qrp-labs.com>)

QRP Labs

QRP Labs <qrp-labs.com> was started by Hans Summers, GØUPL, and offers QRP transceiver kits and other related equipment. As you may have guessed from Hans' callsign, QRP Labs is based overseas. Hans was licensed in 1994 and was inducted into the QRP Hall of Fame (administered by QRP Amateur Radio Club International) in 2009. He started QRP Labs in 2013 while working fulltime as an IT person in the banking industry. In 2016, Hans decided to make QRP Labs his fulltime job, and for the sake of the QRP community, this was an excellent transition (thank you, Hans). QRP Labs offers several competitively priced kits including CW transceivers, GPS receivers, and several useful shack accessories such as a 20-watt HF dummy load, a VFO / signal generator, and a digital clock, among other items.

One of QRP Labs' popular transceivers is the QCX+, a single-band 5-watt CW transceiver equipped with built-in alignment and test equipment, an iambic keyer, a CW decoder, and several other goodies (*Photo A*). The kit can be purchased for the 160-, 80-, 40-, 30-, 20-, or 17-meter bands and operates on 7- to 16-volts DC. There are no surface-mount components to solder, and the kit comes with a double-sided, through-hole silk-screened PCB (two board design). The board is large enough that the parts are not stuffed too closely together, allowing easier parts placement and soldering. The backlit LCD module displays two rows and includes receive and transmit VFO frequencies, an S-meter, battery voltage, and other menu items.

In fall 2020, QRP Labs released the QCX-mini, a smaller version of the QCX+, for those who demand a smaller, lighter-weight transceiver for portable operation. This transceiver is available for the 160- to 17-meter bands (single-band operation) and may be purchased either in kit or assembled form. The QCX-mini also boasts a low current consumption of only 58 milliamps. To make this transceiver smaller, many of the components are surface-mount devices (SMDs) and are pre-soldered to the board; only through-hole components need to be installed if purchased in kit form. I can attest that Hans really hit this one out of the park! I exchanged

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

Photo B. The No Tune Half Wave Antenna by QRPGuys. You supply the wire. (Photo from <qrpguys.com>)

emails with him shortly after the launch of the QCX-mini and he indicated that 80 kits (out of his first batch of 1,000) were left a few days later. In fact, he indicated that half of them sold within the first hour.

The newest release by QRP Labs is the QDX, a four-band, 5-watt transceiver kit designed for digital mode operation on 80, 40, 30, and 20 meters. The QDX has a built-in USB sound card and requires no test equipment to build and align the transceiver. Like the QCX-mini, many of the components are SMD and have been pre-soldered to the board at the factory. Although I do not operate a lot in the digital world, this kit intrigues me and is on my hit list for constructing later this year. At the time of this writing, this kit is out of stock, partly due to its popularity and partly due to the global semiconductor crisis. QRP Labs indicates the kit will again be available as soon as new ICs are sourced.

One of the most anticipated kits in the QRP community is QRP Labs' QSX, an all-band all-mode QRP transceiver. Yes, you read it correctly, all mode! According to QRP Labs, this kit will have all the functions of the QCX but adds SSB, AM, FM, PSK31, RTTY, and WSPR beacon. The kit is being designed for through-hole assembly and sold for the 40-meter band (single band) or with an optional extra board covering 160-10 meters. Power output will be up to 10 watts. Other features will include a built in CW keyer, dual VFO (split operation), frequency and message memories, built-in test equipment for alignment and general-purpose use. The QSX is still in product development and no date has been provided for its release; however, knowing that Hans is working on this project will keep me checking the QRP Labs website on a regular basis as I am excited for its release. This kit is sure to be a sellout as soon as it becomes available.

QRPGuys

Another vendor of QRP products is QRPGuys <qrpguys.com>, an organization of eight hams, three of whom (Doug Hendricks, KI6DS; Steve Weber, KD1JV; and Dan Tayloe, N7VE) are in the QRP Hall of Fame. As indicated on their website, QRPGuys offers budget-friendly and unique kits that can be assembled in an evening or two. Their kits are generally unique in some way, combine features not normally seen, and are low in cost. QRPGuys encourages purchasers of their kits to experiment, modify, and improve their products for the advancement of amateur radio. Nearly all their kits provide parts lists, schematics, PC board layouts, etc. so their products can be completely homebrewed, if desired; however, I would recommend the kit experience in lieu of hunting for parts. QRPGuys offers transceivers, antennas and several station accessories including a dummy load, a noise bridge that is helpful in tuning antennas and / or aligning receivers, and their "Digital Power Port" which fastens to sealed lead acid and Lithium Iron Phosphate batteries to monitor battery capacity.

Their line of transceiver kits includes the AFP-FSK Digital Transceiver III, a digital mode 5-watt transceiver which covers 160-10 meters (band changes are made via plug-in modules) and their very budget-minded Multi-DC CW Transceiver which covers 15, 12, and 10 meters and contains a CW keyer and two 60-character programmable memories. An optional VFO covering additional HF bands is also available for this transceiver.

Aside from the transceivers, up to 10 different antenna kits are offered, including a small, highly portable vertical antenna system for 40-10 meters (DS-1 antenna). The antenna comes resonant on 20 meters and an additional 40-meter coil can be added to make it resonant on 7 MHz as well. An antenna tuner is necessary for operation on other bands. When deployed, the overall length of the antenna is 52 inches. When disassembled, its longest piece is less than 7 inches, which makes this a very travel friendly antenna. One of their more popular antenna kits is the "Portable No Tune Half Wave Antenna" (*Photo B*). This antenna is rated up to 20 watts and covers 80-10 meters depending on the length of the radiating element (you supply the wire for the radiating element). A cut chart providing the approximate length of the radiating element on each band is etched on the PC board, which also acts as a holder for winding the radiating element (a neat idea). QRPGuys also offers an "End Fed Half Wave Antenna with Tuner." This antenna is kitted for either 40-15 meters or 80 meters and is equipped with a tuner to achieve minimum SWR. An LED indicator / absorption bridge circuit is part of the design which helps prevent your finals from being damaged while tuning for low SWR. Best yet, the tuner reportedly weighs in at 1.8 ounces, making it very trail friendly.

Four State QRP Group

The third supplier I would like to highlight is the Four State QRP Group <4sqrp.com>, a non-profit organization that was formed in 2003 for the purpose of promoting the operation and construction and low power amateur radio equipment. If you join their club there are no membership dues since the sale of their kits, which are designed, kitted and sold by club volunteers, covers all operational expenses of the club. Many of 4SQRP's kits are designed by David Cripe, NMØS, who was inducted into the QRP Hall of Fame in 2014. David designed 4SQRP's Cricket series, which are low-cost, easy-to-build (only 43 parts), entry-level CW transceivers (*Photo C*). These transceivers run on a 9-volt battery and have an output of around 1 watt. David, along with Jim Giammanco, N5IB, designed the Bayou Jumper, a crystal-controlled CW trans-

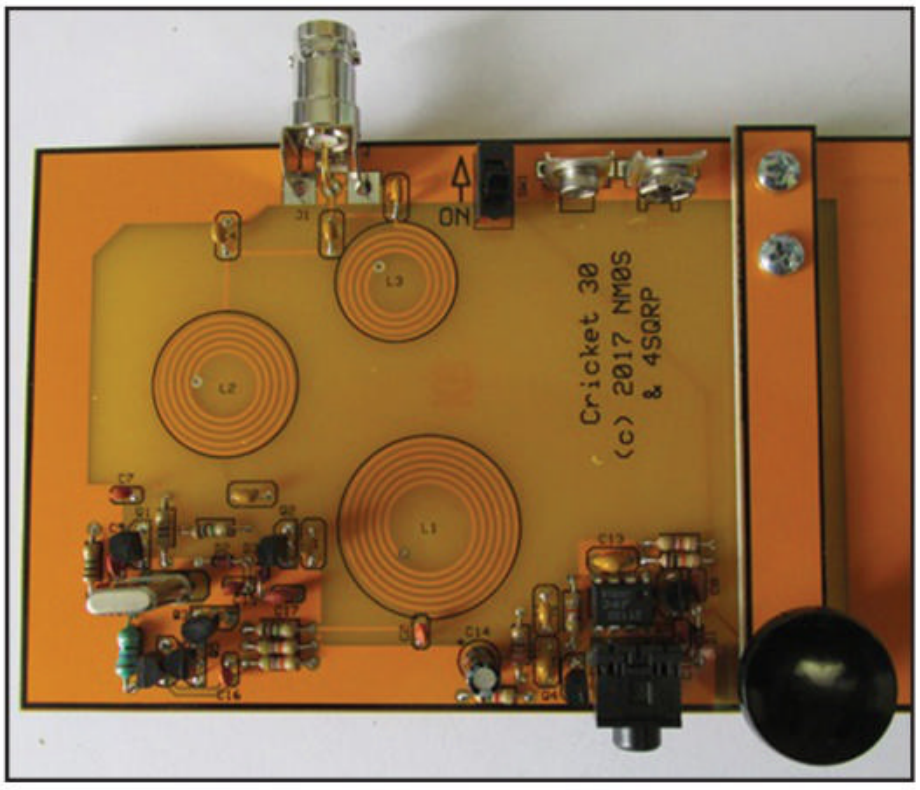


Photo C. Four State QRP Group's Cricket, a simple CW transceiver for the minimalist. (Photo from <4sqrp.com>)

ceiver that pays homage to spy radios of WWII. Regular readers of this column know that I like this kit and the finished product, and, as I stated at the beginning of this month's column, my Soup'er Up'er accessory board (designed by David Martin, NA1MH) for the Bayou Jumper recently arrived. When built, it will enhance the useability of this transceiver.

One kit that is on my wish list is the 4S-Tuner / Antenna Coupler. This tuner is based on the classic T-Match design and includes a unique feature, two LEDs which indicate output power (green LED) and reflected power (red LED). During tune-up, high SWR is shown via a bright red LED (reflected power) and the green LED (output power) is very dim or off. As the tuner is adjusted for low SWR, the red LED begins to dim and the green LED becomes brighter. A 1:1 SWR is achieved when the red LED is off. This tuner is designed for random length wire and end-fed half-wave antennas and is rated for a maximum of 10 watts.

I am already thinking that the Bayou Jumper with the added Soup'er Up'er accessory board in concert with a 4S-QRP Tuner / Antenna Coupler, will make a great combination for Parks on the Air (POTA) and other portable activations this summer.

A Belated New Year's Resolution

For those who did not make a New Year's resolution during the recent holidays or would like to make one that is amateur radio related, consider enlightening others about the power of QRP and the fun in kit building. I took the bull by the horns recently and gave a QRP presentation to my local DX / contest club which is comprised mostly of QRO folks. Although my presentation was well received, I am still waiting for their amps to go up for sale on the used market – HI!

If you have not yet given QRP a try, you need to — I guarantee you will be surprised at what you can do with a few watts. I will not bore you with all the details, but there is only about a 2 S-unit difference on the receiving end when a station lowers its power from 80 watts to 5 watts (from an S-9 to an S-7). I have the idea that people think QRP limits their contacts to a very limited area. I can assure you this is not the case, and challenge you to see what more you can do with less power. *– Until April, 73*

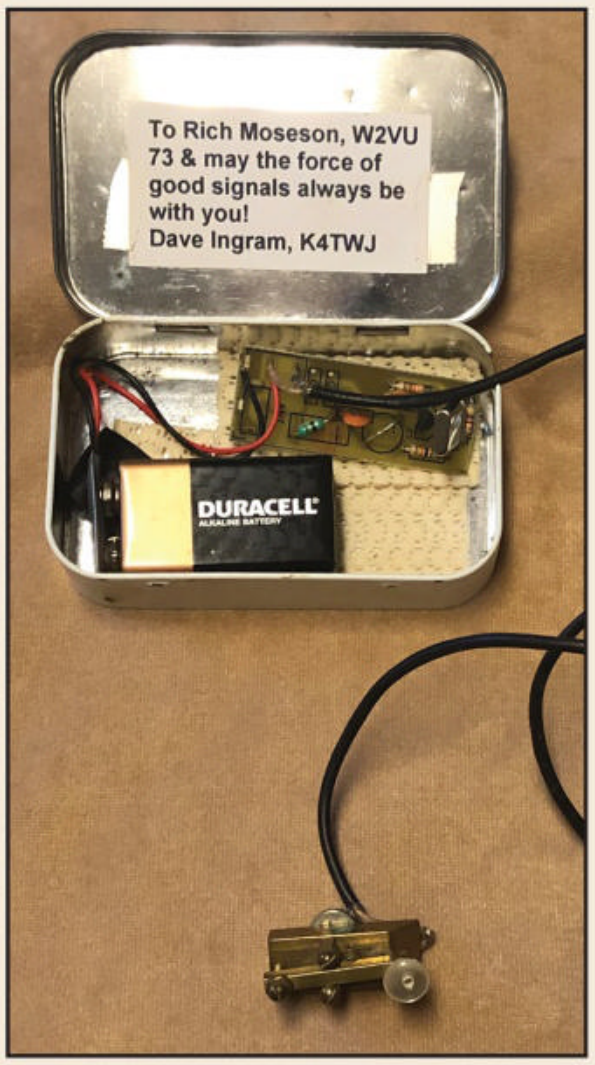
QRP Special:

CQ CLASSIC: *The QRP Column Returns*

While *CQ*'s first QRP column was published in 1973, it went through several iterations and, for many years, the QRP topic was covered regularly by *CQ* columnist and iconic *QRPmeister* Dave Ingram, K4TWJ (SK), in his "World of Ideas" column. The current incarnation of the column first appeared in the April 2000 edition of *CQ*, following a reorganization prompted by the absorption of *CQ VHF* into our pages.

"A Hands-On Guide to QRP Success" is that first "new" column, still penned by Dave, who, by the way, provided my personal introduction to QRP (and QRPp) by sending me a completely self-contained 20-meter transmitter in a mint tin (see photo). It runs on a 9-volt battery and even includes a miniature key. Plus, the key cable is also the antenna! It is now the foundation of my ever-growing collection of QRP kits. Many of Dave's tips from 22 years ago still apply today. – *W2VU*

A self-contained 20-meter transmitter built into a mint tin by K4TWJ (SK) provided W2VU's personal introduction to the world of QRP.



BY DAVE INGRAM, K4TWJ

QRP
The Art of Low-Power Hamming

A Hands-On Guide to QRP Success

Are you ready for QRP views, tips, and words of encouragement, friends? Well the fun starts right here, right now with this new bi-monthly QRP column. Our collection of good news is growing by leaps and bounds, so let's cut short the opening formalities of this first QRP column and let the good times roll!

First, I sense many of you are presently thinking about license restructuring and looking at QRP with renewed interest. You want to know if you really can "work out" with low power, if running QRP on SSB also holds merit, if there are many all-QRP activities on the air, and if I have some more "tried and proven" notes for QRP success, right? Well, the answer to all of these is yes, so start thinking about big thrills on a small budget and read on!

Under favorable band conditions—no, just make that under "reasonable" band conditions—QRP consistently proves it can reach out almost as well as the usual 100 watt setups. Further, the convenience of operating small, "use anywhere" QRP gear for impromptu hamming when "firing up the big rig" is inconvenient may actually prove advantageous. That may seem like reverse logic, but it's true: The more inopportune the time to get on the air, the better that time is for hamming.

The bulk of QRP activity is on CW, true, but that is only because it consistently proves more productive and reliable under various band conditions. A surprising amount of QRP activity, however, is also via SSB-and FM and AM (listen in the 29.0 to 29.7 MHz range of 10 meters) and via FM repeater satellites such as AO-27 and SO-35. Recently, for example, I heard a chap running only 2 watts on 20 meter SSB engrossed in a solid-copy QSO for over 15 minutes. Flipping over to 10 meters SSB, I heard a DX station sign off with K5NU/bicycle mobile QRP right as I tuned on frequency. Isolated incidents? No. This happens every day in the low-power world of SSB QRP!

What are popular choices in SSB QRP transceivers, You ask? MFJ's "94 series" rigs for 10, 20, 40, 75, and 6 meters are

Photo A— Did you say more QRP?

QRP Contest and Activities

Event	Sponsor	Time of Year
QRP Afield	ARCI	Fall/September
ARCI QSO Party	ARCI	Winter, Spring, Summer, Fall
Summer Daze SSB Contest	ARCI	Summer
ORP CW Contest	ARCI	Winter, Spring, Summer, Fall
Homebrew Spring	ARCI	Summer/July
Holidays Spring	ARCI	Winter
Bubba Contest	ARCI	Fall/September
Run for the Border	NorCal	Spring/April
QRP to the Field	Radio Adventure Society	Summer/May
Flight of the Bumblebees	Radio Adventure Society	Spring
The Power of One	Radio Adventure Society	Fall/September
Colorado QRP Party	Colorado QRP Club	Winter, Spring, Summer, Fall
FYBO Field Contest	AZ ScQRPions	Winter/February
Michigan QRP Contest	Michigan QRP Club	January

Fig. 1— Popular QRP contests and on-the-air activities

rugged little tykes with great performance records to their credit. SGC's new SG-2020 all-band transceiver (see "*CQ* Reviews," June 1999 *CQ*) and Elecraft's new K2 kit transceiver (see "World of Ideas," February 2000 *CQ*) are also neat treats, and they are reasonably priced. Are we piquing your interest and enthusiasm, friends? Read on!

Tips for Success

QRP success depends on three main factors: your antenna system, equipment, and operating expertise. Shortcomings in any one of those three areas might be offset by an advantage in the other two, but you really need all three assets on your side for optimum results.

With respect to antennas, my advice is always think big and high efficiency. Larger types such as full-wave loops and extended double Zepps exhibit a creditable edge over basic dipoles and inverted-Vees, and they are really no more difficult to erect. Random wires and/or multiband doublets are okay for 100 watt setups that can afford signal losses, but they are a noticeable setback for QRP. Verticals are okay only if ihey are mounted in the clear and complemented with a good ground or base radial system. Regardless of your selected antenna, performance is always best when the antenna's mating coax cable is new and unspliced, all connections are well soldered and waterproofed, and all lengths are pruned for lowest possible SWR.

Regarding equipment, you need a transceiver that emits a clean signal to catch attention and a smooth VFO plus RIT control so you can call stations on exactly the frequency they are receiving. Fewer and fewer operators tune even slightly for calls, and many use sharp filters continuously. Shifting your transmit frequency only 100 or 200 Hz when a first call fails often yields an immediate reply. Naturally, your transceiver and operating savvy must be fast and sharp enough to copy that reply through long-winded callers/QRM and other band noises. If you use earbud-type phones as many QRPers do, try different types. Some emphasize bass tones, some emphasize high tones, and some drop off mid-range tones and actually attenuate desired signals.

Finally, strive for perfection in your ability to accurately send and receive CW at any speed (or copy speech of any dialect). Try to put yourself in the other operator's place. Make your signal the easiest one on frequency to copy. Use full break-in and listen between your transmitted dots and dashes so you can spot when the frequency is clear and your call should be heard. Some operators have (or develop) the ability to copy a weak signal amidst a sea of QRM (adjusting your RIT so a desired station is the lowest pitch often helps). Other operators need the assistance of narrow filters and/or DSP units. Determine what works best for you and go for it! Now implement some of my suggestions, then think positively and hit the bands with QRP. The good times are waiting!

On-the-Air Activities

If you are new to QRP or if you spend more time building QRP rigs than using them, you may not be aware of the exciting QRP contests, sprints, and QSO parties gracing the airwaves each month, indeed, the list of events is so long (and still growing!) that even super active QRPers have difficulty keeping up with all of them. A condensed sampling of the more well-known contests is shown in fig. 1. As you will notice, many of the contests focus on using battery power and hamming in the great outdoors (even in cold winter weather, no less). Personally, I like the "Run for the Border" contest with near Taco Bell sites good for extra points.

Listen around the popular QRP "hot spots" listed in fig. 2 almost any weekend, and you will hear these contests in full swing. Don't even think about running QRP as a handicap or a weak signal. Just be sure you are only pumping out 5 watts or less, jump in the action, and start making contacts. You will find QRPers are sharp operators with a special knack for pulling weak signals out of the noise.

Do you like award chasing and/or quick gratification? Make just one contact that

QRP Frequencies

Band	CW	SSB
160 meters	1.810 MHz	1.910 MHz
80 meters	3.560 MHz	3.985 MHz
40 meters	7.040 MHz	7.285 MHz
30 meters	10.106 MHz	—
20 meters	14.060 MHz	14.285 MHz
15 meters	21.060 MHz	21.385 MHz
12 meters	24.906 MHz	24.950 MHz
10 meters	28.060 MHz	28.385 MHz

Fig. 2— Popular QRP "hot spots" and operating frequencies

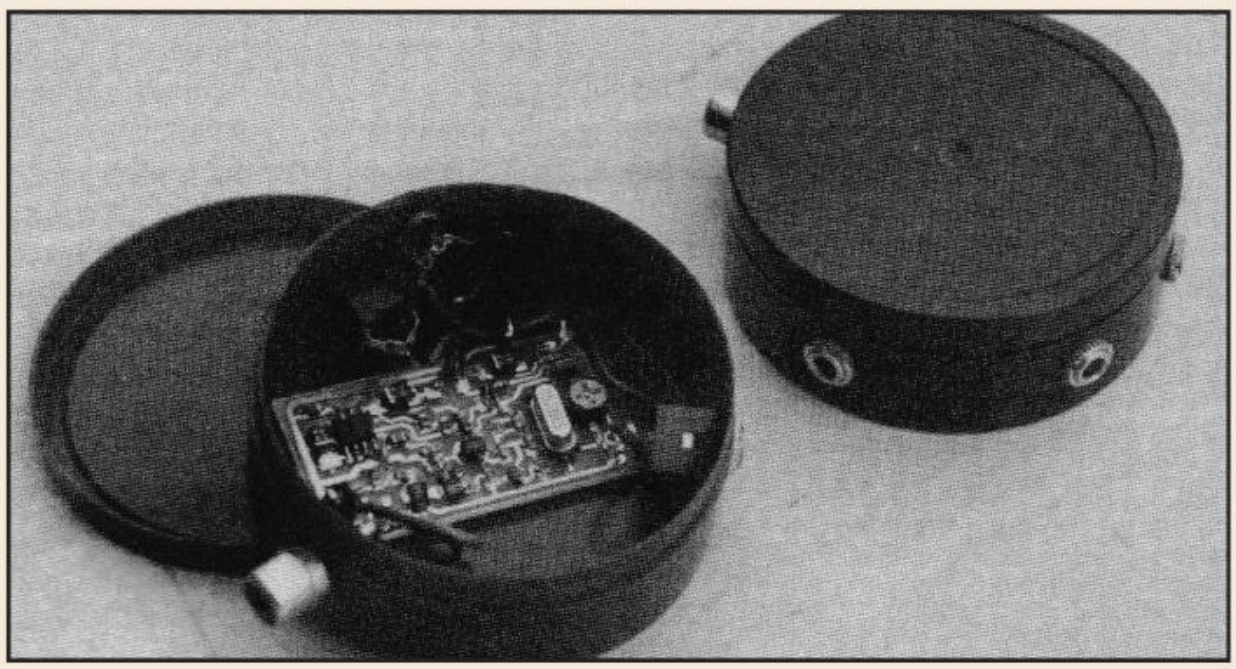


Photo B— This pair of pocket-size rigs are surface-mount KnightSmite transceivers for 80 meters. They were built by WB4JWD and make dandy toss 'n go QRP rigs.

spans a distance tallying 1000 miles per watt, and you qualify for the famous 1K M.P.W. Award available from the QRP Amateur Radio Club International (QRP ARCI).

Details of various contests and awards, incidentally, are usually included in newsletters of their sponsoring clubs. If your stack of newsletters is low or you are not familiar with the format of a particular contest or QSO party you hear in progress, briefly monitoring information exchanges will give you "how to" guidance. Usual exchanges consist of a signal report, QTH, QSO number, and a member number from the club sponsoring the event. Non-members usually transmit their power level in lieu of a club number. It's that easy, and it really opens your eyes to the capabilities of low power.

Clubs and Newsletters

Like contests and QSO parties, the number of big-time QRP clubs is also increasing at a very healthy rate. Joining several of the clubs at one time also makes sense, even if they are not in your local area. In addition to receiving a member number and getting a head start with club kits and projects, many larger clubs also produce outstanding newsletters. These are more than fliers; they are 40- to 60-page mini-magazines filled with details on operating events, kit-building reports and homebrew projects galore. Reading through a few issues plus building one or two of their irresistible projects really gets the QRP enthusiasm rolling. Then almost as soon as you finish reading and building from one group of newsletters, another batch arrives and the fun starts all over again. It is like a a continuous QRP celebration! As a quick guide to joining this action, a list of "most popular" clubs follows.

The QRP Amateur Radio Club International is one of the most popular clubs in QRP and its membership is around the 10,000 mark. The club sponsors a full awards program, and its newsletter, "QRP Quarterly," admirably covers the full field of QRP. Membership is $15 U.S., $20 DX and goes to QRP ARCI, 848 Valbrook Ct., Lilburn, GA 30047.

Northern California QRP Club (NorCal) is another hot and thriving club with over 2000 members around the world. The club is into homebrewing in a big way, and every issue of its newsletter "QRPp" is full of terrific projects to build. Membership is free, subscriptions to QRPp are $15 U.S., $20 DX and go to Jim Cates, 3241 Eastwood Rd., Sacramento, CA 95821.

The New Jersey QRP Club is a new, up-and-coming club with a very enthusiastic membership. Their first newsletters were posted on the Internet, but they recently began printing their own (rather large!) newsletter, and it is filled with great articles covering everything from antennas to projects. If it does not get your QRP adrenalin pumping, check your pulse! Membership in NJQRP is free; subscriptions to their newsletter "QRP Homebrewer" are also $15 annually U.S., $20 DX and go to George Heron, N2APB, 2419 Feather Mae Ct., Forest Hill, MD 21050.

The G-QRP Club is another world-famous QRP club with a large membership (near 7000) and a killer newsletter called "Sprat." The newsletter is always loaded with cool ideas and neat circuits-an absolute gold mine of projects for homebrewing. Sprat serves as a focal point for QRP companies throughout Great Britain. U.S. memberships with Sprat subscriptions are $12 and go to Luke Dodds, WSHKA, 2852 Oak Forest, Grapevine, TX 76051.

The Colorado QRP Club is also well-known for its on-the-air activities, contests, and awards, which are quite efficiently covered in its newsletter "Low Down." It's a good "all around" newsletter with a slant loward onthe-air QRP'n. Membership and annual subscriptions are $12 U.S., $15 DX and go to CQC, P.O. Box 371883, Denver, CO 80237.

There are many more QRP clubs and newsletters, but this list should "getcha goin" for now. If your club's newsletter was not listed, incidentally, pass along the details to me and I will strive to include it next time. I aim to please!

Show and Tell

That winds down the good words and friendly tips for this time gang, but a couple of recently submitted photos and tales must be shared before signing off .

First is a pair of trim KnightSmite surface-mount QRP transceivers that H. D. Martin, WB4JWD, built into repainted tobacco tins (see photo B). The KnightSmite kits were produced by the Knightlites QRP Club and offered by Bob Kellogg, AE4IC, of 4708 Charlottesville Rd., Greensboro, NC 27410 a couple of years ago. They are based on the popular Pixie 2 direct-conversion circuit that uses only a pair of 2N2222s and an LM386 and produces 250 to 500 milliwatts of power. Martin says this was only his second kit to build (the first was KSEDN's "MRX" receiver), and it worked "right off the bat." Martin also asked if other surface-mount kits are in the works. Yes, indeed: MFJ will soon announce its new QRP "Cub," and one of the first Cubs out of the den will be highlighted right here!

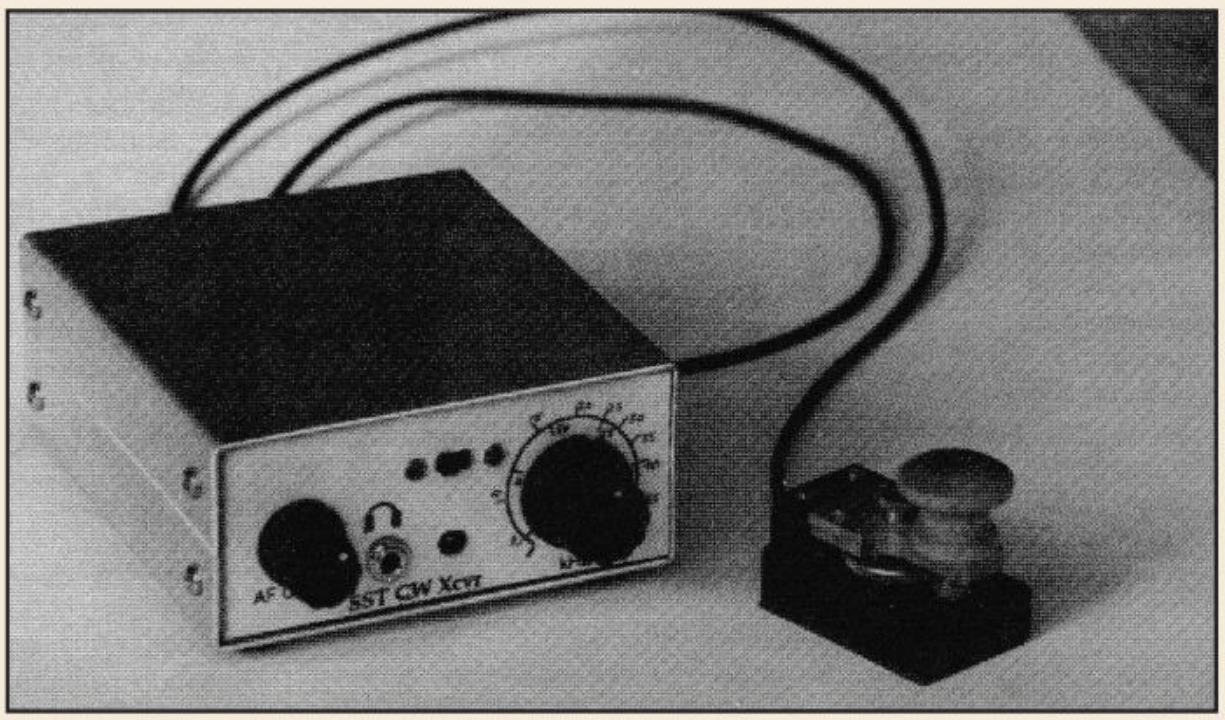


Photo C—This spiffy, hot-performing QRP setup belongs to Englemar Wenk, DK1WE. It consists of a popular 2 watt SST transceiver from Wilderness Radio (modified for dual-range coverage with one VXO) and a snazzy one inch-square key. Englemar makes and sells the little keys, and they are gems.

Next is the little 20 meter SST transceiver and miniature hand-key setup Englemar Wenk, DK1WE, put together and used during his recent visit to the U.S. (photo C). As you may recall from past columns, the SST is a professionally produced kit from Wilderness Radio (P.O. Box 734, Los Altos, CA 94023; telephone 415-494-3806). It sports a quite sensitive and selective superhet receiver, 2 watt transmitter, VXO control, and full QSK. Englemar makes and sells that tiny key (called Micky) you see beside the SST. It is a one inch-square rear-pivoting beauty that looks simply irresistible. His address is DK1WE, Hubenring 4, 88048, Friedrichshafen, Germany (telephone 07544 2635).

If you have a special QRP rig, kit, or project worthy of recognition, incidentally, pass the pertinent details plus some good photos to me and I will do everything possible to help. Remember to include an SASE with letters, be patient for a reply, and always—keep on QRPing! Here's listening for you on 30 meters, kid!

73, Dave, K4TWJ

The island of São Tomé from the air. (All photos courtesy the S9OK team)

DX

BY BOB SCHENCK, N2OO

S9OK – São Tomé 2021

BY THE S9OK TEAM

ENGLISH TRANSLATION BY LADISLAV VALENTA, OK1DIX

This month, I am turning the keyboard over to the Czech S9OK team (translated by OK1DIX) taking us along for the ride on their 2021 DXpedition to São Tomé. This DXpedition was one of only a few big ones last year in this age of Covid. The team did an awesome job. Enjoy their story! – N2OO

São Tomé is the capital island of the Democratic Republic of São Tomé and Príncipe. It is oval in shape (45 kilometers / 28 miles long, 30 kilometers / 18.6 miles wide) and lies in the Atlantic Ocean, almost on the Equator, about 300 kilometers / 185 miles off the coast of Gabon. It is quite mountainous, with the highest mountain rising more than 2,000 meters / 6,500 feet above sea level. The island has a population of just under 200,000 and Portuguese is the main language spoken there.

We first started talking about the expedition to São Tomé before we left for our previous successful expedition to San Andrés (5KØK, 2019). It was agreed that it would be our destination for 2020. We were aware that its position on the Clublog "most wanted" list was not high, but we still hoped that there would be enough interest in working us. After all, HKØ/A was not high either, and there was a lot of interest. After looking at all the accommodation options, which as usual were limited to begin with, we chose a QTH on the northern tip of the island (LOC JJ30HJ). This was one of the few places that could accommodate eight operators and promised reasonable space for antennas. The QTH is open across the ocean to North America, Europe, and Asia, and over a slight elevation to South America. The situation was the worst to VK/ZL due to a steep climb in this direction. Since the island is mountainous, some directions will always be shaded.

Unfortunately, Covid thwarted our plans (as well as the plans of other DXpedition groups around the world), so we postponed the expedition to 2021. We cancelled the booked QTH with the agreement that we would definitely come when the pandemic conditions allowed. What was worse was that the license with the callsign S9OK expired. After a year, we had to apply and pay for a new one. The issue of a new license was unexpectedly complicated. The confirmation of the S9OK call for 2021 took over five months.

During the summer, there was a gradual vaccination of all operators. Everyone hoped that it would work out at least by the end of 2021, even though autumn is usually riskier than summer. We divided the tasks for rig and antenna preparations among us. We planned to build eight stations. Five would be equipped with 1-kilowatt amplifiers. At the beginning of September there was a pre-expedition meeting, as usual at Petr, OK1FCJ's, place in Ritka, where the last details were finely tuned and four antenna bags were finally packed. The fifth bag was still waiting for the completion of new antennas for 6 and 15 meters from OK2ZI's workshop and therefore it was finished by our "Moravian gang" a few days later. We also tested the computer network and set up the loggers.

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Ready to roll after arrival on São Tomé.

Our team, which consists of Petr, OK1BOA; Palo, OK1CRM; Petr, OK1FCJ; Pavel, OK1GK; Ruda, OK2ZA; Luděk, OK2ZC; Karel, OK2ZI; and David, OK6DJ, met on Friday October 1st at 5 p.m. at the Václav Havel airport in Prague. This was preceded by a complete double Covid-19 testing of the whole team. We aimed to arrive on the island with the test being less than 72 hours old, as required by local legislation. The flight from Prague to Lisbon was delayed, so the short meeting with CT1BOH did not take place. Pity. We stayed overnight in Lisbon in an airport hotel and, on Saturday morning, we took the next flight to Sao Tomé with a stopover in Ghana. The journey was uneventful and on schedule. At São Tomé we went through customs, passport and health control. After checking our suspicious baggage (we were carrying 500 kilograms / 1,100 pounds of material, which we fortunately didn't even have to unpack in the end) we got into the hired cars and drove to the QTH which was located about 20 kilometers / 12 miles away in the village of Morro Peixe. Arriving in deep darkness, we met Claudio, who was the local chef and a sort of "night manager" at Residencial Tamarindos, which became our home for the next two weeks. In the morning, the property manager showed us to our future ham shack. It was fantastic. A large pergola 7 meters by 12 meters (23 x 39 feet), bricked on three sides and the fourth wall was a large insect net. We immediately set about unpacking our baggage. It was clear that we wouldn't build the antennas that day, nor would we survey the terrain, but we were able to set up the stations on the tables. There were two stations equipped with K3+JUMA amplifier and two with IC-705+JUMA. The fifth was equipped with SUNSDR2DX+JUMA and three TS-480s, which would be used on 60/6 meters and for FT4 / FT8.

In addition to the ham shack, we rented an apartment house, which contained four modest little apartments, each one room with a narrow double bed and a bathroom. Everything looked exactly as it did in the photos and as promised by the manager, except for the internet. It worked somehow, but very slowly and with major outages. We postponed finding a solution for later, though. We were very tired, so we split up in pairs, went to bed and fell asleep immediately.

Sunday started with breakfast, finished with a bowl of local fruit. Then we did a quick tour of the terrain and suggested antenna placements. The build went quickly as we had already tried and practiced everything from previous expeditions. At noon Claudio called us together for lunch of delicious grilled fish. At that point, three beams for 6 meters were finished, all three five-band Spiderbeams were half finished, eight radiators for the 30- and 40-meter bands were assembled, and one for 40 was even in place on the hill above our QTH. The multiband vertical was also complete. The 80-meter vertical was assembled but still lying on the ground. However, the radial network, which is the most time-consuming piece, was finished. The weather outside was clear, the temperature was around 30° C / 85° F and the humidity was around 90%, so one could imagine how sweat was pouring off of us. After lunch, the construction continued and by evening all the Spiderbeams were up as well as the 80-meter vertical and 2-element beam for 40 meters to the U.S. We also assembled the 2-element Yagis for 17, 15, and 12 meters on a lowered mast close to the ham shack. It was already dark and we didn't want to risk erecting the mast in the dark.

On the Air!

By afternoon, the S9OK call was on the air, activated by David, OK6DJ, as is our tradition. All evening, we were working simultaneously on five bands and gradually we found out when which band started opening. At night, only some of us went to sleep. Most of us took turns at the stations. The pile-ups were unexpectedly big. After a long period without DXpeditions because of Covid-19, our expedition excited the ham radio community around the whole world. We were glad that there would be plenty to do.

On Monday, just after dawn, we continued working on the antennas. We erected a vertical for 160 meters, another for 60 meters and a trio of 2-element Yagis. During this time, the rest of the team took turns at the rig on all bands. They made nearly 10,000 new QSOs. It was excellent, considering the amount of time we spent on the antennas. There were also several power outages. As it turned out later, these outages would be the order of the day. Claudio made sure we were not hungry and prepared more delicious fish for lunch and dinner. At night, we tried 160 meters. Although the vertical can normally be used for RX only to a limited extent, a lot of big-gun stations were calling, so the absence of receiving

The S9OK team

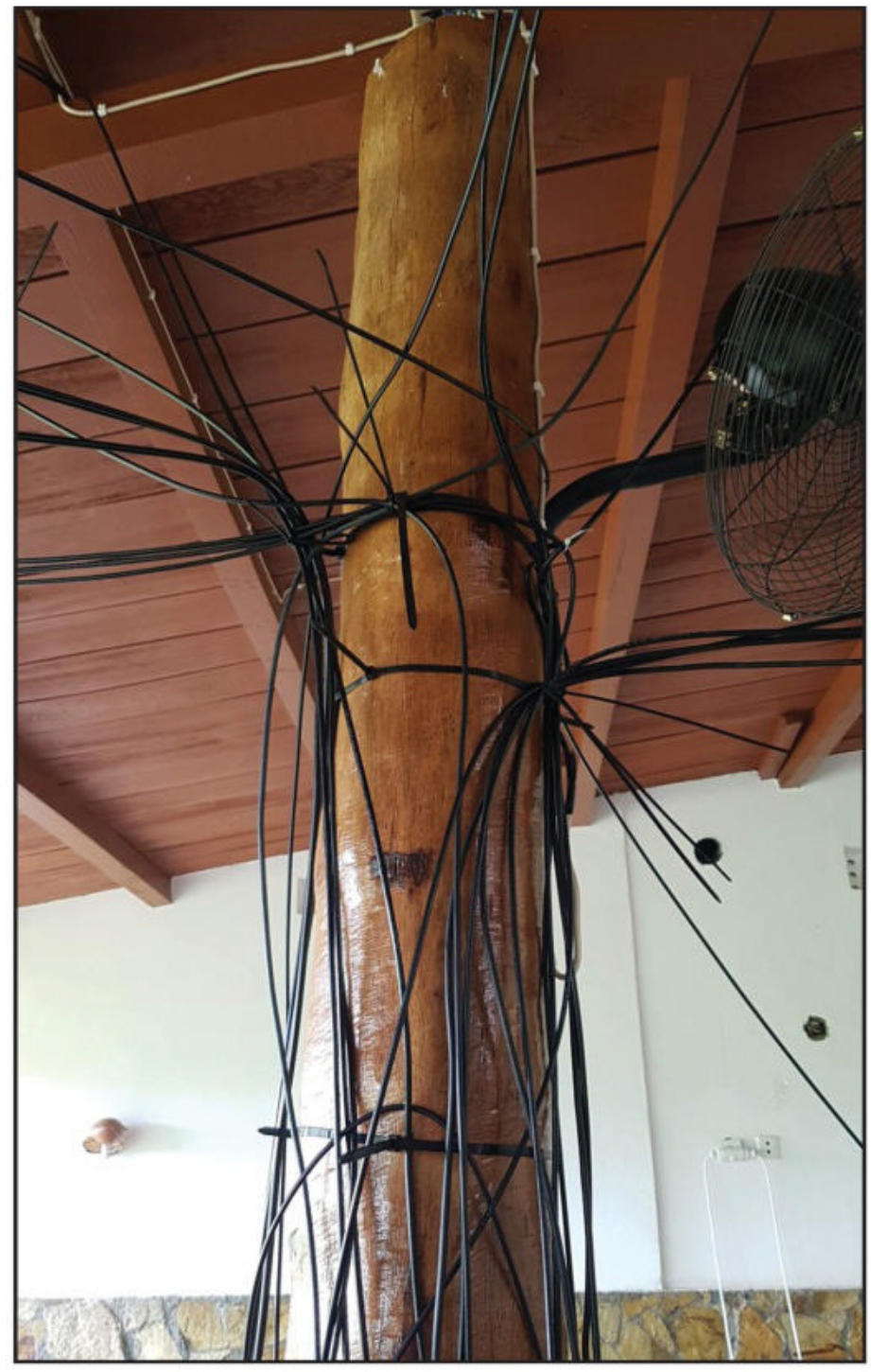
The center of operations for S9OK. The team also rented smaller cabins for sleeping.

antennas basically didn't matter. The log showed the first 197 contacts on 160 meters, including a couple of stations from the U.S.

We worked all night. The upper bands were open until midnight, then the lower bands until morning. We tried to "keep the air full" as much as possible, so there were always at least five stations on the air. Operators slept only 3-4 hours in rotation to accommodate the pileups of callers. During the day, we went in groups to try the local sea. It was warm, clear, and calm. Walking through the village, it was obvious at first glance that S9 is a very poor country and the people live modestly on practically nothing. In the afternoon, the 10-meter band opened up nicely, so part of the team focused on the upper bands and we also activated another station on 6 meters. The remainder set off, equipped with machetes, long pants, and sleeves, to haul two Beverage antennas into the jungle in the directions of JA and the U.S. In the meantime, the facility manager arranged for fiber-optic internet to be set up; an unprecedented thing by local standards. No one believed it, but in the afternoon the technicians really arrived and started to work. Hats off, it couldn't have been done this fast even in the Czech Republic. In the early evening, there were 20,000 QSOs in the log. We were excited to see how the log was filling up and we watched with interest how our friends in OK and OM were gradually "checking" the boxes on Clublog. The only band that didn't have any checks — yet — was 6 meters, but we believed that this would come, too.

The night shift was busy on the lower bands, so the day shift always came before dawn. On 40 meters, VK and ZL were coming by long path. We gave them the maximum space, as the QSOs would be particularly difficult for them. On the other hand, the upper bands (10, 12, and 15 meters) worked very well to JA right after dawn, so again we used these openings to the maximum and only gave space to EU after the sun set in Japan. It was cloudy all day and we wanted to take advantage of this, so part of the team did outdoor activities. We managed to set up another Beverage antenna to Europe through the valley and built a 2-element vertical system for 30 meters, directed to JA. Unfortunately, one of the TS-480s which was used on 60 and 6 meters, broke down in the afternoon. It left us with no other choice but to borrow one from the FT8 setup and limit the traffic on this mode. We also received sever-

Working on assembling one of the many DXpedition antennas.



How many antennas? Just count the feedlines!

al requests from our Japanese colleagues to slightly adjust our bandplan due to the collision frequencies on 80 meters. We have also had some saddening reports from VK/ZL that we made very few QSOs to their area. We were aware of this, but the location of our QTH was unfavorable for this direction. No one was calling us during short-path openings over the mountainous terrain, and therefore, virtually all contacts had to be made via long path. We even set up a Facebook chat with several leading DXers from VK/ZL who provided us with information about when our signals were reaching the region and when it made sense to stop pileups and just focus on that area. This information proved to be very useful and helped increase the number of stations from Oceania in the log.

There are two "pure" SSB operators on our team, Petr, OK1BOA, and Ruda, OK2ZA. Although they tried their best, they could not compete with six CW operators. We noticed remarks on the internet that the number of SSB QSOs compared to other modes was relatively low. So we decided to make an "SSB day" on Thursday and assigned more people to this mode. From lunch all afternoon, evening, and night, until the early morning hours, five stations consistently worked on SSB only. The number of QSOs was increasing nicely, but the pileups were interrupted by power outages. We couldn't continue this way. We knew there was a back-up generator at the QTH. Before using it, we tried to arrange with Claudio to check out their local power lines. The supply seemed strong as there were countless air conditioners on the facades. Our consumption must have been lower compared to them as they were off. We also found out that the coaxial leads from some of the antennas had voltage on their shields. It was clear that there was something wrong with the grounding of the power network there.

In the early evening, when the temperature dropped a bit, we equipped the EU Beverage antenna with radials, for which we had no time before. We also built an additional 2-element vertical system for 30 meters directed to the U.S. In the evening, we hit the 40,000-QSO mark. We logged — mainly due to brisk SSB traffic — more than 10,000 QSOs in one day. At night, most of the tired operators went to bed. We were working mostly on 160 and alternately on 80, 60, and 40. Again there were several power outages. We had to wake up Claudio to ask him to turn on the circuit breakers. The switchbox was in the kitchen, to which we had no access. However, 160 went well, the Beverage antenna received well, and thanks to the experience of our low-band operators, we added another 400 QSOs to the log. However, in the morning the power went out again. Running out of patience, we

A shack with a view … S9OK on the air!

The team had rotating shifts to keep the stations on the air day and night.

insisted on starting up the generator. We used it all day Friday and all night Saturday. During the day, we also spent time troubleshooting problems with Clublog, which was duplicating some FT8 QSOs. The culprit was a misconfiguration of the MSHV program and a different way of processing imported links on Clublog from an ADIF file generated by MSHV and from the Livestream link. We managed to resolve the problem, even if it meant deleting the complete log on Clublog and uploading it again in parts. We then rotated all the upper bands during the day. CW traffic was brisk and, from the feedback we received via FB, emails, and DX Cluster, the amateur community perceived our operation very positively, which of course made us happy. This day was also the first time the 6-meter band had opened and we made several QSOs there as well.

We used the generator all of Saturday night. It was very noisy, but we just needed the power. Using it would make the expedition a little more expensive, though. It had been seven days since we had been on the island, so we set one station aside as it would be operating mainly on RTTY. There is not so much activity with this mode nowadays, as FT8 and FT4 are much more prevalent. After lunch, the next bench-

On the Cover...

Robert Williams, NØQLR, of Peyton, Colorado, operates a Summits on the Air (SOTA) station atop Mt. Herman, Colorado (WØC/FR-063), with a VHF / UHF handheld. He was there with well-known mountaintopper Steve Galchutt, WGØAT, who introduced Williams to SOTA and inspired him to start learning Morse code and studying for his General Class license so he could operate on the HF bands as well.

If you're not already familiar with it, Summits on the Air is a UK-based award program launched 20 years ago to encourage hams to hit the slopes with portable low-powered stations and work the world from mountain peaks across the globe. Participants may take part in the program either as "activators," operating from registered mountain summits, or as "chasers," who try to contact as many activators as possible in order to qualify for a wide variety of awards (and make the trek worthwhile for the activators!). There are separate awards for activators and chasers, and each registered peak has a unique identifier (such as the one for Mount Herman, above, which indicates that it's in the U.S. zero call area (WØ), Colorado (C), the Front Range of the Rocky Mountains (FR) and individual summit number (063). A searchable list of registered summits is on the SOTA website.

Complete information on the SOTA program is available on its comprehensive website, <www.sota.org.uk>, and a constantly-updated list of current activations may be found at the SOTAwatch site, <https://sotawatch.sota.org.uk/en>. *(Cover photo by Steve Galchutt, WGØAT)*

mark was to hit 50,000 QSOs. We were getting a lot of compliments via FB, especially the JA stations appreciated that we were patiently attending to them every evening on the lower bands and every morning at dawn on the upper bands. The pileups had not faded at all. It was clear that we were wrong to think that the DXCC country in 160th place on the "most wanted" list would not be in demand. In the afternoon, we had another radio failure. The PTT output of the new IC-705 didn't work. We could only use it on SSB where the PTTs of the radio and PA are controlled simultaneously with the pedal. It was a complication, but solvable by switching stations. Again, six had opened up. We could log additional stations, but again only from southern Europe. In the early

A clear shot over the ocean is a major plus for any DXpedition.

Three stacked Yagis is a big plus as well!

evening, there was a moment when we were exactly halfway through our expedition. At that point, there were 54,000 QSOs in the log. It became clear to all of us that the previous CDXP "record" of HKØ/A was about to be broken and the optimists among us started to dream about hitting the 100k mark. We knew that the packing of the antennas would go much faster than the construction, and that what we spent two days building would be taken down in four hours. If everything went well, it might work.

Sunday was a bit disappointing. We expected that the bands would be full of stations on the weekend, but it didn't happen. After a poor Saturday came an even poorer Sunday. It seemed that propagation conditions were not bad, but fewer stations were calling. It was probably because another two expeditions, 3DAØRU and J5T/J5HKT, went out in Africa, so the pileups were naturally spread among the three expeditions. We took advantage of this to shut down the stations, disconnect the power supply and thoroughly inspect the wiring. We found several botches. We fixed them and hoped that it would solve our problems. It did, but not completely. The electrical grid on São Tomé is not in tip-top shape. The outages still continued to occur, but they were village-wide outages that were not related to the local wiring. In the evening, we started working on 60-meter SSB. This mode had never been activated on S9 on this band before.

Monday was a special day for us. We completed our efforts in the non-radio amateur area, namely giving gifts to a local school and kindergarten. It all started a few weeks before the expedition when we were approached by Zorro, JH1AJT, the patron of the Foundation for Global Children (FGC). We agreed that he would provide a sum of money which we would use to purchase items for the local schools. Upon our arrival on the island, we explained the matter to the manager, who then arranged not only the exact lists of what the schools might need, but also how much it would cost and where we could buy everything. On Monday, two team members, accompanied by the manager, began a 5-hour shopping marathon. Upon returning to the hotel, we divided the gifts by destinations. One part went to the local primary school and the other to the kindergarten. There were not only computers and their accessories, but also plates, cutlery, light bulbs, balls, papers, pots, scoops, and finally a TV

(Continued on page 96)

Only a small portion of Segevion Island in the Mediterranean – known locally as Love Island – is above water at all times. The two operating positions are on opposite ends of the island. (Photos by the author, except as noted)

It's February, so we'll sprinkle in some love stories with the QRP articles! We'll start on a very small island in the Mediterranean Sea … known locally as Love Island.

Love Island DXPedition — 4X1ØØAI

TOLD WITH PASSION BY ZVIKA SEGAL,* 4Z1ZV

Love Island is the nickname of Segevion Island in the Mediterranean Sea, off the coast of northern Israel. It is part of a group of very small islands called the Akhziv Islands, controlled by the Israeli National Parks and Nature Reserve Authority. Access is permitted only to Love Island. The only way to access the island is by a small boat or kayak, as the surrounding sea is shallow and rocky.

The island itself is about 80 meters (260 feet) from end to end in the long dimension. Very small reefs on the eastern and western sides are a few meters above the water, and 95% of the island is covered by water between 20-100 centimeters (8 to 39 inches) deep, depending on tides.

There is no marina nor any other way of docking a boat and getting close to the stiff rocky island as the rocks may damage the boat. Since the island is part of a nature reserve, access is allowed only during a limited time between sunrise and sunset.

All the above makes access and operation on the island extremely challenging.

This is the only island in Israel recognized for IOTA (Islands on the Air) — AS100 — and by WWFF (World Wide Flora and Fauna) — 4XFFØØ75. It is also in a rare grid locator — KM73mb. The last operation there was in 2011 and new bands and modes such as 6 meters, FT8, and the QO-100 satellite were never operated there. This makes a DXpedition to Love Island very attractive to the ham community.

The Visionary

Since we returned from the 9G2DX DXpedition to Ghana in March 2019 (see article in June 2019 *CQ*), the "vision man" Dov Gavish, 4Z4DX, did not stop looking for a solution to approach the island.

Dov is also known for his cost-saving habits, and finally he found Ronny, 4X5NC, a yacht owner who was very happy to offer his skills and his yacht. As the yacht capacity was very limited to less than seven lightweight people, limited equip-

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ment load and volume, Dov started to secretly gather an "A team" to join the challenge.

We soon learned that sailing a yacht from Haifa would take four to five hours each direction, and the yacht will not be able to get close enough to the island due to the shallow water, so an additional rubber boat would be required.

From Vision to Reality

At that point we moved to plan B, which meant renting a professional catamaran that can approach the island with a much higher capacity of people, carrying almost unlimited load (which later on we learned created a new challenge).

So Dov, the cost efficiency man, decided to increase the group count to 10-12 people. It turned out that only a few hams were willing to participate in this challenge and share the effort and the cost entailed.

A target date in July was set; I applied for a special callsign, 4X1ØØAI, from the Ministry of Communications; eQSL and LoTW accounts were established, and Gil, 4Z1KD, created a qrz.com page like in any professional DXpedition.

Part of the A team was Eyal, 4X1RE, a certified eye physician and dedicated flora and fauna enthusiast. He took the position of the health and safety director of the special operation.

Like in any other major military operation, Eyal and Eli, 4Z1NB (a professional guide, who is known to carry all his

A closer look at one of the operating positions.

The team used a bucket-brigade approach to unloading gear from the boat.

The 4X1ØØAI team on Love Island.

equipment to each field day), took a preliminary boat trip to the island which refreshed Eli's memory from his previous visit there 10 years ago.

Expanding the Team

We started to widen the team — Chanan, 4Z1DZ, the CW professional; Udi, aka the Paper Guy, our ultimate QSL manager; Zeev, 4X5ZS, the FT8 guy; Eran, 4X5KE — a strong guy and professional diver; along with Seth Moshe, 4X1DX, a world class contester, and Jurgen, 4Z5OI, who was willing to operate EME and 23 centimeters (unfortunately, he had to compromise on 6 meters, 2 meters, and 70 centimeters to keep the local community happy).

We created a Google Drive sheet and started to list action items and equipment by person. We had several Zoom meetings to coordinate all of us and while approaching the due date, we noticed that the wave level around the island may reach 2 meters. The operation was postponed by two weeks while praying to God to have a calm sea.

I do not know on which band God was listening, but the fact is that our wishes were granted and by the departure date, the sea was relatively nice to us, with wave level of less than 50 centimeters.

Getting to Love Island

At 6 a.m., we gathered at the Nahariya marina where Yusef the professional sailor was astonished by the amount of the equipment he saw … he did not understand that the term "unlimited load" was interpreted literally. Some hams brought their entire junkbox contents, probably to feel that they were contributing. We had to carry all the equipment from the parking lot about 150 meters to the dock where our boat was moored parallel to another boat. So, we had to load the first boat and transfer everything to the next boat.

Finally, we got on "our" boat and started sailing to the island. When we got closer, we started to realize the magnitude of the challenge. The youngsters Eyal and Eran jumped into the water over the boat bow and created a kind of human chain to unload two tons of equipment to the island. To me it looked like a group of slaves during the exodus!

Once we unloaded the boat, according to plan we divided into two groups, one on each reef. The eastern group had to carry their equipment from the western side, about 80 meters, in shallow water, which took an additional hour.

Step one was to set up sunshades. The use of anchors is prohibited in a natural reserve but luckily the stiff shape of the rocks created a lot of possibilities to tie the guy wires for the shades' poles as well as for the antennas.

The space on the reefs was very limited. One of the challenges was to place and level a table and folding chairs on the extremely uneven, rocky, and curved ground. Finally, everything was set up successfully and once we heard the sweet noise of Eyal's new blue generator — we could start operating.

The Operation

As usual, Dov was very unsatisfied that after 30 minutes he could not start making QSOs. "We are losing hundreds of QSOs …" he said. Knowing his skills, I can testify he was right.

All in all, we set up six stations covering almost the entire HF and VHF bands. However, the climax was the first-time-ever QO100 satellite operation from this rare location.

As usual, part of the challenge was poor radio conditions and interference between stations within the small available space. We unsuccessfully used filters and band allocations, and had to split the operation and have Zeev and Eran go diving for a while with their professional oxygen containers. This freed up the occupied bands and let other stations work.

The QO-100 Challenge

Zeev shared a table with me. While he used an end-fed antenna with an Icom naval antenna tuner which can tune even a nail, his station created a terrible RFI/EMI to my SDR-based QO-100 satellite station. As all processing is software based and my external control box as well as the antenna SDR box were connected to the computer via single USB port, whenever he transmitted, my USB port just blew up, as well as the DC-to-DC converter in the control box.

The partial solution was to move his antenna farther away. But how far can you move it on a very tiny reef?

I had to reconfigure my station without any external USB devices, including the external mouse. The solution was to

Finally on the air!

Operating the QO-100 satellite was a major part of this DXpedition. QO-100 is amateur radio's first (and so far only) geostationary satellite, appearing to remain in one place overhead at all times.

Persuading Zeev, 4X5ZSI; and Eran, 4X5KE, to go scuba diving was the most effective way for the author to operate without intra-station interference! (Photo by Tal Raskin)

Eyal, 4X1RE, brought his 13-year-old son along for the adventure. (4X1DX photo)

work full-time duplex with Tx enabled or, from time to time, ask Zeev to enjoy diving which he did.

Following these actions, I was able to start operating without having to frequently reboot the system.

A huge pileup was building so I moved to split operation – 5 up, 10 up. This enabled the crowd to hear me, but still, identifying the callsigns was very difficult. Unlike an HF pile up in which some operators dominate the spectrum with kilowatts and 18-element Yagis and it is very easy to recognize them, on a satellite transponder the dynamic range is very limited, so there are no extremely strong stations, and even 5-10 stations simultaneously are a challenge.

So, I moved to manage by number — "only stations with 1, only with 2" etc. Guess what — It was better by far, but still not as easy as on HF. Probably working 5-10 up and random scanning will do the job for next time.

The QO-100 community is much smaller than the old school HF operators. It requires a lot of hardware and software integration as there is no "off the shelf station." Therefore, there is a lot of global technology cooperation in forums, social forums and especially WhatsApp groups which create a much closer community. Also, the type of QSOs, even during a DXpedition, is beyond 59/73 due to the clarity of the signal and the people's culture of sharing the experience. It was really exciting to meet people that you know during the DXpedition, knowing that everyone is happy and supporting.

Getting Back

At about 18:00 local time, we started to dismantle the stations and get ready for the boat scheduled for 19:00. The boat arrived on time and loading it was the next challenge. Eran and I used a chair to climb to the shaky boat as the sea was less calm than in the morning. We identified the bottom of the wave and jumped on the boat. We used the same technique to load the boat. We created a human chain to transfer each and every box, pole, container, etc. Honestly, as the one who touched every single piece loaded — half of the weight was redundant and unnecessary. People felt they need to show their contribution.

Arriving at the Dock

During the loading we got a lot of help from the boat operators. So I jokingly asked them — since you are so nice to us, how about bringing the boat to the parking lot?

However, when we got to the dock, the operators asked us to get off the boat and leave all the equipment untouched. Then they sailed the boat to the other side of the dock where one of them used a tractor to drive a loading carriage into the water, load the boat on the carrier, pull it out of the water and drive it to the parking lot, which was a nice "finale" for a very physically and mentally challenging day. Definitely, we will remember it at least till the date that this article will be published.

Summary

We operated on 2, 6, 10, 12, 15, 17, 20, 40, and even 80 meters, mostly SSB with some CW and FT8 noise-penetrating technology, and of course, for the first time ever — 13 centimeters on the QO-100 satellite. We loaded about 1,000 QSOs to eQSL and LoTW. Paper QSLs will be managed by Udi, our dedicated paper guy.

We enjoyed a once in a lifetime experience that combined all elements of our weird but fantastic hobby: Build and set up a ham station in a wild location and environment, make contacts across the globe with a shoebox and pieces of wire, make many hams happy and — last but not least — enjoy a very special social event with people you like and interesting new people you get to know.

The social climax for me was to see Eyal and his 13-year-old son enjoying the experience together, something I could only wish from my three daughters.

Special thanks to all people who made this adventure happen: The whole team, the Israeli Ministry of Communications for granting the special callsign, the Israeli National Parks and Nature Reserve Authority for approving the stay on the island, the Putzker yacht and diving club team for getting us safely to the Island and back, and last but not least, to Daniel Rosenne, 4X1SK, and his XYL, Zippi, for reviewing this article prior to publication.

See you all at the next ham radio event.

A video clip from the operation may be viewed on YouTube at <https://youtu.be/8-eL1QVcuIE>.

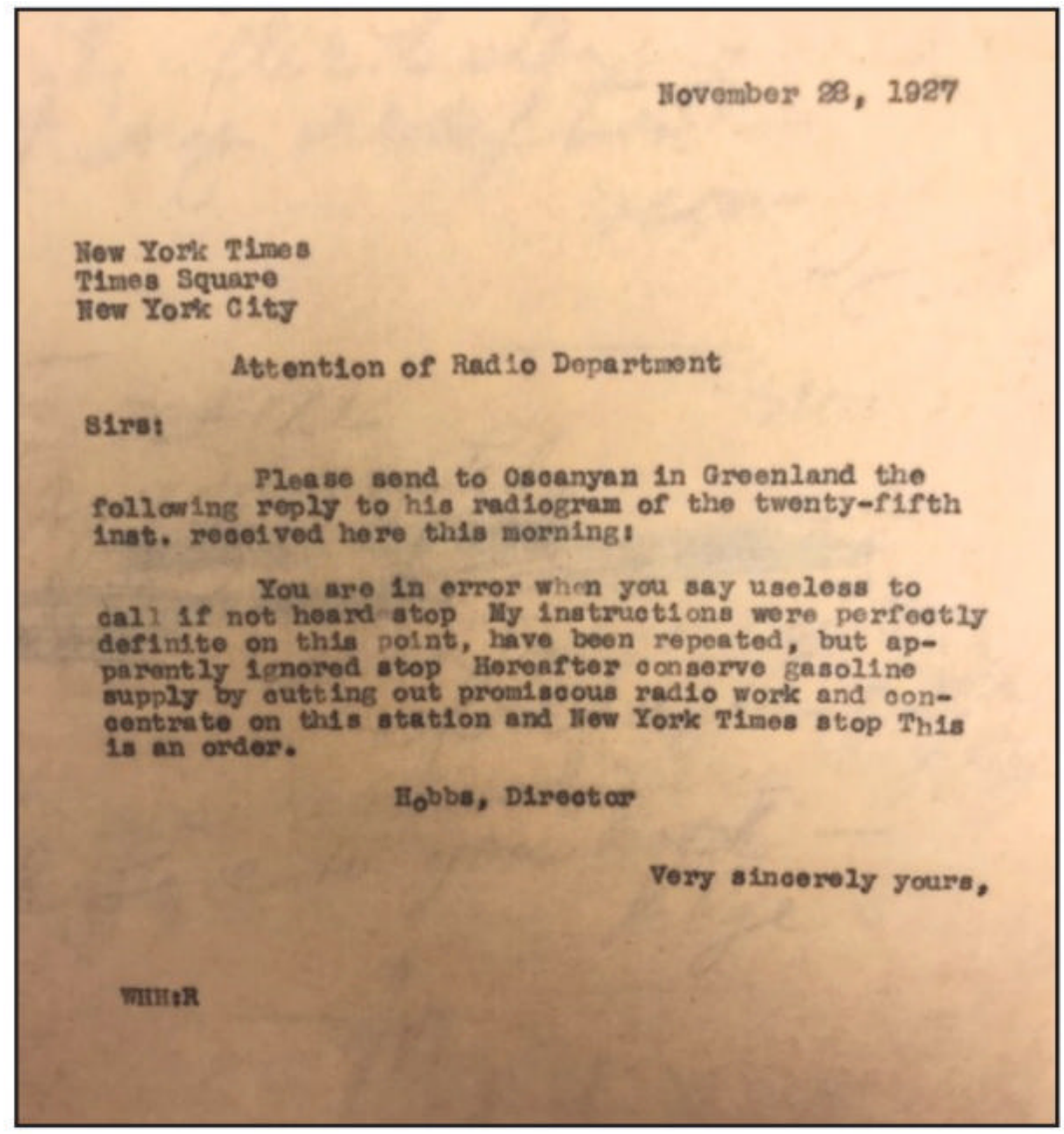
Our February love story interlude continues with a trip back in time to the early days of radio, courtesy of KB8OIS and the University of Michigan archives. Love is on the air!

The First Marriage Proposals Using Morse Code

The History of Telegraphy at the University of Michigan

BY JOHN PALMISANO,* KB8OIS

Photo A. Professor Kelly; 1937 (Family Photo)



November 28, 1927

New York Times
Times Square
New York City

Attention of Radio Department

Sirs:

Please send to Oscanyan in Greenland the following reply to his radiogram of the twenty-fifth inst. received here this morning:

You are in error when you say useless to call if not heard stop My instructions were perfectly definite on this point, have been repeated, but apparently ignored stop Hereafter conserve gasoline supply by cutting out promiscous radio work and concentrate on this station and New York Times stop This is an order.

Hobbs, Director

Very sincerely yours,

WHH:R

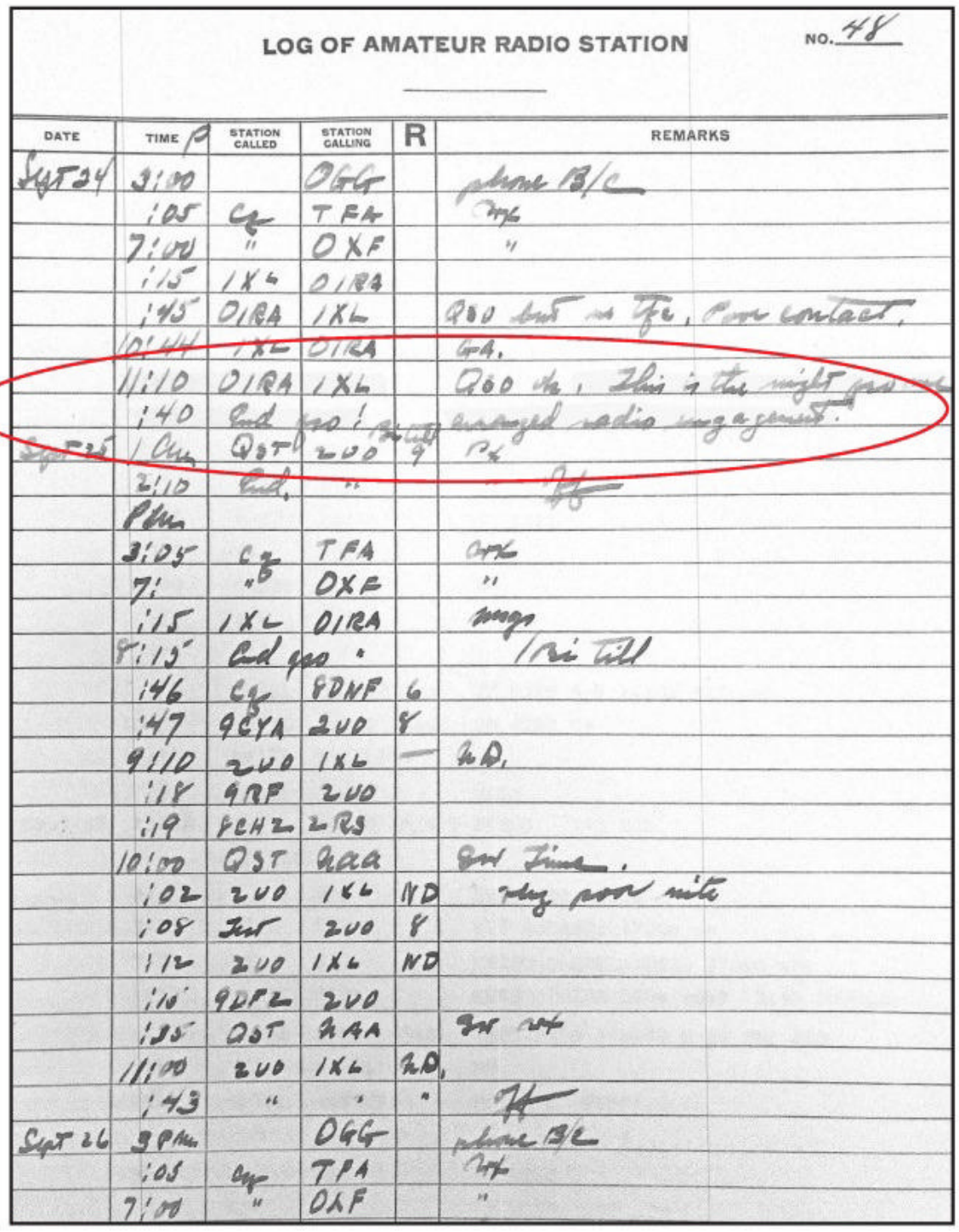
Figure 1. Message from Prof. Hobbs (Courtesy of the Bentley Historical Library, The Regents of the University of Michigan)

While researching the origins of the University of Michigan Amateur Radio Club, I came across the name of Professor E. Lowell Kelly (*Photo A*). Kelly had many accomplishments during his life, having served as a president of the American Psychological Association, Peace Corps Director, and Chair of the Department of Psychology at the University of Michigan.

His work in psychology focused on job performance and evaluating the training process by standardizing the training, defining the evaluation and assessment process, and formulating consistent terminology. Perhaps his most significant observations were of nighttime military aircraft crashes. Lowell noted that airmen were unable to judge the relative distance of aircraft that they were following due to having only a single tail light; there was no point of reference for determining distance. His suggestion was to add lights to the wingtips of the planes. Later, while with the Peace Corps, Kelly would devise the multifaceted questionnaire as part of the Peace Corps selection process. The emphasis of the questionnaire was to select those individuals who were best suited to work and teach in a foreign, unstructured, environment.

Another area of interest for Lowell was identifying personality traits. His unpublished autobiography notes his interest in assessing an individual's personality from conversing with them in Morse code. This eventually led to his coining the term "eye-ball contact," meaning an in-person meeting fol-

** The University of Michigan Amateur Radio Club / W8UM History Project, 2021*
Email: <palmy@umich.edu>



LOG OF AMATEUR RADIO STATION NO. 48

DATE	TIME	STATION CALLED	STATION CALLING	R	REMARKS
Sept 24	3:00		OGG		phone B/C
	:05	Cq	TFA		mg
	7:00	"	OXF		"
	:15	IXL	OIRA		
	:45	OIRA	IXL		QSO but no Tfc, poor contact.
	10:44	IXL	OIRA		GA.
	11:10	OIRA	IXL		QSO ok. This is the night [redacted] arranged radio engagement.
	:40	End QSO			
Sept 25	1 AM	QST	2UO	9	OK
	2:10	End.	"		
	PM				
	3:05	Cq	TFA		OK
	7:	"	OXF		"
	:15	IXL	OIRA		mgs
	:15	End QSO			Ri till
	:46	Cq	9DNF	6	
	:47	9CYA	2UO	8	
	9:10	2UO	IXL	—	ND.
	:18	9RF	2UO		
	:19	9CHZ	2RS		
	10:00	QST	QAA		2nd Time.
	:02	2UO	IKL	ND	Hy pse nite
	:08	Int	2UO	8	
	:12	2UO	IXL	ND	
	:16	9DFZ	2UO		
	:35	QST	QAA		2nd call
	11:00	2UO	IXL	ND.	
	:43	"	"	"	
Sept 26	3PM		OGG		phone B/C
	:05	Cq	TPA		Int
	7:00	"	OXF		"

Figure 2. Oscanyan logbook entry reading "this is the night ___ arranged radio engagement." (Courtesy of the Bentley Historical Library, The Regents of the University of Michigan)

lowing a radio conversation with an unknown person. But there was also the interesting story of how Lowell met his wife, Lillian. Each morning, several amateur radio operators would converse using Morse code. Lowell was in Connecticut at the time and Lillian was in Jamaica. The two would eventually meet briefly in New York City during a business trip. Afterwards, they continued communicating, with Lowell eventually proposing to Lillian by radio. Lillian accepted. Lowell, in his autobiography,[1] said that this was the first-ever marriage proposal using Morse code and further said it was witnessed by many radio operators who listened. This same fact was included in a 1985 interview with the Detroit Free Press.[2]

On further investigation of the university callsign, I came across the name of Paul Oscanyan, a "hired" radio operator for the university's wireless station, W8AXZ. During the 1926-1928 exploration of Arctic Greenland, Oscanyan (3CIH) would travel as one of the expedition's radio operators. Led by UM Professor William Hobbs, their purpose was to study weather and climate changes, national defense strategy, and establish air travel routes from the United States to Europe over the Arctic Circle.

The radio operators on the university campus exchanged frequent communications with Oscanyan in Greenland, and with the New York Times, which was covering the expedition.

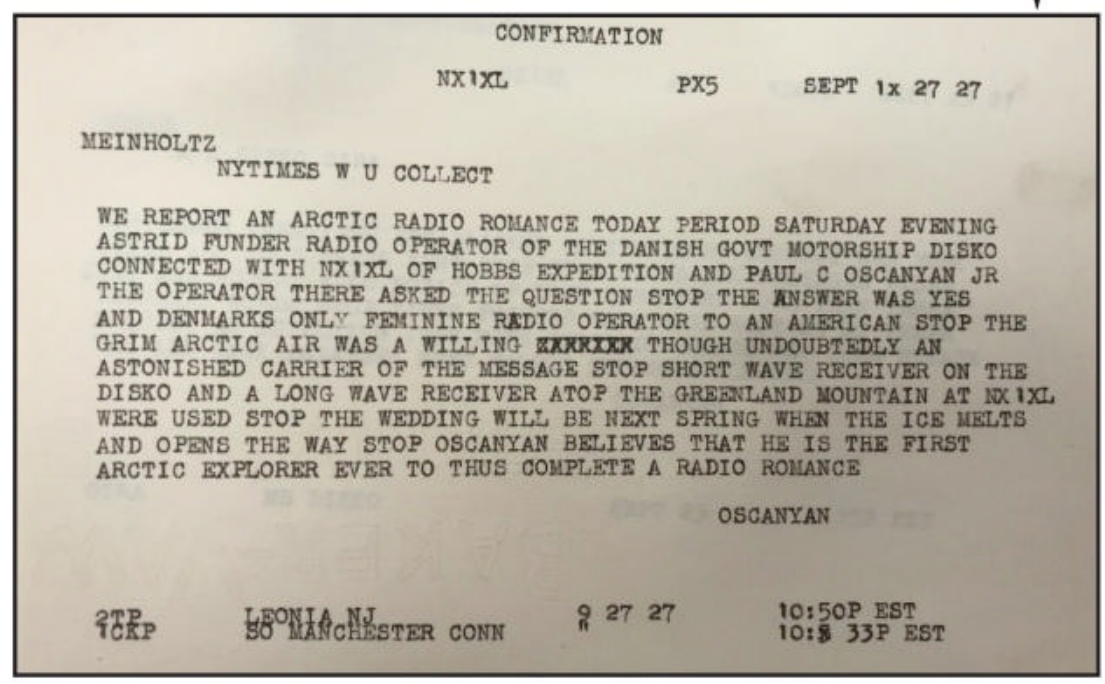
The university's explorers traveled to Greenland from Copenhagen (Greenland is a Danish territory) aboard the Danish vessel Disko. The radio operator of the Disko (ØIRA) was a Ms. Astrid Funder (7AO). On the evening prior to their departure from Copenhagen, both


THE MICHIGAN DAILY

Greenland Expedition Radio Operator Woos And Wins Wife By Aid Of Ether

Figure 3. Michigan Daily article about Ms. Funders and Paul Oscanyan (The Michigan Daily, May 12, 1928)

Figure 4. Telegram from Oscanyan to New York Times, 1927 (Courtesy of the Bentley Historical Library, The Regents of the University of Michigan)


CONFIRMATION

NX1XL PX5 SEPT 1x 27 27

MEINHOLTZ
NYTIMES W U COLLECT

WE REPORT AN ARCTIC RADIO ROMANCE TODAY PERIOD SATURDAY EVENING ASTRID FUNDER RADIO OPERATOR OF THE DANISH GOVT MOTORSHIP DISKO CONNECTED WITH NX1XL OF HOBBS EXPEDITION AND PAUL C OSCANYAN JR THE OPERATOR THERE ASKED THE QUESTION STOP THE ANSWER WAS YES AND DENMARKS ONLY FEMININE RADIO OPERATOR TO AN AMERICAN STOP THE GRIM ARCTIC AIR WAS A WILLING XXXXXXX THOUGH UNDOUBTEDLY AN ASTONISHED CARRIER OF THE MESSAGE STOP SHORT WAVE RECEIVER ON THE DISKO AND A LONG WAVE RECEIVER ATOP THE GREENLAND MOUNTAIN AT NX1XL WERE USED STOP THE WEDDING WILL BE NEXT SPRING WHEN THE ICE MELTS AND OPENS THE WAY STOP OSCANYAN BELIEVES THAT HE IS THE FIRST ARCTIC EXPLORER EVER TO THUS COMPLETE A RADIO ROMANCE

OSCANYAN

2TP LEONIA NJ 9 27 27 10:50P EST
1CKP 50 MANCHESTER CONN " 10:5[illegible] 33P EST

Oscanyan and Funder are said to have "danced all-night at a party." Once the researchers were in Greenland, Oscanyan would continue communicating with Astrid, via Morse code. This romance continued despite the stern message sent from Professor Hobbs to Oscanyan (*Figure 1*). The message said, "conserve gasoline supply by cutting out this promiscuous radio work and to concentrate on this station and the New York Times." Oscanyan would later propose over the radio in Morse code, with Astrid accepting. Oscanyan's logbook entry of the contact is in the UM Archives, reading "this is the night ___ arranged radio engagement" (see *Figure 2*). Their story would be featured in The Michigan Daily (May 12, 1928; *Figure 3*).[3]

In a 1927 message sent from the Greenland Station, NX1XL, to the New York Times, Oscanyan says that he believes that "he is the first Arctic Explorer ever to thus complete a radio romance" (*Figure 4*).

Edison, Too!

Finally, an internet search notes that Thomas Edison taught his second wife, Mina Miller, American Morse code so that they could communicate in private. Edison suffered from a hearing loss and did not want his conversations with Mina overheard. On one night, Edison tapped out his marriage proposal onto Mina's palm. Mina responded "yes". They were married on February 24, 1886.

While Edison's proposal is likely the first marriage proposal using the American Morse Code or the Railroad Morse code, Oscanyan's proposal was probably the first using the more common International or Continental Morse code, and most likely the first by radio. Kelly's proposal would occur several years later.

Notes:

1. E. Lowell Kelly. Bentley Historical Library. The Regents of the University of Michigan.

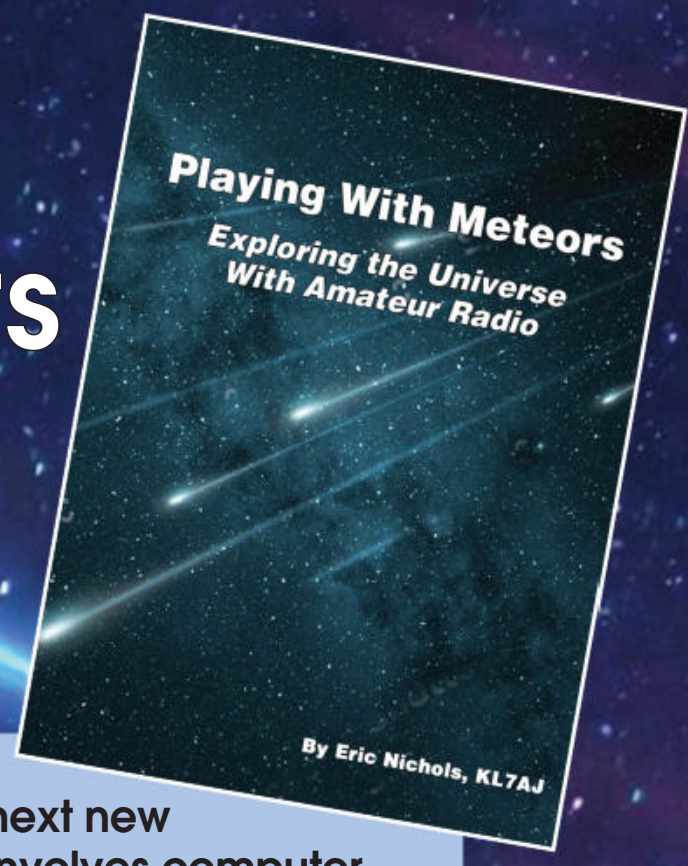
2. Detroit Free Press, 11-21-1985. Staff Writer, Joel Thurtell, K8PSV.

3. The Michigan Daily. 05-12-1928. Greenland Expedition Radio Operator Woos and Wins Wife By Aid of Ether. See <https://tinyurl.com/2ey955wz>.

Playing With Meteors

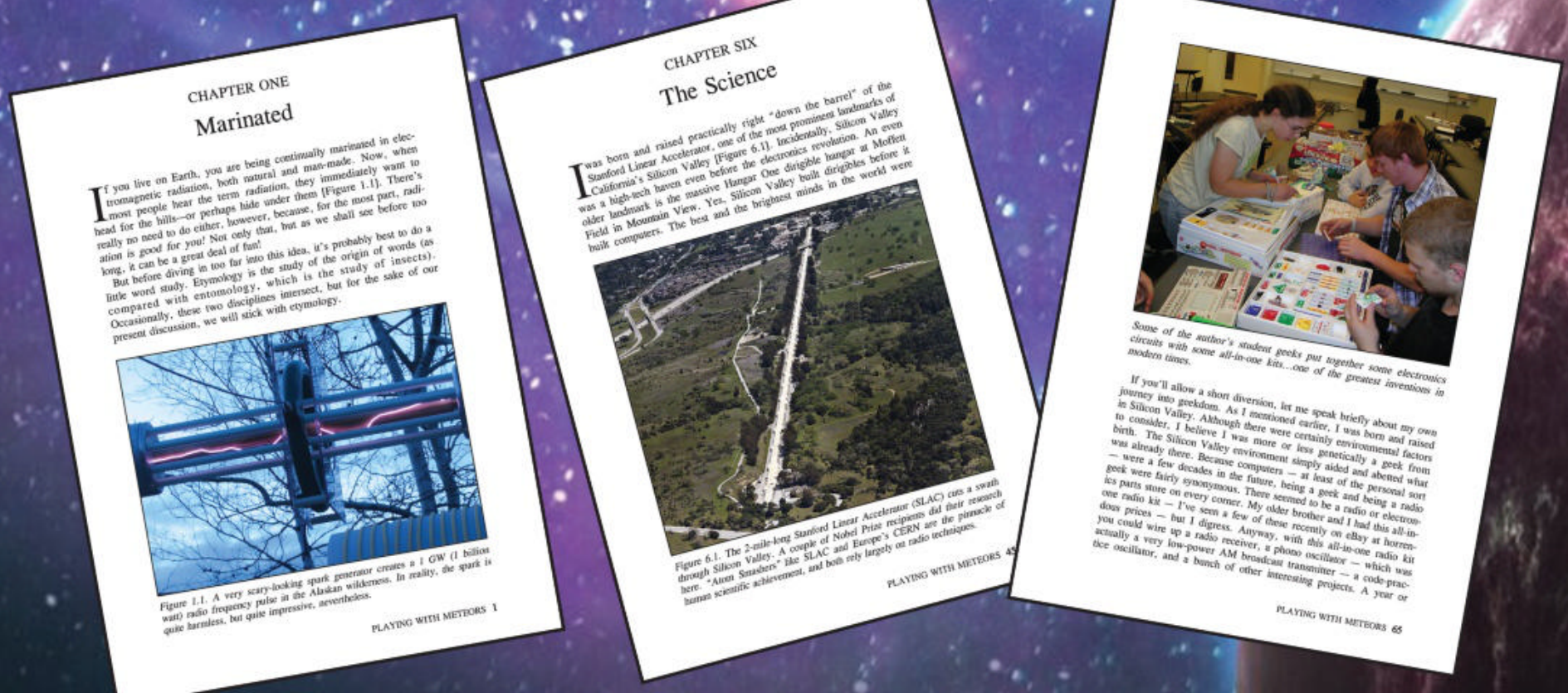
Exploring the Universe With Amateur Radio

By Eric Nichols KL7AJ



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

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



CHAPTER ONE

Marinated

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

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

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

PLAYING WITH METEORS 1

CHAPTER SIX

The Science

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

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

PLAYING WITH METEORS 45

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

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

PLAYING WITH METEORS 65

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2022 WPX Crossword Puzzle

BY ANTHONY LUSCRE,* K8ZT

You probably have seen it before, you write down the callsign of a station you just worked and then do a double-take when you realize it looks like a familiar word such as K1LT, M0OSE, SK1RT, etc. This puzzle takes this a step further.

In this puzzle, each word is actually an Amateur Radio call sign where most numbers represent letters according to either physical resemblance to a letter (1 = I, 5 = S and 0 = O) or often used "cut number" (9 = N).

Clues contain hints to both the word and the country that might issue the callsign. Some are real callsigns and some are fake but none are meant as comments on the possible current, past or future holders of the callsign. Hopefully, guessing the countries of these prefixes will be good practice for any of the three CQ WPX Contests <www.cqwpxrtty.com and www.cqwpx.com> this year: RTTY February 12-13, 2022, SSB: March 26-27, 2022 and CW: May 28-29, 2022.

Bonus information on Callsigns

I have been busy over the last year doing online presentations for clubs around the world. One of the presentations is "Choosing Your Ideal Callsign". You can view the slideshow at <tiny.cc/idealcall> and watch videos of the presentation by searching YouTube for "K8ZT Callsigns". While you are at it you may also want to search for Mike Ritz, W7VO's excellent "The Storied History of the Ham Radio Callsign". For a full list of my presentations visit <tiny.cc/k8zt-p>.

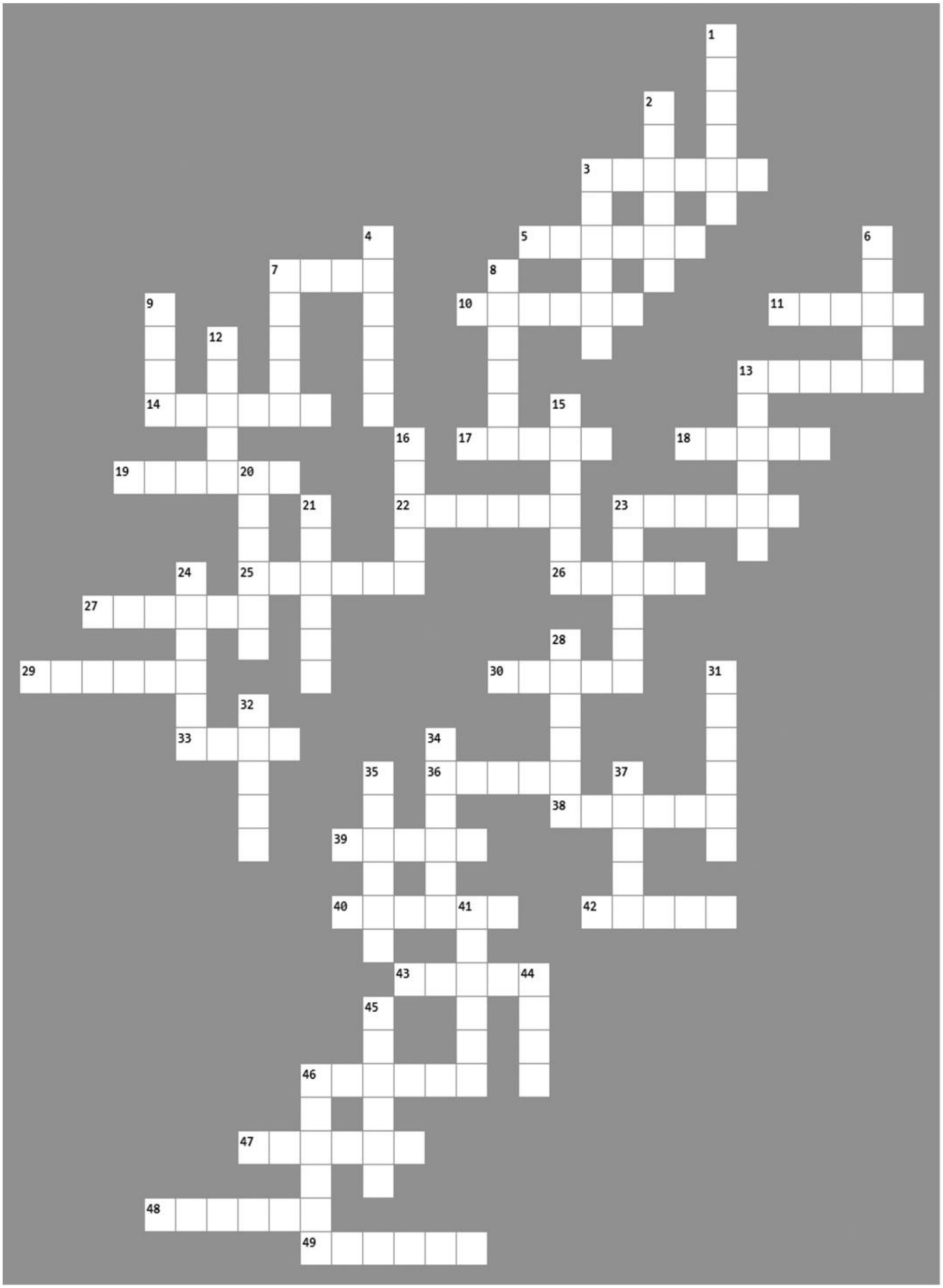
* *Email: <k8zt@arrl.net>*

Across

3. One of five senses down under
5. The Budapest closet was full of _____
7. "_____ Misbehaving" (with an apostrophe) in Illinois
10. Fundamentals in Jiang Xi
11. The unshaven Hungarian was very _____
13. Stated as one's opinion in Belgium
14. Shoes, socks, earrings, gloves, etc. are in _____ Amsterdam
17. The patients' medicine could not be given orally; it had to be administered _____ _____ in Beijing
18. Where you wear your belt in Vermont
19. Spirits that haunt the Channel Islands
22. Fastened wood with a hammer in the Zagreb
23. Lots with trees in Iowa
25. Dorothy, this call sounds like it should be from your home state instead of Wisconsin
26. First two words of the USA national anthem played in Helsinki
27. One of 60 in an hour in Londonderry
29. The Minnesota homeowner heard many _____ on his front door
30. The earth, all of its countries, peoples, and natural features, but actually just a callsign in the USA
33. Of similar character in Connecticut
36. Ten-Tec 565 Transceiver or "The Hunter" constellation in Belgium
38. To scribble, sketch, or make designs on paper often while thinking about something else in Hamburg
39. Eat between meals in Sao Tome & Principe
40. A cup to drink from or a ship in Saskatchewan
42. Love or respect (someone) deeply in Missouri
43. One if by land, two if ____ _____ in Zhe Jiang (2 words)
46. Take in an orphan in French Polynesia
47. The cafe ____ ____ until midnight for late-night desserts in Cagliari (2 words)
48. Two premium cable TV movie channels in Liechtenstein
49. Dried grapes in the Ural mountains

Down

1. Small freshwater fish, used for bait in Derry
2. The author of this puzzle's last name visiting Buenos Aires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Down

3. Quintessential name for an Italian cafe overlooking the Bay of Fundy
4. After poking a hive in Mauritania, the fennec fox's nose was covered with _____
6. The _____ on an object is equal to its mass times its acceleration in France
7. A humble home in Minnesota
8. Overactive Ego or custom callsign in Nova Scotia
9. Initials of the second-best grade of cognac in Namibia
12. Metal tossed in a fountain in Havana
13. Can cause "rusty" metals in Kalaallit Nunaat
15. The Greek LCD projector had inputs for VGA, HDMI and _____
16. Where the Siberian hockey club played all of its matches
20. The _____ oil passed through the Bosporus Strait
21. After robbing a bank in Wisconsin
23. In bad shape after heavy drinking in a Texas bar
24. Previous CCCP or USSR depending on the language of abbrev.
28. Reunion Island Ami
31. The yacht left Tripoli and _____ east to Alexandria
32. Burning strongly and brightly in Paris
34. When the wind blew through the graveyard, he thought he heard in Newfoundland
35. Eight in a cup and sixteen in a pound in Copenhagen
37. His old war _____ caused him to limp around his Kansas farm
41. Not harder in Barcelona
44. His midwestern friends said he was __ ___ to be around (2 words)
45. Bother in the Netherlands
46. Dostoevsky in French Guiana

(Answer Key on page 58)

Looking Ahead In CQ

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

- Results: 2021 CQ WW RTTY DX Contest
- HF Activities for Techs
- Profile: Southwest Ohio DX Association

Plus …

- The NinoTNC and Old-School Packet
- Updates on 630 / 2200 Meters and Crossing the Pond
- Using Vitamin K (as in Kirchhoff)

Upcoming Special Issues

June: Take it to the Field
October: Emergency Comm.
December: Technology

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

BEHIND THE BYLINES...

… a little bit about some of this month's authors

James Green, WB9HDH ("Five Watts and a Dipole," p. 8), returned to active hamming last year after a 40-year absence from the bands, as he explains in his article. A retired technical writer, James operates exclusively QRP CW. He lives in Wauwatosa, Wisconsin.

Gene Hinkle, K5PA ("QRP FT8 to the Field," p. 10 and co-author of "Microphones and Audio Speech Processing for SSB," p. 45), is a regular contributor to *CQ*, often teaming up with other authors to share their joint projects. His many ham radio interests can be found on his webpage, <https://www.k5pa.com>.

Steve Galchutt, WGØAT ("QRP Quickies: A Great Introduction," p. 16), has been a ham since the 1950s and is well-known in the QRP and SOTA (Summits on the Air) communities for his goat-assisted hikes to operate from various mountain peaks in Colorado.

Paul Keon, AB4PP ("QRP Quickies: '35,000 Miles Per Watt' and 'Did I Mention it Was Raining?'" p. 17) is an active member and official storyteller ("scribemeister") of the North Carolina-based Knightlites QRP Society. He is a retired state trooper and enthusiastic quilter as well as QRPer.

Zvi Segal, 4Z1ZV ("Love Island DXpedition – 4X100AI," p. 32), enjoys off-roading, photography, and 3D printing in addition to ham radio. Since 2019, he has been active on the geostationary QO-100 amateur satellite, which was a significant part of the expedition he writes about in this issue. He lives in Raanana, Israel.

Gary White, W5GW (co-author "Microphones and Audio Speech Processing for SSB," p. 45), is a retired Professional Engineer. His interests beyond ham radio include photography, astronomy, and fiction-writing. He has published a novel and won awards for his short stories. His webpage is <https://w5gw.com>.

W5GW and K5PA conclude their two-part article on helping you sound your best on single sideband, focusing this time on proper settings and add-on features to help tailor your transmitted audio.

Microphones and Audio Speech Processing for SSB

Part 2 – Optimizing Audio for Band-Limited SSB

BY GARY WHITE,* W5GW AND GENE HINKLE,# K5PA

Part 1 of this article[1] examined SSB and microphone usage and illustrated that band-limiting of SSB reduces intelligibility and clarity. Recommendations on selecting a mic for amateur SSB use were provided.

Part 2 examines the basic adjustments necessary to properly mate your mic to the audio stages of a modern SSB transmitter. The advanced topics of equalization, noise gates, and compression are also covered. As stated previously but worth restating, SSB audio characteristics are very subjective and vary from mic to mic and individual to individual.

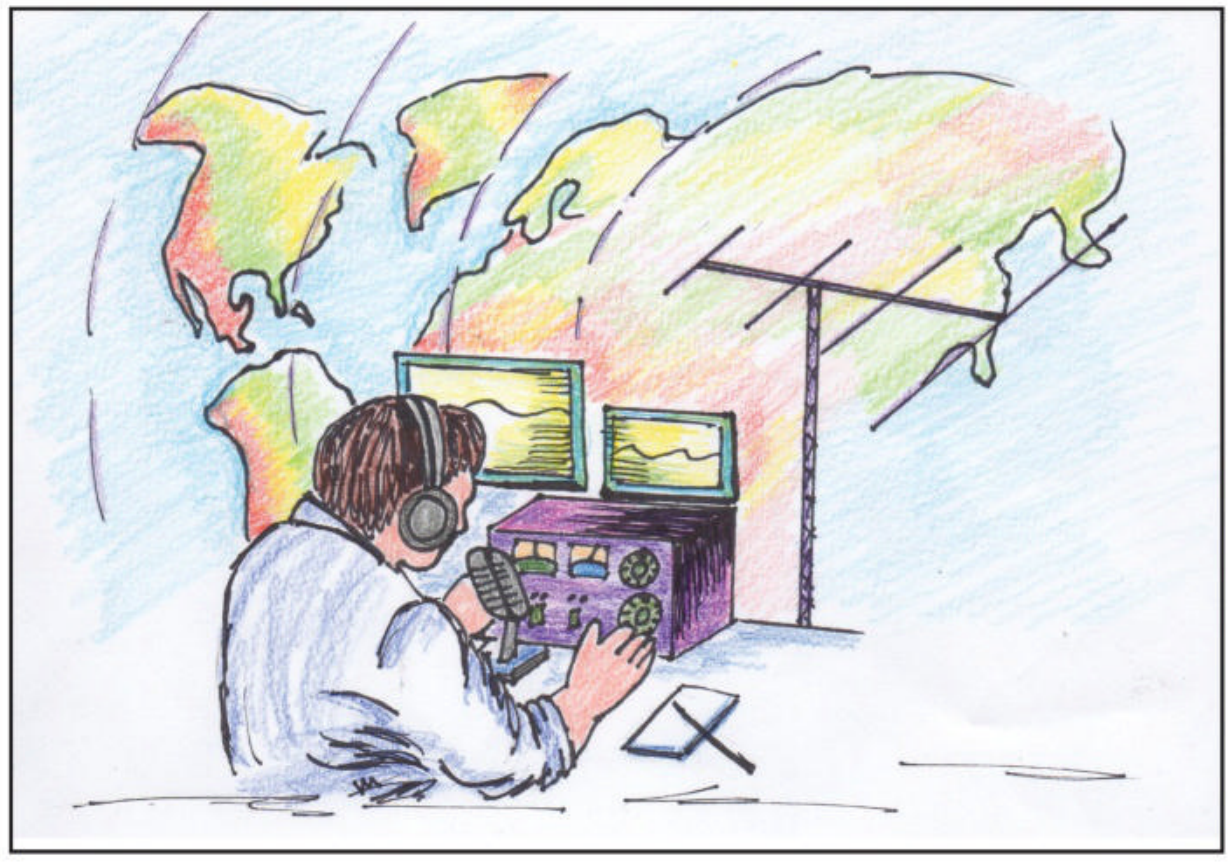


Figure 11. A vision of SSB utopia (Credit: Verlenne Monroe, XYL of Gary White)

Basic Adjustments and Practices

Gain – Proper adjustment of microphone gain is the most important adjustment you can make. Get it wrong and everything else will make little difference in improving your signal. An improper mic gain can result in low power and loss of intelligibility and clarity at the receiving end. Surprisingly, this can result from either not enough mic gain or too much mic gain.

Most modern amateur transceivers have some type of automatic level control (ALC) that is used to adjust the mic gain. The ALC circuitry is designed to keep the audio and RF stages from being driven into non-linear operation. Unfortunately, all ALC circuits and their metering are not created equal. For preliminary mic gain adjustments, follow the manual.

For example, the Icom 7300 manual states: "… select the ALC meter and adjust until the meter reading swings between 30 to 50% of the ALC scale." Speak a long "ahhhhh" while adjusting for a quarter to mid-range reading on the ALC meter. Then, when speaking normally, confirm the ALC peaks in the 30-50% range. This adjustment is critical to mating your voice amplitude to the microphone sensitivity and the transmitter's audio and RF amplification levels. Don't be tempted to think that if 30-50% is good, then 60-100% is better.

Experiments have found the peak to average power ratio of saying a long "ahhhhh" is about 10:1 and represents a normal speaking voice. Do not whistle as it is not representative of an average voice. If you are monitoring an average-reading power meter, the long "ahhhhh" will show a power that is about 10% of the peak envelope power (PEP).

We usually follow-up this preliminary adjustment by reading a line or two from a book while monitoring the ALC meter and adjusting the mic gain even more. For our voices, we've noticed the factory default setting of 50 for mic gain needs to be reduced to about 30 when using the Icom-supplied mic to keep the voice peaks below 50% of the ALC scale.

If you have a peak-reading wattmeter, you can make further refinements of the mic gain setting by watching the peak power while speaking. Reduce the mic gain until the power starts reducing from its maximum peak and then increase it back slowly to return to a maximum peak power output while speaking.

If the mic gain is too high, it will overdrive the audio and RF stages and lead to non-linear operation, clipping, distor-

** Email: <white512@austin.rr.com>*
 # Email: <k5pa@arrl.net>

tion, and splatter outside of the passband. This results in lower power in your SSB passband, loss of clarity, and interference to other stations above or below your passband. If the mic gain is set too low, the RF stages will not be driven to their desired power levels and the received signal strength will be reduced.

Keep Your Speech Volume at a Constant Level – The volume of your voice is not constant. While transmitting, ensure your volume is constant by monitoring the ALC meter. Keeping your voice level constant and speaking normally mates the range of vocal sound pressures to the dynamic range of the mic, and, in turn, the audio and RF amplification stages.

Sometimes we get excited and talk too loudly; other times we tend to speak more softly than normal. Being conscious of our spoken voice is easier said than done. Those of us who wear hearing aids tend to talk louder when wearing them than when they are out.

A hoarse or irritated throat can affect the volume of your articulation. Hams with even minor hearing problems can also have difficulty assessing the loudness of their voice. The ALC meter or indicator is the best way to ensure we keep our voice at a constant level.

Adjust Bandwidth of Your Transmitted Signal to Match Operating Conditions – This assumes you can adjust the bandwidth of your transmitted signal. As an example, the Icom 7300 comes from the factory with three adjustable presets of transmit bandwidth (TBW) settings. They are:

SSB TBW (WIDE): 100-2900 Hz
SSB TBW (MID): 300-2700 Hz
SSB TBW (NAR): 500-2500 Hz

We find removing 200 or 400 Hz from the upper treble ranges impacts intelligibility, and we prefer the following settings:

SSB TBW (WIDE): 100-2900 Hz
SSB TBW (MID): 300-2900 Hz
SSB TBW (NAR): 500-2800 Hz

These settings are subjective, dependent on your voice, microphone, and particular transmitter. While subjective, they are based on language and speech research in how the intelligibility of the English voice is communicated. They are intended as a starting point for your own experimentation and use in different types of operating conditions.

For high SNR (signal-to-noise ratio) QSOs, we like to use the wide setting. For all other QSOs and conditions (DX, low SNR, nets, roundtables, QRM or QRN, etc.), we'll select the middle or narrow setting that is most appropriate.

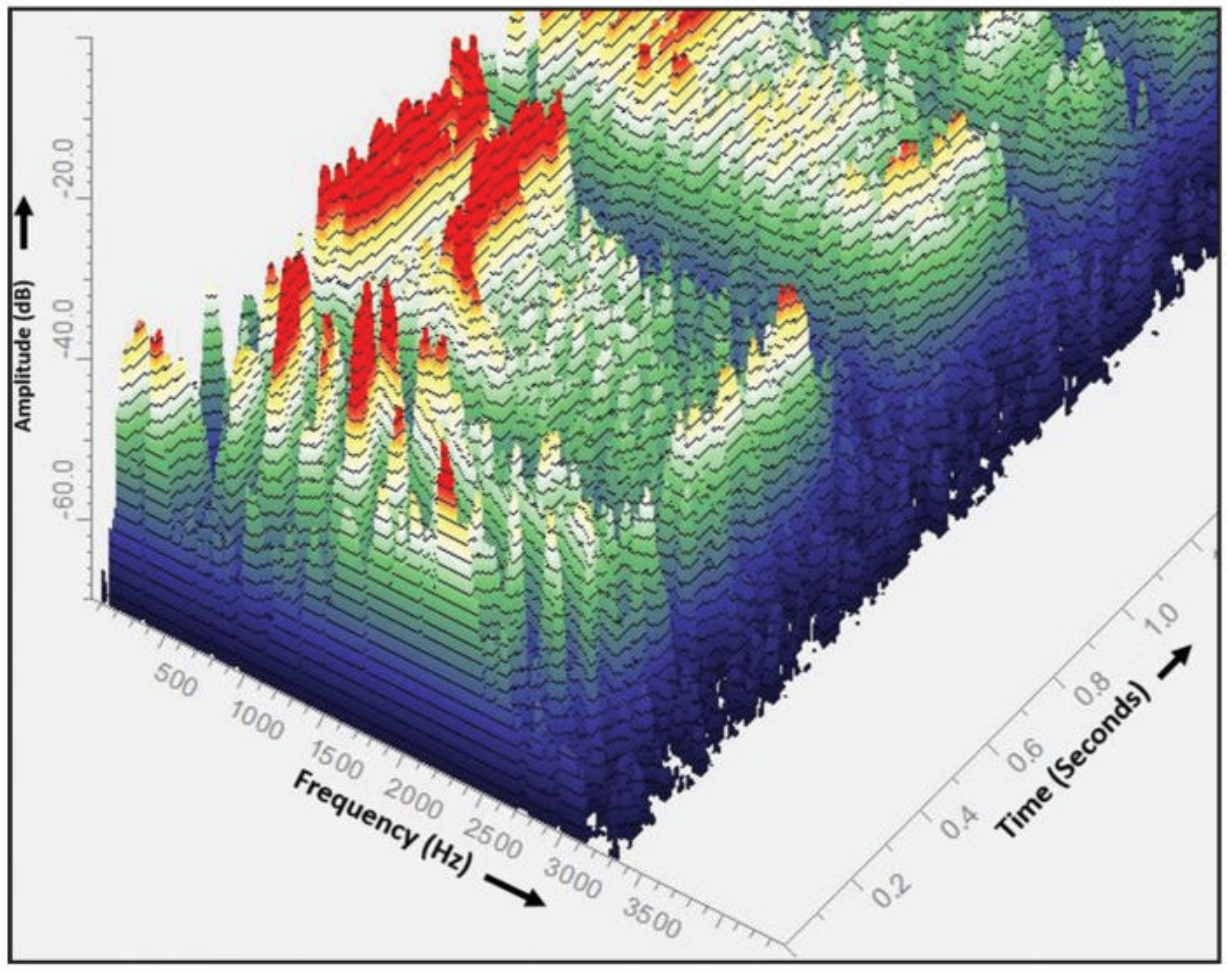


Figure 12. 3-D spectrum of SSB audio (Credit: Gene Hinkle)

Advanced Adjustments and Practices

The aforementioned basic adjustments and practices will improve your SSB signal significantly. Most of us can stop there and be satisfied with the results. In this section, we present advanced signal-processing functions of equalization, compression, and noise gate application. Some of these capabilities are included in modern transceivers. But in many older radios, an external unit is necessary to achieve these signal-processing functions.

Before we get into advanced signal-processing topics, let us visit the human voice in a bit more detail. A 3-dimensional (3-D) spectrum of SSB audio is shown in *Figure 12*. By 3-D, we mean that the voice frequency and amplitude are plotted on the X-Y axis, and then successive plots are stitched together across time, the Z-axis. Thus, the variations in the voice frequencies and amplitudes are plotted across time.

Note that the amplitude of the lower frequencies is generally stronger. Also, there is a wide range of amplitudes in frequency for any given time slice. If this audio signal is amplified equally in a SSB transmitter, a large portion of available power will be allocated to the lower frequencies. We learned in Part 1 that much of the intelligence is carried in the mid-to-higher spectrum of the available SSB bandwidth (1-3 kHz). From *Figure 12*, we see that equal power allocation is not conducive to maximizing intelligibility. This 3-D spectrum was created from a rag-chew net operating on 40 meters. The program that was used for *Figure 12* is called Spectrum Lab by DL4YHF.[2] It can be used to help evaluate settings of band limiting, equalization, and compression.

By redistributing power from the areas of frequency that carry little or no intelligence to bands that provide intelligence, we can improve the intelligibility of our transmitted signal. This process is called *equalization*.

The difference between the lowest discernable signal and the loudest is called *dynamic range*. Because the loudest signal sets the limit of our transmitter's peak power, we look for a method to raise the weaker signals. This process is called *compression*. Most audio or RF compression descriptions state that compression increases our average power while the peak power remains at its upper limit. This is true. But it is also true that compression reduces the dynamic range, and hence fidelity, of the signal.

We want to re-emphasize a point raised in Part 1. Both equalization and compression can increase overall intelligibility, but they do so only by changing the fidelity of the transmitted signal. And carried too far, even the intelligibility of the signal will suffer.

Equalization and compression, while based on scientific principles and facts, have many variables. It's very easy to over-equalize and / or over-compress a signal. The result is loss of clarity, lack of intelligibility, and unpleasant sounding audio. Think "less is more" when it comes to applying equalization and compression techniques.

Both equalization and compression can be used together to improve your success in establishing a communications link. However, it is customary to apply equalization first and then compression while evaluating the results.

Equalization

We provided an example in Part 1 in which the lower and upper frequencies could be attenuated and emphasized in the settings in an Icom 7300.

The equalizer built into the 7300 is called a two-band equalizer. It has a bass band and a treble band. Unfortunately, the specifications for these two bands and the change in attenuation or emphasis are not provided, so experimentation is required to find the best setting for you. For more control in equalization, you might want to use an external equalizer that has more bands and are better specified, and its gain calibrated in dB. Experimentation is necessary when applying equalization, but we can always follow the general guideline of attenuate first, then emphasize.

We've already learned that consonants are the primary driving force of intelligibility. These higher-pitched, but generally weaker and shorter-duration, sounds are predominately in the range of 500 to 4,000 Hz.

The stronger vowel sounds are in the range of 500 Hz to 2 kHz. Vowel sounds or resonance, for a given individual, are a basic characteristic of that speaker's anatomy (vocal tract) and learned speech patterns (i.e., regional accents). The vowels that a speaker articulates are longer-lasting than the short-duration consonants and help integrate the consonants into syllables and words. Vowels provide resonant substance and make the language pleasant to our ears.

While vowel sounds are a lesser contributor to intelligibility than consonants, it doesn't mean that the 14 vowel sounds we have in the English language are unimportant to intelligibility. For example, consider the single-syllable words *boot* and *boat*. The different vowel sounds of *oo* and *oa* provide the bridge between the two consonants to provide a much different sounding word and meaning. Because vowels are of longer duration than consonants, our ears are better equipped to detect and differentiate their sounds.

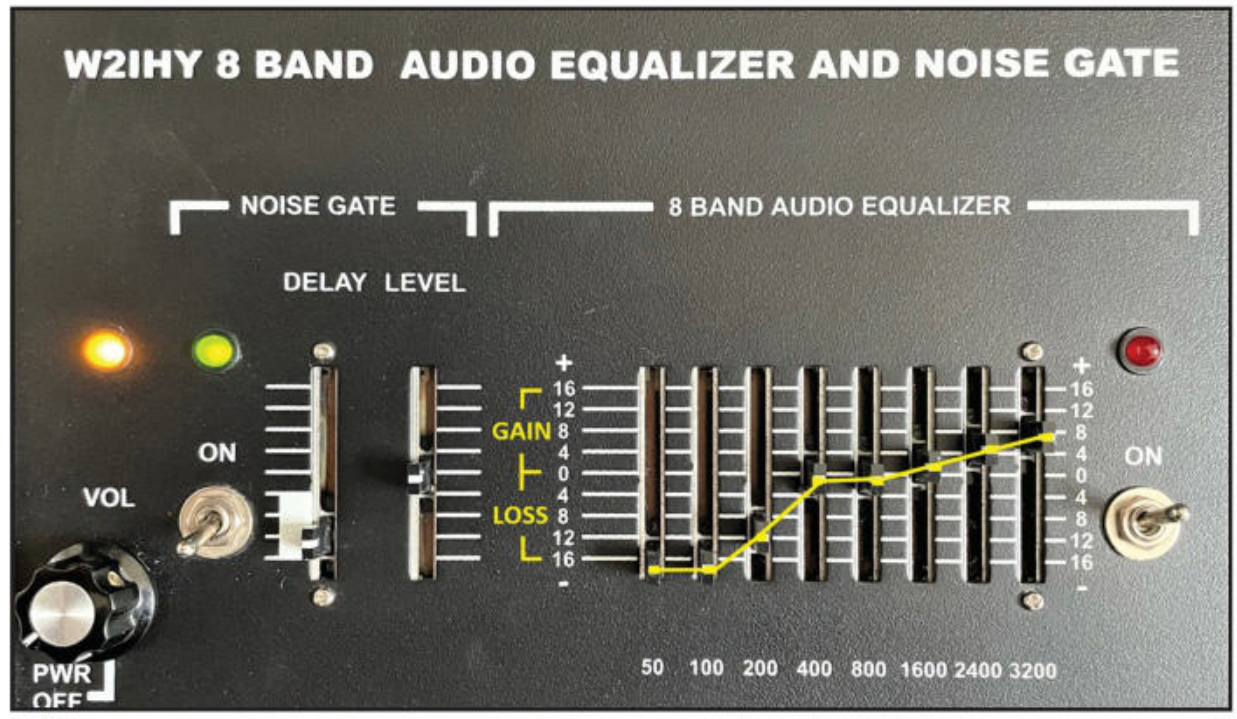


Photo B. Rag-chew equalization (Credit: Gene Hinkle)

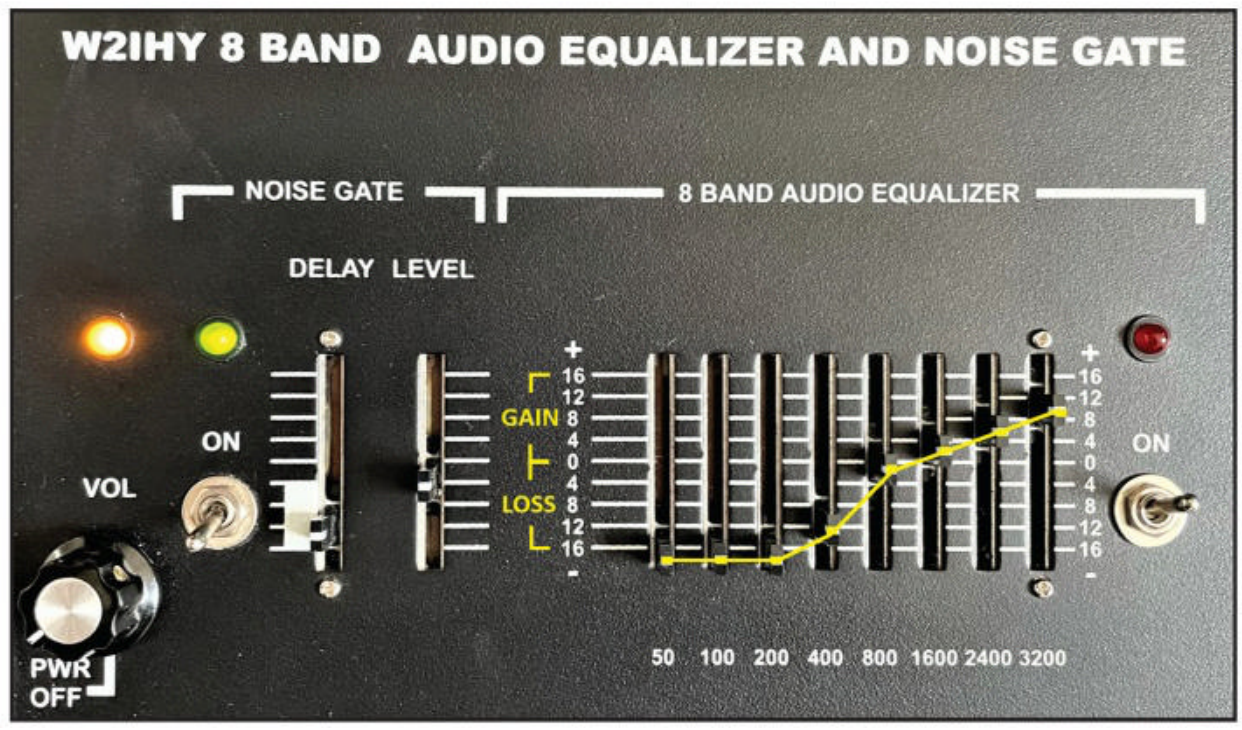


Photo C. Heavier Equalization (Credit: Gene Hinkle)

Keeping these thoughts about consonants and vowels in mind, here are some guidelines for initial settings of an external equalizer:

For high SNR QSOs (*Photo B*):
Cut or attenuate strongly (> 10 dB) below 200 Hz, and
Emphasize lightly (up to 2-6 dB) in a monotonic manner between 750 to 3 kHz

For all other QSOs (*Photo C*):
Cut or attenuate strongly (> 10 dB) below 300-500 Hz, and
Emphasize moderately (up to 5-10 dB) in a monotonic manner between 750 to 3 kHz

While these settings work well with our stations, microphones, and voices, you may require different adjustments. Don't be afraid to experiment. When applying equalization, be sure to readjust your mic gain as the attenuation and emphasis affect the overall level of the signal.

Finally, when applying an external equalizer and your transmitter has an internal equalizer, set the internal equalizer to the flat or neutral settings. That is, don't use both. Your objective in applying equalization is to create a clear and easily understood audio signal, but be aware, the fidelity of your equalized audio will be different than before equalization was applied.

Compression

The action of ALC combined with equalization has already resulted in com-

pression or reduction of the dynamic range of our signal. The objective of additional compression is to achieve increased loudness at the receiver by increasing the average-to-peak signal power level. We are willing to give up some degree of fidelity for this increase in received SNR.

The Fletcher-Munson loudness study in 1933 resulted in the famous set of curves shown in *Figure 13*, which has been refined over the years and codified in 1956 to the ISO 226 standard.[3] This curve shows that our hearing sensitivity is best in the regions where vowels and consonants reside. Yet when applying compression, we are increasing the loudness of all frequencies. Hence, for this reason, its best to apply equalization before applying compression.

Compression can be applied in either the audio or RF stages of a transmitter. Theoretically, either achieves an increase in loudness. If you have a choice, try each (not at the same time of course!) and do some over-the-air tests to see which method you prefer. Our favorite over-the-air test is to transmit a test signal while recording it from an SDR receiver on <websdr.net>.

Many compressors employ limiting or clipping circuitry that can lead to distortion and even signal splatter outside of the desired passband if too much compression is applied. It's impossible to characterize all situations since your transmitting system (voice, microphone, transmitter, and speech processer) may vary. A moderate application of 8-14 dB of compression seems to work best for most radio-microphone-processing systems with typical voices.

Applying too much compression can also reduce intelligibility even if it doesn't create splatter. The received audio sounds muffled and, while louder, words and syllables will be misunderstood. If you don't apply enough compression, the difference in loudness or change in received SNR may not be apparent. As in the case of equalization, after applying compression, go back and check / adjust your microphone gain as necessary.

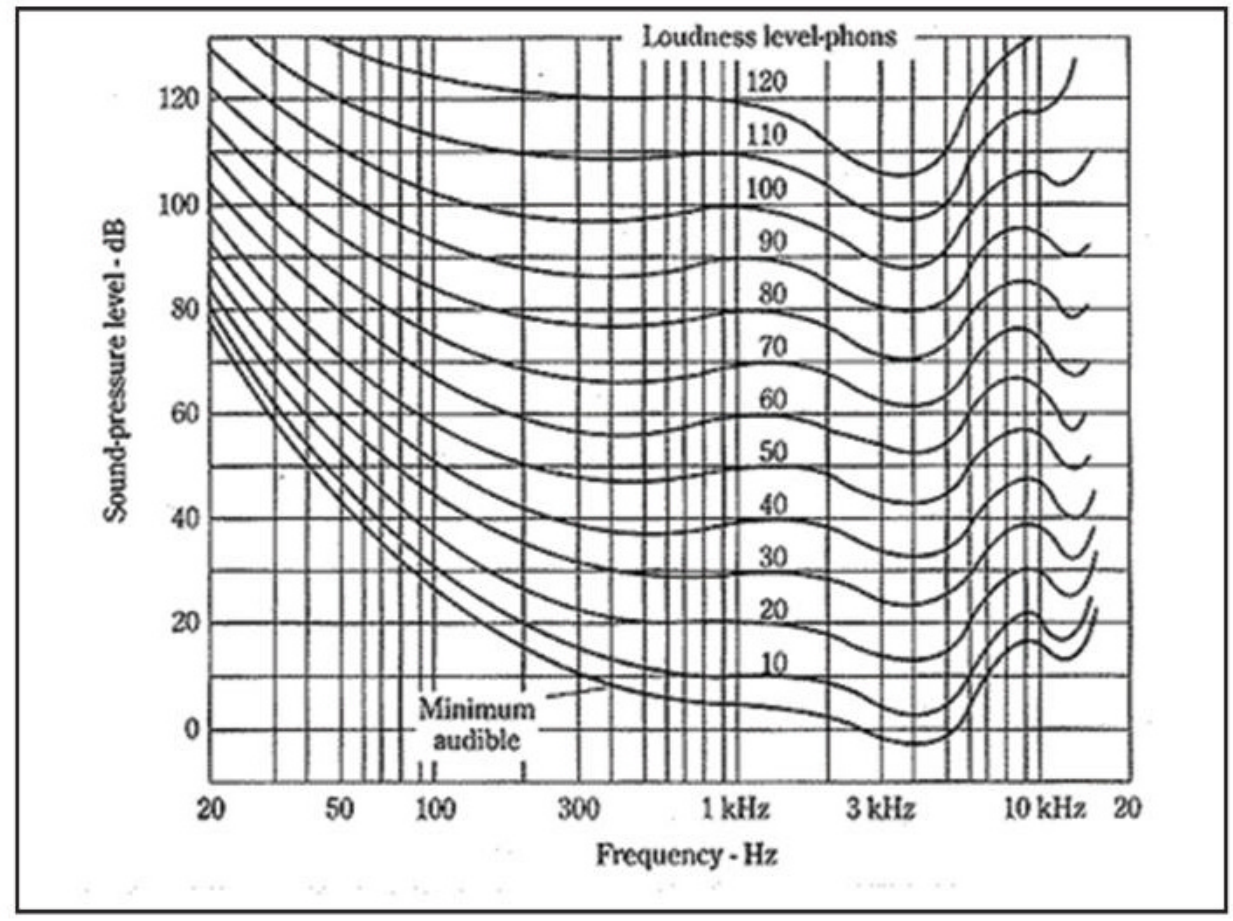


Figure 13. Fletcher-Munson loudness curves (Credit: Wikipedia)

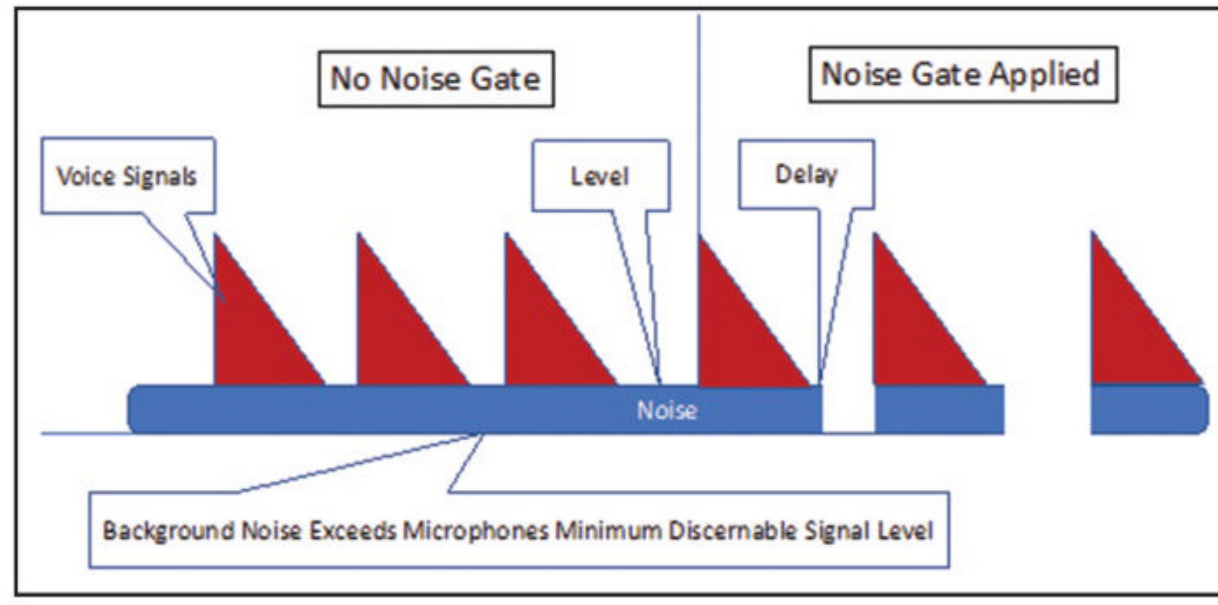


Figure 14. Noise gate operation (Credit: Gary White)

Noise Gate

The term *noise gate* is a misnomer. It should really be thought of as a *noise block*. A noise gate neither increases intelligibility nor changes the characteristics of your voice, but blocks background noise from being transmitted when you are not speaking.

A noise gate has two settings, usually called *Level* and *Delay*. When a noise gate processor is applied and you speak, your spoken voice exceeds a specified threshold level and is passed to the transmitter. When you stop speaking, a delay threshold holds the gate open for a small period and then begins to block the background noise (*Figure 14*).

Think of a noise gate as a squelch control, but on the transmit side rather than the receive side. A noise gate only eliminates annoying noises during lulls in the spoken voice. Please note, when you speak, the background noises are still present in your transmitted signal and may still be objectionable. Common solutions are to either reduce the background noise or use a less sensitive microphone while talking closer.

A solution to excessive background noise is to use two microphone elements placed back-to-back and operated 180° out of phase. Most aviation headsets use this approach to achieve a noise-cancelling microphone. They can be obtained in both electret and dynamic microphone implementations. When using an aviation headset mic with a noise-cancelling element, you must speak very close (about 1/8 to ½ inches) to the microphone.

Additional Instrumentation and Monitoring

There are many methods to monitor a transmitted or received SSB signal. Many modern transceivers have incorporated time (oscilloscope) and frequency domain (waterfall and spectral) displays. The introduction of software-defined radios (SDRs) has made such displays common in even modestly

priced transceivers (*Figure 15*). A word of caution, though. Many such built-in displays are at the audio or baseband level and not at the radio frequency (RF) level. It is still possible to overdrive your transmitter or linear amplifier when these displays indicate a clean signal. External sampling of the RF energy before the antenna and measuring with either an oscilloscope or a spectrum analyzer provides the complete picture of the transmitted signal. Used in conjunction with the ALC meter or indicator, valuable insight can be obtained about the quality of your SSB signal.

Conclusion

Application of audio signal processing is best summed up as a mix of subjective adjustments and techniques based on the science of the spoken and heard human voice. That is, getting a good SSB signal is a mix of art and science. Don't be afraid to mix art with amateur radio. From our own experiences, we've found that a little bit can go a long way, especially when it comes to compression. But most of all, don't be afraid to experiment and try new ideas in your quest for SSB utopia. After all, that is a big part of what makes amateur radio enjoyable.

Figure 15. Icom 7610 SDR audio scope display of waveform and spectrum (Credit: Gary White)

Notes:

1. "Microphones and Audio Speech Processing for SSB, Part 1 – Microphone Types, Use, and Selection," White and Hinkle, *CQ,* January 2022, p. 56
2. Spectrum Lab Website <https://tinyurl.com/54kk7fes>
3. "Factors Governing the Intelligibility of Speech Sounds," N. R. French and J. C. Steinberg, Bell Telephone Laboratories, New York, New York (Nov 22, 1946)

Part 1 of this article[1] covered grounding of surge protection devices (SPDs). This part continues with showing some of the problems that can occur from self-inflicted installation and configuration mistakes. Many of the problems resulted from trying to prevent other future problems from occurring, but the attempts only made matters worse by creating more problems.

EMP & Lightning Surge Protection for HF Radios

With Suggested Practices for Grounding Measurements and Station Configuration, Part 2

BY STEVEN KARTY,* N5SK

While the active protective device inside an HF antenna surge protection device (SPD) is usually a gas discharge tube (GDT), the active protective device inside most AC powerline SPDs is often a metal oxide varistor (MOV). GDTs and MOVs have different characteristics that prevent them from being used interchangeably. The "Workbench" column of the 22 July 2020 issue of *RadioWorld* magazine[2] contains a suggestion to replace GDTs inside low signal level SPDs with MOVs, because MOVs react faster than GDTs, but this is not a good practice.

Although MOVs do respond to surges more quickly than GDTs, the much higher capacitance of MOVs limits their use. There's no problem if loading up the lines being protected with increased capacitance to ground doesn't degrade the signal. But most signals will be adversely affected by extra capacitance. The high capacitance of MOVs also makes them completely unsuitable for use inside antenna SPDs. MOVs are mainly used where the extra capacitance isn't a problem — such as inside AC powerline SPDs. Unfortunately, the failure mode of most MOVs is shorting. MOVs can also overheat and sometimes fall off their connecting leads. There are stories of overheated MOVs melting through surge strips with plastic housings and starting rugs or carpets on fire.

If your station has a vertical antenna, it may need an antenna tuner. *Photo G* shows an antenna tuner located at the base of a vertical antenna. Stray RF energy may get into other equipment and interfere with their proper operation when a vertical antenna is connected directly to a transceiver without an antenna tuner. Some hams have tried adding ferrite beads on the signal wires in other systems to prevent RF energy from causing problems, but that usually won't do any good when an antenna tuner is required.

Photo G. Many vertical antennas require antenna tuners.

Creating Our Own Problems (The Case of the Missing Antenna Tuner)

In one case, I was asked to solve a problem where the building alarms activated every time the radio transmitted. This

* Email: <steven.karty@cisa.dhs.gov>

Photo H. Unnecessary inline RF choke with water-filled connectors (Inset shows construction without shrink sleeve)

Photo I. Bottom of FAA-5522 HF broadband vertical antenna

Photo J. Middle of FAA-5522 HF broadband vertical antenna (before assembly)

was after another person in my group visited the site and told the operators to put ferrite beads on every alarm wire they could find, but it didn't help. This problem was so bad that the only way the radio could be used was to station an additional operator at the alarm control panel to reset it after each transmission. I asked if they had an antenna tuner in their installation, and they said that they didn't. So I asked for the brand and model numbers of their radio and vertical antenna. I then called the manufacturer's distributor, gave them this information, and asked if an antenna tuner was required: The distributor said yes, because that particular antenna is non-resonant. I called the site that had the problem and told them they needed to buy an antenna tuner. They finally admitted that they used to have an antenna tuner between their transceiver and antenna, but it broke and they just bypassed it because someone said it wasn't needed. Although their alarm problem occurred afterward, they never associated it with bypassing the antenna tuner.

The homemade inline RF choke in *Photo H* was constructed by sliding a series of ferrite cores onto a short section of cable before putting connectors on the cable ends. It was an attempt to fix a non-problem because there wasn't any RF on the antenna cable shield that needed to be isolated. Regardless, this choke was installed in an antenna feedline which was left lying on a flat roof. The connectors on the ends of the cable filled with water, which could have been avoided by

1) wrapping them with enough waterproofing tape;
2) not leaving them in a depression where water pools;
3) locating them beneath a cover to direct rain away, instead of leaving them out in the open exposed to rain, and
4) supporting the connectors on the ends of the cable so they are raised slightly above the roof.

The waterlogged connectors caused the VSWR to increase from 1.2:1 (good) to over 4:1 (bad). Removing this unneeded choke and connecting the feedline directly to the antenna brought the VSWR back down to its original low value.

Overly high (bad) VSWR readings for antennas can be caused by antenna SPDs that were installed incorrectly and have corroded inside: This can happen because SPDs are not hermetically sealed, so they have to be kept out of standing water and mounted in enclosures to shield them from rain. If an SPD has a drain hole (or seam), it should be mounted so the drain hole is located at the bottom to allow any internal condensation to drain out. Any exposed connectors should be wrapped with waterproofing tape to keep water out. But if connectors and feed-through barrels are incorrectly wrapped with tape, they could hold water inside instead deflecting it away.

Photo I shows the bottom of an FAA-5522 vertical antenna. *Photo J* shows the middle of the same antenna. The upper antenna element (shown on the right side of *Photo J*) is supposed to have a black plastic ball at its top (not shown) to deflect rain, and the joint between the top and bottom sections should also keep rain out. Any water that condenses out of the humid air that gets inside should run down the center of the mast and harmlessly out through the bottom. But water accumulated because the bottom end of the mast had been completely blocked by a big lump of waterproofing tape that was added by the person who installed it. There was so much water that it took several minutes to drain as the tape was being removed.

Poor Station Practices

The coaxial cables in *Photo K* go to antenna switches that cannot provide enough isolation to prevent a large

ANNOUNCEMENTS *(from page 2)*

JEFFERSON, WISCONSIN — The Tri County Amateur Radio Club will hold its Hamfest 2022 beginning 8 a.m., Sunday, March 22 at the Jefferson County Fairgrounds Activity Center, 503 North Jackson Avenue. Contact: Johnny, KD9IQC, (920) 723-7439. Email: <hamfest@w9mqb.org>. Website: <http://w9mqb.org>. Talk-in 145.49 (PL 123). VE exams.

BOONVILLE, MISSOURI — The Boonville Amateur Radio Club will hold its Hamfest from 8 a.m. to 1 p.m., Saturday, March 26 at the Cooper County Youth Fairgrounds, 16899 Dunkles Drive. Contact: Dwight (660) 621-1265 or Tom (660) 841-5287. Email: <wa0e@arrl.net>. Website: <www.w0brc.org>. Talk-in 147.360+ (PL 127.3).

ANNANDALE, VIRGINIA — The Vienna Wireless Society will hold WINTERFEST! and the 2022 ARRL Virginia Section Convention from 6 a.m. to 2 p.m., Sunday, March 27 at the Northern Virginia Community College Annandale Campus, 8333 Little River Turnpike. Contact: Mike, WA8AHZ, (703) 870-1730. Email: <tablesales2022@viennawireless.net>. Website: <www.viennawireless.net>. Talk-in 146.685 (PL 110.9). VE exams, WAS / DXCC / VUCC card checking.

APRIL

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 2 and from 8 a.m. to noon, Sunday, April 3 at the Crossroads Arena, 2800 South Harper Road. Website: <http://acares.reiselt.com>. Talk-in 146.925. VE exams

MCKEESPORT, PENNSYLVANIA — The Two Rivers Amateur Radio Club will hold its 50th Annual Amateur Radio and Computer Show from 8 a.m. to 2 p.m., Sunday, April 3 at the The McKeesport Palisades, 100 5th Avenue. Contact: Bill Powers, (412) 260-5699. Email: <atsfbill2@gmail.com>. Website: <www.trarc.net>. Talk-in 146.73. VE exams.

BRANSON, MISSOURI — The Four State QRP Group will hold OZARKCON from Friday, April 8 through Saturday, April 9 at the Stone Castle Hotel and Conference Center, 3050 Green Mountain Drive. Website: <http://ocon.rleepotter.com>.

CLAREMORE, OKLAHOMA — The Green Country Hamfest Inc. will hold the Green Country Hamfest 2002 from 4-9 p.m., Friday, April 8 and from 8 a.m. to 3 p.m., Saturday, April 9 at the Claremore Expo Center, 400 Veterans Parkway. Email: <info@greencountryhamfest.org>. Website: <www.greencountryhamfest. org>. Talk-in 147.09+ (PL 88.5). VE exams, DXCC / WAC / WAS / VUCC card checking.

BARTLETT, TENNESSEE — The Mid-South Amateur Radio Association will hold the Memphis FreeFest from 9 a.m. to 3 p.m., Saturday, April 9 at the Bartlett Station Municipal Center, 5868 State Road. Contact: Art Barnett, WA4PSS, (901) 619-5573. Email: <wa9pss@gmail.com>. Website: <https://tinyurl.com/mwv2n6ya>. Talk-in 147.21- (PL 107.2). VE exams.

BELLEVUE, NEBRASKA — The Bellevue Amateur Radio Club will hold the Bellevue ARC Spring Cleanup Hamfest from 9 a.m. to 3 p.m., Saturday, April 9 at the Reed Community Center, 1200 Lord Boulevard. Contact: Dennis Mitchell, KCØYKN, (402) 690-2587. Email: <kc0ykn@cox.net>. Website: <www.bellevuearc.org>. Talk-in 147.39+ (PL 131.8). VE exams.

CUYAHOGA FALLS, OHIO — The Cuyahoga Falls Amateur Radio Club will hold the 66th Annual Hamfest Electronics and Computer Show from 8 a.m. to 1 p.m., Saturday, April 9 at the Emidio and Sons Party Center, 48 E. Bath Road. Phone: (330) 790-1680. Email: <hamfest2022@cfarc.org>. Website: <www.cfarc.org>. Talk-in 147.270+ (PL 110.9) or 444.850+ (PL 110.9). Free VE exams.

GEORGETOWN, DELAWARE — The Sussex Amateur Radio Association will hold the Georgetown Hamfest and Delmarva Radio Electronics Expo and the 2022 ARRL Delaware State Convention from 7:30 a.m. to 2 p.m., Saturday, April 23 at the Cheer Community Center, 20520 Sand Hill Road. Contact: Jamie, W3UC, (410) 202-7690. Email: <hamfestdelware@gmail.com>. Website: <www.radioelectronicsexpo.com>. VE exams.

MOBILE, ALABAMA — The Mobile Amateur Radio Club will hold the Mobile Hamfest from 8 a.m. to 1 p.m., Saturday, April 23 at the Abba Shrine Temple, 7701 Hitt Road. Contact: David Huber, KK4JJM, <davidhuber@bellsouth.net>. Talk-in 146.94.

ODENTON, MARYLAND — The Maryland Mobileers Amateur Radio Club will hold the MMARC 2022 Spring Hamfest from 7:30 a.m. to noon, Saturday, April 24 at the Odenton Volunteer Fire Department, 1425 Annapolis Road (Rt. 175). Contact: Bruce (410) 456-2500. Email: <bmcpherson73@verizon.net>. Website: <https://tinyurl.com/2p935p6k>. Talk-in 146.805- (PL 107.2). VE exams.

Photo K. Rats' nest of RF cables

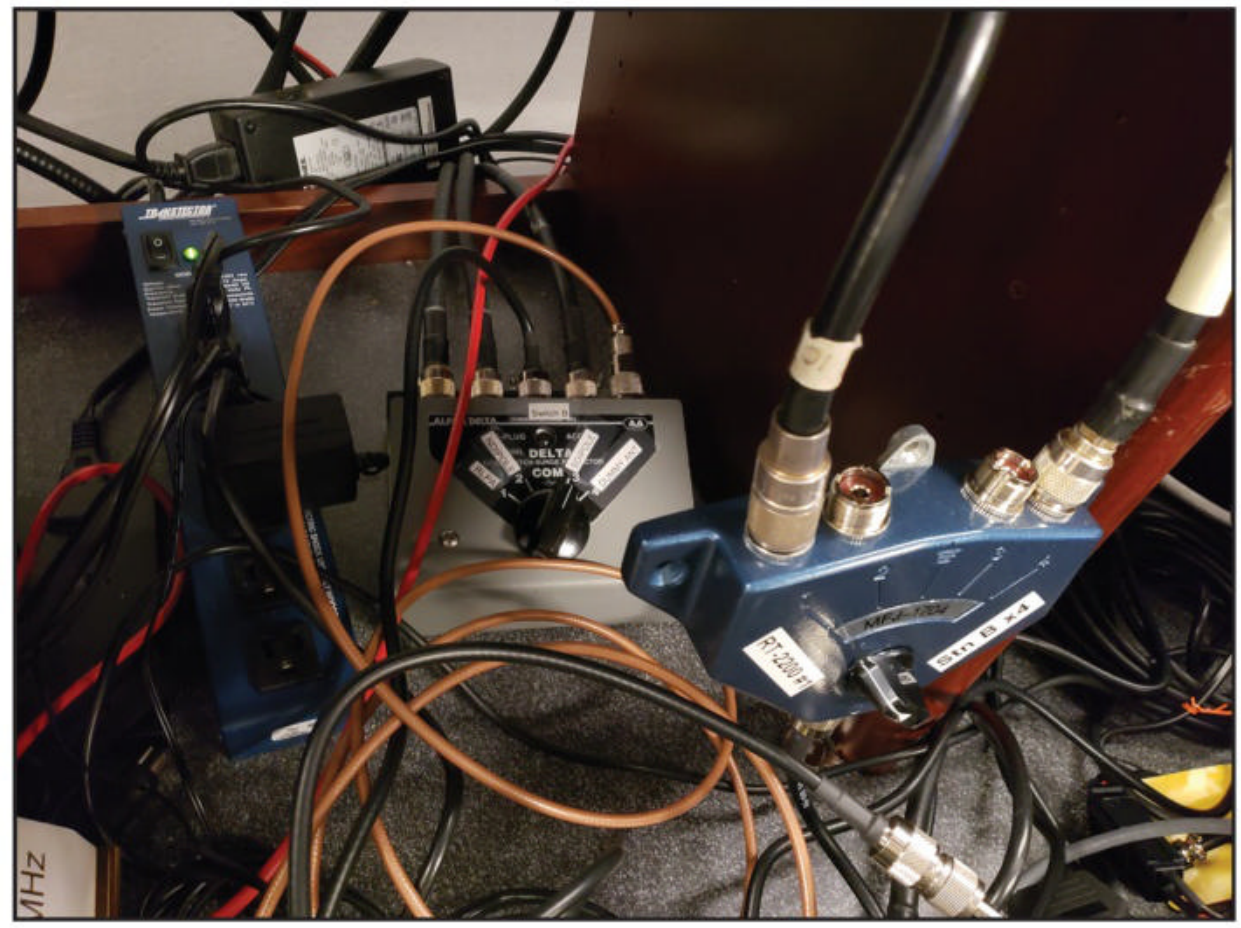


Photo L. Circuitous routing through too many switches

amount of EMP energy from coupling into all the other radios, even if that EMP only comes in from one antenna. Going through the additional antenna switches also introduces additional points of potential failure.

Photo K also shows antenna cables potentially carrying EMPs are all bunched together around equipment, running between all the switches and the radios. The conglomeration of cables can couple and distribute EMP energy everywhere. Multiple antenna cables being routed all around the room close together ensures maximum inductive and capacitive coupling among them: An EMP entering one antenna cable is certain to be coupled onto all the other cables and into each of the radios. Circuitous routing of antenna cables increases susceptibility to EMP damage. An EMP on one cable will be coupled to all the others and damage additional radios.

Figure 9 shows the eight switches used to connect three antennas and one dummy load to four HF radio transceivers used in this homebrew 4x4 switching matrix. Several different cabling arrangements were tried, and *Figure 9* shows one of the later attempts. Unfortunately, this configuration made switching extremely difficult to figure out.

It's very confusing having to make up to eight separate switch changes to reconfigure just one of four transceivers into three antennas and one dummy load. Trying to change an antenna to a different radio was so complicated that eventually two radios were switched together by mistake in one of the earlier attempted designs: This destroyed one of the radios when the other transmitted. The cabling arrangement between the switches was changed several times but still destroyed more radios on the way to the final design. Another problem is that the multiple cables and switches can distribute any EMP energy that may be on one cable through all the other switches, couple it onto all the other nearby cables, and bring it into the other connected equipment. This switching arrangement, which evolved over several years, changed something that was simple and straightforward into an overly complex and confusing ordeal — and it was eventually abandoned.

Photo L shows two of the antenna switches used in the 4x4 matrix, but they do not have enough isolation to prevent an EMP that enters one antenna cable from coupling through all the other switches and cables, and into each of the HF radio transceivers. Antenna switches also introduce additional failure points. These switches were designed to connect one radio to multiple antennas, although they can be

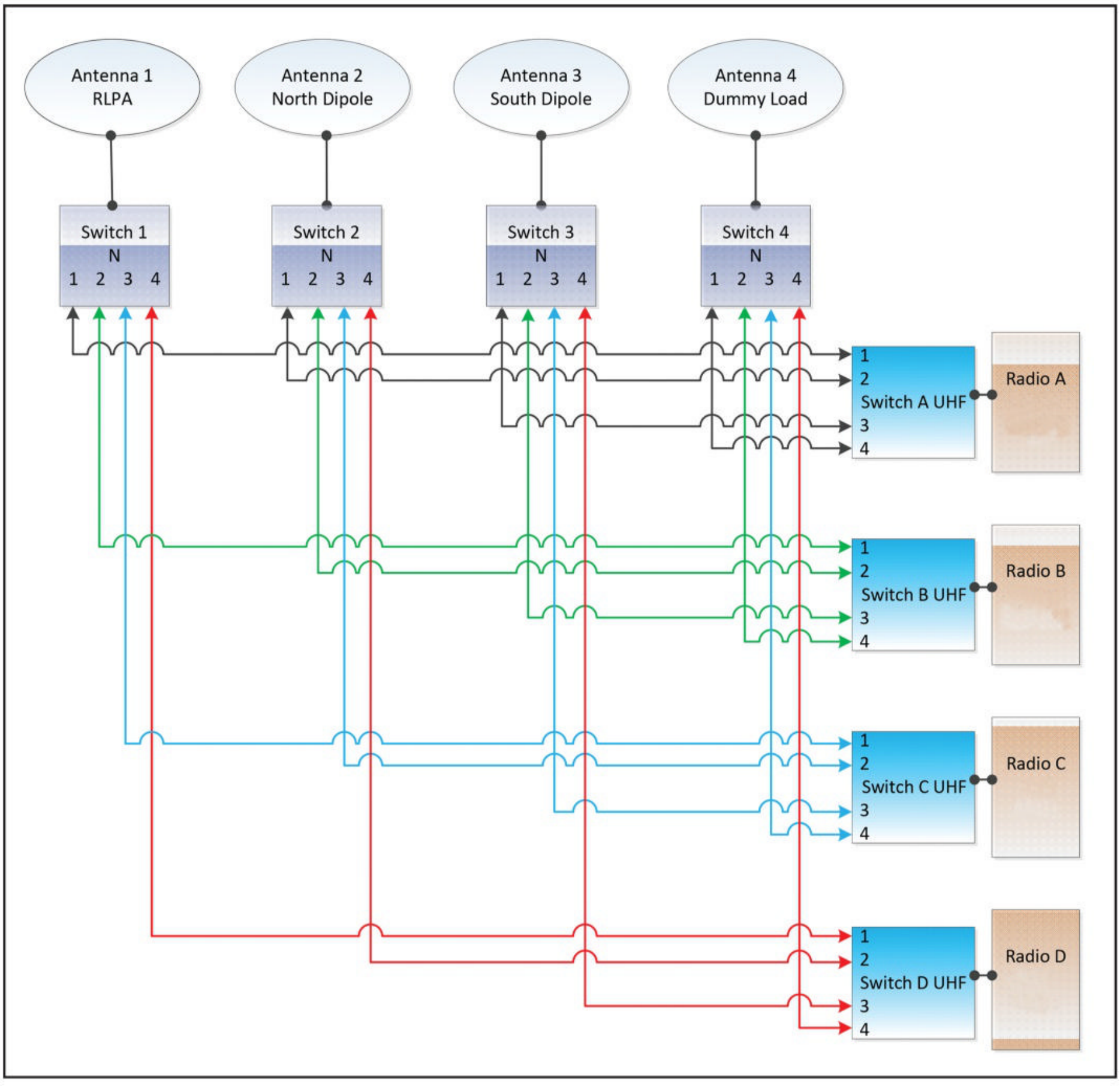


Figure 9. Block diagram of antenna switching matrix

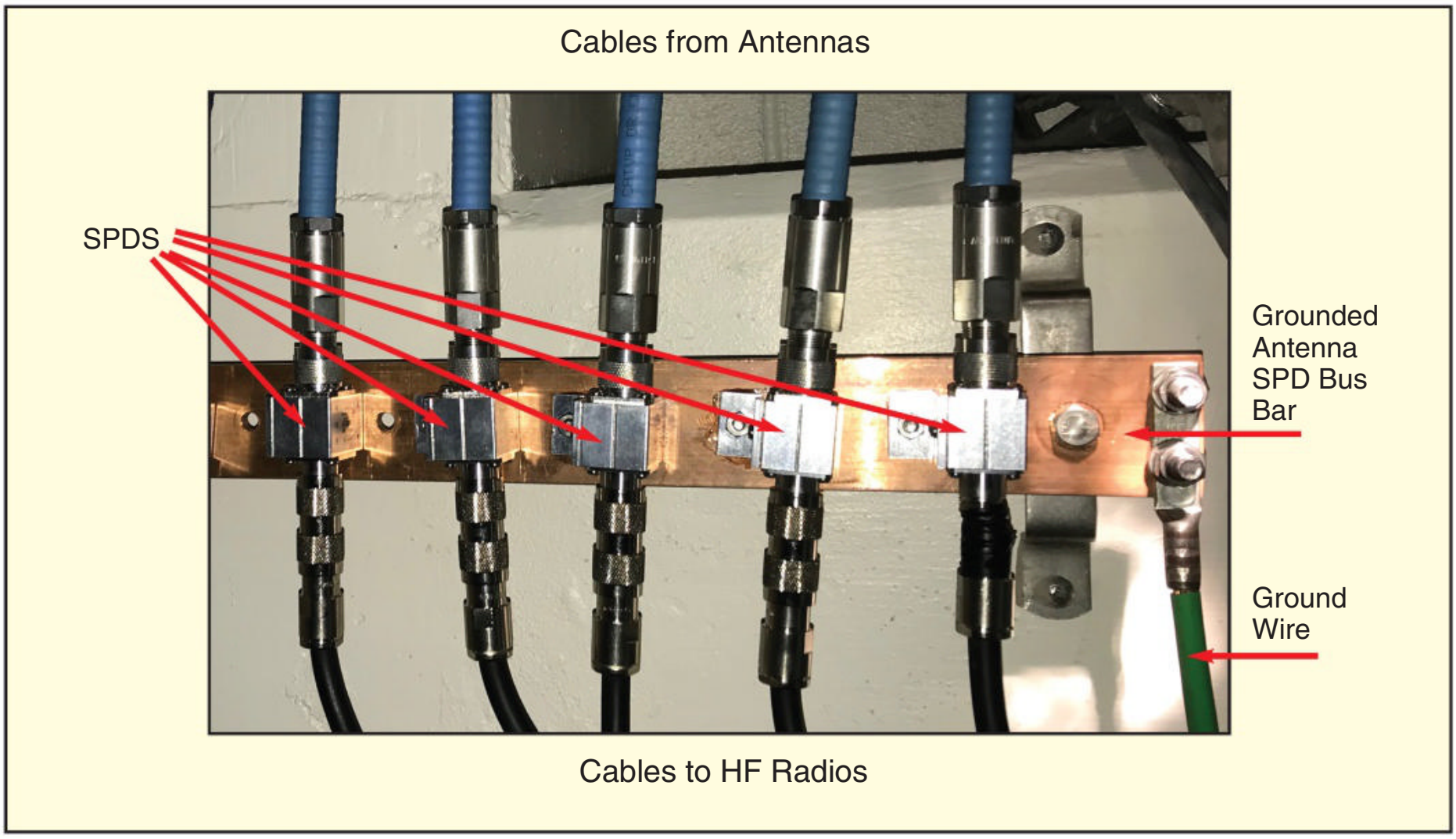


Photo M. HF antenna SPDs mounted on grounded bus bar

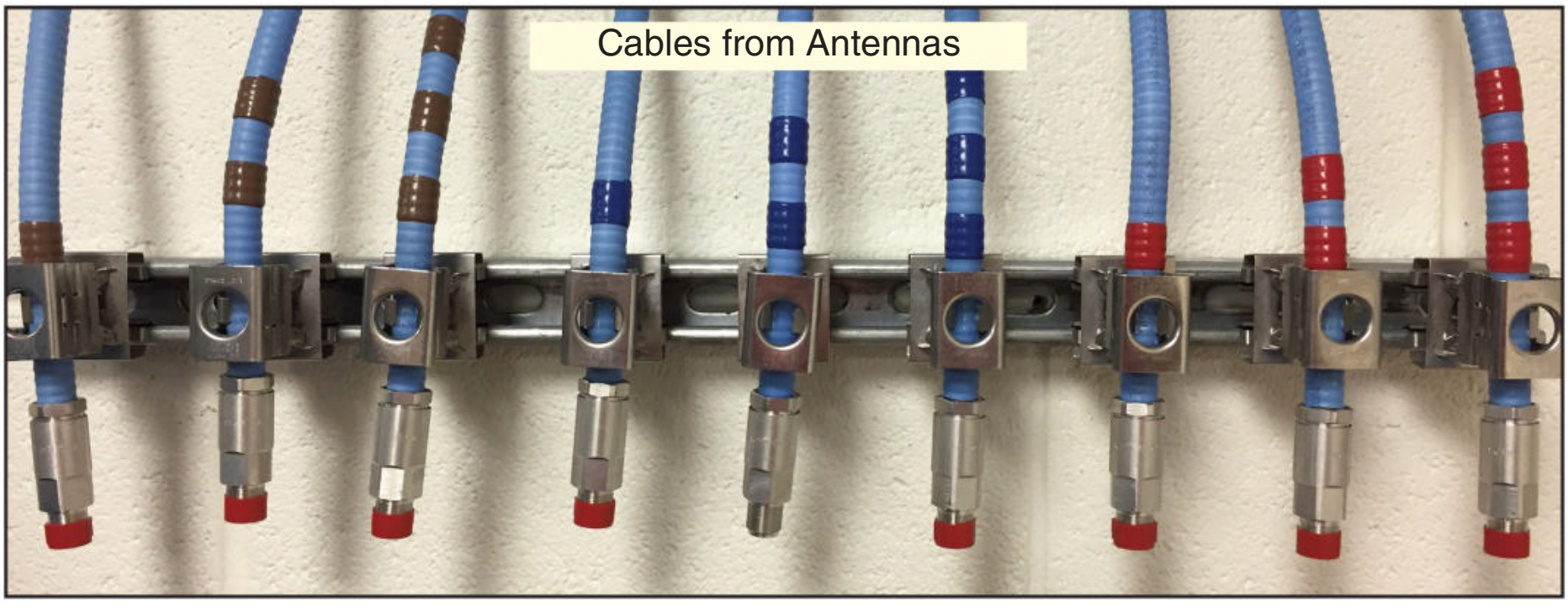


Photo N. Antenna cables ending in connectors

used "backwards" to connect multiple radios to one antenna. But combining both of these functions together through eight switches becomes very complicated and confusing.

Good Station Practices for Multiple Antennas & Transceivers

Photo M shows a good station practice in which all the antenna SPDs are mounted on a grounded bus bar. These antenna SPDs are between the antenna cables and the radio transceiver cables. The buss bar should be located outside the dwelling and connected to a ground wire going to a ground rod. The idea here is to keep the lightning discharge energy outside. It is also a good idea to locate the antenna SPDs inside an enclosure to keep water off them, since they usually are not hermetically sealed.

If you have just a few antennas and a few transceivers, it's easiest to connect the coaxial cables from the antennas directly to the transceivers. But if you have lots of antennas, and if you frequently need to move antennas to different transceivers, then you might want to put connectors on the cables from the antennas as shown in *Photo N*.

This photo shows one way of locating antenna cables and connectors from multiple antennas. Cables from each radio transceiver can be connected to the bottom of whichever antenna cable is desired.

An even better practice is to use an antenna patch panel like the one shown in *Photo O*. The antenna patch panel has

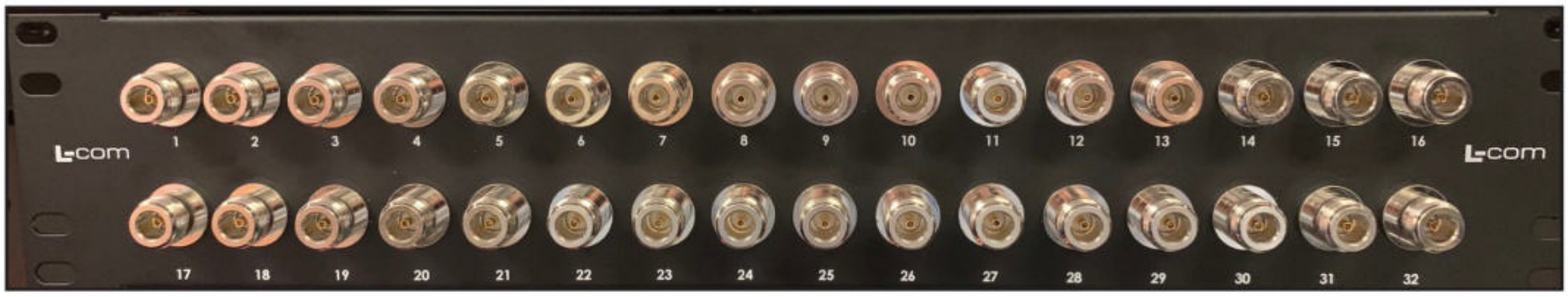


Photo O. Antenna patch panel 3.5-inch (2U), 32 N-type 50-ohm connectors (L-Com Item # PR35N32BLK or PR35N32CMB). Cables from antennas enter back of patch panel (top row); cables to radio transceivers exit back of patch panel (bottom row).

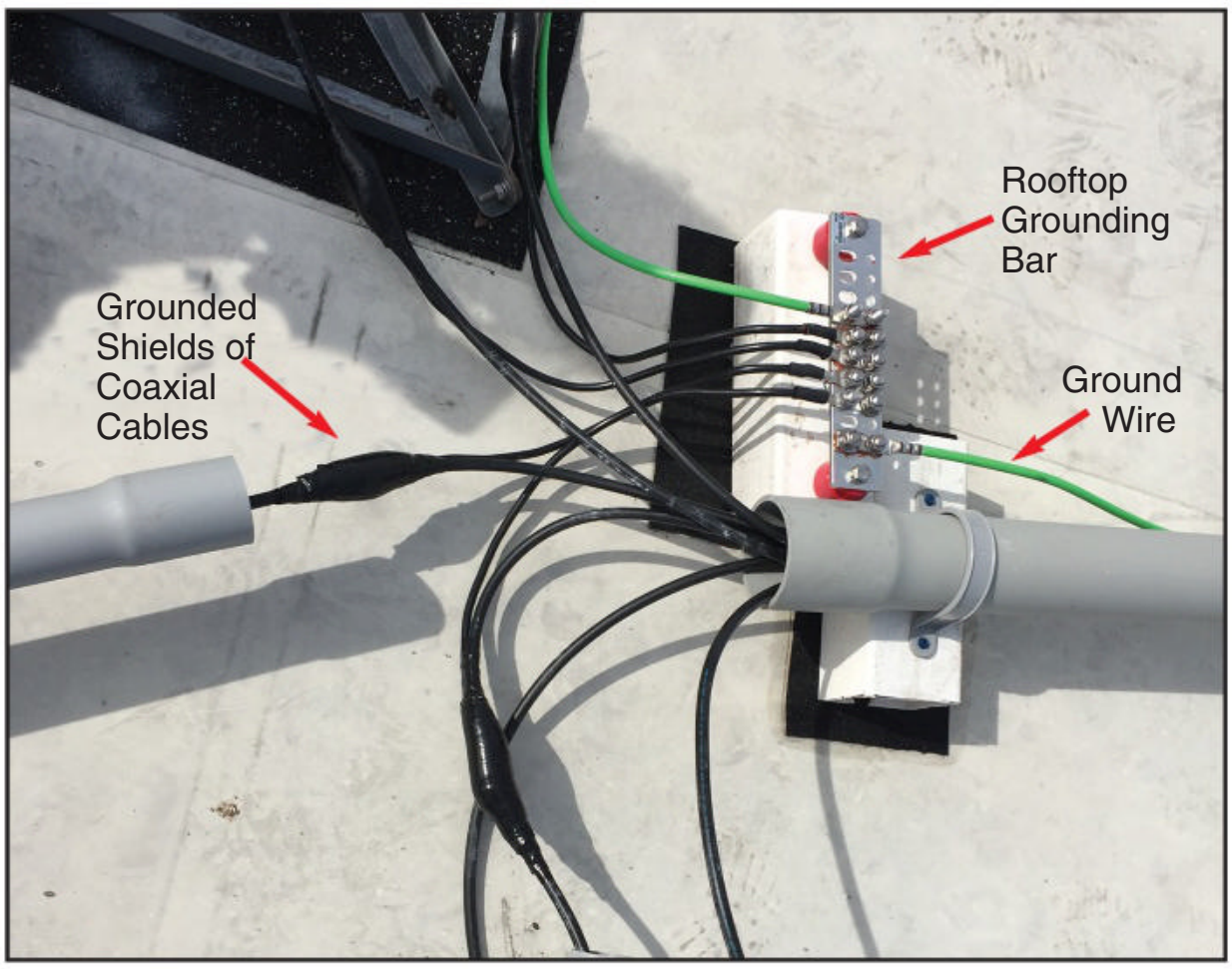


Photo P. Grounding can reduce susceptibility to damage from nearby lightning strikes.

its upper row of connectors coming from the antenna cables and its lower row of connectors going to the transceivers. Short jumper cables can be connected between the antenna connectors to the transceiver connectors.

The nice thing about simple antenna patch panels like the one in *Photo O* is that you can connect only one radio transceiver to one antenna if you only use vertical jumpers on the front. It's also easy to see what's connected to what just by looking at the downleads from the antennas or the jumpers on the front of the patch panel. This patch panel can handle up to 16 antennas in the top row and 16 radios in the bottom row. Just one jumper is required to complete the connection from one antenna (in the top row) to one transceiver (in the bottom row). This patch panel makes it intuitively obvious what is connected to what. It would also be extremely difficult to become so confused that two radios got connected. Embellishments like connecting a dummy load to the back of connector 16 or connecting a jumper between the backs of connectors 15 and 31 may also improve convenience. This patch panel is a much cleaner and easier-to-understand intuitive configuration than the homemade 8-switch matrix in *Photo L*.

Photo P shows a good installation practice of grounding the shields of coaxial cables to reduce damage from induced EMP energy.

Stay Safe!

We hope this article has been helpful in illustrating both proper and improper methods of protecting gear from the energy of nearby lightning strikes (EMP) and in explaining the importance of "doing it right."

Notes:

1. *CQ*, January 2022, p. 30

2. The "Workbench" article on page 12 of the July 22, 2020 issue of *Radio World* <https://tinyurl.com/3brrfu3w> recommends removing GDTs from SPDs and replacing them with MOVs, without recognizing that the increased capacitance of MOVs can greatly degrade the signal being carried: Transtector, PolyPhaser and their associated brands (including L-com, Pasternack, and Fairview Microwave) make a vast line of different types of surge protection devices (SPDs) specifically tailored for the different voltage levels on different types of lines, including leased lines, POTS lines, Ethernet cables (PoE or not, shielded or not, 10/100 or 10/1000), etc.

Stuck at home due to Covid lockdowns, PA2G took advantage of the isolation to learn Morse code and improve his skills as part of an international group of students working with the CWOps group's "CW Academy" program.

My CW Academy Journey

BY GERARD VAN DE GRAAF,* PA2G

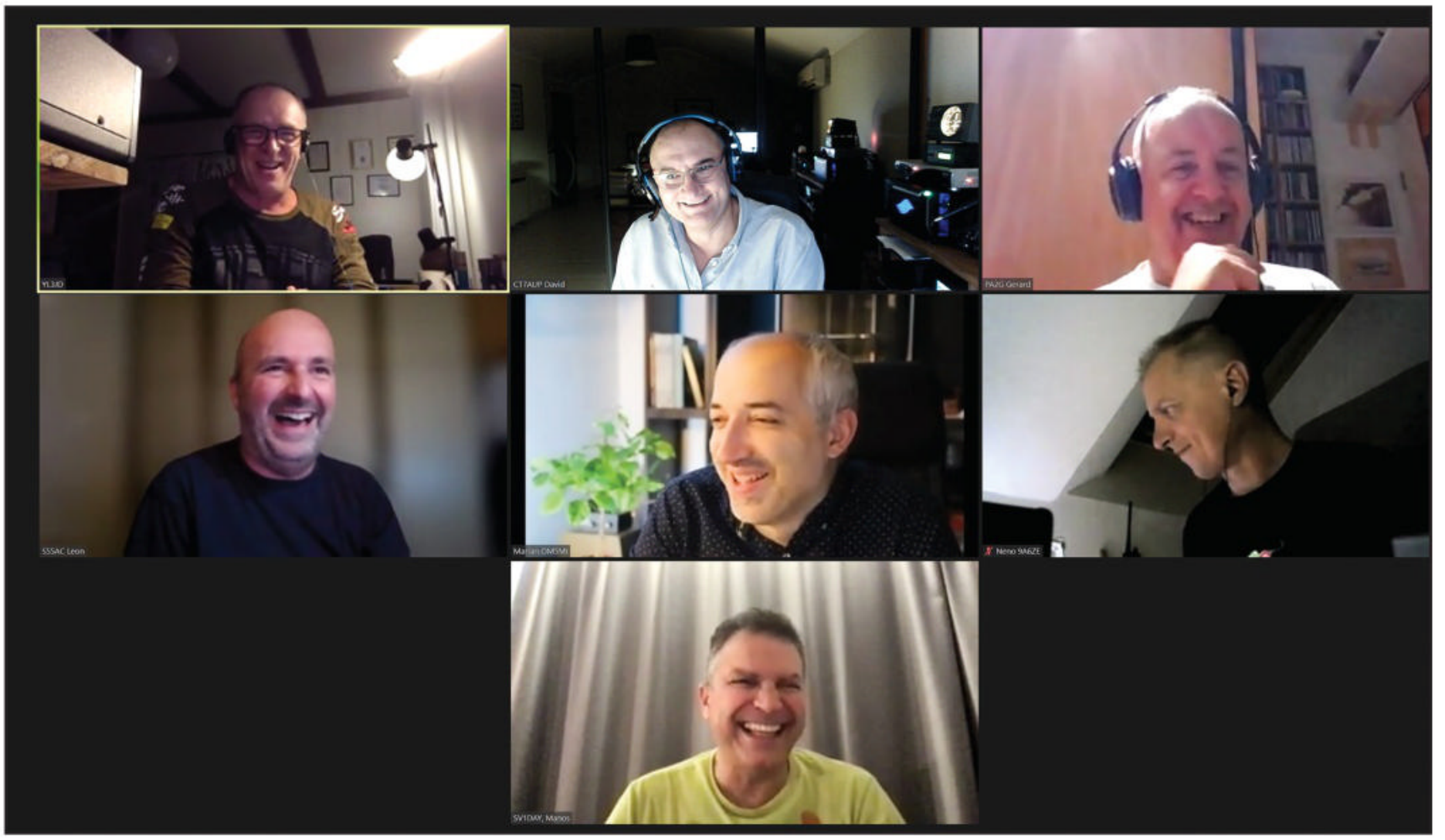
Both the Coronavirus and the radio hobby with its many facets have something to offer for everyone. There are many questions and discussions about the negative effects of Covid-19 (and unfortunately, we are seeing another rise in cases as this is written) leading to people's sense of isolation. However, this hasn`t been my personal experience, even though I've kept to the rules and, sadly, seen friends and colleagues fall sick and be hospitalized, and even worse, lost friends and family to Covid.

Pre-Covid

In October 2019, before Covid-19 broke loose, I had signed up for a CW course with Hans van der Pennen, PA3GXB, at VERON club station PI4VPO (*VERON is the Netherlands' national ham radio organization – ed.*). This was in principle for one evening a week. During the information evening, Hans explained that for those who are a little older, it could be more difficult to pick up some skills. This is an idea I'm in complete disagreement with, since what is old? I had just turned 60 years young, leading a full life at work, enjoying sports and — most importantly — time with my family and grandson. "I'm not falling for this," I thought. My brainpower has enough capacity, I just need to know how to go about learning with CW. Just how will become clear later in the story.

The course with Hans began at the speed of 5 words per minute (wpm) as is typical for most amateurs. Everything was closed during the holidays in December 2019 and by the end of February 2020, Covid-19 was on the increase and the rules became stricter. Then, in March of 2020, the weekly visits to the clubhouse for the CW training were discontinued. It was still possible to follow the training on the Rotterdamse repeater on Monday nights, and later with the SDR in Delft.

* Email: <bastiaan104@gmail.com>



CW Academy classes meet over Zoom and may have students from all over the world. (Photos courtesy of the author)

Personally, I didn't think this much of a solution. At first, I kept up with my practice but it fell away somewhat compared to time spent at the club.

Discovering CW Academy

During the 2020 summer holiday spent on a Dutch campsite, keeping a suitable distance regarding Covid-19 regulations, I read an article on the internet about CWops <https://cwops.org>. While membership in the organization requires a code speed of at least 25 wpm, the group's CW Academy is open to any ham interested in learning Morse code or improving his / her proficiency.

Having found the article interesting, I contacted Joe Fischer, AA8TA, at the end of August. Within 24 hours I had been accepted into the course, which began a week later. The same day, I received a pleasant and interesting email from Duncan Fisken, G3WZD, my "advisor" (as CWops refers to them), out of which flowed an amicable correspondence. No question went unanswered and replies came within minutes. I decided immediately to take the course for beginners starting September 2020.

For me, learning the code was complicated by the fact that I am dyslexic (for those unfamiliar with dyslexia, I recommend reading *The Gift of Dyslexia* by Ronald D. Davis to open a new world of insight; it did for me). I should say here that I had followed a course with PI4DEC in 2004. At that stage, I had difficulty in translating what I heard into readable characters in my head and moreso onto paper. I'm simply a late bloomer. So since one of my rules is not to give up, I was determined to learn it.

Returning to the subject of Duncan, G3WZD, and the start of the CWops beginners' course, there were the four of us in this group: Tony, M6AAO; Martin, EI2HIB; Joao, CT2ITA; and I. We already had the course material and other information via email. Also, a good working PC / laptop / signal key and internet connection for the Zoom sessions were required. We had to be prepared to devote 60 minutes a day to practice. That needn't be in a 1-hour block but could be broken up in to blocks of 10 minutes to half an hour, whatever our preference, so long as we practiced every day for the CWops course <https://tinyurl.com/4wmkxazf>.

We began the first lesson at a reasonably high tempo, which we had to get used to. We were reassured that by the third to fifth lesson, this would no longer be a problem. This proved to be the case. In the meantime, Joao

When he's not on the air or practicing CW online, author PA2G can often be found on the water, enjoying his other hobbies of sailing and scuba diving.

stopped with the lessons and we continued with the three of us in what became something more like private lessons. I looked forward to each lesson on a Monday and Thursday evening with great pleasure, and miraculously learned so much without even realizing it at the time. The beginners course progressed quickly and by lesson 12 or 13, we were using the signal key / paddle. Duncan was very supportive, which was a boost to my self-confidence in CW. He suggested we take part in the SST contest <www.k1usn.com/sst.html> on Friday evenings. The beginners course lasted two months in total, which flew by. The three of us all passed the course and were advised to register for the Basic course, the next higher level. I did this directly and sent an email to Kate Hutton, K6HTN, and Joe Fischer, AA8TA, asking if I could follow the Basic course with Duncan since he had read up on dyslexia and was a good motivator for me. Kate and Joe dealt with my request so that it was possible for me to take the classes with G3WZD. In the meantime. I took part in the SST on Friday evenings, repeating the lessons at least five days a week as well as making use of the LCWO (Learn CW Online) program at <https://lcwo.net> and the Morse Ninja tools at <https://morsecode.ninja>.

From Beginner to Basic

In January 2021, the Basic course began with Michal, SP1MM; Dusann (Leon), S55AC; Neno, 9A6ZE; David, CT7AUP; and I. I must say that from Day 1 of the course, there was a good-humored atmosphere with a great deal of respect for each other. We all got on very well together during the course. Some of us were downright fanatical, helping and supporting each other. G3WZD had done a good job of setting the mood. Happily, by the fourth lesson we were able to welcome another advisor, Theo, PA3HEN, so that Duncan was able to split the group into two during the Zoom lessons so that we would each receive more attention in carrying out our assignments. I saw this as an inspired move and saw everyone develop and improve. Some of us picked up speed very quickly. This meant that others were able to get even more attention if needed. When your classmates saw you working hard, the whole group would help each other. It was a very happy and productive period. Eventually, we all passed the Basic course and were again encouraged to continue. In my case, I used the interim period between courses to increase my sending speed while ensuring the contents were accurate. I worked on this very hard, getting much-needed feedback from Theo and Duncan as well as from my classmates David and Leon. At this point, we used two other programs, RufzXP <www.rufzxp.net> and QRQ <http://fkurz.net/ham/qrq.html>.

Moving Up to Intermediate Level

In April 2021, the Intermediate course started with Hanz van de Pol, YL3ID, as

instructor with the student group comprised of Leon, S55AC; David, CT7AUP; Marian, OM5MI; Simon, MW7KEE (who stopped after one lesson); and I. Some knew Hanz from the Beginners class while for me he was a new acquaintance, though it soon became clear he was an instructor with a passion to help everyone with CW and to motivate them. Again, there was a mutual respect and willingness to help each other within the group. We had a lot of fun, too, while learning from Hanz as well as from each other during the radio competitions and related activities. The work tempo was high as was the mood. Though I had some difficulty in the beginning with copying in my head, Hanz was relentless that we should repeat the exercises, to form words and sentences and make new sentences from these. Each student should repeat this with signals so you would signal new sentences for the next student, who would then repeat the process. This was a very effective learning method for the group. We continued to improve and progressed to Call, RST, time and date, which was a great experience as we looked forward to our Monday and Thursday night lessons.

Occasionally we made contact in CW up to 20 wpm during the SST contest on Friday evenings. I managed to work K1USN from home in CW on 7 MHz and 14 MHz. For this, it was due to that while I live 6 meters (20 feet) below sea level, my longwire antenna with an AT13OE is at a height of 7 meters (23 feet), so it is 1 meter above sea level.

Since the Basic course, we had a WhatsApp group which we still used. With the Intermediate group, we used WhatsApp for CW every day *no matter how busy everyone was with other things.* We had become fanatics, although I didn`t see it like this. Even after we all passed the Intermediate course, we carried on every week with our instructor, YL3JD, until the end of August, when the Advanced course would start. Most of us, myself included, went on a summer holiday. However, we all managed to log on twice a week so long as we had a fast enough internet connection, such was the enthusiasm of the group. By this time, we had welcomed Mano, SV1DAY; and Neno, 9A6ZE, into the group. A few of the group are so proficient that they may become CWops instructors at some point. Who knows? Time will tell.

Advancing to Advanced

At that point, we emailed AA8TA and K6HTN to see if that we could enroll for the Advanced course in August, since we were already represented by an international group and Hanz, YL3ID, would lead the course. The CWops were happy to honor our request. We were very grateful for this.

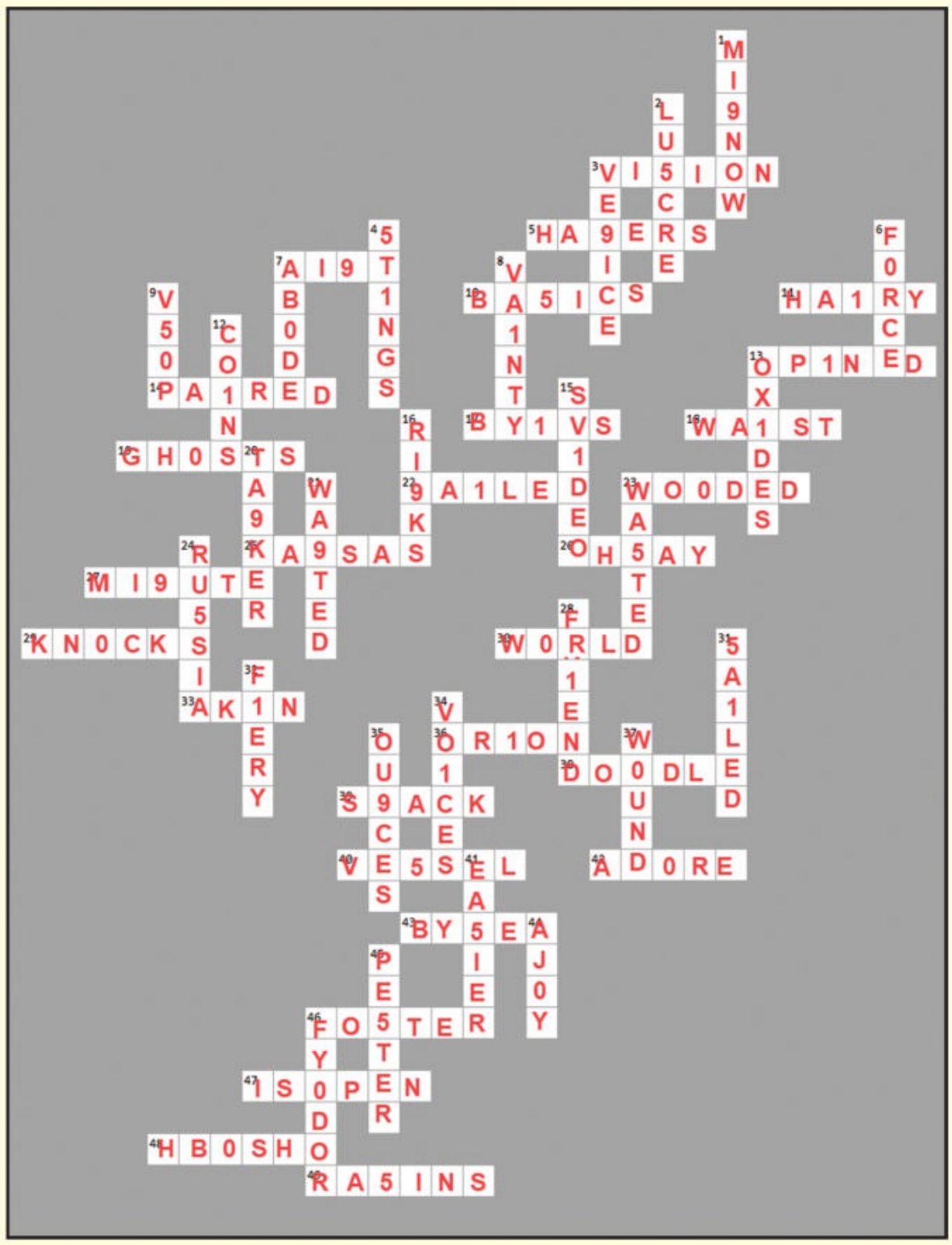
Regarding the group, we are committed to motivating each other. We help each other while having a laugh and a joke. In the end, you have to do the necessary work to learn.

It`s not very often that I look forward to following courses. In this case, I was looking forward to the Advanced course for weeks. In the meantime, we could continue with our CW learning and practice every week over Zoom. This we do with full commitment, the fanatics that we are, but with humor and enjoyment which is the key to success, I would say.

October 21, 2021 was our last lesson of the CWops Advanced course and the whole group passed with flying colors on this wonderful journey of newfound friends.

All our thanks to CWops for this. In my opinion it's a good concept which inspired us to learn. I had never expected to attain such a good tempo with my dyslexia, copying at 29 wpm and sending at 25. I need to keep pushing myself out of my comfort zone. I can still achieve a lot more with a long way still to go, but the CW foundations are there. I hope to meet more enthusiastic and driven CW-amateurs from other countries.

Answers to Crosswood Puzzle *(from page 42)*



Arcing and poor shielding can be the bane of many a ham shack, with RF interference — either to or from your gear — often being the result. Our intrepid electronics detective takes a look at tracking down and eliminating (or at least reducing) some RFI sources, and puts poor shielding to good use as well. We start with "The Case of the Noisy Power Pole."

Sherlock Investigates: Noise

BY "SHERLOCK"*

A few years ago, some terrible burping power line noise was reported to me. It was interfering with a 2-meter AM net. Yes, there is still AM activity on two. The guys in the city were using Gonset Communicators on 145.550 MHz.

Amplitude modulation communications is really susceptible to power line noise interference. You may have noticed it as you drive under power lines with your AM car radio. When and if AM broadcasters change over to digital modulation, that will no longer be noticed. But the noise can also mask out weak signals even if you are on FM. You just won't notice it. It is very bothersome on 630 meters, too (see below).

I found a noisy power pole with my AM receiver and a 4-element beam. It was about 100 yards away from the net control station. I called my old friend in the power company and he sent out a few guys to see what was causing the noise. I showed the linemen the spot and the "engineer" had brought along his Ultrasonic Arc Detector. It had a little parabolic reflector that converted 40 kHz down to a baseband of regular audio frequencies. He confirmed the arcing noise with a little more angular resolution. One lineman took a bucket truck up the side of the pole and hammered in all the ground wire staples and got up to the metal cross arm support braces. As soon as he hit the cross arm braces the noise stopped. The braces are metal and about 3 feet long and are attached to the pole with big metal screws. He pounded the screws in a little more and the noise stopped. Later, the company changed the metal braces over to wooden ones.

The high-voltage field surrounding the power lines was inducing enough voltage into the metal bracket to arc to the bolts. The old steel brackets were just like a 2-meter half-wave antenna.

Photo A. Power lines and their support structures can often be the source of interference. In the case that Sherlock investigated, the noise resulted from arcing between a metal crossbrace and loose bolts. (Photos by the author)

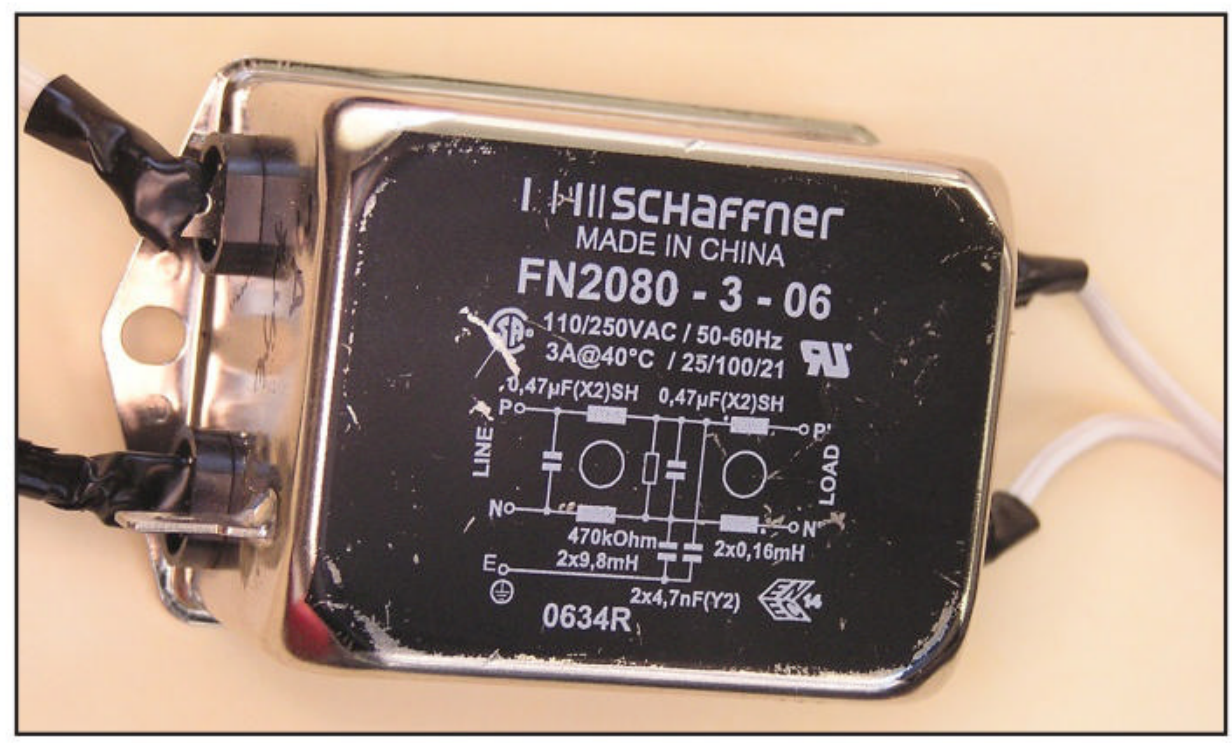


Photo B. These Schaffner power line filters are good for reducing 630-meter noise from low-current devices.

** c/o CQ magazine*

Photo C. Higher current devices, such as power supplies, need higher-rated filters, such as this 6-amp Rockwell Automation 2090.

Photo E. A musical greeting card can be a budget RF detector. The electronics are poorly shielded and will turn on in the presence of an RF field.

Photo D. You can also build your own filter, as Sherlock did for his battery chargers with these two big Sprague filters. See text for details and cautions when building your own.

You can see a video of cross arm installation at <https://tinyurl.com/59ftyh48>. Years before, we had an insulator crack on an 8,000-volt line. They found it the same way and replaced it.

Recently, I was talking to a couple of senior power company linemen who each had their own bucket truck. They were interested in ham radio, so I told them this story. When I got to the "Ultrasonic Arc Detector," they had blank stares on their faces. They had no idea what it was or that our power company owns one that they could use on their job. I told them they could buy an MFJ 5008 <https://tinyurl.com/3f3eweyk> for their truck.

You can make your own Ultrasonic Arc Detector. See <https://tinyurl.com/4frurtt9>. The commercial power companies can buy all kinds of detectors, including UHF Yagi types. You can see some examples at <https://tinyurl.com/mjrhubk7>.

The Noise "Down There" (on 630 Meters)

Tracking 630-meter noise is really hard. I have a little AM transistor radio that helps me to track down offending radiators. I also use my BC-453 that has an "S" meter. So to start off in a good "shotgunning" manner, I bought a dozen Schaffner FN2080-3-06 (3A) power line filters (from eBay; *Photo B*) for my low-current items and put them on all the worst radiators around the house. I also have a 6A filter, a Rockwell Automation 2090 (*Photo C*) for bigger power supplies that needed it. Then I built an RFI filter for my battery chargers using two big Sprague 10JX34, 10A, coaxial feed filters (*Photo D*).

I don't mind noisy things that I can switch off or unplug, I have them tagged. (My XYL's new Speed Queen washing machine has gobs of digital noise coming out of it, even when it is off. I contacted the factory and told them the "Off" switch doesn't turn the machine OFF! They said I needed to buy a 15A line filter, that has no specs.) That helped, but there seems to still be noise out there coming through my antenna.

I installed a battery backup switch-over system for my K3s LF rig and waited. Yesterday, something blew a utilities line breaker and the whole neighborhood lost power. Happy day for me! My K3s was finally operating in an area where there was no local power. The noise was still about the same, but now I have a noise baseline and know that most of my house noise has been eliminated. One of the worst offenders in the house was a wallwart converter that had more noise on 630 meters when the device it was powering was off than when it was on. That one went in the trash.

Use caution when hooking up line filters. There must be a fuse on the hot line side (black wire) that matches the cur-

Photo F. A small HT can produce a big enough RF field at VHF/UHF frequencies to turn on a singing greeting card.

rent capability of the filter and you are going to have 110-volt AC terminals exposed that will need insulating. If you have an Earth ground (green wire) line connection for the filter case, try it first and then try using no neutral connection to see which is best at noise reduction.

Read the *ARRL Handbook* EMI section, Chapters 9 and 28, for exact methods of connection.

The Case of the Helpful Interference: A Simple RF Radiation Detector

You can get a simple RF radiation detector right in the greeting card aisle at your supermarket.

The circuitry inside those "musical" greeting cards (*Photo E*) is poorly shielded. They can be turned on with a small handheld (*Photo F*). If you put your HT on some unused frequency (don't use 146.52, 446.000, or any repeater frequencies) and key the transmitter, you will find the frequency at which your card responds.

My "dancing dog" card is most sensitive at 440 MHz and above. I even used it to check the door leakage on my microwave oven (don't put it inside). When it detects RF, the card starts playing music and the LEDs start flashing. Happy songs. Some cards may not start because they don't respond to your frequency or because you have fried them. If you fry them, you buy them.

You can even use one of these cards to keep you in compliance with the FCC's new RF exposure rules [§1.1307 (b)(3)(i)(C) Table 1] while operating QRP pedestrian mobile. After calibration, all you have to do is hang this around your neck while operating and if it goes off you would just have to lower your power. Plus, you can buy it for a song … just $4.95 in most supermarket card sections.

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

Inexpensive High Speed Pulse Generators

Roughly 20 years ago, we did a column for those starting to investigate high-speed digital logic, and this month I would like to revisit the simple technique we described then. This also fits in with our description of low-cost simple equipment that can be built by the home brewer without a lot of effort (or cost) and while it doesn't produce precision laboratory results, it may still be what you need, at least for a start.

With the experimental work now going on at higher and higher frequencies by some forward-looking amateurs, it occurred to us that there is really no inexpensive way for such experimenters to generate the RF and / or nanosecond rise and fall times needed. Any really high GHz+ frequency generator seems to cost at least a dollar a MHz which works out to be well beyond the casual experimenter's budget. As a result, we originally started to address this by publishing some unique ways we thought of.

You may remember the column we did "way back" then about shock-exciting a microwave cavity with a common doorbell or buzzer to produce a few microwatts. Well, it worked back then and still does. *Figure 1* shows how to do this. Of course, you will need some way to measure what you produce but borrowing (to calibrate something) is usually a whole lot easier (and less expensive) than purchasing. And, since the technique is so unorthodox, you may actually get someone with some real knowledge interested enough to try to help you further. The reason this technique works, by the way, is because the rise and fall times of the opening and closing doorbell contact is practically instantaneous and the harmonics of this rise and fall time cause the cavity to resonate at its natural frequency. If you are a true, dyed-in-the-wool experimenter you can even try to fabricate your own cavity from a coffee or soup can, but determining the actual frequency that results to a high degree is another story. Keep in mind, however, that the accuracy and stability of this method is primarily based on the quality (ruggedness) of the cavity used and the care in building it but, considering the cost, it is hard to beat.

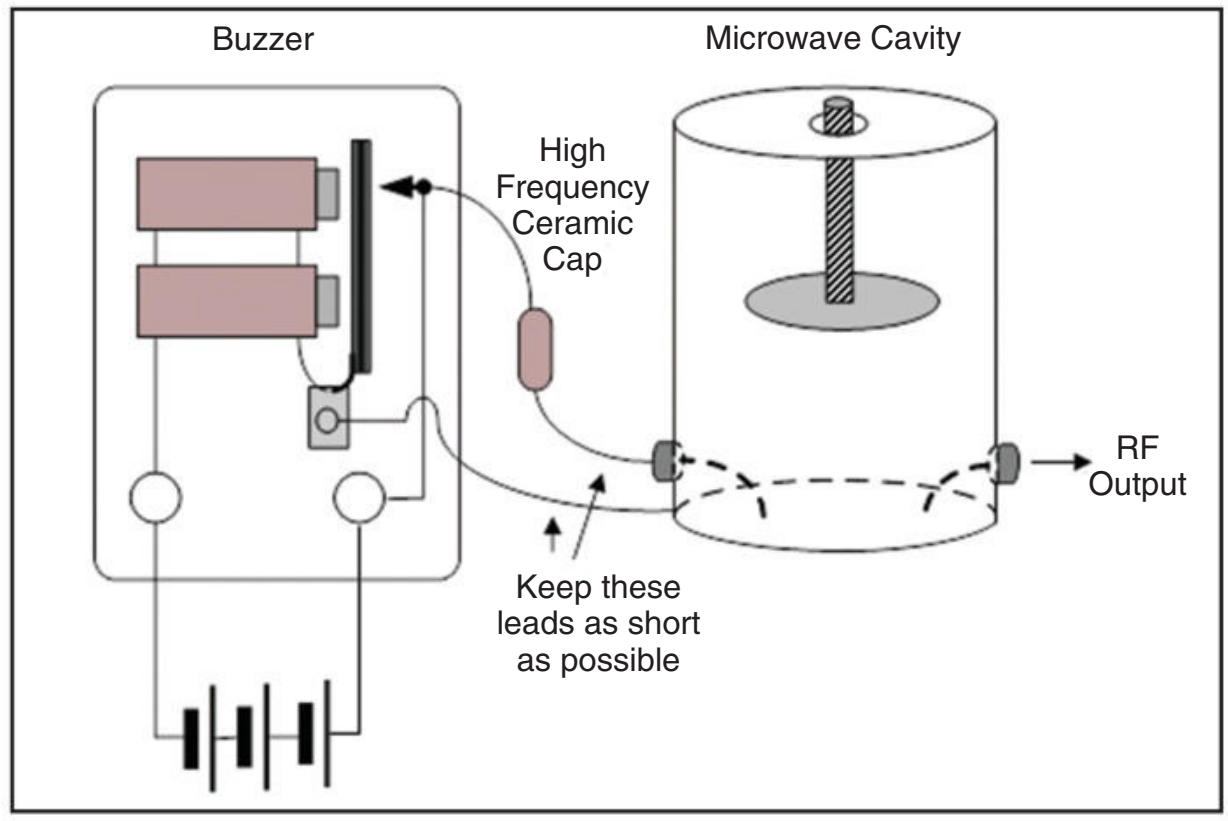


Figure 1. Simple microwave pulse generator

We can use a similar technique to produce fast rise-time pulses. *Figure 2* is an extremely crude pulse generator with a pulse-to-pulse stability that is not great but with a rise-time that is hard to beat, even with the latest devices. Instead of the doorbell buzzer, we have chosen a TTL-compatible reed relay (with an internal back EMF diode) due to the fact that the contacts are enclosed and somewhat more stable. Operation is quite simple: When the contact is open, the output voltage is zero; when it closes, full output is available. You will note that this system is designed to operate in a 50-ohm system since the only type of interconnection for fast rise-time pulses is a 50-ohm matched transmission line. Synchronization with the relay is also not stable due to the delay (on a microsecond basis) of the relay coil as well as the diode contribution.

A nine-volt battery is used for power since connecting a 50-ohm TTL load will result in half the voltage, or about 4.5 volts, which is just about right for TTL signals. Also note that each time the relay closes, 90 milliamperes will flow into the load so be sure to use a heavy-duty 9-volt battery or six C or D cells in series. If portability is not important, a DC power supply would be an even better choice. You may have to experiment with different reed relays to achieve the best overall response without excessive contact bounce. You can even use a TTL driver for the relay if you have one available. Note that conventional relays may bounce a few times, giving you multiple pulses, but if you can find one with mercury-whetted contacts, any bounce will at least be less and overall operation will be better, but that's what experimenting is all about. Whatever type of relay you do wind up using, be sure to keep all output signal leads as short as possible since any stray capacitance anywhere in the relay output portion of the circuit will affect the rise-time.

A possible driver for the reed-relay could be an LM 555 timer connected as shown in *Figure 3*. You will have to "play" with the values to achieve the pulse rate and width desired, but the circuit is quite simple and the values given are a good starting point. Keep in mind that the narrower the pulse, the less the average current from the power supply will be and the longer the battery will last. In addition, the slower the pulse rate, the longer the relay will last. For example, if the reed relay were rated for 10 million operations (a typical low-end reed specification), and the pulse rate set for only 1,000 pps, the relay would

*c/o CQ magazine

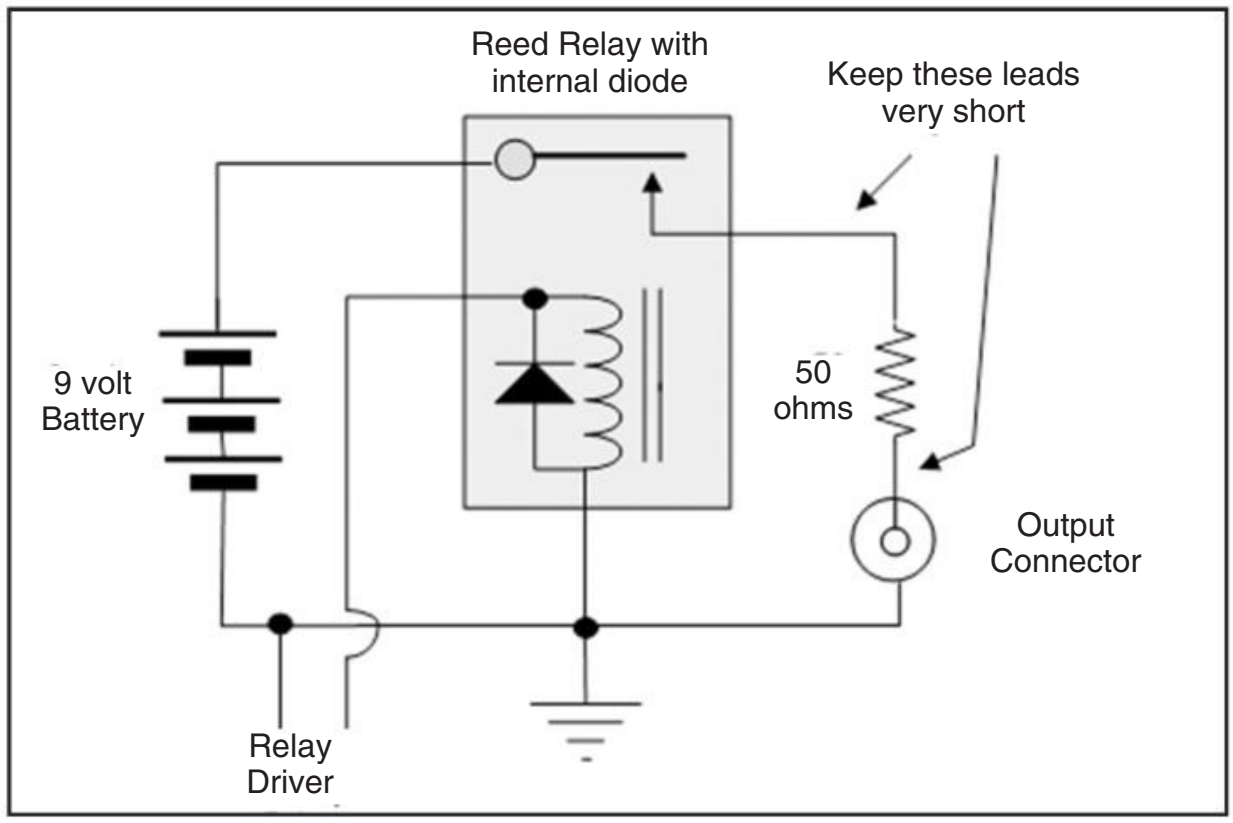


Figure 2. Fast rise-time pulse generator circuit

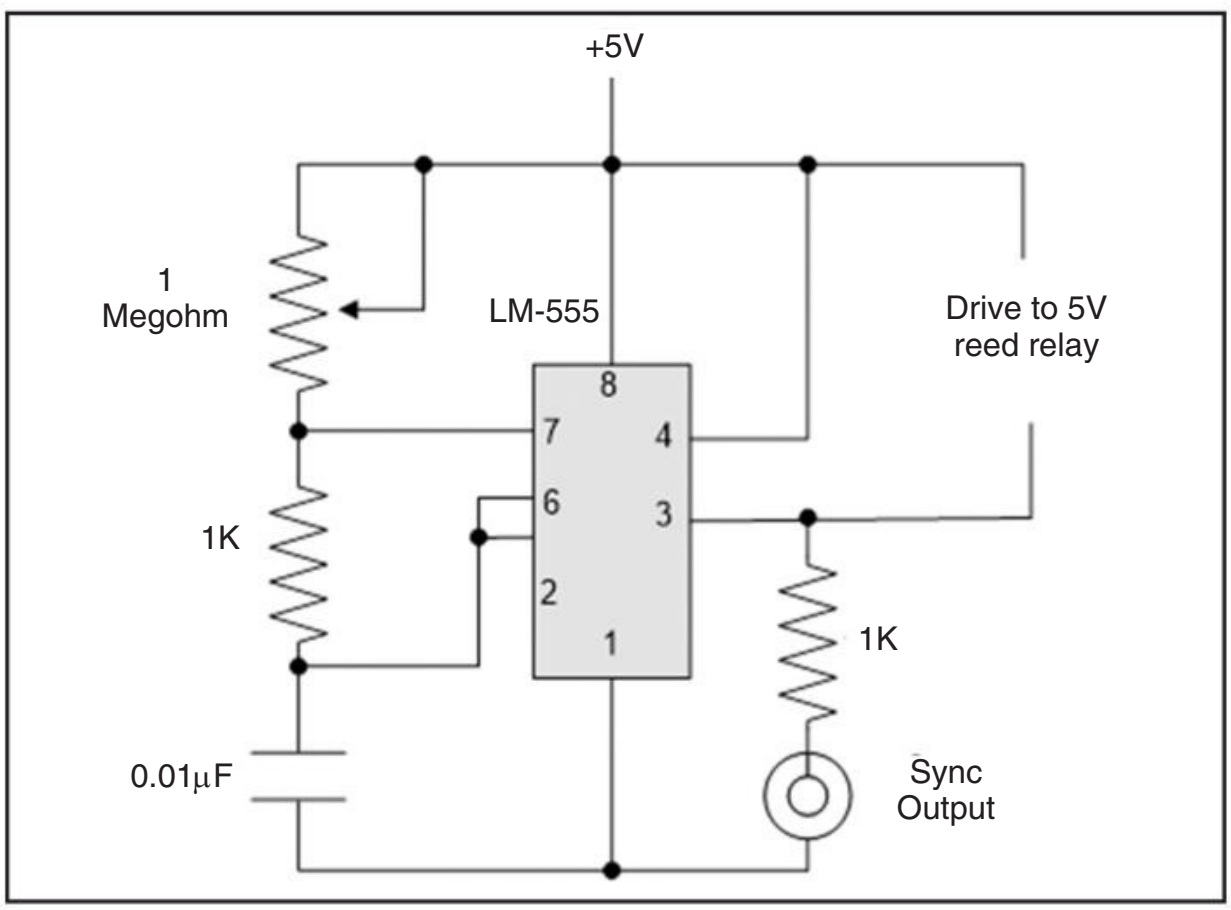


Figure 3. Simple reed relay driver circuit

only theoretically last for a few hours. This is a calculated number, however, and what you actually get may be quite different.

By the way, the circuit also provides a "sync" output that could be used for triggering an oscilloscope, but the stability of the alignment of the rise-time of the sync vs. the rise-time of the actual output pulse may not be too stable due to the delay (on a microsecond basis) of the relay coil as previously mentioned.

When using this circuit, always be certain to use high-quality coax designed for microwave use and be sure to terminate the end in 50 ohms. Also keep in mind that the scope and probes you use both have upper frequency limits, so you may measure rise-times that are slower that what you actually have. For the critics in our midst, before you start to complain, don't lose sight of the performance vs. cost of this generator. I don't think we have exceeded a couple of dollars for everything. At any rate, you get what you pay for, but at least you will have a crude way to produce fast rise-time pulses (even if you have some bounce). If you can come up with a simpler and less expensive way, please let me know and we will be glad to share it with all. *– 73, Irwin, WA2NDM*

THE LISTENING POST

BY GERRY DEXTER

India Will Remain On The Air

Plus, 2022 Will Be the Last Year for the World Radio TV Handbook

Radio Saturno is the new Brazilian on 6150 kHz from Belo Horizante.

~ India's Information and Broadcasting Minister told Parliament back in December that India is not planning to close any of its regional outlets. So, I guess that information we had earlier was way wrong!

~ As the old saying goes, miracles never cease, but could this be one? There are rumors about activity in Papua New Guinea. They claim that Radio Madang and Radio New Ireland have been treated to new studios and offices but so far there's been no mention of any shortwave activity. At this point we are left to hope and to keep checking 3260 kHz and 3905 kHz respectively during those first-light hours around dawn.

~ Shortwave from Brazil has been largely inactive, though it's hard to be sure of the comings and goings, especially with the miserable propagation conditions on 60 meters recently. But some life has emerged on 49 meters, specifically on 6150 kHz, in the form of a Radio Saturno in Belo Horizonte which also has an FM outlet (92.3 MHz) 6150 kHz was one of the frequencies once used by Radio Record in Sao Paulo.

~ Although not often reported, U.S. shortwave station WRNO-New Orleans on 7505 kHz has apparently increased its schedule, continuing past 0500 UTC, perhaps remaining on as late as 1000 UTC.

~ What's going on at Radio Cairo? I've seen indications that they are not being heard. Maybe we should be checking 9900 kHz Abis for the Egyptian broadcaster around 2200. Well ... yup! Cairo has reappeared with a stronger, but sometimes still distorted, signal. They seem to have been silent for some months until now.

~ Late and extremely disturbing word from Denmark. 2022 will be the last edition of the World Radio TV Handbook (WRTH). The WRTH people gave no reason for having drawn the dagger, just that the decision took a lot of thought. I will miss this trusty reference!

Listener Logs

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

Here are this month's logs. All times are in UTC. If no language is mentioned, English is assumed.

ALGERIA—Radio Algerienne on 12060 via France at 1901 with a man reading the news, remote reports in Arabic, and into recitations at 1914. (D'Angelo, PA)

ASCENSION ISLAND—BBC-North Atlantic Relay on 6135 at 0524 with English sound bites, then a man and woman speaking in Hausa; on 6135 at 0542 with an interview on the Sudan coup; on 11810 at 2033 on a water shortage in Uruguay; on 15400 at 1752 with time pips at 1800. (Taylor, WI) On 2022 on the Taliban ruling Afghanistan. (Brossell, WI) On 15400 with time pips, station ID at 1800 and news. (D'Angelo, PA) On 17780 at 1706 with news, station ID, "Focus on Africa" program. (Taylor, WI)

AUSTRALIA—Reach Beyond on 11900 via Kununurra at 1407 with non-stop English religious talk, station ID at 1432 then more religion. (D'Angelo, PA) On 15410 at 2226 with English station ID saying the program would start shortly and into Japanese they went. (Sellers, BC)

AUSTRIA— Radio Austria Intl on 6155 via Moosbrunn at 0611 with woman speaking in German and a program about Bach. (D'Angelo, PA)

Adventist World Radio on 11955 at 1603 with flutes, then woman speaking in Urdu. (D'Angelo, PA)

BRAZIL—(*All in Portuguese –GLD*)

Radio Clube do Para via Belem on 4885 at 0212 with pop music program, nice station ID at 0231. (D'Angelo, PA) At 0857 with Brazilian country music. (Sellers, BC)

Voz Missionaria via Florinapolis on 9665 with a revival-like meeting at 2331. (Brossell, WI)

Radio Clube Central via Goiania on 11815 with talks at 2345. (Brossell, WI)

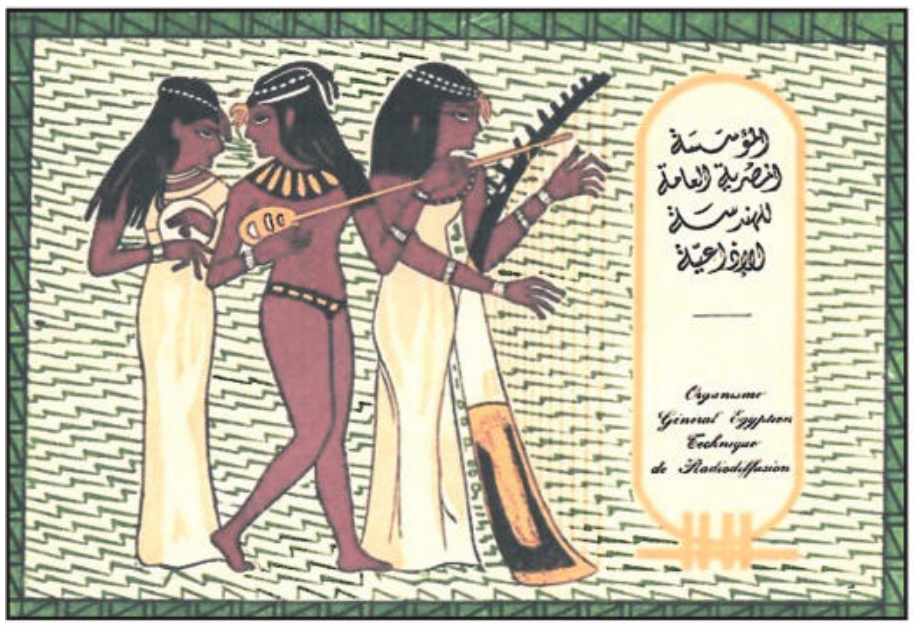
CANADA—CFVP via Calgary on 6030 at 1716 with ads, station ID, and a comedian. (Sellers, BC)

Bible Voice on 6240 via Uzbekistan at 1221 in Hindi with woman briefly, then man giving a sermon; on 11790 via Nauen at 1634 in Somali, then into HOA music. (Taylor, WI) On 11900 via Nauen at 1450-1500* with English preacher, then at 1458 with closing announcements, station ID, contact info, and off. (D'Angelo, PA) On 15310 via Nauen at 1646 in Amharic. (Brossell, WI) At 1725 with HOA pop music, talks, and English station ID. (Rich, KB2DMD)

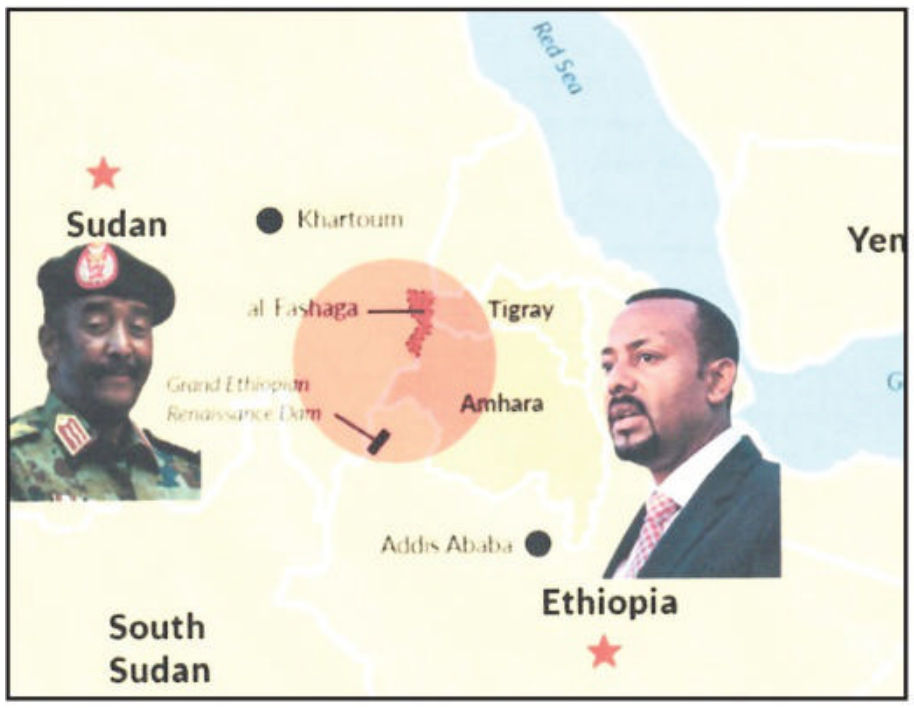
CHINA—China Radio International on 9470 via Xi'an at 0003 with man reading the news in Mongolian, followed by a long talk by another man. (D'Angelo, PA) On 11640 via Madagascar with world news at 2102, //13630. (Sellers, BC) On 13700 via Urumqi in Amoy at 1824; on 15335 via Shijiazhuang in Russian at 1222. (Brossell, WI)

Voice of Jinling on 6200 via Nanjing in Mandarin at 1228, with a sudden sign-on with a man and woman, then the same man with contemporary Chinese music. (Taylor, WI)

**c/o CQ magazine*



A Radio Cairo QSL from around 1977.



Opposition broadcaster Radio Erena displays its area of concern.

Yunnan Radio possibly via Kunming at 1316 with a man speaking in Mandarin. (Taylor, WI)

PBS Xizang on 4905 via Tibet in Tibetan at 1105. (Brossell, WI) On 7255 via Baiding, Tibet, at 1040 with two men speaking in Tibetan. (Taylor, WI)

CUBA—Radio Havana Cuba on 15140 via Bauta at 2003 with a woman reading the news in English. (Sellers, BC)

Radio Progresso on 4765 via Bejucal in Spanish at 0142. (Brossell, WI)

ENGLAND—BBC on 7445 via Madagascar at 1839 with an interview about child care in Africa; on 7265 also via Madagascar; on 11825 via Philippines with news at 2301. (Sellers, BC) On 9750 via Vatican at 1801 with long French talk, two vocals before closing at 1830. (D'Angelo, PA) On 11725 via Oman Relay at 1449 with a man with an interview in Dari; on 15420 possibly via Madagascar at 1654 with an interview in Kinyarwanda, off in mid-sentence at 1659. (Taylor, WI)

ESWANTINI (Swaziland)—TWR Africa on 15105 at 1931 with man speaking in Lingala, contact information mentioning Radio NNB (Nsango Na Bomoi), targeting Congo, later the "Through the Bible" program in Lingala. (Sellers, BC)

FRANCE—Radio France Intl. on 5960 at 2134 in French with apparent news, closed at 2200; on 6040 at 0511-0559* with man and woman speaking in French, also a probable news-type program. (D'Angelo, PA)

Mini-Transat La Boulangere on 5960 at 1528-1558* with woman with non-stop apparent yacht race information, similar to the 2019 event. (D'Angelo, PA)

GERMANY—Deutsche Welle on 11830 via France at 1627 in Amharic and male and female announcers, also 15275; on 15195 with DW IS still repeating at 1612, Hausa listed here until 1530. (Taylor, WI) 15215 via France at 1816 in Hausa. (Brossell, WI) On 17800 via France, man and woman speaking in Hausa at 1341 with talks and music selections. (D'Angelo, PA)

DW Bundesliga on 15350 via France with football play-by-play in Hausa at 1335, this is Saturday only. (Brossell, WI)

GREECE—Voice of Greece on 9420 via Avlis in Greek with vocals at 2227. (D'Angelo, PA)

GUAM—Adventist World Radio on 11620 in Burmese at 1501 with distinctive Burmese music and into woman talking; on 12040 via Agat at 2219 in Sunda, woman and indigenous music, AWR theme at 2230 and open in Javanese. (Taylor, WI)

KTWR on 9900 via Medorn in Kazakh at 1440 with light instrumental. (Taylor, WI)

INDIA—All India Radio on 11560 via Bengaluru at 1404-1429* with nice music, talk by a woman and closing announcements. (D'Angelo, PA)

TWR India on 9665 via Armenia at 1446 with a preacher in English. (Taylor, WI)

JAPAN—Radio Japan on 11630 via Yamata at 2204 with news in Japanese. (Sellers, BC) On 11815 via Yamata in Japanese at 2154. (Brossell, WI)

Radio Nikkei 1 on 6115 with woman and Japanese pop music at 0830. (Barton, AZ)

MADAGASCAR—African Pathways Radio on 9785 via Mahaganga at in Portuguese at 2155 with hymn, male with closing sequence; on 11965 at 2040 with "Ask the Doctor" program. (Sellers, BC)

Radio Feda / World Christian B on 13670 via Mahajanga at 1930 with woman and Middle Eastern pop music until female and closedown. (Barton, AZ)

MALI—RTV Mali on 5995 via Bamako at 2217 with man giving a political-sounding speech. (Sellers, BC)

NEW ZEALAND—RNZI Pacific on 7345 on Covid-19 there. (Brossell, WI) On 15720 via Rangitaiki at 2307 with news, program preview, and weather. (Sellers, BC)

NIGERIA—Voice of Nigeria on 7255 via Abuja at 0612 with man reading news in Hausa, several transmission breaks, and with poor audio. (D'Angelo, PA) On 11770 via Abuja at 1851 with man and woman talking about Nigeria, and ending English at 1857, talking drums at 1900 then into Fulfulde. (Sellers, BC)

NORTH KOREA—Voice of Korea on 15345 in French at 1638. (Brossell, WI)

KCBS on 15180 via Kujang at 1203 in Korean with patriotic ballads. (Rich, KB2DMD, PA)

OPPOSITION—Afghanistan Intl. on 7600 via Uzbekistan at 1342 with man speaking in Pashto, woman, then man with mentions of the Taliban. (Taylor, WI)

Radio Ndarason Intl. (via Ascension to Chad) on 9635 via Woofferton at 1837 ending an indigenous song with a long talk in Kanuri. (Taylor, WI) On 12050 at 2043 with indigenous music. (Sellers, BC)

Sound of Hope (via Taiwan to China), On 11990 in Mandarin at 1218. (Brossell, WI)

Dimtse Radio Erena (via Bulgaria to Eritrea) on 9720 at 1713 in Tigray, man and woman alternating. (Taylor, WI) At 1743-1800* with man with long talk in Tigrinya, instrumental, woman with music in to close. On 15160 at 1511 with woman and man, HOA vocals, off at 1558. (D'Angelo, PA)

Tigray Media House (via France to Eritrea) on 15160 at 1509 with alternating interviews in Tigrinya, short station ID segments at 1533, and 1546 with HOA music. (Taylor, WI)

Dimtse Woyane Tigray (via France to Eritrea) on 15160 at 1504 in Tigray, still going at 1545. (Taylor, WI)

Radiyyoni Dirree Shahggar (via France to Eritrea), on 15330 at 1622 with man speaking in Oromo, instrumental segments, other announcers to closing flutes. (D'Angelo, PA)

Radio Manara Intl. (via France to Nigeria) on 15285 at 1608 in Hausa with man speaking at length, still going at 1626. (Taylor, WI)

North Korea Reform Radio (via Uzbekistan to North Korea) on 7590 at 1404 in Korean, male and female announcers. (Taylor, WI)

Nippon No Kaze (via Taiwan to North Korea) on 7295 at 1350 in Korean with man and contemporary ballad. (Taylor, WI)

Furusato No Kaze (via Taiwan to North Korea) on 7295 at 1332, also on 9560 at 1435 in Japanese, woman with long talk; on 9705 at 1347. (Taylor, WI) On 9940 at 1305 in Korean. (Brossell, WI)

National Unity Radio (South Korea to North) on 6115 at 1249 in Korean with man giving interview. (Taylor, WI)

Radio Tamazuj (via France to Sudan) on 15150 at 1502 man speaking in Sudanese Arabic and local music. (Taylor, WI) On 15550 at 1532 in Sudanese Arabic with various talk features, no station IDs, but seemed to be clearing the frequency for Radio Dabanga at top of the hour. (D'Angelo, PA)

Radio Dabanga (via France to Sudan) on 11640 via Bulgaria at 1617 with woman speaking to past 1625; on 15550 at 1559 with several IDs, jingle IDs then news in Sudanese Arabic. (D'Angelo, PA)

Radyo Denge Welat (via France to Turkey) on 9525 in Kurdish at 2042-2100* with non-stop Kurdish vocals to close. (D'Angelo, PA)

Republic of Yemen Radio (Saudi Arabia to Yemen) on 11860 at 2303 in Arabic. (Brossell, WI)

PHILIPPINES—Radio Pilipinas on 12120 via Tinang in Filipino with some English, a woman on something political; on 9925 with a het, but was listenable on sideband. (Sellers, BC)

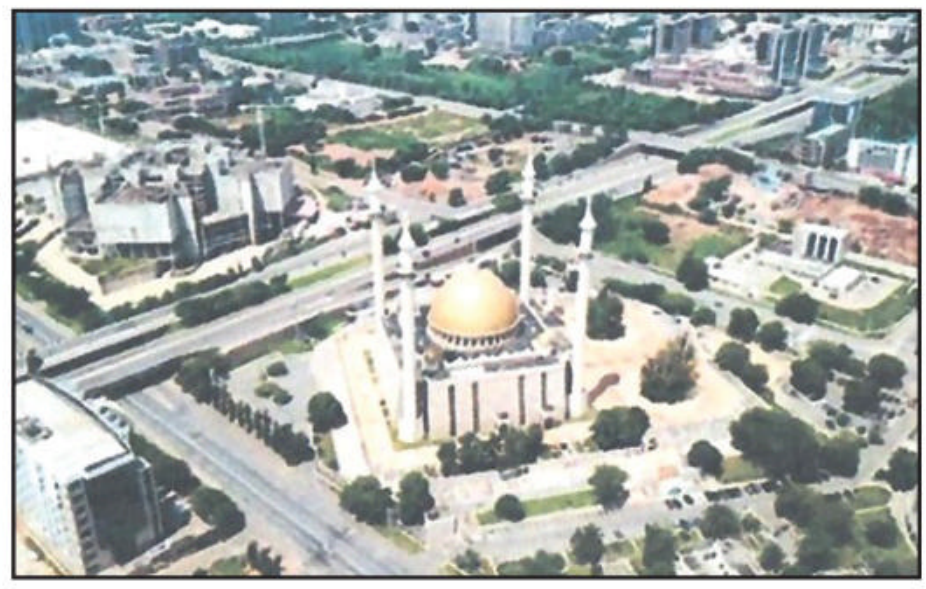
Far East Broadcasting on 9405 via Iba at 2235 with woman speaking in Mandarin and Christian music. (Sellers, BC) On 9540 via Uzbekistan in Hindi W with Southeast Asian music then talks.

Radio Liangyou 1 on 9345 via Iba in Mandarin at 1427 with man with possible sermon, into Chinese-style ballad program; on 9405 via Bocaue at 2230 in Mandarin with sign on by woman. (Taylor, WI)

PIRATES—Lincolnshire Poacher on 6930 upper sideband (u) at 0148 for about a minute before fading out. Costal Rock Radio on 6925 at 0051 with woman giving station ID and a "guess what" format. Two Dog Radio on 6930 at 0158 with rock, pop, station ID, off after wishing listeners a goodnight. (Taylor, WI)

Included in past LPs: Outhouse Radio, X-FM, Two Dog Radio, Ballsmacker Radio, WDOG, Wolverine Radio.

Well-known DXer and broadcaster Dr. Adrian Peterson (AWR) provided this shot of the Voice of America Pinheira (Sao Tome) relay.



Nigeria's capital city Abuja, said to be the country's most beautiful city (and home to the Voice of Nigeria).

Here's one of the DPRK's announcers apparently reading the news. She's no Carole Simpson!

ROMANIA—RRI on 6170 via Tiganesti with English, "Week in Review" program to 2157 close. (D'Angelo, PA) On 9620 with news in English at 2305. (Sellers. BC)

SAO TOME—VOA-Pinheira Relay on 6020 at 0528 in Hausa with two program feeds at once, both cut off at 0530 close. (Taylor, WI) On 11850 open at 2030 with station ID, IS, and into Hausa, off at 2100. (D'Angelo, PA)

SAUDI ARABIA—Saudi Radio on 9675-Riyadh at 2050 with man reading the apparent news, off suddenly just before 2100. (Sellers, BC)

Al Azm Radio on 11745 via Jeddah at 1450 with man giving an interview in Arabic. (Taylor, WI)

SINGAPORE—BBC-Far East Relay on 7485 via Kranji at 1710 with an interview. (Sellers, BC) On 12065 at 1305 with a sports report. (Brossell, WI)

SOUTH KOREA—KBS World Radio on 9630 at 1545 with pops to 1600 close. (Barton, AZ) On 9820 via Woofferton at 1848 with woman speaking in Russian, pop music, off at 1859 close. (D'Angelo, PA)

SUDAN—Republic of Sudan Radio on 7205 via Al Aitahab at 0033 with man speaking in Arabic to 0045. (Taylor, WI) On 15575 at 1432 with talks in Korean. (Brossell, WI)

TAIWAN—Radio Taiwan Intl. on 9555 in Mandarin at 1254. (Brossell, WI)

THAILAND—Radio Thailand World Servic on 15590 via Ban Dung at 0003 with male and female announcers, station ID, and commercials, gone at 0029 when their antenna changed. (D'Angelo, PA) At 0025 with "Thai Radio" station ID. (Brossell, WI)

TURKEY—Voice of Turkey on 9660 via Emirler at 1807 with man and woman reading the news in Turkish and talk features. (D'Angelo, PA)

UNITED STATES—VOA on 6170 via Ascension at 0514 with man speaking in Hausa. (D'Angelo, PA) On 11785 via the Philippine Relay in Mandarin at 1314. (Brossell, WI) On 15250 via Philippines at 1212 with woman speaking in Chinese. (Rich, KB2DMD, PA)

Radio Liberty (RFE/RL) on 15310 via Woofferton at 1418 in Uzbek. (Brossell, WI)

Adventist World Radio on 11985 via Madagascar with man preaching in Nigerian Pidgin at 2106. (Sellers, BC) On 15255 via Tajikistan in Nepali at 1324; on 15440 in Urdu at 1411 via Austria then into Tigrinya at 1651. (Brossell, WI)

Overcomer Ministry on 9400 via Bulgaria at 1705 with youknowho. (Sellers, BC)

WJHR on 15555 via Milton at 1905 with preacher, choir, and station ID including email. (Sellers, BC)

VIETNAM—Voice of Vietnam on 11885 via Son Tay coming on at 2130 with man and woman speaking in English with distorted audio. I made various checks from 2000 through German, French, and Spanish half hour segments, but all had distortion. (Sellers, BC)

Recuerdos (Who Goes There)

~ On 9670 at 1754 with preacher in English, checked back at 1801 still going with a Christian program. (Sellers, BC)

As Time Goes By

Voice of the Revolutionary Party for Reunification, on 4115 kHz at 1036 UTC in Korean from listed Haeju, North Korea on September 13, 1975.

Thanks for Your Logs

Thanks to Rich Parker, KB2DMD, Pennsburg, PA; Harold Sellers, Vernon, BC; Rich D'Angelo, Wyomissing, PA; Mark Taylor, Madison, WI; William Hassig, Mt. Pleasant, IL; Rick Barton, El Mirage, AZ; and Bob Brossell, Pewaukee, WI.

Until next month be sure to ... Celebrate Shortwave!

LEARNING CURVE— EMERGENCY COMMUNICATIONS

BY RON OCHU, KOØZ

Global Ambassadors

As I compose my thoughts for this February issue of *CQ*, it is currently December 11, 2021. Many magazine columnists compose articles to be published two months later. As I sit down before my computer keyboard, the greater St. Louis area is just beginning to recover from an evening tornado outbreak on Friday, December 10th. Early estimates indicate one or more tornadoes had an EF3 strength. Early indications are that one elderly woman in a rural section of St. Charles County, Missouri died from storm-related injuries. Across the Mississippi River, near Edwardsville, Illinois the same thunderstorm squall line which created the deadly tornado in St. Charles County collapsed a huge wall and ripped off a roof at an Amazon fulfillment center, resulting in six known fatalities. First responders and excavators are meticulously removing debris. Hopefully, there will be no further fatalities, but as I compose this article, news is still coming in as responders continue their necessary, helpful work.

Dicey Business

Yes, Friday night was dicey. Tornadoes shrouded in darkness makes them virtually impossible to spot. Sometimes, lightning flashes and power line flashes reveal their nocturnal presence. Ham radio nets were busy getting the weather word out and routing weather-related reports to local emergency management agencies. Sitting in the comfort and safety of my basement, I listened to local hams pass weather-related information back to net control. I was lucky, tornadic weather missed my QTH (location) by 10 miles. Later that night, fellow Americans in Arkansas, Tennessee, and Kentucky experienced the same storm system with devasting damage. Luckily, I had nothing to report this time, but it did bring back memories.

On December 1, 2019, Illinois counties Macoupin and Montgomery experienced three tornado storm tracks, one of which caused severe damage to Taylorville (*Photos A* and *B*). Fortunately, both counties have an excellent Skywarn program and Taylorville residents had a significant "heads-up" on the approaching storm. We were lucky. No lives were lost despite considerable property damage. December and Mother Nature can be very challenging for Midwest residents.

Mother Nature can, and will, throw "curve balls" at us when we least expect it. As ham radio operators, we make ourselves and our stations available to assist our local communities. We are ambassadors of public service and good will. But our responsibility doesn't stop there. I've given some

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

Photo A. Extensive damage along a Taylorville, Illinois, street from a December 1, 2019 EF3 tornado. (Photos by the author, except as noted)

Photo B. One of the many Taylorville homes destroyed by the EF3 tornado.

examples of inter- and intra-state public service / weather emergency communications. However, our radio signals can span the globe. Global communications offer us a unique opportunity to aid our fellow brothers and sisters.

Friendship

In 1985, I was a young teacher starting a family and struggling to make ends meet. I worked a second job as a custodian at a local hospital. One of the areas I kept clean was accounting. While doing my duties, I got to know one of the accountants. Tony, a naturalized citizen, was born and raised in Mexico City. As it turns out, Tony is trilingual. He speaks Spanish, English, and French. I studied French at university and Tony and I would chat in French as I went about dusting and emptying trash cans in the office. I told Tony about my ham radio hobby and whenever I received a QSL (contact confirmation) card, I would show Tony. We became good friends. So, what does this have to with ham radio?

Earthquake

Early in the morning of September 19, 1985, a devasting earthquake hit Mexico City (*Photo D*). There were close to 5,000 fatalities. The news coming out of Mexico City was bleak. In my spare time, I listened to the health and welfare ham radio nets from Mexico City on high frequency (HF). The news was discouraging. There were very few survivors, as I recall, from the older section of the city. My heart went out to these folks. When I saw Tony again, he was fraught with concern and worry. Phone communications with Mexico City was next to impossible. Tony's mother lived in the heavily destroyed, older section of Mexico City. Evening news footage showed the damage in Tony's mother's neighborhood. To make matters worse, Tony had no way to check on his mother's status. Tony asked if he could come over to my QTH to listen for himself and to see if we could get some help.

Trepidation

At first, I hesitated to invite him. I told him that most of the news out Mexico City was bleak and there were not too many survivors from that section. Although I wanted him to find out his mother's status, I didn't want to be the one who could deliver potentially bad news. Thankfully, Tony understood and appreciated my concern. With that out

Photo C. Huge trees were uprooted by the Taylorville tornado.

of the way, how could I say no? I reasoned that knowing is better than not knowing. After all, I would want to know about my family if it were me. Tony speaks Spanish and I do not, so he'd be helpful. Besides, there was the chance that there could be good news.

We arranged a time for Tony to come over to my QTH. I swung my HF triband Yagi (directional antenna) southwest toward Mexico City and I slowly tuned across the HF bands. Most of the health and welfare traffic nets from Mexico were conducted in Spanish. We did find a net, using English, run by the Red Cross. We checked in and I gave them Tony's mother's contact information. They told us that most of the leads took a long time and the news wasn't very encouraging. We thanked them and waited. While waiting, I tuned around and we found a net operating from the stricken area. The hams were speaking Spanish. Tony asked if we could join them. I broke in and Tony told me what to say in Spanish. These radio ops could tell my Spanish was extremely poor, so they kindly switched to English. I gave them Tony's information and they said they'd check.

Tears

An hour later, they got back to us. Tony's mother was alive and safe in a nearby shelter. She was sick with worry knowing that her son would be beside himself with concern and no way to immediately contact him. Thankfully, ham radio bridged the gap and she sent along a message containing Tony's childhood nickname to prove that she was alive and well. I let out a huge sigh of relief and looked at my friend. He had tears of joy and his hands were slightly trembling with relief. I thanked God for the tears of joy and not tears of grief! Tony's mother was relieved to know her son no longer needed to worry. Based upon the news, the odds were against us. Tony's mother's apartment was destroyed, but she got out safely. We profusely thanked the Mexican ham radio ops.

Word is Out

Somehow, the word got out and once again, I was asked to check on a loved one in Mexico City from someone I didn't know. This health and welfare check took a little longer, but more time had passed, and Mexico City was restoring its communications infrastructure. Again, the news was thankfully good. The family wanted to pay me for my services. Of course, I told them that no payment was necessary. But

Photo D. Earthquake damage to Mexico City on September 19, 1985. (Courtesy of Wikimedia Commons)

they were insistent. I thanked them, but I told them as a radio amateur I was forbidden by the Federal Communications Commission (FCC) to accept payment. I could lose my ham radio license. I thought that would settle the matter, but they just wouldn't take no for an answer. A few days later, a big package of mixed nuts arrived by mail addressed to my family. As for Tony, he invited my family over to his home for a backyard BBQ!

Ambassadors of Good Will

Looking back on 1985, I never imagined I would have the opportunity to serve as an ambassador of goodwill. My ham radio hobby and my fondness for meeting new friends through long distance communications (DXing) gave me the skills to assist my community in a genuine and personal way. I also vaguely recall another assistance story involving ham radio. I don't remember the year, but it was during one of the Super Bowls. The team I was mildly rooting for was not playing well and losing badly. Instead of watching the game to its painful conclusion, I went into my ham shack and tuned the HF bands. Propagation was not bad into Missouri. I heard a small sailing vessel calling for help. I contacted the vessel on HF. It was taking on water in the South Pacific. Although not in immediate danger, the captain knew he needed assistance. I got his location over my radio, and I called the Coast Guard office in St. Louis. The Coast Guard knew exactly what to do. They asked me for the vessel's information, the frequency we were on and its status. The Coast Guard contacted a freighter in proximity to the stricken sailing vessel and gave me an estimated time of arrival. I relayed that information to the sailing vessel's captain. The captain was much relieved that help was on the way! Chalk up another one for ham radio!

Looking Back

I look back on those events proudly. I am glad I was able to help. Although the resulting news could have been bad, we lucked out. In all three cases the news was positive. Ham radio truly lived up to its reputation that when all else fails, the amateur radio service comes through. Ham radio made a positive impact with members of my community. As with all technology, it is an extension of ourselves. How that technology is used depends on us and our ability to be ambassadors of good will. Thank you for reading *CQ*.

– Until next month, 73 from KOØZ

Help Wanted — Emergency Communications Editor

N8BHL has had to step down as *CQ*'s Emergency Communications Editor due to personal reasons and we need a new Contributing Editor to fill his shoes. If you're an experienced EmComm leader and at least a reasonably good writer, with time to write a monthly column, please contact Editor Rich Moseson, W2VU, via email at <w2vu@cq-amateur-radio.com>.

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KIT BUILDING

BY JOE EISENBERG,* K0NEB

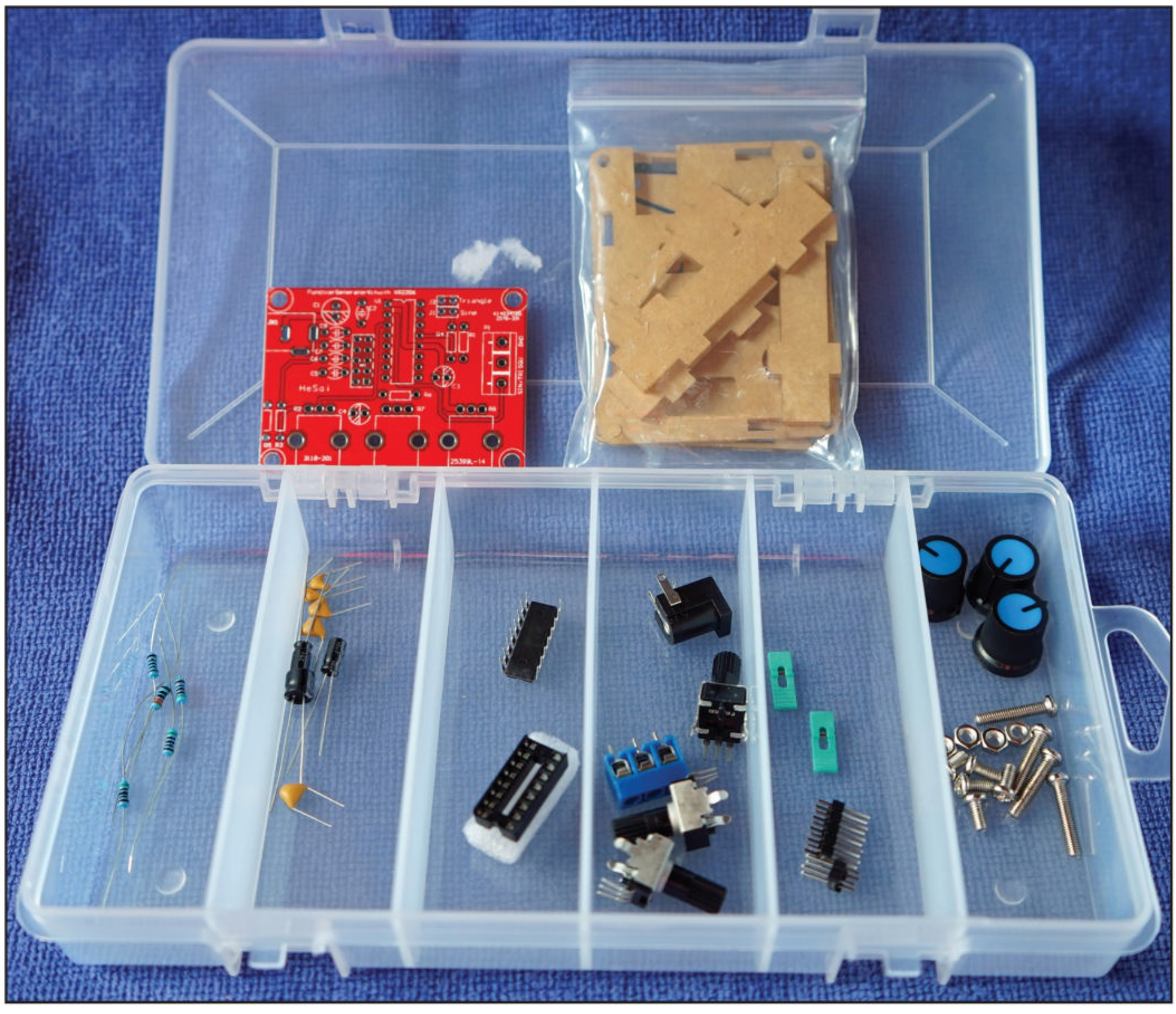
Of Form and Function

A Low-Priced Function Generator You Can Build

When building kits, a number of types of test equipment can be helpful in testing the finished kit. Common in many of the kits I have written about are different styles of audio filters that are useful in making both CW and SSB signals easier to copy in high noise or QRM environments. A function generator can be a helpful tool in determining the effectiveness of different audio filters as well as audio amplifier frequency response.

As with any other type of test equipment, there is a variety of types of function generators, ranging from DDS-controlled devices with digital displays down to the very simple. I'm going to look at a very simple one as it sells for under $10 and is relatively easy to assemble. This simple function generator can produce sine waves, square waves, or triangle waves. Each different type of wave can be useful in evaluating a circuit's ability to handle harmonics and other artifacts associated with the more sharply defined waveforms.

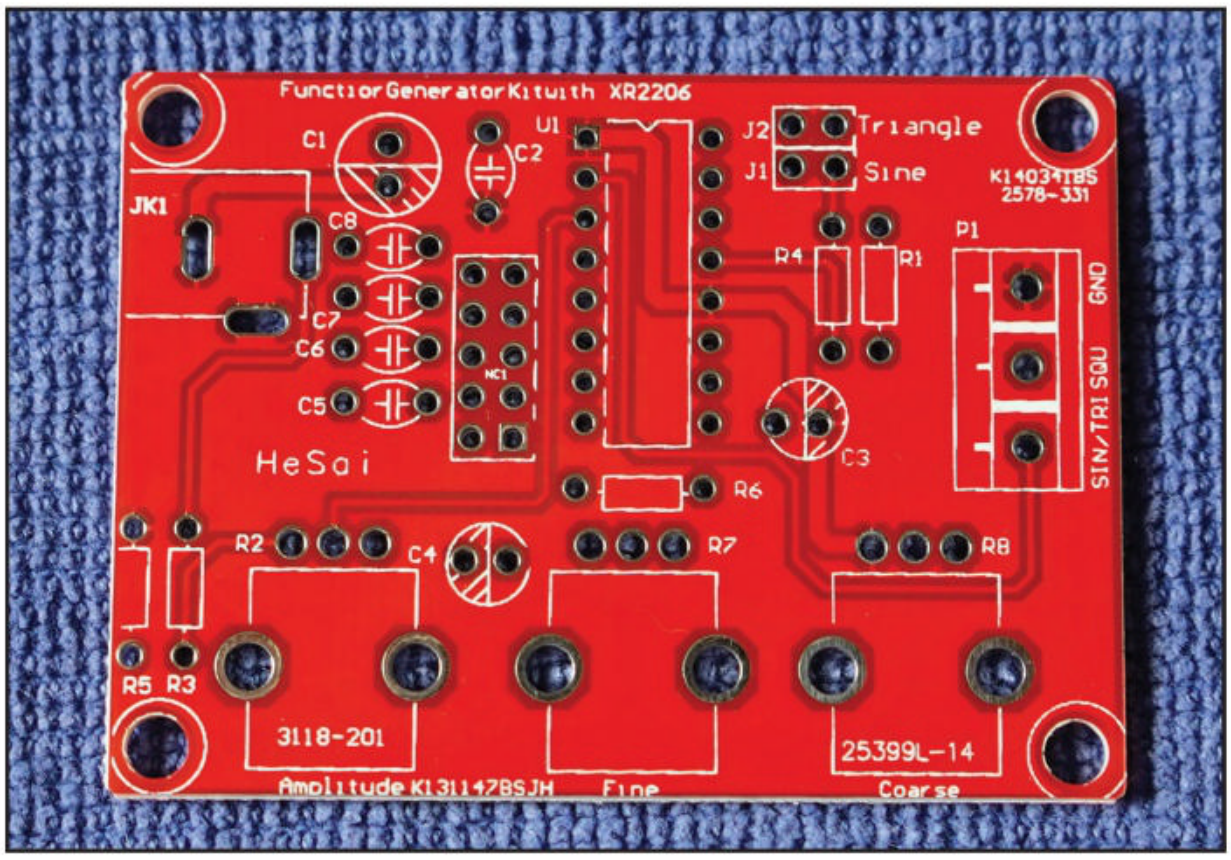
*7133 Yosemite Drive, Lincoln, NE 68507
email: <k0neb@cq-amateur-radio.com>
Hamfest Hotline #5855



Function generator kit parts sorted and ready to assemble. The relatively low parts count makes this an easy kit to assemble.

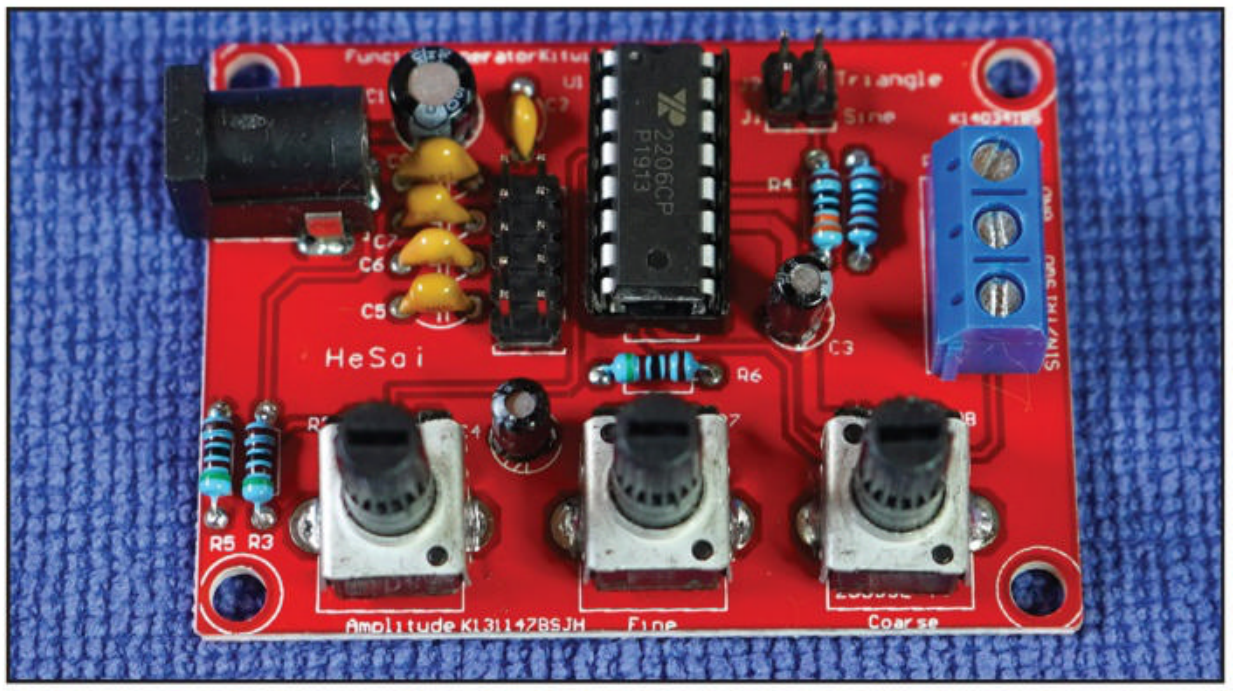
Square waves are better able than sine waves to induce harmonics and other stray signals in amplifiers.

Because this function generator is very inexpensive, it has no frequency display. A frequency counter can be used to determine the actual frequency of the output waveform. It would be helpful to know if the audio filter or amplifier being tested has a frequency response near your preferred tone frequency for copying CW.

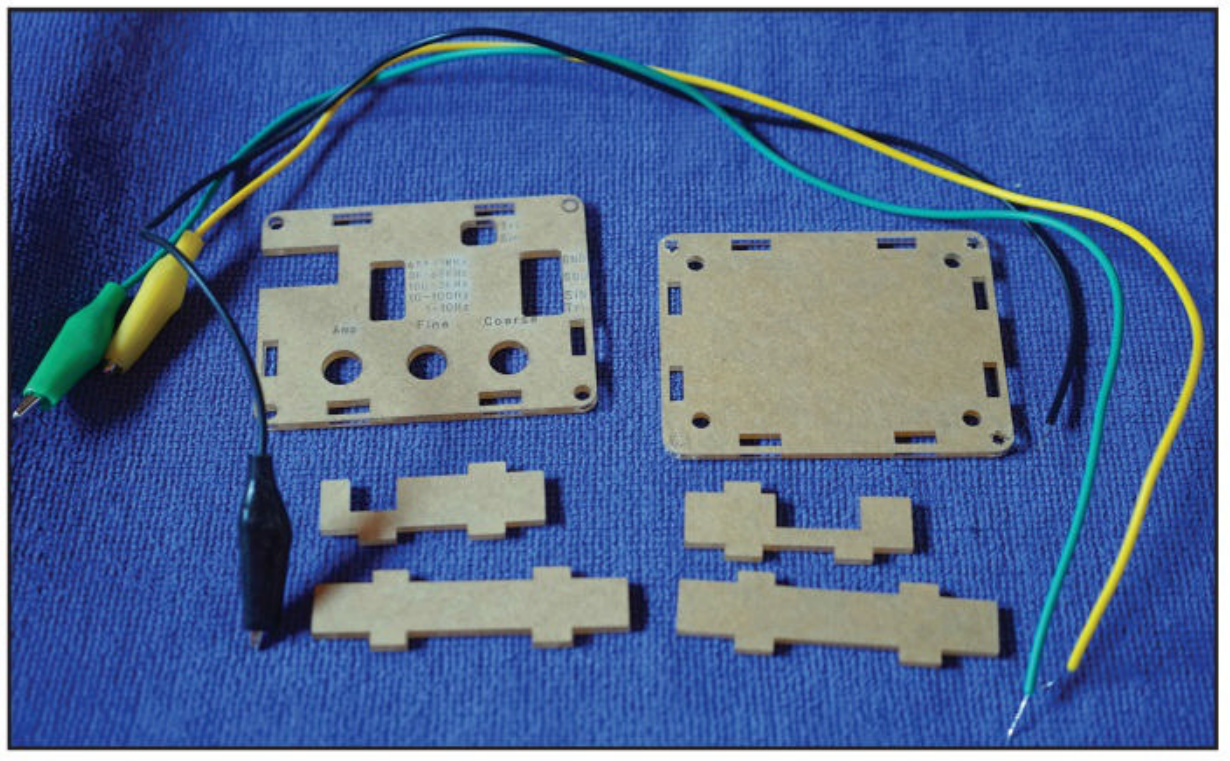


A closeup of the PC board. Notice the holes are extra large, making for very easy parts placement.

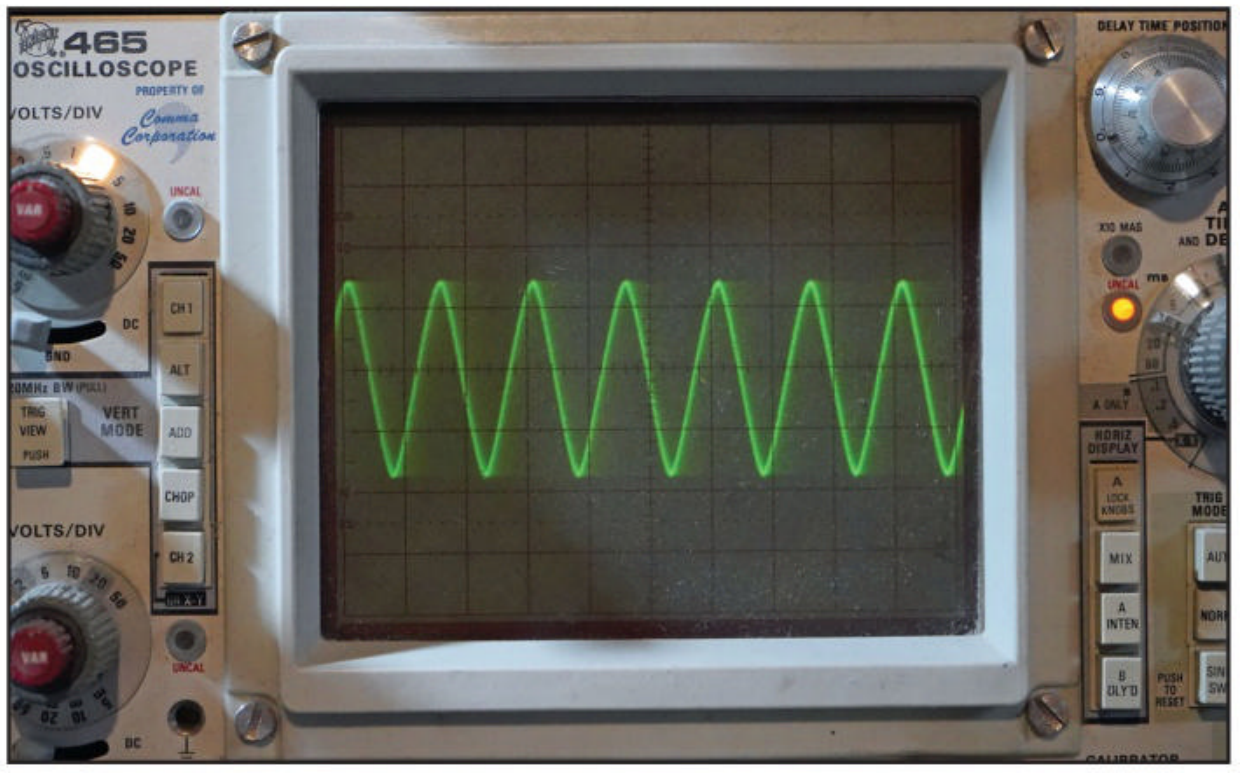
One of my capacitor assortments that made it possible to finish the kit without having to order parts to replace missing ones.



The finished board ready for the clear case assembly.



The case parts before their protective layers are removed along with the clip leads for the output.



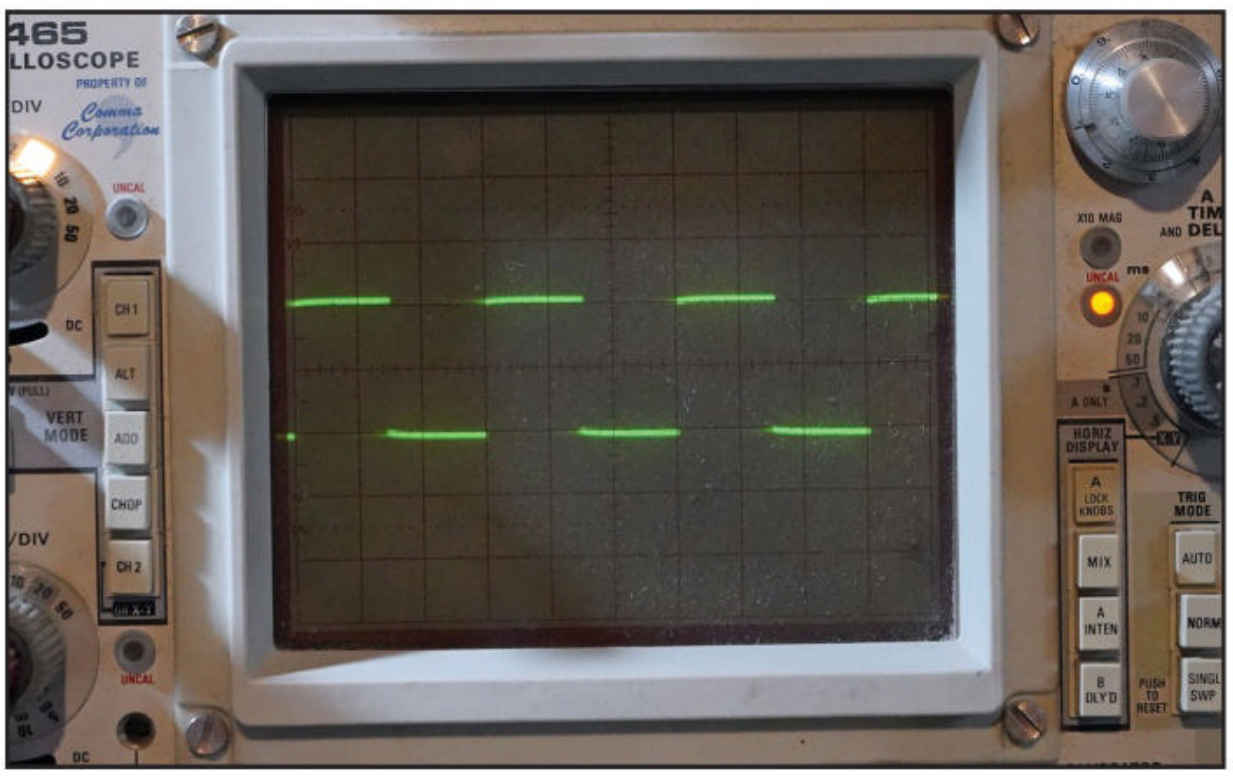
The sine wave output as viewed on an oscilloscope.

By varying the function generator's frequency, the filter characteristics will be evident and adjustment can be made in the filter's settings or parts values to bring it into the desired bandwidth and center frequency.

I found this function generator kit online, and although it has sparse instructions, it does give the parts locations needed to assemble it. With no toroids to wind, this kit can easily be assembled in an hour or so. It comes with a case made from clear Plexiglas® and runs from 9- to 12-volts DC. The integrated circuit that is at the heart of this kit is the XR2206. This IC has been around since the 1970s and was once revered by hackers (then called phreaks) as the heart of what was called a "blue box" device capable of rerouting long-distance telephone calls. The XR2206 produces a very clean and stable output and has stood the test of time, similar to other ICs like the NE555.

Since there are no step-by-step instructions, I followed the rule of component hierarchy and started with the resistors, then capacitors and then semiconductors, followed by the connectors and the case. The bad news during assembly was, like many of these very cheap imported kits, it was missing a couple of capacitors, had duplicates of others, and had an extra XR2206 IC. Fortunately, I keep assortments of standard parts on hand and quickly was able to continue my assembly. The leftover parts will go into my spare parts assortments. One of the more tedious tasks I found was removing the adhesive protective cover material from each of the Plexiglas case parts. This material keeps them from being scratched in shipping, but they take some time to remove.

There is no power switch, so simply connecting a 9-volt battery or a 9- to 12-volt DC power source turns it on. The frequency range is determined by the position of the jumper in the center of the board, while two of the three waveform types (sine, triangle) are determined by the jumper in the upper right. The three output leads are Ground, Square Wave, and Sine / Triangle. Square wave output is always available. There are three controls, one for coarse frequency, another for fine adjustment of frequency and one for output amplitude. I used colored clip leads, cut and tinned and connected to the output connector on the right side. An oscilloscope is ideal for viewing the output waveforms and figuring out the settings for the desired amplitude.



The square wave output.

I found the output to be reasonably stable and could even drive a small speaker. It easily produces 10-volts peak-to-peak waveforms. Using my Tektronix 465, I was able to see the waveforms and see the effect of changing the amplitude, frequency, and fine tuning.

I found this kit on Amazon for $8.99 by searching for a function generator kit. It's amazing how many kits I have found on there. As to the capacitor assortment I used, I have found them online just like the one I use on eBay under the "Bojack" name. Search Amazon or eBay for "Bojack capacitor assortment" and you will not only find their different capacitor assortments, but also their assortments of many other kinds of standard parts already presorted in marked containers. They also have assortments of resistors, transistors, diodes, voltage regulators, LEDs and many other parts. The prices will vary, as will the delivery time, due to current supply chain issues. One of the keys to being a successful kit builder is to have a collection of standard parts ready in case of missing or defective parts in your kit or project and also ready for future modifications.

I hope everyone takes advantage of the cold winter days and long nights to build a kit…

I hope everyone takes advantage of the cold winter days and long nights to build a kit, and be sure to use proper ESD (electro-static discharge) procedures, as indoor humidity can be very low in northern climates.

Finally, I look forward to seeing everyone at Hamcation® in Orlando as well as the upcoming Hamvention® in Dayton in May and many other hamfests that hopefully will once again be held.

– Until next time, 73 de KØNEB
Hamshack Hotline #5855

HOMING IN

BY JOE MOELL,* KØOV

World Class Foxhunting in the Tar Heel State

Results of the 2021 USA National ARDF Championships

Participants in the 2021 USA ARDF Championships are ready to take to the 2-meter classic course. (Photo courtesy of Imre Polik, KX4SO)

Championship Amateur Radio Direction Finding (ARDF) is coming back. For the 20th time, fans of this international radiosport have gathered to see who is best in the nation at finding hidden transmitters on foot in the woods with a map and compass. The competition sites were near Asheboro, North Carolina and the sponsoring organization was the Backwoods Orienteering Klub (BOK).

USA's last pre-COVID national championships were July 28th through August 4, 2019. Enthusiasts from around the country gathered in Raleigh, North Carolina, along with a group of middle- and high-school students visiting from Guangzhou, China.[1] Boston was selected as the site for the annual get-together in June 2020, but the pandemic intervened and cancellation was necessary. The biennial World ARDF Championships were scheduled for early September 2020 in Zlatibor, Serbia, but also had to be cancelled.

With the expectation of a return to normal times, BOK announced the 20th USA Championships for October 14-17, 2021 and the Amateur Radio Union of Serbia rescheduled the World Championships for September 2021. It turned out that the worldwide COVID situation in Asia didn't improve sufficiently for the World Championships to take place, so European radio-orienteers held IARU Region 1 championships in Bulgaria during September and BOK went ahead with a low-key version of the USA championships.

In years when IARU regional championships are held, the USA ARDF Championships have traditionally had the added designation of the IARU Region 2 (North and South America) Championships. Because of continuing restrictions on non-essential travel between the U.S. and Canada, that designation was not made for 2021. Visiting competitors from outside the U.S. are always welcome at the USA championships, but none came this time.

BOK required participants and officials to be vaccinated and to wear masks while indoors. Attendees were mostly from North Carolina and nearby states. Bill Wright, WB6CMD, of Winchester, California, says that he was the only person who traveled by air, whereas the others arrived in their own vehicles. Of the six age categories for males and six for females, there were competitors in all but three.

Into the Woods

Thursday, October 14th was the first day of competition. The event was the sprint, which was added to championship ARDF in 2012. A sprint course has two loops. The first has six slow-keyed 80-meter transmitters on one frequency and the second has six fast-keyed 80-meter transmitters on another frequency. Competitors run through the start corridor leading to the area with slow-keyed transmitters.

After finding all required transmitters from the first loop in any order, they run through the spectator corridor to the area

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The home of Joseph Huberman, K5JGH, and Ruth Bromer, WB4QZG, in the North Carolina woods was headquarters for the 2021 USA ARDF Championships. (Photo courtesy of Mike Minium)

Alla Mezhevaya approaches the finish line in the 2-meter classic competition. On the flag is a registration device for electronic scoring. (Photo courtesy of Imre Polik, KX4SO)

with fast-keyed foxes. After finding all required transmitters from this loop in any order, they run to the finish line. The best sprint performance was turned in by Vadim Afonkin, KB1RLI, who punched in at 12 foxes and finished in 15:41.

The first classic event took place on Friday. These transmitter hunts are called classics because they were the first form of radio-orienteering, beginning over 40 years ago in northern Europe and Scandinavia. Five transmitters are placed in a wooded area of 1,000 acres or more. They transmit for 60 seconds each in rotating order on the same frequency.

Competitors are individually timed as they travel from the starting point to the finish, finding the transmitters required for their category along the way in any order. As I explained in my last column, there are many additional rules for classic and other ARDF events to ensure fairness.

There were two sets of transmitters in the woods this day, one on 80-meter CW and one on 2-meter AM. Persons

In lieu of medals, Imre Polik, KX4SO; Ken Harker, WM5R; and Joe Burkhead, KE8MKR received commemorative coasters at the medal ceremony from organizers K5JGH and WB4QZG. (Photo courtesy Mike Minium)

Bob Frey, WA6EZV, was a medal winner at the first USA ARDF Championships in 2021 and has competed in almost every USA Championships since, including this one. (Photo courtesy of Mike Minium)

in the three categories for men ages 21-59 sought the 2-meter transmitters and the others looked for the 80-meter transmitters.

On 2 meters, Iurii Kolesnykov found his required four transmitters in 59:51 for the best time of the day. Eduard Nasybulin had five required transmitters to find and he did it in 1:32:46. On 80 meters, the best times were turned in by Nadia Scharlau, KO4ADV, for three required transmitters in 51:41 and by Bill Wright, WB6CMD, for four required foxes in 78:15.

Saturday's event was foxoring, another relatively new event that closely resembles classic orienteering because there are circles on the provided map near the continuously transmitting QRPp 80-meter transmitters. Competitors use their orienteering skills to get to the circle locations, then perform direction finding to home in on the foxes that can only be heard there. Norbert Linke found all 10 foxes in 1:04:33 for the best performance of the day.

Sunday, the final day, featured another classic event. Those who hunted on 2 meters on Friday sought 80-meter transmitters this day, and vice-versa. On 2 meters, the best time for four required transmitters was 1:21:34 by Alla Mezhevaya. For three required transmitters, best was Nadia Scharlau, KO4ADV, at 1:06:44. On 80 meters, Norbert Linke found six required transmitters in 1:06:38 and Vadim Afonkin, KB1RLI, got five required foxes in 1:00:53.

Congratulations to these event winners, all of whom received commemorative coasters. Congratulations also to the organizers for a very successful championship event. Meet director was Joseph Huberman, K5JGH. Registrar was Ruth Bromer, WB4QZG. Course designer for the classic and sprint events was Charles Scharlau, NZØI. Course designer for foxoring was David Waller.

Everyone who did well in these championships will be under consideration for membership in ARDF Team USA for the 20th ARDF World Championships, currently rescheduled for September 2022 in Serbia. Our team is also planning to attend the 21st World Championships, being planned for September 2023 in the Czech Republic.

If you have been attending on-foot transmitter hunts in your area and you can navigate your way in the woods with a map and compass, consider joining the fun at the next USA ARDF Championships. The dates and locations have not been firmed up at this writing, but will be announced on my "Homing In" website <www.homingin.com> as soon as they are.

The Orienteering Connection

BOK is one of several classic orienteering organizations that have added ARDF to their regular activities. Clubs in southern California, Albuquerque, and Cincinnati have done likewise. Radio-orienteering and classic orienteering make good partners for practice and championship events. Ham clubs can supply fox transmitters, antennas, and receiver sets. Orienteering clubs have maps, electronic scoring gear, and knowledgeable volunteers.

The ARRL ARDF Committee is seeking local orienteering clubs to join in sponsoring ARDF championships in new locations. To find an orienteering club in your area, visit the Orienteering USA website.[2]

Forty-five years ago, I went on my first 2-meter FM mobile hidden transmitter hunt in Orange County, California, sponsored by the Fullerton Radio Club. It's great fun to look back at the reports of foxhunts in those days. Hiders went out of their way to find unusual ways to test the skills of the hunters. For instance, Ken Diekman, now K6KRD, put a transmitter in a black canister and lashed it atop a bare pole in a field for a night hunt. When hunters aimed their lights up at it, it looked just like an ordinary electrical transformer. Clarke Harris, WB6ADC (SK), transmitted through a 2-meter rhombic antenna near the ground on one hunt and loaded up an out-of-service railroad track for another.

Numerous other southern California clubs and non-club groups also sponsored transmitter hunts back then. An

eager hunter could go on more than one hunt almost every weekend. There were even hunts on the 220- and 440-MHz bands. Depending on the boundaries and rules of the hunt, which were different for each group, the transmitter could be in a plainly visible car, or just about anywhere else except the ocean. Once I gave my little fox transmitter to a youngster and had him hold it for a long ride on the Ferris wheel at a church carnival. Yes, the signal did go up and down.

The Mt. Wilson Repeater Association had the most complex T-hunting rules. These Sunday afternoon hunts encouraged all repeater users, including non-hunters, to participate by giving signal reports and beam bearings on the hidden transmitter. Since the mobile hunts could start anywhere in the repeater's large coverage area, this was very helpful to them. There were bragging rights for the first mobile team to find the hiders, but the official winners were determined by a handicapping formula intended to maximize fairness for new hunters and teams that had not become regular winners. After the hunt, the initial bearings were plotted to determine who won the separate beam-bearing contest.

Plan Now for Foxhunting Weekend

In 1998, *CQ VHF* magazine announced the first CQ National Foxhunting Weekend. After more and more reports came in from Canada and other countries, the name was changed a few years later to the CQ World Wide Foxhunting Weekend. It's not a contest and there's no scoring or prizes; it's just an opportunity for locally organized foxhunting fun.

The next CQ World Wide Foxhunting Weekend will be May 14-15, 2022. 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 in mobiles or all on foot. Since the primary objective is lots of participation, we don't 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[3] 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. 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 make sure 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 eye-safe. Always be mindful of your own physical limitations and never take chances behind the wheel or in the forest.

Afterward, write up the results and send them to me. The list of information in a complete CQ Foxhunting Weekend report is posted on my website.[4] 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.

For some foxhunting ideas, check the stories and photos of last year's Foxhunting Weekend in my "Homing In" column for November 2021. I look forward to receiving your news and photos of mobile and on-foot transmitter hunts in your locality, whether they are on foxhunting weekend or any other time. Happy Hunting!

NOTES:
1. www.homingin.com/raleigh19.html
2. https://orienteeringusa.org/events/clubs
3. www.homingin.com/intlfox.html#rules
4. www.homingin.com/joek0ov/nfw.html

MOBILING

BY JEFF REINHARDT,* AA6JR

Getting Road-Ready

We often deal with the "what" and "how" of mobiling with ham radio gear. This month, we'll explore some of the "where" and "why" ham radio can make your travel adventures more enjoyable.

For many, the "depths of winter" conjure up images of snow-covered landscapes, chilling winds from the north, and home-bound activities like reading a good magazine while seated comfortably next to a blazing fireplace.

While idyllic, the reality for much of the U.S. is quite different. Those of us residing in the Sun Belt that stretches from the deep south across to southern California are quite used to seeing "snow birds" — not the type with wings, but those with vehicles sporting license plates from northern states. Very often, those license plates are attached to motorized RVs or trailers that take up temporary residence in parks, open desert areas or along shorelines that offer great views.

Like some "birds of a feather," the RV crowd often "flocks together" based on the brand of the vehicle they may own. This trait offers a basis of mutual interest and support for problem solving, improvements and unlocking features that may not have been apparent. Sometimes "caravans" are formed with guided or semi-guided tours of specific geographic areas with pre-arranged stops at various parks and areas of interest.

It's also nice to know that ham radio is often a feature found both in parks and among caravan groups. If you're part of such an interest group, getting everyone connected via mobile rigs can bring added pleasure and security to travels and an enjoyable pastime when stationary.

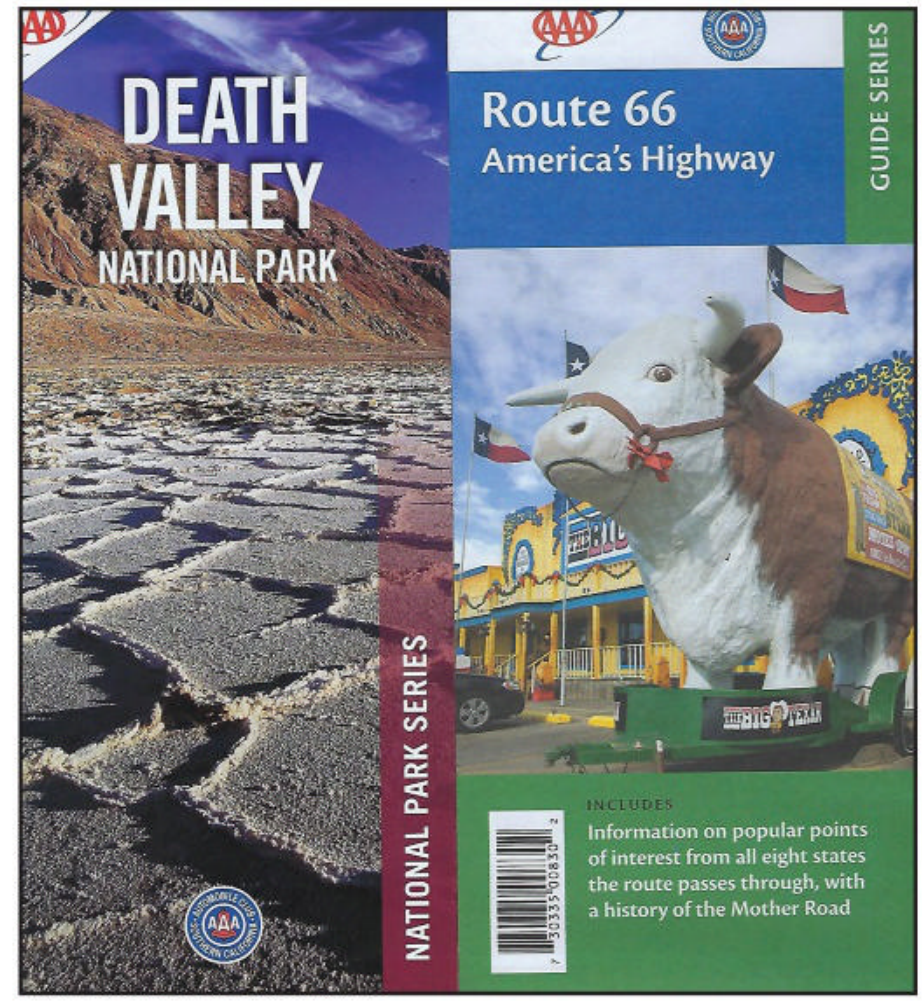
I've noticed a number of RVs that also have 146.52 — the national 2-meter simplex calling frequency — posted somewhere on the rear of the vehicle. That's a smart, efficient, and easy way for others to contact that vehicle. If you have an RV, consider adding that notice to your unit and of course, monitoring that frequency.

Before hitting the road, it's also a good idea to take along a repeater guide of some type, be it printed or through a smart phone app. While I'm sure there are others, I'm partial to *Repeater Book,* a free, well-constructed app that's updated quite often. You can see details at <zbm2.com>.

This app can perform searches for repeaters based on your location or one you can select as you plan your travel route, distance from the repeater, and the user can select which band(s) to search. Repeater info includes the location, distance, mode, callsign, frequency, offset, and any codes that may be needed to access the repeater. It's all quite convenient and well organized. Kudos to the folks who put together this useful accessory.

The Wide-Open Spaces

Several years ago, I met a gentleman who had what I considered to be a "dream job." He was employed by the Auto Club and his duties included verifying the existence and conditions of roads through the Southwest. He was often away for weeks at a time in a company-supplied all-wheel drive vehicle that was stocked with surveying gear, tools, emergency provisions and the like. While we're all familiar with roads of all types that constitute the highways and byways, it was also his job to explore and verify the many unpaved passageways that are found all over the U.S. but proliferate in the western deserts or mountainous parts of the country. Many of these roads are seasonal, often closed by snow or flash floods, and they may or may not be well maintained.



Maps provided by the Auto Club can be the foundation of new mobiling adventures.

There are a few key points to this story. One is to open the eyes of visitors to new areas where there's an amazing array of scenic wonders for those who are able-bodied, well-prepared, and adventurous. Second, I can't think of a better place to take ham radio along as a ready companion in case the unexpected is encountered. Third, as we all deal with the lingering presence of COVID-19 and its many variants, travel to more remote locations may have appeal for many.

And if you're a member of the Auto Club, pick up a few paper maps and examine them closely as you plan out new adventures. A GPS map in the vehicle is nice but it often lacks details that are more easily read on a big map laid over your kitchen table. For example, there's a great Auto Club map dedicated to exploring Death Valley, and many regard winter as the best time to go there. For one, the temperature is likely to be in the comfort zone and the late winter bloom of desert flowers is a treat for the eyes. While its scenic wonders are many and there are good roads in and out, nevertheless there are also many side excursions, "four-wheel

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drive only" routes and hiking trails for those seeking both high adventure and closer proximity to nature. The Auto Club map also contains good supplemental information that every informed visitor should know.

As you consider some of these discovery opportunities, good ham gear should be near the top of your travel-necessities list, as there are still many places in the U.S. where cell service is unavailable.

The Mobile Emergency Unit

Each year, the country encounters threats of severe weather. The recent storms that caused devastation through Missouri, Illinois, and Kentucky serve as reminders that an operational mobile rig has many useful applications, including storm tracking and key communications in the aftermath. Time and again we have learned that the cell phone system is vulnerable to power outages, antenna structure damage, and system overloading. Public safety agencies are also vulnerable to infrastructure damage. As I watched the video coverage from Mayville, Kentucky, I was amazed that a water tower and a nearby fire station were completely destroyed. I would not be surprised to learn that water tower was also home to communication antennas, as that is a common practice in many areas of the country, The nearby fire hall not only saw fire equipment damaged, but many fire facilities also function as communications and / or marshalling hubs.

We're still learning about the recovery efforts in the many stricken communities. But these events should stand as a stark warning to communities across the U.S. to be prepared for an event that will fracture the primary communications networks.

As in the past, ham radio operators need to be operationally prepared and physically equipped to perform in a backup role as the "Plan B" for communities large and small. By owning, maintaining, and having radio gear dispersed over a wide area, the survivability of ham radio communications is an "insurance policy" emergency planners should include among their response resources. Your handheld and mobile rigs need to be part of that structure.

It's Winter Check-Up Time

We opened this visit with image of winter, so let's close with a reminder that winter weather can play havoc with your mobile rig. The extreme shifts in temperature can see a ham radio left in a vehicle transition from below-zero temperatures to the mid-70s in a very short time after the vehicle is started and heat starts flowing. Engine compartment temperature swings are even more impressive. These significant temperature stresses can also affect power and antenna connections. Don't forget that your antennas are also exposed to moisture, road salt, and possibly the buildup of ice or slush that should be removed.

Thankfully, today's gear is most often up to the task of working under extreme conditions but take a few moments to inspect and maintain your equipment, so that it's ready when needed. And on a very cold day, if your rig is showing some strange display characteristics or your transmitter seems out of whack, remember that the rig's manufacturer specifies the operating temperature range for your radio (found in the owner's manual) which might explain unusual or erratic operations.

Here's to safe, happy travels throughout 2022!

– Happy Mobiling, Jeff, AA6JR

By owning, maintaining, and having radio gear dispersed over a wide area, the survivability of ham radio communications is an "insurance policy" emergency planners should include among their response resources. Your handheld and mobile rigs need to be part of that structure.

ANTENNAS

BY KENT BRITAIN, WA5VJB

Back to Basics

I have doing antenna columns for CQ Communications since 1995 and have done columns for four different CQ Communications publications. Let's just say that after well over 150 columns, the air has been getting a bit thin.

Well, there is an old tradition in writing that I wish I had known earlier. If you haven't covered a topic in about 10 years, I'm told, it's perfectly fine to revisit that topic! Wow, 15 years of my own material I can plagiarize.

This month, we will be covering some very easy-to-build Yagis (*Photo A*). Our examples are for 70 centimeters but these are scalable for other VHF / UHF bands as well. This family of nearly 100 different versions goes back to a question posed some 30 years ago. How do you build simple high-performance Yagi antennas out of commonly available materials? No, I am not talking 6061 aluminum alloy tubing for the boom, 2024 aluminum alloy for the elements with Teflon® or Delran® insulators. And directions with all dimensions measured to 1/1000th of an inch. No, I'm talking wooden sticks, coat hangers, yardsticks and a bit of coax (*Photo B*).

Photo A. Simple materials can be used to build a very effective Yagi antenna for the VHF and UHF bands.

Starting With the Driven Element

The 'J' driven element has a lot of advantages. Simple, no additional parts, and your coax is soldered directly to the element (*Photo C*). The very center of a Yagi element is a voltage null. So the shield of the coax can be soldered to the center of the element without the need for a balun. The center of the coax goes near the tip of the 'J.' A dipole has about a 72-ohm impedance, a folded dipole has about a 300-ohm impedance, and this 3/4 of a folded dipole has about a 150-ohm impedance. The other elements of the Yagi have a loading effect on the driven element. So, with just the right spacing of the other elements, that 150 ohms can be pulled down to 72 ohms. Now we have direct feed with 72-ohm coax for any projects that like to use RG59, RG6, or even surplus CATV feedline. Mount the other Yagi elements even closer to the driven element, and that 150 ohms can be pulled down to 50 ohms, giving you a direct impedance match to 50-ohm coax. No baluns, no gamma matches, no T-bars, just solder the coax as shown and start using it.

Build Your Own!

Here is a simple Yagi that I have used as a construction project for many new hams, six elements on 70 centimeters. Easy to build and they have their choice to build them for weak-signal SSB use at 432 MHz, AMSAT LEO (low Earth orbit) at 435 MHz, or for the local FM repeaters at 445 MHz. All versions use the same boom (*Figure 1*). I will typically drill a boom very carefully to the dimensions, then use that one as a drilling template for the next dozen booms. Of course, this doesn't mean you can't build the version of your choice for your own use.

Now, with a roll of wire or some sticks of welding rod, the builder gets to choose which frequency range they want by how they cut the elements. All elements are 1/8-inch diameter material. Aluminum ground rod wire is one of the cheapest, and works well for all but the driven element. Alternatively, 1/8-inch hobby tubing works, as does aluminum welding rod. The various bronze welding rods also work for all the elements. It is really nice to be able to solder your coax directly to the driven element. So bare copper wire and one of the bronze welding rods are highly suggested for the driven element.

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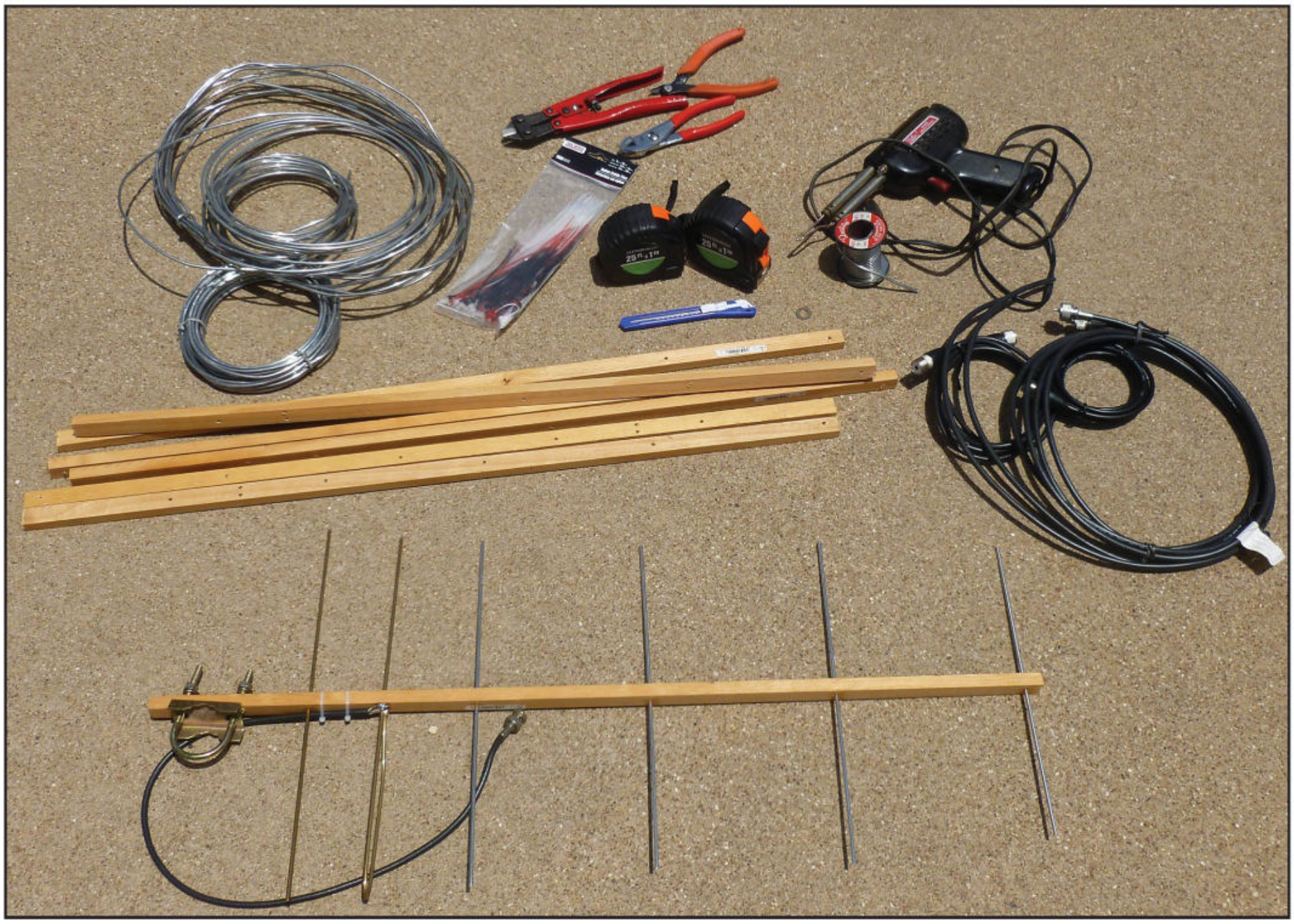

Photo B. Wood, wire, coax, and a few tools are all you need to build the Yagi shown here.

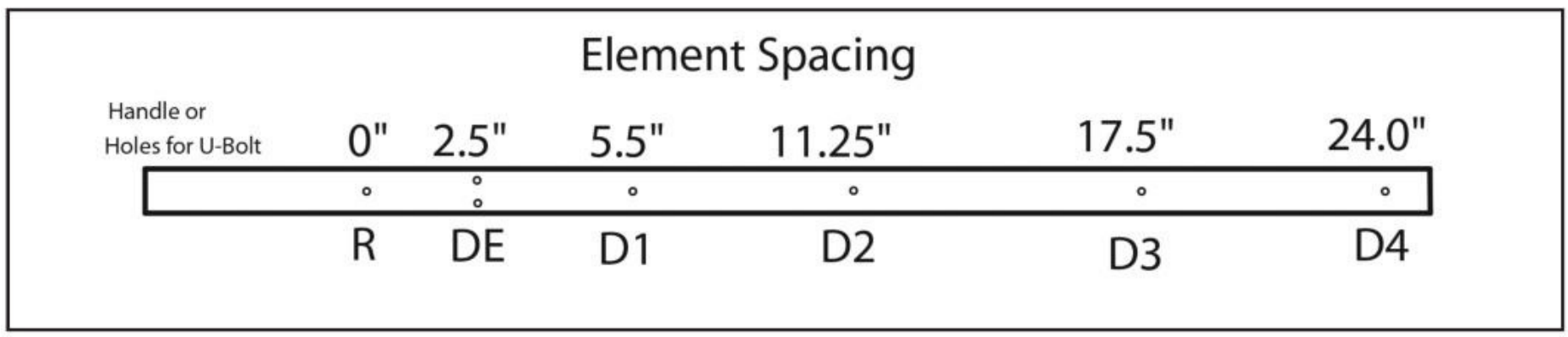

Figure 1. All versions of this antenna use the same wooden boom.

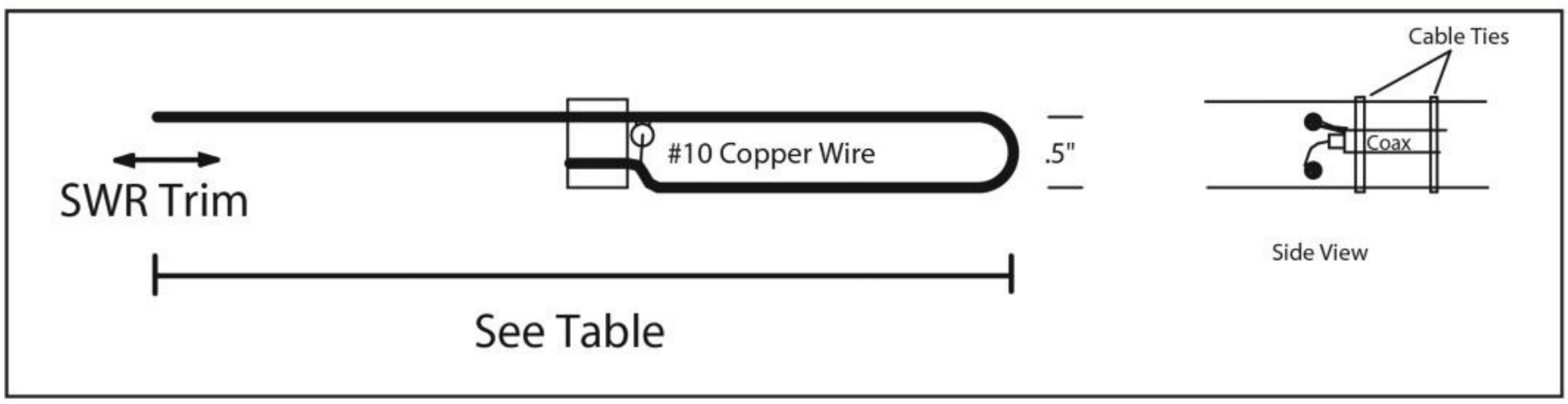

Figure 2. Exact dimensions of the driven element depend on intended frequency of operation. The feedline is connected directly to the element. See text for details and Table 1 for element lengths.

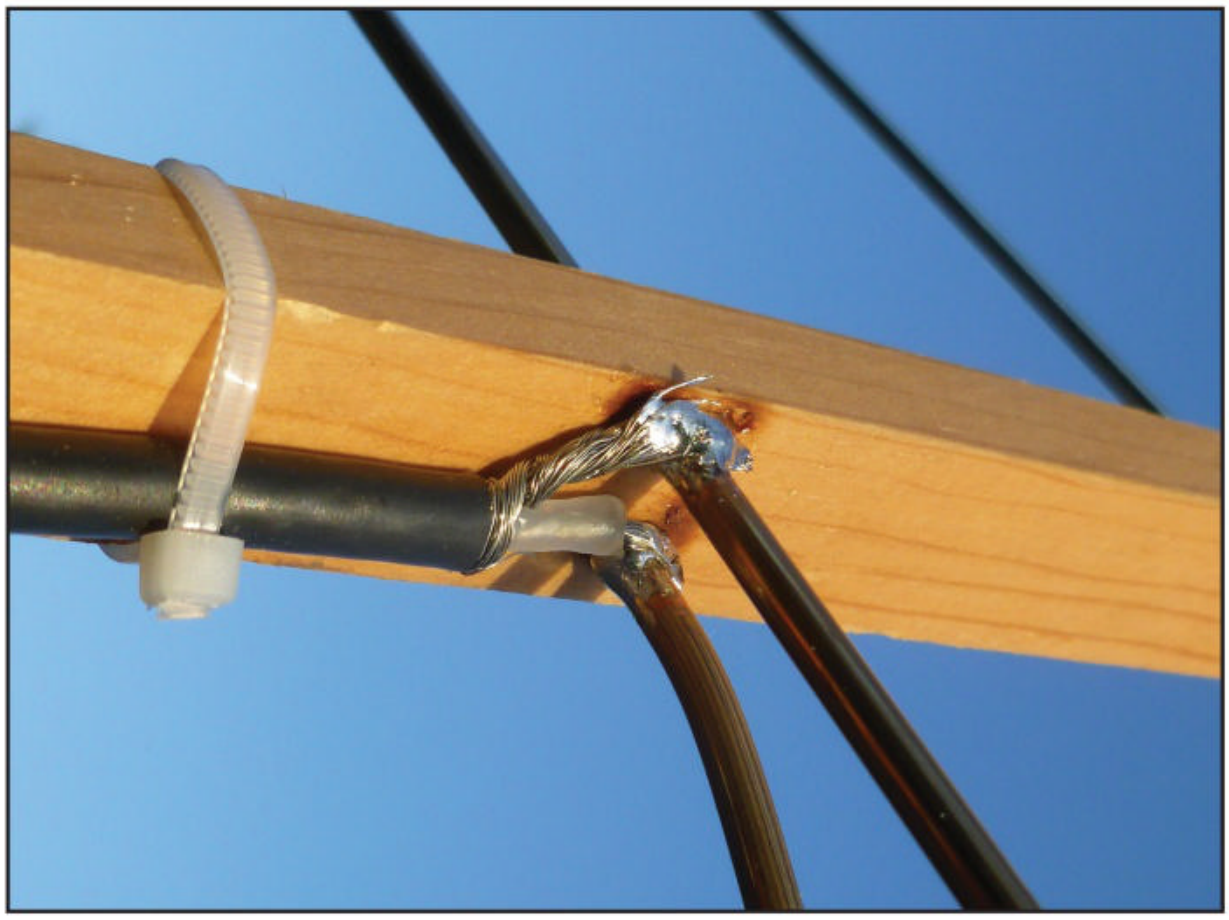

Photo C. The feedline is connected directly to the driven element in this antenna design. No need for baluns or gamma matches.

Table 1
Element Lengths (in Inches)

	432 MHz	435 MHz	445 MHz
Ref	13.50	13.4	13.00
DE	12.75	12.7	12.50
D1	12.40	12.4	12.25
D2	12.00	12.0	11.75
D3	12.00	12.0	11.75
D4	11.00	11.0	11.00

These antennas are great for AMSAT use with the LEO birds.

Dimensions for different frequencies are in *Table 1*.

I have had some early versions of these antennas mounted up in my attic for nearly 30 years and they still perform well. When mounted outside, I suggest a coat of house paint with some RTV sealing the coax braid. The water seal products used to weatherproof decks also work well. But don't expect too many years out of them. One backpacker makes all the elements out of soft materials. Then he "wads it up" and stuffs the antenna in his backpack, gets to his high spot and "unwads" the antenna. He says they are good for about a half dozen waddings and then he makes a new one.

When used as built, the SWR is usually better than 2:1. The free tip of the J driven element can be trimmed for best SWR. Nice, but usually not necessary.

In *Figure 2* and *Photo C*, we show the coax attachment to the driven element. Keep the coax ends short. These antennas have been assembled in some very creative ways over the years, and long leads on the coax effectively make the length of the driven element longer. That is, you make the antenna much lower in frequency. Keep those leads as short as practical. There are also lots of ways to hold the coax to the boom. Cable ties work nicely. Electrical tape, duct tape, and even those wire bread ties have been used.

Another common question is about the width of the loop in that J element. That's really not a critical dimension and could be most anywhere between 1/2 and 1 inch with no change in antenna performance.

These antennas are great for AMSAT use with the LEO birds. Either handheld or on a mount works fine. And for 432-MHz weak-signal work, these are very popular with contest rovers. In all, over 100 different versions of these simple Yagis have been designed and most have been published. So, lots of projects to revisit. Keep that soldering iron hot!

Your Ideas Welcome

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

ANALOG ADVENTURES

BY ERIC P. NICHOLS,* KL7AJ

Spicing Things Up, Part 2

Before diving into this month's topic, I am delighted to report that it looks like we may be having a solar cycle after all! In late October, the bands screamed to life; it was almost like the "olden days." I made my very first 12-meter contacts, *ever*! I'm sure Sir Tomas, NW7US, will have much more to say on this in his column, so I won't wax too wordy here ... though I am highly tempted.

That being said, I trust a number of you have had a chance to experiment a bit with SPICE circuit modeling, and have even settled on a favorite "flavor" of SPICE (See "Spicing Things Up – Part 1," Analog Adventures, Feb. 2020 *CQ*). My particular "flavorite" (I just love coining words) is ICAP4, produced by Intusoft, but I realize it's a bit off the beaten path. The "default" version of SPICE seems to be LTspice, which has most of the functionality of ICAP4, though not organized quite as nicely. The *ARRL Handbook*, among other tomes, has pretty much camped out on LTspice, and I have no problem with that.

Although SPICE was originally designed to aid in the design of complex active devices, such as op-amps, I would say that fully 95% of the SPICE modeling I do is for passive circuits like filters and matching networks.

Dilithium Crystals

I believe the use of Dilithium crystals as a limitless energy source is a ways off in the future, but we have had something nearly as amazing for many years: piezoelectric quartz crystals. If any of you have any doubts about how amazing the lowly quartz crystal is, you need to watch this: <https://youtu.be/wHenisSTUQY>.

I think it's particularly instructive to use SPICE to model the equivalent circuit of a quartz crystal, and see how it behaves in a simulation, and then see how it behaves in real life. The *ARRL Handbook* has conveniently given us some useful information to do just that, as seen in *Figure 1*. Let's work with the 1-MHz fundamental crystal for this exercise. I have a number of these around the shack which I use for building marker generators and such. (100-kHz crystals used to be in plentiful sup-

Table 9.1
Typical Equivalent Circuit Values for a Variety of Crystals

Crystal Type	*Series L*	*Series C (pF)*	*Series R (Ω)*	*Shunt C (pF)*
1 MHz fundamental	3.5 H	0.007	340	3.0
10 MHz fundamental	9.8 mH	0.026	7	6.3
30 MHz third overtone	14.9 mH	0.0018	27	6.2
100 MHz fifth overtone	4.28 mH	0.0006	45	7.0

Figure 1. Inductance, capacitance, and resistance values of various types of crystals, from the ARRL Handbook. (Source: ARRL; used by permission)

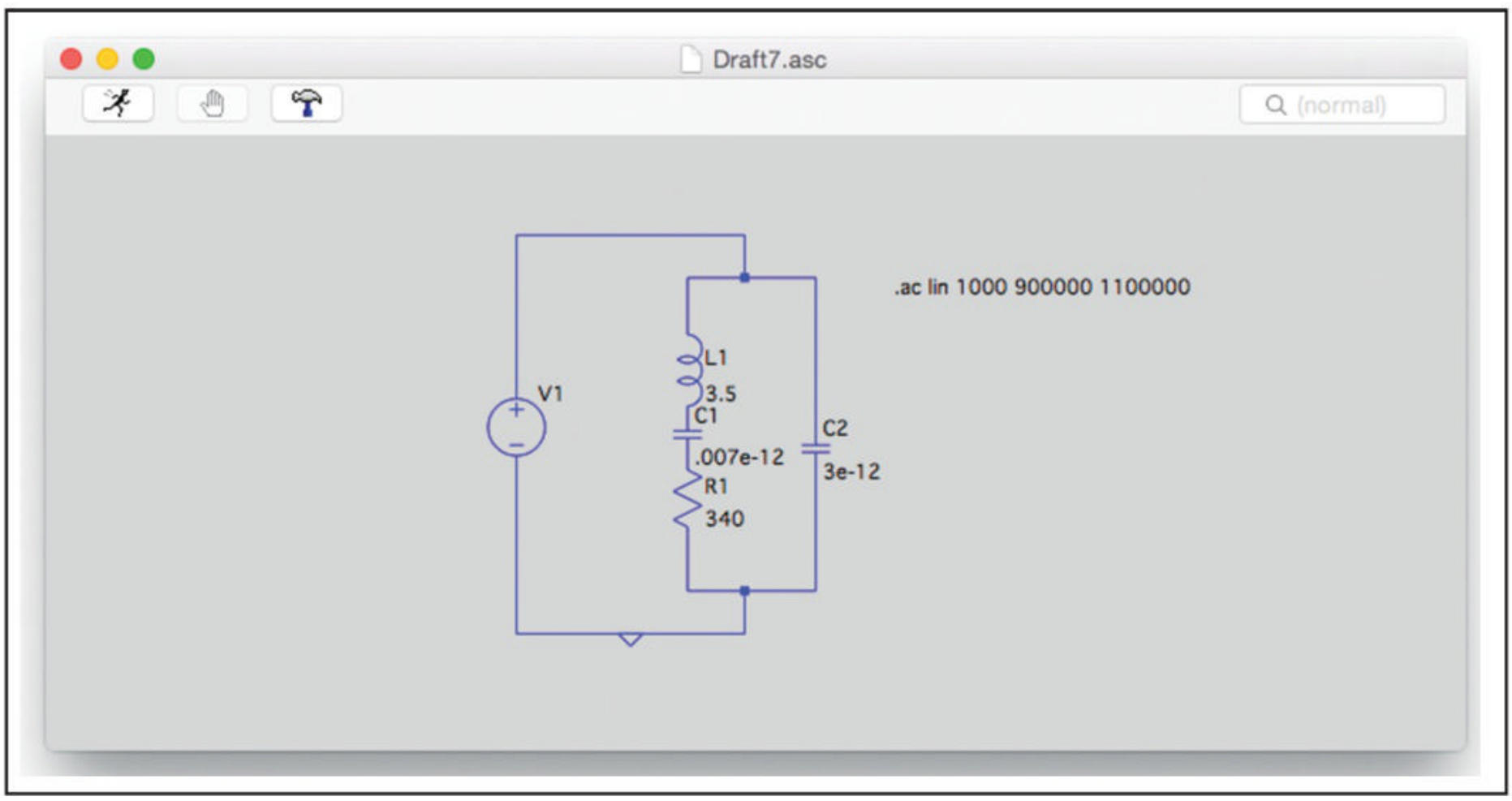

Figure 2. Screenshot of schematic of the SPICE equivalent of a 1-MHz crystal and an RF generator, created in LTspice.

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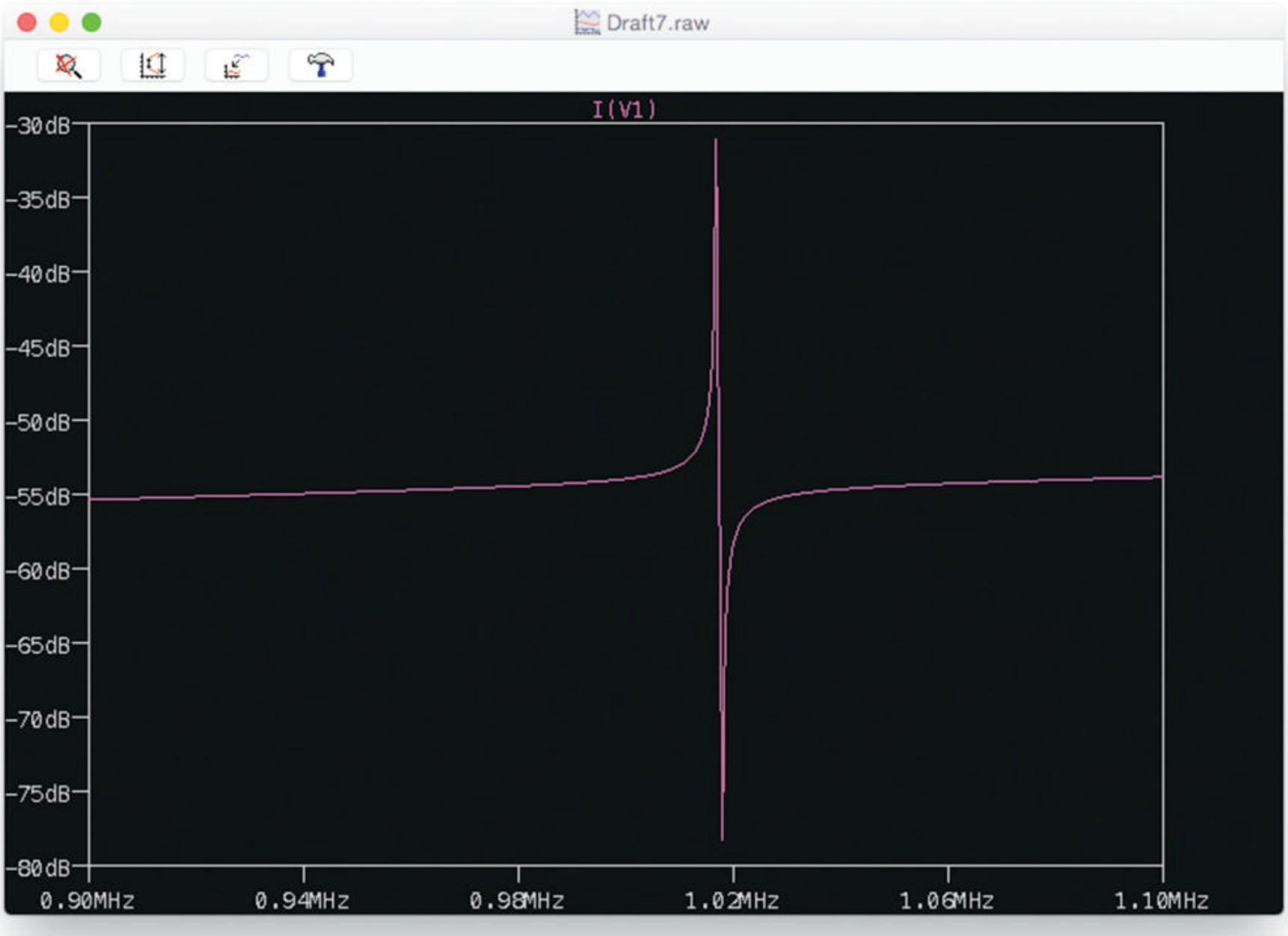


Figure 3. V1 current graph of a simulated 1-MHz crystal.

ply, but nowadays they seem to be as scarce as lips on chickens, so if I need a 100-kHz marker, I just divide down from a 1-MHz oscillator). *Figure 2* is a schematic screenshot of the crystal and an RF generator, created in LTspice.

The SPICE directive "sentence" in the upper right of the window tells us we want to do a linear sweep of the AC generator, taking 1,000 points between 900 kHz and 1.1 MHz. Capacitor values are in scientific notation; you can use this for any component. SPICE is pretty smart at figuring out what you mean, as far as component decimal place values go.

After hitting the RUN command, (assuming we get no errors) we get a blank black screen. We need to select the parameter we want to plot; in this case, the V1 current tells us a lot at a glance (see *Figure 3*).

So now, we see the typical double resonance of a crystal; the upward spike is the series resonance, and the downward spike is the parallel resonance. The extreme sharpness of the spikes tells us the Q of the crystal is very, very, high, which we knew already, didn't we? Of course. That's why we use crystals in the first place.

As you can see, the amplitude scale is in decibels, which allows us to plot a very large range of values, but it can also mask certain features. By converting the plot to a linear scale, we get the image in *Figure 4*. We can now see that the series resonance is a lot "bigger" than the parallel resonance. Not terribly surprising, because the parallel mode uses more components, which generally increases losses.

Now, we *could* theoretically look at the voltages or currents across the individual internal components, but in a real crystal, we don't have access to those ... they don't actually exist. So, we're pretty much confined to looking at the current through the complete crystal and the voltage across it.

By the way, the number one reason that crystals don't achieve their "as advertised" Q in the series resonant mode is that the generator and/or the load are not low values. It is usually NOT a defect of the crystal itself. The Q of the crystal is primarily determined by the ratio of the L1 reactance to the R1 resistance, the familiar X/R formula for Q. Any external resistance adds to R1, and thus lowers the Q of the overall circuit. A series-mode crystal should have a source and a load impedance of as close to zero as possible. Admittedly, this is often easier said than done.

Another hazard of insufficiently low source and load impedances, especially in an oscillator, is that the crystal can flop back and forth between series and parallel resonant modes at random intervals … not a good thing in a transmitter, as one might imagine. Low terminal impedances force the crystal to operate only in the series resonant mode, which as the plot in *Figure 4* shows, is the higher Q mode anyway.

Just for jollies, let's see what happens when we add some resistance to our generator, in this case 100,000 ohms (R2). The new schematic and the results are shown in *Figures 5* and *6*.

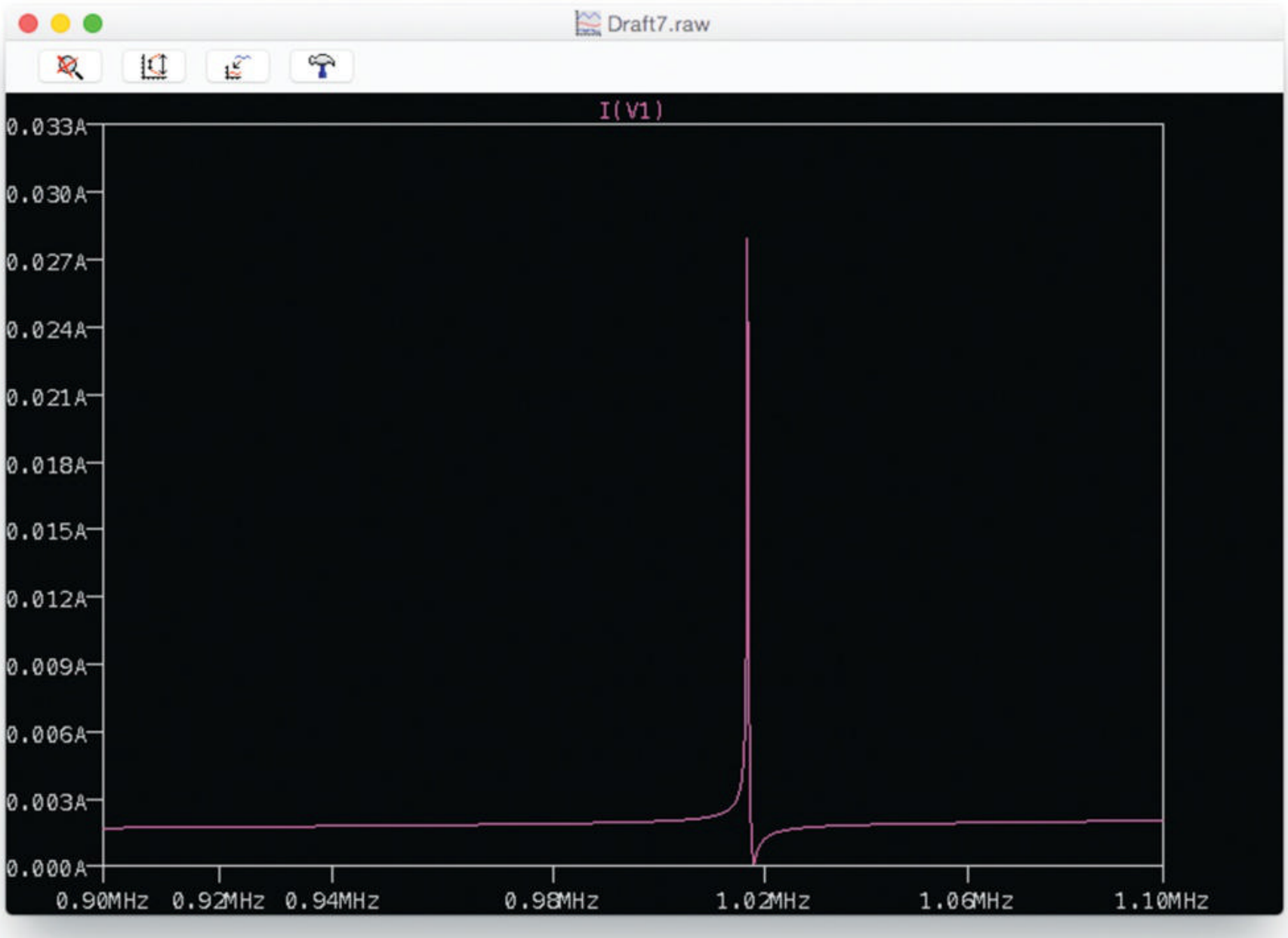


Figure 4. Converting the plot in Figure 3 *to a linear scale.*

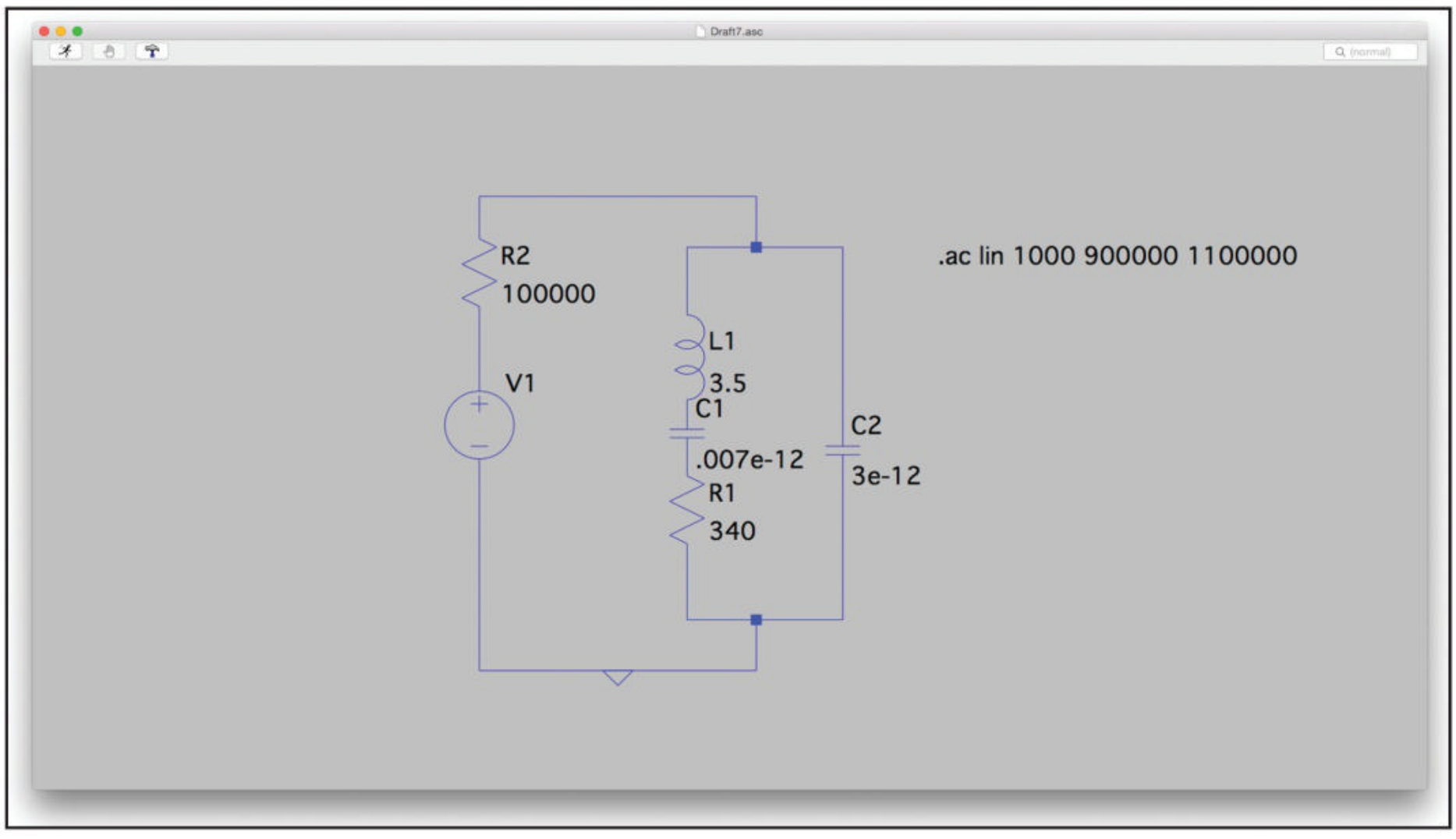


Figure 5. Revised schematic based on adding 100k Ohms of resistance to the circuit.

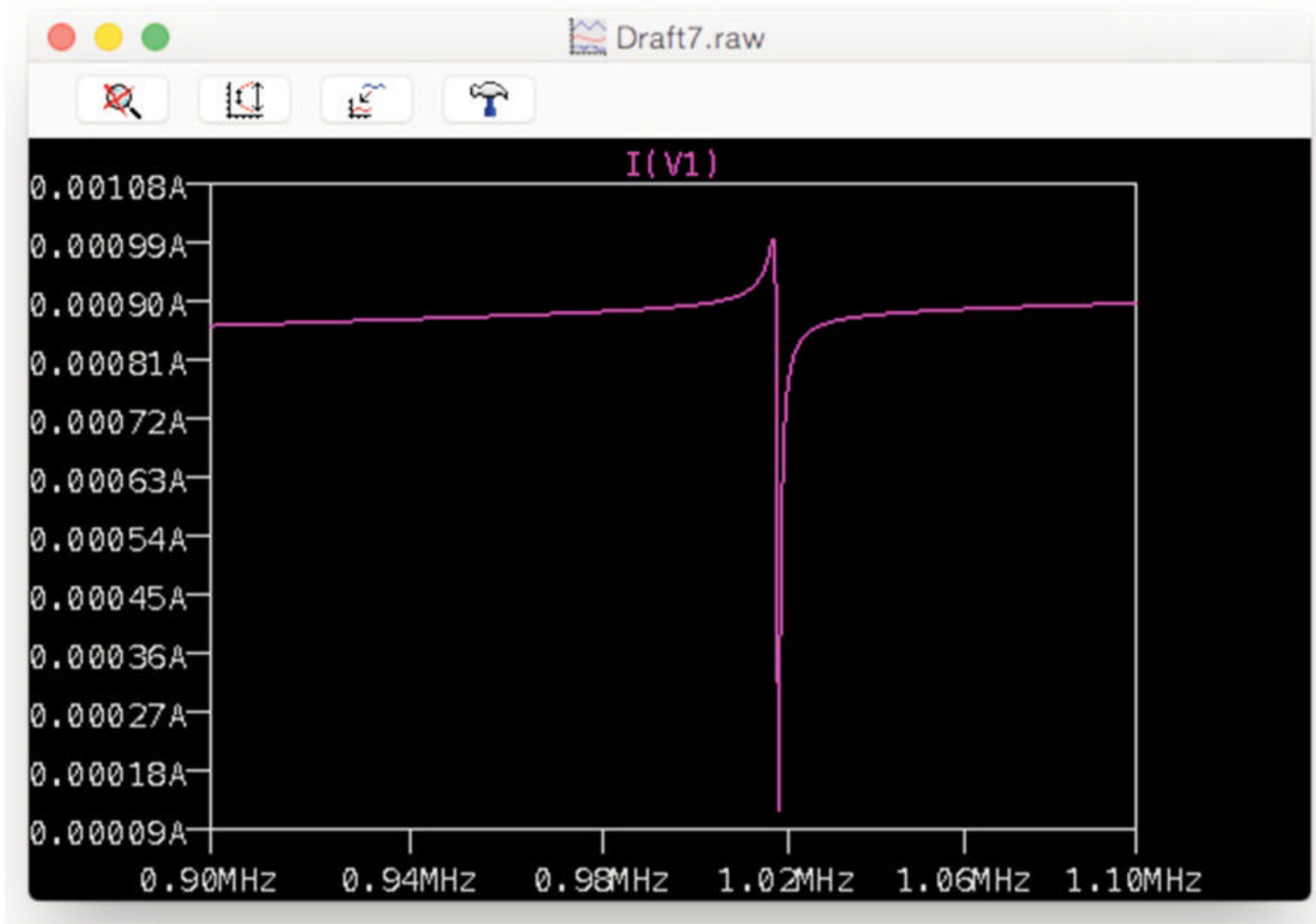
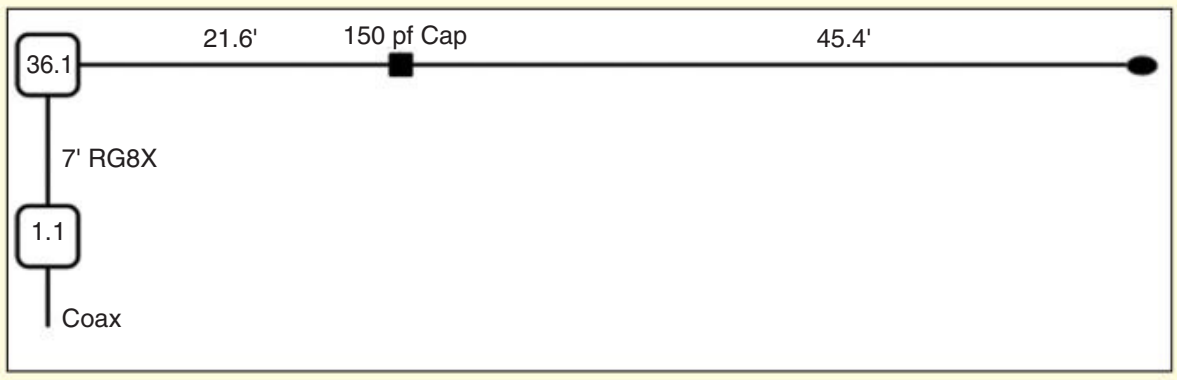


Figure 6. Revised current plot after adding 100k of resistance to the circuit. Note that parallel resonance is now dominant.

Oops…

Figures Never Lie…

… but sometimes they don't match the text in an article! That was the case with *Figure 10* in December's Antennas column, "A Deep Dive Into End-Fed Half-Wave Antennas," by W1IS and KC1DSQ. As co-author W1IS explains, "We designed and tested two versions of the 40M end-fed. Though both work, well, the data in the text delivers better SWR performance than the dimensions on *Figure 10* that was published. Unfortunately, the drawing for the wrong version crept into our submission. The version that matches the text is attached (see below)."



I need to reiterate that SPICE modeling (or any modeling, for that matter) is no substitute for solder.

Well, isn't this interesting? We now see that the parallel resonant spike is the dominant one, and the series resonant spike has decreased significantly. All with absolutely no change to the physical crystal itself. So, don't blame your crystals. Well, they do actually go bad once in a while, but I always give them the benefit of the doubt when things don't work as they should.

I need to reiterate that SPICE modeling (or any modeling, for that matter) is no substitute for solder. (See previous article's comments on Bob Pease). I (almost) always use a physical reality check for my computer modeling. Having a well-tuned "gift of suspicion" can be the electronic tech's most valuable tool.

Before I sign off, I'd like to know if there's any particular widget or technology you'd like me to discuss in Analog Adventures. I have a few of my own obsessions, but I try to keep things balanced. Until next time, keep those soldering irons hot! *– 73, Eric, KL7AJ*

MICROCONTROLLERS IN AMATEUR RADIO

BY JACK PURDUM,* W8TEE

Adding Kevlar® to Your Code

Someone once said that writing the code for a new program takes about 20% of the development time. Testing and debugging that code eats up the remaining 80%. Kinda makes you wonder how programmers manage to screw up the first 20% to such a degree that it takes four times as long to straighten out the mess. I think one reason is because of what I call the *spiderweb effect*.

The Spiderweb Effect

All too often, a small change over in this corner of a program causes things to go whacky in a totally different area of the program. It's like pulling on one thread of a spiderweb and observing how that one little tug can warp the entire fabric of the web. So, it is with program code. A little code change over here causes an avalanche of error messages over there. In my mind, the biggest culprit for triggering such avalanches: *global variables*. Global variables are variables that are available for use (or change) at any point in a program. Global variables are easy to use, but are often the source of some nasty program bugs.

Scope

OK, so if global variables are the problem, how can we fix it? First, let's make it clear what a global variable is. To make the distinction clear, we need to understand the C programming concept of *scope*. Simply stated, *scope refers to the visibility and lifetime of a variable*. Listing 1 is a shell framework of all Arduino-based programs.

Global Scope

If a variable is defined with global scope, every statement following the definition of that global variable to the end of that source code file has the ability to read and change that variable. In Listing 1, *myVariable* has global scope because it is defined *outside of any function* in the source code file. *Global scope means that myVariable is visible to every statement that follows the semicolon on the first line of Listing 1 to the last line in the source code file.*

Listing 1. An Arduino-based Program with myVariable with global scope.

```
int myVariable;     // global scope starts at the end of the semicolon

void setup() {
}

void loop() {
}

int myFunction() {
        // some code...
        myVariable = 10;
}
```

Because the assignment of 10 into *myVariable* near the bottom of Listing 1 occurs after the definition of *myVariable*, the compiler has no problem with that statement.

Now, move the definition of *myVariable* to the bottom of the program so it's the last line, as shown in Listing 2 and compile the program.

Listing 2. An Arduino-based Program with myVariable with global scope.

```
int myVariable;     // global scope starts at the end of the semicolon

void setup() {
}

void loop() {
}

int myFunction() {
        // some code...
        myVariable = 10;
}
int myVariable;     // global scope starts at the end of the semicolon
```

The compiler gets cranky now and issues an error message that says:

'myVariable' was not declared in this scope

* <jack52443@yahoo.com>

How can that be? It still has global scope because it's still defined outside of any function. True, but go back and reread the part of global scope that says "... every statement *following the definition* of that global variable to the end of that source code file...". Yep, *myVariable* has global scope, but the assignment of 10 into *myVariable* takes place *before* it is defined! That's never going to work.

Function (Local) Scope

The only difference between global scope and function scope is where the definition of the variable takes place. Listing 3 is essentially the same as the others, but it moves the definition of *myVariable* into the function named *myFunction().*

Listing 3. An Arduino-based Program with myVariable with function scope.

```
void setup() {
}

void loop() {
}

int myFunction() {
        int myVariable;     // function scope starts at the end of the semicolon
        // some code...
        myVariable = 10;
}                                       // Function scope ends here
```

Once again, *myVariable* comes to life with the semicolon following its definition in the function named *myFunction()*. Now the code compiles without complaint. What happens if you change the *myFunction()* code to that shown in Listing 4?

Listing 4. Modified myFunction() code.

```
int myFunction() {
        // some code...
        myVariable = 10;
        int myVariable;     // function scope starts at the end of the semicolon
}                                       // Function scope ends here
```

This time, the code in Listing 4 tries to use *myVariable* before the statement that defines it. That won't work. (Function scope is also called *local scope* by many programmers. I just happen to think function scope is more descriptive.)

Block Scope

Block scope refers to the scope of *a variable that is defined within a statement block*, as shown here:

```
if (x == 20) {
  int myVariable;       // block scope starts at the end of the semicolon
  myVariable = x + 50;
}                                       // block scope ends here
```

A block scope variable still comes to life when the semicolon in its definition is read, but *its scope dies when the closing parenthesis for that statement block is reached*. So what happens if you try this:

```
if (x == 20) {
  int myVariable;       // block scope starts at the end of the semicolon
  myVariable = x + 50;
}                                       // block scope ends here
myVariable += 20;
```

The last statement above throws an error because *myVariable* died (i.e., went out of scope) with the closing parenthesis immediately above the last statement. Indeed, block scope is so limited it's not used all that often.

Adding Kevlar® (Figuratively) to Your Code

Okay, so what's the problem with Listing 1? After all, it compiles and the code works. The problem is that giving variables global scope makes it harder to debug and correct a program. That pesky 80% probably remains unchanged for program burdened with a lot of global variables. I'm working on a project right now with over 11,000 lines of C code and hundreds of functions. If one of my global variables goes haywire, which of those 11,000 statements is the culprit? It's like every global variable is a hooker and I just gave every statement in those 11,000 lines $500. When the bug crops up 9 months later, which of those 11,000 statements is the father?

What happens if I limit the scope of that nettlesome global variable to function scope? I may not know exactly which statement in the function caused the problem, but at least I know the offending statement is embodied within the function block where the variable is defined. Statement block scope would narrow the search even more.

The Kevlar for your code is the concept of encapsulation. Simply stated, *encapsulation* means restricting the scope of all your variables as much as possible. If some other function needs to access that (now narrowly defined) variable, simply pass the variable to the function that needs it. Passing variables with limited scope still makes debugging much simpler than without the restriction. While using global variables may seem easier, that's only true if you always write perfect code. Otherwise, that 80% always seems to be nipping at your heels.

VHF PLUS

BY TRENT FLEMING,* N4DTF

Sporadic-E Season Approaches!

As I write this, we are in the final hours of 2021, but I am already thinking about Sporadic-E (E_S) on 6 meters, which might start in March, but will certainly be in full swing by April. So, I wanted to remind you old timers, and educate newcomers, about the fun that is to be had.

Getting on the Air: E_S propagation is aptly named. It's not predictable, but that's part of what makes it so much fun. We will dive deeper into the potential causes of E_S, and discuss other propagation modes you need to know about, next month, but for now I want to outline how to prepare for operating on 6 meters. To enjoy the spring / summer season, you need the following: A transceiver capable of 6-meter single sideband, CW or digital, a simple horizontally oriented antenna, and patience. The good news is that most relatively modern HF transceivers now include 6 meters, making the band more accessible than ever before. As to antennas, horizontal polarization is the rule for all VHF and above weak-signal work, so it is best to start there. A simple loop antenna is best, these can be made or purchased, and need only be mounted at around 20 feet to be useful. Of course, the higher the better, but roughly 20 feet is 1 wavelength and a good starting point. A simple dipole will also meet this requirement, and of course is not terribly large, I would also try to get it one wavelength over the ground. But your multi-band HF dipole, or vertical, may very well work for you. In fact, I sometime switch off my beam to my 43-foot vertical just to get a different "view" of propagation, and I can often make contacts that way. Just get started with what you have, and the fun and excitement will lead you to upgrade your capabilities. Our friend Jim Wilson, K5ND, has a wealth of information on his website about ham radio, including an excellent treatment of antennas (*Photo A*). Find Jim's information here: <https://tinyurl.com/wwaam6ut>.

While 6-meter openings aren't predictable, you will find that they occur more often in early to mid-morning, and again in the late afternoon. But most dedicated operators leave a radio tuned to 50.125 MHz in the voice band to listen for openings. Periodically calling CQ is a great idea, the more activity the better. If you begin to connect with folks, it is courteous to move up the band a bit and work on a frequency other than 50.125 MHz, leaving the calling frequency open. It is also good practice to tune up and down the band once an opening starts, as stations will have spread out and you will have the opportunity to work many of them.

Jim Wilson's loop antenna for 6 meters. (Courtesy of Jim Wilson, K5ND)

Digital Thoughts

Digital modes have been popular on 6 for years, especially for meteor scatter and moonbounce (EME), and in recent years for the JT modes, including most recently FT8. As previously discussed in this column, you will find a group of meteor scatter folks using SSB around 50.145 MHz early most mornings, year-round. But the official meteor scatter frequency is 50.265 MHz, and you will find FT8 signals at 50.313 MHz. So if you are already set up for FT8, moving to 6 meters will be easy for you. FT8 expands your opportunities for contacts, even outside of E_S activity, so it is fun to give it a shot.

Personal Experience

I'm just like most of you — I swap rigs, antennas, and accessories regularly, and also try to experiment with new modes, new operating activities, as well as learn more about the enhancement of my signal, both through audio and RF techniques. I'm offering my own experience here simply as an example, and to encourage you to get started. There's nothing magical about the brands or models I will mention. My first few HF rigs were older models, like the Kenwood TS-120, that I bought cheap, fixed up, and had success with. Is it just me, or do you always feel like you need that band or mode you don't have? That was true with my HF rigs ... 80-10 meters meant I was missing out on Topband (160 meters) and 6 meters. No AM mode meant I was missing out on AM nets, etc. So I traded around, up, etc. My first radio with 6 meters was a Kenwood TS-690, which featured 50 watts out on 6. Then I had the Kenwood

* <n4dtf@cq-amateur-radio.com>

TS-60, a single-band all-mode rig. I went in a Yaesu direction after that, first with an FT-950 and then an 897D, both fun radios. Once you have 100 watts on 6 meters, and a decent antenna, you can work most openings very well. At some point you will want a beam, and perhaps even an amp, but again — let's get started. My first couple of years on the band, contacts were made using a loop at 20 feet, with a Yaesu FT-221r driving a Ten-Tec transverter. A whopping 8 watts! Now I have a 3-element beam at about 30 feet and 200 watts from my IC-7700. My initial experience with 8 watts and a simple loop should be a great encouragement to you, and I'm sure you can do better than that day one in many cases.

FM Operation

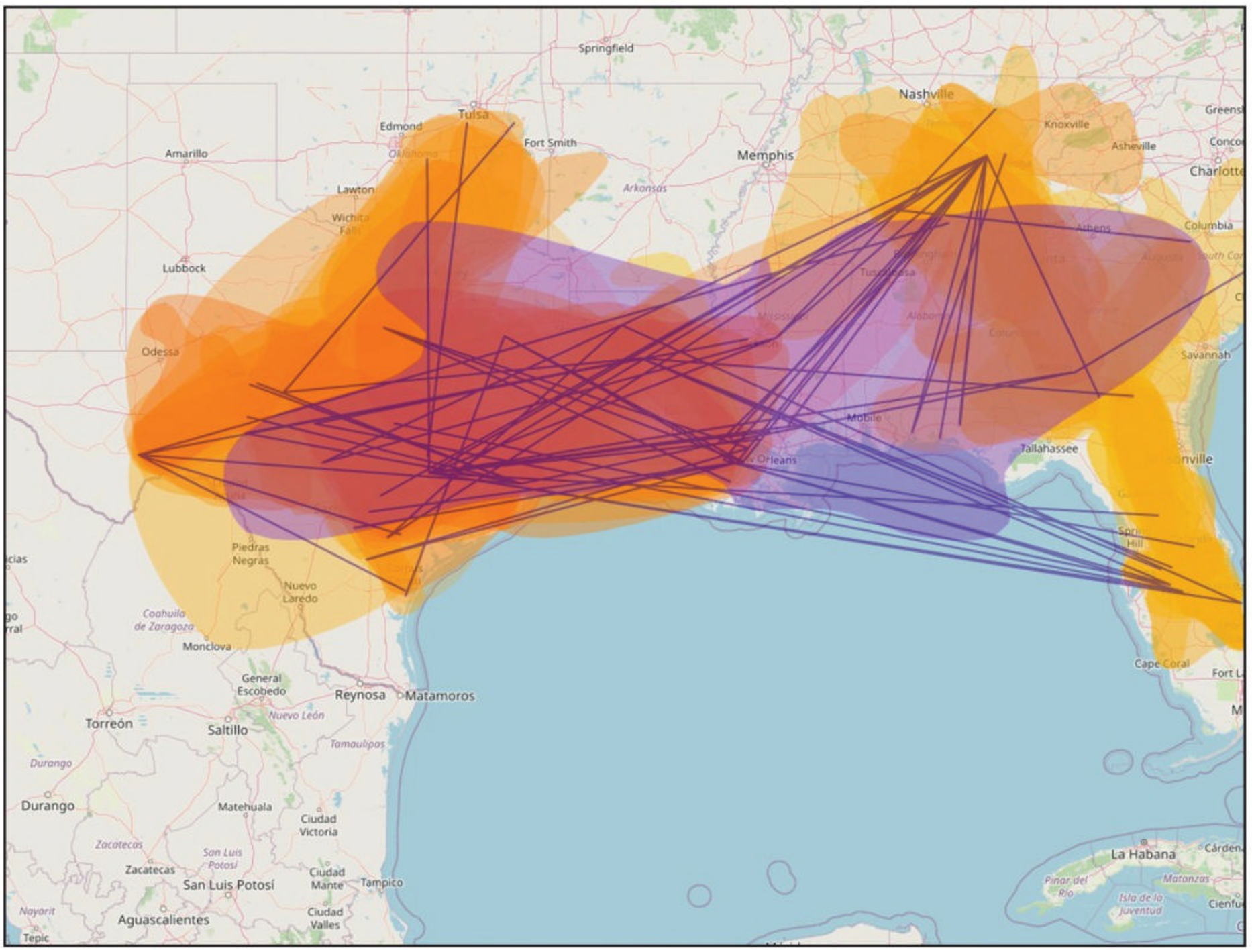
In December, we talked about FM simplex on 2 meters. I want to remind you that there is an active group of 6-meter FM operators, as well. Here, like most FM operation, vertical polarization is the norm, but if you have any 6-meter antenna up, there's no reason not to try it on FM as well. Anytime there is a weak-signal opening, there's the potential that the FM segment of the band will be open as well, but not always. The FM calling frequency is 52.525 MHz, so again you would listen and call here to check on openings. For years I have had 6-meter FM in my mobile, and using a quarter-wave antenna I've had decent success out to several hundred miles when conditions are good. Again, it takes dedication and patience, so it is not for everyone.

A Note About 8 Meters

Recently we wrote about experimental stations in the U.S. on the 8-meter band. The number of licenses has been expanded, and by the summer I expect a good number of operators on the band (roughly 40 MHz) which your 6-meter radio should be able to at least hear. We expect 8-meter propagation to be very similar to 6 meters, so I think it will be of interest going forward.

Operating Reports: 6 Meters to the Land Down Under!

Recently, I wrote about the Ross Hull contest, a 6-meter contest that runs during December and January. I mentioned we often see contacts between the states and VK/UL this time of year, and true to form, I had the following report from Pat, W5VY, in Arkansas. Last evening (Sunday December 26th and Monday December 27th), Pat worked ZL3OZ, ZL3NW, ZL3RC, and ZL7DX. The first QSO was made at 23:42 and the last QSO was recorded at 02:02 UTC. These were FT8 contacts. Pat uses a Flex 6700, Power Genius XL amp-Legal Limit, and a 5L LFA at 82 feet. Pat mentioned that lots of sta-



Tropo propagation in the week leading up to Christmas along the Gulf Coast. As you can see, it was a good morning.

Just a reminder. Listen and call as often as you can on our allotted frequencies. I did this recently on 2-meter sideband after a local net ended, and was rewarded with a good 200-mile contact and a nice QSO with a fellow VHF

tions in Texas worked more ZLs than he heard. He heard west coast ops … Arizona and California, working ZLs for an hour or more after it ended for him.

Finally, Pat relates how 6 meters "lightning" struck for him: "As I noted to Rick, K5UR, on the reflector, I worked Bob, ZL1RS, on CW in February 2012 after only being on 6 meters for a month total. I had a three-element Yagi at about 16 feet and an ICOM IC-7000. I saw Bob spotted and decided to take a listen. I was shocked when I heard him working guys in Texas ... W5LUA was in there of course. I called him and it took a couple of overs for him to get my full call. I was blown away! Been hooked on 6 meters ever since."

Other Operating Reports

From the SWOT Radio Club website, on December 1, 2021 a new net listing:

On Sundays at 8:00 p.m. (local Central time) on 144.250 MHz, a simplex USB 2-meter sideband net — Open to all amateur radio operators who have access to upper sideband on 2 meters — See how far you can be heard or just listen in!

I did a little digging, and learned from Pat, K4PAT, the following:

The Heartland Hams group <http://heartlandhams.org> has operated an SSB net for a number of years. Seeing a need for a backup to the available VHF & UHF repeaters in the county, an FM simplex net was attempted. When that provided only partial coverage Don, WØAF, asked how many folks had SSB capable equipment. When folks made the mode change, using their existing vertical omni antennas, the coverage issues were gone. The net has been in operation for nearly five years.

Your author was pleased to see this net reported, as it emphasizes his comments about simplex nets from recent columns.

From the heartland we look to the southwest and see an excellent report from the weekly Arizona SWOT net, even on the day after Christmas, Bob, N7VD, reports 19 check-ins, encompassing eight grids in two states. More information can be found on their website <https://az-swot.net>.

In the weeks leading up to Christmas, we saw a number of good tropo openings on 2 meters and above, ranging from the Gulf coast to the New England states (*Photo B*).

Just a reminder. Listen and call as often as you can on our allotted frequencies. I did this recently on 2-meter sideband after a local net ended, and was rewarded with a good 200-mile contact and a nice QSO with a fellow VHF and above aficionado! During the above referenced FM simplex net, we had contact from another group also meeting on that frequency, also around 200 miles away. Many times we miss band openings because we aren't there.

That's it until next time. Feel free to share 6-meter tips and techniques. I'd be especially interested in featuring any 6-meter AM activity, and I'm ALWAYS interested in your operating reports.

AWARDS

BY STEVE MOLO,* KI4KWR

Finland's ELK Award

CQ USA-CA Award Update

500 County Level
KD5OMJ – Award number 3818 dated October 24, 2021
AA5NA – Award number 3819 dated November 12, 2021
JR2PZX – Award number 3820 dated November 25, 2021
I2DMI – Award number 3821 dated December 6, 2021
HA9PP – Award number 3822 dated December 19, 2021

1000 County Level
HA9PP – Award number 1940 dated December 19, 2021

1500 County Level
IV3GOW – Award number 1599 dated October 23, 2021

2500 County Level
WB8III – Award number 1392 dated December 7, 2021

During the last few weeks, I have seen that Raisa Skrynnikova ("YL Raisa"), R1BIG/OH7BG (*Photo A*), sponsors an award for working 10 OH stations and one QSO with OH73ELK. Now wait … I can obtain this award (*Photo B*) by working 10 different call areas of Finland and just one QSO with OH73ELK? Well, this sounded like a simple challenge, and so far, it has been the award challenge of 2022 for me … not as easy as it sounds.

According to the OH73ELK website <https://oh73elk.net/page/elk-award>, the ELK Award is printed on high-quality thick paper with OH73ELK stamped in silver on the first 100 awards, and OH73ELK as a hologram starting at number 101. It is available to amateur radio operators and SWLs around the world. The OH73ELK group is covering the costs of the first 300 certificates, including the mailing fee.

Photo A. Raisa Skrynnikova ("YL Raisa"), R1BIG/OH7BG, with the ELK Award, which she sponsors. (Photos courtesy of OH73ELK website)

I can obtain this award by working 10 different call areas of Finland and just one QSO with OH73ELK …sounded like a simple challenge, … not as easy as it sounds.

Photo B. The ELK Award is earned by contacting 10 Finnish call areas plus OH73ELK. The name of the award honors Finland's large elk population.

Photo C. This sign welcomes you to the OH73ELK cottage and station. Both are available to rent if you're visiting the area.

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

Photo D. Aerial view of Vuokalansaari island, with the OH73ELK tower and cottage visible.

You get the award signed by YL Raisa directly from Finland to your home.

You do not need to print or scan anything. Simply email the electronic application <https://tinyurl.com/2p8srt9m> as an attachment to <info@OH73ELK.net>. In the subject line, please write ELK AWARD + your CALL + electronic OR **printed**, depending on which version you want (the electronic version will be sent if you do not specifically request a printed certificate). If you want to have the printed version, please also write your current home address.

Where is OH73ELK?

The station is located in the OH73ELK Radio Cottage (*Photo C*), which is available to rent if you're visiting Finland. It is situated on a small island called Vuokalansaari (*Photo D*), which is connected to the mainland by a bridge, so access is easy. The nearest village is Savonranta (a big supermarket, pharmacy, and restaurant available) and the nearest town is Savonlinna (center of the region).

The distance between OH73ELK and Savonranta is 14 kilometers (9 miles) and between OH73ELK and Savonlinna is 67 kilometers (41 miles).

Good luck!

One off-air mission for the group was purchasing and delivering needed goods to local schools on behalf of JH1AJT's Foundation for Global Children.

with antenna and one large freezer. Visiting both facilities was an incredible experience for us. We could see the joy and happiness on the faces of the children. We were very happy that this goal of our amateur radio mission was also successful. Once again, many thanks to Zorro, JH1AJT, and the FGC.

Later in the afternoon the whole team returned to the station and resumed operations in the usual manner. Everyone found the mode and band that suited them and so the station rotating schedule was more or less natural. In the evening, another benchmark was reached — 70,000 QSOs. We were very encouraged by this. Propagation was exceptionally good on all the upper bands, including 10 meters being open until midnight. We made the most of it with two stations working on 15-meter CW and SSB continuously for many hours. When the bands were closing, we activated the FT4 mode. The great thing was that even on the lower bands the propagation was good and on both 80 and 160 meters, we managed to work more JA stations that evening.

In the morning, when dawn had broken and the traffic on the lower bands ended, there were several power outages again. It was very annoying. We were also worried about the PAs as the power outage during the operation may damage them. We remembered the situation at HKØ/A where several PAs broke due to outages and under-voltage on the power network. Fortunately, nothing similar happened here. Only one PA showed some problems with the reflectometer protection, but was usable after disabling it. The remaining four PAs worked without any problems. Propagation conditions were below average this day and night, but we were still able to make some QSOs. Despite the poor conditions, the 6-meter band briefly opened again, this time also to central EU. We even made one single QSO to our home country with Ivan, OK1PI. We read on the internet about a big flare on the sun which might impact our propagation. We were terrified by that as there were nearly 80,000 QSOs in our log and still almost three days of operation ahead of us. The 100,000 mark was really close, but if we were "obstructed" by the deteriorated propagation conditions, it might not happen. The food didn't help our mood, either. Although Claudio was a really great cook, there was either fish or sometimes chicken for lunch and dinner every day. It was clear to us that there was probably nothing else to be found on the island, although there were goats and pigs running around freely. We were just tired of 10 days of the same food. And to make things worse, another transceiver broke. One of the K3s stopped producing power. It had to be shut down and decommissioned.

On Wednesday, it rained heavily all day with streams of water running down the garden. We monitored the A and K indices. The A was 45, which bode ill for the propagation. The conditions were really bad. We tried CW and SSB regularly, but without success. After many futile CQs, we switched to FT8 or FT4. However, closer to noon there was a reversal, even though it was not noticeable outside and the rain was still intense. Propagation conditions improved dramatically. We started working on all of the upper bands, some with two stations. Europe and North America were coming in surprisingly strongly. Five of our stations were running SSB and two FT8. The rate climbed to 30 QSOs / minute and 900 QSOs per hour. We were thrilled, our mood quickly improved, and we started dreaming of 100k again. With a 900 QSO-per-hour rate, it would be easy. The upper bands faded after midnight, but the lower bands still worked decently. We tuned the 80-meter vertical from CW to the SSB segment and, for the first time, we activated SSB on that band. There was a lot of interest. The operators on the lower bands had a really tough job. The top of the highest mountain on the island was permanently in the clouds and thunderstorms swirled around the mountain several times a day, causing huge QRN. Copying the weak signals through it was very tiring. Unfortunately, the discipline of the callers didn't help, either. Although we made directional calls very frequently, the

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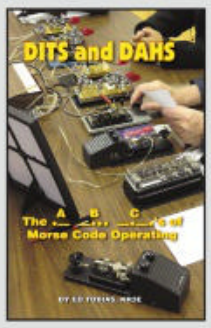

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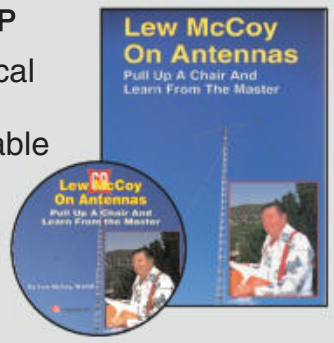

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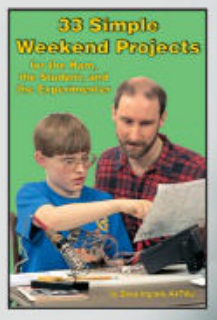

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callers did not respect that. This also applied to OK/OM stations, who, knowing they were calling their friends and hoping that we might somehow favor them, often disrupted pileups of weak stations from distant locations. This was extremely annoying and debilitating. We were thinking of teaching them proper manners — but how?

However, it was not only a lack of operational discipline and minimal sleep (we usually slept 3-4 hours a day) that contributed to operator fatigue, but also the "physical wear and tear" on our bodies. There were big wooden chairs in the ham shack, and after 10 days of constant sitting, literally everything hurt and we did not know how to sit down at the station. Some CW operators solved this by transmitting standing up for a while. It was very uncomfortable and

Heading home … after two weeks, 107,505 QSOs and much too much fish and chicken!

5 Band WAZ

As of December 15, 2021
2344 stations have attained at least the 150 Zone level, and 1091 stations have attained the 200 Zone level.

As of December 15, 2021
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
IK8BQE	199	31
IZ3ZNR	199	1
JA1CMD	199	2
JA5IU	199	2
JA7XBG	199	2
JH7CFX	199	2
JI4POR	199	2
JK1AJX	199	2 on 10M
JK1BSM	199	2
JK1EXO	199	2
K1LI	199	24
K4HB	199	26
K5TR	199	22
K7UR	199	34
K9KU	199	22 on 15M
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
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W3LL	199	18 on 10M
W3NO	199	26
W4LI	199	26
W6DN	199	17
W6RKC	199	21
W6TMD	199	34
W9OO	199	18 on 10M
W9XY	199	22
9A5I	198	1, 16
EA5BCX	198	27, 39
F5NBU	198	19, 31
F6DAY	198	2 on 10M & 15M
G3KDG	198	1, 12
G3KMQ	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
JH1EEB	198	2, 33
KØDEQ	198	22, 26
K1BD	198	23, 26
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3LR	198	22, 23
K3WA	198	23,26
K4JLD	198	18, 24
K9MM	198	22, 26
KI1G	198	24, 23 on 10M
KZ2I	198	24, 26
LA3MHA	198	31 &32 on 10M
N4GG	198	18, 24
N6PF	198	18, & 23 on 10M
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
VK3GA	198	12 & 13 on 10M
W5CWQ	198	17, 18
W6RW	198	2 & 22 on 10M
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
JR1HYA	2337	2021-11-18	151
ON7BJ	2338	2021-11-20	188
DL3JAN	2339	2021-11-23	162
JM2LEI	2341	2021-11-29	174
SP9JZU	2342	2021-12-03	199
JT1CS	2343	2021-12-04	171
K3FM	2344	2021-12-04	160

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
RL3FA	1983	2021-11-23	198
DL1QQ	2181	2021-11-27	189
JA0CIU	2135	2021-12-02	188
DF2GH	2032	2021-12-03	197
EA3EQT	1005	2021-12-04	187
IK2GOQ	2309	2021-12-09	158
SV8CKM	1251	2021-12-10	188

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

5BWAZ #	Callsign	Date	All 200 #
2340	SV8BHN	2021-11-23	1091

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reaced via email: <kc5lk@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).**

The WPX Program

CW

4041 ..... JN1JYD
4042 ..... DJ1AK
4043 ..... JA1KPF
4044 ..... AK9B

SSB

4402 ..... GB1OOH
4403 ..... N9VD
4404 ..... OV7B
4405 ..... KK7GO
4406 ..... WM9K
4407 ..... OV2B
4408 ..... W1HMM
4409 ..... IZ7AUE

Mixed

4357 ..... KØMU
4358 ..... N9VD
4359 ..... OV7B
4360 ..... N7ILO
4361 ..... W7ONY
4362 ..... W5KY
4363 ..... W8DSN
4364 ..... OV2B
4365 ..... OH5NS
4366 ..... JN1SUT
4367 ..... VE3GYL
4368 ..... ER1SKI
4369 ..... DHØKW
4370 ..... OE1CGS
4371 ..... IZ7AUE
4372 ..... KC5DRI
4373 ..... KC7RAS
4374 ..... WA8ZNC
4375 ..... PA5BM
4376 ..... 9A5ADI
4377 ..... JG1GJH
4378 ..... KI6HQT
4379 ..... WM7C
4380 ..... WØKMA

Digital

1658 ..... W7ONY
1659 ..... N9VD
1660 ..... OV7B
1661 ..... N7ILO
1662 ..... VK4SE
1663 ..... KØMU
1664 ..... NZ9A
1665 ..... OV2B
1666 ..... KC8T
1667 ..... OH5NS
1668 ..... JN1SUT
1669 ..... VE3GYL
1670 ..... ER1SKI
1671 ..... WBØATS
1672 ..... DHØKW
1673 ..... W6BCE
1674 ..... KC5DRI
1675 ..... JG1RYQ
1676 ..... JH2GSW
1677 ..... WA8ZNC
1678 ..... PA5BM
1679 ..... KW7MJA
1680 ..... JG1GJH
1681 ..... GB1OOH
1682 ..... 7K3EUT
1683 ..... WØKMA
1684 ..... N2YCH
1685 ..... JI5USJ
1686 ..... K1EHT

CW: 350: W8DSN, DK1MCS. **550:** JN1JYD. **750:** W6AER. **800:** N5KAE. **950:** JR3UIC. **1750:** HB9BIN. **2100:** LB5WB. **5750:** N6JV. **8350:** WA2HZR.

SSB: 350: GB1OOH. **400:** OV7B, K8JH. **450:** N9VD. **500:** WR7X, W1HMM, KA5WSS. **600:** KAØGOA. **800:** OV2B. **950:** W6AER. **1150:** KE4KMG, W6HYI. **1400:** N5KAE.

Mixed: 450: W5KY, KØMU, WØKMA. **500:** W8DSN, DHØKW, JH2GSW, WA8ZNC, JG1GJH. **550:** GB1OOH, N7ILO, KC7RAS, NG2G. **600:** GB1OOH, KI6HQT, JI5USJ, KAØGOA. **650:** ERISKI, N3AML. **700:** JN1JYD, PA5BM. **750:** WQ9F, WB8LEM. **850:** W1HMM. **1000:** N9VD, OV7B, KØARM. **1100:** NA5WH, N8IK. **1150:** KE8FMJ, AK9B. **1200:** MØHIH. **1300:** OV2B. **1350:** DK1MCS. **1400:** WR7X, VE3GYL. **1500:** WU9D, KC1UX. **1600:** KE4KMG. **1850:** K8JH. **1900:** N5KAE. **2150:** HB9MXY. **2250:** JR3UIC. **2500:** W6AER. **2850:** W2YR. **3500:** HB9BIN.

Digital: 350: WA8ZNC, N8IK, W7ONY. **400:** JN1SUT, DHØKW, OE1CGS, WØKMA. **450:** N7ILO, N5KAE, JG1GJH, JI5USJ. **500:** N9VD, N3AML, NG2G. **550:** OH5NS, KC7RAS, PA5BM. **600:** VK4SE, ER1SKI. **650:** WQ9F, W1HMM. **700:** OV2B. **750:** JK1DDQ, OV7B. **850:** KØARM. **900:** K8JH, KA5WSS. **950:** KE4KMG. **1000:** AK9B. **1050:** MØHIH, VE3GYL, DK1MCS. **1100:** NA5WH. **1150:** KE8FMJ. **1250:** HB9MXY. **1300:** WR7X, WU9D. **1400:** KC1UX, K1PL. **1450:** W2YR. **1900:** JR3UIC. **2150:** W6AER. **2450:** HB9BIN.

160 Meters: W8DSN, OH5NS, DJ1AK
80 Meters: OV7B, HB9MXY, LB5WB, K1EHT
40 Meters: OV7B, NZ9A, WQ9F, ER1SKI, W6AER, WB8LEM, W1HMM, WØKMA, DK1MCS
30 Meters: JR3UIC, VK4SE, WQ9F, HB9MXY
20 Meters: N9VD, OV7B, N7ILO, VK4SE, OV2B, JN1JYD, VE3GYL, WQ9F, W6BCE, W1HMM, KC7RAS, JH2GSW, WA8ZNC, PA5BM, 9A5ADI, HB9MXY, NG2G, GB1OOH, KI6HQT, N8IK
17 Meters: OV7B, OV2B, HB9MXY
15 Meters: JR3UIC, OV2B, VE3GYL, DK1MCS
12 Meters: W2YR, W6AER
10 Meters: KE8FMJ, OV2B, HB9BIN, KC5DRI, HB9MXY, W7ONY
6 Meters: OV2B

Africa: OV2B, W6AER
Asia: N9VD, OV7B, VK4SE, OV2B, JN1JYD, JN1SUT, VE3GYL, ER1SKI, KØARM, JG1RYQ, KC7RAS, WA8ZNC, PA5BM, HB9MXY, JG1GJH, 7K3EUT, W7ONY, KC1UX, JI5USJ, AK9B
Europe: GB1OOH, JK1DDQ, N9VD, OV7B, VK4SE, OV2B, JN1JYD, VE3GYL, ER1SKI, DJ1AK, DHØKW, N3AML, W4HMM, OE1CGS, IZ7AUE, JH2GSW, PA5BM, 9A5ADI, HB9MXY, GB1OOH, N8IK, KA5WSS, JI5USJ
Oceania: JK1DDQ, N9VD, OV2B, JN1SUT, JG1RYQ, JG1GJH, KA5WSS, JI5USJ
North America: W7ONY, KØMU, N9VD, OV7B, N7ILO, W5KY, VK4SE, WM9K, W8DSN, NZ9A, OV2B, VE3GYL, WBØATS, W6BCE, W1HMM, KC5DRI, KC7RAS, JG2GSW, WA8ZNC, KI6HQT, WM7C, WØKMA, W7ONY, K1EHT, AK9B
South America: N9VD, OV2B, VE3GYL, K7PT, WU9D, KA5WSS, AK9B

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.

inconvenient, but still better than sitting. Bruised ears from headphones are commonplace on an expedition, and when you add swollen legs from the knees down, it's a far cry from physical comfort. It was the last day of full operation, so we had no choice but to grit our teeth and hang on. The SSB operators were starting to have voice problems, but they were giving it their all. That six-figure mark was within reach.

However, we admit that a gang of eight guys, who went on a 14-day "vacation" in good shape and full strength, would all come home complete wrecks. OK2ZI got stuck by a hedgehog in the leg, OK2ZC got bitten by a centipede that got into his shoe during the night shift. OK1GK got a puncture in his foot while building the 160-meter vertical. The reward, how-

CQ DX Awards Program

Endorsements – SSB

KM2P 338

Endorsements – CW

K9VKY 331

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

The WAZ Program

SINGLE BAND WAZ

17 Meter Digital

14 ..... JA7GAP

20 Meter Digital

39 ..... JAØDOW

40 Meter Digital

20 ..... JA7GAP

160 Meter Updates

576 ..... RL3FA, 35 Zones
616 ..... SP6JZU, 39 Zones
617 ..... DF2GH, 34 Zones
17 ..... W1JR, 38 Zones

ALL BAND WAZ

CW

1165 ..... HB9IIY
1166 ..... DL3JAN
1167 ..... JA7GAP
1168 ..... IKØSHH
1169 ..... JM2LEI
1170 ..... JF1TEU

Digital

311 ..... DL6GBM
312 ..... HB9HBZ
313 ..... KM8V
314 ..... W7SX
315 ..... JL1UXH
316 ..... JJ1HLL
317 ..... SV8CKM
318 ..... JA7CME

Mixed

10120 ..... HB9VAB
10121 ..... N1KDO
10122 ..... HB9HBZ
10123 ..... ON7BJ
10124 ..... S51DD
10125 ..... HA1AC
10126 ..... HB9ODK
10127 ..... DL7UST
10128 ..... K3FM
10129 ..... OV2B
10130 ..... OV7B
10131 ..... JA7FSB

SSB

5524 ..... Z31TU
5525 ..... HB9IIY
5526 ..... ON6ZV
5527 ..... IZ2USP
5528 ..... N2QL

RTTY

310 ..... ON6ZV

EME

24 ..... IW4ARD, 28 Zones

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

ever, was open bands when strong signals came through and the operator managed to "orchestrate" the big pileups. This was also helped by the fact that all our antennas worked flawlessly all the time and generated decent, strong signals. We already had a lot of QSOs on all modes, so on this day we activated the last one — PSK.

With Friday came the gradual end of our expedition, but not before a miracle came true in the morning — 100,000 QSOs were in the log! We opened a bottle of gin and toasted our success. After finishing breakfast, which was good, but just like before, we had to go to the hospital for Covid-19 tests. The whole trip to the capital took about three hours. S9OK could not be on the air during this time of course, so on our return, we started operating right away. As they say, appetite grows with the food. We had to come up with another mark and we set it to 105,652 QSOs. By that number, we would be in the top 20 most successful expeditions of all time, according to the list maintained by GDXF. In the afternoon, we had to start packing some antennas according to the prepared schedule. We took down one Spiderbeam along with the 6-meter Yagi and made only single verticals from all the vertical twins for 30 and 40 meters. Departure from QTH was scheduled for Saturday at 16:30 hours and everything had to be packed perfectly by then. For dinner, we got fish — again delicious, but fish again. After dinner we gave our full attention to the lower bands to make the most of the last night. Anyone who didn't work us now wouldn't have another opportunity on the lower bands. The antennas would go down in the morning. On this last night in particular (for the first time during the expedition), the conditions were great on 160. It started with an opening to JA, with about a hundred new JA stations suddenly appearing on CW. Unfortunately, due to their lack of discipline and problematic reception in the equatorial QRN conditions, only 36 QSOs could be completed. This was followed by strong European stations and then a number of North American stations including several W6/W7 in the morning. On this last night, 277 CW QSOs were made on 160 out of a total of 2,167 contacts. FT8 did not get a turn at all that night. How glad we were that we decided to keep the 160-meter antennas up for the last night.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more ACTIVE countries. With few exceptions, the ARRL DXCC Countries List is used as the country standard. The CQ DX Award currently recognizes 340 countries. Honor Roll listing is automatic when an application is received and approved for 275 or more active countries. Deleted countries do not count and all totals are adjusted as deletions occur. To remain on the CQ DX Honor Roll, annual updates are required. All updates must be accompanied by an SASE if confirmation of total is required. The fee for endorsement stickers is $1.00 each plus SASE. (Stickers for the 340 level and Honor Roll are available.) Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA.

CW

DL3DXX....339
HB9DDZ....339
K4IQJ.....339
K9MM.....339
N4MM.....339
WB4UBD...339
WS9V.....339
EA2IA.....339
F3TH.....339
K2FL 339
K2TQC.....339
K3JGJ.....339
K3UA.....339
K4CN 339
K4JLD 339
K4MQG.....339
K5RT.....339
K7LAY.....339
K7VV.....339
K8LJG.....339
N4AH 339
N4CH 339
N4JF 339
N4NX 339
N5ZM 339
N7FU.....339
N7RO.....339
NØFW 339
OK1MP 339
W3GH 339
W4OEL 339
W5BOS.....339
W7CNL 339
W7OM.....339
W8XD.....339
WK3N.....339
WØJLC 339
WØVTT.....339
YU1AB 339
K8SIX.....338
KA7T.....338
WA5VGI....338
W9RPM.....338
G3KMQ.....337
KØKG.....337
W7IIT 337
K8ME 336
W1DF.....336
W6OUL 336
JA7XBG 335
F6HMJ 334
K1FK.....334
K9OW 334
PY2YP 334
WG5G/QRPp 334
WD9DZV...334
K2OWE.....333
K5UO 333
N6AW.....333
W4MPY.....333
K6LEB.....331
K9VKY 331
N7WO 331
OK1DWC ..331
K6YK.....329
W9IL.....329
IKØADY 328
OZ5UR.....328
AB4IQ 327
K6CU 326
KE3A.....326
EA5BY 325
KA3S.....325
K7CU 324
N3RC 324
N7WO 324
KEØA.....322
YT1VM.....322
4Z5SG.....321
N2LM 321
HB9DAX/QRPp 319
W6YQ 319
HA1ZH 318
N6PEQ.....318
CT1YH 316
EA3ALV 315
RA1AOB ...313
WA4DOU ..312
YO9HP.....312
W6WF 309
KT2C..... 307
K4DGJ 307
W4ABW 306
K7ZM 305
HA5LQ 301
RN3AKK....300
WA9PIE 298
K4IE 295
YU1YO.....295
WA2VQV...292
4XIVF.....286
K6YR.....284
PP7LL 282
WR7Q 282
N2VW.....280
K4EQ 280
W8BLA.....280
WB5STV ...277
YO6HSU ...275

SSB

AB4IQ 340
DJ9ZB.....340
DL3DXX....340
DU9RG 340
EA2IA 340
EA4DO.....340
HB9DDZ....340
I8KCI.....340
IK1GPG.....340
IN3DEI 340
K2FL 340
K2TQC.....340
K3JGJ.....340
K4CN 340
K4IQJ.....340
K4JLD 340
K4MQG.....340
K4MZU.....340
K5OVC.....340
K5RT.....340
K5TVC 340
K6YRA 340
K7VV.....340
K8LJG.....340
K8SIX.....340
K9MM.....340
KE5K.....340
KZ2P 340
N4CH 340
N4JF 340
N4MM 340
N5ZM 340
N7BK.....340
N7RO 340
NØFW.....340
OK1MP 340
OZ3SK 340
OZ5EV 340
VE1YX 340
VE2GHZ....340
VE2PJ.....340
VE3MR.....340
VE3MRS ...340
VE3XN 340
VK2HV 340
W3AZD 340
W3GH 340
W4ABW 340
W5BOS.....340
W6BCQ.....340
W6DPD.....340
W7BJN.....340
W7OM.....340
W8ILC.....340
W9SS.....340
WB4UBD...340
WK3N.....340
WS9V.....340
XE1AE 340
YU3AA 340
JA7XBG 339
KØKG.....339
W2FKF.....339
W4UNP.....339
W9RPM.....339
EA3EQT....338
K3UA.....338
K7LAY.....338
K9HQM 338
KM2P 338
N4NX 338
YU1AB 338
4Z4DX.....338
K1UO 338
N7WR 338
WA5VGI....338
W2CC 338
W7FP 338
W9IL.....338
N4FN.....337
IØZV.....336
K3LC.....336
K8ME 336
EA3BMT....335
F6HMJ 335
HB9DQD...335
IKØAZG 335
IW3YGW...335
OE2EGL....335
VK2HV 335
W4WX.....335
WB3D.....335
AA4S.....334
EA5BY 334
K9OW 334
PY2YP 334
VK4LC.....334
W8AXI.....334
XE1J 334
CT3BM.....333
IK8CNT 333
K8LJG 333
N6AW.....333
OE3WWB..333
WD9DZV...333
N1ALR 328
AA1VX 332
KE3A.....332
N2VW.....332
N5YY.....332
K5UO 331
KC2Q 331
SV3AQR ...331
WØROB 331
W6OUL 331
XE1MEX ...331
KD5ZD 330
WA4WTG..330
W1DF.....330
WØYDB 330
ZL1BOQ....330
AD7J 329
N3RC 329
VE7SMP ...329
WØULU.....329
CT1AHU....328
N2LM 328
AE9DX 327
K7HG 327
K6GFJ.....326
KE4SCY....326
KF4NEF 325
W6WF 325
W9GD 325
VE7EDZ....324
WA5UA 324
F6BFI 323
ON4CAS ...323
VE6MRT ...323
W5GT.....323
N6PEQ.....322
W4MPY.....322
K8IHQ 321
KW3W.....320
TI8II.....320
YO9HP.....320
XE1RBV....317
N7YB.....315
IV3GOW....312
N8SHZ 312
K7CU 311
OK1DWC ..311
KU4BP 310
W6NW.....310
I3ZSX.....309
G3KMQ.....308
KA1LMR....308
RA1AOB ...308
XE1MEX ...308
IK5ZUK 307
IØYKN.....306
XE1MW.....305
K4IE 304
K4ZZR.....304
K7ZM 303
4Z5FL/M....302
K7SAM.....301
KA8YYZ 301
4X6DK.....298
K2HJB.....295
F5MSB.....293
W9ACE 291
N3KV.....289
W6MAC.....289
N5KAE 283
IZ1JLG 282
WA9PIE 282
WD8EOL...281
IWØHOU...277
AKØMR.....276
NØAZZ.....275
SQ7B 275

RTTY

NI4H 338
WB4UBD . 338
WK3N 338
N5ZM 338
OK1MP . . . 337
K4CN 334
K8SIX 334
W9RPM . . 334
W3GH 333
K3UA 332
AB4IQ 323
K4WW . . . 323
N4MM 302
K4IQJ 300
K8ME 278
IN3YGW . . 275

On Saturday morning we were supposed to start packing right away, but we just couldn't do it. The morning shift sat just as every day on CW on 10, 12, and 15 meters at dawn, and we made contact with everyone who called, only with a slight preference for JA. The pileups were not as big as before, but there were still a lot of stations calling. If we stayed there another week, we would still have a lot to do. After breakfast, we split into groups and started packing up. Only the FT4 and FT8 operators stayed at the radio. The final QRT came at 13:44, with a sensational 107,505 QSOs in the log. No one had hoped for this number before departure. We didn't believe we would even get close to the 100k mark.

The packing of the antennas went as planned, without any major problems, since we are already an experienced team. Everything was packed, weighed, and foiled about an hour ahead of schedule. We went to the sea for the last time, but we were only able to stay there for a short time. Then we waited for taxis to arrive. The trip to the airport was uneventful, there were some minor complications at the check-in, but nothing major that would upset such experienced hikers. Before boarding the plane, we joked that we could have been offered fish or chicken for our on-board meals, of which we were fed up. What was the inflight offer? The poor flight attendant probably still doesn't understand how such an innocuous phrase "chicken or fish" could cause such a huge wave of laughter from all 8 passengers in weird yellow t-shirts.

Summing it Up

The total number of QSOs was 107,505, which is a very high mark. We are thinking about the next destination we would like to go to, but wherever it will be, it will not be easy to surpass this mark. Currently, the result puts us in 20th place in the official Megadxpedition ranking <https://tinyurl.com/3e8z43hf>. With only eight people and a modest budget at our disposal, this is an extraordinary achievement.

After the expedition ended, we received many congratulations and compliments on our operation, and on how we promptly changed bands according to the openings and used DX windows to difficult directions. We were active on CW, SSB, RTTY, PSK, FT4, and FT8, gave a large number of stations a band point and for many we were a brand new DXCC country. It is an encouragement to us to keep working. If the world health situation is favorable, you can look forward to another "carnival" next year.

QSL cards are already in production, requests will be processed by David, OK6DJ. All OQRS direct requests were confirmed on LOTW a few days after returning home.

We would like to thank all the stations that made a QSO with us. We would also like to thank the sponsors, both the associations (SEISA, DX-news, Northern California DX Foundation, Northern Illinois DX Association, Far East DX Ploiters, Mediterraneo DX Club, CDXC, Clipperton DX Club, European DX Foundation, Southeastern DX Club, Lone Star DX Association, MASTRANT, GM DX Group, OH DX Foundation, Danish DX Group, Greater Milwaukee DX Association), and individuals, especially W8TOP, K9YC, JA1BK, JA4DND, JH1RFR, JJ3PRT, AC8L, OK1MY, OK5MM, OK1FPG, OK1VK, OK1VJ, RD4A, JA8UIV, W9EWZ, LA5IIA, HB9BAS, OM2RA, RM2D, LB5GI, LA7THA, K6VOX, EA3HSO, HI3SD, KI8JP, W0SZ, K7TM, DM2HK, DD2CW, OK2BTJ, WØCP, OK1MP, OK1DCS, OK1CSS, OK1PA, PY5EG, N7WS, OK2PDN, OK1PI, OK1DOL, and OK2BZM.

For detailed statistics see <https://clublog.org/charts/?c=S9OK#r>

Note: A version of this article in German appeared in *Funkamateur* magazine.

OUR READERS SAY...

Waking Me Up Again…

Editor, *CQ*:

Thanks again for sending the latest issue of *CQ*. I just finished reading your latest Zero Bias (December issue: "The Final Frontier"). It sure did a good job of waking me up again to the value of today's amateur radio. I need to do a better job of being a ham in today's world.

Thanks again and Merry Christmas!!

– 73, Larry Waggoner, WØKA

W2VU replies:

Larry, I'm sure you're already doing a great job of being a ham! But I'm glad the editorial perhaps helped you look at our hobby in a slightly different way. 73 and Happy New Year!

The Glory Days of AM Radio

The following letter was directed to "Magic in the Sky" editor Jeff Reinhardt, AA6JR:

Hi, Jeff…

Loved your piece on "Magic in the Sky" [January issue, "Long Live the King (of Radio)"]. As a 10-year-old kid growing up in Milwaukee, I always tuned our giant console radio on Saturday nights to WWL in New Orleans and listened to the sound of whatever big band was playing. Quite a thrill to hear that station pound in, week after week.

Years later, in traveling the country doing seismic work, kept the radio in my truck tuned all night to 650 AM WSM and the Grand Ole Opry.

There will always be a soft spot in my heart for AM radio.

– 73, Ted Cohen, N4XX

AA6JR responds:

Ted,

Thanks for the kind words about *Magic In The Sky* as it appears in the January *CQ*.

I appreciate your taking the time to share your memories of AM broadcasts.

Its glory days were a lot of fun!

– Best, Jeff, AA6JR

Strange Signals

Editor, *CQ*:

I received a book for Christmas called *Interesting Stories for Curious People*. Each story is general interest except for one that will probably be of special interest to hams and SWLs. [It's titled "Strange Signals" and is about three mysterious stations in Russia transmitting various sounds, occasionally interrupted by possible coded messages.] Perhaps you can forward it to Gerry Dexter who writes "The Listening Post." I'm going to check the frequencies listed at several times of day. I would guess the signals propagate best at night. The other stories in the book are ... well, yes, interesting ... some seem unlikely, others perfectly believable. This one needs to be checked out.

Keep up the great job of putting together each issue of *CQ*!

– 73, Jim Kocsis, WA9PYH

W2VU replies:

Thanks for the heads-up, Jim. As you suggested, I've forwarded this to Gerry and we'll see if he can come up with anything interesting. Meanwhile, please be sure to let Gerry know if you hear these stations. We encourage any of our readers who also enjoy shortwave listening to pass along their loggings to Gerry. 73

BY TIM SHOPPA,* N3QE

Accurately Copying Callsigns Can Make a Difference in Contest Outcomes

At the end of the 2019 CQWW SSB contest, K3LR and W3LPL, the two most prolific U.S. stations in the Multi-Operator / Multi-Transmitter category, were nearly tied. K3LR's claimed score, before logchecking, was just 0.7% higher than W3LPL's score. Frank Donovan, W3LPL, noted that the margin could be described as "only five multipliers or 40 QSOs behind K3LR." After logchecking was completed, W3LPL was found to be ahead by the tiniest of margins — 0.5% — and broke K3LR's 14-year championship streak for the title of top U.S. M/M.

The Culprit: Busted Calls

Mis-copied or "*busted*" calls are typically a few percent of claimed contest QSOs. You can see the mistakes made by some of the world's best contest operators by reading the CQWW public log check reports, available online at <https://cqww.com/publiclcr>. Check the details of K3LR's 2019 CQWW SSB log checking report, and you'll find that 1.4% of calls were identified as being busted, a more substantial loss of points than the 0.6% of QSOs that were assigned "not in log" or NIL status.

Comparing your logging accuracy with the "big guns" is one of the most productive ways to improve your contesting skills. Check your email archives to see if the contest organizer sent you a log check report (LCR), or visit the contest sponsor's website and request a copy of your LCR. In addition to the percentage of calls that you busted or were assigned NIL, you will find the complete details of each of your logging mistakes found during log-checking.

The scoring penalty for a busted call varies among contests. In the CQWW contests (CW, SSB, and RTTY), the penalty for a busted call is substantial — double the claimed points for that QSO are deducted. This is in addition to removal of the claimed points and (possibly) multiplier for the incorrectly copied call(s). A 1.4% callsign bust rate quickly turns into a 4.2% reduction in final score.

The CQ WPX contests have a similar two-QSO penalty for busted calls. The ARRL DX contests assign a single-QSO penalty for busted calls, and in many contests that encourage participation by newcomers — for example the North American QSO Parties — there is no penalty for a busted call beyond removal of credit for the incorrectly logged QSO.

Note that of the above contests, none assigns a penalty for an incorrect exchange beyond the loss of QSO points. The actual difficulty of copying an exchange varies substantially among contests. Serial number contests like the CQ WPX contests are among the most difficult of exchanges because no history file or previous QSO you've had with that station will help you. At the other extreme are the CQWW contests, where knowledge of a callsign usually lets your logger prefill the correct zone exchange.

Both QSO partners must agree calls are correctly copied during the QSO. If a station calling CQ is not identifying frequently or clearly, feel free to ask the operator for his / her callsign, possibly repeated at a slower speed or using different phonetics. If you are calling CQ, do not give your exchange until you've clearly copied your caller's callsign. While running, if you hear a caller repeating his callsign when giving an exchange, give the callsign you've copied yet again and ask for verification, before moving on to the next caller.

No contest assigns a penalty to you if the other operator miscopies your callsign. If points are lost, it will be the operator who made the mistake. Still, make a best effort to ensure the other operator copies your call correctly. If you are search and pounce and the other operator miscopied your call, or you aren't certain he got it correct due to QRM or fading, make multiple attempts to correct until you hear the CQing station clearly come back to your correct call. If you are CQing and you notice you are suddenly getting "called by dupes" — operators you have already contacted on the same band during the contest — be sure to give your callsign after each and every QSO, as you may have been identified on the spotting cluster with an incorrect call.

During the contest you might make extra efforts to verify, on the air, any callsigns that don't appear in the Super Check Partial database of common callsigns. Pete Smith, N4ZR, writes: "Want to be busted less? Get more active." If, in addition to the weekend contests, you get on for mid-week events like the CWops CWTs or the NCCC Thursday night sprints, your callsign (and possibly even your CW fist) will be more quickly identified in a pileup by many of the most active contesters.

Log-checking has become more complete in recent years as contesters submit their electronic logs to the contest organizers. More than 80% of QSOs can be directly matched in many recent large contests. When there isn't a direct match between two logs, the log-checkers have been improving their techniques over the past decades. The not-easily-verifiable QSOs are sorted into several groups. The most common situation is that the callsign logged was correct and a QSO took place, but the QSO partner did not submit a contest log to the organizers. In almost every contest log-checking process, these are scored as valid QSOs.

If nobody else in the contest logged a call, these appear in your LCR as "unique" calls. Some of these uniques are probably busted calls, for example multi-character busts of less common callsigns. If your QSO partner did not submit a log, it is less likely that any busted calls you logged will be found during log-checking. In the weeks after a major contest, the contest organizers make concerted efforts to solicit logs from participants who were logged more than a few times but have not yet submitted a log. If you dabble in a contest and did keep a log, please respond to post-contest requests for your log for log-checking purposes. Your log submission, no matter how minor your effort, will help the contest organizers more completely and accurately score the contest.

LCRs as Instructive Tools

Reading my LCRs helped me identify some common patterns in busted callsigns. My 2021 ARRL DX CW log shows that I busted calls for two QSOs:

QSO: 14008 CW 2021-02-20 1824 N3QE 599 MD YT1X 599 100

email: <n3qe@cq-amateur-radio.com>

The CQ Shortwave Propagation Handbook-4th Edition

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This fourth edition was spearheaded by propagation authority Carl Luetzelschwab, K9LA, merging his updates with the earlier work of the previous editions' authors, Dr. Theodore Cohen, N4XX, George Jacobs, W3ASK, and Robert Rose, K6GKU (SK).

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QSO: 14026 CW 2021-02-20 2030 N3QE 599 MD OH6XS 599 KW

Because my call appears in the logs submitted by YTØX and OH6OS on the same bands and at the same times, the log-checking software easily flags that I had busted the calls:

QSO: 14007 CW 2021-02-20 1824 YTØX 599 100 N3QE 599 MD
QSO: 14026 CW 2021-02-20 2030 OH6OS 599 KW N3QE 599 MD

I also investigated how other hams had busted my call, shown near the end of the LCR. I found examples like "N3QT", "N4QE", W3QE", and "N2QE."

Single-character busts are the most common variety. In the examples from my log, the busts I made of others' calls were single-character busts — I copied a single character in the callsign incorrectly. And 10 of the 13 busts others made of my call can be explained as single character busts as well. Doug Zwiebel, KR2Q, of the CQWW Contest Committee, shared with me a long list of ways that one of the most prolific calls, DFØHQ, was detected as busted in CQWW CW 2021 log-checking. Of the 315 detected busts of DFØHQ, 268 of them were single-character busts, for example "DFØSQ" (123 occurrences) and "DLØHQ" (45 occurrences).

Double character busts for DFØHQ also occurred, and the most common of these was "DLØSQ," which was logged 18 times and represents a combination of the two most common single-character busts. Miscopied callsigns that are missing a single character are represented in the sample as well, with "DFØH" logged 10 times and "DFØQ" logged twice. And miscopied calls with an extra letter are also found during log-checking — "DFØHQE" being the most common example.

Most Commonly Busted CW Characters

A deep dive into public logs reveals the most commonly busted characters in CW callsigns. The public logs from the 2020 ARRL DX contests are available at <https://contests.arrl.org>. I learned a lot about the log-checking process and busted calls by doing my own comparison between submit-

Calendar of Events

All year	**CQ DX Marathon**	**http://bit.ly/vEKMWD**
Feb. 2	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Feb. 2	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Feb. 5	AGCW Straight Key Party	https://bit.ly/3ngQSpB
Feb. 5	EURASIA HF Championship	https://eurasia-contest.com/home
Feb.5	FISTS Winter Saturday Sprint	www.fistsna.org/operating.html
Feb. 5	FYBO Winter QRP Sprint	http://azscqrpions.org/FYBO
Feb. 5	Minnesota QSO Party	www.w0aa.org/mn-qso-party
Feb. 5-6	10-10 Int'l Winter Contest	http://bit.ly/1FrFeBc
Feb. 5-6	British Columbia QSO Party	www.orcadxcc.org/bcqp_rules.html
Feb. 5-6	European Union DX Contest	https://eudxcc.altervista.org/eu-dx-contest/
Feb. 5-6	Mexico RTTY International Contest	www.rtty.fmre.mx/index.html
Feb. 5-6	North American CW Sprint	http://ncjweb.com/north-american-sprint
Feb. 5-6	Vermont QSO Party	www.ranv.org/ranv.html
Feb. 7	RSGB 80m Club Championship, SSB	https://bit.ly/31qpcJl
Feb. 9	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Feb. 12	RSGB 1st 1.8 MHZ Contest CW	https://bit.ly/31qpcJl
Feb. 12	Asia-Pacific Spring Sprint (CW)	http://jsfc.org/apsprint
Feb. 12-13	**CQWW RTTY WPX Contest**	**www.cqwpxrtty.com**
Feb. 12-13	AWA Amplitude Modulation QSO Party	https://bit.ly/2Io0u3e
Feb. 12-13	Dutch PACC Contest	http://pacc.veron.nl
Feb. 12-13	KCJ Topband Contest	www.kcj-cw.com/e_index.htm
Feb. 12-13	OMISS QSO Party	www.omiss.net/Facelift/qsoparty.php
Feb. 12-13	SARL Field Day Contest	http://bit.ly/H0IqQf
Feb. 12-14	YL OM Contest	https://ylrl.org/wp/yl-om-contest
Feb. 13	CQC Winter QSO Party	http://bit.ly/2Qayte1
Feb. 14	PODXS 070 Club Valentine Sprint	http://bit.ly/2Rp8LTk
Feb. 14-18	ARRL School Club Roundup	www.arrl.org/school-club-roundup
Feb. 16	AGCW Semi-Automatic Key Evening	http://bit.ly/2WB74qy
Feb. 16	RSGB 80m Club Championship, DATA	https://bit.ly/31qpcJl
Feb. 19-20	ARRL CW DX Contest	www.arrl.org/arrl-dx
Feb. 19-20	Russian WW PSK Contest	http://bit.ly/2MsppCr
Feb. 20	FISTS Winter Sunday Sprint	www.fistsna.org/operating.html
Feb. 23	UKEICC 80m Contests CW	https://ukeicc.com/80m-rules.php
Feb. 24	RSGB 80m Club Championship, CW	https://bit.ly/31qpcJl
Feb. 25-27	**CQWW 160M SSB Contest**	**www.cq160.com/rules.htm**
Feb. 26-27	Hiroshima Worked All Squares	www.hs-contest.org
Feb. 26-27	North American RTTY QSO Party	http://ncjweb.com/naqp
Feb. 26-27	REF SSB Contest	https://tinyurl.com/p4bbva92
Feb. 26-27	South Carolina QSO Party	http://scqso.com
Feb. 26-27	UBA CW DX Contest	http://bit.ly/W0gZiE
Feb. 27	High Speed Club CW Contest	www.highspeedclub.org
Feb. 27-28	North Carolina QSO Party	http://ncqsoparty.org/rules
Feb. 28	RSGB FT4 Contest Series	https://bit.ly/31qpcJl

ted logs. More than 1.7 million QSO lines are in the public CW logs, and I was able to directly match more than 81% between the logs of two QSO partners without busted callsigns. Where the QSO was not directly matchable but could be explained as a single-character callsign bust, I accumulated statistics about the most common CW callsign busts, and I ranked the most commonly busted characters in *Table 1*. The percentage for each letter is computed as the number of busts for each letter divided by how many times that letter occurred in logged callsigns.

Most prominent in *Table 1* by a large margin, is the letter "H" (4 dits), which is often mistaken for "S" (3 dits). Contesters with "H" in their callsigns often make an extra effort to slow down their sending to try to clear up this confusion. Hans Brakob holds the call KØHB, and when I showed him this result, he wrote of the of the difficulties he has: "I'm guessing that if the 'H' is in an interior position, as in my call, that the incidence of busted 'H' is even higher, maybe approaching 5%. I search-and-pounce a lot, and I need to correct at least 20% who copy an 'S.' I've tried slowing down the 'H', but that doesn't seem to make much difference." Larry Bennet, G4HLN, mentioned the slowing down strategy as well: "S for H is the most infuriating for me — the number of times I've worked stations who respond with 'G4SLN' and don't amend it even when I QRS is quite remarkable!"

Near the top of *Table 1* are other characters that are busted most commonly by losing a single "dit." Right below H is the letter B, which is busted 0.49% of the time. Josep Torres, EA6BF, notes: "Common bust here is in the B in my suffix, people use to send a D." A couple of entries later in the table is the common case of losing a single dit from the letter V. Gerry Hull, W1VE, wrote to me, "Most often, V is busted to U, getting you a non-QSO with W1UE."

I took the most common busts in *Table 1* and drew *Figure 1*, showing the relationship between the most commonly busted CW characters. The arrow from each character shows the most common way it is miscopied. The characters are most commonly confused with each other as a pair are connected with a double arrow. The three letters F, L, and R form a triangle representing the confusion among them.

From reading my log check reports, I knew that the most common bust of my callsign on CW is confusion of the 2 with

Mar. 1	AGCW YL-CW QSO Party	http://bit.ly/3plBhpN
Mar. 2	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Mar. 2	UKEICC 80m Contests SSB	https://ukeicc.com/80m-rules.php
Mar. 2-3	AWA John Rollins Memorial DX Contest	http://bit.ly/2WCGT2C
Mar. 5	SARL YL Sprint	http://bit.ly/H0IqQf
Mar. 5-6	ARRL SSB DX Contest	www.arrl.org/arrl-dx
Mar. 5-6	AWA John Rollins Memorial DX Contest	http://bit.ly/2WCGT2C
Mar. 5-6	Open Ukraine RTTY Championship	http://krs.ho.ua/openrtty
Mar. 5-6	Veron SLP Contest	http://bit.ly/2L9eT1L
Mar. 5-13	Novice Rig Round-Up	www.novicerigroundup.org
Mar. 6	SARL Hamnet 40M Simulated Emergency Contest	http://bit.ly/H0IqQf
Mar. 6	UBA Spring Contest 80m CW	http://bit.ly/2KKAtb9
Mar. 7	RSGB 80m Club Championship, Data	https://bit.ly/31qpcJl
Mar. 9	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Mar. 12	AGCW QRP Contest	http://bit.ly/2KKp3rY
Mar. 12	YB DX RTTY Contest	https://rtty.ybdxcontest.com
Mar. 12	QRP ARCI Spring Thaw SSB Sprint	www.qrpcontest.com/qrparci_thaw
Mar. 12-13	EA PSK63 Contest	http://concursos.ure.es/en/eapsk63/bases
Mar. 12-13	Idaho QSO Party	www.pocatelloarc.org/idahoqsoparty
Mar. 12-13	Oklahoma QSO Party	http://k5cm.com/okqp.htm
Mar. 12-13	North American RTTY Sprint	http://ncjweb.com/north-american-sprint
Mar. 12-13	RSGB Commonwealth CW Contest	https://bit.ly/31qpcJl
Mar. 12-13	South America 10 Meter Contest	www.sa10m.com.ar/index.html
Mar. 12-13	Stew Perry Topband Challenge	www.kkn.net/stew
Mar. 13	FIRAC HF Contest	www.firac.de/html/contest.html
Mar. 13	UBA Spring Contest 2m CW/Phone	http://bit.ly/2KKAtb9
Mar. 13-14	Wisconsin QSO Party	www.warac.org/wqp/wqp.htm
Mar. 16	RSGB 80m Club Championship, CW	https://bit.ly/31qpcJl
Mar. 19	AGCW VHF/UHF Contest	https://bit.ly/3lw91PK
Mar. 19	PODXS 070 Club St. Patrick's Day Contest	http://bit.ly/38ugUiF
Mar. 19-20	Virginia QSO Party	https://bit.ly/3IeqHvl
Mar. 19-20	SARL VHF/UHF Analogue Contest	http://bit.ly/H0IqQf
Mar. 19-20	Russian DX Contest	www.rdxc.org/asp/pages/rulesg.asp
Mar. 19-21	BARTG HF RTTY Contest	http://bartg.org.uk/wp/contests
Mar. 20	UBA Spring Contest 80m SSB	http://bit.ly/2KKAtb9
Mar. 24	RSGB 80m Club Championship, SSB	https://bit.ly/31qpcJl
Mar. 26	FOC QSO Party	www.g4foc.org/qsoparty
Mar. 26-27	Veron SLP Contest	http://bit.ly/2L9eT1L
Mar. 26-27	**CQWW WPX SSB Contest**	**www.cqwpx.com**
Mar. 27	UBA Spring Contest 6m CW/ Phone	http://bit.ly/2KKAtb9
Mar. 28	RSGB FT4 Contest Series	https://bit.ly/31qpcJl
Mar. 30	UKEICC 80m Contests CW	https://ukeicc.com/80m-rules.php
May 28-29	**CQWW WPX CW Contest**	**www.cqwpx.com**

both 3 and 4. *Figure 1* makes it clear that numerals beginning with one or more "dits" are most commonly confused with other numerals that begin with dits, and similarly for numerals that begin with dahs. In both groups, numerals with 4 dits or dahs, are most commonly confused with their neighbors with 3 dits or dahs. And numerals with 2 dits and 3 dahs are most commonly confused with their neighbors with 3 dits and 2 dahs.

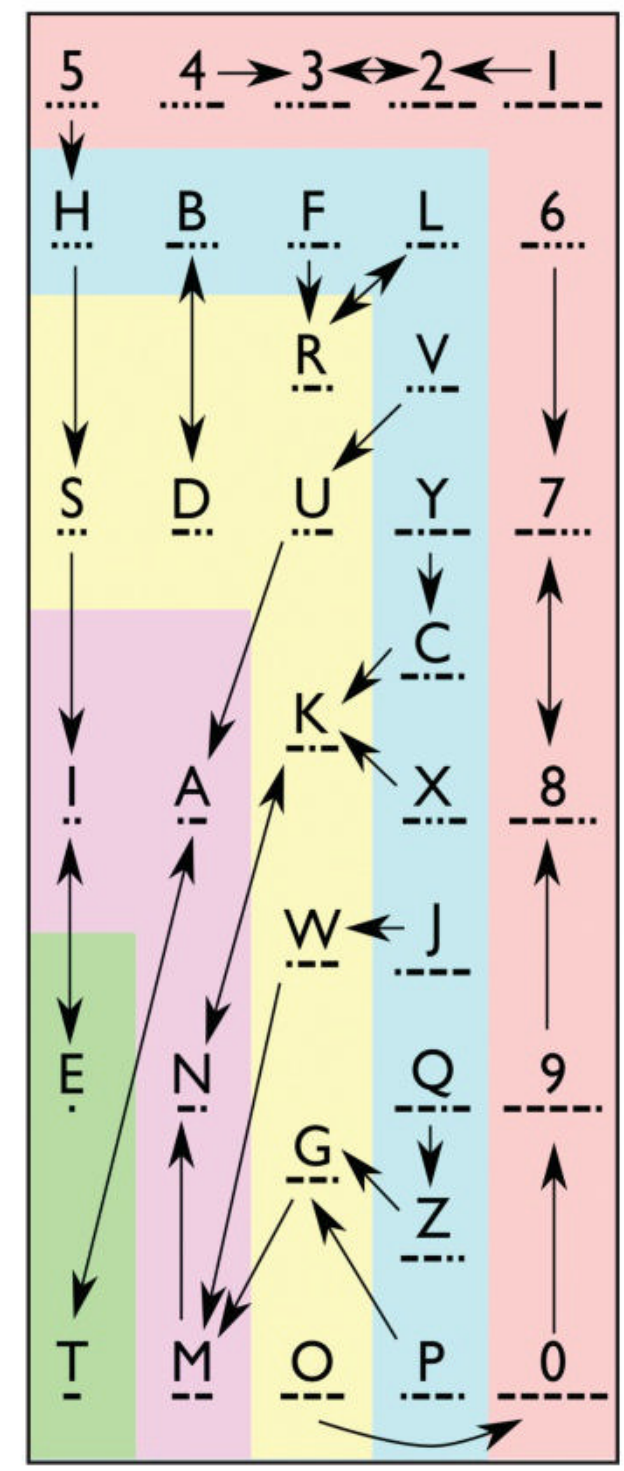
Although not prominently represented in the tables, U.S. contesters with double-letter prefixes told me about some of the most common busts of their calls, in which the second letter in their callsign is often mistaken for a numeral before correction. Mel Crichton, KJ9C, tells me about confusion between J and 1: "My most common bust in crummy conditions is K1GC ... in fact, many times when the other station comes back with 'K1?' I hear nobody else calling, so after a bit I drop my call with spaces between the J and 9." Ben Coleman, NJ8J, writes: "I have similar issues. Stations responding with N1? after I call are usually looking for me."

Bust rates in SSB callsigns are slightly lower than in CW. I applied a similar analysis to the ARRL DX SSB 2020 public logs, and was able to directly match 71% of the QSOs in the Cabrillo files. When a match would occur by just changing a single callsign character, I

Bust Rate	Correct	Most often busted to
0.72%	H ····	S ···
0.49%	B −···	D −··
0.49%	8 −−−··	7 −−···
0.42%	S ···	I ··
0.37%	0 −−−−−	9 −−−−·
0.33%	V ···−	U ··−
0.32%	7 −−···	8 −−−··
0.32%	U ··−	A ·−
0.31%	D −··	B −···
0.28%	F ··−·	R ·−·
0.28%	Z −−··	G −−·
0.28%	I ··	E ·
0.26%	R ·−·	L ·−··
0.25%	9 −−−−·	8 −−−··
0.25%	6 −····	7 −−···
0.24%	2 ··−−−	3 ···−−
0.24%	G −−·	M −−
0.24%	5 ·····	H ····
0.24%	3 ···−−	2 ··−−−
0.23%	4 ····−	3 ···−−
0.17%	L ·−··	R ·−·
0.16%	C −·−·	K −·−
0.16%	Q −−·−	Z −−··
0.15%	J ·−−−	W ·−−
0.15%	Y −·−−	C −·−·
0.15%	O −−−	0 −−−−−
0.14%	1 ·−−−−	2 ··−−−
0.14%	X −··−	K −·−
0.14%	M −−	N −·
0.13%	W ·−−	M −−
0.12%	P ·−−·	G −−·
0.12%	N −·	K −·−
0.11%	K −·−	N −·
0.10%	A ·−	T −
0.10%	T −	A ·−
0.05%	E ·	I ··

← *Table 1. Bust rates for characters in CW callsigns. Data from ARRL DX CW 2020 public logs.*

Figure 1. Arrows show the most common busts for CW characters. Background colors indicate differing number of Morse code elements (count of dits or dahs).



assumed a simple bust and prepared *Table 2*, showing the most commonly busted characters in SSB along with standard international phonetics for each letter.

I arranged the most common phonetics for SSB busted characters in *Figure 2*, connecting the most common busts with arrows. Five of the 10 most common busts in *Table 2* are numerals, and these are grouped into the lower left of *Figure 2*. "Five," "Eight", and "Nine" are grouped together in a little triangle, a result of the similar vowel sound they all share. "Six" and "Seven" have a different number of syllables, but are connected as common busts for each other, likely a result of their identical initial consonants. "Two" and "Three" are similarly confused, likely because of their initial sound.

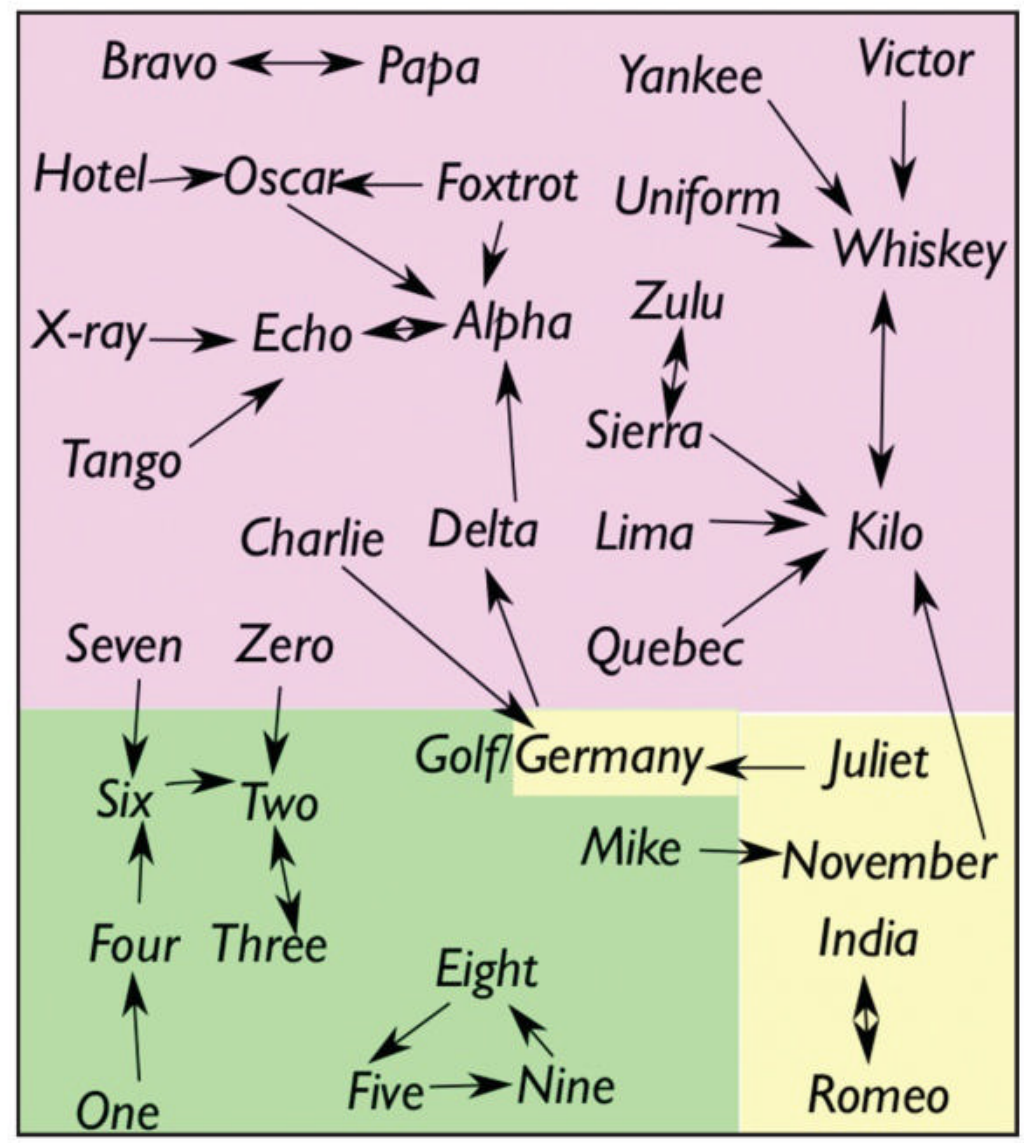
The color-coded background of *Figure 2* is an attempt to draw a relation between the number of syllables used in the phonetic alphabet. The pink background makes it clear that two-syllable phonetics are confused most easily with other two-syllable phonetics. There are a handful of three-syllable phonetics, and among them, "India" and "Romeo" are commonly confused with each other. The confusion between "J" and "G" in phone contesting, I believe can be explained either by not using a phonetic at all, or by the common use of non-IATO "Germany" for "G", that shares the same number of syllables and initial sound as "Juliet."

A major goal of contesting is to build the radio skills and logging accuracy of all amateur radio operators. Both beginning and experienced contesters will benefit from examining their log check reports and comparing with the results available in the CQWW and CQ WPX public LCRs.

Bust Rate	Correct	Most often busted to
0.43%	8 *Eight*	5 *Five*
0.36%	O *Oscar*	A *Alpha*
0.36%	2 *Two*	3 *Three*
0.34%	3 *Three*	2 *Two*
0.28%	G *Golf*	D *Delta*
0.27%	Q *Quebec*	K *Kilo*
0.25%	0 *Zero*	2 *Two*
0.21%	I *India*	R *Romeo*
0.21%	6 *Six*	2 *Two*
0.20%	S *Sierra*	K *Kilo*
0.20%	D *Delta*	A *Alpha*
0.19%	Y *Yankee*	W *Whiskey*
0.19%	T *Tango*	E *Echo*
0.18%	X *X-ray*	E *Echo*
0.18%	J *Juliet*	G *Golf*
0.18%	V *Victor*	W *Whiskey*
0.18%	5 *Five*	9 *Nine*
0.18%	Z *Zulu*	S *Sierra*
0.17%	E *Echo*	A *Alpha*
0.17%	9 *Nine*	8 *Eight*
0.17%	H *Hotel*	O *Oscar*
0.16%	4 *Four*	2 *Two*
0.15%	R *Romeo*	I *India*
0.15%	F *Foxtrot*	O *Oscar*
0.13%	A *Alpha*	E *Echo*
0.13%	U *Uniform*	Y *Yankee*
0.12%	C *Charlie*	G *Golf*
0.12%	N *November*	K *Kilo*
0.12%	K *Kilo*	W *Whiskey*
0.11%	B *Bravo*	P *Papa*
0.11%	W *Whiskey*	K *Kilo*
0.10%	7 *Seven*	6 *Six*
0.09%	M *Mike*	N *November*
0.09%	1 *One*	4 *Four*
0.09%	L *Lima*	K *Kilo*
0.07%	P *Papa*	B *Bravo*

← *Table 2. Bust rates for characters in SSB callsigns. Data form ARRL DX SSB 2020 public logs.*

Figure 2. Arrows show the most common busts for SSB phonetic letters. Background colors indicate number of syllables in each phonetic letter. ↓



February / March Contest Highlights

Every February and March in the 48-hour *ARRL DX Contests*, U.S. and Canadian hams work DX stations around the world for points and multipliers. This year, *ARRL DX CW* is February 20-21st, and *ARRL DX SSB* is March 6-7th. You can find the full rules at <www.arrl.org/arrl-dx>.

The *2021 CQ WPX* contests kick off with *WPX RTTY* on February 12-13th and *WPX SSB* on March 26-27th. In the WPX contests, everyone worldwide works everyone for points, and the use of call-sign prefixes as multipliers means that a recently licensed KM4 is just as worthwhile a multiplier as a DXpedition to an exotic island. Competitive stations plan their contest weekend to maximize the number of DX contacts on the low bands, as these are worth more points than domestic or DX contacts on the high bands. Operate up to 30 hours in the RTTY weekend, and 36 hours in the SSB weekend. Full rules, contest FAQs, and operating hints are at <https://cqwpxrtty.com> and <https://cqwpx.com>.

PROPAGATION

BY TOMAS HOOD,* NW7US

February Propagation

Quick Look at Current Cycle 25 Conditions:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, November 2021: **36**
12-month smoothed, May 2021: **26**

10.7-cm Flux:
Observed Monthly, November 2021: **87**
12-month smoothed, May 2021: **81**

One Year Ago:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, November 2020: **29**
12-month smoothed, May 2020: **5**

10.7-cm Flux:
Observed Monthly, November 2020: **90**
12-month smoothed, May 2020: **72**

From the middle of February through early April, typical equinoctial propagation conditions can be expected on the high-frequency (HF) bands. This usually means a noticeable improvement in conditions between the Northern and Southern hemispheres. Look for improvements between the U.S. and South America, Africa, Australasia, Antarctica, and parts of Asia. Equinoctial propagation occurs during the spring and fall months, when the Sun is most directly overhead at the equator, producing similar ionospheric characteristics over large areas of the world. It tends to maximize during sunrise and sunset periods and over both short- and long-path openings.

We continue seeing an increase of sunspot activity. Little-by-little we'll see improvements in the propagation at higher frequencies over long-distance paths. It is always a surprise to the casual amateur radio operator to get on a band like 10 meters during these periods of low solar activity, and discover that there is life on the band, beyond short-skip distances. Such surprises can occur at any time when the ionosphere is sufficiently energized, especially during periods when sunspots occur, and the daily 10.7-cm Radio Flux levels increase enough to wake up the higher frequencies.

One example of such an event is the last part of October 2021. The 10.7-cm flux rose to about 112 on October 28, 2021, and widespread 10-meter openings ran not only north-south, but east-west, which opened Europe, Africa, and Asia to parts of North America. This is what we get used to daily, during the peak of a cycle. It is always nice when we have this surprise opportunity because of increased sunspot activity as Cycle 25 gains momentum as we head toward the peak years.

This month, during the daylight hours, optimum DX propagation conditions are expected on 20 meters. The band is forecast to be open to all areas of the world sometime during this period, though often with moderate to strong fading. Conditions on 17 and 15 meters may be good, too, but usually for much shorter distances than during the very peak solar cycle years. Conditions are expected to become optimal for an hour or two after sunrise and again during the late afternoon. For short-range paths (regional), 40 meters should be usable during most of the daylight hours. With

We continue seeing an increase of sunspot activity. Little-by-little we'll see improvements in the propagation at higher frequencies over long-distance paths.

increasing hours of daylight during February, expect the HF bands to remain open for an hour or so longer into the early evening than during the winter months.

Daytime openings on the 10- and 12-meter bands will be few, but it is possible for the sun to suddenly become highly active and we will see a few days of great propagation. Openings will be possible for stations in low latitudes using north-south paths, with no openings expected into Europe

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for February 2022

	Expected Signal Quality			
Propagation Index	**(4)**	**(3)**	**(2)**	**(1)**
Above Normal: 2-4, 10-11, 16-17, 19, 24	A	A	B	C
High Normal: 1, 7-9, 18, 21-23, 28	A	B	C	C-D
Low Normal: 5-6, 12, 14-15, 20, 25-27	B	C-B	C-D	D-E
Below Normal: 13	C	C-D	D-E	E
Disturbed: n/a	C-D	D	E	E

Where expected signal quality is:
A--Excellent opening, exceptionally strong, steady signals greater than S9
B--Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C--Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D--Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E--No opening expected.

HOW TO USE THIS FORECAST

1. Using the **Propagation Charts** appearing in "The CQ Shortwave Propagation Handbook, 4th Edition," by Carl Luetzelschwab, George Jacobs, Theodore J. Cohen, and R. B. Rose.

a. Find the *Propagation Index* associated with the particular path opening from the **Propagation Charts**.

b. With the *Propagation Index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the **Propagation Charts** with a *Propagation Index* of 2 will be fair to poor on February 1, fair from February 2 through 5, and good on February 6, and so forth.

2. Alternatively, you may use the *Last-Minute Forecast* as a general guide to space weather and geomagnetic conditions throughout the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these geomagnetic conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at <http://SunSpotWatch.com> provided by NW7US.

and the Far East, unless the 10.7-cm flux rises above 110, or the background X-ray level rises significantly.

During the early evening hours and to as late as midnight, eight bands should be available for DX openings: 15, 17, 20, 30, 40, 60, 75/80, and 160 meters. Fifteen and 17 meters should hold up for openings towards Central and South America and the Caribbean, the Pacific area, Far East, and parts of Asia. Better openings into many areas of the world may be possible on 20 meters during this period, with the strongest signals from southerly and westerly directions. Good DX conditions are also forecast for 30, 40, 60, and 75/80 meters for openings toward the east and the south. Openings in the same direction, but with higher noise levels and weaker signals, should also be possible on 160 meters.

Between midnight and sunrise, it should be a toss-up between 20, 30, and 40 meters for DX paths. These bands should open to many areas of the world with conditions favoring openings toward the south and the west. Expect similar conditions on 75/80 meters, but with weaker signals and higher noise levels. Be sure to check 160 for some unusual DX openings toward the south and the west during this period. Conditions on the bands between 160 and 20 meters are expected to peak at local sunrise.

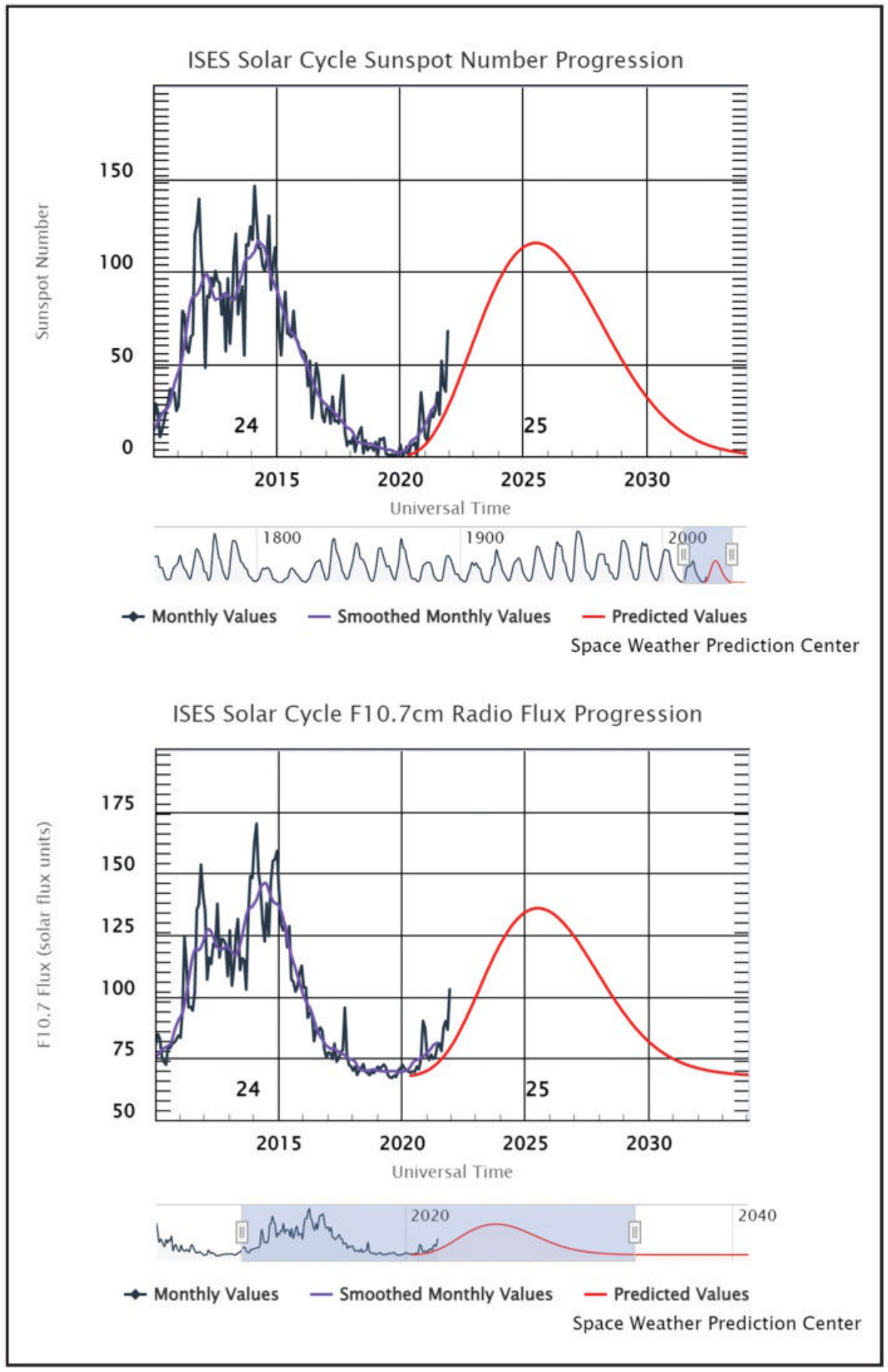


Figure 1. The new solar cycle (Cycle 25) is represented in several ways. In these charts we track the Sunspot Number and the 10.7-cm Radio Flux. In both plots, the black line represents the monthly averaged data and the purple line represents a 13-month weighted, smoothed version of the monthly averaged data. The forecast for the current (or next) solar cycle is given by the red line. (Courtesy of NOAA / SWPC)

VHF Conditions

Check for 6-meter short-skip openings during the daylight hours. Some short-skip openings over distances of about 1,200-2,300 miles may occur. The best times for such openings are during the afternoon hours.

Trans-equatorial (TE) scatter propagation tends to increase during the equinoctial period and some 6-meter openings may be possible between 7 and 10 p.m. local time. The best bet for such openings is between the southern tier states and South America for paths approximately at right angles to the magnetic equator. An occasional TE opening may also be possible on 2 meters. Unlike F_2-layer or sporadic-E (E_s) openings on 6 meters, TE openings are characterized by very weak signals with considerable flutter fading.

Do expect moderate coronal hole activity on occasion. With the influence of coronal mass ejections or elevated solar wind streams, the geomagnetic field may reach minor storm levels. While most days will see quiet conditions, there is a fair chance that geomagnetic storms will trigger modest auroral activity. Auroral activity tends to occur more frequently during the equinoctial period. Look for days when the planetary A index (A_p) is climbing and when the planetary K index (K_p) reaches 5 or higher. These are the days on which VHF auroral-type openings are most likely to occur.

There are no major meteor showers during February that could provide enhanced VHF meteor scatter propagation. For a detailed list of meteor showers, check out <https://tinyurl.com/f9v7fj2u> for a complete calendar of meteor showers in 2022.

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 <http://SunSpotWatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

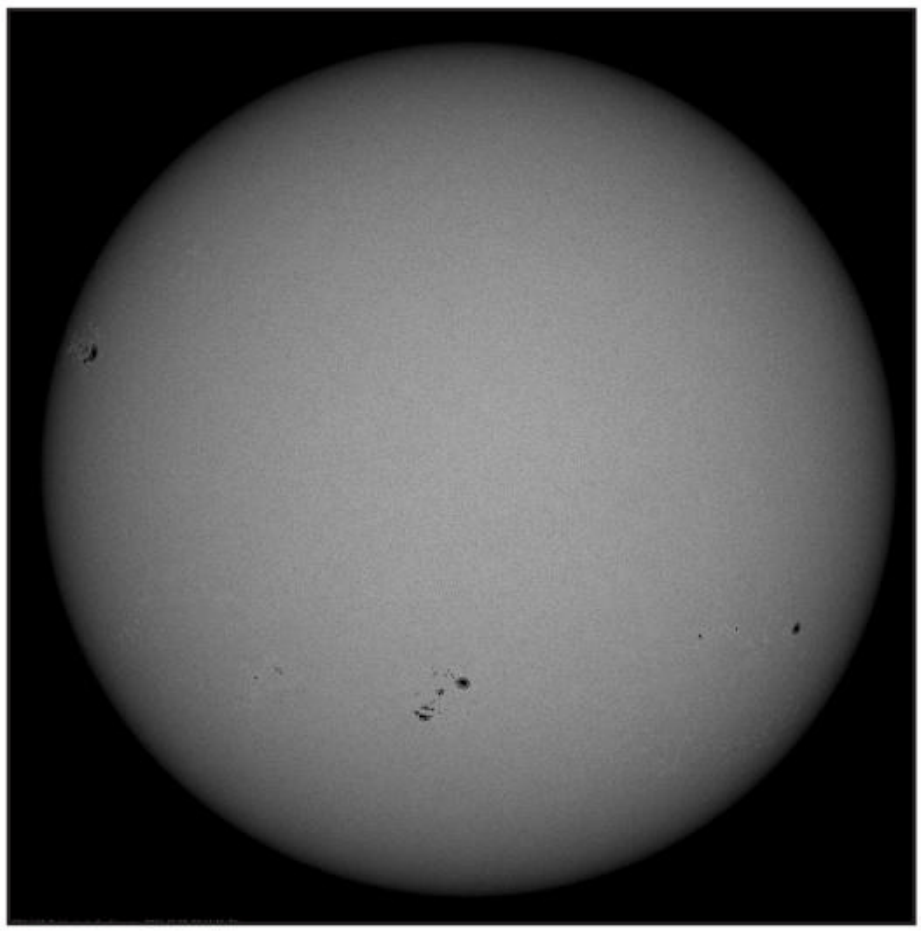
The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for November 2021 was 36.03. The 12-month running smoothed sunspot number centered on May 2021 is 25.70. A smoothed sunspot count of 41, give or take about 6 points is expected for February 2022.

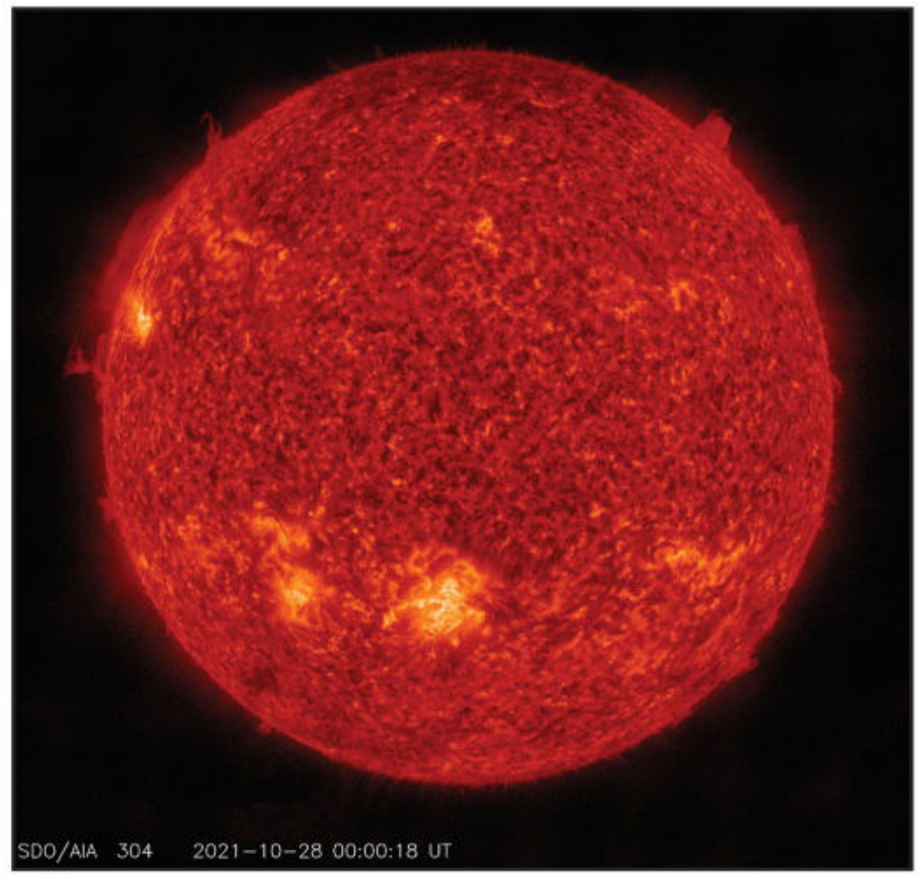
The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 86.57 for November 2021. The 12-month smoothed 10.7-cm flux centered on May 2021 is 80.80. The predicted smoothed 10.7-cm solar flux for February 2022 is 87, give or take 8 points.

Geomagnetic activity level this month is expected to range from quiet to stormy, resulting in occasional degraded propagation. Remember that you can get an up-to-the-day ***Last-Minute Forecast*** at <https://SunSpotWatch.com> on the main page.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may email me, write me a letter, or catch me on the HF amateur bands. If you are on Facebook, check out <https://fb.me/spacewx.hfradio> and <https://fb.me/NW7US> — speaking of Facebook — check out the *CQ Amateur Radio* magazine fan page at <https://fb.me/CQMag>. Also, please check out the new alternative social networking ham radio group at <https://amateurhamradio.locals.com> and please share this with your amateur radio friends and clubs.

– 73, Tomas, NW7US





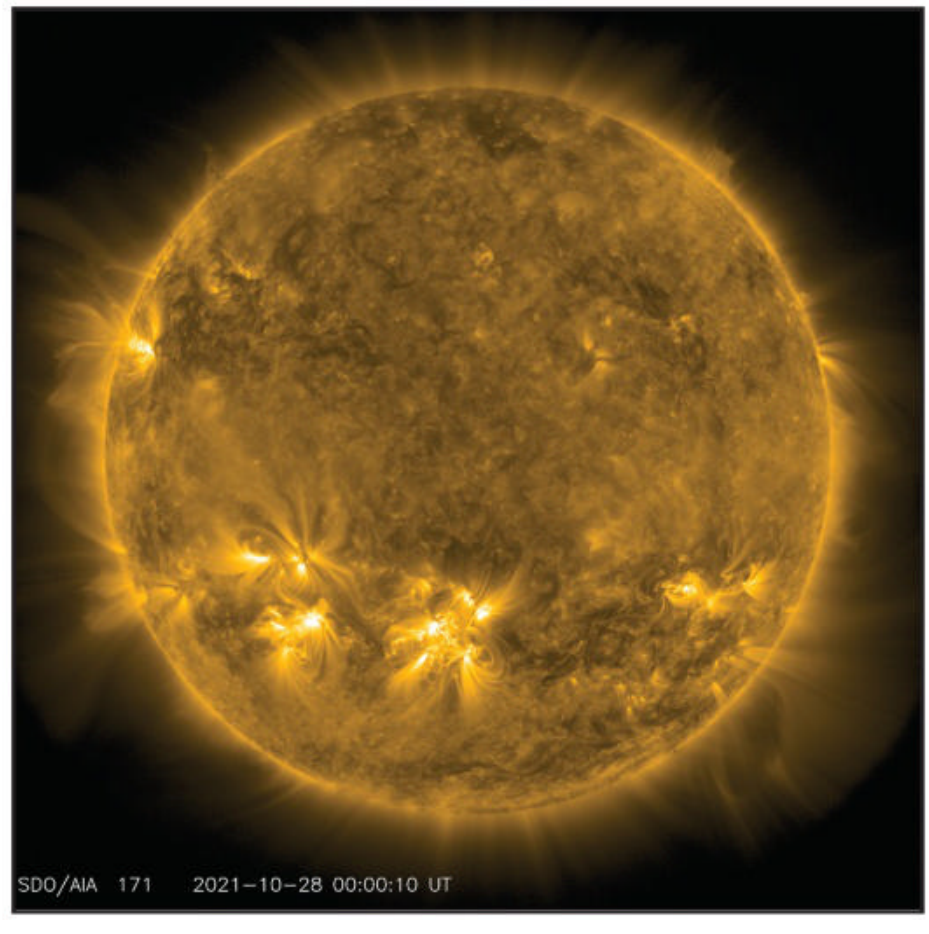


Photo A. At the end of October 2021, a good example of how the Sun can awaken and sunspots appear on the visible disc can be seen in this black-and-white image. This is the natural white-light view of our Sun, on October 28, 2021, revealing a number of sunspots.
The red image is of the same day, and is filtered at the non-visible wavelength of 304 Angstroms, revealing the bright active sunspot regions.
The yellow image is filtered view at 171 Angstroms, which reveals the complex magnetic fields associated with sunspots. This appearance of sunspots drove the 10.7-cm Radio Flux above 110, and with that came life for radio propagation on the 10-meter band (see text). (Courtesy of SDO / HMI, SDO / AIA)

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International DX Association	84		www.indexa.org
LDG Electronics	1,37,61,75	410-586-2177	www.ldgelectronics.com
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preciseRF	5	503-915-2490	www.preciserf.com
PreppComm	63		www.PreppComm.com
QCWA	106	352-425-1097	www.qcwa.org
RF Parts	39	800-921-4834	www.rfparts.com
RT Systems	7,21	800-921-4834	www.rtsystemsinc.com
Radio Amateur Club of JHS 22	67	516-674-4072	www.wb2jkj.org
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W2IHY Technologies	79	845-889-4253	www.w2ihy.com
W5SWL	79		www.W5SWL.com
W7DXX Remote	81		www.w7dxx.com
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FMTV ARTICLES: Comprehensive transmitter and receiver deviation calibration, standards, intermodulation, power amplifier calculations. WB9OQM, http://mathison.freeshell.org

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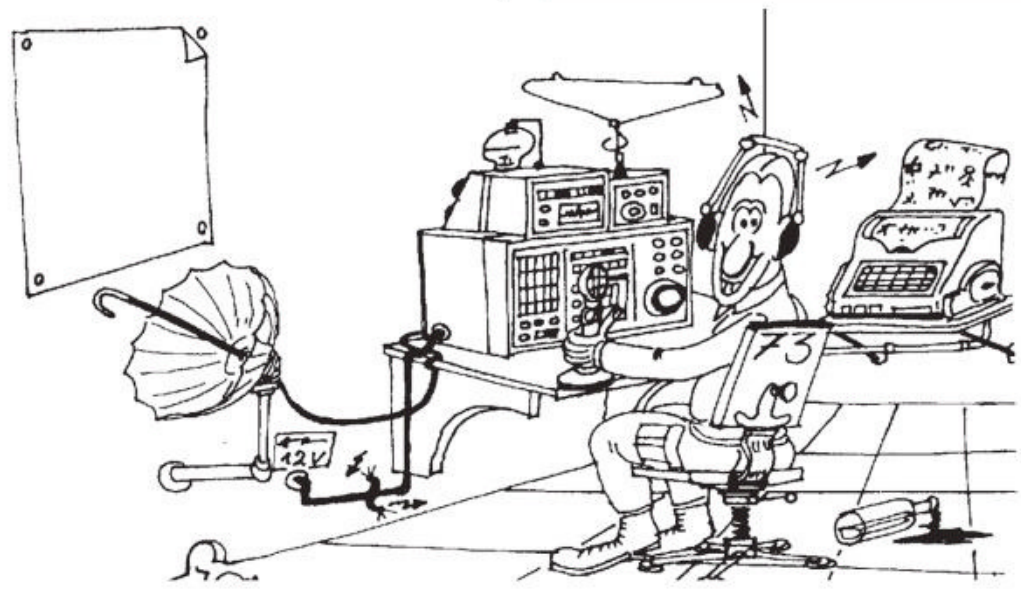

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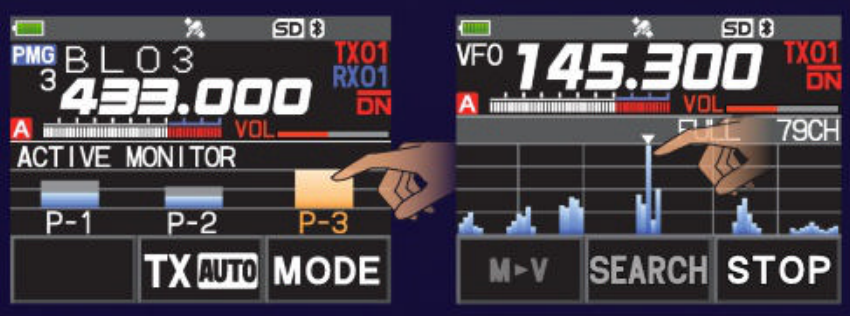

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