RIBs for DXpeditions, p. 84

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CQ Amateur Radio

COMMUNICATIONS & TECHNOLOGY

NOVEMBER 2022

- DXing With Wolves, p. 8
- Results: 2022 CQ WPX CW Contest, p. 13
- The Almost Heathkit, p. 26
- Using an HF Windom on 6 Meters, p. 43

On the Cover: Jelmer Vos, DJ5MO, makes the most of his cozy attic ham shack in Halle, Germany, taking second place worldwide in the Tribander/Wires Low Power overlay of the 2022 CQ WPX CW Contest. Contest results on page 13; more about Jelmer on page 18.

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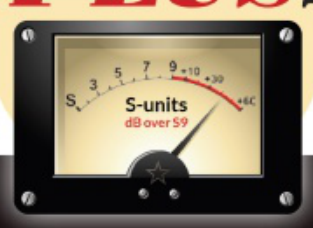

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announcements

NOVEMBER

BELTON, MISSOURI — The Raytown Amateur Radio Club and the Southside Amateur Radio Club will hold the Raytown & Southside Hamfest from 7:30 a.m. to noon, Saturday, November 5 at the Mill Creek Upper Elementary School, 308 South Cleveland Avenue. Email: <info@southsidearc.net>. Website: <http://southsidearc.net>. Talk-in 145.17- (PL 151.4) or 147.12+ (PL 151.4). VE exams.

CONGRESS, ARIZONA — The Hassayampa Amateur Radio Klub will hold the HARKfest Tailgate Hamfest from 8 a.m. to noon, Saturday, November 5 at the North Ranch Escapees RV Park, 30625 S. Highway 89. Contact: Duane Grooms, KDØKYK, <djgrooms@yahoo.com>. Website: <www.harkaz.org>. Talk-in 146.620 (PL 162.2). Free VE exams, ARRL card checking.

ENID, OKLAHOMA — The Enid Amateur Radio Club will hold 2022 Enid Hamfest from 8 a.m. to 5 p.m., Saturday, November 5 at the Stride Bank Center, 301 S. Independence Avenue. Website: <www.enidarc.org>. Talk-in 147.375- or 444.825+. VE exams.

LAWRENCEVILLE, GEORGIA — The Alfred Memorial Radio Club will hold the Stone Mountain Hamfest and the 2022 ARRL Georgia Section Convention from 8 a.m. to 4 p.m., Saturday, November 5 and from 8 a.m. to 2 p.m., Sunday, November 6 at the Gwinnet County Fairgrounds, 2405 Sugarloaf Parkway. Website: <www.stonemountainhamfest.com>. VE exams.

SARASOTA, FLORIDA — The Sarasota Emergency Radio Club will hold the 2nd Sarasota Emergency Radio Club Hamfest from 8 a.m. to 2 p.m., at the Sarasota Red Cross, 2001 Cantu Court. Email: <serc@n4ser>. Website: <http://n4ser.org>. Talk-in 146.73-

KAUKAUNA, WISCONSIN — The Fox Cities Amateur Radio Club will hold its 2022 Swapfest beginning 8 a.m., Sunday, November 6 at the Starlite Club, W2091 County Road JJ. Website: <www.fcarc.club>. Talk-in 146.76 (PL 100). VE exams.

ALPHARETTA, GEORGIA — The North Fulton Amateur Radio League will hold HamJam 2022 from 8:15 a.m. to 1 p.m., Saturday, November 12 at the Reston Ridge Community Center, 3655 Preston Ridge Road, Suite 100. Contact: Web Lamboley, W3WL, <weslamb@aol.com>. Website: <http://hamjam.info>.

BROOKLINE, MISSOURI — The Nixa Amateur Radio Club will hold NARCfest 2022 from 8:30 a.m. to 1 p.m., Saturday, November 12 at The Barn House, 5484 W. Sunshine Street. Phone: (417) 501-4429. Email: <hamfest@nixahams.net>. Website: <https://smlrs.info>. Talk-in 147.015+ (PL 162.2). VE exams.

MANITOWOC, WISCONSIN — The U.S.S. Cobia World War II submarine will air special event station NB8QV from 1400-2100 UTC Saturday, November 12 and from 1400-2100 UTC, Sunday, November 13 to celebrate Veterans Day Weekend. Frequencies include 7.240± and 14.240± MHz. QSL a #10 SASE to Fred Neuenfeldt, W6BSF, 4932 S. 10th Street, Manitowoc, WI 54220-9121. Website: <www.qrz.com/nb9qv>.

MARANA, ARIZONA — The Oro Valley Amateur Radio Club will hold the Tucson Hamfest from 7 a.m. to 1 p.m., Saturday, November 12 at the Marana Middle School, 11285 West Grier Road. Email: <hamfest@tucsonhamradio.org>. Website: <www.tucsonhamradio.org>. VE exams, ARRL card checking.

MONTGOMERY, ALABAMA — The Montgomery Amateur Radio Club will hold the MARC Hamfest and 2022 ARRL Alabama State Convention from beginning 8:30 a.m., Saturday, November 12 at the Alcazar Shrine Temple, 555 East Boulevard. Contact: Lew Nyman (334) 354-1933. Website: <www.w4ap.org/marc>. Talk-in 146.84- (PL 123). VE exams.

FORT WALTON BEACH, FLORIDA — The Playground Amateur Radio Club will hold the Boondocks Swapfest and Open House from 8 a.m. to 3 p.m., Saturday, November 19 at the club property, 17 First Street SE. Website: <www.w4zbb.org>.

FORT WAYNE, INDIANA — The Allen County Amateur Radio Technical Society will hold the 50th Fort Wayne Hamfest & Computer Expo from 9 a.m. to 4 p.m., Saturday, November 19 and from 9 a.m. to 2 p.m., Sunday, November 20 at the Allen County War Memorial Coliseum, 4000 Parnell Avenue. Phone: (260) 579-2196. Website: <www.fortwaynehamfest.com>. Talk-in 146.880-. VE exams, DXCC / WAS card checking.

NORFOLK, NEBRASKA — The Elkhorn Valley Amateur Radio Club will hold 2022 Northeast Nebraska Hamfest from 8:30 a.m. to 2 p.m., Saturday, November 19 at the CHC Hall, 105 West Elm Avenue. Contact: Aaron Mathis, KTØQ, (802) 989-9246. Email: <kt0q.ne@gmail.com>. Website: <www.qsl.net/evarc>.

PARSIPPANY, NEW JERSEY — The New Jersey Antique Radio Club will hold its Fall Swap Meet and Ham Fest from 8 a.m. to noon, Saturday, November 19 at the Parsippany PAL Building, 33 Baldwin Road. Contact: Richard Lee, (914) 589-3751 or Sal Brisindi (732) 857-7250. Email: <radiorich@prodigy.net> or <salb203@aol.com>. Website: <http://njarc.org>.

FAIRLAWN, NEW JERSEY — The Fair Lawn Amateur Radio Club will hold its After Thanksgiving Auction beginning 4:30 p.m., Friday, November 25 at the Fair Lawn Senior Center, 11-05 Gardiner Road. Email: <fairlawnarc@yahoo.com>. Website: <auction.fairlawnarc.org>. Talk-in 145.470- (PL 167.9).

DECEMBER

ARCHBOLD, OHIO — The Fulton County Amateur Radio Club will hold Winterfest 2022 from 8-11 a.m., Saturday, December 3 at the Ruihley Park Pavilion, 320 W. Holland Street. Contact: Bryan Patterson, KB8ELG, (419) 250-6694. Email: <kb8elg@hotmail.com>. Website: <http://k8bxq.org>. Talk-in 147.195+.

(Continued on page 46)

ham radio news

KD2JTX Elected ITU Secretary-General

Doreen Bogdan-Martin, KD2JTX, has been elected as Secretary-General of the International Telecommunication Union, the first woman to hold the position. She takes the reins of the United Nations agency for telecommunication regulation on January 1, 2023. Bogdan-Martin has been Director of the ITU's Telecommunication Development Bureau since 2019, at that time becoming the first woman to hold a senior leadership position in the agency. She is the second radio amateur to hold the agency's top spot. Dr. Hamadoun Touré, HB9EHT, was Secretary-General from 2007 to 2014.

WRC-23 to be Held in Dubai

The International Telecommunication Union has announced that the 2023 World Radiocommunication Conference (WRC-23) will be held from November 20th through December 15th in Dubai, United Arab Emirates. WRCs are held every three to four years, at which time delegates from around the world review and, as needed, revise the ITU Radio Regulations, which provide an international framework for regulation of the RF spectrum and the orbits of communications satellites. The Radio Regulations include the basic structure of the Amateur Radio Service, including frequency allocations and license requirements. The ARRL and International Amateur Radio Union (IARU) are always involved in pre-conference deliberations and send observers to the conferences.

Hams Respond to Hurricanes Fiona and Ian

Amateur radio emergency communicators had a very busy month in September, with two major hurricanes wreaking havoc from the Caribbean to Canada. In addition to the various local EmComm organizations that were active in affected areas, the Hurricane Watch Net collected information on a broad scale to funnel to the National Hurricane Center in Miami, Florida.

According to HWN Net Manager Bobby Graves, KB5HAV, the net activated four times for Hurricane Fiona as it swept through Puerto Rico, the Dominican Republic, and Jamaica before turning north and slamming into the Maritime Provinces of Canada. The net re-activated on September 26th for Hurricane Ian as it moved through the Cayman Islands and western Cuba before setting its sights on the west coast of Florida, where it caused historic levels of damage. The storm crossed the Florida peninsula and made landfall again in South Carolina, but as a much weaker system. Graves reported that the net's volunteers racked up nearly 40 hours of on-air time for Fiona, followed by 93 hours for Hurricane Ian. The net forwarded nearly 200 surface reports to the National Hurricane Center and was involved in notifying officials of at least two people in Florida in need of being rescued. SATERN, the Salvation Army Team Emergency Radio Network, was also heavily involved in relief efforts.

YOTA Camp '23 Set for Canada

The third summer camp program for young radio amateurs from the Americas has been scheduled for July 16-21, 2023 at Carleton University in Ottawa, Ontario. According to the Youth on the Air (YOTA) organization, a team from the Radio Amateurs of Canada will serve as the local host for the camp. The previous two camps were held at the National Voice of America Museum of Broadcasting in Ohio.

Online applications will be accepted at <http://youthontheair.org> starting December 1st from amateurs aged 15-25 residing in North, Central, or South America. A maximum of 30 campers will be accepted. Priority will be given to first-time applicants and those living outside the U.S. Returning campers will serve as leaders during the camp. The YOTA organization encourages potential campers from outside Canada to start now on the process of obtaining a passport and any visas that may be necessary. More information is available on the YOTA website or from Camp Director Neil Rapp, WB9VPG <director@youthontheair.org>.

VOA Headquarters Named Historic Site in Journalism

Speaking of the Voice of America, the Society of Professional Journalists has designated VOA's Washington, DC, headquarters as a Historic Site in Journalism. "For 80 years, the Voice of America has been a source of solid and honest journalism," according to a society announcement. "From its beginning in 1942, despite being a U.S. government agency, through custom, charters and law the editorial independence of VOA journalists has not wavered." A bronze plaque attesting to its status as a National Historic Site in Journalism will be installed outside VOA headquarters at 330 Independence Avenue in Washington.

RSGB to Host Transatlantic Centenary Tests

The Radio Society of Great Britain (RSGB) will celebrate the 100th anniversary of its "transatlantic tests" with a series of special event operations during the month of December. According to the ARRL Letter, the RSGB will be using five callsigns, which the organization originally held in the 1920s: G5WS, "the first to get across" in the one-way tests of 1922; G5AT and G6XX, used during additional tests in 1923; G6ZZ, used for the first railroad-mobile amateur tests in 1924,and G3DR, originally used in the Scottish Highlands, which will now be operated as GM3DR. Variations on these calls will also be activated in different regions of the United Kingdom that are separate DXCC entities, according to the ARRL, including GM5WS (Scotland), GW5WS (Wales), GU5WS (Guernsey), GD5WS (Isle of Man), GJ5WS (Jersey), and GI5WS (Northern Ireland). Additional details are available from RSGB at <https://rsgb.org/transatlantic-tests>.

Arecibo Observatory to Be Replaced by Education Center

The National Science Foundation has decided not to rebuild the iconic radiotelescope at the Arecibo Observatory in Puerto Rico, instead winding down current scientific projects there and converting the facility to an educational center "to serve as a hub for STEM education and outreach."

In an announcement in mid-October, NSF said it was soliciting proposals to manage the education, research, and outreach elements of the new center. The announcement also specified that "(t)he solicitation does not include rebuilding the 305-meter telescope (which collapsed in 2020) or operational support for current scientific infrastructure, such as the 12-meter radio telescope or Lidar facility." According to Angel Vazquez, WP3R, the head of telescope operations at Arecibo, all current scientific work at the facility will end on September 30, 2023.

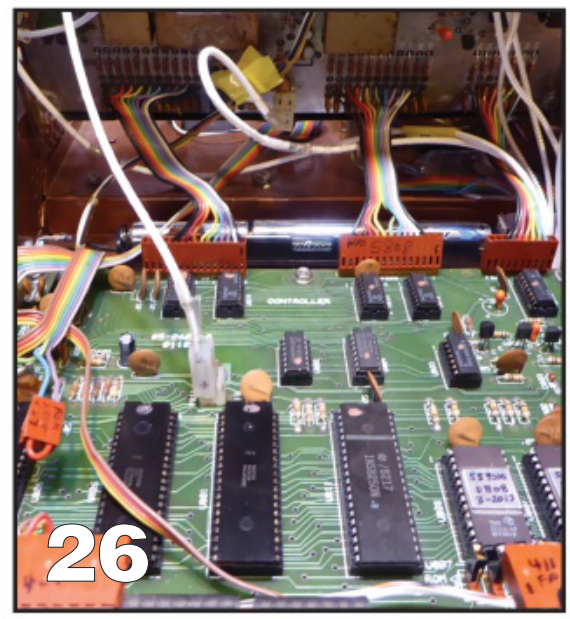
contents

NOVEMBER 2022 • VOLUME 78 NUMBER 11

13 RESULTS OF THE 2022 CQ WORLD WIDE WPX CW CONTEST

By Bud Trench, AA3B

Jelmer Vos, DJ5MO, of Halle, Germany, piloted his home station to second place worldwide in the Tribander / Wires overlay of the 2022 CQWW WPX CW Contest's Single-Op / Low Power category. Contest results begin on page 13; Jelmer's story is on page 18. *(Cover photo courtesy of DJ5MO)*



features

FOCUS ON: Happy Thanksgiving! This is the month we all give thanks for everything we are grateful for. Contesters give thanks for the rise of Solar Cycle 25 helping them achieve great scores in the CQWW WPX CW contest on pages 13 and 100. And CQ is thankful to John Sweeney for leading the CQ Marathon on page 40 and Jeff Reinhardt for penning his Mobiling column on page 69. Plus Joe Eisenberg has a gift guide for Kit Builders on page 56.

columns

departments

miscellaneous

zero bias: a cq editorial

BY RICH MOSESON,* W2VU

The "C"s of the Season

Autumn is prime time for contesting (one "C"), with the CQ World Wide DX Contest's SSB weekend just past at the end of October and the CW weekend (second "C") coming up at the end of this month. Then, as we move into colder weather and start to hibernate in our ham shacks and workshops, it's a perfect time to build stuff, making "construction" our third "C" of the season. The software side of our hobby also gets in on the alphabet action, with much programming for microcontrollers being written in the "C" computer language. This issue touches on all four of them.

Contesting is front-and-center this month, from our cover to the CW results of this year's CQ WPX Contest, the announcement of next year's CQWW 160-Meter Contest and our lead feature story from South America about a group that takes contesting to new heights … literally! "Contesting With Wolves" (p. 8) is kind of a cross between Summits on the Air and competitive contesting. Plus, Contesting Editor N3QE analyzes the most — and least — active CQ zones in the CQWW and WPX Contests. N2NT brings us the rules for our first big contest of 2023, the CQWW 160-Meter Contest on January 27-29 (CW) and February 24-26 (SSB). Finally, as contest DXpeditions start making a comeback after the "Covid pause," DX Editor N2OO brings us an update on a concept that likely will shape the face of DXpeditions moving forward, the Northern California DX Foundation's "Rig in a Box" program that will allow DXpeditions to ecologically fragile locations to set up equipment with a minimal footprint on the desired location and then operate the gear remotely from a boat anchored offshore.

Also in the competitive sphere, KØOV reports in his "Homing In" column on the 2022 world championships of amateur radio direction finding, also known as ARDF or "foxhunting."

CW is our second "C" … which loops us back to our cover and the WPX CW Contest results. "Cover dude" DJ5MO tells us (p. 18) that Morse code gives him higher contest scores from his location in Europe, running low power with a triband beam and wire antennas for the low bands. The strategy seems to work well for him, since he placed second worldwide in the WPX Contest's tribander / wires overlay category. Overall participation in this year's event was down compared with 2021 for several reasons, but there were still enough stations on the air to account for nearly 2 million verified QSOs … all in CW! (So much for the death of Morse code…)

As colder weather settles in here in the Northern Hemisphere and most of us cut back on our outdoor activities, construction season informally gets under way, and we've got the nuts and bolts (resistors and capacitors?) in several articles this month. In "The Almost Heathkit," former Heathkit technician Bob Sumption, N8RS, tells the story of the ill-fated Heath SS-8000 transceiver, how he came to build the only one (of the original three) still in existence, and his role in building the prototype of its successor, the SS-9000. We follow Bob's story with a CQ Classic review of the SS-9000 from back in 1984.

One of the things hams love to build is antennas, and CP6CL tells us how he got an HF Windom antenna to also "play well" on 6 meters. "Ham Notebook" editor KH6WZ shares some of his space this month with Devon Day, KF6KEE, who reports on a high school radio club whose members constructed handheld Yagi antennas with built-in attenuators for foxhunting fun, and got transmitter-hunting tutorials from some of the top people in the field, including our own "Homing In" editor KØOV. Plus, Kit-Building Editor KØNEB offers some holiday gift ideas for builders, including a combination soldering iron and hot air tool for working with surface-mount components.

Our fourth "C" is the computer language of the same name, and Microcontrollers Editor W8TEE continues his series on C-language "pointers" and other tips on successful coding for microcontrollers, which have become an integral part of many ham projects. On a similar theme, Digital Editor N2IRZ reports on his recent trip to the ARRL / TAPR Digital Communications Conference and some of the software and hardware projects that were presented there. (And speaking of projects, be sure to check out our new 2023-24 Ham Shack Project Calendar — yet another "C" — as well as our traditional Amateur Radio Calendar, both of which are available now. Check out our ads in this issue and order on our website. Speaking of ads, please support our advertisers and encourage those companies you don't see here to share their products in our pages.)

Back to the "C"s, it's amazing just how versatile a single letter of the alphabet can be! Oh … let's add one more: Cranberry sauce, to go with your Thanksgiving turkey! We wish all of our U.S. readers a Happy Thanksgiving and remind you that if family time gets a little overwhelming, the CQWW DX CW Contest can offer you a respite during the long weekend, as well as an opportunity to introduce interested family members to contesting, CW and construction (perhaps with a dash of "C" programming) in your ham shack.

– 73, Rich, W2VU

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

news bytes

KM4BUN Receives Young Ham of the Year Award

Audrey McElroy, KM4BUN, of Cumming, Georgia, was presented with the Amateur Radio Newsline Young Ham of the Year award at last summer's Huntsville Hamfest in Huntsville, Alabama. McElroy, who is 18, is a sophomore at Georgia Tech and actively promotes science, technology, engineering, and math (STEM) careers among girls and young women. See our August issue's "News Bytes" column for more about Audrey. Corporate co-sponsors of the YHOTY program include Yaesu USA, *CQ* magazine, Heil Sound, Gigaparts, and Radiowavz. (Photos courtesy Joe Eisenberg, KØNEB)

Audrey McElroy, KM4BUN, with some of the goodies presented to her as this year's Young Ham of the Year. Her swag also includes all current CQ publications and a radio from Yaesu.

2022 Young Ham of the Year presentation. From left to right, Steve Molo, KI4KWR from Gigaparts (also CQ's Awards Editor); Nomi Romero from Yaesu; CQ Kit-Building Editor Joe Eisenberg, KØNEB, representing CQ; Young Ham of the Year Aubrey McElroy, KM4BUN; award presenter and emcee Don Wilbanks, AE5DW, of Amateur Radio Newsline; and from Radiowavz, H.J. Hohensee, KDØDTS, and Emmett Hohensee, WØQH.

With the fall contest season fully under way, Contributing Editor-at-Large Martin Butera takes us on a visit to an unusual contest station on a mountaintop in Brazil, and interviews team leader Fabio Lima, PY2RMZ.

Contesting With Wolves — The ZV4SL Serra do Lopo Contest Station

BY MARTIN BUTERA,* PT2ZDX / LU9EFO

The "Serra do Lopo" contest station can be considered without a doubt as a different sort of contest station, located in a rare or at least atypical place. The name of the station comes from the Serra do Lopo, or Wolf Mountains, given that name due to the large number of wolves that inhabit the region (*Photo A*).

Serra do Lopo is located on the border between the cities of Extrema, in the Brazilian state of Minas Gerais, and Joanópolis in the state of São Paulo, Brazil. The Pico do Lopo (*Photo B*), is the highest point of the mountain at 1,750 meters (5,740 Feet) high. The only access is through trails along so-called "Rota dos Ventos."

The path begins at the foot of the huge mountain, passing through forests and streams. The ascent covers about 600 meters (1,968 feet), but it takes almost two hours to climb, so it is necessary to be in good physical condition.

To find out more about this contest station, we interviewed its team leader, Fabio Lima, PY2RMZ, a radio amateur with extensive contesting experience (*Photo C*).

Photo A. The ZV4SL QSL card, showcasing the wolves for which the Serra do Lopo mountain is named (Note the "SL" in the callsign to match the location). (Photos courtesy of the author)

Let 's Get Started!

CQ: The first thing that comes to mind is to ask you how the idea came about of setting up a contest station at 1,750 meters elevation?

Fabio Lima, PY2RMZ: First of all, I would like to thank *CQ* magazine for providing us with this space from Serra do Lopo, since we are a small group that is still emerging as a contest station. Many thanks from me, Fabio, PY4YY/PY2RMZ; Marcio, PU4MDO; Guilherme, PY2ITM; and Marcelo Pera, PY2AE.

Returning to your question, the idea arose when I visited the place in 2018 and at that time I met Marcio, PU4MDO, a resident of the region, a radio amateur and caretaker of the house that is located on top of the mountain.

I remember our first participation was in the national VHF contest and we operated with the ZV4RCA callsign.

It was a lot of adventure ... a lot of DX in the upper part of the Serra do Lopo. I felt that it was the perfect place to set up a serious contest station and since then we have not stopped working on improving day by day.

CQ: Well, if we talk about places, Brazil is a huge country, with a lot of countryside and incredible islands. Why did you choose a mountain to set up the contest station?

PY2RMZ: Three details made Serra do Lopo the ideal place. First, the altitude of 1,750 meters; it is more than perfect to mount antennas. Second is the trail, a bit slow to climb but if one is in good physical condition, it is easy to reach; and third, the camp. When we reached the top, we discovered an old deactivated cell phone tower, which serves as support for our antennas. Next to the tower there was a building that was used for cell phone transmitters and for technicians. In the past, they often spent weeks assembling or repairing the systems, so there is a house, with some rooms, a kitchen and bathroom.

That construction served us a lot of support and complements perfectly with our tents and all the external elements that we set up every time we climb to the top (*Photos D-F*).

CQ: How many members are involved or make up the station's team?

PY2RM**Z:** We are a small group of about five people, which is always rotating and we are always open to receiving other colleagues to participate in a contest.

** Contributing Editor-at-Large*
Email: <martin_butera@yahoo.com.ar>

Photo B. Pico do Lopo is the highest point of the mountain at an altitude of 1,750 meters, or 5,740 feet.

We know that there are usually many radio amateurs who have never experienced operating from a contest station on top of a mountain, so if you are reading this interview, live in Brazil or anywhere in the world and want to join, just contact us. We are waiting for you.

Another thing I would like to say is that you don't need to have experience in contesting, just have the desire to participate and have fun with us.

CQ: How do you configure the field of antennas and the transmitters in general?

PY2RMZ: We have a tower where the antennas are installed and configured according to the type of VHF or HF event. For HF, we have the following antennas: Triband 3-elements for 10 / 15 / 20 meters; a 7-element tribander, also for 10 / 15 / 20 meters; one simple monoband 5 elements for 10 meters; a full dipole for 40 meters and a full dipole for 80 meters.

On VHF, we have the following antennas (*Photo G*): MA6000 vertical, phased 5x2 Quadra Cúbica (cubical quad), a Yagi with 11 elements phased X2 and another 3-element Yagi (*Photo H*).

CQ: Has the Covid-19 pandemic affected the team in any way, for example when meeting?

PY2RMZ: Luckily we were always able to meet for the contests, taking the precautionary measures, which we all already knew.

The pandemic has made many of us reflect on the importance of natural spaces. Here in Brazil, we are surrounded by incredible places. During the transit of the pandemic, which the whole world is still going through, the competition season took much more courage for all of us who make up the team, because it makes us feel free. The pandemic was without a doubt chaotic, with a lot of fear, many quarantines, lockdowns, and many restrictions. Currently being able to go out and be in contact with nature is something fantastic and even more so if you can make use of a contest station with these characteristics.

CQ: Often, camping or portable contest stations are not taken seriously by other contesters. Why do you think this happens?

PY2RMZ: Well, it is something that I can understand. There are countless contest stations around the world that are

Photo C. Fabio Lima, PY2RMZ, operating the ZV4SL contest station.

Photo D. The ZV4SL contest station, on the Serra do Lopo peak 1,750 meters above sea level.

super-equipped, many of them are huge and colossal.

Right here in Brazil we have big stations like PX2A or ZW5B, and usually when talking about contest stations, that's the image that comes to mind.

Many of our fellow hams may think that we are just a group of crazy people ... Camping is fun, but let me tell you, camping-contesting is twice as hard as just camping. There are two lists of things not to forget, the things for camping and the things for the radio.

Forgetting something at home would be fatal. My QTH in the city of Sao Paulo, is about 120 kilometers (75 miles) away. It's about 2 hours driving along the highway. Adding it all up, I mean going down the mountain, going home, driving up the mountain again and hiking back up, it would take me 8 hours in total.

That is why creating a competitive contest station is not an easy task, much less at 1,750 meters high. All of us who make up the Serra do Lupo team spend a lot of time planning the competitions in advance. Planning for a contest, for example like the next CQ World Wide, starts several months before.

Every time we arrive, we have to start assembling everything from scratch again and again … the antennas that we are going to use, the location that we are going to choose, going up to the old tower to place more antennas, the transmitters, the amplifiers, the switches, the power supplies, hardware.

Beyond the radio, then you must organize everything that has to do with food and camping. That's why the work here never ends, unlike at a conventional contest station where the transmitters, the towers and everything you need is already waiting for you.

Ahhh, and then disassembling the complete station can take two days, since the material has to be lowered little by little.

Photo E. One of the tents used by the ZV4SL team to camp at the highest point of the mountain.

Photo F. The ZV4SL shack, next to the hang-gliding free-flight jump ramp, located at the highest point of the mountain.

In 2019, we used the callsign ZZ4A from Serra do Lopo. We organized a team with colleagues: Tony, OA4DX; Marcio, PU4MDO; Sandro, PY2SR; and me. We got the third position at the national level, placed fifth in South America and 19th worldwide in the CQ World Wide WPX Contest.

Then in the CQ WPX for 2021, also with the callsign ZZ4A, this time operated only by me in the Single-Op Low-Power 10-meter category, I obtained tenth place worldwide.

Perhaps over the years we will be able to achieve more and better positions at the world level and thus they will begin to take more account of us (laughs)...

CQ: I imagine that the climatic issue is something very important. What is it like to transmit and compete at 1,750 meters high?

PY2RMZ: It's a very good question … In contests, most operators are looking for the highest score possible. Here we compete not only for points, but it is also a competition, so to speak, with the climate. The weather in the mountains is difficult to predict, the winds are very strong, many times we have to lower the masts of the antennas to the ground and wait for the gusts to pass, so that they are safe. Here it is impossible to use the rotor, everything is done manually.

The worldwide contests, both the CQ World Wide DX and the CQ World Wide WPX, take place in very different months and it is quite a challenge to prepare for what awaits us on the mountain.

CQ: Do you compete in other contests apart from those sponsored by CQ magazine?

PY2RMZ: Worldwide on HF, our focus is the CQ contests. We also compete in many national contests, especially VHF, taking advantage of the height of the station.

CQ: How are you organized to eat and sleep in the mountains, in full competition?

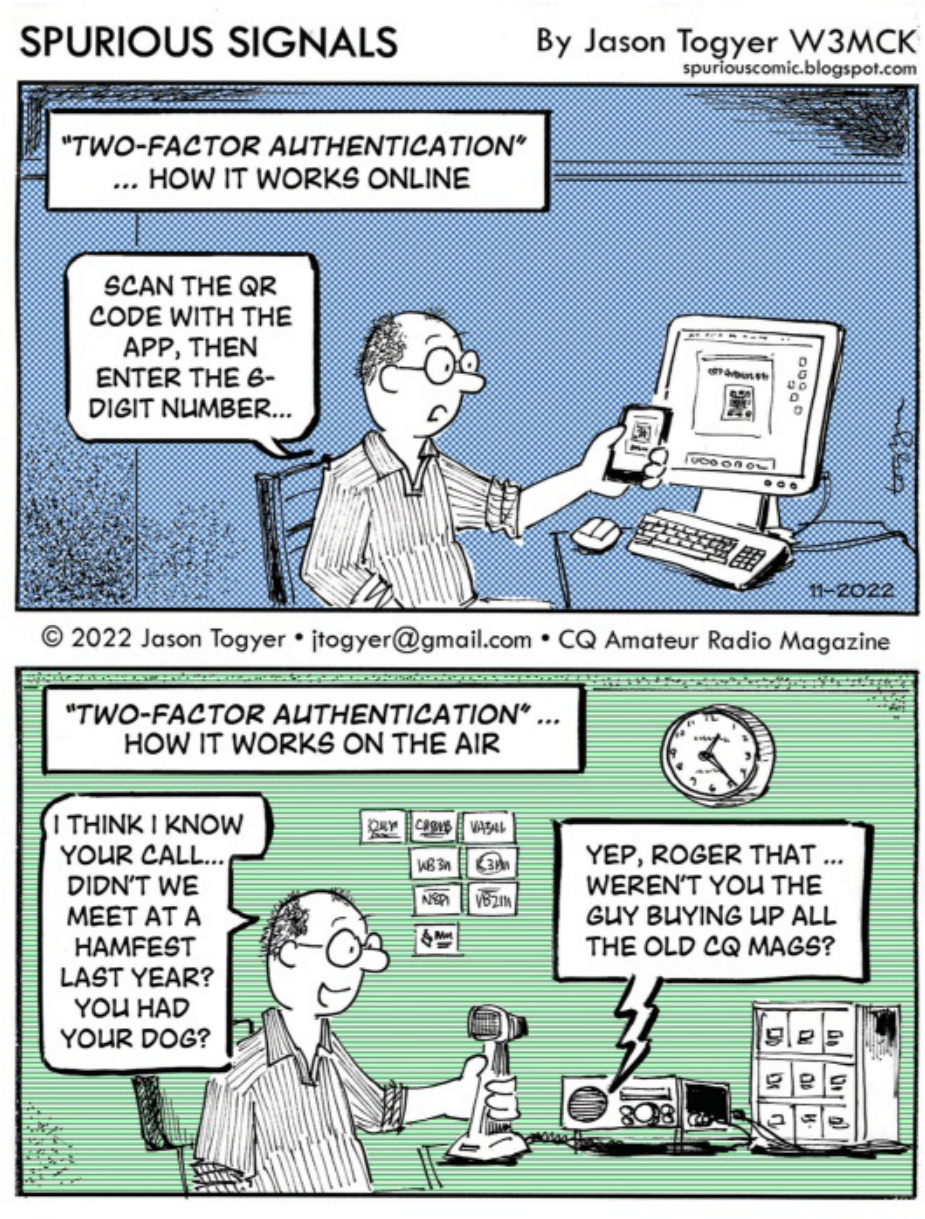


Photo G. VHF antennas outside the ZV4SL contest station.

Photo H. The group's 3-element, 6-meter Yagi, topped by the flag of Brazil, atop Serra do Lopo.

Fabio achieved a new balance with radio and nature. Of course, there are many other radio amateurs like him who love mountains.

PY2RMZ: We know that a key aspect of the contest is to keep the team well fed, but we don't follow any special diet; on the contrary we eat everything, a lot of barbecues (laughs).

At night if there is no propagation, we take a break and warm up at the foot of a campfire. Our idea is to have an experience beyond the contest; participate, but stay connected with the place and the nature that surrounds us. In the mountains we have a 360° view; at night the stars light up and the sunrises are spectacular. On the other hand, sleeping in a bag on a thin self-inflating mattress must be a taste or an acquired skill (laughs).

CQ: I imagine that caffeine is not lacking (laughs)...

PY2RMZ: We are lucky to be located in the south of the state of Minas Gerais, which is the main producer and responsible for most of the specialty coffee crops in the country.

Back to PT2ZDX...

Exploring in some way is something inherent to human beings. Fabio Lima knows it very well, it was for this reason that he created, together with his radio colleagues, a different concept of a contest station in Brazil.

I don't know if you've ever noticed, but contest stations often don't have windows. On the other hand, the Serra do Lopo contest station has a 360° window, where you can see an incredible view of the Jaguari dam to the south, the Itapeva Mountain Range and Vale do Jaguari to the north, the city of Joanópolis to the east and, to the west, the neighboring Serra das Anhumas.

Fabio achieved a new balance with radio and nature. Of course, there are many other radio amateurs like him who love mountains. Perhaps in the future, the best contest stations may look like ZV4SL.

In addition to the photos illustrating this article, be sure to check out these great videos of the ZV4SL contest station on Serra do Lopo:

<https://youtu.be/m8WRh8ZvWII>
<https://youtu.be/aL_bZ27zA0I>
<https://youtu.be/CNwPLSK1to8>
<https://youtu.be/oYRE8_BNZRo>

Results of the 2022 CQ World Wide WPX CW Contest

BY BUD TRENCH*, AA3B

Thank you, Oleg, EI7KD, for the opportunity to take part in my favorite contest. – EI/US2YW

First time ever that I participated in a WPX CW Contest! My little QRP station, it gave me a lot of satisfaction! – IZ4AFL

What great fun. Of course, the conditions are never perfect but that did not spoil the fun. – TF1AM

The band are the bands. Nothing broke, everything worked, Yeah! I had fun. – WA8Y

One of my mentors advised that increased sunspot activity brings both improved propagation and increased likelihood of solar disturbances. His wisdom proved accurate for the 2022 edition of the CQWW WPX CW contest. We were teased by conditions prior to the contest, particularly on the high bands. However, the K-index started to shoot up the day prior to the contest and peaked at 7 around 0600 UTC on the first day, meaning that geomagnetic storms were going to be part of our reality for yet another Cycle 25 operating event.

Figure 1 provides a recap of the CQWW WPX CW logs processed for 2022. Nearly 2 million (M) QSOs were validated based on logs received from 127 DXCC entities. Twenty meters was the most active band, accounting for 39% of all QSOs, followed by 15 and 40 meters at roughly 25% each.

Participation was down by over 20% compared to 2021 and QSOs were off by 31%. Europe was particularly impacted with QSO reductions of 44% from last year. The likely contributing factors to the reduced participation include the war in Ukraine, CQ's policy restricting participation by stations in Russia and Belarus, and resumption of life as normal after Covid-19 impacts.

Single Operator Stellar Performances

Figure 2 shows the breakdown of Single Operator category selections by continent. The percentages of entries in

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OM2VL was one 17 Single Banders who operated the full 36 hours enabling a 20-meter High Power win.

WM3T (NY3A) watching the spectrum on his way to third-place finish in the Single-Op All Band Low Power category.

	Continent							
Metric	AF	AS	EU	NA	OC	SA	ALL	2021
Logs	24	731	2,006	1,552	175	178	4,666	5,960
Operators	26	819	2,272	1,665	199	188	5,169	6,637
DXCC	10	25	50	20	11	11	127	134
Prefixes	16	210	606	523	80	78	1,513	1,819
Reported QSOs By Band (Post Log Checking)								
160M	0	516	16,715	569	41	0	17,841	38,379
80M	605	3,806	93,237	18,814	349	286	117,097	225,368
40M	3,701	25,182	275,477	167,645	7,856	5,902	485,763	787,066
20M	6,496	56,985	378,079	290,171	16,186	15,127	763,044	1,263,208
15M	8,524	83,574	167,941	179,120	20,580	27,191	486,930	397,031
10M	2,952	21,084	28,212	21,270	8,991	25,959	108,468	171,229
All	22,278	191,147	959,661	677,589	54,003	74,465	1,979,143	2,882,281
Average Productivty								
QSOs/Log	928	261	478	437	309	418	424	484
QSOs/Opr	857	233	422	407	271	396	383	434

Figure 1. 2022 activity level summary by continent

each of the three power categories are nearly identical to the 2021 profiles, suggesting that single operators are creatures of habit when it comes to category choices.

Figure 3 provides operating times for the Single-Op All Band categories. As in 2021, about 60% of the operators exited after 12 hours and 90% by 24 hours. There were 136 entrants in the All Band category along with 17 Single Banders who went the full 36 hours.

CR3DX (OM3RM) was the winner of the Single-Op High Power (HP) category, as he was in 2019. Note that CR3DX operated by OM3GI was also the winner 2021, so CR3DX has appeared in the number 1 slot for three consecutive years. H25A (LZ2HM) came in second, despite having the most frequently busted call (406 times) in the contest. LZ5R (LZ5DB) had the highest multiplier count of any single operator and repeated as number three.

P44W (W2GD) notched his sixth Single-Op Low Power (LP) win at his home away from home in Aruba. VE3DZ was planning a vacation-style operation from Bermuda but changed his plans after obtaining special callsign VP9UKR (Support Ukraine). He put together a competitive low power SO2R station using equipment and supplies borrowed from the locals to achieve second place. Third place went to WM3T (NY3A) who returned to the LP category for the first time since 2003.

K3WW can add achieving a second consecutive victory in the Single-Op

	Continent							Average per Entry	
Category	AF	AS	EU	NA	OC	SA	All	Op Time (Hours)	Score Reduction
Single Op High Power Entries									
All Band	6	143	399	551	33	20	1,152	15	10%
Single Band	2	67	205	105	18	26	423	14	11%
Single Op Low Power Entries									
All Band	6	250	694	609	48	55	1,662	12	11%
Single Band	3	161	298	120	32	52	666	9	13%
QRP Entries									
All Band	0	26	86	58	12	3	185	11	9%
Single Band	0	30	67	29	21	7	154	9	13%

Figure 2. Single operator participants by continent

9A22Y is an inspirational Multi-Two effort powered by remote operations from Ukraine!

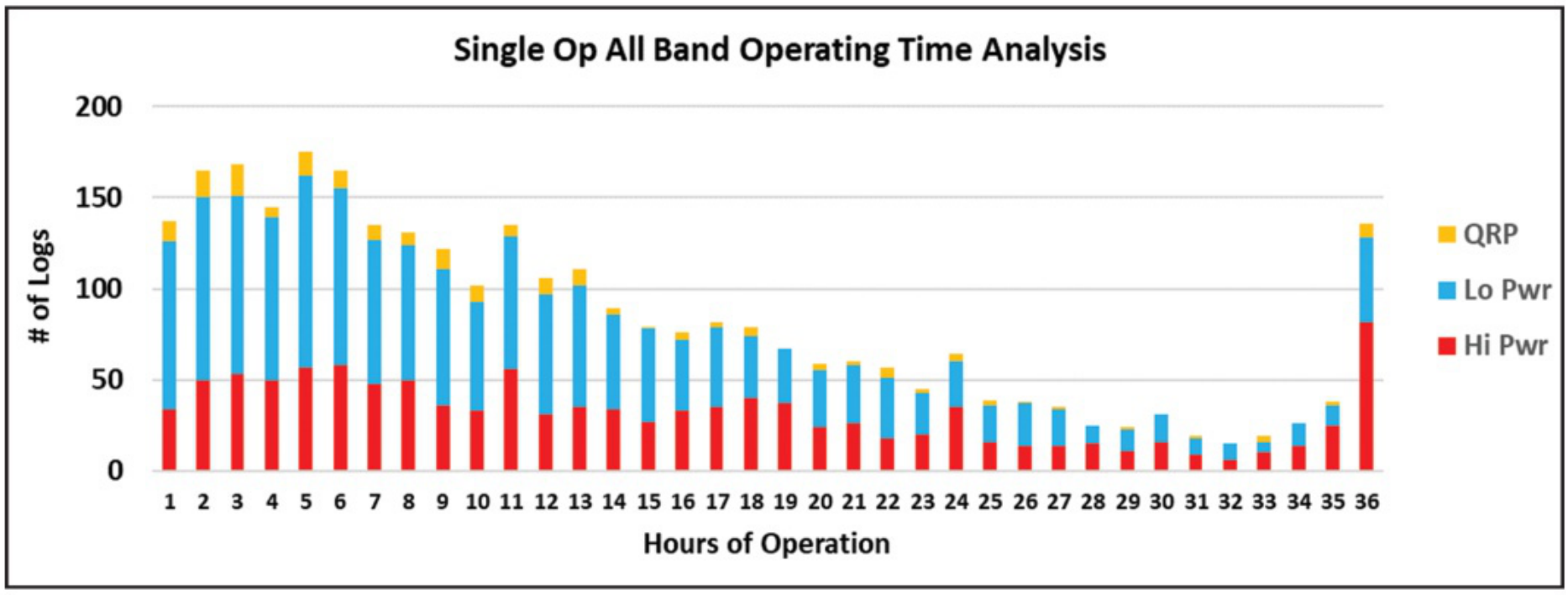


Figure 3. Single operator all band operating time histogram

QRP category to his extensive list of radiosport accomplishments. DM2M (DK3WE) moved up to second from his fourth place QRP finish in 2021.

Single-band highlights included OL1A (OK1CW) achieving his TENTH consecutive 160-meter QRP win. OL4W (OK1IF) also continued his win streak with a fifth 80-meter QRP victory. DQ2C (DL2SAX) narrowly beat HA1TJ in the 80-meter HP category in a race that boiled down to log accuracy. 9A5Y (9A3LG) decided to spend a "few minutes" checking out 40 meters, which turned into a full out effort and a 40-meter HP win. The difference between OM2VL and PP4T (PY2LSM) in the 20-meter HP category was likely operating time; OM2VL came out on top thanks to operating the maximum time permitted. EF3O (EA3O) won 15-meter QRP after winning 20-meter QRP in 2021. LU8DPM, operated by LU1DJX who was a Rookie in 2021, dominated the single-band 10-meter LP category.

Additional Opportunities to Excel – Overlays

The Single Operator Tribander – Wires (TB-Wires) overlay is for participants with antennas that meet the following requirements: A single feedline for the single antenna used on 20 / 15 / 10 meters and single-element antennas for 160, 80, and 40 meters. Separate receive antennas are not permitted. This is the most popular overlay as shown in *Figure 4*.

CT3KN captured his first ever win of the HP TB-Wires after finishing third in both 2020 and 2021; his score was up by more than 60% from last year. N3QE had the best HP TB-Wires results in North America (NA) and was second overall. The top two spots in the LP TB-Wires both belong to Germans: DK5DQ (#1) and DJ5MO (#2). NU2A (N2YO) found his new Hex Beam to be a strong performer on his way to the top LP TB-Wires score in the U.S.

The Classic overlay is for single operators using one radio, without QSO finding assistance, and their score is based on the first 24 hours of their airtime. There were 43 Classic overlay participants who made it to the 24-hour operating time limit. KP2M (KT3Y) was the top gun in the HP Classic for the second year in a row. Second place was earned by ED8W (OM5RW). NN7CW tried the HP Classic for the first time with impressive results – he was first in the U.S. In the LP Classic, the World cham-

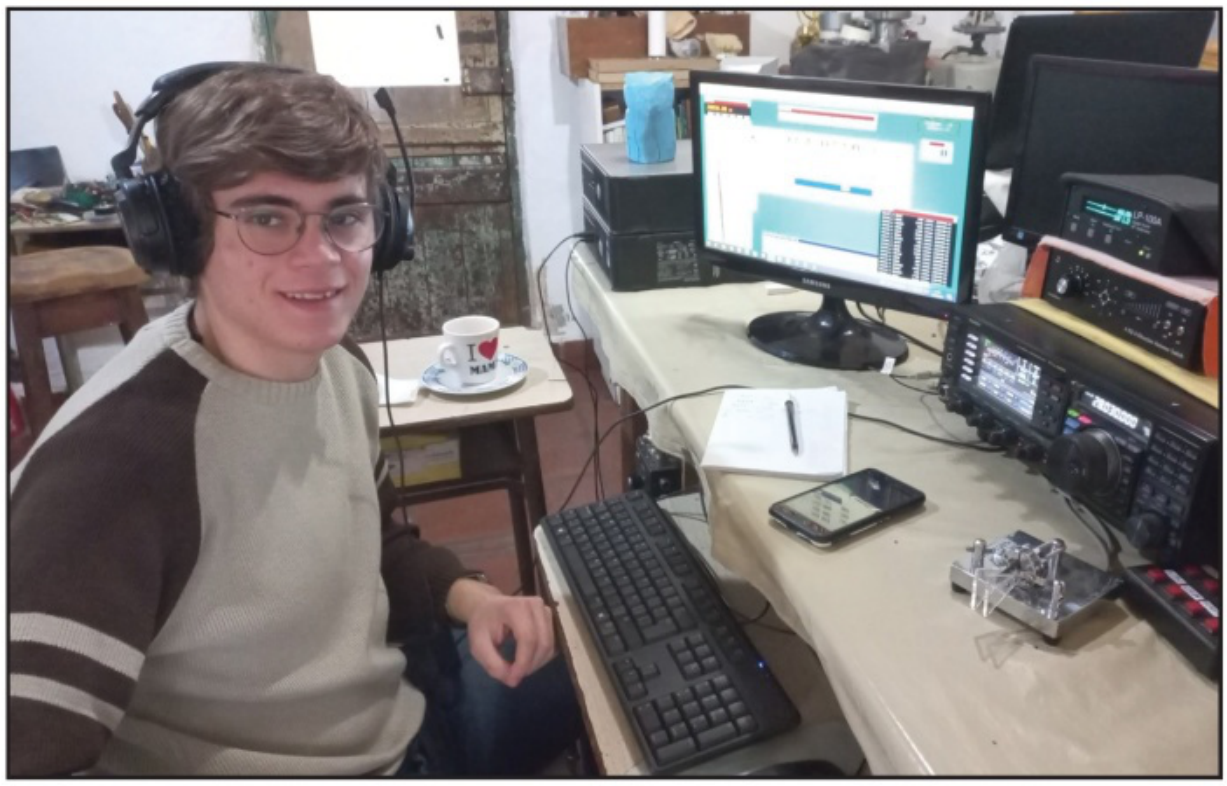
	Continent							Average per Entry	
Category	AF	AS	EU	NA	OC	SA	All	Op Time (Hours)	Score Reduction
High Power Overlay Entries									
TB-Wires	3	24	75	90	7	5	204	16	10%
Classic	1	10	50	58	11	7	137	13	9%
Rookie	0	2	3	2	0	0	7	8	25%
Youth	0	0	8	0	0	0	8	28	11%
Low Power Overlay Entries (Includes QRP)									
TB-Wires	1	52	163	90	13	13	332	14	9%
Classic	2	54	158	96	16	10	336	11	12%
Rookie	0	6	11	14	4	0	35	12	14%
Youth	0	13	7	7	2	1	30	12	7%

Figure 4. Single-Op overlay participation summary

Achievements by Operators Aged 25 or Younger	Call	Age
Highest 60 minute rate (125)	M6T (M0SDV)	21
Lowest Score Reduction (1.2%)*	W8UA	16
Youngest Op, Youth Overlay Top 10, High Power	EA2RCP (UR5YKO)	15
Youngest Op, Youth Overlay Top 10, Low Power	EI8KW	13
Highest QRP Score (63K)	YC1LJT	21
Highest Single Band Score (675K)	IR1N (IU1LCU)	24

*Score greater than 100K

Figure 5. Noteworthy achievements by operators aged 25 or younger



pion was UN4L and KR5X (K1BX) was runner up, with VX3KI (VE3KI) a close third.

The Rookie Overlay is intended to attract new contesters licensed under three years. There were 43 Rookies this year, of which 13 are in their final year of eligibility with 19 in Year 2 and 11 in Year 1. YD6HVF was the newest Rookie, licensed in April 2022. Congratulations to OL2J (OK5MAX) for a dominant win in LP Rookie; his was the highest score among all Rookies. KO4VW won the U.S. LP Rookie honors. The HP Rookie winners were EI6LA (World) and K3KEK (U.S.).

LU8DPM (LU1DJX) dominated the 10-meter Single Band Low Power category.

2022 CQWW WPX CW TOP SCORES

WORLD

Single Op All Band High Power
CR3DX (OM3RM).....17,938,549
H25A (LZ2HM).....15,775,552
EF8R (EA8RM).....15,511,572
LZ5R (LZ5DB).....15,020,324
CR6K (CT1ILT).....12,874,720

Single Op 28 MHz High Power
LW1F (LU5FC).....3,374,198
PY2BK.....2,880,060
LT6M (LU8MHL).....1,909,096

Single Op 21 MHz High Power
ZX5J (DJ4CW).....6,937,200
P49Y (AE6Y).....6,579,417
TM4W (F4DXW).....3,699,186

Single Op 14 MHz High Power
OM2VL.....5,226,681
PP4T (PY2LSM).....4,817,925
YT3X.....4,772,196

Single Op 7 MHz High Power
9A5Y (9A3LG).....4,760,184
OK7W.....4,647,882
S52AW.....3,501,575

Single Op 3.5 MHz High Power
DQ2C (DL2SAX).....840,360
HA1TJ.....820,800
SP2PIK (SP2MKI).....779,898

Single Op 1.8 MHz High Power
YT8A.....205,380
LYØA (LY7M).....196,784
9A73KD (9A2KD).....159,782

Single Op All Band Low Power
P44W (W2GD).....9,775,087
VP9UKR (VE3DZ).....6,089,928
IY3A (IZ3EYZ).....6,083,261
WM3T (NY3A).....4,784,650
OL5Y.....4,634,916

Single Op 28 MHz Low Power
LU8DPM (LU1DJX).....2,230,039
PQ5B (PP5BZ).....1,637,057
LO7H (LU1HLH).....1,216,656

Single Op 21 MHz Low Power
ED1R.....1,702,272
ES7A (ES7GM).....867,336
YT9W.....857,584

Single Op 14 MHz Low Power
IF9A (IT9PPG).....2,021,976
ES7GN.....1,774,590
YU5M.....1,703,592

Single Op 7 MHz Low Power
YU7WW.....1,330,875
E797WARD (E73AA).....999,792
OM3CQ.....894,516

Single Op 3.5 MHz Low Power
SO7M (SP7IFM).....456,092
OL5J.....413,492
YU1ED.....400,325

Single Op 1.8 MHz Low Power
OK6Y (OK2PTZ).....142,943
SNØR (SQ9IAU).....114,695
DR9ØTJU (DL6KWN).....93,888

Single Op All Band QRP
K3WW.....2,747,416
DM2M (DK3WE).....2,539,839
ON6NL.....1,646,390
LY9A.....1,600,446
DK7HA.....1,540,554

Single Op 28 MHz QRP
4I1EBC.....246,120
4F3OM.....99,962
N4IJ.....34,845

Single Op 21 MHz QRP
EF3O (EA3O).....585,849
AA1K.....310,100
SV1JG.....195,597

Single Op 14 MHz QRP
KA4RRU.....504,138
S51Z.....340,008
G2X (GØDCK).....231,192

Single Op 7 MHz QRP
OK6OK.....440,134
CO8OH.....273,726
PG2AA.....269,598

Single Op 3.5 MHz QRP
OL4W (OK1IF).....352,268
SP7M.....83,467
UN9LDC.....44,436

Single Op 1.8 MHz QRP
OL1A (OK1CW).....82,533
DL1AOB.....31,920
HA1TI.....6,496

Multi-Single High Power
D4Z.....18,939,090
UP2L.....17,128,440
ZF1A.....14,483,864
E7DX.....13,296,761
WU2X.....12,942,860

Multi-Single Low Power
UN4Q.....7,613,994
LY5W.....4,626,680
YL4U.....3,686,245
LY2J.....3,375,952
JA6GCE.....3,319,845

Multi-Two
ES9C.....18,247,320
IQ2CJ.....17,908,800
OL3Z.....15,595,524
HG7T.....15,153,544
DQ1A.....13,992,564

Multi-Multi
9A1A.....25,605,468
YT5A.....23,229,255
LZ9W.....22,185,384
NH7T.....16,202,780
LN8W.....13,743,581

Multi-Distributed
ZM1A.....15,617,665
PV2K.....12,026,916
OT7T.....8,870,960
EA1URA.....5,083,644
9H6A.....4,397,221

Rookie
High Power
EI6LA.....182,640
DL3ON.....117,192
K3KEK.....54,927
VA6BGE.....17,316
9V1PL.....2,320

Rookie
Low Power
OL2J (OK5MAX).....1,440,738
KO4VW.....358,848
VE3KOT.....319,956
KY4ID.....286,976
KY4GS.....256,038

Classic
High Power
KP2M (KT3Y).....9,048,600
ED8W (OM5RW).....8,393,936
ZF2SS (KO7SS).....6,550,155
PJ2T (WI9WI).....5,996,067
DJ5MW.....5,106,240

Classic
Low Power
UN4L.....3,115,080
KR5X (K1BX).....2,393,373
VX3KI (VE3KI).....2,377,648
9M6NA (JO4JKL).....1,890,900
WQ5L.....1,799,634

Tribander / Wires
High Power
CT3KN.....9,169,552
N3QE.....5,525,370
HZ7C (7Z1SJ).....4,084,800
MM9I.....4,066,440
LZ3ZZ.....3,846,699

Tribander / Wires
Low Power
DK5DQ.....3,852,505
DJ5MO.....3,681,558
DL4FN.....3,301,500
SP9XCN.....3,072,784
DL6RAI.....2,945,070

Youth
High Power
M6T (MØSDV).....5,380,608
YTØC.....4,900,386
EA2RCP (UR5YKO).....1,668,641
LY5AX.....1,519,144
IR1N (IU1LCU).....675,288

Youth
Low Power
5B4AQC (DK6SP).....3,983,847
KM4SII.....1,903,611
YD2UWF.....401,792
JI1UPL.....211,816
EI5LA.....206,590

UNITED STATES

Single Op All Band High Power
AA3B.....10,836,378
K1LZ.....7,688,480
AJ1I (K1ZZ).....7,505,722
NU5A (K5GN).....7,397,958
KQ2M.....7,148,424

Single Op 28 MHz High Power
WB9Z.....248,492
NS1L (N6SS).....240,990
K3PA.....96,520

Single Op 21 MHz High Power
K3UA (@K3LR).....3,342,324
K1KI.....2,288,363
K2SSS.....2,121,668

Single Op 14 MHz High Power
K3LR (N2NC).....3,918,096
NA6TT (N6CW).....2,253,916
N2BA.....1,951,460

Single Op 7 MHz High Power
AB3CX.....2,562,390
WK1O.....2,218,755
KØRF.....1,922,778

Single Op 3.5 MHz High Power
W3BGN.....258,318
WV4P.....59,408
W6XI.....7,398

Single Op 1.8 MHz High Power
K5UR.....11,376

Single Op All Band Low Power
WM3T (NY3A).....4,784,650
KQ1F (K1XM).....4,596,647
AC1U (N1UR).....3,651,552
KD5DD (N4OGW).....3,438,336
WN1GIV (N4BP).....3,207,048

Single Op 28 MHz Low Power
NN4AC (N3AC).....12,328
W6JPL (K6ICS).....8,586
NC6V.....7,938

Single Op 21 MHz Low Power
WB4TDH.....441,976
N5JR.....437,076
WA1FCN.....225,568

Single Op 14 MHz Low Power
W7UT.....280,606
NU8A.....198,484
KW6AA.....126,492

Single Op 7 MHz Low Power
AA4NP.....442,884
NØNI.....411,424
NS3T.....224,612

Single Op 3.5 MHz Low Power
N4OO.....19,440

Single Op All Band QRP
K3WW.....2,747,416
N7IR.....575,016
W1FJ.....557,406
W6JTI.....515,147
AC2YD.....419,547

Single Op 28 MHz QRP
N4IJ.....34,845
KW7R.....3,267
W2VRK.....1,440

Single Op 21 MHz QRP
AA1K.....310,100
WA6FGV.....14,364

Single Op 14 MHz QRP
KA4RRU.....504,138
W5LA.....25,414
KF4AV.....18,792

Single Op 7 MHz QRP
K4XL.....134,550

The Youth overlay was offered for the first time this year targeting operators aged 25 or younger. The 38 Youth overlay participants ranged in age from 13 to 25 years. It is encouraging to see that the average operating time for Youth Overlay High Power participants was the highest of any single-op cohort at 28 hours, and their average score reduction was the lowest at 7%.

M6T (MØSDV) has an impressive resume at age 21 including multiple contest and DX expeditions; he can now add a World win of the HP Youth overlay to his list of achievements. YTØC, also age 21, was second overall, and

NU2A (N2YO) earned the top U.S. score in the Low Power, Triband-Wires Overlay category.

NE6M.....31,165
W4RYW.....8,680

Multi-Single High Power
WU2X.....12,942,860
KU1CW.....5,565,120
WK9M.....5,184,927
AG3I.....3,921,148
N4QS.....3,907,139

Multi-Single Low Power
KA9VVQ.....89,056
NJ1F.....20,520

Multi-Two
NI4W.....13,354,120
K9CT.....11,896,596
KC7V.....8,248,756
NX6T.....7,584,168
WD6T.....6,810,027

Multi-Multi
NR6O.....9,373,580
KT7E.....3,720,276
WA3EKL.....2,186,794
K3CT.....738,204
KD2RD.....492,633

Multi-Ditributed
WC7Q.....3,237,696
WU5K.....973,080

Rookie
High Power
K3KEK.....54,927

Rookie
Low Power
KO4VW.....358,848
KY4ID.....286,976
KY4GS.....256,038
KI2D.....61,533
KO4AWC.....36,285

Classic
High Power
NN7CW.....4,899,223
KM1W (W1UE).....4,048,380
KZ5D.....1,930,494
K6AR.....1,696,080
AJ6V.....1,575,890

Classic
Low Power
KR5X (K1BX).....2,393,373
WQ5L.....1,799,634
NK4O.....1,056,480
K3JT.....1,034,055
W4SPR.....930,465

Tribander / Wires
High Power
N3QE.....5,525,370
KQ4R.....3,206,952
AB2E.....2,308,493
N1TO.....2,263,734
K3MD.....2,100,189

Tribander / Wires
Low Power
NU2A (N2YO).....2,621,457
WC4E.....1,966,888
NE9U.....1,792,089
N1EN.....1,645,622
K1TR.....1,636,944

Youth
Low Power
KM4SII.....1,903,611
W8UA.....167,307
KE8HBV.....105,780
KD9LSV.....57,057
N4JEH.....1,440

EUROPE

Single Op All Band High Power
LZ5R (LZ5DB).....15,020,324
CR6K (CT1ILT).....12,874,720
OMØR (OM3GI).....10,051,683
HG3R (HA3NU).....9,962,304
OM7M (OM5ZW).....9,812,789

Single Op 28 MHz High Power
HA5JI.....491,436
YT1X.....333,720
DH8BQA.....242,170

Single Op 21 MHz High Power
TM4W (F4DXW).....3,699,186
S5ØK.....2,940,520
EF5U (EA5U).....2,602,410

Single Op 14 MHz High Power
OM2VL.....5,226,681
YT3X.....4,772,196
ED3O (EA3CX).....4,767,360

Single Op 7 MHz High Power
9A5Y (9A3LG).....4,760,184
OK7W.....4,647,882
S52AW.....3,501,575

Single Op 3.5 MHz High Power
DQ2C (DL2SAX).....840,360
HA1TJ.....820,800
SP2PIK (SP2MKI).....779,898

Single Op 1.8 MHz High Power
YT8A.....205,380
LYØA (LY7M).....196,784
9A73KD (9A2KD).....159,782

Single Op All Band Low Power
IY3A (IZ3EYZ).....6,083,261
OL5Y.....4,634,916
MX7DX (MØUNN).....4,473,546
OL9R (OK6RA).....4,412,529
SN7O (SP7IVO).....4,333,274

Single Op 28 MHz Low Power
SV2BOH.....120,310
IR4Q (IU4MRU).....71,808
S53V.....49,457

Single Op 21 MHz Low Power
ED1R.....1,702,272
ES7A (ES7GM).....867,336
YT9W.....857,584

Single Op 14 MHz Low Power
IF9A (IT9PPG).....2,021,976
ES7GN.....1,774,590
YU5M.....1,703,592

Single Op 7 MHz Low Power
YU7WW.....1,330,875
E797WARD (E73AA).....999,792
OM3CQ.....894,516

Single Op 3.5 MHz Low Power
SO7M (SP7IFM).....456,092
OL5J.....413,492
YU1ED.....400,325

Single Op 1.8 MHz Low Power
OK6Y (OK2PTZ).....142,943
SNØR (SQ9IAU).....114,695
DR9ØTJU (DL6KWN).....93,888

Single Op All Band QRP
DM2M (DK3WE).....2,539,839
ON6NL.....1,646,390
LY9A.....1,600,446
DK7HA.....1,540,554
DG3T (DF5RF).....1,473,528

Single Op 28 MHz QRP
HG3IPA (HA3JB).....18,177
YO8WW.....3,838
DL1EFW.....2,310

Single Op 21 MHz QRP
EF3O (EA3O).....585,849
SV1JG.....195,597
LZ2RS.....151,751

Single Op 14 MHz QRP
S51Z.....340,008
G2X (GØDCK).....231,192
9A2EY.....129,480

Single Op 7 MHz QRP
OK6OK.....440,134
PG2AA.....269,598
SP6EIY.....149,568

Single Op 3.5 MHz QRP
OL4W (OK1IF).....352,268
SP7M.....83,467
SP8OOE.....23,310

Single Op 1.8 MHz QRP
OL1A (OK1CW).....82,533
DL1AOB.....31,920
HA1TI.....6,496

Multi-Single High Power
E7DX.....13,296,761
ED7W.....11,123,304
HG6N.....10,375,088
SP8R.....10,306,780
OK5Z.....9,199,883

Multi-Single Low Power
LY5W.....4,626,680
YL4U.....3,686,245
LY2J.....3,375,952
HG22TISZA.....2,856,646
HG5C.....2,586,337

Multi-Two
ES9C.....18,247,320
IQ2CJ.....17,908,800
OL3Z.....15,595,524
HG7T.....15,153,544
DQ1A.....13,992,564

Multi-Multi
9A1A.....25,605,468
YT5A.....23,229,255
LZ9W.....22,185,384
LN8W.....13,743,581

Multi-Ditributed
OT7T.....8,870,960
EA1URA.....5,083,644
9H6A.....4,397,221
EA4URE.....4,375,952
OG3B.....3,541,488

Rookie
High Power
EI6LA.....182,640
DL3ON.....117,192

Rookie
Low Power
OL2J (OK5MAX).....1,440,738
YO3HEX.....159,525
IR4Q (IU4MRU).....71,808
SP5DJ.....58,283
OE8ACT.....18,297

Classic
High Power
DJ5MW.....5,106,240
TM5T (F5VKT).....2,674,212
LZ7J (LZ1CL).....2,366,640
HA8DU.....1,981,288
YL2VW.....1,974,820

Classic
Low Power
DL1WA.....1,329,705
DK3YD.....1,176,418
OLØA (OK1CZ).....1,108,870
5Q6EE (OZ2I).....1,093,533
DJ3HW.....777,621

Tribander / Wires
High Power
MM9I.....4,066,440
LZ3ZZ.....3,846,699
DL3UB.....3,704,472
IO6A (IK6QON).....3,677,714
9A2AJ.....3,674,835

Tribander / Wires
Low Power
DK5DQ.....3,852,505
DJ5MO.....3,681,558
DL4FN.....3,301,500
SP9XCN.....3,072,784
DL6RAI.....2,945,070

Youth
High Power
M6T (MØSDV).....5,380,608
YTØC.....4,900,386
EA2RCP (UR5YKO).....1,668,641
LY5AX.....1,519,144
IR1N (IU1LCU).....675,288

Youth
Low Power
EI5LA.....206,590
IUØLJD.....105,525
DP4X (DJ4MX).....35,868
2MØGUI.....21,060
E7ØAW.....14,382

On the Cover

Jelmer Vos, DJ5MO, has been a ham since 1996 and a contester since 2001, but he says he's still learning, "which is what I really like about our hobby in general and HF contesting in particular." Born in the Netherlands, Jelmer has lived in Germany since 2009. He works as an (RF) IC design engineer and is married with two children.

Introduced to radio as a young teen via CB and shortwave listening, Jelmer received his first amateur license at age 17. He says he had limited antenna possibilities at his parents' house, but tried several homemade wire antennas, along with building his own amplifiers and tuners. As an electrical engineering student at the time, Jelmer says his early ham experience "really helped in learning HF design."

Asked to join a multi-op contest team at PA1TT in 2001, he quickly became addicted to contesting. He and a group of friends decided to form their own contest group, PA6Z, and built a well-equipped multi-op station, which was in use until 2012, when the owner sold the property. Living in Germany at that point, Jelmer decided to focus on contesting from his home station (an IC-7700 transceiver, a tribander with 3 elements each on 20 and 15 meters plus 5 elements on 10, a rotary dipole for 40, a full-size dipole on 80 and an inverted-L on 160).

"Single-op contesting from home is really different from a multi-op situation," Jelmer noted. "I had to learn a lot, e.g., when to be on what band, when to sleep, and what antennas work best in my situation." He adds, "I prefer CW for contesting, and usually participate in the low power section of the CQWW and CQ WPX as main events. Having only a moderate station from my location in Europe, I believe the best result can be achieved with low power CW." It's clearly an effective strategy, as Jelmer finished this year's WPX CW Contest (results article on page 13) in second place worldwide in the Tribander / Wires overlay of the Single-Op / Low Power category! *(Cover photo courtesy DJ5MO)*

	Continent							Average per Entry	
Category	AF	AS	EU	NA	OC	SA	All	Op Time (Hours)	Score Reduction
Multi-Single HP	1	13	27	21	2	3	67	33	12%
Multi-Single LP	0	5	20	3	3	0	31	26	11%
Multi-Two	0	4	19	12	1	0	36	40	12%
Multi-Multi	0	3	4	7	1	0	15	36	10%
Multi-Distributed	0	2	7	3	1	1	14	36	15%

Figure 6. Multi-Operator participation summary

OL2J (OK5MAX) was the winner of the Rookie Overlay.

M6T (MØSDV) at age 21 took first place in the High Power Youth Overlay.

Highest QSO Points/QSO by Stations Operating 36 or More Hours														
Category	Africa		Asia		Europe		N. America		USA		Oceania		S. America	
Single Op AB HP	CR3DX	3.61	C4W	3.33	S53MM	2.94	CF2T	3.28	K3RA	3.02	VK6T	4.02	-	-
Single Op AB LP	-	-	5B4AQC	3.74	OL9R	2.88	VP9UKR	3.31	KQ1F	2.90	9M6NA	3.31	P44W	3.71
Single Op AB QRP	-	-	-	-	DK7HA	2.45	K3WW	2.59	N7IR	2.02	-	-	-	-
Single Op SB HP	-	-	-	-	OK7W	3.31	K3LR	2.22	NA6TT	1.88	-	-	-	-
Single Op SB LP	-	-	-	-	ES7A	1.95	-	-	-	-	-	-	-	-
Multi-Single HP	D4Z	3.59	UP2L	3.43	DA2X	2.73	ZF1A	2.93	WU2X	2.89	7A2A	3.10	CE3CT	3.39
Multi-Single LP	-	-	UN4Q	3.23	DP7D	2.50	-	-	-	-	-	-	-	-
Multi-Two	-	-	BH3GIY	2.04	DM6V	2.70	VX9ML	3.58	WD6T	2.44	-	-	-	-
Multi-Multi	-	-	JA3YBK	2.43	9A1A	2.55	KL7RA	2.90	NR6O	2.18	NH7T	3.45	-	-
Multi-Distributed	-	-	9M2A	2.33	OT7T	2.39	WC7Q	1.83	WC7Q	1.83	ZM1A	3.66	PV2K	3.03

Highest Mults Worked/Total Mults (%) for Stations Operating 36 or More Hours														
Category	Africa		Asia		Europe		N. America		USA		Oceania		S. America	
Single Op AB HP	CR3DX	77%	C4W	61%	LZ5R	83%	AA3B	71%	NU5A	65%	VK6T	53%	-	-
Single Op AB LP	-	-	5B4AQC	44%	IY3A	67%	WM3T	56%	KQ1F	53%	9M6NA	37%	P44W	63%
Single Op AB QRP	-	-	-	-	DM2M	45%	K3WW	46%	N7IR	26%	-	-	-	-
Single Op SB HP	-	-	-	-	OM2VL	71%	K3LR	62%	NA6TT	53%	-	-	-	-
Single Op SB LP	-	-	-	-	IF9A	54%	-	-	-	-	-	-	-	-
Multi-Single HP	D4Z	77%	UP2L	78%	E7DX	82%	ZF1A	74%	WU2X	74%	7A2A	44%	PR2E	70%
Multi-Single LP	-	-	UN4Q	57%	LY5W	61%	-	-	-	-	-	-	-	-
Multi-Two	-	-	BH3GIY	34%	ES9C	90%	NI4W	81%	K9CT	79%	-	-	-	-
Multi-Multi			JA3YBK	59%	9A1A	94%	NR6O	70%	KT7E	53%	NH7T	68%	-	-
Multi-Distributed			9M2A	34%	OT7T	72%	WC7Q	53%	WC7Q	53%	ZM1A	72%	PV2K	72%

Figure 7. QSO point and multiplier capture performance benchmarks

16-year-old W8UA was the HP U.S. Youth winner. The LP Youth overlay champion is 5B4AQC (DK6SP), age 24, followed by KM4SII, age 19. *Figure 5* exhibits additional young operator noteworthy achievements.

Multi-Operator Masters

Figure 6 shows the breakdown of Multi-Op participation by continent. The percentage spreads of Multi-Op station types reflect a reduction in Multi-Single LP and increase in Multi-Two operations as compared to 2021.

An all-Swiss team of operators came together to celebrate the 70th birthday of Philippe, HB9ARF, and to pilot D4Z to number 1 in the Multi-Single HP category. The Multi-Single HP winner from 2020, UP2L, was second. WU2X was fifth overall and was the only U.S. station in the Multi-Single HP top 10. The Multi-Single LP category was won decisively by UN4Q. The team at ES9C returned to the Multi-Two category for the first time since 2008 and earned a narrow win over IQ2CJ. The highest scoring Multi-Two operation from the U.S. was at NI4W. The 9A1A ops rejoiced at returning to the Multi-Multi category post Covid-19. Despite heavy

Best 10, No Reduction		Best 10, Single Op, >1000 QSOs		
Call	QSOs	Call	QSOs	Reduction
K1HT	233	DK1KC	1,211	0.5%
AB1J	221	SP9XCN	1,680	0.9%
OM7AT	209	WX8C	1,545	1.1%
7K3CZU	174	OV3X (OZ8AE)	1,020	1.1%
AB1U (W6RKC)	141	DL7URH	1,090	1.4%
OH5ZA (OH1ZAA)	140	AJ1I (K1ZZ)	2,656	1.5%
F1TRE	130	DK5DQ	1,812	1.5%
VE2QV	126	DL4FN	1,683	1.7%
JE8KKX	124	KR2Q	1,764	1.8%
K1TW	116	YL2PJ	1,147	1.8%

Best Multi-Op by Category, >500 QSOs			
Category	Call	QSOs	Reduction
Multi-Single HP	WU2X	3,979	4.4%
Multi-Single LP	OZ/DJ5LA	1,023	4.7%
Multi-2	WD6T	2,869	4.7%
Multi-Multi	AG1C	563	7.3%
Multi-Distributed	WU5K	926	5.8%

Figure 8. Exemplary log accuracy

Single Op HP Peak Rates		Single Op LP Peak Rates		Single Op QRP Peak Rates	
Call	Rate	Call	Rate	Call	Rate
CR6K (CT1ILT)	234	P44W (W2GD)	145	DC9RI	110
LZ5R (LZ5DB)	227	P3AA (RN3QO)	142	K3WW	106
H25A (LZ2HM)	217	UN4L	139	LZ50YE(LZ1YE)	90
EF5Y (EB5A)	204	HF74QMP (SP9GFI)	134	LY9A	84

Multi-Op by Category Peak Rates		
Category	Call	Rate
Multi-Single HP	ZF1A	159
Multi-Single LP	UN4Q	133
Multi-2	ES9C	241
Multi-Multi	9A1A	385
Multi-Distributed	OT7T	299

Figure 9. Peak 60-minute rates

How do competitive operators maximize their scores in the WPX contests? It often boils down to selecting bands, on-times, and operating techniques that maximize QSO point production from multiplier-rich regions.

QRN from local thunderstorms, they secured the Multi-Multi category win. YT5A and LZ9W also reported battling heavy QRN but persevered to place second and third, respectively. The teammates at NR6O reported highly variable band conditions and great times on their way to first place in Multi-Multi in the U.S. ZL3CW and ZL3IO decided to try the Multi-Distributed category on the Thursday before the start of the contest. Their approach to synchronizing stations was to share logs via email every several hours. This low tech, two-person team, took ZM1A to top of the Multi-Distributed category. Second place went to PV2K and the winning Multi-Distributed score in the U.S. belongs to the WC7Q team.

Performance Benchmarks

How do competitive operators maximize their scores in the WPX contests? It often boils down to selecting bands, on-times, and operating techniques that maximize QSO point production from multiplier-rich regions. *Figure 7* provides benchmarks for QSO point and multiplier productivity for stations that operated 36 or more hours. The highest QSO points / QSO ratio was 4.02 achieved by VK6T (VK6LW), followed

2022 CQWW WPX CW PLAQUE WINNERS AND DONORS

SINGLE OPERATOR ALL BAND

WORLD - High Power: Steve Bolia, N8BJQ Plaque. Won by: CR3DX operated by Tibor Ferenec, OM3RM
WORLD - Low Power: Caribbean Contesting Consortium Plaque. Won by: P44W operated by John Crovelli, W2GD
WORLD - QRP: Bill Parker, W8QZA Plaque. Won by: Charles D Fulp Jr, K3WW

USA - High Power: Martin Huml, OL5Y Plaque. Won by: Bud Trench, AA3B
USA - QRP: John T. Laney, K4BAI Plaque. Won by: Gary Hembree, N7IR**
USA Zone 3 - High Power: Northern California Contest Club Plaque. Won by: ND7K operated by Timothy Coker, W4IX @N6WIN
USA Zone 3 - Low Power: Arizona Outlaws Contest Club Plaque. Won by: Willie Baber, WJ9B
USA Zone 4 - High Power: Jerry Rosalius, WB9Z and Val Hotzfeld, NV9L Plaque. Won by: NU5A operated by David McCarty, K5GN
USA Zone 4 - Low Power: Jerry Rosalius, WB9Z and Val Hotzfeld, NV9L Plaque. Won by: KD5DD operated by Torsten Clay, N4OGW
USA Zone 5 - High Power: Steve Narducci, W9SN Plaque. Won by: Krassimir Petkov, K1LZ**

EUROPE - High Power: Ivo Pezer, E73A/9A3A Plaque. Won by: LZ5R operated by Milen Dimov, LZ5DB
EUROPE - Low Power: Vitor Santos, PY2NY Plaque. Won by: IY3A operated by Matteo Marzilli, IZ3EYZ
EUROPE - QRP: Bruce Olney, WY7N Plaque. Won by: DM2M operated by Pit Schmidt, DK3WE

AFRICA: Michael Perry, WM1K Memorial by N1RR Plaque. Won by: EF8R operated by Juan Hidalgo, EA8RM**
ASIA: Rick Tavan, N6XI Plaque. Won by: H25A operated by Andrey Sachkov, LZ2HM
NORTH AMERICA* - High Power: Louisiana Contest Club Plaque. Won by: KP2M operated by Philip Allardice, KT3Y
NORTH AMERICA* - Low Power: Dick Green, WC1M Plaque. Won by: VP9UKR operated by Yuri Onipko, VE3DZ
NORTH AMERICA* - QRP: Dale Martin, KG5U Plaque. Won by: Edibel Frias Mesa, CM3EFM
SOUTH AMERICA: Andrew Faber, AE6Y Plaque. Won by: PJ2T operated by Jim Fitzpatrick, WI9WI**
OCEANIA - High Power: Lloyd Cabral, KH6LC Plaque. Won by: VK6T operated by Kevin Smith, VK6LW
OCEANIA - Low Power: Wes Printz, W3SE/ZL3TE Plaque. Won by: Rob Van Geen, NH6V @KH6LC
CANADA - High Power: Radio Amateurs of Canada (RAC) Plaque. Won by: VC2A operated by Victor Androsov, VA2WA
CANADA - Low Power: Contest Club Ontario Plaque. Won by: CG2Z operated by Pierre Loranger, VA2CZ
JAPAN: Wes Printz, W3SE/ZL3TE Plaque. Won by: Masa Okano, JH4UYB
ASEAN (3W 9M 9V DU HS V85 XU XW XZ YB): Champ C. Muangamphun E21EIC Plaque.
Won by: Ron Schiltmans, DU3T

SINGLE OPERATOR, SINGLE BAND

WORLD - 28 MHz Low Power: Six Stars Contest Station LS1D Plaque. Won by: LU8DPM operated by Mario Andraca, LU1DJX
WORLD - 14 MHz: Gene Walsh, N2AA Memorial (by K2SS, K2TW, KR2Q, W2RQ, NN4X) Plaque. Won by: Laszlo Vegh, OM2VL
WORLD - 7 MHz: Tennessee Contest Group Plaque. Won by: 9A5Y operated by Rc Jan Hus, 9A3LG
WORLD - 3.5 MHz: Ranko Boca, 4O3A Plaque. Won by: DQ2C operated by Dr Harald Gerlach, DL2SAX
WORLD - 1.8 MHz: Dusko Dumanovic, ZL3WW Plaque. Won by: LYØA operated by Algirdas Uzdonas, LY7M
USA - 21 MHz: Charlie Wooten, NF4A Plaque. Won by: Phil Koch, K3UA @K3LR
USA - 14 MHz: Kansas City DX Club Plaque. Won by: K3LR operated by John R Golomb, Jr, N2NC
USA - 3.5 MHz: Wes Printz, W3SE / ZL3TE Plaque. Won by: Steven Sussman, W3BGN
USA - 1.8 MHz: Jim Galm, W8WTS Plaque. Won by: Rick Roderick, K5UR
EUROPE - 21 MHz: Vince Weal, K4JC Plaque. Won by: TM4W operated by Van Langhenhoven Stephane, F4DXW
EUROPE - 3.5 MHz: Ranko Boca, 4O3A Plaque. Won by: Felber Gyula, HA1TJ**

OVERLAY CATEGORIES

WORLD - Tribander/Single-Element: Scott Wright, KØMD Plaque. Won by: Ricardo Martins, CT3KN
USA - Tribander/Single-Element: Mike Polom, NE8P Plaque. Won by: Tim Shoppa, N3QE
USA - Tribander/Single-Element Low Power: Ron Sigismonti, N3RS Plaque. Won by: NU2A operated by Ciprian Sufitchi, N2YO
EUROPE - Tribander/Single-Element: Matija Brodnik, S53MM Plaque. Won by: John Dundas, MM9I
WORLD - Rookie: Val Edwards, W8KIC Memorial by K3LR Plaque. Won by: OL2J operated by Adam Stepanek, OK5MAX
USA - Rookie: Chris Kantarjiev, K6DBG Plaque. Won by: Steve Randall, KO4VW

		New Record		Previous Record		
Category/Overlay	Region	Call	Score	Call	Score	Year
Multi-Multi	Oceania	NH7T	16,193,474	ZL6QH	16,143,840	2004
Multi-Distributed	Oceania	ZM1A	15,617,665	No Entry	-	-
Multi-Single Low	Asia	UN4Q	7,613,994	HS0ZIA	5,235,307	2015
QRP 20M	North America	KA4RRU	504,138	AA2A	487,461	2021
QRP 15M	Oceania	KH6ZM	169,332	YB5AQB	33,504	2006
QRP 80M	Asia	UN9LDC	44,436	JH1OGC	26,307	2011
Low 160M	Oceania	KH7M (KH6ZM)	100	YC0LOW/0	96	2007
Classic High Power	Africa	ED8W (OM5RW)	8,393,936	No entry	-	-
Classic Low Power	Oceania	9M6NA (JO4JKL)	2,720,945	V73NS	376,124	2020
Classic Low Power	North America	KR5X (K1BX)	2,393,373	W9SN	2,352,499	2021

Figure 10. New regional records

EUROPE - Rookie: GØCKV, OH1VR, OH2BH, OH2KI Plaque. Won by: Rafal Lukawiecki, EI6LA**
WORLD - Youth: Ukrainian Contest Club Plaque. Won by: M6T operated by Jamie Williams, MØSDV
EUROPE - Youth: GØCKV, OH1VR, OH2BH, OH2KI Plaque. Won by: Janko Mihailovic, YTØC**

MULTI-OPERATOR, SINGLE-TRANSMITTER

WORLD: Walter Skudlarek, DJ6QT memorial by Rhein-Ruhr DX Association Plaque. Won by: D4Z operated by HB9AMO, HB9ARF, HB9CAT
WORLD - Low Power: Mike Goode, N9NS Memorial by Hoosier DX and Contest Club Plaque. Won by: UN4Q operated by UP1G, UA4Z
USA: Phil Allardice, KT3Y Plaque. Won by: WU2X operated by N2QV, K5GO, N5DX
EUROPE: Andy Ruse YO3JR/YR1A Plaque. Won by: E7DX operated by E7ØT, E74A, E76C, E77EA, E77C, E77DX
NORTH AMERICA*: Rich Strand, KL7RA Memorial Plaque. Won by: ZF1A operated by NN1C, UT5UDX, W9KKN, KI6RRN
ASEAN (3W 9M 9V DU HS V85 XU XW XZ YB): Champ C. Muangamphun E21EIC Plaque. Won by: E2A operated by E21EIC, E29TGW

MULTI-OPERATOR, TWO-TRANSMITTER

WORLD: UA1DZ Memorial by W3UA Plaque. Won by: ES9C operated by ES2RR, ES2MC, ES5TV, ES4RD, ES5RY, ES5JR, YL3DW, ES1BVG, ES5QA, ES2ADF
USA: Florida Contest Group Plaque. Won by: NI4W operated by N4WW, KØLUZ, N4KM, K1MM, W4WF
EUROPE: Tom Georgens, W2SC Plaque. Won by: IQ2CJ operated by IK2JUB, IK2QPR, IK2YCW, IK3QAR, IK4VET, IZ1LBG**

MULTI-OPERATOR, MULTI-TRANSMITTER

WORLD: Steve Merchant, K6AW Plaque. Won by: 9A1A operated by 9A5W, 9A9A, 9A7R, 9A6A, 9A5E, 9A3SMS, 9A8A, 9A2EU, 9A7DR
USA: Mori Young, KR5V Memorial by N5RZ Plaque. Won by: NR6O operated by N6RO, K3EST, K6AW, N6WM, WA6O, WD6T, WX5S, WU6P
EUROPE: Jeff Demers, N1SNB Plaque. Won by: YT5A operated by YT1AD, YT2T, YT3W, YU1BV, YU1KX, YU1YV, YU2FG, YU6DX, YU8A, YU9DX, R7KW**

MULTI-OPERATOR, DISTRIBUTED

WORLD: Sid Caesar, NH7C Plaque. Won by: ZM1A operated by ZL3CW, ZL3IO

ADDITIONAL AWARDS

WORLD - Contest Expedition: Phil Goetz, N6ZZ Memorial by Paul Goetz Plaque. Won by: P49Y operated by AE6Y**
CHINA - Any Multi-op Category: Andrey Sachkov, LZ2HM Plaque. Won by: BA7MT operated by BH7KBE, BH7PFH, BD7JPC, BG7PXC, BD7KBB

COMBINED AWARDS

WORLD - Combined Score on SSB and CW: Yuri Blanarovich, K3BU Plaque. Won by: Andrey Sachkov, LZ2HM
USA - Combined Score on SSB and CW: Bill Fisher W4AN Memorial by KM3T Plaque. Won by: Richard F Didonna, NN3W
WORLD - Combined Prefixes on SSB and CW: Norm Koch, WN5N Memorial by K2RED Plaque. Won by: Milen Dimov, LZ5DB
CALIFORNIA - Combined score on SSB and CW: Northern California Contest Club Plaque. Won by: Marko L Myllymaki, N5ZO
CQ WPX Contest Triathlon Award - Combined Score on RTTY, SSB, and CW (min 500 QSOs per mode): DX-Lodge Roatan (HQ9X) Plaque. Won by: Milen Dimov, LZ5DB
CALIFORNIA - Combined Score on RTTY, SSB, and CW: Northern California Contest Club Plaque. Won by: Bob Wolbert, K6XX

CLUB AWARDS

World - Combined SSB/CW: CQ Magazine Plaque. Won by: Yankee Clipper Contest Club
USA - Combined SSB/CW: Marty Sullaway, NN1C Plaque. Won by: Potomac Valley Radio Club**
World Triathlon (CW/SSB/RTTY) - Combined Score on RTTY, SSB, and CW (min 500 QSOs per mode): DX-Lodge Roatan (HQ9X) Plaque. Won by: Bavarian Contest Club

* Applies only to North American stations outside the USA and Canada
** Denotes awarded to runner-up in category

5B4AQC (DK6SP), age 24, was in first place in the Low Power Youth Overlay category.

CLUB SCORES

UNITED STATES

Club	# Entrants	Score
Yankee Clipper Contest Club	150	267,888,655
Potomac Valley Radio Club	187	193,613,516
Frankford Radio Club	124	155,174,214
Northern California Contest Club	96	132,573,889
Florida Contest Group	67	74,264,644
Society Of Midwest Contesters	115	57,626,631
Arizona Outlaws Contest Club	50	54,197,103
Southern California Contest Club	53	54,052,109
Willamette Valley DX Club	47	43,650,500
Central Texas DX And Contest Club	18	33,312,689
Western Washington DX Club	28	26,755,198
Minnesota Wireless Assn.	75	22,299,796
Tennessee Contest Group	39	21,511,032
Alabama Contest Group	19	21,113,681
Texas DX Society	11	18,764,632
Mad River Radio Club	24	17,685,093
DFW Contest Group	30	14,992,740
Swamp Fox Contest Group	19	13,202,827
North Coast Contesters	17	11,876,595
South East Contest Club	36	11,272,663
Kentucky Contest Group	22	11,213,255
Deep Dixie Contest Club	10	9,778,029
Northeast Maryland Amateur Radio Contest Society	25	9,449,825
Carolina DX Association	5	7,684,438
Grand Mesa Contesters Of Colorado	28	7,556,274
Big Sky Contesters	9	7,348,498
Hudson Valley Contesters And DXers	23	7,125,528
Niagara Frontier Radiosport	18	6,260,640
Order Of Boiled Owls Of New York	13	4,375,229
Kansas City Contest Club	12	4,001,836
Bay Area DXers	9	3,606,108
Spokane DX Association	17	2,547,580
Heartland DX Association	7	2,330,044
CWOPS	7	2,288,554
Portage County Amateur Radio Service	10	1,957,258
Bristol (Tn/Va) ARC	12	1,653,338
The Villages Amateur Radio Club	4	1,572,542
Mother Lode DX/Contest Club	7	1,306,937
South Jersey Radio Association	8	1,298,421
New Providence ARC	7	1,298,346
Northeast Wisconsin DX Assn	4	1,275,286
Hilltop Transmitting Assn	4	1,147,434
Silver Comet Amateur Radio Society	5	1,037,140
Rochester (Ny) DX Assn	7	909,143
Hamilton Amateur Radio Club	5	724,497
North Fulton Amateur Radio League	4	592,859
Metro DX Club	4	344,778
Kansas City DX Club	5	344,419
Oh-Ky-In ARS	7	285,502
Sierra Nevada Amateur Radio Society	4	238,729
Skyview Radio Society	4	139,386
Southwest Ohio DX Association	5	85,707
Phil-Mont Mobile Radio Club	5	54,384
Granite State ARA	4	36,186

DX

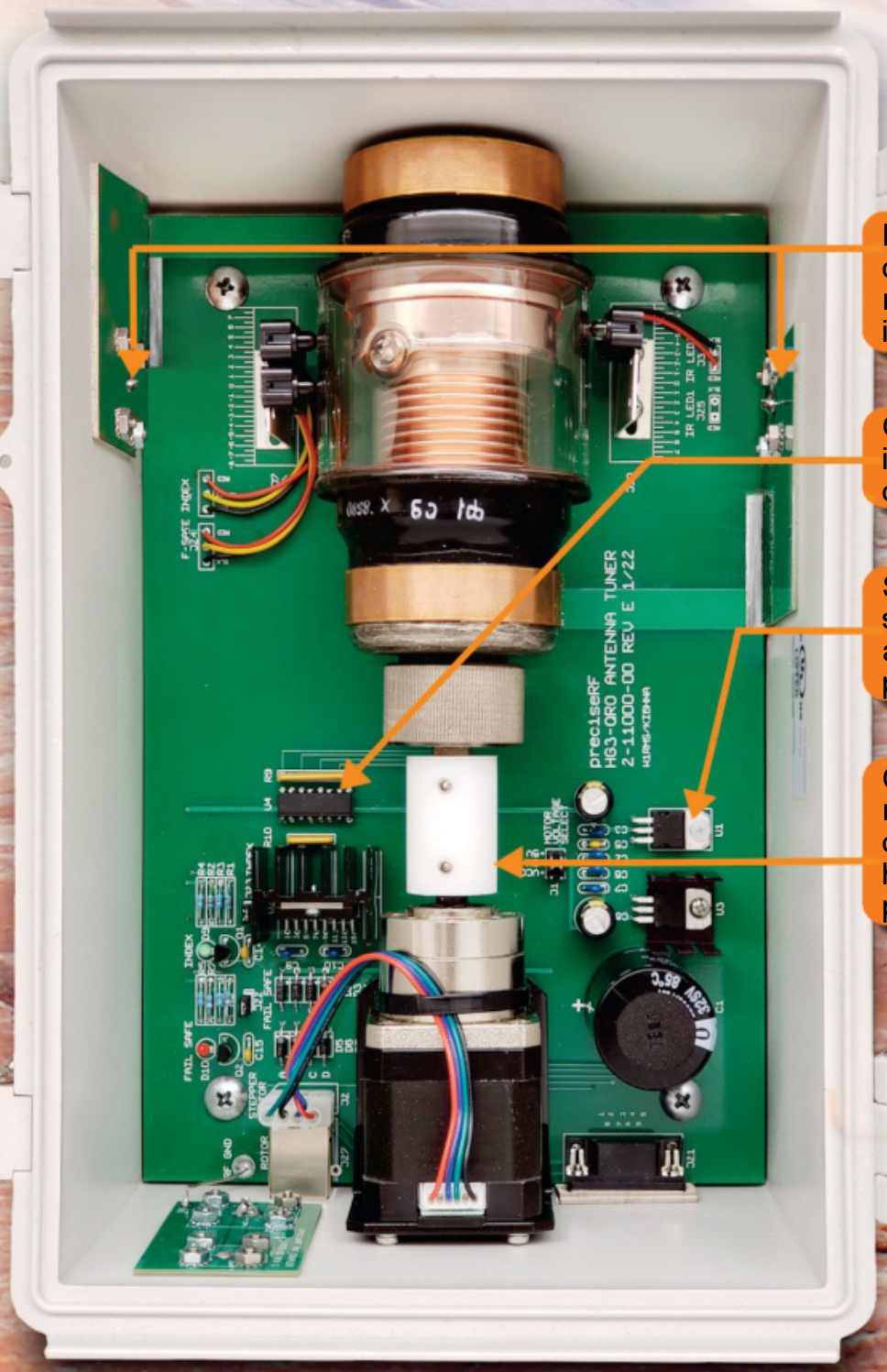
Club	# Entrants	Score
Italian Contest Club	149	238,552,119
Bavarian Contest Club	219	230,353,552
Araucaria DX Group	60	128,611,360
EA Contest Club	65	117,405,998
Croatian Contest Club	35	85,698,306
Contest Club Ontario	63	83,129,369
Rhein Ruhr DX Association	86	82,950,298
Baltic Contest Club	21	78,064,539
Contest Club Serbia	29	72,119,542
Milara Contest Club	5	58,522,718
HA-DX-Club	15	45,241,104
Slovenia Contest Club	21	43,090,464
Contest Club Belgium	30	42,965,607
Belokranjec Contest Club	10	35,944,632
Clipperton DX Club	15	32,778,334
Lu Contest Group	32	32,745,641
Rio DX Group	61	31,319,287
La Contest Club	8	29,233,463
Contest Club Finland	35	29,189,340
Orca DX And Contest Club	17	28,861,488
Czech Contest Club	21	28,682,422
Kaunas University Of Technology Radio Club	39	27,609,669
VK Contest Club	24	27,106,903
Contest Group Du Quebec	10	25,353,540
Catalonia Contest Club	18	23,956,457
SP DX Club	59	21,018,454
Latvian Contest Club	25	19,132,681
Crows Contest Team	4	16,819,510
West Serbia Contest Club	8	15,115,790
Siam DX Group	22	14,964,634
Radio Amateur Association Of Western Greece	7	14,940,520
Ukrainian Contest Club	9	13,393,246
Associacao Dos Radioamadores Do Parana	9	13,259,962
Chiltern DX Club	9	12,430,052
CE Contest Group	15	11,153,695
RSGB Contest Club	7	10,558,614
RTTY Contesters Of Japan	4	10,249,788
Danish DX Group	19	10,074,882
Thracian Rose Club	30	9,986,250
Vrhnika Contesters	4	9,905,422
European DX Contest Club	5	9,464,658
YB-Land DXing Passion Is	170	9,048,483
5NNDXCC	28	8,024,301
Maritime Contest Club	16	7,362,512
Aripa DX Team	7	6,330,226
Cdr Group	31	6,280,485
599 Contest Club	13	5,819,108
Radioclubul Radu Bratu	5	5,810,813
Ubro	10	5,618,474
ZRHB Contest Club	9	5,590,404
GMDX Group	6	5,537,436
Interest Group RTTY	10	5,388,106
Radiosport Manitoba	9	5,123,286
YB Land DX Club	36	5,004,781
CSA Steaua	4	3,940,974
Okayama DX Club	6	3,897,586
Pelila Up	4	3,110,281
CWSP	7	3,067,325
SP-CW-C	6	2,992,666
Union Francaise Des Telegraphistes	6	2,954,797
Gunma Contest Club	13	2,826,497
Mediterraneo DX Club	4	2,765,404
Bosnia And Herzegovina Contest Club	6	2,717,460
Keymen's Club Of Japan	32	2,622,469
SKØQO Sodertorns Radioamatorer	4	2,323,924
Sharks DX Team	10	2,310,178
Vytautas Magnus University Radio Club	5	2,205,385
SK6AW Hisingens Radioklubb	11	2,181,170
YU1ANO & YU1A Contest Team	6	2,059,211
CS Petrolul Ploiesti	6	1,975,503
599 DX Group	8	1,966,759
Riihimaen Kolmoset	5	1,920,394
Philippine Amateur Radio League	7	1,898,444
VU Contest Group	13	1,763,190
CSM Craiova	6	1,733,429
Fuchu Amateur Radio Club	10	1,676,010
Peterborough Amateur Radio Club	7	1,368,115
Cubanos Libres De Patria Y Vida	4	1,348,918
Chilean Pacific DX Group	6	1,228,287
Cabreuvadx	42	1,203,744
Japan Contester's Club	4	1,069,314
YO DX Club	10	948,444
Falcons DX Group	23	937,363
Sharp Ham Club	7	856,729
Lithuanian Contest Group	6	839,128
CSU Pitesti	5	809,119
SK5AA Vasteras Radioklubb	6	789,016
Harcerski Klub Lacznosci Sp6zhp	5	784,402
CWFJ Group	4	757,911
Radio Club Kvarner Rijeka	9	743,884
Club De Radio Amateur Del Estado De Guanajuato	4	738,167
National Children's Palace	5	677,972
YYP Club	6	670,788
Korea Contest Club	4	615,859
SP9PBB	7	613,056
King's Lynn Amateur Radio Club	8	581,370
Radio Club Venezolano Caracas	5	569,821
West Borneo DX Club	8	526,661
Tipalayo DX Club	5	505,274
Admira Arad	4	487,747
Guara DX Group	9	485,576
7A DX-Contest Club	13	460,430
Nesrac Malaysia	4	448,647
RAAC Cyclades DX Club	4	435,119
World Wide Young Contesters	5	426,408
Grupo DXXE	5	386,848
SK6EI	4	380,667
Radio Officers Assn. RS	4	373,332
9M HF & Amp DX Contest Group	4	356,119
YB6_DX Community	23	307,053
Online Amateur Radio Community	5	295,453
DX101 Contest Club	4	278,386
CSU Brasov	6	251,638
Orari Lokal Bogor	11	165,366
Just For Fun Contest Club	7	119,425
Radiofarol DX Group	8	108,069
Norfolk Amateur Radio Club	4	102,308
SPDXT	4	78,459
A1 Club	5	73,462
The Akita DX Association	4	60,992
Orari Lokal Kediri	6	45,946
NIAR	9	14,770
Radio Club De Panama	4	13,901
Single Fighter DX Group	4	12,516
YB7-DX Club	4	11,941

Club scores with 4 or more entries.

COMPROMISE WAS NOT AN OPTION FOR THE NEW HG3 QRO-A!

No Compromises Mag Loop
The new HG3 QRO-A raised the bar again for Magnetic Loop Antennas (MLA). MLAs are well known for their superior performance. The remotely tuned HG3 QRO-A MLA covers 80*-10 meters with stepper motor precision and resolution. The high Q vacuum capacitor allows for 1.5 KW PEP*. The 45,000-step resolution delivers an unprecedented 511 Hz resolution bandwidth allowing you to set your band preferences spot on. Rapid-Tune automatically scans each band for the lowest SWR and works with most HF radios.

It Pays to Pay Attention
How do you make a great product even better? You listen to your customers.The heart of an MLA is the tuner. We made so many improvements to it that we now call it the HG3 QRO-A. The HG3 Plus Controller also received new firmware and an improved SWR function. *Some limitations may apply or are optional.



HG3 QRO-A Improvements:

- Integrated capacitor to radiator connections with six times more copper surface area for improved efficiency
- Optical isolated driver interface allows for a longer control cable and RFI rejection
- Separate logic circuit and stepper motor power supplies allow for smoother and more precise tuning
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by 5B4AQC (DK6SP) (age 24 and LP) at 3.74. The 9A1A crew captured an amazing 94% of all multipliers identified during the log checking process and LZ5R (LZ5DB) was way out in front of all other Single-Ops with an 83% yield.

Check out *Figure 8* to behold the operators who did their utmost to copy the correct calls and serial numbers. DK1KC had only one Not In Log and one incorrect exchange out of 1,211 QSOs — absolutely astounding!

The 2022 rate leaders are provided in *Figure 9*. Note that 14 of the 17 calls shown in *Figure 9* contain four characters which likely contributed to their amazing rates. Imagine how hard HF74QMP had to work to earn a spot on this list!

All world records were unchanged; however, 10 new continental records were established as shown in *Figure 10*. Note that KH6ZM accounted for two new single band Oceania records: QRP 15 meters (KH6ZM) and Low Power 160 meters (KH7M).

Opportunities for Improvement

Enforcement actions were limited and included warnings for out-of-band operation, disallowing the Classic Overlay for stations that were assisted, and disallowing the TB-Wires Overlay for stations using improper antenna configurations.

I received lots of traffic this cycle regarding the TB-Wires Overlay. The purpose of the TB-Wires Overlay is to enable competition by similarly equipped stations, thus the restrictions on the number and types of antennas. It is not intended to cover all potential "antenna deprived" scenarios. It is important to note that only one antenna, fed by a single feedline, is permitted on 20 /15 /10 meters. Please review the rules and FAQ regarding the TB-Wires Overlay and reach out to me if you have questions.

Final Thoughts, Observations, and Praise

My goal while preparing this article was to highlight operating excellence, and I am pleased to observe that 127 calls were cited for their accomplishments. I particularly enjoyed studying the achievements of the Rookie and Youth operators as I anticipate seeing their calls highlighted in future contest results.

It is inspiring to share that 21 Ukrainians competed in WPX CW despite adversity they faced from the war. Many of their operations were

remote or hosted by stations in safe havens. This terrible conflict cannot end soon enough.

The administration of the 2022 CQWW WPX CW would not have been possible without the support of 3V8SS, CT1BOH, DL6RAI, EA4KD, ES5TV, F6BEE, I2WIJ, IK2QEI, JK3GAD, K1AR, K1DG, K1EA, K5TM, K5TR, K5ZD, KM3T, KR2Q, LA6VQ, N5KO, N6TR, N8BJQ, OH6LI, OK2FD, PA3AAV, PY2WS, S5ØA, S5ØXX, SV1DPI, VE3TM, WØYK, WA7BNM, and YO3JR. Please join me in praising their contributions to the radiosport community and CQWW WPX contests.

I hope to see you in the next CQWW WPX CW contest on May 27th and 28th, 2023. Thank you for your participation and 73.

(Scores on page 100)

VK6T (VK6LW) had the highest average QSO points to QSOs ratio of any full time participant.

CR6K (CT1ILT) is the rate champion.

The 1979 World Administrative Radio Conference, or WARC-79, was generally very good for hams. But it knocked a brand-new Heathkit off the production line. Here's the behind-the-scenes story of how WARC-79 sidelined the Heath SS8800 … from the man who owns the only one in existence.

The Almost Heathkit

BY BOB SUMPTION,* N8RS

In 1977-1979, a new top-of-the-line 6-band synthesized HF transceiver kit was being developed at Heathkit to replace the well-known SB104. Named the SS-8000, it featured fully synthesized operation with a greenish blue vacuum-fluorescent dual digital frequency display for split channel operation; selectable receiver passband shift; 2.1-kHz, 400-Hz, and 200-Hz selectable crystal filters for SSB, CW, and RTTY; noise blanker; RIT; adjustable speech compression; very fast up and down tuning buttons to zip quickly across the band; and a big central tuning knob. This transceiver (*Photo A*) was also capable of being operated digitally by computer for remote operation. The tuning steps were in 100-Hz increments. These are regarded today as rather large steps but operating it, I find it tunes nicely.

Development of this deluxe transceiver was nearly completed as the year 1979 rolled around. Three test SS-8000 transceivers (called proof build kits) were assembled by three of the technicians in Heathkit amateur radio engineering. As far as I have been able to find out by talking to other ex-Heathkit employees, Bill Johnson was president of Heathkit in 1979, the head engineer of the SS-8000 project was Bob Groh. The technicians who worked on the SS-8000 transceiver and built the three proof-build units (of which only one exists today) were Lewis Lambert, then WD8LDV; Bob Mann, W8LHP; and Dave Poplewski, KC8IV (now SK).

As 1979 rolled along, the SS-8000 was moving quickly out of the design stages and getting ready to become a real Heathkit. The very first draft assembly manuals were written … and then came the news that the World Administrative Radio Conference in Geneva,

Photo A. The author with his Heathkit SS-8000 — the only one in existence. (Photos courtesy of the author)

Photo B. The remake of the SS-8000 … the Heath (not a kit) SS-9000 9-band synthesized transceiver, including 30, 17, and 12 meters. Only 350 were built. All were fully assembled and tested at the Heathkit factory in Benton Harbor, Michigan.

* Email: <Mooo46@yahoo.com>

Switzerland, had approved three new HF ham bands, 30, 17, and 12 meters. This made the SS-8000 transceiver kit obsolete just before it was to be offered for sale. Despite Heathkit spending thousands of dollars developing this deluxe state-of-the-art transceiver, the whole project was simply cancelled. Two of the three proof-build SS8000s were taken apart and disposed of, so all that remained of the SS-8000 project was a single assembled example sitting on a shelf in the Heathkit amateur radio design department.

I left Heathkit to work at a TV station when entire departments at Heathkit were shut down and the employees' jobs were eliminated. At that time, I thought the last SS-8000 had been taken apart and sold for scrap, but I was wrong. It had been taken apart but all the parts were placed in a big box and stored in someone's basement or garage.

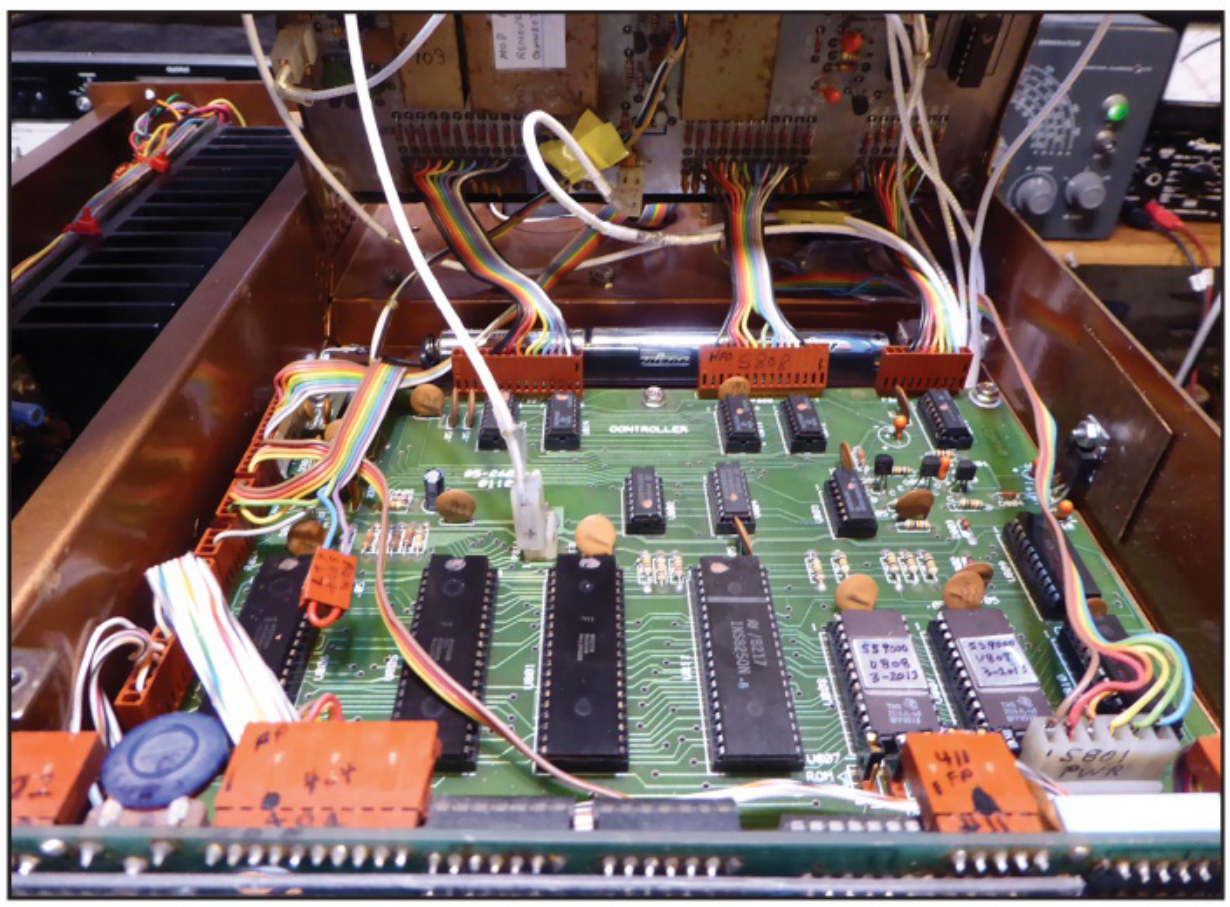


Photo C. The SS-9000 controller board with the two programmed Eproms at the lower right.

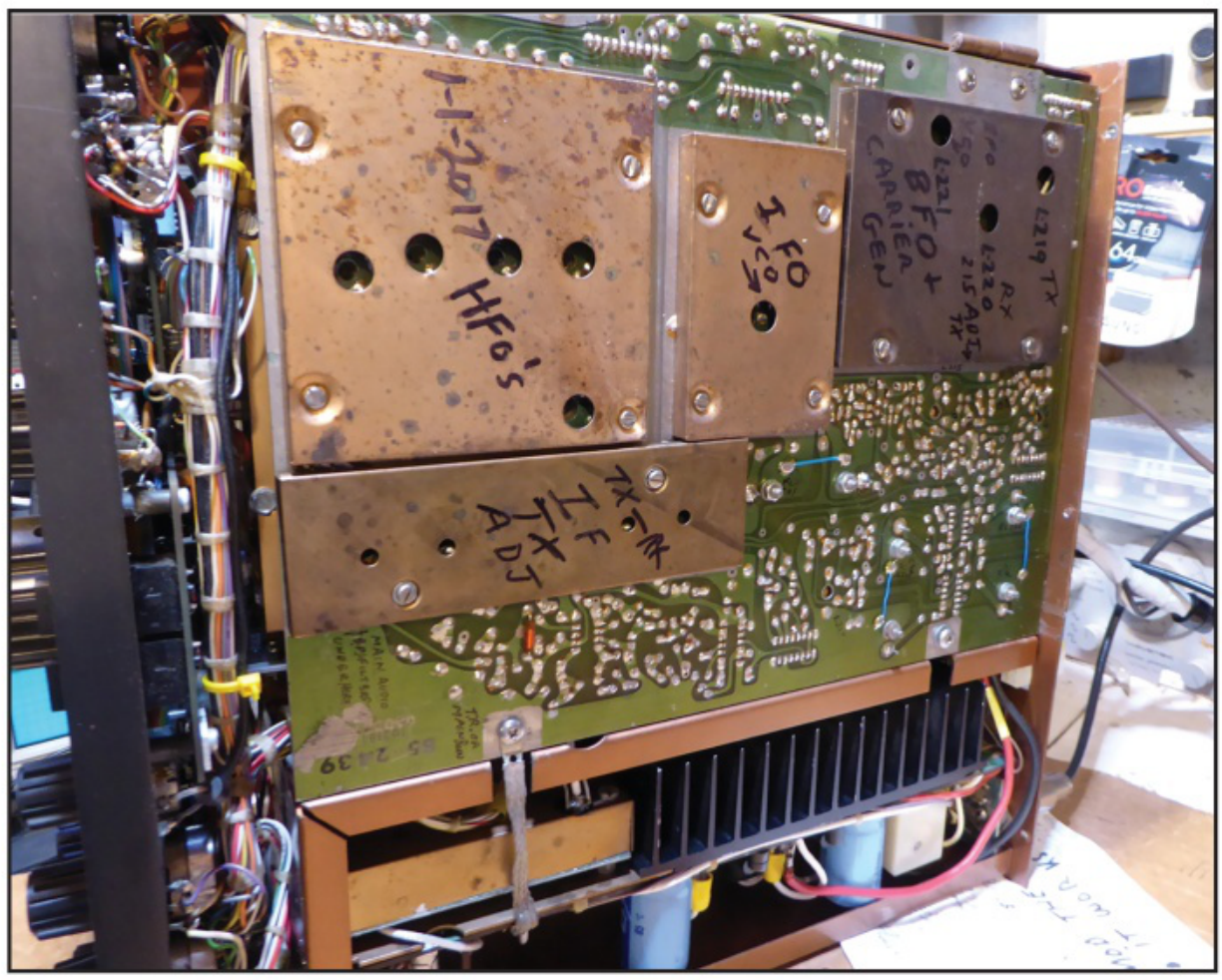


Photo D. Bottom view of the main (transmit-receive) board of the SS-9000.

The Replacement Model...

In 1981, I was working in the Heathkit amateur radio service department under Ed Mosher, WA8ZVO, when a job opening was posted on the bulletin board for someone with a lot of building experience to work on a new 9-band version of the SS-8000 to be named the SS-9000. This would not be a kit, as it was decided that the average amateur radio operator would not have access to the type of equipment necessary for proper alignment and there were close to 3,500 parts in the SS-9000, so it would be fully assembled and aligned in the Heathkit plant. I spoke to my boss about this job opening and he said, "This is Heathkit. If you see a job posted and you think you can do that job, they will give you a chance. If you succeed, then you will be given that job. If you don't succeed, you will be right back here in the service department."

So I applied for the job and was interviewed by Earl Harris, W8OT, the head of the engineering department, and told I would be working on the new SS-9000 synthesized HF transceiver. I was given two weeks to assemble the first SS-9000 from scratch. And so I started out in Heathkit engineering close to January 1, 1982 as I recall. I found myself in an office cubicle with tools, test equipment, and two big workbenches. I remember the first day saying to myself, "Where do I start?" and answering myself, "With the chassis, of course," and I also had that one and only SS-8000 sitting on the shelf overhead which is very similar to the SS-9000 but with three fewer bands.

Then I became aware of what a great team I was working with in Engineering. Bill Linebaugh showed me how to make circuit boards and do silk-screen printing and Bob Hutchins made the first SS-9000 wiring harness for me. Others who helped were the SS-9000 engineer, also my new boss, Jerry Tolsma, plus Lewis Lambert, Ron Dillon, and Terry Purdue, who designed the synthesizer board. This was a great team indeed!

With the help of all of the guys in Heathkit amateur radio engineering, I finished the very first working SS-9000 in eight days (*Photos B-F*) and secured a job as lead technician on the SS-9000 project. My job then was building several of the SS-9000 transceivers, testing power amplifiers for the SS-9000 and checking the assembly line to see that the transceivers were being properly assembled. The people on the SS-

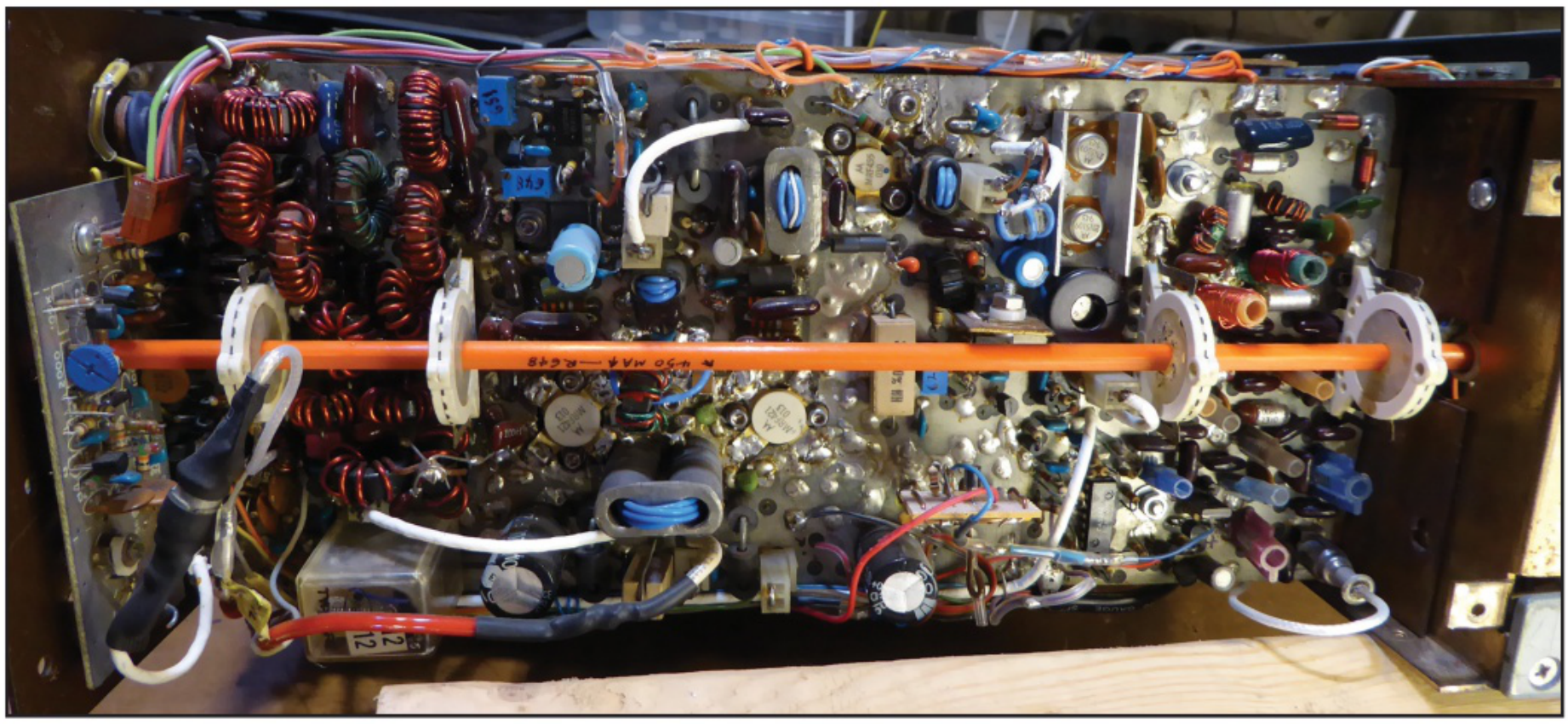


Photo E. The SS-9000 RF power amplifier board with the input band filters on the right and the output toroid filters on the left. The four band switches can be seen with the orange switch shaft that turns them.

9000 assembly line sure did a good job. I found very few errors in assembly.

The End of the Beginning

The first run was to be 375 SS-9000 transceivers, but the assembly line was stopped as Heathkit was going out of the ham radio business. Total production was close to 350 units completed. Leftover parts and chassis were sold as scrap.

Those 350 fully assembled SS-9000s were all sold. As I recall, the price started at more than $3,000 (*over $9,400 in today's dollars, according to the U.S. Bureau of Labor Statistics – ed.*) and then Heath lowered the price due to slow sales and being about to shut down.

Interesting sidenote: The serial numbers on the production units were simply peel-and-stick white paper stickers, most of which have not survived the 40+ years since production, so many of the SS9000s in use today are without serial numbers. At the time, I questioned the use of the plain paper serial number stickers but nothing was done about it as Heathkit was going out of the ham business. I also questioned the lack of any voltage measurements on the schematics and was told, "If you want to do that go ahead," so I added voltage measurements to the schematics. I was thinking of guys like me — Heathkit customers out there trying to repair their SS-9000 transceivers.

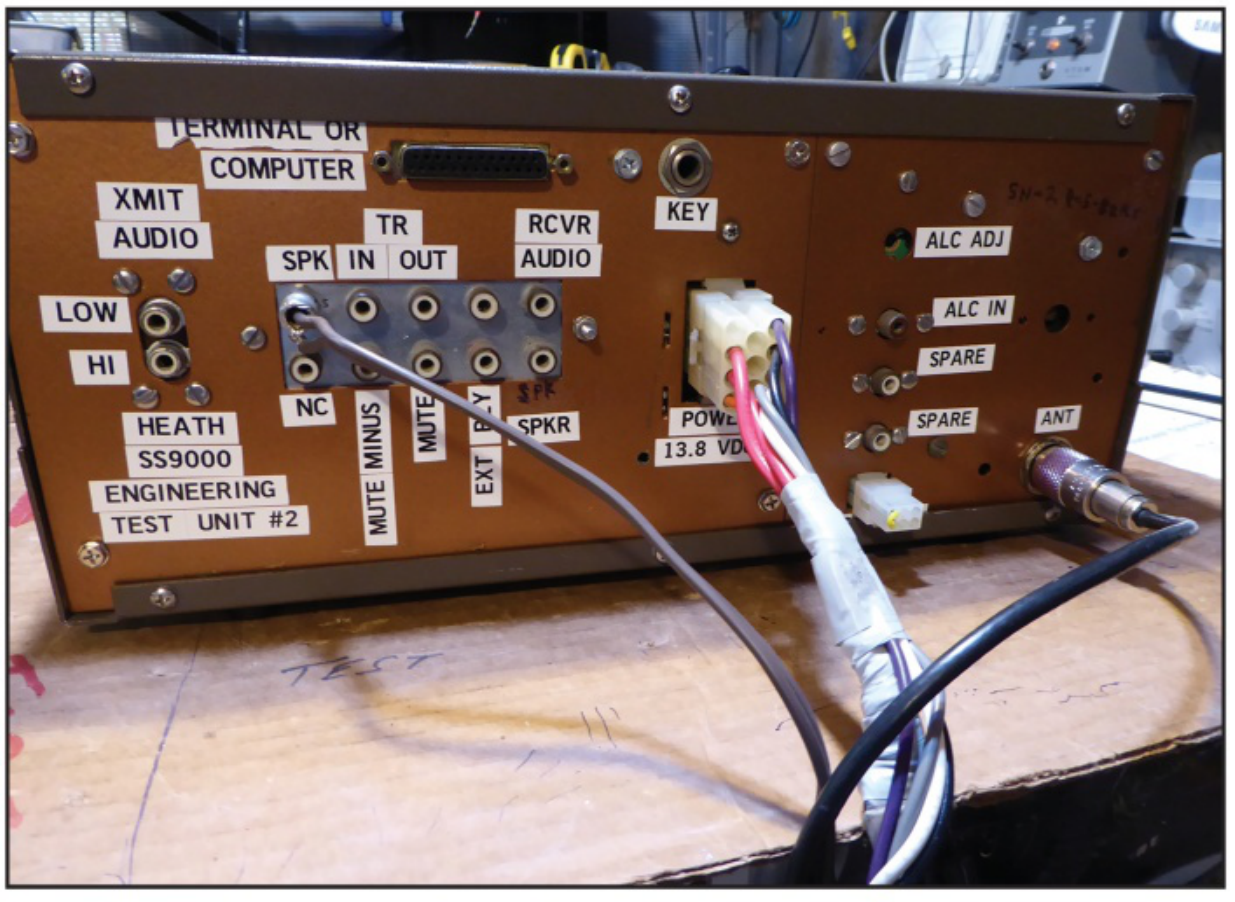


Photo F. Rear view of SS-9000 number one. It had no labels or markings on the back so I made labels for it with a label maker.

The Rest of the Story

It was 2015, and while surfing the internet and looking at Heathkit items for sale on eBay as I often do, I was very surprised to see offered for sale a large box of SS-8000 transceiver parts. The listing said SS-8000 transceiver for sale, but all I saw in the pictures was a big box of very dirty circuit boards, loose parts, and an SS-8000 front panel. It was what I would call an extremely severe basket case. The end result of all this was that I purchased the box of parts and eventually re-assembled a working Heathkit SS-8000 transceiver — the only one in existence!

It was a long and difficult task as many parts were missing or damaged, the wiring harness was all chewed up by rodents. It took well over 200 hours of work at the bench and a lot of additional work searching for parts and circuit boards. (*The author documented this project in a series of six YouTube videos. Part 1 is at <https://tinyurl.com/2u373pcc> and the wrapup is at <https://tinyurl.com/2t3xv8vj>. Ed.)*

I wish to thank Bob Mann, W8LHP; Gary Franklin, K8BKB; Earl Harris, W8OT; and David Poplewski, KC8IV (now SK) for information and help.

CQ CLASSIC:

The Heath (Not a) Kit

Elsewhere in this issue, former Heathkit technician Bob Sumption, N8RS, provides the background for the Heathkit-that-never-was, the SS-8000, and how it was transformed into the SS-9000, one of the last ham rigs the company built and on which he was chief technician, building the prototype, and supervising the construction of additional units. *CQ* reviewed the SS-9000 in February 1984, and we thought it would be appropriate to reprint that review as this month's "CQ Classic." – *W2VU*

CQ REVIEWS:

The Heath SS-9000

H.F. Synthesized Transceiver

BY JOHN J. SCHULTZ, W4FA

The Heath SS-9000 h.f. all-band transceiver has been a fairly long time in coming on the market. However, it is now available as Heath's top-of-the-line transceiver. It is only available as a completely assembled unit, and the only accessories available for it are a matching power supply and a service manual. No other accessories are available simply because a full range of filters is standard with the SS-9000.

By now everyone who has followed the Heath line of amateur radio products knows that there is something very new and different about the SS-9000. It is not simply a transceiver one can manually tune and operate, but rather it can be completely remote controlled via a terminal.

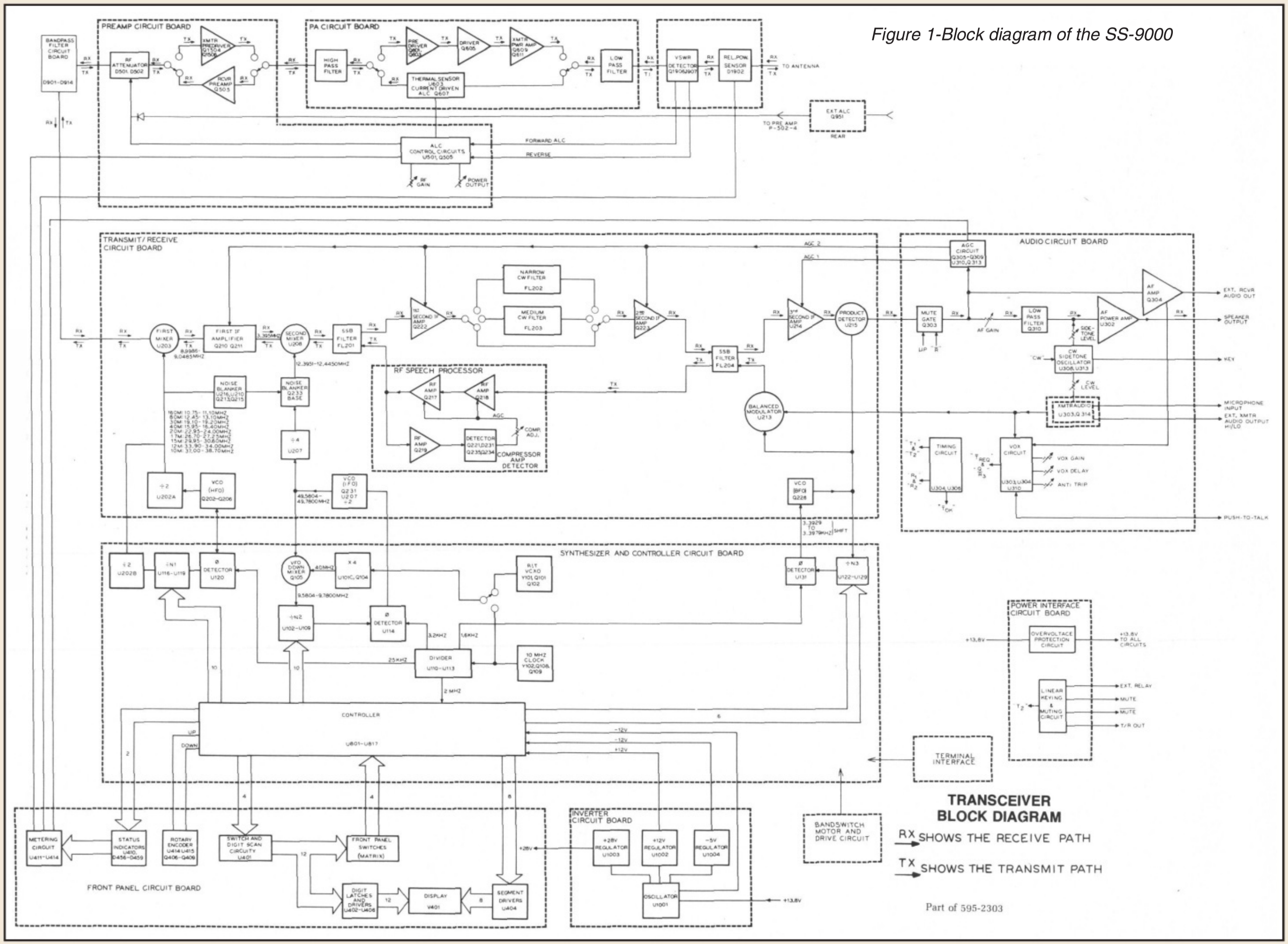
However, as tempting as it is to race on to describe the computer controlled possibilities of the SS-9000, we'll first describe it as a manually operated transceiver. This should give the reader a feel for the capabilities of the unit as a radio, and then we'll go on to the terminal control possibilities for the unit. After that, if one basically can understand what the radio can do and how it can be controlled, one will easily be able to appreciate some of the new possibilities it opens up for all sorts of innovative ideas regarding h.f. transceiver usage.

The SS-9000 on the operating table with the PS-9000 power supply below it.

Specifications

Table I lists the general specifications for the SS-9000. Basically, the transceiver is an amateur-band-only unit designed for s.s.b., c.w., and RTTY service. All control frequencies within the unit are frequency synthesized. Two six-digit frequency displays are provided for what are essentially the v.f.o. A/B frequencies. There is also one frequency memory per band. Tuning of the transceiver is done by a main tuning control which has a fixed tuning rate of 5 kHz/revolution. Table II shows the transmitter specifications. The transceiver is rated to deliver 100 watts PEP and 100 watts carrier on c.w./RTTY into a 50 ohm load. The automatic cutback in power output when the load v.s.w.r. reaches 2:1 is only to 80 watts. As

Figure 1-Block diagram of the SS-9000



shown in the table, a combination time/temperature factor also determines the power output. The rest of the specifications regarding carrier suppression, unwanted sideband suppression, harmonic radiation, etc., are all quite good, being in the 50 + dB range. Table III shows the receiver specifications. The sensitivity is very respectable for a modern-day transceiver. The s.s.b. shape factor is 2.38 (6/60 dB), which, on the other hand, is not exceptional for a modern-day transceiver. Image rejection and i.f. rejection are specified at a very good - 70 to - 90 dB. RIT is provided with a specified range of ± 250 Hz.

Circuitry

Figure 1 shows a block diagram of the SS-9000's circuitry. If one concentrates on the Preamp, PA, Transmit/Receive, and Audio circuit boards, it is fairly easy to follow the receive/ transmit signal flow paths.

Received signals first pass through separate low-pass and high-pass filter assemblies on the PA circuit board. They are then applied to a receive preamplifier which is followed by a PIN diode attenuator (which acts as the r.f. gain control) and an assembly of nine electronically switched bandpass filters. The signal goes on to the first mixer stage where it is mixed with the h.f.o. signal and translated to a 9 MHz i.f. This is followed by an amplifier and bandpass filter stage, and then the signal goes on to a second mixer. In the second mixer the signal is mixed with an approximately 12.4 MHz i.f.o. frequency and translated to its final i.f. of 3.395 MHz. This signal then passes through the main s.s.b. filter, further amplification, either of the two c.w. filters when desired, more amplification, and then on to a product detector. Final audio amplification of the audio output of the product detector is preceded by a low-pass filter stage.

For transmit, microphone input signals are amplified and applied to a balanced modulator stage which produces a d.s.b. signal at the 3.395 MHz i.f. This signal passes through a first s.s.b. filter and then, if it is activated, through the r.f. speech processor circuit. After that circuitry, it passes through a second s.s.b. filter and then is translated to the 9 MHz i.f. The signal is then further translated to its final output frequency and amplified through an amplifier chain to its final output level.

A basic frequency standard and three synthesizer loops for the voltage-controlled oscillator sections are on the

GENERAL	
Frequency Readout	Two 6-digit electronic displays
Readout Accuracy	To the nearest 100 Hz
Frequency Control	Synthesized VFO, HFO, and BFO for stability and easy tuning
Tuning	100 Hz per step. 5 kHz per knob rotation. Pushbuttons provided for up/down tuning (rate is internally adjustable).
Operation	Split transmit/receive or transceive from either readout.
Synthesized Lock Indicator	Visual indication when the synthesizer is un-locked. Transmitter is disabled when the synthesizer is un-locked.
Frequency Coverage (megahertz)	1.8 to 2.0*. 3.5 to 4.0*. 7.0 to 7.3*. 10.1 to 10.15. 14.0 to 14.350*. 18.068 to 18.168*. 21.0 to 21.450*. 24.890 to 24.990. 28.0 to 29.7. WWV@15.0
* Extended receiver coverage (above and below these bands).	
Frequency Stability	Less than 3 ppm drift from turn-on for first 15 minutes. Less than 3 ppm/hour drift after 15 minutes warm-up. Less than 20 pprn drift from 0° C to +40° C. (Single crystal-controlled 10 MHz frequency standard.)
Modes of Operation	LSB. USB. CW-Wide. CW-Medium (400 Hz filter). CW-Narrow (200 Hz filter). RTTY (LSB, 400 Hz filter).
Operating Temperature Range	0° C to +40° C
Speech Processing	Adjustable RF speech compressor.
IF Shift	Incremental plus and minus passband shift (- 600, - 400 , -200, - 100 , 0 , +100, + 200, and +400 Hz) in the SSB modes.
Power Requirements*	11 to 16 VDC with a nominal current maximum of 25 amperes at 100 watts CW output. Receiver current is 2 amperes nominal.
Front Panel Connectors	Microphone, headphones.
Rear Panel Connectors & Control	Antenna (SO-239). Linear ALC In. Linear ALC Adjust. Low Power Enable. Spares (5). DC Power Input. CW Key Jack. External Transmit Audio In (2). Speaker Out. External Receiver Audio. T/R In. T/R Out. Mute. Mute (inverted). External Relay (linear). RS-232 Computer interface.
*All specifications are referenced to 13.8 VDC at 25°C ambient.	

Table 1-General specifications of the SS-9000.

TRANSMITTER	
RF Power Output.	SSB: 100 watts PEP. CW & RTTY: 100 watts.
Duty Cycle	100% with appropriate automatic power output reduction by an internal thermal sensor. This reduction is determined by the time factor and the ambient temperature. The nominal parameters are as follows: Ambient Temperature: + 25° C. Supply Voltage: + 13.8 VDC. Frequency: 14.1 MHz. Mode: CW key down, 100% duty cycle Example: Power Output / Time 100 watts / 0 min. 80 watts / 3 min. 60 watts / 10 min. 40 watts / Infinite
Load Impedance	50 ohms.
VSWR	This Transceiver is stable at any VSWR and load impedance. The VSWR cutback circuitry guarantees at least 80% of rated power at any VSWR less than 2:1 and a minimum of 15 watts at any VSWR.
Transmitter Protection	Thermally protected. High VSWR cut-back. Overcurrent protection.
Carrier Suppression	50 dB down from a 100 watt, single-tone (1000 Hz) output.
Unwanted Sideband Suppression	55 dB down from a 100 watt, single-tone (1000 Hz) output.
Harmonic Radiation	50 dB down below 50 MHz; 65 dB down above 50 MHz.
Spurious Radiation	50 dB down, except at 17 meters (40 dB down).
Third Order Distortion	30 dB down from a 100-watt, PEP; two-tone output.
T/R Operation	SSB: PTT or VOX. CW: Semi break-in.
CW Sidetone	To speaker or headphones (800 Hz tone, adjustable level).
Microphone Input	High impedance (25 k ohm) with a rating of —55 dBm.
Front Panel Meter	Receive: S units. Transmit (selectable: ALC, relative RF power, or speech compression).
Phone Patch Impedance	4 ohm output to speaker, high impedance input to transmitter.
Available Accessories	AC power supply/speaker with built-in dual time 12/24-hour clock. Customer Service Manual.
Cabinet Dimensions	6-1/8” high x 14” wide x 13-3/4” deep (15.6 X 35.6 x 34.9 cm).
Weight	35 lbs (15.9 kg).

Table II- Transmitter specifications of the SS-9000.

Transmit/Receive board (h.f.o., i.f.o., and b.f.o. signals) form the synthesizer.

A simply labeled block “controller” is, however, the “intelligent” heart of the SS-9000. As can be seen from figure 1, this element performs an interface function between external commands (via front-panel controls or from a terminal interface) and the internal circuits on all of the previously mentioned circuit boards. The controller consists of a CPU, a peripheral interface adapter, a static memory interface, a read-only memory, 256 bytes of CMOS RAM, and various latches and gates.

The block marked “Terminal interface” contains an asynchronous communications element (ACE). This device performs the functions of the conventional UART and has an internal software programmable baud rate generator, modem control, and self-test functions.

Physical Construction

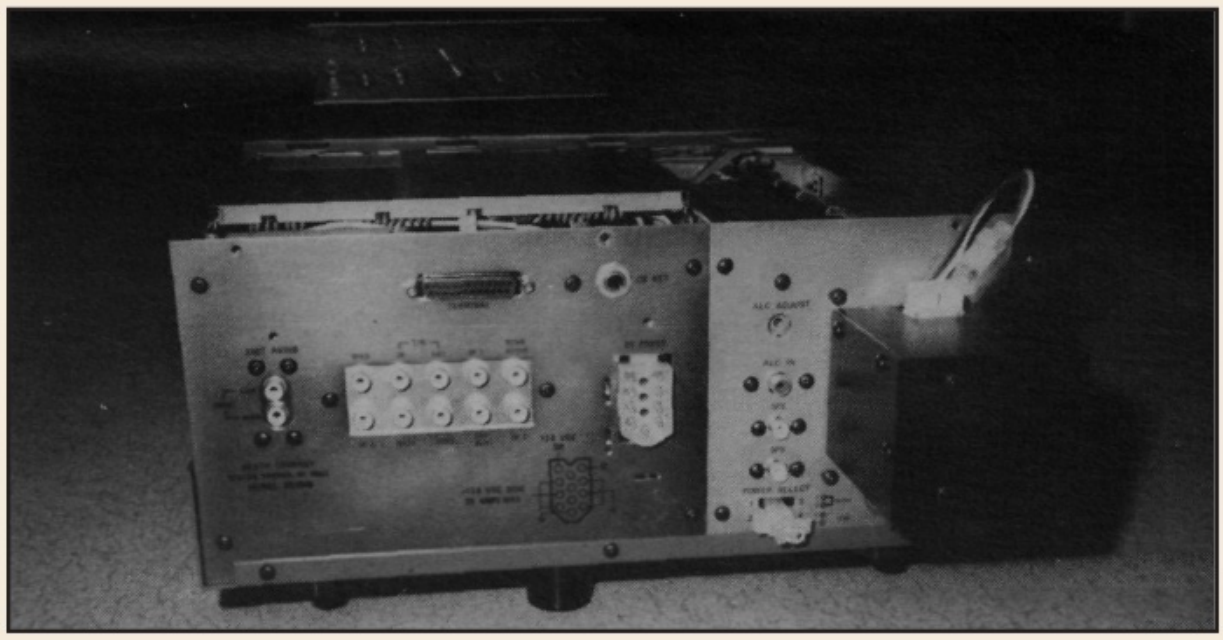
The specification tables give the size and weight data for the SS-9000. The front panel is of die-cast zinc construction with a brushed metal rim around the entire front panel and again around the frequency display area. The panel has a two-tone light/dark gray finish, and the control markings, which are all cast and raised from the panel, are painted white. Various LED’s indicate the setting of functions such as RIT on/off, Noise Blanker on/off, etc. The two frequency readouts use green LED displays. The transceiver is enclosed by a two-part rolled steel enclosure such that one can access either the top or bottom half of the interior. Overall, the external appearance of the SS-9000 is very impressive. The knobs all have a very smooth operating feel, and they are well spaced and logical in their arrangement. The photographs illustrate what one sees if one starts to take the top and bottom covers off of the SS-9000. Although the preceding circuitry description may have sounded a bit simple, the SS-9000 is a very complicated “machine” inside. However, it is extremely well constructed. All of the components are very neatly mounted, the PC boards are absolutely “clean," and there is a generous amount of individual copper shields around sensitive circuit areas. The front panel hinges forward for service accessibility, and all of the main circuit boards fan out for easy access without having to use extenders. For service access, should it ever be required, the construction of the SS-9000 has to be rated as outstanding. The arrangement of the PA stages within the transceiver is par-

ticularly interesting. As can be seen from the photographs, the PA stage is mounted internally with its heat sink and does not need any fan!

Controls and Operation

Figure 2 shows the front-panel controls on the SS-9000 in detail. Many of the controls are self-explanatory, and obviously Heath labored quite a bit on the subject of which functions should be assigned front-panel controls in order to achieve operating ease and clarity, versus having the front panel look like the cockpit of a commercial airliner.

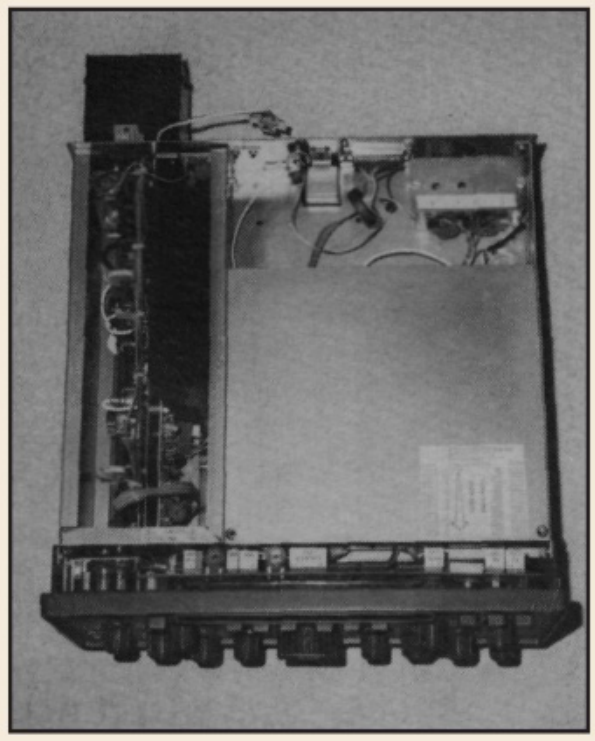
Separate a.f. and r.f. gain controls are available as well as a.g.c. selection which includes an "off" position. The RIT knob is conveniently located next to the main tuning knob. The Passband Shift Control will slide the fixed i.f. filter bandwidth above or below the i.f. center frequency. The Main Tuning is noted as adjusting the receive frequency in 100 Hz steps and that is true, but the coverage per revolution is 5 kHz. The meter indicates S units in receive and a.l.c., power output or compression level in transmit. The Meter Select pushbutton changes the meter function, and as it is alternatively depressed, the LED's for ALC, PWR, or COMP will be illuminated. In a similar manner, if the pushbuttons for TUNE, RIT, or NB are depressed, the LED's above them will



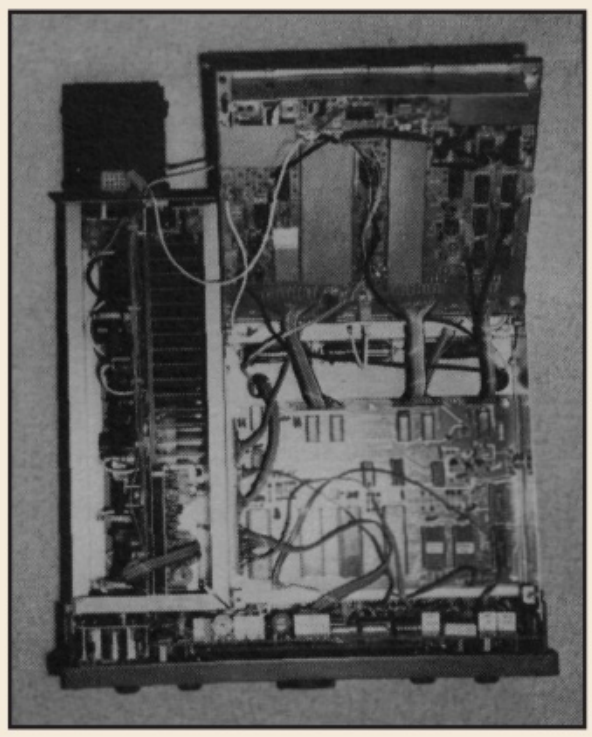
Rear panel of the SS-9000. The box on the right contains the bandswitch motor. External connections are provided for just about any purpose: linear amplifier, ALC, audio connections, PTT, etc.

RECEIVER	
Sensitivity	0.3 μV for 10 dB (S + N)/N SSB on the 40 thru 10 meter bands; 0.5 μV on the 160 and 80 meter bands.
Selectivity	2.1 kHz at 6 dB down; 5 kHz at 60 dB down.
	CW filters:
	CWM: 400 Hz at 6 dB down; 1.5 kHz at 60 dB down.
	CWN: 200 Hz at 6 dB down; 1 kHz at 60 dB down.
Overall Gain	Less than 1 microvolt for a .25 watt audio output.
Audio Output	1.5 watts into 4 ohms at less than 10% THD.
AGC	Fast-attack with switch selectable Off. Fast, and Slow decay.
Intermodulation Distortion 20 kHz spacing	-70 dB
Image Rejection	-80 dB (except -65 dB on the 17 and 12 meter bands).
Second IF Rejection	-90 dB.
First IF Rejection	-80 dB (except -60 dB on the 40 and 30 meter bands).
Internally Generated Spurious Signals	Generally below the noise level; all below 1μV equivalent.
RTT	± 250 Hz.

Table III- Receiver specifications of the SS-9000.



Just taking the top cover off the unit, one notes the very clean, well-shielded construction.



One shielded cover hinges upward to reveal still more PC boards and individually shielded assemblies. Note the heatsink on the left for the internally mounted PA stage.

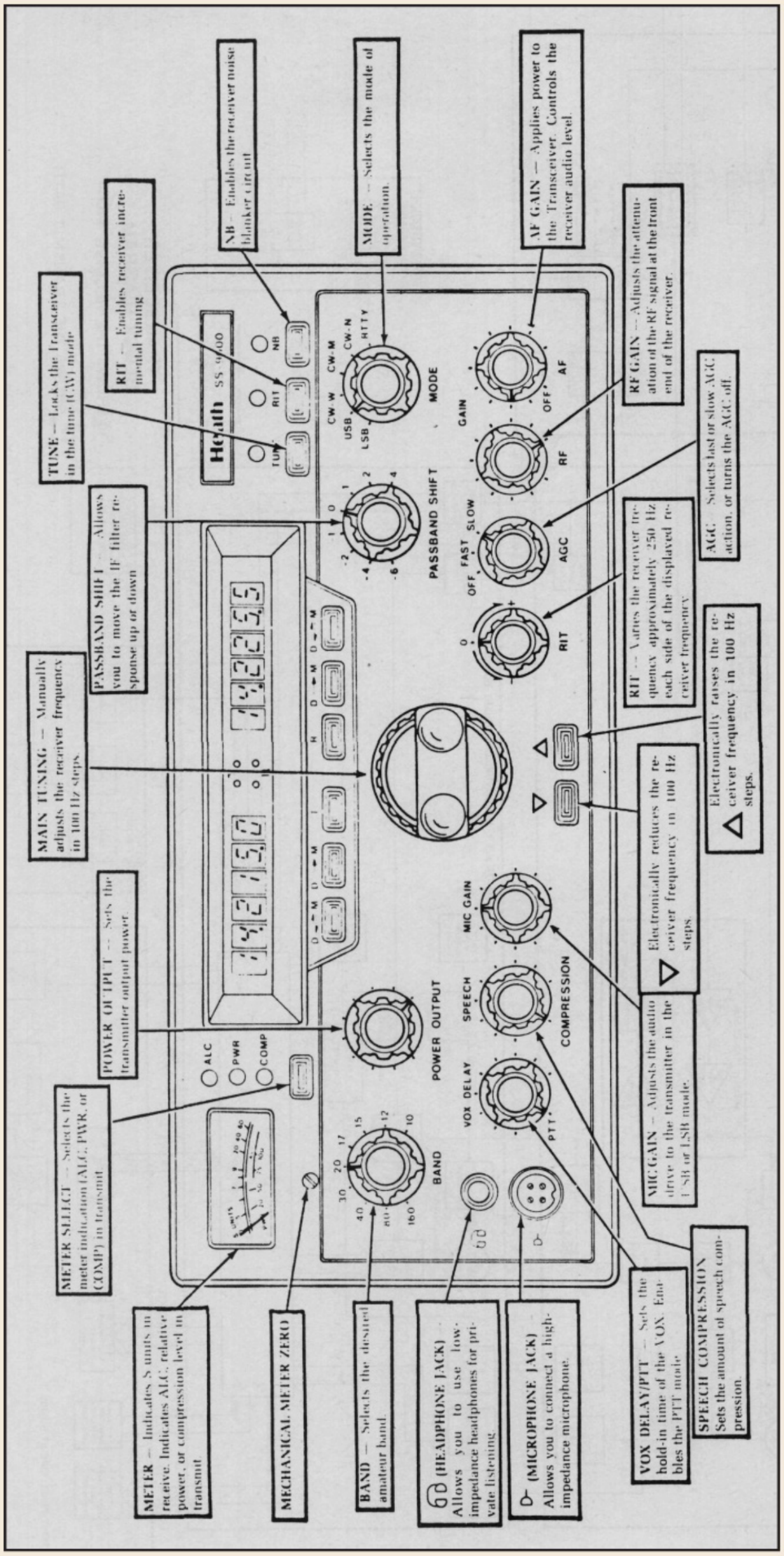
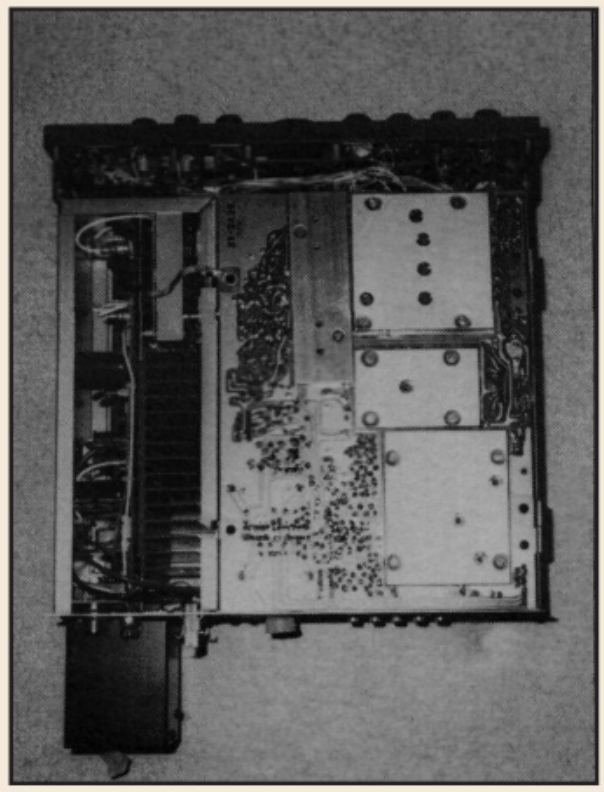


Figure 2- Front panel controls on the SS-9000.



A look af the bottom inside of fhe SS-9000 with more shielded assemblies and the PA heatsink again on the left side.

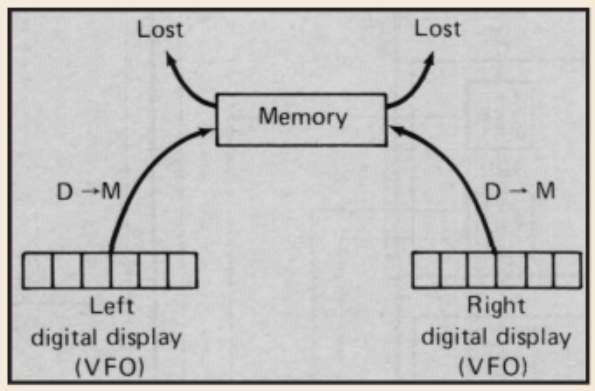


Figure 3- Basic memory system in the SS-9000. If the D→M pushbutton under either display is depressed, the frequency from that display goes into memory. Whatever frequency was in memory is lost. A separate D⇆M pushbutton under each display allows one to toggle the displayed and memory frequency without changing the memory frequency.

illuminate to indicate an "on" status. The Power Output control allows one to adjust the power output from a few watts to the nominal, full 100 watts output. Although the power output scale on the panel meter is supposed to be only a relative indicator, it does, in fact, indicate almost the exact power output over the 20-100 watt range. The Speech Compression control, although it is not indicated in figure 2, does have a click-stop "off" position at its extreme CCW rotation point. The two pushbuttons below the main tuning knob provide for a frequency scan function. If either the up or down button is depressed, the receive frequency will be scanned accordingly. The operation is com-

pletely a manual start/stop one. The rate of scanning can be set internally to be from 2.5 to 270kHz/sec. Any user should find most of the controls to be extremely easy to understand. The pushbuttons under the dual frequency display are also extremely easy to use, but they do require just a small bit of explanation. Between the two frequency displays there are four LED's. The upper set has red LED's and is associated with the T (transmit) pushbutton. The lower set has green LED's and is associated with the R (receive) pushbutton. By using the pushbuttons, one can set the right or left digitally displayed frequency to be both the receive and transmit frequency, or one to be the receive frequency and the other the transmit frequency, or vice versa. So, split frequency operation is possible over the complete extent of any one band.

The pushbuttons marked D and M with the arrows control the memory function on each band. The memory operates as shown in figure 3. There is one memory per band, and if the D→ M pushbutton under either display is pressed, the displayed frequency will go into memory, erasing whatever frequency was in memory. The displayed frequency does not change, so one can go on tuning. The D ⇆M pushbuttons under each display simply exchange the displayed frequency and the frequency in memory. One push on the switch will call up the memory frequency on the display, and another push will restore the originally displayed frequency. The frequency written in memory is not affected by use of the D⇆M pushbutton. The transceiver will also remember which v.f.o. was set up for receive and transmit on each band. The dual v.f.o./memory system is not the most elaborate one found in a manual transceiver, but it is very straightforward and easy to use.

Performance

Table I indicated that the actual frequency coverage extended beyond some band edges. The actual frequency coverage of the SS-9000 unit tested is shown in Table IV. As can be seen, there is quite generous extended coverage on some bands. It's only too bad that the 30 meter coverage couldn't be extended down to 10.0 MHz.

As was mentioned before, the arrangement of the various controls is nicely done and the transceiver is very easy to use in practice. The 5 kHz tuning rate is a nice compromise for s.s.b.

Band	Low Freq. (MHz)	High Freq. (MHz)
10	28.000.0	29.700.0
12	24.890.0	24.990.0
15	20.925.0	21.760.0
17	17.699.0	18.200.0
20	13.925.0	15.000.8
30	10.100.0	10.150.0
40	6.925.0	7.375.0
80	3.425.0	4.075.0
160	1.745.0	2.055.0

Table IV-Actual SS-9000 frequency coverage

and c.w. tuning, especially when using the narrow c.w. filter. Unfortunately, one has to take the top cover off to set the scan tuning rate and once it's set, that's it. The front-panel selection of two tuning or scan rates would have been a helpful feature. The manual tuning "feel" is excellent—smooth without being too loose. The simple pushbutton marked Tune is a very great convenience feature, and it's hard to understand why more transceivers don't have such a feature. When the pushbutton is depressed, the transceiver is keyed in the c.w. mode. Since the PA is automatically s.w.r. protected, to adjust an antenna tuner, for instance, one simply presses the Tune button and adjusts the tuner. The power output automatically comes up as the tuner is adjusted to present a 50 ohm load to the SS-9000.

On receive, one gets the impression that received signals sound very "clean." This was confirmed by bench measurements which showed the SS-9000 to easily meet its claimed specifications. A few very minor spurious signals (equivalent to less than 0.5 μV) were found on the upper end of 10 meters, but they would never be noted in actual operation. The s.s.b. selectivity is adequate except for extreme conditions when a bit better shape factor would be helpful. The passband shift is moderately helpful under bad QRM conditions. The RIT control actually had a range of ± 400 Hz and was perfectly adequate for s.s.b. or c.w. use, but the received frequency display does not indicate the offset set by the control. The display itself is perfectly stable and flicker-free. It is also easy on the eyes with its green color. Heath does not give overload specifications and overload measurements were not made, due to a lack of time before changing QTH's, but the impression one gets when operating the lower end of 40 meters at night is that the SS-9000 can easily hold its own. The noise blanker is very effective against almost any impulse (e.g., ignition) type noise. Overall, on receive the SS-9000 demonstrates excellent performance, although some operators might like to have more QRM fighting aids (e.g., variable bandwidth tuning and a notch filter).

On transmit, the SS-9000 also easily meets its specifications. The power output ranged from 105 to 110 watts over the entire range of the transceiver. The PA was absolutely stable with any type of mismatched load. With a proper load, it easily maintained full power output for repeated full 5 minute periods before the automatic circuitry started to reduce the output to prevent overheating. There is no fan, so operation is perfectly quiet. On s.s.b. the third order IMD products measured a respectable -32 dB. Keying is smooth and semi-break-in is possible since the VOX delay time can be used to adjust the transmit hold-in time on c.w. Sidetone monitoring is provided with adjustable level at a fixed 800 Hz frequency. The r.f. speech processor is very effective, and numerous on-the-air reports of "very, very good" audio were received (a common, medium-impedance dynamic microphone was used). The only awkward thing about the processor is that one must note the meter scale reading when the meter is set to Comp with the tune switch activated and then adjust the compression-level control to that same meter reading while transmitting. There is no separate "compression" scale on the meter.

Terminal Interface

The 25-pin " D " connector on the rear panel of the SS-9000 is the key to unleashing the real capabilities of the transceiver. It is the RS- 232C signal-level standard in/out terminal which allows the transceiver to interface with an ASCII terminal, modem, or computer. If you have a Heath H-19 or Zenith Z-19 video terminal, you just plug the extension cable that comes with the terminal into the SS-9000. If you do not have that equipment, instructions are given for general interconnection.

Commands will be accepted by the transceiver to control and monitor all functions that are under the control of the microprocessor in the order received, and if they are not in the proper syntex, the transceiver will generate one of 12 error codes (e.g., numbers which will indicate attempted out-of-band operation, improper switch command, etc.). The same command that

can be used to set a parameter to a particular value also allows one to examine the currently set value of that parameter. Table V shows the commands accepted by the transceiver. One can, for instance, note that one command will print the current setting of the bandswitch, and then the same command can be used, if desired, to change bands. Expressions are used to specify frequencies for either the display or memory. The transceiver can do numerous things under terminal control which it cannot do under manual control. The scan rate can be set as desired, frequencies can be added to or subtracted from the left or right displays or memory on different bands, memory frequencies may be combined for use on one band instead of having just one memory per band, etc. Basically, the SS-9000 can be commanded by a terminal to do anything except turn itself on.

In practice, this means that one can sit at a terminal and completely control the transceiver. For example, one might ask for a listing of frequencies and various control settings. Then by keystroke, one can change bands, put different frequencies in the v.f.o.'s, tune or scan up and down from a set frequency, adjust the passband shift, etc. On s.s.b. one still needs audio in/out connections to the transceiver. However, with a suitably equipped terminal, c.w. and RTTY can be automated for all practical purposes.

Since the SS-9000 can be terminal-controlled, it can, of course, be operated by a computer program. What sort of program one might want to devise is left up to the imagination. One could write a program for the transceiver to check certain frequencies on certain bands at specific times, to scan specific band segments at certain times, to set up itself for a certain mode of operation on a specific frequency at given times, etc. If a signal-recognition device could also be integrated into the system, a computer program could be written such that the transceiver would search various segments of various bands and sound an alarm when a specific signal is found. It probably will not be too long, for instance, before stations who like to keep DX schedules will be using computer-controlled transceivers to automatically search out the best band, including crossband possibilities, and frequencies with the least QRM for their schedules immediately before the schedule time starts and to set up the transceiver at each end for operation.

The software demonstration package ($5^1/_4$ inch diskette) which comes with the SS-9000 doesn't suggest anything like the foregoing idea. However, it does introduce one to terminal control of the SS-9000 in a very practical manner by asking the operator to perform various control functions from a keyboard and then performing various control functions on its own for illustrative purposes. Although it has a "teaching" function, it also illustrates how the SS-9000 can be controlled by a computer program.

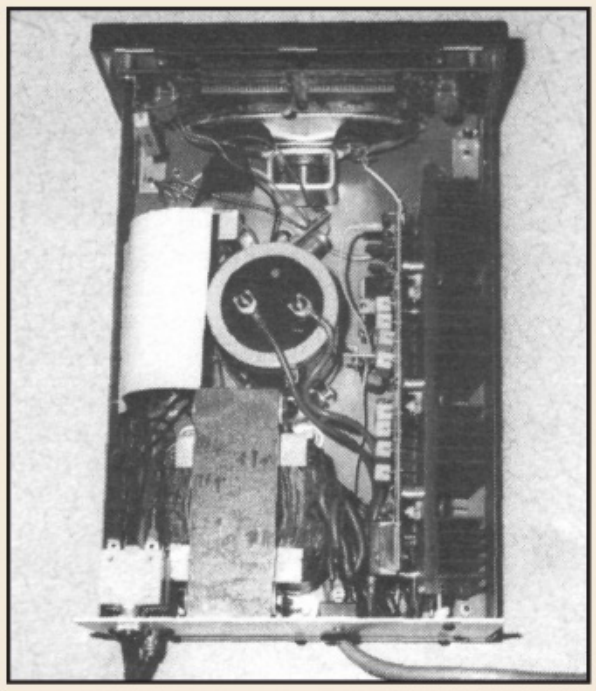
COMMANDS

BR[ate] =	Prints the current Baud Rate setting.
BR|ate] = n	Sets the Baud Rate setting.
	where: n = 50, 75, 100, 150, 300, 600, 1200, 1800, 2000, 2400, 3000, 4800, 7200, or 9600.
BA[nd] =	Prints the current Band switch setting.
BA[nd] = n	Rotates the Band switch to the n meter band.
	where: n = 16[0], 8[0|, 4[0], 3|0], 2[0], 17, 15, 12, or 1[0].
MO[de] =	Prints the current Mode switch setting.
MO[de] = n	Sets the Mode to n.
	where: n = LO[wer|, UP[per|, W[ide], M[edium], N[arrow], or R[TTY].
SH[ift] =	Prints the current PASSBAND SHIFT switch setting.
SH[ift] = n	Sets the Passband Shift to n.
	where: n = -6[00|, -4[00], -2[00], -1[00], 0, 1[00], 2[00], 4[00].
S[can] =	Prints the current SCAN switch setting.
S[can] = n	Sets the Scan rate to n.
	where: n = 1, 2, 3, 4, 5,6, 7, 8, 9, 10, 11,12,13, 14,15, *or* 16 *NOTE*: 1 = approximately 2.5 kHz per second; 16 = approximately 300 kHz per second.
SW[itch] =	Releases all switches to their physical settings. NOTE: This includes the BAUD RATE switches.
L[ock]	Locks all switches to their current state.
PS[switch]	Prints the switch settings. NOTE: An "L" (locked) appears after any switch setting that was set from the terminal
PF[req]	Prints the frequencies in memory for all bands.
PF[req]<band>	Prints the frequencies in memory for <band>, where <band> is one of the values for n listed in the BA[nd] command (see above). NOTE: The frequencies that are selected for receive and transmit are indicated by R and T respectively.
RI[ndicator]	Toggles the receive indicator for the current hand
RI[ndicator] <band>	Toggles the receive indicator for <band>
TI[ndicator]	Toggles the transmit indicator for the current band
TI[ndicator] <band>	Toggles the transmit indicator for <band>.
RE[ceive]	Sets the Receive mode.
TR[ansmit]	Sets the Transmit mode.

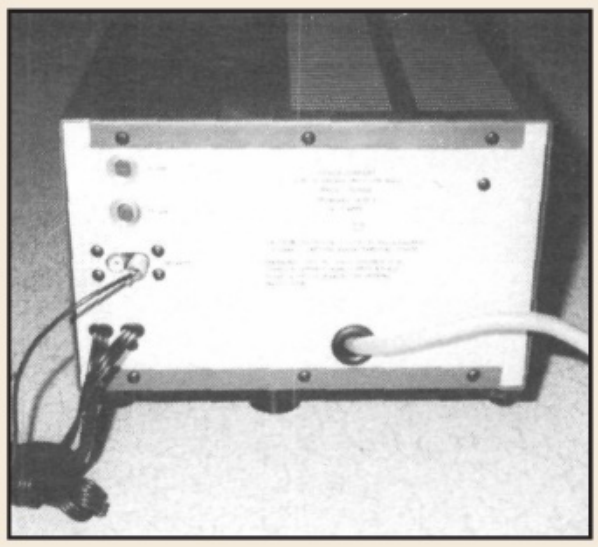
Table V-Terminal commands for the SS-9000.

Antenna Switch Interface

The bandswitch on the SS-9000 is controlled for non-manual operation by a motor assembly on the rear of the transceiver. The motor assembly has some external connections such that it can be interfaced with the Heath SA-1480 Remote Coax Switch. When this



A look inside the PS-9000 power supply. Note the hefty heatsink on the right side for the regulator pass transistors



A rear view of the PS-9000. Separate line cords are provided for the power supply/clock circuits and there are two circuit breaker resets (one for each of the two 110 V primary windings on the power transformer).

is done, any one of up to five antennas can be automatically selected when the bandswitch on the SS-9000 changes.

Accessories

The main accessory for the SS-9000 is the PS-9000 power supply. It is styled to match the SS-9000 and basically supplies a regulated 13.8 v.d.c. output with a 25 ampere intermittent or 15 ampere continuous rating. It has current limiting and thermal protection but no apparent over-voltage crowbar circuitry. Filtering in the unit is mainly provided by a hefty 39,000 mF capacitor. Construction is quite rugged, and it can be set up to operate on 110/220 volt, 50/60 Hz.

The unit also contains two independent 2400-hour format clocks and a good-quality speaker. Two separate line cords are provided so the clocks can remain on an unswitched line and the power supply itself can be connected to a station's "big switch" a.c. line. The clocks can be set by front-panel pushbuttons, and an internal adjustment is provided to set the brightness of each clock. The clocks use the line frequency for timing purposes and must be reset if an a.c. power interruption should occur.

The only other accessory for the SS-9000 is a service manual costing $35.00. The owner's manual which comes with the SS-9000 gives very complete and clear installation and operating instructions. However, the SS-9000 is a complex unit, and it makes good sense for detailed service information to be contained in a separate manual. The manual itself was not examined, but considering the clarity of the owner's manual and all other Heath manuals, it undoubtedly is of the same high quality.

Summary

The SS-9000 is a very high quality transceiver in every respect—construction, performance, and control. It is also an expensive transceiver. In considering purchase of the unit, one primarily would have to balance the cost of the unit against one's anticipation of making use of its extraordinary terminal control possibilities.

Announcing:

The 2023 CQ World Wide 160-Meter Contest

CW: 2200Z January 27 to 2200Z January 29
SSB: 2200Z February 24 to 2200Z February 26

DEADLINES FOR LOG SUBMISSIONS ARE 5 DAYS!

I. OBJECTIVE:

For amateurs around the world to contact other amateurs in as many U.S. states, Canadian provinces, and countries as possible utilizing the 160-meter band.

II. BAND USE:

1810-2000 kHz in ITU Region 1. 1800-2000 kHz in ITU Regions 2 and 3. All entrants are encouraged to spread out as much as possible, obeying frequency restrictions and power limits for their own country. Any violations of the ITU band use may result in disqualification.

Please be aware and considerate of other users of data modes such as FT8 in the contest band segments.

III. CATEGORIES:

For Single Operator Assisted Only: The use of one and only one remote receiver located within 100 kilometers of the main transmitter site is permitted, in addition to the receiver at the transmitter site. WebSDRs are OK, but must be located within the 100-kilometer limit. The rule is designed to accommodate new technology, and for those who experience high noise levels at the transmitting site. Anyone found using a remote receiver outside the limit will be subject to disqualification.

For all categories: The main site is defined as all transmitters, receivers, and antennas must be located on the same contiguous property. If the property is not contiguous, then all equipment must fall within a 1,500-meter radius. All antennas must be connected by wires to the main station. This rule applies to all entrants.

There is only ONE CQ Running frequency allowed for each station. “Flip Flopping” between two frequencies during the same time period (thus taking up two frequencies) is unsportsmanlike and will result in disqualification.

The use of any so-called “Chat Rooms” via the internet or similar means for communication between stations or operators during the contest period is strictly prohibited. Do not arrange or confirm QSOs by any other means than the use of the 160-meter band and the same mode as used in the contest. Any such use may result in disqualification at the discretion of the committee. The use of self-spotting is not allowed in any category.

Remote operation for UNASSISTED entries is permitted under the following conditions:

- The use of any receiver located away from the main site is strictly prohibited.
- The use of a separate receiver at the remote-control operator location is strictly prohibited.
- Any receiver not physically located at the main TX site is strictly prohibited. This includes receivers linked via the internet or RF that are not located at the main TX site.
- If the remotely operated station is located in another DXCC entity, it is required to comply with all local country regulations.

Operating time: Each contest is 48 hours long and starts at 2200Z. Single operator stations may only operate 30 out of the 48 hours. Multi-Operator stations may operate 40 hours. Off times must be a minimum of 30 minutes in length for all categories.

(A) Single Operator: One person performs all of the operating, logging, and spotting functions. Maximum operating time is 30 hours. QSO finding assistance is NOT allowed* (See definition below). Only one transmitted signal is allowed at any moment in time. Maximum power is 1,500 watts total output.

(B) Single Operator / Low Power: Same as (A) with the exception that the output power shall not exceed 100 watts. Stations in this category compete with other Low Power stations only.

(C) QRP: Same as (A) with the exception that the output power shall not exceed 5 watts. Stations in this category compete with other QRP stations only. Note: All QRP stations may use *QSO finding assistance*.

(D) Single Operator Assisted / High Power: Same as (A) with the following exceptions: The use of *QSO finding assistance* IS allowed. The use of one and only one remote receiver within 100 kilometers of the transmitter site is allowed.

(E) Single Operator Assisted / Low Power: Same as (D) with the following exceptions: Output power shall not exceed 100 watts.

(F) Multi-Operator: HIGH POWER ONLY. All rules apply as in Single-Op Assisted (except remote receivers ARE NOT allowed); however, more than one operator (person) is involved in the operation. Maximum operating time is 40 hours. Only one transmitted signal is allowed at any moment in time. Maximum power is 1,500 watts total output or the output power allowed by your country, whichever is less.

*QSO FINDING ASSISTANCE: The use of any technology or other source that provides callsign or multiplier identification of a signal to the operator. This includes, but is not limited to, use of a CW decoder, DX cluster, DX spotting websites (e.g., DX Summit), local or remote callsign and frequency decoding technology (e.g., CW Skimmer or Reverse Beacon Network), or operating arrangements involving other individuals.

IV. EXCHANGE:

RS(T) and state for U.S., province for Canada, and CQ Zone for DX. Note: Zones are location indicators only and do not count for multipliers.

V. MULTIPLIER:

U.S. States: (48 contiguous states); U.S. District of Columbia (DC) (1)

Canadian Provinces: (14) VO1, VO2, NB, NS, PEI (VY2), VE2, VE3, VE4, VE5, VE6, VE7, VE8 (NWT), VY1 (YUK), VY0. Note VO1 and VO2 are separate due to tradition.

DXCC countries plus WAE countries: WAE: 1AØ, 3A, 4O, 4U1I, 4U1V, 9A, 9H, C3, CT, CU, DL, E7, EA, EA6, EI, ER, ES, EU, F, G, GD, GI, GJ, GM, GM/s, GU, GW, HA, HB, HBØ, HV, I, IS, IT (without IG9/IH9 Zone 33 which are listed in Africa), JW, JW/b, JX, LA, LX, LY, LZ, OE, OH, OHØ, OJØ, OK, OM, ON, OY, OZ, PA, R1F, RA, RA2, S5, SM, SP, SV, SV/A, SV5, SV9, T7, TA1, TF, TK, UR, YL, YO, YU, Z6, Z3, ZA, ZB.

VI. POINTS:

Contacts with stations in own country: 2 points.

Contacts with other countries on same continent: 5 points.

Contacts with other continents: 10 points.

Maritime mobile contacts count 5 points. There is no multiplier value for a maritime mobile contact.

VII. SCORING:

All stations — the final score is the result of the total QSO points multiplied by the sum of all multipliers (states, VE provinces, DX countries).

VIII. AWARDS:

Certificates will be awarded to all entries. They are downloadable and located here: <https://cq160.com/scores.htm>.

Trophies will be awarded for top scorers in many categories. The trophies and donors for all categories can be found here: <https://cq160.com/plaques.htm>.

If you are interested in sponsoring a plaque, please contact us at: <questions@CQ160.com>.

IX. CLUB COMPETITION:

Any club that submits at least three logs may enter the Club Competition. The name of the club must be clearly identified under club competition on the summary sheet, or summary portion of the Cabrillo log. Please make sure all entrants from your club use the same club name (spelled the same) in the Cabrillo entry. Most club names can be found here: <https://cq160.com/clubnames.htm>.

Non-compliance with this request may result in your score not being credited to your club's entry.

X. LOG INSTRUCTIONS:

The deadline for log submissions is 5 days from the end of the contest.

For CW this is 2200 UTC February 3, 2023.

For SSB this is 2200 UTC March 3, 2023.

The submission of Cabrillo logs is required. Please submit CQWW 160 Meter Contest logs via the web upload tool found at: <https://cq160.com/logcheck>.

Paper / Disk logs: Paper logs or other formats than Cabrillo are no longer accepted for submission.

For hardship cases that require more time for log submission, send an email to <director@CQ160.com>. We will make every effort to accommodate you if you have a valid reason for delay.

Cabrillo formatted logs are received by a log processing robot. If your log has been submitted correctly, the robot will reply with a confirmation. If there is a problem with your log, the robot will send you an error message containing suggestions for how to fix your log. Read this email carefully. Most log submission problems are minor and can be corrected in one pass. Submit your log as many times as needed. The last submitted log will be the version that counts for your official entry. You can check the status of your log at our web page Log Received tab. Other inquiries may be sent to <questions@cq160.com>.

XI. PENALTIES AND DISQUALIFICATION:

Logs will be cross checked and penalties will be applied at the committee's discretion for contacts determined to be bad or busted. The bad QSO is removed and a penalty of two more equivalent QSOs is applied to the points only. No penalty should be applied for unique QSOs unless they are deemed excessive. A log may be disqualified for violation of amateur radio regulations, unsportsmanlike conduct, or claiming excessive unverified contacts.

Report file outputs showing final score calculations will be available for all entrants after the results are published. The decisions of the CQWW 160 Contest Committee are final.

XII. DECLARATION:

By submitting a CQWW 160 Meter Contest log, and in consideration of the efforts of the CQWW 160 Contest Committee to review and evaluate that log, an entrant unconditionally and irrevocably agrees that he/she has: 1) read and understood the rules of the contest and agrees to be bound by them, 2) operated according to all rules and regulations that pertain to amateur radio for the station location, 3) agreed the log entry may be made open to the public, and 4) accepted that the issuing of disqualifications and other decisions of the Committee are official and final. If an entrant is unwilling or unable to agree to all of the foregoing, the entrant should not submit the entry or submit the entry as a Checklog only.

Announcing:

2023 CQ DX Marathon

January 1 – December 31, 2023
Logs Due January 5, 2024

2022 Logs Due January 5, 2023

The 2022 DX Marathon ends December 31st, so please review your log and check for errors. The DX Marathon website <www.dxmarathon.com> has all the information on how to submit your 2022 log and contains many helpful hints on how to improve your score. The 2022 submission deadline is January 5, 2023 at 2359Z.

Beginning January 1, 2023, the DX Marathon will have a new Manager — Mark Wohlschlegel, WC3W, (<wc3w@dxmarathon.com>; see announcement below). Mark is a well-qualified DXer and is building a team that will be expanding the DX Marathon so even more hams can participate. Look for future informational releases from Mark during 2023. I want to thank everyone who has made the last 17 years so very enjoyable managing the DX Marathon. – *73, John, K9EL*

The CQ DX Marathon is designed to promote DXing activity throughout the year rather than only on contest weekends and during DXpeditions. Because activity is not concentrated in specific time periods, credit is given for contacts on all ham bands, including those not normally used for contesting (e.g., 60, 30, 17, and 12 meters).

Scoring is simple: You score one point the first time you work a new country and/or a new zone during the year. Add the points up at the end of the year for your total score. There are no multipliers.

Here are the complete rules:

Activity period: The CQ DX Marathon is a yearlong activity, beginning at 0000 UTC January 1st and ending at 2359 UTC December 31st. Each year's event is separate.

Frequencies: Any authorized amateur frequency may be used. Contacts through repeaters or satellites are not allowed for credit, nor are contacts with maritime or aeronautical mobile stations. All contacts must be made entirely over amateur radio frequencies – i.e., Echolink-type contacts do not count.

Modes: Any authorized amateur mode may be used, but three modes will be recognized in the DX Marathon — CW, Phone, and Digital. Except for single-mode submissions, cross-mode QSOs are permitted but the mode used by the DX station must be shown in the submission.

General: Each entrant in the DX Marathon may submit one log each year per operating location. Participants submitting logs for single-mode or single-band entries must include only those contacts in their submission. Logs submitted with multiple modes or multiple bands will not be considered for single-mode or single-band awards. Entries with two or more callsigns will count as a single entry only if all contacts were made by the same (single) operator at the same station using the same antennas, and each callsign used is listed in the comments section of the submission form. Remote operation is permitted if all transmitters, receivers, and antennas are at a single physical location. A remote station in a different country than the entrant's country of license must comply with all local laws and regulations. If an entrant operates from both a primary station and a remote station, separate entries for each location may be submitted provided such separate entries have different callsigns or a portable callsign designator. Entries that include contacts made with the assistance of remote receivers and/or transmitters in addition to contacts from a primary station are not permitted.

Categories

There are three entry classes, "Formula," "Limited," and "Unlimited."

Formula: An entrant may choose one of two options in this class: (1) All contacts must be made with a maximum output power of 5 watts, regardless of band or mode; or (2) the operator may run a maximum of 100 watts output to a simple antenna, such as a vertical or dipole (see the appendix below for further rules on antennas used in either option for Formula Class). An operator in Formula Class must select QRP (5 watts or less) or 100 watts and limited antennas at the beginning of the year's DX Marathon and may not switch between entry modes during the year. All contacts must be made without the use of higher power or prohibited antennas to initially secure the contact. Use of spotting nets such as a DX Cluster® is allowed. Details of antennas used in either option of Formula Class must be included on the official submission form to qualify for Formula Class. Formula Class entries without antenna descriptions (type, height, and length, for example) may be re-classified to Unlimited Class.

Limited: Limited Class entrants are allowed a maximum output power of 100 watts and simple antennas, such as verticals or dipoles, plus small directional antennas such as Yagis and multi-element loop, hex, and quad-type antennas for the 6-, 10-, 12-, 15-, 17-, and 20-meter bands, and single-element rotatable dipoles for the 30- and 40-meter bands. See the Appendix below for further description of the Limited Class antennas that are allowed. All contacts must be made without the use of higher power or prohibited antennas to initially secure the contact. Use of spotting nets such as a DX Cluster® is allowed. Details of antennas used in Limited Class must be included on the official submission form to qualify for Limited Class. Limited Class entries without antenna descriptions (type, height, and length, for example) may be re-classified to Unlimited Class.

Unlimited: Any antenna or antennas may be used, along with any power level for which the operator is licensed. Use of spotting nets such as DX Cluster® is allowed.

Scoring

Each country worked is worth one point. Each CQ zone worked is worth one point. The total score is the sum of zones

and countries worked on any mode and any authorized band. There are no multipliers of any kind. Each country and zone count only once. A single QSO may count for both a country and a zone. If, during the year, you work 238 countries and 37 zones, your score is 275. If you work all 40 zones and 150 countries, your score is 190. The CQ DX Countries List and the CQ Zone List constitute the official lists. The lists are available on the DX Marathon website. In the case of ties, the operator whose last scoring contact was earlier chronologically will be judged the winner. Decisions of the DX Marathon Manager are final.

Submissions

Submissions must be made electronically via the DX Marathon upload webpage, <www.dxmarathon.com/logupload.htm>. If the participant is not able to use the upload link submissions may be sent via email to <logs@dxmarathon.com>. A Microsoft Excel® template into which contacts may be entered is available for download from the CQ DX Marathon website at <www.dxmarathon.com>. The website also provides other options for those without access to Excel®. Software is available to generate the DX Marathon submission form direct from an ADIF file. All submissions must be received by January 5, 2024. If your primary callsign changed during the year, please enter your current callsign at the top of the DX Marathon entry form and add previous (or contest) callsign(s) in the comments section of the form.

Verification: QSLs are not required. The operator is expected to claim contacts only from stations the operator has every reason to believe are legitimate, and only to claim contacts in which an accurate two-way exchange was clearly accomplished (see Appendix for further explanation). Scores will be adjusted by the DX Marathon committee for claimed contacts with pirates or any station not considered legitimate. Submissions may be penalized or voided in cases of fraud or poor sportsmanship. Every QSO may be subject to verification by the DX Marathon Manager. Decisions of the DX Marathon Manager are final.

Clubs: Clubs are strongly encouraged to use the framework of this contest for intramural and regional competitions. Please be sure to enter your club's name on the submission form.

Results: The final listing of official scores and winners will be published in *CQ* magazine and/or the CQ website and the DX Marathon website.

Awards

Plaques: The DX Marathon will award plaques as follows: Highest overall score in Unlimited Class; highest overall score in Limited Class; highest overall score in Formula Class, both 5-watt and 100-watt options; highest overall CW only, highest overall SSB only and highest overall Digital only scores; highest overall score for single-band entries for the 10-, 12-, 15-, 17-, 20-, 30-, 40-, 60-, and 80-meter bands; highest overall score for each of the 6 continents and highest overall CW scores in Europe and North America. Plaques for CW, SSB, band, and continent winners are awarded regardless of class and may only be awarded if the winning scores in those categories are at least 50% of the score of the overall DX Marathon Unlimited Class winner. Entrants may receive only one plaque per year. In the case of a participant qualifying for more than one plaque, that participant will receive a plaque for the highest level based on the above order.

Certificates: Certificates are awarded to qualified participants in this order: Highest overall score on the 160-, and 6-meter bands; highest overall score for each of the three modes on each continent with the exception of CW in Europe and North America; highest overall score in each CQ zone; highest overall score in each country; highest overall score for each class in the U.S.; highest overall score in Unlimited, Limited, Formula 100 watt and Formula 5 watt classes in each U.S. callsign district; highest overall score in each Canadian callsign district. Plaque winners are not eligible for certificates. Only one certificate will be awarded per entrant. In the case of a participant qualifying for more than one certificate, that participant will receive a certificate for the highest level based on the above order. In all cases, the rulings of the Marathon Manager are final.

Youth Overlay: In 2022 we introduced the new Youth overlay category. The Youth category for 2023 is open to anyone who was born on January 1, 1998 or later. Special Youth certificates will be awarded to the highest Youth score in each of the six continents. To enter in the Youth overlay, the entrant must use the comments box at the bottom of the DX Marathon entry form and clearly state that it is a Youth entry and clearly state their date of birth. All Youth entries may be subject to age verification.

Appendix

Formula Class antennas, option 1: Operators selecting the 5-watt option are limited to antennas on a single tower and whose height does not exceed 65 feet or 20 meters above ground elevation. Wire antennas may also be used but must meet the criteria of the 100-watt option and may be tower-supported at only one point.

Formula Class antennas, option 2: Antennas for operators choosing the 100-watt option must be either simple verticals or wire antennas lacking significant gain. No arrays are allowed, whether vertical or horizontal. Wire antennas, regardless of type, may not exceed 130 feet or 40 meters in length, may not be higher than 65 feet or 20 meters above ground at any point of the antenna and may be tower-supported at only one point. The tallest point of vertical antennas used may not be higher than 65 feet or 20 meters above ground. Yagis, quads, and rotatable dipoles may not be used in this category. There is no limit on the number of antennas that may be used if each antenna meets the above criteria.

Limited Class Antennas: Antennas for Limited Class include all Formula Class option 2 antennas for use on all bands plus directional antennas such as Yagis and multi-element loop, hex, and quad-type antennas on the 20- through 6-meter bands. Directional antennas with no more than 3 elements per band are allowed on the 20- through 6-meter bands. Boom length may not exceed 16 feet (5 meters) for antennas with booms. Single-element rotatable dipoles are allowed for the 30- and 40-meter bands. Directional antennas and rotatable dipoles must not be higher than 50 feet (15 meters) above ground and all directional antennas must be on a single tower or support.

Contacts: Each contact for a claimed country or zone must be a solid contact. The station claiming a contact with another station is expected to have had his or her callsign fully and accurately received and transmitted by the other station, and to have copied his/her own call being correctly sent by the other station. For example, K2MGA may not claim credit for a QSO with a DX station who had his call as K3MGA, even though in many cases the DX station would QSL the contact with the correction made (after receiving a card from K2MGA, realizing the error, and correcting his/her log). For a contact to count, both stations must correctly copy both callsigns completely.

Introducing New DX Marathon Manager Mark Wohlschlegel, WC3W

Incoming CQ DX Marathon Manager Mark Wohlschlegel, WC3W. (Photo courtesy of WC3W)

Mark Wohlschlegel, WC3W, has been appointed as Director of the CQ DX Marathon by *CQ* Editor Rich Moseson, W2VU. Mark succeeds John Sweeney, K9EL, who has held the post since the program was reinstituted in 2006.

An electrical engineer, Mark has been a ham radio operator since age 12. He currently lives in Palm Beach Gardens, Florida, with his wife of 49 years. Both his wife and two adult children are licensed hams. Due to antenna restrictions in his home community, Mark and a ham friend have built a remote station about 80 miles from his home QTH (photos on QRZ.com). Mark and his wife spend about five months of each year in Grand Lake, Colorado, where he has a small HF station and a UHF repeater.

Wohlschlegel says his goals for the DX Marathon program include working to double participation over the next 3-5 years

Mark's operating preferences are CW, FT8, and SSB, in that order. He routinely chases DX on all bands. Besides amateur radio, Mark flies single-engine airplanes, enjoys motorcycle riding and sailing, and is a musician in his church.

Wohlschlegel says his goals for the DX Marathon program include working to double participation over the next 3-5 years by increasing the number of categories and encouraging greater participation by DX clubs around the world.

"I want to thank John Sweeney for getting the DX Marathon up and running in 2006 and guiding it successfully through the past 16 years," said Moseson. "Building an activity like this from the ground up is a huge challenge. I also look forward to working with Mark in the future. I am very impressed with his dedication to the DX Marathon program and his vision for its future."

Wohlschlegel will take over as DX Marathon director with the 2023 running of the year-long activity.

behind the bylines...

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

Bob Sumption, N8RS ("The Almost Heathkit," p. 26), is a former Heathkit engineering employee and Extra Class ham active since 1958. He was the Lead Technician on the Heath SS9000 project and builder of the very first Heath SS9000 at Heathkit Engineering in January 1982.

José Carlos León Ortega, CP6CL ("Using an HF Windom Antenna on 50 MHZ," p. 43), was born and grew up in Havana, Cuba. He attended the University of Havana, from which he earned a Bachelors degree in physics, a Masters in microelectronics and electromedicine, and a Ph.D. in the same fields in 1997. For 20 years, he worked at the Central Institute of Digital Research in Havana, designing electronic equipment for medicine, and taught postgraduate courses at the University of Havana and at the José Antonio Echeverría Polytechnic Institute, also in Havana.

He has lived in Bolivia since 2000, where has worked in several universities, in academic boards as Head of Department, Postgraduate Director and Dean.

His first amateur radio license — CO3CL — was received in 1983. Since 2015, he has held the Bolivian callsign CP6CL. José has written many scientific articles published in various international journals about the physics of semiconductors and radio amateurs. This is his second article for *CQ*.

Update On CQ DX Marathon Program

The administration of the CQ DX Marathon program is in transition from John, K9EL to Mark, WC3W. Mark has structured an organization to diversify the administration of the DX Marathon among a team of volunteers. In addition, a management team has been formed to provide direction for the expansion of the program in future years. The management team has developed a vision / mission statement for the CQ DX Marathon Program.

The DX Marathon's original mission was to provide an incentive for HF DXing activity throughout the year, rather than being concentrated on major contest weekends and operations of DXpeditions. An additional mission is to create a measurement tool of the increasing effectiveness that both ham radio equipment and operators have in pursuing DX on multiple bands and multiple modes of operation (CW, SSB, digital) on a year-to-year basis. The mission includes tripling the number of participants over the next 3-5 years.

Mark says: "I feel that the vision statement and growth targets are very realizable. We are on the upswing of Cycle 25, which should provide lots of opportunities for operators to work lots of DX. This, combined with the growth of FT8, makes it possible for many more operators who do not have 'mega-stations' to work some very exciting DX."

"Our objective during 2023 is to ensure a smooth transition from K9EL to our team of volunteers. The second objective will be to organically grow the number of participants."

"We already have some exciting changes being made that will be released toward the end of this year in addition to an FAQ section on the DX Marathon website."

Using software modeling and on-air experience, CP6CL shows that a Windom antenna intended for use on HF, from 80 to 10 meters, is also an effective antenna for 6 meters.

Using an HF Windom Antenna on 50 MHz

BY JOSÉ CARLOS LEÓN ORTEGA,* CP6CL

I have always been a person who likes challenges. On the other hand, I have always thought that doing amateur radio activity with large and expensive antennas is not especially challenging. Using directional antennas with several kilowatts of power, with the same approximate propagation conditions for all, always guarantees the success of the communication, of course, with a little skill and patience to look for the opportunity in the pileup.

As far as I am concerned, despite having a very large and long piece of land on which to be able to install any type of antenna aimed in any direction, I have always practiced amateur radio with a Windom antenna, oriented east-west, with dimensions for the 80-meter band (13.9 + 27.9 meters, or 45.6 + 91.5 feet) and with it I have worked all the HF bands (except 160 meters, for which I have a 57-meter / 187-foot-long inverted L).

One day, with the purchase of a new 6-meter radio (a gift from a good friend), I wondered whether this antenna could also work on 50 MHz. I did my calculations and simulations and dared to use it. Here are the results that give rise to this work.

** Email: <josecarlosleon48@yahoo.com>*
Website: <www.udi.edu.bo>

The Windom Antenna

This antenna dates back to 1929 and was developed by Loren Windom, W8GZ.[1] There have been many variants and redesigns of it,[2] but the original design remains to this day. It is a multiband antenna fed at a strategic point where the voltage waveforms coincide in a region of space (66% of its length) and this means that the coupling impedance does not change much over several bands (see *Figure 1*).

At least on 80 (3.5 MHz) and even multiples of it (7, 14, 21, and 28 MHz), the antenna works properly, achieving very good results. Its radiation patterns allow me, at least from my location in Bolivia (CP6), to contact stations in Europe, East Asia, West Asia, North America, and North Africa with relative ease (see *Figure 2* for 10-meter example).

But, what about 50 MHz and this antenna? That was exactly the question I asked myself and the first thing I set for

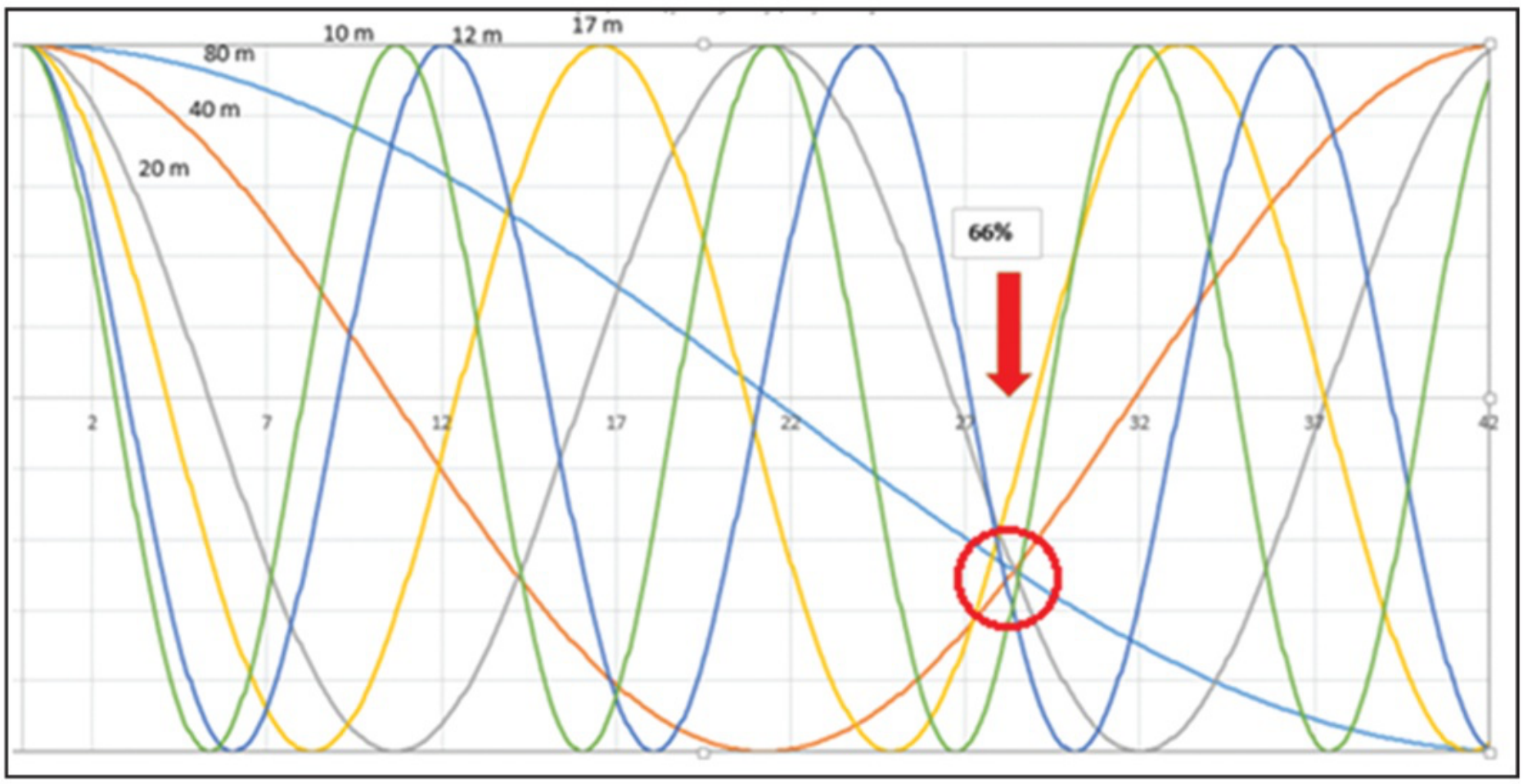


Figure 1. Windom wave distribution for amateur HF band signals on six HF bands. Note the convergence at 66% of the 80-meter length.

Call	Grid	Date	Time	Band	Mode	RST sent	RST rec.	Freq. MHz
VR2XMT	OL72cm	20220405	032630	6 m	FT8	-16	-12	50.313
BV6KO	PL03de	20220405	033330	6 m	FT8	-20	-10	50.313
VR2CC	OL72ch	20220405	033630	6 m	FT8	-18	-10	50.313
BV6CC	PL03ca	20220405	034000	6 m	FT8	-15	-19	50.313
VR2XYL	OL72cm	20220405	032300	6 m	FT8	-19	-11	50.313
BA7IO	OL73eb	20220405	032030	6 m	FT8	-14	-24	50.313

Table 1. QSOs made with east Asia during an opening on 50 MHz using the Windom antenna.

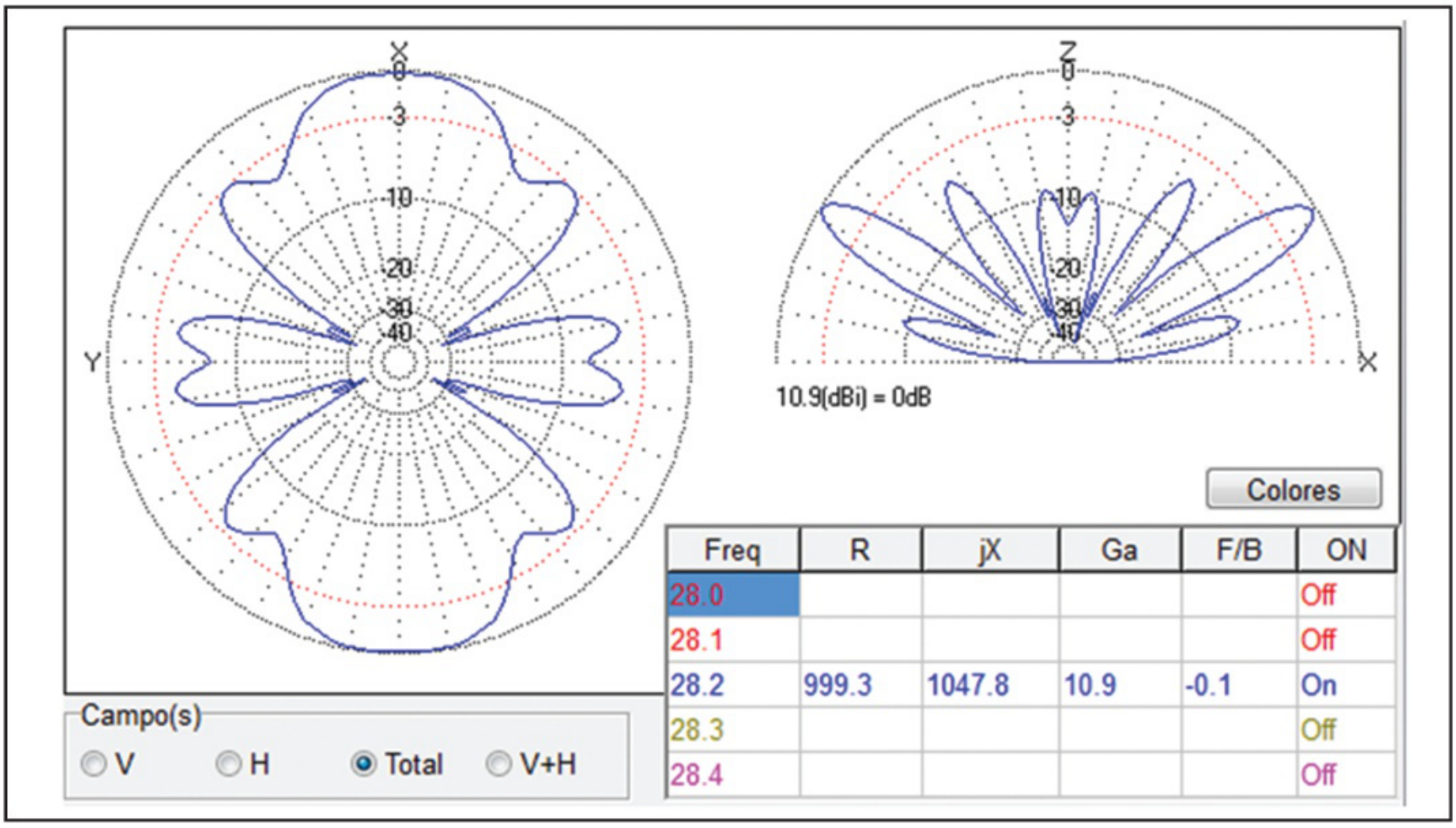


Figure 2. Windom radiation diagrams for 10 meters.

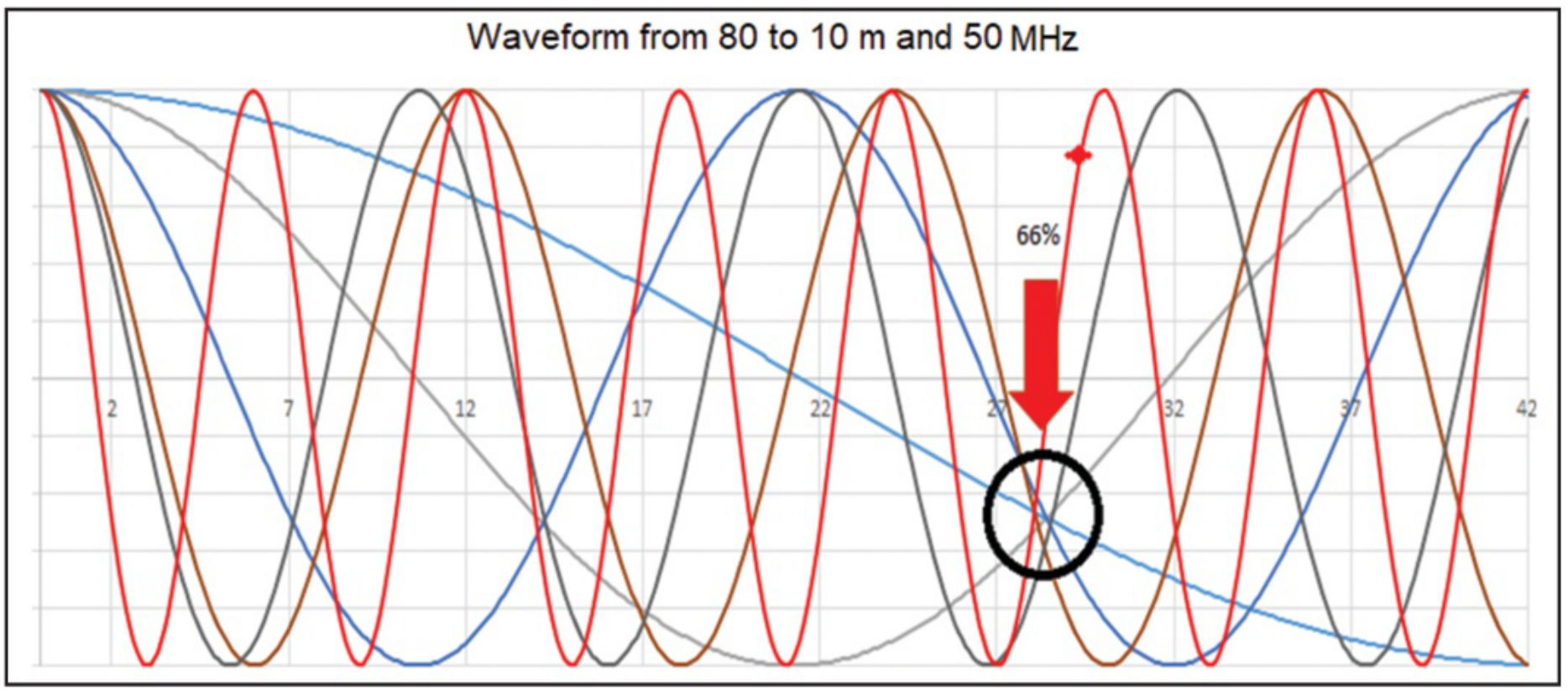


Figure 3. The 50-MHz waveform (red) also passes close to the 66% point.

myself as a challenge was to characterize it for that band. If the distribution of the 50-MHz waveform is plotted together with the signals shown in *Figure 1*, the following results (seen in *Figure 3*) are observed: The waveform of the 50-MHz signal (in red in the figure) also passes very close to the point of interception of the other waveforms (66%, already typical of this type of antenna).

In other words, the impedance at the feed point for the 50-MHz band has a value very close to the impedances of the remaining HF bands. This was the first clue I had to get excited about using this antenna on 6 meters.

The only things missing were the calculations of other parameters such as gain, impedance, etc., and for this a simulation was carried out with the Mmana v.3.0.0.31 software. The results are shown in *Figure 4*.

Note the following from *Figure 4*:

1. Impedance at the feed point is close to 200 ohms, which matches very well with 50 ohms and a 4:1 balun.
2. The inductive component is low (barely 90 ohms), which can be eliminated with an antenna coupler.
3. The SWR is also very low and can be brought to an optimal level with a coupler.
4. The gain of the antenna is 14.5 dBi, equivalent to a Yagi with 6 or 7 elements.
5. The radiation angle is very low, which is very good for DX.

I have to confess that the results surprised me. That's when I decided to get the radiation patterns. It can be seen from *Figure 5* that this is an antenna with many radiation lobes for many places, practically for the 360° of the circumference, and that makes it omnidirectional. Just what I was looking for to make CQ calls when the band opens up.

In addition, in the vertical radiation pattern (*Figure 6*), some peaks with very low angles (marked with arrows) are very opportune for DX, in my case directed towards Europe, Western Asia, Eastern Asia, and North Africa. In other words, communication with Japan was guaranteed. I just had to wait for the appropriate band opening (this is 6 meters, after all!).

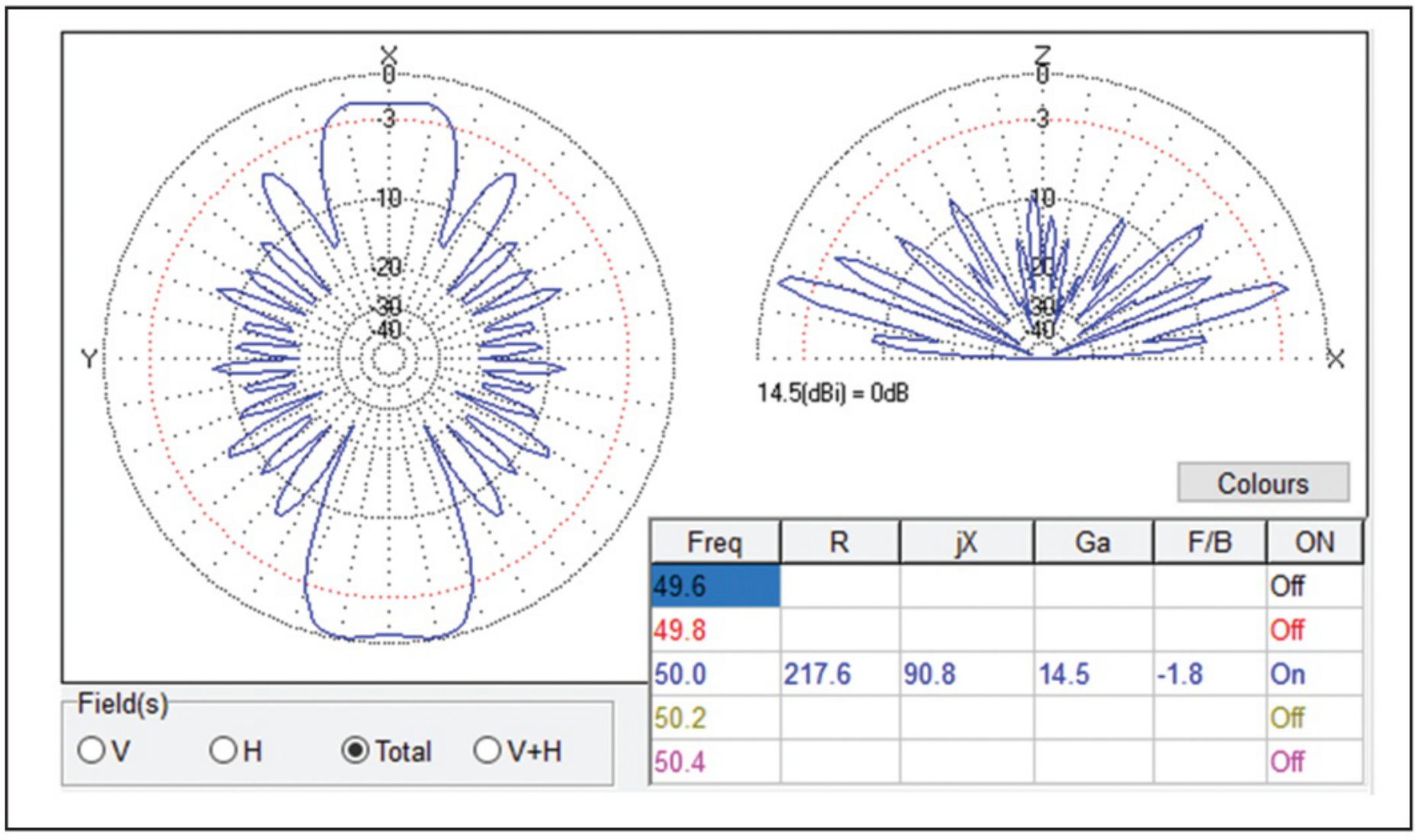
QSOs

Table 1 shows the contacts made one day during an opening with East Asia. The FT8 contacts were made dynamically and sequentially (report, response report, RR73m and 73), without the need to repeat frames. The countries contacted on this occasion were Hong Kong, Taiwan, and China.

If the vertical radiation pattern is superimposed with a map centered on Bolivia[3] (*Figure 7*), it is observed that indeed some of the strongest lobes are directed toward the contacted region, which surely coincided with an opening of the Magic Band that day. The approximate distance of these QSOs was 19,000 kilometers (11,800 miles). All the contacts were made with a FT655s transceiver, with 100 watts of power and an MFJ 6-meter tuner, Model MFJ-

F (MHz)	R (Ohm)	jX (Ohm)	SWR 50	Gh dBd	Ga dBi	F/B dB	Elev.	Ground
50.0	217.6	90.77	5.15	---	14.51	-1.78	17.0	Perfect

Figure 4. Simulation results with Mmana V.3.0.0.31.



Freq	R	jX	Ga	F/B	ON
49.6					Off
49.8					Off
50.0	217.6	90.8	14.5	-1.8	On
50.2					Off
50.4					Off

Figure 5. Windom radiation patterns for 50 MHz.

announcements

(from page 2)

TROY, MICHIGAN — The L'anse Creuse Amateur Radio Club will hold its 49th Annual Swap & Shop from 8 a.m. to noon, Sunday, December 4 at the Balkan American Community Center, 1451 E. Big Beaver Road. Contact: Russ Price, N8HAR, <n8har1977@gmail.com>. Website: <www.n8lc.org>. VE exams.

PLANT CITY, FLORIDA — The Florida Gulf Coast Amateur Radio Council will hold the 47th Annual Tampa Bay Hamfest and the 2022 ARRL West Central Florida Section Convention from 1-6 p.m., Friday, December 9 and from 8 a.m. to 4 p.m., Saturday, December 10 at the Strawberry Festival Grounds-Expo Building, 301 N. Lemon Street. Website: <www.tampabayhamfest.org>. Talk-in 147.165+ (PL 136.5). VE and commercial exams, DXCC / WAS / IARU / VUCC card checking.

MINDEN, LOUISIANA — The Minden Amateur Radio Association will hold the MARA Christmas Hamfest from 8 a.m. to 2 p.m., Saturday, December 17 at the Minden Civic Center, 520 Broadway. Website: <http://n5rd.org>. Talk-in 147.300. VE exams.

JANUARY 2023

LOCUST FORK, ALABAMA — The Blount County Amateur Radio Club will hold Freezefest 2023 from 8 a.m. to noon, Saturday, January 7 at the Locust Fork High School Cafeteria, 155 School Road. Website: <http://w4blt.org>. Talk-in 146.700- (PL 91.5). VE exams. Contact: Jack (407) 443-1963.

ORLANDO, FLORIDA — The K4KDI Winter Tailgate 2023 will be held on 6 a.m. to noon, Saturday, January 14 at the South Conway Road Baptist Church, 6099 S. Conway Road. Website: <https://k4kdi.square.site>.

PONCHATOULA, LOUISIANA — The Southeast Louisiana Amateur Radio Club will hold the SELARC 41st Annual Hammond HamFest from 8 a.m. to 4 p.m., Saturday, January 21 at the Ponchatoula Community Center, 300 N. 5th Street. Contact: Tyrone Burns, N5XES, (985) 687-2139. Email: <wb5net@arrl.net>. Website: <www.selarc.org>. Talk-in 147.000- (PL 107.2). VE exams.

QUARTZSITE, ARIZONA — Quartzfest 2023 will be held from Sunday, January 22 through Saturday, January 28 at Bureau of Land Management property outside Quartzsite. Contact Kristyn Weed, KR1SS, <KristynWeed@gmail.com>. Website: <www.quartzfest.org>.

ROYAL OAK, MICHIGAN — The Hazel Park Amateur Radio Club will hold its 55th Annual Swap & Shop from 8 a.m. to noon, Sunday, January 22 at the Royal Oak Farmers Market, 316 E. Eleven Mile Road. Email: <hazelparkswap@gmail.com>. Website: <www.hparc.org>. Talk-in 146.640 (PL 100).

COLINSVILLE, ILLINOIS — The Saint Louis & Suburban Radio Club will hold Winterfest 2023 from 8 a.m. to 1 p.m., Saturday, January 28 at the Gateway Convention Center, One Gateway Drive. Website: <http://winterfest.slsrc.org>.

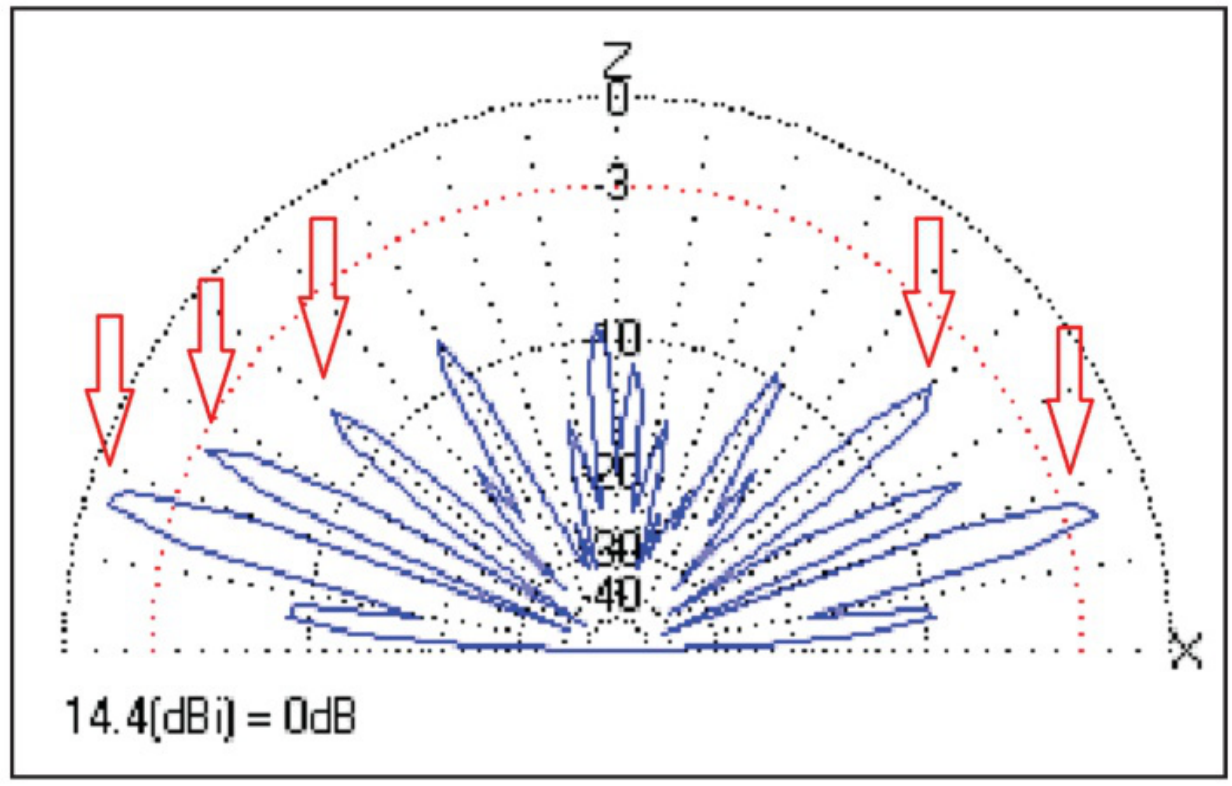


Figure 6. Low lobes in the vertical radiation pattern.

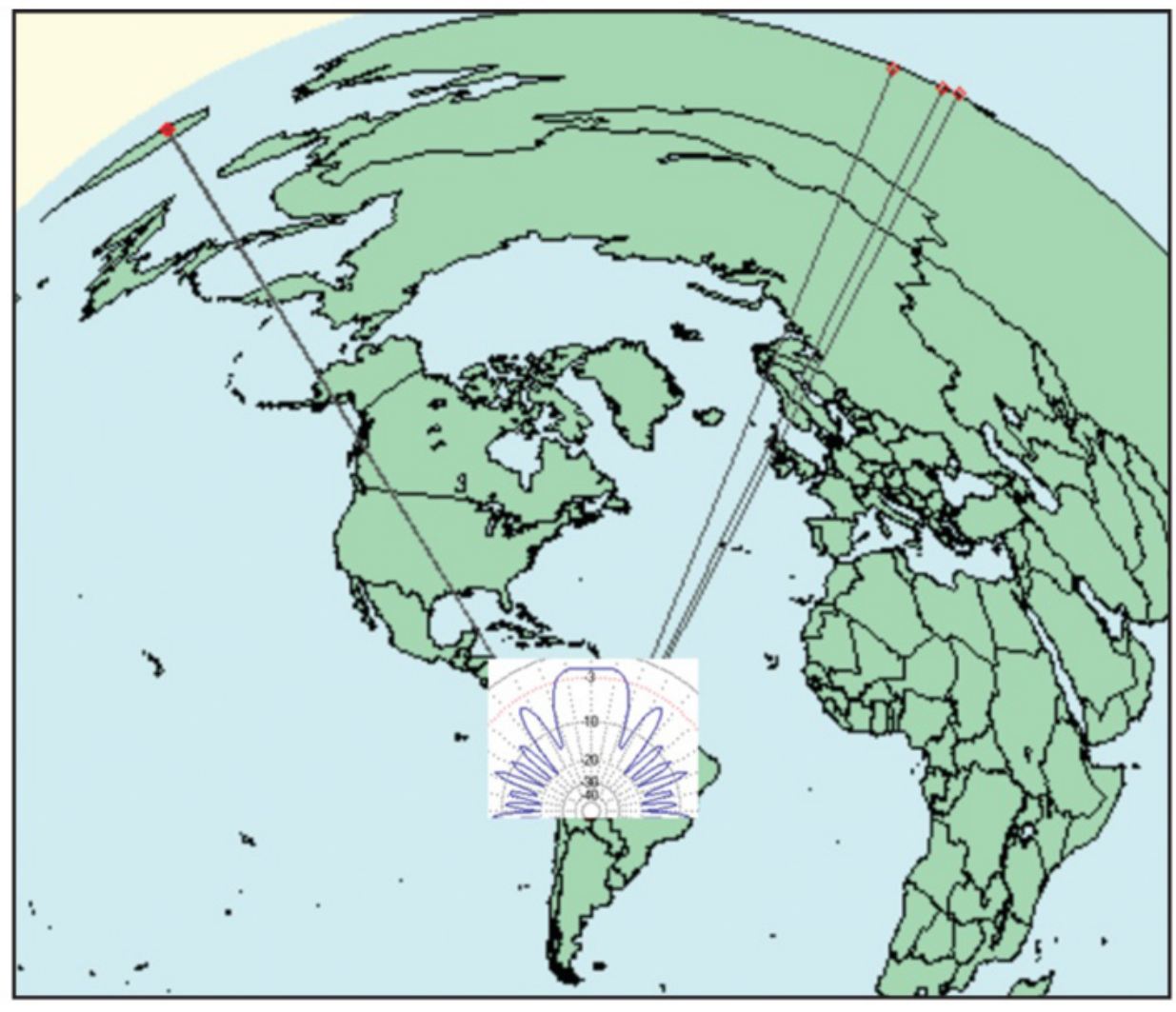


Figure 7. Map with superimposed vertical radiation patterns.

906. The widespread opening lasted about two hours.

Conclusions

The Windom antenna for 80 meters can work fine in the 50-MHz band. Contacts in all directions (360°) can be guaranteed, depending on the directions of the band openings. With only 100 watts, contacts can be made up to 19,000 kilometers away.

Recommendations

I recommend this approach, above all, for those people who have large plots of land but cannot make large investments of money in antennas.

Notes:

1. <https://tinyurl.com/mr2rk92n>
2. <https://tinyurl.com/4hhnz9j8>
3. <https://tinyurl.com/5276rwez>

math's notes

BY IRWIN MATH,* WA2NDM

Fusion Cooking in Amateur Radio?

This month I have something quite different for you, so please bear with me. I am sure that many of you are familiar with the topic of "fusion cooking," which describes converting a food that has been a "standard" staple for many years into something the "experts" consider real progress. An example of this is the so-called "pizza-bagel" which takes a delicious bagel, normally eaten with cream cheese and lox (smoked salmon) or butter, into a creation that uses tomato sauce, mozzarella cheese, etc. to "create" a unique new "modern" treat. Or, what about a "croissant-wich" which takes a delightful delicious French croissant, cut in half and then used to make a sandwich with God-knows what inside — sacrilege! I, for one, consider these not necessarily clever or progressive but actually examples of encouraging those who are not familiar with either bagels or croissants to never even attempt to know (or enjoy) what the originals actually taste like. What a loss!

In this vein I also believe that this type of "fusion-cooking" approach has its rough counterpart in our hobby that I have come to call "fusion-amateur radio." Let me explain. Those old timers among us are well aware of the technique of dipping and loading a final, adjusting coupling to achieve a low SWR in order to obtain the maximum output between a transmitter and an antenna, experimenting with all sorts of circuits, antennas, and other approaches as well as even using a spectrum analyzer to see what is happening on either side of the transmitting or receiving frequency. Well, with the new "fusion-rigs," everything is done for you at the push of a button (and obviously for a "fusion" price). For an amateur radio rag chewer or contest addict who only wishes to talk or make the most contacts he or she can, which constitute a significant part of the hobby, these advantages are probably considered OK and even welcomed. The other part of the hobby in which technically-oriented amateur radio operators actually want to learn, experience and understand what is really going on between the microphone / key and antenna, is then short-changed. What have they learned, or for that matter, experienced from a fusion rig? It is almost like saying that if you never get burned with a soldering iron you may never truly understand what soldering really is.

I know that there will be many of you who probably think I am backward in thinking or even in the process of developing Alzheimer's and I do understand your thoughts. However, I know personally that the thrill of amateur radio started for me when as a youngster I made my first contact with a rig I built from scratch, copying, and trying to understand a schematic diagram from an article written in an old magazine which I did not quite understand (not to mention getting soldering burns along the way). This experience was what introduced me to a hobby that I still love and have loved (and have written about) for a good portion of my life. Although I can now afford the bells and whistles of today's "modern" state-of-the-art rigs and do not have to actually understand technically what I am doing, I can also communicate with a modern cell phone and basically do the same or similar thing, especially if I dial numbers at random and hopefully reach others having similar desires. Knowing what is going on inside the phone electrically is not necessary or even important in this case.

Please understand that I have no problem with modern amateur radio equipment and their manufacturers. In fact, I truly respect, marvel and am certainly very glad to see just how clever and creative people can be. Neither do I suggest that we go back to the days of spark coils and vacuum tubes, but I also think that it is important to at least understand what the "originals" actually were in order to respect what forward-looking designers (including amateurs in many cases) were and are able to achieve. Then one can truly appreciate where we have come from, where we are heading and intelligently decide what path (or paths) he or she wishes to follow.

As a final comment, if I have offended anyone with the above, I truly apologize. It is just one man's point of view. Your comments are welcome.

– 73, Irwin, WA2NDM

**c/o CQ magazine*

the listening post

BY GERRY DEXTER

Good News: The WRTH Lives On!

~ We've been rescued! Pulled out of our funk by a German organization called the Radio Data Center, which moved into the breech and bought the rights to World Radio Publications, the publishers of the *World Radio TV Handbook* (WRTH). Further, the organization plans to continue publishing the *Handbook*, beginning with a 2023 edition. No official announcement has been released yet, but they already have a website <www.wrth.org> so the move appears pretty solid. As Gabrial Heater used to say on his nightly Mutual Radio broadcast, "Ah ... there's good news tonight."

~ There appears to have been some recent activity from Radio Congo, Brazzaville, in the Republic of the Congo. This from a Spanish DXer who notes what he believes is them on 6115 kHz closing abruptly at 1843 UTC. He has heard African music and commercials; both contents were consistent with his previous logs. That's all fine for Spain, but the 1800 hour doesn't help us in the U.S., propagation-wise.

~ Speaking of QSLs (which we weren't), Radio Free Asia has announced the release of its 26th anniversary QSL card. The new "Giving Voice to the Voiceless" QSL will confirm reports to Radio Free Asia, 2025 "M" Street, Suite 300, Washginton DC. Or you can send email requests to <qsl@rfa.org>.

Listener Logs

Remember, your shortwave broadcast station logs are always welcome. But please ensure 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.

ALASKA—KNLS via Anchor Point on 9795 with man and woman speaking in English and a pop number at 1202. (Sellers, BC)

ALGERIA—Radio Algerienne on 7200 via Bechar at 0435 with Arabic songs. (Sellers. BC) At 0500 with 5+1 time pips and a man reading the news in Arabic, off at 0504. (D'Angelo, PA) On 9585 via France in Arabic at 2259, off at 2300. (Taylor, WI)

AUSTRALIA—Reach Beyond on 9610 via Kununurra at 1230 in Hindi. (Brossell, WI)

ASCENSION ISLAND—BBC North Atlantic Relay on 7345 at 0636 with an interview. (Sellers, BC)

BOTSWANA—Voice of America Relay on 4930 via Mopeng Hill at 0510 with woman hosting a magazine program. (Barton, AZ) On 5925 at 0344 interview-

Radio Algerienne's Chaine 3 network was the first to be relayed by the new Bechar site.

One of the ultra-modern studios / control rooms at Radio Kuwait.

*c/o CQ magazine

ing a writer. (Sellers, BC) On 15580 at 2013 with U.S. and Afro pop music. (Brossell, WI)

CANADA—CFRX via Toronto on 6070 at 0731 with an interview about a movie. (Sellers, BC)

Bible Voice on 15310 via Nauen at 1615 with excited man speaking in Oromo. (Barton, AZ) At 1605. (Brossell, WI) At 1656 in Somali, into possibly Tigrinya at 1700. (Taylor, WI)

CHINA—China Radio International on 7350 via Kashi at 0012 with man and woman hosting English features; on 15600 via Beijing at 0032 with continuous instrumental music in their Portuguese service. (D'Angelo, PA) On 11660 via Kashi in French at 2208; on 11955 via Kunming at 2218 in Tagalog; on 11975 via Mali at 2156 in French; on 15335 via Shijiazhuang in Russian at 1243. (Brossell, WI) On 13685 via the Mali relay at 1922 with woman speaking in Arabic, then closing announcements. (D'Angelo, PA)

COLOMBIA— On 4940 via Macaio with an evangelism format in Spanish at 0942 with woman and romantic ballads. (Taylor, WI)

ENGLAND—BBC, 15435 via Philippines in Korean at 1615. (Brossell, WI)

IBRA Media / Radio Sama on 15510 via Woofferton at 1830 with Middle Eastern vocals, off just before 1900. (Barton, AZ)

FRANCE—Mini Transit Sailing on 13735 via Issoudun at 1509 with man speaking a few words in English, instrumental music at 1530, very weak and closed at 1540. (D'Angelo, PA) (*I think Rich meant the rest was in French. –GLD*)

GUAM—Adventist World Radio on 9895 in Korean at 1239. (Brossell, WI) On 12080 via Agat at 1620 closing in English at the bottom of the hour. (Barton, AZ)

Trans World Radio / KTWR on 9910 via Agana ending Mandarin at 1212 with station ID, and contact information then off, sked says there should be English at 1215. (Sellers, BC) On 15200 at 1606 in Ukrainian. (Brossell, WI)

HAWAII—WWVH on 15000 via Kokole Point at 1259 with a woman giving full station ID + address, WWV was just audible underneath. (Taylor, WI)

INDIA—All India Radio on 11560 via Kingsway at 1149 in Tibetan with woman talking for over 10 minutes; CNR-1 jammer was not in harmonic with 11610 on this day. (Taylor, WI) On 15030 via Bengaluru in Dari at 1456. (Brossell, WI)

JAPAN—Radio Japan on 7355 via Yamata at 0429 opening sign on, woman reading the news in English. (Sellers, BC) On 11625 via Yamata at 2030 with long talk in Japanese; on 11655 at 1500 with a typical magazine program in Japanese. (Barton, AZ) On 9750 in Japanese at 1236. (Brossell, WI)

Radio Nikkei One on 3925 via Nagara at 1050 with Japanese and English pop music. (Sellers, BC)

Network One on 6055 via Nagara at 0922 in Japanese with local rap, Nikkei Two was way better at 0924. (Taylor, WI)

KUWAIT—Radio Kuwait on 15530 via Kabd at 0458 with Arabic music, sign on at 0500, poor and hard to tell it was English. (Sellers, BC) At 0505-0548, pleased to hear RK in English again with a religious program to 0530, then some music, followed by news in English, but was beginning to fade by 0540. (D'Angelo, PA)

MADAGSCAR—World Christian Broadcasting on 13760 via Majahanga at 0348-0359* with man and a creation segment in English, New Life ID at 0354, then gave English schedule, and a nice vocal selection to close. (D'Angelo, PA)

African Pathways Radio on 11825 with English sign-on at 0400, Bible message, and music. (Sellers, BC) On 11965 via Mahajanga with an English health feature at 2022, followed by a Bible for Children series, station IDs. (D'Angelo, PA)

Madagascar World Voice / Radio Feda on 13670 via Majahanga in Arabic at 1915. (Brossell, WI)

MALI—Radio Mali via Bamako on 5995 at 0653 in French, local music, possible news headlines at 0701. (Sellers, BC)

MEXICO—Radio Educacion via Mexico, D.F. on 6185 at 0100 with mariachi music. (Barton, AZ) At 0728 in Spanish with upbeat instrumental music, man and woman giving the station ID at 0733. (Sellers, BC)

NETHERLANDS—The Mighty KBC on 9925 via Nauen at 0102 hosting program on vintage Euro pirates, playing rock and airing ads for various KBC imports, began closedown at 0056. (D'Angelo, PA)

NEW ZEALAND—RNZ Pacific on 7245 at 0802 with news in Pidgin; on 9700 at 0645 interviewing a reserve bank executive. (Sellers, BC) On 15720 via Rangitaiki at 0448 on an increasing number of dog attacks there. (Sellers, BC)

NIGERIA—Voice of Nigeria on 7255 via Abuja in Hausa at 0630 with wooden drum, talk. (Sellers, BC)

NORTH KOREA—Voice of Korea on 11735 in Korean at 1239. (Brossell, WI) On 12015 at 1530 with patriotic music and man speaking in Russian. (Barton, AZ)

KCBS on 3250 with long talk in Korean at 1215; on 3320 ditto at 1216. (Barton, AZ) On 6099.9 via Kujang in Korean with DPRK opera at 1021. (Taylor, WI)

OPPOSITION—Furusato No Kaze (Japan to North Korea) on 9705 at 1450 in Japanese with woman hosting program of lively pop music. (Barton, AZ)

Echo of Hope (South Korea to North) on 9095 with long talks in Korean at 1030, changes to 9100/9105 each Monday morning here. (Barton, AZ) On 9105 with man speaking in Korean and harmonics on 3985, 4890, 5995, 6350 (irreg.) to 1109, 6250 was missing. (Taylor, WI)

National Unity Broadcasting Station (via Taiwan to North Korea) on 7200 at 1219 with woman and upbeat talk in Korean, light vocal, interview with man. (Taylor, WI)

Radio Free North Korea (via Uzbekistan to North Korea) on 11510 at 1317 with woman speaking in Korean and interview with man. (Taylor, WI)

Radioni Dirree Shaggar (via France to Somalia) on 15415 at 1609 in Somali. (Brossell, WI)

PERU—Radio Logos via Chazuta on 4810 in Spanish at 1039 with low key talk, woman joining him around fade out. (Taylor, WI)

PHILIPPINES—Far East Broadcasting on 9795 via Iba in Vietnamese with preacher at 1109. (Sellers, BC) On 12055 via Bocaue at 0001 in Lu and female vocals in Lahu and almost Pacific-Island type music at 1045. (Barton, AZ) In Khmer at 1255, Southeast Asian music, male announcer, then Cambodian instrumental music. (Taylor, WI) On 9920 via Ibo in Bahnar at 1245; on 12095 at 1225 in Mien. (Brossell, WI)

PIRATES—Pirate Radio Relay Network on 6950 upper sideband (u) at 2341 with drums, singing, sound effects, hard rock guitar and more drumming before going off at 2349, station ID from HFU. Free USB on 6925u at 0130 with variety of rock, pop music, and with some slow-scan TV (SSTV). Thunder Chicken on 6930u / 6932u at 0032 / 2138 with segued jazz vocals, SSTVs, station ID at 0143. Bad Dog Radio on 6925u 0125 hosted by Uncle Bob with some political flavor, SSTVs. (Taylor, WI)

WDOG on 6950u at 0111 with rock, progressive rock. QRM Radio on 6950u at 2243 weak with rock under noise, SSTV/FAX, and more of it at 2318. (Hassig, IL)

The antenna field at WWVH, Hawaii, WWVs sister station in the Pacific.

PREVIOUSLY REPORTED—Clever Name Radio, Sycko Radio, WHIZ, Radio Free Whatever, Ballsmacker Radio, Wolverine Radio, Captain Morgan, WDDR, Corn Desert Outpost, WTF Radio Worldwide, Mix Radio Intl.

SAO TOME—VOA Relay on 6080 via Pinheira with news in English at 0407. (Sellers, BC)

SAUDI ARABIA—Al-Azm Radio on 11745 via Jeddah at 0032 with male and female announcers and a discussion in Arabic, some nice vocals at 0042. (D'Angelo, PA)

SINGAPORE—BBC Far East Relay on 9410 via Kranji at 1117 discussing native American actors. (Sellers, BC) On 11695 via Kranji at 1207 with a piece on Pelosi's trip and other news items. (Taylor, WI)

SOUTH KOREA—KBS World Radio on 6015 via Hinminjok in Korean at 1053 with low-key DJ with possible station ID at the top of the hour. (Taylor, WI) On 15575 via Kimjae with IS at 0157 opening in Spanish, theme music, Korean tips. (Barton, AZ) At 1456 with man speaking in Korean and news. (D'Angelo, PA)

SRI LANKA—Sri Lanka Broadcasting Corp. on 11905 via Trincomalee at *0028-0055* with O/C, drums, vocals, woman giving announcements and program of vocals. (D'Angelo, PA)

TAIWAN—Radio Taiwan Intl. on 9555 via Paochung in Mandarin at 1227. (Brossell, WI) On 13590 via Paoching at 2300 with station ID and woman speaking in Korean. (Barton, AZ)

THAILAND—Voice of Thailand on 9390 at 1200 with time pips, English sign on, female announcer. (Sellers, BC) On 15590 via Udon Thani at *0000-0029* with English news, usual station IDs, ads, promos. (D'Angelo, PA)

TURKEY—Voice of Turkey on 9830 with news at 2204. (Brossell, WI)

UNITED STATES—VOA on 13755 via the Northern Marianas relay in Mandarin at 1453; on 15119 via the Philippine Relay in Mandarin at 1432. (Brossell, WI)

Radio Free Asia on 11570 via Kuwait Relay in Tibetan at 1209. (Brossell, WI)

RFE / Radio Liberty on 15255 via the Thailand relay in Tajik at 1435; on 15310 via Woofferton in Uzbek at 1444. (Brossell, WI)

Mashaal Radio on 15365 via Thailand relay in Pashto at 1246. (Brossell, WI)

WJHR via Milton on 15555 at 1947 with preacher taking show and taking questions from the congregation. (Taylor, WI)

VANUATU—Radio Vanuatu via Port Vila on 11835 third harmonic with island music at 0804, just beginning to fade in. (Sellers, BC)

VIETNAM—Voice of Vietnam on 9840 via Sontay at 1143 ending English news with feature on concerts. (Sellers, BC) On 12020 via Sontay in Japanese at 1220. (Brossell, WI)

ZAMBIA—Voice of Hope-Africa on 9680 via Makeni Ranch at 0440 with man hosting religious program, pop vocals after the hour. (Barton, AZ)

Quien Sabe

Nothing new this month, but I'd remind you to keep an ear on the 9900-kHz area for that periodic mystery Arabic station and that near permanent but still unidentified Colombian / Venezuelan on 4940 kHz.

QSL Quests

Want to get foreign mail? Try these trusted verifiers: Radio Free Asia, Trans World Radio, Adventist World Radio, Vatican Radio, CRI, Radio Taiwan ... even those f***** pirates.

As Time Goes By

Mamore Radiodifusion via Guyamaren, Bolivia, on 4602 kHz at 0243 UTC on June 24, 1972 in Spanish using just 850 watts.

Thank You

Thank you to: Harold Sellers, Vernon, BC; Rick Barton, EL Segundo, AZ; Rich D'Angelo, Wyomissing, PA; William Hassig, Mt. Pleasant, IL; Mark Taylor, Madison, WI; and Robert Brossell, Pewaukee, WI.

Until next month, keep on keepin' on and Celebrate Shortwave!

emergency communications

BY JOHN FERGUSON,* K3PFW

Planning

Plans are nothing, planning is everything.
–General Dwight D. Eisenhower

The quotation above has been around in several versions, with "Ike" himself repeating it differently several times. No, it is not a contradiction, but a very definitive statement on the difference between "things" and "actions." To add value to this premise, Prussian Field Marshal Helmuth von Moltke is given credit for the oft quoted phrase, "No plan survives first contact with the enemy." Things are fragile; thoughts, ideas, and mental processes are resilient, and can last forever.

Emergencies by their very nature are unplanned, not necessarily unforeseen. Conditions can develop that are conducive to something happening. It then becomes a "when," not an "if." Think hurricane season which just passed, although technically we are not officially clear until the end of the month. We've had a ringside seat here to Hurricane Ian, rated as a "hundred-year storm." Incidents don't necessarily take our calendars and schedules into account, however, and can be decidedly annoying in that way. Yet our response to same must be organized and planned to be effective.

So, what could happen in your area and how and why should you plan, if the plan may not fit? You will learn from experience, and from talking to others around you, what you might expect. History will tell you a lot, as in "that area always floods when we get heavy rain to the north." Look at what has happened in the past. It provides knowledge of experience. Consider what has been done to mitigate those previous situations. On the other hand, what has happened to make thing possibly worse? What changes have occurred in the last five years and what could happen with some of the new developments, industries, and businesses around where you are? What will your auxiliary communication support group be expected to do or provide, and where? Doing something now, and again next year, and even the year after that, to plan what kind of response you might need to support would be excellent practice, even though you might never get to test the plan. It's the process of planning that is important.

Making a Basic Plan

A first step in the planning process might be considered the "What if?" stage. Analyzing what is and could be an issue that you might have to consider. We are communicators. We don't "put out the fire." That's not our job, and we don't need to figure that part out. We need to develop some ideas as to what and how we will perform our role, and you don't do that in a vacuum. You need to meet with, and work with, the agencies and groups you may need to support, who are probably working on their "What ifs," too.

Nearly all disasters of any size are going to displace people from their homes, and require that the response and recovery agencies, both government and non-government (NGOs), open shelters. State, county, and city governments, the Red Cross and the Salvation Army are all involved in the sheltering process. This is a common occurrence across the range of bad things that can happen, from fires to floods and hurricanes; and a good place for hams to help. But how and when, with what and whom? Asking questions, of yourself, others, and managers in the agencies responsible for opening the shelters, will get you a whole lot of information.

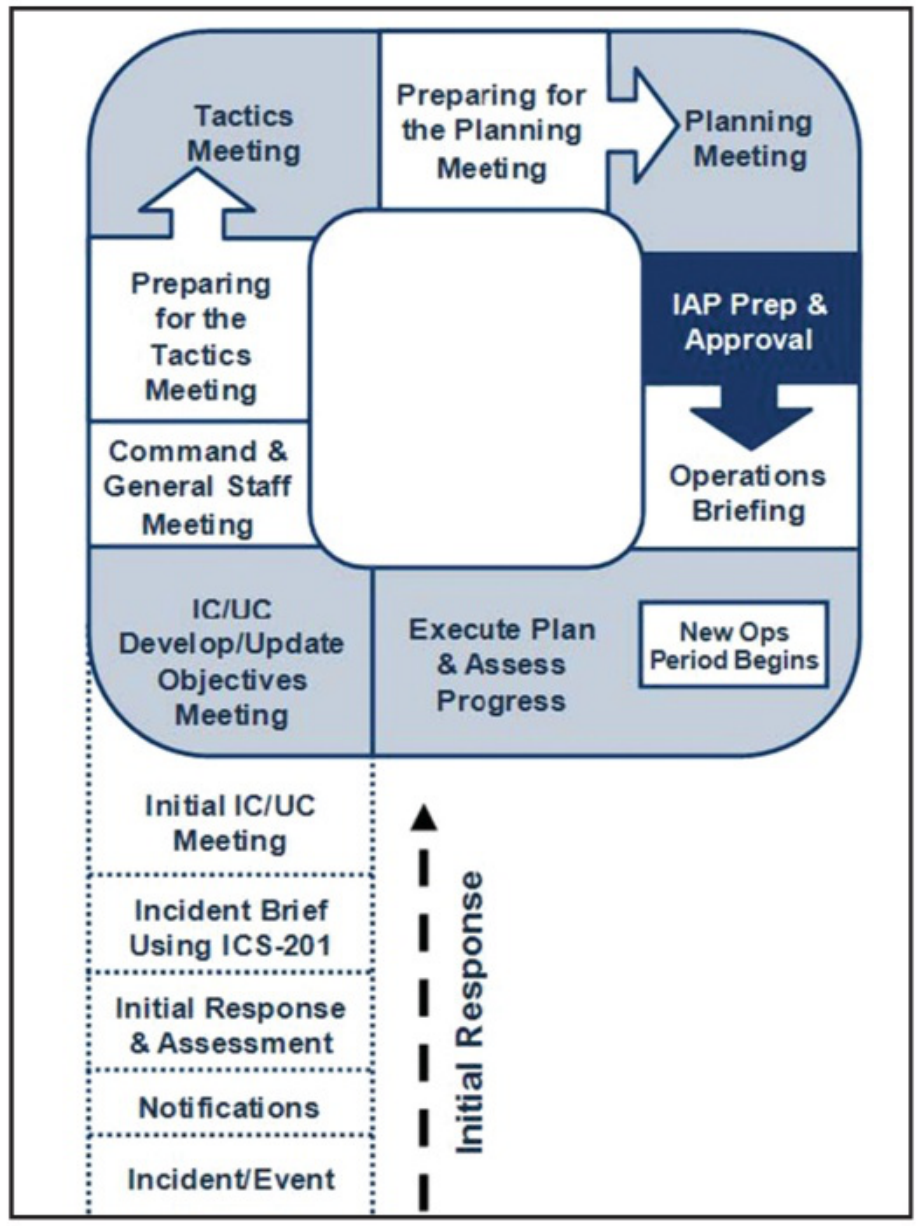


Figure 1. The "Planning P." cycle then repeats itself until the incident is successfully resolved.

Now you need to take the information that you've learned and start working on your plan. In this exercise, the overall objective is to provide communication for a shelter. What kind of information will need to be exchanged between locations will be the first issue to solve. If the disaster is large and the sheltering activity will be ongoing for multiple days or weeks, be prepared to handle a bunch of health and welfare traffic. What will be your primary objectives be, and what kind of strategy will be needed? Keep in mind as you develop your plan that what you are looking at now may not be exactly what you will face later. For the first draft, keep it broad; don't get bogged down in details.

Next, when you have a draft plan, share it with your people and the agencies you will be supporting. Get feedback.

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Politely accept criticism. Then re-draft the plan. When you think it's ready for what may come, this would be a good time to test it in a simulation. A table-top exercise would be a good place to work out any remaining kinks. Most agencies will eventually hold full-scale exercises to test their readiness. Try to be included. These types of exercises don't happen often, due to the expense involved. After you have had a chance to test the plan, in an exercise or during the real thing, evaluate how well it worked, and what revisions might be necessary.

For something like a shelter communication support incident, you know basically what you are going to do and where you are going to do it; the only change might be the "who." But what happens if we now get into an extended operation that might drag on for days? Your plan will now be folded, spindled, mutilated and stretched, and you will have new issues to work out. Planning is an active verb.

Disasters don't come just from Mother Nature. You might also consider doing some "what ifs" on technology failures. Think through what the loss of internet service over a wide area might be like. We all get upset when we can't get to our email or surf the net for an hour or so. Regional power failures (remember Texas in the winter of 2021?), think about the impact if that went on for three or four days? Next month the featured topic for *CQ* will be technology. This column will be looking at technology from a different angle, such as how we deal with the loss of it, and what can you do with it.

Incident Command System Planning

At the center of the success and effectiveness of the Incident Command System (ICS) is the planning process. All response and recovery operations should be managed under the ICS because it is mandated by FEMA. We, as providers of auxiliary communication support, must be aware of the aspects of the ICS and comfortable with their application, and the planning process is a critical part. Getting the basic ICS training from the FEMA Emergency Management Institute (EMI) online courses is not only a great way to learn about the ICS but is a requirement for volunteers in almost all situations. Taking advantage of the free courses available on the EMI course list is a great way to increase your knowledge in a whole range of disaster related subjects.

The ICS "basic four" are the minimum requirements for most volunteers:

- IS-100: Introduction to the Incident Command System
- IS-200: Basic Incident Command System for Initial Response
- IS-700: An Introduction to the National Incident Management System
- IS-800: National Response Framework, An Introduction

The ICS is an amazing, scalable system for managing just about anything, but exceptional when facing an emergency or disaster situation. From the initial response through the recovery process, there is an ongoing continuous planning process that keeps everything focused on getting results. At the center of this is the "ICS Planning P" (*Figure 1*). The ICS planning process develops the Incident Action Plan (IAP) and every managed incident will have one. It can be as simple as a single sheet of notebook paper, handwritten for a small incident, or it can be several notebooks thick for a major public event. The event will be broken into separate operational periods, and there will be a planning process for each period. This is where the "Planning P" comes in.

For the sake of clarity, although the terms are frequently used interchangeably, we will call an unscheduled emer-

gency response to something an “incident” and the response to a calendar-scheduled activation an “event”. The lexicon of ICS tries to avoid double meanings, but sometimes words get used in other situations. A nuclear reactor emergency, for example, is called an event. I sure wouldn’t think that I would want to schedule one.

The initial response to an incident, fire accident, or HAZMAT spill is really more of a reactive response. The response to the incident begins with a dispatch of appropriate units. As the units arrive on scene, the ranking officer begins to direct the activities of the responding units with tactics that experience has shown may work. As things begin to develop, more decisions become necessary. You may have heard the term “size up.” This is the quick overview and decision-making period, maybe seconds to minutes, when the officers in charge use their observations, their training, and their experience to develop tactics and utilize resources. This initial period is where experience is probably more important than training, although the training is necessary and required to work at this level. The stem of the Planning P is where the initial response is occurring and when personnel work to gain awareness of the situation and establish the organization for incident management. The individual in charge of the response is the Incident Commander (IC). This may be the first officer on scene, or a later ranking arrival. For mega-events, the Incident Command, or Unified Command may actually be located away from the action. Unified Command (UC) is best described as a “committee that speaks with one voice.”

Usually, if the plan is a simple one, it can be shared orally with the responders. In the beginning of an incident, the situation can be in chaos and situational awareness hard to obtain, so the IC often develops this initial plan quickly and with incomplete information. If, instead of a two-car accident, where the initial dispatch was for a “motor vehicle accident I 495, north of exit 12,” units arriving on scene find 40 vehicles in a massive pileup, this now enters the lexicon of an “expanding incident.” You gotta hate those, they can ruin your day. Unfortunately, situations like this happen frequently and the smooth transition of the response to ramping up as needed is where the training and discipline of the responding units come into play. Most response type units have outline plans for types of responses that can be called into use as the situation is analyzed. The plan for mass casualty might fit this example. Most response agencies will have several mass casualty plan outlines. That might now trigger mutual-aid agreements with surrounding area units, local hospitals start holding staff and clearing the emergency receiving area, etc. All of this is still technically in the initial response stage. As the incident management effort grows, additional lead time, more staff, information systems, and technologies are brought into play and will enable more detailed planning. Those in the planning process have a voracious appetite for hard information. Numbers, facts, credible observations; these all need to be communicated back to the planning team members.

The steps for the formal planning process are essentially the same as for the first responders on-scene determining initial tactics and for personnel now developing the formal written IAPs. The incident personnel, initially on-scene, perform the steps in the leg of the “P” only one time. Once they are accomplished, incident management shifts into a cycle of planning and operations, informed by ongoing situational awareness and repeated each operational period.

The following are brief descriptions of the meetings and briefings that are repeated each operational cycle until the conclusion of the incident or event. In other words, the staff keeps going around the body of the “Planning P,” until the incident

is over. These points are extracted from the March 2018 Incident Action Planning Process E/L/G 0300 Intermediate Incident Command System for Expanding Incidents, ICS 300 4.

1. Objectives Development / Update: The IC/UC establishes the incident objectives for the initial operational period. After the initial operational period, the IC/UC reviews the incident objectives and may validate them, modify them, or develop new objectives.

2. Strategy Meeting / Command and General Staff Meeting: After developing or revising the incident objectives, the IC/UC typically meets with the Command and General Staff, and sometimes others, to discuss the incident objectives and provide direction.

3. Preparing for the Tactics Meeting: Once the approach to achieving or working toward achieving the incident objectives is determined, the Operations Section Chief and staff prepare for the Tactics Meeting by developing tactics and determining the resources that will be applied during the operational period.

4. Tactics Meeting: In the Tactics Meeting, key players review the proposed tactics developed by the Operations Section and conduct planning for resource assignments. The OPS Section Chief leads the Tactics Meeting, and key participants include the LOG Section Chief, Safety Officer, a Planning representative and other invitees, preparing for the Planning Meeting.

5. Planning Meeting: Following the Tactics Meeting, staff collaborate to identify support needs and assign specific resources to accomplish the plan. The Planning Meeting serves as a final review and approval of operational plans and resource assignments developed during and after the Tactics Meeting. At the end of the Planning Meeting, Command and General Staff confirm that they can support the plan.

6. IAP Preparation and Approval: Based on concurrence from all elements at the end of the Planning Meeting, the Incident Commander or Unified Command approves the plan.

7. Operational Period Briefing: Each operational period starts with an Operational Period Briefing. Incident supervisory and tactical personnel receive the IAP during the briefing. Members of the Command and General Staff present the incident objectives, review the current situation, and share information related to communications or safety. Following the Briefing, supervisors brief their assigned personnel on their respective assignments.

kit building

BY JOE EISENBERG,* K0NEB

Holiday Gifts for Builders

With fall's chill in the air, we know that the holiday shopping season is upon us. So, whether you are shopping for a fellow kit builder or leaving hints for someone who might be shopping for you, here are a few suggestions to make the gifting process go a lot easier.

Heating Up Winter's Chill

As Tim Allen would say, "It's Tool Time." With surface-mount (SMD) components becoming more common in kits as well as surplus PC boards being plentiful containing surface-mount parts, a heat tool is very handy. For a long time, I have used one sold by Hobby Lobby for ink embossing for about $20, but the main drawback is the lack of temperature control as well as a very broad heat and air output. For many years, hot air rework stations have cost in the order of several hundred dollars, making them out of reach for the typical kit builder.

But just as low cost HTs invaded the amateur market, so have low-cost soldering tools. The LRT 8868 Hot Air Rework Station combines a digitally temperature-controlled hot air tool with a digitally controlled soldering iron. All of this for around 40 bucks. When using this tool to remove or solder in place a SMD part, the hot air tool is used to concentrate heat on the small area of the PC board in question. Soldering SMD parts can be done using solder paste, with is really a mixture of solder and flux into a greyish paste delivered by a syringe. When I am using a hot air tool to solder a part, I place tiny "mouse droppings" of solder paste on those spots and use a pair of tweezers to place the part on those pads before applying heat. This tool comes with three different sized nozzles to control how much of the PC board will be heated.

Applying heat to those pads allows the flux to melt and the solder to begin to flow and do its magic. Often, it is difficult to control exactly how much solder paste comes out of the syringe onto the pads, and that results in some pads having solder bridges. The LRT 8868 has a soldering iron attached that has a variety of tips, including a very sharp conical tip, ideal for working with SMD components. By holding the soldering iron tip horizontally across the pads that are unintentionally bridged, the excess solder can be drawn to the tip and taken away.

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The LRT 8868 has both a digitally controlled heat tool and a digitally controlled soldering iron. The kit comes with two sets of tweezers, five different soldering tips, three different heat nozzles, some solder wick, a tip cleaning sponge, and a sample-sized roll of solder.

The soldering and heat tools plug into the base.

Because this tool doesn't have a heavy transformer, it can be easily transported to use for group kit building. Each side has independent temperature control, and I found setting the soldering iron to 300° C and the hot air tool to 400° C worked well. There is a cradle for the hot air tool as well as for the soldering iron. Placing the hot air tool into the cradle begins a programmed cooldown process. The kit comes with five additional soldering tips of various sizes and shapes as well as three different size heat nozzles, two different types of ESD-protected tweezers, a roll of solder wick, and a tiny roll of solder. A small soldering tip cleaning sponge is included as well, although the tool has no place to put the sponge.

When desoldering a SMD part, I simply heat it with the hot air tool while holding on to it with tweezers and carefully lifting it off the board as soon as it completely loosens up. The hot air tool can also be used to shrink heat-shrink tubing. It doesn't say what kind of solder is supplied with it, but it is a very small amount. I highly recommend using 63/37 solder, rosin core no clean for best results when soldering kits. Building the Four State QRP Group's 4S-Dummy Load kit as I featured in the July 2022 issue is a great way to practice using this tool to assemble an easy SMT-based kit.

You can find this low-cost hot air rework station along with a multitude of similar tools on Amazon. The link for this item is: <https://amzn.to/3cSKpSt>. The LRT 8868 sells for $39.99 and is shipped free if you are a member of Amazon Prime, and often in just a day or two.

The 63/37 solder is available at many electronics stores, such as Microcenter or Harbor Freight. The link for the recommended solder at Harbor Freight is: <https://bit.ly/3Qlh0hj> and it sells for $19.99 for a half pound roll. Remember that Harbor Freight often puts out coupon deals including 20% off, so watch for those when shopping for soldering irons and solder there.

Light the Night!

When building kits, adequate lighting and magnification are a must. Using a type of light that accurately illuminates things like resistors helps eliminate errors caused by misidentifying color-coded values. I recommend a light that offers true white light. Some builders prefer a more mellow "warm" white light, which is OK for doing most building, but can sometimes make an orange strip appear brown, etc. But with personal preferences varying, this magnifying light allows you to change the color temperature of the light, allowing bright white for parts identification or a softer light if your eyes prefer for the rest of the project <https://a.co/d/42GT5Z7>. For

Both tools have cradles for safe storage. In addition, cradling the heat tool triggers an automatic cooldown mode. Setting the soldering iron for 300° C and the heat tool for 400° C seems to work well.

$32.99, this magnifying lamp is hard to beat and has full control of the light brightness and color temperature with a control on the cord. It comes with a clamp mount, which is appropriate for a workbench. There are similar lamps available with your choice of mounting platform, either a clamp or a weighted base.

Protecting Against Electrostatic Discharge

Finally, with the cold weather months upon us, there is an increase in static electricity in our homes, especially those of us who live where it gets very cold. Raising the temperature from below freezing outdoors to a comfortable room temperature greatly lowers the relative humidity. Humidifiers help, but aren't always completely effective in preventing damage to sensitive CMOS devices. Having a soldering mat not only helps protect your work surface, it can help in ESD mitigation as well.

Electrostatic discharge can be felt when you touch a grounded object, like a wall switch, etc. Static discharge voltages as low as 30 volts can damage CMOS devices, and these cannot always be felt. This soldering mat not only has heat protection for your work surface, but it also has a full ESD connection set, including a wristband for the user. For $19.99, it is hard to beat this soldering mat. I highly recommend placing a soldering mat in a cookie sheet to also keep your smallest parts from straying. You can find this soldering mat on Amazon at: <https://a.co/d/jhXxJeQ>.

Travel Plans

I look forward to getting a break from the cold weather this season and seeing everyone in Orlando in February at Hamcation® or in Yuma.

– Until next time, 73 de KØNEB

18+

WHAT IS AVAXHOME?

AVAXHOME-

the biggest Internet portal, providing you various content: brand new books, trending movies, fresh magazines, hot games, recent software, latest music releases.

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homing in

BY JOE MOELL,* KØOV

Foxhunting at the Championships in Bulgaria and a Youth Camp in Ohio

It began as a private hunting ground for Bulgarian kings. Now it's a modern ski resort in the Rila Mountains, complete with fine hotels and one of the world's greatest biathlon courses. That's Borovets, located about 25 miles southeast of Sofia, the capital city of Bulgaria.

During the first week of September, Borovets was the site of the 20th World Championships of Amateur Radio Direction Finding (ARDF), hosted by the Bulgarian Federation of Radio Amateurs (BFRA).

These championships were a long time coming. World Championships are normally held in even-numbered years in Europe or Asia. National amateur radio societies make proposals to the International Amateur Radio Union (IARU) ARDF Working Groups in hopes of hosting. A proposal by The Amateur Radio Union of Serbia (SRS) to host in 2020 was accepted back in 2017. The pandemic forced SRS to cancel and reschedule for 2021, but that also became a no-go. It was thought that Covid-19 case counts would be significantly lower and travel restrictions would be lifted in time for another try in 2022, but many Asian countries were still under severe limitations. Korea was the only nation in IARU Region 3 that submitted a Letter of Intent to participate.

Vadim Afonkin, KB1RLI, added to his collection of medals by winning gold in the M50 category on 80 meters at the 2022 World Championships in Bulgaria. (Photo courtesy of BFRA)

Two Dozen Selected

This spring, the ARRL ARDF Team Selection Subcommittee optimistically announced that 24 people were being offered the opportunity to represent the U.S. at the 2022 World Championships. If all had accepted, this would have been the largest ARDF Team USA ever to participate in the World Championships and would have included 17 men, 6 women, and one youth.

Countries in the former Soviet bloc, such as Russia, Ukraine, and the Czech Republic, have traditionally been the big winners at the world ARDF Championships. Most have established national teams that train together all year and whose travels are supported by their governments. In the past, it was not uncommon for these three nations to win over 90% of the medals. But these countries' predominance has lessened as radio-orienteers in more countries, including the U.S., have improved their performances.

By contrast, Team USA members are true amateurs, who train mostly in their home states and pay their own way to all events. That makes our progress in the sport quite remarkable. The last time BFRA hosted the World Championships was 2006 and it was a memorable year for Team USA. Team members reported that the courses were physically and mentally the toughest they had ever encountered. There was also an outbreak of norovirus among the attendees that sidelined some team members.

Despite these adversities, Nadia Scharlau, now KO4ADV, captured a bronze medal in the 2006 80-meter classic event. Stateside radio-orienteers have continued to improve and at the last pre-Covid championships in Korea during 2018, our 11-member team garnered a total of 10 medals. So that set the stage for fierce competition among the European and American radio-orienteers in 2022.

Everything changed on February 24th, when Russian forces invaded Ukraine. The Russian Ministry of Sports considers Serbia to be a "friendly" country, so the Russian ARDF team continued making plans to attend. IARU leaders did not ban the Russians, but competitors from Ukraine and numer-

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ous other countries immediately made it clear that they would not participate if Russians were allowed to be there.

Serbian leaders realized that the greatly reduced attendance due to the war, plus the continued high incidence of Covid and travel restrictions in Asian countries, meant that hosting the championships would not be economically viable for them. On May 9th, SRS announced cancellation of the Serbian events. IARU Region 1 leaders immediately sought another national society to take on the championships on short notice. On June 8th, BFRA stepped forward and offered to host at the Borovets resort on the same dates. Bulgaria had no Covid-related entry and stay restrictions

The matter of Russian or Ukrainian competitors at the World Championships was settled on July 2nd, when the Russian Ministry of Sports announced that the Russian team would not be permitted to attend because, as a member of the European Union, Bulgaria was considered an "unfriendly country" to Russia.

Elizabeth Afonkin was the youngest member of ARDF Team USA at the 2022 World Championships in Bulgaria. Here she is punching in at the finish of a competition on 80 meters. (Photo courtesy of BFRA)

An offset attenuator for foxhunting was an ideal first construction project for the Youth on the Air (YOTA) camp participants. (All YOTA camp photos courtesy Neil Rapp, WB9VPG)

To nobody's surprise, 2022 attendance was off by over 30% compared to the last World Championships in 2018. For the first classic event, the 207 starters included 25 from Ukraine, 33 from the Czech Republic, and 17 from Slovakia. Almost all of the rest were from other European countries. The only competitor from Asia was Inwon Lee, HL2IYI, from Korea. Because of the lateness of the announcements, the difficulties of air travel and concerns about Covid and other illnesses, there were only four members of Team USA: Elizabeth Afonkin (W19), Vadim Afonkin, KB1RLI (M50), Gheorghe Fala (M21), and Alexander Myachin (M50). This was our smallest team since the U.S. first attended the World Championships in 1998.

Triumphing on 80 Meters

As a prelude to the World Championships for national teams, BFRA hosted the World ARDF Cup for individuals from August 24th through 27th. In the 80-meter classic competition on August 26th, Alexander Myachin and Vadim Afonkin, KB1RLI, took second and third place, respectively, finding four required foxes in a 6.1-kilometer route.

With that auspicious beginning, the stage was set for even better news on September 1st in the second classic event of the World Championships. This day featured two full five-fox courses, one on 2-meter AM and the other on 80-meter CW. Groups of competitors in different categories started at 5-minute intervals, some for one band and the rest for the other band. They sought the required transmitters for their category and then rushed to the finish, which was in a different location from the start.

In ARDF, the required foxes may be found in any order. There is a continuous transmitter on a separate frequency near the finish to help those who get lost, lose their map, or break their glasses. Measured point-to-point from start to each fox and then to the finish by the shortest route, the courses for various categories ranged from 4.7 to 5.8 kilometers. But, it wasn't always possible to run point-to-point in these difficult courses.

On this day, KB1RLI triumphed over two dozen other competitors in the M50 category, finding five 80-meter fox transmitters in just 53:04. He was 24 seconds ahead of Zbynek Zacek from the Czech Republic, who took second place. Normally, the M50 category competitors are required to find only four of the five transmitters, but this event was unusual because M21 and M50 were required to

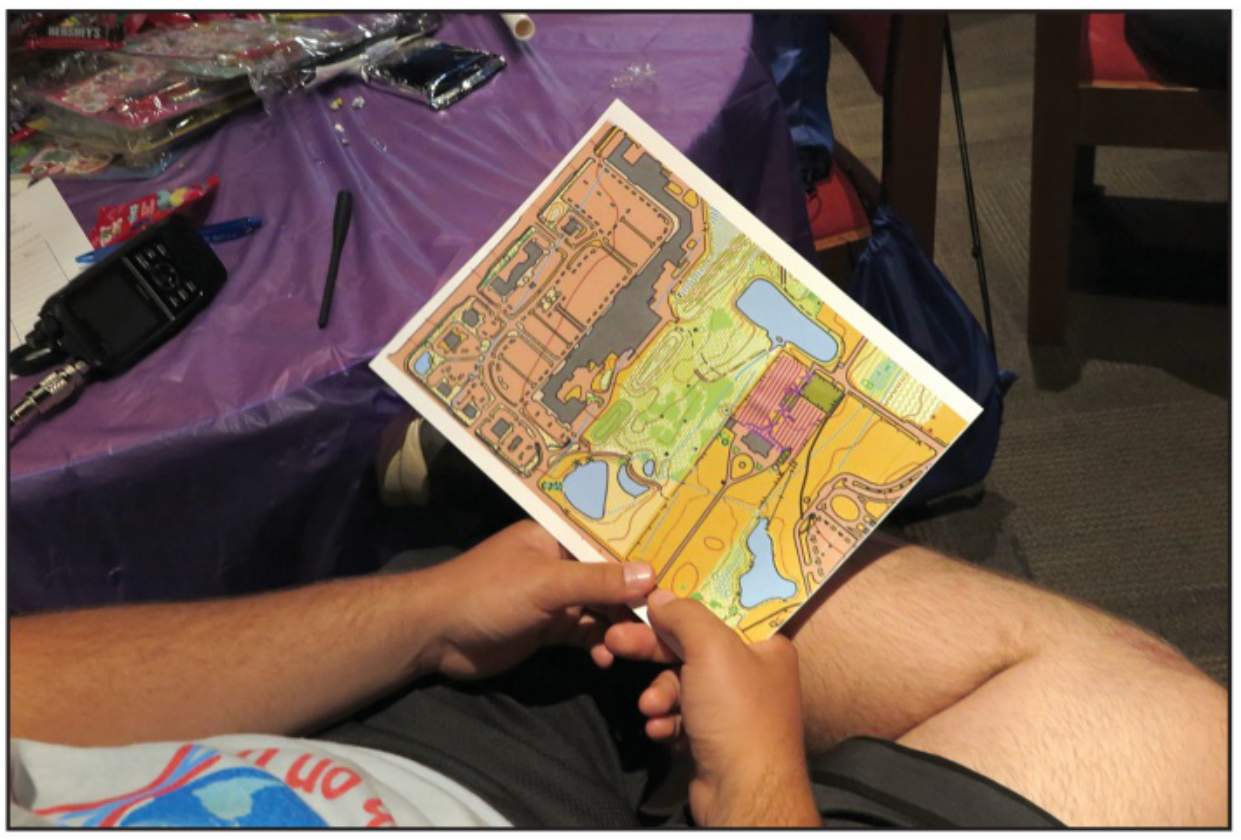
find all five on a course with an optimum route of almost 5 kilometers.

In World Championship classic events, there are medals for the first three individuals in each category. There are also national team awards in each category, based on the aggregate scores of the two or three individual team members. The team members are not permitted to assist each another on the courses. In addition to Vadim's individual gold medal, he and Alexander Myachin captured bronze for Team USA in the M50 team aggregate score standings.

Congratulations to Vadim and Alexander. Another up-and-coming member of the team was Elizabeth Afonkin, the teenage daughter of Vadim, who competed in the W19 category for women ages 19 and under. She did not win World Championship or World Cup medals in Bulgaria, but this was not surprising because so many in her category were considerably older. But back in July 2022, Elizabeth ran in the 15th Balkan ARDF Championship and ARDF Black Sea Cup. There in the W16 category for ages 16 and under, Elizabeth took second place in all four events, which had course lengths up to 4.5 kilometers. Congratulations to Elizabeth!

Here's to even better times next year. Radio-orienteers in the Czech Republic had been originally scheduled to host the World Championships in 2022 and are now on track to put on a make-up championship event at Liberec in the Jizera Mountains during the summer of 2023. Our team members will be selected from best performers at the 2022 and 2023 USA ARDF Championships. Watch for more information in my "Homing In" website[1] and in future columns.

A YOTA camp participant works on her 2-meter measuring-tape Yagi antenna for foxhunting.



YOTA foxhunters were given an orienteering map of the hunt area.

Youth on the Foxhunt

Radio foxhunting was an important part of the second Youth-On-The-Air (YOTA) summer camp near Cincinnati, Ohio from June 12-17, 2022. Headquarters for a week of amateur radio learning and mentoring was the Voice of America Museum in West Chester, Ohio. YOTA is following in the footsteps of the very successful Youngsters-On-The-Air movement in Europe and elsewhere. YOTA camp is for already-licensed hams between the ages of 15 to 25 living in North, Central, or South America.

The Cincinnati area has been a center of excellence in radio-orienteering since 2003, when U.S.'s national ARDF championships took place there. Cincinnati hams have hosted subsequent championships in 2010 and 2017 and have put on a forum and on-foot foxhunt at Hamvention® almost every year. YOTA's ARDF advisor is Bob Frey, WA6EZV, of Hamilton, Ohio. Bob is a frequent medal winner at USA's ARDF championships and has competed at the World Championships four times between 2000 and 2006.

Last year at USA's first YOTA camp, Bob set up a foxoring course on 80 meters. Campers constructed their own 80-meter ARDF sets[2] from kits to use on the course. For 2022, the foxhunting focus was on 2 meters. Campers were invited to build their own measuring-tape Yagis and active attenuators to use connect to ID-52A handi-talkies that were provided to all campers by Icom.

The measuring-tape antennas were the standard WB2HOL design[3] with added coax wrap baluns. Attenuator kits came from 3rd Planet Solar.[4] "I 3D-printed the attenuator board cases from STL files provided by KC9ON," Bob

explained. "With minor exceptions, all of the kits worked very well. Of course, this was the first time soldering for many of the campers, so we had to fix some cold solder joints. R&L Electronics provided cables, jumpers, and connectors to complete the setups."

The kit-building session took place on Monday. On Thursday afternoon, WA6EZV set out a short ARDF course with five QRP transmitters on the grounds. He then gave a presentation on basic direction-finding and navigating skills, handed out orienteering maps, and the hunt was under way. "I started them out at 5-minute intervals and then watched the fun," Bob wrote. "There were 22 on the hunt and they all had a great time, cheered on by the camp staff."

Kudos to WA6EZV for putting on a successful radio-orienteering activity at the YOTA camp. Hat tips also to his helper Jocelyn Brault, KD8VRX and to Camp Director Neil Rapp, WB9VPG.

It's Texas in 2023

Eastern Texas will be the site of the next Championships of ARDF for the U.S. New Mexico Orienteers will host from April 19-23, 2023, using maps provided by North Texas Orienteering Association. The Meet Director will be Jerry Boyd, WB8WFK. Course designers will be Nadia Schlarlau, KO4ADV and Charles Scharlau, NZØI.

Practice, training, and equipment testing will take place on Wednesday, the first day. That will be followed by four days of competitions in sprint, foxoring, and classics (2 and 80 meters). Medals will be awarded for each event in each of the IARU age / gender categories.

All hunts will take place in the 3,026-acre Cooper Lake State Park near Sulfur Springs, Texas. Sulfur Springs is about 95 miles northeast of Dallas-Fort Worth airport. To avoid an advantage of familiarity, anyone planning to participate in these championships may not enter the wilderness areas of the park until the first day of competition. However, the camping areas may be entered via the main roads. Camper, tent, and cabin camping are available and encouraged.

Bulletin One from the organizers[5] has more information about this embargo and the competition schedule. The official event website is being prepared. In the coming weeks, there will be postings there about rules, frequencies, registration, and lodging available by link from the "Homing In" site.

USA's ARDF Championships are open to anyone of any age who can safely navigate in the woods with handheld radio gear for several kilometers. Don't worry if you are inexperienced at radio-orienteering, as this is a chance to learn from experts. An amateur radio license is not a requirement. Mark your calendar and plan to attend.

This is my last call for reports of activities during the CQ Worldwide Foxhunting Weekend back in May. I will be reporting on Foxhunting Weekend in my next column. 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. Also, if your club did foxhunting with Scouts during Jamboree-On-The-Air in mid-October, I want your stories and photos of that as well.

Happy hunting!

Where is it? YOTA camp foxhunters are seeking five hidden transmitters.

YOTA camp staff cheered on the foxhunters.

Notes:
1. <www.homingin.com>
2. <www.sdr-kits.net/R3500D-ARDF-Kit>
3. <https://tinyurl.com/2tc3cru6>
4. <https://tinyurl.com/4t4fmnpx>
5. <https://tinyurl.com/3vmt6yzs>

the ham notebook

TEXT AND PHOTOS BY WAYNE YOSHIDA*, KH6WZ

Maker Faire®, T-Hunting for Fun, and Other Things

It was so great to be a Maker at the recent Maker Faire® Orange County (California)[1,2]. Although it was a one-day only event, there were a lot of visitors and exhibitors. The Orange County Fairgrounds is an excellent venue, with plenty of parking. The location is also a big plus for out-of-town visitors, since there are many tourist attractions in the area, including Disneyland, Knott's Berry Farm, and for hams, Ham Radio Outlet.

But the best news came toward the end of the day: Maker Faire Orange County will happen in 2023. Details, including show dates, are to be determined, but I am already sketching out some ideas for new displays and demonstrations.

There was a short notice on Facebook, and the timing was very tight. I barely had time to enter an application, make my plans, and ensure my projects were working.

Unfortunately, I did not have enough time to create something new, and I barely had enough time to fix some things before the event. But, as they say in the business, the show must go on.

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As always, there were some ham visitors to the Maker Faire, and there was another Maker display featuring ham radio, with a focus on AMSAT (Radio Amateur Satellite Corporation)[3], ARISS (Amateur Radio on the International Space Station), and CubeSatSim[4]. I was glad to see Mike Spohn, N1SPW, and his demonstrations showing how hams can communicate via satellite and talk directly to astronauts aboard the International Space Station (ISS). This is a great idea, presenting a different angle on ham radio's capabilities (*Photo A*).

Maker Faire and ham radio are a great match for many reasons. Not only is it a great venue to demonstrate ham radio, but it can also be used to practice emergency preparedness, network for jobs and career management, socializing, public speaking, recruiting new radio club members, and encouraging kids to become interested in electronics and technology.

My angle on ham radio at Maker Faire events continues to be a way to change and enhance the ham radio image. By that I mean to make ham radio a service to the community, a positive influence on kids, education and social balance, and equity.

Photo A. Great to see another ham radio booth at Maker Faire, but with a different angle: Mike Spohn, N1SPW, demonstrates ham radio space satellite equipment and operating.

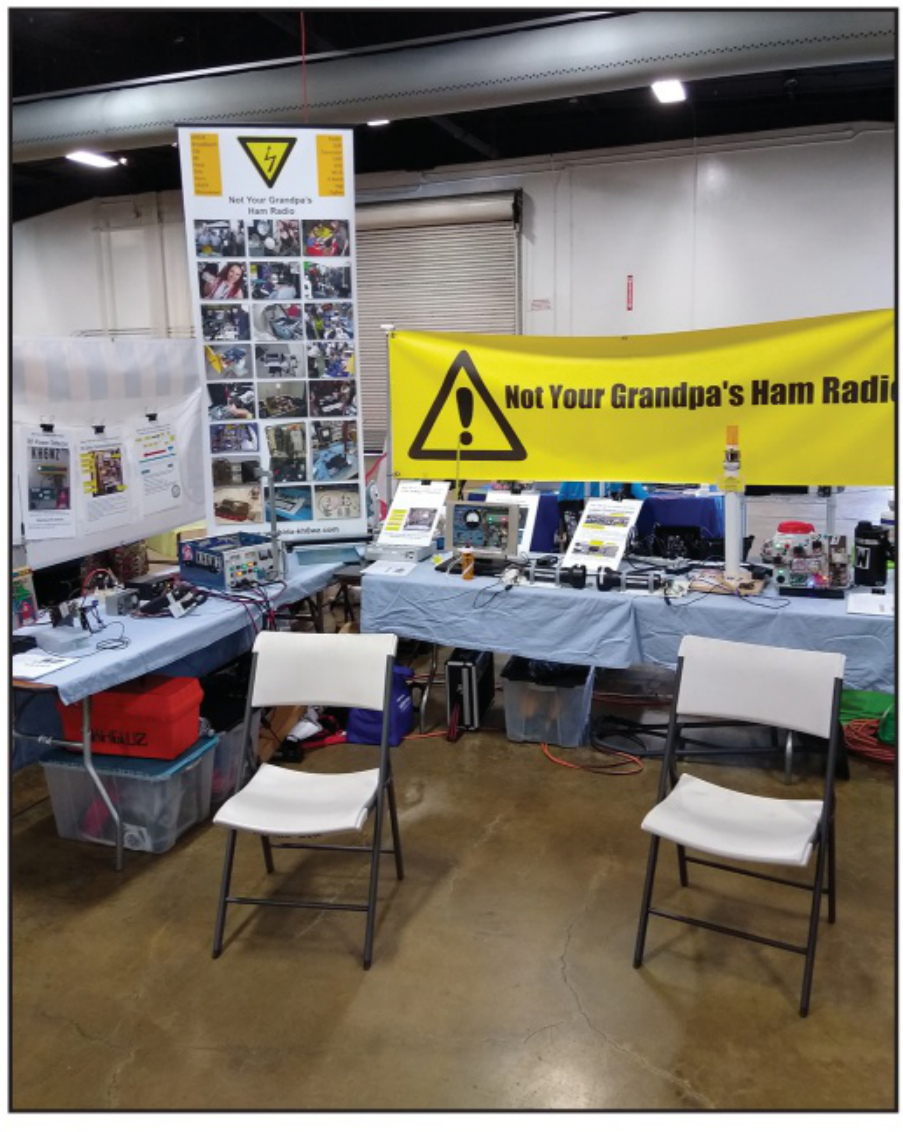

Photo B. "Not Your Grandpa's Ham Radio" at Maker Faire Orange County 2022. The emphasis is homemade projects and electronics and radio technology education for youngsters.

Photo C. Weather before and during the event was unstable, and I hoped for some natural lightning to detect. Fortunately or unfortunately, I had to use my artificial lightning sources at showtime.

Here are some highlights from Maker Faire Orange County, 2022:

• A view of the booth, freshly set up, minutes before the show opened (*Photo B*).

• The lightning detector / 300-kHz receiver is shown in *Photo C*. Interestingly, we had thunderstorms a few days before the event, and a little bit of rain on show day. I hoped the detector would have something to find, but the weather improved. I had to create some artificial lightning with my little Tesla coil and my re-packaged BBQ striker.

• The Oakwood School in North Hollywood made an appearance as seen in *Photo D*. This private school has an amazing program that teaches students how to think and to be creative in solving problems. A link[5] to a video featuring Marcos Arias, STEAM Chairman, explaining their program and their modified definition of the acronym STEAM can be found in number 5 in the References section. The video will be on the home page toward the bottom.

• Among my favorite things to watch are the robotics displays and competitions. My favorite robot from Maker Faire Orange County is the FIRST Robotics Competition team from Valley Christian High School in Cerritos, California. Their robot is called “Phineas” and features, “climbing capabilities and an automated target-acquisition system.” As I watched these creations competing, I could not believe the robots were designed and built by high school students. I wish I had robotics in high school. I don’t have a good image of this robot, and the 51 second video I made is grainy. So, take a look at the link I pasted in number 6 of the References section to see Phineas in action[6].

• FIRST® stands for “For Inspiration and Recognition of Science and Technology,” a non-profit organization founded by Dean Kamen, the inventor of the Segway.

While on the topic of ham radio and education, please read the sidebar article about how a local high school ham radio club increased fun and excitement during the pandemic. It is written by Devon Day, KF6KEE, who claims to

Photo D. Oakwood School in North Hollywood, California, featured interesting contests and games to encourage problem-solving skills.

Photo E. A crimping tool kit for crimp-type coaxial connectors. The ratchet and die are the critical tools.

Photo F. A crimp-type PL-259 properly installed on LMR400 coax. A length of weatherproof heat shrink tubing over the crimp and outer jacket will be added as a finishing touch.

be retired, but seems to be constantly busy with things to do and helping the community.

More on the PL-259 Connector

Soldering PL-259 connectors always seems to draw comments. Here are some great comments and my replies to this critical soldering skill.

Janice, KO4UWU, asked about the various types of solder, solder flux, soldering irons and stations.

Jon, KZ1G, wonders how I get the connector shell hot enough for soldering, with that little soldering iron. Jon also mentioned that he has tried many methods for soldering the PL-259 but has moved on to crimp connectors that work well.

I like to refer people to the Elecraft website, since they sell products in kit form. Although these hints focus on printed circuit board assembly and soldering, the information is very useful for all electronics work, and has very useful advice on tools and solder. The document can be found on their website: <https://tinyurl.com/46s2mf6e>.

Regarding soldering irons and soldering stations, I have been using my Weller WTCPT soldering station since I was in high school (1970s). However, that model has been discontinued.

Follow the guidelines in the Elecraft document and you will make a wise choice.

Some examples include Weller model WE1010NA, and chisel-shaped tips rated at 850° F. Another alternative might be the Hakko FX888D-23BY, which can be adjusted to 899° F.

I do not have any connection with these soldering tool companies or their sellers, and I have not tried either the Weller or the Hakko unit. I am sure your local electronics parts or ham radio store can make a good recommendation, if you describe the features mentioned.

Speaking of tools, here is one of my favorite ham radio construction blog sites. Look at the Dave Richards, AA7EE, site for good advice, and lots of projects that look like fine art. Dave makes projects using the "Manhattan" style. The URL for his construction hints page is listed under #7 in the References section.

Here are some additional hints for PL-259 soldering success:

1. Start with high-quality connectors. I buy connectors from my local ham radio dealer, who stocks Amphenol and other manufacturers' products. The connectors I buy are silver-plated brass and have Teflon® insulation. Do not buy connectors with plastic insulators.

2. If the connector is nickel-plated, I use a round rattail file and remove the plating around the area that contacts the braid, where the holes are.

3. This addresses Jon's question: When soldering the shell to the cable braid, I hold the entire iron tip (not the point) firmly against the connector barrel. Hold the iron tip and its shaft firmly against the shell until the solder starts to melt.

As the solder melts, move the iron around the barrel and feed the solder into the hole where you can see the braid.

Feed the solder so it wicks into the braid and into the shell holes. Make sure you can see the molten solder wicking into the connector (capillary action). This is the indicator that you have the shell hot enough to make the solder flow correctly.

If the solder is not flowing, but seems to be balling up, or rolls off the shell, this means you do not have enough heat. It may also mean your connector is not clean. Or you did not remove the nickel plating as I mentioned earlier. Go back and file that chrome off.

During the process, always keep the iron in contact with the barrel until you have soldered the braid to all four of shell holes.

The 800° tip and holding the entire tip against the shell are the keys to success to ensure enough heat is hitting the connector.

Regarding the crimp-style PL-259 connectors, I agree this may be a better way of making the right connection, and many of my friends are having good

success. I have not tried this method since I have dozens of traditional, solder-on style PL-259s on-hand. Having the right ratcheting tool and compatible connectors are the keys to success of getting crimp-style connectors properly assembled. Notice the term is "crimp-type" and not "solderless." The center pin must be soldered to the cable.

Dennis Kidder, W6DQ, recommends the tool kit pictured in *Photo E*. It is available from DX Engineering[8]. Other retailers may have similar tools. A completed PL-259 on LMR-400 is shown in *Photo F*. Dennis also recommends adding weatherproof heat shrink tubing over the cable for the final touch.

One Final Thought

I highly recommend all hams find and join a local ham radio club — this way, you will be able to find some good, in-person help from people. The *CQ* website has a list of radio clubs, searchable by state. Go here: <https://tinyurl.com/yu7e3vyv>. *– 73, Wayne, KH6WZ*

References
1. Maker Faire Orange County (Calif.) <https://oc.makerfaire.com>
2. My favorite way to explain Maker Faire is this video <https://youtu.be/Wlw4qRJ5YZo>
3. Radio Amateur Satellite Corporation (AMSAT) <www.amsat.org>
4. The CubeSat Simulator Project Page (CubeSatSim) <http://cubesatsim.org>
5. Oakwood School STEAM Program, North Hollywood, CA <https://tinyurl.com/y7bt2hfx>
6. "Phineas" by students from Valley Christian High School in Cerritos, California <www.epicrobotz.org/welcome>
7. Dave Richards AA7EE Manhattan-style construction and hints <https://tinyurl.com/4a3k54as>
8. DX Engineering PL-259 connectors and connector assembly tools <www.dxengineering.com>

Sato Academy High School Installs New Antennas and Tries Fox Hunting to Boost Excitement and Fun

BY DEVON DAY, KF6KEE

Photo G. Devon Day, KF6KEE, helps students build a tape measure Yagi for ARDF, a new activity at Sato Academy High School Radio Club. (Photo courtesy of Devon Day, KF6KEE)

Keeping a high school amateur radio club fresh and interesting can be tricky. There is a balance between building student confidence using an amateur radio and learning new and interesting things. Throw in a pandemic and that challenge gets even more intense. We have to keep radio fun.

This year, we played a lot of ham "Hide and Go Seek," installed two HF Comet 250 B antennas and added guy lines to a 2-meter Yagi antenna on top of the school's auditorium. We added six mag-mount antennas to our club's 10 Yaesu FT 60-R Go Bags to improve our signal strength in and around steel buildings during a school evacuation or emergency drills.

We have begun a weekly net on the local Long Beach Repeater Associates, K6CHE, repeater on Tuesdays at 2:50 p.m., local time. That has given students practice as net control operator and has drawn in adult radio operators from all over Southern California.

Recently, four student radio operators traveled from Long Beach to Fullerton to meet with the Fullerton Radio Club, W6ULI, to build a Yagi antenna with an attenuator for tracking transmitters and compete in a low-key foxhunt (transmitter hunt).

Marvin Johnston, KE6HTS, taught the antenna clinic. Student operators from Sato Academy of Math and Science, Liam, Samuel, Emmett, and Jared all had a chance to build parts of an antenna.

International Amateur Radio Direction Finding champion Jay Thompson, W6JAY, came by and agreed to take all of us out on to the foxhunt course and show us some of the nuances he learned over the years. Having an experienced ARDF competitor showing us the basics was a huge help. In our case, our mentor has won 18 medals in international competition. We had one of the very best.

Liam Van Citters, KN6QXK, also joined us as we started our first foxhunt.

The terrain at Hilltop Park in Fullerton is very hilly and rough. Finding a transmitter was made more difficult as the signals bounced back from adjacent hills and valleys.

Jay and Liam took the lead. The rest of us did our best to keep up. In the end, Jay and Liam found all three transmitters.

All of this was possible because of the invitation from Joe Moell, KØOV, who has authored over 200 articles about ARDF and has written a book on the subject (*and is* CQ*'s "Homing In" columnist – ed)*. Joe was enthusiastic about the Sato Academy Radio Club coming out for Saturday's antenna clinic and T-hunt which he organized and directed.

Back at Sato Academy of Math and Science, Liam demonstrated how to use our newly made T-Hunt antennas. We used one of our Yaesu FT 60-R radios to act as the transmitter.

The experience of trying something new and working with another amateur radio club was a great one. Reaching out into the radio community helped keep the fun in the Sato Academy Amateur Radio Club.

microcontrollers in amateur radio

BY JACK PURDUM,* W8TEE

Using C Pointers: Step 2

In Step 1 of this series, we showed how much work the compiler has to do to process simple statements like these:

```
int x;
int y;
x = 5;
y = x;
```

After the definition (*not* declaration) of *x* and *y*, verbalizing the last statement, we can say: "Find the lvalue (i.e., memory address) of *x*'s bucket and grab the rvalue inside that bucket. Now get the lvalue of *y*'s bucket, and take *x*'s rvalue (i.e., 5) and dump it into y's bucket located at its lvalue." Note: "normal" assignment expressions in C involve taking the rvalue of one variable and making it the rvalue of a different variable. That is, assignment statements are usually rvalue to rvalue.

We can illustrate this with *Figure 1*. When we defined *x*, assumed the compiler assigns it memory address 1000. When we defined *y*, the compiler assigned memory address 1002. On the Arduino Uno or Nano, integer values are 16-bit numbers, so 2 bytes of memory are allocated for each variable. On a 32-bit processor, each variable would have been assigned 4 bytes of memory. (The compiler doesn't necessarily place the addresses next to each other.) *Figure 1* shows the location in memory (i.e., the lvalue) of the two variables as well as their values (rvalue). Sticking with our bucket analogy discussed in my previous column, the variables are depicted as buckets residing in memory.

Why Use Pointers?

In some cases, your only option is to use pointers. As we've discussed, a function can only return a single value. Consider the following example:

Listing 1. Using a function to change values.

```
/*****
  Purpose: Set the value of y based on the value of x and
reassign x

  Argument list:
    int a          the input value that determines b's value
    int b          the dependent variable

  Return value:
    void
*****/
void MyFunction(int a, int b)
{
  if (a < 10) {
    a = 1;
    b = 20;
  } else {
    a = 2;
    b = 50;
  }
}

void setup() {
  int x = 5;
  int y = x;

  MyFunction(x, y);
  Serial.print("x = ");
  Serial.print(x);
  Serial.print("   y = ");
  Serial.print(y);
}

void loop() {  }
```

When I run this program, the output is: *x = 5, y = 5*. What? We want the value of *x* (i.e., its rvalue) after the call to *MyFunction()* to be either 1 or 2 and the value of *y* (rvalue) should be either 20 or 50. What went wrong?

Nothing.

The code does what it was told to do. Keep in mind that, when using a variable in a function call, the compiler *copies* the rvalue of the variables used in the function call. The compiler fetches the *rvalues* of *x* and *y* from their buckets and *copies* those values to a chunk of memory called the *stack*. Assume the lvalue of *x* is 1000 and the lvalue of *y* is 1002 in *setup()*. Note what this means: Because the stack is located in a different part of memory, the lvalue of the stack is different than the lvalues of either *x* or *y*. When program control gets to the *MyFunction()* code, the compiler has already told the function the lvalue of the stack. Let's say we're running this code on an Arduino Nano where an *int* takes two bytes of storage (i.e., *x* and *y* have 2-byte buckets) and we assume that the lvalue of the stack is memory address 4000.

The computer's stack is like a stack of plates at a salad buffet in a restaurant. If you put another plate on the stack, what used to be the top of the stack (plate 4000) is now "one plate below" the top of the stack (TOS). To the computer, the TOS is now plate 3999. In other words, a computer stack grows downwards in memory.

Because the compiler knows there are two *int* variables passed to the function, it generates code that goes to the stack's lvalue of 4000 and pops bytes 4000-3999 into *a* and bytes 3998-3996 into *b* in the code in Listing 1. Variables *a* and *b* are temporary variables that are located on the stack (memory addresses 4000-3996). Therefore, the lvalue of *a* is 4000, and the lvalue of *b* is 3998. Because the lvalues of x and y (1000 and 1002) are not the lvalues of their copies a and b (4000 and 3998) in M*yFunction()*, there is no way for *MyFunction()* to have access to or change their original values.

Function calls that use copies of the parameter variables use a process of *Call by Value*. Call by Value simply means the needed function parameter rvalues are *copied* onto the stack and the function call is made. Because *MyFunction()* has no clue as to the lvalues of *x* and *y*, it is impossible for

* <jack52443@yahoo.com>

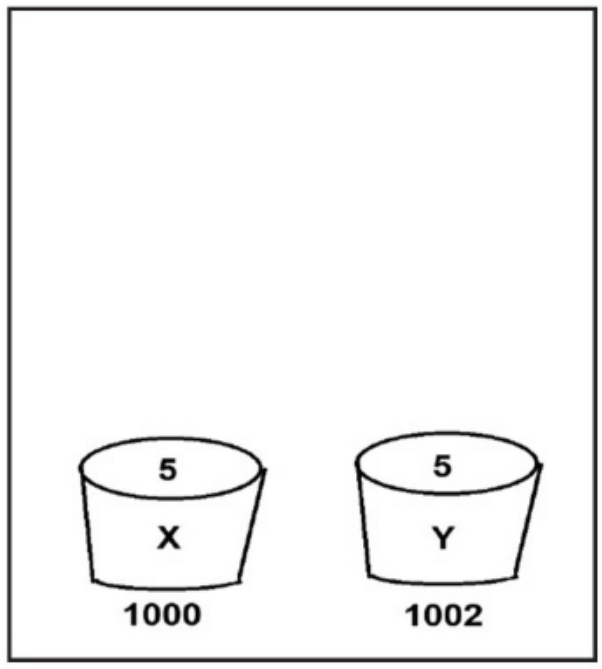

Figure 1. Variables x and y represented as buckets in memory.

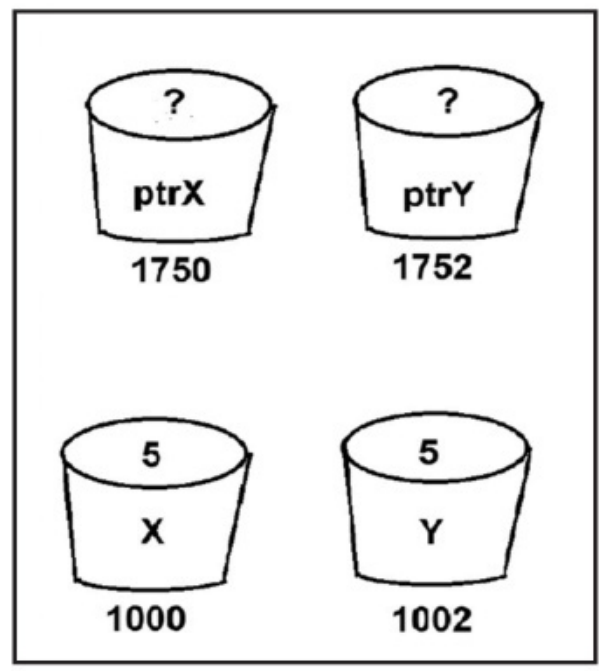

Figure 2. Memory after defining the pointer variable ptrX and ptrY.

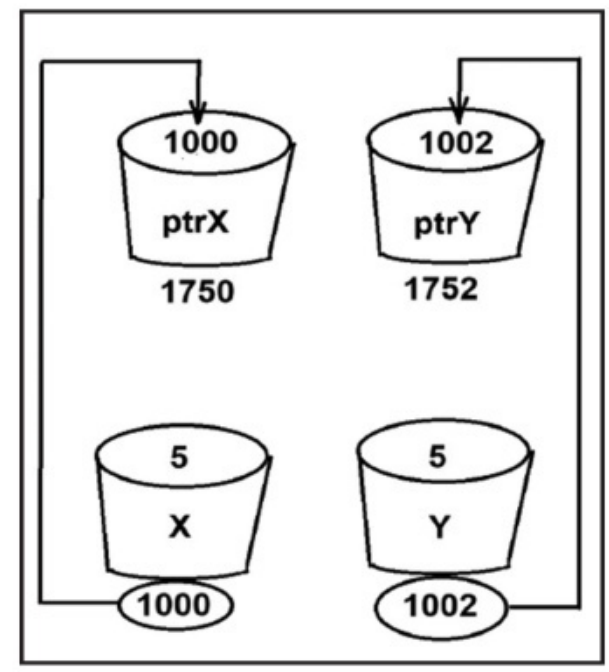

Figure 3. Memory map after pointer initialization.

the function to change their rvalues back in *setup()*. (The reason is because *x* and *y* are "out of scope" when executing the *MyFunction()* code. Scope is a topic of another column.)

The point is: If you need to change the value of one or more variables in a function, you need to use a special mechanism known as a pointer.

What is a Pointer?

A pointer is a special kind of variable that should only hold two things: 1) a memory address (i.e., an lvalue), 2) a null (i.e., '\0'). Because a pointer can only hold a memory address, the number of bytes used by a pointer is always the same for any given machine; the size of a memory address on the host machine (2 bytes for 16-bit processors, 4 bytes for 32-bit machines). Because pointers are different than "regular" variables, we need different syntax to define a pointer so the compiler can keep things straight. Suppose we want to define a pointer for each variable in our sample program above. We can do it with the following syntax:

```
int *ptrX;
int *ptrY;
```

When the compiler sees the asterisk (*), called the *indirection operator*, just before the variable names, it makes a note in the symbol table that these are pointer variables. Because they are pointers, each one is given the same sized bucket; 2 bytes for 16-bit machines, 4 bytes for 32-bit machines. This is shown in *Figure 2*. (The compiler doesn't confuse the multiply operator with the indirection operator because the semantics are different. Multiply requires two operands, indirection only requires one.)

We have assumed the compiler placed the two pointer variable buckets at memory addresses 1750 and 1752. We show the rvalues for both pointer variables in *Figure 2* as question marks because they hold whatever random bit pattern existed when they were allocated. Those rvalues are useless to us as they stand, because their values are garbage. Indeed, many a beginning programmer has written their name into the middle of the operating system because they used a pointer with an unknown rvalue.

Recall that a statement like:

```
x = y;
```

causes the compiler to go through this process:

1. find the memory address of *y* (i.e., its lvalue)
2. go to that memory address and get the value stored there (its rvalue) and store it temporarily
3. Now get memory address of *x* (its lvalue)...
4. ...and pour *y*'s rvalue bytes of data into *x*'s bucket (its rvalue)

Note the process: A "regular" assignment statement is the movement of one variable's rvalue (*y*) into the rvalue of the other variable (*x*) ... rvalue to rvalue, remember? To make a pointer useful, we must tie the pointer with the variable it is associated with. The question, therefore, is: How can we assign the lvalue of one variable into the rvalue of a pointer variable? Easy! Initialize the pointer variable with the memory address (lvalue) of its intended partner.

Initializing a Pointer

What we need is a mechanism to tie the pointer to its associated variable. We can do that with a pointer assignment statement:

```
int x = 5;
int y = x;
int *ptrX;
int *ptrY;

ptrX = &x;          // Pointer assignment statements
ptrY = &y;
```

The ampersand in the last two statements is called the address-of operator. The *address-of operator* tells the compiler to fetch the address of *x* (its lvalue) and assign that into the rvalue of *ptrX*. After this first lvalue-to-rvalue pointer assignment takes place, we say that *ptrX is initialized to point to variable x*. Then we initialize *ptrY* to point to variable *y* in the next statement. After pointer initialization statements, the memory map looks like *Figure 3*.

Note that the rvalue of the pointer variables are the lvalues of their associated variables. Always remember: *An uninitialized pointer always points to trouble!*

what's new

Icom IP110H WLAN Transceiver

Icom has introduced its newest license-free wireless local area network (WLAN) transceiver, the IP110H. This compact and lightweight handheld radio is designed for those needing to stay connected while on the move.

With the IP110H, you can quickly make all, group, talkgroup, individual, and telephone calls with the push of a button. While doing so, you can communicate with teams like a telephone conversation with Icom's Simultaneous TalkListen function. With most two-way radios, if you are receiving, you cannot transmit. TalkListen makes conversations more natural by allowing users to talk and receive at the same time, streamlining communications. An optional Bluetooth® headset (VS-3) is available for discreet or hands-free use though one is not required for full TalkListen functionality.

The IP110H is small in size, only measuring 2.2- × 3.8- × 1-inches, but it was constructed using a durable waterproof and dust-tight design (IP67/ IP54) that meets MIL-STD-810-G. In addition, the IP110H has over 20 hours of battery operating time so users can focus on the task at hand. Other features of the IP110H include audio recording for instant review, 1,000-mW audio output, incoming call and message vibration alerts, and Over-the-Air programming (OTAP). Safety features include Motion / Stationary Detection, Man Down, and Lone Worker, all of which send an emergency call when triggered.

Icom has not released pricing for the IP110H. The IP110H is shipping and available for immediate purchase only through Network Certified dealers. To find a dealer who is certified to sell the IP110H, check out the Icom where to buy link, select Network. <https://tinyurl.com/muenujnt>.

An uninitialized pointer could have any unknown bit pattern as its rvalue and if you try to make an assignment with it, who knows where your data might go?

Using a Pointer

Let's stick with our example above and say we have changed the code to the following:

```
int x = 5;
int y = x;
int *ptrX = &x;              // Define and initialize the pointers
int *ptrY = &y;

MyFunction(ptrX, ptrY);
```

Note that we are now passing the pointers to MyFunction() instead of copies of the variables x and y rvalues. Using pointers in the function call means we are passing lvalues to MyFunction(), not rvalues like before. This process of using pointer variables in a function call is referred to as call by reference. Because call by reference is much different than call by value, we need to let MyFunction() know that it's receiving lvalues, not rvalues, for the function parameters. Therefore, we change the first line of the function definition to:

```
void MyFunction(int *a, int *b)
```

This new function definition tells the compiler that it is being passed pointer variables rather than regular variables. And because we have initialized the function parameters of *MyFunction()* properly, *the rvalues of the pointer variable function parameters are the lvalues of some other variables.* Read that last sentence over and over until you're sure you understand it. Now, let's present the function code to properly use those pointers.

```
void MyFunction(int *a, int *b)
{
  if (*a < 10) {
    *a = 1;
    *b = 20;
  } else {
    *a = 2;
    *b = 50;
  }
}
```

The asterisk operator used in the statement expressions above is called the *indirection operator*. Consider, for example, the statement:

```
*a = 1;
```

Remember, variable *a* at this pointer is the lvalue of *x* back in *setup()*. The asterisk tells the compiler: *Hey! I'm a pointer variable holding some other variable's lvalue. So take my lvalue and indirectly go to that memory address, and store the value 1 in that bucket.* Because *ptrX* is an *int* pointer, it knows to form that constant 1 as a 2-byte *int.*

Note what just happened. You assigned the value 1 at *x*'s memory address and, in the next statement, stored 20 at *y*'s memory address using the process of indirection. Now when you run the program, *x* now equals 1 and *y* now equals 20. This is all possible because we changed *MyFunction()*'s parameters from copies of *x* and *y* (i.e., call by value) to pointers for *x* and *y* (i.e., call by reference).

Conclusion

In the next column we will show you some examples of how you might want to use pointers in your own programs. For now, try to create some of your own programs that use pointers. For example, create an array of random numbers, and search for the minimum and maximum values and use pointers to set *min* and *max* defined in *setup()* and display their values.

mobiling

BY JEFF REINHARDT,* AA6JR

Fast Forward

Joe Goodham prepared for his morning trip to the office in the usual way. Usual, that is, for the work "week" that requires appearing at the office twice each week; his assigned days are Tuesday and Friday. After the pandemics of 2020, 2026, and 2031, remote work had become the norm but business school research had determined that an office presence twice each week was best for productivity, management updates, and to advance team projects that drew on the synergy emerging from face-to-face meetings. Each employee was assigned specific days so that a work surface could be shared among the rotating staff presence in the newer, downsized offices.

He eased himself into the compact but comfortable confines of his car and ordered it to prepare his customary decaf Americano brew as the auto eased onto the street for the 25-minute commute to the office park / residential plaza, a mixed-use structure that was a small community of about 2,500 people, give or take.

Joe activated the mobile ham radio but before he could monitor the bands, his communications implant signaled a message from his wife; her gentle voice wished him a good day, and would he please remember to pick up a small gift for their daughter, whose birthday is tomorrow. The reminder was committed to the implant's memory as a nudge set for when he would leave the office, as detected by the implant's GPS and motion detectors.

Turning his attention back to the radio, his implant linked to the control module, which informed him that solar conditions were about average that day. The display screen lit up with a depiction of conditions, a representation of the D, E, and F layers at that moment and the receiver had found a few DX contacts that may be possible on 20 meters, a station calling CQ on 17 and a local roundtable discussion on 40. Joe told the radio to find the CQ and responded to the caller with his ID and began a pleasant QSO with the station located in the Canadian Maritimes. The Canadian was impressed with Joe's mobile signal, which sprang from a microtuned antenna that continually optimized both input and output. The autologger had already captured the essential information from the contact and forwarded the data to the central logbook; at the same time, notification of the contact in progress was also available to every ham connected to the worldlink. While the two were conversing, the data stream between the two stations brought up the name, location, and even a photo of the conversants, a brief biography and the weather conditions at each location. The data screen also flashed a message saying another two stations had begun a contact on a frequency just a few Hertz away; no problem, the narrow digital signals had made QRM a thing of the past.

While listening, Joe sipped his coffee as the self-driving car slipped along the boulevards. He briefly took notice of the close integration of cross-traffic at a busy intersection; continuously integrated vehicle-to-vehicle communications had made traffic signals (and driver-piloted vehicles) obsolete in the early part of the 2030s. As a result of the traffic management systems, accidents and police traffic enforcement were no longer costly problems. The vehicle spoke a gentle reminder that he would arrive at the office in less than 5 minutes, so Joe wrapped up the contact and bade 73 to his Canadian contact, took a last sip of coffee, and made a mental note to review his award eligibility status on the home viewer, when he returned that evening. Since all data everywhere was now in The Cloud, information was always available, be it on a viewer, eyeglass projection, a wristband, or verbally through the implant.

Joe's car eased itself into the company-provided inductive charging port, the hatchway opened and Joe began his workday in a good frame of mind as he tried to imagine how his hobby could get any better.

A somewhat younger version of your author in front of the Cannonball Run Pub in Wyoming, New York, circa 1998.

Back to The Past (Present?)

While we're not quite living *The Jetsons* lifestyle (even though 2022 was the year in which George was supposedly born), the future is being shaped as you read this page. Self-driving cars are a reality, already traveling the streets of San Francisco in taxi service and they will soon appear in Austin and Phoenix. You can read more about this amazing project at <www.getcruise.com>

Imagine how mobile operations might change as you travel solo and work contacts to your heart's content. CW or digital modes could be done while working a key or keyboard. And while I'm sure there are some who are doing that now, the danger of distracted driving would be erased, even for those drawn into a compelling 2-meter roundtable discus-

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sion. Emergency responders or weather observers could be free to report their findings in great detail. I'm sure we're just scratching the surface, but the common denominator is that many mobile functions that were best accomplished by two persons in a vehicle could soon be achieved by one. So, are we ready to create the future of mobiling?

A Late Autumn Story

Shifting gears (a little mobiling humor), I'll share a true story from my youth that took me years to assemble.

My college life was rather lean economically. Like the old joke goes, "I was so broke, I couldn't pay attention …" I was getting by through working minimum-wage jobs, a few small grants, some student loans (all paid back in full, thank you) and acting as an RA my senior year. A feisty little VW transported me from my freshman through junior years but its rust-ridden body and chassis fell victim to the salt-strewn winter highways of upstate New York. Alas, the Bug was beyond repair and my budget would not allow for repair or replacement. But back in those days, it was still possible to get around by displaying one's thumb to cover some pretty good distances or just get across town.

My college was located in the little village of Geneseo, New York, a bucolic setting aside the sprawling agricultural Genesee River valley. The campus is right out of a movie set, ivy covered brick buildings set on a hillside with magnificent views.

One weekend, I had thumbed my way to Buffalo, some 70 miles distant. Though I can't recall the exact purpose, I think there was a woman involved. If you ever read Kerouac's *On The Road,* you get an idea of the serendipity of hitchhiking as a hit-or-miss mode of travel. Sometimes you did well, other times you shivered in the rain. I'm often taken back to those days when I hear Simon & Garfunkel's *America* — "*It took me four days to hitchhike from Saginaw ...*" Sadly, it's no longer wise or safe to engage in the practice. But I digress.

While returning from Buffalo, I got out of the city to US 20 and was picked up for few short stints that took me into farm country. Dusk was beginning to set in that autumn evening and I began to walk as the passing traffic grew scarce. A few cars rushed by and my hopes were waning as the cold began to cut through my jacket. Then, a sports car passed, but pulled over. The deep-voiced middle-aged driver asked where I was headed, I told him and he said, "get in" and I did. No sooner did I close the door when I said, "This is a Lamborghini Miura." The driver responded, "Not many people would know that," because at that early date, Lambos were pretty rare. He said I can take you down 63 to 19; after that, you're on your own." I said I was grateful for the ride and added that if he wanted to use any of the capabilities of that amazing car, that was OK with me. We didn't chat much, but I enjoyed the warmth and any attempts at conversation would be challenged by the "music" from the mid-engine V-8 mounted just behind my head.

At the Route 19 intersection, I bade my thanks to the driver as he headed off to the little hamlet of Wyoming, New York. As a cold mist set in, I was (kind of) lucky to catch a ride to my destination in the open cargo bed of a pickup truck, but hey, it was a ride.

The Radio Connection

It was only a few years (yes, years) later that I put the pieces of this story together and came to the conclusion that the Lamborghini driver was most likely Brock Yates, an amazing man of many talents, race car driver, author, broadcaster, editor of *Car and Driver* and other magazines, creator of the famous (but illegal) *Cannonball Baker Sea-To-Shining-Sea Memorial Trophy Dash,* screenwriter including the *Cannonball Run* and *Smokey and the Bandit* films, which made Yates a lot of money off the presence of CB radios in cars and trucks across the U.S. And I dare say, many of us (now hams) were among the millions of CB users in the 1970s (I still have two). Yates and his late wife Pamela were also restaurateurs, as owners and operators of the now defunct Cannonball Run Pub in Wyoming, New York.

Some years later, a bit older and a tad more prosperous, I did a return trip to upstate New York and made it a point to stop and have an adult beverage at the pub (see photo), the walls of which were covered with racing memorabilia, much of it autographed by some of the world's most famous drivers. Sadly, Mr. Yates wasn't there that day, and he passed away in 2016. So I was never able to fully confirm my suspicions, or convey my thanks for a ride given to a shivering, starving, student that cold autumn night. But in support of my presumption, the population of Wyoming doesn't exceed three digits and most of the vehicles found in that area are made by John Deere, so my supposition seems pretty strong that he was the Lambo pilot.

The roundabout end to this story is that mobile radios figured prominently in his string of film successes, just one more example of taking a good idea and putting it to a new, fascinating and in his case, lucrative use.

– Happy Mobiling!
73, Jeff

digital connection

BY DON ROTOLO,* N2IRZ

The 2022 ARRL & TAPR Digital Communications Conference

Some Notes From the 41st Annual DCC

Some of the attendees at the 41st annual ARRL & TAPR Digital Communications Conference held in Charlotte, North Carolina last September. While not yet finalized, next year's DCC will most likely happen in Phoenix, although there was some discussion of having it virtually as was done in 2021.

In the middle of September, I drove to Charlotte, North Carolina to attend the 41st annual ARRL & TAPR Digital Communications Conference (DCC). Originally known as the Computer Networking Conference (CNC), this annual event has people from the breadth of humanity, hams and non-hams, experts and beginners, gathering together to find out where the state of the art lies in digital communications. When TAPR (Tucson Amateur Packet Radio) joined with the ARRL to run these conferences, the name DCC was adopted.

As a short 4-hour drive from Atlanta, along with a $99-a-night discounted room rate, this was yet another opportunity to meet with fellow enthusiasts in person instead of yet another Zoom meeting. I was fortunate at Hamvention to avoid the recent bat sniffles plague, but at the Huntsville Hamfest I did manage to catch Covid-19 for the very first time. Thankfully the vaccines and boosters did their job and I suffered only a mild sore throat for a few days along with about a half-day of fever. Yes, I am fully vaccinated and boosted: In the immortal words of John Cleese, "Well, I may be an idiot, but I'm no fool."

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The range of presentations was only exceeded by the opportunities for personal networking and conversation. This month, I'll just touch on several topics of interest, and over the course of the next several months we will take a closer look at a few.

GPS Receiver Board

Jason Rausch, K4APR, gave the first presentation on Saturday morning about his work on an integrated APRS tracker that he developed and showed at the conference. I'll write more about that some other time, because what interested me even more was his low-cost GPS receiver board.

The GPS receiver board is about the size of a USB memory stick. Using a Radionova M10578-A2 GPS chipset, it delivers GPS data as you might expect, along with a 1PPS (one pulse per second) output. The Radionova chipset is known to be one of the best around, with high sensitivity for faster and more robust satellite acquisition. If you have any potential use for GPS data, this would be a very nice solution.

Folks interested in running APRS on a computer (such as a laptop or Raspberry Pi) would find this small (just under 1 x 2 inches) board quite handy. Since all GPS receivers deliver fairly accurate time information, it can also be handy for digital modes (such as FT8) and other activities that need

accurate timing. It has a 1PPS output for super-accurate timing applications in the lab. He is also developing a version suitable for the workbench: A little bit larger, with five LED indicators and some other useful features.

With lots of handy features, such as SMA connectors for the included magnetic-mount antenna and 1PPS output, power to support an active antenna, micro-USB connector (a cable with a USB-A connector is also included) and onboard CR2032 battery to help with faster GPS fix acquisition, it should deliver everything you'd want in a GPS receiver, even your location (imagine that). Two DIP switches select the serial data rate, and the board includes LED indicators for power, valid GPS fix, and 1PPS status.

While still in the development stages, he expects to make these available in the $70 range through his company, RPC Electronics, LLC, before the end of the year. Visit his website <www.rpc-electronics.com> for more information.

1PPS and Precision Timing

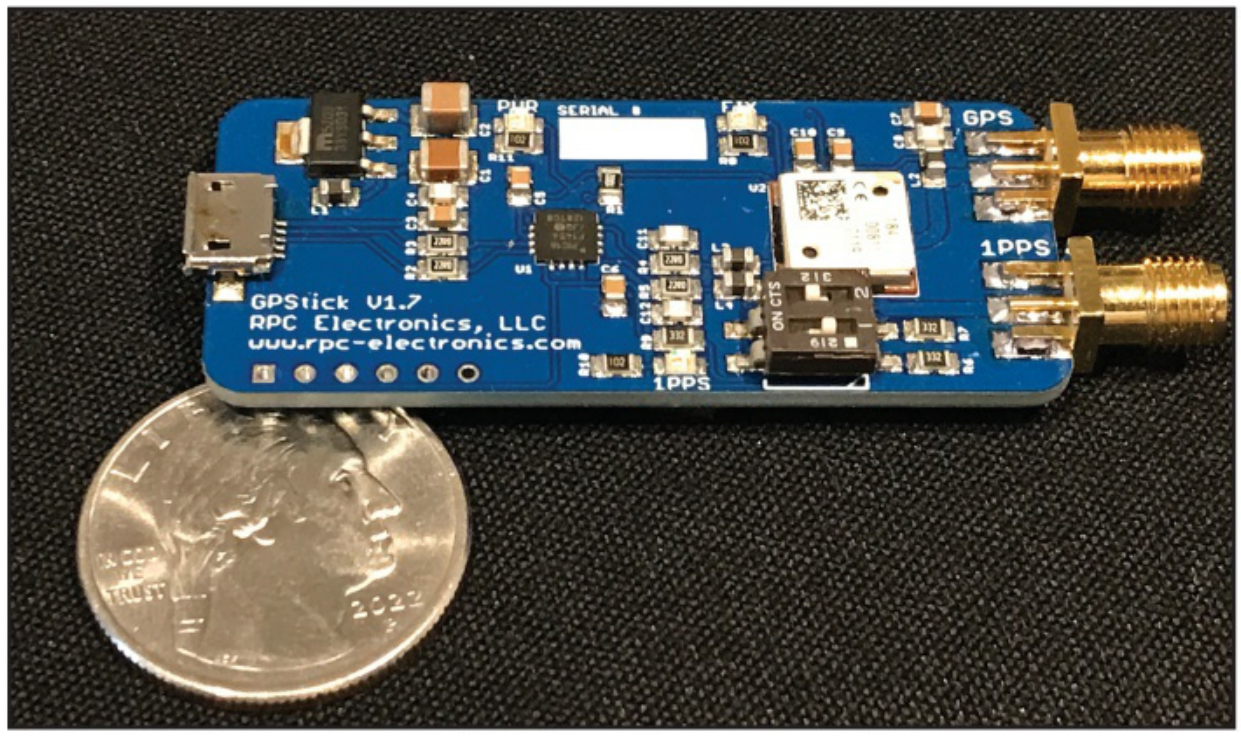
Speaking of 1PPS, John Ackermann, K8UR, gave a fascinating presentation that explained in plain language some of the pitfalls of relying on GPS for precision timing. The 1PPS output is extraordinarily clean, often offering accurate timing to within about a hundred nanoseconds to NIST (National Institute of Standards and Technology) time. However, many GPS chipsets have the ability to multiply upwards the 1PPS output to much higher frequencies, well into the megahertz range. Setting your GPS chip to, say, a 10 MHz output sounds all well and good to get a stable and accurate laboratory reference.

Laboratories (including those of advanced amateurs) often have test equipment that needs a very accurate and stable time base to deliver high-quality measurements. One can also use such a reference signal as a means of maintaining excellent frequency stability in radio transmitters and receivers. The temptation to just use the GPS chip's 10 MHz output and say it's good is a misplaced idea. As John explained, you'll get 10 million pulses out of the chip every second, but not every pulse is the same size: The chip's internal clock isn't as accurate, so to deliver the 10-MHz output, the chip will actually skip pulses so that there's only 10 million of them. In other words, while the 10-MHz output will average to a fairly precise 10 MHz over time, in any given second it can stop pulsing long enough to introduce glitches into your equipment and measurements.

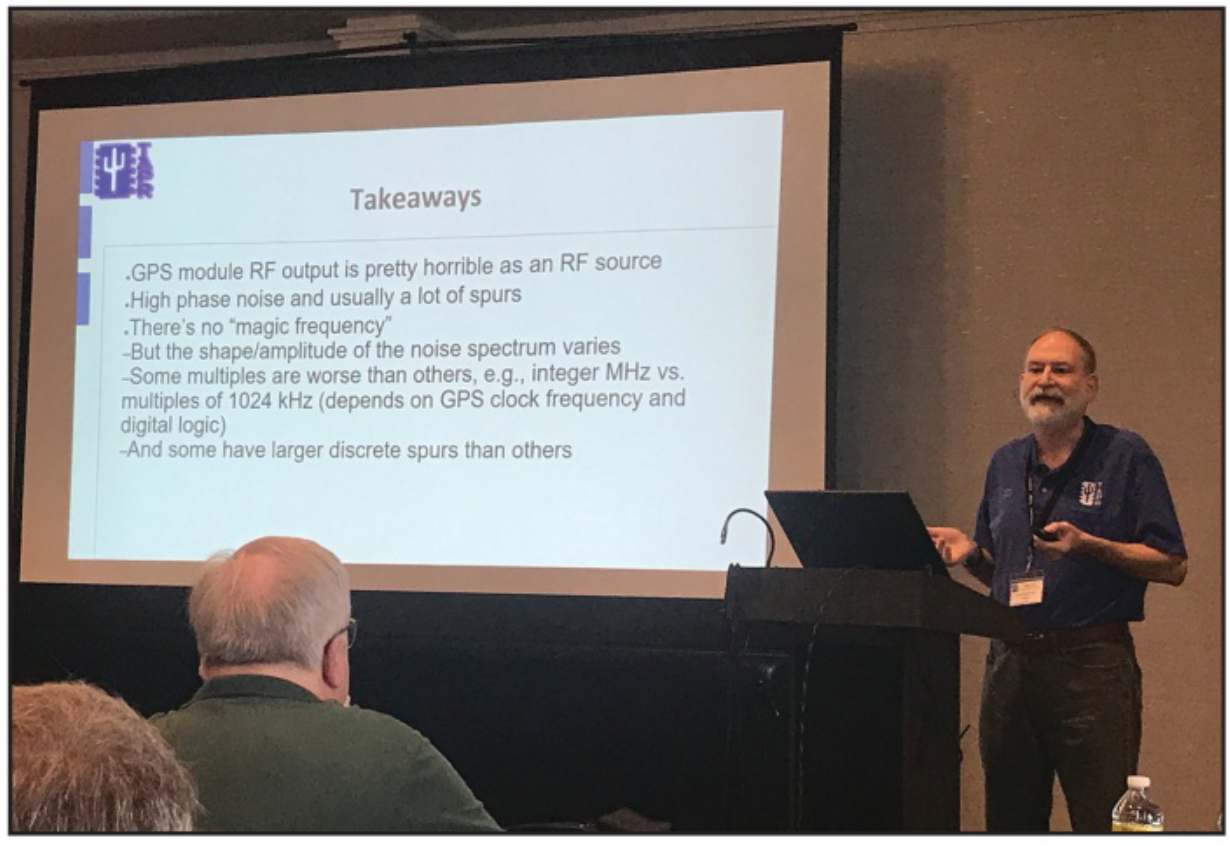
A GPS Disciplined Oscillator (GPSDO) makes use of the GPS 1PPS signal to discipline an external oscillator to deliver an accurate frequency output. It does this by comparing the phase of the GPS signal to that of the oscillator and, based on the error found, nudging the oscillator with a very slow Phase-Locked Loop (PLL) to move back toward the correct frequency. But this is not a trivial endeavor, particularly if you want a good reference signal.

A GPS chip's RF output cannot be used to replace a GPSDO, but John explained that "jitter attenuator" chips exist that basically perform the PLL and oscillator function to simplify the delivery of an accurate and stable RF clock. Hams call it phase noise, computer folks call it jitter, but they are the same thing: Instability of the reference. But beware, they are measured differently and cannot be directly compared.

These jitter attenuator chips are developed to clean up any noise from wiring, connectors, and other local sources, in the lab-wide reference signal. As such, they tend to have faster PLL loops, since they expect to start with a fairly good signal. Nonetheless,



The GPStick from RPC Electronics. Tiny yet powerful, this inexpensive GPS receiver offers a precision 1PPS output along with adjustable USB baud rates and an onboard battery to ensure quick fix acquisition from a cold start.



John Ackermann, N8UR, at the 2022 DCC in Charlotte, presenting his thoughts on getting precise timing from a GPS receiver.

they do have applications for GPS-derived reference signals, and they are considerably easier to implement than a traditional GPSDO.

M17 Digital Voice

I had the pleasure of sharing a table at dinner with some of the folks involved with the M17 Project <m17project.org> team. They are developing a new digital radio protocol for data and voice for the ham community. The digital voice (DV) part of the protocol uses the free and open Codec 2 voice encoder.

Those of you involved with DV can remember several years ago some DV modes used a certain DV codec without paying the licensing fees. When the codec's owner pointed this out, a minor panic to find a replacement occurred, resulting in (at least) Codec 2.

Anyway, The M17 project is working on software and hardware designs that are open source, meaning they can be copied, modified, and shared freely to maintain amateur's ability to tinker with things.

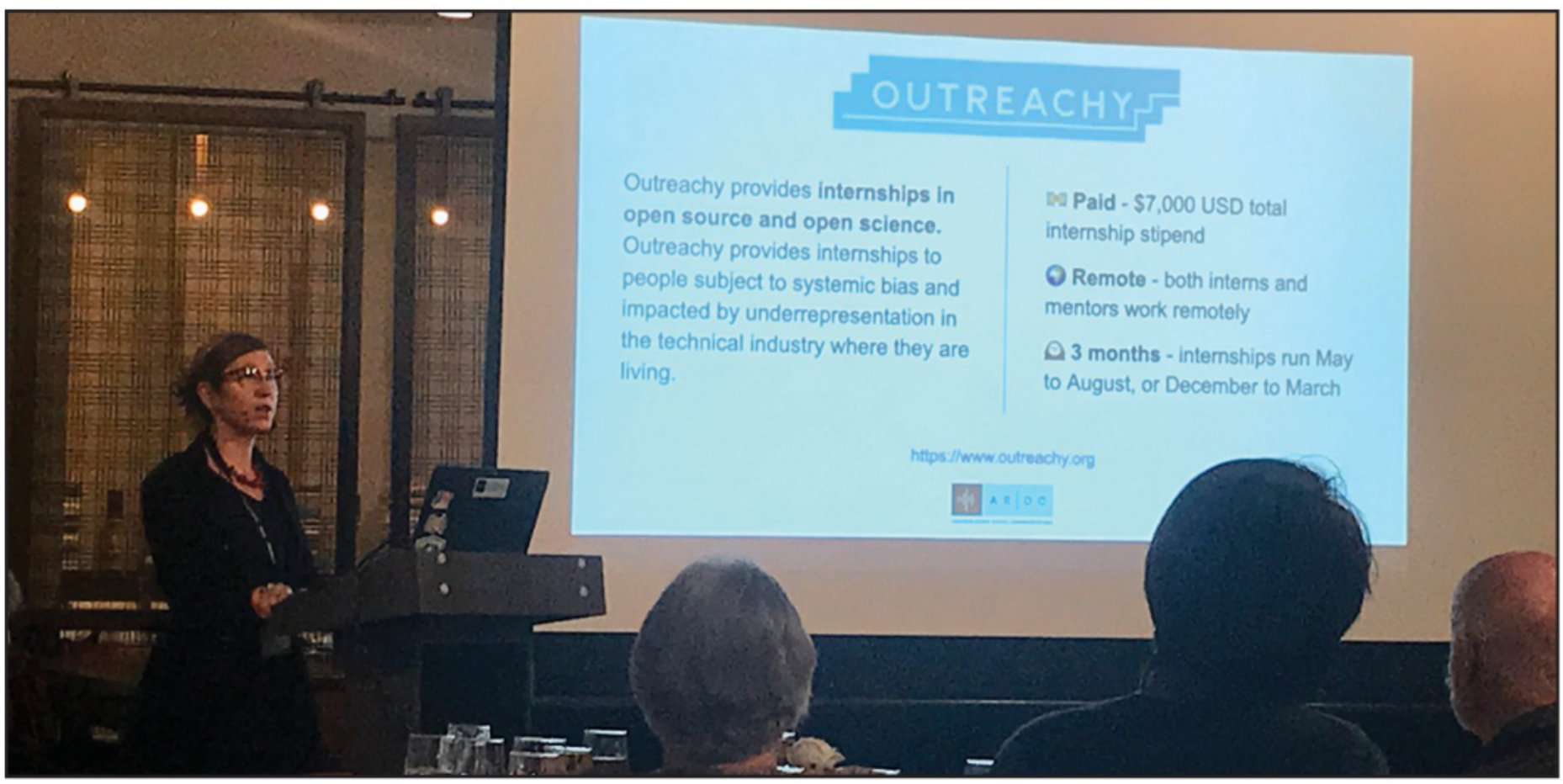
While still months or years away from being ready, they are working and moving everything forward, a little at a time. Right now, Ed Wilson, N2XDD, told me that they are looking for volunteers to help, especially as they move from design into hardware. If you're at all interested, or perhaps even qualified, I urge you to give them a shout via their website. They did get some help in the form of a grant from ARDC, which brings me to my next topic.

ARDC

Amateur Radio Digital Communications (ARDC) is a philanthropic organization dedicated to the support, promotion, and enhancement of digital communication, as well as to broader communication science and technology. It offers grants large and small to people and teams aligned with their philanthropic goals, such as The M17 Project and TAPR. The group has funded a total of 61 new projects with over $5.6 million so far in 2022, ranging from $15,000 to over $1 million.

ARDC traces its roots to 1981 when, at the beginning of the internet, Hank Magnuski, KA6M, was assigned the

Amateur Radio Digital Communications (ARDC) presented a grant to allow these University of Scranton (PA) students attend the DCC in Charlotte. Their advisor, Nathaniel Frissell, W2NAF, is in the gray shirt at front right.



Rosy Schechter, KJ7RYV, the executive director of ARDC, presenting at the DCC Saturday banquet. Her topic was creating the right environment to welcome new amateurs to the hobby.

Class A 44.0.0.0/8 block of 16.7 routable IP addresses for amateur radio use, establishing AMPRNet. Many years later, in 2019, a fraction of those addresses — then and now having a value in the tens of millions of dollars — were sold off and ARDC was created and funded. According to one attendee, they should be able to fund a few million dollars' worth of grants every year in perpetuity with the proceeds.

This year's DCC was originally planned in 2019 for 2020, but then Covid happened. While a typical DCC attracts over a hundred attendees — and TAPR negotiated its contract based on that historical figure — the reality of 2022 meant that somewhat fewer people registered. Even though the contract was fairly generous and low-priced, as it was negotiated in 2019, there was still a significant funding shortfall. ARDC stepped in to relieve this financial burden from TAPR, and those ARDC representatives in attendance were thank=ed enthusiastically.

One of ARDC's goals is the support and growth of amateur radio. Funding the travel expenses for a group of students from the University of Scranton to attend the DCC this year was part of that. Rosy Schechter, KJ7RYV, the executive director at ARDC, gave a wonderful talk at the Saturday banquet on the topic of welcoming new participants to amateur radio. I wish I could relate her points more accurately, but the gist is to be welcoming, meet them where they are, ensure that knowledge transfer happens, and follow through to ensure they are getting what they need.

If you or your group might have a need for funding, I urge you to contact ARDC. They are always looking for worthy projects to fund, and yours might just qualify. Visit <www.ampr.org> to get more information on grants: What ARDC is looking for, their requirements, and to learn how to complete their online application. Grants are awarded twice a year, so if you miss the next deadline, there's always another on the horizon.

FST4W

One of the most interesting presentations was delivered by Gwyn Griffiths, G3ZIL, on the topic of some findings regarding the FST4W mode on VLF. Gwyn wasn't there in person, instead sending on a pre-recorded presentation, but he made an interesting point.

FST4W is part of the WSJT-X package and offers WSPR-like transmissions on the 630- and 2200-meter bands. With QSO time slots of 120, 300, 900, and 1,800 seconds (that's 15 minutes!), it has unbelievable performance in the presence of noise, pulling valid signals from something like -30 dB from the noise floor. With a bandwidth on the order of 0.5 Hz, this kind of performance isn't all that shocking.

One would think that by increasing the time period, we'd get much better performance, and that is true — to a point. The weakness that G3ZIL presented, which actually shows the longer-time modes to be almost unusable in certain circumstances, flies in the face of reason, but when we stop to consider it, actually makes perfect sense.

That weakness is frequency stability. Just like we hear a lot more noise when trying to decode a narrow CW transmission while using a wide SSB filter, FST4W with its narrow bandwidth underperforms when the transmitter and/or receiver drift in frequency by something on the order of 1 Hz. And, having any radio system maintain that kind of frequency stability over a 15-minute period is a bit of a stretch, especially when compared to a 120-second period.

The conclusion is that unless such stability can be maintained, the performance of FST4W-1800 drops off like a rock when either side of the conversation drifts in frequency even just a little. Without any drift, it offers superior performance to the other versions of this mode.

It struck me as odd that the 1,800-second mode might perform poorly in the real world, but the reasons for that phenomenon make sense to me. I guess this would be a good use for a GPSDO.

TAPR

And, finally, we come to the host of the DCC, Tucson Amateur Packet Radio. Although it hasn't been based in Tucson for quite some time, and its main focus isn't packet radio anymore, the organization is working on several really interesting projects, such as the Tangerine SDR (Software-Defined Radio) and TAPR TICC. During the annual membership meeting, it was noted that around 25 of the TAPR TICC (a time-stamping counter with a 60-picosecond resolution) kits flew off the shelves in August alone. You can read about these and other projects, as well as the products, services, and documents TAPR offers to the amateur community, at <www.tapr.org>.

TAPR is stable financially, but if you are a digital radio enthusiast, please consider offering some support. Become a member, write for the TAPR *Packet Status Register*, volunteer to help with a project, or pitch a project you'd like to do with them. Without our support, organizations like this eventually run out of money and enthusiasm and just wither away.

That's all for this month, but I have a couple of ideas for what we'll explore in the coming year. If YOU have any ideas, please drop me a line, as it would be great to hear from you.

– Until next time, 73 de N2IRZ

learning curve

BY RON OCHU, KOØZ

Going in (Auroral) Circles

Ah, it is November. A nip is in the air, summer's heat and humidity become a distant memory; Thanksgiving and the holiday season are nearing. November is also a time when we spend more time indoors, which means more time to make radio Qs (QSOs: contacts / conversations) both near and far. HF DXing (long distance radio contacts made using the high-frequency shortwave bands) is near and dear to this columnist's heart. Antennas are a vital component to successfully work DX. Directional antennas like Yagis (*Photo A*) and cubical quads (*Photo B*) are DX operators' favorite antennas because they concentrate RF (radio frequency) emissions in a desired azimuth (direction). Of course, omnidirectional HF antennas (*Photo C*) can also work DX stations, but directional antennas make working DX, especially rare DX with hundreds trying to call the station (or a pileup), easier to put into your logbook. But antennas are only a part of the equation to working DX.

Where to Point the Antenna?

An omnidirectional antenna radiates in all directions, so knowing where to concentrate RF energy is not as important as when using a directional antenna. Which azimuth (bearing) do I need to point my directional antenna to concentrate my RF in the DX's direction?

This is where great circle bearings come into play. Since elementary school, most of us have viewed our planet either in terms of a globe or a Mercator map projection (*Photo D*). Mercator maps depict accurate continental shapes, but not size and distances. On the other hand, an azimuthal map accurately depicts direction from a central point (*Photo E*), in this case, it's centered on Cairo, Egypt. This is known as a great circle bearing. A ham radio operator in Cairo, Egypt, wishing to work a station in Brazil would need to point his directional antenna slightly southwest. Looking at a Mercator map projection, it doesn't appear to be much different.

Photo A. The Yagi is a popular directional antenna. Rotor motors are used to move directional antennas. (Photos courtesy of Wikimedia Commons, except as noted)

Now let's look at an azimuthal map centered on the central part of the U.S. The world looks a lot different in terms of direction (*Photo F*), especially when compared to the Mercator map projection shown in *Photo D*. According to the Mercator map, if I wanted to work Spain, I would need to point my antenna due east. However, the azimuthal map informs me that a due east heading would concentrate my signal toward central Africa. In fact, Spain's heading is closer to 60° and not 90°. From the central U.S., Australia can be found between 250 and 300°. Good to know if I wish to work eastern or western Australia. Australia lies along a more

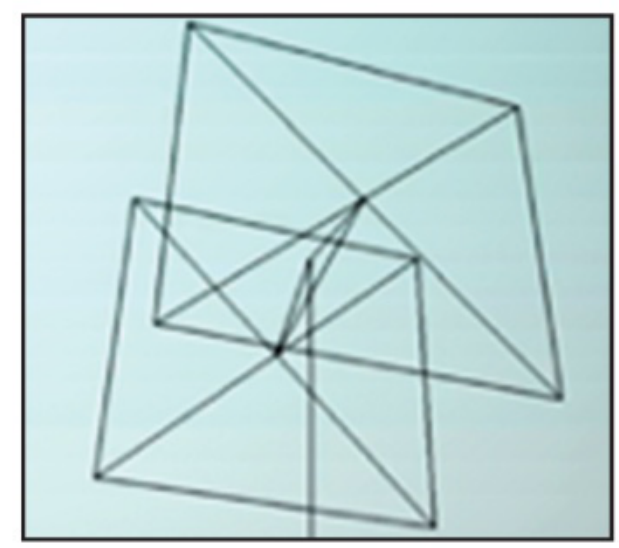


Photo B. A cubical quad is another popular directional antenna.

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

westerly direction than what a Mercator map indicates.

Obviously, knowing which true direction to aim a directional antenna increases chances for a successful QSO. Where can I obtain an azimuthal (great circle) map? Fortunately, you can download a personalized azimuthal (great circle) map for your QTH thanks to the generosity of Thomas Epperly, NS6T. He maintains a website, <https://ns6t.net/azimuth/azimuth.html> that will generate a map centered on your QTH (location). Knowing true direction is important, but there's another factor to our equation: QRN.

QRN

QRN, also known as static, comes from a variety of sources. Some static is generated by man-made sources (*if the source is man-made, it is called QRM –ed*) such as arcing power lines and electric motors. Most static comes from natural sources such as lightning strikes and space weather effects. Our sun constantly produces a solar wind that envelopes our solar system and our planet (*Photo G*), which causes atmospheric noise.

Solar wind is a plasma stream of charged particles emanating from our sun. These particles interact with Earth's magnetic field, which protects our planet from our Sun's harmful radiation. This magnetic field is created by Earth's molten iron core. One of the drawbacks to this molten core is that it causes earthquakes, volcanic eruptions, and tsunamis, but we can be grateful that it produces a strong, protective, magnetic field to protect our fragile, life-supporting atmosphere from being stripped away by the solar wind.

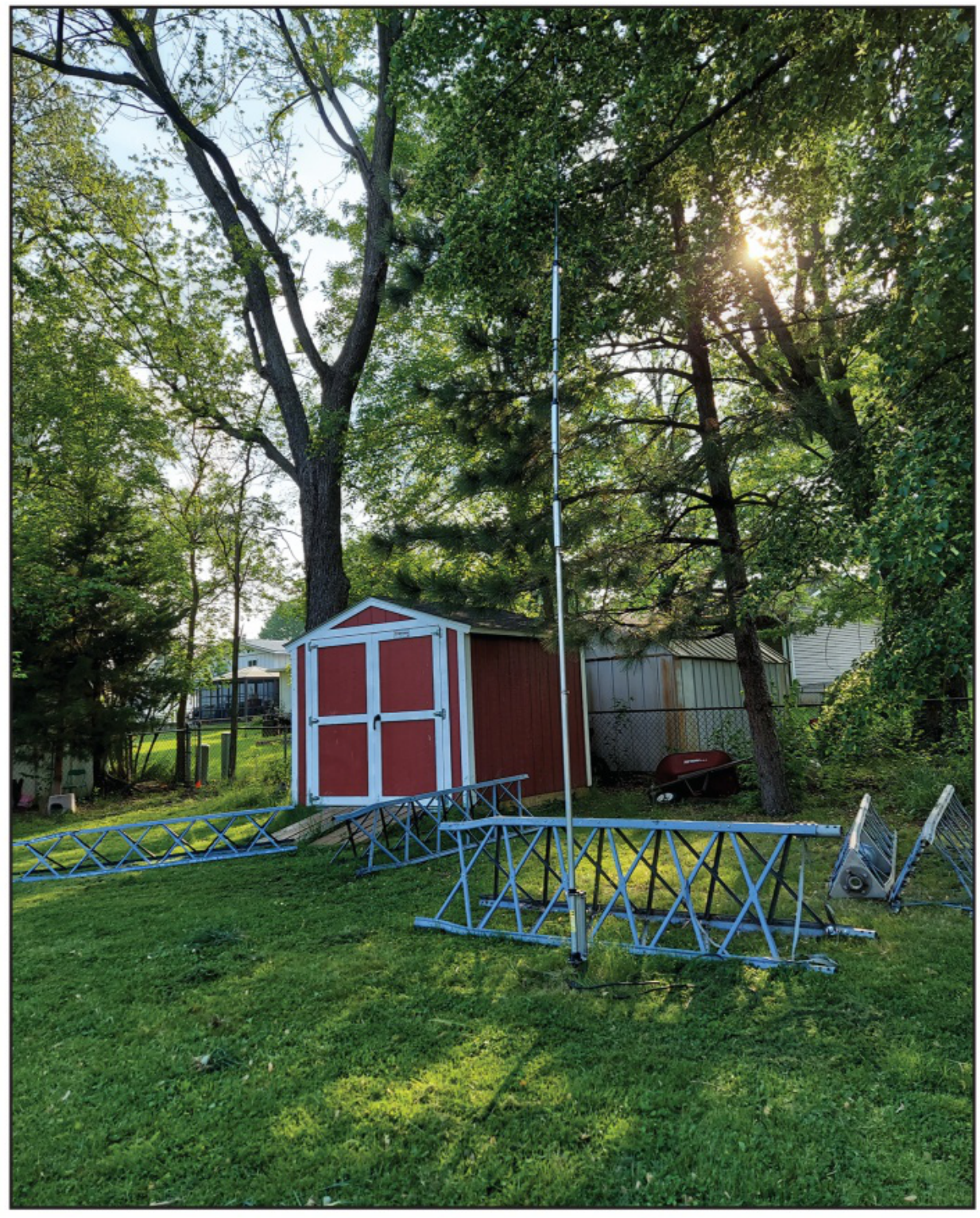


Photo C. A vertical antenna is omnidirectional. It can transmit and receive in all directions. (Photo by KOØZ)

Photo D. A Mercator projection is a commonly used map to depict the world. It accurately depicts continent shapes but not their true size or distance from each other.

Our sister planet, Mars, has a very thin atmosphere. Many scientists have theorized that Mars once had a more substantial atmosphere, but it was stripped away by the solar wind. It is thought that Mars's molten core solidified over time; thereby greatly reducing its magnetic field and any subsequent protection from solar wind impacts. After a long time, it has rendered Mars a cold, desert-like planet.

Aurora

Periodically, our sun produces intense coronal mass ejections and solar flares that, combined with the solar wind, impact Earth's magnetic field. This interaction with our planet's magnetic field can produce amazing light displays known as the Aurora Borealis (northern lights) and the Aurora Australis (southern lights) (*Photo H*). These phenomenal light shows are beautiful, but they are made up of charged particles that interact with Earth's ionosphere. We know HF radio waves are refracted in the ionosphere, which creates "skip zones," thereby allowing our signals to reach distant continents. However, if the ionosphere becomes "too" charged, HF signals can be absorbed in an ionospheric region called auroral circles.

We have two auroral circles. One is centered around the North Pole and the

Photo E. Azimuthal (great circle) maps are ideal for showing true bearings from a central spot. This map is very useful for hams using directional HF antennas.

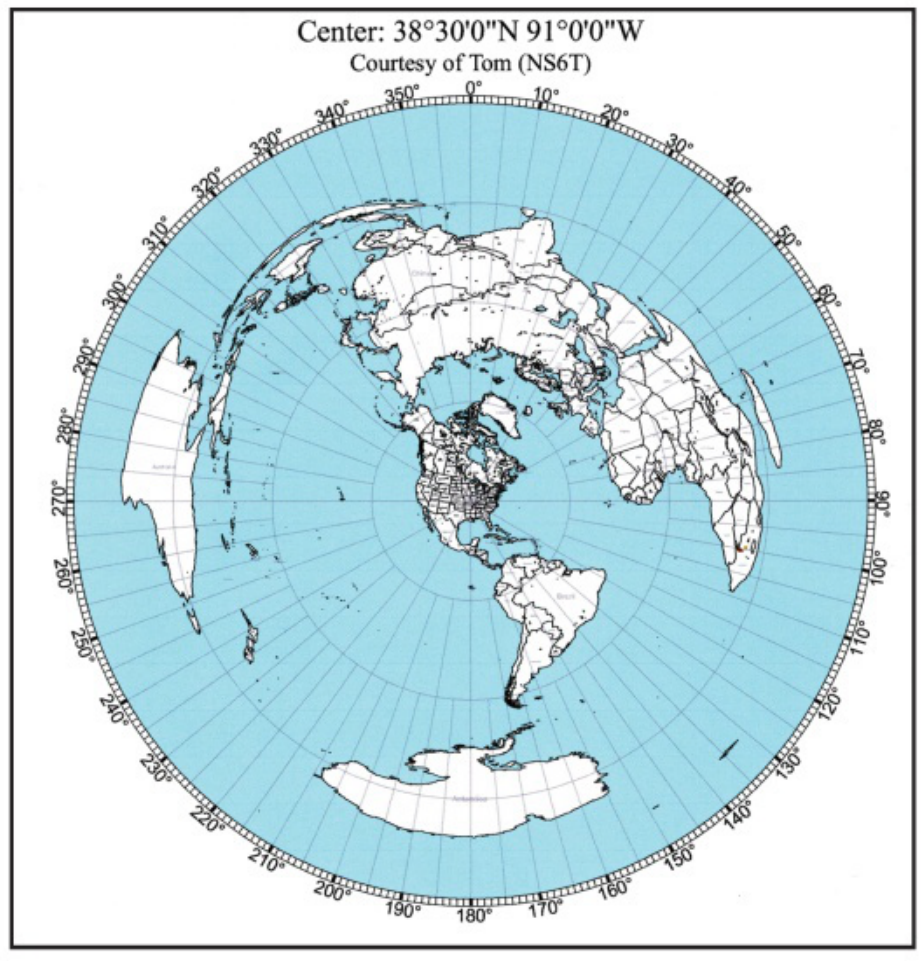


Photo F. An azimuthal (great circle) map generated from NS6T's website centered on my grid square EM48 in the central U.S. (Courtesy of <https://ns6t.net>)

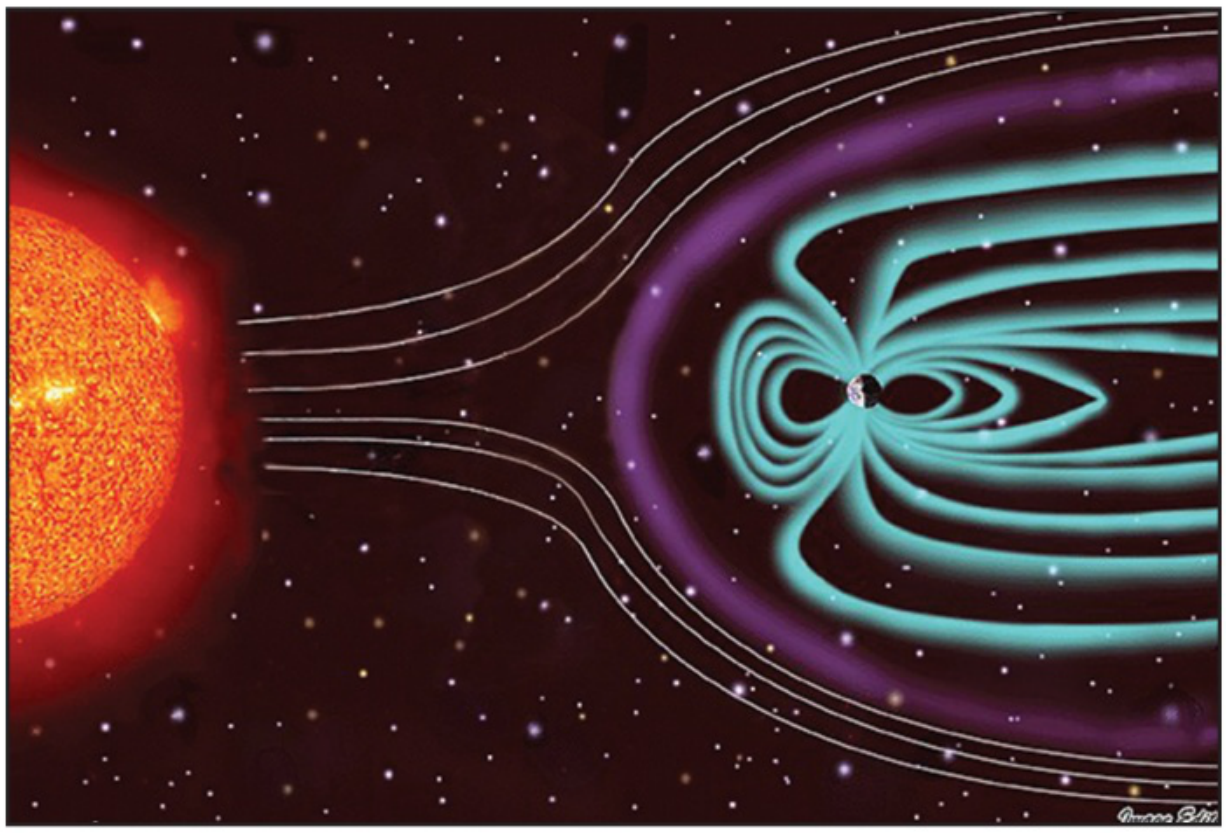


Photo G. The sun emits particles in what's known as the solar wind. Solar wind interacts with Earth's magnetic field which in turn affects DX propagation.

Photo H. Our sun's solar wind interacting with our Earth's magnetic field is responsible for aurora. If the ionosphere becomes very charged, radio signals can be absorbed along certain paths.

other the South Pole (*Photos I and J*). The National Oceanic and Atmospheric Administration's Space Prediction Center (NOAA SPC), using the Ovation Aurora model, publishes a daily aurora forecast <https://tinyurl.com/db9eusx8>. Examining *Photos I* and *J*, the auroral circle is clearly seen. Green indicates a probability of aurora of approximately 2 to 45%. The darker the color the greater the probability. What is interesting to note is the oval can increase in size and expand outward as energy levels increase with solar interaction. *Photo K* is a fine example of intense auroral activity. This event took place on September 8, 2017. The red is indicative of intense auroral activity in the ionosphere that extends well toward the northern U.S. border.

Combining Circles

We now have two predictive "tools" in our DX toolbox. We have a great circle bearing (azimuthal) map, and we have a website to forecast aurora. Using our great circle bearing map centered on the U.S., we see it looks similar to the map used by NOAA's SPC Ovation forecast model. This is very helpful for amateur radio operators. For example, if we wish to direct our antenna toward England, a heading of 45° would work nicely. On most days we should have a good, clear path. However, if a geomagnetic storm is in progress like the one depicted in *Photo K*, it's easy to see that the 45° heading to most of Europe passes right through the "red" area in the auroral circle. There is very high chance that RF signals are being absorbed along that path until the storm subsides. All we would hear would be static. If there are days when the band(s) appear to be "dead," then check out the aurora forecast model. This model's product is not minute by minute, but it does give a very good picture of current activity. Likewise, check out the southern hemisphere aurora forecast model. Next, check to see if your intended DX path passes through these circles.

Other Factors

There are other space weather factors to consider such as solar indices, CME (coronal mass ejections), solar flares and radio blackouts, but we'll save those for a later date. In the meantime, a great website that gathers all this useful information in one place can be found at <https://dx.qsl.net/propagation>. DX.QSL.net does a wonderful job of maintaining this website to provide a "one-stop space weather DX propagation shop."

Multidisciplinary Ham Radio

Ham radio has many facets. It is truly multidisciplinary. Combining a great circle map with an auroral forecast model is just one facet. Communications, meteorology, electronics, physics, engineering, public service, radiosport (contesting), writing, propagation, digital and software development are just a few of its disciplines. It is hard for an inquisitive mind to become bored with this hobby.

Going In Circles

I hope this little foray into circles piqued your interest in space weather as applied to DX propagation. It is a fascinating subject area and it's fun to correlate band conditions with space weather related events. The term "atmospherics" is beginning to be

parsed out with more data and a deeper understanding of ionospheric propagation.

Whenever I sit down at my operating desk, I dutifully check out space weather conditions to get an inkling of ionospheric propagation and compare it to my real-time listening conditions on my transceiver. Thank you for reading *CQ* and I look forward to working you on the bands!

– 73 from Ron, KOØZ

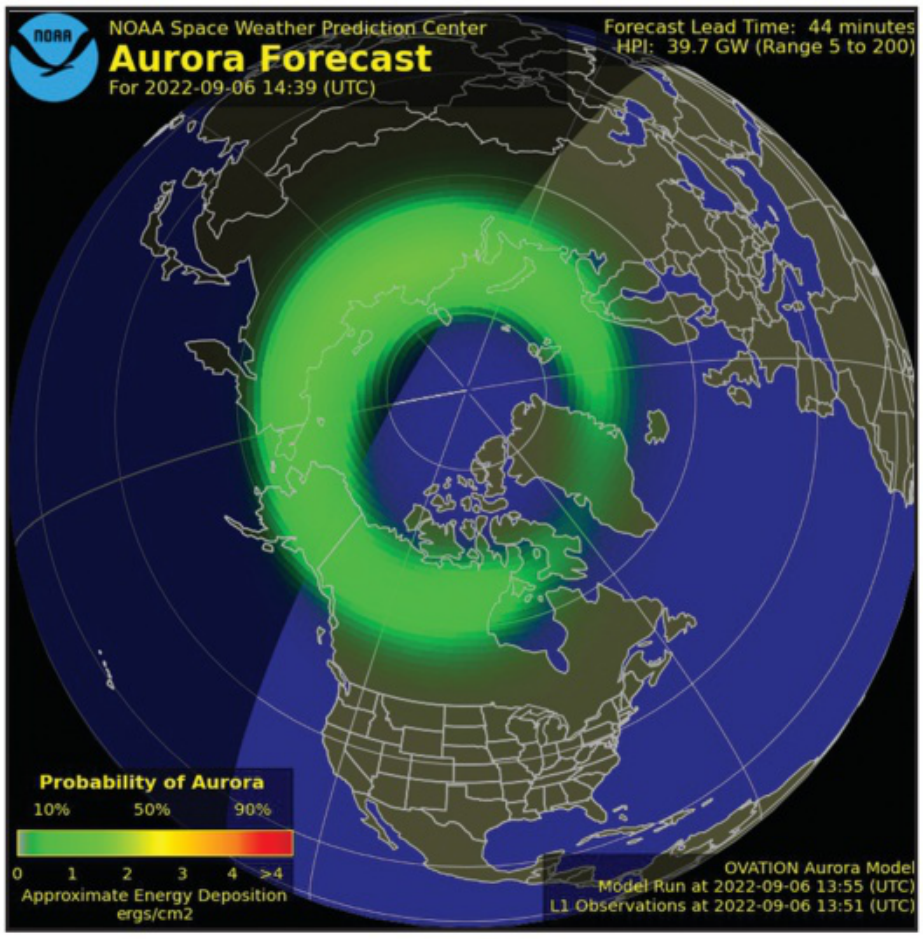


Photo I. NOAA's SPC Ovation northern hemisphere model. On this day, the probability of aurora activity and subsequent RF absorption is low.

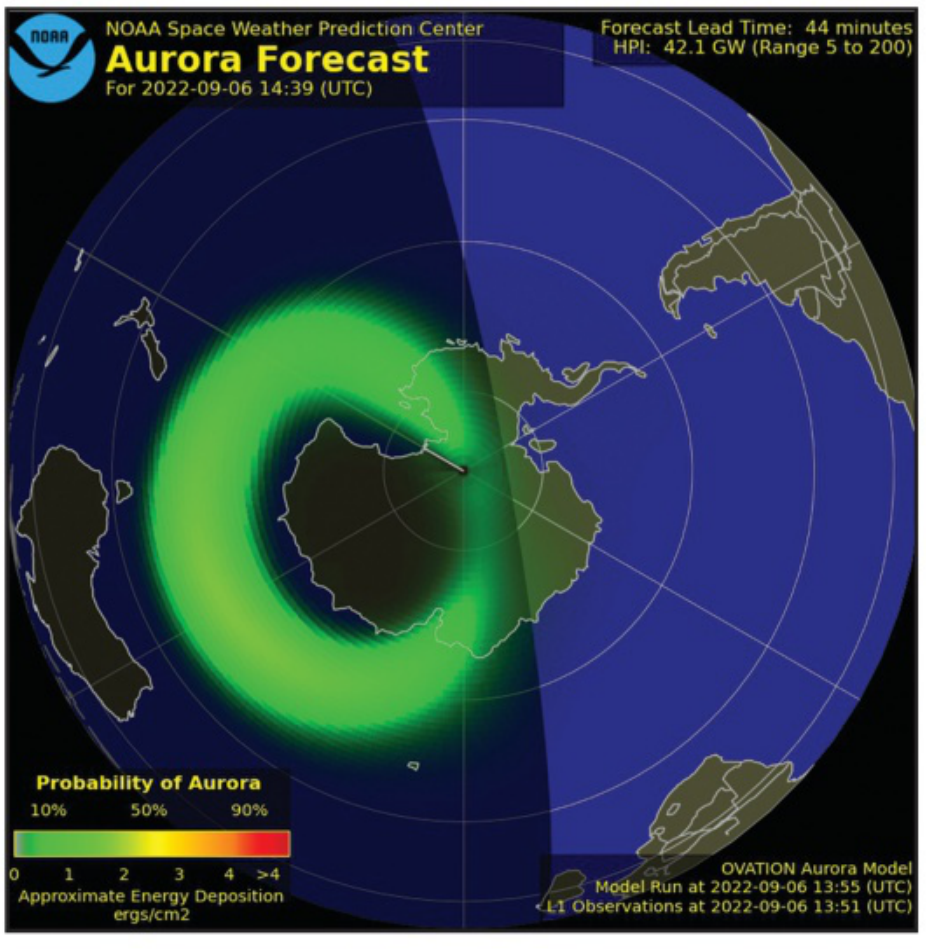


Photo J. NOAA's SPC Ovation southern hemisphere model.

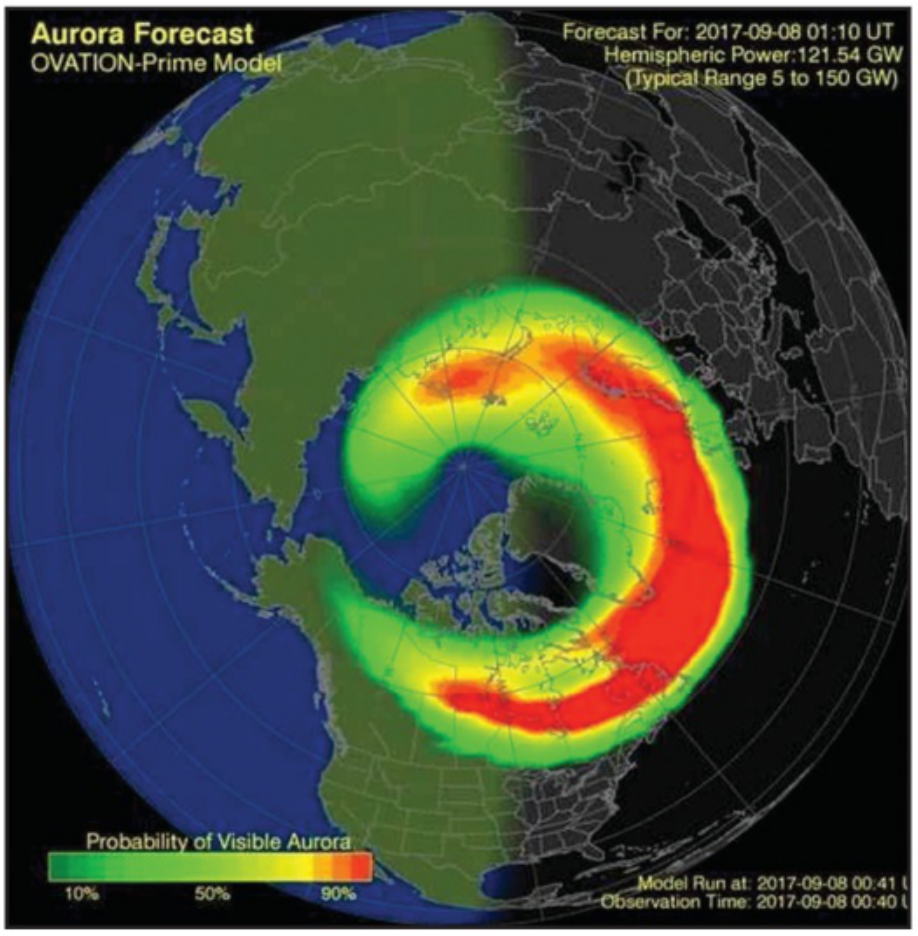


Photo K. NOAA's SPC Ovation model shows a forecast of high auroral activity in the northern hemisphere. RF paths from the U.S. to Europe will most likely be temporarily affected or absorbed.

vhf plus

BY TRENT FLEMING,* N4DTF

Sporadic-E Season Wrap-up and Planning for 2023

As we enter late fall, it is time to look back on the summer Sporadic-E (E_s) season and begin making plans for next year. I've had a good VHF season dating back to April, and have begun getting my QSLs in order, following up on some older ones, generally making sure I have confirmations for all my activity. On 6 meters, I've added a couple of dozen new grids this year, and I've also added new grids on 2 meters and 432 MHz. In most years, November presents a low point in VHF activity, especially 6-meter E_s. Never stop listening or calling occasionally, especially as the next couple of years offer the potential for F_2 on 6 meters, as sunspots increase. My suggestion is to set up alerts from one of the propagation sites, such as <dxmaps.com>, so that you are made aware of any activity if you are away from the radio. Remember, too, that mid-December to early January can bring a brief, but enjoyable E_s season, including the opportunity to work into the South Pacific. In general, however, you can expect less activity than we have seen during the summer E_s season, as well as the excellent tropo some parts of the country have seen recently.

In terms of preparing for next year, perhaps it is time to take stock of your shack. If you will indulge me, I want to start with some fundamentals. Your antenna and transmission line are critical to your success. I suggest you sketch out your current setup, paying particular attention to each step in the transmission line. Direct connection from your rig to your antenna is perhaps the most ideal, but for many of us there are "extras" like switches, transverters, amplifiers, and even meters. Insertion loss is of course a concern, but a bigger concern is likely the condition of the jumpers you are using, as well as the final transmission line to the antenna. Start with an antenna analyzer or NanoVNA and check each step of the way. The time you spend ensuring your transmission line and associated connections are in the best working order will pay dividends in terms of better reception, improved power out, and less potential stress on your radios from SWR issues.

Second, based on the results of your analysis, consider whether your antennas are functioning well. Connectors may be aging, perhaps elements are loosened or bent. Once again, work done to improve the antenna will reward you with better operating conditions. Don't forget your rotator. Check your compass points alignment, control cable and connections, and mechanical connections to the mast. If you are using an older control unit, is it time to consider an upgrade that provides computer control? If you have lightning protection on your feed lines, do you also have protection on your controller cables?

It is a good idea to review your operating plans and goals and think about any new bands or modes you wish to add. This can range from adding a new radio to adding a transverter, to simply adding an antenna for a band you already have on a radio. Many VHF operators have newer radios that offer 1.2 GHz, and as I wrote last year, this band can be your gateway to SHF activity. Perhaps a higher-power transverter would let you eliminate an amplifier in your transmission line, taking out a device and a couple of connectors and thus removing some potential points of failure. If you enjoy FM activity on 2 meters and above and currently use a vertical, adding a vertically polarized beam will allow you to work more distant repeaters, and take part in simplex nets or other activity more effectively. I'm sure you will think of something you'd like to add or change.

Photo A. The Kenwood TS-930s that I've recently been restoring.

Around here, I'm still deciding about new antennas and feed lines, and believe that 902 MHz is a band worth exploring. I'm also going to do some basic housekeeping, rearranging operating positions to allow cable access from the rear, and generally tidying up things. Also, the HF bands are heating up nicely and I expect to spend some time adding some DXCC band counters, while continuing to monitor for VHF plus activity.

Please write and let me know about your plans, goals, successes, and failures. We learn from each other!

From the N4DTF Shack

Radios on my bench recently included a Kenwood TS-930 (*Photo A*). This unit had been stored away for many years in an attic. While I was able to restore it to working order, there were some things that would have made that task a little easier. So I thought that I'd offer a few thoughts on properly storing a radio that you don't intend to use for an extended period of time. First, please consider keeping it in a temperature and humidity-controlled environment: That means indoors with proper heating and air conditioning. Second, cover the unit to prevent dust from getting in (plastic wrap, large sealable plastic bags are all acceptable, but make sure not to use tape as it may mar the surface of the radio. Third, identify and remove batteries (see *Photo B*). This was the single biggest issue with the TS-930, as you can see in the photo. To be fair, our friend had no reason to open the unit, and was not aware that there were batteries inside. A review of the manual will help you to ascertain whether your unit includes batteries for memory protection or other reasons. The corrosion was cleaned up, and any further damage prevented,

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Photo B. A little-known internal battery holder made a mess of the 930 prior to restoration.

in part because he brought me the unit before trying to turn it on ... and I of course had a look inside before I applied power. Back to storing your radio: If you have the original packaging, great (yes, it really is a good idea to keep the original packaging). Replace the radio in the packaging just as you took it out and seal up the box with packing tape. If you don't have the original packaging, take time to cut some foam or egg crate material to pack the item securely in a box large enough to accommodate it. Protecting connectors and knobs is critically important, as damage to these is often difficult to repair. Finally, remember to include in the box any cables, manuals, and notes about modifications or repairs, as well as any quirks (the radio's not yours) that you have noticed.

Finally, let me make this radical suggestion: If you really don't need that radio and have no real plans for it, consider selling it or even giving it to a fellow ham to help them get started, or allow them to get on a new band or mode. While some of us enjoy restoring and operating older equipment, you will find that the pace of innovation in our industry will render many "current" radios hopelessly behind the times relative to newer units in just a few years. You'll also reduce a little clutter, and possibly help someone else enjoy the hobby more (especially if you throw a little "elmering" in with the radio). I would love to hear your stories about repurposing a radio you no longer need or want.

Another item on my bench is a rotor controller that clearly experienced some component damage from a stray electrical event. A couple of resistors, three diodes, and two voltage regulators bit the dust. Visual and olfactory examination pointed out the problem. This one will be relatively easy to repair, but I mention it because it points how just how sensitive our equipment is. While many of us focus on grounding and lightning protection — as we should — we should also spend time addressing protection on the "power in" side of our components. I'm a big fan of Uninterruptible Power Supply (UPS) solutions. UPSs provide protection against several common types of failure in electronic components. First, by providing a regulated supply of power to your devices, they reduce the chance of failure from power spikes and surges that escape the naked eye yet put much strain on various components. Second, in the event of a short-term power failure (less than 3-5 minutes) they can easily maintain power to your devices and prevent the frustrations of radios or computers resetting or rebooting unnecessarily. Finally, in the event of a longer outage, they provide time for you to properly power down your devices and avoid corrupted files or other problems. This can be a lifesaver if you are operating digital modes or have a contest software file open. A part of navigating the melding of computers and radios is investing in solutions that minimize the chance of failure.

Please share your tips for protecting equipment and of course, your war stories.

On the Air

6 Meter Successes

Faithful reader Mario Karcich, K2ZD, writes as follows:

"I guess the last of the E season here was August 16th when at 1218 UTC I worked 9K2GR at 16dB, 1309 9K2YM at -13dB and at 1310 9K2OW called me with a -09 dB signal. On Sept 7th, I worked Lance, TO7GJ, Mayotte at 2254 UTC on Q65A EME. He was -26dB and I received a report of -23dB. *This was my 6-meter DXCC Number 222 and the FIRST North American contact with Mayotte on 6 meters.*"

Mario, thanks as always for your report, and congratulations on more milestones and another successful 6-meter season! Check out Mario's QRZ page, you will be impressed at his long involvement with 6 meters and his successes on that band, and others.

222 Activity in Pacific Northwest

Yes, I do write about 222 MHz a lot. I believe it is a great band, with many opportunities for weak signal, digital, and even FM activity. You may be aware of the weekly 222 Activity Night held on Tuesdays, beginning around 7:30 p.m. local time. This is not region specific, but there are many operators in New England who regularly are active. This month, I wanted to provide reports from the other side of the country, to encourage those outside of New England to get on 222 and make some noise.

Dave Miller, VE7HR, is in CN89 and offered the following report regarding Tuesday night, August 30th:

"Strange propagation last night. Rick, W7RNB, was blasting the grill cloth off my speaker, unlike the last couple of weeks. Jim, K7ND, was quieter than normal.

Tom, KE7SW, was up and down and able to copy direct pointed 161° or 360° using our North Shore mountains as a reflector. It was good to hear Mike, K7MDL, and Eric, N7EPD."

Jim, K7ND, offered a complementary report from Fox Island, Washington, in CN87. He reports record-setting temperatures around the Puget Sound on August 30th. "The following stations checked in on 222 that evening: W7RNB, KG7PD, N7MWV (CN86), KE7SW, KB7IOG, W7GLF, N7EPD, VE7HR (CN89), K7MDL (CN88), W7YOZ. Dave, VE7HR, (see above) was a bit weaker here than the last few weeks. I looked south and east with no results."

That's it for this month ... I hope you have found encouragement to make some changes or improvement in your shack, contributing to a more enjoyable on-air experience. Please do let me know of your activities whether on the air, on the bench, or visiting a hamfest. *– 73, Trent, N4DTF, EM55*

awards

BY STEVE MOLO,* KI4KWR

Worked All Italian Provinces Award

CQ USA-CA Update

500 County Level
OK1FPG – Award number 3831 dated April 20, 2022
AA5JF – Award number 3832 dated May 17, 2022
WC4J – Award number 3833 dated June 12, 2022
LA4CAA – Award number 3834 dated June 16, 2022
K9MRQ – Award number 3835 dated June 20, 2022
JA6VQA – Award number 3836 dated June 22, 2022
IK5BSC – Award number 3837 dated June 22, 2022
JH1FSB – Award number 3838 dated July 17, 2022
JA9LX – Award number 3839 dated July 19, 2022
JAØFLL – Award number 3840 dated August 10, 2022
K5JC – Award number 3841 dated August 17, 2022
CE4WT – Award number 3842 dated August 21, 2022
JA1XEC – Award number 3843 dated September 24, 2022

1000 County Level
WC4J – Award number 1947 dated June 12, 2022
NF5KE – Award number 1948 dated June 22, 2022
JA1IAZ – Award number 1949 dated August 8, 2022
K5JC – Award number 1950 dated August 17, 2022
W6OAT – Award number 1951 dated August 19, 2022
OK6DJ – Award number 1952 dated August 25, 2022
N7WFK – Award number 1953 dated September 20, 2022

1500 County Level
W6OAT – Award number 1602 dated August 19, 2022
OK6DJ – Award number 1603 dated August 25, 2022

2000 County Level
W6OAT – Award number 1477 dated August 19, 2022

2500 County Level
W6OAT – Award number 1396 dated August 19, 2022

3000 County Level
W6OAT – Award number 1295 dated August 19, 2022

3077 County Level - Whole Ball of Wax
OM2VL – Award number 1270 dated August 7, 2022
W6OAT – Award number 1271 dated August 19, 2022

During Huntsville Hamfest 2022, an amateur operator spoke to me about an award his family back in Italy had for Worked All Italian Provinces. Wish he would have given me his information so I could give some credit for an award I did not really know about.

The award is offered by A.R.I. (Associazione Radioamatori Italiani, Italy's national ham radio association) for HF bands, to radio amateurs around the world and the rules seem to be fair in obtaining the requirements for the award. The award is issued to radio amateurs / Shortwave Listeners (SWLs) worldwide who can prove to have made two-way radio contacts or heard stations in a minimum number of Italian provinces or territories. There has been an update for a new multi-band classification and is listed in the application which will be linked at the end of the article for anyone interested.

Now the best part of this award is the QSO start date being June 2, 1948, but has the exemption for Italian provinces that became established after 1948. There is a table on their website <https://tinyurl.com/2j99844t> that lists all the provinces. It was last updated in 2017, with three provinces deleted and one renamed.

So, what bands can this be obtained on, you may wonder; all HF bands from 160-10 meters are in play for the award, including the WARC bands (30, 17, and 12 meters) so fair play for all entities. The award has several mode categories: Mixed, Phone, CW, or Digital and let us not forget the SWL version for listeners. There is a slight catch where the version you choose to work cannot be upgraded so you would need to apply for a separate award in this case.

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

Types of Awards

We start with the Basic Award which is two levels. The first is 75 different provinces for Italian applicants and 60 for foreign applicants … seems fair to me. The award is issued as a PDF format, to keep costs down I would assume. Now as I read up on the award to explain to everyone reading the article there is now the Multi-band Classification and Honor Roll.

To keep how it is explained, I am providing what is stated online exactly as it is written:

"Since this edition of the Rules the Provinces can be accredited even on more HF bands. For each QSO / Province accredited on each band is attributed one point, and a proper classification will be kept for this kind of participation. The classification is specific by mode, same as Basic Award; different modes mean different multi-band classifications, so different Basic Awards as specified in previous chapters.
The theoretical max number of points reachable is 990 (110 provinces — deleted included — multiplied by 9 HF bands).
The Honor Roll level is established at 500 points. The Honor Roll will be published on ARI website <www.ari.it>, with the complete Multi-band Classification and in the magazine Radio Rivista.
The participation to the Multi-band Classification and upgrades are electronically managed.
Those who already got the Basic Award with previous version of these rules will have their score confirmed but they must send the complete GCR list of previous QSOs in electronic format with first request of upgrade."

So let's make the adventure even more interesting with upgrades to the basic award. So, after you have obtained the

Basic Award, you can ask for credits for new QSOs you obtain but only done once in the calendar year. The Italians take very great pride, no doubt, for this award and publish participant scores on <www.ari.it> and in the ARI magazine, *Radio Rivista* (see <https://tinyurl.com/2673p7ey> for 2022 versions).

We also have activations for the provinces which reminded me of Parks on the Air-like activations but for the provinces, of course each province has a numbered code, in the format WAIP-XX. The group has a dedicated award and class for people who activate at least 10 Italian provinces with HF operations as a resident or portable / temporary, but foreign operators can certainly participate by contacting the award manager.

How to Apply for the W.A.I.P Award

The manual method involves filling out the WAIP2 form as PDF or manually filling it out and scanning the form and sending via email. The second method, which is likely the most common, is a version of the form in Excel which you fill out and send as an attachment to the awards manager for submission. But wait, you can easily send your ADIF format log and just fill in the Comment field with the code for which province you worked.

There are two forms, the WAIP1 and WAIP2, which must be sent to the manager at <waip@ari.it> for award submission. Claimed contacts must be through either paper QSL card, EQSL, or Logbook of the World (LoTW). I would suggest, if using paper QSL cards, to scan them and email the scans to the awards manager if required by them. For SWLs, one QSO / QSL can be claimed for crediting only

the province of the station who confirmed the QSL and not that of the worked station if the QSO was between Italian stations. So, I am sure the WAIP Manager can request to check any QSO being claimed which makes perfect sense to me.

Cost for the Award

The Basic Award is free and provided as a PDF file. The group does not suggest asking for a classic paper award, but if you do, it is subject to a charge of 15 Euros plus shipping fees. So why not keep it simple, in my opinion, and download the PDF?

Application link: <https://tinyurl.com/ctu52kdr>
Website: <https://tinyurl.com/2j99844t>

dx

BY BOB SCHENCK,* N2OO

NCDXF DXpedition RIB Project (Radio In Box)

This month, we turn the keyboard over to Gregg Marco, W6IZT, who is on a team sponsored by the Northern California DX Foundation (NCDXF) to create "RIBs" for DXpedition use (A "RIB" is a self-contained "Radio In a Box".) . In my August DX column, we first introduced you to RIBs and their potential impact to the future of DXpeditions. This month, Gregg will provide some more detail into the project.
I personally find this aspect fascinating and a step into keeping amateur radio alive on many of the most sensitive entities around the globe! I think that you will agree after reading this that the RIB team is taking us into the future of DXpeditions. I wholeheartedly endorse this project and want to thank NCDXF for its sponsorship. I want to also acknowledge George Wallner, AA7JV; Gregg Marco, W6IZT; Mike Snow, KN4EEI; Don Greenbaum, N1DG; and Hal Turley, W8HC, among others, for their participation in this awesome project. For a more detailed article on the RIB project, please read the article in the NCDXF Spring 2021 Newsletter at <https://tinyurl.com/2n4hk9zx>.
Now, here's Gregg. – N2OO

In the August issue of *CQ*, N2OO shared his thoughts on DXing, Past, Present and Future. His perspective on future expeditions caught my eye. We agree with Bob that future DXpeditions to environmentally sensitive areas may be quite different than we have seen in the past. The days of mega-DXpeditions to environmentally protected areas are likely behind us. Getting permission to activate these entities has become increasingly difficult, and the costs are continuing to rise. These environmentally protected areas dominate the top 25 most wanted DXCC entities. A new approach is needed, one that is less invasive, has a smaller footprint, and one that can support projects that the managing entity and/or other ecological interests desire to complete.

*email: <n2oo@comcast.net>

The Rig in a Box, or RIB (*Photo A*), is a solution that was developed by George Wallner, AA7JV. In 2020, the NCDXF funded the construction of six RIBs that would be made available to DXpeditions in hopes that a smaller, less invasive, approach would enhance our ability to gain permission to activate rare environmentally protected DXCC entities. What began as a Rig in a Box has opened the door to potential new concepts for low impact minimally invasive expedition techniques.

The RIB itself is a remotely controllable, rapid deployment, fully self-contained, hardened communications platform consisting of:

- A 1.5-kilowatt, water-cooled HF multi-mode radio
- A monitoring and control system
- Antenna switching and tuning

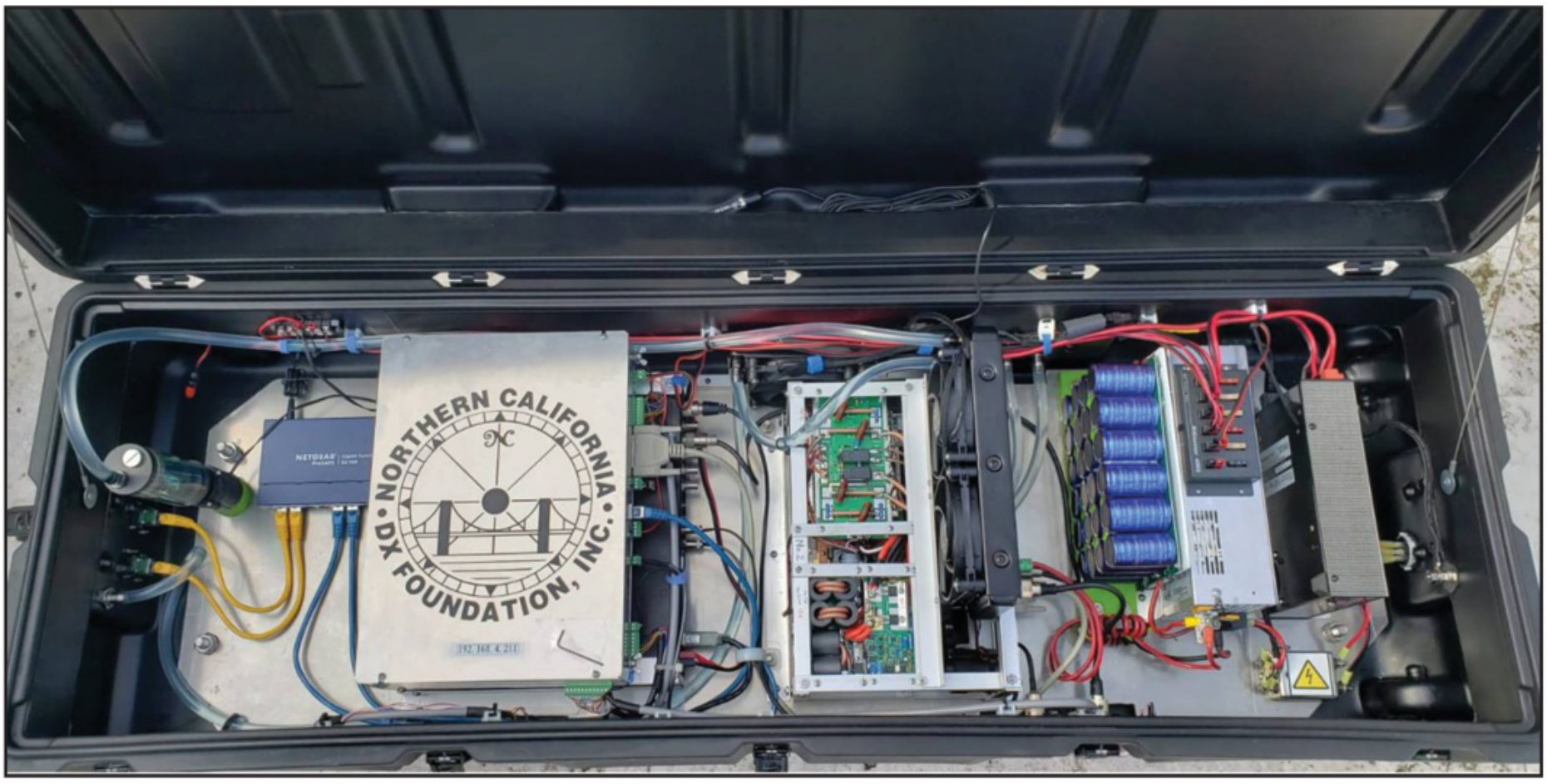


Photo A. Inside look at the RIB. Power supply on right, radios on left.

Photo B. George Wallner, AA7JV, and Mike Snow, KN4EEI, deploying full RIB package on an island in the Bahamas.

5 Band WAZ

As of September 1, 2022
2412 stations have attained at least the 150 Zone level, and 1107 stations have attained the 200 Zone level.

As of September 1, 2022
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
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
K1OA	199	28
K4HB	199	26
K5TR	199	22
K7UR	199	34
KZ4V	199	26
N3UN	199	18
N4NX	199	26
N4WW	199	26
N4XR	199	27
N6PF	199	23 on 10M
N8AA	199	23
N8DX	199	23
N8TR	199	23 on 10M
RA6AX	199	6 on 10M
RU3DX	199	6
RWØLT	199	2 on 40M
RX4HZ	199	13
RZ3EC	199	1 on 40M
S58Q	199	31
SM7BIP	199	31
SP9JZU	199	19 on 10M
USØSY	199	1 on 15M
VK3HJ	199	34
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W3LL	199	18 on 10M
W3NO	199	26
W4LI	199	26
W6DN	199	17
W6RKC	199	21
W6TMD	199	34
W9OO	199	18 on 10M
W9XY	199	22
9A5I	198	1, 16
AB4IQ	198	23, 26
DL6JZ	198	1, 31
EA5BCX	198	27, 39
F5NBU	198	19, 31
F6DAY	198	2 on 10M & 15M
G3KDG	198	1, 12
G3KMQ	198	1, 27
HB9FMN	198	1 on 80M & 10M
I1EIS	198	1 & 19 on 10M
JA1DM	198	2, 40
JA3GN	198	2 on 80M & 40M
JA7MSQ	198	2 on 80M & 10M
JH1BNC	198	2 on 80M & 10M
JH1EEB	198	2, 33
KØDEQ	198	22, 26
K1BD	198	23, 26
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3LR	198	22, 23
K3WA	198	23,26
K3XA	198	23,34
K4JLD	198	18, 24
K9MM	198	22, 26
KI1G	198	24, 23 on 10M
KZ2I	198	24, 26
LA3MHA	198	31 &32 on 10M
N4GG	198	18, 24
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
W2IRT	198	28, 28
W5CWQ	198	17, 18
W7AH	198	22, 34
W9RN	198	26, 19 on 40M
WC5N	198	22, 26
WL7E	198	34, 37
Z31RQ	198	1, & 2 on 10M
ZL2AL	198	36, 37

The following have qualified for the basic 5 Band WAZ Award:

Callsign	5BWAZ #	Date	# Zones
OP4K	2408	09/01/2022	197
LY5W	2409	09/01/2022	200
K6UIP	2410	09/08/2022	164
G8GNI	2411	09/24/2022	150
EA5HM	2412	09/24/2022	175

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
VE3UZ	2345	12/17/2021	183
K1TZQ	2405	8/19/2022	174
W6WF	2213	5/10/2020	162
IUØLFQ	2195	2/23/2020	194

New recipients of 5 Band WAZ with all 200 Zones confirmed:

5BWAZ #	Callsign	Date	All 200 #
2409	LY5W	9/1/2022	1107

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Jose Castillo. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N4BAA may also be reached via email: <n4baa@cq-amateur-radio.com>.

*Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).

The WPX Program

CW

4067 ..... N7ZUF

SSB

4442 ..... DD5VL
4443 ..... RQ7L

Mixed

4487 ..... W4GOV
4488 ..... KB1UZ
4489 ..... K9SUL

Digital

1818 ..... JP1GHJ
1819 ..... SV1OCA
1820 ..... W4GOV
1821 ..... KB1UZ
1822 ..... KE7IN
1823 ..... DL1LTG
1824 ..... W7AJC
1825 ..... IU4AAJ
1826 ..... W5FO
1827 ..... YDØBJJ
1828 ..... KD5DDV

CW: 400: VE3FAC. 5200: W8IQ.

SSB: 500: K6VHF. 650: DD5VL. 950: DL6JZ. 1000: N7ZUF.

Mixed: 500: AB9BH, VE3FAC, W8BO. 600: JP1RLN. 650: N1IVY, JP1RLN. 750: W4GOV, KD2RUY. 1000: JG1JPE. 1100: JG1JPE. 1150: KM4VI. 1350: M7ZUF, IK8FLW. 1500: N8IK. 2450: N6PM. 6100: ON4APU.

Digital: 350: N1IVY, KE7IN. 400: AB9BH, W8BO. 450: DL1LTG. 600: JP1RLN. 650: JP1RLN. 750: W4GOV, KD2RUY. 800: N7ZUF. 1000: JG1JPE, N8IK. 1100: SV1OCA, JG1JPE. 1150: G8GNI. 1700: K6VHF. 1950: W9VOB. 2300: N6PM.

160 Meters: G8GNI
40 Meters: N7ZUF, W8BO
30 Meters: JG1JPE, N8IK
20 Meters: JG1JPE, N7ZUF, SV1OCA, W4GOV
17 Meters: JP1RLN, JG1JPE, AB9BH, N8IK
15 Meters: JG1JPE, N7ZUF, JP1RLN, YDØBJJ
6 Meters: DL6JZ, G8GNI

Asia: N8IK, N7ZUF, JP1GHJ, YDØBJJ
Europe: JP1RLN, N7ZUF, DD5VL, VE3FAC, W4GOV, DL1LTG, IU4AAJ, YDØBJJ
Oceania: N7ZUF, N7ZUF, W9VOB
North America: JG1JPE, DL6JZ, N7ZUF, W4GOV, KB1UZ, KE7IN, W7AJC, W5FO, KD5DDV, K9SUL
South America: DL6JZ, N8IK

Award of Excellence: TF3JB
160M Bar: TF3JB
30M Bar: TF3JB
17M Bar: TF3JB
12M Bar: TF3JB
6M Bar: TF3JB
Digital Bar: TF3JB

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.

- RX antenna system
- System networking
- Power conditioning

In a typical RIB deployment, the RIBs would be placed on an island (*Photo B*) and the participants would operate from a boat, significantly reducing the DXpedition's on-island footprint. Network connectivity from the boat to the island is over a 900 MHz point-to-point wireless bridge. Testing has confirmed that up to six RIBs could be easily supported over a single 900-MHz wireless bridge at a range of up to 4 miles over open water.

The modular design of the RIB impacts many aspects of a DXpedition and provides us with an opportunity to optimize almost every step of the DXpedition process. We foresee a move away from a megateam approach to one with fewer operators, and for longer durations.

The typical mega-DXpedition would have a cargo container full of equipment. The transit time of a container from the U.S. to New Zealand can take 8 weeks or more in each direction, all the time being exposed to marine climate. Our approach would be to ship the gear via air freight with the RIB and associated equipment shrink-wrapped to pallets. Air freight would take just a few days, and becomes viable as we are shipping far less equipment, and no operator infrastructure.

With less equipment and fewer ops, we don't need a vessel capable of transporting a dozen ops and a cargo container full of gear. This opens the door to utilize smaller vessels at a significantly lower cost. It is our observation that the number of viable boats has diminished significantly in the post-COVID world. Smaller vessels may be

The WAZ Program

SINGLE BAND WAZ

6 Meter

197 ..... IUØLFQ

12 Meter Digital

7 ..... K3FRK

15 Meter Digital

13 ..... N6PAT

17 Meter CW

136 ..... JF3LOP

17 Meter Digital

28 ..... JA7HRM

20 Meter Digital

53 ..... JR3UIC
54 ..... JR1HYA
55 ..... KE8FMJ
56 ..... JA7HRM
57 ..... OH1LR

30 Meter CW

171 ..... JF3LOP

40 Meter Digital

27 ..... JA7HRM

80 Meter CW

114 ..... SP9JZU

160 Meter

697 R7LP ..... 33 Zones

ALL BAND WAZ

CW

1208 ..... YB1UUN
1209 ..... HA1AC
1210 ..... VE9VIC
1211 ..... IK4MTF

Digital

382 ..... W9CY
383 ..... YB1UUN
384 ..... K4SAF
385 ..... DD8BA
386 ..... EA4/K1WE
387 ..... JF1OCQ
388 ..... K8YC
389 ..... KE8FMJ
390 ..... JA7HRM
391 ..... OH1LR
392 ..... AG1A
393 ..... WB5KFP

Mixed

10292 ..... ND4V
10293 ..... YB1RUS
10294 ..... W9CY
10295 ..... RU9SO
10296 ..... SP8ALT
10297 ..... RQ7L
10298 ..... K4SAF
10299 ..... VE6SH
10300 ..... NZ6E
10301 ..... OZ9QW
10302 ..... JR3UIC
10303 ..... EA4/K1WE
10304 ..... K5DNL
10305 ..... LU3OZ
10306 ..... W5WGF
10307 ..... K9WX
10308 ..... DG1KBY
10309 ..... JF1OCQ
10310 ..... AK6A
10311 ..... KE8FMJ
10312 ..... OH1LR
10313 ..... AG1A
10314 ..... IK4MTF
10315 ..... KF6JOQ

SSB

5544 ..... ND4V

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Jose Castillo, N4BAA, 6773 South State Road 103, Straughn, IN 47387.. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Jose Castillo, N4BAA. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <n4baa@cq-amateur-radio.com>.

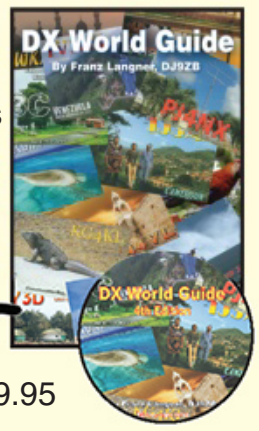
Falling Leaves... ...Falling Prices

DX World Guide-4th Edition

by Franz Langner, DJ9ZB

This is the fourth edition of Franz Langer's series of books bearing the title *DX World Guide*. This 380-page, fourth edition, full color throughout, includes information on well over 300 DX entities.

Whether used as a desk reference for the DXer of any level of proficiency or as a "wish book" for DXers just starting his or her DXCC journey, the new *DX World Guide* is a worthy and pleasant companion!



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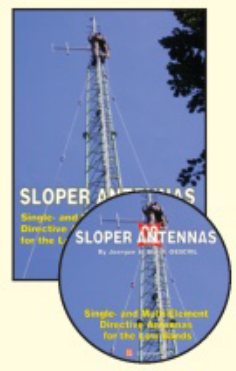
Single- and Multi-Element Directive Antennas for the Low Bands

With calculations and practical experience, this book shows which basic concepts have to be considered for sloper antennas for the low bands.



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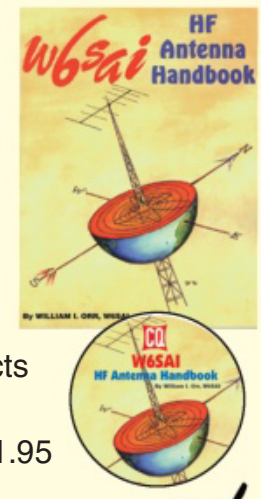

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by Dave Ingram, K4TWJ

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The Quad Antenna

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by Lew McCoy, W1ICP

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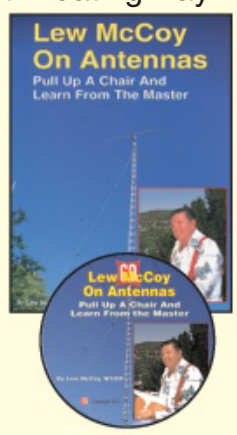

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Photo C. RIB being loaded onto boat used for island landing.

Photo D. One RIB completely set up on the island.

our only option to get to these remote protected locations.

Typically, a large-scale expedition would use multiple full-sized resonant antennas. Our approach also differs from this model. We have been testing, and continue to test, multiband vertical antennas that can be easily deployed in a matter of minutes by one or two people. They can have remote tuners at the base, enabling a single antenna to serve multiple bands. The tuner also compensates for the effect that the tides have on the tuning of the antenna. On one recent trip, we had a single station on the air within 45 minutes after arriving on the island!

We have made several trips to the Bahamas to test the RIBs, emulating how the solution would be deployed and operated in a DXpedition environment (*Photos C*, *D*, and *E*). Operating in major contests is the best proving ground we have. The team is proud of the results that we have been able to achieve. We hope to be on the air again this year as C6AGU in the CQWW CW and ARRL 160 contests.

The CQ DX Field Award Program

Digital Endorsement

NKØS .....50 MHz

Mixed Endorsement

NKØS .....1.8 MHz
K1NU 204
W9RPM 184

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, Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA. Please make all checks payable to the award manager.

CQ DX Awards Program

No Update

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Please make checks payable to the Award Manager, Keith Gilbertson. 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.

CQ DX Field Award Honor Roll

The CQ DX Field Award Honor Roll recognizes those DXers who have submitted proof of confirmation with 175 or more grid fields. Honor Roll lisiting is automatic upon approval of an application for 175 or more grid fields. To remain on the CQ DX Field Award Honor Roll, annual updates are required. Updates must be accompanied by an SASE if confirmation is desired. The fee for endorsement stickers is $1.00 each plus SASE. Please make all checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604.

Mixed

K2TQC.....288	HA1RW.....239	WI8A.....219	KF8UN.....205	ON4CAS.....194	K2SHZ.....182
W1CU.....267	VE3XN.....239	HA1AG.....218	OM2VL.....205	HB9DDZ.....193	KJ6P.....180
VE7IG.....254	I6T.....230	JN3SAC.....214	K1NU.....204	N4NX.....192	W6XK.....180
HAØDU.....253	K8OOK.....229	HA9PP.....213	K1NV.....204	HA1ZH.....190	W5ODD.....177
OM3JW.....253	N8PR.....229	WA5VGI.....213	VE7SMP.....204	BA4DW.....188	NØFW.....176
W6OAT.....252	HA5AGS.....228	IV3GOW.....211	RW4NH.....203	K2AU.....187	WA9PIE.....176
HA5WA.....250	9A5CY.....227	W4UM.....210	HB9AAA.....200	K8YTO.....186	HB9BOS.....175
IK1GPG.....245	K9YC.....227	N4MM.....208	N5KE.....200	WO7R.....185	NKØS.....175
OK1ADM.....245	VE3ZZ.....226	OK1AOV.....208	W3LL.....199	N3RC.....184	
K8SIX.....240	KØDEQ.....221	F6HMJ.....206	NIØC.....196	W9RPM.....184	

SSB

W1CU.....249	VE7SMP.....201	W4UM.....198	N4MM.....189	W3LL.....187	DL3DXX.....175
W4ABW.....202	KØDEQ.....198	JN3SAC.....191	WA5VGI.....189	NØFW.....176	

CW

W1CU.....253	KØDEQ.....214	DL2DXA.....209	WA5VGI.....197	N4MM.....186	N7WO.....175
HA5WA.....234	JN3SAC.....211	W4UM.....201	NIØC.....196	OK2PO.....184	
DL6KVA.....233	DL3DXX.....210	OK1AOV.....198	HB9DZZ.....189	N4NX.....177	

Digital

W1CU.....195	HA5WA.....177	JN3SAC.....175	KØDEQ.....175

Photo E. Two RIBs set up on an island.

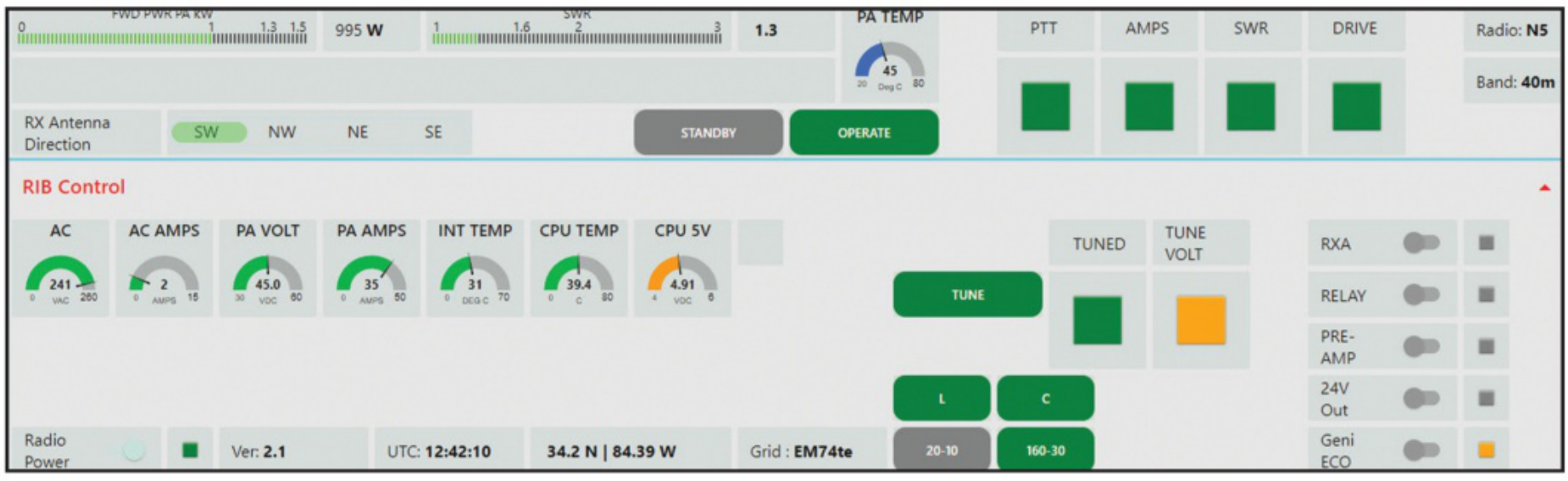

Photo F. Computer screen shot of software that remotely controls RIB.

Over the past two years, the RIB has received incremental improvements, some in hardware, but mostly in software, to simplify operation and to improve system monitoring (*Photo F*). The operator experience is no different than if the radio was sitting in front to them.

On our trip to the Bahamas in late June and early July, we brought along a STARLINK satellite terminal. We were all amazed at the performance. Throughput exceeded our expectations. Lower in cost than both VSAT and BGAN, STARLINK can enable a DXpedition to be a much more interactive experience for the DX community. Suffice it to say that the DXpedition experience of the future can be much more than filling band slots. STARLINK latency is not much different than a terrestrial internet connection. Perhaps N2OO's vision of working a pileup on Heard Island from his living room will become a reality.

The WPX Honor Roll

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

9677 9A2AA	4763 KW9A	3109 NXØI	2450 N6PM	1870 N5KAE	1524 NH6T/W4	1217 AB1QB	1032 DG5LAC	757 WB3D
8602 9A2NA	4757 I2MQP	3099 N6FX	2420 WA6KHK	1854 AC7JM	1484 FG4NO	1204 VA2IG	1023 N4WQH	750 AB1Q
8188 K2VV	4703 IK2ILH	3077 K1PL	2400 N7ZO	1828 K7LV	1480 K4JKB	1201 K9BO	1016 W9QL	736 JA3MAT
8188 W1CU	4681 JH8BOE	3028 IK2DZN	2391 WO7R	1824 WF7T	1462 DL4CW	1167 WA9PIE	1012 NØVVV	711 AG1T
7059 EA2IA	4423 N1RR	2987 AG4W	2391 IZØFUW	1821 PY5FB	1447 K3XA	1153 N3CAL	1010 VE3RZ	695 W8WDW
6955 KF2O	4574 JN3SAC	2968 AB1OC	2356 NE6I	1820 WU9D	1422 I2VGW	1148 SP8HKT	1007 AA4QE	682 AI8P
6040 KØDEQ	4462 K1BV	2965 W2YR	2252 JH1QKG	1746 K6UXO	1408 NH6T	1141 4F3BZ	1006 NØRQV	678 WE8L
5859 ON4CAS	4342 WB2YQH	2963 N3RC	2225 JH1APK	1741 N6PEQ	1398 ES4RLH	1137 YO5BRZ	1000 WB6IZG	674 N5JED
5715 S53EO	4298 VE3XN	2697 AK7O	2203 KI1U	1711 NS3L	1361 VA3VF	1136 KO9V	999 N3DF	661 AL4Y
5602 ON4APU	4241 N6QQ	2651 HK3W	2176 V51YJ	1707 K4WY	1333 AF4T	1116 YU7FW	995 PU2GTA	633 TI5LUA
5539 N4NO	4215 W3LL	2642 AA8R	2159 VA7CRZ	1684 W1FNB	1322 AA4FU	1112 N6MM	966 W6WF	621 K4HDW
5508 N8BJQ	4201 YO9HP	2616 9A2GA	2133 KØKG	1667 AD3Y	1301 KB9OWD	1107 PY2MC	953 JP1KHY	616 AC6BW
5482 VE1YX	3978 WD9DZV	2591 IK2RPE	2113 W2FKF	1643 SV1DPI	1301 K1DX	1100 WA3GOS	919 ON7MIC	605 IW2FLB
5453 YU1AB	3818 K9UQN	2589 DG7RO	2056 NKØS	1639 N7QU	1301 KM5VI	1109 KE8FMJ	889 WU1U	
5396 N6JV	3793 AB1J	2583 PA2TMS	2046 YO8CRU	1616 TA1L	1299 JA6JYM	1088 NJ4Z	866 K2KJ	
5387 W9OP	3538 9A4W	2550 K6ND	2016 N2WK	1590 JF1LMB	1295 NIØC	1084 KG4JSZ	857 R1AV	
5215 I5RFD	3459 W9IL	2532 AE5B	1995 JR3UIC	1570 PY5VC	1280 WF1H	1069 IZ4MJP	856 N2YU	
5039 WA5VGI	3329 W6XK	2457 K5UR	1972 K3CWF	1568 N3AIU	1260 UR6LEY	1058 N6DBF	835 K6RAH	
4934 W9OO	3130 SV1EDY	2538 K4HB	1955 NIØC	1547 KC1UX	1219 K6HRT	1036 DL5KW	833 N4JJS	

SSB

7200 OZ5EV	3174 I3ZSX	2532 W9IL	2094 I8LEL	1587 N3XX	1146 SQ7B	1004 WA5UA	758 IV3GOW	637 K5WAF
6334 9A2NA	3172 YO9HP	2483 AG4W	2093 W2WC	1550 IK2RPE	1136 K3CWF	978 EA7HY	724 WF1H	630 W6US
6145 K2VV	3141 DL8AAV	2451 EA3GHZ	2084 K5UR	1442 DG7RO	1112 NH6T	957 W9QL	724 W3TZ	624 K6KZM
5404 VE1YX	3138 N8BJQ	2443 JN3SAC	2076 K2XF	1393 N5KAE	1103 W6XK	934 PY5VC	717 KØDAN	606 KJ4BIX
5338 KF2O	3108 I4CSP	2400 W4QNW	2008 WD9DZV	1389 NKØS	1098 K4CN	931 YB1AR	717 N3JON	604 GØBPK
4916 EA2IA	3105 WA5VGI	2335 KG1E	1955 EA3NP	1386 HK3W	1096 JA7HYS	929 NS3L	714 YB2TJV	
4410 I2MQP	3067 N6QQ	2327 K1PL	1935 SV1EOS	1386 IK4HPU	1093 N6MM	919 KA5EYH	713 JH1APK	
4165 KØDEQ	2990 KF7RU	2326 CX6BZ	1884 WA6KHK	1371 VE6BF	1089 IZ8FFA	893 W9RPM	710 WA9PIE	
3723 I8KCI	2984 KI7AO	2209 IK2QPR	1879 K3IXD	1338 NE6I	1089 IT9ABN	889 N3AIU	700 N4FNB	
3681 N4NO	2946 PT7ZT	2201 NQ3A	1848 AB5C	1334 EA3EQT	1042 IZØBNR	875 K7SAM	700 JA1PLL	
3585 SV3AQR	2903 IN3QCI	2200 N6FX	1825 KQ8D	1264 N6PEQ	1032 DG5LAC	854 K6HRT	694 KG4HUF	
3535 KW9A	2857 4X6DK	2198 AB1OC	1812 K6ND	1262 K7LV	1031 K4CN	833 DK8MCT	690 W6PN	
3456 W9OO	2650 IK2DZN	2155 K9UQN	1668 W2YR	1258 N1KC	1031 IK8OZP	808 UR6LEY	684 KO9V	
3416 W3LL	2595 EA1JG	2131 N3RC	1646 VE7SMP	1222 YF1AR	1022 NW3H	802 N6OU	675 F1MQJ	
3348 CT1AHU	2582 PA2TMS	2129 AE5B	1641 AE9DX	1187 IZ1JLG	1012 KU4BP	801 K3XA	655 VA3VF	
3274 YU7BCD	2576 AA1VX	2113 W2FKF	1622 K5CX	1183 KI1U	1006 NJ4Z	766 I2VGW	647 YB8NT	
3186 N1RR	2568 SM6DHU	2109 NXØI	1611 W2ME	1150 VE6BMX	1004 K4HB	763 K4JKB	640 UA9YF	

CW

7674 WA2HZR	4164 WA5VGI	3012 WD9DZV	2357 W9HR	1708 NIØC	1421 KN1CBR	992 F5PBL	807 N5KAE	620 AF5DM
7200 K2VV	4076 I7PXV	2948 IK3GER	2291 N3XX	1691 KI1U	1389 IT9ELD	968 K3CWF	783 YB1AR	615 JH6JMM
6024 9A2NA	3974 JN3SAC	2943 N6QQ	2212 AC5K	1653 W2YR	1342 VE6BMX	962 K7LV	752 K6HRT	608 W9RPM
5511 KF2O	3804 W9OO	2915 KA7T	2203 NXØI	1626 W6XK	1235 JH1APK	944 AB1OC	743 JA5NSR	600 NY4G
5392 EA2IA	3773 KW9A	2811 OZ5UR	2022 AF5CC	1620 DG7RO	1220 AA4FU	908 NH6T	738 NH6T/W4	600 IK2SGV
5160 N4NO	3648 N1RR	2667 W9IL	1998 K5UR	1595 PY5FB	1210 DL4CW	897 HK3W	732 SQ7B	
5282 N6JV	3504 YU7BCD	2548 EA2CIN	1973 N3RC	1555 K1PL	1196 N3AIU	891 DK8MCT	727 JF1LMB	
4992 W8IQ	3462 K9UQN	2531 I2MQP	1905 WA6KHK	1505 R3IS	1098 LU5OM	890 NS3L	722 WA9PIE	
4916 IZ3ETU	3279 IØNNY	2497 W3LL	1832 N4YB	1483 VE1YX	1087 AE5B	889 N3AIU	720 K4CN	
4886 I3FIY	3214 SM6DHU	2490 N6FX	1762 K6ND	1480 WO3Z	1062 K3XA	864 YO5BRZ	652 IK2DZN	
4874 KØDEQ	3041 YO9HP	2477 VE6BF	1744 NE6I	1458 AG4W	1036 DL5KW	848 PY5VC	636 NKØS	
4776 N8BJQ	3031 EA7AAW	2424 W2WC	1727 K6UXO	1443 WA2VQV	997 N6PEQ	821 HB9DAX	629 IV3GOW	

DIGITAL

3187 KØDEQ	2251 EA2IA	1711 W2YR	1426 AB1OC	1108 KE8FMJ	992 N3DF	862 JP1KHY	750 NH6T/W4	611 KO9V
3145 KF2O	2242 HK3W	1704 IK2DZN	1378 K3CWF	1093 KI1U	992 K9UQN	855 R1AV	681 PY5VC	600 ADØFL
2996 W3LL	2217 YO9HP	1657 N1RR	1353 K1PL	1091 VA3VF	983 PU2GTA	833 N4JJS	680 K2KJ	
2978 N8BJQ	2103 K2YYY	1643 N3RC	1333 W1FNB	1060 AF4T	966 NS3L	812 UR6LEY	672 K9AAN	
2872 W6XK	1836 AG4W	1633 WU9D	1308 NKØS	1054 KW9A	947 I2VGW	811 WF1H	670 IV3GOW	
2570 WD9DZV	1818 W1EQ	1551 AC7JM	1227 ES4RLH	1051 KH6SAT	917 K7LV	810 N3CAL	668 KA5EYH	
2558 NT2A	1811 NX$I	1501W2/JR1AQN	1189 JF1LMB	1047 RW4WZ	881 NE6I	800 WA3GOS	654 JA3MAT	
2366 WA5VGI	1790 JN3SAC	1500 JH1APK	1149 W9IL	1009 GUØSUP	870 WB6IZG	783 YB1AR	640 WA9ONY	
2308 N6PM	1759 N7ZO	1459 KC1UX	1112 AB1QB	1002 NØRQV	866 SQ7B	750 ON7MIC	636 W9RPM	

REMOTE OPERATION

CW	MIXED	SSB	DIGITAL
7277 K9QVB	4026 N1RR	2953 N1RR	671 N1RR
3292 N1RR			

contesting

BY TIM SHOPPA,* N3QE

Getting in the Zone

Each fall, I send and copy many thousands of CQ zone numbers in my participation in the fall CQ World Wide DX Contests. The 40 CQ zones are also used as multipliers in scoring the CQWW DX Contests. Less major contests using the CQ zones in their exchange include DX stations in the CQ 160 Meter CW and SSB contests, the GACW WWSA CW DX contest, non-Japanese stations in the JIDX SSB and CW contests, the JT DX contest, and the World Wide Iron Ham contest.

In his article, "A Brief History of the CQWW Contest", Bob Cox, W3EST, traces the origins of a 40-zone DX map to an *R/9* magazine award in 1934 (*the precursor of today's CQ Worked All Zones, or WAZ, award – ed.*), which was later revised in 1936 by *Radio* magazine to boundaries very similar to today's CQ Zone map. In the February 1936 *Radio* magazine article, "DX Zones of the World: A new DX Yardstick," he finds a note that the zones were drawn with "no consideration to the number of amateurs which may be located within a particular zone, as this is a factor of no permanence." You can read more about K3EST's research into the evolution of the 40-zone map at the start of <https://cqww.com/history.htm>.

I analyzed the zone exchanges logged by contesters in publicly available CQWW CW and SSB logs from 2005-2021, and find that in the 21st century there remains a huge disparity in on-air activity by zone. For more than a quarter billion logged QSOs over these 17 years, I accumulated statistics for both the zone sent and zone received. The resulting distribution of contest QSOs by zone are shown in descending order in *Table 1*. Zone 14, Western Europe, appears in the logs 350 times more commonly than the rarest, Zone 34 covering Northeast Africa. Within the continent of North America, the West Coast (Zone 3) appears in logged QSOs less than a third of the time that the East Coast (Zone 5) appears, with the Midwest (Zone 4) in between.

In the public logs, the most common

email: <n3qe@cq-amateur-radio.com>

CQ Zone		Percent of logged QSOs
Western EU	14	20.67
Central EU	15	20.23
Eastern NA	05	11.45
Eastern EU	16	9.78
Central NA	04	7.24
Japan and Korea	25	4.22
Balkan	20	3.71
Western NA	03	3.22
West Indies	08	2.42
Western Siberian	17	1.89
Northwest AF	33	1.74
Central SA	11	1.62
Northern SA	09	1.60
Southeast SA	13	1.09
Eastern AS	24	1.03
Central Siberia	18	1.00
Soutwest AS	21	0.78
Indonesian	28	0.60
Central America	07	0.48
Phillipine	27	0.47
Central Pacific	31	0.47
Central AF	35	0.43
Eastern VK	30	0.39
New Zealand	32	0.37
Southwest SA	12	0.33
Eatern Siberian	19	0.32
Southeast AS	26	0.29
Western SA	10	0.26
Southern NA	06	0.26
Northwestern NA	01	0.23
South African	38	0.20
Southern AS	22	0.18
North Atlantic	40	0.18
Northeast NA	02	0.17
Central AS	23	0.15
Western VK	29	0.12
Equatorial AF	36	0.12
Eastern AF	37	0.10
Madagascar	39	0.10
Northeast AF	34	0.06

Table 1. The 40 CQ Zones, arranged in order of increasing rarity. Data is from the "to" and "from" zone columns of CQWW CW and SSB public logs, 2005-2021, <www.cqww.com/publiclogs>.

Table 2. The top 20 most frequent pairings of zones logged in the CQWW CW and SSB contests, 2005-2021. In each pair of zones, the lower zone number is listed first.

CQ Zone pair	Occurences
14-15	13873682
05-14	9555749
15-16	7838596
05-15	7753176
14-16	7075560
15-15	5864797
14-14	5686813
04-14	4433966
04-15	3553590
14-20	2941457
15-20	2572245
05-08	2011087
03-25	1982111
05-16	1970643
15-17	1554061
16-20	1552691
15-25	1528230
04-08	1466268
04-05	1400971
14-33	1259405

"to" and "from" pairs of zones found in the logged QSOs take place between Zone 14 (Western Europe) and Zone 15 (Central Europe). These will be at best 1-point QSOs, as they are both on the same continent. Also near the top of the list of common to-from zone combinations, which I list in *Table 2*, are contacts inside Zone 14, inside Zone 15, and between these zones and Zone 16 (European Russia and Ukraine), and the European part of zone 20 (the Balkan countries), all 1-point QSOs with a rich base of country multipliers.

The second most common combination of zones logged are three-point QSOs between the East Coast of North America (Zone 5) and Western Europe (Zone 14). To break out of North American and European activity, we have to go all the way down to the 13th most popular pairing of zones, which is between the West Coast of North America (Zone 3) and Japan and South Korea (Zone 25). At the 14th most popular pairing, we find Asiatic Russia (Zone 17) in communication with zone 15 in the middle of Europe. At the very bottom of the top 20, we find zone 33 in Africa making QSOs with zone 14 in Western Europe.

As you make QSOs during the 48-hour CQWW contest weekend, you'll find that working a new zone will also usually result in working a new country. As a result, each new zone you work on each band will likely be a "double multiplier." The N1MM+ contest logging program likely highlights callsigns that would be double multipliers in green, highlighting them as even more valuable than red single multipliers.

Contesters in the U.S. do not earn any points by working other U.S. hams in the CQWW CW and SSB contests, but they do earn country and zone credit. In the N1MM+ logger, these new multipliers will be highlighted as multipliers even though they are not worth any points. Occasionally on the air you'll hear the phrase "for the mult" along with a search-and-pounce station's callsign when they're working zero-point stations in their own country for zone and country multipliers. You don't have to be sheepish going for these QSOs — multipliers count per band in CQWW, and you'll miss out on a total of 12 multipliers each contest if you don't work your own country and zone.

Your contesting program will often be able to auto-fill the zone exchange in CQWW contests for you. For CQ zone information, the callsign you type in is cross referenced against the patterns in the Country File currently installed on your computer. As travel restrictions worldwide are lifted and DXpeditions pick back up, keeping your Country File up to date will avoid zone confusion during the heat of the contest. If your logging PC is connected to the internet and you're using the popular N1MM logging program, you can select the "Tools->Download And Install Latest Country File" menu option and in two mouse clicks be updated. If your logging computer isn't on the internet or you are using a different logging program, you can visit the Country File website <www.country-files.com> in advance, manually download the country file, and sneakernet the file to your logging PC for installation.

For several common zones, the Country File is not the final word for zone determination. The callsign area in a U.S. ham's callsign may not correspond to his geographic location, and some callsign areas span multiple CQ zones. The Country File contains special exceptions for several hundred com-

Calendar of Events

All year	CQ DX Marathon	http://bit.ly/vEKMWD
Nov. 1	Silent Key Memorial Contest	https://skmc.hu/en/rules.html
Nov. 2	UKEICC 80 Meter Contest SSB	https://ukeicc.com/80m-rules.php
Nov. 2	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Nov. 5-6	IPARC Contest	www.iparc.de
****Nov. 5-6	Ukrainian DX Contest	http://urdxc.org/rules.php?english *****CANCELED
Nov. 5-7	ARRL CW Sweepstakes	www.arrl.org/sweepstakes
Nov. 6	High Speed Club CW Contest	www.highspeedclub.org
Nov. 7	RSGB Autumn Series, Data	https://bit.ly/31qpcJl
Nov. 9	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Nov. 12	FISTS Saturday Sprint	www.fistsna.org/operating.html#sprints
Nov. 12-13	10-10 Digital Fall Contest	http://bit.ly/1FrFeBc
Nov. 12-13	ARRL EME Contest	www.arrl.org/eme-contest
Nov. 12-13	CQ-WE Contest	https://cqwe.cboh.org
Nov. 12-13	JIDX Phone Contest	www.jidx.org
Nov. 12-13	OK/OM CW DX Contest	http://bit.ly/19rrRjl
Nov. 12-13	Worked All Europe RTTY Contest	https://bit.ly/36ubggF
Nov. 12-14	AWA Bruce Kelley 1929 Memorial QSO Party	https://bit.ly/2FtzQEn
Nov. 12-14	PODXS070 Club Triple Play Low Band Sprint	http://bit.ly/2Cq2yUA
Nov. 13	FIRAC HF Contest	www.firac.de/html/contest.html
Nov. 13-14	Fall Classic Exchange CW	www.classicexchange.org
Nov. 15-16	Fall Classic Exchange CW	www.classicexchange.org
Nov. 16	RSGB Autumn Series, SSB	https://bit.ly/31qpcJl
Nov. 16	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Nov. 18	YO International PSK31 Contest	www.yo5crq.ro/index.htm
Nov. 19	All Austrian 160M Contest	https://bit.ly/3fgsiUo
Nov. 19	Feld Hell Turkey Sprint	https://bit.ly/3asfcjj
Nov. 19	RSGB 2nd 1.8 MHZ Contest CW	https://bit.ly/31qpcJl
Nov. 19	SARL Newbie Party	http://bit.ly/H0IqQf
Nov. 19-20	LZ DX Contest	http://lzdx.bfra.bg/rulesen.html
Nov. 19-20	REF 160-Meter Contest	https://bit.ly/3iHzsQU
Nov.19-20	SARL Field Day Contest	http://bit.ly/H0IqQf

mon U.S. and VE contest calls that are in zones; if you're working deep into non-contester population, especially new hams who have claimed vanity callsigns, you'll have to accurately listen for the zone to log it. Asiatic Russia spans multiple CQ zones as well (17, 18, and 19), and while the Russian letter and digit prefixes are a good clue as to the location of an Asiatic Russia call, you still should make an effort to log the correct zone. Tim Makins, EI8IC, maintains a particularly useful map showing the relation between Russian prefixes and CQ Zones at <https://bit.ly/3SrKsEe>.

What if you are called by a station that genuinely doesn't know their zone, or gives you a serial number instead of a zone? The CQWW Rules FAQ is very direct on the subject: "Log the zone based on their location." With a recently installed Country File, you'll be most efficient if you simply log the correct zone it recommends; trying to extract geographic details of a station (possibly a station with zero-point QSO value, if you're a U.S. station working another U.S. station) during the heat of a contest is never going to be worthwhile.

Can you review your log at the end of a contest using an online database to fill in missing zone numbers, or attempt to correct zone numbers that seem suspect? This is expressly forbidden by CQWW Rule IX.9: "Correction of logged callsigns and exchanges after the contest by using any databases, recordings, email, or other methods of confirming QSOs is not allowed." The CQWW FAQ expands that you are allowed to make corrections to your log after the contest but only from your own notes or memory, not from external sources like the DX Cluster, Reversebeacon spots, or DX newsletters. The prohibition on post-contest log corrections is common among all contests, and makes it all the more important to have a recent Country File installed on your logging PC before the contest.

New Live-Streaming Opportunities for Assisted Ops in the 2022 ARRL Sweepstakes

Are you operating in a multi-op or in the Unlimited (assisted) single operator category in ARRL November sweepstakes? If so, think about live-streaming it as well. This is explicitly allowed — for the first time ever in any contest rules — by the 2022 Sweepstakes Rules, under section HCAT.2.2: "Entrants are permitted to use social media, video live streaming, and internet chat rooms."

I've done some investigation and the most comprehensive audiovisual approach to live-streaming in video-gaming is offered by Twitch, <www.twitch.tv>. The Twitch streaming tools offer excellent support for putting your face (via a webcam) on the screen along with your PC's screen, and many aspects of amateur radio contesting — scores, strategy, tactics, and mechanics — are shared with the multiplayer video gamers that make up the bulk of Twitch's customer user base.

Other streaming services may be better than Twitch for targeting amateur radio enthusiasts who might be older than the typical video gamer and frequent other social sites. In my time on Facebook; I've become a member of dozens of ham-radio oriented groups where a live-stream promoting amateur radio contesting would be entirely appropriate. If you've spent a time establishing a YouTube presence tailored around amateur radio, that would also be a good way to attract

Nov. 19-21	ARRL SSB Sweepstakes	www.arrl.org/sweepstakes
Nov. 19-21	AWA Bruce Kelley 1929 Memorial QSO Party	https://bit.ly/2FtzQEn
Nov. 20	FISTS Sunday Sprint	www.fistsna.org/operating.html#sprints
Nov. 20	Homebrew & Oldtime Equipment Party	www.qrpcc.de/contestrules/hotr.html
Nov. 24	RSGB Autumn Series, CW	https://bit.ly/31qpcJl
Nov. 26-27	CQWW DX CW Contest	www.cqww.com/index.htm
Nov. 28	RSGB FT4 Contest Series	https://bit.ly/31qpcJl
Nov. 30	UKEICC 80 Meter Contest CW	https://ukeicc.com/80m-rules.php
Dec. 1	QRP ARCI Top Band Sprint	www.qrparci.org/contests
Dec. 2-4	ARRL 160-Meter Contest	www.arrl.org/160-meter
Dec. 3-4	PRO CW Contest	www.procontestclub.ro/PCC%20Rules.html
Dec. 3-4	FT Roundup	www.rttycontesting.com/ft-roundup/rules
Dec. 3-4	UFT Contest	www.uft.net/activites-et-concours/rencontres-uft
Dec. 7	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Dec. 10-11	ARRL 10M Contest	www.arrl.org/10-meter
Dec. 10-11	Veron 28 MHz SWL Contest	http://bit.ly/2L9eT1L
***Dec. 10-11	TRC Digi Contest	https://trcdx.org/rules-trc-digi/ CANCELED
Dec. 10-12	PODXS070 Club Triple Play Low Band Sprint	http://bit.ly/2Cq2yUA
Dec. 11	CQC Great Colorado Snowshoe Run	www.coloradoqrpclub.org/contests/snow.htm
Dec. 11	QRP ARCI Holiday Spirits Homebrew Sprint	www.qrparci.org/contests
Dec. 14	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Dec. 16	AGB Party Contest	http://ev5agb.com/contest/contests_e.htm
Dec. 17	RAC Winter Contest	www.rac.ca/contesting-results
Dec. 17-18	Croatian CW Contest	www.9acw.org/index.php/rules/english
Dec. 17-18	OK DX RTTY Contest	www.crk.cz/ENG/DXCONTE
Dec. 17-18	Stew Perry Topband Challenge	www.kkn.net/stew/stew_rules.html
Dec. 18	ARRL Rookie Roundup, CW	www.arrl.org/rookie-roundup
Dec. 21	VHF-UHF FT8 Activity	www.ft8activity.eu/index.php/en
Dec. 25	RAEM Contest	https://raem.srr.ru/rules
Dec. 26	DARC Xmas Contest	https://www.darc.de/?id=820
Dec. 30	YOTA Contest	www.ham-yota.com/contest
Dec. 31-Jan. 1	Bogor Old and New Contest	https://contest.orari-bogor.org

fellow hams into contesting. Both Facebook and YouTube offer video streaming platforms for sharing both station video and audio as part of the new opportunity to live-stream within the contest rules.

A full-time entry in the ARRL Sweepstakes starts off with excellent rates late Saturday afternoon and into Saturday evening. During these busy times, most live-streaming efforts would largely be exhibiting your skills as you tune the band or run a frequency. The audio might simply be what you're hearing on your headphones during receive, and your own transmitted signal (CW or phone) while transmitting. Because you'll be so busy on the air, any explanation of the contest — including a link to the rules — will best be shared in a video banner that you are displaying on the desktop.

Opportunities to deliver verbal commentary will likely pick up starting mid-morning on Sunday in Sweepstakes, when rates often take a nosedive. If you're running a CQ loop, you might bring a promotion of the contest more prominently into your livestream's audio mix. Take advantage of the slower rates to share some of the technological tools in the shack and on your desk that let you make QSOs and optimize your score. Highlight your long-term goals through your logger's rate meter and score totals, or explain how you're using spotting assistance to pick off new QSOs and maybe even search for the rarest multipliers.

Speaking of rare multipliers in ARRL Sweepstakes, Gerry Hull, W1VE, again plans to activate the Yukon / Northwest Territories (NWT) using the technology of remote contesting. J. Parke Allen, VY1JA, hosts the remote activity via his station in Whitehorse. Gerry notes recent station improvements including a TS-590, an HF2K kilowatt solid-state amplifier, and plans to have single-band dipoles installed on a 70-foot mast in time for both modes of Sweepstakes.

November and December Contest Highlights

The ARRL November Sweepstakes contest — held on the weekend of Nov. 5-6th for CW, and Nov. 19-21st for SSB — has several rule changes above and beyond allowing assisted ops to live-stream. You can find the new rules and operating hints at <www.arrl.org/sweepstakes>.

The Deutsche Amateur Radio Club sponsors the Worked All Europe RTTY contest, a 48-hour event held the weekend of Nov. 12-13th this year. Activity is more expansive than the name implies; like most RTTY contests, everyone works everyone for points and multipliers. Additionally, any transcontinental station you work may result in up to 10 extra points via QTCs, a contest-based form of message passing. If you use the N1MM logger, Larry Gauthier, K8UT, has created a video covering the details of QTC exchange in this logger — you can find it on the N1MM website at <https://bit.ly/3rn8YKP>.

The world's largest CW contest, the CQ World Wide DX CW Contest, is Nov. 26-27th. NG3K, Bill Feidt, frequently updates his announced DXpedition page at <https://bit.ly/3Sui98k>, with new DXpeditions. An announcement near press time reveals that K6ZO, Don Jones, will be activating 7Q6M in Malawi. Follow the DX newsletters, update your country file, and join in for the CW DX action that weekend. Full rules are at <https://cqww.com>.

In the first two weekends of December, the single-band ARRL 160-Meter Contest (Dec. 2-4th) and ARRL 10-Meter Contest (Dec. 10-11th) are held. Frank Donovan, W3LPL, has been predicting exceptionally good conditions on the 10-meter band. The ARRL contest portal, at <https://contests.arrl.org>, will allow you to access the rules as well as view results from the previous solar cycle to see the fun we're in for as the solar flux rises.

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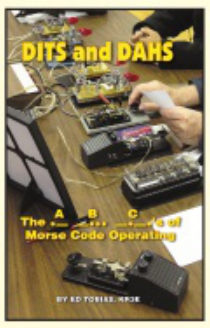

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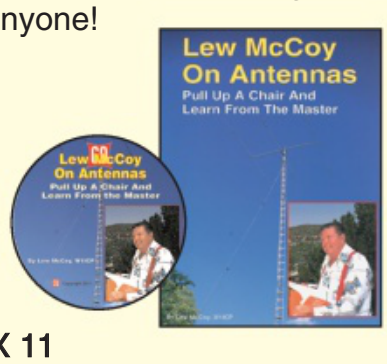

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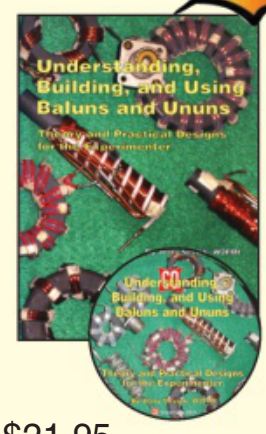

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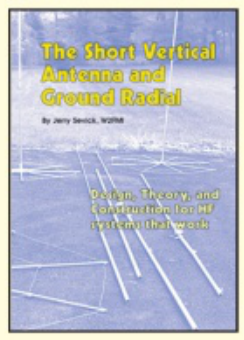

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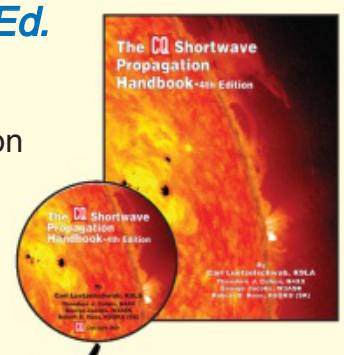

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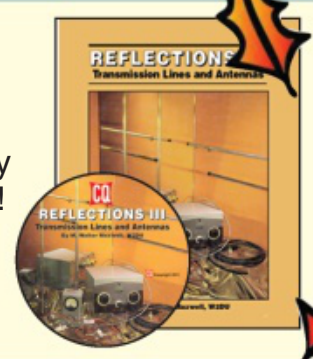

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propagation

BY TOMAS HOOD,* NW7US

November Shortwave Propagation

Quick Look at Current Cycle 25 Conditions:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, August 2022: 70
12-month smoothed, February 2022: 64

10.7-cm Flux:
Observed Monthly, August 2022: 118
12-month smoothed, February 2022: 109

One Year Ago:
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, August 2021: 23
12-month smoothed, February 2021: 19

10.7-cm Flux:
Observed Monthly, August 2021: 78
12-month smoothed, February 2021: 78

Last month's column contained a detailed review of conditions expected during October. Let's look at what we can expect this month.

160 Meters: Expect an increase in DX openings on this band during the local hours of darkness, starting at dusk and lasting into the sunrise period. This season will mostly have stable conditions on this band and other medium-wave bands like 120 meters (for the SWLs among us). This winter will be reasonably quiet, though conditions may at times be marginal if the geomagnetic field activity becomes stormy. The combined effect of the decreased static levels and longer hours of darkness in the northern latitudes will make 160 meters a pleasurable band during winter. During this month's CQWW CW contest, participants should experience fair to good scores on this band. Look for openings toward Europe and toward the south from the eastern half of the U.S. and toward the south, the Far East, Australasia, and the South Pacific from the western half of the country. These openings should be strong during the contest period.

80/75 Meters: This should be a great band for DX openings to many areas of the world during the hours of darkness and into the sunrise period. Eighty meters becomes a reliable long-distance band throughout the entire period of darkness. The band should peak toward Europe and in a generally easterly direction around midnight. For openings in a generally western direction, expect a peak just after sunrise. The band should remain open toward the south throughout most of the night. Noise levels will be considerably down from October, and the period for band openings in a particular direction will be a bit longer. Some CQWW contest operators may take the challenge of operating exclusively on 80, an adventure in skill and patience. The conditions are expected to be favorable for high scores on this band.

60 Meters: Competing with both the 75- and 40-meter bands, this band may provide coverage during those periods when propagation is less useful on those bands. During hours of darkness, seasonal static levels are lower than they were during the summer, and nighttime Maximum Usable Frequencies (MUFs) on some paths could be just above 5 MHz this month. That results in possible DX until morning hours. The band should be open first for DX toward Europe and the east during the late afternoon. Signals should increase in intensity as darkness approaches and peak from an easterly direction closer to midnight, and from a westerly direction just after sunrise. Remember, just as with 80 / 75 meters, signals tend to peak as the sun rises on the eastern end of a propagation path.

40 Meters: Competing with the 80-meter band, this should be a hot DX band during the dark hours as the seasonal static levels are lower than they were during the summer. Nighttime MUFs on some paths could fall below 7 MHz this

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for November 2022

	Expected Signal Quality			
Propagation Index	(4)	(3)	(2)	(1)
Above Normal: 7, 9-11, 15-16, 19-20, 22-23, 25	A	A	B	C
High Normal: 3-6, 8, 12-14, 17-18, 24, 26, 30	A	B	C	C-D
Low Normal: 1-2, 28-29	B	C-B	C-D	D-E
Below Normal: 21, 27	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 3 will be fair to good on November 1st and 2nd, good from November 3rd through October 6th, and then excellent on November 7th, and so forth.

2. Alternatively, you may use the *Last-Minute Forecast* as a general guide to space weather and geomagnetic conditions throughout the month. When conditions are *Above Normal*, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as *Disturbed* will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these geomagnetic conditions. In general, when conditions are *High Normal* to *Above Normal*, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at <https://SunSpotWatch.com> provided by NW7US.

month, resulting in this band closing on those paths until morning hours. The band should be open first in the late afternoon for DX toward Europe, changing over to favor the west until after dawn. Signals should peak from an easterly direction closer to midnight, and from a westerly direction just after sunrise. Like 80 and 60 meters, signals here tend to peak as the sun rises on the eastern end of a propagation path.

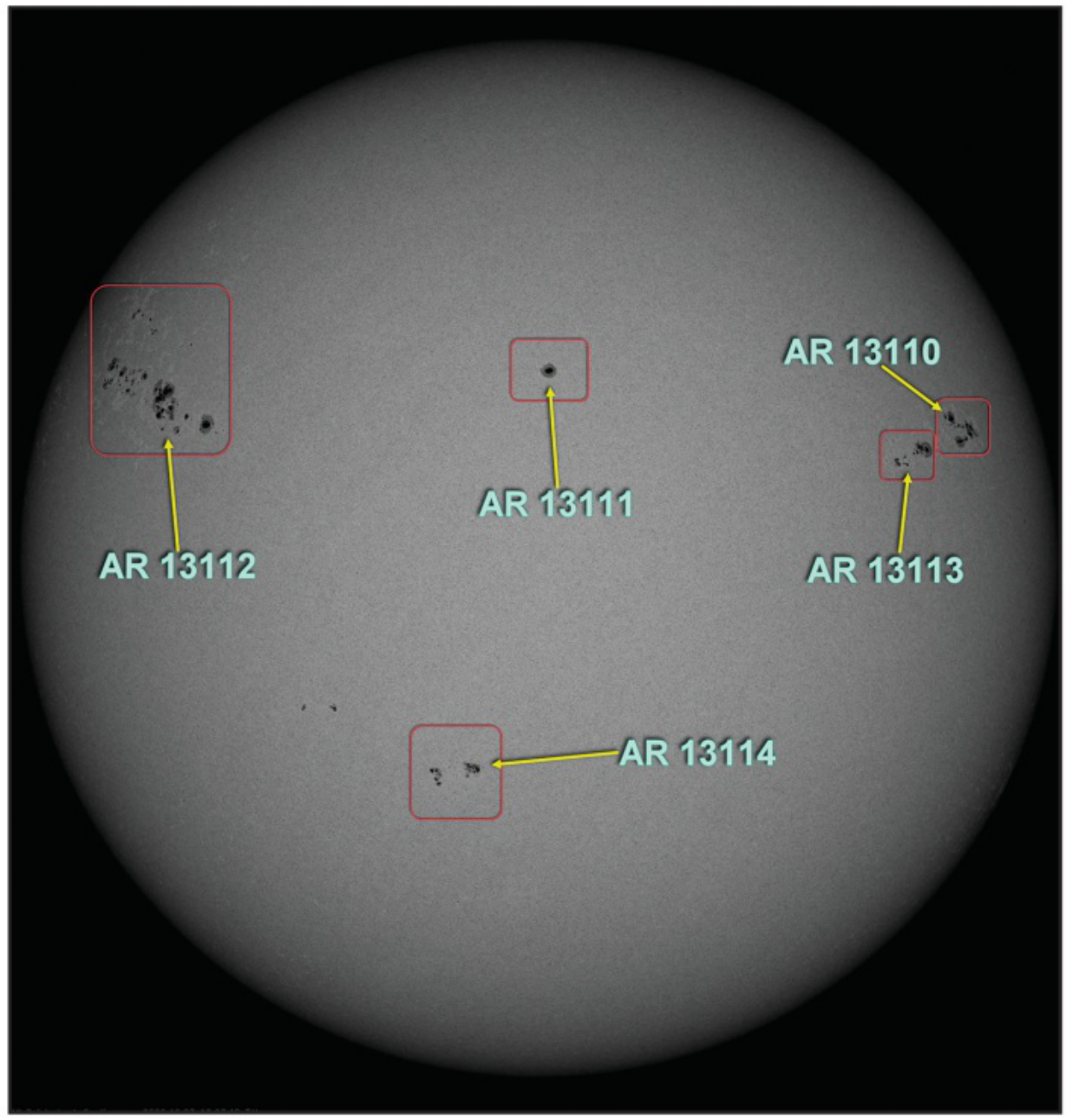
30 Meters: Competing with the 20-meter band, this band offers digital and CW operators an edge for hunting DX. Like other lower-frequency bands, this one should be open first for DX toward Europe and the east during the late afternoon. Signals should increase in intensity as darkness approaches and peak from an easterly direction closer to midnight, and from a westerly direction just after sunrise. What is great about this band is that it often has the best of characteristics found on both 20 and 40 meters, just shifting throughout the day.

20 Meters: DX openings should be possible on this band mostly during the day, and somewhat during the night depending on the path and the path's end points (where you are, and where your contact is, and the path between). However, because of the shorter daylight hours in the Northern Hemisphere, nighttime path openings on this band will be shorter this month compared to October, with signal peaks from about an hour or two after sunrise and again during the late afternoon and early evening hours for those paths that may be open. Don't forget to look for long-path openings for about an hour or so after sunrise and again for an hour or so before local sunset.

17 Meters: This band is becoming a contender for reaping great DX. Conditions for paths in the Northern Hemisphere will be poor to fair, but usable mostly at low latitudes to DX areas that are also at low latitudes. This is primarily a daytime band, and spend time hunting DX, as openings occur more often here than on the 15-meter band.

15 Meters: The conditions for propagation between U.S. and DX entities will be poor to fair on this band, especially at low latitudes. Fluctuating conditions are expected at these frequencies from shortly after sunrise through the early evening hours. The band could remain open into the evening toward southern and tropical areas.

12 Meters: Expect conditions on this band to be much like on the 10-meter band. A daytime band, fluctuating conditions are expected at these frequencies from shortly after sunrise through the early evening hours. The band could remain open into the evening toward southern and tropical areas. Keep watching, as this band could provide a surprise or two this month.



We are now witnessing most days with not just a few sunspots, but with many, as can be seen in this white-light image taken on October 3, 2022. There is no missing the great progress of this cycle. Even the 10-meter band is alive with much activity from DX locations. (Courtesy of NASA/SDO)

10 Meters: With an expected 10.7-cm flux higher than about 115 on the best days of the month, this band will have some excellent conditions. Contest participants in low- and middle-latitude locations can expect daytime F-layer propagation contacts during the contest weekend, mainly on north-south paths, but possibly some good one-hop east-west propagation. If open, the band will peak right after sunrise, and just a bit before sunset, local time. Openings toward Europe and in a generally easterly direction, when they exist, will be short, peaking an hour or two before noon. Those toward South America and Africa peak during the early afternoon hours. Optimum conditions toward the Far East, Australia, southern Asia, and the South Pacific are forecast for the late afternoon and early evening hours, especially from stations in lower latitudes. This band will require a lot of skill and better-than-average antennas.

VHF Conditions

The Leonids meteor shower is typically the big event for November. This shower is active from early November and lasts all month. For those readers who are attempting to fire up the VHF transceiver and activate the 6-meter beam antenna to propagate a signal off of the plasma trails of these meteors, there may be enough hourly activity this year to make this a hot event.

Working VHF propagation off meteor trails (the highly ionized plasma trails left by the meteor) requires some reasonable power and gain, and good operating skill. With the latest high-speed burst-mode CW software as well

as the WSJT modes,, you can possibly work even the smaller meteors. There is a guide written by Kirk, NTØZ, available as a PDF document located at <https://tinyurl.com/d22t3snx>.

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 <https://SunSpotWatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

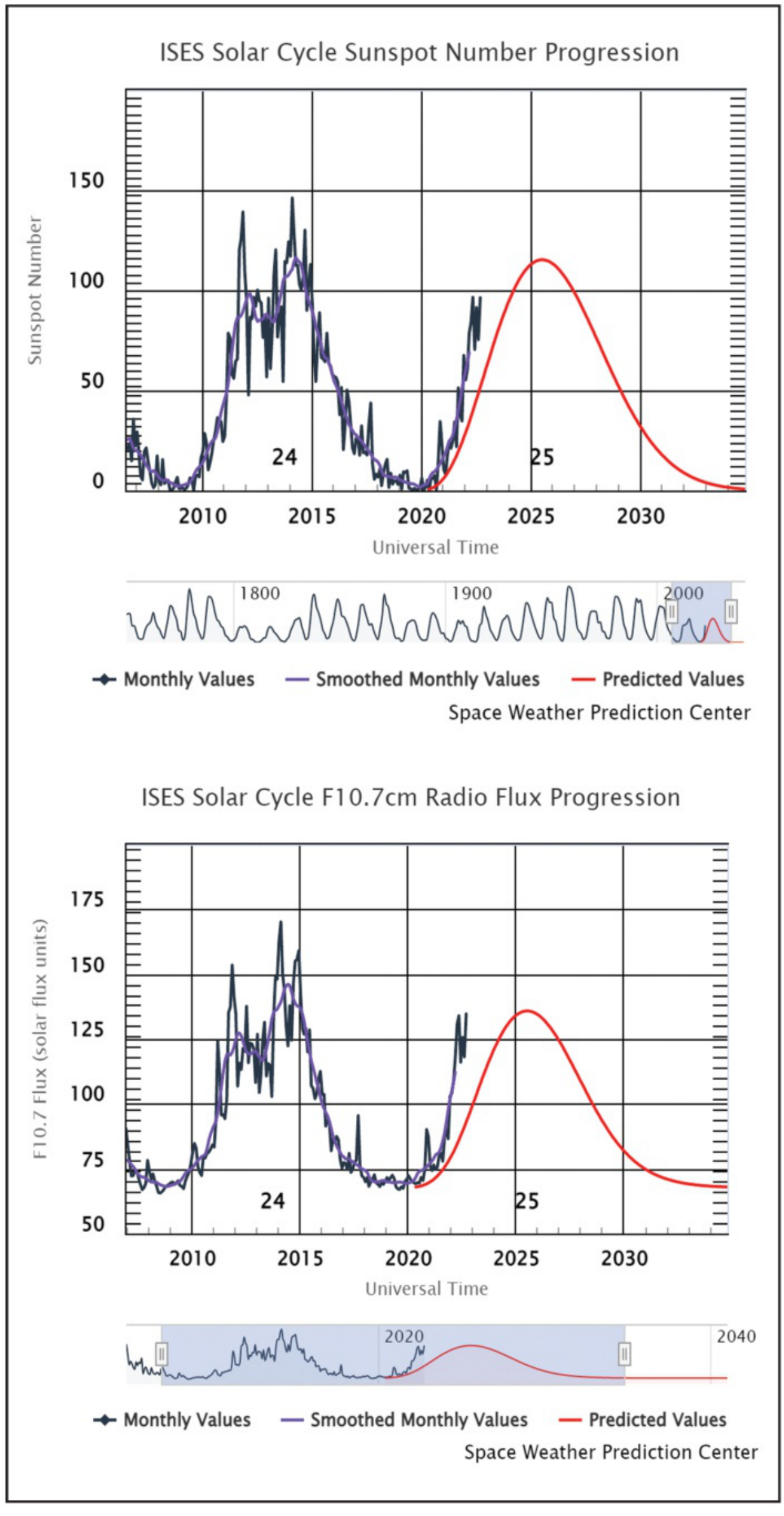
The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for August 2022 was 69.74. The 12-month running smoothed sunspot number centered on February 2022 is 65.61. A smoothed sunspot count of 72, give or take about 7 points, is expected for November 2022.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 118.13 for August 2022. The 12-month smoothed 10.7-cm flux centered on February 2022 is 109.15. The predicted smoothed 10.7-cm solar flux for November 2022 is 110, give or take 5 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



Impressive: The plots confirm that we are seeing a rapid rise of this cycle, Sunspot Cycle 25. If the trend continues upward, this cycle may well outperform the last several cycles (in terms of sunspot activity). (Courtesy of NOAA/SWPC)

our readers say...

Warmth in Antarctica

October author Ted Cohen, N4XX ("Antarctic Memories") wrote the following to fellow author Stew Gilmor, W1FK, after reading his adjacent article, "The Chill in Antarctica":

Great memories, Stew … Loved the story about you and your soon-to-be-wife. With the equipment I had, the only messages I was able to get to my girlfriend, Susan, in Madison, Wisconsin (the woman who eventually would become my wife in 1964) was via CW. But in both our cases, ham radio came through for us when there was literally no other way to communicate with our loved ones.

– 73, Ted, N4XX (ex CE9AF, et al.)

WA2NDM's Active Antenna

The following was directed to "Math's Notes" editor Irwin Math, WA2NDM:

Howdy Irwin,

It was a pleasure reading your article, "An Active Antenna Project," in the September 2022 issue of *CQ*. As an 81-year-old enthusiast of "rebuilding" old shortwave receivers, I've often wished for this very device. This weekend I ordered the few parts I didn't have in my "junk box" and started construction.

For my construction, I'm adding a single SPDT (ON/OFF/ON) switch, located in the Active Antenna construction box. This switch will independently control the ON/OFF function of both the 9-volt battery and remote power supply. I'm also adding a SPST switch in the remote power supply construction box for ON/OFF control of the Active Antenna when it is located at a remote distance.

Thank you, Irwin, and thank you, *CQ*, for publishing a construction project that only requires basic electronic identification / construction skills and is useful regardless of the age of our equipment.

– Jerry L. Wilson, K5JLW
Huntington, Texas

FYI, I believe your article paragraph beginning with the words "Figure 2 is a schematic of the remote power ..." contains a typographical error. I believe the last sentence in this paragraph should begin with the word "Note" instead of "Not".

WA2NDM replies:

Thank you for your comments, Jerry. I aim to please and will try to add as many of these types of projects as I can from time to time.

W2VU replies (regarding the typo):

Thanks for the catch, Jerry. You are correct, that should read "Note," not "Not." Sometimes, those "e"s fall off the ends of words and roll away, HI!

Please Keep Your Address Up to Date

Editor, *CQ*,

I would guess that most amateurs working toward USA-CA use some type of tracking program to help keep track of contacts, cards, etc. Recently MARAC's new logger program added a feature to allow you to check the home county of stations you are working using the digital modes of WSJT. This feature is linked to QRZ.com and checks the grid square transmitted against the grid square listed in the station profile on QRZ. Since modes like FT8 and FT4 are basic contact modes it is difficult to exchange county information. After stepping away from working on this award for several years, I have started trying to finish working and confirming the last 400 counties I need for USA-CA. Since I have used the various logging programs made available by fellow county hunters, I applauded the new and updated logger program.

Since an accident in 2016 that has caused my hearing to decline, I pretty much live on FT8. I was truly excited about being able to check the home county of the station I was working. Imagine my surprise when I check a station using this new feature and the program says, "grids do not match." I know we tend to be a mobile society and move around a lot more than we use to. But, aren't we supposed to keep the FCC informed of our current address? When I get this message, I check the ARRL website and the FCC site to see if I can determine where the station I worked is actually located. I have found in numerous instances that QRZ, ARRL, and FCC sites all give a different address for the same station. Well, chalk that contact up as being useless for anything except the grid square they claim to be operating from. And if you want to use this information, it is best to hope they use LoTW. You certainly can't mail a QSL card to the station to confirm anything needing a QSL card like USA-CA. And you can't do eQSL either, when their profile says "I don't use that."

This is an open appeal to all my fellow amateurs to check your information and update it. You may not be chasing awards, but some of us are. And without your help, those of us working on awards can't get the confirmations we need.

– Sandy Walker, WB4EVH

W2VU responds:

The FCC's main concern is having an address at which you may be reached if Commission staff needs to contact you. They are less concerned with the physical location of your station at any given time (and considering how mobile many hams are — especially county hunters — this is probably a good thing). There are, of course, no requirements that you update your location information with QRZ.com or any other callsign server.

I would think that, if a person does not use an online confirmation database such as LoTW or eQSL, sending a physical QSL card to their address of record with the FCC (or their QRZ.com listing) would be a viable option. Even if they don't have physical QSL cards of their own, they can respond with a confirmation letter that will be acceptable by just about all award programs.

However, your request for everyone to keep their location info up to date is a good one for many reasons.

– 73, Rich, W2VU

USA-CA Award Custodian Brian Bird, NXØX, adds:

Sandy,

I very much understand your concerns and your appeal to the general ham population. I would just like to point out one or two items from the USA-CA award standpoint.

Like you mention, there is some "guessing" taking place on what county you are in when software is trying to match the location of the station compared to the stations mailing address on file. That, in my opinion, is more of a MARAC concern (or should be) than CQ's.

When applying for the USA-CA award through CQ, we do require a confirmation via either "hard card" QSL or eQSL. Doing so will confirm the station's physical location on his end no matter how brief the contact was. MARAC's awards do not require confirmations and hence the assumptions taking place on their end.

Even if you're using the MARAC software for the initial USA-CA award — which, by the way, is a fantastic product that Don, K3IMC, has put many many hours into — you will still need to enter the contact as confirmed for the initial award, verifying the county.

I'd like to mention one other thing for clarification. At the present time, the only two ways to confirm contacts for the USA-CA award is either via a "hard card" QSL or via the eQSL website for electronic confirmations. Unfortunately, LoTW confirmations are not currently allowed for the USA-CA award.

– 73, Brian, NXØX
USA-CA Awards Custodian

Number groups after call letters denote following: Band (A = all; an additional A is All Band Assisted; A after each band is Assisted for that band), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Line scores in italics indicate late log received (past the deadline). Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

2022 WPX CW RESULTS

SINGLE OPERATOR

NORTH AMERICA

United States

District 1

K1LZ	A	7,688,480	2791	928
AJ1I	"	7,505,722	2656	973
			(OP: K1ZZ)	
KQ2M	"	7,148,424	2858	894
WU3A	"	6,551,800	2648	940
			(OP: W3UA)	
AK1W	"	6,142,712	2533	961
			(OP: K5ZD)	
WC1M	"	6,092,409	2589	867
KA1IS	"	5,181,422	2188	857
KM1W	"	4,048,380	1853	714
			(OP: W1UE)	
K1AR	"	3,786,408	1846	774
NB1N	"	1,889,664	1212	592
WT1M	"	1,837,945	1175	565
			(OP: K1RX)	
AJ1AJ	"	1,679,964	1336	572
K1TZQ	"	1,575,802	1175	538
KB1W	"	1,178,268	973	507
AE1T	"	1,028,139	844	519
W1ARY	"	991,935	904	469
W1WEF	"	965,550	902	471
W3SM	"	865,176	720	472
WA1T	"	*863,232*	*821*	*512*
AK1MD	"	833,899	810	451
KE1VT	"	818,376	846	488
K2LE	"	648,440	630	430
W1GD	"	645,414	501	363
K1ESE	"	615,459	566	367
K2RB	"	613,170	696	405
N1RO	"	335,314	506	301
KB1NO	"	321,328	398	304
WF1OC	"	289,395	400	295
			(OP: W1RM)	
WX7T	"	277,182	386	261
			(OP: K1RM)	
NT1N	"	270,512	384	319
WJ1X	"	262,352	376	304
N1QY	"	220,651	367	233
KA2KON	"	216,590	324	242
N1MGO	"	186,624	335	243
K1BZ	"	167,706	297	231
W1HNZ	"	158,730	286	222
N1KM	"	146,222	275	226
KZ1M	"	144,755	291	221
K1TH	"	129,940	240	178
N1RR	"	120,643	273	223
K1DJ	"	107,421	245	183
W8HAP	"	89,121	225	183
N1NN	"	84,898	215	187
K1WR	"	59,488	158	143
W1TO	"	58,788	159	138
K1EBY	"	39,312	119	108
ND1X	"	34,440	123	120
K1RV	"	20,710	111	95
W1KM	"	15,498	98	82
W1IS	"	7,965	61	59
W8HMK	"	2,925	39	39
K1KI	21	2,288,363	1429	791
W1UK	"	2,312	34	34
W1OHM	14	25,812	114	108
W1/PY1MX	"	*21,809*	*140*	*113*
AE6JV	"	312	13	13
WK1O	7	2,218,755	1045	595
K1JB	"	1,089,598	693	439
*KQ1F	A	4,596,647	1984	799
			(OP: K1XM)	
*AC1U	"	3,651,552	1938	744
			(OP: N1UR)	
*KR5X	"	2,393,373	1411	633
			(OP: K1BX)	
*NG1R	"	2,382,282	1529	657
			(OP: W1QK)	
*N1EN	"	1,645,622	1232	571
*K1TR	"	1,636,944	1166	536
*KM1CC	"	814,159	822	431
			(OP: N1DC)	
*K1MD	"	496,184	600	367
*KS1J	"	494,484	489	356
*KX1E	"	450,756	544	342
*KG1V	"	372,792	524	317
*AC5XK	"	352,359	512	329
*W1NU	"	274,000	400	274
*WO1N	"	167,956	279	211
*K1HT	"	157,641	233	187
*W1DYJ	"	144,270	259	229
*N1API	"	139,200	240	240
*KI1U	"	136,939	300	211
*K1AJ	"	114,576	199	176
*N1DID	"	104,342	233	203
*W1MJ	"	85,560	207	155
*KC1PJE	"	79,365	219	165
*W1VKE	"	77,744	224	172
*W1NSK	"	74,305	241	193
K1AV	"	*73,580*	*160*	*130*
*N1CEO	"	25,630	130	110
*K1SEC	"	23,744	141	112
*K1TW	"	23,500	116	100
*K1SX	"	23,166	92	78
*N1JI	"	15,300	83	75
*N1AM	"	13,500	78	75
*KN1H	"	10,218	82	78
*KB1FGC	"	9,768	101	88
*K1LHO	"	9,191	107	101
*WD1S	"	7,820	74	68
*N1DM	"	6,118	48	46
*KX1X	"	5,985	37	35
*AJ1DM	"	4,346	50	41
W1CVE	"	*2,350*	*26*	*25*
W1LEM	"	*2,318*	*69*	*61*
*KM3T	"	1,377	29	27
*K1ECU	"	702	27	26
W1STR	"	*351*	*13*	*13*
			(OP: KM1P)	
*KM1NDY	"	350	14	14
W1FWS	"	*200*	*11*	*10*
*N1CGP	28	2,821	35	31
*AB1J	21	85,536	221	198
*KV1J	"	4,800	53	50
*WB1AEL	"	450	15	15
*AI1TT	14	69,564	215	187
			(OP: W1WBB)	
*W2TT	7	168,064	221	208
*KA1QYP	"	90	9	9

District 2

KR2Q	A	2,788,828	1764	721
WA2CP	"	2,575,881	1347	693
			(OP: KC2GOW)	
AB2E	"	2,308,493	1474	649
KE2D	"	1,785,020	920	599
WR2G	"	1,397,790	989	558
AF2F	"	1,341,571	1023	539
W2NO	"	1,301,288	830	568
WN2O	"	1,015,584	733	447
			(OP: N2GC)	
N2WK	"	1,000,350	803	494
N2MF	"	904,050	739	410
WA2OAX	"	820,356	764	411
NS2N	"	779,898	737	434
K2RET	"	689,169	604	431
W2OIB	"	557,700	591	390
WB2NVR	"	551,000	619	380
N2SQW	"	511,360	500	376
WB2NFL	"	502,804	628	373
NN2NN	"	500,688	600	366
KA2MGE	"	414,180	579	351
WS9M	"	357,000	512	350
K2NV	"	337,185	484	295
NE2V	"	324,405	368	267
WB2PJH	"	284,660	482	331
WB2WPM	"	284,445	403	301
WA2MCR	"	223,573	406	287
AK2S	"	221,076	348	276
KA2K	"	213,776	269	248
AB2ZY	"	201,761	334	259
WT2J	"	192,052	336	266
N2RC	"	141,000	250	200
W2JV	"	138,736	266	208
K3TS	"	136,510	206	187
K4RUM	"	116,600	252	200
W2YR	"	109,400	210	200
N2KHH	"	101,541	231	187
WQ2N	"	95,000	280	200
			(OP: W2VQ)	
KY2N	"	78,402	222	179
			(OP: N2ZN)	
W2CN	"	54,831	181	147
W2TB	"	51,084	149	129
K2QMF	"	45,588	145	116
N2YBB	"	39,528	136	122
N2AXX	"	30,360	106	92
KA2D	"	11,000	61	55
KF2TI	"	6,731	54	53
W6YR	"	6,350	51	50
WO2X	"	1,078	23	22
KF2O	"	912	19	19
K7RB	"	234	9	9
W2KU	"	99	10	9
W2XK	"	48	4	4
K2SSS	21	2,121,668	1323	761
KU2M	"	1,207,758	978	606
KA2AEY	"	882	22	21
N2RJ	"	*48*	*4*	*4*
N2BA	14	1,951,460	1210	742
W2AW	"	1,880,080	1217	710
			(OP: N2GM)	
N2NT	"	94,377	228	193
AB3CX	7	2,562,390	1121	639
K2CJ	"	57,375	127	125
*N2UU	A	843,484	762	433
*NM2A	"	637,600	685	400
*NF2RS	"	580,144	685	404
*W2FDJ	"	404,260	469	340
*KE2WY	"	304,200	482	312
*WW2P	"	304,000	423	320
*W2LCQ	"	246,431	347	263
*N1NQD	"	232,356	315	268
*KC2VVZ	"	220,023	398	261
			(OP: W2LC)	
*N2RI	"	215,364	389	262
*AC2RL	"	156,891	294	241
*KD2EPM	"	118,600	302	200
*W2GDJ	"	99,702	213	191
*W2DXE	"	87,780	228	210
*KY2T	"	82,004	199	166
*KI2D	"	61,533	184	159
*W2CLA	"	60,131	201	157
*KD2P	"	56,700	169	150
*KA2FIR	"	53,482	168	143
*WE2DX	"	47,750	142	125
*KA2IRQ	"	39,424	168	128
*WA2CHV	"	31,374	135	126
*WB2HLM	"	31,302	107	94
*KD2TUD	"	27,798	145	123
*K3WHD	"	22,464	128	104
*KR2D	"	19,224	105	89
*NM2R	"	12,403	84	79
*AA2AW	"	11,125	111	89
*NK1N	"	9,384	80	68
*AI2U	"	7,194	126	109
*AA2TH	"	7,020	56	54
*KS2A	"	7,008	86	73
*KB2URI	"	6,164	47	46
*KD2SGM	"	6,132	46	42
*KS2G	"	4,085	43	43
*W2YK	"	3,800	42	40
*N2BZD	"	3,136	51	49
*WO2T	"	2,730	37	35
*KB2AMY	"	2,077	32	31
*W2VM	"	1,400	29	28
*W3EH	"	987	24	21
*KB2GD	"	462	15	14
*KD2JC	"	9	9	9
*W2TZ	14	99,696	235	201
*N2EIM	"	13,158	87	86
*W2NTV	"	12,168	76	72
*KB2MN	"	3,458	41	38
*WA2JQK	7	169,510	324	253
*W2CG	"	116,337	172	157
*N2JNZ	"	24,645	94	93
*N2NKX	"	1	1	1

District 3

AA3B	A	10,836,378	3661	1071
K3RA	"	5,647,362	2262	826
N3QE	"	5,525,370	2381	870
KT3M	"	4,231,059	2059	791
			(OP: N3AD)	
KF3P	"	3,514,576	1590	793
			(OP: K3MM)	
K3WJV	"	3,389,776	1727	758
K3ZO	"	2,822,657	1458	743
NW3Y	"	2,592,384	1340	688
W8FJ	"	*2,363,323*	*1197*	*731*
WK2G	"	2,269,278	1545	657
N3OC	"	2,157,078	1447	638
K3MD	"	2,100,189	1352	637
K2LNS	"	1,987,776	1339	612
N3FCP	"	1,922,532	1269	604
K3TC	"	1,909,926	1282	626
W3LL	"	1,807,014	1374	627
			(OP: WB4FDT)	
K3UL	"	1,696,022	1155	601
N3FZ	"	1,482,920	1149	566
NG3R	"	1,449,000	893	575
			(OP: N3DXX)	
K3WU	"	1,150,526	942	494
KC3M	"	1,006,470	911	530
W3FV	"	999,792	713	477
K3PP	"	951,593	688	499
K3CCR	"	948,588	713	411
			(OP: N3UM)	
N3AM	"	869,130	690	435
AA3R	"	860,886	714	507
W3FIZ	"	629,590	577	377
NN3RP	"	477,774	617	381
K3ZU	"	*469,635*	*393*	*393*
NG3J	"	442,928	510	304
K3TN	"	428,184	535	342
NA7L	"	375,360	561	340
NT2DR	"	366,452	467	317
KU2C	"	311,856	397	292
WA3AER	"	294,722	431	298
NF3R	"	276,723	367	277
N3FJP	"	220,844	333	274
K3CY	"	204,880	282	208
WY3A	"	200,431	230	209
K3VA	"	173,988	285	243
N3RD	"	167,857	337	229
AG4Q	"	136,895	269	209
KE3GK	"	133,276	268	233
NX3Z	"	82,668	201	166
K3FH	"	80,522	212	163
KE3X	"	75,361	184	143
K3AU	"	73,845	147	135
			(OP: K2YWE)	
WX3B	"	72,981	192	159
NO3U	"	*53,460*	*152*	*132*
NN3L	"	*46,222*	*147*	*121*
			(OP: N3RD)	
K3AK	"	34,163	159	127
K9RS	"	29,326	96	86
NA3DX	"	29,202	102	93
			(OP: W3IZ)	
K3NM	"	27,937	120	91
K3GW	"	25,116	102	91
WW3S	"	*18,318*	*71*	*71*
AK3B	"	14,800	92	80
KA3D	"	13,300	78	76
N3RM	"	9,145	61	59
W2CDO	"	8,584	60	58
AA3S	"	4,371	51	47
W3GVX	"	3,536	39	34
N3WMC	"	3,410	70	55
AA2AD	"	2,013	38	33
N3AML	"	299	13	13
KG4USN	"	75	5	5
KØOO	28	16,748	90	79
K3UA	21	3,342,324	1697	892
			(OP: @K3LR)	
N4ZR	"	522,631	533	433
KS3F	"	97,704	207	207
K3LR	14	3,918,096	1887	936
			(OP: N2NC)	
N3XL	"	6,195	66	59
WØBR	"	*2,805*	*33*	*33*
NC3Y	7	744,328	702	421
WO3Z	"	174,981	272	219
W3BGN	3.5	258,318	420	254
*WM3T	A	4,784,650	2033	850
			(OP: NY3A)	
*NJ3K	"	1,055,157	1054	509
*NU3A	"	690,336	701	408
*KB3AAY	"	621,884	719	428
*K3QP	"	497,140	518	371
*WM3PEN	"	470,520	566	360
			(OP: W3WHK)	
*N2EM	"	459,750	642	375
*N2EY	"	398,160	522	315
*AD3PA	"	323,900	454	316
			(OP: K3MSB)	
*WT3K	"	180,245	337	235
*W3KB	"	141,728	213	206
*WB3FAE	"	136,713	287	199
*NR3Z	"	133,170	304	230
*W3WTD	"	101,915	251	187
*W3AVP	"	98,645	245	181
*KE3ZT	"	80,033	219	163
*N2MA	"	79,808	213	172
*KD3KA	"	60,480	213	160
			(OP: W3WC)	
*NX3V	"	50,925	252	175
*NE3I	"	40,230	151	135
*WK3A	"	40,180	106	98
*AC3U	"	35,211	146	121
			(OP: W3UL)	
*W3YJ	"	27,120	131	113
*WB3EGD	"	19,012	114	98
*KF3G	"	18,676	99	92
*AC3IU	"	17,136	117	102
*K3JSJ	"	16,289	105	91
*WA3AAN	"	11,100	82	75
*KC3DLL	"	10,200	92	75
*W3TAS	"	8,349	76	69
*W3PNM	"	7,239	59	57
*N3JNX	"	5,668	57	52
*K3ES	"	4,648	62	56
KY3W	"	*3,285*	*48*	*45*
*AC3EK	14	1,638	27	26
*W2JSJ	"	448	14	14
*NS3T	7	224,612	323	241
*AJ3M	"	247	13	13

District 4

NY4A	A	6,777,732	2720	897
NR3X	"	5,923,644	2929	894
			(OP: N4YDU)	
WR3O	"	5,420,481	2822	913
			(OP: K4RO)	
NN7CW	"	4,916,655	2294	765
WO4O	"	4,773,006	2234	854
AD4EB	"	4,386,210	2221	879
N6AR	"	4,230,416	2013	824
WZ4F	"	3,769,282	2184	803
			(OP: K4AB)	
K4OAQ	"	3,483,858	1772	761
AD4TR	"	3,321,938	2113	746
			(OP: N4UU)	
KQ4R	"	3,206,952	2007	756
KJ4QHL	"	3,042,100	1740	725
KØZR	"	2,837,824	1535	704
K4PV	"	2,269,344	1707	672
N1TO	"	2,263,734	1494	666
K3IE	"	2,216,406	1241	654
KM9P	"	2,056,371	1475	661
			(OP: KØEJ)	
KM4FOC	"	2,026,920	1469	635
			(OP: K2SX)	
N4CW	"	1,884,360	1283	615
W3US	"	1,464,192	1103	558
K5KG	"	1,458,540	1086	555
NE2CC	"	1,399,015	986	545
			(OP: W4CU)	
K4BAI	"	1,373,109	1262	537
NE4EI	"	1,330,335	1207	555
NS4X	"	1,268,029	1128	553
N4CWZ	"	1,202,280	980	516
AF4T	"	1,133,657	947	497
WN7S	"	1,099,776	1100	512
WA4JUK	"	1,056,244	905	476
W4NZ	"	1,020,566	1028	502
KK4R	"	903,070	889	485
KG4W	"	884,392	693	487
N8KH	"	774,336	818	436
N4KS	"	666,648	781	423
NN4SS	"	611,124	577	401
AI4WW	"	600,456	679	381
KT4O	"	595,730	677	410
N3JT	"	577,590	629	390
NN3W	"	515,540	509	346
NR4M	"	481,338	524	363
NF4A	"	432,180	541	343
N4KH	"	415,552	538	344
K9UQN	"	351,495	530	321
K4NMR	"	346,185	385	245
N3CW	"	341,796	404	313
AA4DD	"	306,793	354	241
NN4NN	"	254,740	400	271
			(OP: K3SV)	
NI7R	"	254,200	248	248
N5TOO	"	248,287	496	269
K4HQK	"	244,736	323	239
K5VIP	"	237,864	294	264
N4FP	"	205,130	390	281
ND4Y	"	189,486	389	261
N4CF	"	176,250	339	250
W3TB	"	148,730	280	214
AA4CF	"	*139,742*	*305*	*214*
W4GHV	"	137,907	284	231
N3KN	"	135,746	296	227
W8FN	"	133,749	340	231
K3WA	"	131,758	313	226
NZ4N	"	128,520	263	210
WØLL	"	123,830	225	203
			(OP: K8FC)	
KM4HI	"	114,741	211	209
K7OM	"	110,808	310	216
W4UT	"	86,880	213	160
WA4DT	"	84,669	191	167
KN6BU	"	83,433	172	137
W4VIC	"	75,524	175	158
W7HJ	"	75,255	184	173
AF4WY	"	64,260	168	135
			(OP: K2AV)	
W2XYZ	"	62,050	189	146
ND4G	"	58,598	166	166
W6UB	"	52,281	184	157
W4XO	"	49,416	176	142
N4QWF	"	*46,720*	*170*	*146*
N4TL	"	41,040	138	120
K3DNE	"	39,804	158	124
NN4NT	"	38,180	135	115
K4HR	"	36,180	166	134
K4QPL	"	34,560	142	120
KE4KY	"	30,456	132	108
W4EAB	"	28,320	115	96
KB4KBS	"	25,070	139	109
AF3K	"	24,890	113	95
WM4Q	"	23,968	114	107
K4KZ	"	19,224	130	108
N4PD	"	14,820	76	76
N2UO	"	14,212	82	76
N3ND	"	14,208	81	74
NF7D	"	10,368	69	64
NO9E	"	10,020	64	60
AB4PP	"	7,065	52	45
W4ZGR	"	5,772	45	39
NQ4J	"	4,558	56	53
			(OP: K8LF)	
K4DME	"	1,276	30	29
N6DW	"	990	22	22
WH6LE	"	520	20	20
W4BCG	"	30	5	5
WF7T	28	38,194	143	113
NA4W	"	33,078	139	111
			(OP: K4WI)	
WW4R	21	1,255,630	1028	614
			(OP: N4ZZ)	
NE8P	"	851,424	828	543
N4OX	"	631,005	675	465
NJ4U	"	492,800	650	440
			(OP: K4EA)	
NX4N	"	13,515	105	85
KU8E	14	1,139,670	998	603
W4PM	"	27,900	157	124
AC6ZM	"	*90*	*9*	*9*
WV4P	3.5	59,408	190	158
*WN1GIV	A	3,207,048	2116	741
			(OP: N4BP)	
*N4XL	"	2,745,894	1545	734
*NU2A	"	2,621,457	1628	711
			(OP: N2YO)	
*WC4E	"	1,966,888	1148	616
*KM4SII	"	1,903,611	1210	591
*WF9A	"	1,102,500	991	490
			(OP: LZ4AX)	
*NK4O	"	1,056,480	945	480
*K4GM	"	940,491	866	459
*W4SPR	"	930,465	835	465
*WA1S	"	717,828	754	492
*AC4G	"	642,375	625	375
*N4XD	"	601,512	833	426
*N3CKI	"	446,586	551	343
*K2MK	"	441,956	616	353
*AA4LR	"	432,720	542	360
*W4YE	"	409,656	492	338
*W4EE	"	407,032	479	332
*N4NTO	"	404,397	608	343
*K4IE	"	403,040	576	352
*KO4VW	"	358,848	544	336
*KB4CG	"	346,580	574	310
*W4RN	"	344,948	430	332
*KY4ID	"	286,976	466	304
*KM4FO	"	286,378	536	298
*WS6X	"	260,640	402	288
*KY4GS	"	256,038	461	278
*N4QI	"	256,004	433	287
*N9TF	"	237,938	417	271
*K4DR	"	209,874	430	266
*KN4DEB	"	179,580	371	246
*WA4IPU	"	178,486	318	266
*WA8OJR	"	171,787	377	253
*W9WI	"	155,686	371	241
*KT3T	"	149,568	253	192
*KG4IGC	"	147,408	286	222
*N4UW	"	144,966	290	222
*K4FTO	"	118,116	294	204
*NG2J	"	111,186	310	213
*W9SN	"	101,092	221	199
*AB3AI	"	100,672	288	208
*WN3F	"	98,496	250	192
*K5VG	"	96,300	238	180
*K3YDX	"	92,826	248	191
*KN4RD	"	89,400	257	200
*AE4Y	"	88,973	284	193
*K4FJW	"	86,480	246	188
*W4CMG	"	83,435	221	185
K4LW	"	*81,243*	*244*	*177*
*KC4LZN	"	80,196	217	164
*KO4XJ	"	77,172	238	177
*W2ECK	"	73,848	181	136
*WA2LMC	"	67,228	265	196
*WS4C	"	65,888	163	142
*W4ZXT	"	62,429	212	163
*WBØCJB	"	58,058	212	154
*AE4AN	"	54,806	165	134
*W3AJL	"	53,900	213	154
*KB3FW	"	49,910	191	155
*K3ZGA	"	48,984	197	156
*KG3V	"	47,677	163	139
*KØCIE	"	43,942	154	127
*NA9J	"	38,073	126	111
*KO4AWC	"	36,285	150	123
*W4DAN	"	32,856	128	111
*K4TZ	"	32,190	196	145
*K3TW	"	28,634	119	103
*N4EK	"	27,348	121	106
*AAØO	"	27,262	96	86
*W4YDY	"	26,307	133	111
*K4ORD	"	25,740	109	99
*W4RKU	"	25,500	100	100
*N1XI	"	24,514	123	119
*KF8N	"	*24,320*	*109*	*95*
*WX4HP	"	23,004	119	108
*WD4CFN	"	21,105	119	105
*KA3MTT	"	19,950	132	105
*N3GTG	"	19,872	106	96
*KS3K	"	19,620	100	90
*W4NNF	"	17,613	116	103
*KK4WDP	"	16,168	93	86
*NN4DF	"	15,572	68	68
*K8LBQ	"	14,820	110	95
*NE8O/4	"	13,694	95	82
*N2NYR	"	12,804	79	66
*K4RAB	"	12,348	70	63
*N1ZX	"	11,850	85	79
*N2JF	"	11,520	78	72
*AD8J	"	11,457	72	67
*N4JRG	"	9,648	70	67
*K4YCR	"	9,380	75	67
*KSØCW	"	9,088	74	71
*KW4LQ	"	8,844	73	66
*K4MI	"	8,470	59	55
*W4SSF	"	7,936	65	64
*KO4OL	"	6,200	67	62
*NN4RB	"	5,130	53	45
*AI4GR	"	4,324	47	47
*K4PP	"	3,375	46	45
*K2TV	"	3,256	49	44
*N4HER	"	2,560	35	32
*K4CAB	"	2,520	43	40
*N4DPM	"	2,380	36	34
*K4EES	"	2,150	45	43
*W9GOL	"	2,054	29	26
*NC4RT	"	2,054	30	26
*AD4TJ	"	1,972	35	34
*KO4DN	"	*1,961*	*41*	*37*
*K3MZ	"	1,550	25	25
*N4NM	"	1,312	35	32
*NU4N	"	864	26	24
*N8RW	"	768	16	16
*WM4I	"	741	20	19
*KS4S	"	595	17	17
*WD4OHD	"	576	17	16
*K4DZR	"	*442*	*18*	*17*
*N1GFV	"	410	12	10
*N2YF	"	276	13	12
*K4RSA	"	270	10	10
*KE4QCM	"	230	10	10
*WD4ETU	"	162	9	9
*KC2KWA	"	36	4	4
*NN4AC	28	12,328	79	67
			(OP: N3AC)	
*AA8R	"	6,171	57	51
*N4MM	"	2,142	36	34
*KN4JN	"	816	25	24
*WB4TDH	21	441,976	579	404
*WA1FCN	"	225,568	416	304
*N4HA	"	119,658	258	231
*NJ4Q	"	8,008	59	56
*NR4O	"	3,750	53	50
*W4OT	"	1,092	27	26
			(OP: K4JC)	
*N3EA	14	98,241	281	229
*N4IU	"	39,903	157	141

*NQ4K	"	11,194	66	58
*W3SI	"	4,914	65	63
*KB4DE	"	3,906	44	42
*N4JEH	"	1,440	47	45
*WU4B	"	1,218	29	29
*K4RFK	"	176	12	11
*K4NNK	"	96	6	6
*AA4NP	7	442,884	462	334
*K4WW	"	21,728	111	97
*WB4FSF	"	55	6	5
*KEØL	"	35	7	7
*N4OO	3.5	19,440	102	80

District 5

NU5A	A	7,397,958	3491	986
			(OP: K5GN)	
KT5J	"	6,637,306	3160	949
			(OP: K5PI)	
KN5A	"	5,655,832	2890	914
			(OP: K5WA)	
AD5A	"	4,027,644	2412	837
KK5I	"	3,209,976	2085	772
			(OP: W5CW @K5CM)	
N5RZ	"	3,113,014	1983	727
WXØB	"	2,981,664	2124	756
			(OP: AD5Q)	
KZ5D	"	1,930,494	1606	642
KM5G	*"*	*1,207,374*	*1131*	*534*
N5EE	"	1,200,479	1162	541
W5GN	"	987,460	968	509
KT5C	"	891,632	1097	532
AC4CA	"	865,886	884	487
K5UV	"	559,767	818	403
K5TIA	"	505,172	623	391
N3BB	"	338,011	665	337
N5TJ	"	259,369	406	323
KA5M	"	236,530	400	310
KM5VI	"	222,794	391	286
KØNM	"	208,075	466	287
KD5J	"	134,692	352	223
N5WNG	"	130,416	230	176
N5UI	"	130,301	320	229
N5CW	"	104,535	288	207
W2IY	"	95,118	257	191
N5XJ	"	82,044	214	172
NE5A	"	71,103	232	173
AF5J	"	62,914	221	166
K5NA	"	62,172	268	132
N5KD	"	56,826	191	154
K3KEK	"	54,927	217	153
N5UM	*"*	*42,799*	*170*	*127*
WA5LHM	"	29,835	152	117
K5LY	"	29,524	148	121
WØZW	"	20,910	96	82
WA5LXS	"	20,564	102	97
WØVX	"	17,952	108	88
K7UD	"	16,744	102	92
K5CKS	"	10,804	82	74
K7IA	"	8,410	61	58
W5RF	"	6,435	60	55
WW5W	*"*	*3,212*	*45*	*44*
K5PAR	"	780	20	20
KN5S	28	133	7	7
			(OP: K5WW)	
NN5Z	21	296,903	429	367
			(OP: W5TM)	
KZ5J	"	221,760	426	308
NK5G	"	61,404	191	172
K5MV	"	336	14	14
N5JJ	14	1,272,628	1230	602
NZ5A	"	45,123	193	169
K5UR	1.8	11,376	103	79
*KD5DD	A	3,438,336	2103	768
			(OP: N4OGW)	
*N5YT	"	2,051,312	1419	656
*WQ5L	"	1,799,634	1386	614
*WA5SOG	"	957,950	891	490
*NO5W	"	538,670	819	415
*NN5T	"	405,000	576	324
*K5XU	"	381,240	579	360
*W6FB	"	285,348	478	316
*K5MR	"	222,562	423	257
*N5AW	"	148,992	254	192
*K5GQ	"	137,632	257	187
*WA5LFD	"	130,168	321	212
*K5ME	"	128,260	289	220
*WR5P	"	123,824	355	218
			(OP: K5OY)	
*N5IF	"	96,120	235	178
*KØYA	"	90,415	202	169
*AG5AY	"	88,320	250	192
*N5MF	"	61,710	256	187
*NN5O	"	52,299	207	149
*NF6P	"	51,867	201	153
*WB5BHS	"	39,424	185	128
*N5XE	"	39,045	141	137
*N5KWN	"	38,907	154	131
*K5DHY	"	34,314	148	129
*AE5P	"	32,750	158	125
*KD2KW	"	31,536	132	108
*N5CHA	"	27,960	137	120
*WB5K	"	17,120	144	107
*KS5Z	"	11,280	88	80
*AB8YZ	"	9,960	94	83
*NR5TX	"	8,687	82	73
*K5KXJ	"	7,952	85	71
*KG5VK	"	6,954	63	57
*W5GCX	"	5,246	47	43
*NM5N	"	5,088	64	53
*NC5G	"	4,860	63	60
*N5JGE	"	4,848	48	48
*WX7V	"	3,654	45	42
*K5YX	"	2,652	36	34
*K5KUA	"	2,325	33	31
*WØTG	"	1,518	24	23
*WA5BDU	"	1,280	21	20
*K5OLV	"	1,100	26	25
*KG5RXG	"	528	24	24
*AB5XM	"	416	16	16
*K7ZYV	"	216	18	18
*W5BM	28	48	4	4
*N5JR	21	437,076	546	426
*WD5HCK	"	50	5	5
*AE5MM	14	10,965	89	85
*KC6ZBE	"	3	1	1
*W5XNA	"	1	1	1

District 6

NT6Q	A	4,770,993	2611	899
			(OP: N5ZO)	
KU6W	"	2,218,718	1450	694
			(OP: K9YC)	
K6AR	"	1,696,080	1316	592
K6NR	"	1,601,664	1274	582
AJ6V	"	1,575,890	1370	590
NF6A	"	1,481,800	1119	478
			(OP: K6XX)	
WA6KHK	"	1,064,700	1002	525
AC6T	"	944,475	812	525
WQ6K	"	886,044	671	564
			(OP: N6IE)	
KE1B	"	728,538	854	474
K6RC	"	669,222	773	459
NW6H	"	597,698	735	394
			(OP: K6RB)	
N6RV	"	513,936	589	387
NN6DX	"	440,672	574	376
			(OP: W1PR)	
K6OK	"	407,537	474	377
K6PO	"	387,720	535	359
KU6F	"	365,568	674	336
			(OP: K6SRZ)	
K6RIM	"	359,160	485	328
N6TQ	"	258,075	413	279
W6SX	"	210,280	513	280
NT6X	"	204,372	390	252
K6YK	"	191,178	344	258
K6MM	"	179,219	345	277
N6GEO	"	125,171	300	199
AI6Z	"	112,545	231	183
W1RH	"	89,890	300	202
K6FA	"	88,605	237	179
K6EFA	"	81,832	258	193
W6KC	"	79,808	263	172
NN6C	"	70,064	171	151
			(OP: W6SC)	
W8GJK	"	59,250	216	150
NK6A	"	54,670	200	154
AB1U	"	42,693	141	133
			(OP: W6RKC)	
W6RGG	"	42,328	208	148
W6GEE	"	30,856	150	116
N6WT	"	30,704	125	101
K6NV	"	29,766	162	121
N5KO	"	22,088	111	88
KF6NCX	"	18,088	144	119
K8TR	"	17,298	122	93
N6IC	"	16,744	103	91
K7GK	"	14,245	96	77
N6GP	"	7,686	68	63
K6BEW	"	3,984	53	48
KG6AO	"	2,552	32	22
WI6X	"	2,432	38	38
AF6SA	"	2,015	32	31
W6DMW	"	1,560	37	30
W4NJK	"	493	32	29
K6VVK	"	40	5	5
K6NA	28	88,690	249	181
K6KM	"	5,400	51	45
KD6X	21	44,247	161	147
KK6MU	*"*	*783*	*29*	*27*
NA6TT	14	2,253,916	1508	797
			(OP: N6CW)	
N6VOH	*"*	*3,120*	*48*	*48*
NA2CC	"	2,880	37	36
KB6CA	"	368	16	16
*W6TK	A	766,870	879	442
*K6JS	"	202,500	485	270
*W7TR	"	157,950	323	234
			(OP: KH2TJ)	
*NG6O	"	154,614	307	219
			(OP: K6GHA)	
*N6TTV	"	154,220	303	220
*K6LRN	"	74,290	209	190
*K6UF	"	45,880	192	124
*W6ZL	"	45,262	148	106
*KN6BAZ	"	44,200	219	136
*K6CSL	"	23,192	134	104
*WQ6X	"	17,487	105	87
*N6VH	"	16,880	106	80
*AI6W	"	14,196	89	84
*KE6JAC	"	13,725	106	75
*NE6NE	"	13,440	95	84
*AA6IO	"	11,766	89	74
*AI6SL	"	11,390	75	67
*NF6R	"	10,318	96	77
*N6LL	"	8,777	73	67
*AG6JA	"	8,710	76	67
*N6SPP	"	8,680	79	70
*KE6GLA	"	7,467	64	57
*AA6VX	"	6,138	73	66
*W6NKR	"	5,778	63	54
*KC8J	"	4,648	64	56
*K6JF	"	3,430	55	49
*WF6F	"	3,219	38	37
*N9DK	"	1,890	37	35
*NC6Q	"	1,702	42	37
*AF6N	"	1,078	24	22
*WW6D	"	900	27	25
*N6YEU	"	900	20	20
*AE6PL	"	726	23	22
*AE6XC	"	450	18	18
*W6JBR	"	297	11	11
N6HAN	*"*	*153*	*9*	*9*
*K6EI	"	105	7	7
*NC6V	28	7,938	70	54
*WA7BNM	"	4,746	49	42
*W6JPL	"	925	26	25
			(OP: K6ICS)	
*N6RM	21	100,280	263	218
*K6TPS	"	112	7	7
*KW6AA	14	120,229	274	251
*W6DER	"	8,625	88	75
*KN6MLM	"	612	18	18
*N6EWG	"	3	1	1
KA9A	*7*	*3,315*	*39*	*39*
*K5CAO	3.5	110	5	5

District 7

NR7DX	A	5,926,968	2823	939
			(OP: N9RV)	
ND7K	"	4,981,083	2627	849
			(OP: @N6WIN)	
AA5B	"	4,347,792	2174	831
			(OP: N6TR)	
AA6AA	"	2,860,668	1617	687
			(OP: @W7RN)	
KA6BIM	"	2,114,896	1239	644
KH6ND/NZ7	"	1,711,513	1807	653
KM7W	"	1,686,096	1472	648
			(OP: KL9A)	
WS7L	"	1,293,600	1198	600
KN7K	"	1,213,222	1256	578
K7AR	"	1,018,164	776	527
KS7T	"	931,294	1015	559
KC7EFP	"	823,998	983	483
N7EPD	"	643,032	714	468
K6XT	"	434,250	667	375
K7JQ	"	260,178	590	309
K7GS	"	221,451	315	291
W7GF	"	183,312	395	268
N7RVD	"	168,315	348	245
N7IP	*"*	*135,801*	*265*	*237*
KD7H	"	128,535	307	205
W7GES	"	120,750	295	210
K6SEA	"	120,546	227	181
			(OP: KA6BIM)	
K7HP	"	109,120	355	220
N7ZUF	"	108,676	281	202
AA7A	"	103,158	247	198
KT7RC	"	89,250	355	210
			(OP: N6RC)	
KE2VB	"	81,144	255	184
N7GR	"	81,055	324	215
K7VIT	"	76,382	249	181
N9NA	"	71,280	268	180
AD7XG	"	62,825	221	175
NW7M	"	57,195	160	155
W7PV	"	53,040	224	170
K9PY	"	44,548	186	148
W6KGP	"	43,310	184	142
K7HI	"	42,316	206	149
WN7M	"	38,934	138	126
			(OP: K7BTW)	
N7DSX	"	34,648	144	122
KB7AZ	"	33,875	142	125
K7UT	"	29,719	149	113
W7PP	"	25,296	112	102
W2HZ	"	17,958	93	82
K7MY	"	12,972	99	92
NQ7R	*"*	*11,692*	*77*	*74*
W6OAT	"	10,281	73	69
W7SLS	"	8,540	82	61
K2RD	"	4,515	48	43
WU6W	"	2,079	34	33
KG7MVH	"	1,131	34	29
KA7MDM	"	1,040	21	20
NS1L	28	240,990	436	290
			(OP: N6SS)	
NO7R	21	879,674	933	569
			(OP: AA7V)	
KN7Y	"	148,204	416	268
WR5J	14	881,184	1018	548
			(OP: K7ZQ)	
K6KR	"	5,950	51	50
N6MA	7	456,456	488	312
K7WP	"	387,807	444	313
W6XI	3.5	7,398	56	54
*WJ9B	A	1,948,013	1439	629
*K6WSC	"	827,050	626	595
*AK6A	"	576,050	660	410
*K7HBN	"	361,745	492	355
*W7OM	"	273,258	487	323
*N7YY	"	216,576	433	288
*WAØWWW	"	196,416	321	264
*W7TMT	"	194,310	452	255
*WN6W	"	188,034	390	259
*W4IDX	"	139,755	408	231
*AF7NX	"	131,124	349	223
*W7ZI	"	114,800	266	200
*W7WSV	"	105,570	277	207
*K7AZT	"	95,090	290	185
*N7JI	"	82,482	288	177
*K7NEW	"	75,600	268	180
*W7MTL	"	59,202	216	143
*NB7O	"	46,717	204	137
*KI7VEM	"	46,540	197	130
*K7SHR	"	42,606	199	162
*N7UVH	"	38,622	170	123
*K7ROG	"	34,080	129	96
*KB7AK	"	29,260	153	110
*KK7A	"	28,832	142	106
*AB5ZA/7	"	28,556	158	121
*WB6JJJ	"	27,772	137	106
*KNØW	"	26,537	170	119
*KF7GGN	"	25,645	174	115
*N7VS	"	23,230	159	115
*WT8P	"	20,114	133	113
*NW6V	"	17,391	107	93
*N7GOA	"	16,198	117	89
*N7KRN	"	15,272	124	92
*K7NXL	"	14,525	104	83
*KN7T	"	12,300	100	75
*WA7KVI	"	10,736	114	88
*W7VAS	"	10,496	104	82
*WØVQ	"	9,945	108	85
*K7YIC	"	9,660	117	84
WA7YAZ	*"*	*9,576*	*98*	*76*
*WZ8T	"	8,712	80	72
*W7CFR	"	7,128	73	66
*AG7GB	"	5,780	83	68
*WA7YXY	"	5,133	66	59
*W7POE	"	4,505	63	53
*KN7A	"	4,450	55	50
*K7ARJ	"	3,920	38	35
*KQ7TJ	"	3,366	56	51
*W7JMM	"	2,576	56	46
KB7SDM	*"*	*1,792*	*36*	*32*
*KD7GOM	"	1,612	27	26
*AA7AZ	"	1,044	30	29
*NA7P	"	989	24	23
*KB7ABJ	"	736	26	23
*NØKRE	"	620	22	20
*WM5F	"	455	15	13
*K7SXN	"	221	13	13
*N7HYV	"	170	10	10
KU7Y	*"*	*144*	*9*	*9*
*KA6JLT	"	112	16	16
*W7PFY	"	28	7	7
*WV7S	21	17,170	113	101
*WA8ZNC	"	12,183	110	93
*WØBF	"	5,760	50	48
*K7ULS	"	5,278	65	58
*WB7QMR	14	14,400	111	96
*K5HDU	"	12,690	101	90
*KD7HU	"	7,488	83	72
KT7G	*"*	*135*	*9*	*9*

District 8

NA8V	A	4,862,536	2343	868
W8MJ	"	3,283,635	1886	815
K8GL	"	2,728,244	1500	764
WA8Y	"	1,729,875	1359	659
K8AJS	"	1,231,450	1084	550
K8MP	"	875,595	894	465
K8QKY	"	701,820	682	420
NO8DX	"	580,125	651	375
			(OP: K8MR)	
K8JQ	"	569,664	806	387
WB8AKW	"	560,303	744	391
K8PK	"	340,119	496	351
NI8G	"	320,170	507	317
			(OP: W8CAR)	
WA8MCD	"	269,104	361	278
K8RR	*"*	*161,920*	*329*	*253*
NO8C	"	135,361	326	223
W8PI	"	97,970	202	194
K8MEG	"	93,879	220	183
WA8LRW	"	83,213	223	173
KB8KMH	"	73,134	171	153
WB2RPW	"	68,385	269	235
N8AA	"	60,830	199	154
NS8O	"	56,090	216	158
W8IQ	"	42,723	187	141
WØCG	"	39,437	141	113
K8CMO	"	28,386	146	114
K8LX	"	14,651	111	91
KX8AA	"	12,312	94	81
			(OP: K2CUB)	
K8RCT	"	7,564	61	61
AA5TA	"	5,916	55	51
KE8KES	"	2,485	38	35
K8ESQ	"	2,310	36	35
KE8E	"	2,204	42	38
AJ8B	"	1,782	27	27
W8TOM	28	5,148	56	52
KC9LA	14	80,180	212	190
K8BB	"	24,961	155	109
N8RY	*"*	*364*	*15*	*13*
*NC8C	A	1,905,134	1466	623
*AA8CA	"	1,606,416	1347	588
*NN8UU	"	1,246,848	1191	544
*K3JT	"	1,034,055	957	495
*KV8Q	"	893,673	1009	459
*N8BJQ	"	499,626	596	369
*N8LR	"	455,244	580	354
*KA8JBK	"	409,024	641	352
*WA8MDC	"	404,481	615	357
*N8PE	"	386,750	589	350
*K8BL	"	300,014	482	286
*KE8PX	"	230,892	426	284
*K7DR	"	221,112	399	249
*K3DMG	"	214,890	350	285
*W8ASA	"	188,650	297	275
*WB8JAY	"	187,566	438	258
*W8UA	"	167,307	313	217
*AB8OU	"	128,952	297	216
*AE8TF	"	123,336	308	216
*N4LSJ	"	123,066	240	159
*K8RGI	"	117,316	292	211
*KE8HBV	"	105,780	252	205
*N8HHG	"	78,754	206	169
*WA8YZB	"	66,970	284	181
*WA8KAN	"	60,648	218	168
*N8EA	"	43,148	163	134
*NF8M	"	37,674	162	126
*WA8RCN	"	37,555	186	145
*K8WWS	"	32,804	165	118
*W5DT	"	30,120	144	120
*WY8DX	"	28,662	120	102
			(OP: K8GT)	
*KB8TL	"	22,134	127	102
*N4RA	"	22,080	104	92
*KD8DEU	"	19,210	91	85
*N8FYL	"	14,952	96	89
*K4YJ	"	14,421	75	69
*KB8GAE	"	11,020	87	76
*AA8SW	"	5,320	62	56
*W8TB	"	5,170	64	55
*WT8WV	"	4,578	43	42
*WE8L	"	4,386	44	43
*K8AKC	"	3,792	50	48
*N8TCP	"	3,444	45	41
*AG8W	"	2,808	42	39
			(OP: K8MJZ)	
KD8W	*"*	*2,401*	*55*	*49*
*W8KNO	"	1,014	26	26
*W8NNC	"	520	22	20
*W8FSM	"	510	15	15
*ND8D	"	264	11	11
W8BZY	*"*	*126*	*10*	*9*
*K9NW	*21*	*5,243*	*49*	*49*
*W8MK	"	4,560	48	48
*NU8A	14	198,484	350	286
*W8GOC	"	90,064	229	208
*W8JJ	"	45,750	178	150
*AF8A	"	14,976	110	96
*AK2U	"	1,980	33	33
*NE8J	"	460	22	20
*N4HAI	"	190	10	10
*N8CWU	"	180	17	15
*WB8JUI	7	181,260	327	228
*W8MET	"	150,742	304	226

District 9

N2BJ	A	714,357	653	483
W9RE	"	690,460	633	380
KW9A	"	597,840	625	424
NE9A	"	559,921	740	409
			(OP: N9TK)	
N9EP	"	401,592	642	348
KY9KYO	"	400,652	554	349
W9OP	"	387,816	551	339
KG9N	"	376,812	487	324
W9EWZ	"	346,830	545	330
W9YK	"	295,356	469	302
W9MS	"	238,434	390	294
N5EP	"	218,981	368	287
W9MR	"	210,648	370	268
KØTQ	"	182,952	290	231
KØVW	"	135,762	342	242
AJ9C	"	121,888	281	208
WS9W	"	102,235	205	161
KJ9C	"	99,450	275	195
KZ9DX	"	68,470	198	167
WB9VGO	*"*	*67,319*	*200*	*163*
W9FFA	"	63,180	266	180
N7US	"	50,008	148	133
WQ5O	"	29,785	138	115
AB9CD	"	21,312	123	111
W9NJY	"	21,216	130	102
K9DUR	"	18,258	129	102
N9GUN	"	17,622	107	89
KØPG	"	11,938	116	94
W9KXQ	"	4,416	74	69
WB9TFH	"	943	23	23
AI9T	"	574	14	14
W3HDH	*"*	*406*	*14*	*14*
KC9EOQ	"	104	8	8
N9WK	"	40	4	4
W9DGI	"	36	6	6
WB9Z	28	248,492	476	292
W9SE	"	65	5	5
W9ILY	21	472,175	499	425
W9PA	"	94,554	208	206
KN9P	"	196	14	14
KK9V	14	87,261	218	177
K9STM	"	4,042	48	47
K9OM	7	798,322	643	449
*NE9U	A	1,792,089	1401	663
*KYØQ	"	878,712	898	492
*K9CW	"	621,432	711	411
*NS9RC	"	496,834	855	394
			(OP: W8LVN)	
*WD9CIR	"	415,233	671	351
*N7ZZ	"	383,994	622	351
*N9DJ	"	365,840	513	340
*N9UA	"	324,480	456	338
*K9UIY	"	252,840	525	294
*WB9HFK	"	217,056	445	266
*WA9LEY	"	213,226	423	278
KG9X	*"*	*199,120*	*297*	*262*
*K9WA	"	157,855	323	241
*WT9Q	"	145,976	270	257
*KE9SA	"	143,058	339	226
*K9MA	"	129,570	299	210
*N9UNX	"	129,310	241	193
*W9QL	"	118,035	304	215
*N9SB	"	107,600	309	200
*WU9D	"	91,556	268	188
*WA9LKF	"	59,472	231	177
*KD9LSV	"	57,057	179	143
*WB9UGX	"	53,460	224	162
*W9VQ	"	46,580	149	137
*KC9YL	"	45,582	173	142
*W9KM	"	40,221	139	123
*KC9IL	"	38,480	170	130
*KY6AA	"	29,592	132	108
*KB9S	"	29,464	145	116
*W9NXM	"	27,285	113	107
*AG9A	"	17,459	82	79
*K7CS	"	15,910	103	86
*KD9OIN	"	14,356	83	74
*KK9N	"	10,792	89	76
*W8NWG	"	10,290	133	105
*N9CO	"	8,496	60	59
*K9PMV	"	7,040	59	55
*K9CC	"	4,664	61	53
*N8HWV	"	3,268	48	43
*KC9WIB	"	2,580	46	43
*AA9RK	"	2,556	43	36
*WA9LKZ	"	2,132	45	41
*N9EDL	"	1,560	27	26
*NV9X	"	672	30	28
*K6PVZ	"	432	16	16
*KF9VV	"	320	20	20
NY9X	*"*	*221*	*13*	*13*
*KD9LTN	"	64	17	16
*N9UN	"	50	5	5
NJ9R	*"*	*3*	*1*	*1*
*KB7ISP	28	1	1	1
			(OP: W9SE)	
*W9KHH	21	575	25	25
*WB7UOF	14	1	1	1
*KX9DX	7	18,952	130	103

District Ø

WX8C	A	2,941,884	1545	748
KTØR	"	1,738,880	1512	640
			(OP: KØAD)	
NSØR	"	830,695	981	515
WT7TT	"	563,766	912	434
			(OP: WØZA)	
KMØO	"	533,975	743	403
NXØI	"	430,782	675	366
NØAV	"	427,763	635	371
NCØB	"	415,659	674	397
			(OP: NØTA)	
K4IU	"	411,279	642	363
WØETT	"	390,185	548	365
WFØGM	"	328,874	510	338
			(OP: KJØI)	
NWØM	"	249,343	544	293
WDØT	"	244,850	461	295
NTØEE	"	225,903	404	293
NGØT	"	196,092	301	234
NØAT	"	168,592	422	257
NØBUI	"	165,388	323	239
WØUY	"	132,075	300	225
NG7A	"	118,144	277	208
NØGN	"	112,489	350	221
ADØH	"	90,308	297	211
W7RF	"	86,376	245	183
KØTG	"	70,616	230	182
NØKQ	"	62,169	228	159
KØFJ	"	36,646	146	146
ADØAB	"	24,990	121	102
KØTRL	"	15,752	97	88
KØDME	"	15,438	113	93
ACØE	"	13,340	108	92
KØINN	"	11,328	72	59
W7II	"	10,703	91	77
WØGAS	"	2,720	32	32
WØHRO	"	1,924	28	26
K3PA	28	96,520	301	190
WØGXA	"	1,140	23	20
KOØA	21	504,612	616	428
			(OP: NØAX)	
KUØK	"	481,950	644	425
			(OP: KØVBU)	
NØNR	"	303,064	578	344
KØAV	"	62,592	192	163
NØXM	"	1,666	35	34
NNØDX	14	56,606	199	166
			(OP: K9DU)	
KØTC	"	10,241	82	77
WØFLS	"	8,662	68	61
NFØN	"	1,798	32	31
WØTY	"	392	14	14
KØRF	7	1,922,778	1067	594
*NAØN	A	1,877,214	1638	669
*AD1C	"	928,893	907	497
*KØRC	"	816,042	762	491
*N4VI	"	435,554	730	371
*AI6O	"	429,471	693	401
*NN7A	"	345,510	516	330
*N7WY	"	333,237	485	339
*KØEA	"	332,766	547	342
*AEØDX	"	302,736	512	318
*WZØW	"	283,417	526	337
*KVØI	"	282,387	684	339
*KAØPQW	"	275,378	609	314
AAØAW	*"*	*270,432*	*484*	*313*
*KØHX	"	250,800	511	300
*KØKX	"	207,828	326	276

*AEØEE	"	138,754	367	238
*WBØN	"	103,828	273	202
*NØUK	"	79,662	251	187
*N5TU	"	68,445	218	169
*KNØV	"	64,527	198	157
*NIØDX	"	57,081	197	159
*WO7U	"	44,044	170	143
*KMØDX	"	43,901	236	143
			(OP: WØTT)	
*WØPF	"	38,808	162	132
*N5KB	"	35,490	160	130
*WØYJT	"	31,920	178	140
*KØMPH	"	25,984	130	112
*KØWRY	"	24,860	128	110
*KØUU	"	22,890	154	109
*NOØL	"	22,152	113	104
*KØGUZ	"	20,009	145	107
*KØPC	"	18,445	100	85
*KO9V	"	17,860	134	95
*W6GMT	"	15,197	120	91
*NZØT	"	12,994	137	89
*ACØW	"	12,411	63	63
*KØUK	"	10,730	93	74
*KBØNES	"	8,816	89	76
*WØEJ	"	8,432	80	68
*KYØO	"	7,448	86	76
*AKØBC	"	6,270	55	55
*AA5WZ	"	3,542	101	77
*NYØJ	"	2,915	65	55
*KO4YIN	"	2,296	46	41
*WA2JQZ	"	2,200	45	40
*W4IFI	"	1,833	41	39
*KØWOI	"	1,472	33	32
*KEØQKF	"	384	14	12
*KEØTT	21	40,572	159	138
*N9HDE	"	16,684	111	97
*NN5SD	"	8,906	80	73
			(OP: KØJV)	
*W7UT	14	280,606	440	346
*W2UP	"	7,169	72	67
*AGØMN	"	972	30	27
			(OP: KØJP)	
*AIØM	"	6	2	2
*KCØQWE	"	1	1	1
*NØNI	7	411,424	505	344
*WBØB	"	3,150	47	45

Alaska

AL7LO	A	242,764	384	274
AL2F	"	9,222	68	53
KL2R	21	20,700	109	92
			(OP: N1TX)	
KL7KY	3.5	152	8	8
*AL1G	A	17,460	113	90
*KL1/K1KK	14	5,967	57	51
			(OP: HK1A)	

Bermuda

*VP9UKR	A	6,089,928	2339	786
			(OP: VE3DZ)	

Canada

District 1

VY2TT	A	10,006,500	3500	953
			(OP: K6LA)	
VA1MM	"	746,880	631	389
VO1BQ	"	118,069	211	167
VO2AC	"	29,068	98	86
VE9OA	"	12,638	82	71
VE9AA	21	1,419,201	1051	567
VX1ANU	"	75,374	213	169
VO1CH	"	4,988	43	43
VE9HF	14	390,060	498	330
VA1RST	7	16,170	56	55
VY2ZM	1.8	25,636	77	68
*VO1HP	A	38,390	126	110
*XK2LI	"	21,090	110	95
			(OP: VY2LI)	
*VA1CC	"	19,656	92	91
*VE9KK	"	14,904	81	72

District 2

VC2A	A	10,188,318	3054	1022
			(OP: VA2WA)	
CF2T	"	9,035,145	2916	945
			(OP: VA2EW)	
VE2FK	"	813,645	754	405
VC2Z	"	53,795	178	145
			(OP: VA2UR)	
VA2QR	"	3,811	37	37
VE2GT	3.5	36	3	3
*CG2Z	A	3,070,116	1450	756
			(OP: VA2CZ)	
*VE2IR	"	738,840	722	393
*VE2OWL	"	96,473	199	181
*VE2HEW	"	87,278	196	151
*VE2QV	"	34,980	126	106
*VE2HLS	14	115,342	227	202
*VE2IEA	"	105,300	226	195

District 3

XL3A	A	9,133,200	3158	944
			(OP: VE3AT)	
VE3MIS	"	1,748,880	1200	560
			(OP: VA3JK)	
VA3TNM	"	1,125,740	811	473
VE3CT	"	462,738	446	331
			(OP: VE3UTT)	
VE3TW	"	280,635	377	265
VA3FH	"	252,086	390	241
VE3UZ	"	238,160	400	260
VE3YT	"	204,127	331	241
VE3KP	"	130,468	210	169
VE3MDX	"	33,354	114	109
VE3EJ	21	3,317,652	1630	834
VE3NE	7	2,483,393	1038	563
VE3NZ	"	2,172,906	992	526
VA3AR	"	1,448,550	819	435
*VX3KI	A	2,377,648	1321	568
			(OP: VE3KI)	
*VE3MGY	"	1,509,936	1076	498
*VE3OI	"	1,007,746	743	461
*VA3FF	"	793,950	698	395
*VE3GFN	"	729,492	702	372
*VA3WB	"	554,561	532	349
*VE3VY	"	428,139	460	303
*VE3AQ	"	354,474	470	282
*VE3KOT	"	319,956	390	273
*VA3SB	"	300,314	429	266
*VE3HEU	"	259,128	405	244
*VE3NFN	"	193,760	400	280
*VE3KTB	"	187,060	296	199
*VA3OKG	"	175,176	268	216
*VA3FN	"	93,912	201	156
*VA3EON	"	93,600	239	160
*VA3PAF	"	91,760	219	148
*VE3QO	"	89,590	207	155
*VE3SSR	"	74,102	183	134
*VA3EJN	"	59,925	202	141
*VE3JZT	"	50,096	160	124
*VE3LMS	"	46,148	150	139
*VA3EC	"	44,544	140	116
*VA3TMV	"	41,160	153	120
*VA3ROC	"	38,533	142	113
*VA3PM	"	31,458	128	107
*VE3EUS	"	24,346	87	74
*VE3EKA	"	12,483	81	73
*VE3NRT	"	12,033	66	63
*VE3MVM	"	11,935	60	55
*VE3HG	"	6,644	47	44
*VG3TTB	"	5,805	45	43
*VE3FZ	"	4,386	46	43
*VX3OU	"	3,920	36	35
*VA3IJK	"	3,432	43	39
*VE3VIG	"	276	12	12
*VA3IIF	21	900	30	30
*VE3TM	14	855,286	710	499
*VE3ZY	"	8,037	58	57
*VE3AYR	7	3,570	33	30

District 4

VE4GV	A	68,497	218	143
*VA4HZ	A	168,399	298	231
*VE4DL	"	73,260	225	165
*VE4IM	"	25,500	125	102
*VG4JP	21	8	2	2
			(OP: VA4JP)	

District 5

VE5MX	A	1,658,220	1077	580
VX5ZX	21	25,088	124	112
			(OP: VE5ZX)	
*VX5UO	A	212,562	381	241
*VE5KS	28	901	18	17

.

District 6

VE6BBP	A	1,598,401	1111	587
VE6KC	"	182,007	283	243
VA6BGE	"	17,316	101	78
*VE6WR	A	84,660	205	170
*VE6JTW	"	4,420	72	65
*VA6RCN	"	162	9	9
			(OP: VE3RCN)	
*VE6UM	21	50,116	176	134
			(OP: VE6BMX)	

District 7

VA7KO	A	892,012	858	418
VA7VK	"	218,592	373	207
VE7JKZ	"	153,710	261	190
VG7RN	"	50,740	148	118
VA7DZ	"	15,920	88	80
VA7XU	"	11,748	83	66
VE7IO	"	5,376	52	48
VG7DX	28	507	14	13
VG7OM	14	1,266,048	972	576
			(OP: VA7OM)	
*VA7ST	A	8,568	67	56
*VE7AB	"	6,020	45	43
*VE7BGP	"	4,429	50	43
*VE7GOG	"	2,280	35	30
			(OP: VA7QCE)	
*VA7ZM	"	350	15	14
*VE7MR	7	1,740	20	20
*VE7ARN	"	1,134	18	18

District 8

XK1AAA	A	115,619	294	199

Cayman Islands

ZF2SS	A	6,550,155	2566	815
			(OP: KO7SS)	

Costa Rica

TI7W	A	118,604	267	199
			(OP: N3KS)	
*TI2OY	A	732,251	747	403
*N5NU/TI2	"	152,110	321	205
			(OP: N5NU/TI2)	

Cuba

*CO8NMN	A	1,138,500	889	450
*CO8WN	"	568,856	578	337
*CO2VDD	"	7,020	60	54
*CO6WD	14	264,190	399	290
*CM3OR	7	1,353	34	33

Dominican Republic

*HI8A	A	139,611	240	173
*HI8PAP	"	45,372	144	114

Greenland

OX3LX	21	99,370	242	190

Grenada

*J35X	21	588,456	634	396

Guatemala

*TG9ADM	14	6,734	79	74

Haiti

*HH2JA	21	458,248	661	334
			(OP: JK1UWY)	

Martinique

TO3F	A	5,870,180	2500	841
			(OP: ON4RU)	

Mexico

XE2X	21	1,669,200	1200	600
XE1CT	14	841,090	863	482
*XE1RE	A	13,260	97	85
*XE2AU	"	8,296	69	61
*XE1AQY	28	518	14	14
*4A5E	21	4,268	50	44
			(OP: XE1EE)	
*XE2W	14	750	25	25

Panama

*HP1RIS	28	3,325	36	35

Puerto Rico

WP4X	A	7,195,188	2798	858
			(OP: NP4Z)	
*WP3C	A	4,225,104	2028	793
			(OP: N2TTA)	
*KP3N	"	1,250,623	931	517
*KP4YO	"	131,760	305	216
*NP4H	"	51,375	147	137
*KP3W	21	354,996	416	346
*KP4JRS	"	331,526	465	311
*KP4DQC	"	18	3	3
*NP4AW	14	88,000	209	176
*KP4JFR	7	100	10	10

St. Kitts & Nevis

V48A	A	2,396,436	1339	607
			(OP: WX4G)	

U.S. Virgin Islands

KP2M	A	9,048,600	2868	900
			(OP: KT3Y)	
WP2Z	"	3,107,187	1553	733
			(OP: K9VV)	
*KP2B	A	298,368	427	259
			(OP: LU8EOT)	

United Nations HQ

*4U1UN	A	3,422,375	1627	655
			(OP: KO8SCA)	

AFRICA

Canary Islands

EF8R	A	15,511,572	4278	1062
			(OP: EA8RM)	
ED8W	"	8,393,936	2836	856
			(OP: OM5RW)	
ED8M	28	21,497	93	83
			(OP: EA8DIG)	
EA8DIG	14	18,720	84	78
*EA8AQV	A	168,245	266	209
*EF8BBM	"	2,296	28	28
*EA8TR	28	2,296	30	28
*EA8CYU	21	24,849	105	99
*EA8DHC	14	6,464	73	64

Madeira Islands

CR3DX	A	17,938,549	4239	1171
			(OP: OM3RM)	
CT3KN	"	9,169,552	2756	973
CQ3J	"	841,701	820	447
			(OP: CT3MD)	
*CT9/PF5X	A	412,012	489	292

Morocco

*CN8WW	A	66,882	180	142

Namibia

*V51MA	A	4,617	59	57

South Africa

*ZS1OIN	A	189	7	7

St. Helena

ZD7BG	A	1,447,389	979	501

ASIA

Asiatic Turkey

TA2SE/3	A	503,028	530	314
TA4AU	7	259,380	235	198
*TA7I	A	1,915,818	1051	538
*TA2IJ	"	54,808	161	136
*TA2L	"	8,964	56	54
*TA4RC	"	4,230	48	45
*TA3DJ	21	12,420	72	69
*TA2UCT	7	9,944	47	44
*TA2TC	"	1,380	16	15

Azerbaijan

*4K6FO	21	424,826	488	311

Bahrain

A92GE	A	180,620	293	220

China

BG1HGS	A	941,172	976	428
BA4DL	"	616,776	871	372
BG2QMO	"	456,492	611	327
BG1AL	"	292,236	492	294
BA4AEO	"	46,720	193	128
BA4TB	21	1,945,884	1295	668
BD7DX	"	1,524,264	1094	602
BI7MEK	"	295,886	576	337
			(OP: BD7LPD)	
BY4SZ	"	266,802	525	318
BG9NJY	"	299	13	13
BH1EBF	14	46,018	142	133
BA5CW	3.5	20,412	113	84
*BG6GQE	A	778,120	904	392
*BH6KOK	"	713,296	849	409
*BI8CZM	"	518,100	593	330
*BH4RRG	"	382,689	532	303
*BG1WNU	"	206,283	501	231
*BI4JCM	"	199,548	400	241
*BH4AYG	"	187,146	451	222
*BG5JND	"	127,260	280	210
*BH3EMV	"	77,190	260	166
*BH1AUJ	"	56,448	172	147
*BD4RHV	"	52,920	188	140
*BG8TFN	"	49,984	189	142
*BG6RJN	"	48,048	180	154
*BD7BW	"	32,249	217	119
*BG7XWF	"	30,226	195	119
*BA5AB	"	21,484	92	82
*BH2TVR	"	20,418	130	82
*BD4VGZ	"	17,085	118	85
*BG6QAL	"	16,154	125	82
*BH4TYL	"	14,868	104	84
*BG4FQD	"	13,197	109	83
*BG3IYX	"	12,240	88	80
*BH1JHC	"	12,236	122	76
*BH4TIH	"	8,160	146	85
*BI1BDS	"	7,442	79	61
*BA2BA	"	6,213	79	57
*BY1TL	"	5,184	74	54
			(OP: BI1GRI)	
*BD3QT	"	4,680	76	60
*BI6LFJ	"	3,450	100	75
*BH8PVC	"	2,800	44	40
*BI4QKE	"	2,701	49	37
*BD5II	"	2,379	53	39
*BI1JPC	"	2,214	27	27
*BA6KC	"	1,760	33	32
*BG8PM	"	1,496	25	22
*BG2KYH	"	340	25	20
*BDØBK	"	252	14	14
*BD7JZC	"	72	6	6
*BA4SCP	"	49	7	7
*BH4BFS	28	46,574	195	146
*BA4II	"	26,320	197	112
*BH4FCD	"	25,208	212	137
*BD7NQA	"	13,528	86	76
*BH4WPN	"	312	16	13
*BA8CY	21	556,800	674	400
*BH7JUO	"	254,604	384	294
*BD7LQM	"	90,624	326	192
*BG7SSK	"	65,856	230	168
*BA3AX	"	61,854	260	183
*BH8OCW	"	30,240	146	126
*BI1NJI	"	17,112	128	93
*BI1JNP	"	16,065	97	85
*BH3DAX	"	15,224	119	88
*BG5UZW	"	13,195	99	91
*BG3INN	"	9,085	93	79
*BG5JNT	"	5,985	73	57
*BG3HMQ	"	3,876	52	51
*BA5AD	"	176	8	8
*BA3MM	"	25	5	5
*BA7LAC	"	4	2	2
*BG8BXM	"	1	1	1
*BD7OB	14	45,870	158	139
*BA3OM	"	38,808	162	126
*BH4CAC	"	27,370	142	115
*BH4TVU	"	19,885	167	97
*BA1IO	"	2,652	40	39
*BH4XDZ	"	0	4	4
*BH8MDV	7	95,744	152	136
*BH1RWJ	"	3,531	46	33
*BG2KZP	"	1	1	1
*BI4SDT	3.5	902	23	22

Cyprus

H25A	A	15,775,552	4119	1132
			(OP: LZ2HM)	
C4W	"	7,652,040	2473	930
			(OP: 5B4WN)	
5B4AOF	14	181,412	312	209
*5B4AQC	A	3,983,847	1612	661
			(OP: DK6SP)	
*P3AA	"	1,768,947	1119	479
			(OP: RN3QO)	
*5B4AIF	"	384	13	12
			(OP: 5B4AIE)	

Georgia

4L8A	21	481,950	526	357
4L2M	1.8	84,488	134	118
*4L6QL	A	428,314	478	331

Hong Kong

VR2CO	A	497,198	740	338
VR2GP	3.5	1,856	34	29
*VR2NC	28	31,823	209	121

India

VU2YYF	A	548,772	624	329
VU2TMP	"	178,396	307	206
VU2IBI	"	19,530	104	93
*VU3GDS	A	179,712	344	234
*VU2DED	"	84,966	199	147
*VU2DCC	"	41,769	151	119
*VU2FGQ	21	69,275	189	163
*VU2XE	"	44,268	140	119
*VU2JOS	14	11,270	75	70
*VU2BQN	"	936	18	18

Israel

4Z5LY	A	2,707,250	1496	595
4Z1DZ	"	5,445	47	45
4XØA	28	159,936	304	224
			(OP: 4X1VF)	
4X1MM	"	79,474	217	158
4Z5ML	21	473,760	488	360
*4X1ST	A	882,080	685	370
*4Z4AK	"	148,104	259	198
*4Z5MU	28	68,832	192	144
*4Z5LU	21	19,504	92	92
*4Z4KX	3.5	249,872	246	184

Japan

District 1

JE1LFX	A	2,653,162	1421	694
JE1NVD	"	1,679,999	1237	551
JL1CNY	"	924,908	903	428
JK1LSE	"	821,486	890	431
JA1PNA	"	574,173	635	393
JR1GSE	"	541,296	715	358
JN1THL	"	527,296	546	352
JH1HIC	"	472,068	602	324
JH1FSF	"	445,550	511	335
7K4VPV	"	383,570	530	317
7L1FFH	"	298,112	416	274
JH1CTV	"	296,153	499	247
JH1OLB	"	184,005	336	235
JQ1CIV	"	146,000	277	200
JJ1VFE	"	138,891	267	201
JA1CJP	"	129,618	269	171
JF1LMB	"	128,283	252	183
JF1UOX	"	127,792	292	196
JA1TMG	"	118,496	244	161
JH1JNJ	"	108,180	225	180
JQ1UXN	"	87,318	236	154
JS1DEH	"	83,213	279	173
JH1FNU	"	77,760	211	160
JM1PIH	"	69,825	178	147
JI1FOE	"	65,073	182	109
JG1LHB	"	52,520	152	130
JA1DKT	"	50,750	156	125
7K1JFM	"	40,810	170	106
JJ1QLT	"	39,412	134	118
JA1XRA	"	35,203	126	107
JA1AYO	"	31,208	122	94
JE1QHP	"	27,440	115	98
JQ1TIV	"	26,390	116	91
JP1LRT	"	24,386	114	89
7M4CLF	"	18,880	83	64
JH1NXU	"	17,094	103	74
JK1HIY	"	10,148	66	59
JI1HNC	"	9,462	64	57
7K2PZG	"	9,280	60	58
JR1JCB	"	8,528	55	41
JR1WYW	"	6,968	54	52
JL1LNC	"	3,306	43	38
JG1OGM	"	2,414	34	34
JR1IJV	"	1,269	27	27
JI1LNR	"	960	20	20
JL1JJD	*"*	*836*	*20*	*19*
7K4AEA	"	608	20	19
JS1KQQ	"	341	11	11
JS1NDM	"	261	9	9
JK1BAB	"	171	9	9
JA1WWO	"	153	9	9
JA1BPA	28	88,074	254	189
JK1WSH	"	48,764	184	146
JL1MUT	"	11,661	81	69
JA1FFB	"	4,554	55	46
JR1BAS	"	1,475	25	25
JH1BNC	"	836	22	22
JE1CKA	21	1,107,177	901	543
7K4XNN	"	585,565	663	415
JH1ACA	"	1,326	27	26
JA1MJN	"	672	16	16
JI1ALP	14	26,829	121	99
JI1JPJ	"	6,608	58	56
JA1YPA	"	48	4	4
			(OP: JA1PEJ)	
JA1TBA	7	104,272	150	133
*JA1BJI	A	2,383,769	1478	619
*JI1RXQ	"	1,866,102	1153	566
*JH1EAQ	"	1,357,503	1026	509
*JA1IAZ	"	555,135	611	357
*JK1OLT	"	401,375	495	325
*JI1UPL	"	211,816	466	232
*JS1KKY	"	204,314	341	251
*JA1PCM	"	164,138	296	214
*JQ1COB	"	163,452	304	212
*JF1GZZ	"	136,128	311	192
*JK1JHU	"	82,634	250	158
*JJ2JQF/1	"	74,866	250	166
*JA1RPK	"	66,080	182	118
*JK1EVU	"	65,331	197	153
*JK1BVN	"	58,692	209	134
*JG1XIO	"	56,548	174	134
*JF1WNT	"	52,864	185	118
*JF1JDG	"	50,939	170	133
*JA1SCE	"	49,266	164	119
*JK1AKP	"	47,795	169	121
*JL1GPG	"	45,879	175	123
*JA1RRA	"	45,510	150	123
*JO1PZR	"	44,982	186	126
*JK1AUY	"	42,112	155	128
*JJ1GXY	"	41,900	139	100
*JH1YMC	"	41,234	179	106
			(OP: JF1VNR)	
*JJ1EJX	"	39,432	172	106
*JA1GFD	"	36,852	135	111
*JA1CPU	"	35,815	113	95
*JR1DVB	"	35,451	134	101
*JJ1KZZ	"	33,284	113	106
*JH1DJD	"	31,059	128	119
*JL1QDO	"	30,914	101	82
*JA1UHJ	"	30,393	148	99
*JM1VNJ	"	29,667	117	93
*JJ1ONK	"	28,106	116	94
*JR1AQI	"	25,389	121	91
*JE1RRK	"	24,786	100	81
*7K1VKU	"	24,196	108	92
*JO1WIZ	"	22,113	117	91
*JI1HSV	"	19,314	92	74
*JA1UXV	"	18,012	93	76
*JR1LEV	"	14,213	70	61
*JG1TGQ	"	14,124	76	66
*JM1KNI	"	13,393	66	59
*JA1GZK	"	13,000	78	65
*JI1DGW	"	12,400	85	62
*JK1FUP	"	11,573	84	71
*JL1LOF	"	9,620	69	65
*JP1JZR	"	9,588	79	68
*JK1JAS	"	9,472	69	64
*JH1ASG	"	7,560	81	60
*7J1ADJ	"	7,560	68	60
*JG1SWV	"	7,056	47	42
*JQ1PCT	"	6,930	61	55
*JF1HAJ	"	5,989	55	53
*JA1OHP	"	5,890	46	38
*JR1BQJ	"	5,546	54	47
*JQ1EPD	"	5,123	49	47
*JA1HNW	"	4,171	45	43
*JA1CRJ	"	3,937	33	31
*JJ1LRD	"	3,854	49	41
*JN1HYU	"	3,760	45	40
*JQ1ARQ	"	3,441	37	37
*JL1FAR	"	3,162	37	34
*JF1OPO	"	3,131	33	31
JA1KZP	*"*	*3,096*	*38*	*36*
*7L1DST	"	2,640	32	30
*JR1CAD	"	2,352	34	28
*JH1BCS	"	1,848	36	28
JS1LQI	*"*	*1,755*	*29*	*27*
JK1VMC	*"*	*1,705*	*33*	*31*
*JA1RXC	"	1,518	25	23
*JE1GWO	"	1,276	22	22
*JQ1VDJ	"	1,222	31	26
*JA1PTO	"	990	15	15
*JJ1JVC	"	920	21	20
*JI1LAI	"	792	18	18
*JG1CMT	"	476	14	14
*JH1HMC	"	416	20	16
*JH1VMM	"	399	19	19
*JH1TJH	"	260	10	10
*JN1FAO	"	189	9	9
*JG1LMT	"	55	5	5
*JA1CHY	"	21	3	3
*JR8WOW/1	"	12	2	2
JA1IZZ	*"*	*12*	*2*	*2*
*JA1UII	"	8	2	2
*JF1OVA	28	14,874	91	74
*JF1RYU	"	6,588	60	54
*JO1VRK	"	4,042	48	43
*JL1EEI	"	1,827	31	29
*7J1YAD	"	1,375	25	25
			(OP: JF1TEU)	
*JE1WBA	"	15	3	3
*JJ1RJR	21	227,640	357	280
*JR1CBC	"	155,232	298	252
*7K3CZU	"	48,564	174	142
*JG1UKW	"	24,075	127	107
*7N4XTA	"	18,018	102	91
*JI1BBN	"	16,660	96	85
*JH1VIX	"	16,287	111	89
*JA1UOA	"	10,824	70	66
*JF1ROR	"	6,612	66	57
*JK1BQC	"	3,783	41	39
*JO1KTD	"	3,234	52	49
*JA1WBX	"	1,075	27	25
*JH1NVA	"	819	21	21
*JP1PIJ	"	589	33	31
*JI1NZA	"	578	18	17

*8J1DENPA	"	384	12	12
		(OP: JF3CGN)		
*JA1LKY	"	255	17	15
*JA1YEV	"	24	6	6
		(OP: JA1GTE)		
*JJ1HHJ	"	1	1	1
*JJ1ENZ	14	56,832	174	148
*JA1QIF	"	12,530	75	70
*JA3GZE/1	"	10,640	80	76
*JH1WHA	"	9,920	67	64
*JN1GNL	"	3,914	39	38
*JO1JKH	"	65	5	5
*JA1SVP	7	146,432	222	176
*JJ1AEB	"	74,932	150	131
*JR1ABS	"	11,760	52	49
*JI1CAZ	"	1,008	14	14
*JN1VFV	"	96	6	6
*7M2CWO	"	6	1	1
*JA1EQO	"	2	1	1
*JK1HWU	3.5	13,065	91	67
*JE1LPZ	"	168	6	6
*JE1SPY	1.8	2,360	53	40
*7J2YAB/1	"	240	16	15
		(OP: JA2NQG)		
District 2				
JF2OZH	A	733,628	741	394
JR2PMT	"	563,740	602	355
JS2MKU	"	474,083	545	373
JR2AWS	"	333,336	497	258
JF2FIU	"	306,772	548	283
JA2AXB	"	292,929	420	273
JE2BOM	"	183,456	318	208
JR2ALA	"	144,336	266	194
JA2HYD	"	99,575	240	175
JJ2CJB	"	20,416	96	88
JA2JWH	"	12,816	90	72
JF2CTS	"	1,026	20	19
JE2PCY	21	35,733	169	129
JA2XCR	"	435	15	15
JA2FSM	14	6,000	52	50
JA2GTW	7	2,640	22	22
*JA2KVB	A	1,001,776	850	464
*7K1MAG/2	"	290,862	410	286
*JA2FXV	"	212,496	385	233
*JA2ODB	"	182,971	313	229
*JG2TSL	"	123,630	278	195
*JG2RFJ	"	120,213	253	171
*JA2GHP	"	61,488	211	144
*JR2ATZ	"	51,456	145	128
*JH2NWP	"	43,146	124	102
*JS2KWL	"	36,630	142	110
*JA2KPW	"	35,316	158	109
*JS2FLS	"	30,294	163	102
*JK2RCP	"	30,199	137	101
*JG2AIG	"	28,458	131	93
*JH2XQY	"	21,032	99	88
*JS2KHM	"	20,560	90	80
*JM2LEI	"	15,352	81	76
*JF2VAX	"	10,270	72	65
*JP2XSP/2	"	9,128	57	56
*JI2IXA	"	5,934	52	43
*JA2QVP	"	4,005	50	45
*JS2AZO	"	3,577	55	49
*JJ2QXI	"	3,264	38	34
*JR2UQU	"	1,368	25	24
*JG2KGS	"	270	11	10
*JJ1NIU/2	"	55	5	5
*JS2FZH	28	10,557	97	69
*JE2CPI	"	3,318	47	42
*JH2RIH	"	2,380	42	34
*JA2HZA	"	1,566	30	27
*JH2JNU	"	40	9	8
*JS2PHO	21	21,008	120	101
*JF2NLH	"	6,496	62	56
*JS2ITI	"	348	13	12
*JR2TRC	"	192	12	12
*JA2KKA	14	27,540	110	102
*JE8TRU/2	7	2,542	35	31
*JR2WLQ	"	1	1	1
District 3				
JQ3ALW	A	514,026	580	342
		(OP: JH1TXG)		
JA3IBU	"	348,580	454	290
JR3KQJ	"	313,983	551	261
JN3SAC	"	286,740	405	270
JR3RIU	"	212,790	388	246
JA3VOV	"	188,320	353	214
JF3KCH	"	82,688	329	152
JA3AVO	"	36,002	129	94
JA3LIL	"	12,410	83	73
JA3KKE	"	7,968	66	48
JM3UGA	"	7,568	49	44
JE3VRJ	"	6,006	46	42
JG3KMT	"	4,488	52	44
JR3UIC	"	406	14	14
JA3XOG	28	14,094	92	81
JF3LOP	"	748	18	17
JH3QFY	21	62,957	173	157
JA3BXF	"	37,375	133	125
JF3NDW	"	63	7	7
JA3GOJ	14	5,289	45	43
JH3FUK	7	117,320	155	140
JL3DQX	3.5	108	9	9
*JA3JM	A	183,700	352	220
*JQ3BVC	"	138,159	393	189
*JI3XOK	"	37,376	174	128
*JA3NUT	"	35,417	145	107
*JO3OEF	"	26,885	118	95
*JO3QVT	"	24,816	108	88
*JA3MAT	"	10,962	70	63
*JQ3BAV	"	5,368	50	44
*JF3RLV	"	4,788	60	57
*JF3GFH	"	2,790	32	31
*JS3EOE	"	2,618	47	34
*JJ3IUS	"	1,860	30	30
*JI3KDH	28	15,792	96	84
*JA3RAZ	"	3,198	44	39
*JF3BFS	21	727,426	683	466
*JF3IYW	"	70,705	233	179
*JA3JRI	"	14,784	98	84
*JR3XEX	"	2,660	46	38
*JA3DAY	"	640	20	20
*JG2CNS/3	"	390	16	15
*JR3KAH	"	380	20	19
*JF3LGC	"	220	10	10
*JG3LDD	"	40	6	5
*JJ8RUN/3	14	448	14	14
*JA3YVI	"	54	7	6
*JG3EHD	"	48	4	4
*JA3MIB	7	600	10	10
*JF3ROH	"	266	7	7
*JP3WEL	3.5	396	12	12
		(OP: JG1EIQ)		
District 4				
JH4UYB	A	4,770,216	2182	792
JR4OZR	"	3,681,656	1760	748
JH4UTP	"	2,777,571	1677	647
JA4CZM	"	60,480	181	135
JA4BEV	"	1,025	27	25
JR4PUR	"	646	21	17
JA4VNE	21	21,018	112	93
*JE4MHL	A	978,048	958	432
*JM4WUZ	"	387,180	506	324
*JI4WHS	"	263,418	459	258
*JH1MTR/4	"	65,664	190	128
*JH4CES	"	26,754	93	91
*JA4JLT	"	21,888	112	96
*JA4LCI	"	10,752	64	64
*JA4GQD	"	840	22	21
*JA4TUJ	"	714	14	14
*JH4PUS	21	3,471	43	39
*JH4FUF	"	1,122	23	22
*JA4EZP	"	64	8	8
District 5				
JE5JHZ	A	108,996	222	186
JA5BEN	"	29,406	106	87
JA5NSR	3.5	7,632	62	53
*JA5TX	A	19,700	121	100
*JR5CAG	"	1,081	23	23
*JJ5RBH	"	84	6	6
*JH5FTY	28	50	6	5
*JA5CBU	21	91	7	7
*JH5HDA	14	4,950	53	50
District 6				
JR6CSY	A	669,469	802	389
JA6FFK	"	296,203	424	271
JE6WGT	"	251,667	484	239
JE6QQN	"	239,184	353	264
JK6DXD	"	214,344	313	229
JA6BZI	"	164,472	286	231
JA6MWW	"	121,923	266	207
JA6BWH	"	75,036	187	148
JA6ACZ	"	21,420	97	85
JA6FFO	"	12,870	98	65
JA6BCV	"	3,104	33	32
JA6CNX	"	1,184	38	37
JE6WOQ	21	127,160	300	220
JG6OZC	"	110,561	287	209
*JG6JAV	A	593,480	642	370
*JH6OPP	"	253,129	459	269
*JA6CVR	"	64,680	208	140
*JH6EXF	"	17,712	93	82
*JF6KKC	"	16,008	102	87
*JE6JZP	"	544	18	17
*JA6GMC	28	5,841	69	59
*JA6UKY	"	180	13	12
*JA6CDC	"	24	6	6
*JA6WFM	21	814,264	710	487
*JH6QIL	"	247,059	431	291
*8J6YAB	"	245,014	542	301
		(OP: JA6VZB)		
*JF6ABL	"	28,783	129	107
*JR6KBF	"	17,255	103	85
*JE6PJP	"	2,220	42	37
District 7				
JA7NVF	A	1,382,097	1218	519
JA7ACM	"	849,110	731	410
JO7KMB	"	439,632	553	344
JA7AUM	"	46,860	149	132
JA7GYP	"	29,328	103	78
JN7TAN	"	6,862	52	47
JA7ZP	"	1,275	26	25
JF7PHE	28	67,392	236	162
JA7OWD	"	37,922	173	134
JH7XGN	21	1,405,338	964	597
JR7IWC	"	52,496	154	136
JH7XMO	3.5	6,256	60	46
*JH7QXJ	A	890,514	807	414
*JH7IXX	"	133,942	333	193
*JR7ASO	"	24,219	101	81
*JP7GRU	"	2,520	29	28
*JE7SRK	"	1,892	22	22
*JM7GTK	"	396	12	11
*JF7VVL	21	2,275	41	35
*JF7GDF	"	81	9	9
*JH7VHZ	14	453,936	546	386
*JA7LLL	"	13,320	78	74
*JE7PNN	7	24	2	2
District 8				
JH8FIH	A	93,620	204	155
JA8RUZ	"	38,760	176	114
JG8TDZ	28	198	10	9
JH8SLS	21	4,895	69	55
JH8GEU	14	138,774	272	229
*JA8RWU	A	339,879	649	277
*JM8LND	"	103,356	277	174
*JM8FEI	"	96,558	293	154
*JE8KKX	"	26,040	124	84
*JA8CXY	"	11,480	66	56
*JH8RXM	"	10,416	61	48
*JK8PBO	"	3,003	45	39
*JE8UHY	"	2,925	43	39
*7K1NUZ/8	"	1,344	34	28
*JA8DNV	"	174	6	6
*JK8CEE	21	1,333	31	31
*JA8HBO	14	6,264	58	54
*JG8NKJ	"	147	7	7
*JA8AJE	7	1,638	18	18
District 9				
JA9CWJ	A	299,827	411	281
JH9CEN	"	9,702	75	66
JA9CCG	"	5,661	63	51
JH9FCP	"	2,133	29	27
JR9GMS	"	820	21	20
JF9JTS	21	282,037	391	301
		(OP: JAØTEA)		
JA9FHB	1.8	16	2	2
*JA9XAT	28	9	3	3
District Ø				
JAØFVU	A	2,071,886	1358	617
JJØJML	"	1,584,048	1167	541
JIØVWL	"	148,500	324	220
JJØPJD	"	143,441	258	191
JHØGHZ	"	25,628	98	86
JHØZHQ	21	138,040	306	238
		(OP: JH1BBT)		
JJØVNR	7	939,843	588	369
JHØILL	"	43,956	133	111
JAØIOF	"	5,160	51	43
JJØUSR	"	870	15	15
*JHØNEC	A	773,828	690	409
*JHØMUC	"	407,028	577	321
*JHØDUG	"	62,172	231	132
*JGØEXP	"	46,917	151	117
*JIØWVQ	"	37,994	144	121
*JJØVXN	"	6,976	87	64
*JFØIUN	"	319	11	11
*JAØGCI	28	4,750	55	50
*JAØBJY	21	555	15	15
*JHØEPI	14	267,306	387	298
*JRØBQD	7	212,947	303	203
Kazakhstan				
UPØL	A	3,838,407	1762	723
		(OP: UN9LW)		
UP5B	"	2,961,582	1570	559
		(OP: UN7ZO)		
UN9GD	21	1,370,520	964	564
*UN4L	A	3,115,080	1562	612
*UN7FW	"	431,568	510	333
*UNØL	"	80,388	194	154
*UN7QF	"	13,392	76	72
*UN7CN	21	228,464	342	262
*UN7LDR	"	98,091	221	173
*UN7ZZ	"	63,474	164	149
Kuwait				
9K2NO	28	937,924	812	442
Kyrgystan				
*EXØM	21	704	22	22
Mongolia				
JT1CD	A	1,870	35	34
*JT1CO	A	1,026,780	839	436
Nepal				
9N7AA	A	1,814,904	1380	554
Ogasawara				
*JD1BOW	A	109,862	465	163
Qatar				
A71BX	14	1,609,790	1077	610
Republic of Korea				
DS4EOI	A	1,898,541	1510	579
HL2BQG	"	1,272,531	1344	487
HL2ZN	"	58,855	221	149
HL4CEL	"	27,485	308	115
HL2VXK	"	312	14	13
*HL1VAU	A	527,650	719	346
*HL2IDT	"	70,716	204	142
*HL5FEI	"	46,428	190	146
*DS3EXT	"	37,506	162	114
*HL2CFY	"	24,386	108	89
*HL2KV	"	5,600	70	56
*6K2KUS	"	4,089	51	47
*HL3AMO	28	11,914	89	74
*6K2EGQ	14	1,260	42	30
*HL4CFN	"	3	1	1
*HL5YI	3.5	6	3	2
Saudi Arabia				
HZ7C	A	4,084,800	1972	740
		(OP: 7Z1SJ)		
*HZ1TT	A	1,086,713	846	409
Singapore				
9V1YC	A	1,422,908	1151	508
9V1PL	14	2,320	30	29
*9V1HY	A	2,220	30	30
*9V1BX	"	171	11	9
*9V1XX	21	77,686	226	179
Taiwan				
BV4VQ	28	220	12	10
BV2LA	21	26,481	107	97
*BU2EO	A	319,740	680	292
*BU2EV	"	1,794	43	39
*BV3UN	"	45	5	5
*BU2EP	21	18,527	109	97
Thailand				
HS5NMF	A	1,234,965	1199	501
E21YDP	21	538,650	604	399
HS3NBR	14	61,513	167	137
*HS8KAY	A	510,508	662	358
*E27EK	"	366,972	558	318
*E29AHU	"	28,197	177	117
*HS5AES	"	27,060	145	110
*HS8NKB	"	13,350	88	75
*HS8KGG	"	4,512	56	48
*HS4MLV	"	1,357	31	23
*HS5TXB	"	320	18	16
*HS8JWH	28	92,500	254	185
*E2ØXMG	"	3,042	46	39
*HS8HEX	21	166,221	337	253
*E22UUW	"	158,508	300	238
*E25CRF	"	46,718	213	142
*E21IZC	7	70	6	5
United Arab Emirates				
*A65DF	A	24,960	108	96
Vietnam				
*XV9DL	A	23,688	133	94
		(OP: WY7M)		
*XV9NPS	14	4	2	2
West Malaysia				
*9M2TO	A	501,303	630	363
*9M2SAF	"	17,472	94	78

EUROPE

Albania				
ZA1AK	14	26,784	138	124
*ZA1ME	A	192,270	461	255
*ZA1EM	"	90,870	308	195
*ZA1F	"	70,047	258	181
Austria				
OE5TXF	A	2,560,140	1721	660
		(OP: G3TXF)		
OE5OHO	"	2,100,885	1004	617
OE1TKW	"	492,036	573	393
OE6MMD	"	107,512	230	178
OE3DXA	"	98,271	217	183
OE1XA	"	42,192	160	144
		(OP: OE1EPU)		
*OE1CIW	A	516,726	648	378
*OE5CYL	"	312,220	499	335
*OE3NHW	"	78,090	206	190
*OE8ACT	"	18,297	127	107
*OE3MCS	"	9,088	77	71
*OE5HIL	"	5,922	54	47
*OE5POP	"	1,368	37	36
*OE1HLB	"	952	32	28
*OE5FDM	14	5,883	55	53
*OE7MOP	7	78,432	208	172
Balearic Islands				
EA6FO	A	9,349,722	3598	1107
		(OP: EA3M)		
EA6NB	"	312,040	496	290
*EF6B	A	404,936	710	392
		(OP: EA6BF)		
*EA6ZS	"	36,640	186	160
*EA6SX	1.8	2,736	38	38
Belarus				
EW3LN	A	0	0	0
*EW8AX	21	0	0	0
Belgium				
OR3A	A	2,724,865	1554	715
OQ5M	"	2,504,387	1320	641
		(OP: ON5ZO)		
ON4TTT	"	1,005,485	832	499
OR1Z	"	443,430	703	379
ON6MR	"	220,220	367	286
OO4T	28	429	13	13
OO4O	14	335,172	407	372
OT2X	"	4,819	71	61
ON5WL	3.5	37,680	160	120
*ON5JT	A	1,022,606	1060	481
*ON3DI	"	941,409	950	459
*ON9TT	"	277,932	485	318
*ON4CT	"	170,275	362	245
*OT6E	"	118,472	376	251
*ON5ZZ	"	74,285	224	179
*ON7XN	"	69,006	198	159
*ON4LY	"	11,600	102	100
*OPØHQ	"	1,680	46	42
		(OP: OP5T)		
*ON2VHF	"	1,560	43	40
*ON1DX	14	152,076	355	276
*ON3ND	"	107,256	312	246
*ON3PAT	"	105,465	279	237
*ON7NU	"	80	10	10
*OT5Q	7	212,265	386	265
*ON6FC	"	30,525	142	111
Bosnia-Herzegovina				
E77A	21	2,148,777	1357	771
*E7/Z35M	A	479,669	689	367
*E72U	"	341,880	461	330
*E7ØAW	"	14,382	106	94
*E78CB	"	0	2	2
*E74SL	14	2,242	39	38
*E797WARD	7	999,792	862	477
		(OP: E73AA)		
*E77ZZ	"	5,236	35	34
Bulgaria				
LZ5R	A	15,020,324	4740	1262
		(OP: LZ5DB)		
LZ3ZZ	"	3,846,699	2116	831
LZ7J	"	2,366,640	1556	692
		(OP: LZ1CL)		
LZ8W	"	1,043,392	974	548
		(OP: UW7LL)		
LZ1AQ	"	595,296	664	432
LZ1ZJ	"	514,350	622	405
LZ4W	"	193,103	363	307
LZ1UK	"	168,078	320	257
LZ1GE	"	108,020	296	220
LZ1HW	"	90,860	190	154
LZ7A	"	22,155	110	105
		(OP: LZ1RF)		
LZ1MS	28	132,362	324	229
LZ8R	"	989	23	23
LZ5K	21	769,950	831	522
		(OP: LZ1QZ)		
LZ2ZG	"	10,730	67	58
LZ1QN	14	1,562,288	1310	728
LZ2NG	"	185,514	373	294
LZ1RW	"	52,397	179	151
LZ77ZZ	"	32,984	191	152
		(OP: LZ2UW)		
LZ1MC	"	13,534	70	67
LZ33E	3.5	76,560	219	165
		(OP: LZ5XQ)		
*LZ1JZ	A	1,320,405	1225	565
*LZ3QE	"	1,057,369	1073	551
*LZ7DX	"	895,850	814	475
*LZ2CH	"	172,894	404	274
*LZ3TL	"	75,072	228	192
*LZ1KZ	"	69,300	198	165
*LZ8A	"	50,041	207	163
		(OP: LZ2GPB)		
*LZ7O	"	46,230	156	134
		(OP: LZ1ONK)		
*LZ1PJ	"	31,008	128	114
*LZ2DF	"	15,903	105	93
*LZ2HT/P	"	1,976	40	38
*LZ1BY	"	720	32	30
*LZ2GS	28	19,694	101	86
*LZ1IA	"	1,200	26	24
*LZ1VKD	14	352,365	539	417
*LZ2PS	7	355,448	454	314
Corsica				
*TK/F5NBX	A	9,983	74	67
Crete				
*SV9COL	A	19,908	86	79
*SV9RNG	14	39,900	218	175
Croatia				
9AØBB	A	6,530,524	2339	1001
		(OP: 9A3XV)		
9A2AJ	"	3,674,835	1806	815
9A7DX	"	2,623,633	1404	851
9A3LET	"	120,420	271	223
9A6D	"	86,688	204	172
9A1KDE	"	55,485	151	135
		(OP: 9A2VR)		
9A7Y	"	32,472	107	99
9A4W	21	2,538,780	1458	786
9A7V	14	4,367,682	2003	1026
9A1P	"	3,712,133	1837	971
		(OP: 9A1UN)		
9A3YT	"	282,722	433	362
9A5Y	7	4,760,184	1724	836
		(OP: 9A3LG)		
9A1CCY	3.5	19,497	98	97
9A73KD	1.8	159,782	357	226
		(OP: 9A2KD)		
*9A1AA	A	2,623,050	1519	725
*9AØDIG	"	445,312	571	392
		(OP: 9A3SM)		
*9A1DR	"	391,140	520	369
*9A2R	"	386,616	468	362
*9A3MA	"	243,513	373	311
*9A3VM	"	199,800	341	300
*9A4WY	"	150,480	341	240
*9A5G	"	129,234	314	238
		(OP: 9A2VX)		
*9A9XX	"	86,314	256	206
*9A2IK	"	52,490	215	181
*9A4MZ	"	50,397	184	157
*9A3SM	"	34,398	130	117
*9A9EE	"	6,840	64	60
*9A8M	14	230,408	450	332
		(OP: 9A7DM)		
*9A4R	"	15,295	101	95
Czech Republic				
OK3X	A	5,417,577	1959	957
		(OP: OK1VK)		
OLØW	"	4,927,450	2083	935
		(OP: OK1DSZ)		
OK2QA	"	2,197,440	1502	672
OK2EA	"	1,444,608	1288	576
OK1OA	"	1,042,080	891	501
OL7T	"	552,120	644	430
		(OP: OK2BXU)		
OK2EQ	"	187,473	349	253
OK4MM	"	136,136	299	238
OK1KTI	"	70,210	205	170
OK6CX	"	38,100	142	127
OK2PF	"	18,954	91	81
OK8AW	21	404,397	487	343
OK1XC	"	71,394	186	163
OK7W	7	4,647,882	1686	834
OL7D	"	1,600,065	982	555
		(OP: OK1DG)		
OK1DX	3.5	118,582	273	211
*OL5Y	A	4,634,916	1954	858
*OL9R	"	4,412,529	1679	913
		(OP: OK6RA)		
*OK2BFN	"	1,973,860	1282	644
*OK2MBP	"	1,467,313	1161	551
*OL2J	"	1,440,738	1095	611
		(OP: OK5MAX)		
*OLØA	"	1,108,870	965	490
		(OP: OK1CZ)		
*OK5OK	"	791,268	794	466
*OK1QM	"	557,467	686	409
*OK1HEH	"	421,592	598	349
*OK2GU	"	283,632	534	311
*OK1DKU	"	234,780	369	260
*OK1UKY	"	206,988	450	282
*OK1BR	"	200,900	430	287
*OL3E	"	167,417	367	251
*OK2SGY	"	151,320	352	260
*OK1TRJ	"	147,150	318	225
*OK2BLD	"	116,909	299	221
*OK1DKE	"	99,561	323	231
*OK2PIM	"	98,903	261	199
*OK1SI	"	85,536	244	176
*OK1FCA	"	85,002	259	186
*OK1AUO	"	71,622	228	173
*OK8KM	"	71,340	235	174
*OK2VX	"	60,885	207	165
*OK1WSL	"	57,399	204	159
*OL5T	"	49,000	161	140
*OK1FMG	"	32,619	153	131
*OK1FMJ	"	25,338	109	103
*OK1FRJ	"	19,339	92	83
*OK1JR	"	11,778	89	78
*OK1DXW	"	10,248	100	84
*OK2BND	"	8,024	73	68
*OL8M	"	3,848	37	37
*OK1BLU	"	3,520	46	44
*OK7SE	"	1,584	24	24
*OK5SWL	"	640	20	16
		(OP: OK2SWD)		
*OK1DUG	"	416	18	16
*OK1MMN	21	34,632	124	117
*OL3R	14	356,997	485	381
		(OP: OK1VWK)		
*OK1DKR	"	163,520	344	280
*OK3DM	"	53,106	174	159
*OK5SA	"	10,465	93	91
*OK2DIK	"	8,664	82	76
*OK1JDJ	"	6,206	59	58
*OK6N	7	254,400	328	265
		(OP: OK2PTS)		
*OK1AGE	"	221,446	382	263
*OK2ABU	"	108,306	246	198
*OK8SMS	"	53,605	192	151
*OK2PYA	"	43,754	171	131
*OK2CVH	"	28,558	134	109
*OK6D	"	20,140	99	95
		(OP: OK2TEO)		
*OK1FGD	"	11,005	79	71
*OK2RN	"	4,608	51	48
*OK2SWD	"	170	11	10
*OL5J	3.5	413,492	571	334
*OK1USP	"	303,050	500	319
*OK2HBR	"	112,037	295	199
*OK2STM	"	36,315	193	135
*OK5D	"	25,480	129	104
		(OP: OK1DTP)		
*OK2BRQ	"	25,164	125	108
*OK1DTP	"	6,545	62	55
*OK6Y	1.8	142,943	328	223
		(OP: OK2PTZ)		
Denmark				
OZ3SM	A	1,853,176	1366	692
OV3X	"	1,603,642	1020	643
		(OP: OZ8AE)		
OU4N	"	814,830	718	471
		(OP: OZ4KG)		
OZ8SW	"	155,570	281	235
OZ2TF	"	146,272	358	224
OZ8PG	14	65,872	214	179
OZ7DK	7	9,100	68	65
OZ7YL	3.5	30,705	136	115
OZ1ADL	1.8	5,406	51	51
*5Q6EE	A	1,270,950	1092	555
		(OP: OZ2I)		

*OZ1AAR	"	371,007	544	351
*OZ6AGX	"	84,729	250	183
*OZ5UR	"	66,144	205	156
*OZ2BKK	"	59,220	232	180
*OZ1IVA	"	33,417	164	141
*OZ3TQ	"	11,844	95	84
*OZ7AEI	"	5,885	62	55
*OZ6TM	"	3,784	47	43
OZ5DX	*"	*912*	*20*	*19*
*OZ4VW	"	280	14	14
*OZ1KZX	14	23,865	119	111

England

G5W	A	6,157,272	2286	996
		(OP: G3BJ)		
M6T	"	5,380,608	2314	904
		(OP: MØSDV)		
MX3W	"	4,620,903	2168	879
		(OP: G4FAL)		
M4T	"	4,029,956	2161	812
		(OP: MØBEW)		
GØMTN	"	3,463,920	2033	765
MØX	"	2,623,036	1729	691
		(OP: MØRTI)		
G2E	"	1,651,392	1268	576
G2NF	"	1,141,121	927	551
G3XTT	"	1,080,547	1028	559
M1X	"	832,344	937	439
		(OP: GØCKP)		
M7Q	"	398,008	491	356
		(OP: G4PIQ)		
G1SCT	"	248,542	444	287
G4LPD	"	105,328	264	227
G3ZGC	"	98,400	213	160
G3YXX	"	32,504	163	136
MØNGN	"	27,454	121	106
G3TDH	"	21,079	116	107
G3T	"	9,198	78	73
		(OP: G3VGZ)		
G8X	28	159,174	330	239
		(OP: G4FJK)		
GB2FRA	21	746,998	701	466
		(OP: YO4RDW)		
G2O	"	59,136	200	176
		(OP: GØUVX)		
M2G	"	44,954	160	133
		(OP: G4RCG)		
GØORH	"	17,280	100	96
G8A	14	539,936	616	376
		(OP: G3XSV)		
M4N	"	517,784	637	472
		(OP: G4IZZ)		
G4IRN	"	120,692	266	211
G6M	"	54,516	234	177
		(OP: G4BYG)		
G4AMT	"	12,028	66	62
G4IIY	7	1,036,350	788	470
*MX7DX	A	4,473,546	2097	842
		(OP: MØUNN)		
*M2J	"	1,061,924	891	514
		(OP: G4NBS)		
*G4PVM	"	1,011,500	999	500
*G2W	"	542,230	671	430
		(OP: G4DBW)		
*M3AWD	"	491,150	692	418
*G3SVK	"	453,744	725	368
*MØICR	"	423,696	590	364
*M5G	"	314,758	573	337
		(OP: MØURL)		
*G9F	"	276,336	431	303
		(OP: G4BVY)		
GØFGI	*"	*221,040*	*378*	*307*
*GØORY	"	215,696	444	272
*M3X	"	202,950	396	275
		(OP: MØIHT)		
*G8KEK	"	162,500	359	250
*M9N	"	151,188	369	258
		(OP: G7WHI)		
*GØMFR	"	142,592	315	256
*2EØINN	"	96,579	263	189
*G8GHD	"	90,432	243	192
*MX1COL	"	83,888	284	214
		(OP: G4EUW)		
*MØDSL	"	82,368	246	176
*G3SQU	"	71,740	225	170
*G3RTU	"	58,344	200	156
*MØRYB	"	55,390	168	145
*G4DYC	"	44,744	161	136
*MØMPM	"	33,528	157	132
*GØOSK	"	24,395	125	119
*G5VZ	"	8,832	85	69
*MØWJG	"	1,700	37	34
*MØKNG	"	594	18	18
*GØATG	"	425	17	17
*MØCVO	"	216	32	27
*G6C	28	264	12	12
		(OP: MØITR)		
*G3OGP	"	35	5	5
*M5W	21	793,485	715	495
*G4LPP	"	23,868	102	102
*G4OTU	"	196	14	14
*M6W	14	1,351,254	1149	678
		(OP: G3WW)		
*M2U	"	239,757	491	343
		(OP: MØDHP)		
*MØSEV	"	89,444	311	236
*G4C	"	54,736	237	176
		(OP: GØIBN)		
*G3YJQ	"	27,300	144	130
*G4WGE	"	26,398	153	134
*2E1FVS	"	24,990	144	119
		(OP: MØHOM)		
*GØWAT	"	21,716	146	122
*G4BEE	"	13,090	88	85
*G3ZRJ	"	12,006	98	87
*M5P	"	8,395	83	73
		(OP: M5BIR)		
*G3YZO	"	2,385	47	45
*G6MSY	"	1,131	29	29
		(OP: G4NXG)		
*G4N	3.5	51,984	175	152
		(OP: G4ZVB)		

Estonia

ES2/URØMC	A	229,308	505	291
ES1BH	"	74,880	272	208
*ES2QX	A	114,181	279	227
*ES5EP	"	30,875	131	125
*ES2TT	"	1,972	30	29
*ES7A	21	867,336	785	568
		(OP: ES7GM)		
*ES7GN	14	1,774,590	1359	794

European Turkey

*TA1NAI	A	77,440	222	176
*TA1NCT	"	4,293	57	53

Faroe Islands

OY1CT	A	655,046	1166	497

Fed. Rep. of Germany

DK9PY	A	7,589,400	2524	1092
DJ5MW	"	5,106,240	2128	810
DF3VM	"	4,963,804	1964	916
DM4X	"	4,473,414	1956	886
		(OP: DD2ML)		
DK3WW	"	3,921,728	1612	928
DL3UB	"	3,704,472	1842	828
DL2RMC	"	2,617,142	1639	706
DG5E	"	2,556,859	1274	727
		(OP: DK2CX)		
DL5LYM	"	2,445,072	1165	798
DQ6Q	"	2,061,696	1176	708
		(OP: DL5XJ)		
DM3M	"	2,044,900	1283	650
		(OP: DM3XRF)		
DL7ON	"	1,970,493	1223	721
DL1NEO	"	1,872,192	1063	796
DL5YM	"	1,810,557	1296	609
DKØ5ØBN	"	1,289,647	1041	599
		(OP: DK5PD)		
DL1NKS	"	1,282,356	1025	537
DL8WEM	"	1,232,748	919	566
DJ8EW	"	977,784	943	524
DAØBCC	"	977,032	947	478
		(OP: DL6MHW)		
DL1DTL	"	957,437	774	611
DF8XC	"	920,989	691	529
DJØSP	"	863,870	816	490
DL6KVA	"	852,618	840	442
DL9GTB	"	843,519	690	587
DJ9RR	"	821,440	707	544
DL1BUG	"	804,960	739	516
DK6WL	"	771,580	664	446
DJ9MH	"	737,550	713	495
DL6AG	"	722,799	738	441
DL5YL	"	692,208	757	437
DL4ZA	"	684,054	795	427
DL1VDL	"	580,797	659	439
DF7TV	"	568,854	603	442
DF4XX	"	553,728	679	448
DJ4WT	"	527,520	646	420
DHØGHU	"	473,501	533	391
DAØDX	"	452,488	709	347
		(OP: DL2DCX)		
DG9SEH	"	418,106	493	338
DQ1P	"	323,610	410	345
		(OP: DK1IP)		
DK9IP	"	305,599	382	293
DF8V	"	293,664	431	336
		(OP: DF8VO)		
DK2AT	"	277,023	456	321
DL2NFC	"	267,903	387	289
DJ6GI	"	256,865	346	287
DL6HCC	"	246,357	355	279
DL5ST	"	229,887	437	287
DK1AX	"	222,272	343	302
DL1MRL	"	207,036	439	284
DJ2QV	"	204,980	342	277
DL4VK	"	185,256	379	279
DL1LOD	"	184,926	313	238
DL6DVU	"	173,922	355	287
DL1ATZ	"	166,725	296	225
DJ2BC	"	164,750	308	250
DL2MDU	"	154,000	302	250
DJ8BS	*"	*151,110*	*254*	*207*
DL3ON	"	117,192	317	228
DJ2AX	"	112,623	294	217
DF6RI	"	112,554	284	222
DK8MM	"	110,160	219	216
DL1STG	"	100,548	229	189
DL4RCE	"	96,131	217	217
DL5ANT	"	80,340	211	156
DK5JM	"	77,792	195	143
DM7C	"	71,232	188	159
		(OP: DL7CX)		
DL2FAG	"	68,200	246	200
DL4JLM	"	62,880	166	120
DR5M	"	62,643	200	157
		(OP: DL5NEN)		
DL1HWS	"	56,322	148	126
DKØSU	"	54,740	175	140
		(OP: DF7SA)		
DJ4KW	"	48,032	189	158
DL2OE	"	46,332	161	132
DL5ASK	"	45,780	167	140
DH1TST	"	30,302	125	109
DJ5AN	"	28,440	102	90
DGØKS	"	24,157	142	119
DJ6TB	"	22,680	116	105
DF2RG	"	21,280	95	95
DJ8QA	"	19,400	121	97
DF5DK	"	19,285	108	95
DL7LX	"	18,156	96	89
DL2ZBO	"	16,720	119	95
DG1CMZ	"	16,320	90	80
DL6UAA	"	15,836	95	74
DK3AX	"	14,703	96	87
DH8VV	"	13,394	85	74
DK7ZT	"	11,645	95	85
DL7NY	"	9,044	89	76
DL6DH	"	7,581	62	57
DF6QE	"	6,042	59	53
DL6NAV	"	4,860	48	45
DJ4MO	"	2,688	44	42
DL1CC	"	576	18	18
DB7BN	"	220	10	10
DH8BQA	28	242,170	444	305
DL4CF	"	24,832	114	97
DJ9AO	"	10,582	87	74
DL2ARD	21	1,016,368	782	556
DL5KVV	"	99,897	235	213
DD2CW	"	22,962	96	89
DA3X	14	1,549,653	1089	677
		(OP: DL5JS)		
DL9LM	"	226,611	375	327
DF5EG	"	176,532	334	313
DL6RDE	7	1,313,144	946	524
DL4ME	"	942,816	760	488
DK5XG	"	705,177	681	419
DP4D	"	460,096	600	364
		(OP: DL1OJ)		
DL8QS	"	443,680	596	376
DH6DAO	"	2,622	39	38
DQ2C	3.5	838,125	802	447
		(OP: DL2SAX)		
DF1MM	"	389,435	546	355
DF8AA	"	48,020	152	140
*DK5DQ	A	3,852,505	1812	815
*DJ5MO	"	3,681,558	1502	863
*DL4FN	"	3,301,500	1683	775
*DL2NBU	"	3,067,092	1523	756
*DL6RAI	"	2,945,070	1551	761
*DR7T	"	2,683,065	1433	759
		(OP: DF1DN)		
*DD5M	"	1,924,107	1152	673
		(OP: DJØZY)		
*DK1KC	"	1,867,586	1211	646
*DM7W	"	1,646,678	1060	638
		(OP: DL8MAS)		
*DM6EE	"	1,411,020	1011	585
*DL1WA	"	1,329,705	1104	585
*DL7URH	"	1,326,320	1090	562
*DA3T	"	1,324,680	1081	581
		(OP: DL8DXL)		
*DL8TG	"	1,324,050	1044	582
*DK3YD	"	1,176,418	1043	521
*DL1QQ	"	985,552	895	496
*DJ1OJ	"	846,810	854	485
*DJ3HW	"	777,621	785	471
*DL5JQ	"	687,080	652	445
*DK7YY/P	"	652,315	760	461
*DL4SDW	"	571,136	612	388
*DL2TR	"	554,400	799	400
*DL4AC	"	535,901	683	419
*DF1LON	"	529,100	637	407
*DK2FG	"	494,208	721	352
*DM5B	"	493,680	635	408
		(OP: DG6IMR)		
*DL75HIL	"	453,228	644	358
		(OP: DL1EAL)		
*DL5ARM	"	400,693	547	337
*DL9NEI	"	366,390	529	345
*DJ2FL	"	357,072	542	346
*DK5TRI	"	329,065	576	341
*DJ5CW	"	326,874	547	347
*DL9MWG	"	315,084	596	341
*DK2ZO	"	314,400	451	300
*DP5P	"	305,124	389	282
		(OP: DL1MHJ)		
*DKØGYB	"	301,670	413	311
*DL/G4BJM	"	289,395	510	295
*DM3F	"	275,352	410	308
		(OP: DH5FS)		
*DL1DQW	"	260,800	390	326
*DL5CL	"	231,210	388	315
*DG1VL	"	216,660	394	314
*DL3DRN	"	210,728	419	284
*DL4XU	"	208,512	417	288
*DJØYI	"	203,490	429	285
*DM3ZM	"	167,495	323	241
*DL7YS	"	166,408	314	244
*DJ3RA	"	154,395	332	235
*DL7ULM	"	153,228	298	226
*DF2WZ	"	135,973	306	227
DL6NBS	*"	*134,096*	*310*	*232*
*DR2C	"	130,455	318	223
		(OP: DJØIF)		
*DL7UGN	"	128,261	296	251
*DL3KWF	"	123,202	372	229
*DF9TS	"	122,880	318	240
*DJ9SN	"	121,524	281	228
*DL3KWR	"	117,105	312	211
*DL1EMA	"	116,413	297	209
*DH6BH	"	112,112	265	208
*DM6WAN	"	111,104	288	217
*DJ3XA	"	109,414	294	227
*DL1SAN	"	101,606	293	202
*DM5JBN	"	100,188	231	207
*DK7TY	"	98,468	268	206
*DL1SO	"	96,824	250	196
*DM2RN	"	91,938	246	199
*DLØULM	"	88,395	275	213
		(OP: DF2DR)		
*DH2URF	"	81,774	269	198
*DL/DL1ASP	"	81,480	272	210
		(OP: DL/DL1ASP)		
*DL4FDI	"	80,794	244	199
*DM3AA	"	76,812	225	173
*DL1THB	"	74,880	260	195
*DL2NEA	"	73,100	218	170
*DL9MFY	"	68,800	206	160
*DL1VJL	"	64,625	160	125
*DK5ZX	"	63,875	216	175
*DM6ØUEA	"	61,502	215	161
		(OP: DH8BQA)		
*DL5KBO	"	58,353	215	159
*DL4JU	"	56,672	196	161
*DL3RDM	"	55,242	211	162
*DK5GB	"	54,322	204	157
*DL3CX	"	53,001	189	151
*DL9GMC	"	51,988	212	164
*DK3PM	"	49,416	178	174
*DL1HSI	"	46,926	205	158
*DK4RM	"	46,305	169	135
*DF3CE	"	43,080	145	120
*DF4TS	"	42,632	184	146
*DP4X	"	35,868	153	122
		(OP: DJ4MX)		
*DL2AXM	"	35,140	182	140
*DHØJAE	"	33,664	158	128
*DL3MB	"	33,390	155	126
*DJ3WE	"	27,840	140	120
*DL7ØWOB	"	27,370	146	115
*DJ4WM	"	26,760	146	120
*DL5DTG	"	25,740	122	110
*DL7VDX	"	25,228	108	106
*DL2SWR	"	24,341	113	101
*DK5KF	"	24,310	126	110
*DAØY	"	23,968	129	112
		(OP: DL2GPK)		
*DJ3GE	"	23,205	127	105
*DK7A	"	23,144	103	88
		(OP: DJ8VH)		
*DJ2MX	"	22,244	100	83
*DF7EE	"	21,306	137	106
*DC8YZ	"	20,988	134	106
*DHØAAC	"	19,686	107	102
*DL9SAS	"	19,503	123	99
*DL8RB	"	19,475	107	95
*DL1GME	"	18,557	98	77
*DLØNQ	"	17,170	109	101
		(OP: DL1MDY)		
*DL7PIA	"	17,108	101	94
*DJØMA	"	16,928	102	92
*DL6RBH	"	16,791	103	87
*DD5VL	"	16,240	94	80
*DH7TS	"	14,076	106	92
DJ6RN	*"	*13,872*	*80*	*68*
*DL2RUG	"	12,972	80	69
*DL1FMG	"	11,972	92	82
*DL2VN	"	11,613	85	79
*DF1LX	"	11,297	109	79
*DL9NDW	"	10,296	69	66
*DM3XB	"	10,218	97	78
*DL4FCJ	"	9,882	66	61
*DK6QW	"	9,750	72	65
*DL7VRG	"	9,581	71	67
*DO4OD	"	9,100	71	70
*DK8CB	"	7,370	59	55
*DL8UKE	"	6,820	62	55
*DL1EJD	"	6,700	72	67
*DL1AWC	"	5,586	63	57
DB3LO	*"	*5,428*	*48*	*46*
*DL2MM	"	5,252	58	52
*DL3SFB	"	4,770	48	45
*DF8UO	"	4,557	53	49
*DO2MS	"	4,510	58	55
*DL1NKB	"	4,161	67	57
*DF1GRA	"	3,783	44	39
*DL5IF	"	3,552	55	48
*DK3CC	"	3,237	40	39
*DL75DRG	"	2,993	46	41
		(OP: DL4EAX)		
*DL1YAB	"	2,016	33	32
*DM6DX	"	1,700	35	34
*DL5DWF	"	1,625	25	25
DK9HE	*"	*1,600*	*26*	*25*
*DK2PC	"	1,596	38	38
*DL1JHW	"	1,530	30	30
*DK9ZE	"	1,440	30	30
*DK2YL	"	1,302	21	21
*DL7UPN	"	910	27	26
DG6MDG	*"	*693*	*22*	*21*
*DF4WO	"	140	10	10
*DL9SEV	"	105	7	7
*DL8NFA	"	104	14	13
*DM1TX	"	70	7	7
*DC2CL	"	32	4	4
*DL4JWU	"	9	9	9
*DL1NUX	28	2,883	35	31
*DL9GK	"	1,380	23	20
*DM5RC	"	72	6	6
*DL9YED	21	49,005	147	135
*DHØGDS	"	40,468	148	134
*DJ9KH	"	6,893	65	61
*DO6AN	"	312	14	13
*DL4GBA	"	247	13	13
*DL1SBF	"	220	12	11
DM2CYN	*"	*0*	*0*	*0*
*DL4WA	14	447,615	517	441
*DL2LRT	"	194,845	335	293
*DJ7UC	"	186,531	359	291
*DG4UF	"	107,415	265	231
*DL8BV	"	25,347	131	119
*DLØGEO	"	20,437	127	107
		(OP: DL2YAK)		
*DL4HCF	"	15,958	110	101
*DL5CC	"	12,495	111	105
*DC8SG	"	8,970	70	69
*DM3AW	"	5,995	55	55
DF7CB	*"	*1*	*1*	*1*
*DM5LS	7	487,084	566	377
*DL5KUD	"	479,650	543	362
*DK4LX	"	398,130	512	345
*DM5A	"	258,594	349	282
		(OP: DJ5NN)		
*DM7CW	"	174,924	358	258
*DFØBV	"	113,436	208	207
		(OP: DL1MAJ)		
*DB8AH	"	1,080	28	27
*DFØSX	3.5	24,198	123	111
		(OP: DL1CW)		
*DR9ØTJU	1.8	93,888	276	192
		(OP: DL6KWN)		
*DF7GG	"	76,791	232	179
*DL5SFC	"	44,844	165	148
*DK8NC	"	2,146	37	37

Finland

OH1F	A	4,918,023	2431	957
		(OP: OH1TM)		
OG2P	"	3,720,076	1946	908
		(OP: OH2PM)		
OG6N	"	3,633,319	1873	929
		(OP: OH6NIO)		
OG73X	"	1,853,355	1506	665
		(OP: OH8LQ)		
OI5AY	"	1,783,220	1541	652
		(OP: OH5LLR)		
OH2BA	"	1,741,320	1406	630
		(OP: JK3GAD)		
OG7F	"	1,707,643	1440	623
OH1VR	"	1,174,880	1093	560
OH3FM	"	1,054,550	1077	575
OH6LI	"	1,051,589	1011	539
OH7KBF	"	768,170	1011	494
OH3OJ	*"	*650,010*	*887*	*461*
OH1ØA	"	346,164	522	364
		(OP: OH1X)		
OH2CI	"	193,288	430	296
OH2BAH	"	182,361	369	267
OH3EX	"	121,776	243	236
OH6BA	"	91,670	277	206
OH8MJ	"	35,496	128	116
		(OP: OH1RX)		
OH2ID	"	3,792	52	48
OH2KI	"	2,378	30	29
OH5BE	"	2,112	24	22
OHØJ/1	"	162	12	9
		(OP: OH1RX)		
OH6AC	28	16,896	114	96
		(OP: OH6CS)		
OG7A	"	6,486	82	69
		(OP: OH6MW)		
OG1D	21	20,774	103	94
OH1QX	"	1,300	28	26
		(OP: OH1ZAA)		
OH8X	14	3,349,312	1958	944
		(OP: OH6UM)		
OH4KA	"	2,591,160	1712	858
		(OP: UR8UQ)		
OH5ZA	"	35,894	140	137
		(OP: OH1ZAA)		
OH2VZ	"	18,150	117	110
OH6TN	"	13,464	72	66
OH6RE	"	2,700	30	30
OG6B	7	2,905	36	35
		(OP: OH1ZAA)		
OH1RX	1.8	80,100	238	180
*OH1NA	A	550,338	764	402
		(OP: OH1NOA)		
*OH1SIC	"	200,549	453	251
		(OP: SM5SIC)		
*OH7GGX	"	152,964	371	252
*OH1TS	"	104,420	323	227
*OH5UQ	"	60,606	194	182
*OH8KA	"	13,345	94	85
*OH5MQ	"	8,576	73	67
*OH6OS	"	5,073	59	57
*OH1KH	"	4,272	52	48
*OH5VT	"	1,078	25	22
*OH3MZ	"	120	13	12
*OH9SE	21	22,220	124	110
*OH5TS	14	559,208	734	494
*OH7KC	"	44,022	205	174
		(OP: OH7MFO)		
*OH6JUM	"	30,080	139	128
*OG2N	"	18,796	148	127
		(OP: OH2BN)		
*OH2LU	"	9,856	98	88
*OH3MM	"	360	18	18
*OH3NAQ	7	50	5	5

France

TM5T	A	2,674,212	1715	703
		(OP: F5VKT)		
F6IRA	"	2,236,520	1371	748
TM9C	"	1,845,337	1331	589
TM6X	"	805,922	769	446
		(OP: F5VHY)		
TM4A	"	739,206	736	507
		(OP: F6AUS)		
F6ARC	"	481,395	589	335
F6HDI	"	375,584	445	352
F6EZV	"	336,672	526	334
F5PHW	"	228,872	346	244
TM2Y	"	184,050	299	225
		(OP: F6BEE)		
F4HGU	"	139,920	295	220
F5JFU	"	95,151	232	197
F8DFP	"	55,500	197	148
F5RAB	"	42,624	132	111
F5PHY	"	25,420	153	124
F1MLN	"	19,760	89	76
F8DGF	"	2,205	35	35
F5BTH	"	693	23	21
TM4W	21	3,699,186	1784	877
		(OP: F4DXW)		
TMØSOC	"	1,612	26	26
		(OP: F5PBL)		
F5PAL	14	619,737	779	501
F6IRE	"	2,806	47	46
*F5NKX	A	1,758,240	1023	666
*F5SGI	"	827,330	801	446
*F5ICC	"	367,728	505	326
*F6DCQ	"	363,662	394	394
*F5OZC	"	207,760	424	265
*F5NTZ	"	164,193	341	229
*F5KLE	"	158,270	378	238
*F4VVG	"	98,328	246	204
*F5VV	"	89,351	256	199
*F8CRS	"	44,415	145	135
*F6CEL	"	43,365	129	105
*F4FRC	"	40,700	181	148
*F4HYY	"	35,904	167	132
*F6GCI	"	32,984	140	124
*F1TRE	"	31,920	130	114
*F4CZV	"	27,816	137	122
*F5JU	"	27,572	118	113
*F5BMI	"	25,029	123	103
*F6JOE	"	24,198	140	111
*F4FHV	"	22,577	131	107
F6API	*"	*13,416*	*99*	*86*
*F/DL3IAS	"	11,680	78	73
*F5TYY	"	8,424	86	78
*F1VEV	"	3,542	46	46
*F4GFT	"	1,131	33	29
*TM77SM	"	10	2	2
		(OP: F4GYM)		
*F5DM	28	1,550	26	25
*F1IKA	7	4,005	49	45

Greece

J42L	A	5,475,780	2473	1044
		(OP: SV2DSJ)		
SX1T	"	1,979,982	1809	694
		(OP: SV1ENG)		
SV1RK	*"	*83,720*	*213*	*182*
SV8IIR	"	4,982	56	53
SV2JAO	28	240,695	469	299
SV2ESW	21	73,726	258	193
SV1ME	14	1,037,229	1123	589
SV2HXX	"	799,370	1012	559
*SV8OVJ	A	395,418	680	354
*SV2EVS	"	283,360	579	352
*SV1AJO	"	235,382	500	322
*SV1JFL	"	50,830	207	170
*SV8DJW	"	32,604	184	156
*SV2SKD	"	26,230	152	122
*SV2SIF	"	8,362	88	74
*SV1CEI	"	4,560	42	38
*SV8MDV	"	2,115	49	45
*SV2BOH	28	120,310	316	227
*SV1CDN	21	9,179	71	67
*SX335T	14	8,364	73	68
*SV1AAK	"	4,950	46	45
*SV2/ OK1CDJ	"	3,445	53	53
			(OP: OLØM)	

Guernsey

*MUØFAL	21	140	10	10

Hungary

HG3R	A	9,962,304	3013	1166
		(OP: HA3NU)		
HG8R	"	7,941,549	2730	1023
		(OP: HA8JV)		
HA8A	"	7,872,480	2641	1065
		(OP: HA8DZ)		
HG6O	"	3,286,560	1852	820
		(OP: HA6OA)		
HA7RY	"	3,224,064	1608	768
HG1A	"	2,760,200	1728	746
		(OP: HA1ZN)		
HA2KMR	"	2,685,165	1558	749
HA8DU	"	1,981,288	1254	668
HA5NR	"	479,039	536	407
HA5UX	*"	*314,942*	*486*	*314*
HA3OU	"	310,312	407	316
HA6OI	"	195,190	378	262
HA7I	"	190,190	370	266
			(OP: HA7JTR)	
HA7PL	*"	*140,985*	*352*	*241*

HA5JI	28	491,436	571	396
HG1S	21	2,555,784	1333	792
(OP: HA1DAE)				
HA8M	"	539,189	611	391
HAØLZ	"	84,864	244	204
HG5D	14	3,930,192	1907	1008
(OP: HA8QZ)				
HG3N	"	3,611,542	1764	983
(OP: HA3LN)				
HA1AH	"	3,591,016	1780	949
HGØY	"	2,939,240	1672	788
(OP: HA7GN)				
HA8IB	"	815,232	780	579
HA8UT	7	38,396	127	116
HA1TJ	3.5	820,800	759	450
HA8FK	"	637,065	668	405
HA4A	"	571,926	670	398
HA8BE	1.8	98,230	264	190
*HA7UI	A	2,085,285	1476	645
*HA7MF	"	1,243,875	1052	535
*HA2E	"	321,935	495	335
(OP: HA2EAV)				
*HA5BMS	"	273,980	393	266
*HA8LLK	"	153,066	334	263
*HA8TKS	"	700	20	20
*HA7PO	21	31,232	126	122
*HG6V	14	1,262,760	1015	680
(OP: HA6IAM)				
*HA2EOU	"	108,732	252	221
*HA4YF	"	2,867	49	47
*HA7RS	"	40	10	10
*HA9RP	7	224,192	297	248
*HA9TA	"	166,866	228	203
*HA1WD	"	47,320	154	140
*HA8L	"	15,744	97	82
(OP: HA8RD)				
*HGØDQR	"	4,747	49	47
(OP: HA5GY)				

Iceland

TF1AM	14	104,118	308	259
*TF3VS	A	79,059	266	219
*TF3JB	14	75	5	5

Ireland

EI/UW8SM	A	1,873,020	1407	620
EI6LA	"	182,640	253	240
EI/US2YW	"	146,772	365	243
EI8KW	"	140,224	343	224
*EI5LA	A	206,590	377	283
*EI8GP	"	3,731	47	41
*EI9KY	"	240	10	10
*EI3CTB	21	6,240	64	60
*EI5KO	"	576	18	18
*EI6KW	14	25,619	141	137
*EI6JK	1.8	6,032	58	58

Isle of Man

MD2C	A	1,103,376	1008	543
*GD4EIP	A	42,670	227	170

Italy

IR2Q	A	9,810,318	3076	1141
(OP: IK2PFL)				
IO6A	"	3,677,714	2022	809
(OP: IK6QON)				
IKØYUT	"	1,790,800	1431	605
IK3UNA	"	1,582,872	1238	606
4U29MAY	"	1,141,840	977	560
(OP: E73A/9A3A)				
I3FIY	"	820,482	902	471
IR4K	"	789,446	816	434
(OP: IZ4ZZB)				
I2WIJ	"	719,082	741	439
IO3M	"	361,788	490	354
(OP: IU3PMA)				
I1NVU	"	267,320	493	326
IK2SND	"	255,316	498	284
I1HJT	"	202,500	416	270
IKØYVV	"	112,668	340	229
IR3L	"	104,364	292	223
(OP: I3FDZ)				
IZ8DVD	"	97,610	308	215
IO3A	"	31,232	142	122
(OP: IV3HAX)				
IK3OII	"	18,960	79	79
IUØPJJ	"	14,544	108	101
IW2EVH	"	13,182	82	78
IKØXFD	"	10,608	70	68
IK2LFF	"	10,450	57	50
IZ4DZD	"	10,152	76	72
IK2IKW	"	8,256	64	64
I5MXX	28	93,888	247	192
IO3C	"	468	20	18
IR8O	21	528,880	618	440
(OP: IZ8GCB)				
IR2D	"	290,304	468	324
IR4E	"	110,744	236	218
(OP: IK4ZHH)				
IR1N	14	675,288	788	498
(OP: IU1LCU)				
IZ2DII	"	558,558	673	462
IQ5LI	"	480,236	706	422
IZ3JPM	"	5,742	79	66
IK1BXN	"	1,357	23	23
IQ1DF	7	3,402,030	1469	755
(OP: IK1HJS)				
I2IFT	"	2,819,766	1293	699
IO3F	"	209,585	400	251
IKØGDG	"	188,340	379	258
IK2AHB	"	180,432	328	252
IV3RYP	"	38,354	141	127
IK1PMR	3.5	453,024	511	352
IR1Q	"	271,794	412	291
(OP: IU1JCZ)				
*IY3A	A	6,083,261	2353	1009
(OP: IZ3EYZ)				
*IK4DCX	"	1,240,704	988	576
*IK2FIR	"	724,182	699	411
*IØGOJ	"	510,473	702	401
*I6FDJ	"	263,736	493	296
*IZ4DYX	"	240,240	438	273
*IV3FPX	"	233,442	440	297
*IK2ULV	"	222,372	400	284
*IN3HUU	"	159,581	292	227
*IK2AOO	"	157,500	362	250
*IK8PGM	"	156,972	353	254
*IN3OWY	"	142,140	343	230
*IK4RQJ	"	128,402	282	218
*IKØTUM	"	126,500	297	230
*IK7UKF	"	120,520	310	262
*IW2FUT	"	118,456	269	221
*I5YKQ	"	109,947	293	201
*IK7RVY	"	107,440	359	316
*IUØLJD	"	105,525	248	201
*IK5MEP	"	97,610	341	215
*IKØPXD	"	87,468	284	197
*IQ3GA	"	79,373	275	203
*IV3YNB	"	69,706	225	182
*IKØISD	"	67,620	184	161
*I2IOJ	"	63,036	184	153
*IK6GPZ	"	54,720	183	160
*IK2AUK	"	50,711	201	157
*IN3MNS	"	48,906	187	143
*IK2SAR	"	46,920	156	136
*I1WQR	"	46,488	226	149
*IZ5BBS	"	41,610	190	146
*IK8ARF	"	39,552	148	128
*IK4MTF	"	35,052	160	138
*IZ2DLV	"	33,762	110	102
*IK7NXU	"	29,458	110	103
*IK2RLS	"	26,471	130	103
*IØWBX	"	22,466	103	94
*IK7LMX	"	22,300	112	100
*IK2WXQ	"	22,176	111	96
*IW1RLC	"	22,155	120	105
*IU2JWF	"	18,042	100	93
*I3JUK	"	16,932	95	83
*IK2AIT	"	16,000	115	100
*IK3MLF	"	15,921	90	87
*IK3YBX	"	14,758	100	94
*IZ1PLH	"	13,965	119	105
*IK2NUX	"	10,836	94	86
*I2TFJ	"	10,804	82	74
*IK4XQT	"	10,660	102	82
*IZ3ZLT	"	8,750	74	70
*IRØY	"	6,660	61	60
(OP: IWØGYC)				
*IU6FUB	"	6,076	70	62
*IU6AIG	"	5,913	80	73
*IZ8CLM	"	5,453	45	41
*IW2BZY	"	5,040	51	48
*IK2CFD	"	4,888	52	52
*IZ5JLW	"	3,403	43	41
*IKØALT	"	2,880	38	36
*IK1LBL	"	2,139	33	31
*IV3DLW/P	"	1,891	31	31
*IK5BSC	"	1,508	26	26
*IZ3KMY	"	1,479	30	29
*IW2OGY	"	1,352	60	52
*IK1YRA	"	765	17	17
*IZ2FME	"	420	14	14
*IZ2BHQ	"	352	11	11
*IKØVVP	"	190	10	10
*IW5ECP	"	136	8	8
*IZ4APU	"	105	5	5
*IK3OYU	"	9	3	3
*IR4Q	28	13,825	91	79
(OP: IU4MRU)				
*IZ8BRI	21	629,953	691	491
*IW5ELA	"	4,343	45	43
*IK2YGZ	"	713	23	23
*IK1ZFO	14	32,760	176	156
*IO4X	"	19,224	102	89
(OP: IK4ZGO)				
*IZ2LTW	"	12,879	81	81
*IKØRMR	"	2,440	66	61
*I5OVS	"	952	36	34
*IV3ZNK	"	850	26	25
*IK5OJB	"	144	12	12
*IW2ENA	"	8	2	2
*IV3EAD	7	546,588	515	378
*IZ5ICH	"	486,639	580	389
*IZ4OSH	"	270,270	477	286
*IQ5OX	"	101,258	274	197
(OP: IZ5FDE)				
*IK1QBT	"	79,261	250	169
*IKØEFR	"	73,935	194	159
*IK1MTZ	"	27,876	109	101
*IZ4GRP	"	3,060	41	36
*IN3ZWF	"	1,176	26	24
*IW2JPB	"	700	20	20
*IZ2ABZ	"	168	15	14

Latvia

YL7X	A	5,147,116	2189	961
(OP: YL2LY)				
YL2VW	"	1,974,820	1333	674
YL7A	"	1,362,396	1122	662
(OP: YL2GM)				
YL2PJ	"	1,244,972	1147	569
YL2KO	"	1,165,200	971	600
YL3FT	"	379,533	526	371
YL3JD	"	97,482	311	211
YL6W	21	182,210	353	266
(OP: YL2GD)				
YL2BJ	14	1,182,897	1101	681
YL2SM	"	1,031,818	965	566
*YL1YF	A	861,714	988	441
(OP: YL3GAZ)				
*YL2EA	"	321,436	491	326
*YL3GX	"	58,377	218	183
*YL2NK	"	9,116	101	86
*YL5W	21	176,130	376	285
(OP: YL2GN)				
*YL2QV	"	63,426	197	186
*YL2LW	"	3,219	37	37
*YL3FW	7	376,974	484	358

Lithuania

LY9Y	A	3,730,480	1998	844
LY2XW	"	1,556,103	1095	591
LY2K	"	1,553,342	1143	613
LY5AX	"	1,519,144	1273	566
LY7T	"	1,449,890	1226	587
LY2SA	"	944,840	864	520
LY4ZZ	"	520,080	602	394
(OP: LY2BMX)				
LY1XA	"	419,254	505	374
(OP: LY2KA)				
LY5R	"	146,845	294	215
LY1CT	"	101,460	238	190
LY4T	"	65,520	223	168
LY3CY	"	36,579	197	137
LY5E	28	205,048	392	284
(OP: LY2IJ)				
LY2W	"	5,300	60	50
LY2FN	21	235,928	370	308
LY2MM	14	1,904,044	1298	769
LY5A	"	192,372	360	246
LY5O	3.5	5,123	51	47
LYØA	1.8	196,784	395	251
(OP: LY7M)				
*LY4L	A	3,519,978	2041	802
*LY2EE	"	1,570,104	1015	648
*LY5XX	"	1,086,888	1082	506
*LY2DX	"	805,376	794	512
*LY3I	"	441,045	543	405
*LY2MC	"	231,924	458	308
*LY3NX	"	122,265	297	209
*LY2OU	28	5,896	78	67
*LY5I	21	89,352	218	204
*LY3AB	14	165,597	349	289
*LY3B	7	894,128	791	464
*LY2X	"	376,204	518	326
*LY2AT	3.5	69,601	206	163
*LY3DA	"	61,776	197	156

Luxembourg

LX4A	A	348,450	542	345
LX1NO	28	15,006	95	82
*LX2KD	A	46,224	197	144
*LX1ER	21	2,432	32	32

Malta

9H1CG	A	35,862	160	139
*9H1AE	14	5,082	71	66

Netherlands

PA3AAV	A	2,516,736	1579	678
PA5WT	"	1,561,238	1254	623
PG5M	"	769,360	782	472
PI4VPO	"	706,112	786	472
(OP: PA2A)				
PE6Q	"	482,289	588	373
PC3M	"	411,792	577	373
PE1RDP	"	231,426	447	299
PAØCT	"	202,440	399	280
PA4Y	"	168,596	266	226
PA5KT	"	99,588	242	193
PAØGJV	"	44,280	166	135
PAØJNH	"	30,912	126	112
PA1BX	"	27,084	126	111
PE5TT	"	8,100	58	54
PAØINA	"	6,048	58	54
PA1CA	"	987	22	21
PA5MW	28	13,578	84	73
PI4COM	21	125,160	274	210
(OP: PA3EWP)				
PA6AA	14	113,520	275	240
(OP: PB7Z)				
PA3DDP	"	5,856	48	48
PA3EWP	7	110,290	229	205
*PA2TA	A	1,003,392	998	468
*PC1PM	"	992,268	995	516
*PA3BUD	"	506,324	578	364
*PC3T	"	421,243	419	349
*PA2DK	"	385,996	603	338
*PE1EEC	"	339,355	479	335
*PC4H	"	320,974	524	334
*PC5Q	"	305,536	492	308
*PA2W	"	290,422	499	307
*PA75DXCC	"	289,668	465	303
(OP: PAØRRS)				
*PA7F	"	272,289	496	281
*PC5C	"	260,469	513	297
*PA9M	"	244,956	347	298
*PG6F	"	181,896	400	264
(OP: PAØGRU)				
*PA7KY	"	99,471	282	213
*PA3DTR	"	94,122	262	189
*PC7E	"	89,610	299	206
*PG7R	"	84,972	250	194
*PA3EWG	"	84,972	286	194
*PA3DBS	"	77,056	241	172
*PDØJMH	"	70,455	242	183
*PA3GDG	"	61,540	228	170
*PA3EEG	"	59,150	213	175
*PA7RA	"	49,910	221	161
*PA2VS	"	49,126	196	154
*PA3EVY	"	47,280	145	120
*PAØCMF	"	43,452	192	153
*PA3CVI	"	43,050	204	150
*PEØCD	"	34,191	170	131
*PE1HWO	"	33,136	123	109
*PA2AZ	"	29,104	127	107
*PD7CJT	"	28,928	151	128
*PAØTCA	"	23,664	117	102
*PA3DUU	"	21,945	99	95
*PA7RW	"	20,060	156	118
*PA3ARM	"	17,622	118	99
*PI4FL	"	15,717	100	93
*PAØRBA	"	15,486	97	89
*PA2A	"	11,808	100	82
*PE4KH	"	11,016	96	81
*PA2CHM	"	10,044	89	81
*PG2W	"	7,979	87	79
*PA1BBO	"	6,272	73	64
*PA1BD	"	4,600	52	50
*PA3HGF	"	4,089	50	47
*PA3GUO	"	2,170	31	31
*PE4A	"	1,066	27	26
*PA3GCH	"	528	24	24
*PA8MM	"	504	19	18
*PA4TJ	"	500	20	20
*PA3EPO	"	460	23	23
*PA1MAR	"	384	24	24
*PD1BHZ	"	372	12	12
*PA4VHF	28	44,069	153	127
*PAØJED	21	23,484	112	103
*PD2DX	14	89,100	223	220
*PG7M	"	63,412	194	191
*PA4OES	"	35,100	144	130
*PDØME	"	23,375	143	125
*PA3DRL	"	12,369	99	93
*PA2REH	7	343,040	443	335
*PA3GVI	"	104,155	242	185
*PAØMIR	"	38,125	146	125
*PD1RP	"	17,544	101	86

North Macedonia

Z35Y	A	182,666	399	253
Z33B	14	241,165	529	347
Z39A	7	64,860	168	141
Z35F	1.8	70,950	215	165
*Z35W	A	116,154	308	243
*Z33F	21	357,615	573	405

Northern Ireland

MIØHOZ	A	10,609	153	103
GBØAEL	"	4,347	75	69
(OP: MIØHOZ)				
*MI5I	A	1,808,730	1529	638
(OP: GIØRQK)				

Norway

LA7GIA	A	750,752	935	464
LC5T	"	658,515	836	429
(OP: LB5WB)				
LAØCX	"	572,426	743	433
LC7X	"	313,920	524	320
LA7AK	"	93,060	259	188
LA9OI	"	89,460	256	213
LA7SI	"	55,277	209	167
LB2TB	"	46,250	145	125
LA8HGA	"	38,934	150	126
LA3TK	"	10,368	67	64
LC5Z	"	12	2	2
(OP: LB5GI)				
LA9PJA	14	12,045	73	73
*LC9A	A	384,748	670	364
(OP: LB1TI)				
*LA2HFA	"	352,872	549	338
*LB2WG	"	82,593	239	189
*LA5LJA	"	81,780	249	188
*LA6CF	"	79,566	214	178
*LA5UF	"	11,223	96	87
*LA3ZA	"	1,276	22	22
*LC1R	"	999	40	37
(OP: LB5SH)				
*LA2XNA	"	195	13	13
*LA6PB	"	52	14	13
*LAØGE	21	53,890	203	170

Poland

SN7Q	A	7,272,540	2601	990
(OP: SP7GIQ)				
SP1NY	"	1,508,550	1000	565
SO3O	"	1,015,280	983	518
SP3HRN	"	917,246	923	482
SP3HLM	"	783,666	643	442
SP9ENV	"	674,240	733	448
SP4Z	"	616,902	619	429
HF1K	"	488,818	666	374
(OP: SP1MGM)				
SN6A	"	466,830	587	390
(OP: SP6CES)				
SP6A	"	392,046	585	362
SP2FAP	"	373,470	559	354
SN5N	"	195,250	430	275
(OP: SP5KP)				
SP4W	"	136,710	311	217
SP1JQJ	"	134,756	306	236
SP2XX	"	130,425	289	235
SP2QCW	"	47,064	172	148
SP9WZJ	"	43,646	186	157
SP3JDZ	"	19,095	101	95
SP5GNI	"	6,820	60	55
SQ7M	"	3,350	76	67
SQ7BFC	"	1,007	25	19
SQ6LJV	"	496	16	16
SO5N	28	4,418	54	47
(OP: SP5BMU)				
SP3CMX	"	510	20	17
SN2B	21	1,258,430	941	610
(OP: SP2MKT)				
SP5OXJ	"	571,648	576	448
SP5AUY	"	242,778	383	258
SN5X	"	312	12	12
(OP: SP5GRM)				
SP3CW	14	1,087,200	970	600
SNØW	"	422,598	567	418
(OP: SQ9HQ)				
SP3CYY	"	284,144	408	344
SP5GQX	"	109,725	235	209
SP2HMT	"	93,186	207	186
SP3A	"	37,500	174	150
SP9EML	"	12,654	75	74
SP5GH	7	44,082	93	93
SP9MZH	"	26,361	113	101
SP2PIK	3.5	779,898	756	434
(OP: SP2MKI)				
SQ6MS	"	535,080	638	392
SP5CNA	"	317,034	515	309
SN1W	"	316,287	478	311
(OP: SQ1DNJ)				
SP3GTS	"	79,459	223	181
SQ5JUP	"	72,210	235	166
SO6OO	"	59,796	208	151
SQ7U	"	54,832	192	149
*SN7O	A	4,333,274	1992	862
(OP: SP7IVO)				
*SP2R	"	3,390,310	1834	833
*SP9XCN	"	3,072,784	1680	748
*SN5J	"	1,749,978	1231	621
(OP: SP5JXK)				
*SP1AEN	"	1,738,500	1334	610
*SP7CF	"	1,555,092	1127	561
*SQ3RX	"	1,319,760	1058	585
*SP9DLY	"	1,010,870	1067	490
*SP2GMA	"	561,540	693	420
*SP2AYC	"	518,851	682	379
*SN8J	"	364,536	510	332
(OP: SP8ALT)				
*SP2DKI	"	357,504	523	336
*SN1T	"	336,528	458	328
*SP5UFK	"	332,840	507	314
*SN7F	"	304,236	502	324
(OP: SP7AH)				
*HF74QMP	"	295,323	525	287
(OP: SP9GFI)				
*SP2FOV	"	270,720	448	320
*SP9W	"	265,440	479	336
*SN4D	"	246,357	435	279
(OP: SP4GAP)				
*SQ2GXO	"	231,952	427	266
*SP6GCU	"	175,788	369	257
*SQ9S	"	175,700	352	251
*SP2GCE	"	166,779	346	261
*SP3BBS	"	164,730	350	255
*SP2HHX	"	163,856	339	266
*SP3CCT	"	156,948	317	246
*SP9GMI	"	129,156	284	229
*SQ6JNX	"	128,960	276	260
*SQ9FMU	"	89,680	241	190
*SP5TT	"	72,393	208	177
*SP5DJ	"	58,283	224	167
*SP3LGF	"	51,256	187	149
*SP7JDI	"	48,216	222	164
*SN5WD	"	44,446	175	142
*SP6MI	"	43,516	210	172
*SQ3R	"	41,667	163	129
(OP: SQ3HMM)				
*SP7LIE	"	41,003	161	131
*SQ3POS	"	27,195	128	105
*SQ2ICX	"	23,000	108	100
*SP3FSM	"	22,176	116	99
*SP9IHP	"	20,405	91	77
*SP5GDY	"	18,634	96	77
*SQ2RH	"	8,418	76	69
*SP6BEN	"	4,840	40	40
*SP6IHE	"	2,160	27	24
*SP9KJU	"	1,708	31	28
(OP: SP9MDY)				
*SP7TEX	"	1,430	27	26
*SP8K	"	756	20	18
*SP9IVD	"	220	12	11
*SP2EPV	"	26	29	26
*SP/UT5UT	28	18,655	101	91
*SP1/UX1HW/M	"	180	10	10
*HF7A	"	99	11	9
*SP3FPF	21	57,252	167	156
*SN4EE	"	38,190	155	134
(OP: SP4AWE)				
*SP9R	"	23,562	108	99
*SP7IIT	"	15,840	96	88
*SP6DHH	"	4,982	54	53
*SQ6A	"	1,425	25	25
*SN2N	"	644	29	28
*SQ5VCO	"	27	3	3
*SP4JCQ	14	1,050,714	832	651
*SP1R	"	639,969	675	473
*SP9CXN	"	105,799	279	241
*SP8CGU	"	52,805	195	179
*SP5ENG	"	41,216	178	161
*SQ9FQY	"	33,418	163	154
*SP6DMI	"	19,488	130	116
*SP6LMQ	"	10,101	101	91
*SOØA	"	6,622	80	77
*SQ1WO	"	5,782	62	59
*SQ5W	"	3,720	68	60
*SN4A	"	1,672	38	38
*SP8BRT	"	1,656	46	46
*SP9EMI	"	1,188	34	33
*SP4AAZ	"	1,025	25	25
*SN6S	7	681,294	715	419
(OP: SP6ZC)				
*SN1F	"	441,501	496	367
(OP: SP1GZF)				
*SP9JZT	"	398,558	496	349
*SP3VT	"	381,480	510	340
*SP9OUV	"	214,851	379	273
*SP7OGP	"	149,408	300	224
*SP8GNF	"	133,152	285	219
*SQ7LQJ	"	83,936	212	172
*SP4F	"	22,800	106	100
*SO7M	3.5	456,092	624	364
(OP: SP7IFM)				
*SP4AWE	"	156,980	353	235
*SP5WAZ	"	1,104	26	24
*SNØR	1.8	114,695	288	203
(OP: SQ9IAU)				
*SQ8MFM	"	63,042	216	158

Portugal

CR6K	A	12,874,720	4195	1201
(OP: CT1ILT)				
CR6E	"	154,108	317	236
(OP: CT7AIX)				
*CR5O	A	2,153,952	1554	648
(OP: CT7AJL)				
*CT1DRB	"	1,363,230	1060	729
*CT7AUP	"	565,650	618	419
*CT1ELZ	"	93,730	292	206
*CT1BOH	"	76,128	210	156
*CT1EHK	"	17,112	104	93
*CT7AQD	"	7,380	69	60
*CS5FAT	"	6,600	72	66
(OP: CT1DUD)				
*CT7/DL3CQ	"	928	32	29
*CT1BWW	28	480	16	16

Romania

YO4NF	A	2,748,273	1940	737
YO9HP	"	935,208	988	558
YO4DW	"	856,647	835	509
YO3GNF	"	425,196	619	372
YO4AR	"	390,528	694	384
YO9AYN	"	255,430	401	287
YO7CW	"	188,415	390	265
YO7LGI	"	24,840	102	92
YO3FF	"	17,205	121	111
YR8I	28	105,884	258	206
(OP: YO8OY)				
YO9RIJ	"	61,957	227	167
YPØK	7	1,546,657	1024	551
(OP: YO8RXP)				
YO5CUQ	3.5	2,170	34	31
YO2GL	1.8	41,925	161	129
*YO4DG	A	1,155,307	1148	523
*YO4FHU	"	635,580	837	428
*YO7ARZ	"	357,390	550	330
*YO8BDW	"	328,020	640	330
*YO3APJ	"	221,125	409	305
*YO4SI	"	142,370	308	230
*YO3GCL	"	108,680	272	209
*YO6HSU	"	88,395	283	213
*YO4AAC	"	81,055	292	215
*YO8RFS	"	68,529	189	159
*YO5YM	"	59,452	214	167
*YO9GDN	"	45,375	127	121
*YO7LYM	"	44,250	238	177
*YO6DBL	"	41,800	176	152
*YO4CSL	"	30,628	144	124
*YO8BDQ	"	21,294	97	78
*YO2ARM	"	17,266	97	89
*YO/LZ4UU	"	5,060	52	46
*YO3YV	"	5,000	56	50
*YO2LDU	"	2,318	41	38
*YO9HG	"	2,000	44	40
*YO3BIZ	"	406	15	14
*YO4FZX	28	34,194	182	139
*YR2X	"	27,648	120	108
(OP: YO2LEA)				
*YO2CMI	"	6,783	55	51
*YO2NAA	21	127,600	258	220
*YO2IS	"	61,424	197	176
*YO3JW	"	26,250	138	125
*YO5OBA	"	7,504	60	56
*YR8A	14	651,918	696	537
(OP: YO8AXP)				
*YO8TNB	"	572,322	698	527
*YO4BEW	"	57,267	213	189
*YO9CWY	"	46,003	201	179
*YO6DMR	"	42,900	167	156
*YO5BTZ	"	21,912	146	132
*YO5OAC	"	14,144	114	104
*YO6LA	"	12,870	126	117
*YO7HGM	"	1,156	38	34
*YO3HEX	7	140,768	256	212
*YO8BGD	"	27,146	105	98
*YO2MJZ	"	4,368	28	28
*YO5AVN	3.5	286,395	442	305
*YO5AXF	"	84,042	247	174
*YO5QDI	"	52,950	170	150

Sardinia

*ISØLYN	A	100,536	279	236

Scotland

MM9I	A	4,066,440	2189	840
GS4FOC	"	1,473,066	1490	567
		(OP: GM3WUX)		
MM3T	"	380,888	616	376
GM7V	"	351,182	607	338
		(OP: GM3WOJ)		
GM2Y	"	62,790	227	182
		(OP: MMØDXH)		
GM4EVS	14	17,542	109	98
*MM2T	A	1,136,250	1070	505
		(OP: GMØLIR)		
*MM/W7YAQ	"	602,316	686	429
*GM4X	"	94,430	279	190
		(OP: GM4WZG)		
*GM3W	"	36,250	176	145
		(OP: GM3JKS)		
*2MØGUI	"	21,060	111	108
*GM4NNC	"	2,814	71	67
*GM4UYZ	14	1,302	32	31

Serbia

YTØC	A	4,900,386	2106	898
YT6X	"	3,663,675	1694	855
YU7KW	"	1,537,056	1083	593
YT1X	28	333,720	450	324
YT1UR	"	215,137	375	247
YU7EE	"	163,560	321	232
YU5W	"	131,670	269	210
YT7X	21	562,424	622	458
		(OP: YU7CF)		
YT9A	"	400,785	485	347
YT7R	"	19,422	100	83
		(OP: YU7BW)		
YT3X	14	4,772,196	2204	1053
YT2ISM	"	376,992	718	408
YT1A	7	2,984,100	1343	686
YT4T	"	2,680,202	1273	686
YU1RA	"	978,164	717	473
YT3K	"	858,514	718	454
YT8A	1.8	142,135	323	217
*YU5T	A	553,737	785	393
*YU1KT	"	270,230	473	305
*YT1XC	"	50,298	195	166
*YU1ML	"	30,962	187	137
*YU1ZZ	"	22,246	121	98
*YU1NR	"	918	28	27
*YU1LD	"	629	19	17
*YT2RX	28	18,286	93	82
*YT9W	21	857,584	840	532
*YU5M	14	1,703,592	1370	717
*YU7WW	7	1,330,875	884	525
*YU4SSR	"	301,892	449	284
*YU1ED	3.5	400,325	548	335
*YT1WA	"	120,335	278	205
*YU7D	"	78,496	226	176

Sicily

IT9SSI	A	207,000	444	300
IO9J	14	133,280	454	280
IT9ESW	7	934,092	610	486
IT9BLB	1.8	114,938	269	202
*IT9CKA	A	73,696	245	188
*IT9AJP	"	34,122	146	141
*IW9GRL	"	22,368	110	96
*IT9VDQ	"	9,860	98	85
*IT9RGY	"	1,742	30	26
*IT9JGX	"	28	4	4
*IT9IVU	28	10,206	76	63
*IT9RZU	"	6,448	54	52
*IT9LKX	21	401,638	566	409
*IT9VCE	"	2,680	45	40
*IF9A	14	2,021,976	1610	814
		(OP: IT9PPG)		

Slovak Republic

OMØR	A	10,051,683	3215	1151
		(OP: OM3GI)		
OM7M	"	9,812,789	3024	1127
		(OP: OM5ZW)		
OM7RU	"	4,440,128	1824	848
OM7LM	"	1,531,800	1116	600
OM3CPF	"	1,041,704	935	472
OM6AL	"	383,690	562	370
OM3CFR	"	252,252	393	308
OM2VL	14	5,226,681	2197	1077
OM3CW	"	363,393	541	387
OM6NM	7	614,460	548	380
OM2XW	3.5	222,110	397	266
*OM7LW	A	3,279,780	1527	855
*OM5NL	"	1,125,744	898	564
*OM5KM	"	631,598	683	418
*OM8ON	"	473,982	521	394
*OM5CM	"	400,860	559	340
*OM5TX	"	367,965	497	333
*OM7AG	"	309,111	570	323
*OM2DT	"	277,665	456	321
*OM4AY	"	163,440	310	240
*OM4DU	"	130,560	295	240
*OM6MS	"	100,245	298	205
*OM5UM	"	86,600	250	200
*OM3CDN	"	86,559	268	183
*OM5MX	"	81,702	213	178
*OM4O	"	62,928	180	152
		(OP: OM3NI)		
*OM7AT	"	56,416	209	172
*OM2AGN	14	17,649	113	111
*OM3CQ	7	894,516	703	463
*OM8AQ	"	22,176	102	96
*OM2KI	"	16,660	93	85
*OM7JG	"	7,434	60	59
*OM6TU	3.5	55,664	206	142
*OM6TX	"	39,500	161	125

Slovenia

S53MM	A	9,552,948	2873	1132
S57K	"	7,505,843	2556	1063
S55T	"	7,317,966	2567	1042
		(OP: S57AL)		
S53F	"	6,588,582	2477	1001
S58M	"	6,057,100	2285	1018
S52C	"	1,878,162	1352	597
		(OP: S52P)		
S59AA	"	1,294,641	1030	603
S52F	"	337,183	538	319
S51NM	"	94,886	258	209
S5ØK	21	2,940,520	1530	820
S5ØR	"	1,913,016	1212	708
S57DX	14	3,621,723	1877	939
S53Z	"	1,971,150	1322	773
S52AW	7	3,501,575	1499	749
S51YI	"	3,429,760	1482	736
S51J	"	1,790,393	1005	583
S51DX	"	135,824	325	208
S56X	1.8	114,063	300	197
*S52W	A	2,191,368	1475	697
*S56C	"	404,448	581	352
*S51MF	"	179,724	296	204
*S58RU	"	91,245	319	237
*S58D	"	72,316	233	179
*S51ZJ	"	57,638	200	161
*S57KM	"	56,392	199	152
*S52ON	"	27,945	129	115
*S53V	28	49,457	159	137
*S54X	7	756,966	571	469
*S51MM	"	211,932	328	261
*S57X	3.5	133,455	293	217
*S53AR	1.8	28,000	133	112

Spain

EF5Y	A	9,124,640	3470	1120
		(OP: EB5A)		
EF1A	"	2,496,044	1560	692
		(OP: EA1X)		
EA5M	"	1,675,800	1248	588
EA2RCP	"	1,668,641	1264	611
		(OP: UR5YKO)		
EA5FID	"	1,291,224	996	584
EA5JX	"	938,322	839	462
EB5F	"	305,322	492	337
EC3AIT	"	79,728	206	176
EA4FME	"	43,350	174	150
EA2BD	"	19,570	108	95
EA3KE	"	15,225	146	105
EC1KR	"	10,349	81	79
EA7JW	"	1,848	23	21
EA7BUU	"	510	16	15
EA5BY	28	32,825	135	101
EF5R	"	30,576	131	112
		(OP: EA5BWR)		
EA5GIE	"	1,980	32	30
EF5U	21	2,602,410	1591	778
		(OP: EA5U)		
EC5K	"	1,333,380	1060	626
EC4C	"	340,600	496	325
EA5O	"	104,742	237	198
EF1C	"	19,380	144	114
ED3O	14	4,767,360	2290	1040
		(OP: EA3CX)		
EA3X	"	638,260	858	485
EA3OH	"	485,030	694	455
EB1A	7	3,154,094	1313	683
		(OP: EA1DAV)		
*ED2R	A	415,596	679	354
		(OP: EA2T)		
*EA4BAS	"	346,446	504	342
*EA5IFY	"	224,675	485	275
*EA4Z	"	221,260	385	260
*EC3UA	"	190,350	299	225
*EA3XR	"	188,925	370	275
*EA1VT	"	187,650	430	278
*EA4XT	"	139,650	333	245
*EE2A	"	122,408	284	214
		(OP: EA2SN)		
*EA4M	"	76,960	251	208
*EA4IL	"	74,760	220	178
*EA5GX	"	64,998	193	157
*EA2PA	"	52,688	193	148
*EA5DO	"	50,575	206	175
*EH4ØURV	"	42,630	197	147
		(OP: EB1RL)		
*EA3HRE	"	37,365	157	141
*EA5CP	"	34,453	153	131
*EA4EM	"	22,149	127	107
*EA5JA	"	20,628	140	108
*EA4LG	"	16,008	95	87
*EA4FIT	"	9,936	82	72
*EB5CS	"	9,514	80	71
*EA1IQM	"	7,688	64	62
*EC7K	"	7,380	67	60
*EA5DD	"	6,272	72	64
*EA3IFV	"	6,264	59	58
*EC5AGM	"	3,825	52	51
*EA1JCE	"	2,925	50	45
*EF7N	"	1,645	37	35
		(OP: EA7KHB)		
*EA5GIA	"	40	20	20
*ED7O	28	155,142	312	221
		(OP: EA7EU)		
*EA7J	"	1,850	30	25
*ED1R	21	1,702,272	1216	704
*EA7BHO	"	51,993	163	159
*EA7GVR	"	31,740	142	138
*EA5Q	"	5,985	61	57
*ED3T	14	407,772	604	423
		(OP: EA3HSO)		
*EA4FLY	"	68,482	227	194
*EC4TA	"	52,542	240	189
*EA7OR	"	29,892	150	141
*EA5MR	"	11,984	114	107
*EA2AZ	"	7,260	70	66
*EA4HKF	"	4,032	48	48
*EA5ITT	7	86,020	192	170
*EA2NN	"	5,014	51	46
*EA1DD	3.5	69,913	175	151
*EA1DA	"	2,170	31	31

Sweden

SE5E	A	5,475,648	2682	948
		(OP: SM5AJV)		
SC7DX	"	2,187,514	1367	721
SMØHRP	"	1,518,075	1170	585
SMØT	"	851,904	900	493
SA6NIA	"	649,901	921	409
SD1A	"	424,490	676	374
		(OP: SM1TDE)		
SF1Z	"	415,953	544	409
		(OP: SMØHEV)		
SDØW	"	394,716	631	381
SCØT	"	360,766	618	353
		(OP: SAØBVX)		
SD6M	"	264,020	489	307
		(OP: SA6BGR)		
SM7IUN	"	194,184	373	248
SM3OMO	"	190,509	341	253
SEØB	"	173,190	424	251
		(OP: SAØBXV)		
SM6NZA	"	19,975	90	85
SM6CNN	"	8,476	57	52
SM6CMU	"	6,072	50	44
SMØN	"	2,613	41	39
		(OP: SMØJCA)		
*SEØX	A	1,530,551	1118	671
		(OP: SMØMDG)		
*SD6F	"	1,071,224	1169	518
		(OP: SM6JWR)		
*SM5CSS	"	714,560	831	464
*SDØN	"	657,183	753	439
		(OP: SMØNSJ)		
*SF6W	"	628,367	880	401
		(OP: SM6EWB)		
*SM5MX	"	351,210	576	345
*SE4E	"	222,999	483	287
		(OP: SM4DQE)		
*SM5ACQ	"	221,392	500	274
*SM6TOL	"	208,780	513	286
*SM3EAE	"	205,416	490	317
*SM7CIL	"	202,860	362	276
*SM5DXR	"	185,444	422	259
*SM6NT	"	151,526	381	239
*SFØA	"	149,492	372	266
		(OP: SMØLPO)		
*SE6K	"	87,780	299	210
		(OP: SM6FZO)		
*SM5IMO	"	82,650	255	174
*SM6S	"	70,686	220	187
*SK5AA	"	52,812	212	163
		(OP: SM5KRI)		
*SM6IQD	"	42,966	200	154
*SM7RYR	"	40,619	201	151
*SM6GBM	"	40,166	192	151
*SM5LW	"	35,224	154	136
*SM6MIS	"	34,250	177	137
*SM4EPR	"	14,329	106	89
*SM5CCT	"	13,064	110	92
*SM7BHM	"	12,516	99	84
*SF5M	"	3,354	43	43
		(OP: SM5SYO)		
*SM5COP	"	384	12	12
*SM6DPB	28	16	4	4
*SM6F	21	21,112	98	91
		(OP: SM6CUK)		
*SM6FPC	14	154,575	271	225
*SM7ATL	"	12,125	105	97
*SG2SOP	"	5,002	64	61
		(OP: SM5EFX)		

Switzerland

HB7X	A	6,372,564	2285	1012
		(OP: HB9DDO)		
HB9DQL	"	3,401,592	1678	813
HB9TOC	"	3,288,747	1674	759
HB9CVQ	"	1,569,862	1086	581
HB9IJC	"	844,246	760	494
HB9KOG	"	96,886	241	193
HB9AUK	"	39,729	143	123
HB9CZF	"	23,114	96	91
HB9DVZ	"	9,271	80	73
*HB9BXE	A	1,260,830	1109	590
*HB9FAP	"	478,186	545	373
*HB9RB	"	306,432	393	342
*HB9TWM	"	267,025	348	275
*HB9DCM	"	255,640	387	280
*HB9GFT	"	38,766	179	142
*HB9BGF	"	12,330	106	90
*HB9BUN	"	11,424	70	56
*HB9BXQ	"	6,160	50	44
*HB9IIH	"	1,824	39	38
*HB9HEI	"	1,092	28	26
*HB9GKM	"	84	13	12
*HB9HFM	14	9,831	95	87
*HB9ETR	"	5,504	66	64
*HB9TSU	"	1,332	40	37
*HB5ØSH	7	645,183	696	399
		(OP: HB9CIC)		

Ukraine

*UR7MZ	A	302,168	541	353
*UY4MK	"	297,065	412	295
*US7IGN	"	179,036	408	286
*UX3UU	28	1	1	1

Vienna Intl. Center

*4U1A	14	128,616	412	276
		(OP: OE1ZZZ)		

Wales

GW2CWO	A	162,819	329	237
		(OP: GWØETF)		
MWØSAW	"	1,092	23	21
*GW4HBK	28	319	11	11
*GWØRYT	21	30,388	120	107

OCEANIA

Australia

VK6T	A	7,245,000	2240	805
		(OP: VK6LW)		
VK4SN	"	2,263,429	1212	553
VJ3A	"	2,189,616	1205	572
VL2G	"	1,980,060	1121	541
		(OP: VK2GR)		
VL2N	"	931,287	736	427
		(OP: VK2PN)		
VJ5W	"	860,890	669	437
		(OP: VK5GR)		
VK2BJ	"	638,640	517	360
VK7GN	"	472,644	539	342
VK5T	"	128,656	243	187
VK4JU	"	38,831	149	103
VK7BO	"	4,028	43	38
VK6DW	"	2,574	34	33
VK3Y	"	1,624	30	28
VK4AFU	"	1,360	21	20
VK3X	28	663	17	17
		(OP: VK3GK)		
*VJ4O	A	9,550	65	50
*VK5DC	"	9,063	57	53
*VL5Q	"	8,340	65	60
*VK1DD	"	6,048	38	36
*VK6RZ	"	3,510	28	27
*VK3KTT	"	2,100	30	30
*VK4XU	"	1,440	26	24
*VK2IG	28	21,983	109	89
*VK3IU	"	14,162	94	73
*VL3O	"	3,276	39	36
*VL3E	"	940	23	20
		(OP: VK3TZ)		
*VK3G	21	9,438	67	66
		(OP: VK3GF)		
*VJ3O	14	4,620	45	44
		(OP: VK3TX)		
*VK4JJ	"	336	12	12

Brunei Darussalam

*V85T	A	78,076	237	149

East Malaysia

*9M6NA	A	2,720,945	1476	557
		(OP: JO4JKL)		
*9M6W	"	142,756	292	178
		(OP: 9M6ZAE)		
*9M8DEN	"	9,350	60	55

Fiji

3D2AG	A	587,194	661	331

French Polynesia

*FO/4Z5LA	21	28,551	131	93

Guam

NH2DX	21	590,031	615	351
		(OP: KG6DX)		

Hawaii

AH6KO	A	3,846,284	1776	646
KH6TU	"	3,726,080	1594	656
		(OP: AD6E)		
WH7T	"	3,615,320	1674	670
		(OP: WH7W)		
WH6R	"	230,208	361	218
NH6N	"	203,550	268	177
KH6Y	"	23,670	117	90
KH6AQ	21	1,108,532	922	431
*NH6V	A	4,571,559	1764	729
		(OP: @KH6LC)		
*KH6CJJ	"	428,810	508	274
*KH7M	1.8	100	5	5
		(OP: KH6ZM)		

Indonesia

YB8UTI	A	527,724	579	274
YB2MM	"	250,848	354	234
YB2IQ	"	242,046	349	238
YB2HAF	"	59,784	166	141
YB1DOL	"	35,856	122	108
YB2TS	"	35,380	146	116
YB1TQL	"	10,795	94	85
YC8DUL	"	3,774	41	37
YC7YGR	28	87,454	211	146
YB7KE	"	20,230	107	70
YE3WIL	"	2,400	33	32
YB3IZK	"	1,863	29	27
YB1IQE	21	2,212	29	28
YB3FTD	"	640	18	16
YC6BTI	"	221	13	13
YE3AA	14	4,988	44	43
*YC2VOC	A	2,037,406	1254	541
*YCØVM	"	565,957	597	347
*YB1AYO	"	533,232	591	322
*7B3A	"	518,502	571	309
		(OP: YC3GIF)		
*YB1RKT	"	234,867	323	237
*YB1JCD	"	225,720	374	228
*YB9ELS	"	215,985	367	231
*YC9AAI	"	181,224	291	216
*YB1LUE	"	107,270	232	170
*YB1BX	"	102,500	233	164
*YB1MIG	"	74,892	197	158
*YC2KJC	"	71,222	188	149
*YC1PZ	"	59,535	168	135
*YB1UUN	"	47,214	145	122
*YC3DOC	"	33,120	129	115
*YB2GV	"	29,993	129	89
*YC2XCD	"	18,270	111	87
*YE1GD	"	18,164	109	76
*YB1BA	"	12,480	92	80
*YBØISE	"	11,468	69	61
*YD1FRU	"	2,958	36	34
*YC1TCA	"	2,356	39	31
*YC1KQV	"	1,474	22	22
*YE3ESW	"	1,298	25	22
*YE8DWC	"	972	19	18
*YB1NIN	"	731	19	17
*YB6IUP	"	490	17	14
*YB1WCK	"	220	10	10
*YB1EIG	"	119	7	7
*YF8AIK	"	96	6	6
*YDØRFS	"	9	9	9
*YD2UWF	28	99,450	211	170
*YF3FBV	"	9,960	62	60
*YB1HR	"	5,088	50	48
*YB3BGM	"	2,848	33	32
*YD3ASV	"	1,034	23	22
*YC9FAR	21	309,288	420	263
*YB1BML	"	51,660	165	140
*YB9AOS	"	20,737	115	89
*YB2VYY	"	3,774	38	37
*YC1JEL	"	3,570	47	42
*YD9VE	"	3,040	38	38
*YC1RYX	"	2,812	40	38
*YD2UFR	"	1,224	25	24
*YB1NXR	"	480	16	15
*YF3FZR	"	220	12	11
*YC2CLH	"	90	10	9
*YD9MBM	"	45	5	5
*YC1GDF	"	12	2	2
*YE4IJ	14	36,188	116	109
*YB9DE	7	265,824	239	213
		(OP: YB3MM)		

New Zealand

ZL1IF	A	1,537,224	952	507
ZL3AB	"	314,571	392	291
ZL2RX	"	44,149	155	119
ZL3P	28	123,504	282	166
		(OP: ZL3PAH)		
ZL4TT	21	370,852	478	278
ZL1BBW	14	432,306	464	329
ZL4YY	"	8,512	62	56
*ZL1MDE	A	24	4	4

Philippines

DU3T	A	2,412,388	1536	503
DV3A	28	312,707	455	263
DU1EV	"	205,499	395	217
4F2KWT	1.8	936	13	12
*4D3X	A	1,081,575	946	345
*4E1AGW	"	128,318	275	166
*4F3BZ	28	287,609	471	227
*DX7HQ	21	465	15	15
		(OP: DU7RH)		
*DU1VGX	14	3,293	39	37

Wallis & Futuna Islands

*FW1JG	A	270	12	10

SOUTH AMERICA

Argentina

LU6D	A	778,008	720	421
LU1DZ	"	332,588	445	268
LU3VED	"	320,866	398	301
LW1D	"	255,688	398	248
		(OP: LW1EUD)		
LW1F	28	3,374,198	1635	734
		(OP: LU5FC)		
LT6M	"	2,492,504	1348	658
		(OP: LU8MHL)		
LO5D	"	416,262	483	318
LU7HN	"	225,504	356	243
LU8QT	21	1,342,653	949	519
LU6UO	"	473,850	524	351
LU5OM	"	454,422	515	318
LU5FF	14	517,962	539	346
*LS5H	A	900,576	680	424
		(OP: LW5HR)		
*LV1F	"	452,184	548	332
		(OP: LU4FTA)		
*LU5YF	"	435,045	467	299
*LU1WUD	"	106,029	237	187
*LU9GBR	"	50,570	163	130
*LU6OA	"	11,840	69	64
*LU7CRA	"	3,240	41	40
*LU6ETB	"	480	15	15
*LU8DPM	28	2,230,039	1233	641
		(OP: LU1DJX)		
*LO7H	"	1,216,656	900	497
		(OP: LU1HLH)		
*LU4HK	"	375,182	443	298
*LU1II	"	7,500	52	50
*LU2DPW	"	2,697	31	31
*AZ1A	14	78,604	185	172
		(OP: LU1AW)		
*LU5DF	"	645	15	15

Aruba

P49Y	21	6,579,417	2461	949
		(OP: AE6Y)		
*P44W	A	9,775,087	2751	959
		(OP: W2GD)		

Brazil

PQ5FB	A	3,204,430	1400	685
ZV5M	"	2,603,151	1293	603
		(OP: PY5AMF)		
ZX2E	"	1,810,053	1107	549
		(OP: PY2ZEA)		
PY1VOY	"	542,340	513	345
PY5DK	"	70,044	169	156
PY2EU	"	25,602	110	102
PY4EK	"	22,074	91	78
PT7BI	"	7,600	84	76
PV8DX	"	7,050	50	47
PY2NFE	"	4,275	48	45
PV8AAS	"	1,458	29	27
PY2BK	28	2,880,060	1524	690
PY2MC	"	567,700	594	350
PY3LX	"	10,758	73	66
ZX5J	21	6,937,200	2340	1025
		(OP: DJ4CW)		
PY3TD	"	266,869	355	283
PY4RGS	"	59,136	164	132
PY3TR	"	336	24	24
PY2XJ	"	48	6	6
PP4T	14	4,817,925	1841	931
		(OP: PY2LSM)		
PY2PT	"	759,895	679	401
PR7ZAJ	"	1,518	24	23
PT4A	3.5	31,108	83	77
		(OP: PP2BT)		
*PR3A	A	3,195,135	1577	703
		(OP: PY3OZ)		
*PY2FRQ	"	1,525,554	1006	486
*PT2AW	"	480,102	510	322
*PY4ARS	"	379,200	421	300
*PY2XL	"	316,928	382	256
*PP2RON	"	301,549	364	269
*PY5AKW	"	258,318	352	254
*PY2BBQ	"	141,155	243	185
*PX1C	"	139,860	258	210
		(OP: PY1JR)		
*PY2POA	"	80,613	199	159
*PP5DAN	"	67,068	198	162
*PY2MIA	"	44,880	155	120
*PU2VLW	"	39,270	131	119
*PP5TG	"	38,586	139	118
*PU2UAF	"	25,389	132	117
*PY2HBS	"	25,284	107	98
*PY4ZO	"	24,376	105	88
*PY2BOA	"	19,303	106	97
*PY2RX	"	18,260	88	83
*PY2PIM	"	15,678	89	78
*PP5RB	"	12,091	121	107
*PY2OKB	"	10,290	78	70
*PY2VCP	"	9,581	68	67
*PY2AXH	"	8,056	64	53
*PY5IQ	"	6,960	97	87
*PY2DN	"	6,890	55	53
*ZV2F	"	6,210	73	54
		(OP: PY2SFA)		
*PU2TNT	"	5,368	48	44
*PY1KB	"	3,854	46	41
*PY2LPM	"	3,104	35	32
*PY2REC	"	2,044	28	28
*PY1NP	"	1,239	21	21
*PY7OJ	"	1,104	24	24
*PY2OT	"	1,008	20	18
*PY1FI	"	960	20	20
*PU3DRM	"	128	10	8
*PQ5B	28	1,637,057	1049	571
		(OP: PP5BZ)		
*PY2EX	"	405,450	447	318
*PY4XX	"	207,916	333	236
*PY1AX	"	199,689	317	257
*PY2RSA	"	184,672	296	232
*PY1DX	"	72,900	188	162
*PY2RH	"	69,037	183	131
*PY3DX	"	63,873	165	141
*PY1ZV	"	33,495	143	105
*PY1MK	"	10,626	71	66
*PU8PSF	"	6,042	66	57
*ZZ7ZZ	"	4,280	45	40
*PY1OX	"	1,566	30	29
*PP2AR	"	1,170	27	26
*PY1NSC	"	820	21	20
*PY1FOX	"	775	25	25
*PU3MLN	"	528	22	22
*PV8AJ	"	527	17	17
*PU3GLO	"	42	15	14
*PT9DX	21	569,687	537	391

*PY4BZ	"	353,138	474	317
*PR7GY	"	294,465	401	293
*PY2WMW	"	268,932	337	292
*PY4LH	"	209,836	334	251
*PY2QT	"	145,632	250	222
*PY2FSR	"	67,795	171	149
*ZZ2WPX	"	40,572	136	126
		(OP: PU2OGQ)		
*PY2FCL	"	33,000	120	110
*PY2DPM	"	29,274	105	102
*PY1KO	"	15,168	82	79
*PY2ARY	"	7,920	62	60
*PU2USK	"	6,966	55	54
*PY2NY	14	1,619,874	1003	558
*PT6B	"	35,964	128	111
		(OP: PY6TS)		
*PY1SAD	"	9,720	62	60
*PY2MQ	"	119	7	7
*PP2CC	3.5	1,452	22	22
*PY3YC	"	1	1	1

Chile

CE2LR	A	1,564,200	954	495
CB3R	28	491,841	555	333
		(OP: XQ3SK)		
XQ1KZ	21	2,586,432	1316	709
XQ3SK	14	855,966	702	431
CE2DX	"	211,958	365	262
*XR3W	A	2,875,950	1455	630
		(OP: XQ4CW)		
*CE4WT	"	18	3	3
*XQ3WD	28	205,155	333	235
*XQ1CR	"	884	28	26

Colombia

*HK3ZD	21	377	13	13

Curacao

PJ2T	A	7,124,127	2527	757
		(OP: WI9WI)		

Ecuador

*HC2AO	A	223,788	288	204
*HC5AI	"	176,315	325	197
*HC1JQ	21	6,477	51	51

Paraguay

*ZP6/N2GK	A	2,755,000	1485	625
*ZP9MCE	21	14,322	80	77

Peru

OA4SS	A	1,485,840	1071	453
*4T4T	A	980,191	739	437
		(OP: OA4DX)		

Uruguay

CX5UA	A	1,429,948	939	514
CX1AA	"	189,448	280	199
		(OP: CX6DRA)		
CX2BR	28	127,400	276	175
*CW3A	A	1,276,290	902	522
		(OP: CX5CBA)		
*CX9AU	"	219,915	333	243
*CX1CAN	"	5,838	47	42
*CX2AQ	21	491,729	481	353

Venezuela

*YV5COR	A	13,952	70	64
*YV1JGT	28	40,208	157	112

QRP

K3WW	A	2,747,416	1534	691
DM2M	"	2,539,839	1555	687
		(OP: DK3WE)		
ON6NL	"	1,646,390	1269	610
LY9A	"	1,600,446	1381	606
DK7HA	"	1,540,554	1080	582
DG3T	"	1,473,528	1149	588
		(OP: DF5RF)		
LZ6E	"	1,129,956	885	573
		(OP: LZ1GU)		
LZ5ØYE	"	788,184	1005	492
		(OP: LZ1YE)		
N7IR	"	575,016	734	388
W1FJ	"	557,406	614	346
YU1LM	"	529,429	738	389
W6JTI	"	515,147	720	361
DL1JDQ	"	472,381	647	377
AC2YD	"	419,547	444	321
N3CZ	"	361,382	480	311
DC9RI	"	359,466	533	331
M7R	"	339,099	545	327
		(OP: GØTPH)		
JH7UJU	"	326,430	489	270
KV2U	"	292,200	424	300
		(OP: K2YG)		
HG5O	"	288,414	398	294
		(OP: HA5OB)		
W6QU	"	271,660	465	289
		(OP: W8QZA)		
EA7AAW	"	230,388	445	292
K2AL	"	223,573	402	287
BH4TQX	"	218,994	455	226
PE2K	"	207,750	432	277
G4OZG	"	187,460	414	260
JK2VOC	"	182,620	401	230
OZ7BQ/P	"	164,983	370	259
JK1TCV	"	161,000	304	200
HAØGK	"	159,641	407	263
EA7JYO	"	157,696	278	224
ON7CC	"	156,006	347	243
PC5D	"	151,200	336	240
JA4XHF/3	"	150,347	288	193
HA5BA	"	150,064	328	226
OH3Ø77F	"	149,310	357	237
W5VS	"	138,774	303	229
4X6FB	"	135,468	211	159
OK1KDN	"	134,470	314	226
PAØRDT	"	131,565	358	245
VK2CCC	"	129,926	250	167
KR4AE	"	128,652	307	213
EA1GT	"	127,400	385	245
SMØGNS	"	118,066	356	239
DU1WBX	"	103,509	252	159
EA1AER	"	101,913	282	211
HG7J	"	100,192	281	202
2EØCVN	"	90,308	309	214
F5PLC	"	89,910	197	135
DF7XR	"	85,570	252	199
W7LG	"	81,458	235	169
IV3DRP	"	80,179	245	197
NX1P	"	79,459	260	181
NØUR	"	75,396	251	183
BD1KV	"	74,256	184	182
JE3AKU	"	68,103	194	141
LY5G	"	67,860	245	180
OH3KQ	"	61,992	225	168
HA2ZB	"	58,671	203	159
S53WW	"	51,538	196	146
K8ZT	"	51,408	159	144
WY7N	"	50,100	235	150
K3HW	"	49,932	165	146
VE3KQN	"	49,105	148	115
LZ2AF	"	48,654	193	159
KB8PGW	"	48,495	229	159
NC1A	"	47,895	182	155
K2WW	"	47,084	162	158
K4PQC	*"*	*43,890*	*168*	*133*
PA3DSB	"	43,186	202	151
DK7OG	"	42,048	187	144
KC2WUF	"	40,820	158	130
7K1CPT	"	40,530	149	105
LZ7DP	"	40,504	201	166
IK3BVD	"	40,365	178	135
G4FPA	"	39,102	164	133
DL2AOM	"	36,156	188	138
G4BUE	"	34,710	174	130
BD3OOX	"	33,345	120	117
KK1CWO	"	31,824	135	102
		(OP: W1UU)		
OK1HCG	"	30,012	146	123
S53FO	"	28,194	156	127
WA4PGM	"	26,928	111	102
DS1TUW	"	25,872	126	88
AC9VC	"	25,764	142	113
G5BBL	"	25,752	130	111
DL8LR	"	25,536	134	114
OK1DMP	"	25,443	105	99
W4ER	"	24,960	122	120
NH6O	"	24,940	108	86
V31MA	*"*	*24,653*	*103*	*89*
KJ5T	"	22,684	137	107
K2EKM	"	20,088	135	108
A41CK	"	19,019	95	77
SP6NIV	"	18,720	118	96
OE7AFT	"	18,507	103	93
DDØVS	"	18,437	126	103
DL8ZAJ	"	18,330	108	94
WC7S	"	18,252	156	117
AA8OY	"	17,860	116	95
PY2IAX	"	15,484	91	79
AF9J	"	15,322	126	94
CM3EFM	"	15,247	94	79
YB1PEF	"	15,120	74	72
BH4PVP	"	14,352	96	69
WR4I	"	14,276	85	83
EA5FOG	"	14,248	121	104
ON5IA	"	13,083	101	89
AG8Y	"	12,879	115	81
		(OP: W8EH)		
JE1PMQ	*"*	*10,845*	*52*	*45*
YB1TIA	"	9,912	72	59
W1TW	"	9,207	106	93
EA4U	"	8,437	65	59
PA3MET	*"*	*8,346*	*92*	*78*
DL2PR	"	7,821	92	79
OM3CUG	"	7,448	64	56
DL6MWG	"	7,300	82	73
JR1XKU	"	7,290	67	54
HB9LL	"	7,040	73	64
		(OP: HB9TPN)		
PAØZAV	"	6,600	76	66
YD6ROA	"	6,440	70	56
WØMB	"	5,547	46	43
NN7SS	"	5,432	70	56
		(OP: K6UFO)		
G8AFN	"	5,278	62	58
OK7PZ	"	4,950	59	50
NO2D	"	4,788	61	57
W1ND	"	4,692	57	51
HB9HDV	"	4,134	57	53
VE7NI	"	4,042	50	43
BH1DYK	*"*	*3,872*	*45*	*44*
JR1UJX/2	"	3,680	54	46
JR2EKD	"	3,360	48	40
VA6TI	"	2,769	43	39
N3ZP	"	2,295	28	27
KKØU	"	2,242	38	38
BD7JIR	"	2,196	43	36
ZL3GA	"	2,010	34	30
DL4YX	"	1,980	54	44
PA1B	"	1,927	45	41
JAØIND/1	"	1,863	24	23
JS1BXH	"	1,800	34	30
EA3TJ	"	1,798	73	62
SP9RQH	"	1,740	30	29
HK4KM	"	1,525	26	25
KIØG	"	1,435	44	35
NQ2W	"	1,428	30	28
DK3UW	"	1,400	36	35
WC5D	"	1,353	34	33
W6SIY	"	1,350	25	25
N9TTK	"	1,323	27	27
K3WWP	"	1,260	21	20
M2F/P	"	1,230	32	30
		(OP: GØOOG)		
LYØNAS	"	1,150	26	25
DL3MFQ	"	1,071	22	21
DG2FDD	"	1,024	35	32
ON6PJ	"	960	40	40
EI8FH	"	954	19	18
BH2SWB	"	943	23	23
N6HI	"	855	19	15
JK1ANA	"	836	30	22
BH7QP	"	770	30	22
DF8AN	"	667	23	23
DL7PM	"	594	18	18
DJ3EI	"	567	21	21
LY2BGP	"	560	17	16
YB3EDD	"	532	19	19
AA2MA	"	522	32	29
YB2CTE	"	493	17	17
PA2PCH	"	475	19	19
KB9RPG	"	435	15	15
MØXXM	"	396	19	18
W2EB	"	384	12	12
2EØWWV	"	288	17	16
DU9GT	"	231	12	11
YB6IVW	"	160	18	16
KA3TTT	"	154	12	11
PU2MLO	"	152	8	8
N6ARA	"	150	10	10
BG6WAJ	"	120	10	10
DL8MF	"	96	6	6
KO4GOF	"	91	7	7
JG1BGT	"	63	9	7
YF3BVD	"	40	4	4
DC1MBR	*"*	*8*	*2*	*2*
PA3GNZ	"	4	4	4
4I1EBC	28	246,120	426	210
4F3OM	"	99,962	292	151
N4IJ	"	34,845	138	115
HG3IPA	"	18,177	95	83
		(OP: HA3JB)		
JG1RYQ	"	11,016	82	68
3G3O	"	10,266	70	59
		(OP: XQ3OP)		
PU2TWZ	"	4,928	67	64
YB3BOA	"	4,095	45	35
YO8WW	"	3,838	43	38
KW7R	"	3,267	39	33
DL1EFW	"	2,310	38	35
E21AOY	"	1,820	29	28
W2VRK	"	1,440	33	32
9A1VV	"	1,323	21	21
PY1CMT	"	874	20	19
F8AKC	"	836	20	19
SP4NKJ	"	726	25	22
NØJK	"	675	15	15
YC8RAG	"	672	16	16
LW9EKA	"	476	14	14
CS7AWB	"	448	16	16
S59GS	"	264	12	12
YB9GV	"	195	13	13
CO6EC	"	126	7	7
K2GMY	"	105	7	7
JH9ETC	"	8	2	2
OH1MN	"	6	3	2
KT3Q/Ø	"	2	1	1
MØHMJ	"	1	1	1
EF3O	21	585,849	563	433
		(OP: EA3O)		
AA1K	"	310,100	410	350
SV1JG	"	195,597	387	309
KH6ZM	"	169,332	296	206
LZ2RS	"	151,751	327	263
4Z4UO	"	80,290	182	155
YC1LJT	"	63,245	157	139
JR1NKN	"	52,246	186	151
JE1CAC	"	51,430	154	139
HG3C	"	50,064	162	149
4I1EBD	"	35,964	133	108
PY2VQ	"	26,600	100	95
YB8JEC	"	23,312	104	94
BG7TWJ	"	18,786	148	101
VX6WQ	"	17,711	94	89
		(OP: VE6WQ)		
SQ4HKU	"	14,742	96	91
WA6FGV	"	14,364	124	108
YO8RAA	"	12,480	82	78
IT9KCD	"	11,920	91	80
PY2CER	"	11,760	100	98
YC4SIZ	"	6,944	58	56
JA1KPF	"	6,496	66	56
PA5DX	"	6,307	53	53
DL2TM	"	4,576	50	44
YL2HB	"	4,366	62	59
YB3DXG	"	3,872	48	44
IZ2WYA	"	3,600	40	40
JI1AEP	"	2,840	43	40
BI1JY	"	2,356	42	38
		(OP: BI1JNP)		
YBØAZ	"	2,030	30	29
YC1HBP	"	675	15	15
YCØBAS	"	675	15	15
9A5MP	"	552	25	24
BD7LZM	"	476	18	17
SP9LAS	"	200	10	10
JG1GPY	"	189	9	9
BH3QKK	*"*	*180*	*13*	*12*
BI4MUH	"	170	11	10
WD6DX	*"*	*112*	*8*	*8*
JK1CNL	"	80	20	20
YC2MPF	"	65	5	5
JK1VUZ	"	35	5	5
JJØSFV	"	15	3	3
YD6HVF	"	9	3	3
KJØP	"	4	2	2
DO1HFS	"	1	1	1
KA4RRU	14	504,138	556	438
S51Z	"	340,008	474	372
G2X	"	231,192	460	338
		(OP: GØDCK)		
YT5YTT	*"*	*209,841*	*437*	*339*
9A2EY	"	129,480	340	260
JK7DWD	"	82,716	198	183
JQ1NGT	"	58,934	211	158
HF5WIM	"	47,614	198	179
DL1FY	"	44,117	161	157
YU9YAU	"	40,425	191	165
BX2AHP	"	35,712	145	128
OK1LO	"	27,604	142	134
W5LA	"	25,414	147	131
LY2LF	"	20,930	145	130
KF4AV	"	18,792	114	108
LY4BF	"	17,901	133	117
		(OP: LY2BBF)		
K9AXT	"	15,664	97	88
YO4BEX	"	11,660	114	110
OE3OPW	"	10,824	109	88
ON9EEE	"	8,848	82	79
IZ2QKG	"	7,700	88	77
IU3MIK/P	"	7,644	95	84
S57EA	"	7,276	73	68
G3L	"	5,700	64	57
		(OP: G3LHJ)		
VE2/PY2KGB	"	4,992	49	48
EA2CAR	"	4,345	57	55
IR6D	"	4,218	64	57
		(OP: IK6QRH)		
N2JJ	"	3,431	47	47
DG3EK	"	3,072	52	48
ZM3T	"	2,772	39	36
		(OP: ZL3TE)		
ZL2IFB	"	2,688	32	32
N3HCN	"	2,553	38	37
JR1LLD	"	2,201	31	31
EA4GJT	"	2,112	46	44
K9TR	"	1,677	43	43
N9LQ	"	1,302	33	31
KQ2RP/1	"	1,054	35	34
YB7GRN	"	528	17	16
VL6K	"	364	14	14
		(OP: VK6WX)		
SV8/SV1CEI	"	360	12	12
IU4BNS	"	3	1	1
AH7RF	"	1	1	1
OK6OK	7	440,134	526	359
CO8OH	"	273,726	283	222
PG2AA	"	269,598	433	294
SP6EIY	"	149,568	293	228
DJ2RG	"	142,044	355	228
K4XL	"	134,550	214	195
IW3ILM	"	104,715	240	195
YO8RIX	"	43,875	169	135
HA3KGC	"	39,730	152	137
		(OP: HA3GC)		
9A6TT	"	39,130	144	130
NE6M	"	31,165	137	115
OM3WZ	"	19,412	100	92
W4RYW	"	8,680	74	70
JK7UST	"	1,944	18	18
DL2NY	"	966	23	23
K8BZ	"	555	15	15
CO2KR	"	480	12	12
SO2U	"	435	15	15
		(OP: SP2UUU)		
JH3DMQ	"	216	9	9
JG3DHN/1	"	136	9	8
JK1DVP	"	104	8	8
XQ3OP	"	98	7	7
BG3LTM	*"*	*16*	*4*	*4*
BD4LB	"	2	1	1
OL4W	3.5	352,268	559	322
		(OP: OK1IF)		
SP7M	"	83,467	252	191
UN9LDC	"	44,436	100	92
SP8OOE	"	23,310	134	111
BH1APZ	"	40	5	5
JH4RUM/4	"	1	1	1
OL1A	1.8	82,533	235	183
		(OP: OK1CW)		
DL1AOB	"	31,920	149	120
HA1TI	"	6,496	62	56
YT1BD	"	2,016	32	32
YP8A	"	1,431	27	27
WØGJ	"	9	3	3
DL1AWD	"	1	1	1

ROOKIE
NORTH AMERICA

United States

District 2

*KI2D	A	61,533	184	159
*KD2SGM	"	6,132	46	42

District 4

*KO4VW	A	358,848	544	336
*KY4ID	"	286,976	466	304
*KY4GS	"	256,038	461	278
*KO4AWC	"	36,285	150	123
*W4SSF	"	7,936	65	64

District 5

K3KEK	A	54,927	217	153
*NR5TX	A	8,687	82	73

District 6

*KN6MLM	14	612	18	18

District 7

KB7SDM	*A*	*1,792*	*36*	*32*
*W7PFY	"	28	7	7

Canada

District 3

*VE3KOT	A	319,956	390	273
*VA3OKG	"	175,176	268	216

District 6

VA6BGE	A	17,316	101	78
*VE6JTW	A	4,420	72	65

ASIA

China

*BI1NJI	21	17,112	128	93
*BI1JNP	"	16,065	97	85

Hong Kong

*VR2NC	28	31,823	209	121

Japan

District 1

JK1BAB	A	171	9	9
*JK1AUY	A	42,112	155	128

Japan

District Ø

*JJØVXN	A	6,976	87	64

Singapore

9V1PL	14	2,320	30	29

Thailand

*E25CRF	21	46,718	213	142

EUROPE

Austria

*OE8ACT	A	18,297	127	107

Czech Republic

*OL2J	A	1,440,738	1095	611
		(OP: OK5MAX)		

Fed. Rep. of Germany

DL3ON	A	117,192	317	228
*DL7PIA	A	17,108	101	94
*DJØMA	"	16,928	102	92
*DD5VL	"	16,240	94	80

Ireland

EI6LA	A	182,640	253	240

Italy

IUØPJJ	*A*	*14,544*	*108*	*101*
*IR4Q	28	71,808	91	79
		(OP: IU4MRU)		

Lithuania

*LYØNAS	A	1,150	26	25

Poland

*SP5DJ	A	58,283	224	167
*SQ5VCO	21	27	3	3

Romania

*YO3HEX	7	159,525	256	212

Spain

*EA4HKF	14	4,032	48	48

OCEANIA

Australia

*VK4JJ	14	336	12	12

Indonesia

*YC9AAI	A	181,224	291	216
*YD2UFR	21	1,224	25	24
*YD6HVF	21	9	3	3

CLASSIC
NORTH AMERICA

United States

District 1

KM1W	A	4,048,380	1853	714
		(OP: W1UE)		
WX7T	"	277,182	386	261
		(OP: K1RM)		
W1TO	"	58,788	159	138
W1OHM	14	35,700	114	108
AE6JV	"	312	13	13
*KR5X	A	2,393,373	1411	633
		(OP: K1BX)		
*KM1CC	"	814,159	822	431
		(OP: N1DC)		
*K1MD	"	496,184	600	367
*AC5XK	"	352,359	512	329
*K1HT	"	157,641	233	187
*N1JI	"	15,300	83	75
*N1DM	"	6,118	48	46
*N1CGP	28	2,821	35	31
*KA1QYP	7	90	9	9

District 2

AF2F	A	1,341,571	1023	539
WN2O	"	1,015,584	733	447
		(OP: N2GC)		
N2MF	"	904,050	739	410
NS2N	"	779,898	737	434
*WA2JQK	7	169,510	324	253
*AC2RL	A	156,891	294	241
*WA2CHV	"	31,374	135	126
*KR2D	"	19,224	105	89
*KS2A	"	7,008	86	73

District 3

W3BGN	3.5	258,318	420	254
*N2EM	A	459,750	642	375
*N2EY	"	398,160	522	315
*AD3PA	"	323,900	454	316
		(OP: K3MSB)		
*W3WTD	"	101,915	251	187
*NX3V	"	50,925	252	175
*NE3I	"	40,230	151	135
*W3YJ	"	27,120	131	113
*KC3DLL	"	10,200	92	75
KY3W	*"*	*3,285*	*48*	*45*
*K3HW	A	49,932	165	146

District 4

NN7CW	A	4,899,223	2294	765
N8KH	"	774,336	818	436
N4KS	"	666,648	781	423
NN4NN	"	254,740	400	271
		(OP: K3SV)		
N4FP	"	205,130	390	281
W8FN	"	133,749	340	231
W4UT	"	86,880	213	160
ND4G	"	58,598	166	166
K4QPL	"	34,560	142	120
*NK4O	A	1,056,480	945	480
*W4SPR	"	930,465	835	465
*AC4G	"	642,375	625	375
*K4DR	"	209,874	430	266
*N4HA	21	119,658	258	231
*K4FTO	A	118,116	294	204
*K3YDX	"	92,826	248	191
*WS4C	"	65,888	163	142
*N4IU	14	39,903	157	141
*N4EK	A	27,348	121	106
KF8N	*"*	*24,320*	*109*	*95*
*WD4CFN	"	21,105	119	105
*K8LBQ	"	14,820	110	95
*AD4TJ	"	1,972	35	34

District 5

KZ5D	A	1,930,494	1606	642
KZ5J	21	221,760	426	308
K5LY	A	29,524	148	121
*WQ5L	A	1,799,634	1386	614
*WA5LFD	"	130,168	321	212
*NM5N	"	5,088	64	53
*NC5G	"	4,860	63	60
*K5OLV	"	1,100	26	25
*KJ5T	A	22,684	137	107
*WC5D	"	1,353	34	33

District 6

K6AR	A	1,696,080	1316	592
AJ6V	"	1,575,890	1370	590
K6NR	"	1,561,536	1274	582
NF6A	"	1,481,800	1119	478
		(OP: K6XX)		
KU6F	"	365,568	674	336
		(OP: K6SRZ)		
K6YK	"	191,178	344	258
W6GEE	"	30,856	150	116
K6VVK	"	40	5	5
*W6TK	A	766,870	879	442
*KW6AA	14	126,492	274	251
*W6ZL	A	45,262	148	106
*KC8J	"	4,648	64	56
*K6EI	"	105	7	7

District 7

N6MA	7	456,456	488	312
K6XT	A	434,250	667	375
W7GF	"	179,018	395	268
KE2VB	"	81,144	255	184
W2HZ	"	17,958	93	82
K7MY	"	12,972	99	92
W6XI	3.5	7,398	56	54
WU6W	A	2,079	34	33
*K7HBN	A	324,240	492	355

*W7OM	"	273,258	487	323
*K7AZT	"	95,090	290	185
*W7MTL	"	59,202	216	143
*NB7O	"	46,717	204	137
*K7SHR	"	42,606	199	162
*WV7S	21	17,170	113	101
*WA8ZNC	"	12,183	110	93
*KD7GOM	A	1,612	27	26
*AA7AZ	"	1,044	30	29
*WY7N	A	50,100	235	150
District 8				
K8MP	A	875,595	894	465
W8TOM	28	5,148	56	52
KE8E	A	2,204	42	38
*K3JT	A	1,034,055	957	495
*WA8MDC	"	354,312	615	357
*NU8A	14	198,484	350	286
*WB8JAY	A	187,566	438	258
*WB8JUI	7	181,260	327	228
*AB8OU	A	128,952	297	216
*AF8A	14	14,976	110	96
*KB8PGW	A	48,495	229	159
District 9				
KØVW	A	135,762	342	242
KJ9C	"	99,450	275	195
*WD9CIR	A	415,233	671	351
*N7ZZ	"	383,994	622	351
*K9UIY	"	252,840	525	294
*W9QL	"	118,035	304	215
*W9KM	"	40,221	139	123
*KC9IL	"	38,480	170	130
*K6PVZ	"	432	16	16
District Ø				
NØAV	A	427,763	635	371
WØETT	"	390,185	548	365
WDØT	"	244,850	461	295
NNØDX	14	56,606	199	166
			(OP: K9DU)	
*W7UT	14	280,606	440	346
*NØUK	A	79,662	251	187
*NØJK	28	675	15	15
Alaska				
AL7LO	A	242,764	384	274
Canada				
District 1				
VE9AA	21	1,419,201	1051	567
VE9HF	14	390,060	498	330
VO1BQ	A	118,069	211	167
VA1RST	7	16,170	56	55
*XK2LI	A	21,090	110	95
			(OP: VY2LI)	
District 3				
VE3MDX	A	33,354	114	109
*VX3KI	A	2,377,648	1321	568
			(OP: VE3KI)	
*VA3FF	"	793,950	698	395
*VE3ZY	14	8,037	58	57
*VA3IIF	21	900	30	30
District 4				
*VE4DL	A	73,260	225	165
District 6				
*VE6UM	21	50,116	176	134
			(OP: VE6BMX)	
District 7				
VA7KO	A	892,012	858	418
*VE7AB	A	6,020	45	43
*VE7GOG	"	2,280	35	30
			(OP: VA7QCE)	
Cayman Islands				
ZF2SS	A	6,550,155	2566	815
			(OP: KO7SS)	
Cuba				
*CO8NMN	A	1,057,990	889	450
*CO8WN	"	401,360	578	337
*CO8OH	7	273,726	283	222
Haiti				
*HH2JA	21	458,248	661	334
			(OP: JK1UWY)	
Panama				
*HP1RIS	28	3,325	36	35
Puerto Rico				
*KP4YO	A	131,760	305	216
*NP4H	"	51,375	147	137
U.S. Virgin Islands				
KP2M	A	9,048,600	2868	900
			(OP: KT3Y)	

AFRICA

Canary Islands				
ED8W	A	8,393,936	2836	856
			(OP: OM5RW)	
*EA8TR	28	2,296	30	28

ASIA

China				
*BH8MDV	7	144,282	152	136
*BI1JY	21	2,356	42	38
			(OP: BI1JNP)	
India				
*VU2DCC	A	41,769	151	119
*VU2JOS	14	11,270	75	70
Japan				
District 1				
JA1XRA	A	35,203	126	107
*JS1KKY	A	204,314	341	251
*JJ2JQF/1	"	74,866	250	166
*JK1BVN	"	58,692	209	134
*JL1GPG	"	45,879	175	123
*JO1PZR	"	44,982	186	126
*JR1DVB	"	35,451	134	101
*JI1BBN	21	16,660	96	85
*JR1LEV	A	14,213	70	61
*JG1TGQ	"	14,124	76	66
*JA1GZK	"	13,000	78	65
*JQ1PCT	"	6,930	61	55
*JR1BQJ	"	5,546	54	47
*JA1CRJ	"	3,937	33	31
*JN1HYU	"	3,760	45	40
*JO1KTD	21	3,234	52	49
*7L1DST	A	2,640	32	30
*JE1SPY	1.8	2,360	53	40
*JH1NVA	21	819	21	21
*JN1VFV	7	96	6	6
*7K1CPT	A	40,530	149	105
District 2				
JE2BOM	A	183,456	318	208
JR2ALA	"	144,336	266	194
*JG2RFJ	A	120,213	253	171
*JA2KKA	14	115,260	110	102
*JS2PHO	21	21,008	120	101
District 3				
JR3RIU	A	212,790	388	246
JA3VOV	"	157,403	353	214
JL3DQX	3.5	2,340	9	9
*JI3XOK	A	37,376	174	128
*JS3EOE	"	2,618	47	34
*JA3YVI	14	2,250	7	6
*JG3EHD	"	48	4	4
*JE3AKU	A	68,103	194	141
District 4				
*JM4WUZ	A	387,180	506	324
*JH1MTR/4	"	65,664	190	128
*JH4FUF	21	1,122	23	22
*JA4TUJ	A	714	14	14
District 5				
*JA5CBU	21	91	7	7
District 6				
JA6BWH	A	75,036	187	148
JA6BCV	"	3,104	33	32
*JR6KBF	21	22,227	103	85
*JH6EXF	A	17,712	93	82
District 7				
*JH7QXJ	A	819,702	807	414
*JF7VVL	21	2,275	41	35
District 8				
JA8RUZ	A	38,760	176	114
*JA8RWU	A	324,929	649	277
*JA8HBO	14	6,264	58	54
*JK8PBO	A	3,003	45	39
*JE8UHY	"	2,925	43	39
*JG8NKJ	14	147	7	7
District Ø				
*JIØWVQ	A	37,994	144	121
Kazakhstan				
*UN4L	A	3,115,080	1562	612
UNØL	"	*80,388*	*194*	*154*
Nepal				
9N7AA	A	1,814,904	1380	554
Taiwan				
*BU2EO	A	245,920	680	292
Thailand				
*E22UUW	21	158,508	300	238
*HS8KGG	A	4,512	56	48

EUROPE

Albania				
*ZA1F	A	70,047	258	181
Austria				
*OE7AFT	A	18,507	103	93
Belgium				
*OT5Q	7	212,265	386	265
*ON4CT	A	170,275	362	245
Bosnia-Herzegovina				
*E7/Z35M	A	479,669	689	367
Bulgaria				
LZ7J	A	2,366,640	1556	692
			(OP: LZ1CL)	
*LZ1VKD	14	352,365	539	417
*LZ2GS	28	19,694	101	86
Croatia				
*9A8M	14	230,408	450	332
			(OP: 9A7DM)	
*9A5G	A	129,234	314	238
			(OP: 9A2VX)	
*9A2IK	"	52,490	215	181
Czech Republic				
OK2EQ	A	187,473	349	253
OK1XC	21	71,394	186	163
*OLØA	A	1,108,870	965	490
			(OP: OK1CZ)	
*OK1DKU	"	234,780	369	260
*OK2HBR	3.5	112,037	295	199
*OK1AUO	A	71,622	228	173
*OK8SMS	7	53,605	192	151
*OK1FGD	"	11,005	79	71
*OK1JDJ	14	6,206	59	58
*OK1HCG	A	30,012	146	123
*OK1LO	14	27,604	142	134
Denmark				
*5Q6EE	A	1,093,533	1092	555
			(OP: OZ2I)	
England				
*M5G	A	314,758	573	337
			(OP: MØURL)	
*M2U	14	239,757	491	343
			(OP: MØDHP)	
*M3X	A	202,950	396	275
			(OP: MØIHT)	
*MØSEV	14	89,444	311	236
*G4BEE	"	13,090	88	85
*G3YZO	"	2,385	47	45
*M7R	A	339,099	545	327
			(OP: GØTPH)	
Fed. Rep. of Germany				
DJ5MW	A	5,106,240	2128	810
DL4ME	7	1,013,500	760	488
DF6RI	A	112,554	284	222
DL1HWS	"	56,322	148	126
DKØSU	"	54,740	175	140
			(OP: DF7SA)	
DJ4KW	"	48,032	189	158
DL2ZBO	"	16,720	119	95
*DL1WA	A	1,329,705	1104	585
*DK3YD	"	1,176,418	1043	521
*DJ3HW	"	777,621	785	471
*DL5KUD	7	479,650	543	362
*DK4LX	"	398,130	512	345
*DK2ZO	A	314,400	451	300
*DJ2FL	"	204,952	542	346
*DL7YS	"	166,408	314	244
*DF2WZ	"	135,973	306	227
*DFØBV	7	113,436	208	207
			(OP: DL1MAJ)	
*DG4UF	14	107,415	265	231
*DL9MFY	A	68,800	206	160
*DM6ØUEA	"	61,502	215	161
			(OP: DH8BQA)	
*DL4JU	"	56,672	196	161
*DL1HSI	"	46,926	205	158
*DF3CE	"	43,080	145	120
*DK5KF	"	24,310	126	110
*DM3XB	"	10,218	97	78
*DL4FCJ	"	9,882	66	61
*DM3AW	14	5,995	55	55
*DK8NC	1.8	3,268	37	37
DG6MDG	*A*	*693*	*22*	*21*
*DL1SBF	21	220	12	11
*DL4JWU	A	9	9	9
*DK7OG	A	42,048	187	144
*DL8ZAJ	"	18,330	108	94
*DG3EK	14	3,072	52	48
DC1MBR	*A*	*8*	*2*	*2*
Finland				
OH2BA	A	1,741,320	1406	630
			(OP: JK3GAD)	
OH1VR	"	1,174,880	1093	560
OH1ØA	"	346,164	522	364
			(OP: OH1X)	
OH5ZA	14	35,894	140	137
			(OP: OH1ZAA)	
OH2VZ	"	18,150	117	110
OG6B	7	2,905	36	35
			(OP: OH1ZAA)	
OH1QX	21	1,300	28	26
			(OP: OH1ZAA)	
*OH5TS	14	559,208	734	494
*OH1SIC	A	200,549	453	251
			(OP: SM5SIC)	
*OH1TS	"	104,420	323	227
*OH5MQ	"	8,576	73	67
*OH3MM	14	360	18	18
France				
TM5T	A	2,674,212	1715	703
			(OP: F5VKT)	
*F5NTZ	A	164,193	341	229
Greece				
*SV8OVJ	A	395,418	680	354
*SV8DJW	"	32,604	184	156
*SV2SKD	"	26,230	152	122
*SV1CDN	21	9,179	71	67
*SX335T	14	8,364	73	68
*SV8MDV	A	2,115	49	45
Hungary				
HA8DU	A	1,981,288	1254	668
*HA5BMS	A	273,980	393	266
*HA2EOU	14	108,732	252	221
*HA5BA	A	150,064	328	226
Ireland				
EI/US2YW	A	146,772	365	243
Italy				
IKØYUT	*A*	*1,790,800*	*1431*	*605*
I1NVU	"	267,320	493	326
IO3F	7	209,585	400	251
IK2AHB	"	180,432	328	252
*IV3EAD	7	546,588	515	378
*IV3FPX	A	233,442	440	297
*IK2ULV	"	222,372	400	284
*IKØTUM	"	126,500	297	230
*IQ5OX	7	101,258	274	197
			(OP: IZ5FDE)	
*IK1QBT	"	79,261	250	169
I1WQR	*A*	*46,488*	*226*	*149*
*IK8ARF	"	39,552	148	128
*IK2AIT	"	16,000	115	100
*IZ1PLH	"	13,965	119	105
*IU6FUB	"	6,076	70	62
*IZ5JLW	"	3,403	43	41
*IKØRMR	14	2,440	66	61
*IZ3KMY	A	1,479	30	29
*IV3ZNK	14	850	26	25
*IW2JPB	7	700	20	20
*IZ2ABZ	"	168	15	14
Latvia				
YL2VW	A	1,974,820	1333	674
YL7A	"	1,362,396	1122	662
			(OP: YL2GM)	
YL2PJ	"	1,244,972	1147	569
YL6W	21	182,210	353	266
			(OP: YL2GD)	
Lithuania				
LY4T	A	65,520	223	168
LY5O	3.5	5,123	51	47
Luxembourg				
LX1NO	28	15,006	95	82
Netherlands				
*PA2VS	A	49,126	196	154
*PAØMIR	7	41,789	146	125
Norway				
LC5T	A	658,515	836	429
			(OP: LB5WB)	
*LB2WG	A	82,593	239	189
Poland				
SO3O	A	1,015,280	983	518
*SP1R	14	522,430	675	473
*SN7F	A	304,236	502	324
			(OP: SP7AH)	
*HF74QMP	"	295,323	525	287
			(OP: SP9GFI)	
*SP9OUV	7	214,851	379	273
*SP2GCE	A	166,779	346	261
*SP4AWE	3.5	156,980	353	235
*SP7OGP	7	149,408	300	224
*SP9CXN	14	105,799	279	241
*SP5ENG	"	56,286	178	161
*SP8CGU	"	52,805	195	179
*SP7JDI	A	48,216	222	164
*SN4EE	21	38,190	155	134
			(OP: SP4AWE)	
*SP9R	"	23,562	108	99
*SP6BEN	A	4,840	40	40
*SQ5W	14	3,720	68	60
SP8BRT	"	*1,656*	*46*	*46*
*SQ6A	21	1,425	25	25
*SP1/UX1HW/M	28	180	10	10
*HF5WIM	14	47,614	198	179
*SQ4HKU	21	14,742	96	91
*SP4NKJ	28	726	25	22
Portugal				
*CT7AUP	A	565,650	618	419
Romania				
YO3GNF	A	425,196	619	372
YR8I	28	105,884	258	206
			(OP: YO8OY)	
YO2GL	1.8	42,380	161	129
*YO8BDW	A	229,177	640	330
*YO5AXF	3.5	114,130	247	174
*YO5YM	A	59,452	214	167
*YO7LYM	"	44,250	238	177
*YO6DMR	14	42,900	167	156
*YO3JW	21	26,250	138	125
*YO2ARM	A	17,266	97	89
*YO9HG	"	2,000	44	40
Scotland				
MM3T	A	380,888	616	376
Serbia				
YU1RA	7	978,164	717	473
Sicily				
*IT9CKA	A	73,696	245	188
*IT9KCD	21	12,312	91	80
Slovak Republic				
*OM2DT	A	205,257	456	321
*OM3CDN	"	86,559	268	183
*OM7AT	"	56,416	209	172
*OM2AGN	14	17,649	113	111
Slovenia				
*S57X	3.5	133,455	293	217
*S53WW	A	51,538	196	146
Spain				
EA5M	A	1,675,800	1248	588
EF1C	21	27,324	144	114
*EA1DD	3.5	69,913	175	151
*EA3TJ	A	1,798	73	62
Sweden				
*SM5CSS	A	714,560	831	464
*SF6W	"	628,367	880	401
			(OP: SM6EWB)	
*SM5MX	"	351,210	576	345
*SM5LW	"	35,224	154	136
*SM4EPR	"	14,329	106	89
Switzerland				
*HB9IIH	A	1,824	39	38
*HB9LL	A	7,040	73	64
			(OP: HB9TPN)	
Ukraine				
*UX3UU	28	1	1	1
Vienna Intl. Center				
*4U1A	14	128,616	412	276
			(OP: OE1ZZZ)	

OCEANIA

Australia				
VL2G	A	1,980,060	1121	541
			(OP: VK2GR)	
VL2N	"	931,287	736	427
			(OP: VK2PN)	
*VK3IU	28	14,162	94	73
*VJ3O	14	4,620	45	44
			(OP: VK3TX)	
*VK2CCC	A	129,926	250	167
East Malaysia				
*9M6NA	A	1,890,900	1476	557
			(OP: JO4JKL)	
Hawaii				
WH7T	A	3,615,320	1674	670
			(OP: WH7W)	
*NH6O	A	24,940	108	86
Indonesia				
YB2MM	A	250,848	354	234
YB7KE	28	20,230	107	70
YC8DUL	A	3,774	41	37
YB1IQE	21	2,212	29	28
*YB1JCD	A	172,010	374	228
*YC3DOC	"	33,120	129	115
YC2XCD	"	*18,270*	*111*	*87*
*YB8JEC	21	23,688	104	94
*YB1TIA	A	9,912	72	59
*YB2CTE	"	493	17	17
*YB9GV	28	195	13	13
New Zealand				
ZL1IF	A	1,537,224	952	507
ZL4YY	14	13,184	62	56
Philippines				
*DU1VGX	14	4,141	39	37

SOUTH AMERICA

Argentina				
LT6M	28	1,909,096	1348	658
			(OP: LU8MHL)	
LO5D	"	416,262	483	318
*LU6OA	A	11,840	69	64
*LU2DPW	28	2,697	31	31
Brazil				
ZX2E	A	1,810,053	1107	549
			(OP: PY2ZEA)	
PY2MC	28	567,700	594	350
*PY2NY	14	1,619,874	1003	558
*PY2ARY	21	7,920	62	60
*PU2TNT	A	5,368	48	44
*ZZ7ZZ	28	4,494	45	40
Chile				
CB3R	28	491,841	555	333
			(OP: XQ3SK)	
*XQ1CR	28	884	28	26
Curacao				
PJ2T	A	5,996,067	2527	757
			(OP: WI9WI)	
Uruguay				
*CX2AQ	21	491,729	481	353

TRIBANDER / WIRES

NORTH AMERICA

United States

District 1				
W1WEF	A	965,550	902	471
W3SM	"	865,176	720	472
K2LE	"	648,440	630	430
KB1NO	"	321,328	398	304
N1QY	"	220,651	367	233
N1KM	"	146,222	275	226
KZ1M	"	144,755	291	221
ND1X	"	34,440	123	120
*N1EN	A	1,645,622	1232	571
*K1TR	"	1,636,944	1166	536
*W1NU	"	274,000	400	274
*AI1TT	14	81,060	215	187
			(OP: W1WBB)	
*W1FJ	A	557,406	614	346
District 2				
AB2E	A	2,308,493	1474	649
N2BA	14	1,951,460	1210	742
KE2D	A	1,785,020	920	599
WR2G	"	1,397,790	989	558
W2NO	"	1,301,288	830	568
K2RET	"	689,169	604	431
WB2NVR	"	551,000	619	380
N2SQW	"	511,360	500	376
KA2MGE	"	414,180	579	351
NE2V	"	324,405	368	267
W2CN	"	54,831	181	147
KA2D	"	11,000	61	55
WO2X	"	1,078	23	22
K7RB	"	234	9	9
*N2UU	A	843,484	762	433
*NM2A	"	637,600	685	400
*NF2RS	"	580,144	685	404
*W2FDJ	"	404,260	469	340
*W2GDJ	"	99,702	213	191
*KB2URI	"	6,164	47	46
*KS2G	"	4,085	43	43
*W2YK	"	3,800	42	40
*WO2T	"	2,730	37	35
*K2AL	A	223,573	402	287
*N2JJ	14	3,431	47	47
District 3				
N3QE	A	5,525,370	2381	870
K3MD	"	2,100,189	1352	637
NC3Y	7	744,328	702	421
WA3AER	A	294,722	431	298
NF3R	"	276,723	367	277
KS3F	21	97,704	207	207
K3AU	A	73,845	147	135
			(OP: K2YWE)	
KØOO	28	29,328	90	79
*NJ3K	A	1,055,157	1054	509
*K3QP	"	497,140	518	371
*NR3Z	"	133,170	304	230
*AC3U	"	35,211	146	121
			(OP: W3UL)	
*WA3AAN	"	11,100	82	75
*AJ3M	7	247	13	13
District 4				
KQ4R	A	3,206,952	2007	756
N1TO	"	2,263,734	1494	666
NE2CC	"	1,399,015	986	545
			(OP: W4CU)	
K4BAI	"	1,373,109	1262	537
N4CWZ	"	1,202,280	980	516
KU8E	14	1,139,670	998	603
N4OX	21	651,910	675	465
NN4SS	A	611,124	577	401
NF4A	"	432,180	541	343
K5VIP	"	237,864	294	264
W2XYZ	"	62,050	189	146
W4XO	"	49,416	176	142
N4TL	"	41,040	138	120
K3DNE	"	39,804	158	124
WF7T	28	38,194	143	113
KB4KBS	A	25,070	139	109
WM4Q	"	23,968	114	107
*NU2A	A	2,621,457	1628	711
			(OP: N2YO)	
*WC4E	"	1,966,888	1148	616
*K4GM	"	940,491	866	459
*AA4LR	"	432,720	542	360
*N4NTO	"	404,397	608	343
*KB4CG	"	346,580	574	310
*KT3T	"	149,568	253	192
*N4UW	"	144,966	290	222
*NG2J	"	111,186	310	213
*AA8R	28	6,171	57	51
*NR4O	21	3,750	53	50
*W4OT	"	1,092	27	26
			(OP: K4JC)	
*WA4PGM	A	26,928	111	102
*W4ER	"	24,960	122	120
*W4RYW	7	8,680	74	70
*N3HCN	14	2,553	38	37
District 5				
KT5C	A	891,632	1097	532
N5TJ	"	259,369	406	323

KM5VI	"	222,794	391	286
N5UI	"	130,301	320	229
WA5LXS	"	20,564	102	97
*NN5T	A	405,000	576	324
*W6FB	"	285,348	478	316
*K5MR	"	222,562	423	257
*K5GQ	"	137,632	257	187
*WR5P	"	123,824	355	218
			(OP: K5OY)	
*NN5O	"	52,299	207	149
*N5XE	"	39,045	141	137

District 6

KE1B	A	728,538	854	474
NN6DX	"	440,672	574	376
			(OP: W1PR)	
K6PO	"	387,720	535	359
W6SX	"	210,280	513	280
NT6X	"	204,372	390	252
K6MM	"	179,219	345	277
AI6Z	"	112,545	231	183
W1RH	"	89,890	300	202
NN6C	"	70,064	171	151
			(OP: W6SC)	
NK6A	"	54,670	200	154
AB1U	"	42,693	141	133
			(OP: W6RKC)	
K6NV	"	29,766	162	121
N5KO	"	22,088	111	88
KF6NCX	"	18,088	144	119
WI6X	"	2,432	38	38
*W7TR	A	157,950	323	234
			(OP: KH2TJ)	
*K6CSL	"	23,192	134	104
*W6JPL	28	8,586	26	25
			(OP: K6ICS)	

District 7

KM7W	A	1,686,096	1472	648
			(OP: KL9A)	
KS7T	"	931,294	1015	559
NO7R	21	879,674	933	569
			(OP: AA7V)	
KC7EFP	A	823,998	983	483
K7JQ	"	260,178	590	309
K7GS	"	221,451	315	291
K7HP	"	109,120	355	220
K7VIT	"	76,382	249	181
W7SLS	"	8,540	82	61
*N7JI	A	82,482	288	177
*AB5ZA/7	"	28,556	158	121
*KNØW	"	26,537	170	119
*KN7T	"	12,300	100	75
*WZ8T	"	8,712	80	72
*NX1P	A	79,459	260	181
*NN7SS	"	5,432	70	56
			(OP: K6UFO)	

District 8

NO8DX	A	580,125	651	375
			(OP: K8MR)	
K8PK	"	340,119	496	351
AA5TA	"	5,916	55	51
N8RY	*14*	*364*	*15*	*13*
*AA8CA	A	1,606,416	1347	588
*NN8UU	"	1,246,848	1191	544
*K8BL	"	300,014	482	286
*K7DR	"	221,112	399	249
*N8FYL	"	14,952	96	89
*ND8D	"	264	11	11
*AG8Y	A	12,879	115	81
			(OP: W8EH)	

District 9

W9ILY	21	472,175	499	425
KK9V	14	109,746	218	177
*NE9U	A	1,792,089	1401	663
*K9CW	"	621,432	711	411
*N9UA	"	324,480	456	338
*WA9LEY	"	213,226	423	278
*K9WA	"	157,855	323	241
*KC9YL	"	45,582	173	142
*KB9S	"	29,464	145	116
*KX9DX	7	18,952	130	103
*K7CS	A	15,910	103	86

District Ø

KMØO	A	533,975	743	403
NCØB	"	415,659	674	397
			(OP: NØTA)	
K4IU	"	411,279	642	363
NWØM	"	249,343	544	293
NGØT	"	196,092	301	234
W7RF	"	86,376	245	183
NØKQ	"	62,169	228	159
*AD1C	A	928,893	907	497
*KØKX	"	207,828	326	276
*KMØDX	"	43,901	236	143
			(OP: WØTT)	
*KØPC	"	18,445	100	85
*KBØNES	"	8,816	89	76
*NØUR	A	75,396	251	183

Canada

District 1

*VE9KK	A	14,904	81	72

District 2

*VE2IR	A	738,840	722	393

District 3

VE3UZ	A	238,160	400	260
*VE3MGY	A	1,509,936	1076	498
*VE3OI	"	1,007,746	743	461
*VE3TM	14	855,286	710	499
*VE3GFN	A	729,492	702	372

District 6

*VE6WR	A	84,660	205	170
*VA6RCN	"	162	9	9
			(OP: VE3RCN)	

Costa Rica

*TI2OY	A	732,251	747	403
*N5NU/TI2	"	152,110	321	205
			(OP: N5NU/TI2)	

Puerto Rico

*KP4JRS	21	331,526	465	311
*KP4JFR	7	11,390	10	10

U.S. Virgin Islands

*KP2B	A	298,368	427	259
			(OP: LU8EOT)	

AFRICA

Canary Islands

ED8M	28	1,342,250	93	83
			(OP: EA8DIG)	
EA8DIG	14	18,720	84	78

Madeira Islands

CT3KN	A	9,169,552	2756	973

Morocco

*CN8WW	A	66,882	180	142

ASIA

Asiatic Turkey

*TA7I	A	1,915,818	1051	538
*TA2IJ	"	54,808	161	136
*TA4RC	"	4,230	48	45

Georgia

*4L6QL	A	428,314	478	331

India

VU2YYF	A	548,772	624	329
VU2IBI	"	19,530	104	93
*VU3GDS	A	179,712	344	234
*VU2DED	"	84,966	199	147

Israel

4Z5LY	A	2,707,250	1496	595
4XØA	28	159,936	304	224
			(OP: 4X1VF)	
*4Z4KX	3.5	249,872	246	184
*4Z5MU	28	68,832	192	144

Japan
District 1

JK1LSE	A	821,486	890	431
JR1GSE	"	541,296	715	358
JH1HIC	"	472,068	602	324
7K4VPV	"	383,570	530	317
JH1CTV	"	296,153	499	247
JQ1UXN	"	87,318	236	154
JI1JPJ	14	6,608	58	56
JL1LNC	A	3,306	43	38
JS1KQQ	"	341	11	11
*JA1PCM	A	164,138	296	214
*JF1GZZ	"	136,128	311	192
*JJ1AEB	7	87,420	150	131
*JK1JHU	A	82,634	250	158
*JH1VIX	21	64,628	111	89
*JG1XIO	A	56,548	174	134
*JF1WNT	"	52,864	185	118
*JF1JDG	"	50,939	170	133
*JJ1KZZ	"	33,284	113	106
*JO1WIZ	"	22,113	117	91
*JK1HWU	3.5	13,065	91	67
*JK1FUP	A	11,573	84	71
*JP1JZR	"	9,588	79	68
*JJ1LRD	"	3,854	49	41
*JQ1VDJ	"	1,222	31	26
*JA1CHY	"	21	3	3

District 2

JF2FIU	A	306,772	548	283
JA2JWH	"	12,816	90	72
*7K1MAG/2	A	290,862	410	286
*JA2FXV	"	212,496	385	233
*JG2TSL	"	123,630	278	195
*JA2GHP	"	61,488	211	144
*JR1UJX/2	A	3,680	54	46

District 3

JQ3ALW	A	514,026	580	342
			(OP: JH1TXG)	
JN3SAC	"	286,740	405	270
JM3UGA	"	7,568	49	44
*JP3WEL	3.5	335,800	12	12
			(OP: JG1EIQ)	
*JI3KDH	28	15,792	96	84
*JA3MIB	7	600	10	10
*JG3LDD	21	40	6	5

District 4

*JE4MHL	A	978,048	958	432
*JA4LCI	"	10,752	64	64

District 5

JE5JHZ	A	108,996	222	186

District 6

*JH6OPP	A	253,129	459	269
*JA6CVR	"	64,680	208	140
*JF6ABL	21	43,776	129	107
*JE6JZP	A	544	18	17

District 8

*JM8FEI	A	96,558	293	154
*JE8KKX	"	26,040	124	84

District 9

JA9CWJ	A	299,827	411	281
JA9CCG	"	5,661	63	51
*JH9ETC	28	8	2	2

District Ø

JJØJML	A	1,584,048	1167	541
JJØPJD	"	143,441	258	191
*JHØNEC	A	773,828	690	409
*JHØMUC	"	407,028	577	321
*JHØDUG	"	62,172	231	132

Kazakhstan

*UN7FW	A	431,568	510	333

Oman

*A41CK	A	19,019	95	77

Saudi Arabia

HZ7C	A	4,084,800	1972	740
			(OP: 7Z1SJ)	
*HZ1TT	A	1,086,713	846	409

Singapore

*9V1HY	A	2,220	30	30

Thailand

*E29AHU	A	28,197	177	117
*E21IZC	7	70	6	5

EUROPE

Belgium

ON4TTT	A	1,005,485	832	499
*ON9TT	A	277,932	485	318
*ON4LY	"	11,600	102	100
*OPØHQ	"	1,680	46	42
			(OP: OP5T)	
*ON7NU	14	80	10	10
*ON6NL	A	1,646,390	1269	610
*ON5IA	"	13,083	101	89

Bulgaria

LZ3ZZ	A	3,846,699	2116	831
LZ1HW	"	90,860	190	154
*LZ1JZ	A	1,320,405	1225	565
*LZ7DX	"	895,850	814	475
*LZ2HT/P	"	1,976	40	38
*LZ5ØYE	A	788,184	1005	492
			(OP: LZ1YE)	

Corsica

*TK/F5NBX	A	9,983	74	67

Croatia

9A2AJ	A	3,674,835	1806	815
9A1KDE	"	55,485	151	135
			(OP: 9A2VR)	
*9A1AA	A	2,623,050	1519	725
*9A2R	"	386,616	468	362
*9A3MA	"	243,513	373	311
*9A4WY	"	150,480	341	240
*9A9XX	"	86,314	256	206

Czech Republic

OK1OA	A	1,042,080	891	501
OK2PF	"	18,954	91	81
*OK1QM	A	557,467	686	409
*OK2GU	"	283,632	534	311
*OK1TRJ	"	147,150	318	225
*OK1DKE	"	99,561	323	231

Denmark

OZ3SM	A	1,853,176	1366	692
OV3X	"	1,603,642	1020	643
			(OP: OZ8AE)	
*OZ6TM	A	3,784	47	43
OZ5DX	*"*	*912*	*20*	*19*

England

GØMTN	A	3,463,920	2033	765
M7Q	"	398,008	491	356
			(OP: G4PIQ)	
G4LPD	"	105,328	264	227
G3TDH	"	21,079	116	107
*M6W	14	1,351,254	1149	678
			(OP: G3WW)	
*M2J	A	1,061,924	891	514
			(OP: G4NBS)	
*G4PVM	"	1,011,500	999	500
*MX1COL	"	83,888	284	214
			(OP: G4EUW)	
*2EØCVN	A	90,308	309	214
*G4BUE	"	34,710	174	130

Estonia

ES2/URØMC	A	229,308	505	291

Fed. Rep. of Germany

DL3UB	A	3,704,472	1842	828
DL2RMC	"	2,617,142	1639	706
DL5LYM	"	2,445,072	1165	798
DL1NEO	"	1,872,192	1063	796
DL5YM	"	1,810,557	1296	609
DJ8EW	"	977,784	943	524
DL1DTL	"	957,437	774	611
DJØSP	"	863,870	816	490
DQ2C	3.5	840,360	802	447
			(OP: DL2SAX)	
DK2AT	A	277,023	456	321
DL6HCC	"	246,357	355	279
DJ2AX	"	112,623	294	217
DL4RCE	"	96,131	217	217
DL7LX	"	18,156	96	89
DJ9AO	28	15,130	87	74
DJ4MO	A	2,688	44	42
*DK5DQ	A	3,852,505	1812	815
*DJ5MO	"	3,681,558	1502	863
*DL4FN	"	3,301,500	1683	775
*DL6RAI	"	2,945,070	1551	761
*DM7W	"	1,646,678	1060	638
			(OP: DL8MAS)	
*DM6EE	"	1,411,020	1011	585
*DL7URH	"	1,326,320	1090	562
*DA3T	"	1,324,680	1081	581
			(OP: DL8DXL)	
*DL8TG	"	1,324,050	1044	582
*DL1QQ	"	985,552	895	496
*DK7YY/P	"	652,315	760	461
*DF1LON	"	529,100	637	407
*DJ5CW	"	326,874	547	347
*DP5P	"	305,124	389	282
			(OP: DL1MHJ)	
*DM3F	"	275,352	410	308
			(OP: DH5FS)	
*DL5CL	"	231,210	388	315
*DJ7UC	14	186,531	359	291
*DJ3RA	A	154,395	332	235
*DJ9SN	"	121,524	281	228
*DL1EMA	"	116,413	297	209
*DM5JBN	"	100,188	231	207
*DHØGDS	21	40,468	148	134
*DAØY	A	23,968	129	112
			(OP: DL2GPK)	
*DC8YZ	"	20,988	134	106
*DHØAAC	"	19,686	107	102
*DL8RB	"	19,475	107	95
*DF1LX	"	11,297	109	79
*DO4OD	"	9,100	71	70
*DC8SG	14	8,970	70	69
*DK2YL	A	1,302	21	21
*DG3T	A	1,473,528	1149	588
			(OP: DF5RF)	
*DG2FDD	"	1,024	35	32
*DJ3EI	"	567	21	21

Finland

*OH1NA	A	550,338	764	402
			(OP: OH1NOA)	

France

TMØSOC	21	15,106	26	26
			(OP: F5PBL)	
*F8CRS	A	44,415	145	135

Greece

*SV2EVS	A	283,360	579	352

Hungary

HG6O	A	3,286,560	1852	820
			(OP: HA6OA)	
HG1A	"	2,760,200	1728	746
			(OP: HA1ZN)	
HA3OU	"	310,312	407	316
*HA8LLK	A	153,066	334	263
*HA1WD	7	47,320	154	140
*HA1TI	1.8	6,496	62	56

Ireland

*EI3CTB	21	13,365	64	60

Isle of Man

MD2C	A	1,103,376	1008	543

Italy

IO6A	A	3,677,714	2022	809
			(OP: IK6QON)	
I2IFT	7	2,819,766	1293	699
IK3UNA	A	1,582,872	1238	606
I2WIJ	"	719,082	741	439
IR8O	21	528,880	618	440
			(OP: IZ8GCB)	
IO3M	A	361,788	490	354
			(OP: IU3PMA)	
IK2SND	"	255,316	498	284
IKØYVV	"	112,668	340	229
IK3OII	"	18,960	79	79
IK2IKW	"	8,256	64	64
*IZ8BRI	21	629,953	691	491
*IK2AOO	A	157,500	362	250
*IK4RQJ	"	128,402	282	218
*IK2AUK	"	50,711	201	157
*IK4MTF	"	35,052	160	138
*IK1ZFO	14	32,760	176	156
*IK7NXU	A	29,458	110	103
*IK2RLS	"	26,471	130	103
*IW1RLC	"	22,155	120	105
*IU2JWF	"	18,042	100	93
*IK3YBX	"	14,758	100	94
*IZ2LTW	14	12,879	81	81
*IRØY	A	6,660	61	60
			(OP: IWØGYC)	
*IW2BZY	"	5,040	51	48
*IV3DLW/P	"	1,891	31	31
*IK1YRA	"	765	17	17
*IW5ECP	"	136	8	8
IW2ENA	*14*	*8*	*2*	*2*
*IZ2QKG	14	13,248	88	77

Latvia

*YL1YF	A	861,714	988	441
			(OP: YL3GAZ)	

Lithuania

LY7T	A	1,449,890	1226	587
*LY5XX	A	1,086,888	1082	506
*LY3AB	14	165,597	349	289

Luxembourg

*LX1ER	21	2,432	32	32

Malta

9H1CG	A	35,862	160	139

Netherlands

PI4VPO	A	706,112	786	472
			(OP: PA2A)	
*PC3T	A	421,243	419	349
*PC4H	"	320,974	524	334
*PA3DBS	"	77,056	241	172
*PG7M	14	63,412	194	191
*PE1HWO	A	33,136	123	109
*PG2W	"	7,979	87	79

North Macedonia

Z35F	1.8	70,950	215	165
Z39A	7	64,860	168	141
*Z33F	21	357,615	573	405

Northern Ireland

*MI5I	A	1,808,730	1529	638
			(OP: GIØRQK)	

Norway

LA7GIA	A	750,752	935	464
LAØCX	"	572,426	743	433
LA7AK	"	93,060	259	188
LA3TK	"	10,368	67	64
*LA2HFA	A	352,872	549	338
*LA6CF	"	79,566	214	178
*LAØGE	21	53,890	203	170

Poland

SP3JDZ	A	19,095	101	95
*SP9XCN	A	3,072,784	1680	748
*SP1AEN	"	1,738,500	1334	610
*SN1F	7	441,501	496	367
			(OP: SP1GZF)	
*SN8J	A	364,536	510	332
			(OP: SP8ALT)	
*SP9W	"	265,440	479	336
*SP9GMI	"	129,156	284	229
*SQ6JNX	"	128,960	276	260
*SP6MI	"	43,516	210	172
*SP/UT5UT	28	18,655	101	91
*SQ2RH	A	8,418	76	69
*SP9KJU	"	1,708	31	28
			(OP: SP9MDY)	
*SP9IVD	"	220	12	11
*SP2EPV	"	26	29	26
*SO2U	7	435	15	15
			(OP: SP2UUU)	

Portugal

CR6E	A	154,108	317	236
			(OP: CT7AIX)	
*CR5O	A	2,153,952	1554	648
			(OP: CT7AJL)	
*CT1DRB	"	1,363,230	1060	729
*CT1BOH	"	76,128	210	156
*CT1EHK	"	17,112	104	93

Romania

YO4NF	A	2,748,273	1940	737
YO3FF	"	17,205	121	111
*YO5AVN	3.5	286,395	442	305
*YO3APJ	A	221,125	409	305
*YO3GCL	"	108,680	272	209
*YO4AAC	"	81,055	292	215
*YO2IS	21	61,424	197	176
*YO6LA	14	32,186	126	117
*YO4CSL	A	30,628	144	124

Scotland

MM9I	A	4,066,440	2189	840
GM2Y	"	62,790	227	182
			(OP: MMØDXH)	
*MM2T	A	1,136,250	1070	505
			(OP: GMØLIR)	

Serbia

YT6X	A	3,663,675	1694	855
YT3K	7	858,514	718	454
YT8A	1.8	205,380	323	217
YT7R	21	19,422	100	83
			(OP: YU7BW)	
*YT2RX	28	18,286	93	82
*YU1LM	A	529,429	738	389

Sicily

IT9SSI	A	207,000	444	300
*IT9RZU	28	6,448	54	52

Slovak Republic

*OM5KM	A	631,598	683	418
*OM5CM	"	400,860	559	340
*OM6TU	3.5	55,664	206	142

Slovenia

S51DX	7	157,992	325	208
S56X	1.8	114,063	300	197
*S52W	A	2,191,368	1475	697
*S54X	7	756,966	571	469
*S51MM	"	211,932	328	261
*S57KM	A	56,392	199	152
*S53FO	A	28,194	156	127

Spain

EC5K	21	1,333,380	1060	626
EA5FID	A	1,291,224	996	584
EA3OH	14	485,030	694	455
EA4FME	A	43,350	174	150
*EA4BAS	A	346,446	504	342
*EA4M	"	76,960	251	208
*EH4ØURV	"	42,630	197	147
			(OP: EB1RL)	
*EA1DA	3.5	8,568	31	31
*EA4U	A	8,437	65	59

Sweden

SMØHRP	A	1,518,075	1170	585
SD1A	"	424,490	676	374
			(OP: SM1TDE)	
*SD6F	A	1,071,224	1169	518
			(OP: SM6JWR)	
*SDØN	"	657,183	753	439
			(OP: SMØNSJ)	
*SE4E	"	222,999	483	287
			(OP: SM4DQE)	
*SM7CIL	"	202,860	362	276
*SFØA	"	149,492	372	266
			(OP: SMØLPO)	
*SE6K	"	87,780	299	210
			(OP: SM6FZO)	
*SM6F	21	21,112	98	91
			(OP: SM6CUK)	
*SM5CCT	A	13,064	110	92
*SF5M	"	3,354	43	43
			(OP: SM5SYO)	

Switzerland

HB9DQL	A	3,401,592	1678	813
HB9CVQ	"	1,569,862	1086	581
*HB9BUN	A	11,424	70	56

Ukraine

*US7IGN	A	179,036	408	286

OCEANIA

Australia

VJ5W	A	860,890	669	437
			(OP: VK5GR)	
*VL5Q	A	8,340	65	60
*VK3KTT	"	2,100	30	30
*VL3E	28	940	23	20
			(OP: VK3TZ)	

Guam

NH2DX	21	590,031	615	351
			(OP: KG6DX)	

Hawaii

AH6KO	A	3,846,284	1776	646
KH6TU	"	3,726,080	1594	656
			(OP: AD6E)	

Indonesia

*YB1RKT	A	234,867	323	237
*YB9ELS	"	215,985	367	231
*YB1UUN	"	47,214	145	122
*YE1GD	"	18,164	109	76
*YDØRFS	"	9	9	9
*YB1PEF	A	15,120	74	72

New Zealand

ZL3AB	A	314,571	392	291
ZL2RX	"	44,149	155	119
*ZL3GA	A	2,010	34	30

Philippines

DU3T	A	2,412,388	1536	503
*4F3BZ	28	287,609	471	227
*4F3OM	28	99,962	292	151
*4I1EBD	21	35,964	133	108

SOUTH AMERICA

Argentina

LU6D	A	778,008	720	421
LU1DZ	"	332,588	445	268
LW1D	"	255,688	398	248
			(OP: LW1EUD)	

*LS5H	A	900,576	680	424
		(OP: LW5HR)		
*LV1F	"	452,184	548	332
		(OP: LU4FTA)		
*LU6ETB	"	480	15	15
Brazil				
PY3LX	28	34,800	73	66
*PY4LH	21	209,836	334	251
*PX1C	A	139,860	258	210
		(OP: PY1JR)		
*ZV2F	"	6,210	73	54
		(OP: PY2SFA)		
*PY2MQ	14	1,170	7	7
*PU3GLO	28	42	15	14
Chile				
*CE4WT	A	18	3	3
*3G3O	28	10,266	70	59
		(OP: XQ3OP)		
*XQ3OP	7	98	7	7
Peru				
OA4SS	A	1,485,840	1071	453
Uruguay				
*CW3A	A	1,276,290	902	522
		(OP: CX5CBA)		

YOUTH
NORTH AMERICA
United States
District 4

*KM4SII	A	1,903,611	1210	591
*N4JEH	14	1,440	47	45
*KO4GOF	A	91	7	7

District 8

*W8UA	A	167,307	313	217
*KE8HBV	"	105,780	252	205

District 9

*KD9LSV	A	57,057	179	143

Cuba

*CO2KR	7	480	12	12

ASIA
China

*BD4VGZ	A	17,085	118	85
*BG5UZW	21	13,524	99	91
*BH2SWB	A	943	23	23

Cyprus

*5B4AQC	A	3,983,847	1612	661
		(OP: DK6SP)		

Japan
District 1

*JI1UPL	A	211,816	466	232
*JG1CMT	"	476	14	14

District 2

*JS2FLS	A	30,294	163	102
*JS2FZH	28	10,557	97	69
*JJ1NIU/2	A	55	5	5

District 3

*JQ3BVC	A	138,159	393	189

Republic of Korea

*DS1TUW	A	25,872	126	88

Singapore

*9V1BX	A	171	11	9

Taiwan

*BX2AHP	14	35,712	145	128

EUROPE
Bosnia-Herzegovina

*E7ØAW	A	14,382	106	94

Croatia

9A3LET	A	120,420	271	223

England

M6T	A	5,380,608	2314	904
		(OP: MØSDV)		

Fed. Rep. of Germany

*DP4X	A	35,868	153	122
		(OP: DJ4MX)		
*DC2CL	"	32	4	4

Ireland

EI8KW	A	140,224	343	224
*EI5LA	A	206,590	377	283

Italy

IR1N	14	675,288	788	498
		(OP: IU1LCU)		
*IUØLJD	A	105,525	248	201

Lithuania

LY5AX	A	1,519,144	1273	566

Poland

*SP5WAZ	3.5	7,192	26	24

Scotland

*2MØGUI	A	21,060	111	108

Serbia

YTØC	A	4,900,386	2106	898

Spain

EA2RCP	A	1,668,641	1264	611
		(OP: UR5YKO)		

Sweden

SA6NIA	A	649,901	921	409

OCEANIA
Indonesia

*YD2UWF	28	401,792	211	170
*YC1LJT	21	63,245	157	139

SOUTH AMERICA
Brazil

*PY2POA	A	80,613	199	159

MULTI-OPERATOR
SINGLE-TRANSMITTER
HIGH POWER
NORTH AMERICA
United States
District 1

WK1Q		1,095,941	898	473
NC1CC		574,655	609	437
N1SOH		245,756	418	262

District 2

WU2X		12,942,860	3979	1124
NY6DX		3,372,660	1729	820
W2ZQ		9,381	59	59

District 3

AG3I		3,921,148	1974	812
ND3D		3,036,819	1527	733

District 4

WK9M		5,184,927	2391	913
N4QS		3,907,139	2034	821
N4IQ		2,864,533	1832	721

District 5

KJ5Y		1,936,145	1491	653

District 6

WM6A		1,535,195	1443	641
N6MI		443,800	606	350

District 7

KU1CW		5,565,120	2408	930
KU7T		3,139,830	1912	783

District 9

KV3T		1,223,379	1335	543

District Ø

ADØLI		148,512	529	312

Canada
District 3

VE3YAA		956,250	715	450

District 7

VE7SAR		1,988,928	1330	576

Cayman Islands

ZF1A		14,483,864	4405	1124

AFRICA
Cape Verde

D4Z		18,939,090	4557	1158

ASIA
Asiatic Turkey

TC3X		3,053,474	1541	557

China

BA7MT		1,445,080	1498	520
BI4SSB		1,328,185	1150	515
BA7LOK		1,023,630	1058	458
BA3RA		71,508	216	177

Japan
District 1

JA1ZGO		1,348,113	1069	507
JA1ZGP		2,784	30	29

District 3

JL3ZHU		78,526	209	142

District 6

JG6YLY		2,192,701	1429	613

Kazakhstan

UP2L		17,128,440	4246	1176

Thailand

E2A		4,579,380	2412	741
E2E		793,520	889	436

West Malaysia

9M2S		2,975	39	35

EUROPE
Austria

OE1XTU		5,929	51	49

Bosnia-Herzegovina

E7DX		13,296,761	4035	1247

Czech Republic

OK5Z		9,199,883	3081	1141
OK7O		8,517,360	2988	1104
OL1C		2,488,650	1588	706

England

MX4U		1,174,056	1129	568
M6N		20,384	100	91

Fed. Rep. of Germany

DA2X		7,744,614	2639	1074
DP6A		6,546,384	2482	1014
DLØLA		6,238,990	2477	985
DB2WD		947,488	807	464
DQ9M		290,784	507	312
DM1T		282,953	449	319

Finland

OI3SVM		8,640	72	64

Looking Ahead

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

- So You Want to Go on a DXpedition?
- MF/LF – A Visit from Murphy
- A Low-Voltage Transformer
- A Low-Resistance Ohmmeter

Plus…

- Rules, 2023 CQ WPX RTTY Contest
- 2022 CQ Index

Upcoming Special Issues

February: QRP
June: Take it to the Field
October: Emergency Communications

France

TM1D		347,446	479	374

Hungary

HG6N		10,375,088	3581	1136
HA3DX		5,804,490	2448	955

Italy

II8K		8,873,032	3516	1162

Moldova

ER3R		1,403,384	1134	607

Norway

LN4BBC		242,888	576	313

Poland

SP8R		10,306,780	3520	1210
SP6ZHP		187,726	428	253

Slovak Republic

OM5WW		4,198,788	2033	828
OM4Q		2,656,428	1601	732

Spain

ED7W		11,123,304	3761	1194

Sweden

SJ2W		7,250,850	3211	1107
SKØQO		1,798,950	1300	670

OCEANIA
Indonesia

7A2A		4,376,440	2106	670
7AØD		191,070	307	193

SOUTH AMERICA
Brazil

PR2E		12,454,074	3568	1062
ZZ7A		5,519,457	2144	813

Chile

CE3CT		4,507,161	1800	739

MULTI-OPERATOR
SINGLE-TRANSMITTER
LOW POWER
NORTH AMERICA
United States
District 2

*NJ1F		20,520	98	95

District 9

*KA9VVQ		89,056	300	184

Canada
District 7

*VA7MM		3,712	36	32

ASIA
Asiatic Russia
China

*BY4DX		1,362,938	1284	523

Japan
District 6

*JA6GCE		3,319,845	1851	705
*JA6YLP		2,844	37	36

Kazakhstan

*UN4Q		7,613,994	2716	867

West Malaysia

*9M2U		216,908	403	257

EUROPE
Bosnia-Herzegovina

*E7CW		1,907,220	1176	717

Bulgaria

*LZ6O		987,044	1035	508

Czech Republic

*OL1B		160,060	377	265

Denmark

*OZ/DJ5LA		1,255,680	1023	545

Fed. Rep. of Germany

*DP7D		2,570,020	1364	755

France

*F8KLY		613,080	706	468

Hungary

*HG22TISZA		2,856,646	1685	782
*HG5C		2,586,337	1647	703
*HG6L		1,436,330	1039	578
*HA5KLR		10	3	2

Latvia

*YL4U		3,686,245	2185	815

Lithuania

*LY5W		4,626,680	2233	920
*LY2J		3,375,952	1910	821

Poland

*3Z1K		1,826,895	1369	635
*SP8ZOC		34,320	172	156
*SN15ØJS		17,748	115	102
*SP9PBB		4,928	49	44

Republic of Kosovo

*Z66BCC		2,254,608	1954	614

Romania

*YO4KAK		7,700	80	77

Slovenia

*S58MU		1,913,620	1475	587

OCEANIA
Indonesia

*7B1K		666	19	18
*7A9Y		75	5	5

Philippines

*DX9EVM		319,713	486	237

MULTI-OPERATOR
TWO-TRANSMITTER
NORTH AMERICA
United States

NI4W		13,354,120	4592	1220
K9CT		11,896,596	4218	1193
KC7V		8,248,756	3832	1046
NX6T		7,584,168	3625	1032
WD6T		6,810,027	2869	973
KK6P		5,090,837	2766	863
N7DX		4,323,942	2419	837
WG3J		2,690,640	1710	720

NORTH AMERICA

VC7M		8,675,924	3127	967
VX7GL		7,079,743	2721	869
*VX9ML		4,747,440	1754	755
VC6R		3,729,957	1962	737

ASIA

BH3GIY		1,403,904	1343	512
BD4QA		654,884	868	404
BY1OK		373,750	671	325
*BY6LY		111,150	303	190

EUROPE

ES9C		18,247,320	5978	1365
IQ2CJ		17,908,800	5202	1300
OL3Z		15,595,524	4695	1263
HG7T		15,153,544	4858	1247
DQ1A		13,992,564	4317	1214
IB8A		11,943,270	4365	1179
DM6V		11,814,625	3728	1175
9A22Y		11,720,034	3774	1198
S573M		11,572,818	3939	1173
LY4A		9,780,121	3869	1157
DP9A		9,555,663	3421	1157
SO4R		9,229,029	3736	1137
SZ1A		8,544,660	3793	1060
G5O		6,658,239	2906	973
OH9W		4,885,485	2791	957
OZ5W		4,381,446	2100	827
*EA3FZT		1,331,400	1270	600
*EA6URL		194,864	457	304
*DM5W		35,532	162	141

OCEANIA

*7C8C		316,192	469	241

MULTI-OPERATOR
MULTI-TRANSMITTER
NORTH AMERICA
United States

NR6O		9,373,580	4059	1060
KT7E		3,720,276	2387	798
WA3EKL		2,186,794	1304	694
K3CT		738,204	738	454
KD2RD		492,633	564	381
AG1C		483,225	563	379

Alaska

KL7RA		8,157,650	2958	950

ASIA

JA3YBK		5,686,980	2614	897
JF1NHD		2,038,750	1444	625
*JA2YGP		4,510	58	41

EUROPE

9A1A		25,605,468	7027	1428
YT5A		23,229,255	7071	1379
LZ9W		22,185,384	6987	1348
LN8W		13,743,581	4844	1217

OCEANIA

NH7T		16,202,780	4541	1034

MULTI-OPERATOR
MULTI-DISTRIBUTED
NORTH AMERICA
United States

WC7Q		3,237,696	2201	803
WU5K		973,080	926	540

Mexico

4A7A		2,535,760	1630	580

ASIA

9M2A		1,346,708	1140	508
BY3CQ		760,536	1092	378

EUROPE

OT7T		8,870,960	3416	1085
EA1URA		5,083,644	2446	978
9H6A		4,397,221	2855	859
EA4URE		4,375,952	2794	878
OG3B		3,541,488	2204	829
IQ1NO		3,113,156	1862	796
OE2S		1,483,945	965	661

OCEANIA

ZM1A		15,617,665	3907	1091

SOUTH AMERICA

PV2K		12,026,916	3649	1089

CHECK LOGS

3V8SS, 4M5K, 4Z4DX, 5P5Q, 5Z4VJ, 7N3IJT, 9H/SV1DAY, A41JZ, AA8TA, AC2OC, AC6NT, AI9K, AK9B, BD1IIJ, BG3FB, BG4NMT, BG5TOX, BG8SRK, BH1MCB, BH2UBD, BV3FG, CT7/DL7AU, CT7/ PA3GCU, CX4AD, DF2KK, DF2SD, DG1PM, DJ3CQ, DJ7GS, DKØRPO, DK9TN, DL2RTJ, DL3FBB, DL4LT, DL4VBU, DL7DZ, DL8LAQ, DL8ULF, DL8WJM, DL9SCO, DM5MA, DR5W, DR5X, E71A, E74O, E77BW, E77Y, E79Q, EA1DWI, EA1IQ, EA1WH, EA3AQ, EA3D, EA3VN, EA4KD, EA4OR, EA4S, EA7A, EA7TG, EA8/IK1PMR, EA9E, EC1DD, EC7AMY, EC7C, EE5AA, EI3Z, EI7CC, EU7X, EXØDX, F/E72T, F4HPZ, F5IYJ, F6FLU, G3KHZ, G4DDL, G4HZV, G4PNC, G4RRM, G4ZOB, GBØSSB, GMØEGI, GM7PVZ, HA3FUT, HB9AFZ, HB9AWS, HB9CEY, HB9DOS, HB9EP, HB9GNY, HF6C, HG4I, HI8RD, HK3W, IØ/S58Y, II2S, II3WRTC, II4WRTC, II5WRTC, II6WRTC, II8M, II8WRTC, IKØOFF, IKØWRB, IK1YDB, IK2XDE, IO3X, IUØITX, IV3TRK, IW2MYH, IW3FVZ, IZ3GNG, IZ4AFL, IZ5NFD, JA1JPM, JE1DXC, JH1FSB, JH1GNU, JH1WOY, JI1AVY, JI2TKX, JJØPKS, JN1ILK, JN1RVS, JP1EHC, JS1OYN, JS6RTJ, K1DTC, K3STL, K6NIA, K7EA, KC1OPD, KD6WW, KH6CW, KP4AA, KU5B, KV5Y, L33M, LA1U, LA7XK, LC9T, LN7TTT, LR3M, LU2DGZ, LU3WC, LU7DLS, LY2BNL, LZ1ND, LZ1YF, LZ1ZF, LZ2HR, LZ4A, LZ8E, M2E, M4X, N2CG, N4EFS, N4ES, N7MU, N7SE, N7WS, N8DXZ, N9BT, NQ5M, NX5M, OE6JTD, OE8TTR, OH2PQ, OH7MA, OH8SE, OK1DM, OK1ES, OK1FMX, OK1NF, OK1RR, OK1TD, OK2BOB, OK2CSU, OK2FB, OK2OHA, OK2OKO, OK2PAY, OK2SG, OK2TJ, OK4RQ, OK5NW, OL6M, OM3SX, OM5CD, OT4T, OZ6TL, PAØVLY, PA3HEN, PA3I, PA4J, PY2ATR, PY4HO, PY4NF, RT6N, S5ØU, S52WD, S52WW, S53K, S59T, SB3W, SC3A, SD5M, SG5Z, SMØQ, SM3CZS, SN2M, SN2S, SP2LNW, SP3BP, SP4JWR, SP6OWY, SP7FCX, SP7Y, SP9MDY, SQ2HEB, SQ3WW, SQ4AVD, SQ8L, SQ8LUV, SQ9NFC, SV1GRB, SV1PMQ, SV2BXZ, SV3RF, SV9DJO, TM2CW, UN7JID, UN7PWM, UTØRS, UY1HY, VE3WG, W3SA, W4VG, W5PB, W6YA, W8NOR, W8OV, WB5N, WR4T, YL2TD, YL3FO, YL3JI, YO3AF, YO3FRI, YO4TL, YO6CFB, YO6FGZ, YO8SBQ, YO9CB, YP5A, YT5ANA, YU1RM, YU3TA, YU7OPQ, Z3ØA, ZL1T, ZL4NR, ZS1A, ZS5XT.

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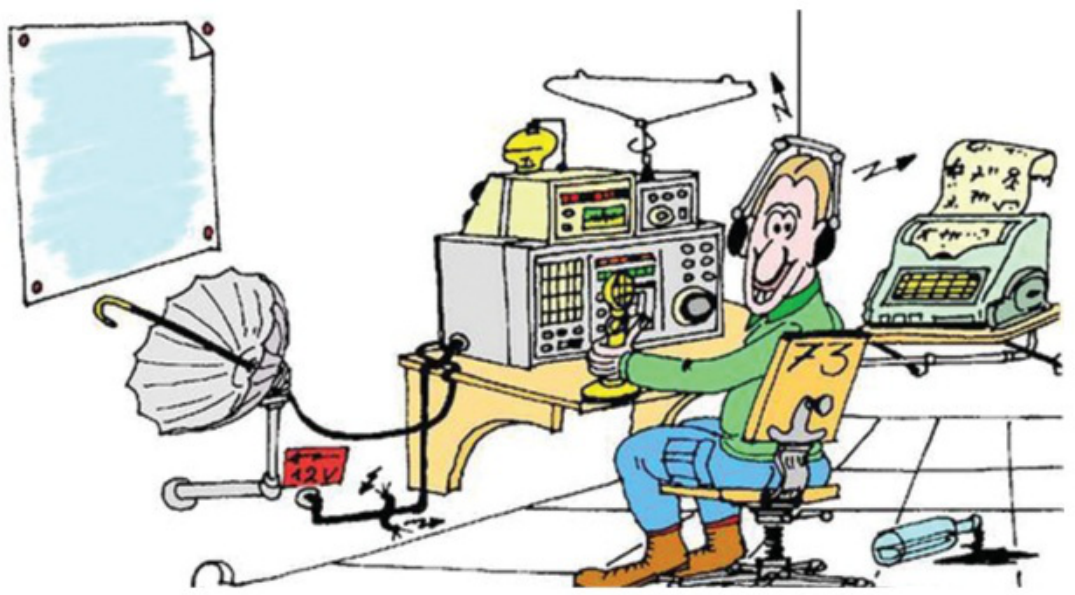

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