The Solar Wind, p.91

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COMMUNICATIONS & TECHNOLOGY

JULY 2019

- Repurposing Computer Power Supplies, p. 10
- Results: 2019 CQ WPX RTTY Contest, p. 16
- Dayton Photo Tour, p. 24

On the Cover: Fifty years since the first manned moon landing ... how long until the first lunar DXpedition? See pages 4 and 8.

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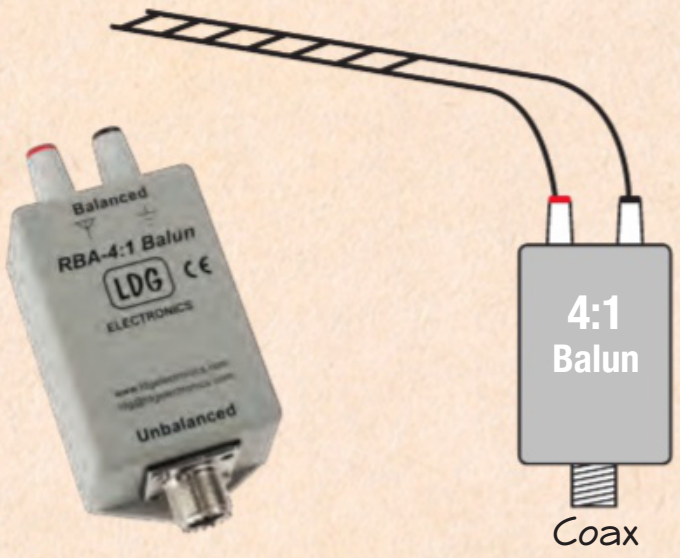
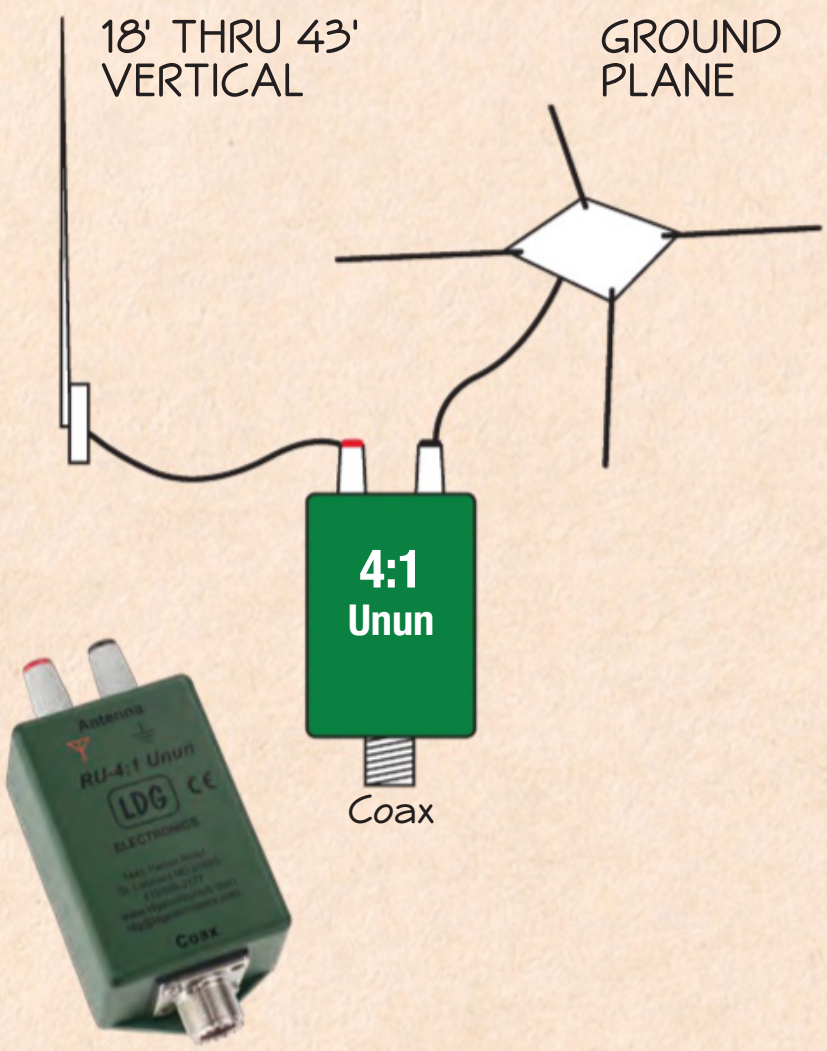


18' THRU 43' VERTICAL

GROUND PLANE



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- Dual Antenna
- 1000W SSB / 350W Digital
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ANNOUNCEMENTS

JULY

HARRISBURG, PENNSYLVANIA — The Harrisburg Radio Amateurs' Club will hold its **48th Annual Firecracker Electronics Expo and Hamfest** beginning 8 a.m., Saturday, July 6 at the Harrisburg Area Community Center, 3599 Industrial Road. Contact: Terry Snyder, WB3BKN, P.O. Box 355, Halifax, PA 17032. Phone: (717) 896-0256. Email: <wb3bkn1@gmail.com>. Website: <www.w3uu.org>. Talk-in 146.13+ (PL 100). DXCC / WAS card checking.

OAK CREEK, WISCONSIN — The South Milwaukee Amateur Radio Club will hold its **Swapfest 19'** beginning 6:30 a.m., Saturday, July 6 at the American Legion Post 434, 9327 South Shepard Avenue. Contact: Karen, KC9WQJ, (414) 578-0492 or Mike Lea, W9MRL, (262) 880-2091. Website: <www.qsl.net/wa9txe>. Talk-in 146.91.

SALISBURY, NORTH CAROLINA — The Rowan Amateur Radio Society will hold the **34th Annual Firecracker HAM-FEST** from 8 a.m. to 2 p.m., Saturday, July 6 at the Salisbury, NC Civic Center, 315 Martin Luther King Avenue, S. Contact: Doug Spriggs, W4DCS, (704) 762-0192. Email: <w4dcs@arrl.net>. Website: <www.rowanars.com>. Talk-in 145.41 (PL 136.5) or 146.52. VE exams.

PLAINS, PENNSYLVANIA — The Murgas Amateur Radio Club will hold the **40th Annual Wilkes-Barre Hamfest and Computerfest** beginning 8 a.m., Sunday, July 7 at the Polish American Veterans, 2 South Oak Street. Contact: Herb, K2LNS, (570) 829-2695. Email: <murgasarc@fmail.com>. Website: <http://hamfest.murgasarc.org>. Talk-in 146.61 (PL 82.5). VE exams.

INDIANAPOLIS, INDIANA — The Indianapolis Hamfest Association will hold the **49th Annual Indianapolis Hamfest** from 2-7 p.m., Friday, July 12 and from 6 a.m. to 2 p.m., Saturday, July 13 at the Marion County Fairgrounds, 7300 E. Troy Avenue. Phone: (317) 829-6868. Website: <www.indyhamfest.com>. DXCC card checking.

ERIE, PENNSYLVANIA — The Wattsburg Wireless Association will hold the **18th Annual Northwest PA Hamfest** beginning 7:30 a.m., Saturday, July 13 at the Greene Township Municipal Building, 9333 Tate Road. Email: <hamfest@wattsburg-wireless.us>. Website: <www.wattsburg-wireless.us>. VE exams.

PHOENIXVILLE, PENNSYLVANIA — The Mid Atlantic Amateur Radio Club will hold the **Valley Forge Hamfest** beginning 8 a.m., Saturday, July 13 at the Kimberton Fire Co. Fairgrounds, 762 Pike Springs Road. Contact: Jeremy Carlo, N2ZLQ, (917) 612-2163. Email: <n2zlq@marc-radio.org>. Website: <www.marc-radio.org>. Talk-in 146.13- (PL 131.8) or 147.06+ (PL 131.8). VE exams.

ROSEVILLE, MINNESOTA — The Minnesota Amateur Group of Independent Communicators will hold the **16th Annual MAGIC TAILGATER** from 8 a.m. to noon, Saturday, July 13 at the Galilee Lutheran Church, 145 N. McCarrons Boulevard. Website: <www.magicrepeater.net>. Talk-in 145.170 (PL 100).

TEXAS CITY, TEXAS — The Tidelands Amateur Radio Society will hold the **Texas City, Tidelands Hamfest** from 8 a.m. to 2 p.m., Saturday, July 13 at the Doyle Convention Center, 2010 5th Avenue North. Contact: TARS, P.O. Box 73, Texas City, TX 77592. Website: <www.tidelands.org>. Talk-in 147.14 (PL 167.9) or 442.025 (PL 103.5). VE exams, T-hunt.

AUGUSTA, NEW JERSEY — The Sussex County Amateur Radio Club will hold the **41st Annual SCARC Hamfest** beginning 8 a.m., Sunday, July 14 at the Sussex County Farm & Horse Show Fairgrounds, 37 Plains Road. Phone: (973) 862-8197. Email: <hamfest@scarcnj.org>. Website: <www.sussexhamfest.org>. Talk-in 147.30+ (PL 151.4). VE exams.

ESSEX, MONTANA — The 85th Annual Glacier-Waterton International Hamfest will be held Friday, July 19 through Sunday, July 21 at the Glacier Meadow RV Park, 15735 U.S. Highway 2 East. Email: <directors@gwhamfest,org>. Website: <www.gwhamfest.org>. VE exams, T-hunt.

RENO, NEVADA — The Sierra Nevada Amateur Radio Society will hold **NVCON** and **2019 ARRL Nevada State Convention** from 9 a.m. to 5 p.m., Friday, July 19 and from 9 a.m. to 5:30 p.m., Saturday, July 20 at the Boomtown Casino Hotel, 2100 Garson Road. Phone: (775) 453-4142. Email: <info@nvcon.org>. Website: <http://nvcon.org>. VE exams, special event station.

ALEXANDER, NEW YORK — The Lancaster Amateur Radio Club will hold the **Batavia Hamfest** beginning 6 a.m., Saturday, July 20 at the Alexander Firemen Grounds, 10708 Alexander Road (Rt. 98). Contact: Luke, N2GDU, <luke48@gmail.com>. Website: <http://w2so.org>. Talk-in 147.285 (PL 141.3). VE exams

CARY, NORTH CAROLINA — The Cary Amateur Radio Club will hold its **47th Annual SWAPFEST** from 9 a.m. to 1 p.m., Saturday, July 20 at Harold Ritter Park, 301 West Lochmere Drive. Website: <www.caryarc.org>. VE exams.

CHEHALIS, WASHINGTON — The Chehalis Valley Amateur Radio Society will hold the **21st Annual Ham Radio Tailgate Swap Meet** from 9 a.m. to noon, Saturday, July 20 at the Southwest Washington Fairgrounds, 2555 N. National Avenue. Contact: John, (360) 273-5929. Email: <k7osk@boatanchor.com>. Website: <http://cvars.org>. Talk-in 147.060+ (PL 110.9).

ELYRIA, OHIO — The Northern Ohio Amateur Radio Society will hold **NOARFEST** from 8 a.m. to noon, Saturday, July 20 at Lorain County Community College-John A. Spitzer Conference Center, 1005 N. Abbe Road. Contact: Carl Rimmer, W8KRF, (216) 256-9624 (before 9 p.m.). Email: <noarsfest@noars.net>. Website: <www.noars.net>. Talk-in 146.70- (PL 110.9).

KENAI, ALASKA — The Moosehorn Amateur Radio Club will hold the **12th Annual Kenai Peninsula Hamfest** from 10 a.m. to 3:30 p.m., Saturday, July 20 at the Kenai American Legion Hall, 902 Cook Avenue. Contact: Ed Cole, KL7UW, (907) 776-5829. Email: <kl7uw@acsalaska.net>. Website: <www.kl7uw.com>. Talk-in 146.88-. VE exams.

LOUISA, KENTUCKY — The Big Sandy Amateur Radio Club will hold its **Hamfest** from 8 a.m. to 1 p.m., Saturday, July 20 at the Lawrence County Community Center, 205 Bulldog Lane. Contact: Tom Lykins, K4LID, (606) 638-4735, Email: <k4lid@panix.com>. Website: <http://bsarc.org>. Talk-in 147.390 (PL 127.3).

SCHAUMBURG, ILLINOIS — The Motorola Amateur Radio Club will air special event station **K9MOT** to commemorate Motorola's contribution to the Apollo program. Frequencies include 3.83, 7.23, 14.245, 21.435 MHz for SSB; 3.543, 7.043, 14.043, 21.043, 28.043 MHz for CW. QSL to Motorola ARC, P.O. Box 59701, Schaumburg, IL 60159. Email: <k9mot@arrl.net>. Website: <www.qsl.net/k9mot>.

SLIDELL, LOUISIANA — The Ozone Amateur Radio Club will hold the **2019 Slidell EOC Hamfest** from 8 a.m. to 2:30 p.m., Saturday, July 20 at the John Slidell Park Gymnasium, 105 Robert Boulevard. Email: <hamfest@w5ala.net>. Website: <www.w5ala.net>. Talk-in 147.27+ (PL 114.8). VE exams.

PEOTONE, ILLINOIS — The Kankakee Area Radio Society will hold **KARSFEST 2019** beginning 6 a.m., Sunday, July 21 at the Will County Fairgrounds. Contact: Art Reis, K9XI, (815) 348-7752. Email: <karsfest@gmail.com>. Website: <www.w9az.com>. VE exams, card checking.

SOMERSET, PENNSYLVANIA — The Somerset County Amateur Radio Club will hold the **Somerset County PA Hamfest** from 8 a.m. to 1 p.m., Sunday, July 21 at the Somerset County Technology Center, 281 Technology Drive. Contact: Stew, AK3J, (814) 444-0637. Email: <ak3j@arrl.net>. Website: <www.k3smt.org>. Talk-in 147.195+ (PL 123) or 443.250+ (PL 123). VE exams.

VAN WERT, OHIO — The Van Wert Amateur Radio Club will hold the **31st Annual Van Wert Hamfest** beginning 8 a.m., Sunday, July 21 at the Van Wert County Fairgrounds, 1055 S. Washington Street. Contact: Steve Kouts, WA8WKF, (419) 771-8152. Email: <secretary@w8fy.org>. Website: <http://w8fy.org>. Talk-in 146.850.

WASHINGTON, MISSOURI — The Zero Beaters Amateur Radio Club will hold its annual **Hamfest** from 7 a.m. to 1 p.m., Sunday, July 21 at the Washington Elks Hall, 1459 West 5th Street. Contact: Bruce Serbus <kd0kcf@sbcglobal.net>. Talk-in 147.24+. VE exams.

(Continued on page 50)

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A publication of

CQ Communications, Inc.
17 West John Street
Hicksville, NY 11801 USA.

CQ Amateur Radio (ISSN 0007-893X) Volume 75, No. 7. Published monthly by CQ Communications, Inc., 17 West John Street, Hicksville, NY 11801, Telephone 516-681-2922. E-mail: cq@cq-amateur-radio.com. Fax 516-681-2926. Web site: www.cq-amateur-radio.com. Periodicals Postage Paid at Hicksville, NY 11801 and at additional mailing offices. Subscription prices (all in U.S. dollars): Domestic-one year $42.95, two years $77.95, three years $111.95; Canada/Mexico-one year $57.95, two years $107.95, three years $156.95: Foreign Air Post-one year $72.95, two years $137.95, three years $201.95. Single copy $6.99. U.S. Government Agencies: Subscriptions to CQ are available to agencies of the United States government including military services, only on a cash with order basis. Requests for quotations, bids, contracts., etc. will be refused and will not be returned or processed.

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Printed in the U.S.A.
POSTMASTER: Send address changes to:
CQ Amateur Radio, 17 W. John Street., Hicksville, NY 11801

HAM RADIO NEWS

"Near-Normal" Atlantic Hurricane Season Predicted

The National Oceanic and Atmospheric Administration (NOAA) is predicting a "near normal" Atlantic hurricane season this year, with between 9 and 15 named storms, of which 4 to 8 might become hurricanes, half of which could become major hurricanes (category 3 or higher). The forecast from NOAA's Climate Prediction Center does not predict the possibility of landfalls. Forecasters say competing climate factors will likely cancel out each other's effects, leading to the likelihood of an average season. The Atlantic hurricane season runs from June 1 to November 30 of each year.

Hurricane Response Was Key Element of Amateur Radio Demonstration

A major hurricane with mass casualties in the mid-Atlantic and New England states was the scenario for a demonstration of amateur radio's ability to transmit and receive messages without commercial power, telecommunications infrastructure, or permanent stations. The ARRL reports that the demonstration involved roughly a dozen hams from South Carolina to Maine and was held in coordination with both the Federal Emergency Management Agency (FEMA) and the American Red Cross. A combination of voice and digital modes was used by participating hams to transmit messages to ARRL Headquarters station W1AW, from which they were relayed to a joint Red Cross-FEMA meeting under way in Baltimore. The League reports that Red Cross officials monitoring the test were impressed with hams' ability to match Red Cross message formats in their digital messages, which were sent using *fldigi* and *flmsg.*

FT4 Beta "Release Candidate 7" in Use Until Mid-July

An improved "release candidate" version of the WSJT-X 2.1.0 digital program suite — including the new contest-focused FT4 mode — was made available for testing in early June and should be in use through the end of the CQ World Wide VHF Contest on July 21. Release candidate 7 was issued after a "serious bug" was discovered in version 6, according to the ARRL. The newest version features several enhancements over previous release candidates. A mock contest was held on June 4 and 5 to test the new software under "real-world" conditions. Co-developer Joe Taylor, K1JT, reported on QRZNow.com that he operated for approximately three hours, making 143 contacts in 29 states, 5 Canadian provinces, and 15 DX locations. FT4 was not available for use during the ARRL June VHF Contest or ARRL Field Day. It is unclear whether it will be available during the CQ World Wide VHF Contest on July 20-21, as Taylor says he anticipates a "general release" version of the software by "mid-July." For more about FT4, see this month's "VHF-Plus" column on page 76.

In a related item, the ARRL reports that the latest *TQSL* update for its Logbook of the World (LoTW) program includes FT4 as a submode of MFSK. In addition, the 11.8 update includes two new satellites, AISAT-1 and PO-101.

ARRL Seeking Volunteer Monitors

The ARRL is in the process of replacing its decades-old Official Observer (OO) program with a new joint ARRL/FCC *Volunteer Monitor* program and is now accepting applications. According to the *ARRL Letter,* Volunteer Monitors will listen both for improper activity and exemplary on-air behavior. In one significant change from the OO program, all VM reports will go to ARRL headquarters, which will issue advisory notices.

VM applicants must be ARRL members who have never been in trouble with the FCC themselves, must be able to use state-of-the-art receiving equipment and must be able to access remote receive sites if requested. Applicants will be vetted and interviewed by ARRL staff, and then undergo a training and certification program. Appointments will be valid for three years, unless terminated sooner by the ARRL.

Complete information is available at <https://tinyurl.com/y2u5l4ud>; applications should be emailed to <volunteer-monitor@arrl.org>.

Milestones: Another Krenkel Award and YASME Recognitions

AMSAT President Joe Spier, K6WAO, has been honored with Russia's E.T. Krenkel Medal for "outstanding global contributions to amateur radio." According to the AMSAT News Service, Spier held several leadership positions in the organization before becoming its president. He is also a long-time supporter of the Amateur Radio on the International Space Station (ARISS) program. Spier is the second U.S. ham awarded a Krenkel medal this year. Last month, we reported that Ellen White, W1YL, the *grand dame* of DXing, had been similarly honored.

The YASME Foundation announced its 2019 Excellence Award winners at the Dayton contest forum. Angel Vazquez, WP3R, the Head of Telescope Operations at Puerto Rico's Arecibo Observatory, was honored for his disaster relief work following Hurricane Maria, and "as an outstanding ambassador for amateur radio," according to a YASME news release. Nikola Percin, 9A5W, was also honored for outstanding work in advancing amateur radio in Croatia and his work in recruiting young amateurs. In addition, the foundation announced three $5,000 grants, one each to the Foundation for Amateur Radio and the ARRL for scholarships, and one to Italy's WRTC2022 committee for "general support." YASME will also sponsor the so-called "Widow's Ball" at WRTC2022.

Additional News Throughout This Issue

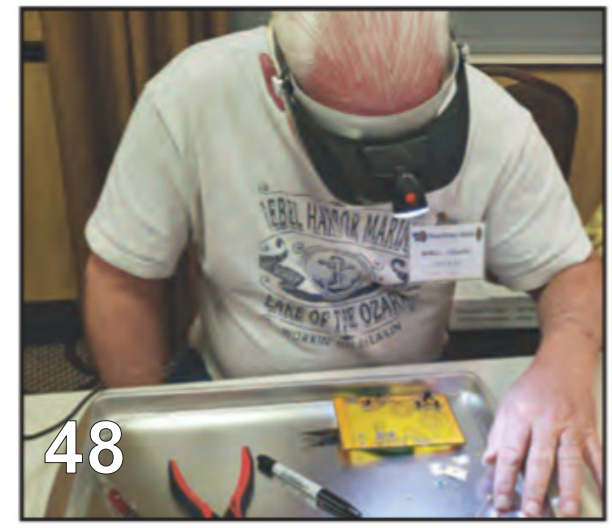
This is a very "newsy" month and we have additional news items spread around this issue, including:

CONTENTS

JULY 2019 • VOLUME 75 NUMBER 7

COVER: 50th ANNIVERSARY OF MEN WALKING ON THE MOON

Apollo 11 landed the first men on the moon 50 years ago this month. NASA is now planning to return. Could there be a lunar DXpedition in our not-too-distant future? Or are these astronauts making Moon-Earth-Moon contacts with another lunar colony? See Zero Bias on page 8 for more.
(Cover illustration by Jason Togyer, W3MCK)



FEATURES

FOCUS ON: The Dayton Hamvention is always a a huge deal with a massive enthusiastic crowd looking for great deals and playing with the new toys! *CQ* has it covered on page 24. Hall of Fame Inductees can be found on page 32.

COLUMNS

DEPARTMENTS

AR-DV1

Multi-mode Digital Voice Receiver

Get your hands on the industry-leading analog and digital voice receiver that automatically recognizes and monitors popular digital modes including APCO P25, DMR, dPMR™, NXDN™, MOTOTURBO™, D-Star™, Digital CR, Yaesu System Fusion, Kenwood and Alinco EJ-47U formats. You also get analog AM, WFM, NFM, CW and Upper & Lower Sideband reception.

Packed with features like a SD/SDHC card to record audio, back up its 2,000 memories or update its field-upgradeable firmware, the AR-DV1 can operate on its own or using computer control through its micro USB port. The multi-purpose display shows the digital or analog mode, DMR color codes, channel IDs, P25 NAC Codes and more!

The AR-DV1 can serve monitoring enthusiasts, public safety, military, federal, state and local law enforcement agencies, emergency managers, diplomatic services, news-gathering operations and more.

The AR-DV1 is available in a professional (unblocked) or USA consumer version.*

For more information on the AR-DV1, go to www.aorusa.com

Check these AR-DV1 Features:

- wide band coverage from 100kHz to 1300MHz*
- computer control for easier programming and monitoring operation
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- a micro USB computer interface
- built-in SD/SDHC card reader for audio recording
- higher 1st IF frequency 1705 MHz provides higher image rejections
- CSV memory data capability for frequency uploads/ downloads and firmware updates
- 2000 memory channels (50 channels X 40 banks)
- alpha-numeric channel labels
- offset reception and priority channel selection
- auto-notch filter
- noise reduction
- voice inverter
- discriminator output

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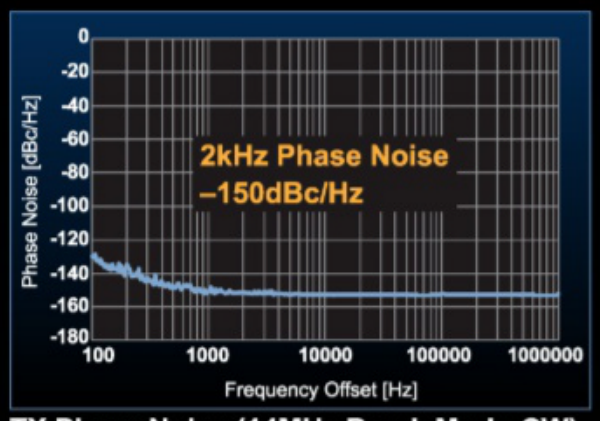
Transmit Signal Purity

High-Quality Transmission with Outstanding Phase noise characteristics

The excellent C/N characteristics provided by 400MHz HRDDS (High Resolution Direct Digital Synthesizer) used in the FTDX101 local oscillator circuit contribute significantly to the superb performance of both the receive and the transmitter sections. Yaesu conducted a thorough examination of each element in the transmission final stage such as clock distributor that divides/distributes the local signal from the 400MHz HRDDS circuit as a clock signal to each block, as well as FPGA, D/A converter, final power amplifier etc., and then carefully selected the latest circuit configuration to improve the C/N characteristics of the entire transmitter block. The transmission signal of the FTDX101 is generated directly from a 16-bit D/A converter without passing through the mixer circuit, therefore distortion and noise are significantly suppressed.

As a result, high-quality local signal characteristics are maintained without degradation to the final stage, and the transmission phase noise characteristics achieve an extraordinary –150 dBc/Hz at 2kHz separation. FTDX101 transceiver users will enjoy the outstanding performance as well as confidence and pride in the high-purity of their transmission signal.



TX Phase Noise (14MHz Band, Mode:CW)

TX Final Stage (MP Version)

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C4FM/FM 144/430 MHz Dual Band 5W
Digital Transceiver

New

FT-70DR

《 700 mW Loud and Clear audio,
Commercial Grade Specifications 》

C4FM/FM 144/430 MHz Dual Band 5 W
Digital Transceiver

FT2DR

《 Improved 66 ch GPS receiver included 》

System Fusion II

C4FM Digital
Pursuing Advanced Communications

C4FM/FM 144/430 MHz Dual Band 50 W
Digital Transceiver

FTM-100DR

《 Improved 66 ch GPS receiver included 》

C4FM/FM 144/430 MHz
Dual Band Dual Receive Digital Repeater

New

DR-2X

C4FM/FM 144/430 MHz Dual Band 50 W
Digital Transceiver

FTM-400XDR

《 Improved 66 ch GPS receiver included 》

C4FM/FM 144 MHz 65 W
Digital Transceiver

FTM-3200DR

《 Genuine 65 Watts High Power 》

CW/SSB/AM/FM/C4FM
HF/50/144/430 MHz Wide-Coverage
100 W All Mode Transceiver (144/430 MHz: 50 W)

FT-991A

《 Real-Time Spectrum Scope included 》

C4FM/FM 430 MHz 55 W
Digital Transceiver

New

FTM-3207DR

《 Heavy Duty 55 Watts High Power 》

System Fusion II Supports All C4FM Portables and Mobiles

- Firmware updates will enable System Fusion II compatibility with all existing C4FM products.

YAESU
The radio

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ZERO BIAS: A CQ Editorial

BY RICH MOSESON,* W2VU

Of Eagles and Earthbounce

Boy Scout camp. Sitting on the floor of the rec hall, watching a grainy black-and-white image on a TV that one of the camp directors had brought in for all of us to watch, and listen, as Neil Armstrong counted down the number of feet to the lunar surface and then announced, after the picture had briefly gone black, "Houston, Tranquility Base here. The Eagle has landed." Cheers and applause, then holding our breaths as Armstrong and crewmate Buzz Aldrin climbed down the ladder and became the first humans to set foot on ground that wasn't on the Earth.

It was July 20, 1969 — 50 years ago this month — and I remember the Apollo 11 moon landing like it was yesterday. And if you're age 55 or older, there's a good chance that you do as well. It was a moment of national pride for Americans, to be sure, but also an amazing achievement to be shared by the whole world — as Armstrong famously put it — "one giant leap for mankind." The moon landing marked a high point for science and technology that has not been equaled since.

Is there a ham radio connection here? Of course. Even though none of the three astronauts on Apollo 11 (Armstrong, Aldrin, and command module pilot Michael Collins) was a ham, there were many hams who worked on the Apollo program, as well as the preceding Gemini and Mercury missions. The space program was the highest of high-tech at the time and ham radio was a natural companion. In addition, the amateur radio space program had been growing up side-by-side with government and commercial space programs.

This year also marks the 50th anniversary of AMSAT, the Radio Amateur Satellite Corporation, which was formed at the suggestion of then-*CQ* Propagation Editor George Jacobs, W3ASK. The Washington, DC-based AMSAT took on the mantle of leading the amateur satellite program from the west-coast-based Project OSCAR, which was finding it difficult to get launch approvals without connections in Washington. Hams at NASA began planting the seeds for amateur radio on manned space flights, which first came to fruition in 1983 when Astronaut Owen Garriott, W5LFL (SK), operated on 2 meters from the space shuttle. The success of this operation led to the development of SAREX, the Shuttle Amateur Radio EXperiment, which morphed into today's ARISS, Amateur Radio on the International Space Station. As a result, many of today's astronauts hold ham licenses and operate from orbit.

NASA is now planning a return to manned lunar missions, with a goal of again landing men (and hopefully, women, this time) on the Moon within five years. With the number of astronauts who hold amateur licenses, it is quite likely that at least some members of future lunar crews will also be hams, which means we definitely could see ham stations on the Moon in the not-too-distant future. *CQ* cartoonist Jason Togyer, W3MCK, came up with the possible scenario on this issue's cover as a tribute to the 50th anniversary of the Apollo 11 landing with a nod toward the future as well. What we couldn't quite figure out, though, was whether the astronauts on the cover are talking to hams back on Earth or contacting a distant lunar base via Earthbounce, perhaps also known as M-E-M or Moon-Earth-Moon. We'll just have to wait and see on that little detail! But we'll be certain to provide full coverage of the first lunar DXpedition … and of what happens when you try to bounce a radio signal off the *top* of the ionosphere!

Meanwhile, Back on Earth…

The history of the amateur satellite program illustrates once again the role that hams can play as citizen scientists, working alongside professionals in various fields. In reviewing AMSAT's history in the special 50th anniversary issue of the *AMSAT Journal*,[1] I was reminded of the many contributions the amateur satellite program has made to space science and the satellite industry. It was hams who developed cubesats, showed that GPS worked from *above* the satellite constellation and made the first satellite-to-satellite link between OSACRs 6 and 7. This paved the way for NASA's Tracking and Data Relay Satellite (TDRS) system that maintains near-constant communication for several satellites, including the International Space Station and the Hubble Space Telescope.

Dayton Amateur of the Year Nathaniel Frissell, W2NAF, with CQ Editor Rich Moseson, W2VU, at the 2019 Dayton Awards Banquet.

Citizen science was also front-and-center at this year's Dayton awards banquet, where Nathaniel Frissell, W2NAF, was honored as Amateur of the Year. Frissell (an Eagle Scout) was recognized primarily for his work as the founder of HamSci, a citizen science initiative that encourages collaboration between radio amateurs and ionospheric scientists. (See our Dayton photo essay, as well as our own CQ Hall of Fame induction article, elsewhere in this issue, for additional recognitions at Hamvention®.)

While it is always a pleasure to attend these banquets and meet each year's honorees, this one was special for me, as I've known Nathaniel since he was 15, and his skills as a leader and organizer, as well as a top-notch researcher, were evident early on. Nathaniel has already established himself as one of our hobby's next generation of leaders.

I was as impressed with Nathaniel's acceptance speech as I have been with the work that got him there, and particularly with his closing remark — which I can't top so I'll use it as my closing as well — that "awards are not just a recognition of what you have done, but an affirmation of what you should continue doing." Congratulations to all, and keep on doing what you're doing!

– 73, Rich, W2VU

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

Note:

1. See <https://tinyurl.com/y3t346t7>

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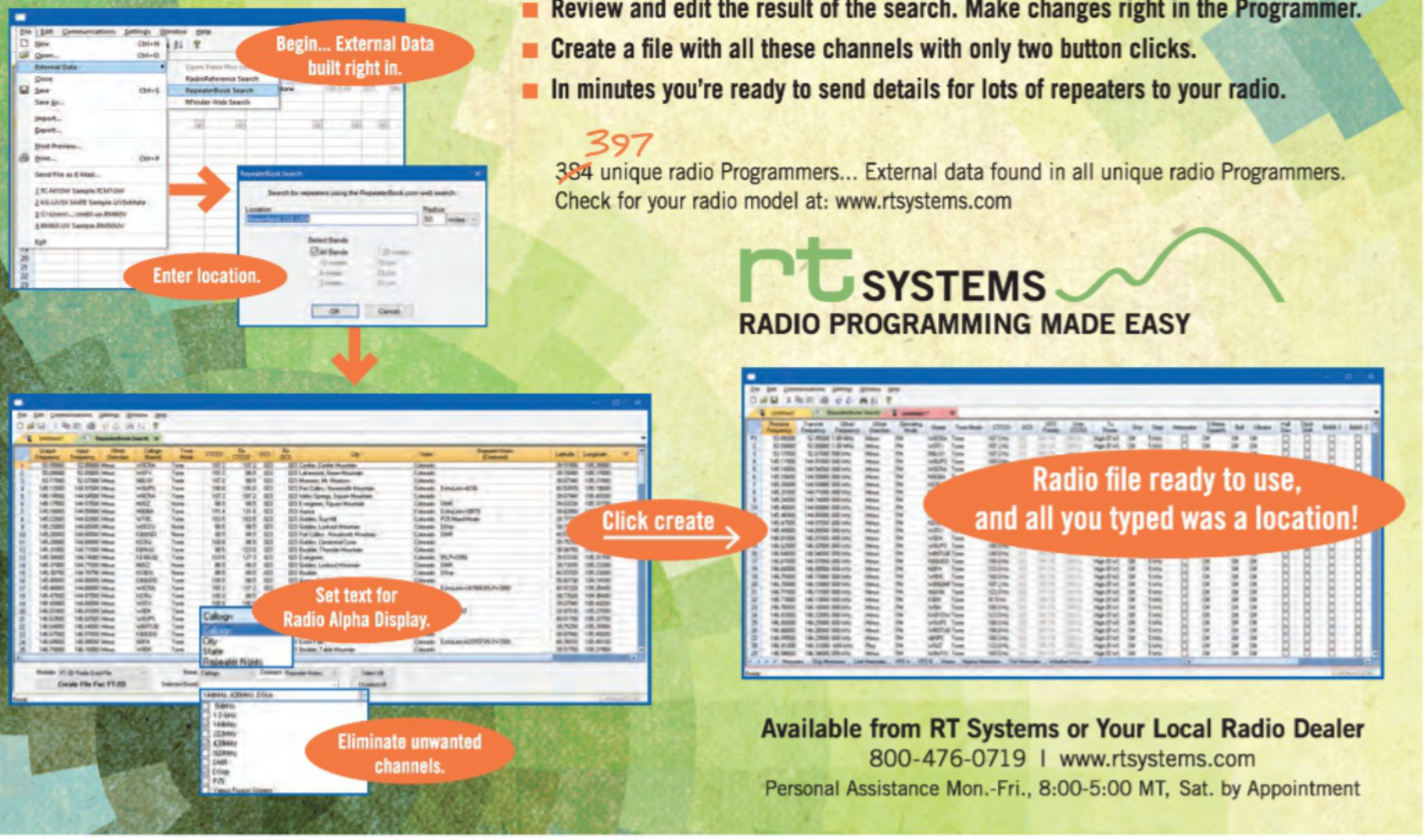

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Digital-Only AM Broadcasting?

The following is from Communications Horizons editor Rob de Santos, K8RKD:

The future of the AM broadcast band in the U.S. has continued to be in doubt despite several initiatives by the FCC to give it renewed life. Only FM translators have seen much impact until now. The broadcast industry seems to be taking the lead to help itself. Recently, a petition was filed with the FCC[1] to allow AM stations to go fully digital and forego the analog mode entirely.

Texas-based Bryan Broadcasting has asked the FCC to authorize it to go "HD" 24 hours a day without any of the analog overlap currently common to digital AM in the U.S. Several stations, most recently WWFD of Frederick, Maryland, are doing or have done this experimentally. Major industry associations, including the National Association of Broadcasters, have backed the proposal. Along with other proposals to move to digital (e.g. authorize DRM), it now seems broadcasters will no longer wait for the FCC to lead. –*RDS*

Note:
1. <https://tinyurl.com/y5p7wjhw>

This radio won't do you much good if broadcasters are successful in bids to abandon analog broadcasting on AM and go all-digital. You'll need to have an "HD"-capable receiver to listen.

If you're like most of us, you probably have a perfectly working power supply from a long-dead computer (maybe more than one) sitting around your shack because "it might come in handy someday." K8HSY and WB5VQX say someday is now and show you how to convert a computer power supply into something useful for ham radio or other applications.

Putting a Computer Power Supply to Work in Your Ham Shack

BY RON MILLIMAN,* K8HSY AND MIKE MILLIMAN,# WB5VQX

We had a few scavenged tower case computer power supplies kicking around for a while (*Photo A*). So we launched an investigation online into how these power supplies could be put to new uses and found some excellent instructions. With the use of a talking multimeter, we were able to successfully convert a couple into a 12-volt DC ham shack power supplies and have been using it to run Ron's Kenwood TM V7A transceiver, using a 300-watt supply, and Mike's µBitx transceiver, using a 200-watt supply, for a while with no issues. The photos in this article are of Mike's build, which also brings out the 5-volt and 3.3-volt supplies out for future use.

The links below will take you to articles explaining the conversion. After the links, we will give a detailed description of the connectors and pin configurations and what we did to determine the various wires and pinouts. We did this with a standard 20-pin ATX style power supply unit (PSU), and it's a bit of a challenging project, so this article is just for awareness and to encourage you to give it a try. Check out this online guide to start: <https://tinyurl.com/y94dhs8w>.

The following link contains pinout tables for the ATX style PSU; we're interested in the 20-pin connector, but we have included the 24-pin information for those converting a newer style ATX PSU: <https://tinyurl.com/yakcjcwe>.

Here is some additional information based on our experience that you might find useful if you decide to tackle this project. There is normally a label on one side of the power supply that will tell you its parameters, such as "12 VDC, 6 amps, 200 watts max" (*Photo B*).

It's not an exact conversion, as you can see: 200 watts divided by 12 volts equals approximately 16.7 amps, yet the supply says max 6 amps at 12 volts. The difference comes in when you consider that the power supply is designed to put out more than just +12 VDC. The

Photo A. Some of the old desktop computer power supplies we had lying around, waiting to be repurposed.

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total wattage rating of the supply is the sum of all of the outputs of all the various voltages, while the 6-amp rating of the 12-volt supply applies only to that portion of the supply. So, that means the maximum output of the 12-volt supply is 72 watts, with another 128 watts available for the other voltages. But note that the pictured power supply specifies a maximum of 125 watts for the combination of both 3.3-volt and 5-volt supplies. The remaining 3 watts will cover the low-current -12 volt and -5 volt supplies. When you convert one of these supplies, you must ensure that you do not draw more power from each voltage than that particular section of the supply is capable of handling, and that the total power draw of all supplies does not exceed the overall rating of the supply (200 watts in this case).

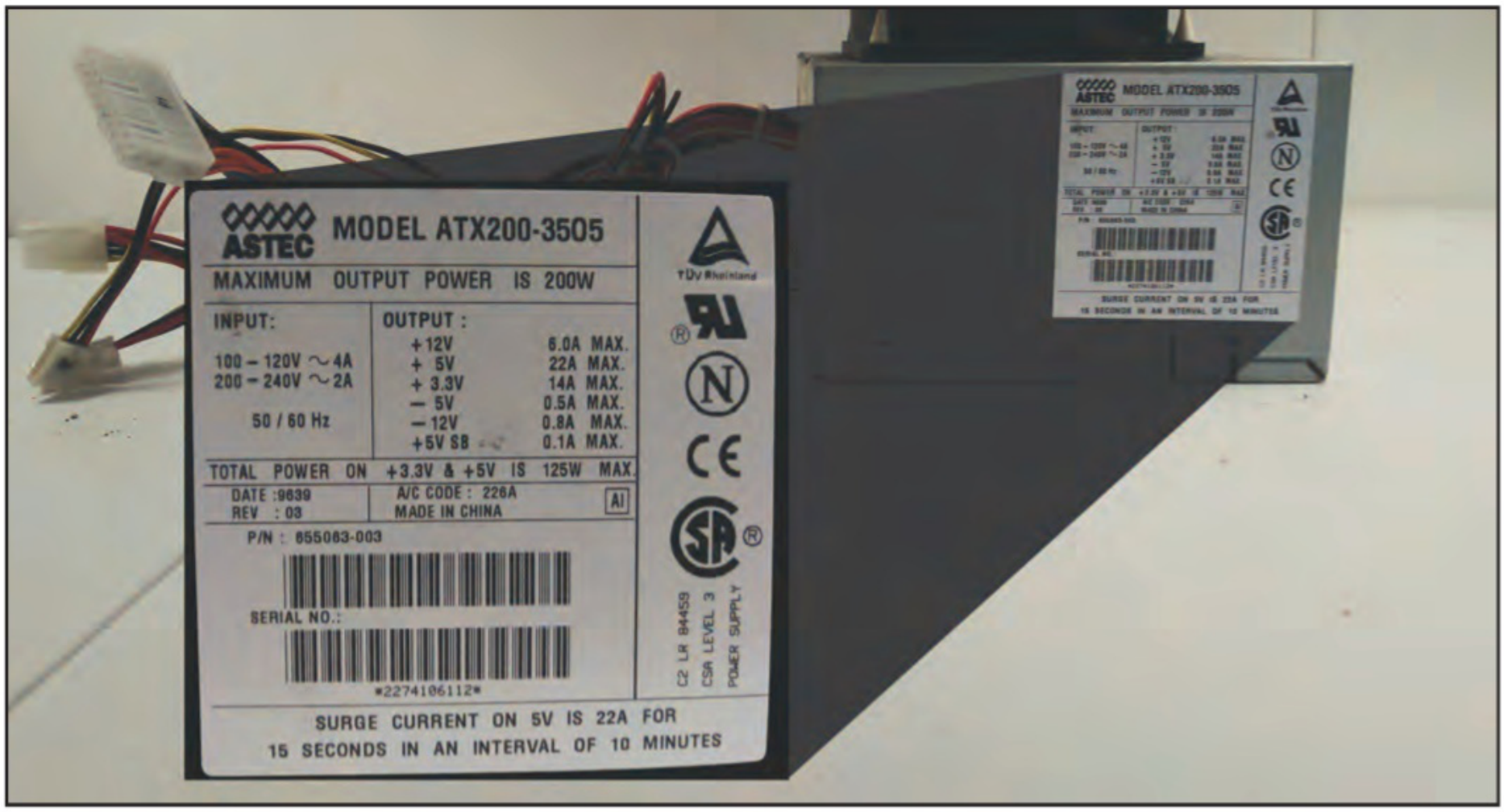


Photo B. Power supply specification label.

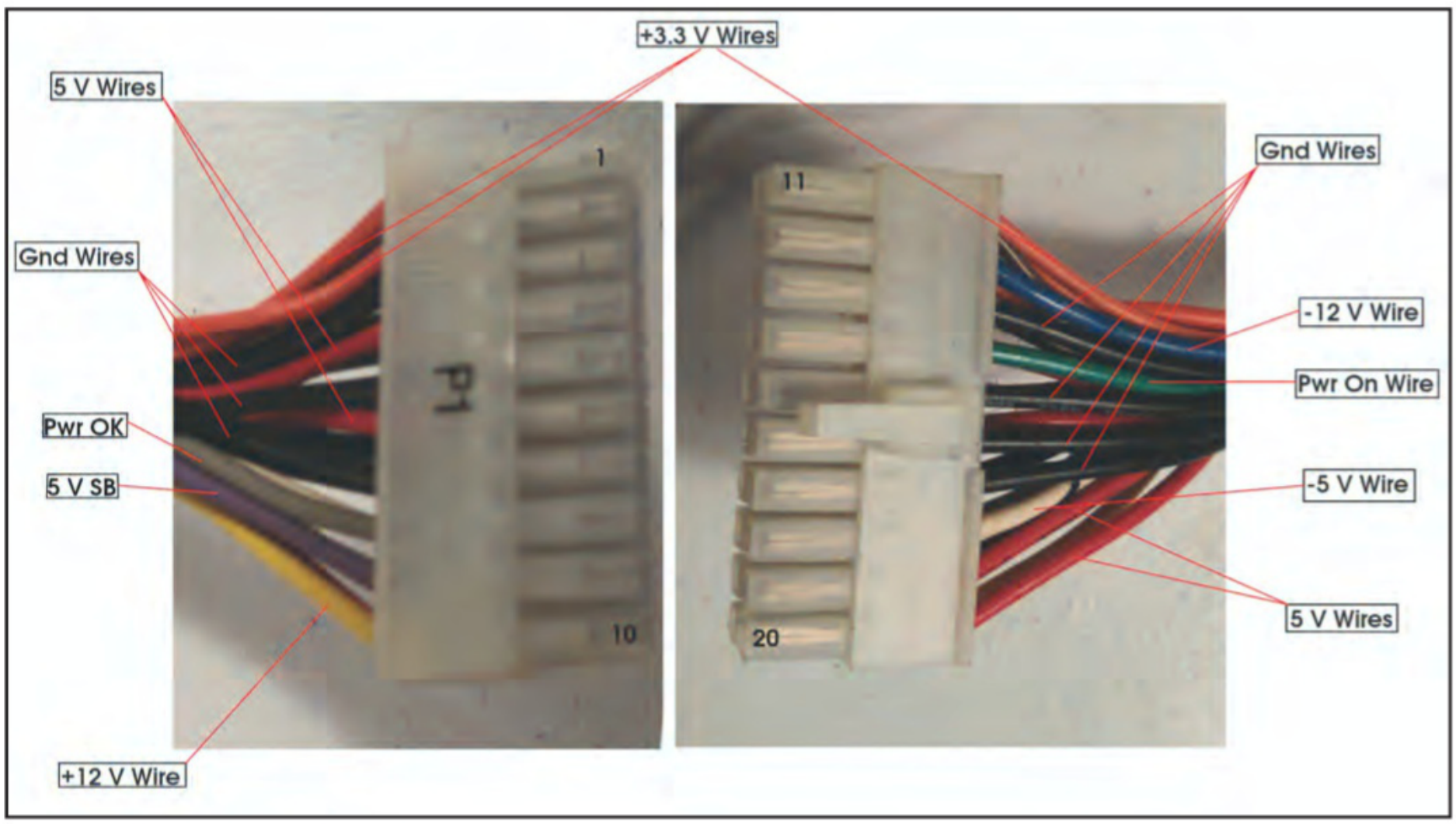
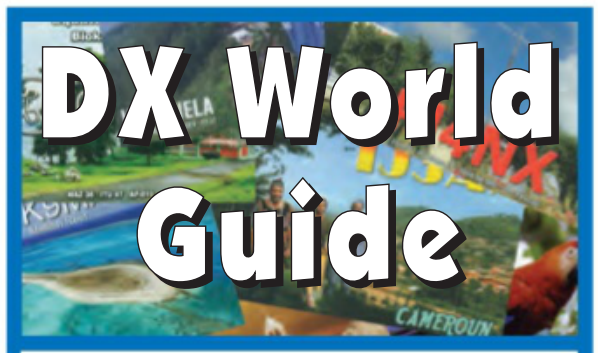


Photo C. 20-pin connector wiring.



New 4th Edition!

By Franz Langner, DJ9ZB

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

This is the fourth edition of his series of books bearing the title *DX World Guide*. It was first published in Germany in 1988 and followed by a second edition, also in Germany in 1977. The third edition, published in the U.S.A in 2012 was the first to use color throughout. This 380-page, fourth edition, also full color throughout, includes information on well over 300 DX entities.

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As this conversion involves only the 12-volt supply, we are limited to 6 amps from the 12-volt line, and this will not exceed the 200-watt limit, so there are no worries. If you decide to expand on this and use the 5-volt and/or the 3.3-volt supplies, be sure to calculate the expected power draw from each voltage and add them all together to ensure you do not overload the supply.

With the newer Pentium and up supplies, more chips have gone to 12 volts, so there is more current-handling on the 12-volt end. Most high-quality desktop supplies are rated around 17 amps, but that rating might be total current. Remember, in a lot of the computer supplies, there can be more than one 12-volt rail. Those specs are usually available for most PSUs online somewhere.

Untangling the Wires

When you get into the supply, the sheer number of wires and connectors can be a little overwhelming until you separate them out and realize you only need to worry about a few of them. In addition to the main 20-pin connector, which you can't miss, there are also several 4-pin Molex connectors daisy-chained to-

Table 1

Pin No.	20-Pin Connector			24-Pin Connector		
	Name	**Color**	**Description**	**Name**	**Color**	**Description**
1	3.3V	Orange	+3.3VDC	3.3V	Orange	+3.3VDC
2	3.3V	Orange	+3.3VDC	3.3V	Orange	+3.3VDC
3	COMMON	Black	Ground	COMMON	Black	Ground
4	5V	Red	+5VDC	5V	Red	+5VDC
5	COMMON	Black	Ground	COMMON	Black	Ground
6	5V	Red	+5VDC	5V	Red	+5VDC
7	COMMON	Black	Ground	COMMON	Black	Ground
8	Pwr Ok	Gray	Power OK	Pwr Ok	Gray	Power OK
9	5VSB	Purple	+5VDC Standby Power	5VSB	Purple	+5VDC Standby Power
10	12V	Yellow	+12VDC	12V	Yellow	+12VDC
11	3.3V	Orange	+3.3VDC	12V	Yellow	+12VDC
12	-12V	Blue	-12VDC	3.3V	Orange	+3.3VDC
13	COMMON	Black	Ground	3.3V	Orange	+3.3VDC
14	Pwr On	Green		-12V	Blue	-12VDC
15	COMMON	Black	Ground	COMMON	Black	Ground
16	COMMON	Black	Ground	Pwr On	Green	
17	COMMON	Black	Ground	COMMON	Black	Ground
18	-5V	White	-5VDC	COMMON	Black	Ground
19	5V	Red	+5VDC	COMMON	Black	Ground
20	5V	Red	+5VDC	-5V	White	-5VDC
21				5V	Red	+5VDC
22				5V	Red	+5VDC
23				5V	Red	+5VDC
24				COMMON	Black	Ground

Table 1. Pinouts for both 20- and 24-pin ATX computer power supply connectors. Only a few of the wires will be used for 12-volt purposes.

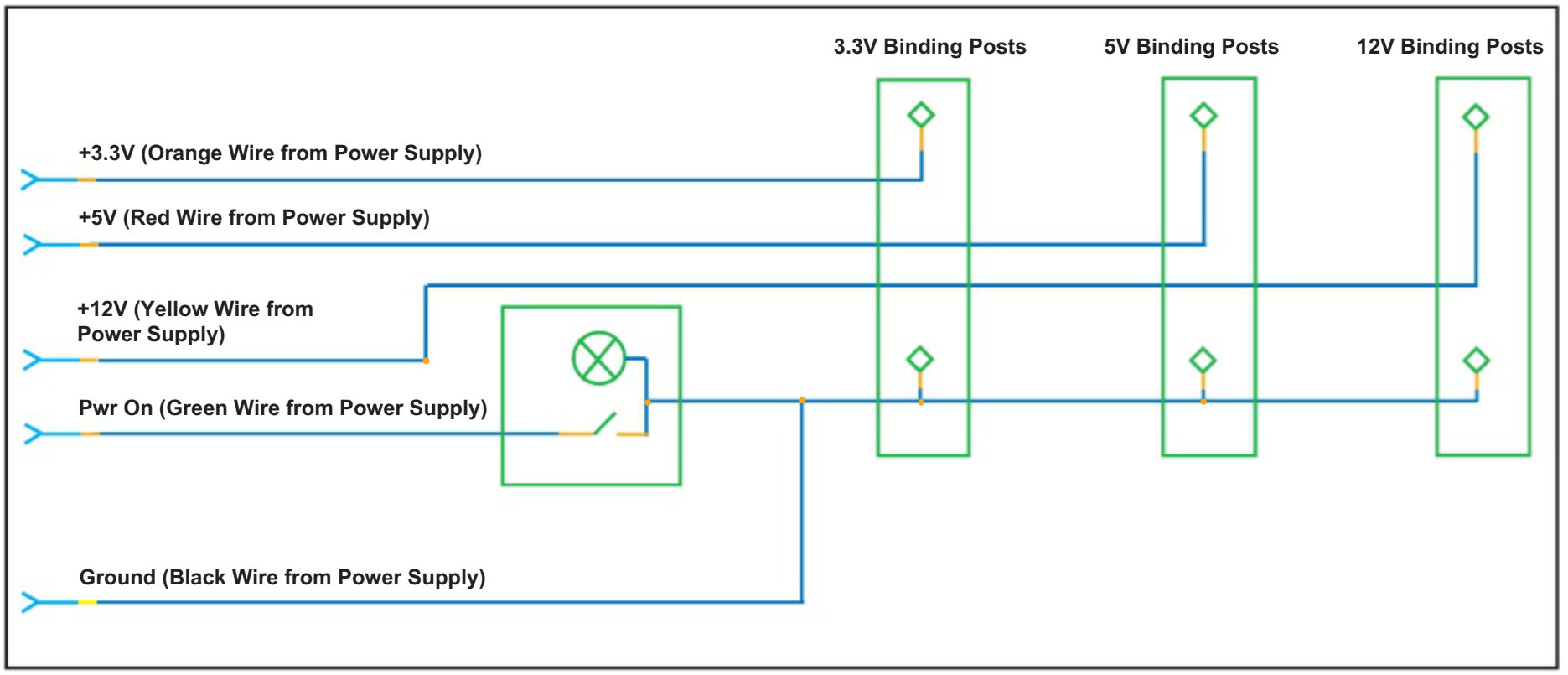

Figure 1. Power control switch and indicator schematic.

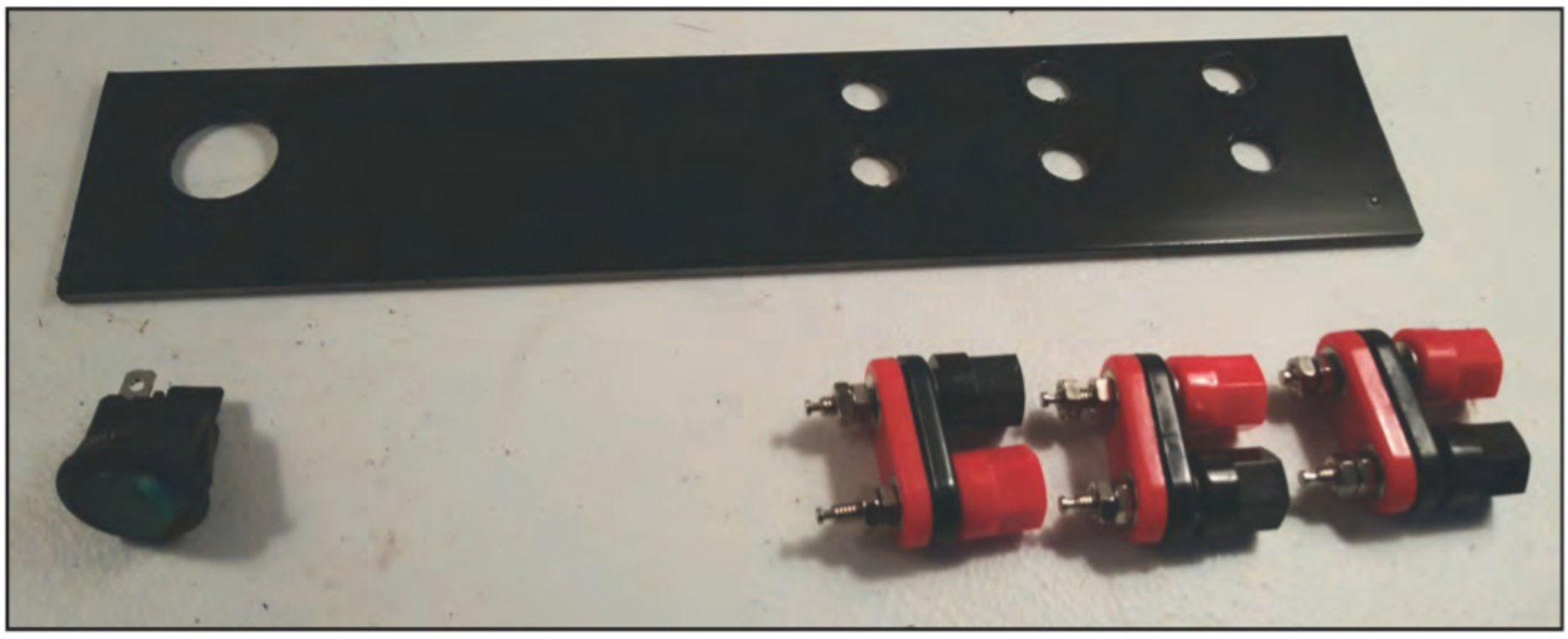

Photo D. Parts used for Mike's build.

gether for hard drives (there may be as many as eight of them); and at the end of this string of Molex connectors, there is usually a small floppy drive pigtail connector (quite tiny). There is also a square 4-pin block connector on its own. The square block connector has two +12 volt and two ground wires on it as well, and likely comes from the same rail as the 4-pin rectangular Molex connectors.

The wires on the main 20-pin (or 24-pin) connector are color coded. These are the same for all ATX power supplies (*Photo C*):

- +3.3V wires are orange
- +5V wires are red
- -5V wires (if they are present) are white
- +12V wires are yellow
- -12V wires are blue
- ground wires are black
- "power on" sensor is green
- + 5V standby power is purple
- "power good" indicator is gray

The green power-on sensor wire is internally connected to 5 volts through a pull-up resistor. If you connect this wire to ground (any black wire), the power supply will turn on. The purple standby power wire puts out +5 volts even if the rest of the power supply has not yet turned on, allowing you to power any circuit that might control the ON/OFF signal. The gray "power good" indicator is at 5 volts if each of the output wires is operating at the correct voltages and could be used to power a LED indicator.

The large 20-pin motherboard connector is made up of two rows of 10 pins each. If you are holding the connector with the guide key on the top (this is a piece of plastic that sticks out from the long side of the connector shell), pin one is the leftmost pin on the bottom row (it's square), pin 10 is the rightmost on the bottom row, pin 11 is the leftmost on the top row,

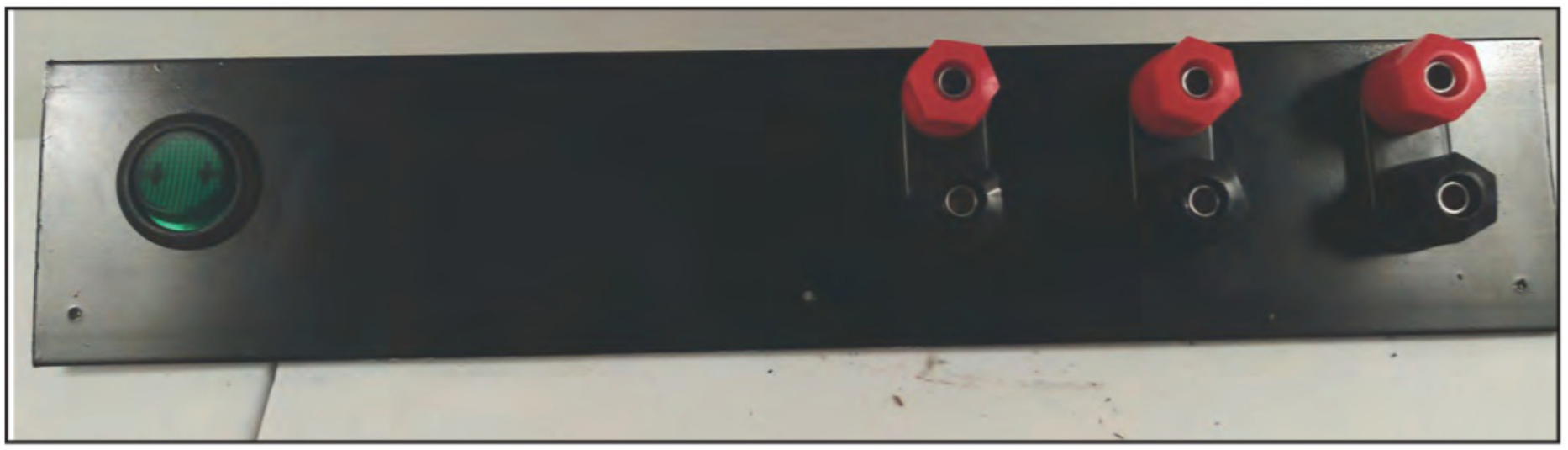

Photo E. Assembled panel with all parts mounted.

Photo F. Panel installed at operating position.

and pin 20 is the rightmost pin on the top row (also square). So for reference, pin one is directly below pin 11, and pin 10 is directly below pin 20. The 24-pin connector is arranged in the same way except there 12 pins in each row instead of 10; therefore, the bottom row starts on pin one at the left and has pin 12 on the right end and the top row has pin 13 on the left and pin 24 on the right. All of the pin references in this article will refer to the 20-pin connector, so if you are using a PSU with a 24-pin connector, you will have to make the necessary adjustments. See *Table 1* for the pinouts for each type of connector.

The only wires that we need to be concerned for our purposes are the green wire to pin 14, and any of the black wires (we used the one from pin 13). You have to tie the green wire to ground or any of the black wires to make the power supply turn on. Cut the green wire anywhere you like. Then, cut the black wire going to pin 13; it'll be the pin towards the longer section of pins and wires on the connector, not on the shorter side. Then, strip the green and black wires and tie them together using tape or heatshrink to insulate the splice (a small blue wire-nut will work nicely as well), or the green and black wires may be connected to a SPST switch to allow turning the supplies on/off from the switch. Mike used a 12-volt lighted rocker switch for both on/off control and indication (see schematic, *Figure 1*). This tells the computer power supply to turn on.

Next, you will need one of the yellow +12 volt DC wires. We used a 12-volt wire from one of the four Molex connectors, as these have a higher current rating than those on the ATX connector. Holding the 4-pin Molex connector (of which there will be several daisy-chained together on each computer PSU) with the key guide on top of the shell, the right pin is

Table 2. Parts List

Qty	Item
1	Aluminum panel (salvaged from an old piece of electronics, drilled, and painted)
1	Illuminated 12-volt rocker switch (All Electronics P/N LRS-29G, any SPST switch will do)
3	Binding posts (All Electronics P/N BP-25)

Photo G. Completed project powering a µBitx transceiver.

+12 volts, the two center pins are ground and the left pin is +5 volts. Cut a yellow wire off the 4-pin Molex connectors (remember, it's the right-hand pin and wire when holding the Molex connector with the key guide on top). Then cut the wire right next to that for the ground. Now, you can just strip these and tie them straight to your radio's DC cord, or you can use some banana terminals, binding posts (as Mike did), Anderson Power Poles, or whatever you want to make quick and easy connections.

You can cut the ATX connector right off and tape up the ends of the wires at this point as you will not need anything else for a plain 12-volt PSU. If you want to build something with USB charging power etc., you can certainly get the parts easily enough and use any +5 volt wire as per the pin out table to create a charging port for your phone or whatever. In fact, a typical 250-watt PSU can provide 2-amp charging to probably 3 or 4 devices at once if you use the high current +5 volt wires found on the 4-pin hard drive Molex connectors. If you want a secondary lower-current 12-volt line, use the +12 volt wire from pin 10 on the ATX connector as well ... great for shack accessories, etc.

Check Your Work

We used a multimeter throughout to check for ground continuity and for 12 volts once I tied the green and black wires together. The green wire does show 5 volts when not shorted to ground, but it uses a pull-up resistor so, once you ground it, it just turns the supply on and off. As noted earlier, you can put a switch between the green wire and ground if you want to be able to turn the PSU on and off if it doesn't have its own switch on the back.

This is a very rough conversion, and you can get as fancy and tidy as you want. Possible enhancements include mounting binding posts and/or USB ports on the PSU chassis, cutting all unnecessary wires inside the chassis to make a nice clean build, adding meters, etc. Mike made a panel to attach to his operating position with binding posts and a switch (see *Photos D-G*).

A Few Preautions

An article appeared in *QST* a few years ago that included a warning that you should use good-quality, well-shielded supplies because the usual computer does not supply much current at 12 volts; so cheaper supplies may get hot when converted and subjected to heavy loads. Also, the older supplies on XT and ATX boards had a more limited 12-volt supply capability; most of those chips ran at 5 volts, so the 12 volts was just for powering the fan and disk drives. In addition, cheap unshielded supplies may emit loads of RF, causing birdies that can get into your receiver. These are all valid and should be taken into consideration.

Another caution is that some computer power supplies don't regulate all their output voltages independently. What this does is cause the 12-volt line to change voltage if the load on the 5-volt line is heavy. Switching power supplies do what they do by sending a variable-width pulse through the primary of their power transformer. This pulse width controls the output voltage of the whole transformer, so taps off of the secondary may not show the proper voltage if the transformer sees a high load on the 5-volt line because that is where the voltage regulator sits. The 5-volt line regulates very nicely under a heavy load, but the other voltages may go too high as the comparator adjusts the pulse width to make the 5-volt output happy.

Unless you add a 5-volt USB charging port or something, load restrictions aren't really an issue when using just the high-current 12-volt rail supplying the 4-pin Molex connectors. With a good quality, shielded supply, this makes a small, cheap and useful shack power supply. Computer PSUs tend to be very well-regulated and clean and for usually quite a bit less, even new, than your typical 23-amp supply from Samlex, Pyramid, etc. A local shop has a 500-watt computer PSU for $39. This would conservatively provide 15 amps at 12 VDC, more than enough to run a couple dual-banders at 50 watts forever.

These supplies are not great for full 100-watt HF rigs, as those are looking for 22 amps minimum at 13.8 volts, but any mobile rig is going to run fine at 12 volts as that is what the batteries in our cars put out. If you can scavenge a couple of these PSUs for free, you could certainly run them in parallel for more current capability. We would suggest running a good, high-current, 12-volt regulator and balancing resistors between the supplies if you are going to parallel them.

We hope this helps and motivates you, as it did us, to dig into those old PSUs sitting around collecting dust. They can be used for far more than ham radio stuff. They can power 12-volt LED lighting, motors, and plenty of the new kit-style devices that are out there.

Results of the 2019 CQ WPX RTTY Contest

BY ED MUNS, WØYK

One of the best contests, I enjoyed ... E74EB
Another great RTTY contest even the poor props couldn't stop the fun ... HSØZED
Super contest, TNX ... IZ2ZQP
Superrrr contest. Wow ... SN2WOSP
Great time with my wife sharing time in contest and family! ... XE2N
I love CQ WPX RTTY Contest ... YBØNDT
Fantastic contest weekend with CQWW WPX RTTY 2019! Thanks to organizers and operators! … KF4QFJ
Enjoyed the contest ... ZL2RX
One of the best contests of the year! ... K9OM
Another great contest! ... KX4KU
Always an awesome contest! ... WX6V

EB8AH won Multi-Single Low Power. The team consisted of (from l. to r.) Kari, OH4KA; Jouni, OH8GDU; Jari, OH8WW; and Pekka, EA8AH.

** P.O. Box 1877, Los Gatos, CA 95031-1877*
Email: <wØyk@cqww.com>

The 25th installment of the CQ WPX RTTY Contest experienced similar bottom-of-the-cycle propagation as last year. The number of submitted logs was down 7% to 3,099. Another 2,018 calls appeared at least three times in these logs for an overall participation exceeding 5,000 active stations.

Both 15 and 10 meters remained at a 10-year low in activity, same as last year. For example, only nine stations made 10 or more contacts on 10 meters, led by W5PR with 34. The top QSO achiever on 15 meters was CR3DX, followed by eight stations in South America. Table 1 shows percent of QSOs by band, across all logs received for the last 10 years.

Multi-Two station CR3DX achieved the highest QSO total with 5,003, as well as the most 20-meter contacts with 1,791. Single-band 80-meter OL4C made the most 80-meter QSOs with 1,137 and Multi-Multi 9A1A made the most on 40 meters: 1,752. Once again, 9A1A led with the most prefix multipliers at 1,154, though down from prior years' efforts.

New records were set at the World (3) and Continental (11) levels, three times the new records set in 2018 (1 and 4, respectively). Despite poor propagation, it is still possible to set or break a major record:

	World		Continent	
	New	Avail	New	Avail
SO10	0	3	0	18
SO15	0	3	0	18
SO20	1	3	3	18
SO40	0	3	0	18
SO80	0	3	3	18
SOAB	0	3	0	18
MSH	1	1	1	6
MSL	0	1	3	6
M2	1	1	1	6
MM	0	1	0	6
Total	3	22	11	132

First time RTTY test ... DH2WQ
My first CQWW RTTY Contest ... DG5MLA
First time in this contest ... G3YCH
First time entering this contest. Nice to get some DX (DX for me!) ... G6EES
My first participation in this contest ... HB9TZU
This contest was first RTTY contest for me ... JH4FUF
My very first RTTY contest. Lot of fun ... OH2BEN
It was my first RTTY contest ... SP2WGB
First RTTY Contest ... KD4LEM

Band	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
80	13%	15%	11%	11%	8%	7%	10%	17%	17%	20%
40	27%	28%	23%	26%	21%	21%	23%	33%	36%	35%
20	36%	35%	27%	28%	22%	21%	25%	36%	41%	41%
15	23%	21%	30%	29%	28%	27%	32%	14%	5%	5%
10	0.5%	1%	9%	6%	21%	25%	11%	0.1%	0.03%	0.05%

Table 1. Band-by-band breakdowns of QSO percentages, 2010-2019.

The radio... YAESU

True RF Legend
True Performance

FT DX 5000MP Limited

RF μ-Tuning Unit
(Optional)

■ **Provides ultra-high-Q RF preselection selectivity**

Congratulations

We congratulate WRTC 2018 Y81N Winning Team from Lithuania

The winners of the World Radio Team Championship 2018
Gedas Lucinskas (LY9A) and Mindis Jukna (LY4L)

Rig used: 2 x FTDX5000MP

YAESU PRIME SPONSOR WRTC 2018

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YAESU USA
6125 Phyllis Drive, Cypress,
CA 90630 (714) 827-7600

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Specifications subject to change without notice. Some accessories and/or options may be standard in certain areas. Frequency coverage may differ in some countries. Check with your local Yaesu Dealer for specific details.

Second time in the CQ WPX RTTY contest and enjoyed it even more! ... KE3K
This was my first RTTY contest, what a blast! ... KE1IH
This was only my second RTTY contest ... N9KJU
My 4th RTTY contest! ... WN4AFP

Single-Operator (2,872 Entries)

There are many single-operator entry categories to satisfy a wide range of interests. Low power remains the most popular power level, while 40 and 20 meters were again the most popular single-band categories this year:

	80	40	20	15	10	SB	AB	SO
QRP	15	33	17	5	2	72	73	145
LP	74	150	188	34	2	448	1,299	1,747
HP	43	94	99	15	2	253	727	980
Total	132	277	304	54	6	773	2,099	2,872

QRP (145)

Gendron, F5BEG, won the All-Band category with DK7HA and OK3FD close behind.

The 15 80-meter entries came from four continents with Virgil, YO9BCM, taking the top spot. JM1NKT set a new Asia record with Yoshi, JG1LFR, close behind. Rianto, YG3FZR, established the first Oceania record with four contacts in 24 minutes, which shows there are still records that can be set or broken in this contest.

Forty meters had 33 entrants, also across four continents, and Albert, DL5RK, finished far ahead of the group.

A new world record was set by Giovanni, IZ7FLP, on 20 meters. Mubarek, A71AE, set a new Asia record and Andi, YC8AO, set a new Oceania record.

Atsushi, JR1NKN, topped the five entries in 15-meter QRP.

Munehiro, JH3DMQ, won 10 meters with just 18 minutes of operating time.

Low Power (1,747)

Andrea, IK6VXO, won All-Band over the four Europeans in the top slots. John, KK9A, took 5th and top North America honors while Yuri, RT9S, was 6th with top Asia honors.

Grzegorz, SQ4NR, won on 80 meters in the 74-entry field. After the top 24 finishers – who were all European – Mike, WB8BZK, was the top North American entrant. The first entries ever from Oceania were six Indonesian stations with Galih, YC2VOC, topping the list to establish the first 80-meter Low Power record for this continent.

2019 WPX RTTY TOP WORLD SCORES

SINGLE OPERATOR
HIGH POWER ALL BAND
P49X (WØYK) 10,754,846
OL9A (OK2ZAW) 7,501,256
SN7Q (SP7GIQ) 7,327,350
AA3B 6,363,225
LZ5K (LZ5DB) 6,206,922
G2F (MØCKE) 5,453,461
UW1M (UR5MW) 4,853,499
S53X 4,809,946
VE5MX 4,748,328
ACØC 4,734,210

28 MHz
KZ5MM (W5PR) 1,680
NA4W (K4WI) 1,457

21 MHz
CV7S (CX7SS) 805,560
CR6T (CT1ESV) 141,588
I4LCK 124,435
I5MXX 55,622
PY2SHF 30,199

14 MHz
V37DX (DH8BQA) 2,396,328
ED8W (EA8DO) 2,158,180
EM2G (UR7GO) 1,774,326
HG8R (HA8JV) 1,726,112
UA5C 1,566,600

7 MHz
IZ4NIC 4,987,776
S53M (S51FB) 4,239,172
K9OM/4 2,380,644
WQ5OO 2,371,200
DM6DX 2,298,772

3.5 MHz
OL4C (OK1NP) 2,907,656
IQ1RY (IZ1LBG) 2,780,558
UX2X (UT2XQ) 2,278,100
IZØKBR 1,567,392
IZ3SQW 1,471,808

LOW POWER
ALL BAND
*IK6VXO 5,471,250
*IT9RGY/4 4,846,776
*TM3Z (F4DSK) 4,807,728
*4O3A (4O9TTT) 3,917,716
*KK9A/4 3,844,440
*RT9S 3,490,368
*SO9M (SQ9UM) 3,428,040
*LY6A 2,532,050
*UW6E (UR6EA) 2,355,029
*ZZ2T (PY2MNL) 2,290,635

21 MHz
*PX2A (PY2XV) 704,184
*PY2UD 585,273
*ZV2C (PY2CX) 561,120
*PY2XC 63,315
*PU2TRX 50,142

14 MHz
*5C5W (CN8KD) 1,573,769
*MIØM (MIØSAI) 989,097
*LZ2JA 618,412
*UN6LN 548,595
*G8X (G4FJK) 519,870

7 MHz
*7Z1SJ 1,288,468
*I3PXN 909,828
*ES5RY 795,142
*US7KC 784,728
*SQ7CL 746,232

3.5 MHz
*SQ4NR 1,036,112
*YT2AAA 975,154
*OM3ZWA 915,356
*DF1MM 901,600
*UZ2HZ 880,896

QRP
ALL BAND
F5BEG 1,263,072
DK7HA 1,181,768
OK2FD 1,017,144
IK2XDE 919,224
MM3AWD 774,060
YU1ANO (YU1LM) 493,800
DD2ML 429,852
K2YG 325,125
EW8G 203,889
WE4M (N2QT) 171,589

21 MHz
JR1NKN 840
HG3C 799
IZ3NVR 242

14 MHz
IZ7FLP 629,880
A71AE 349,279
HG3IPA (HA3JB) 124,020
UX8ZA 40,040
WE6EZ/5 37,960

7 MHz
DL5RK 538,986
LZ2TU 195,456
EE3X (EA3KX) 185,220
YT5DEY 171,720
R9FBT 150,144

3.5 MHz
YO9BCM 282,978
YO8WW 96,570
YT5YTT 67,704
SQ2NNN 65,268
US3IW 57,348

MULTI-OPERATOR
SINGLE TRANSMITTER (HIGH)
S52X (S5ØXX) 9,838,584
HG1S (HA1TJ) 8,441,062
PJ4Z (WW4LL) 8,016,843
9A5D (9A3AW) 7,577,856
DR5N (DJ9DZ) 6,936,615
HG7T (HA7TM) 6,878,075
UZ2I (UT2II) 6,701,338
NV9L 5,172,516
SZ1A (SV1DPI) 4,825,316
OK7O (OK1XFJ) 4,607,442

MULTI-OPERATOR
SINGLE TRANSMITTER (LOW)
*EB8AH (OH4KA) 7,818,720
*ED9E (EA9CD) 5,274,636
*9A7T (9A2EU) 3,851,712
*OT6M (ON9CC) 3,566,196
*DQ4W (DL1MAJ) 2,242,800
*LY5W (LY2BVQ) 2,150,448
*TC7G (TA7AZC) 2,103,582
*PI4CG (PD2PKM) 2,089,790
*RA3Y 1,937,920
*RK3PWR (R3PJL) 1,758,834

MULTI-OPERATOR
TWO TRANSMITTER
CR3DX (CT3BD) 24,254,241
DP9A (DG1HWM) 8,815,636
S549APR (F5RAV) 8,813,808
K9CT (K9WX) 8,789,400
DP7D (DF2SD) 8,478,900
LY9Y (LY7Z) 8,055,696
NCØDX (WØLSD) 4,603,284
C37URA (C31CA) 4,405,040
DLØCS (DG8LG) 3,482,850
KE1S (W1AN) 2,823,680

MULTI-OPERATOR
MULTI-TRANSMITTER
9A1A (9A5W) 18,965,990
UB6B (R7AB) 10,614,186
LY2W (LY1FW) 9,164,328
NR4M (KS4Q) 8,264,608
LZ6ØKAA (LZ1AO) 7,224,150
AA5AU/4 (N1MGO) 6,915,392
S5ØA 4,622,298
DGØRO 4,191,894
NA5NN (K2FF) 3,570,905
WV6I (N6WM) 2,967,636

ROOKIE
HIGH POWER
ALL BAND
YO4FPF 329,708
VU2ZMK 95,172
KN4BIT 17,355

14 MHz
S53TM 353,772

7 MHz
IU1JCZ 252,778

LOW POWER
ALL BAND
*IU8HPD 1,390,884
*S55BA 987,552
*S51I 527,386
*UA4HJ 453,312
*SV8OVH 323,144
*W9JWC (KD9LSV) 320,597
*SQ8W 311,484
*AA4LS 286,464
*SP9KB 172,179
*HA1DD 168,675

21 MHz
*YG2UFA 2,871
*PU2UAH 1,081

14 MHz
*PY2FRQ 37,985
*VE2NCG 37,723
*RQØC 35,956
*HA1LZ 3,654
*JT1YL 1,690

7 MHz
*IU4HRJ 556,068
*IN3EYI 345,800
*9W2SAF 144,354
*YCØRI 129,630
*KG5THG 108,896

TRIBANDER/SINGLE ELEMENT
HIGH POWER
ALL BAND
N3QE 3,576,573
DP6M (DK9IP) 3,206,245
DM5TI 2,514,642
M7T (G3YYD) 2,485,311
UZ1WW 2,260,995
YL1S (YL1ZF) 2,243,822
OZØJD 1,889,146
DR7B (DL2JRM) 1,657,370
DK1FW 1,611,039
DLØHMK (DF2HN) 1,602,255

21 MHz
EA5FID 14,784
EA3OH 3,293

14 MHz
V37DX (DH8BQA) 2,396,328
EF1Z (EA1BD) 872,534
SX73SC (SV2BFN) 742,118
IU4CHE (PARA) 713,904
RU5TT 495,720

7 MHz
K9OM/4 2,380,644
IT9RZU 839,160
MØUNI 287,364
IZ5EME 284,896
LC2C (LB1HI) 284,088

3.5 MHz
IZ3SQW 1,471,808
EU4E 903,000
SV2BXA 788,900
IK3ORD 767,382
SP5DL 696,672

LOW POWER
ALL BAND
*ZZ2T (PY2MNL) 2,290,635
*IK3TPP 1,962,378
*CT7AJL 1,877,580
*S57U 1,671,047
*OE2E (OE2GEN) 1,605,285
*R7MM 1,599,520
*UT5EPP 1,576,988
*ON5GQ 1,555,113
*LX5IGRY (LX1ER) 1,512,480
*IT9VCE 1,426,620

21 MHz
*PY2XC 63,315
*L77D (LU6DC) 45,235
*UR5QU 31,752
*YV1SW 18,174
*YT8A 14,544

14 MHz
*IW9FDD 436,482
*UR2Y (USØYW) 428,922
*IZ8EFD 396,535
*IK4LZH 291,078
*R5ACQ 276,318

7 MHz
*UR5WCQ 743,208
*OK2RU 677,758
*IW2MXY 563,550
*ED4T (EA4CWN) 439,704
*KS4AA 413,400

3.5 MHz
*SQ4NR 1,036,112
*DF1MM 901,600
*UZ2HZ 880,896
*OK4GP 728,460
*E77EA 724,880

Sulaiman, 7Z1SJ, won 40 meters in the 150-station field, followed by Carlo, I3PXN, and Toomas, ES5RY.

Mohamed, 5C5W (CN8KD), handily won 20 meters for the second year in a row with Simon, MIØM, (MIØSAI) taking second place in this largest single-band category.

Julio, PX2A (PY2XV), won 15 meters over the other next six finishers, also from South America. Next came the top European, Victor, UR5QU.

Takeshi, JF1OVA, won 10 meters with just six QSOs. That just about sums up the high bands.

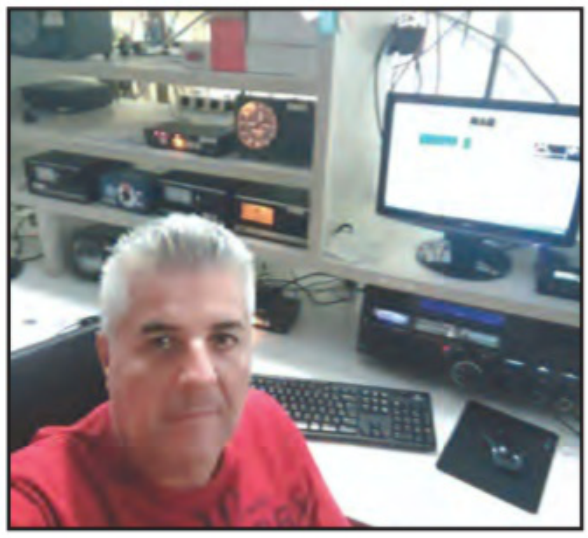
High Power (980)

Ed, P49X (WØYK), won All-Band, his 11th highest score out of 13 consecutive entries in this contest. Jan, OL9A (OK2ZAW), just squeaked by Kris, SN7Q (SP7GIQ), for second place. Bud, AA3B, topped the North American field for 4th place overall.

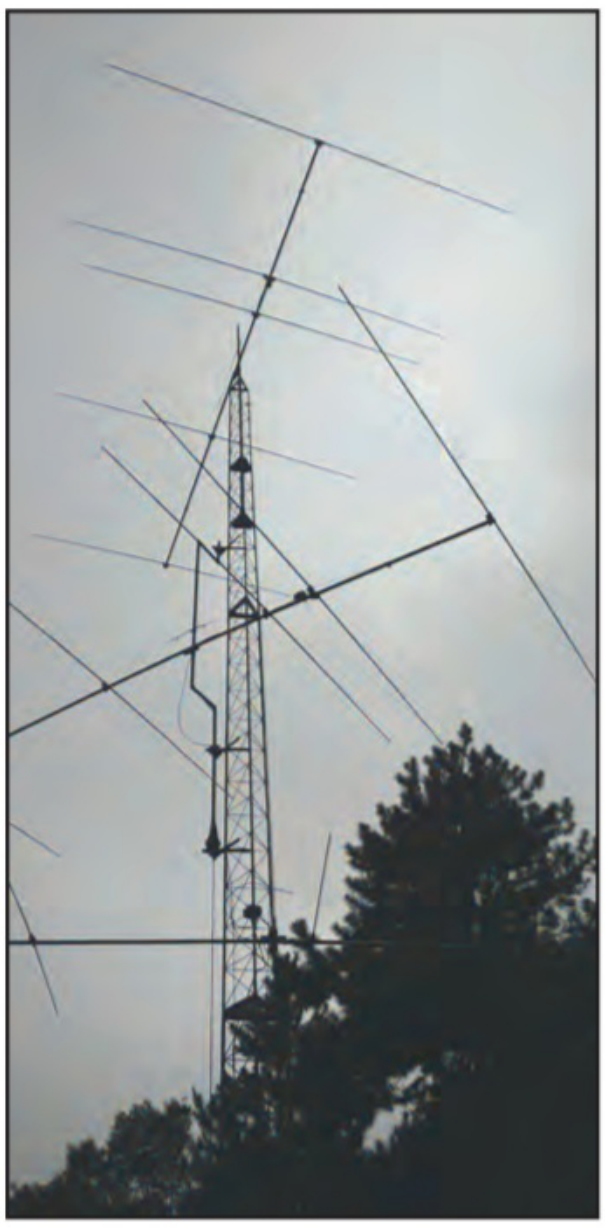
Jan, OL4C (OK1NP), took first on 80 meters with Filippo, IQ1RY (IZ1LBG), close behind in the all European entries that comprise the first 16 finishers. Then came George, VE3NZ, who was first in North America.

Nicola, IZ4NIC, won 40 meters after a close second place in 2018. Miha, S53M (S51FB), took second with Dick, K9OM, and Victor, WQ5OO, very close for 3rd and 4th in North America.

Oliver, V37DX (DH8BQA), won 20



Julio, PY2XV, won SO 15 meters Low Power as PX2A.



15-meter stack at PX2A.

2019 CQWW WPX RTTY TOP UNITED STATES SCORES

SINGLE OPERATOR
HIGH POWER
ALL BAND

AA3B	6,363,225
ACØC	4,734,210
WK1Q (K1MK)	4,091,472
N3QE	3,576,573
W3FV	2,817,944
AK1W (K5ZD)	2,650,428
WK7S (K6LL)	2,647,040
WV1K (N1IXF)	2,646,340
K5DU	2,402,848
KZØUS (W7RY)	2,256,961

28 MHz

KZ5MM (W5PR)	1,680
NA4W (K4WI)	1,457

14 MHz

N2MM	879,660
WW2DX	857,760
W9ILY	337,625
AA7V	172,974
4U1WB/3 (AJ3M)	123,750

7 MHz

K9OM/4	2,380,644
WQ5OO	2,371,200
WX5S/6 (N6DE)	1,640,640
K8IA/7	1,334,742
K4WW	498,324

3.5 MHz

KT4RR (W5MX)	374,550
N6SS/7	373,632
KW7MM	96,600
NØOK	31,878
K8YE	26,208

LOW POWER
ALL BAND

*KK9A/4	3,844,440
*K9NR	1,067,472
*KF2O	1,067,392
*WW3S	959,104
*AA2MF/4	942,028
*W3RGA	854,700
*NY6DX/2	852,550
*W4LC	663,995
*N2HMM	633,204
*KA2D	519,183

21 MHz

*W4UAL (K4CWW)	3,354

14 MHz

*KU2M	398,195
*KF6RY (W6ZL)	141,705
*WB2NVR	72,160
*N2YBB	62,757
*N2MUN	55,242

7 MHz

*KS4AA	413,400
*WK9U	324,480
*W2VTV	209,720
*KK8MM	148,104
*KG5THG	108,896

3.5 MHz

*WB8BZK/9	266,960
*K2DFC	73,114
*AB9YC	55,620
*W9RF (1)	26,040
*KU7T	11,926

QRP
ALL BAND

K2YG	325,125
WE4M (N2QT)	171,589
W6QU (W8QZA)	130,529
K2YGM/4	60,248
KI9S	45,408
W3IQ/8	37,642
KC9NBV	15,808
N6MA/7	10,360
W1IG	10,200
K1SX	10,146

14 MHz

WE6EZ/5	37,960
N1VVV	1,178

7 MHz

KH6KG/W5/5 (KH6KG/W5)	107,146
WD9FTZ/8	60,836
W4ER	4,070

MULTI-OPERATOR
SINGLE TRANSMITTER (HIGH)

NV9L	5,172,516
KZ7X (W7WW)	3,347,888
W4MLB (AF4Z)	1,261,379
WV4P	1,159,368
NXØI	1,053,308
KM4OQO	589,157
AK9D/0 (KCØVTJ)	557,648
K5RZA	532,860
WU6TT (W6DR)	143,374
AA4YL	132,273

MULTI-OPERATOR
SINGLE TRANSMITTER (LOW)

*NG1R (W1QK)	842,160
*KD6TR/7	115,291
*ADØLI	115,206
*KN4DUA (AC6ZM)	93,694

MULTI-OPERATOR
TWO TRANSMITTER

K9CT (K9WX)	8,789,400
NCØDX (WØLSD)	4,603,284
KE1S (W1AN)	2,823,680
KB8O	2,786,488
KT7E (K7ZS)	2,464,020
KB3VQC	2,291,460
W7II/0	1,376,845
NX6T (N6NC)	1,101,672
K5MXG	332,766
W4CDA (KG4UQL)	15,045

MULTI-OPERATOR
MULTI-TRANSMITTER

NR4M (KS4Q)	8,264,608
AA5AU/4 (N1MGO)	6,915,392
NA5NN (K2FF)	3,570,905
WV6I (N6WM)	2,967,636
KU1CW/7	2,939,696
KA6BIM/7	941,460

ROOKIE
HIGH POWER
ALL BAND

KN4BIT	17,355

LOW POWER
ALL BAND

*W9JWC (KD9LSV)	320,597
*AA4LS	286,464
*AJ3C	69,185
*AA8SW	50,800
*KB7AK	16,878
*W2XK	9,420

7 MHz

*KG5THG	108,896
*K7HKR	20,000
*ADØTZ	1,092

TRIBANDER/SINGLE ELEMENT
HIGH POWER
ALL BAND

N3QE	3,576,573
KO7SS	1,453,998
NR4O	1,349,964
W2CDO/3	1,337,628
KI6DY/0	1,317,833
N5HC	1,252,679
WS6X/4	1,218,150
AD5XD	1,120,419
WA7AN (K9DR)	978,147
AA3S	973,352

14 MHz

W9ILY	337,625
AA7V	172,974
W9IL/4	51,471
KI7DG	4,590

7 MHz

K9OM/4	2,380,644

3.5 MHz

K8YE	26,208

LOW POWER
ALL BAND

*W3RGA	854,700
*NY6DX/2	852,550
*W4LC	663,995
*KA2D	519,183
*K3RWN	491,808
*AB4SF	459,792
*WB5TUF	451,400
*W4PJW	422,712
*KF4FC	422,196
*K8LS/5	376,567

14 MHz

*KF6RY (W6ZL)	141,705
*N2YBB	62,757
*N2MUN	55,242
*AB1J	45,675
*W4RRE	40,800
*N9TF	40,588

7 MHz

*KS4AA	413,400
*WK9U	324,480
*KK8MM	148,104
*K5IB	106,760
*WN4AFP	84,940

3.5 MHz

*AB9YC	55,620
*N9SE	37,800
*W9RF (1)	26,040

**Low Power*

meters and missed the North America record. Alex, EM2G (UR7GO), and Pal, HG8R (HA8JV), were very close for 3rd and 4th to top the European contenders.

Eugenio, CV7S (CX7SS), won 15 meters again this year.

Chuck, KZ5MM (W5PR), diligently won 10 meters with 34 QSOs over nearly 8 hours.

Students 10-15 years old, for some their first contest ... ES5YG
Licensed from 2018 December, age 14 ... HA1DD
Age 14 years and licensed from December 2018 ... HA1LZ
Martin, 16 years old ... IN3EY
I am only one YL and youngest ham operator. I am 12 years old. My license start from 15th of January 2019 ... JT1YL

Multi-Operator (134)

Multi-Single is the most popular multi-operator category, by far:

MSL	MSH	M2	MM
43	49	27	15

Multi-Single Low Power (43)

EB8AH (OH4KA, OH8WW, OH8GDU, EA8AH) set a new world record with their clear win over rival African station ED9E (EA9CD, EA9FY, EA9AAU, EA8ACD, EA9ACP, EA9ACT, EB9DG, EA7KI, EA7KP). 9A7T (9A2EU, 9A5MR, 9A4OP, 9A5CB) was third, to lead the Europeans in the next four places, followed by a new Asia record by TC7G (TA7AZC, TA7AOF, TA7EB, TA7EA). PR2E broke the South America record.

Multi-Single High Power (49)

First place went to S52X (S50XX, S52K, S52X, S55G, S55Y, S56Y, S57AV, S57NA) to upset last year's winner HG1S (HA1TJ, HA1DAI, HA1SN, HA1DAE). PJ4Z (WW4LL, NN9DD) took third to beat last year's second place team at 9A5D (9A3AW, 9A3ID, 9A3VM, 9A7Z). Eighth place NV9L (NV9L, K9CS, N9TK, N9LAH, WB9Z) won North America.

Multi-Two (27)

CR3DX (CT3BD, CT3DZ, CT3EN, CT3KY, OM2KW, OM3RM, OM7LW) set a new world record by 30%, which was set by the same team at CR3A in 2017. DP9A (DG1HWM, DK1DSA, DK4WA, DL5YYM, DL8UAT, DL9NDV, DM5JBN) and S549APR (F5RAV, S50LD, S51TC,

2019 CQWW WPX RTTY TOP EUROPE SCORES

SINGLE OPERATOR
HIGH POWER
ALL BAND

OL9A (OK2ZAW) 7,501,256
SN7Q (SP7GIQ) 7,327,350
LZ5K (LZ5DB) 6,206,922
G2F (MØCKE) 5,453,461
UW1M (UR5MW) 4,853,499
S53X 4,809,946
ER4A (UT5UDX) 4,658,812
YO9HP 4,646,763
OM2VL 4,572,454
EMØI (UT2IZ) 4,314,363

21 MHz

CR6T (CT1ESV) 141,588
I4LCK 124,435
I5MXX 55,622
YTØZ (YU1ZZ) 25,004
EA5FID 14,784

14 MHz

EM2G (UR7GO) 1,774,326
HG8R (HA8JV) 1,726,112
UA5C 1,566,600
S57DX 1,430,860
LZ6Y (LZ1KU) 1,326,378

7 MHz

IZ4NIC 4,987,776
S53M (S51FB) 4,239,172
DM6DX 2,298,772
YU1AU 2,204,488
S51CK 2,027,880

3.5 MHz

OL4C (OK1NP) 2,907,656
IQ1RY (IZ1LBG) 2,780,558
UX2X (UT2XQ) 2,278,100
IZØKBR 1,567,392
IZ3SQW 1,471,808

LOW POWER
ALL BAND

*IK6VXO 5,471,250
*IT9RGY/4 4,846,776
*TM3Z (F4DSK) 4,807,728
*4O3A (4O9TTT) 3,917,716
*SO9M (SQ9UM) 3,428,040
*LY6A 2,532,050
*UW6E (UR6EA) 2,355,029
*IK3TPP 1,962,378
*CT7AJL 1,877,580
*IKØCHU 1,797,070

21 MHz

*UR5QU 31,752
*YT8A 14,544
*IKØPRP 13,794
*I3FGX 12,276
*IK2TDM 6,272

14 MHz

*MIØM (MIØSAI) 989,097
*LZ2JA 618,412
*G8X (G4FJK) 519,870
*IW9FDD 436,482
*UR2Y (USØYW) 428,922

7 MHz

*I3PXN 909,828
*ES5RY 795,142
*US7KC 784,728
*SQ7CL 746,232
*UR5WCQ 743,208

3.5 MHz

*SQ4NR 1,036,112
*YT2AAA 975,154
*OM3ZWA 915,356
*DF1MM 901,600
*UZ2HZ 880,896

QRP
ALL BAND

F5BEG 1,263,072
DK7HA 1,181,768
OK2FD 1,017,144
IK2XDE 919,224
MM3AWD 774,060
YU1ANO (YU1LM) 493,800
DD2ML 429,852
EW8G 203,889
LZ3RR 146,496
SN2WOSP (SP2UUU) 117,624

14 MHz

IZ7FLP 629,880
HG3IPA (HA3JB) 124,020
UX8ZA 40,040
RA3XEV 5,150
IU2IGX 1,350

7 MHz

DL5RK 538,986
LZ2TU 195,456
EE3X (EA3KX) 185,220
YT5DEY 171,720
R9FBT 150,144

3.5 MHz

YO9BCM 282,978
YO8WW 96,570
YT5YTT 67,704
SQ2NNN 65,268
US3IW 57,348

MULTI-OPERATOR
SINGLE TRANSMITTER (HIGH)

S52X (S5ØXX) 9,838,584
HG1S (HA1TJ) 8,441,062
9A5D (9A3AW) 7,577,856
DR5N (DJ9DZ) 6,936,615
HG7T (HA7TM) 6,878,075
UZ2I (UT2II) 6,701,338
SZ1A (SV1DPI) 4,825,316
OK7O (OK1XFJ) 4,607,442
OK1KSL (OK1AHJ) 4,071,375
OH2HAN 3,677,955

MULTI-OPERATOR
SINGLE TRANSMITTER (LOW)

*9A7T (9A2EU) 3,851,712
*OT6M (ON9CC) 3,566,196
*DQ4W (DL1MAJ) 2,242,800
*LY5W (LY2BVQ) 2,150,448
*PI4CG (PD2PKM) 2,089,790
*RA3Y 1,937,920
*RK3PWR (R3PJL) 1,758,834
*ED3D (EA3AYQ) 1,469,093
*PI4VAD (PA3DUU) 811,966
*EA4URE (EB2DSP) 767,618

MULTI-OPERATOR
TWO TRANSMITTER

DP9A (DG1HWM) 8,815,636
S549APR (F5RAV) 8,813,808
DP7D (DF2SD) 8,478,900
LY9Y (LY7Z) 8,055,696
C37URA (C31CA) 4,405,040
DLØCS (DG8LG) 3,482,850
ED2C (EA2VE) 2,133,472
OM3KFF (OM4DW) 1,342,224
SP5KCR (SQ5WWK) 498,344
EA3MR 334,887

MULTI-OPERATOR
MULTI-TRANSMITTER

9A1A (9A5W) 18,965,990
UB6B (R7AB) 10,614,186
LY2W (LY1FW) 9,164,328
LZ6ØKAA (LZ1AO) 7,224,150
S5ØA 4,622,298
DGØRO 4,191,894
DR3W (DL3ABL) 2,467,839
ED2V (EA2CYJ) 304,554

ROOKIE
HIGH POWER
ALL BAND

YO4FPF 329,708

14 MHz

S53TM 353,772

7 MHz

IU1JCZ 252,778

LOW POWER
ALL BAND

*IU8HPD 1,390,884
*S55BA 987,552
*S51I 527,386
*UA4HJ 453,312
*SV8OVH 323,144
*SQ8W 311,484
*SP9KB 172,179
*HA1DD 168,675
*IU4JIC 129,564
*R2PU 129,425

14 MHz

*HA1LZ 3,654
*IU2IGX 1,350

7 MHz

*IU4HRJ 556,068
*IN3EYI 345,800
*2EØLXE 71,250
*EA7JZZ 45,696
*SP9WPN 6,160

3.5 MHz

*R2FBZ 227,696
*DO1ISE 169,600

TRIBANDER/SINGLE ELEMENT
HIGH POWER
ALL BAND

DP6M (DK9IP) 3,206,245
DM5TI 2,514,642
M7T (G3YYD) 2,485,311
UZ1WW 2,260,995
YL1S (YL1ZF) 2,243,822
OZØJD 1,889,146
DR7B (DL2JRM) 1,657,370
DK1FW 1,611,039
DLØHMK (DF2HN) 1,602,255
UV7V (UX1VT) 1,433,124

21 MHz

EA5FID 14,784
EA3OH 3,293

14 MHz

EF1Z (EA1BD) 872,534
SX73SC (SV2BFN) 742,118
IU4CHE (PARA) 713,904
RU5TT 495,720
UC6N 363,747

7 MHz

IT9RZU 839,160
MØUNI 287,364
IZ5EME 284,896
LC2C (LB1HI) 284,088
UT5LA 227,392

3.5 MHz

IZ3SQW 1,471,808
EU4E 903,000
SV2BXA 788,900
IK3ORD 767,382
SP5DL 696,672

LOW POWER
ALL BAND

*IK3TPP 1,962,378
*CT7AJL 1,877,580
*S57U 1,671,047
*OE2E (OE2GEN) 1,605,285
*R7MM 1,599,520
*UT5EPP 1,576,988
*ON5GQ 1,555,113
*LX5IGRY (LX1ER) 1,512,480
*IT9VCE 1,426,620
*DL3SYA 1,365,210

21 MHz

*UR5QU 31,752
*YT8A 14,544
*IKØPRP 13,794
*I3FGX 12,276
*IK2TDM 6,272

14 MHz

*IW9FDD 436,482
*UR2Y (USØYW) 428,922
*IZ8EFD 396,535
*IK4LZH 291,078
*R5ACQ 276,318

7 MHz

*UR5WCQ 743,208
*OK2RU 677,758
*IW2MXY 563,550
*ED4T (EA4CWN) 439,704
*Z37DX (Z33F) 328,636

3.5 MHz

*SQ4NR 1,036,112
*DF1MM 901,600
*UZ2HZ 880,896
*OK4GP 728,460
*E77EA 724,880

**Low Power*

Multi-Two K9CT won North America and was 4th worldwide (near to far: Jim, N7US; Larry, KT9L; Tim, K9WX).

S51ZJ, S55KZ, S56B, S56DE, S57PM, S59MZ) are virtually tied for 2nd and 3rd place. K9CT (K9WX, AI9T, ND9G, K9CT, KT9L, N7US) was first in North America for 4th place worldwide.

Multi-Multi (15)

World record holder 9A1A (9A5W, 9A9A, 9A6A, 9A7R, 9A7C, 9A8A, 9A3SMS, 9A5PL, 9A5AEU, 9A7ROR) again took top honors as they have every year since 2012. UB6B (R7AB, R7DA, RA6YDX, R6YP, R7TU, RU7A) and LY2W (LY1FW, LY2FN, LY2MM, LY2NY, LY2PAD, LY2W, LY5O) took the next two places. NR4M (KS4Q, K5OF, NR4M, W4GO, K4GM, K3NC, N4DXS, KA4RRU, K3UI, N3ZV, N3AIU) won North America and AA5AU (N1MGO, AA5AU, WS7I, K3ZV, W4AAW, KT1I, KJ0D, W4TMO @W4AAW) was second in North

2019 WPX RTTY PLAQUE WINNERS AND DONORS

SINGLE-OPERATOR HIGH POWER

World: Jeff Blaine, ACØC. Won by: **Ed Muns, P49X (op. WØYK)**
USA: Abroham Neal Software by K3NC. Won by: **Bud Trench, AA3B**
USA: 7th Call Area: Hank Lonberg, KR7X (in memory of Bob Wruble, W7GG). Won by: **Dave Hachadorian, WK7S (Op. K6LL)**
Europe: FlexRadio Systems. Won by: **Jan Sustr, OL9A (Op. OK2ZAW)**

SINGLE-OPERATOR LOW POWER

World: Mike Sims, K4GMH. Won by: **Andrea Tonci, IK6VXO**
North America: Alabama Contest Group. Won by: **John Bayne, KK9A**
Europe: FlexRadio Systems. Won by: **Gabry Iuliani, IT9RGY/4**
Asia: Doug Faunt, N6TQS. Won by: **Yuri Kotelnikov, RT9S**
Oceania: Doug Faunt, N6TQS. Won by: **Ozkan Ozal, TA7I**

SINGLE-OPERATOR QRP

World: FlexRadio Systems. Won by: **Gendron Gerard, F5BEG**

SINGLE-OPERATOR SINGLE BAND

World 7 MHz: Steve Booklout, NR4M, and the "Goat Farm Gang". Won by: **Nicola Bughignoli, IZ4NIC**
World 14 MHz: Steve "Sid" Caesar, NH7C. Won by: **Olivier Droese, V37DX (Op. DH8BQA)**
World 14 MHz Low Power: Kenny Young, AB4GG. Won by: **Mohamed Kharbouche, 5C5W (Op. CN8KD)**
World 21 MHz: Wray Dudley, AB4SF. Won by: **E. Eugenio De Marino, CV7S (Op. CX7SS)**

MULTI-OPERATOR, SINGLE-TRANSMITTER HIGH POWER

World: FlexRadio Systems. Won by: **S52X (Op. S5ØXX, S52K, S52X, S55G, S55Y, S56Y, S57AV, S57NA)**
North America: Mike Benjamin, W2GR. Won by: **NV9L (Op. NV9L, K9CS, N9TK, N9LAH, WB9Z)**

MULTI-OPERTATOR, MULTI-TWO

World: Steve Bookout, NR4M, and the "Goat Farm Gang". Won by: **CR3DX (Op. CT3BD, CT3DZ, CT3EN, CT3KY, OM2KW, OM3RM, OM7LW)**
North America: Ed Muns, WØYK. Won by: **K9CT (Op. K9WX, AI9T, ND9G, K9CT, KT9L, N7US)**
Europe: FlexRadio Systems. Won by: **DP9A (DG1HWM, DK1DSA, DK4WA, DL5YYM, DL8UAT, DL9NDV, DM5JBN)**

MULTI-OPERATOR, MULTI-TRANSMITTER

World: Steve Bookout, NR4M, and the "Goat Farm Gang". Won by: **9A1A (9A5W, 9A9A, 9A6A, 9A7R, 9A7C, 9A8A, 9A3SMS, 9A5PL, 9A5AEU, 9A7ROR)**
North America: BeLoud.US. Won by: **NR4M, The "Goat Farm Gang" (Op. KS4Q, K5OF, NR4M, W4GO, K4GM, K3NC, N4DXS, KA4RRU, K3UI, N3ZV, N3AIU)**
Europe: FlexRadio Systems. Won by: **UB6B (R7AB, R7DA, RA6YDX, R6YP, R7TU, RU7A)**

CLUB COMPETITION

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

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Club Competition

DX: The Bavarian Contest Club dominated again this year with 81 logs for first place. Also repeating last year's 2nd place finish was the Ukrainian Contest Club with its 55 entries. Third place was the Slovenia Contest Club with 11 logs.

USA: Fourth place overall and repeat USA winner was the Potomac Valley Radio Club with 59 logs, followed by the Northern California Contest Club with 53 logs and 5th place overall. The Society of Midwest Contesters was close behind with 55 logs.

Closing

A searchable database of the results from every CQ WPX RTTY Contest is available at <www.cqwpxrtty.com/scores.htm>. The search criteria are very versatile, allowing one to see results and records for virtually any

The ED9E team was 2nd in Multi-Single Low Power.

2019 WPX RTTY CLUB SCORES

United States

Club	# Entrants	Score
POTOMAC VALLEY RADIO CLUB	59	35,242,211
NORTHERN CALIFORNIA CONTEST CLUB	53	31,408,821
SOCIETY OF MIDWEST CONTESTERS	55	30,346,097
FRANKFORD RADIO CLUB	29	20,382,544
YANKEE CLIPPER CONTEST CLUB	26	14,198,369
ARIZONA OUTLAWS CONTEST CLUB	24	12,513,511
KANSAS CITY CONTEST CLUB	5	8,715,899
GEORGIA CONTEST GROUP	4	8,491,143
WILLAMETTE VALLEY DX CLUB	16	8,265,822
FLORIDA CONTEST GROUP	14	8,257,567
GRAND MESA CONTESTERS OF COLORADO	5	4,980,747
MINNESOTA WIRELESS ASSN	22	4,119,693
CENTRAL TEXAS DX AND CONTEST CLUB	7	3,989,121
TENNESSEE CONTEST GROUP	12	3,800,103
MAD RIVER RADIO CLUB	7	3,261,802
CTRI CONTEST GROUP	6	3,252,121
KENTUCKY CONTEST GROUP	9	2,970,545
DFW CONTEST GROUP	9	2,952,873
CAROLINA DX ASSOCIATION	7	2,923,323
NIAGARA FRONTIER RADIOSPORT	8	2,308,865
SOUTHERN CALIFORNIA CONTEST CLUB	17	1,818,148
ORDER OF BOILED OWLS OF NEW YORK	8	1,642,385
SHENANDOAH VALLEY WIRELESS	4	1,271,062
NORTH COAST CONTESTERS	8	1,198,152
BRISTOL (TN/VA) ARC	4	1,087,569
WESTERN WASHINGTON DX CLUB	11	979,503
SWAMP FOX CONTEST GROUP	8	861,780
METRO DX CLUB	4	819,657
NORTH CAROLINA DX AND CONTEST CLUB	3	775,661
NEW PROVIDENCE ARC	3	741,253
TEXAS DX SOCIETY	6	726,556
SOUTH EAST CONTEST CLUB	5	703,051
THE VILLAGES AMATEUR RADIO CLUB	6	624,655
SPOKANE DX ASSOCIATION	7	611,383
DEEP DIXIE CONTEST CLUB	3	574,414
UTAH DX ASSOCIATION	3	409,240
MISSISSIPPI VALLEY DX/CONTEST CLUB	3	337,002
NE MARYLAND AMATEUR RADIO CONTEST SOCIETY	3	278,896
NORTHEAST WISCONSIN DX ASSN	4	181,885
MERIDEN ARC	3	158,008
ALABAMA CONTEST GROUP	4	71,147

DX

BAVARIAN CONTEST CLUB	81	83,265,012
UKRAINIAN CONTEST CLUB	55	49,640,391
SLOVENIA CONTEST CLUB	11	35,337,350
CROATIAN CONTEST CLUB	8	24,019,614
RHEIN RUHR DX ASSOCIATION	59	23,738,163
VYTAUTAS MAGNUS UNIVERSITY RADIO CLUB	7	21,478,103
INTEREST GROUP RTTY	12	20,051,285
ITALIAN CONTEST CLUB	38	19,932,604
HA-DX-CLUB	7	18,604,897
CONTEST CLUB ONTARIO	24	7,815,059
LATVIAN CONTEST CLUB	12	7,800,369
RUSSIAN CONTEST CLUB	10	6,321,454
EA CONTEST CLUB	17	6,255,352
BELARUS CONTEST CLUB	7	5,081,232
CONTEST CLUB FINLAND	10	4,183,118
SKY CONTEST CLUB	3	4,046,260
SOUTH URAL CONTEST CLUB	4	3,953,599
ARAUCARIA DX GROUP	8	3,719,809
CHILTERN DX CLUB	5	3,693,797
ARIPA DX TEAM	4	3,527,761
ORCA DX AND CONTEST CLUB	10	3,391,461
CONTEST CLUB SERBIA	7	3,337,574
RUSSIAN DIGITAL RADIO CLUB	15	2,940,697
RIIHIMAEN KOLMOSET	3	2,866,862
LA CONTEST CLUB	4	2,734,540
RTTY CONTESTERS OF JAPAN	9	2,708,969
CONTEST GROUP DU QUEBEC	7	2,697,690
YB LAND DX CLUB	42	2,685,038
KRIVBASS	4	2,588,940
WORLD WIDE YOUNG CONTESTERS	5	2,483,560
TRAC RADIO AMATEUR CLUB TRABZON BRANCH	5	2,097,701
CATALONIA CONTEST CLUB	4	1,996,239
SK5AA VASTERAS RADIOKLUBB	3	1,535,765
SP DX CLUB	14	1,474,606
YO DX CLUB	4	1,449,551
CLIPPERTON DX CLUB	3	1,406,136
CE CONTEST GROUP	4	1,292,438
RIO DX GROUP	8	1,290,978
THRACIAN ROSE CLUB	5	1,264,593
GIPANIS CONTEST GROUP	5	1,090,945
MEDITERRANEO DX CLUB	3	1,046,480
VK CONTEST CLUB	3	914,816
THAILAND DX ASSOCIATION	3	755,788
SPALDING & DISTRICT AMATEUR RADIO SOCIETY	4	593,539
LU CONTEST GROUP	7	539,294
TORBAY ARS	4	504,405
SK6AW HISINGENS RADIOKLUBB	4	452,613
YB6_DXC	3	441,445
SIAM DX GROUP	4	417,307
SINGLE FIGHTER DX GROUP	8	330,038
MARITIME CONTEST CLUB	3	315,094
VU CONTEST GROUP	3	283,996
ARCK	5	273,099
NEWBURY AND DISTRICT ARS	5	239,775
DANISH DX GROUP	3	231,576
NORFOLK AMATEUR RADIO CLUB	3	221,697
599 CONTEST CLUB	5	201,729
CDR GROUP	4	152,369
CHILEAN PACIFIC DX GROUP	3	144,452
RU-QRP CLUB	5	134,375
LA-DX-GROUP	3	63,382

combination of category and geographic area in the world. It's a fine way to "level the playing field" and see how one's operating stacks up against other similar stations.

Log Check Reports (LCRs) can suggest ideas to improve operating accuracy. This valuable information is available upon request to <w0yk@cqwpxrtty.com>. As well, we now have capability to email each participant a link to his/her personal LCR. You can compare your log check statistics with the averages across all logs in this contest. This year's statistics are very close to last year. This may be due in part to improved log-checking algorithms:

- 1.1% busted (incorrect) received callsign
- 1.5% busted serial number received
- 1.6% NIL (Not In Log)
- 4.2% total error rate
- 9.2% score reduction (with penalties and lost mults, score reduction is higher than raw error rate)

Achieving a zero error rate may mean that too much time is being spent on accuracy. Speed and accuracy are a trade-off for optimal communication.

Certificates are available online for download and printing locally. The link for your certificate is on the far right of your score listing in the Scores Database at <www.cqwpxrtty.com/scores.htm>.

Sponsoring a plaque is an opportunity to give back and show appreciation for the contest. You can choose an unsponsored plaque in any category, whether listed or not at <www.cqwpxrtty.com/plaques.htm>. Contact <w0yk@cqwpxrtty.com> to sign up.

A number of volunteers work tirelessly in the background to bring contests to us. Ken, K1EA, and Randy, K5ZD, continue to improve and support the log checking and website software. KM3T, N5KO, and K5TR quietly manage the IT infrastructure behind the log submittal robots, log storage, and log-checking software. The WWROF (World Wide Radio Operators Foundation) provides financial support for the IT services required, among other support for contesting in general. All of us can help with our donations to WWROF, so please consider this way to give back to radiosport. Finally, thanks to Jason, KD2IWM, Managing Editor at *CQ Amateur Radio,* for his supportive editing work on these results.

The 26th CQ WPX RTTY Contest will be held on 8-9 February 2020. I look forward to seeing everyone again then!

(Scores on page 97)

HG-1 Reviewed in June 2019 QST

Magnetic loop antennas (MLA), when properly tuned, are well known for their superior selectivity, low noise and high directivity. Remote tuners and antenna rotators play a big part in this. Introducing a new high gain antenna package - the outdoor deployable, all-weather, HG-1 WR PreciseLOOP®. This integrated package includes the HG-1 WR remote tuner, the AR-1remote rotator and the new universal HG-2 controller. One common CAT-6 cable controls both the tuning and antenna rotation. This new MLA is ideal for fixed deployment at your QTH, or in portable field operations. PreciseLOOP® antenna packages start at $299.

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- Rugged AR-1 Rotator
- HG-2 Controller
- CAT-6 Control Cable

* Some items optional, check the website

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Another year, another Dayton … as usual, there was something for just about everyone at this year's Dayton Hamvention®, held once again at the Greene County Fairgrounds in nearby Xenia, Ohio. Here's a sampling of who and what we saw…

The Dayton Trifecta

The Dayton Hamvention's Third Year at the Greene County Fairgrounds was Nearly Perfect

TEXT BY RICH MOSESON,* W2VU
PHOTOS BY W2VU; JOE EISENBERG, KØNEB; BOB SCHENCK, N2OO; AND BOB HOPKINS, WB2UDC

It was Dayton, so there were thunderstorms — although fewer than usual — and mud, although less than usual. Overall, the weather was excellent, the food offerings were great, and — oh, yes — there was the hamfest, with new gear from major manufacturers, forums hosted by experts in their fields, award dinners and, of course, the flea market! The Hamvention's third year at Xenia's Greene County Fairgrounds was, in our view, the best one yet.

Here's a pictorial sampling of what we saw, and what you might have missed (even if you were there). You'll find more about Hamvention — including more photos — in several of our columns in this issue.

* *Editor, CQ <w2vu@cq-amateur-radio.com>*

The Flea Market

Once again, the old adage rang true … if it exists, you can likely find it in the Dayton flea market. Most of what we saw even had a radio connection…

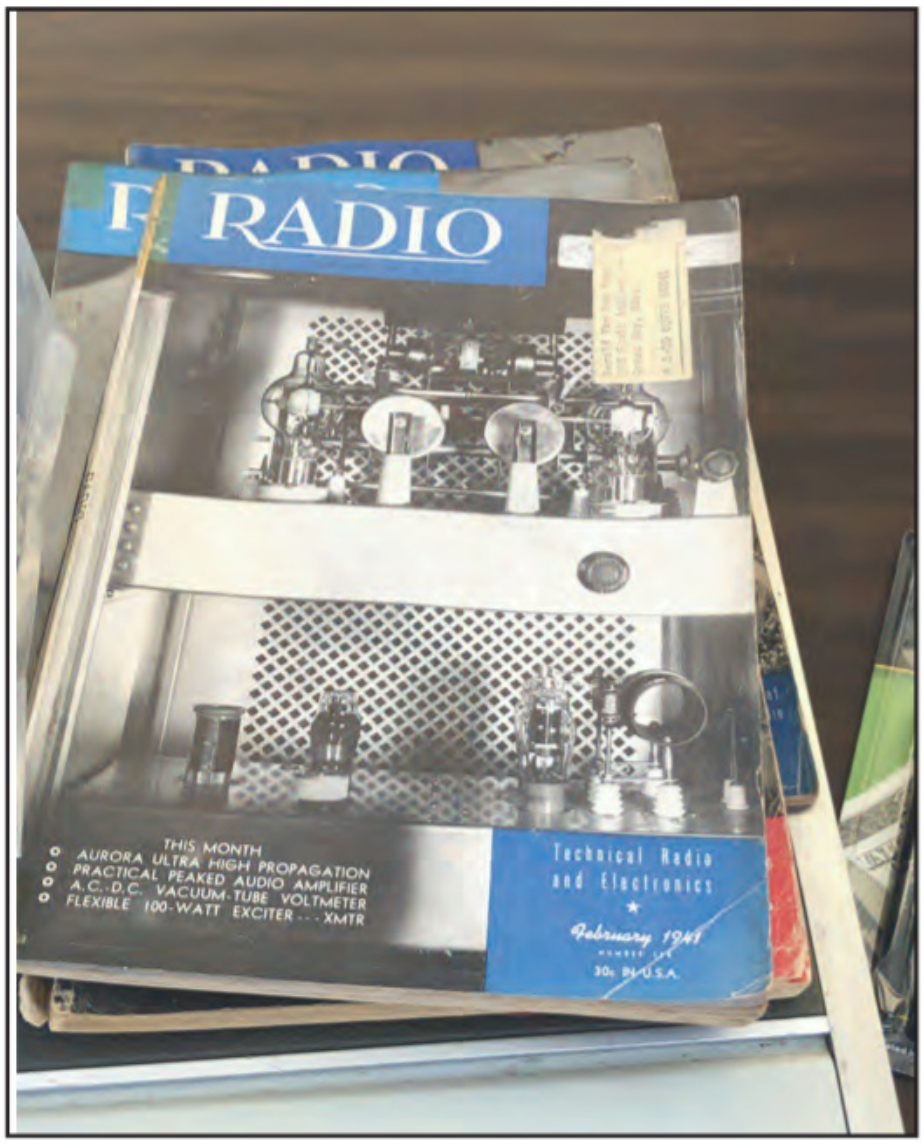
This way to the bargains … and other people's trash that might just become your treasures! (Flea market photos by W2VU)

It's a good thing he has side-view mirrors! If you were looking for restored Drake gear, this was the SUV to visit!

Clearly, KB1JEY was enjoying his time in the sun … selling stuff would be a bonus!

With all due respect, this looks like a case of someone's wife saying, "It goes to the flea market or it goes in the trash … and don't bring any of it back!"

Some vintage gear, on the other hand, looked very well cared-for.



This was W2VU's flea market prize — a stack of Radio magazines from the 1930s. Radio was CQ's predecessor.

Maybe I'll sell some stuff. If not, I'll just sit here and play my music!

QRP kit-maker Rex Harper, W1REX (center) designed this LED light key (left) for Scout troops and enjoyed showing off his 19th-century telegraph lineman's portable key (right) for testing repaired lines.

New Gear

Dayton has traditionally been a place and time for manufacturers to launch new models. Columnist Joe Eisenberg, KØNEB, wasn't chained to a booth, so he managed to get out and see some of the new goodies. Here's a sampling:

The new Icom IC-9700 triband VHF/UHF all-mode radio.

Named with a nod to the legendary FT-101 transceiver of the 1970s, Yaesu's new FTDX101D transceiver is a top-of-the-line software defined radio covering the HF bands plus 6 meters.

Elecraft debuted its new K4 SDR HF transceiver at Dayton.

The new MFJ RigPi Remote Station Controller produces a big display on the video screen from a very small and feature-filled box. Microcontrollers Editor K8ZT discussed the RigPi in his June column. It was designed by Howard Nurse, W6HN, son of former Heathkit President David Nurse, W8GCD (SK).

The new Yaesu FT3DR handheld offers 5 watts of analog FM or digital C4FM audio on 2 meters and 70 centimeters.

People

Ham radio is a social hobby as well as a technical one, and one of the great parts of going to any hamfest is the chance to catch up with old friends and to make some new ones. All that is amplified at Dayton, with attendees coming from all over the world. We'll start our people photos at our "home away from home" for the weekend…

CQ Managing Editor Jason Feldman, KD2IWM, and Editor Rich Moseson, W2VU, during a quiet moment at the CQ booth. (KØNEB photo)

Things were a bit busier when DX Editor Bob Schenck, N2OO, stopped by with his camera. Busy helping customers are (L-R) Editor W2VU; VHF-Plus Editor Tony Emanuele, K8ZR; and Ad Manager/Associate Publisher Dottie Kehrwieder. (N2OO photo)

We had a visit from (and delightful chat with) veteran DXpeditioners Susan Meckley, W7KFI; Don Jones, K6ZO; and Steven Wilson, KA6S. Last November, Susan and Don operated the CQ World Wide DX CW Contest from Malawi as 7Q7M and 7Q6M, respectively. (W2VU photo)

''Ham Radio Roundtable" host Tom Medlin, W5KUB, and Astronaut Doug Wheelock, KF5BOC, launch one of several ham radio-equipped balloons released on a breezy Saturday. (KØNEB photo)

Editor Rich Moseson, W2VU, led a Friday afternoon forum on CQ's upcoming 75th anniversary. He had help from Microcontrollers Editor Anthony Luscre, K8ZT, and frequent author Bob Hopkins, WB2UDC, who also shot this photo.

Actor Jet Jurgensmeyer, KEØUWZ, who plays "Boyd" on Fox TV's "Last Man Standing" program, visited Hamvention from Hollywood, as did "Last Man Standing" Executive Producer John Amodeo, AA6JA (not pictured). (KØNEB photo)

The Youth Tech booth's learn-to-solder program drew a steady stream of interested young people. (W2VU photo)

Marty Sullaway, NN1C (center), poses at the Youngsters on the Air (YOTA) booth with two leaders of the newly formed Young Amateurs Radio Club. YARC is planning to launch a U.S. version of Europe's Youth Contesting Program during this month's IARU HF Championship contest. (W2VU photo)

Keepin' it legal … Hamvention Chairman Jack Gerbs, WB8SCT; Greene County Sheriff Gene Fischer, KX8GCS, who became a ham after working with the Hamvention folks; and Hamvention official spokesman (among other things) Michael Kalter, W8CI. (KØNEB photo)

Hamvention Awards Banquet

The Dayton Hamvention is the venue for a variety of award presentations, including CQ's DX and Contest Hall of Fame inductions (see article elsewhere in this issue as well as this month's DX and Contest columns), but the "star of the show" is the Hamvention's own very prestigious awards, which are presented each year at an invitation-only banquet. *CQ* was invited to attend and chronicle the event…

The Hamvention banquet was held for the first time this year at the Mills Park Hotel in Yellow Springs, Ohio, not far from Xenia. (Banquet photos by W2VU)

A lot of effort went into the very creative microphone centerpiece placed on each table.

The banquet was attended by a variety of "movers and shakers" in the ham radio world, in addition to Hamvention committee members and award recipients.

Dayton Amateur of the Year awardee Nathaniel Frissell, W2NAF (center); flanked by his wife Rachel, W2RUF; and fellow New Jersey ham (and Nobel laureate) Joe Taylor, K1JT. Frissell was recognized for organizing the HamSci program, which encourages collaboration between radio amateurs and ionospheric scientists. In accepting his honor, Frissell said that "awards are not just a recognition of what you have done, but an affirmation of what you should continue doing."

Dayton's Technical Achievement Award this year went to telegraph key designer and manufacturer Pietro Begali, I2RTF. He is accompanied in this photo by Hamvention Awards Committee Chairman Frank Beafore, WS8B.

Dayton's Club of the Year award this year went to New Hampshire's Nashua Area Radio Society, which — among other achievements — holds seven licensing classes each year, has a 93% success rate on license exams and is responsible for 230 new or upgraded licenses in the past four years.

The Special Achievement Award for 2019 went to Chris Janssen, DL1MGB, in recognition of his work as chairman of the 2018 World Radiosport Team Championship (WRTC2018) event last year in Germany.

Postscript – Barely a week after Hamvention ended, on the night of Memorial Day, a swarm of tornadoes swept through Dayton and surrounding areas, causing significant damage and, amazingly, only one death. One of the structures that was heavily damaged by one F3 tornado was Hamvention's former home, Hara Arena in the Dayton suburb of Trotwood (see photo in this month's Emergency Communications column). While the arena had been closed for the past three years and in a state of disrepair (even before it closed), those of us who had been there so many times in the past couldn't help but look in awe at those photos, recognizing specific places that we'd been that felt the full force of the tornado. Our thoughts and prayers are with the people of Dayton and surrounding areas who suffered losses as a result of these tornadoes and/or flooding caused by the same weather system.

Announcing:

2019 CQ Hall of Fame Inductees

CQ magazine is pleased to announce its 2019 Hall of Fame inductees, including two new members of the CQ DX Hall of Fame (including one group), three inductees into the CQ Contest Hall of Fame and five new members of the CQ Amateur Radio Hall of Fame.

The CQ Amateur Radio Hall of Fame honors those individuals, whether licensed hams or not, who have made significant contributions to amateur radio; *and* those amateurs who have made significant contributions either to amateur radio, to their professional careers or to some other aspect of life on our planet. This year, we are inducting five new members, bringing to 326 the total number of members inducted since the hall's establishment in 2001.

The 2019 inductees (listed alphabetically) are:

• **John Attaway, Sr., K4IIF (SK)**, served for more than 20 years as *CQ*'s DX Editor, proposing the establishment of the CQ DX Hall of Fame in 1967. Professionally, John was a chemist who spent 26 years as Director of Scientific Research for the Florida Department of Citrus, where he worked to improve the quality of Florida orange juice. He served on several industry committees and was named to the Florida Citrus Hall of Fame in 2001.

• **Dave Bernstein, AA6YQ,** author of the DXLab software suite, which he makes available to the amateur community at no charge and without advertising. Dave also volunteered his time and talent over several years to help the ARRL resolve major issues with its Logbook of the World electronic confirmation service.

• **Doreen Bogdan-Martin, KD2JTX,** Director of the International Telecommunication Union (ITU) Telecommunication Development Bureau and the first woman ever to hold a senior elected position in the ITU.

• **Predescu Florin Cristian, YO9CNU,** founder of Europe's Youngsters On The Air (YOTA) program to encourage young people to become hams and be active on the air; and

• **Ellen White, W1YL,** the *grand dame* of DXing, served as the ARRL's Deputy Communications Manager, was *QST* magazine's DX editor, recorded *QST* on tape for the Library of Congress's talking book program for the visually-impaired, and was instrumental in the founding of Murphy's Marauders (the predecessor of today's Yankee Clipper Contest Club) and the Florida Contest Group. She was also recently awarded Russia's E.T. Krenkel Medal for outstanding global contributions to amateur radio.

CQ DX and Contest and Halls of Fame

The CQ DX and Contest Halls of Fame honor those amateurs who not only excel in personal performance in these major areas of amateur radio but who also "give back" to the hobby in outstanding ways.

The **CQ DX Hall of Fame** was established in 1967 to recognize those amateurs who have made major contributions to DXing and DXpeditioning. This year, we induct one individual and one group. The 2019 inductees are:

Joe Taylor, **K1JT** – Nobel Prize winning-astrophysicist who has revolutionized the face of DXing with his suite of

Joe Taylor, K1JT (left), is inducted into the CQ DX Hall of Fame by CQ DX Editor Bob Schenck, N2OO. (Photo by Robert Pantazes, W2ARP)

WSJT weak-signal digital modes, including FT8, which is capable of decoding signals well below the noise level. The modes pioneered by Joe have kept the HF bands busy and the DXers active even during the current solar minimum. Other WSJT modes have also revolutionized VHF/UHF DXing via moonbounce and meteor scatter. Taylor shared the 1993 Nobel Prize in physics for the discovery of binary pulsars and is a member of the inaugural (2001) "class" of inductees to the CQ Amateur Radio Hall of Fame.

Silvano Borsa, **I2YSB**, **and the Italian DXpedition Team** – The Italian DXpedition Team has made more than 20 major DXpeditions in the past 20 years, mostly to Africa, where its members have activated more than a dozen rare countries,

John Miller, K6MM (left), accepts the DX Hall of Fame plaque on behalf of Silvano Borsa, I2YSB, and the Italian DXpedition Team. (Photo by Robert Pantazes, W2ARP)

making nearly 1.4 million QSOs along the way. In addition, the team has arranged for the donation and delivery of two ambulances from Italy to Somalia, one of the many countries it has activated.

In addition to team leader Silvano Borsa, I2YSB, the Italian DXpedition Team members include: Alfeo Caputo, I1HJT; Vincio Ravizza, IK2CIO; Angelo Selva, IK2CKR; Marcello Cassinelli, IK2DIA; Stefano Casari, IK2HKT; Angelo Gino Zambaiti, IK2RZP; and Mac Shimamoto, JA3USA.

The **CQ Contest Hall of Fame** was established in 1986 to recognize those amateurs who have made major contributions to the art of radio contesting. The 2019 inductees are:

Bruce Horn, **WA7BNM** – provides a great service to the contesting community via web-based resources for many popular contests. He maintains the most comprehensive contest calendar on the web, and he developed the popular <3830Scores.com> website where contesters go to post raw scores after an event ends, to compare notes and search past contest logs. He is also past manager of the North American QSO Party and developed the log submission apps on the *National Contest Journal* website.

Dean Straw, **N6BV** – is an outstanding contester, a talented writer, editor, presenter and educator, and has advanced the state of the art in antennas, computer modeling, propagation, and contest planning and preparation. As an ARRL staff member for 15 years, he edited multiple editions of *The ARRL Antenna Book* and several other publications. He also developed the High Frequency Terrain Analysis (HFTA) software, which revolutionized antenna system planning by linking antenna design, installation height, tower location, surrounding terrain, and the expected angles of propagation to target regions. His work with the propagation prediction program VOACAP revolutionized the way we plan for contests, allowing specific band opening predictions dependent on solar conditions to indicate when band changes and operations should be planned.

CQ Contest Editor David Siddall, K3ZJ (left), presents CQ Contest Hall of Fame plaque to Bruce Horn, WA7BNM (center), May 18th, 2019, at the Contest Dinner in Dayton, Ohio. Bruce was introduced by fellow CQ Contest Hall of Famer Dick Norton, N6AA (right). (Photo by Bob Wilson, N6TV)

John Miller, K6MM (right), accepts CQ Contest Hall of Fame plaque on behalf of Dean Straw, N6BV (not present), as introduced by CQ World Wide DX Contest Director John Dorr, K1AR. (Photo by Bob Wilson, N6TV)

David Siddall, K3ZJ, presents CQ Contest Hall of Fame plaque for Kresimir (Chris) Kovarik, 9A5K (SK), to Chris's friend, Krassy Petkov, K1LZ. (Photo by Bob Wilson, N6TV)

Kresimir "Chris" Kovarik, **9A5K (SK)** – developed the DXLog and KLog programs, competed in the World Radiosport Team Championship (WRTC) and served the broader amateur radio community in Europe as past president of the Croatian Amateur Radio Association and as vice-chairman of the IARU Region 1 HF Committee. He became a Silent Key earlier this year.

Formal inductions to the CQ Contest and DX Halls of Fame were conducted in conjunction with the Dayton Hamvention® in May. DX Hall of Fame inductions were conducted at the Dayton DX Dinner by *CQ* DX Editor Bob Schenck, N2OO. Contest Hall of Fame presentations were made at the Dayton Contest Dinner by *CQ* Contest Editor Dave Siddall, K3ZJ. A video of the 9A5K Contest Hall of Fame induction shot by Marty Sullaway, NN1C, is on YouTube at <http://nn1c.org/9A5K>. Bob Wilson, N6TV (a 2017 Contest Hall of Fame inductee), shot a video of the N6BV presentation, which is at <https://youtu.be/jXZ7qWgBzVw>.

Our thanks to all and congratulations to the inductees!

Announcing:

2019 CQWW DX RTTY Contest

September 28-29
Starts 0000 UTC Saturday; Ends 2359 UTC Sunday

Join more than 6,000 participants from over 150 DX entities and all 40 CQ Zones in the world's largest RTTY contest.

The CQ World Wide DX RTTY Contest (CQWW RTTY) offers 48 hours of non-stop DX chasing fun. Whether you are competing for awards, looking for a few new band-countries, or simply filling the logbook, the CQWW has something for everyone. Check out the Classic and Rookie Overlay Categories.

Contest Basics

Working stations is easy. Exchange and log signal report and your CQ Zone number, e.g 599 14. Continental U.S. and VE stations also send QTH, e.g., 599 05 MA. If you're not sure which zone you're in, visit <http://bit.ly/1BHtmsP>. Generally speaking, the U.S. West Coast is in Zone 3, the East Coast is in Zone 5, and the rest of the lower 48 is in Zone 4.

Contacts are only valid on the 3.5-, 7-, 14-, 21-, and 28-MHz amateur bands. Please observe established band plans.

Scoring

Final score is based on QSO points earned for each contact times the number of multipliers worked.

Multipliers are the number of DX entities worked on each band plus the number of CQ Zones worked on each band plus the number of US/VE QTHs worked on each band.

Contacts with other continents count three points each. Contacts with the same continent, but different country, count two points. Same country contacts count one point.

Don't worry about calculating your score; the contest log checking software will do that for you when you submit a log.

Entry Categories

The competition is divided into Single Operator and Multi-Operator categories. Single Operator categories also offer two additional Overlay categories.

Single Operator (all bands or any single band): only the one operator finds, makes, and logs all contacts.
- High power: Up to 1,500 watts
- Low power: 100 watts or less
- QRP: 5 watts or less

Single Operator Assisted (all bands or any single band): the one operator may use the DX Cluster or other tools to help find contacts. The one operator must make and log all contacts.

Classic Overlay: Allows the use of only one radio, no QSO finding assistance, and only counts the first 24 hours of operating time — off times are a minimum of 60 minutes during which no QSO is logged. Single Operator Assisted entries are not eligible for this Overlay category.

Rookie Overlay: Only open to operators who were first licensed as radio amateurs less than three (3) years before the date of the contest. Indicate date licensed in the soapbox field of your log.

Multi-Operator: More than one person is involved in operating the station.

Single-Transmitter: This category allows one transmitter to work any station. It may change bands as many as 8 times per hour. Note: A second transmitter may be used to work multipliers only. This category has some very specific restrictions so please read the full rules carefully.
- High power: Up to 1,500 watts
- Low power: 100 watts or less

Two-Transmitter: Allows the use of two transmitted signals on two bands. Each station may change bands as many as 8 times per hour.

Unlimited: Allows the use of one transmitted signal on each of the five bands.

Awards

Electronic certificates will be made available for download for everyone who submits an entry.

Submitting Your Log

All entrants who use a computer to log the contest or prepare their contest logs MUST submit their logs electronically. Electronic logs should be in the Cabrillo format. Upload your log on the Web at <www.cqww.com/logcheck/>. The website also includes a utility to convert your ADIF format log file if needed. See full rules for instructions regarding paper logs.

All entries must be sent **WITHIN FIVE (5) DAYS** after the end of the contest: No later than 2359 UTC **October 4**, **2019**. Resubmitting an entry after the deadline will result in it being considered as a late log.

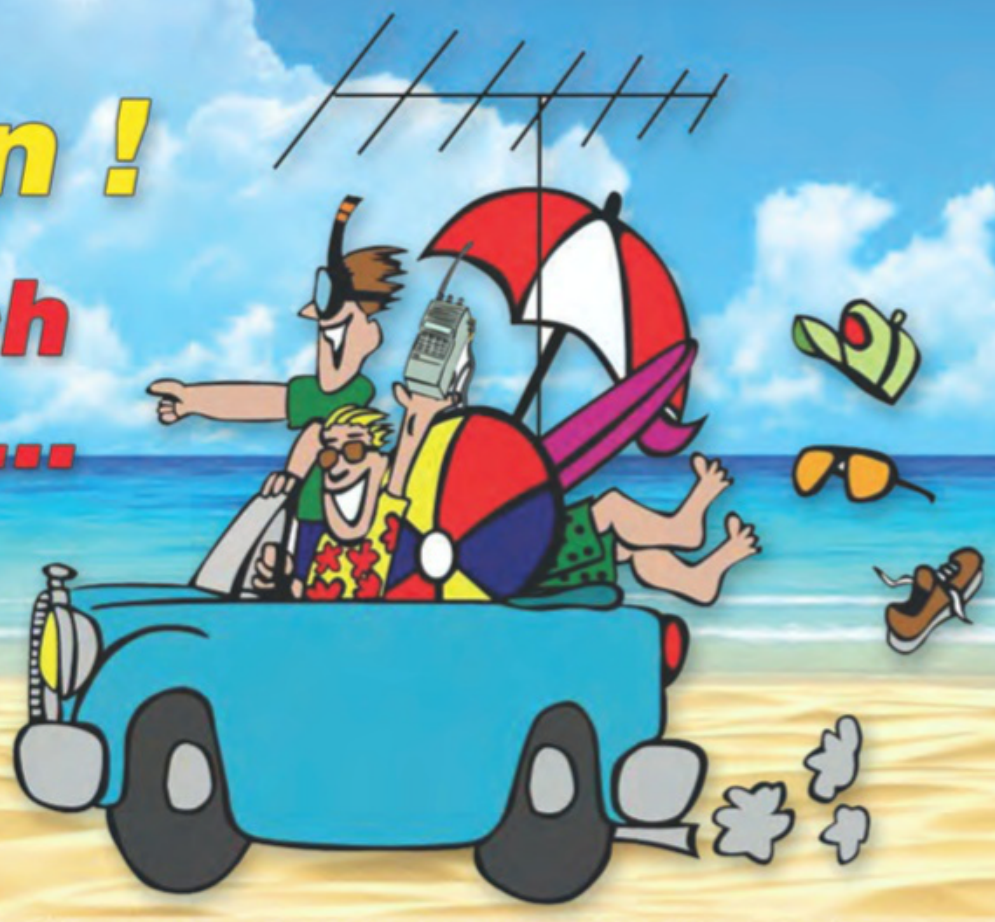
Only one entry is permitted for each callsign. Any log submission will replace any previous submissions.

Full Rules

The complete rules of the CQWW RTTY DX Contest are available in different languages on the Web at <www.cqwwrtty.com/rules.htm> and in English only on the *CQ* magazine website at <www.cq-amateur-radio.com> (Look for link on home page or the CQWW RTTY DX Contest main page). Please review the rules before the contest. Questions may be submitted by email to <questions@cqwwrtty.com>.

Fun in the Sun !

Head to the Beach with a good book...



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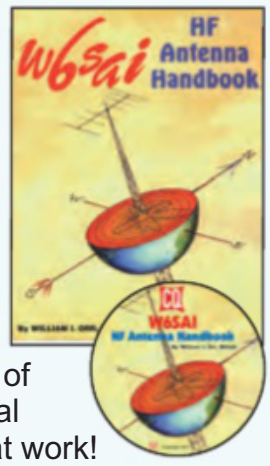
by Bill Orr, W6SAI



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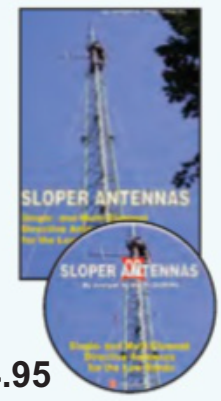

With calculations and practical experience, this book shows which basic concepts have to be considered for sloper antennas for the low bands.

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Did you ever have a contact that just didn't make sense from a typical propagation perspective? If you've spent enough time on the air, chances are good that your answer is yes. W2IY shares one of his unusual propagation experiences and would like to hear about yours as well.

An Odd HF Propagation Experience

BY MICHAEL TORTORELLA,* W2IY

It was a dark and stormy night in Downeast Maine. Well, dark. Stormy, not so much, this time. If you read my brief story in June 2016 *CQ*,[1] you may recall that a vacation in Southwest Harbor, Maine, is a summer tradition for my family. While there, I set up a portable station to enjoy some ham radio while away from home. This story concerns some interesting propagation oddities on HF that I experienced during my stay in Maine two years ago, in July 2017.

If you don't have access to the original article, here is a brief summary of the station setup. The transceiver is a TenTec Eagle running 100 watts and the antenna is a Mini-Products C-4 vertical dipole. This antenna is quite short, only about 10 feet in overall height, fed in the center (so no radials), and *very* heavily loaded at top and bottom (*Photo A*). The transceiver is controlled by a Windows 7 laptop running DXLab for day-to-day operation and N1MM Logger+ for contests. Both the IARU and IOTA contests occur during our stay and I enjoy operating in both, even though the station is far from competitive.

A Quiet Band (or Not)

This story is not about a contest, though. If you have been on HF at all in the past year or two you know that propagation is pretty poor for DX on 20 and 15 meters, and essentially nonexistent for DX on 10 meters. I want to share with you my experience with what looks like a bit of anomalous propagation. Here's the background: I am listening on the CW portion of 20 meters at about 0200-0300 UTC, about 10 to 11 p.m. local time in Maine. As you would expect, the band is dead. But not quite! There are two or three very strong DX signals thundering in at over S-9, from UA9/UAØ, UA1, and OH. There is nothing to be heard on frequencies between these three stations. Quiet. Dead quiet. But three huge DX signals, all workable easily with my 100 watts and C-4 vertical. This persists for perhaps 10 minutes or so, after which either the signals fade, the band goes completely dead and nothing is heard, or a different set of very strong, discrete signals appears.

I related this experience to *CQ* Editor Rich Moseson, W2VU, who told me it reminded him of some 6-meter openings he'd experienced in the early 2000s, at the peak of solar cycle 23. He recalled them being called "spotlight openings" that appear between two very specific parts of the world, with very strong signals that are inaudible to anyone else who is outside of that path. This seems like an apt term for what I experienced on 20 meters, as described above. I was not

Photo A. W2IY's portable antenna used on his annual vacations to coastal Maine. (Photo by Andrea G. Blum)

* w2iy@verizon.net

able to tell whether anyone else on the band was hearing the stations I was hearing, but I feel reasonably certain that there must have been other stations (geographically) near the ones I was hearing, and I was not able to hear them at all. In other words, it's hard to imagine that the only station that was on the air from where the UA9 was located was the one I was hearing. It was late afternoon at that location when I experienced this; it seems unlikely that no one else from there was on the air at that time. All this points to a very narrow opening to a very small geographic area.

This has happened to me more than once, and other friends have indicated to me that they have also experienced this phenomenon. So I think it may not be terribly unusual, and it would be interesting to figure out what is causing this. If you accept the standard ionospheric reflection model, the MUF (maximum usable frequency) at these times is way below 14 MHz and nothing should be reflected off the ionosphere at this high a frequency. However, the ionosphere is not uniform: Levels of ionization may differ from place to place. With my professional background in probability and statistics, I began to think of explanations like: Some small clouds of higher ionization appear at random places and times, allowing propagation between me and other very specific, discrete locations. The clouds soon dissipate and the strong signals disappear. The clouds would have to be fairly small (because otherwise more propagation to a wider geographic area would be apparent) and form and dissipate quickly (otherwise the resulting propagation would persist for a longer time). However, I don't have enough physics knowledge to speculate about where such cloud(s) might be coming from or how they might arise.

Do You Have a Similar Story?

I have asked a couple of our local propagation gurus about this and have not yet been able to stimulate any interest. I think it would be interesting to hear whether others have experienced this phenomenon, where they are located, what time(s) and frequencies it was noted, and other related information. An interesting study could be developed to help learn more about propagation in times of zero to very few sunspots, and perhaps flesh out a richer picture of how the ionosphere works. (*We've checked in with a couple of our own propagation gurus — through emails and previously published articles — and they've got a few ideas. See the sidebar. – ed.*)

So if you have seen this in your operations, please send me some information: Your call, the date, UTC time, and frequency of the contact, your QSO partner's call, whether your antenna is horizontal or vertical (to try to get a sense of what your takeoff angle might be), your output power, and the great circle distance from you to your QSO partner. With enough data we may be able to draw some pictures similar to the maps of VHF sporadic-E openings. With some reasonable assumptions, we might then be able to guess at where a reflecting ion cloud might hover, and this might allow us to assess how plausible is this as a reasonable explanation for what we are seeing (hearing). If enough responses are received, I will analyze them to see what we might learn from the phenomenon and report back here. Thanks in advance for your efforts and interest.

REFERENCES

1. M. Tortorella, "Weekend at IOTA's," *CQ*, June 2016, pp. 13-15.

Our Propagation Experts: It's Probably a Duct … or Sporadic-E … Maybe Both

Brief, narrowly-defined band openings have been described in *CQ* before, but mostly in relation to 160-meter propagation. In the December 2005 issue, Carl Luetzelschwab, K9LA, wrote an article titled "Ducting and Spotlight Propagation on 160 Meters." He defined spotlight propagation as "a small geographic area that is favored with good propagation at any given time," adding that "Oler and Cohen suggested that spotlight propagation is simply the unpredictable result of coming out of a duct. I agree wholeheartedly with this, and I further believe that irregularities in the ionosphere are generally the cause."

Carl was referring to a two-part *CQ* article by Cary Oler and Ted Cohen, N4XX, titled "The 160-Meter Band: An Enigma Shrouded in a Mystery," that appeared in the March and April 1998 issues. We asked N4XX about Michael's experience, and he replied, in part…

"Perhaps the MUF — the *real* MUF on the path of interest (better, the HPF, or *highest possible frequency*) happened to pop up on those paths, yielding the opening. Remember, what we call the MUF really is a median value. This could result in "spotlight" propagation if the HPF just happened to be between the stations mentioned. What the MUF was on any particular day really is not that important here … it's just a statistical number and may or may not be relevant at any specific point in time.

"Regardless, we're talking signals over the North Pole, and it would be interesting to know what the levels of solar and geomagnetic activity were at the time. I suspect we're dealing with some kind of sporadic-E propagation here … in, out, gone in a flash, with humongous signals for a short period of time. I used to love watching for sporadic-E openings on VHF TV when I lived in Milwaukee … infrequently caught stations up to 600 miles away with perfect pictures and sound for up to 10 minutes … only to have them take a deep dive and disappear, never again to be seen. Glorious stuff."

W2VU's two cents: While ducting is normally associated with MF bands, such as 160 meters, and with VHF/UHF bands, it only makes sense that the phenomenon also occurs in between those two ranges on the HF bands, except that we often don't recognize it because we *expect* long-distance QSOs on HF. Likewise, while sporadic-E is usually associated with the 28-MHz and higher frequency bands, it very likely occurs on the middle HF bands as well, but again, isn't recognized as such unless it results in out-of-the-ordinary propagation. One other possibility to consider is a combination of these modes. It was a July morning in OH and UA1 and late afternoon in UA9/UAØ when W2IY heard these signals, prime time for summertime sporadic-E. It's possible that he was at one end of a duct whose other end was at the midpoint of sporadic-E openings in Europe and Asia to both the east and west. The signals were very strong as long as the conditions were optimal, but dropped out when either the sporadic-E openings ended or the duct closed or moved.

One of the wonderful things about ham radio is the opportunities we have to conduct citizen science by gathering data on unusual propagation that can then be analyzed by propagation scientists. If you have had similar experiences, please send your data to W2IY, who will collect it and see if there is enough *there* there to pass along for additional research and analysis.

Most commercial radios today have excellent audio filtering on both receive and transmit. But sometimes you might want to build a customized filter, either for use with a bare-bones rig, to make up for less-than-stellar mics or speakers, or just to impress your friends! WB9YBM draws us a map.

Active Audio Filter Design

BY KLAUS SPIES,* WB9YBM

The standard L-C filter design, a longtime staple in RF and audio applications, is a time-proven technique in both high-, low-, and band-pass applications. L-C filters, whose characteristics are determined by varying combinations of inductance (L) and capacitance (C) — are very capable in handling the power and higher frequencies coming out of a transmitter when reducing harmonics to desired levels. Especially with high-Q components, there is minimal degradation in output power levels.

In low-power audio applications, however, even minimal loss of signal can become an issue. For such applications, therefore, a different approach needs to be considered. Initially, amplification can be added between stages of a passive L-C filter, but a bit more research will show that an amplifier can be configured to act as both an amplifier *and* a filter. This is typically referred to as an *active audio filter.*

Several different approaches come to mind, the first being a simple transistor amplifier. While this is certainly an option, the average home-brewer is not inclined to do design work on two fronts: First to choose the appropriate transistor amplifier, then modify that research to include filtering. To make project work easier, a simpler approach would be useful. Enter the ubiquitous 741 op-amp (operational amplifier). This common op-amp is a time-proven device that's cost effective, easily obtained, and easy to work with.

Armed with these preliminary criteria, we've narrowed our focus to allow for an easier grasp of what needs to be done. There is a plethora of reference resources available to the hobbyist: My objective here is to filter through all of those options and pull them together into one easy resource for active audio filter design. This includes notes on considerations I've discovered while designing and building several such filters for both work and home applications.

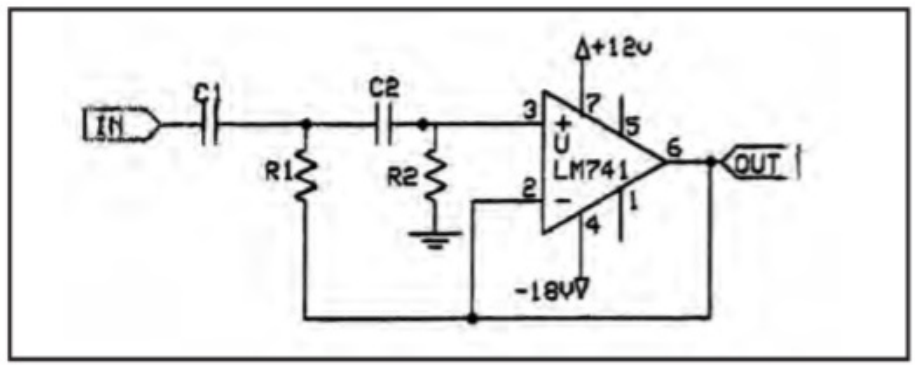

Figure 1. Second-order high-pass filter

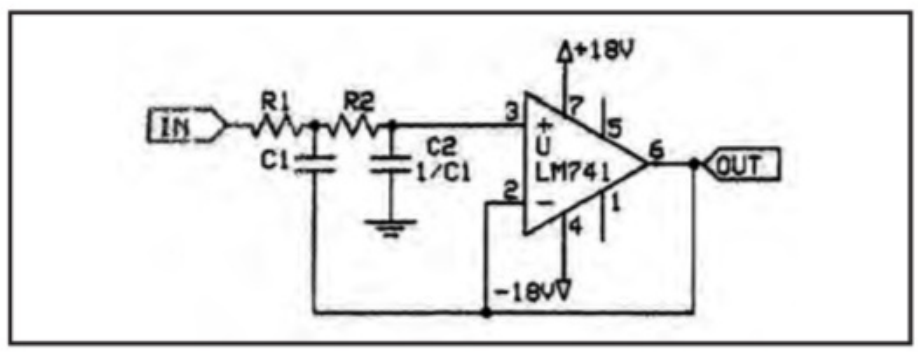

Figure 2. Second-order low-pass filter

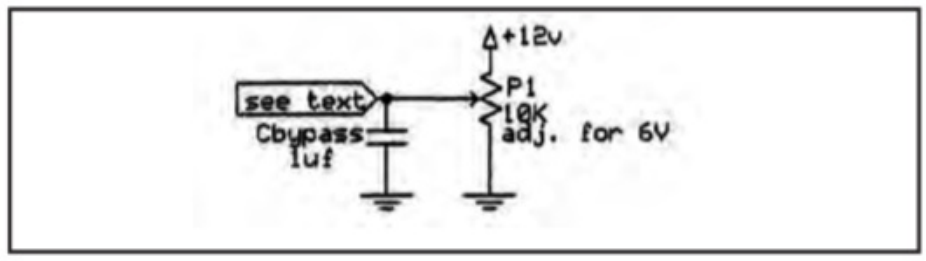

Figure 3. Modifications needed for single-supply circuits

How Much is Your Butter Worth?

The two most common filter types are the Butterworth and Chebyshev response. Both are built with the same components and have similar circuit design characteristics, as shown in the schematics (*Figures 1-3*). The difference between the two response types is that the Chebyshev design has a steeper roll-off than the Butterworth response. The other difference is that the Butterworth has a flat gain response before (or after) the roll-off ("before" in the case of low-pass, and "after" in the case of high-pass), while the Chebyshev response has a 0.5-dB ripple.

The schematics in *Figures 1* and *2* each show a two-stage, or "second-order" filter. Since a second-order filter can be as easily built (i.e., with as little loss) as a first-order filter, a second-order filter provides the "best bang for the buck." These two-stage filters can be chained together to form fourth-, sixth-, eighth- (and so on) order filters.

To convert a high-pass filter as seen in *Figure 1* into a low-pass filter as shown in *Figure 2*, the position of the capacitors and resistors are simply swapped.

The schematics also show the wiring typical to split-supply operation used with op-amps. To power these filters to something in more typical use in the hamshack, remove the side of all components going to ground and connect to the wiper arm of P1 (see *Figure 3*). Also remove the negative supply to the op-amps (pin 4) and connect that to ground. (I've found the filters operate equally well in either configuration).

Determining Values for Your Needs

To begin calculating the 3-dB roll-off point of the filter (called "W_o") use the formula $W_O=2\pi f$ where f=frequency of choice

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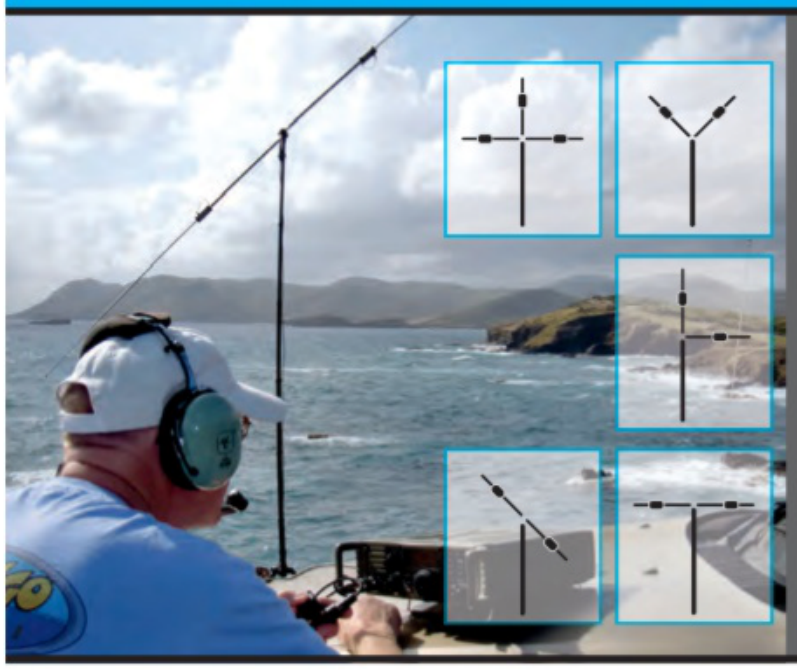

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Table 1. Normalized Capacitance Values, Butterworth Response

N	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
1	1.000															
2	1.420	0.704														
3	1.000	1.000	1.000													
4	1.080	0.926	2.620	0.381												
5	1.000	1.240	0.806	3.240	0.309											
6	1.040	0.962	1.420	0.704	3.860	0.259										
7	1.000	1.100	0.909	1.600	0.625	4.480	0.223									
8	1.020	0.980	1.200	0.830	1.800	0.550	5.120	0.195								
9	1.000	1.060	0.940	1.300	0.769	1.000	1.000	5.760	0.174							
10	1.020	0.980	1.120	0.893	1.420	0.704	2.200	0.454	6.400	0.156						
11	1.000	1.104	0.906	1.300	0.769	1.520	0.658	2.400	0.417	7.020	0.142					
12	1.000	1.000	1.080	0.926	1.260	0.794	1.640	0.609	2.620	0.382	7.660	0.130				
13	1.000	1.020	0.980	1.120	0.893	1.340	0.746	1.760	0.568	2.820	0.355	8.300	0.120			
14	1.000	1.000	1.060	0.943	1.180	0.847	1.420	0.704	1.880	0.532	3.020	0.331	8.940	0.112		
15	1.000	1.020	0.980	1.100	0.909	1.240	0.806	1.500	0.666	1.000	1.000	3.240	0.309	9.560	0.105	
16	1.000	1.000	1.040	0.962	1.140	0.877	1.300	0.769	1.580	0.633	2.120	0.472	3.440	0.291	10.200	0.980

in Hertz. W_O is expressed in radians since the filters have poles that can be charted on an X-Y graph.

To calculate the capacitance values of low-pass filters, assume each resistor to be 10K in value (final values will be scaled later after preliminary calculations are completed), using the following formula: $C = C_n / W_o R$ where C_n is chosen from the normalized capacitance values in either *Table 1* (for Butterworth response) or *Table 2* (for Chebyshev response), and W_O is determined by the previously discussed formula. After a bit of practice, it will be easy to develop a "feel" for which starting values of resistors will provide reasonable capacitance values based upon values (standard sizes) available.

One cautionary note about resistor values: While resistances of 10K or less may be viable results on paper (through calculations), actual operation has proven that those values (10K and less)

are typically too low to let the circuit function properly. Under those conditions, the roll-off response can be off by a factor of anywhere from 10 to 100.

For high-pass filters, the same tables apply and the following formulas are used:

• Normalized resistance values (R_n) are calculated as $R_n = 1 / C_n$;

• To calculate resistor values from normalized resistance values, $R=R_nZ$;

• Z is calculated with the formula used for normalized capacitance values, $Z= C_n / CW_o$ except that in this case we substitute "R_n" for "C_n" and "R" for "C".

The following formulas are utilized for scaling normalized values to new values:

$C_{new} = C_{old} / K_m K_f$ where
$R_{new} = K_m R_{old}$, K_m =normalized resistance value and $K_f = 2\pi fC$.

Now You Can Roll Your Own

At this point, we should have enough information to calculate high- and low-pass filters for most standard audio applications. While much of this has been done for us by the engineers who initially designed our transmitters and receivers for optimum operation (i.e., a balance of reasonable audio quality versus the limitations imposed by maximum allowable bandwidth), there are still situations in which we might want to "tweak" the quality of our transmitted audio due to such things as a less-than-perfect microphone, or our received audio because of poor audio reproduction of those teeny-tiny hand-held speakers, or even in repeaters (especially split-site repeaters) with their extensive audio pre-processing. Or maybe you'd just like to impress visitors to your hamshack with studio quality received audio.

Table 2. Normalized Capacitance Values, Chebyshev Response, 0.5dB ripple

N	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
1	1.000									
2	1.720	0.581								
3	1.000	3.420	0.292							
4	1.420	0.704	5.880	0.170						
5	1.000	2.360	0.424	9.080	0.110					
6	1.360	0.735	3.620	0.276	13.020	0.077				
7	1.000	2.180	0.459	5.160	0.194	17.680	0.057			
8	1.360	0.735	3.220	0.310	6.940	0.144	23.060	0.043		
9	1.000	2.120	0.472	4.420	0.226	8.960	0.112	29.160	0.034	
10	1.340	0.746	3.060	3.260	5.780	0.173	11.220	0.890	35.980	0.02728

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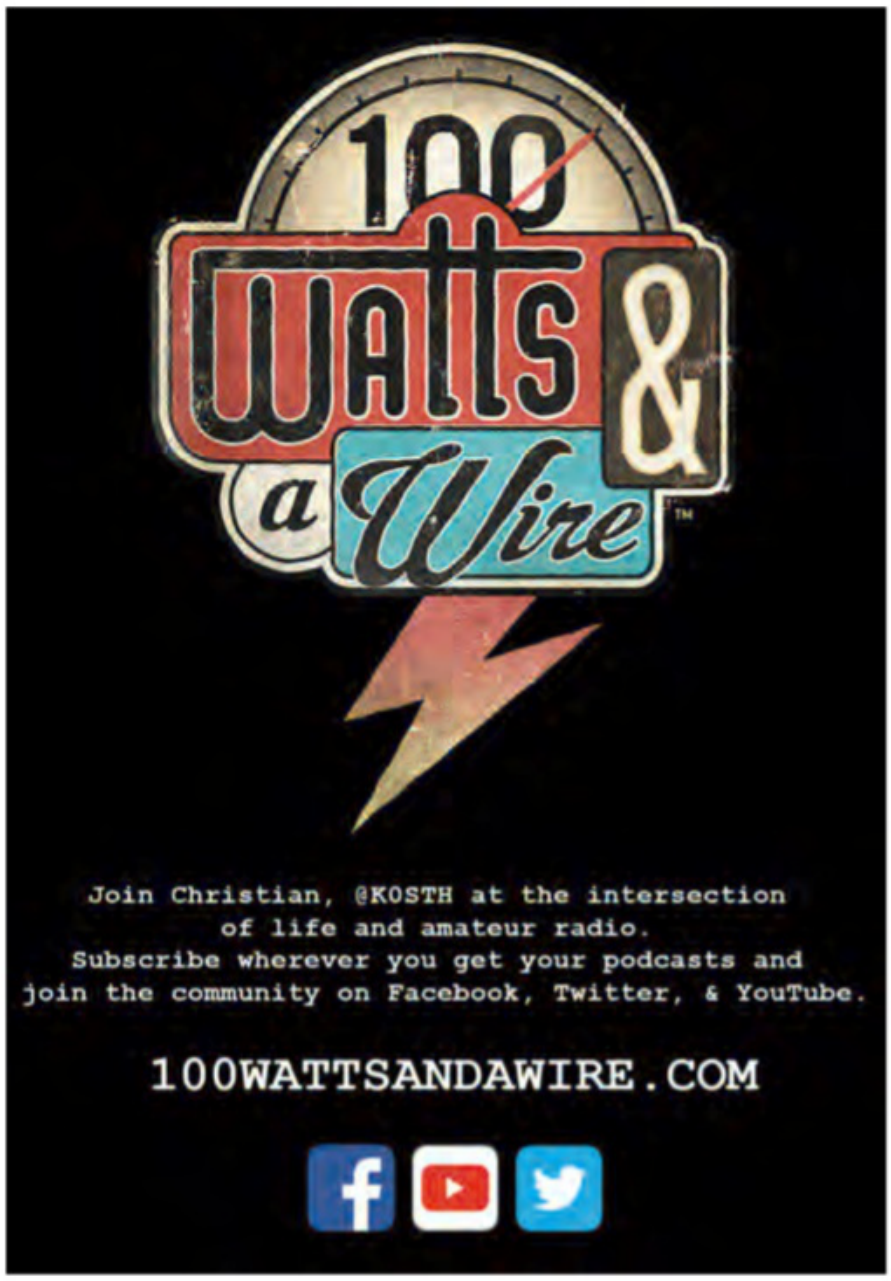

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BY ED TOBIAS, KR3E

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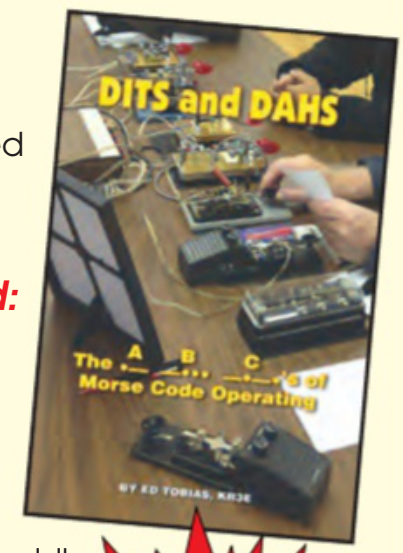

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MATH'S NOTES

BY IRWIN MATH,* WA2NDM

Multicolor LEDs

It is well-known fact that the primary colors we all know (red, blue, and green) can be mixed to essentially create all colors. For example, red + blue = magenta, red + green = yellow, and green + blue = cyan. If all of them are mixed together, we get white and obviously, if we do not use any, we get black[1]. This fact is used in electronic displays of all types and many types of printed pictures. A simple magnifying glass or jeweler's loupe will clearly show this — just look at your computer monitor with one. With this in mind, we thought that perhaps we could do this with separate LEDs. In looking at the internet we found that several articles on the subject had been written and, since it is easy to experiment with this, we thought it might be of interest to our readers.

Figure 1 is a schematic of a simple experimental test setup we came up with. It consists of a regulated 5-volt power supply; three 100-ohm, 5-watt, wire-wound potentiometers; three fixed 50-ohm resistors; as well as red, blue, and green LEDs; and a common closed circuit phone jack, the purpose of which we will explain later. The potentiometers are used to vary the current to the independent LEDs while the resistors protect the LEDs against full voltage, which can destroy them. By the way, these values can (and should) be varied to use whatever you may have on hand, as they are not critical. The main point when doing this investigation is to assure that you will not exceed the maximum current rating of the LEDs you use. This can be calculated by the following formula:

R = (5 - V)/I
where
V = the forward voltage drop of the LED used and
I = the maximum allowable current.

Keep in mind that various LEDs will have different forward voltage drops so be sure to do the math for each one you plan to experiment with and look at the appropriate data sheet for the specific devices you use.

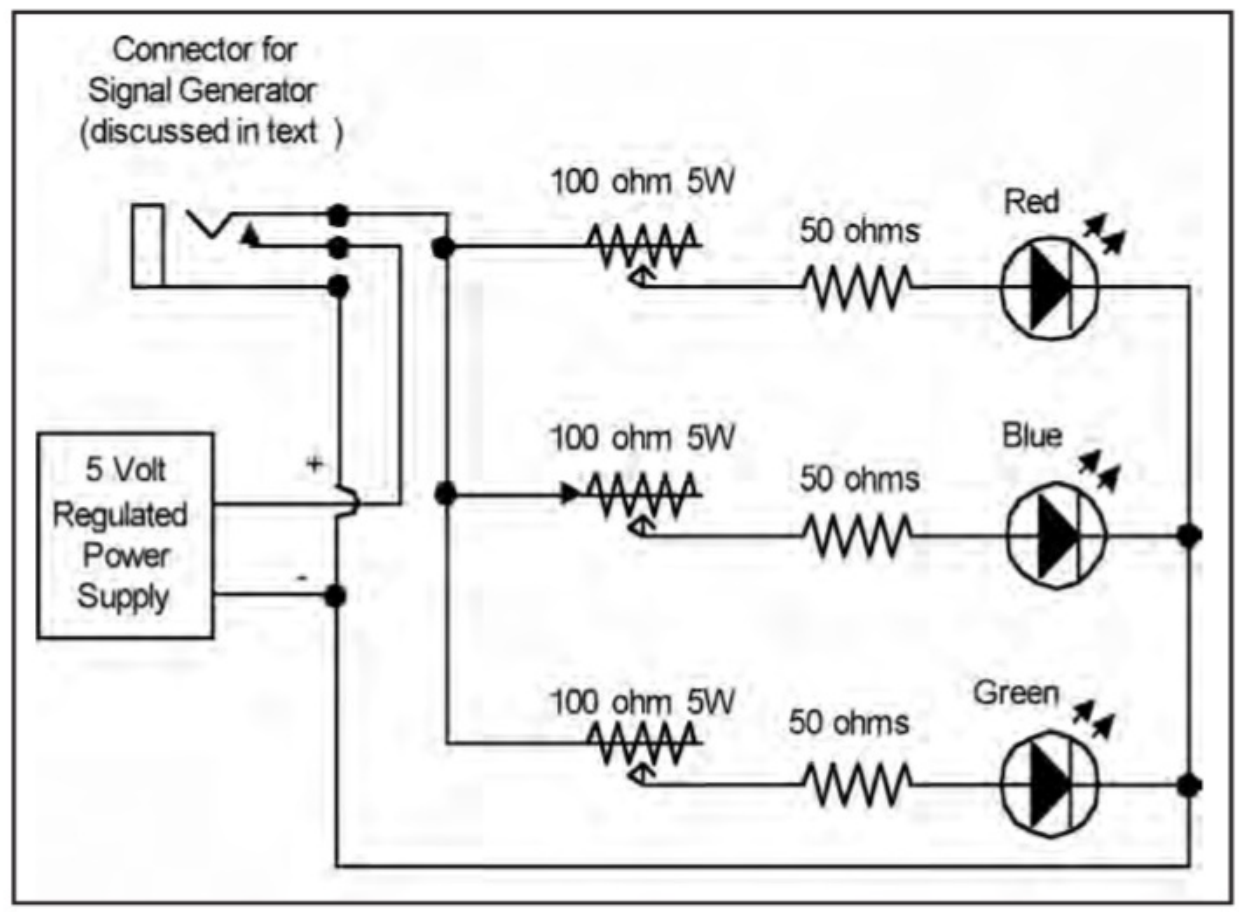


Figure 1.

Use the closest standard values you have (or can obtain) and make sure that the power supply you use can provide at least 1/2 amp to cover all of the requirements (resistors and LEDs) as well as to assure that the voltage will remain steady regardless of the various currents. The choice of the actual LEDs is up to you, but if you consult the catalogs of most electronic supply companies, you will find a very wide range in the primary color outputs. In fact, you will also see that LEDs are available with colors slightly above or below their ideal color and these are worth experimenting with as well.

To get the full effect, it is important to group the LEDs as close together as possible. If you purchase leaded LEDs, they will be easier to work with and can be mounted in a simple piece of wood or metal so that the device housings are touching each other. In fact, the closer they are to each other, the better the results will be. In your monitor screen, tiny surface-mount devices are used and they are so close that your eye just sees them as single points. Note that only red, blue, or green LEDs are used.

When you look at *Figure 1*, you will also see the closed-circuit phone jack type connector we mentioned earlier. This is used if you want to use pulses to control LED duty cycles or pulse rates for further experimentation. With this circuit, you will require 5-volt pulses with enough current to light the LEDs. Many signal generators that can provide higher current TTL pulses can be used for this phase of the investigation, or you can design your own pulse generators. Keep in mind that the circuit is only a starting point. Using *Figure 1* as a starting point and your imagination, you can easily design other test circuits to experiment with individual LED pulsing, etc. It is up to you.

– 73, Irwin, WA2NDM

Notes:

1. These are the primary colors and color mixes of light and electronics, including television. But they are different from the primary colors of pigments that you may remember learning about in art class — those primary colors are red, yellow, and blue, with all three mixing to form black, and white being the absence of all color. In the printing world, all different colors may be created by mixing four primary colors: cyan, magenta, yellow, and black.

*c/o CQ magazine

THE LISTENING POST

BY GERRY DEXTER

Big Changes Coming to U.S. Shortwave, But Not in A Good Way

~ Once again, the geniuses at the U.S. Agency for Global Media (USAGM) in Washington D.C. are playing around with the country's international shortwave voices. The USAGM's Greenville, North Carolina site's transmitters, used mostly for Radio Marti, are to be replaced as the current units are nearly worn out. The new units are said to be more efficient and less expensive to operate. The Voice of America (VOA) will cut back on the use of English and make serious reductions in Mandarin, Cantonese, and Russian; and the VOA service to Afghanistan will be limited only to TV.

Further, Radio Free Europe/Radio Liberty will eliminate Radio Marshaal and reduce broadcasts in Pashto to Afghanistan and Pakistan. RFE/RL will also delete its Georgian service and make several cuts or deletions to its Balkans service.

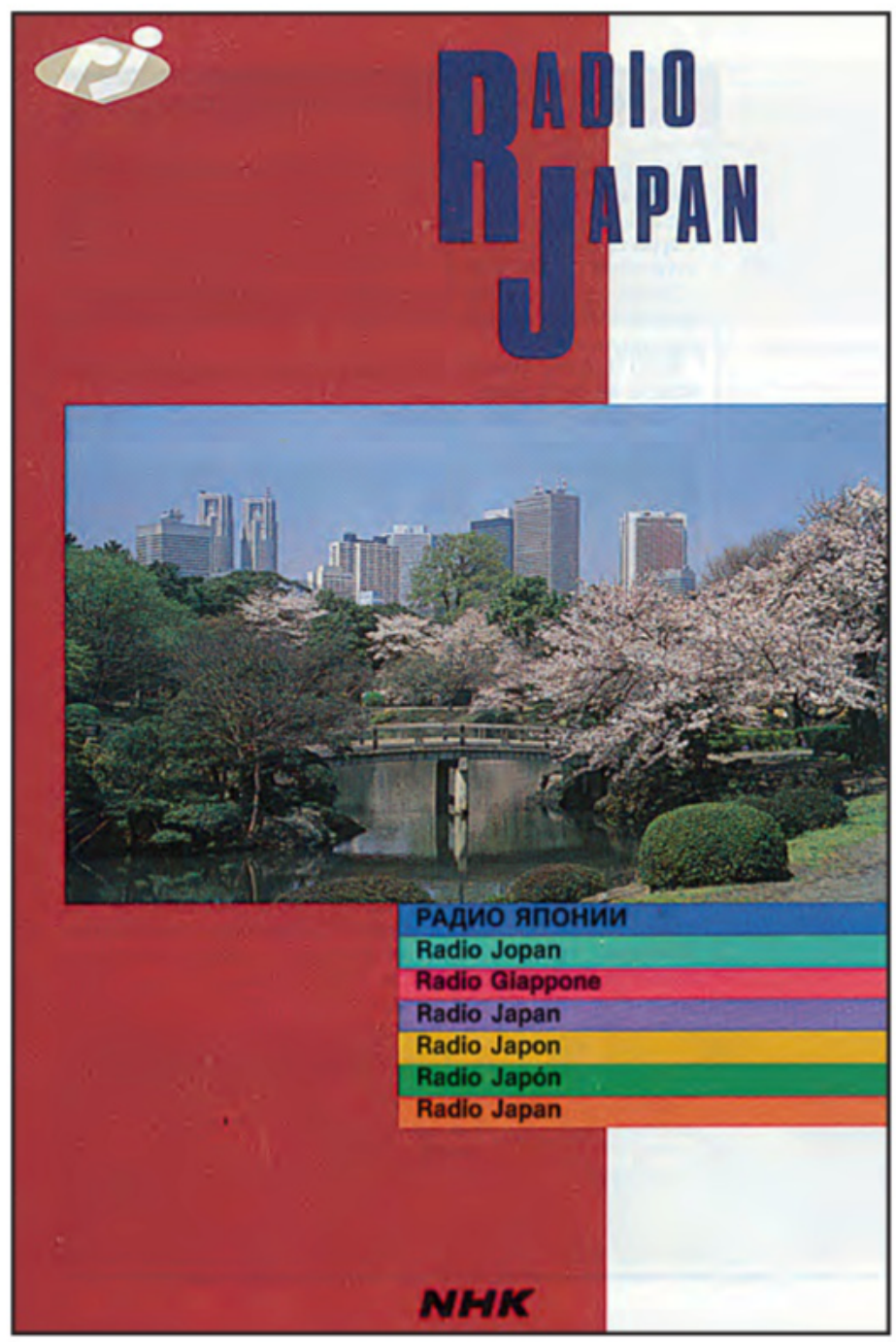
During this dash to the doors, Radio Free Asia will also eliminate Cambodian and Mandarin from its schedule (really, to Asia? –*ed*) Mind you, all these changes are only proposed. Some cutbacks may not even happen or may not be as serious as advertised. But be advised … changes are coming.

~ Wontok Radio Light has returned to the air on 7325 kHz from Port Moresby, Papua New Guinea. PNG stations are among our favorite DX targets so I'm especially pleased to welcome this one back.

**c/o CQ magazine*

A QSL from Japanese broadcaster Radio Aum Shinrikyo, 15485 kHz. The leader, Shoko Asahara, was responsible for the 1995 Sarin gas attack on a Japanese subway. The attack killed 13 and injured many others. Asahara and six other cult members were executed for the attack.

A far better and way more innocent "cult" gathered in Lake Geneva (WI) a few years ago. From left to right were GLD, Bill Dvorak (WI), Tim Noonan (WI), Mark Taylor (WI), and Tom Gavaras, (MN).



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~ Radio Sultanate of Oman is now using 9620 kHz. I'm unsure if this replaces 15140 kHz, which the station has used since it went on the air in 1970, or whether the 31-meter outlet is only an addition.

~ Bangladesh Betar currently seems to be running only with its external service.

~ Radio Xoriyo Ogadenya and the Voice of Independent Oromiya have abandoned their efforts against Ethiopia, confirming an item I had in a "Listening Post" column a few months back.

~ Radio Nigeria at Kaduna is no longer being relayed by Issoudun, France. (Seems as soon as I announce something like this, they promptly give it up! –*ed*)

~ Bolivia's Radio Yura has been reactivated on variable 5985 kHz. This one is most frequently heard in the early morning hours. Say plus or minus 1000 hours.

~ A DXer in Spain received a letter from LRA36 in Argentine Antarctica informing him that it operates only on Tuesdays and Thursdays from 1230-1400 UTC. That may be another reason why it is so seldom reported.

~ One of the transmitters on Saipan (run by IBB for Radio Free Asia) has returned to the air after taking a Typhoon hit. The IBB/Tinian site is also reported to be active again.

Leading Logs

Remember, your shortwave broadcast station logs are always welcome. Please ensure to double or triple space between the items, list each logging

All India Radio sent this card for its site at Jaipur on 4910 kHz. It still operates on that frequency today.

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. 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. After you've read the printed logs, you'll find more online at <www.cqpluslisteningpostblog.com>.

CHINA—China National Radio/PBS Voice of the Strait, Guinan, 4900 at 1128 in Mandarin, woman hosting a music program; PBS Xizang, 4920, Baiding at 1126 in Tibetan with alternating male and female announcers; 7270-Hot Hot at 1206 in Mongolian, man and woman speaking alternating between them with woman conducting an interview. (Taylor, WI)

ERITREA—Voice of the Broad Masses, Asmara, 7180 (INTRUDER) pounding in at 0328 with an HOA program in vernacular. (KB2DMD, PA)

GUINEA—Radio TV Guineenne, Conakry, 9650 at 2145 with indigenous music and someone speaking French, xylophone-like music and possible news at 2200. (Sellers, BC) Very nice signal in the 2200 hour, then off at 2221. (Figliozzi, NY)

MALI—Radio Mali, Bamako, 5995 at 2246 with a man and woman reading the news in French. RHC was due to sign on here at 2300. (Figliozzi, NY)

OPPOSITION—Nippon No Kaze (Japan to North Korea), 9685 with pop vocals at 1510. (Barton, AZ)

Echo of Hope (South Korea to North Korea), 3985 at 1013 with man speaking at length in Korean, 6250 with Korean pop music at 1157. (Taylor, WI)

You'll find more logs on line at <www.cqpluslisteningpostblog.com>.

QSL Quests

Radio Free Asia has just announced the issuance of its 70th QSL card version. This design commemorates the memory of Lee De Forest who was so instrumental in the development of radio. The 70th QSL card will be used through August of this year, so if you want one you'd better hurry and get a report off to RFA, 2025 M Street NW, Washington, DC, 20036. <www.rfa.org>.

Back in the Day

Malawi Broadcasting Corporation, Kimbe, running 100 kilowatts with English on 3380. Heard at 0409 UTC on September 27, 1995. Sign on was at 0301 UTC.

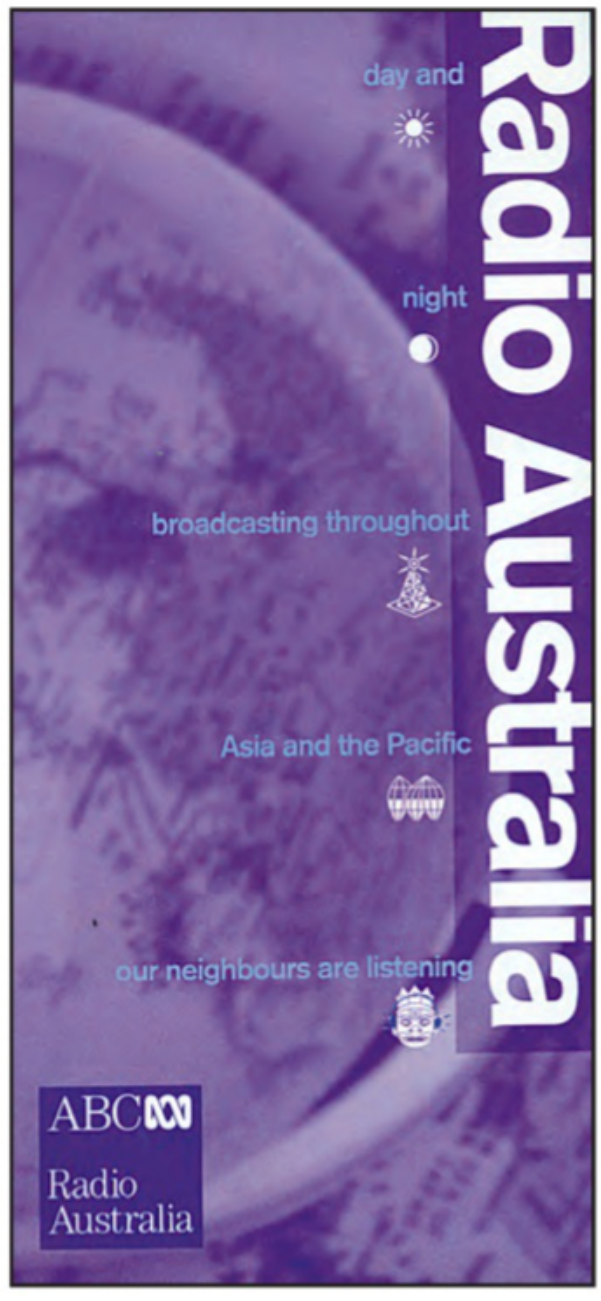
Just Sayin'

When somebody (usually a service person) says "(I'll) be right back" you can take that to mean sometime within the next 20 seconds, or 20 minutes, or maybe two hours. Even, at the extreme, two weeks!

Thanks for Your Logs

High fives and all that to: Harold Sellers, Vernon, BC; William Hassig, Mt. Vernon, IL; Bob Brossell, Pewaukee, WI; Art Delibert, North Bethesda, MD; Rick Barton, El Mirage, AZ; John Figliozzi, Half Moon, NY; and Richard Parker, KB2DMD, Pennsburg, PA. Thanks to each of you!

Until next month, good listening and ... Celebrate Shortwave!



The reverse side of this folder from Radio Australia has tips on how to listen to them. You'd get nowhere if you tried those tips today!

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WHAT'S NEW

Mastwerks Debuts New Tripod Antenna Masts at Hamvention®

Mastwerks, a spinoff company from Buddipole, debuted the RTS-1500 series, the newest line of lightweight collapsible antenna masts featuring a tripod, at the 2019 Dayton Hamvention®. Constructed from ultra-rugged, nylon-reinforced custom injection-molded parts, custom aluminum tubing, and stainless steel, the new tripod masts are available in three different heights (4, 7, and 10 meters; or 13, 23, and 33 feet, respectively).

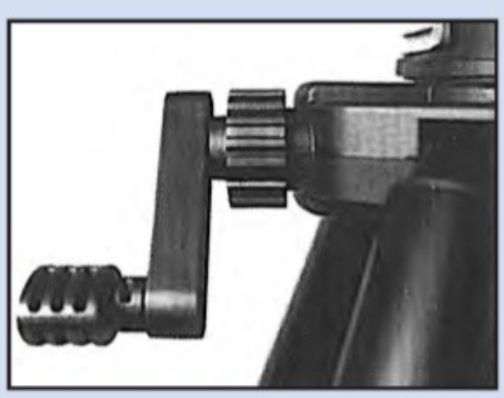
A new patent-pending mast tube shape and adjustable angle struts prevent rotation within itself and removes rotational force on the collar locks, making the RTS-1500 series of antenna masts ideal for field use. Quick-release lever locks enable fast and secure height changes and single-hand operation.

Mastwerks' upcoming motorized rotator and electronic control unit with compass is planned for a Fall 2019 release. (Photo by Jason Feldman)

Continuing the ease-of-use theme, the RTS-1500 features a unique hand crank that will rotate the tripod effortlessly and lock it into position automatically, meaning you can deploy directional Yagis or dipoles in the field quickly. Mastwerks also gave a sneak peek at a new remote-controlled motorized rotator with an electronic compass that will automatically turn the antenna in any direction without having to crank it. Watch for that in the fall.

As of presstime, all of the masts and tripods are only available in black, with camouflage being considered. The 4-meter mast collapses to 0.61 meters (2 feet), the 7-meters to 1.22 meters (4 feet), and the 10-meters collapses to 1.625 meters (5 feet, 4 inches). Combined weights are: 4 meters, 3.75 kilograms (8.3 pounds) with the mast and tripod; 7 meters, 4.9 kilograms (10.8 pounds); 10 meters, 6.25 kilograms (13.8 pounds).

Mastwerks says the new tripod and masts are available now, with the motorized rotator and electronic control unit available in the fall. For more information, contact Mastwerks (503) 372-6474. Email: <info@mastwerks.com>. Website: <www.mastwerks.com>.



EMERGENCY COMMUNICATIONS

BY WALT PALMER,* W4ALT

Interview With a Dead Man

I had an interesting experience last week. I interviewed a dead man.

I know I will never win a Pulitzer with my writing or interviewing skills, but I now envision a place in a dusty corner of *Ripley's Believe It or Not*. We sat down following a local Auxcom event, and I started the interview this way, "So Deadman, how did you get into this predicament?"

My first indication that he really was not that dead is during my initial phone call, he eagerly agreed to meet me anywhere to pass along his messages. Deadman — to whom I'll also refer from time to time as Charlie, even though that isn't his real name — had been aware of his high blood pressure since he was a young man, and he didn't help his situation with some high stress situations along the way. He became overweight, smoked, and although a fair athlete in school, did no exercise for over four decades. Sound familiar?

Having explained his background, Deadman was adamant that we are each responsible for our own health, and he had been personally responsible for his own untimely death. He said, "No one knows your bad health habits better than you!"

Charlie told me he'd been at an evening event, felt tired, sat down to rest, and remembers nothing more. They now tell him he died. Fortunately, two people saw that he was unresponsive, stretched him on the floor, called 911, and started CPR. Another player went to fetch an Automated External Defibrillator (AED), only to find it locked up, then ran quite a distance to find another AED. The paramedics soon arrived and rushed Charlie to the ER where they did an excellent job of resuscitating him and putting him into a medically induced coma. The doctors told his wife that the strength of his heart suffered from his lack of an exercise regimen.

I was taking notes furiously while Charlie told his story. Later, as I reviewed my notes from the conversation, I noticed I had scribbled on the margin, "Why, why, why did I eat all those potato chips for lunch? And that ice cream last night?"

Charlie suddenly asked me if I had heart trouble. "Me? Why, do I look it?" I could suddenly feel the unattractive fat bulging over my belt, and then he slipped in a right hook by reminding me that exercise alone is not enough to lose all that weight. He got me on age as well because he then went on to add, "We all need to change our eating habits as we age."

Deadman didn't tell me one piece of new information during this entire interview, but the way he told me — so wonderfully happy about still being alive — is what got my attention.

His second message was also as passionate. Just because people technically know how to use first aid equipment does not mean they will. He went on to add that many freeze in the face of emergency.

I can hear some reader sitting in front of the television saying to his wife, "I don't want to get dead exercising like that Deadman guy, so turn up the volume and pass the potato chips." But the real message here is that Charlie, because of his own personal exercise schedule, and of proper medical attention, is alive because of his own attention to exercise, and with the prompt action of trained bystanders.

Information about diet and exercise is abundantly available, but many people are not paying attention. That's the reason I have written in this playful format for such a serious subject. Deadman doesn't care if you have a daily exercise regimen, or walk around the block, just keep moving and exercise. And for all of us — pay attention to one another and take immediate action when we recognize a friend who needs help.

Charlie expects to do something that few dead people do — he will soon go to Hawaii to visit his son — who is a company commander in the United States Marine Corps and a soon-to-be father — and a new grandbaby.

The EmComm Connection

As I gathered my thoughts to write this story, I began to realize the stress placed upon us as emergency communicators. Whether working in a shelter, at an outdoor public event, or even dining out at a restaurant, are you prepared and properly trained to spring into action to save a life should that moment arise?

Are you prepared to provide manual CPR?

"Oh, yeah. I took Red Cross classes in 1999, so I am ready."

Not so fast there, buck-o. There is new thinking regarding the proper method to administer this lifesaving maneuver. In the "good ol' days," the recommended CPR sequence was five chest compressions followed by a rescue breath. Today the procedure calls for 30 compressions followed by two rescue breaths.

And how about the Heimlich maneuver for a choking victim? Can you perform this procedure effectively and without hesitation? How about if the victim to too big for you to reach around? What will you do?

Can you spot a stroke victim? Can you perform FAST, and I don't mean quickly, but follow the Face, Arms, Speech, and Time protocol?

If you survive an active shooter event, are you ready to "stop the bleeding, stop dying"?

We have been trained to observe and identify emergency exits (both regular and non-traditional) when entering public places. Do you also keep a mindful eye for AEDs (Automatic External Defibrillators) and fire extinguishers?

As emergency communicators, we are sometimes assigned to very public events. Our responsibility includes being on the lookout for unusual packages or unattended backpacks, individuals acting oddly, people with unusual bulges or uneven apparel bulkiness, and reporting anything suspicious to the proper authorities.

We as emergency communicators are a part of the elite side of the population. In the United States, 46% of adults do not know how to perform CPR. If you are one of the 46%, take the time to receive proper training. Learn how to perform the Heimlich maneuver. Know how to identify a stroke victim.

We are volunteers, but we are professionals.

* *email: <w4alt@cq-amateur-radio.com>*

Ohio Hams Respond to Memorial Day Tornadoes

Amateur radio emergency communicators responded to an outbreak of tornadoes in Ohio on Memorial Day that killed one person and caused extensive damage, including to Hara Arena, the (former) longtime home of the Dayton Hamvention.

According to ARRL Ohio Section Emergency Coordinator Stan Broadway, N8BHL, the storms came just as Ohio ARES (Amateur Radio Emergency Service) was about to launch a partnership with the state emergency management agency's "Watch Desk," under which both HF nets and a statewide DMR (digital mobile radio) talkgroup would alert some 2,000 Ohio amateurs of emergencies in order to provide enhanced "situational awareness" to state officials.

"We got to launch that system under pressure Memorial Day Monday evening," Broadway reported, "as severe storm systems swept across Ohio, producing over 33 tornado warnings and 9 confirmed touchdowns. One person died and there were multiple injuries. Hundreds of homes and buildings were damaged, mainly in western and south-central Ohio. The largest storm (an EF-3) seriously damaged portions of Dayton including destroying Hara Arena, home for years to Hamvention."

Ohio AuxComm station W8SGT was activated and received situation reports through the night from amateurs in affected areas. Broadway said the information was fed directly into the state's "WebEOC" software to help the Watch Desk determine the need to ramp up to assist county EMA directors' requests for aid.

Broadway also noted that the operation "was not without problems," explaining that "the storms were so intense that desense significantly restricted our communication. Later, on Tuesday, we lost the ability to connect with our local DMR repeater. That was resolved Wednesday as the radio programming was changed. After storm passage, HF became more usable, both on the state 3.902 MHz SSB net, and 3.585 MHz Ohio Digital Emergency Net (OHDEN) in case forms would be transmitted. First-tier communications remained solid in most of the affected areas, but amateur operators were able to provide situational awareness that enhanced their response."

Most of the Ohio ARES nets closed down by Wednesday evening, two days after the storms struck. However, officials in the Youngstown area requested continued ARES activation to help with damage assessment from storm related flooding.

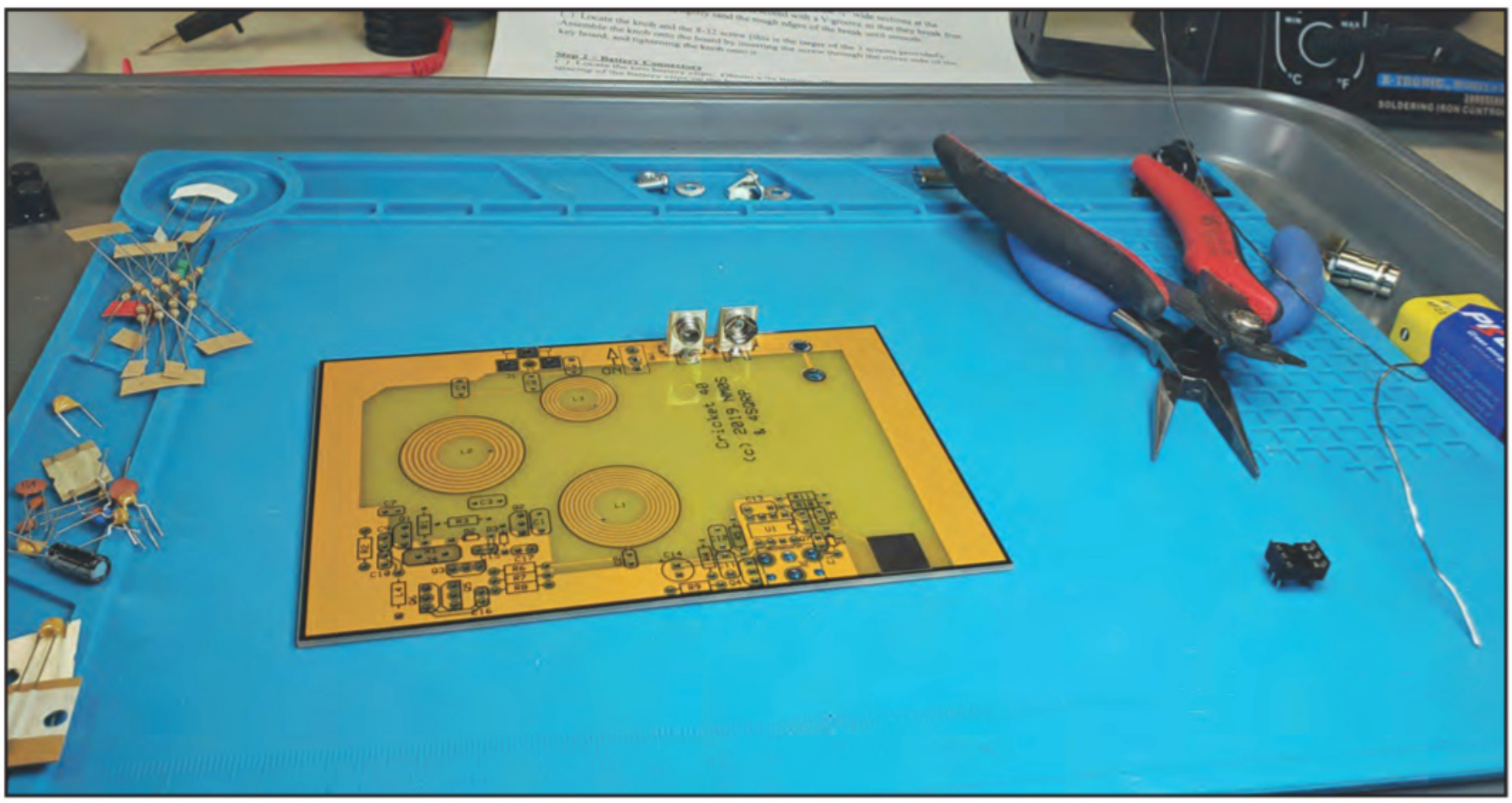
The hams' contributions were noted and appreciated by state emergency management officials, said Broadway, noting that, "as the state EOC opened its full session on Tuesday morning, recognition was given to the amateur radio operators who worked through the night to assist."

This drone image shows just some of the damage inflicted on Hara Arena, former home of the Dayton Hamvention®, by an EF-3 tornado on May 27. The complete drone video of the scene is online at <https://tinyurl.com/y3d4u5lt>. (WHIO-TV photo)

KIT-BUILDING

BY JOE EISENBERG,* KØNEB

A Great Time At Ozarkcon



The 40-meter Cricket with the 9-volt battery tabs mounted and the rest of the parts yet to be assembled.

Every year, the Four State QRP Group puts on an outstanding QRP conference in Branson, Missouri. Ozarkcon has become an annual trek for me as it offers great seminars and a huge group kit-build, as well as a great place to hold a convention. This year was no exception, and a big announcement was made about an upcoming new kit to be offered. Attendance for 2019 grew to over 200, a landmark in the growth of this great gathering.

Building a Cricket

The group kit-build this year was the third in the "Cricket" series of kits designed by David Cripe, NMØS. The Cricket is a very simple 1-watt CW transceiver, and has excellent receiver sensitivity and stability. The first one, released two years ago, was for 80 meters, followed by the 30-meter version last year. This year's Cricket will probably be the most popular yet, as it is for the 40-meter band. With the sunspot cycle approaching its low point, 40 has become one of the most active bands for QRP operators. The 40-meter Cricket was made available for the very first time to the builders at Ozarkcon.

The Cricket features coils that are spiral wound as part of the PC board, so there are no toroids to wind. The parts are relatively easy to work with, and it is powered by a single 9-volt battery. An on/off switch, a BNC antenna jack, and a headset jack are provided on the board. The straight key is a part of the kit as well, and is a part on the main board. An alternative part is provided that allows you to connect your favorite straight key or keyer output if desired. This year, we had over 50 builders assembling the kits all at once with a

Kurt Zoglmann, ADØWE, uses a rather unique board holder made from stiff wires and alligator clips.

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e-mail: <k0neb@cq-amateur-radio.com>

nearly perfect outcome and lots of signals from table to table and later from room to room in the hotel. Assembly time varied from about an hour or so for the most experienced builders to about three hours for newer builders.

You can order the new 40-meter Cricket at <www.4sqrp.com/cricket40.php> for $33.50 including shipping in the U.S.

Group Kit-Build Logistics

With plenty of help ensuring each builder had what he/she needed, the build went smoothly. The directions were pre-printed for each builder, making for easy inventory of the parts and allowing everyone to build at their own pace.

With so many builders at once, the logistics of doing a group kit-build of this size come to mind. Of course, the first consideration should be the kind of tables that are used, and how to protect the tabletops and keep our parts from disappearing. We used plastic-topped tables, so being extra careful to protect the surface from damage by hot solder was a must. I prefer to use a cookie sheet with a lip around it so my parts don't end up either rolling off of the table or getting lost in the carpeting. The cookie sheet also keeps the hot solder that inevitably falls from my work from burning the table or any covering placed on it.

Power for soldering and lighting is the next consideration, and the use of outlet strips and extension cords must be done carefully to avoid overloading the circuits in the facility where you are holding your event. It wouldn't impress the site owner if we tripped circuit breakers! A typical soldering iron we hams most often use for building kits draws less than 30 watts, but that, along with an LED or fluorescent magnifying lamp, can still add up. The best bet is to use cords drawing from as many different outlets as possible to avoid the AC circuit overload problems. Most typical outlets are on a 15 or 20-amp circuit breaker, allowing for a few users to be connected on one circuit.

Ten builders with soldering irons only draw about 300 watts total at peak draw. I often bring a roll-up extension cord that allows me to plug into a wall outlet and access four breaker-protected outlets, letting one other builder share my connection with me. The cord I use is available at this link <https://tinyurl.com/y2cj46yt> or other sources that carry the Woods 2801 Extension Cord.

I have found 10-15 builders to be the ideal number for a group kit-build, to prevent the instructor and helpers from being overloaded, especially if there are a number of beginners. Ozarkcon has a lot of experienced builders, so the larger group is easier to handle. At 10-15 builders, power outlets and strips are easier to deal with. Some groups buy a bunch of inexpensive strips and plug them into the outlets or to cords and get them plugged in to make for much quicker seating and assembly time.

Charles Jackson, WØCCJ, was nearing completion of his Cricket 40.

Ed, WG5F, and Karen Meyer, W5KKM, assemble their Crickets, taking a break from their duties as the prize committee for Ozarkcon.

If your club is interested in putting on a group kit-building experience, I can give you more specific suggestions tailored to your needs and perhaps even appear in person to help or lead.

The Nouveau 75

The next big news from Ozarkcon was the preview of the new Nouveau 75. This kit, which should be available at Dayton or just after is a 75-meter AM QRP transceiver. David Cripe, NMØS,

My completed Cricket 40 ready to be tested.

Twenty-five-foot extension cord reel with outlets.

took the Small Wonder Labs version of this transceiver, updated it, and created the PCB case and made it into a very updated and synthesized radio. The new kit is a hybrid, meaning that there are a number of surface mount parts that are already mounted to the PC board. So, there is no surface mount assembly needed. There are, however, a few toroids that need to be wound. There will be about 30 through-hole components to mount as well as the case assembly, but no point-to-point wiring as in the original K1SWL-designed kit. David used my Retro-75 kit I assembled nine years ago to test and compare its performance with the new transceiver.

The Nouveau 75 will cover about 3 to 6 MHz on receive, making for some enjoyable shortwave listening, including such stations as WTWW and WBCQ. The digital display will make tuning easy, and I look forward to building and writing in detail about this great new kit soon. Watch <4sqrp.com> for availability.

With the summer partly over, it is time to look forward to seeing as many of my readers as possible at the Huntsville Hamfest. See you in Huntsville!

– Until next time, 73 de KØNEB

ANNOUNCEMENTS *(from page 2)*

LINCOLN, NEBRASKA — The Central States VHF Society will hold the **53rd Annual CSVHFS Conference** from 3-8 p.m., Thursday, July 25; 8 a.m. to 5 p.m., Friday, July 26; 8 a.m. to 10 p.m., Saturday, July 27; and Sunday July 28 at the Country Inn & Suites by Radisson, 5353 N. 27th Street. Email: <registration@csvhfs.org>. Website: <http://2019.csvhfs.org>. DXCC / VUCC / WAS / WAC card checking.

OKLAHOMA CITY, OKLAHOMA — Ham Holiday 2019 and the **2019 ARRL Oklahoma State Convention** will be held from 3-9 p.m., Friday, July 26 and from 8 a.m. to 3 p.m., Saturday, July 27 at the Oklahoma City Community College, 7777 S. May Avenue. Website: <http://hamholiday.com>. VE exams.

CHAMBERSBURG, PENNSYLVANIA — The Cumberland Valley Amateur Radio Club will hold the **CVARC Hamfest 2019** from 8 a.m. to noon, Saturday, July 27 at the Cumberland Valley Engine & Machinery Association Show Grounds, 1501 Criders Church Road. Email: <hamfest@w3ach.org>. Website: <http://w3ach.org>. Talk-in 147.120+ (PL 100). VE exams.

MONUMENT, COLORADO — The Pikes Peak Radio Amateur Association will hold the **PPRAA 49th Annual Ham Radio Megafest** from 8 a.m. to 1 p.m., Saturday, July 27 at Lewis-Palmer High School, 1300 Higby Road. Email: <megafest@ppraa.org>. Website: <http://ppraaa.org>. Talk-in 146.970- (PL 100). VE exams.

WAYNESVILLE, NORTH CAROLINA — The Western Carolina Amateur Radio Society will hold the **WCARS Hamfest 2019** from 8 a.m to 2 p.m., Saturday, July 27 at the Haywood County Fairgrounds, 758 Crabtree Road. Email: <wcars.nc.hamfest@gmail.com>. Website: <www.wcars.org>. VE exams.

RAVENNA, OHIO — The Portage Amateur Radio Club will hold its **Hamfair 2019** from 8 a.m. to 3 p.m., Sunday, July 28 at the Maplewood Career Center, 7075 State Route 88. Contact: Joanne Solak, KJ3O, (330) 274-8240. Email: <kj3o@arrl.net>. VE exams.

UTICA, NEW YORK — The Utica Amateur Radio Club will hold **RadioCom 2019** from 8 a.m. to noon, Sunday, July 28 at the Deerfield Firehouse Grounds, 5476 Trenton Road. Contact: Bob Decker, AA2CU, (315) 797-6614. Email: <tbd2626@yahoo.com>. Website: <www.uticaarc.com>. Talk-in 146.76-. VE exams.

AUGUST

CARLINVILLE, ILLINOIS — The West Central Illinois Hamfest will be held from 7 a.m. to 1 p.m., Saturday, August 3 at the Macoupin County Fairgrounds. Contact: Jim, N9LQF, (217) 248-3548. VE exams.

GROVE CITY, OHIO — The Voice of Aladdin Amateur Radio Club will hold the **2019 Columbus Hamfest** from 8 a.m. to 1 p.m., Saturday, August 3 at the Aladdin Shrine Center, 1801 Gateway Circle. Website: <www.columbushamfest.com>. Talk-in 146.760- (PL 123). VE exams.

TRUMANSBURG, NEW YORK — The Tompkins County Amateur Radio Club will hold the **Ithaca Hamfest** from 7 a.m. to noon, Saturday, August 3 at the Trumansburg Fairgrounds. Email: <ne2t@arrl.net>. Website: <http://tcara-ny-org>. VE exams.

VINTON VIRGINIA — The Roanoke Valley Amateur Radio Club will hold the **Roanoke HamFun** from 8 a.m. to 1 p.m., Saturday, August 3 at the Vinton Moose Lodge, 2127 E. Washington Avenue. Website: <http://roanolehamfest.info>. Talk-in 146.985- (PL 107.2). VE exams.

BERRYVILLE, VIRGINIA — The Shenandoah Valley Amateur Radio Club will hold the **69th Annual Berryville Hamfest** beginning 6 a.m., Sunday, August 4 at the Clarke County Ruritan Fairgrounds, 890 W. Main Street. Contact: John, WD4GEK, (540) 436-3818 or (540) 333-0837. Email: <berryvillehamfest@gmail.com>. Website: <www.svarc.us>. VE exams.

FAYETTEVILLE, NORTH CAROLINA — The Cape Fear Amateur Radio Society will hold the **21st Annual Ole Fashioned CFARS SwapFest** from 8 a.m. to noon, Saturday, August 10 at the Cumberland County Shrine Club, 7040 Ramsey Street. Contact: David, KR4OE, (910) 624-1394. Email: <kr4oe@nc.rr.com>. Talk-in 146.910- (PL 100). VE exams.

HUNTINGTON, WEST VIRGINIA — The Tri-State Amateur Radio Association will hold its **57th Annual Hamfest** from 8:30 a.m. to 1:30 p.m., Saturday, August 10 at the New Baptist Church, 610 28th Street. Contact: Fred Herr, WD8AGH, (304) 736-2057. Email: <wd8agh@gmail.com>. VE exams, card checking.

ONALASKA, WISCONSIN — The Riverland Amateur Radio Club will hold its **Swapfest** from 8 a.m. to 1 p.m, Saturday, August 10 at the Onalaska American Legion, 731 Sand Lake Road. Contact: Greg Miller, KA9FOZ, (608) 792-7841. Email: <ka9foz@gmail.com>. Talk-in 146.970 (PL 131.8). VE exams, DXCC / VUCC / WAC / WAS / 160m card checking.

RACINE, WISCONSIN — The Megacycle Club of Racine will hold its **Free Fest** from 6 a.m. to 1 p.m., Saturday, August 10 at the Greater Racine Kennel Club, 6320 Six Mile Road. Contact: Dan, KA9OIL, <ka9oil@yahoo.com>. Website: <www.w9udu.org>. Talk-in 147.270+ (PL 127.3).

O'FALLON, MISSOURI — The St. Charles Amateur Radio Club will hold the **SCARC Hamfest** from 7 a.m. to noon, Sunday, August 11 at the O'Fallon Elks Lodge, 1163 Tom Ginnever Avenue. Contact: Michael Maninger, KCØGKN, (636) 697-5381. Email: <scarc.hamfest@gmail.com>. Website: <http://wb0his.org.hamfest>. Talk-in 146.670- or 145.330-.

HUNTSVILLE, ALABAMA — The Huntsville Hamfest Association will hold the **Huntsville Hamfest** and **2019 ARRL Alabama State Convention** from 9 a.m. to 4:30 p.m., Saturday, August 17 and from 9 a.m. to 3 p.m., Sunday, August 18 at the Von Braun Center, South Hall, 700 Monroe Street W. Contact: Mark Brown, N4BCD, (256) 503-8887. Email: <mark.n4bcd@yahoo.com>. Website: <www.hamfest.org>. Talk-in 146.94 (PL 100) or 145.33- (PL 100). VE exams, DXCC card checking, Young Ham of the Year presentation.

LEARNING CURVE

BY RON OCHU, KOØZ

Maker Spaces

The British poet, John Masefield, penned the line in his poem *Sea Fever*, "And all I ask is a tall ship and a star to steer her by." Masefield's line, combined with the adage, "Give a man a fish, you feed him for a day. Teach a man to fish, and you feed him for a lifetime," serves quite well for this month's theme.

Meet George

Please meet George Fetters, chairman of the board, Inventor Forge Maker Space (IFMS) (*Photo A*) of St. Peters, Missouri, <www.InventorForgeMakerSpace.org>. George is an enthusiastic individual with a clear vision. George is all about "open source" and assisting people with technology by making it more accessible to anyone with an interest. In fact, George and his six fellow board members dedicate a good chunk of their personal time making Inventor Forge available to over 90 members. Social media attracts a few members, but word of mouth is by far the best way, so far, of attracting new members. Typically, word of mouth generates one to two new members a week. The goal is to reach 150 members.

Inventor Forge Maker Space's mission is to promote an interest in science, technology, engineering, art, and math. It is a registered 501 (c)(3) nonprofit serving St. Charles County, Missouri and surrounding areas. Makers, innovators, students, and startups are all welcome. Anyone with an interest in the mission is welcome to become a member. Members pay monthly dues, sign a liability waiver, and have access to 3-D printers, laser etchers, woodworking tools, metalworking tools, CNC milling machines, T shirt presses, banner makers, and a plasma cutting machine (*Photo B*). All the tools are available for member use after they're certified to use them properly. Instructions are available to members so they can acquire certification.

Classes and Expansion

In addition to some expensive technology, IFMS also offers classes in electronics, soldering, Arduino and Rasp-

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

Photo A. George Fetters, technology enthusiast, DIYer, and IFMS chairman. (All photos by KOØZ)

Photo B. Two IFMS members working on a wood project.

Photo C. Microwave enthusiast Herbert Ullmann, AF4JF, with his 1.2- and 10-GHz rigs.

Photo D. 2018 Microwave Update (MUD) poster.

Photo E. Paul Wade, W1GHZ, microwave enthusiast and guru.

berry Pi projects, sewing, and jewelry making. Future plans include expanding into the arts by offering pottery kilns, leatherworking tools, painting, and crafts. Presently, IFMS is comprised of approximately 65% male and 35% female members, but the board hopes more women will avail themselves of the group's facilities and services. George speculates the current mix is the result of traditional societal views about male roles. However, more women are involving themselves with STEM (science, technology, engineering, and math) and he hopes that more women will find IFMS. The group is diligently working to be even more inclusive.

Diversity in membership brings in people with different interests and talents, but it also serves to generate different, new, and exciting ways to accomplish things. George is constantly amazed at creative approaches members bring to a project. Many times, George thought to himself, "I wouldn't necessarily approach a project that way," only to find – to his amazement – that the different approach was often a better one. DIYers (do it yourselfers) enjoy sharing and trying out new technologies with IFMS providing tools that many hobbyists wouldn't have ready access to use.

AF4JF

For example, Herbert Uhlmann, AF4JF (*Photo C*), is passionate about microwave communication. Herbert introduced me to George and IFMS. A big part of the allure of ham radio microwave enthusiasts, but at the same time a large drawback, is limited availability of parts and their subsequent cost, especially when it comes to microwave antennas and feed horns. Commercially-made microwave antennas above 10 GHz are not very affordable for ham radio operators. The surplus market offers some parts, but, for the most part, microwave enthusiasts need to fabricate their own antennas and associated parts. At the 2018 Microwave Update Conference (MUD) (*Photo D*), Paul Wade, W1GHZ (*Photo E*), shared his thoughts and experiences with milling his own waveguide transitions and feed horns (*Photo F*) at a local maker space. Paul used a CNC to fabricate his feed horn.

CNC (computerized numerical control) uses a program of computer commands to control a machine, whether it be a milling machine or a lathe. These programs can be shared, and results duplicated. Submitting an individual, custom-made request to a business can prove to be very expensive and beyond the range of a hobbyist. That's where a maker space can come in very handy. AF4JF wants to experiment with a dual-band (10 and 24 GHz) feedhorn; however, there are very few easily found. Consequently, Herbert learned how to use a CNC metal lathe (*Photo G*). AF4JF is taking his newly learned CNC skills and after he finishes his first feed horn, plans to produce additional feed horns for area microwave enthusiasts when his work schedule allows him time. Sharing skills and resources in a DIY

(do it yourself) manner is a cornerstone of amateur radio.

DIY is Maker Space

Historically, DIY (do it yourself) was an integral part of being a radio amateur. In the early days of amateur radio, commercially made radios either didn't exist or were way too expensive for the typical ham to purchase. Scrounging up electronic parts by "cannibalizing" junk radios and TV sets was the norm. Grinding down crystals to operate on a specific frequency was the tried-and-true method employed by radio amateurs before VFOs (variable frequency oscillators) proliferated, thereby liberating hams from crystal operation. Can you imagine operating in those gone by years before VFOs?

For example, in years past, if I wanted to operate 40-meter phone, my transmitter would have been crystal controlled. Perhaps, I only have a 7.230-MHz crystal. I am calling, "CQ," and you hear my call, but the nearest crystal frequency you have in your stock is 7.250 MHz. The difference in frequency would force me to search the band and listen for each your signals, which could take minutes. There's a very good chance that we would miss each other entirely. If we had made a sked (schedule) beforehand, our chances of making a contact dramatically increase. Still, not operating on the same frequency grows wearisome after

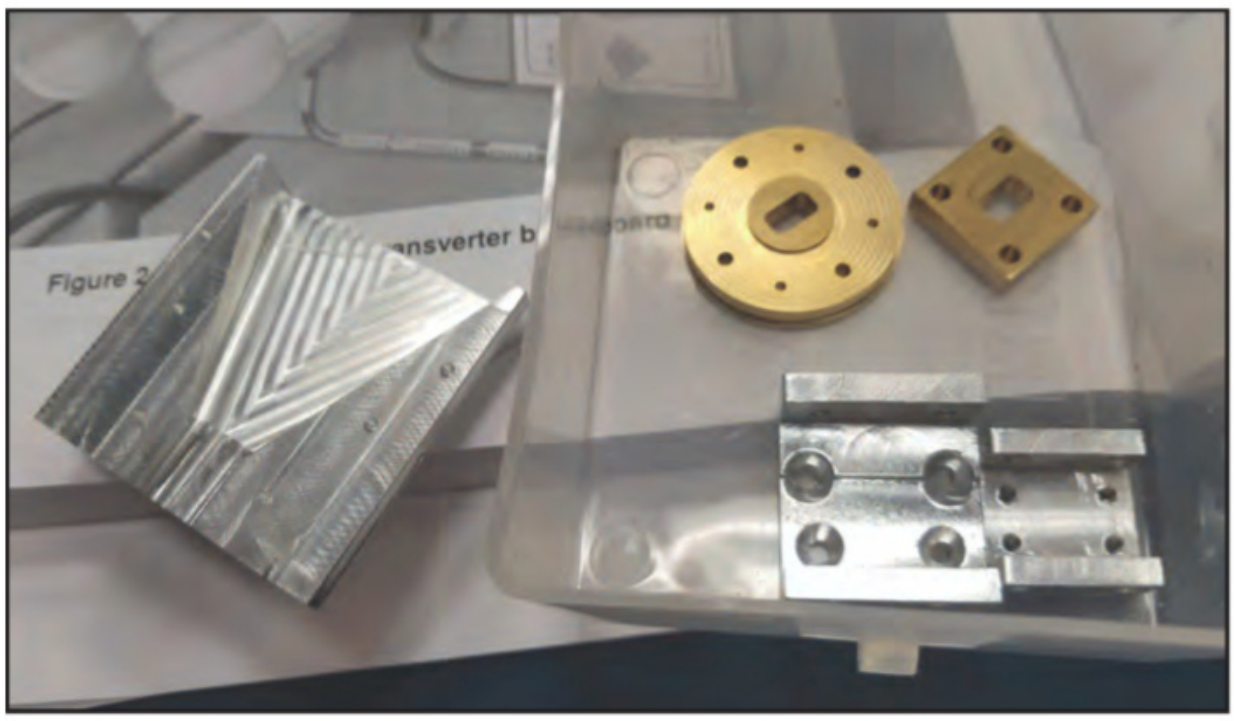

Photo F. W1GHZ CNC-machined microwave parts.

Photo G. Herbert Ullmann, AF4JF, explaining the ins and outs of an IFMS metal lathe.

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Photo H. IFMS 100-watt laser available to members.

Photo I. An electronics/soldering station for IFMS members.

a while. I may get tired of that, and I may decide to grind my crystal down to bring it closer (higher in frequency) to 7.255 MHz. Of course, I'd need to be careful not to break the wafer-thin crystal plate. Ham radio clubs offered advice and assistance with grinding crystals as well as parts. Fortunately, frequency selection is no longer a matter of keeping a stock of crystals close at hand (unless you're into vintage radios).

DIY still exists in ham radio, and it's very prevalent in ham radio niches such as the microwave and QRP (low power) communities. Microwave enthusiasts fabricate a lot of their own equipment, which requires advanced metalworking tools. Many QRP operators live to design and to build transceivers. 3-D printers are increasingly popular with hams for fabricating plastic boxes and enclosures.

The St. Louis QRP Society is a club that will spend an enjoyable evening *not* discussing minutes, treasury balances, or committee reports. Rather, their time is spent poring over block diagrams or schematics of the latest QRP rig, antenna tuner, or antenna. The DIY spirit is alive and well in groups such as this one. Ham radio used to be more like these groups. Readily made, off the shelf rigs are very nice, but there's something to be said for making a project work from scratch or a kit. We're putting electron-

ics theory into practice. Add to this mix the adage, "necessity is the mother of invention," combined with desire and willingness to learn and you have the recipe for a maker space such as IFMS. The spirit and trappings of yesteryear's hams are alive and well in maker spaces across the nation.

Three years ago, George started IFMS meetings at the local library. The first few meetings saw a lot of interest and there were as many as 30 people, but nothing was getting done. It was akin to herding cats. Consequently, George and two other enthusiasts gathered a few others, collected dues, and rented a small space to meet and to gather tools. Soon a "Field of Dreams" scenario began to unfold. "Build it and they will come." As more members joined, IFMS started running out of space. Fortunately, the St. Charles County Economic Development Center (EDC) heard about IFMS and met with George. Monetary grants and a much larger meeting space became available with the aid of EDC. IFMS members have continuous access to the equipment to work on projects. Dues assist with rent and purchasing more equipment. IFMS has a 100- and 60-watt laser for etching and burning (*Photo H*). There's an electronics corner with soldering station (*Photo I*) and a Bridgeport mill (*Photo J*). IFMS listens to its members and additional space and equipment is being continuously added as resources allow.

Meanwhile, as AF4JF learns more about metalworking, he is getting other hams involved and he's making friends at IFMS and introducing them to ham radio. There's talk among some of the members of experimenting with high-altitude ballooning and ham radio. Paul Wade's microwave horn made at his maker space and presented at the 2018 MUD (*Photo K* and *L*) is what inspired AF4JF to see if St. Peters has a maker space.

Photo J. Herbert, AF4JF, standing next to the Bridgeport milling machine.

That's a Match

No doubt about it, ham radio enthusiasts are a perfect match for maker spaces. This is where folks of all ages are gathering with a vision and a purpose. Maker spaces are perfect for hams to locate hard-to-find tools and make new friends. Maker spaces and their members epitomize life-long learning; thereby, providing not only the proverbial ship and a star, but also the adage, "teach a man to fish, he'll eat for a lifetime!"

Reader Feedback

I'd like to thank readers who take time to send me emails. It's good to hear from you. It's nice to know that you enjoy the column. Jagur Thomas, N7HEX, emailed me to point out that there are also slow-scan television (SSTV) apps for Android and iPhones. These apps can listen to SSTV audio from a transceiver and decode it to produce a picture. They can even take a picture and convert it to audio tones that can be played from the phone to a rig's microphone to transmit a SSTV picture. Personally, I've not purchased, or have I tried these apps, so I can't comment on them from personal use, but they are worth checking out. I thank Jagur for making me aware of them.

Thank you for reading *CQ* and I hope to hear you on the air.

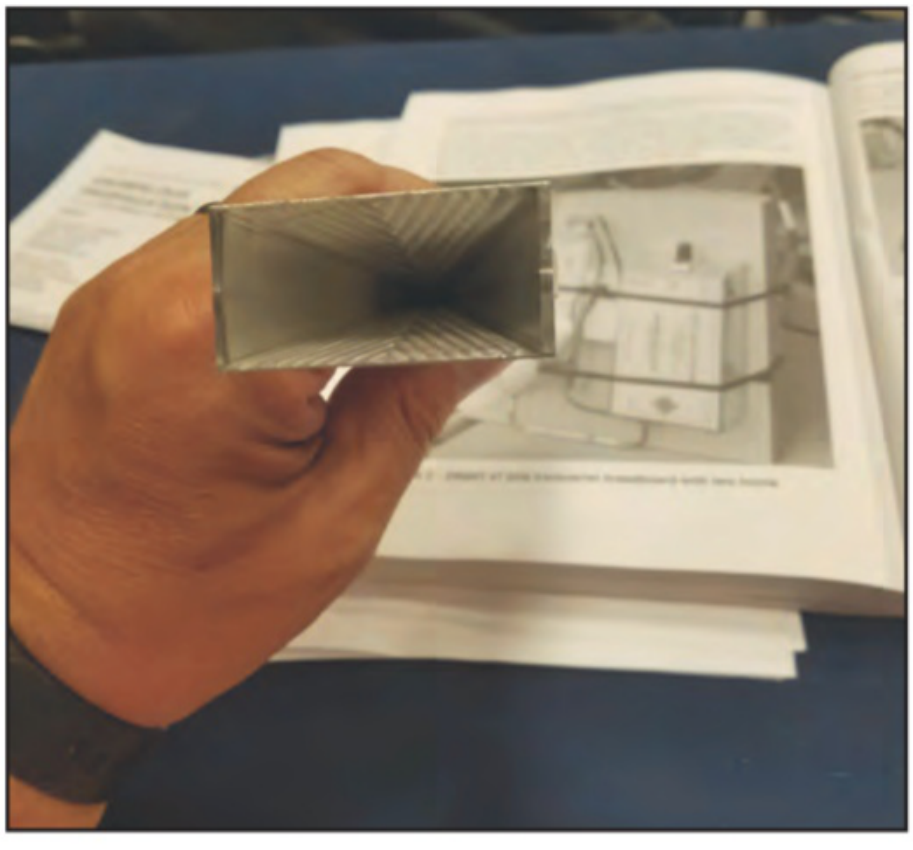

Photo K. Front view of W1GHZ feed horn, milled at a maker space and shown at MUD.

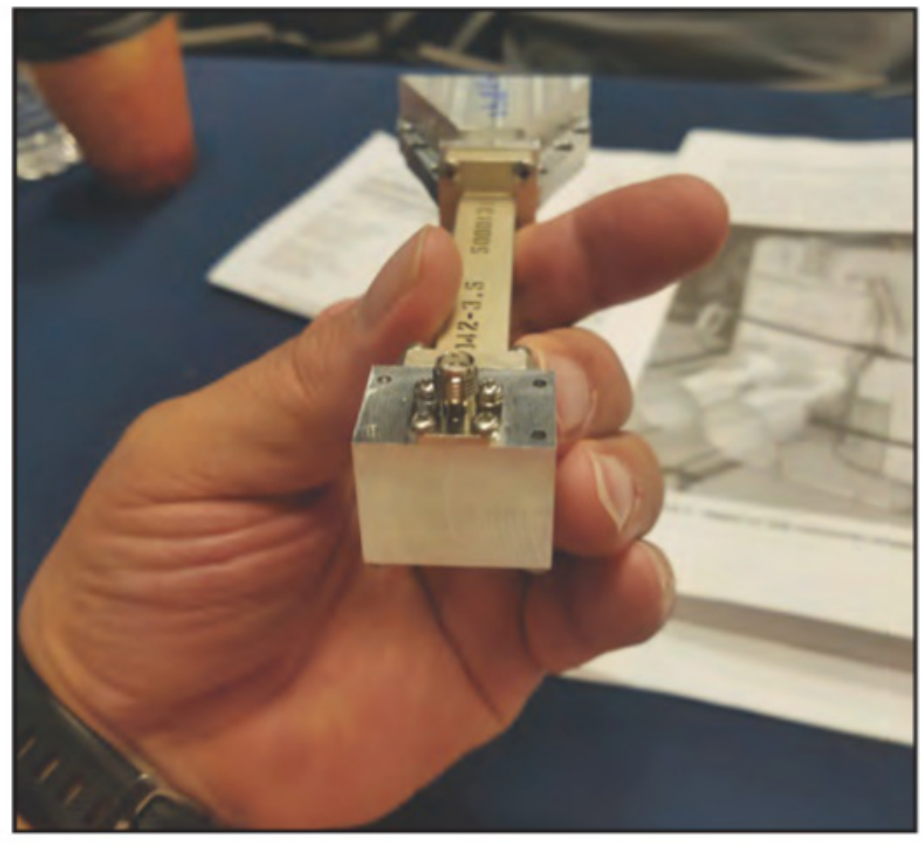

Photo L. Another view of the W1GHZ maker space-milled microwave feed horn.

THE HAM NOTEBOOK

TEXT AND PHOTOS BY WAYNE YOSHIDA*, KH6WZ

Here and There, This and That

Miscellaneous Life Changes and Projects on the Workbench

This is one of those "column deviations" that happens once in a while. My new day job is filled with multiple projects and priorities, short deadlines, and lots of stress. In other words, it's the same as my previous job, but slightly different.

Because of the job change, my daily routine and pastime activities also must change. Throw in some unplanned emergencies and things in my life get really complicated. I am sure everyone goes through this once in a while.

So, this column is a recap of radio-related things going on, either in my head or on my workbench. Some of these ideas or things may appear in a future installment of my "Ham Notebook" column.

Maker Faire Bay Area

This amazing event is the same weekend as the Dayton Hamvention®, a truly unfortunate conflict. As this is being written, I am once again scrambling to get some new Maker Faire projects built, tested, and running.

One of the new items for this year's show is a small Tesla Coil, powered by a 12-volt wall wart power supply. It will be used to generate artificial lightning for the lightning detectors (300-kHz receivers) also on display. The warning sign for this item is shown in *Photo A*. The whimsical wording is inspired

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Photo A. This is the warning sign for the Tesla coil under construction for the 2019 Maker Faire season. The sign indicates the nature of Maker Faire events: Hands-on displays.

Photo B. This is a view of the high-voltage circuit for the miniature Tesla coil for Maker Faire and similar educational demonstrations and events.

Photo C. I always wanted to build a field-strength meter, and finally completed one. It is a simple and useful piece of test equipment — and an excellent item to demonstrate radio frequency energy at Maker Faire events.

by other typical warning signs seen at Maker Faire events I've visited. The high voltage module is presented in *Photo B*. A mount and display stand are needed to complete the project for kid-safe, hands-on demonstrations.

A field strength meter is easy to build and can be a handy instrument for anyone with a transmitter. I wanted to make one of these for a very long time. My completed version is shown in *Photos C* and *D*. It features a vintage 4-inch diameter Triplett meter and a tape-measure antenna. A BNC connector is also included so another or different antenna can be connected. It covers HF to VHF

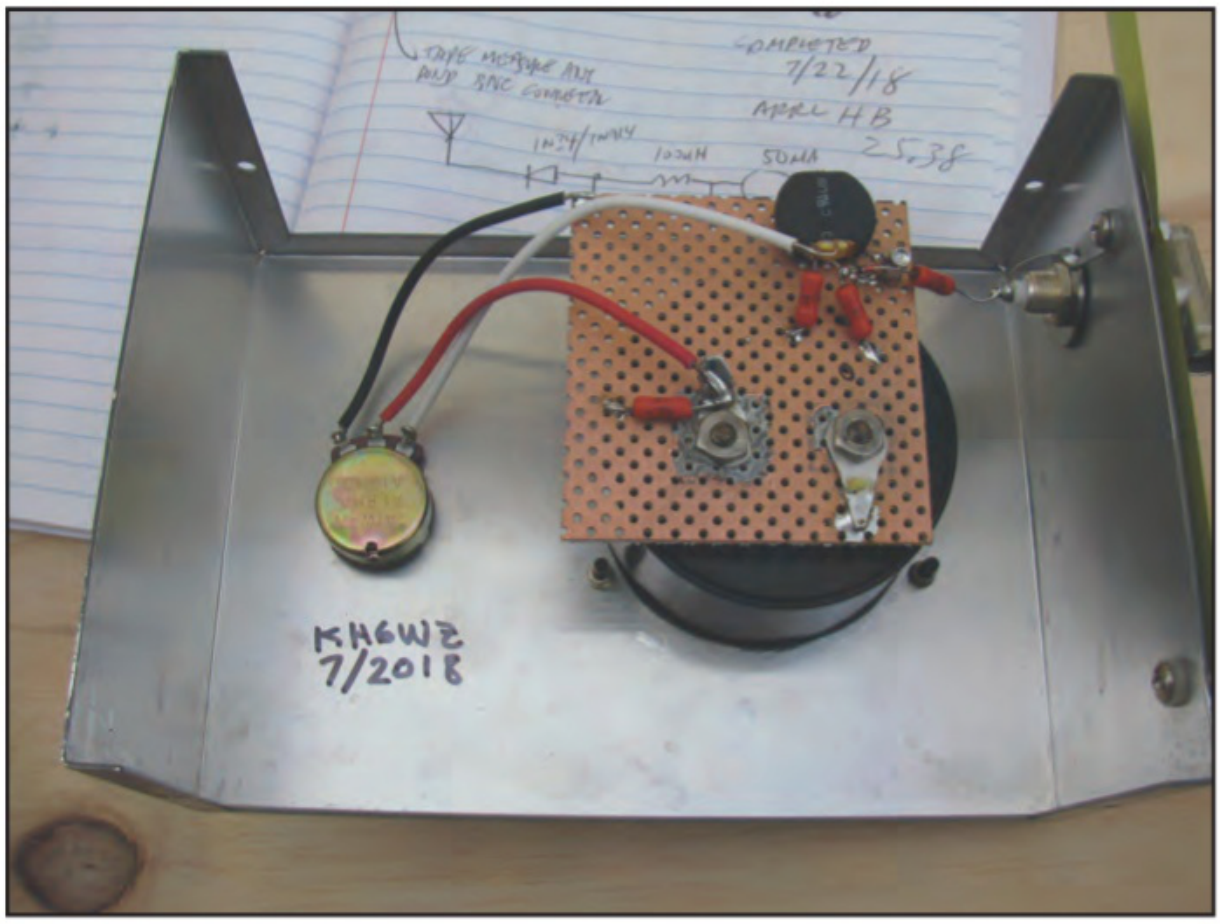

Photo D. An inside view of the field-strength meter shows how simple it is. A BNC tee is temporarily in place so other antennas can be attached. In normal demonstration use, a length of tape measure is used as an antenna for that "Maker Faire look."

Photo E. Some of the useful items found at the local radio swap meet. These items will find new life as useful instruments for my shop, shack or workbench, or as Maker Faire demonstration projects.

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Photo F. A local electronics surplus and recycling center held an open house event. Racks and bins filled with interesting and amazing items were there for browsing and purchase. A nice surprise: Buyers earned a free breakfast burrito with any purchase.

bands. The circuit appears in many issues of *The ARRL Handbook for Radio Communications*. The meter will be placed next or near to the various transmitters we will have on display at the Faire, so the meter needle will wiggle when the transmitters are working.

I also have some homebrew VHF and UHF mobile and portable antenna ideas to try. The ideas come from the need to outfit my new car (2018 Chevy Volt) with my dual-band mobile radio and control head. Since I am a "maker," I decided it would be a good time to consider making, rather than buying, my next set of mobile antennas (antennae?). Some requirements I wrote down in my ham notebook include performance that comes close to or meets store-bought antenna or antennas and must be as weatherproof as commercial units. One dual-band (2m/70cm) antenna is the goal, but two single-band antennas would be acceptable. A low profile would be desirable so the car and antenna can enter and exit covered parking lots, but is not a necessity. So, my homebrew mobile antenna could be anything from a quarter-wave or bottom- or center-loaded whip to a patch or ring type of design. This should be fun.

Photo G. More racks of things ... here are some potentially useful items for any electronics lab.

Swap Meet and Surplus Treasures

I absolutely love finding surplus electronic and mechanical things, not for what they are, but for what they can become. I am fortunate to live within a reasonable driving distance of the famous TRW Swap Meet, which is actually located on the Northrop Grumman parking lot in Redondo Beach, California. I picked up some nice items that will undertake a transformation into something interesting and useful for either Maker Faire demonstrations or for use in my ham radio activities.

Some of the items appear in *Photo E*. The vintage Simpson 260 VOM, functional but with a cracked and broken case, was a bargain at $10. How could I pass that one by? And the 7-segment LED displays, about 3-inches by 5-inches each, will make a nice indicator for — something. A giant frequency display, perhaps. In the back are three brand-new Bud aluminum chassis boxes, a bit large, but at $5 each, it was something I had to buy. They may be the perfect chassis for the vacuum tube projects on my "Things to Do" list.

Another excellent bargain-hunting event took place earlier this week: A local electronics salvage company held an open house event, see *Photos F* and *G*.

In addition to the useful items for sale,

Photo H. I really wanted to buy one of these avionics units, but it was out of my budget. The gyro unit would make an interesting do-nothing piece of technical art in my living room. Too bad.

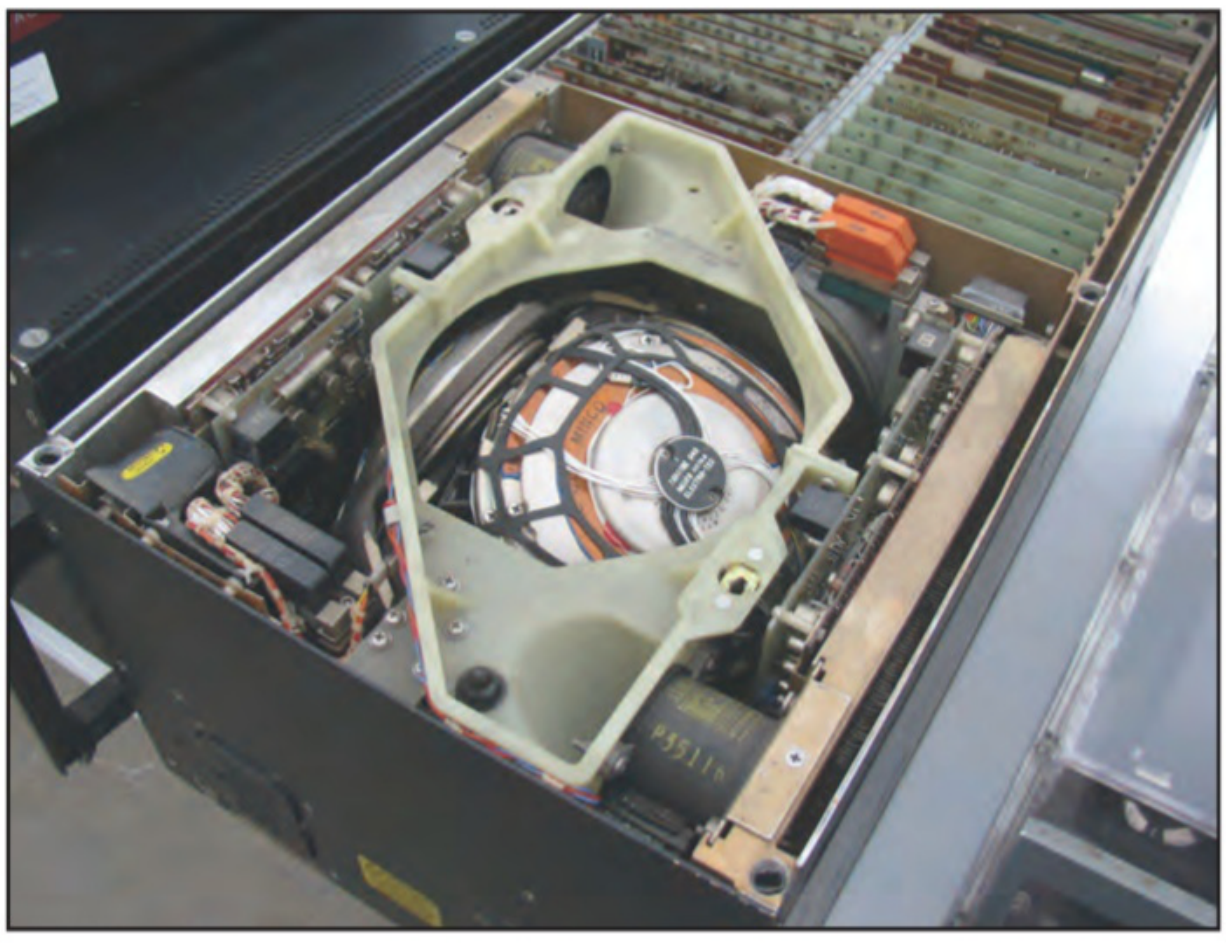

Photo I. Here is a closer look at the gyro unit inside.

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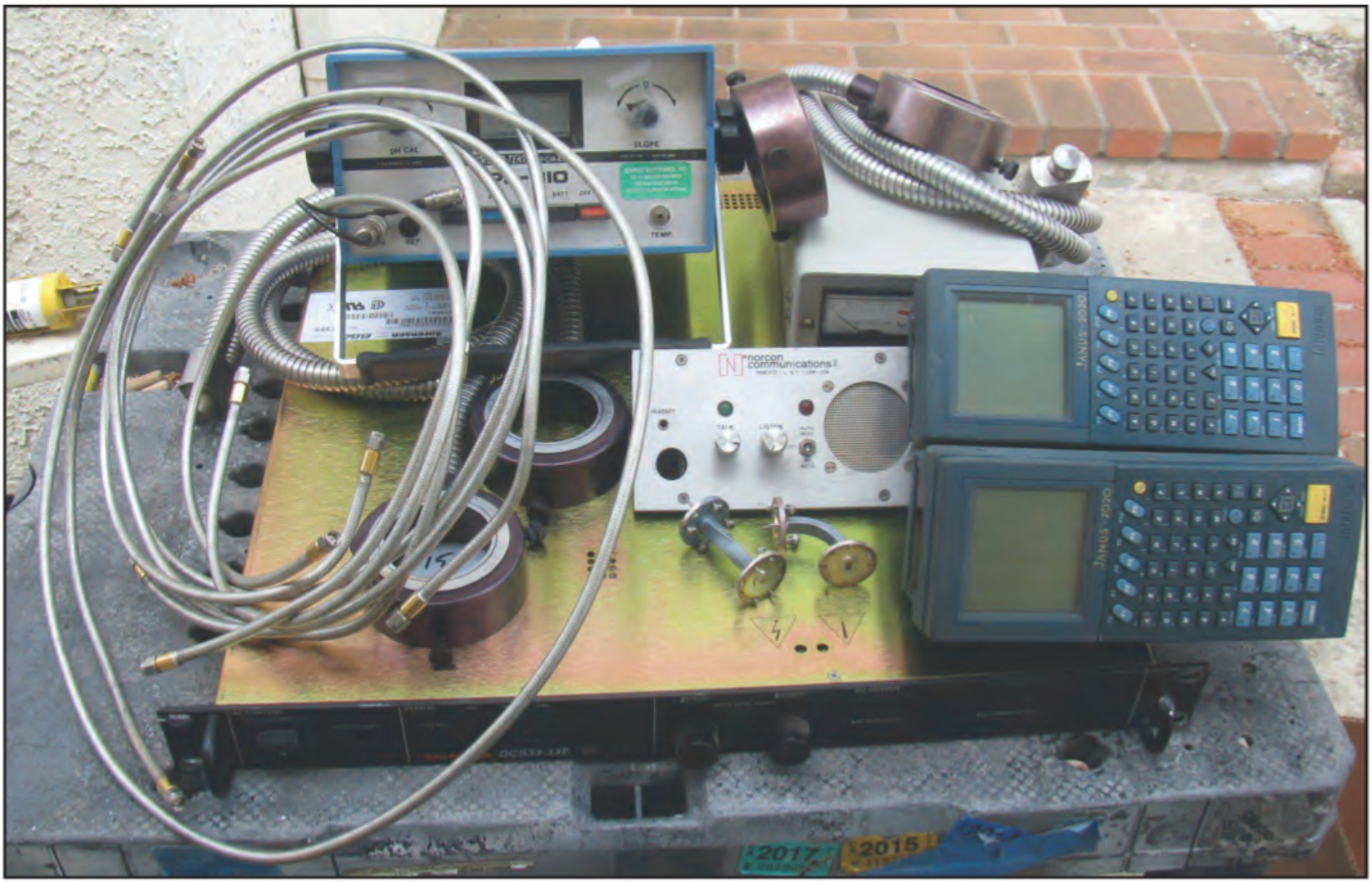

Photo J. Some of the items I acquired at the open house event. These items will be diverted from the landfill and become useful demonstration units or will have new functions in upcoming projects.

there were two outstanding items I really wanted, but I kept my mind in check and let them pass.

The first item, priced at over a thousand dollars, is a gyroscopic aircraft auto-pilot unit. There were four such units, one from a military aircraft and three from commercial passenger jets, shown in *Photo H*. A closer look at the gyro section is in *Photo I*.

The second item, which was too big to fit into my car: An airport beacon or some sort of radar unit. I don't have a good picture showing this, unfortunately. If nothing else, the aluminum (fiberglass?) radome could be the basis of an R2D2 robot or something.

I've been looking for surplus barcode scanners for a while, so when I saw a box of them at a reasonable price, I grabbed two. I think they might make a handy housing for either a laser (using the built-in laser unit) or a 10-GHz communicator (using a Gunnplexer unit) pair.

In *Photo J*, at the lower left corner, under the coax jumpers, is a set of fiber-optic ring lights. I can put these to good use for macro- and micro-photography. I don't have a light source, but should be able to make one easily. On the bottom of the stack, not clearly visible, is a nice Sorenson variable power supply. It is in a 1U-size rack cabinet, and goes from zero to 33 volts and zero to 33 amps. Other items visible in the picture include unknown portable test instruments, which I purchased for their nice cabinets.

The Job and Career

As mentioned at the beginning of this column, my new day job is busy and stressful, but I consider it the good kind of stress. This is because I have gone through the same situations throughout my entire career as a technical writer, and because I am learning new things on all fronts at the office. It is the excitement of change and the ability to use all of my past experience with writing and editing, computer applications, engineering documents and engineers, and adapting to the new environment.

But the best part of my new job: I was recruited away from my previous company, a place where I enjoyed my work, the company and its products, and its mission and vision. But the new opportunity was too good to pass up. It's nice to be noticed and wanted.

Years ago, I often argued with an older co-worker. That person used to say, "Don't argue with me, I have over 20 years of experience." To me, that response is the same as "because I said so."

Although I would comply, I never respected that person. And this is the reason I never liked speaking or hearing about anyone's "x years of experience," because without a reason, it simply means someone is of a certain age, or at least, just old. I have much more respect for people who prove their experience and expertise by demonstrating with their actions and decisions or how they perform their everyday tasks and assignments.

That's all I have for this month's column. As always, if you have any questions, comments or suggestions for topics to explore, let me know via email. Think of this column as a springboard for starting discussions or inspiring you to create or make or contribute something to *CQ* magazine and our audience. *– 73, Wayne, KH6WZ*

DIGITAL CONNECTION

BY DON ROTOLO,* N2IRZ

Innovation Past Forward: The New Computer Museum of America in Roswell, Georgia

Think for a moment about what you know: A lifetime's accumulation of facts and skills, and likely ever-increasing. How did you get all that? For many of my generation — the baby boomers — we got it from our parents and older siblings. I learned electronics first from my older brother, who eventually graduated as an electrical engineer (as did I). Another older brother taught me how to work on cars. Colleagues at work fostered a love for ham radio and fooled me into passing my Novice code test. And, of course, my father who, owning his own manufacturing company, taught me to be fearless in approaching new challenges. He didn't have the money to hire outsiders to repair his machinery, so he did it himself.

This brings up the question: How will today's youth learn these kinds of skills? Now that we have millennials entering their parenting years, do they have the skills needed to pass on to their kids? After all, modern American society is becoming less and less dependent on the blue-collar skills so prevalent in the second half of the last century, as more and more cling to the fallacy that everyone should go to college. I've seen so many high school students who have never used a screwdriver, and that makes me cringe.

While I am trying to become part of the solution by mentoring the local high school's FIRST Robotics team, I am not alone. This month, in celebration of its grand opening in its permanent exhibition space, after years of development and local pop-up exhibits, we'll take a close look at the new Computer Museum of America in Roswell, Georgia.

Lonnie Mimms, the founder and primary driver of the CMoA, has been collecting computers and technology over a period of 40 years. Having insider connections, knowing the industry, and being in the right places at the right times, he has amassed one of the world's most comprehensive collections of computing artifacts and equipment. From his vision of preserving these items as tools of learning, so future generations can learn about and be inspired by the development of these technologies, and born of a project to simply catalog and archive all this "stuff," came the idea for a museum unlike any other.

When we think of a museum, we think of rooms full of lifeless exhibits, each artifact with a small card explaining what it is and its significance in the history of something. Certainly not every museum is like this: Some, like Liberty Science Center (in the shadow of the Statue of Liberty in Jersey City, New Jersey) have some "cool" exhibits geared towards making science fun for kids, but even that, for the most part, is a collection of artifacts with little cards.

The CMoA has a somewhat different vision: Bring this stuff to life, make it inspiring and memorable. Not only explain what it is, but why it was important. Get stories from the people who used or designed or installed these things, introducing the human factor to better explain their meaning and significance. The ultimate goal is to develop a deep understanding of the origins and effects of the technological revolution that computing has spawned in our modern society.

A SCELBI 8H microcomputer. Before the Altair 8080, there was the SCELBI (pronounced "sell-bee"). Announced to the world with a tiny ad in QST in March 1974, it sold as a kit starting at $440, but with the full 16k of Random Access Memory the price jumped to over $3200. Based on the Intel 8008, this is one of the very first personal computers.

In an online article by Appen Media <https://bit.ly/2WoHbbX>, museum Vice President Karin Mimms (Lonnie's wife) said, "It's more than just a technology museum, it's an innovation center. People think, 'oh, it's just computers.' But it goes into so many other areas, because computers have touched every industry known to man."

Full disclosure: I am not at all involved with the CMoA, and my impressions come entirely from a single visit several months before the museum is scheduled to officially open to the public. I visited one evening as part of a small group of IEEE (Institute of Electrical and Electronic Engineers) members, based out of Georgia Tech in Atlanta, who got a sneak peek of the work-in-progress. I also gleaned some newer information from its website <https://computermuseumofamerica.org>.

Roswell, Georgia is a mid-size city "outside the perimeter" (OTP) to the north of Atlanta. With a population of nearly 100,000 and a land area of over 40 square miles, it is a mix of solid suburbia and intensive highway retail. The main east-west highway, Georgia Route 92, has a speed limit of 45 MPH but it still takes nearly a half hour to get from one end of town to the other (outside rush hour) because of the traffic lights. Old historic Roswell, centered near town hall and Canton Street, is a lively collection of (mostly) outstanding restaurants, fascinating and eclectic shops, and even two

* *c/o CQ magazine*
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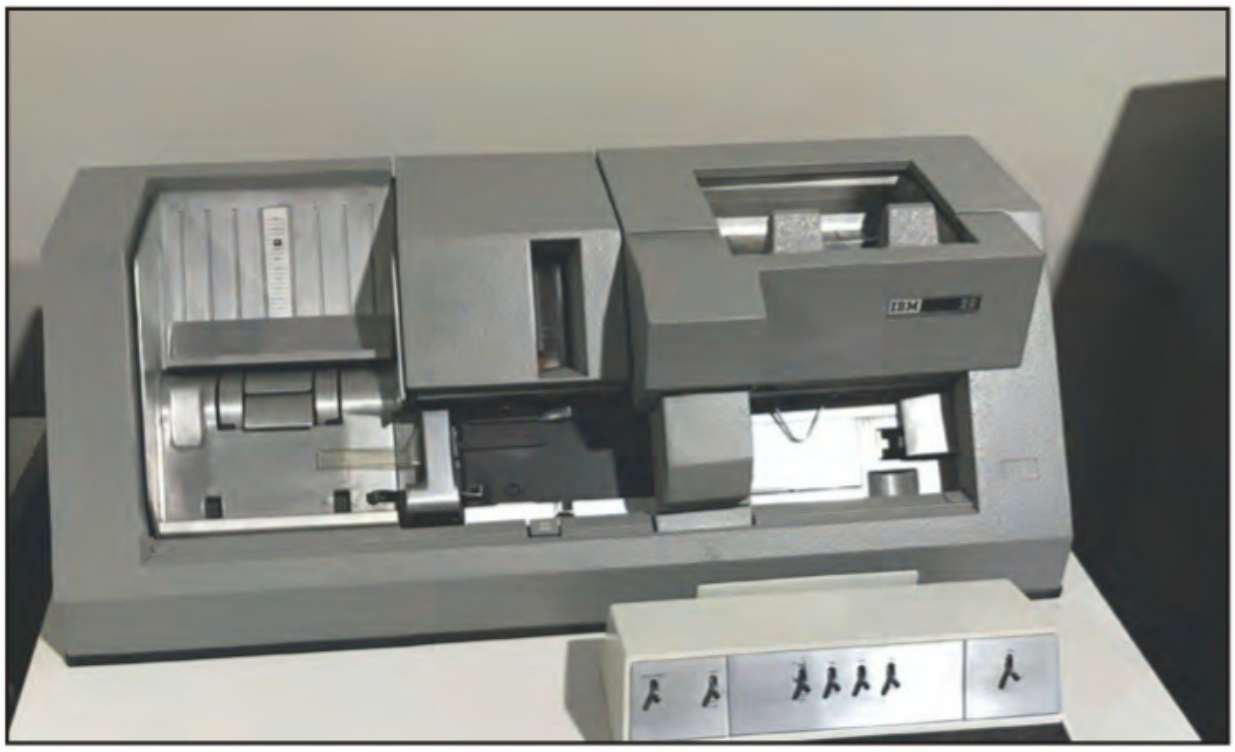


An IBM Model 29 card punch machine. Before hard disks, floppies and cassette drives, the only way to store computer programs was a physical piece of card stock known as a punch card, with punched holes representing ASCII characters. These cards each stored a single line of computer code and were carried around in shoeboxes and wrapped with rubber bands to ensure they stayed in the correct order — "dropping your deck" was a traumatic event, since re-sorting the scattered cards was a day's work. I recall many late nights in engineering school working on just such a machine.

craft breweries spread out over a couple of easily-walkable blocks. There seems to be a celebration or festival almost every weekend, as well as the terrifically popular (and family- and pedestrian-friendly) Alive after Five event on the third Thursday of each month.

As is typical for such a setting, the retail businesses are clustered along Route 92 and the major north-south highway, Georgia Route 9. (Hardly anyone uses the route numbers, as these roads have names, but these change names unexpectedly several times as they make their way through town). Along with stand-alone stores and small strip malls are some larger mall-like clusters, although none has more than a dozen or so stores. And, as we all should know from hearing the news, retail brick-and-mortar stores are currently suffering from a downturn. You probably know of a shopping mall in your town that is half empty, or worse.

It is in one of these under-utilized small malls — the Roswell Town Center — that the CMoA makes its home. Located right next to the busiest intersection in town (corner of routes 92 and 9), on the lower floor near the Aurora movie theater and the WhirlyBall Atlanta space, is the huge exhibit space housing CMoA. Inside the museum are dozens of supercomputers and computing-related exhibits designed to spark the imagination. When I visited, only the lower floor was in use, but there are plans to more than double the size of the museum by expanding to a second floor.

This Cray DD49 hard disk drive, tucked off in a corner of the supercomputer gallery, was the most interesting artifact for me. The size of a large filing cabinet, it has a capacity of perhaps 100 MB and cost several tens of thousands of dollars new. Compare that to my 5 TB portable HDD that I bought at Costco for $129, which is a little bigger than a deck of cards.

We entered off to the side of the supercomputer gallery and started at the timeline of how computing came to be. The mint-condition computers (yes, we can call them that) were the big draw for a geek like me, but probably a greater attraction for most folks are the explanations of their significance, which were in the draft stages when I visited. Instead of leaving most of the details to the imagination, which younger or disinterested visitors might not capture, this was all spelled out in the displays that I saw.

Of course, any museum dedicated to something the visitor already finds interesting will be a good place to visit. However, what about those who are not really interested? Many years ago, I visited the Belskie Museum of Art & Science <www.belskiemuseum.com> in Closter, New Jersey. Abram Belskie was a talented sculptor who, amongst several sculpting talents, later specialized in bas-relief medals. The coin-like medals, and the processes used to sculpt and fabricate them, was shown in the tiny museum and was fascinating for me, because I could understand what I was seeing.

Not so for my daughter, who had been assigned a visit for her schoolwork: There was little interpretive or explanatory information. The cards simply show a few dry facts about each artifact.

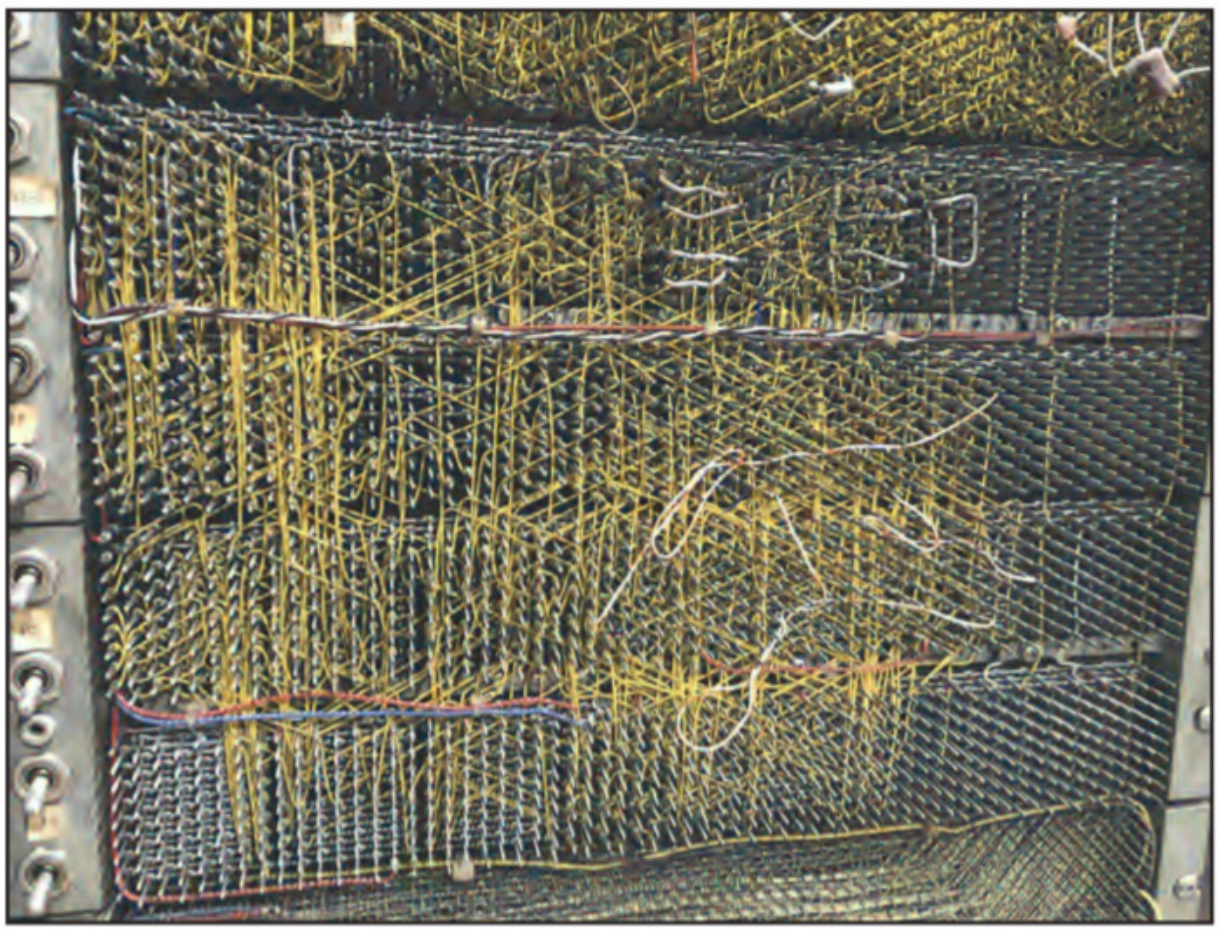
It should be different in the CMoA: Enthusiasts will certainly see lots of things that are fascinating, but even the non-enthusiast, dare I say even the mildly bored and hostile visitor, will find the visit satisfyingly interesting.

Turning the corner from the timeline, you are immediately attracted to the Apollo space flight display. We've all heard the stories about the Apollo flight computers and how ridiculously low-performing they were compared to, say, a mod-

The gentleman at the center, one of the IEEE group, tells stories to the group about the Cray XMT he'd spent a good portion of his career with. Chief Advocacy Officer Todd Peneguy (right, with name badge) wants some of the (unclassified) stories to be included with the exhibit.

ern $5 Raspberry Pi Zero microcontroller. But the display, with several attractive displays to draw you in, shows why NASA didn't use the more powerful processors available at the time, and why it really wasn't necessary anyway. (After all, they did complete their missions, right?)

But to walk right into the spaceflight display is to go right past all those PDP computers and the punch card display. There's a wall dedicated to Byte magazine, showing hundreds of colorful covers from the magazine's days, and a peek around the corner of the supercomputer gallery.

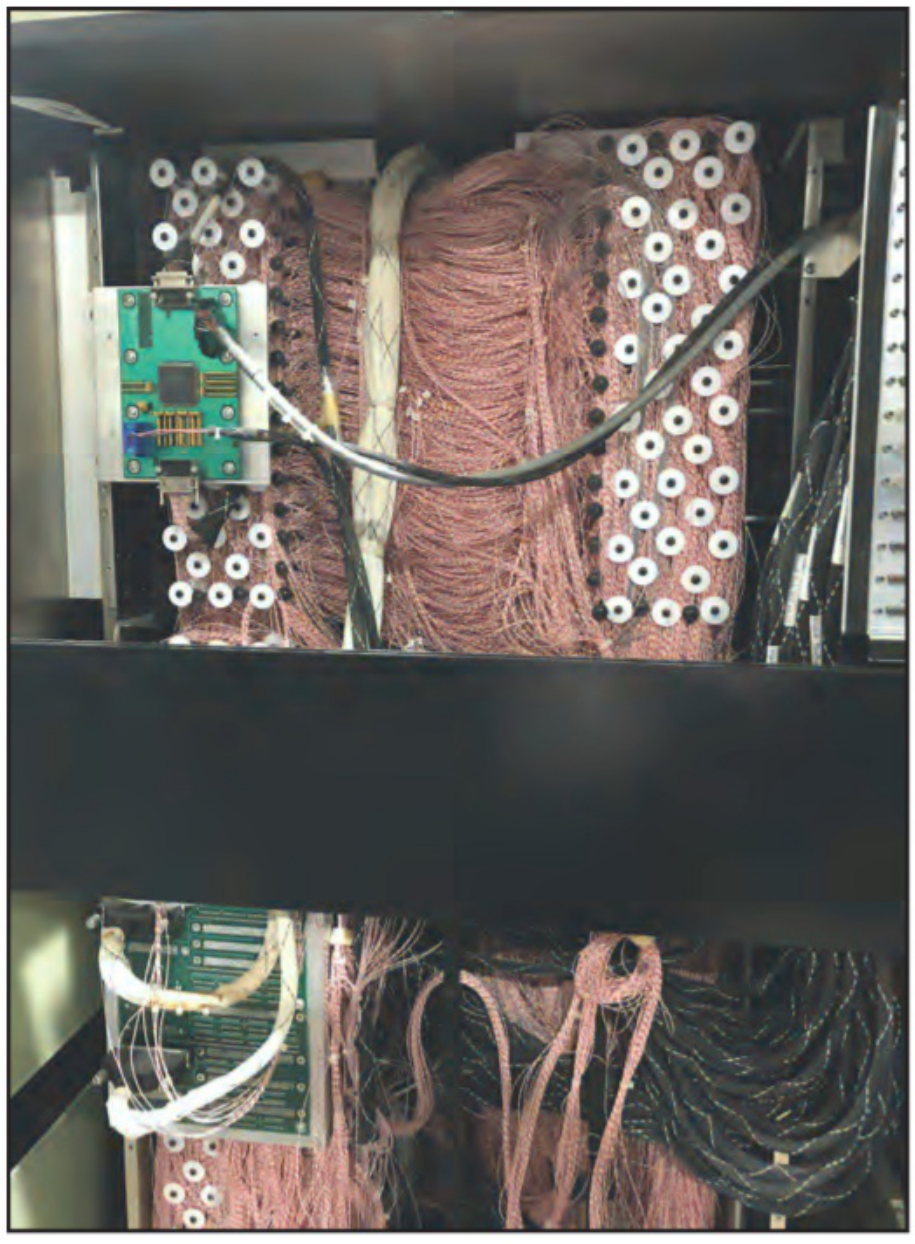


Wire Wrap Hell. Before printed circuit boards were widely used, one-off and low-production circuits were interconnected using wire-wrap techniques, where the special wire was wrapped around square pins to make a connection. This photo shows about one-third of the open side of an older supercomputer in the PDP gallery. The white wires are repairs.

Sprinkled around the supercomputers (dozens of them!), but in their own spaces, are displays about some of the most difficult computing problems, which form the reasons for even creating those supercomputers: The human genome, weather and climatology, atomic energy, cryptography, energy exploration and engineering design, to name a few. Each of these displays is quite good in its own right, but combined together helps us better understand why anyone would try to even build a supercomputer. And these are not just dry displays of fact. For example, the climatology and weather area has a dynamic sculpture representing the mathematics of a tornado and thundercloud, to show how supercomputers made better weather prediction possible.

On the other end of the scale, there is a series of video game consoles in the vintage arcade, and visitors are encouraged to play them. Remember Pong? If not, you really need to play a game or two. The museum creators envision many displays being rotated every 18 months or so.

They started on the first floor, according to Chief Advocacy Officer Todd Peneguy, because they weren't sure the second floor could handle the weight of the supercomputers. Plans for the additional space include maker spaces, co-working offices, discovery spaces, classrooms, and other amenities. The basic idea is to develop into a technology learning and innovation



Cray Guts. This photo shows the innards of a piece of supercomputer. I'm not sure who thought using all the same wire color was a good idea.

center which, given the proximity of Georgia Tech and other prominent universities, is sorely needed in the Atlanta area. Peneguy feels that there is no reason that Atlanta cannot become more of a technology and innovation center of the country, and that this venue is going to help spark that fire.

The museum will celebrate its grand opening on Saturday, July 20, not coincidentally the 50th anniversary of man's first landing on the Moon. If you find yourself traveling near Atlanta in the future, try to make some time to head north on Route 400 into Roswell and spend a few hours at the CMoA.

– *Until next time, 73 de N2IRZ.*

A NASA space suit in the Apollo display area. Some of the artifacts in the display are quite rare and seldom seen by the public. This photo was taken before the signage was installed.

The founder of the CMoA, Lonnie Mimms (white shirt, at left) explains the significance of the different systems generations in the PDP gallery. This was taken before the final signage was placed.

MAGIC IN THE SKY

BY JEFF REINHARDT,* AA6JR

"Return With Us Now..."

"...to those thrilling days of yesteryear..." So went the intro to the weekly adventures of The Lone Ranger.

Like all good technical publications, *CQ* does well in keeping readers informed on the latest new amateur radio equipment and technology, software programs, operating modes, and the like. In these pages you'll also find news, regulatory info, contest results, awards updates, and other contemporary developments. But it seems appropriate here, in the summer of 2019, to take a temporary vacation-time leave of the "here and now" and reflect on some of the "blasts from the past" because, well, this year calls to mind some pretty significant milestones.

Like it Was Yesterday

Using the cover date of this magazine as a benchmark, exactly 50 years ago, the world held its breath as the Apollo 11 mission built toward its climax. The hopes and prayers of billions across the planet were reflected in white knuckles, eyes riveted on flickering TV screens, and ears straining to decipher the raspy transmissions of the Lunar Module *Eagle* making its harrowing descent to the Moon's Sea of Tranquility. And then — planet-wide jubilation with the message, "Tranquility Base here, the *Eagle* has landed."

If you were part of that experience, it's a moment in time you'll never forget, along with where you were and who you were with. If you're too young to have been in that moment, it was like few others. The turmoil of the 1960s came to a momentary stop. For the duration of the astronauts' time on the Moon, our culturally and politically fragmented planet was one. While the mission was the manifestation of American ingenuity and determination, the accomplishment was indeed celebrated by all mankind. Hard to believe it was 50 years ago — but if you want an indicator as to how far we've come in a short amount of time, 50 years prior to the moon landing, aviation and radio communications were both in their infancy. Looking at where we are now, the list of technological advancements derived from America's investment in the space program might occupy this entire publication, and maybe then some, as the list keeps growing.

Just a month after the lunar mission came Woodstock, a summer musical celebration that became much more than the sum of its parts. It evolved to represent so many things, including a generation. It was an exclamation mark on an amazing decade overflowing with history, both good and bad, a closing of the book on many pre- and post-war societal norms and the beginnings of many new chapters in music, culture, business, technology, how we viewed others, the environment, and more. What the space program was to technology, the culmination of the '60s at Woodstock was a demarcation point indicating the world's culture was now being redefined and reset by the post-war (or baby boom) generation.

"CQ, CQ, CQ"

So what does all this have to do with amateur radio? We were there. Hams

A 1986 Heathkit catalog still offered amateur radio gear but by then, the "build it yourself" era was coming to a (temporary) close.

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were at the cutting edge of technology from the earliest days of radio up through the space program, including the early experiments with satellites that included monitoring the mysterious beeps from *Sputnik* through the launches of early amateur radio communication satellites.

We were (and are) the builders, the tinkerers, counted among the engineers who perhaps cut their teeth building crystal sets or soldering joints on a homebrew or Heathkit rig. We learned the new "language" of a schematic diagram. We reveled in the latest developments, ranging from transistors to integrated circuits and then developing new applications for these wonders, not just radio-related, like repeaters. Choose an item, from the musical *Moog Synthesizer* to life-saving medical equipment and ultimately to the now-many generations of computers that have transformed life on this planet at an amazing pace. Electronics are at the core of most of the major developments we can identify over the last 60 years.

The "It" Factor

So what was the "it" that ignited your interest in radio? That certain spark that drove your interest to learn about this mysterious means of communication that perhaps encouraged you and millions of others to explore the technical aspects that may have led to a career in electronics, engineering, or just the enjoyment of our hobby? It's that certain quality that goes beyond the question of "why" and replaces it with "why not?" While difficult to identify, that same "it" is still out there, perhaps landing today on a young student who may be tomorrow's designer of a communications repeater based on the Moon, or a device that makes today's pocket phones look like crude antiques. The evolution of contemporary and future devices rests on the pyramid of visionary inventors, developers, tinkerers, engineering professionals, investors, and builders who made today's devices possible. While the years may pass by, the drive to advance our knowledge and culture is relentless.

Back to the Future

In tune with this bit of reminiscing, I'm a bit of a pack rat, but from time to time I go through the accumulated boxes in my storage areas to dispose of the items accumulated over the decades. My most recent motivation has been scanning into the computer the boxes of old fading photos to preserve and share them with my kids and future generations. Also in those boxes are remnants

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Lafayette offered electronics and home entertainment enthusiasts a wide array of choices in its catalogs. This 1973 edition had a section devoted to the ham radio audience.

of past (pre-digital) decades including some old catalogs that have been fun to reexamine. It's a hoot to see the "new" technologies of yesteryear and the prices asked for those treasures against the backdrop of today. I'm loathe to assign the catalogs to the recycle bin, as there aren't too many printed versions distributed anymore. Yet I'm sure my descendents might wonder, "What did he keep these things around for?"

So I've chosen a few examples to share with you (see photos) in the hope they may bring back a memory or generate a chuckle. After all, it's summer and what better time is there to kick back from the everyday bustle, sip a cool drink, and take a few deep and relaxing breaths?

And since it's summer, it may be ideal to stroll outdoors on a comfortable evening and take a look up at the Moon that's been there so long; a mystery to ancient civilizations, a companion to young lovers, a riddle to be solved by early mathematicians and a wonder to behold through even a crude telescope. After thousands of years of human history and countless eons before, man finally set foot on it just five short decades ago. So what's next? Yes, there's so much more to learn, many more challenges to take up, and countless technical obstacles to overcome but maybe tonight, take a brief moment to look up and enjoy what's been accomplished using *The Magic In The Sky.*

Tube Type	Each	Tube Type	Each	Tube Type	Each	Tube Type	Each
1B3GT/1G3GT	3.68	6BL8/ECF80	2.56	6HV5A	8.39	8CG7/8FQ7	2.84
1K3GT/1J3GT	3.68	6BQ5/EL84	3.64	6HZ6	2.98	10GN8	4.49
1V2	2.38	6BZ6	2.95	6J85	4.45	12AT7/ECC81	3.19
2AV2	2.94	6C86A/6CF6	3.08	6JC6	4.17	12AU7A/ECC82	2.87
3A3/3AW3	3.75	6CG3/6CE3/6CD3	3.76	6LQ6/6JE6A	7.79	12AV6	2.38
3AT2	3.64	6CG7/6FQ7	2.84	6JH6	3.29	12AX7A/ECC83	2.59
3CU3A	4.69	6CG8A	3.99	6JS6B	6.99	12BA6	2.68
3DB3	4.10	6CJ3/6DW4B/6CL3	3.49	6JU8A	4.13	12BE6	2.84
3GK5	3.59	6DQ6B/6GW6	4.99	6KA8	4.55	12BY7A/12BV7	3.29
3HM5/3HA5	3.59	6EA8	3.68	6KD6	7.89	12GN7A	5.19
4BZ6	3.29	6EH7	3.55	6KE8	5.69	17JZ8	3.59
4EJ7/LF184	3.39	6EJ7/EF184	3.29	6KT8	4.99	23Z9	4.45
5GH8	4.38	6EW6	3.25	6KZ8	3.79	24LQ6	7.79
5LJ8	4.10	6GF7A	4.94	6LB6	7.89	33GY7A	5.99
5U4GB	2.87	6GH8A	2.94	6L6GC	5.69	35W4	2.11
6AQ5A/6HG5	3.15	6GJ7/ECF801	2.79	6LJ8	4.10	38HE7	6.85
6AU6A	3.05	6GM6	3.92	6LU8	4.49	50C5	2.87
6AW8A	4.17	6GU7	3.89	6U8A/6KD8	3.64	7025	2.59
6BA6/EF93	3.12	6GY6/6GX6	3.19	6U10	3.78		
6BA11	4.55	6HB7	3.59	6V6GTA	4.27		
6BK4C/6EL4A	6.97	6HM5/6HA5	3.57	6Z10/6J10	5.69		

In 1977, Radio Shack offered everything from room-filling stereo systems to a pack of resistors. It even offered replacement tubes, with a convenient tube tester at most locations.

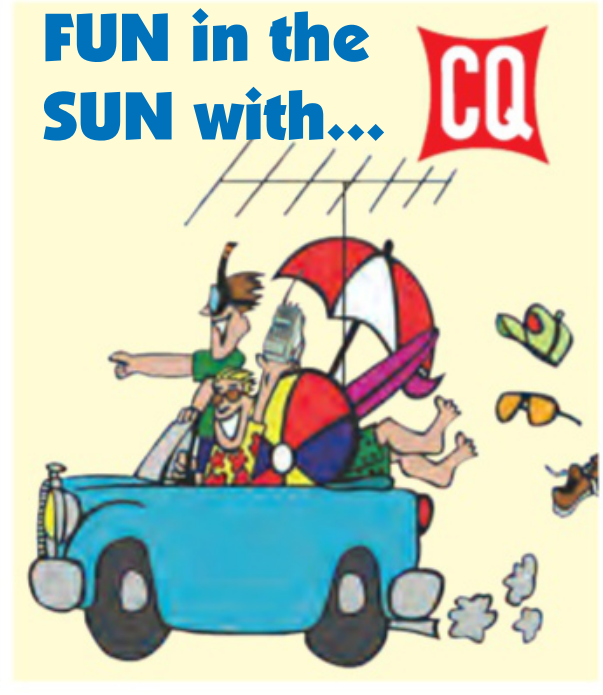
BEHIND THE BYLINES...

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

Ron Milliman, **K8HSY** (co-author, "Putting a Computer Power Supply to Work in Your Ham Shack," p. 10), is a business consultant and retired professor of marketing at Western Kentucky University. He is also past president of the South Central Kentucky Council of the Blind. Ron has been a ham since 1957, loves CW, and currently chases DXpeditions and special event stations.

Michael Tortorella, **W2IY** ("An Odd HF Propagation Experience," p. 36), wrote about his summer vacation ham activities on Maine's Mount Desert Island (home of Bar Harbor and Acadia National Park) in the June 2016 issue of *CQ* ("Summer at IOTA's"). Subsequent email discussions with *CQ* Editor W2VU about some unusual propagation led to his writing this article.

Klaus Spies, **WB9YBM** ("Active Audio Filter Design," p. 38), is a frequent contributor to *CQ*, offering a variety of practical projects for the ham shack, although this one is a little more theoretical than most. Look for upcoming articles from Klaus on using your radio's squelch circuit for more than keeping the radio quiet when a frequency isn't busy, and on bringing new life to older VHF/UHF radios.



GORDO'S SHORT CIRCUITS

BY GORDON WEST, WB6NOA

But … It Worked LAST Year!

Seasoned hams know the routine well — another public service event requesting ham radio support. Been there, done that, right?

After nearly 50 years of a monthly weekend standing on a street corner, radioing in bib numbers, or broadcasting a lost child report, I *always* find that my grab-and-go radio bag of tricks (*Photo A*) has something that's gone wrong since the last time I grabbed-and-went! These public service events are good training for all of us to check our response gear often!

Here are some of my notes of my on-scene go-bag bloopers:

• My favorite headset on which the flexible ear pad covering has disintegrated to a sticky blob

• My new headset mic level way too hot for local crowd noise, or totally unusable in the wind (*Photo B*)

• Lost my CTCSS cheat sheet to figure out what tone 4Z is in Hertz in the comms plan

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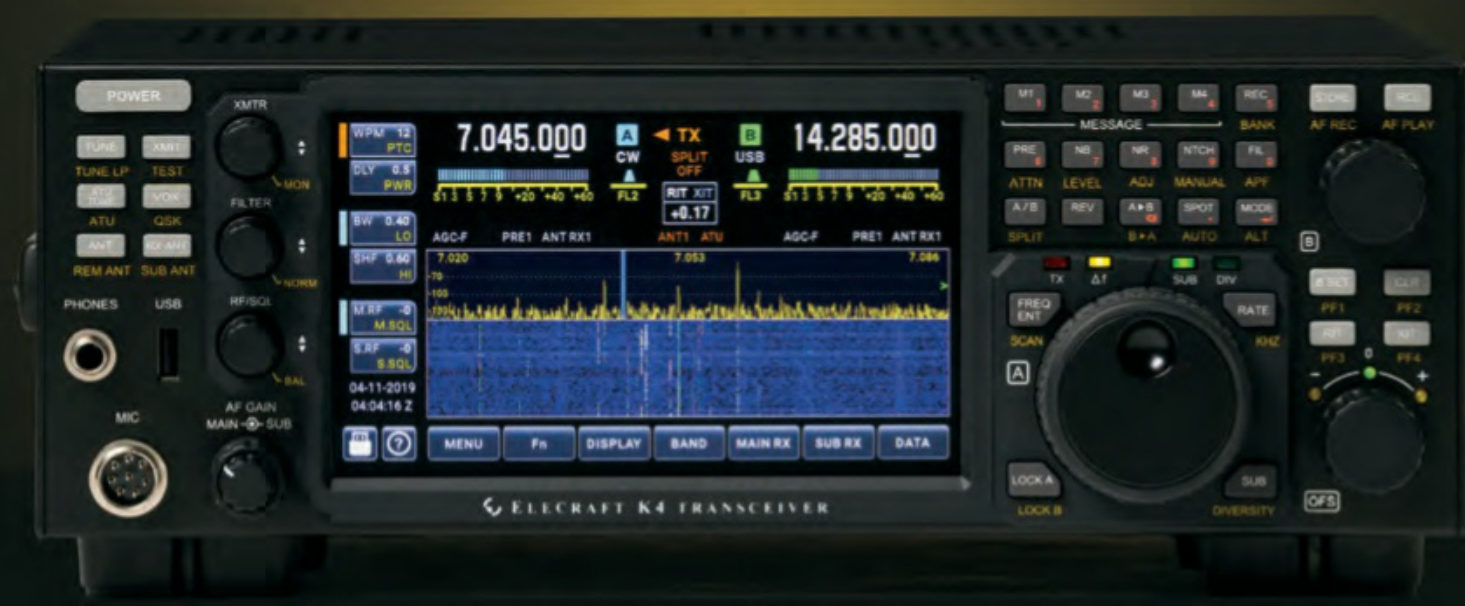
Photo A. Is your grab-and-go radio bag re-checked to make sure everything is working properly?

Photo B. Crowd noise may cause over-deviation on a new headset until the mic gain is properly adjusted.

K4 HIGH-PERFORMANCE DIRECT SAMPLING SDR



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Our new K4 features advanced signal processing, a 7" touch display, and controls optimized for ease of use. It includes single or dual panadapters, a high-resolution tuning aid, and built-in data modes. Via the Internet, a K4 can be 100% remote controlled from a PC, tablet, or even another K4, with panadapter data included. Work the world from anywhere, in style!

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Photo C. Make sure your HT's mic plug is fully seated.

Photo D. A portable shortwave set can help track grow-light ballasts.

• Working my handheld on which the remote mic plug wiggled out a micron (*Photo C*) to put the unit in transmit without my knowing it (thank goodness the rig has a timeout timer circuit!)

• NiCad battery back with initial full charge, going dead halfway through the event (the pack was only 8 years old!). Now I use the AA alkaline trays for which I *know* the freshness of the cells.

• At Quartzfest, dust getting into the talk-in radio's plastic mic jack and receiver — good signal, just no TX audio.

• Intermittent rubber duck? I only dropped the HT once! Nope, antenna fine, but the internal SMA jack solder connection broke off at the board. I used flexible conductive solder wick for a new connection from board to jack.

Another learning experience for new hams doing local public service support comms through a distant repeater is desensitization. Every time street corner ham A gets close to rover 1 a few yards away, they can't talk to each other ... until they are separated by a hundred feet! This is a common "problem" with new hams on 2 meters with a tight 600-kHz offset — nearby HTs just can't take the overload.

And of course, the inevitable last-minute frequency change problems for those hams with no-name Chinese radios that

nearly defy field programming by the tone pad. Anytime I have a ham tell me that programming by hand is a snap, I give him or her one of my import radios, and say I need 147.000 MHz with a positive split, DCS of 343, medium power, long squelch hang time. End of discussion.

So next time your communications team says "yes" to supporting a public service event, take an assignment, bring your radio go-kit, and then sorta-smile when you find something inside that worked 5 years ago, but no longer plays perfectly today. It comes with being a ham, so have plenty of backups. And check out your go-bag gear before you grab and go.

Tracking Down the New QRN

"QRN" = *Noise*! Lots of noise lately! From HF to 2 meters, we are getting bombarded with QRN.

But before we can try to eliminate a noise problem, we need to positively identify what noise we are trying to silence.

Both the 2-meter ham band and the VHF marine band at 156 MHz are smack dab in the radiated noise window from some name-brand and no-name light-emitting-diode (LED) light bulbs. When viewed on a spectrum analyzer, home LED bulb noise may have little effect on HF, but peaks between 140 and 170 MHz.

Here's a tip for tracking down a noisy bulb: Tune in a 24-hour weather station around 162.500 MHz, and dial in a *weak* one just above your 2-meter receiver's noise floor. With the volume way up, start turning off or unscrewing home LED bulbs. When the distant weather station suddenly comes in clearly, you've found the suspect bulb. Try another brand of bulb as a replacement.

Sometimes moving your 2-meter base antenna to the other side of the house will help, too. Keep in mind that home light bulb LED noise usually travels only about 100 feet from the source. Your rooftop 2-meter antenna might be mounted right over your radio room's LED track light system.

On high frequency, here in California, our laws now permit home growing of certain plants for personal recreational use. It is the grow light BALLAST that may radiate an S-9 buzz that comes and goes as timers turn the systems on and off. RF ballast buzz can travel several blocks.

Time to walk the block discreetly with a portable HF SSB/CW receiver, such as the Yaesu FT-817/818. Tune in continuous WWV transmissions at 5, 10, or 15 MHz (*Photo D*) as a constant signal source. As you get closer to the source, WWV will begin to disappear in the noise, as you also reduce the telescopic whip to the point you can hear the noise with almost no antenna. Chances are you found the possible location of the broadband noise. Then you need to hope that you and that neighbor are friends, and can come up with an alternate RF ballast to run the grow lights.

Perhaps suggest to a neighbor they program their lights to come on when they are less likely to *interfere* with area communications systems, like local *police* or fire calls. Maybe run them midnight to daybreak?

These "hydroponic" systems are tearing up HF reception for *blocks* — not just your own house with an LED porch light.

With LED lights QRNing VHF, and grow-light ballasts killing HF reception, we hope the ARRL will continue its efforts to convince the FCC to step up enforcement of non-certified noise radiating RF ballasts coming in from noisy suppliers.

Thanks for Your Check-In, John

I like to eavesdrop on nets around the country, and enjoy the professional net

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Photo E. Run your net with a smile and interact with those who check-in.

controllers who make these nets so important to the growth of ham radio. Here in my area of California, I sometimes hear local 2-meter net control stations who roll their call downs so impersonal and robotic, I now see why new hams don't come back for future check ins.

Nets are fun gathering spots for local news, club meetings, solar reports for HF, wants or listings for items to sell or give away, link info for SDR stations on the internet ... offering net listeners *more* than just rolling down the list, calling callsigns, one after another.

But the clincher, in *my* opinion, is a net controller who will call a station in disinterest, the station replies, and without acknowledging that station, rolls on to the *next* callsign.

Many new stations may think their new radio is not reaching net control, as they didn't get that friendly "Thanks, Paul, for the check-in tonight...," and the net controller just moves on to the next station to call, and again, not acknowledge that station that everyone else indeed heard over the repeater or simplex.

Let's have fun with our regular net check-ins. Rotate an experienced friendly net controller (*Photo E*) with a new ham net controller, to show them the simple ways to make the net more than just a rundown of callsigns with no acknowledgements to each participant. The more news and fun we can make during our weekly ham nets, the greater potential to grow your organization and our ham radio service.

New General Class Question Pool

On July 1, the General Class element 3 question pool was revised to add a few questions on digital operation, and while several questions that no longer reflect current popular technology were eliminated. If you have an older book to study for your element 3 General Class exam, you will likely still do well on the exam, as the *majority* of questions didn't change at all.

Take some practice exams on the internet, and you will likely only find a couple of exam questions that do not look familiar, but have logical common-sense correct answers. Of course, my new General book (*Photo F*) has the latest pool, for exams given between July 1, 2019 and June 30, 2023.

If you are *teaching* ham classes to your club, take advantage of the W5YI/Gordo free updated instructor program, and download the free instructor guidebooks, with all the details on how to roll a ham class with the reorganization of the updated question pools for easier teaching by topic areas.

Go to <www.haminstructor.com>, get logged in, and take advantage of the *free* instructor materials that you may download and print for your upcoming classes this summer and fall.

Hope to meet up with your clubs or hamfest on SKYPE. Contact me at <GORDO@WB6NOA.com> and let's put a program together.

Happy E_s this summer to you all!

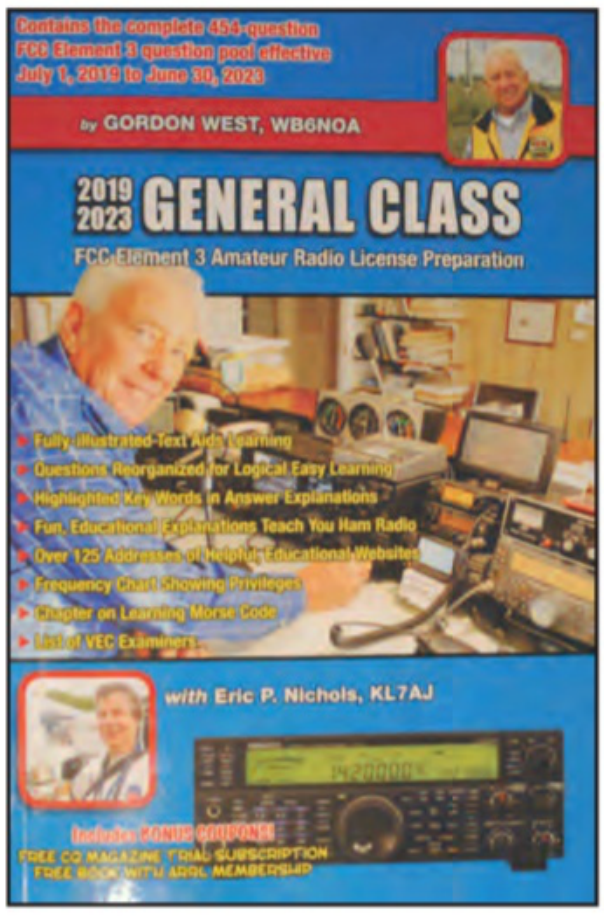

Photo F. The new 2019-2023 Gordo General Class book.

"Ham Nation" recently celebrated its 400th podcast with Joe Walsh, WB6ACU; Bob Heil, K9EID; Gordo; and all the hosts.

MF/LF OPERATING: Life Below the AM Broadcast Band

BY JOHN LANGRIDGE,* KB5NJD

Calculating EIRP – It's Not as Tough as You Might Think

As I prepare this column in early spring, we are 18 months into activity on the 630- and 2200-meter bands regulated under FCC Part 97 rules and, out of the scores of questions that I receive between each article, only two have ever been on the subject of how to take measurements that lead to determination of *Effective Isotropic Radiated Power*, or EIRP. That potentially means a couple of things:

1) Most people "get it" and the procedures are straightforward. Procedure-driven individuals will generally find this to be the case; or

2) Amateurs are rolling the dice using best-guess tactics and don't have a clue what is actually being radiated from their antennas.

The truth probably lies somewhere between the two.

A Nebulous Undertaking

It's true that determining accurate EIRP values for a suburban backyard antenna for use below the AM broadcast band can be a nebulous undertaking in which even the most careful measurements might result in errors as high as three to six decibels. Even so, I've been careful to stress that amateurs should exercise due diligence in determining their station parameters and in getting that information, and how they arrived at their values, on paper. While I don't expect anyone to show up on most amateurs' doorsteps, scrutinizing their operation, it's important for us to show that we know what we are doing and instill confidence, which can go a long way in the future when we ask the FCC for things like power increases.

Why is it so difficult to make accurate determinations of EIRP at these frequencies? It may not be if you happen to live on an unobstructed, flat, antenna range with careful control of the ground conditions, but the majority of operators on both bands face the reality of operating MF and LF from "typical" small plots of land, often in suburban residential areas that are surrounded by the spoils of urban sprawl including houses, trees, power lines, light poles, water towers, and cell towers, to name just a few. All of these things can be detrimental to antenna measurements. Remember that the near-

Photo A. Here is a common General Electric thermocouple-type RF ammeter. For vertical antennas, the meter leads can be inserted in the output lead of the antenna tuning unit to the antenna, but mount the meter as if it were at high potential to avoid arcing to other objects and creating bigger problems. With loops, simply insert the meter anywhere in the loop circuit. Near the feedpoint is often the most convenient location, but for small loops, current distribution is relatively constant so it can be inserted anywhere along the radiator.

Photo B. This very busy image shows the common arrangement used at KB5NJD for measuring total system resistance. The center conductor of the analyzer (pink wire) interfaces with the input of the loading coil. The ground lead (red wire) connects to the ground bus in the antenna-tuning unit (ATU). Note that the ATU ground jumper can be seen disconnected in the lower right of the image. This removes the LC matching network from the circuit for the purpose of these measurements. The coax is also disconnected at the input of the ATU (not shown).

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Photo C. This modified spreadsheet allows the user to enter values of measured feedpoint resistance (total system resistance) and adjust the values of applied power in order to achieve desired EIRP. Frequency and radiation resistance estimates must also be entered. These can be determined from modeling or from WØYSE's spreadsheet also mentioned in this article. Only modify the blue values!

Monopole Radiation Factor	3		
Frequency	474.5 kHz		
Total resistance	22.5 ohms		
Power input	60 Watts		
I_{rf}	1.6 A		
Rrad	0.6300 ohms		
Efficiency	-15.6 dB		
EIRP	5.04000 W	=	7.0 dBW
		=	37.0 dBm

field radiation on these bands can extend hundreds — if not thousands — of feet from the antenna. Traditionally, the most accurate data are found using field strength measurement techniques just as they are used in the broadcast industry. Unfortunately, these techniques are often beyond the scope of most amateurs' capabilities due to the cluttered near field previously mentioned, as well as a lack of readily available, inexpensive, commercially-calibrated equipment. Most broadcast-band, field-strength meters have to be excluded as well as they do not cover either of our bands and, even if the controls allowed operating in the spectrum of interest, antenna and instrumentation calibration would be in question. And it goes without saying that since we are dealing with absolute measurements, a simple relative field-strength meter that often utilizes telescoping antennas will not provide the desired results.

Some amateurs have successfully built and calibrated field strength measurement antennas for use with selective level meters and other RF voltmeters,[1,2] but this approach is more of an academic project and does not account for the problems associated with the realities of urban and suburban life. And one should not underestimate the importance of making accurate measurements in the calibration of the instrumentation as well as the actual measurements for the transmitting antenna in question. These are NOT the places to cut corners. Fortunately, there are other acceptable measurement methods that allow amateurs to get "close enough" and are perfectly legal.

Measurement Techniques

One of the most common techniques available to amateurs for making EIRP determinations for vertical and loop antennas involves measuring antenna current. When coupled with accurate estimates of radiation resistance and the gain factor, calculating EIRP is a breeze:

$$P_{EIRP} = I^2 \times R_r \times G_a$$

Where:
P_{EIRP} = EIRP in watts
I = measured RF antenna current in amps
R_r = estimated radiation resistance in ohms
G_a = gain factor, ("3" for most loops and verticals using perfect ground gain values)[3]

Current is most commonly and accurately measured using a thermocouple-type RF ammeter (*Photo A*). However, meters in usable ranges from one tenth of an amp up to three or four amps for verticals and up to 10 amps for loops have become scarce in recent years, and those that can be found may be damaged. Most often, when problems exist, the meter movements are fine but the thermocouple junctions are damaged. My success rate with hamfest-acquired thermocouple-type RF ammeters is about 50%.

For verticals, the meter can be inserted into the antenna lead on the either side of the loading coil at the antenna feedpoint, but is most often found on the high voltage side between the loading coil and antenna, so ensure that the meter is completely floating above ground potential to avoid arcing. With loops, the meter is usually inserted at the feedpoint in the antenna lead itself. In either configuration, the meter resistance is generally less than an ohm but it is common in broadcast installations to use a bypass switch or jumper around the meter when measurements are not being taken in order to reduce overall antenna loss resistance.

It's often handy to determine the necessary current required to achieve the EIRP limit for the band of interest (5 watts EIRP on 630 meters and 1 watt EIRP on 2200 meters for most) and that's accomplished by simply rearranging the formula and solving for current. Required antenna current can then be adjusted by increasing or decreasing final amplifier power output to the antenna. When making current measurements, the antenna should be both resonated and matched, and the transmitted signal should be a sine wave carrier (a CW carrier is fine). Mismatched antennas can result in erroneous or diminished results, so keep that in mind. Every dB counts for our compromise systems.

Another popular and related method for determining EIRP often used with verticals is to measure the total system resistance (also known as the feedpoint resistance) of the resonated but unmatched antenna, using an antenna analyzer that covers the frequency range of interest. Unlike measuring antenna current to calculate EIRP, this approach doesn't need power to be applied to the antenna to make the determination but taking measurements is very straightforward for those who can follow directions. This approach can also be used to check the values determined from other methods and generally both results should be relatively close.

Making Your Measuerments

The first step is to ensure that the antenna is resonated on the measurement frequency using an analyzer or even a "scope match[4]". At the antenna feedpoint, the center con-

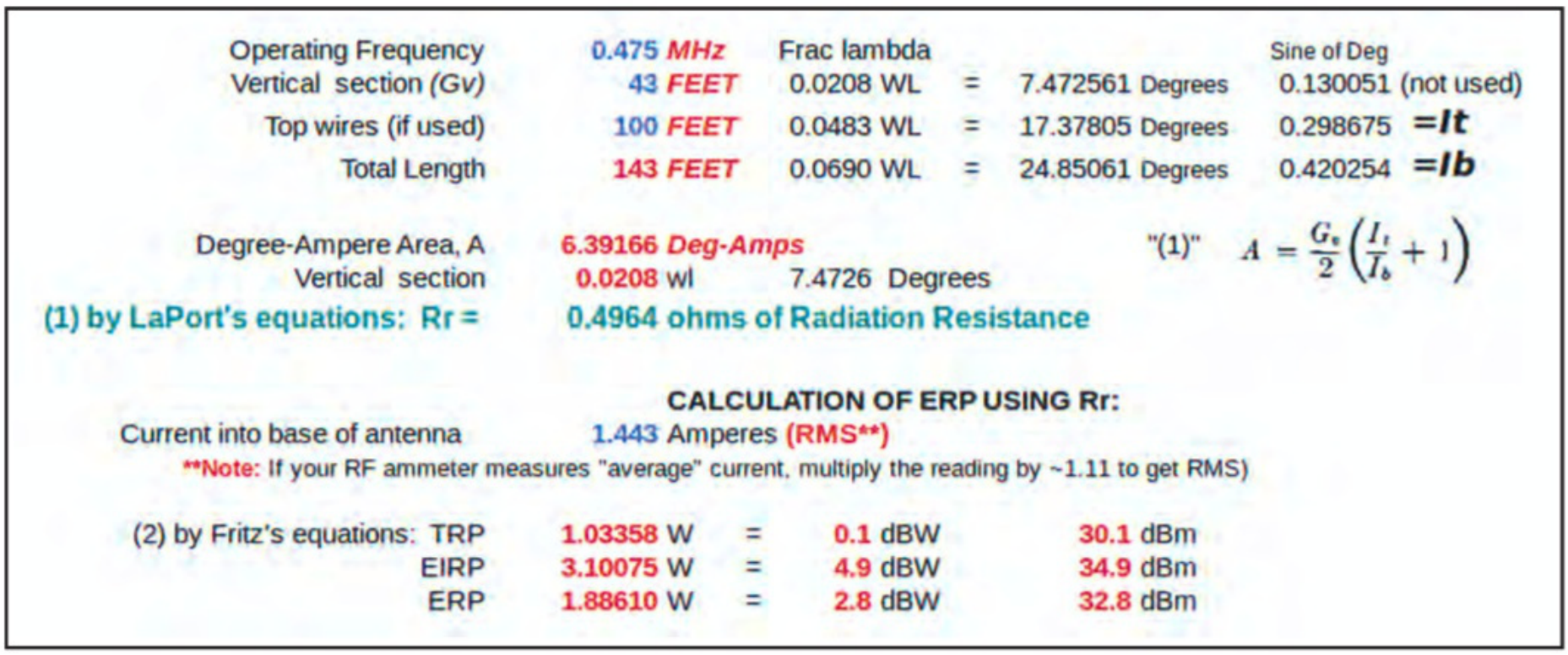

Figure 2. WØYSE's spreadsheet is based on Laport's calculations, which utilize the main attributes of a short vertical antenna — including physical height and the total length of top loading wires — to accurately determine radiation resistance. Users can also manipulate RF current values to determine necessary values to achieve a certain EIRP. These values are referenced to the user-defined antenna attributes. Again, modify only the blue values!

ductor of the antenna analyzer should be connected directly to the input of the antenna's loading coil. Ground for the analyzer is accomplished with a short lead to the antenna's ground system. No coax is used here. The ground connection should be solid on both the antenna side and at the analyzer. I have soldered a heavy lead to the shell of a PL-259 for the ground connection at the analyzer. I used to use small alligator clips on the analyzer connections to the antenna but these really need to be solid connections to ensure low resistance (see *Photo B*).

The matching circuit should also be removed from the antenna system as we are trying to determine the value of resistance for the resonated antenna, not the value required to match the feedline to the antenna. This is the part that can get a bit complicated, however, because there are a number of ways to match an antenna, including split-winding transformer, grounding the bottom of the loading coil (autotransformer), and an LC network to name just a few. If you are using transformer coupling, the transformer will have to be removed for this measurement and the analyzer connected directly to the loading coil and ground lead. It's handy to design antenna tuning units with jumpers for this reason. If the autotransformer approach is used, simply remove the ground tap connection of the loading coil. In the case of the LC network, which is what I use in my system, I have a jumper between the coil tap and capacitor bank that I disconnect to make measurements. Your measurements should only include the loading and radiator in series plus the ground connection for the analyzer.

Once the physical connections are complete, double check that the resonant frequency has not changed. Resonance is the point where the reactance (X) value is zero (or near zero in real world situations). If resonance did change, the matching device was also supplying some degree of loading. This is not uncommon behavior, but the antenna should be adjusted so that it is once again resonant. At this point, simply read the value of resistance, which contains all of the loss resistances such as ground, environmental, loading, and conductor losses and a very small, real contribution in our case from radiation resistance. My Rig Expert AA-30 analyzer displays the resistance as "R." I like to make these measurements with my body located some distance from the antenna to avoid any coupling. I rarely see much change, but better safe than sorry. I'm not saying you need to read the value with binoculars from across the backyard, but just be mindful of your location with respect to the loading and radiating element.

Playing With the Numbers

Now that you have a system resistance value to work with, its time to play with the numbers. The variation on the formula previously presented certainly can be used in conjunction with a few other formulas to arrive at the required transmitter power for the measured system resistance to achieve 5-watts EIRP, but I like to use a spreadsheet to help speed the process of manipulating the numbers (see *Fig. 1*). This heavily modified spreadsheet[5] originated from amateurs on the Radio Society of Great Britain's RSGB-LF email reflector back in 2012. It's a reasonable calculation tool but there were some problems with the original version, most notably with the way that radiation resistance was determined. I stripped out all of those calculations, instead choosing to use a different source for determining the radiation resistance, which was deemed more accurate and reliable. What remains is another form of the same formula previously specified in addition to current calculations that are based on applied power to the antenna and feedpoint (system resistance) that was measured in previous steps. By adjusting the value of applied power (power input), one can arrive at values necessary to achieve the desired EIRP level.

I've not said much about radiation resistance up until this point but the value that you use in your calculations is very important. If you don't get this part right, you might as well not be going to the trouble to make these calculations. There are a number of methods for determining radiation resistance

and it is always a derived (never measured!) value. As I mentioned previously, the method originally used in the spreadsheet was a poor estimation, over-inflating the radiation resistance value so that it was reporting 5-watt EIRP for much lower power levels applied to the antenna. In short, the operator was being "shortchanged" and had the right to apply more power to the antenna than the calculations were reporting.

For antenna modelers, radiation resistance values can be determined for the *unloaded* radiator and are often referenced to the perfect ground gain model, which helps us remain legal since real-world values can never exceed this theoretical value. This is why the spreadsheet uses a "monopole radiation factor" of 3, which is a derived value for the 4.77 dBi attributed to the ground model for verticals.

For those not interested in the tedium associated with antenna modeling, there is another spreadsheet that I like to use by Neil Klagge, WØYSE[6], that was developed with the help of Rudy Severns, N6LF, and is based on the highly-accurate Laport calculations for determining EIRP, radiation resistance[7], and antenna current for user-provided antenna dimensions (see *Fig. 2*). These calculations are usable for vertical antennas up to 30° tall (about 175 feet), which will include most of the antennas on the air and can be utilized for determining both current required to achieve maximum legal radiated power and radiation resistance values for making calculations with measured values of current that were described initially in this article, in addition to the total system resistance method. In both spreadsheets, only values in blue may be manipulated.

DO Try This At Home

EIRP determination is generally not a difficult undertaking using the approaches described but sometimes the task of manipulating the values can be overwhelming. Download the spreadsheets linked at the end of this article, play with the numbers that are in blue font and observe how the various dependencies change as you change values. It's fascinating to watch how these values are interrelated.

A closing note: My April column unintentionally confused EIRP with actual radiated power. Please see "Oops" on page 110 of the June issue of *CQ* for a discussion. If you have questions or comments, please contact me at <KB5NJD@gmail.com>.

Notes/References

For your convenience, the following links, in addition to bonus material, may be found at <http://njdtechnologies.net/cq/>.

1. Field strength measurements by W1TAG: <https://tinyurl.com/y37mselz>
2. ON7YD's comments on field strength measurements to determine ERP (not EIRP!): <https://tinyurl.com/yxskzhux>
3. N6LF's discussion of soil conditions and how monopole radiation factor is determined: <https://tinyurl.com/y5b73gpe>
4. KL7L's excellent video tutorial on scopematch: <https://tinyurl.com/y3z6dfag>
5. Modified spreadsheet for total system resistance method of EIRP determination: <https://tinyurl.com/y6rcw79k>
6. WØYSE's spreadsheet relating antenna physical attributes, antenna current and radiation resistance: <https://tinyurl.com/y6347obq>
7. WØYSE's discussions of a variety of related topics, including the mathematics of determining radiated power, current measurements, and associated calculations: <https://tinyurl.com/y4tk5j4w>

Young Ladies' Radio League, Inc. Since 1939

For 75 years the Young Ladies' Radio League, Inc. (YLRL) has helped women find their voice in Amateur Radio with members of all ages and interests.

The YLRL sponsors a number of certificates for both YLs and OMs. Members can earn special YL Certificates.

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For more information on the YLRL, the current dues amounts, weekly YL Net locations or how to join please go to our website at **www.ylrl.org** or contact the Publicity Chairwoman, Cheryl Muhr, NØWBV at n0wbv@earthlink.net. All Officer information is also listed both on the website and in each edition of the magazine and you may contact any Officer as well.

With thanks to the OMs who encourage and support us.

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VHF PLUS

BY TONY EMANUELE,* K8ZR

GriDXpeditions, FT4, and More

VHF Plus Calendar

CQ World Wide VHF Contest: July 20th & 21st
Central States VHF Society Conference: Lincoln, NE July 25th - July 27th
ARRL 222 MHz & Up Distance Contest: August 3rd & 4th
ARRL 10 GHz & Up Contest: August 17th & 18th
ARRL September VHF Contest: September 14th - 16th
ARRL 10 GHz & Up Contest (Weekend 2): September 21st & 22nd
ARRL EME Contest 2.3 GHz & Above: September 21st & 22nd

The K5N team of Dan Bates, N5TM; Bill Simpson, N5YA; Kyle De Haas, KA5D; Kourt De Hass. KB5PRZ; Ivan De Haas, KG5UNR; and Marshall Williams. K5QE, will take to the road in July with the intent of activating grid DL89 in Study Butte, Texas, just west of the Big Bend National Park; and DL79 in Presidio, Texas, both rare grids and high on the FFMA's list of most wanted grids[1]. Though the plan is somewhat fluid as this is written in late May, the team plans on being QRV on 50 MHz on July 6th from DL89 and from DL79 on July 9th, depending on actual station setup and tear-down.

Operation will take place on SSB and CW whenever Sporadic-E (E_s) is evident due to the much higher QSO rates associated with those modes. K5N will operate FT8 or MSK144 when band conditions dictate. Following the usual standard practice, the DXpedition will transmit the first sequence when operating the digital modes. The DXpedition expects to have access to the internet at both locations and will use the chat page <http://chat.n5tm.com> available on the Slack VHF Chat system for you to contact N5TM.

CY9C St. Paul Island DXpedition

The veteran team of Murray Adams, WA4DAN; Pat Dolan, N2IEN; Phil McBride, VA3QR; Lee Imber, WW2DX; Bill Engel, K5DHY; Dan Sullivan, W4DKS; and Will Roberts, AA4NC, will activate St. Paul Island, Nova Scotia, Canada, FN97, using the callsign of CY9C, from July 31st to August 8th on 6 and 2 meters.

Given its location, St. Paul Island is not an easy grid/DX entity to work because, for most of North America, multiple hop E_s is necessary. Of course, FT8 will be a game changer and it is safe to say that for many people, the mode will result in a new DX entity on 50 MHz that might not have been possible on SSB or CW. Conditions will dictate which mode, SSB, CW or FT8, the team will use during its stay.

The well-equipped station will run 500 to 800 watts to a 6-element Yagi on SSB, CW, FT8, and EME on 6 meters. On 144 MHz, the team will run 1-kilowatt SSPA to a pair of custom-designed and optimized 10-element Yagis.

The CY9C crew encourages smaller stations (i.e. low power and a single Yagi with or without elevation) to try and work the 2-meter station. You should check in on their website <http://cy9c.com/index.html> for the latest updates.

Buzzards, Satellites and FT4

Bob Yates, W4GCB, of LaGrange, Georgia in grid EM73, reports that the Buzzard Net convenes every Monday evening at 2230 UTC on 50.155 MHz.

Photo A. Bill Koch, W2RMA, standing on 5-story parking garage in Virginia Beach, Virginia, FM26au, looking toward the north, while scouting locations for ARRL's 10-GHz and Up Contest. See text for more details. (Courtesy of K1RZ)

c/o CQ magazine
email: <k8zr@cq-amateur-radio.com>

The net averages nearly 100 check-ins with that number doubling if E_s is in play. Net controls are Ed Ekkebus, KE4EE, and Rob Momon, N4VPI, who follow an "around the compass" format beginning north and moving clockwise, continuing until 0015 UTC or later depending on activity. Six check-ins to the net will qualify you for a Buzzard number and certificate. To date, over 200 stations have earned that honor[2].

At the other end of the spectrum, the IARU Satellite Coordination Panel has announced the amateur radio frequencies for the Australian 76-GHz CubeSat CUAVA-1, which is expected to launch from Japan in July 2019 into a 400-kilometer orbit. The downlink frequencies are: 437.075 MHz, 2404.00 MHz, 5840.00 MHz, and 76.800 GHz, while the uplink frequencies are: 145.875 MHz, 2404.00 MHz, and 5660.00 MHz. Hopefully, the launch will be a success.

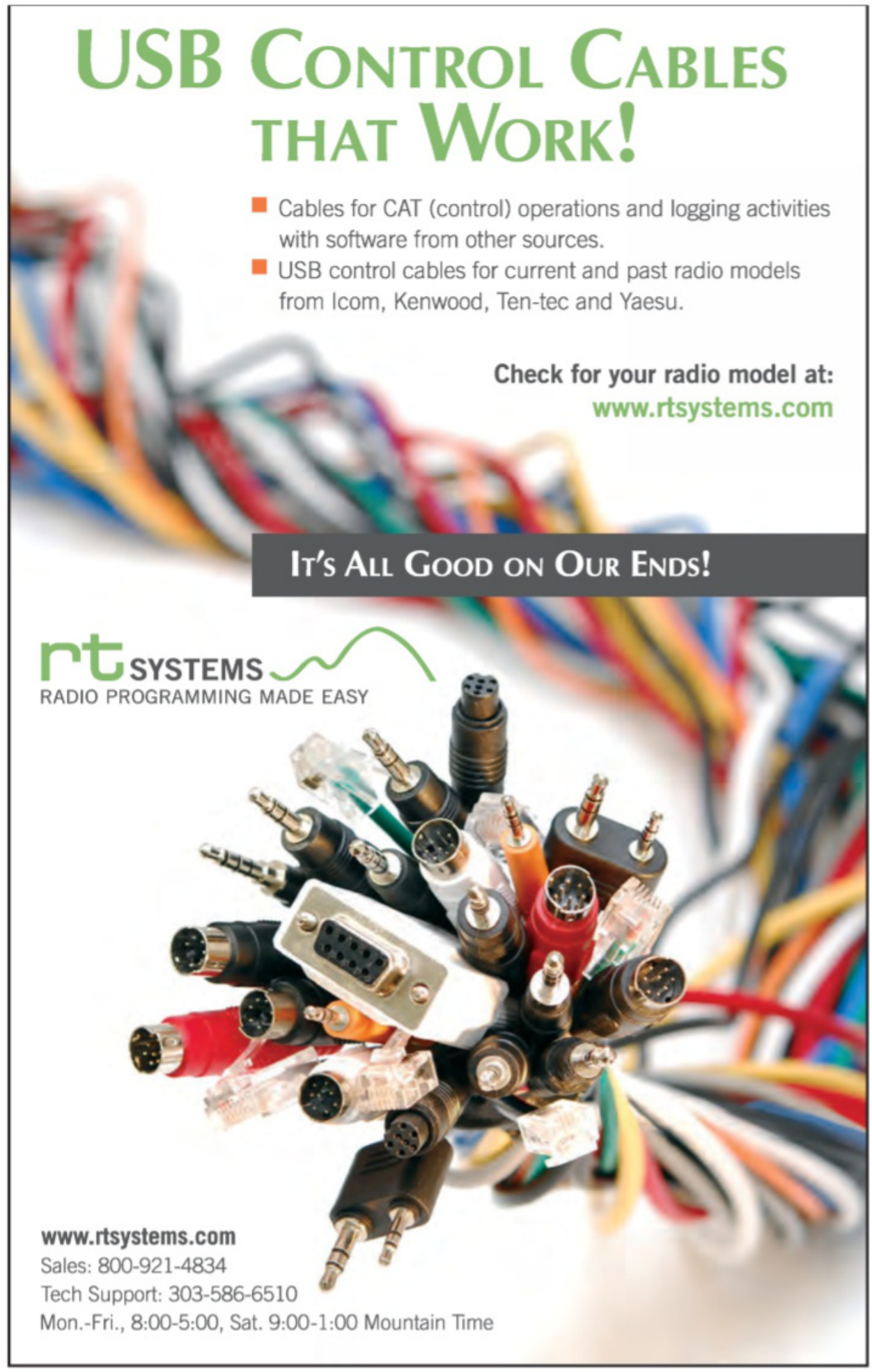
The VHF Super Conference was held in Sterling, Virginia in late April with 200-plus participants who experienced a first-class conference in every respect. Presentation topics ranged from large vertical arrays for 6 meters to optical communications, with a wide variety of topics in between. Joe Taylor, K1JT, took the opportunity to introduce the WSJT FT4 protocol for digital contesting[3].

Described as an experimental digital mode, FT4 was designed specifically for contesting. Like FT8, it uses fixed-length transmissions composed of structured messages with formats optimized to meet the minimum standards required for a valid QSO[4]. The FT4 transmit/receive sequences are 6 seconds long vs. 15 seconds for FT8 (i.e., 2.5 times faster) and comparable to those of RTTY contesting. See the WSJT-X website for additional details regarding the specifics of the protocol. As of presstime, the general availability (GA) release of WSJT-X 2.1.0, which will include FT4, is scheduled for July 15th.

Bill Koch, W2RMA, and Dave Petke, K1RZ, took advantage of the assembled masses attending the Super Conference to organize a 10-GHz "make some noise" activity event Wednesday evening and Thursday morning prior to the start of the conference. Their intent was twofold: To encourage 10-GHz operation by both home stations in the general area and conference attendees willing to operate portable/rover while Bill and Dave scouted potential operating sites along the Atlantic Ocean from Norfolk, Virginia and north for possible use the first weekend of the ARRL 10 GHz and Up contest in August.

Dave reached out to experienced rovers Brian Skutt, N3IQ, and Christophe Huygens, ON4IY, for advice on possible operating sites and strategies. Many may remember that ON4IY roved with Bill Seabreeze[5] (SK) W3IY/R. ON4IY was able to attend the conference, giving it special meaning for those who worked the pair in the '90s and early 2000s.

Armed with suggestions from N3IQ and ON4IY, Bill and Dave assembled a plan that included a total of 13 sites spread over grids FM26, FM17, FM27, and FM28. After agonizing over a starting point — further south into North Carolina or start at Virginia Beach and go north — they elected to start at Virginia Beach, FM26au. The location was chosen because it had a 5-story parking garage on the beach (*Photos A* and *B*). It also provided good visibility in the various directions of the 12 other stations that planned on being QRV from home or portable on Wednesday evening and/or Thursday morning.



Dave Petke, K1RZ, FM26au, waiting to receive W2RMA's signal. (Courtesy of W2RMA)

Those stations included: W3SZ, W3EKT, W4DEX, W3IP, K3TUF, K1TEO, N9ZL/R, K8ZR/R, W3HMS/R, K1MAP/R, K3HWC/R, and WA3USG/R.

By all accounts, the "make some noise" event was a success. Many QSOs in excess of 300 kilometers (186 miles) were made. Ed Bruns, W3EKT, was able to work his fifth grid, qualifying for VUCC on the band, while Bill and Dave verified operating sites from Virginia Beach to Delaware. Many of those sites are conveniently located near ice cream stands, offering an incentive — and some might claim a necessity — during what can be a warm 10 GHz and Up contest along the Atlantic seaboard. As Bill noted, "It was a lot of driving but we learned a lot about potential spots and access. All in all, a fun day and a half!"

On the Bands

The North Texas Microwave Society (NTMS) has aligned its 2-meter activity night to coincide with the Southeast VHF Group's (Florida and Georgia) and it paid off in May when several stations worked across the Gulf of Mexico on 144.174 MHz using FT8. An example of what was worked was submitted by Brad Fuller, WQ5S, in EM13. He worked AF5CC, EM04; W5AFY, EM03; N5PGH, EM13; NN5DX, DM80; N5WDK, EL19; K5GZR, EL29; KO4MA, EL88; and WB4OMG, EL98, for his best DX of 1,693 kilometers (~1,052 miles). The Southeast VHF Group meets on the FT8 calling frequency of 144.174 MHz on Sunday night at 2030 EDT (Monday @ 0030UTC) and the NTMS ops start a half hour later at 0100 UTC.

Multi-hop E_s was in action the last weekend in May with many locations in North America taking part in the band openings. A few in the Midwest worked their first Europeans of the E_s season (*Figure 1*). Though there are no guarantees, the last week of June into the first week or two of July historically has seen multi-hop E_s openings to Europe and Asia on 6 meters.

– 73 and CU on the bands, Tony, K8ZR

Notes:

1. FFMA Fred Fish Memorial Award. Requirements: work & confirm all 488 Maidenhead grid squares in the 48 contiguous US.
2. See: <https://tinyurl.com/y3mtcagd>
3. Developed by Joe Taylor, K1JT; Steve Franke, K9AN; and Bill Somerville, G4WJS.
4. Call signs of both stations, an agreed upon exchange of information such as grid square or signal report and acknowledgment by both stations that the information has been received.
5. Sadly, Bill became a silent key in 2005.

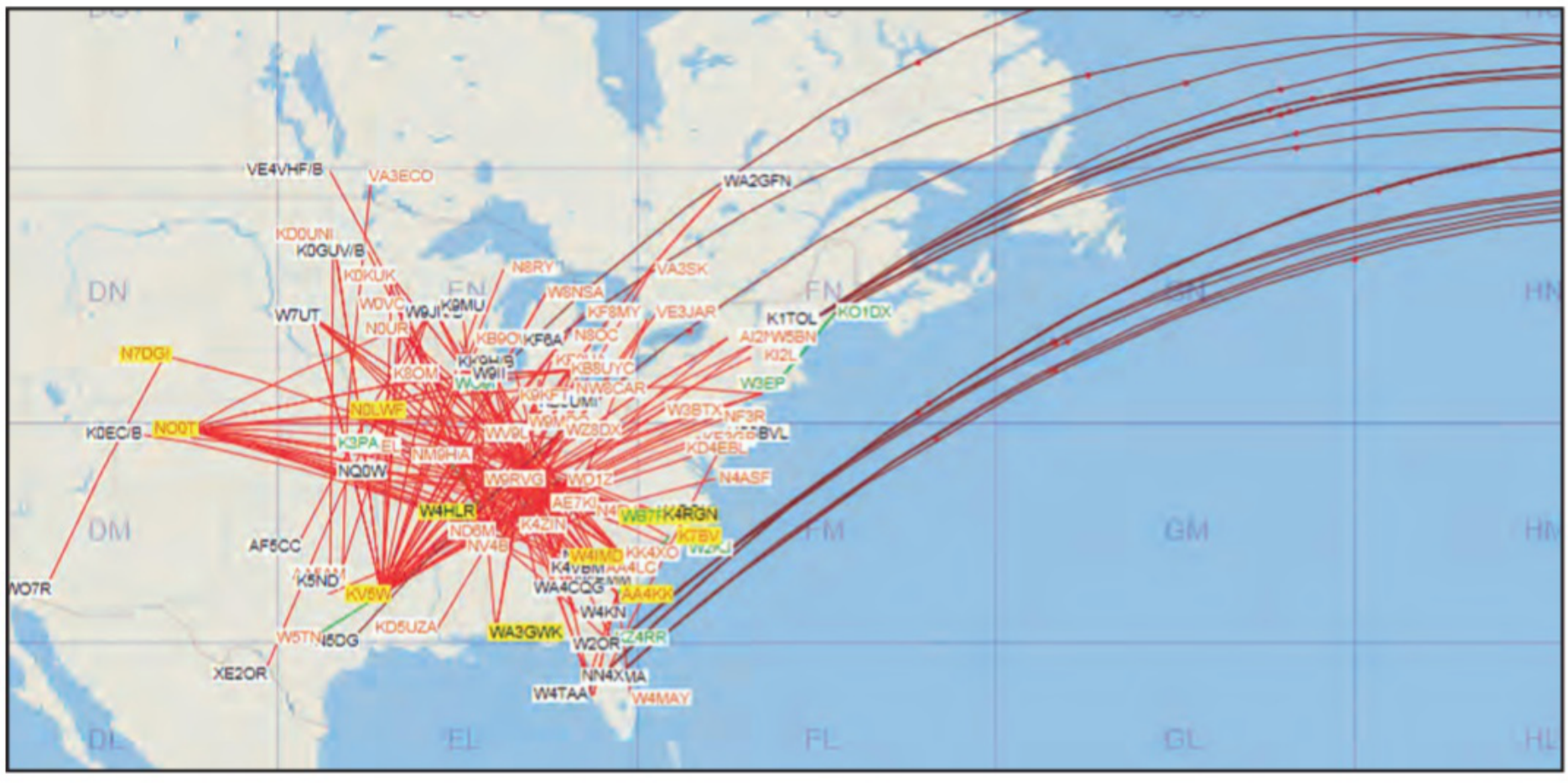


Figure 1. Six meters came alive in late May as shown in this map from May 24th. (Courtesy of DX Maps <www.dxmaps.com>)

WHAT'S NEW

Elecraft Releases K4 Transceiver

Elecraft introduced its newest flagship transceiver, the K4, at the 2019 Dayton Hamvention®. The new K4 has taken many of the best features of the K3 and P4 line of transceivers and blended them with a top-of-the-line SDR and a large touch screen for ease of use. Elecraft noticed the recent revolution in direct sampling and SDRs; however, rather than rush out a new transceiver, it took the best ideas, tested them, and quietly merged them into a new kind of radio.

In particular, operators who've used Elecraft's K3S transceiver and P3 panadapter will find the K4's controls familiar, and its complement of I/O compatible with their existing stations. They'll also discover the bright, 7-inch touch display, which combines a large panadapter with three multi-function controls and includes a unique built-in help system.

There are three K4 models to choose from: the basic K4; the K4D, which adds diversity receive capability; and the K4HD, which goes a step beyond other direct-sampling SDRs, adding a dual-superhet module for the ultimate in blocking and close-in dynamic range.

The K4 and K4D, like other "pure" direct-sampling radios, do not require crystal roofing filters. Digital signal processing is used to provide advanced demodulation, filtering, and signal display. The K4HD can operate either in direct-sampling or superhet mode. Typically, the latter is only needed in the presence of extreme signals.

Flexibility — now and in the future — was a major design goal for the K4. All of Elecraft's transceivers can be tailored to your current needs. Modules are segmented strategically to allow updates at moderate cost, so you won't have to invest in a new radio every couple of years.

With the K4, you can operate at the radio itself or from anywhere — whether it's your living room, back porch, or halfway around the world. One K4 can control another, including streaming panadapter display. You can also use a tablet, netbook, or desktop PC. When operating the radio directly, you can use both the built-in large, full-color touch LCD and an external monitor (HDMI), with different content combined with a rich set of real controls. Elecraft's advanced fine-tuning aid, with its resampled bandwidth as narrow as +/- 1 kHz, is displayed separately from the main panadapter. You can turn it on by tapping either receiver's S-meter or by tapping on a signal of interest.

Per-VFO transmit metering makes split mode completely foolproof. Band-stacking switches and per-receiver controls are both intuitive and versatile, adapting to operating context. Usage information on these and other features is just one tap away, thanks to the radio's built-in help system. Application programmers will benefit from the K4's easy-to-use command set, including many new commands for setting up the panadapter and audio streams.

The K4 includes dual receive from 100 kHz to 54 MHz. An internal VHF/UHF module is also planned, but its frequency range has not yet been finalized. The RF signal chain in the K4 incorporates parallel hardware processing of data streams, including a dedicated DSP subsystem. This, combined with silent, PIN-diode T/R switching, ensures fast CW break-in. Data and speech-processing delays are also minimized.

Standard DSP features include easy-to-adjust, per-mode RX/TX equalization; clean, punchy RF speech processing; full DVR capabilities; and several built-in data decode/encode modes. Direct-sampling technology results in an ultra-flat passband response for clean RX and TX audio. Since the signal chain is software-defined, the DSP can be field upgraded to add new algorithms and operating modes.

The rear panel includes all the RF, analog and digital inputs and outputs you'll need to complete your station, featuring three antenna ports for HF and one for VHF/UHF, external amp RF sample input, ground wingnut, Ethernet port, two USB ports, RS-232 and ACC, front and rear mic and key, and HDMI. All K-line accessories are supported, including amps, ATUs, and our K-Pod station controller. The HDMI video output supports an external display with its own user-specified format.

You can upgrade or add options as desired, or as new technology becomes available. This extensibility applies to software as well. The K4's powerful, fast-starting CPU provides unlimited expansion opportunities.

An optional KAT4 ATU has a nominally 10:1 matching range. It includes three antenna jacks, any one of which can be selected as an input for one or both receivers. An expansion slot is reserved for a high-performance VHF/UHF module (expected in 2020), with output of approximately 15 watts. This module will support all modes. A no-soldering kit version of the K4 is planned for later release. Builders will learn about advanced radio technology as they proceed. All modules are pre-aligned and tested.

A Basic K4 with wide-range dual receive has a suggested retail price of $3995; the K4D with diversity receive and the K4HD with a dual superhet module each have a suggested retail price of $4695.99. For more information, contact Elecraft, 125 Westridge Drive, Watsonville, CA 95076. Phone: (831) 763-4211. Email: <sales@elecraft.com>. Website: <www.elecraft.com>.

Focus on CQ Awards: iDX – CQ's "Secret" Award

Plus ... Meet the New USA-CA Custodian Brian Bird, NXØX

While we continue our search for a successor to K1BV as Awards Editor, we'll continue to profile CQ's own operating awards with a close-up look at CQ's iDX Award, an award aimed at beginners to grow their interest in DXing. –W2VU

There's really nothing secret about CQ's iDX Award, except that very few people even know it exists, especially those hams it is aimed at — newcomers to DXing and award-chasing. The CQ iDX Award is an introductory award, along the lines of old-time Novice awards, which encourages the development of a DXing "mindset" by recognizing the accomplishments of those amateurs who make confirmed contacts with between 25 and 100 different DX countries ("entities") through the use of internet-linked repeater systems or remote bases. Now, before you start writing to us in ALL CAPS that internet-linked contacts, such as via D-Star, Echolink, etc., aren't *real radio*, keep in mind that for many new hams, these systems that connect to and through repeaters provide their first opportunities to make contact with hams in faraway places. We want to encourage this, because if you find you enjoy contacting faraway hams through repeaters and the internet, then you're more likely to want to do the same using only the ionosphere. Our goal with the iDX award is to create new DXers.

Because this is an introductory award, because many repeater-only hams do not yet have traditional QSL cards, and because these contacts do/will not count toward traditional DXing awards, our confirmation requirements are somewhat more relaxed for this award than for traditional DX awards (see rules for specifics). However, since it is still an amateur radio award, we do require that at least one end of each contact must be made by amateur radio. Computer-to-computer contacts, while possible on such systems as Echolink, will *not* count for this award. At least one person in each contact must be on the radio. All contacts must be made after 0000Z on January 1, 2006. For gathering verifications, we encourage use of technology to avoid the inconvenience, expense, and delay of postal mail whenever possible. The complete rules follow.

RULES: THE CQ iDX AWARD

1. The CQ iDX Award is an introductory award for contacts made between licensed amateurs in different countries by means of Voice over Internet Protocol (VoIP) linking systems. These systems include, but are not limited to, IRLP (Internet Radio Linking Project), EchoLink, WIRES, and internet-linked remote base systems, which use the internet and VoIP to connect amateur radio repeaters and operators. At least one station in each contact must be transmitting via radio in the amateur bands (e.g., computer-to-computer Echolink QSOs do not count toward this award). SWLs may qualify by monitoring the required contacts and receiving confirmation from at least one of the stations involved.

2. The basic award is issued for confirmed VoIP contacts with amateurs in at least 25 countries. Endorsement stickers are issued for 50, 75, and 100 confirmed countries. All contacts must have been made after 0000 UTC, January 1, 2006.

3. All contacts must be two-way (SWLs must monitor two-way contacts). Confirmations are required. For the purposes of this award *only*, acceptable confirmations include traditional QSL cards, electronic/online confirmations from sources approved by CQ (see CQ website for details) and verifiable emails. All confirmations must contain the callsigns of both stations, the name, mailing address, and location of the sending station (if different from the mailing address at the time of contact) and details of the contact, including date, time, mode and frequency band used by the sending station for the contact (if the station accessed the amateur bands via the internet, the confirmation should indicate "Internet" in place of frequency), and must state that the contact is via VoIP (including specific system name). Email confirmations must also include the sender's valid email address and must be dated within 60 days of the contact for which credit is claimed. CQ reserves the right to spot-check confirmations.

4. Applications should be submitted on the official CQ iDX Award application (form 2006-A). Reasonable facsimiles or computer printouts are also acceptable. Contacts should be listed in alphabetical order by callsign prefix. Listings must include the frequency band (or internet) used by each station, as well as the VoIP linking system used. Confirmations must be verified by one of the authorized checkpoints for the

Help Wanted: CQ Awards Editor

As of this issue's deadline, we were still looking for a successor to K1BV as CQ Awards Editor (as noted elsewhere in this column, Brian Bird, NXØX, has agreed to take on the role of USA-CA Custodian). Awards Editor candidates should be accomplished "wallpaper" collectors with a passion for discovering and sharing information on operating awards from around the world, have the time to research and write a monthly column, and be able to reasonably express themselves with the written word. If you're interested in taking on this role, please contact Editor Rich Moseson, W2VU, at <w2vu@cq-amateur-radio.com>.

CQ DX Awards, or must be included with the application. Return postage must be included.

5. An SASE must be enclosed with all endorsement applications. Stations outside the United States must include an SAE with two IRCs for airmail return.

6. Any altered or forged confirmations will result in permanent disqualification of the applicant.

7. Fair play and good sportsmanship in operating are required for all amateurs working toward CQ DX Awards. Repeated use of poor ethics will result in disqualification of the applicant.

8. A fee of $6 is required for *CQ* subscribers applying for a CQ iDX Award certificate. A copy or scan of the latest *CQ* mailing label must be attached for the subscriber discount. For non-subscribers the certificate fee is $12. Endorsement stickers are $1 each for all applicants. IRCs (International Reply Coupons) are acceptable in lieu of check or cash, where available.

9. All contacts must be with land-based or shipboard amateur stations. Contacts with aircraft are not acceptable. Contacts from international waters are not acceptable. Shipboard stations must be in the territorial waters of a country, no more than 12 miles (19 kilometers) from shore, operating in accordance with that country's laws and regulations, and the confirmation must indicate the country from whose waters the shipboard station is operating. The CQ DX Award countries list or ARRL DXCC Countries List determines what entities are considered separate countries. In the event of differences between the lists, the CQ DX Award countries list will govern.

10. In the event of any disputes or disagreements, decisions of the CQ DX Awards Manager shall be final.

11. All checks must be made payable to Keith Gilbertson. Applications should be sent to Keith Gilbertson, KØKG, CQ DX Awards Manager, 21688 Sandy Beach Lane, Rochert, MN 56578-9604 USA.

Introducing CQ USA-Counties Award Custodian Brian Bird, NXØX

Last month, we announced the appointment of Brian Bird, NXØX, as the new custodian of the CQ USA-Counties Award (USA-CA). Our announcement included a basic introduction, but Brian promised a more detailed one for this issue, outlining his experience as a county-hunter and his plans for the award going forward. Here it is… –W2VU.

Hello everyone, I'm Brian Bird, NXØX, from Duluth, Minnesota. First of all, I would like to thank Ted Melinosky, K1BV, for his contributions to the USA-CA award program these past 21 years as award custodian. THANK YOU, TED!

I am very honored to be selected as your new USA-CA award custodian. I'm looking forward to carrying on with the great history and tradition of this award and any challenges that may lie ahead. Part of being the USA-CA awards custodian is to not only handle the issuing of awards that have been earned in a timely manner, but giving you the public recognition so rightfully deserved for earning such a prestigious award.

One of the first items discussed with Rich, W2VU, was a possible refresh of the award rules to reflect the times we live in today. The few new rule changes announced last month were generally dealing with the ever-increasing cost structure for international mailings, electronic award submissions and payments, my contact information, and a couple of minor wording changes. The updated USA-CA award rules were updated and posted June 1st to CQ's website.

As of this writing, I am still waiting for the records to be shipped from Ted. When I receive them, I'll need a few weeks to organize and sort through everything so I know where to begin and what I have. I hope to be all spooled up by the time you read this. Along with the transfer of the custodian duties to me and updated award rules, this was also a good time to update and refresh the plaque for the "Whole Ball of Wax." More on this in the coming months.

A little about myself ... I started out in ham radio back in the early '90s and worked for the awards that most folks start out with, such as WAS, DXCC, etc. After reaching those goals I'd set for myself, I gravitated towards working all 3,077 (actually 3,076 at that time) counties as I had a good start with my previous contacts. I really started getting serious with county hunting in the late '90s and earned the "Whole Ball of Wax" award in 2004 by working and confirming all 3,077 counties on mixed modes. Within the next year, I finished working them all on SSB while my wife Shari, KBØMHH, also finished working them all for her full USA-CA award in 2005. Shari and I have met many friends through county-hunting and even hosted the national county hunters convention in 2011. Chasing and working the counties has also been a good family bonding opportunity with my father, Cliff, ACØB. He really got hooked on working the counties during that same timeframe and earned his full USA-CA award in 2004.

Quick story ... My father and I were finishing up our USA-CA awards that same timeframe in the spring of 2004. It became a little friendly competition between us to see who would complete the award first. With him down to his last couple and me looking for my final coveted county, my father and mother drove out and made a special trip from Minnesota to Carter County, Montana, to "put out" the county mobile for the county hunting group, but more importantly, for my last to finish. So the next month, I returned the favor and made a mobile trip to Clay County, Tennessee, to put out *his* last county. I know I'm going to get asked this, so yes, I did also make a trip a year later to help my wife finish up *her* last county, Talbot County, Maryland. I would not have heard the end of that if I had not done that for her, haha. It was a fun time.

Ok, back to a little about myself. My time spent now on the radio between work and my other interest of aviation has been to complete my last handful of contacts for the DXCC Honor Roll and CQ's 5-Band WAZ award. I'm also working on finishing USA-CA all CW, with just over 400 to go. A "little" side adventure for Shari and me has been getting out and putting counties on the air. So far, we have put out 1,459 different counties and have completed putting out over 10 different states. So I'm sure at some point we will make it a goal to put out and run all 3,077 counties.

I can only hope that I serve you all with the same great service of my predecessors and please feel free to contact me with any questions that you may have. I hope that you may find many new counties just up the band…

DX

BY BOB SCHENCK, N2OO

DXers and Dayton/Xenia

Having just returned from the annual Dayton Hamvention® held in Xenia, Ohio I thought it might be good to detail my perspective as a DXer to this year's event.

I have been attending Hamvention off and on since 1975. I probably missed five or six over that span but I never kept track. In my memory, there have been three hotels where the DXers gathered. Some of you old timers will remember the "Biltmore" from the '70s. When that hotel closed, the venue moved to the Admiral Benbow Sheraton Hotel a few blocks away. After a few years, that hotel also closed and the main DXers' venue moved to the Crowne Plaza Hotel across the street and it has remained there since then. What I remember from the old days was a bunch of "younger" DX enthusiasts and bathtubs full of iced down beer in multiple rooms and hospitality suites that ran to 3 or 4 a.m. every night. Such is not quite the case anymore. Yes, there are still a couple of hospitality suites, and iced beer. But they are generally almost empty by midnight now. A sign of our age, and the times, I guess.

The Friday evening DX Dinner, organized by the Southwest Ohio DX Association (SWODXA), was always held at the Crowne Plaza but several years ago, after a rather poor experience with the food and the service, the DX Dinner was moved to the Dayton Marriott where it remains today. This is the venue for DX award presentations. This year, as noted in this column, I was proud to induct two more into the CQ DX Hall of Fame. It also hosts the SWODXA DXpedition of the Year award, which, in my opinion, has become the worldwide standard for this acknowledgment every year. This year's recipient was the KH1/KH7Z Baker Island DXpedition. This year also featured the first Island Radio Expedition Foundation (IREF) IOTA Expeditioner of the Year award, which was presented to Cezar Trifu, VE3LYC.

The Contest Dinner continues at the Crowne Plaza on Saturday evening and Tim Duffy, K3LR, runs Contest University from the Crowne Plaza on

Your editor, N2OO; W4 QSL Bureau Manager Paul Sturpe, W3GQ; CQ DX Hall of Fame inductee Joe Taylor, K1JT; Gary Dixon, K4MQG; and Richard Williams, W3OA, after the DX Dinner. (Photo by John Scott, K8YC)

KH1/KH7Z DXpedition of the Year! N1DG holds the SWODXA DXpedition of the Year award and K6TD holds the Japan International DX Meeting DXpedition of the Year award, both presented at the DX Dinner. (Photo by John Scott, K8YC)

** Email: <n2oo@comcast.net>*

Thursday. So, essentially, the Crowne Plaza has become the "contesters' hotel." It is worth noting that there were a few "issues" at the Crowne Plaza this year related to the hotel and its location.

Obviously, there's a lot of mixing between DXers and contesters. I consider myself a DXer who likes to dabble in contests. As I get older, the thought of going on a DXpedition to some uninhabited island in the sub-Antarctic has become physically and financially less appealing. As such, running in a contest gives me the adrenaline rush I need from time to time on the air. But my heart is on the DX side. But I digress.

I am beginning to wonder if DXers could consider a move to the hotel where the DX Dinner is hosted? I am certainly not the one to do anything about this other than to float the thought. I already know of many DXers who stay at the Marriott. Other than the DX Dinner, I do not know of any other "official" hospitality suites or events that are held there specifically for DXers. And I am sure there are many other considerations of which I am unaware. I just thought that I would state the obvious and see if anyone in authority has the same thoughts.

As for the new Hamvention venue in Xenia, I have been to all three that have now been held at the Greene County Fairgrounds. The first year was a learning experience for everyone. Last year, appropriate adjustments were made and it got much better. This year, in my opinion, I felt that the Hamvention folks did a stellar job putting everything together. Also worth noting is that the forum rooms at Xenia are simply awesome, well lit, large, and air conditioned. The DX forum was held at a prime time and was well attended. The Hamvention committee deserves kudos for a job well done. I felt that it took over 20 years to finally kind of figure out the right format for handling the Hara Arena location, but only 2 years to get Xenia set up right. I am also sure that the Hamvention folks will continue to make even more improvements in the future at Xenia. I want to convey my personal appreciation for a job very well done.

One last note: Late on Monday, May 27, and into early Tuesday, May 28, multiple tornadoes ripped through the Dayton area causing extreme damage along an eerie path that ran across the north side of downtown and east almost all the way out to Xenia. One of the first things to get hit was the old Hara Arena. There are multiple pictures online of the resulting damage. Although Hara had its issues, it also held many fond memories for me from nearly 40 years of attending the Hamvention there, including those hot and sweaty rooms where the DX forums were held. Fortunately for me, I also remember many of the forums, and the people who attended them. From everything I have seen to date, the new venue in Xenia is great. I am looking forward to next year.

CQ DX Hall of Fame Induction

Once again this year, I had the honor of inducting the newest members of the CQ DX Hall of Fame at the DX Dinner (Thanks to SWODXA for again providing this venue). The basics about our new inductees are in the general CQ Hall of Fame article elsewhere in this issue (which also includes inductees into the CQ Contest Hall of Fame and the CQ Amateur Radio Hall of Fame), but I wanted to add a little detail here about our newest honorees.

Italian DXpedition Team

Silvano Borsa, I2YSB, and his Italian

Dayton is all about meeting old friends! Here are Bill Barr, N4NX, and Bob, N2OO.

The CQ DX Field Award Program

New Awards – CW

HA5WA 73
OK1DKR 74
4F3BZ 75

New Awards – Mixed

KG4LUN 162
NØKOE 163
N3JNX 164

Endorsements – CW

HA5WA 235
OK1DKR 100, 150

Endorsements – Mixed

K9YC 227
W6OAT 249

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.

The WPX Program

CW

3897 . . . . . K4KZ

SSB

4209. . . . . VA3ZNQ
4210. . . . . K4KNO

Mixed

3839 . . . . . G4CTY
3840 . . . . . K4KZ
3841 . . . . . IU8IYE
3842 . . . . . LA7EIA

Digital

1033. . . . . WA1VGM
1034 . . . . . W3LMC
1035 . . . . . G4CTY
1036 . . . . . K4KZ
1037 . . . . . JE2DLR
1038 . . . . . SP5GSM
1039 . . . . . ADØCS

CW: 400: K4KZ. **600:** MØDHP. **700:** OH1LAR. **2650:** KB1EFS. **4900:** W8IQ. **7900:** WA2HZR.

SSB: 450: W5UJ. **700:** HB9EFK. **800:** OH1LAR. **1050:** KE4KMG. **1600:** HB9MXY. **1750:** K6FG. **2800:** PT7ZT.

Mixed: 450: W5UJ, LA7EIA. **550:** N4CQR. **650:** K4WRX, N3DF. **800:** K4KZ. **850:** W1KE, MMØRYP. **1000:** KBØHL. **1100:** OH1LAR. **1750:** JR3UIC. **1800:** HB9EFK. **1900:** HB9MXY. **3300:** KB1EFS.

Digital: 350: G4CTY. **450:** K4KZ. **500:** SP5GSM. **550:** N4CQR. **650:** N3DF. **700:** HA9PP. **850:** W1KE, JE2DLR. **900:** HB9MXY. **950:** EA3UU. **1150:** K6FG. **1350:** JR3UIC. **1500:** HB9EFK. **2150:** KB1EFS.

160 Meters: K4KZ, KB1EFS, HB9EFK, K6FG
80 Meters: KB1EFS
60 Meters: KB1EFS
40 Meters: K4WRX, PDØDNA, K6FG
30 Meters: KB1EFS
20 Meters: K4KNO, JE2DLR, JR3UIC
17 Meters: KB1EFS
15 Meters: K4KZ, KB1EFS
12 Meters: KB1EFS
10 Meters: KB1EFS
6 Meters: KB1EFS

Asia: HB9MXY, JE2DLR
Europe: HB9MXY, G4CTY, K4KZ, JE2DLR, IU8IYE, LA7EIA
Oceania: JE2DLR, HA9PP
North America: HB9MXY, W3LMC, K4KZ, JE2DLR, ADØCS
South America: HB9MXY, K4KZ, HB9EFK, K6FG

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.

DXpedition Team were nominated by the Northern California DX Club. The group has been prolific in its travels, and the nomination listed the following major DXpeditions it has conducted over the past 20 years: 5U1A – Niger – 2002; Somalia – 6OØCW – 2005; 6OØN – Somalia – 2006; J2ØMM, J2ØRR – Djibouti – 2007; 9L1X – Sierra Leone – 2008; 9G5TT, 9G5XX – Ghana – 2009; 5V7TT – Togo – 2010; 5M2TT – Liberia – 2011; TU2T – Ivory Coast – 2011; 6OØCW – Somalia – 2012; TT8TT – Chad – 2012; XT2TT – Burkina Faso – 2013; TO2TT – Mayotte – 2013; 9J2T – Zambia – 2014; TY1AA – Benin – 2014; 9QØHQ – Rep. of Congo – 2015; 5ZØL – Kenya – 2015; 3XY1T – Guinea – 2016; TL8TT – Central African Republic – 2017; J5T – Guinea Bissau – 2017; TJ2TT – Cameroon – 2018; 9XØT, 9XØY – Rwanda – 2018; TT8RR, TT8XX – Chad – 2019 (delayed due to security issues; 5XØT, 5XØX – Uganda scheduled for October 2019.

Over the years, according to NCDXC, the Italian DXpedition Team has 1,385,650 contacts, not including this year's operations. According to the GDXF DXpeditions Honor Roll, the Italian DXpedition Team has made 21 "mega DXpeditions," more than any other group that is listed.

The team makes a major effort to work all of the bands and to leave no geographic area underserved. The Italian DXpedition Team has set a very high standard for operating and QSLing. Their contributions to the global DX Community are enormous. In addition, the Italian DXpedition Team has facilitated the donation and transportation of two ambulances from Italy to Somalia.

Joe Taylor, K1JT

Already a member of the CQ Amateur Radio Hall of Fame for his professional achievements as a Nobel Prize-winning

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The WAZ Program

SINGLE BAND WAZ

6 Meter Updates

141 .....DK1FW, 26 Zones
122 .....EA8DBM, 38 Zones

15 Meter RTTY

12.....SP6TRX

20 Meter SSB

1253.....SP6TRX

160 Meter

579 .....SV8GFW, 39 Zones

160 Meter Updates

573 .....W7AH, 32 Zones
546 .....DK1FW, 35 Zones
521 .....RN3QN, 40 Zones

ALL BAND WAZ

CW

1026.....IZ2FLX
1027.....IZ8VYU
1028 .....W7GF

Digital

83.....ZS1XG
84 .....JH3LIB
85.....F6DHD
86.....JAØCIU
87.....IZ8VYU

Mixed

9707.....EA2BD
9708.....W7JET
9709.....N4RT
9710.....WB6EWM
9711 .....WF4W
9712 .....JH3LIB
9713 .....K4JKB
9714 .....N2ZZ
9715 .....K4ZOT
9716 .....OM2AGN
9717.....IZ2FLX
9718.....OZ6KK
9719 .....KØCOM

SSB

5442.....IZ8VYU
5443.....N6PAT
5444.....JJ1ENZ

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

5 Band WAZ

As of May 15, 2019
2136 stations have attained at least the 150 Zone level, and
1019 stations have attained the 200 Zone level.

As of May 15, 2019
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
HA0HW	199	1
HA5AGS	199	1
I5REA	199	31
IK0XBX	199	19 on 10M
IK1AOD	199	1
IK8BQE	199	31
IZ3ZNR	199	1
JA1CMD	199	2
JA5IU	199	2
JA7XBG	199	2
JH7CFX	199	2
JK1BSM	199	2
K1LI	199	24
K2RD	199	18
K4HB	199	26
K5FUV	199	23
K5TR	199	22
K7UR	199	34
K9KU	199	22 on 15
KB0EO	199	23
KZ4V	199	26
N3UN	199	18
N4NX	199	26
N4WW	199	26
N4XR	199	27
N8AA	199	23
RA6AX	199	6 on 10M
RU3DX	199	6
RW0LT	199	2 on 40M
RX4HZ	199	13
RZ3EC	199	1 on 40M
S58Q	199	31
SM7BIP	199	31
SP3RBG	199	2 on 10M
VE2TZT	199	23
VO1FB	199	19
W1FJ	199	24
W1FZ	199	26
W2LK	199	23
W3NO	199	26
W4LI	199	26
W4UM	199	23
W6DN	199	17
W6RKC	199	21
W9XY	199	22
WA0MHJ	199	23
WA2BCK	199	23
9A5I	198	1, 16
EA5BCX	198	27, 39
F5NBU	198	19, 31
G3KDG	198	1, 12
G3KMQ	198	1, 27
HB9FMN	198	1 on 80 & 10
JA1DM	198	2, 40
JA3GN	198	2 on 80 & 40
JA7MSQ	198	2 on 80 & 10
JH1EEB	198	2, 33
K2EP	198	23, 24
K2TK	198	23, 24
K3JGJ	198	24, 26
K3LR	198	22, 23
K3PA	**198**	**18,23**
K4JLD	198	18, 24
K5OT	198	18, 23
KZ2I	198	24, 26
N2QT	198	23, 24
N4GG	198	18, 24
N8TR	198	18, 23 on 10
UA4LY	198	6 & 2 on 10
UN5J	198	2, 7
US7MM	198	2, 6
W5CWQ	198	17, 18
W6OUL	198	37, 40
W6TMD	198	34,40
W9RN	198	26, 19 on 40
WC5N	198	22, 26
WL7E	198	34, 37
ZL2AL	198	36, 37

The following have qualified for the basic 5 Band WAZ Award:

Callsign	5BWAZ #	Date	# Zones
F5VHQ	2132	2019-04-27	152
K7VV	2133	2019-04-27	200
JH9DRL	2134	2019-04-28	167
JA0CIU	2135	2019-04-30	184
K1ACL	2136	2019-05-10	166

Updates to the 5BWAZ list of stations:

Callsign	5BWAZ #	Date	# Zones
LU2DX	2035	2018-05-30	195
ON6KE	1847	2019-05-10	181
K1BD	1337	2019-05-10	193
K3PA	1941	2016-10-16	198

New recipients of 5 Band WAZ with all 200 Zones confirmed:

5BWAZ #	Callsign	Date	All 200 #
2133	K7VV	2019-04-27	1019

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, John Bergman, KC5LK, 125 Deer Trail, Brandon, MS 39042-9409. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to John Bergman. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. KC5LK may also be reached via e-mail: <kc5lk@cq-amateur-radio.com>.

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

The WPX 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

8771 .....9A2AA	5070 .....N8BJQ	3739 ....WD9DZV	2394 .....AE5B	1813 .....IZØFUW	1462 .....DL4CW	1260 .....UR6LEY	1016 .....W9QL	708 .....N4JJS
7815 .....K2VV	4773 .....WA5VGI	3611 .....W2OO	2368 .....HK3W	1767 .....JR3UIC	1460 .....N6PM	1219 .....K6HRT	1012 .....NØVVV	682 .....AI8P
7415 .....9A2NA	4771 .....I2MQP	3539 .....AB1J	2340 .....NE6I	1718 .....N5KAE	1447 .....K3XA	1217 .....AB1QB	1010 .....VE3RZ	680 .....JA6JYM
7262 .....W1CU	4681 .....JH8BOE	3538 .....9A4W	2293 ....WA6KHK	1711 .....NS3L	1422 .....I2VGW	1167 .....WA9PIE	1007 .....AA4QE	661 .....N3DF
6452 .....EA2IA	4583 .....W9OO	3459 .....W9IL	2203 .....KI1U	1667 .....AD3Y	1408 .....NH6T	1153 .....N3CAL	1006 .....NØRQV	661 .....AL4Y
6292 .....KF2O	4574 .....JN3SAC	3099 .....N6FX	2176 .....V51YJ	1652 .....N6PEQ	1398 .....ES4RLH	1137 .....YO5BRZ	919 .....ON7MIC	633 .....TI5LUA
5581 .....ON4CAS	4561 .....NN1N	3073 .....IK2DZN	2133 .....KØKG	1647 .....9A2GA	1361 .....VA3VF	1136 .....KO9V	919 .....KC1UX	621 .....K4HDW
5477 .....N4NO	4521 .....IK2ILH	2968 .....AB1OC	2109 .....W2FKF	1643 .....SV1DPI	1341 .....W1FNB	1116 .....YU7FW	913 .....K9BO	616 .....AC6BW
5489 .....S53EO	4462 .....K1BV	2866 .....AG4W	2100 .....N7ZO	1616 .....TA1L	1322 .....AA4FU	1107 .....PY2MC	889 .....WU1U	609 .....R1AV
5355 .....KØDEQ	4306 ....WB2YQH	2757 .....NXØI	2016 .....N2WK	1570 .....PY5VC	1301 .....JF1LMB	1100 ....WA3GOS	835 .....K6RAH	605 .....IW2FLB
5332 .....W9OP	4298 .....VE3XN	2697 .....AK7O	2013 .....JH1APK	1568 .....N3AIU	1301 ....KB9OWD	1074 .....WU9D	757 .....WB3D	600 .....WA3QWA
5262 .....I5RFD	4201 .....YO9HP	2589 .....DG7RO	1930 .....K3CWF	1524 ...NH6T/W4	1301 .....K1DX	1069 .....IZ4MJP	736 .....JA3MAT	
5294 .....YU1AB	3831 .....W3LL	2550 .....K6ND	1888 .....VA7CRZ	1484 .....FG4NO	1301 .....KM5VI	1032 .....DG5LAC	726 .....JP1KHY	
5273 .....VE1YX	3821 .....N6QQ	2528 .....W6XK	1828 .....K7LV	1480 .....K4JKB	1295 .....NIØC	1023 .....N4WQH	718 .....KE4PLT	
5126 .....N6JV	3764 .....K9UQN	2508 .....PA2TMS	1821 .....PY5FB	1462 .....AC7JM	1280 .....WF1H	1019 .....N6MM	711 .....AG1T	

SSB

6535 .....OZ5EV	3318 .....W3LL	2595 .....EA1JG	2098 .....K5UR	1641 .....AE9DX	1209 .....N6PEQ	1012 .....KU4BP	808 .....UR6LEY	684 .....KO9V
5958 .....9A2NA	3274 .....YU7BCD	2568 ....SM6DHU	2094 .....I8LEL	1622 .....K5CX	1187 .....IZ1JLG	1004 .....K4HB	802 .....N6OU	675 .....F1MQJ
5934 .....K2VV	3172 .....YO9HP	2532 .....W9IL	2093 .....W2WC	1611 .....W2ME	1183 .....KI1U	1004 .....WA5UA	801 .....K3XA	655 .....VA3VF
5297 .....IØZV	3108 .....I4CSP	2508 .....PA2TMS	2088 .....N3RC	1587 .....N3XX	1150 .....VE6BMX	1000 .....N6MM	766 .....I2VGW	647 .....YB8NT
5198 .....VE1YX	3090 .....WA5VGI	2451 .....EA3GHZ	2076 .....K2XF	1550 .....IK2RPE	1146 .....SQ7B	978 .....EA7HY	763 .....K4JKB	644 .....JH1APK
5008 .....KF2O	3073 .....I3ZSX	2443 .....JN3SAC	2013 .....NXØI	1442 .....DG7RO	1124 .....K3CWF	957 .....W9QL	758 .....IV3GOW	640 .....UA9YF
4752 .....EA2IA	3062 .....DL8AAV	2362 .....AG4W	1988 .....W4QNW	1388 .....NKØS	1112 .....NH6T	947 .....W6XK	724 .....WF1H	637 .....K5WAF
4513 .....I2MQP	3050 .....N8BJQ	2335 .....KG1E	1955 .....EA3NP	1386 .....IK4HPU	1098 .....K4CN	934 .....PY5VC	724 .....W3TZ	630 .....W6US
4208 .....I2PJA	2990 .....KF7RU	2326 .....CX6BZ	1935 .....SV1EOS	1371 .....VE6BF	1096 .....JA7HYS	931 .....YB1AR	717 .....KØDAN	624 .....K6KZM
3939 .....KØDEQ	2984 .....KI7AO	2209 .....IK2QPR	1879 .....K3IXD	1357 .....HK3W	1089 .....IZ8FFA	929 .....NS3L	717 .....N3JON	606 .....KJ4BIX
3685 .....N4NO	2936 .....N6QQ	2201 .....NQ3A	1874 ....WD9DZV	1338 .....NE6I	1089 .....IT9ABN	919 .....KA5EYH	714 .....YB2TJV	604 .....GØBPK
3555 .....SV3AQR	2903 .....IN3QCI	2200 .....N6FX	1848 .....AB5C	1334 .....EA3EQT	1042 .....IZØBNR	893 .....W9RPM	710 .....WA9PIE	600 .....WU1U
3433 .....NN1N	2658 .....PT7ZT	2198 .....AB1OC	1825 .....KQ8D	1312 .....N5KAE	1032 .....DG5LAC	889 .....N3AIU	700 .....N4FNB	600 .....WA3PZO
3399 .....I8KCI	2857 .....4X6DK	2122 .....AE5B	1812 .....K6ND	1262 .....K7LV	1031 .....K4CN	875 .....K7SAM	700 .....JA1PLL	
3333 .....W9OO	2650 .....IK2DZN	2109 .....W2FKF	1789 ....WA6KHK	1258 .....N1KC	1031 .....IK8OZP	854 .....K6HRT	694 .....KG4HUF	
3333 .....CT1AHU	2623 .....W2OO	2105 .....K9UQN	1646 .....VE7SMP	1222 .....YF1AR	1022 .....NW3H	833 .....DK8MCT	690 .....W6PN	

CW

7131 ....WA2HZR	4198 .....IZ3ETU	2948 .....IK3GER	2357 .....W9HR	1744 .....NE6I	1342 .....VE6BMX	962 .....K7LV	821 .....HB9DAX	652 .....IK2DZN
6878 .....K2VV	4093 .....WA5VGI	2915 .....KA7T	2295 .....EA7AAW	1727 .....K6UXO	1295 .....NIØC	944 .....AB1OC	783 .....YB1AR	629 .....IV3GOW
5633 .....9A2NA	4046 .....I7PXV	2811 .....OZ5UR	2291 .....N3XX	1691 .....KI1U	1295 .....AG4W	935 .....K3CWF	782 .....F5PBL	620 .....AF5DM
5058 .....N4NO	3974 .....JN3SAC	2806 ....WD9DZV	2212 .....AC5K	1620 .....DG7RO	1220 .....AA4FU	908 .....NH6T	752 .....K6HRT	615 .....JH6JMM
5052 .....EA2IA	3584 .....NN1N	2685 .....W2OO	2211 .....W3LL	1595 .....PY5FB	1210 .....DL4CW	903 .....N6PEQ	743 .....JA5NSR	608 .....W9RPM
5043 .....N6JV	3523 .....W9OO	2667 .....W9IL	2022 .....AF5CC	1505 .....R3IS	1200 .....KN1CBR	891 .....DK8MCT	738 .....NH6T/W4	605 .....NKØS
5028 .....KF2O	3504 .....YU7BCD	2615 .....N6QQ	2010 .....K5UR	1480 .....WO3Z	1197 .....JH1APK	890 .....NS3L	732 .....SQ7B	600 .....NY4G
4697 .....W8IQ	3318 .....K9UQN	2531 .....I2MQP	1969 .....NXØI	1443 ....WA2VQV	1196 .....N3AIU	889 .....N3AIU	722 .....WA9PIE	600 .....IK2SGV
4634 .....YU7LS	3279 .....IØNNY	2490 .....N6FX	1880 .....N3RC	1389 .....IT9ELD	1098 .....LU5OM	864 .....YO5BRZ	720 .....K4CN	
4452 .....KØDEQ	3214 ....SM6DHU	2477 .....VE6BF	1772 ....WA6KHK	1357 .....W6XK	1062 .....K3XA	848 .....PY5VC	711 .....JF1LMB	
4394 .....N8BJQ	3041 .....YO9HP	2424 .....W2WC	1762 .....K6ND	1348 .....VE1YX	1027 .....AE5B	842 .....HK3W	692 .....N5KAE	

DIGITAL

2629 .....N8BJQ	1889 .....HK3W	1426 .....AB1OC	1149 .....W9IL	1047 .....RW4WZ	901 .....W1FNB	810 .....N3CAL	672 .....K9AAN	611 .....JP1KHY
2558 .....NT2A	1790 .....JN3SAC	1335 .....K3CWF	1129 .....NK$$S	1021 .....NN1N	898 .....K9UQN	800 .....WA3GOS	670 .....IV3GOW	609 .....R1AV
2474 .....W3LL	1756 .....K$$DEQ	1325 .....W2OO	1112 .....AB1QB	1009 ...GU$$SUP	866 .....SQ7B	798 .....KC1UX	668 .....KA5EYH	600 .....N1RR
2361 .....KF2O	1734 .....AG4W	1259 .....N6PM	1093 .....KI1U	1002 .....N$$RQV	858 .....WU9D	783 .....YB1AR	654 .....JA3MAT	600 .....AD$$FL
2348 .....N6QQ	1704 .....IK2DZN	1254 .....JH1APK	1091 .....VA3VF	971 .....JF1LMB	830 .....NE6I	750 .....ON7MIC	652 .....N3DF	
2218 .....YO9HP	1600 .....WA5VGI	1250W2/JR1AQN	1090 .....K2YYY	966 .....NS3L	824 .....EA2IA	750 .....NH6T/W4	640 .....WA9ONY	
2141 ....WD9DZV	1465 .....N7ZO	1227 .....ES4RLH	1089 .....AC7JM	947 .....I2VGW	812 .....UR6LEY	708 .....N4JJS	636 .....W9RPM	
1901 .....W6XK	1456 .....N3RC	1206 .....NX$$I	1051 .....KH6SAT	917 .....K7LV	811 .....WF1H	681 .....PY5VC	611 .....KO9V	

REMOTE OPERATION

CW	MIXED	SSB
7319 .....K9QVB	3983 .....N1RR	2923 .....N1RR
3253 .....N1RR		

Only in Xenia … N2OO with Kristen Andrews, KB3OQV … who also ended up on the front page of the local Dayton newspaper!

astrophysicist, Joe Taylor, K1JT, was honored this year specifically for his contributions to the art of DXing. He was nominated by both the Northern Illinois DX Association and the South Jersey DX Association.

Joe's WSJT suite of weak-signal digital modes has revolutionized DXing, starting on VHF and UHF with modes that made meteor scatter and moonbounce accessible to many more stations, and then on HF with JT9 and, most recently, FT8 (*and its new contest-focused derivative, FT4, which is profiled in this month's VHF-Plus column –ed*). While FT8 was originally intended for VHF/UHF use, the SJDXA nomination notes that it quickly found favor on the HF bands as well.

"Very quickly, it was discovered that low-power, very simple, stations could make contacts on HF that were never before possible (DX!). Within a year, more FT8 QSOs were being made than by the established SSB and CW modes, as documented in ClubLog statistics. It will not replace those modes, but it became a new weapon in the arsenal of DXers, many of whom had never operated a digital mode … (M)ost large DXpeditions are now including FT8 in their operating plans … Not since the invention of single sideband transmission has there been a mode that has taken off so quickly and made itself a part of the DX community."

– I will see ya' in the pileups! de N2OO

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	VE3ZZ....223	NIØC....193
W1CU....260	KØDEQ....221	N4NX....192
VE7IG....254	HA1AG....218	K1NU....191
HAØDU....253	JN3SAC....214	W3LL....191
OM3JW....253	HA9PP....213	HA1ZH....190
W6OAT....249	W4UM....210	BA4DW....188
IK1GPG....245	WA5VGI....209	HB9DDZ....188
OK1ADM....244	OK1AOV....208	K2AU....187
HA5WA....243	N4MM....207	K8YTO....186
K8SIX....240	F6HMJ....206	WO7R....185
HA1RW....239	KF8UN....205	N3RC....184
VE3XN....239	OM2VL....205	K2SHZ....182
I6T....230	VE7SMP....204	KJ6P....180
N8PR....229	RW4NH....203	W5ODD....177
HA5AGS....228	IV3GOW....201	NØFW....176
9A5CY....227	HB9AAA....200	WA9PIE....176
K9YC....227	N5KE....200	HB9BOS....175
WI8A....227	W3LL....195	
K8OOK....224	ON4CAS....194	

SSB

W1CU....239	W4UM....198	W3LL....184
W4ABW....202	JN3SAC....191	NØFW....176
VE7SMP....201	N4MM....187	DL3DXX....175
KØDEQ....198	WA5VGI....185	

CW

W1CU....249	DL3DXX....203	OK2PO....184
HA5WA....235	W4UM....200	N4MM....183
DL6KVA....233	OK1AOV....198	N4NX....177
KØDEQ....214	WA5VGI....192	N7WO....175
JN3SAC....211	NIØC....190	
DL2DXA....209	HB9DZZ....186	

Digital

W1CU....192		

CONTESTING

BY DAVID SIDDALL,* K3ZJ

North American QSO Parties and Worked All Europe DX CW Contests Provide Mid-Summer Opportunities

Plus: Russian and Bulgarian Ops in Annual WRTC-like Competition; RSGB IOTA Contest Activates Islands Worldwide; North American QSO Party Activates Three Modes in Three Weekends; World Radiosport Team Championship Qualification Rules

July and August offer multiple interesting opportunities to sample mid-summer propagation. Last month, ARRL Field Day, the IARU HF Contest, and CQ's own World Wide VHF Contest were highlighted here. Don't forget to get on the air for the last two, which are held during the middle of this month: July 13-14 for the IARU HF competition and July 20-21 for the CQWW VHF contest. Last month's column has details and links.

If you can't sleep the night before the CQWW VHF, here's an idea: See how many Russian Radiosport Team Championship (RRTC) stations you can work. Top Russian contesters will compete multi-single style as teams located in the field using special callsigns, similar to last year's World Radiosport Team Championship (WRTC2018) in Germany.

This competition is on a smaller scale than the WRTCs, but it was from these annual Russian contests that the WRTC designed its Field Day-style operations when the event was hosted in Russia back in 2010. Activity will be for just eight hours, from 0700 through 1500 UTC on Saturday, July 20. Everyone except the Russian competitors should follow the IARU HF Championship rules and use any of the logging programs for that contest. The CQWW VHF and NAQP RTTY QSO contests begin three hours later, so there's no conflict.

Later in the month, the Radio Society of Great Britain's Islands on the Air (IOTA) contest will play upon the airwaves. This contest is described briefly below. The important thing to note is a rules change this year. Signal reports no longer are part of the required exchange. While not unique — grid squares instead of signal reports have long been the norm for VHF and UHF contests — this is the first HF competition that comes to mind that has dropped signal reports from the exchange. The island designator used in the exchange is equivalent to a grid square and this change long has been discussed among IOTA aficionados.

The North American QSO Party (NAQP), sponsored by the ARRL's *National Contest Journal*, brings out hundreds of club participants vying for a club trophy that annually moves to the winning club. The trophy winner is determined by a unique scoring system based on contest points and the number of individual club participants. The rules governing the NAQP club challenge are at <http://naqpc.org/rules.htm>. This is a three-part domestic contest held on three separate Saturdays. Each Saturday is devoted to a single mode — CW, SSB, or RTTY. Power is limited to 100 watts for competitors, and small stations with just wires or a vertical can do extremely well.

email: <k3zj@cq-amateur-radio.com>

Shown speaking at Contest University 2019 in Dayton are (L-R Bryant Rascoll, KG5HVO; and Chris Hurlbut, KL9A. Both were WRTC2018 competitors in Germany. Bryant — who is also the current Newsline Young Ham of the Year — talked about bringing new blood into contesting. Chris presented a tutorial on serious contesting from a remote station. (Photo by K3ZJ)

Finally, we look at the rules that are governing the WRTC2022 competition to be named a team leader and a seat in northern Italy at the event itself. Each WRTC organization adopts its own rules for its version of the event, with the advice of the WRTC Sanctioning Committee. While many of the rules are carried over from event to event, changes also are made each time that may be based on local conditions and preferences, the evolution of technology, and other factors. As noted elsewhere in this month's column, the idea of portable operations with equal antennas was an innovation adopted by the Russian organizers in 2010 and carried forward by the organizers of WRTC2014 and WRTC2018. Below we look at the WRTC2022 qualification rules. (The competition rules that will govern during the competition itself are expected to be adopted closer to the time of the event itself.)

Russian Radiosport Team Championship (RRTC)

The annual Russian Radiosport Team Championship (RRTC), organized by the Russian Amateur Radio Union (Soyuz

Radiolyubitelei Rossii — SRR), will be held on Saturday, July 20, from 0700 to 1500 UTC on 40-10 meters, employing both CW and SSB. This is the Saturday immediately after the IARU HF Championship. Use your same logging program and module that you use for the IARU HF Championship.

Highly competitive operating under equalized conditions was pioneered in Russia around 1980. The Field Day-style competition is an effort to "level the playing field" by creating as equal conditions as possible — geographic location, antennas, power, etc. The RRTC developed over decades and its structure formed the basis for introducing field operations and identical antennas at the World Radiosport Team Championship in 2010 (WRTC2010) that was held near Moscow. Similar WRTC field operations with identical antennas also was adopted for the WRTC2014 competition held near Boston, and again for WRTC2018 held near Wittenberg, Germany.

Between 25 and 30 teams from all over the Russian Federation are expected to participate, including three or four youth teams. The callsigns used for this event generally have been some of the same ones used at WRTC2010, from the block R31A-R39Z.

Similar teams may be competing with each other in Bulgaria at the same time under identical rules, but we were not able to confirm Bulgarian plans by our deadline. If you hear stations using the callsign block LZØAA-LZØAF and sending a three-character code as their exchange, those are members of the Bulgarian contingent. Those stations can be worked in the exact same manner as the Russian teams and will welcome your three-point QSO.

Participants can make QSOs among themselves and with the rest of the world, so everybody is invited to the party. For the participants, QSOs outside of their own ITU zone count the maximum three points, so they will be happy to work you.

Calendar of Events

All year	**CQ DX Marathon**	**http://bit.ly/vEKMWD**
July 1	RAC Canada Day Contest	https://tinyurl.com/yydd2ud9
July 1	RSGB 80m Club Championship, CW	http://bit.ly/2RsAJ4a
July 1-7	10-10 Int. Spirit of 76 QSO Party	http://bit.ly/1FrFeBc
July 6	FISTS	Summer Slow Speed Sprint https://tinyurl.com/y2u8zgfg
July 6-7	Marconi Memorial HF Contest	https://tinyurl.com/y3k7a6cf
July 6-7	DL-DX RTTY Contest	http://www.drcg.de
July 6-7	Original QRP Contest	https://tinyurl.com/y3j7ca3j
July 6-7	PODXS 070 Club 40 Meter Firecracker Sprint	http://bit.ly/2FUmeOL
July 10	RSGB 80m Club Championship, SSB	http://bit.ly/2RsAJ4a
July 13	FISTS Summer Sprint	https://tinyurl.com/y2u8zgfg
July 13-14	IARU HF Championship	www.arrl.org/iaru-hf-championship
July 13-14	Veron SLP Contest	http://swl.veron.nl/Rules_SLP.html
July 20	RSGB 2nd 40m QSO Party	http://bit.ly/2YS3E2O
July 20-21	**CQWW VHF Contest**	**www.cqww-vhf.com**
July 20-21	North American RTTY QSO Party	http://ncjweb.com/NAQP-Rules.pdf
July 21	CQC Great Colorado Gold Rush	https://tinyurl.com/yxar3mmt
July 25	RSGB 80m Club Championship, Data	http://bit.ly/2RsAJ4a
July 27-28	RSGB IOTA Contest	https://tinyurl.com/y4bxmq5d
Aug. 3	European HF Championship	http://bit.ly/H2eMg5
Aug. 3-4	10-10 Int'l Summer Contest SSB	http://bit.ly/1FrFeBc
Aug. 3-4	ARRL 222 MHz and Up Distance Contest	http://bit.ly/2IJZcy9
Aug. 3-4	North American CW QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 4	SARL HF Phone Contest	http://bit.ly/H0IqQf
Aug. 10-11	Worked All Europe CW Contest	http://bit.ly/2vufgcb
Aug. 10-11	Maryland-DC QSO Party	www.w3vpr.org/node/325
Aug. 17-18	ARRL 10 GHz and Up Contest	www.arrl.org/10-ghz-up
Aug. 17-18	SARTG RTTY Contest	www.sartg.com
Aug. 17-18	North American SSB QSO Party	http://ncjweb.com/NAQP-Rules.pdf
Aug. 17-18	International Lighthouse Lightship Weekend – ILLW	https://illw.net/
Aug. 17-18	RDA Contest	http://rdaward.org/rdac1.htm
Aug. 17-18	CVA DX Contest CW	https://tinyurl.com/yytjqglp
Aug.17-18	KCJ Contest	www.kcj-cw.com/e_index.htm
Aug. 18	ARRL Rookie Roundup RTTY	www.arrl.org/rookie-roundup
Aug. 18	NJQRP Skeeter Hunt	https://tinyurl.com/y5vqmw3z
Aug. 18	SARL HF Digital Contest	http://bit.ly/H0IqQf
Aug. 24-26	Hawaii QSO Party	http://hawaiiqsoparty.org/
Aug. 24-25	Kansas QSO Party	www.ksqsoparty.org/
Aug. 24-25	Ohio QSO Party	www.ohqp.org/index.php/rules
Aug. 24-25	SCC RTTY Championship	http://bit.ly/I6rx9O
Aug. 24-25	YO DX HF Contest	www.yodx.ro/en/english
Aug. 24-25	50 MHz Fall Sprint	http://svhfs.org/wp/2019-fall-sprint-rules/
Aug. 24-25	CVA DX Contest SSB	https://tinyurl.com/yytjqglp
Aug. 25	SARL HF CW Contest	http://bit.ly/H0IqQf
Aug. 31	Colorado QSO Party	http://ppraa.org/coqp
Aug. 31-Sept. 1	UK/EI DX Contest	http://bit.ly/2RpKsVT
Sept. 28-29	**CQWW RTTY DX Contest**	**www.cqwwrtty.com**

– Contest Calendar compiled by Cathy Ross

Signal reports no longer are mandatory in the RSGB's Islands on the Air Contest (see text for details). This year's event will be held over the weekend of July 27-28.

The Russian Radiosport Team Competition was the model for WRTC competitive siting for the past three WRTC events held in Moscow, Boston, and Wittenberg, Germany. The original event will take place on July 20 this year, and participation worldwide is welcome during the 8-hour event.

As in the IARU HF contest, multipliers count once per band even though each station can be worked for points twice on each band — once each on CW and SSB.

Unique to this competition, every two hours, each team changes its callsigns and exchange. The teams send a three-character code as their exchange while everyone else sends their ITU zone (the same as in the IARU HF Championship). You may work the same team four times on the same band/mode and not even know it.

Log submissions are accepted worldwide for the four hours immediately following the end of the contest. The log submission deadline this year is Saturday, July 20 at 1900 UTC. Computer checking of the logs commences at 1900, and the final results are announced Sunday morning local time. Upload your log to: <https://tinyurl.com/y5gtgn4c>. The complete rules in English are at <https://tinyurl.com/y6qmz8xp>. (Click on "English" at the top of the screen if they appear in a different language.)

We usually do not elaborate on competitions with limited participation from North America, but sometimes it is interesting to review unique contest formats and accept the challenge to try something a little different. For those of us in North America this year, if conditions are good, I would expect that some of these stations will be workable on 40 meters at the start of the contest, and later on 20 meters from as early as 1100 or 1200 UTC. The stations all are feeding their 100 watts to dipoles mounted at about 32 feet on 40 meters and to tribanders at 33 feet on 20 meters.

RSGB Islands on the Air (IOTA) Contest

Don't forget the RSGB IOTA Contest, especially if you live or are vacationing on an island. This contest attracts good participation worldwide, but especially in Europe. Last year, approximately 2,200 logs were submitted. Both CW and SSB are used on 80-10 meters (excluding the WARC bands). The 2019 contest period commences at 1200 UTC on Saturday, July 27, and runs through 1200 UTC on Sunday, July 28.

Note that the rules have been changed this year in one major respect. Stations no longer are required to send signal reports ("59" or "599"). Non-island stations may just send their serial number, and island stations may send just their serial number plus IOTA island reference (such as "EU115"). If you are not sent a signal report, log 59 (SSB) or 599 (CW). If you are not sent a serial number, log "0".

RSGB provides a handy beginners guide for new entrants. Check it out here at <https://tinyurl.com/y2pvlnhz>. Logs must be submitted within five days of the contest end at <https://tinyurl.com/y2o4ote8>.

North American QSO Party (NAQP)

NAQP contests are sponsored by the *National Contest Journal* and run twice each year. There are three separate Saturdays on which the 12-hour summer NAQP contests are held, one each for RTTY, CW, and SSB, in that order. Each mode runs from 1800 UTC, Saturday to 0600 UTC on Sunday. This year, the NAQP RTTY launches at 1800 UTC on Saturday, July 20, and continues until 0600 UTC on Sunday, July 21. CW is held from 1800 UTC on Saturday, August 3, through 0600 UTC on Sunday, August 4. The final leg, SSB, takes off at 1800 UTC on Saturday, August 17 and ends on Sunday, August 18 at 0600 UTC.

Complete rules for all three NAQP events are found at <www.ncjweb.com/NAQP-Rules.pdf>. Some of the most expert operators are found in these contests, and major clubs compete for bragging rights and a trophy based on scoring all six yearly events. Note that the maximum output power recognized for awards is 100 watts. The logs of stations running more than 100 watts are classified as check logs.

Worked All Europe DX Contest (WAEDC) CW

The annual WAEDC CW contest will be held from Saturday, August 10 at 0000 UTC through Sunday, August 11 at 2359 UTC. Bands used are 80-10 meters (excluding the usual WARC bands). Note that the rules state that the IARU band plan should be followed and further, that for CW, "no operation to take place on: 3560-3800; 7040-7200; 14060-14350 kHz." In this competition, single operators are limited to 36 hours of operating out of the 48-hour total contest period.

A unique aspect of this contest is that any station activating a WAE country for the contest from which no log has been received for the last three years will be recognized as a "WAEDC Hero" and receive a special prize. For 2019, these countries are: 1AØ, C3, HV, JW/b, JX, OY, R1F, SV/A, and T7.

Note a significant change in this year's rules. The log submission period has been shorted significantly. Logs are due seven days after the end of the contest. Also, don't forget the recording rule instituted last year for top competitors. Upon request of the contest manager, the top three entrants of every category have to send an audio recording consisting of both the received and transmitted signal for the entire operating period. If a station fails to send the

requested recording, all not directly checkable QSOs may be removed. The complete contest rules are located at <https://tinyurl.com/y82wy2wm>.

WRTC2022 Qualification and Competition Rules (Part 2)

Qualifying as a team leader at WRTC-2022 is not for everyone. Top-notch competitors fully occupied by family matters, daily work, or similarly finding themselves with limited time for ham activities sometimes do not vie for a WRTC seat because of the time and rigor required. Others just are not interested, have other priorities, or may not be up to it physically. That being said, many contesters figure out how to make time and engineer a serious run at qualifying. It is a matter of personal priorities and interests, as well as an assessment of available station facilities.

An interesting aspect is that the organizers do not require any sort of statement of intent to enter the qualifying competition. If you enter a contest, you are automatically entered into the WRTC qualifying tabulations. Only after the qualifying events end must interested competitors apply to the WRTC for a team leader slot. The top scorer or scorers from each selection area who apply by the deadline will be offered the team leader seats unless a disqualifying factor is found. The qualifier truly is whomever makes the cut based upon published criteria and then applies to participate in the event.

Scores are calculated for every entrant in an eligible event and displayed on the web in a searchable tabulation organized by selection area. If you enter one or more of the eligible contests, your call and position within your selection area will be displayed on the WRTC qualification standings. The standings information for WRTC2022 will be posted shortly on the group's website and be updated continuously as final contest results become available. In the meantime, to see how you did in the qualifying rounds for WRTC2018, check out your call at <https://tinyurl.com/y2mxdx4w>. When available, a similar listing for WRTC2022 will be available at <http://wrtc2022.it/en/>.

In an attempt to attain a roughly level playing field, geographic areas based on a mix of geography and contest participation are drawn up. The competition for seats is limited to other contesters resident in the same "selection area." There are 37 selection areas: 10 from Europe, 10 from North America, 7 from Asia, 4 from Africa, 3 from Oceania, and 1 from the Caribbean. More than one team may qualify from some of these areas, but only one-per-country in most (not all) cases.

The qualifying events consist of 24 eligible contests spread over two years, starting with the ARRL DX CW contest in February 2019 and ending with the CQWW CW contest in November 2020. The top 12 scores for each operator are counted for one's WRTC qualification score, subject to certain limitations. A serious entrant usually must compete in at least 12 of the individual qualifying events, and many participate in more.

Navigating to qualification success is enhanced by carefully assessing the capabilities of the station(s) that will be used, selection of contests to enter, and the category in each contest in which to compete.

Next month, we will explore these WRTC subjects, and also note news from the WRTC organizers as they ramp up fundraising for the event.

– Until next month, 73, Dave, K3ZJ

WRTC2022 organizers receive a $5,000 check from the World Wide Radio Operators Foundation (WWROF) to kick off their fundraising efforts in the U.S. From left, Claudio Veroli, I4VEQ, Organizing Committee; Carlo De Mari, IK1HJS, President; and John Dorr, K1AR, Founding Director of WWROF. (Photo by N6TV)

Oops...

It's All in the Call

The dyslexic transposition gremlins were busy rearranging callsigns for June's cover story, "Finding My True North," by Mark Schreiner. Mark's callsign is NK8Q, and we had it right on his article and the first of three mentions in the table of contents, but transposed his prefix to KN8 in the other two mentions and on the cover itself. We apologize and will be sending the gremlins to bed without their nidder!

PROPAGATION

BY TOMAS HOOD,* NW7US

The Solar Wind

A Quick Look at Current Cycle 24 Conditions
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, April 2019: 6
12-month smoothed, October 2018: 4

10.7-cm Flux:
Observed Monthly, April 2019: 72
12-month smoothed, October 2018: 70

A_p Index:
Observed Monthly, April 2019: 6
12-month smoothed, October 2018: 7

***One Year Ago:* A Quick Look at Solar Cycle Conditions**
(Data rounded to nearest whole number)

Sunspots:
Observed Monthly, April 2018: 5
12-month smoothed, October 2017: 10

10.7-cm Flux:
Observed Monthly, April 2018: 70
12-month smoothed, October 2017: 75

A_p Index:
Observed Monthly, April 2018: 7
12-month smoothed, October 2017: 10

In recent months, we've noted some rather geomagnetically-stormy days, with a correlated degradation of radio signal propagation on the shortwave spectrum. The question is asked, "If we're not seeing many sunspots, and few if any solar flares, why are we having days with high geomagnetic activity and rough propagation?" To answer that, let's review some core ideas involved in space weather and radio propagation.

The Sun, and each planet, has a magnetic structure. The Earth has a north pole and a south pole, with magnetic field lines running between them, forming a donut shape of magnetic flux energy. The Sun has a magnetic structure, as well. It can become quite complex, with several intertwined poles. The Sun even reverses its northern and southern poles each solar cycle.

The Sun's magnetic field permeates the entire solar system, and beyond. This region that stretches from the Sun outward past the end of the solar system is called the heliosphere. The magnetic field that originates in the Sun and stretches out through the heliosphere is called the Interplanetary Magnetic Field (IMF). The IMF interacts with the Earth and is a primary cause of space weather.

The IMF sprawls out away from the Sun in the form of a huge "current sheet," a vast expanding surface where complex magnetic field lines run from one solar pole far out into the solar system, then arch back again along this sheet to return to the sun's other pole.

We have spacecraft that measure the IMF near the Earth; one measurement is known as the "B sub-Z" (B_z), which provides a way to observe the polarity at the spacecraft. The IMF magnetic field lines have polarities that change from north (seen as a positive B_z) to south (indicated by a negative B_z).

The huge solar current sheet that expands away from the sun is 10,000 kilometers (6,215 miles) thick and extends past the orbit of Pluto. The entire heliosphere is organized around this giant sheet, which carries an electrical current that is about 16 orders of magnitude less than that of the current carried in an ordinary light bulb.

Ordinarily, the current sheet circles the Sun's equator, spreading out in a wavy sheet that might resemble a dancer's skirt that flies up while the dancer is spinning. As Earth orbits the Sun, it dips in and out of the main structure of this wavy current sheet. On one side of the sheet, the Sun's magnetic field lines point northward. On the other side, they point southward.

Space is not a vacuum, at least in our solar system. The Sun's atmosphere extends very far out from the Sun. Space

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for July 2019

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Above Normal: 2, 6, 13, 15-16, 19, 26, 29	A	A	B	C
High Normal: 1, 3-4, 7, 9, 11-12, 14, 17-18, 20, 25, 27-28, 30-31	A	B	C	C-D
Low Normal: 10, 21-22, 24	B	C-B	C-D	D-E
Below Normal: 23	C	C-D	D-E	E
Disturbed: 5, 8	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

Using the Propagation Charts appearing in "The New Shortwave Propagation Handbook," by George Jacobs, Theodore J. Cohen, and R. B. Rose.

Find the Propagation Index associated with the particular path opening from the Propagation Charts.

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 1 will be poor to fair on July 1, while on July 2 propagation will be fair, then on July 3 and 4, poor to fair conditions, and so forth.

Alternatively, you may use the Last-Minute Forecast as a general guide to space weather and geomagnetic conditions throughout the month. When conditions are Above Normal, for example, the geomagnetic field should be quiet, and space weather should be mild. On the other hand, days marked as Disturbed will be riddled with geomagnetic storms. Propagation of radio signals in the HF spectrum will be affected by these geomagnetic conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the ionosphere supports the path that is in consideration. This chart is updated daily at http://SunSpotWatch.com provided by NW7US.

in our system is filled with plasma, a low-density gas in which the individual atoms are charged. The temperature of the Sun's atmosphere is so high that the Sun's gravity cannot hold on to it. The plasma streams off the Sun in all directions at speeds of about 300 to 400 kilometers per second (about 1 million miles per hour). This is known as the solar wind.

The speed of the solar wind fluctuates, and sometimes the wind carries with it magnetically complex plasma clouds. These clouds are regions where high-speed wind catches up with slower-speed wind, resulting in a twisting of the IMF's magnetic signature.

South-pointing solar magnetic field flux lines tend to connect with Earth's own magnetic field (think of holding two bar magnets together, one bar magnet's northern pole against the other bar's southern pole). Solar wind energy can then penetrate the local space around our planet and fuel geomagnetic storms.

Coronal Holes

At times, weak magnetic regions emerge on the Sun. Because of the weak magnetic structure and the resulting low density in these regions, solar plasma tends to "pour out" of these regions, billowing away from the Sun on the solar wind. These regions are known as "coronal holes" because of the way solar plasma escapes the Sun's gravitational and magnetic hold.

The corona is so hot that the gases in it lose some of their electrons in the powerful collisions between atoms, becoming ions. This creates "electrified gas," or "plasma." The solar plasma is a mixture of positively- and negatively-charged electrons.

An example of plasma can be seen by looking at a neon light. You are looking at plasma; gas inside the tube is energized to the point where light is emitted. Because plasmas are electrically conductive, they can steer magnetic fields. And they are steered by magnetic fields. Over coronal holes, solar magnetic fields are stretched and dragged into interplanetary space by the inertia of the expanding plasma that spirals out on the solar wind.

The speed of the solar wind is high (on average 600 to 800 kilometers/second) over coronal holes and low (roughly 300 km/s) over the rest of the Sun. Plasma streams that have

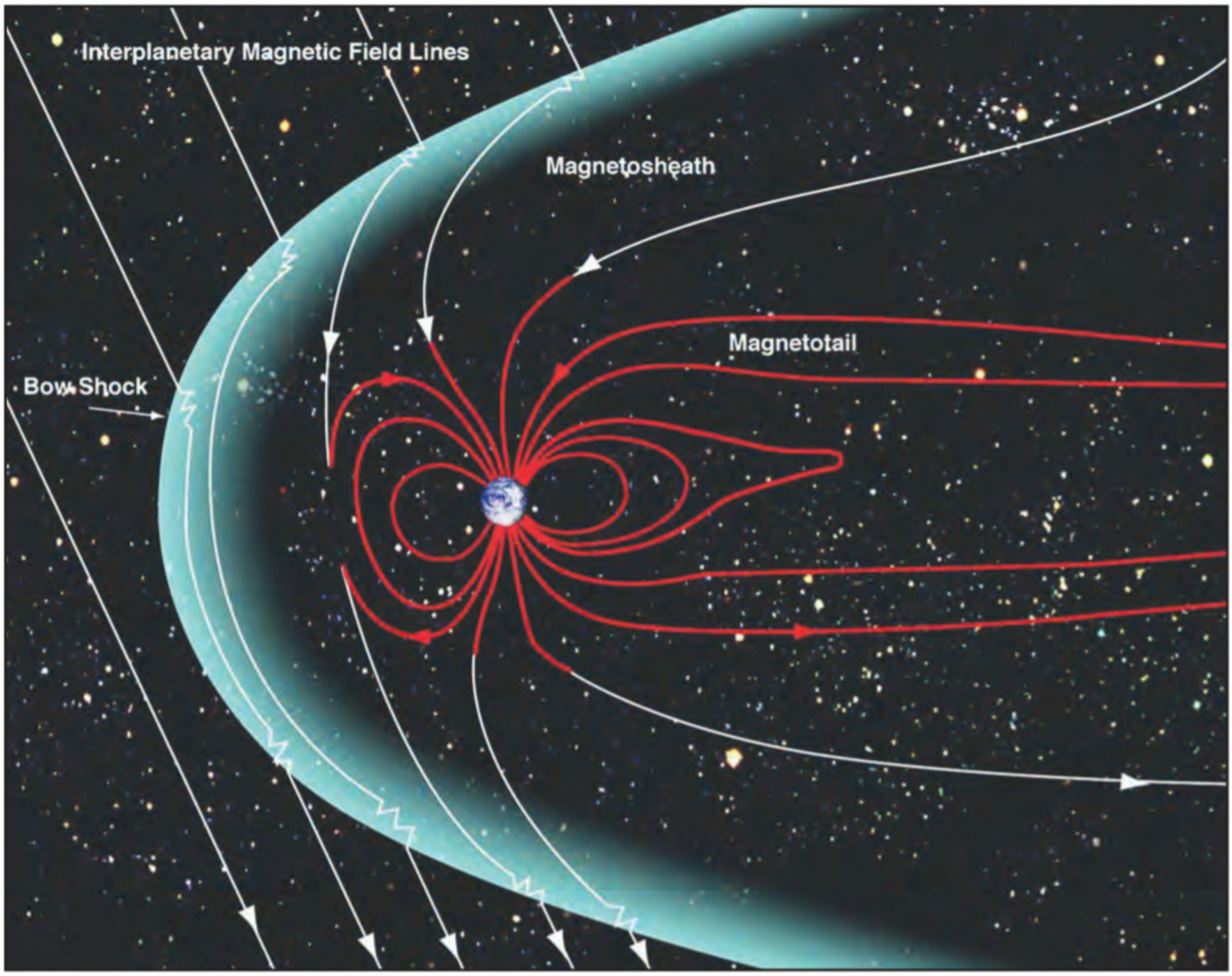

Figure 1. A diagram of a portion of the magnetosphere. Note that the magnetotail is huge; it is stretched out far away from the Earth and the Sun, by the pressure of the solar wind. The Sun-Earth connection involves the ever-present solar wind, and the Interplanetary Magnetic Field (IMF). The solar wind can cause geomagnetic storms and aurora (see text) during its interaction with the magnetosphere. Credit: NASA

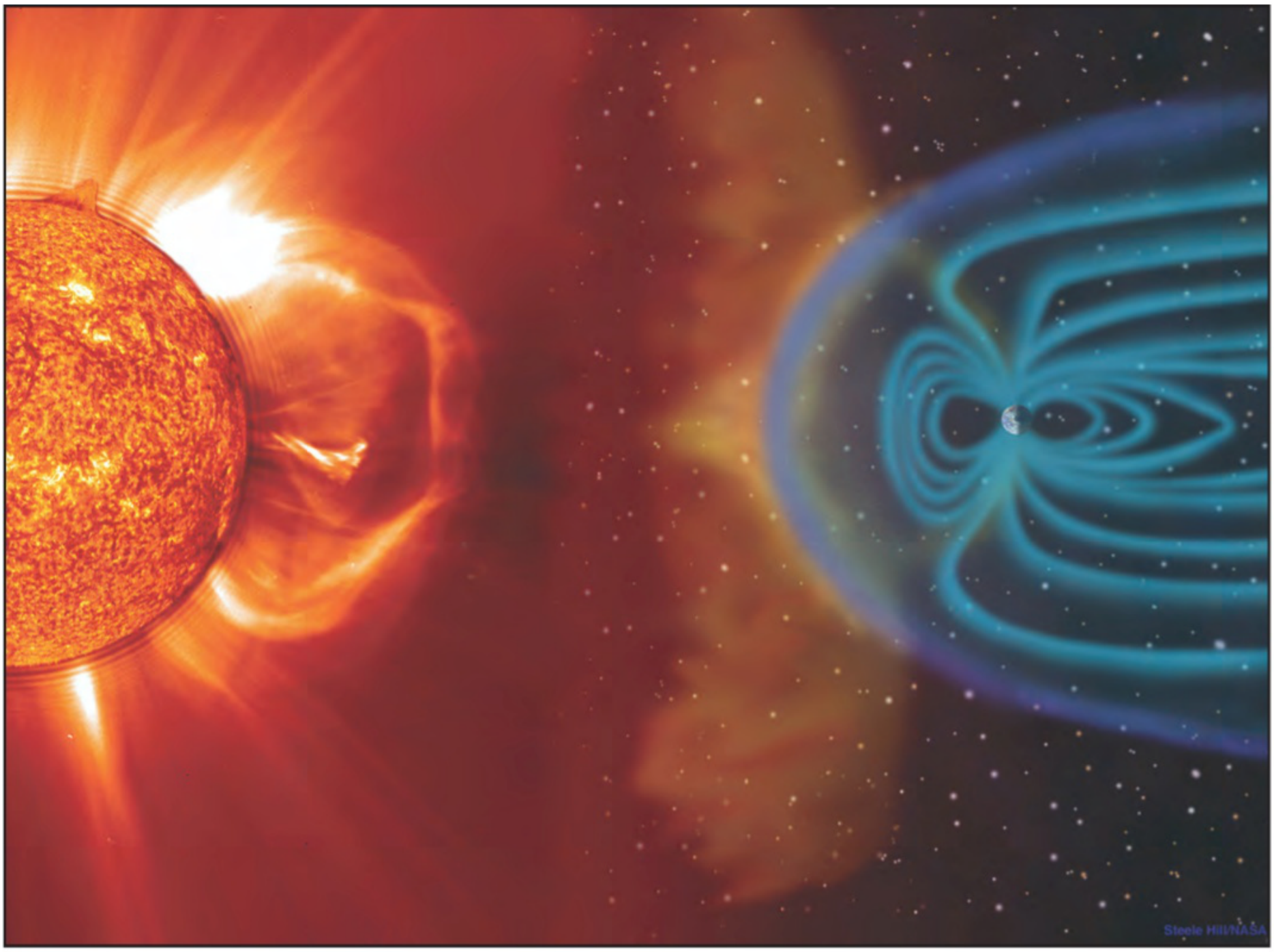

Figure 2. The Sun-Earth Connection. NASA and solar scientists watch the Sun in an effort to better predict space weather — blasts of particles and magnetic field elements from the Sun that impact the magnetosphere, the magnetic bubble around the Earth. Filled by charged particles trapped in Earth's magnetic field, the spherical comet-shaped magnetosphere extends out 40,000 miles from Earth's surface in the sunward direction and more in other directions, especially out away from the Sun and Earth, as the magnetotail. Source: Steele Hill/NASA/SOHO

escaped from coronal holes ride the solar wind at much greater speed than the "quiet" solar wind.

Coronal holes follow the rotation of the Sun, taking about 27 days for a full revolution around the Sun. This means that if the coronal hole lasts long enough, we'll see it influence space weather every 27 days. When a coronal hole survives to make it around a second time, it is said to be "recurrent." Coronal holes, then, are typically long-duration features.

Coronal holes are largest and most stable at or near the solar poles, and are a source of high-speed solar wind. However, those holes situated at or near the solar equator tend to have the greatest impact on the Earth.

The Earth has a magnetic field with a north and a south pole that is enclosed within a region surrounding the Earth called the magnetosphere. As the Earth rotates, its hot core generates strong electric currents that produce the magnetic field, which reaches 36,000 miles into space. The magnetosphere prevents most of the particles from the Sun, carried by solar wind, from impacting the Earth. The solar wind distorts the shape of the magnetosphere by compressing it at the front and causing a long tail to form on the side away from the Sun. This long tail is called the magnetotail.

Geomagnetic disturbances are generated by encounters with southward-oriented magnetic fields of the IMF and solar wind, and the density and speed of the solar wind. The ability of the solar wind to disturb the Earth's magnetosphere is a function of its speed and the strength and orientation of the magnetic fields. In the presence of a strong southward magnetic field component (seen as a B_Z with a negative index), a "connection" is made between the solar wind's magnetic fields and the Earth's magnetic fields (picture two pole magnets, where the north pole of one "connects" with the south pole of the other).

If the coronal hole is positioned along the Sun's equator, and is facing Earth, the plasma and solar particles from the coronal hole will pass by the Earth as the Sun rotates. The enhanced solar wind, dense with the extra solar plasma and with the speed elevations and variations caused by the coronal hole, buffet the Earth. If the magnetic orientation of the solar wind is southward, the coronal-hole-enhanced solar wind causes geomagnetic storms (some with aurora), and degrades ionospheric propagation for days at a time. Because the coronal hole may last long enough to rotate back into Earth-directed position 27 days later, these stormy conditions will recur as well.

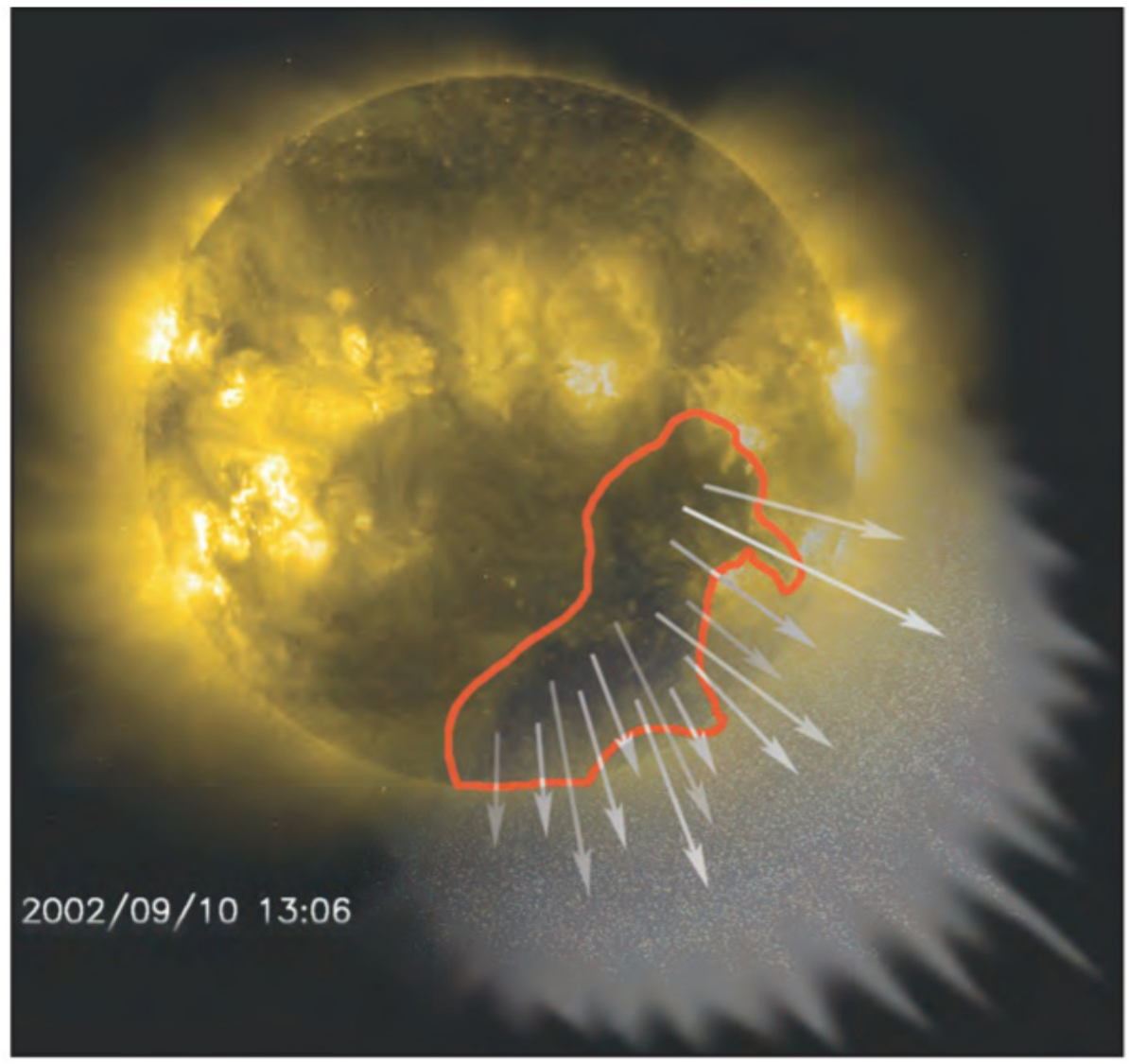

Figure 3. Coronal holes appear as dark areas of the corona when viewed in ultraviolet light. This large hole area seen here on 10 September 2002 had a direct impact on Earth. Coronal holes are often the source of strong solar wind gusts that carry solar particles into space. This one spewed a large stream of charged particles out to our magnetosphere and beyond. Solar wind streams take 2-3 days to travel from the Sun to Earth, so it probably originated from the Sun about 9 September. The magnetic field lines in a coronal hole extend out into the solar wind rather than coming back down to the Sun's surface as they do on other parts of the Sun. Although they are usually located near the poles of the Sun, coronal holes can occur at other places as well (see text). Source: NASA/SOHO →

Geomagnetic activity is measured around the world, and is reported by the "K-index." These worldwide measurements are averaged and combined into the "Planetary K-index" (K_p), which is calculated and reported every three hours. These are then used to calculate each day's "Planetary A-index" (A_p). The higher these indices, the greater the geomagnetic disturbance. The K_p ranges from 0 (no activity; all quiet) to 9 (major storm level). If the K_p rises above 4, it is typical to see aurora; the greater the K_p, the stronger the possible resulting aurora. Of course, the stronger the geomagnetic storm, the greater the degradation to radio propagation on the high frequencies.

The ionosphere is affected by these changes due to the disturbance created by the solar wind. Because the Earth's magnetic field becomes disturbed, with quickly moving and chaotic magnetic field lines, the ionosphere experiences a decrease or even a depletion of ionization. Depressions in ionospheric density cause major communications problems because radio frequencies that previously had been refracting off the ionosphere now punch through. The Maximum Usable Frequency (MUF) on a given radio signal's path can be decreased by a factor of two during an ionospheric storm event (a substorm). Storm effects are more pronounced at high latitudes.

During the declining phase of a solar cycle (as we are in with the current cycle), we see more coronal holes than during

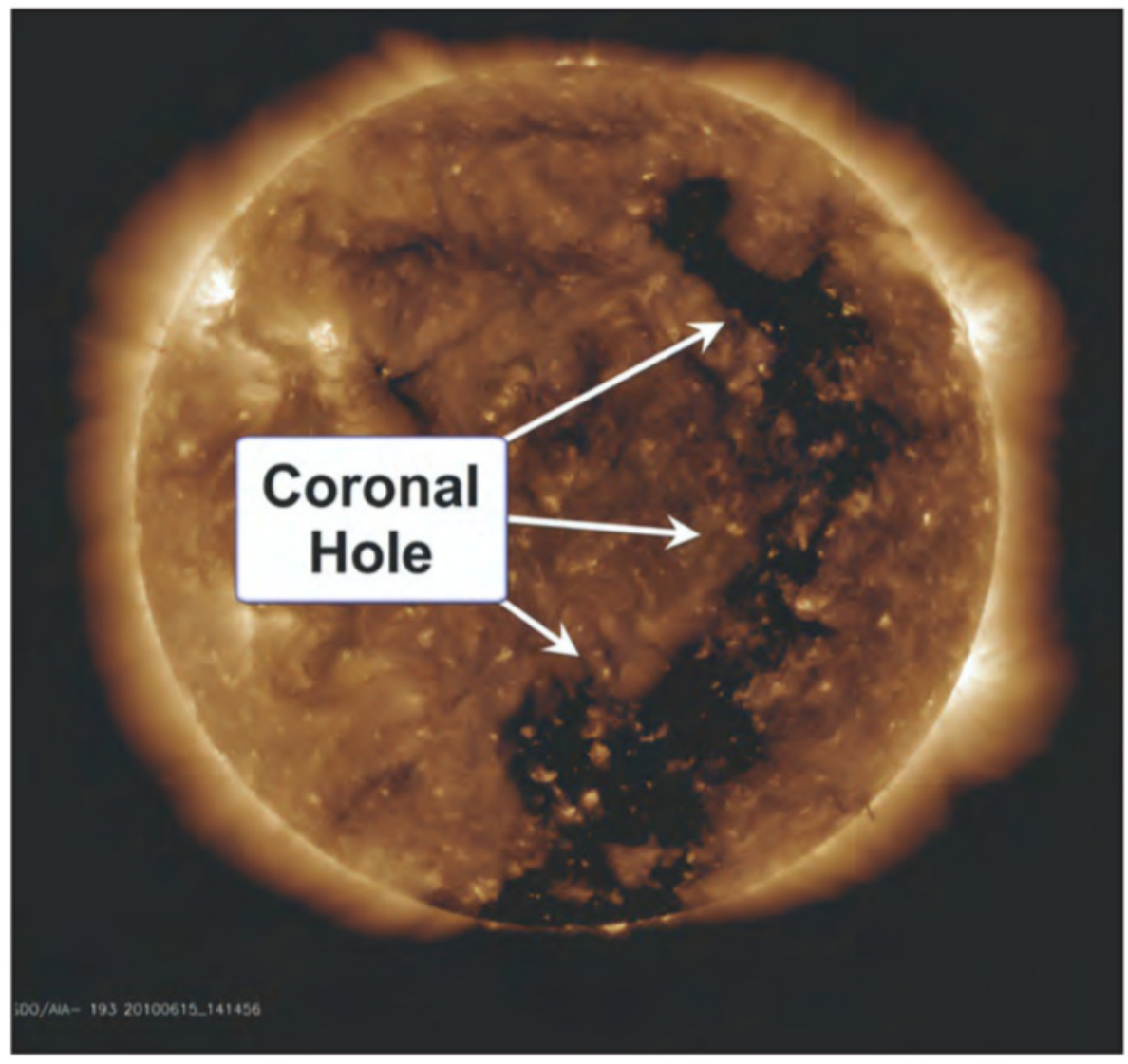

Figure 4. Coronal holes are large regions in the corona that are less dense and cooler than surrounding areas. The open structure of their magnetic field allows a constant flow of high-density plasma to stream out of the holes. There is an increase in the intensity of the solar wind effects on Earth when a coronal hole faces us (see text). Source: SDO/AIA →

the beginning phase of a cycle. At any time, though, geo-effective (Earth-facing) coronal holes are a source of frustration for those involved with shortwave radio communications. Coronal hole activity often contributes to days of very poor propagation on the high frequencies (30 MHz and below). On the other hand, when these geomagnetic storms and aurora occur, VHF may come alive via exotic aurora-mode propagation.

This July, we'll see days when recurring coronal holes may dominate space weather. Solar activity will be low to moderate, so those days affected by coronal holes will likely exhibit poor HF propagation. There may be days when it will be a challenge to hear the station you're hunting for, and for another station to hear your signals.

I've provided live updates of the K_p and A_p indices, as well as other space weather and radio propagation data, at my webpage, <http://SunSpotWatch.com/>. Next month, we'll look at more space weather science. Stay tuned!

HF Conditions

Solar activity is expected to be at about the same level as we observed last year at this time of year — no sunspot activity. This results in low Maximum Usable Frequencies (MUFs). Yes, there might be a sunspot or two, but it is unlikely that we'll see any this month.

Even so, shortwave radio listeners may expect fair openings into most areas of the world throughout the day on 22, 19, and 16 meters, and amateur radio operators may expect the same on 20, 17, and perhaps 15 meters. Through the summer, you can expect propagation between north and south regions during the daylight hours. Twenty through 17 meters will be the strong daytime bands, with 20 (amateur) and 19 (SWL) remaining popular throughout the year. Reception of stations located in tropical or equatorial areas may be possible well into the hours of darkness. For distances between 800 and several thousand miles, expect exceptionally strong signals. Multi-hop signals will be observed.

For the SWLer, 25 and 22 meters will remain open from just before sunrise to a few hours past sunset. From late afternoon to well into darkness, expect these bands to offer worldwide coverage.

Thirty-one meters and the 30-meter amateur band are year-round power bands with outstanding domestic and international paths, around the clock. During periods of low geomagnetic activity this summer, these bands may offer long distance DX all through the night.

OUR READERS SAY...

A Vote For FT8

Editor, *CQ*:

Have just read and re-read my May 2019 issue; you see, I am a new subscriber to *CQ* after a 55+ year drop in my original subscription from my earliest days in ham radio (January,1956).

FT8 (discussed in "Digital Connection," p. 64) has been given a "bad rap" by "amateur radio operator syndrome," a specific disease that affects many of us who are given bad and/or poor information; or when we make that very first contact with a new radio and never again read the user manual.

As noted in the *CQ* May issue, FT8 is *great* for contest operators and/or DX hunters who only need a "hello and goodbye" contact. However, in my experience, roughly one in 10 US stations and one in 20 DX stations will exchange more than the usual two FT8 exchanges. I have had as many as eight exchanges, taking more than just a few minutes, similar to a non-digital CW or voice contact.

Back to the user manual, TX MACROS has the ability to send many 13-digit FREE messages, resulting in more than a "hello and goodbye" contact. I have been on FT8 since January 2018, operating 6-160, including 60 meters, and I am having a good time using my basic station. It does not matter what time of day or night it is when using FT8, as I can always find a band with FT8 signals, resulting in new contacts.

So far, I have 13 prepared 13-digit "free messages" [select TAB 2 located below ERASE on the screen=FREE MSG]. I send one or more of these as the contact dictates, and always end the contact with the built-in 73.

I have no knowledge of other digital modes used, PSK, JT-65, FT-4, FT-9, etc. and I have not yet learned the benefits of using the "waterfall" on my laptop computer—-too busy having fun on FT-8.

In the spirit of ham radio, I hope to read from you and/or work you on FT-8.

47 & 73,
Dennis Moriarty, K8AGB

Digital Connection editor Don Rotolo, N2IRZ, replies:

Hello Dennis,

Welcome back to the hobby. I am sure you'll find some things are changed, but for the most part it's still about people and communicating. Some of the communication tools might be a little different, but soldering irons and PL-259s haven't changed.

Your point that 13 characters can lead to meaningful communications is not incorrect. Indeed, I am sure that I could make myself understood over the distances, a point I alluded to in my article by mentioning that 13 characters every 30 seconds is better than nothing when the chips are down. After all, 20 dB below the noise isn't something trivial: Most modes would be happy to be recognizable 3dB *above* the noise! And, having something so robust definitely removes a lot of the work from making contacts.

Nonetheless you should keep in mind the ham who spends 30 to 45 minutes on a contact - like me. You see, I am not normally an extrovert, and speaking with strangers in person is very stressful for me. A day in the booth at Dayton saps all my energy, and I have to be alone and quiet for a few hours afterwards to recharge. On the air, it's the opposite: I gain energy from hearing about others. It is a great way for me to turn a cruddy day at work into a good one, without resorting to alcohol or drugs, as some do.

I know you're just getting started, and it is not always easy to find back issues of *CQ*, but now that you have everything connected for FT-8, you also have all you need to work PSK-31. While you can't work stations 20 dB below the noise, you don't need a lot of power (10 watts is recommended) to go around the world. Plus, using PSK-31 will give you a much better idea of the value and use of the waterfall display. I highly recommend downloading and installing FLDIGI for this (and several other digital modes). DigiPan is another good program you might consider instead, but having one is as good as the other, and together they are redundant. There is a lot of info on these programs on the Internet, and installation and setup are not difficult. I urge you to give it a try, so you can compare the modes.

If typing isn't your thing - when I switched from 2 fingers to 3 a few years ago, I got 50% faster - PSK-31 software also supports macros just like FT-8. But long ragchews are a lot easier, faster, and technically more challenging. After all, I use radio because it's difficult - if I want a clear and perfect voice connection, I use my telephone.

You mention DMR: I wrote extensively on this mode not that long ago as well.

Thanks for writing, and I wish you well!

Vy 73,
Don N2iRZ

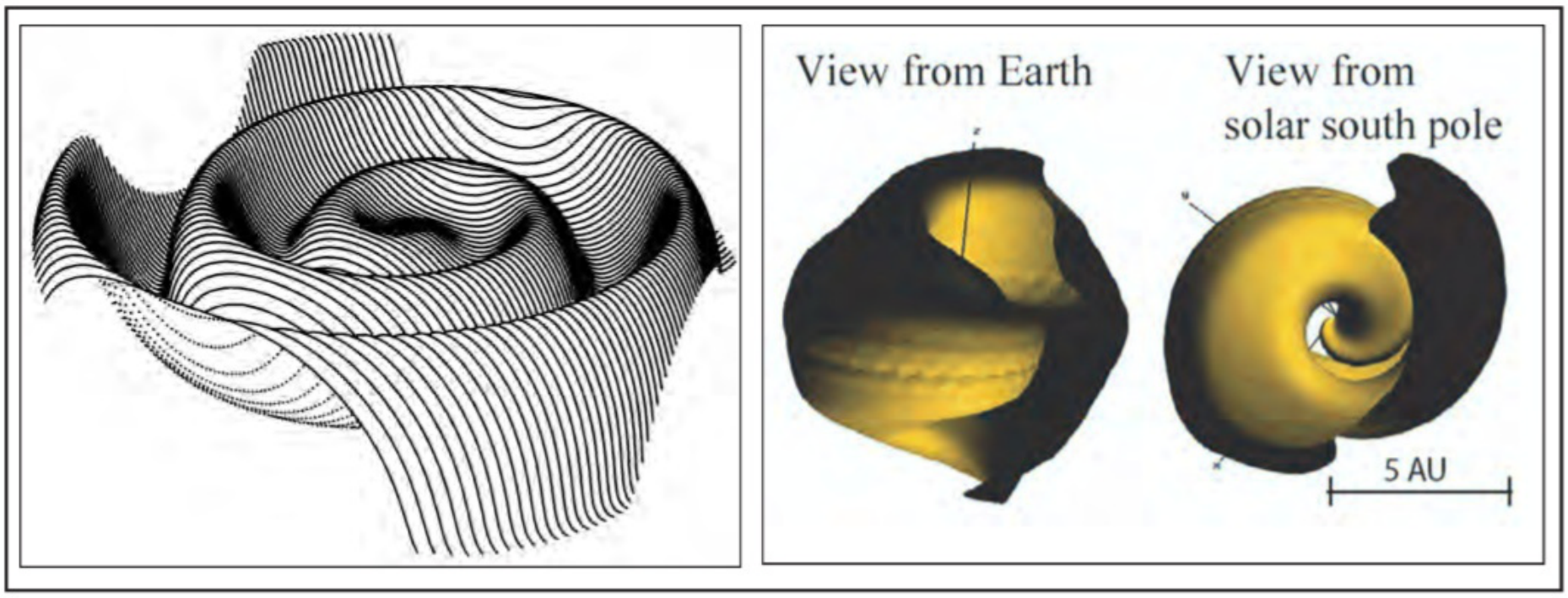

Figure 5a (left). The heliospheric current sheet is shaped like a ballerina's skirt. The sheet extends to the outer reaches of the Solar System, resulting from the influence of the Sun's rotating magnetic field on the plasma in the interplanetary medium. On this sheet ride the solar winds (see text). Credit: J. R. Jokipii, University of Arizona.
Figure 5b (right). The shape of the heliospheric current sheet in March 2000 as calculated by the Blue Horizon supercomputer using data from several spacecraft. Source: NASA

Forty-one and 49 meters offer domestic SWLing propagation during daylight hours and somewhat during the night, and the same on the 40-meter amateur band. The tropical bands (60, 75, 80, 90, and 120 meters) are not noticeably affected by the solar flux, but are degraded during geomagnetic storminess. Through the summer, expect these bands to be more challenging, though less this year than last year. Overall, daytime bands will open just before sunrise, and last a few hours after dark. Look higher in frequency during the day, as these frequencies will be less affected by any solar storms occurring, and more broadcasters have transmissions in these upper bands.

VHF Conditions

July is one of the noticeably more active months of the year for VHF propagation between stations from about 500 to about 3,000 miles apart. Strong signals appear on the lower VHF spectrum, and then quickly fade away. Experienced VHF DXers know this season as the Sporadic-E (E_S) season, and July is in the very peak of the yearly season that begins in May, and ends by September.

E_S propagation affects the highest frequencies of the shortwave spectrum, as well as the lower to (sometimes) mid-VHF spectrum. It occurs most frequently during late spring and early summer. E_S propagation does not typically last very long, but the openings can be quite strong. The key to E_S is the chemistry and physics of Earth's atmosphere.

E_S propagation tends to occur in two peaks during the daylight hours centered on either side of noon. E_S occurrence during the year seems to follow a similar trend, with the main peak in the late summer, and a second but weaker peak occurring in the winter. During the winter peak, E_S is most common just after sunset. The summer daytime peak is in the morning between 7 a.m. and noon, local time. A secondary peak occurs between 8 and 10 p.m. However, observations over many decades show a slightly stronger likelihood of E_S in the morning than in the afternoon or evening. Despite the apparent greater likelihood of E_S in the morning hours, however, this diurnal characteristic is much less noticeable in the day-to-day casual observation of DXers. In addition, check for E_S after dark.

If you use Twitter.com, you can follow @hfradiospacewx for hourly updates that include the K index numbers. You can also check the numbers at <http://sunspotwatch.com>, where this columnist provides a wealth of current space weather details as well as links. Please report your observations of any notable propagation conditions, by writing this columnist via Twitter, or via the Space Weather and Radio Propagation Facebook page at <https://fb.me/spacewx.hfradio>.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for April 2019 was 5.5. The 12-month running smoothed sunspot number centered on October 2018 was 4.1. A smoothed sunspot count of 5, give or take about 5 points, is expected for July 2019.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 72.4 for April 2019. The 12-month smoothed 10.7-cm flux centered on October 2018 is 70.3. The predicted smoothed 10.7-cm solar flux for July 2019 is 66.

The observed monthly mean planetary A-Index (A_p) for April 2019 was 6. The 12-month smoothed A_p index centered on October 2018 was 7.1.

Geomagnetic activity this month should be mostly quiet with fair-to-good propagation conditions, except for those days indicated in the Last-Minute Forecast during which we expect degraded propagation (remember that you can get an up-to-the-day Last-Minute Forecast at <http://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 <www.facebook.com/spacewx.hfradio> and <www.facebook.com/NW7US>. Speaking of Facebook, check out and follow the *CQ Amateur Radio* magazine fan page at <www.facebook.com/CQMag>. *– 73, Tomas, NW7US*

2019 CQWW WPX RTTY Contest Line Scores

Number groups after call letters denote folowing: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. Late logs are listed in Italic. (Note that country names and groupings reflect the DXCC list at the time of the contest.)

SINGLE OPERATOR
NORTH AMERICA
United States-District 1

WK1Q	**A**	**4,091,472**	**1562**	**756**
			(OP:K1MK @K1TTT)	
AK1W	"	2,650,428	1374	621
				(OP:K5ZD)
WV1K	"	2,646,340	1359	614
				(OP:N1IXF)
K1SM	"	692,265	695	399
WX1S	"	423,258	392	318
N1MD	"	380,640	507	305
NC1CC	"	376,030	578	310
AA1O	"	328,950	393	255
W1SS	"	306,660	493	285
KR1CW	"	257,754	406	266
				(OP:W1CTN)
W1TO	"	242,292	340	244
WK1J	"	195,808	339	211
N6EE	"	193,050	249	198
W2DAN	"	190,292	423	226
W1SJ	"	183,920	381	209
NV1Q	"	149,730	322	210
W1HBR	"	131,202	308	222
WA2HIP	"	76,752	231	144
NG1I	"	58,875	209	125
K1RO	"	51,054	197	127
WB1AEL	"	40,341	142	119
K3IU	"	31,240	126	110
KV1J	**14**	**22,374**	**172**	**113**
***W1ARY**	**A**	**415,896**	**565**	**312**
*KB1LRL	"	238,854	394	242
*KA1C	"	232,440	422	260
*NN1D	"	200,859	356	213
*W1DYJ	"	161,408	299	194
*N1API	"	118,784	232	232
*NA1S	"	92,565	209	153
*KG1V	"	83,398	216	161
*AE1T	"	41,890	153	118
*AB1ZQ	"	40,710	166	115
*AA1SU	"	39,055	154	107
*KC1SA	"	36,153	175	117
*W1MJ	"	25,245	135	99
*WA1N	"	3,520	50	44
*K1LHO	"	3,071	47	37
*W1ZFG	"	1,296	28	27
*K1ECU	"	825	16	15
*KJ1J	"	336	14	12
***AB1J**	**14**	**45,675**	**180**	**145**
*K1NZ	"	112	8	8
WK1Q	**A**	**4,091,472**	**1562**	**756**
			(OP:K1MK @K1TTT)	
AK1W	"	2,650,428	1374	621
				(OP:K5ZD)
WV1K	"	2,646,340	1359	614
				(OP:N1IXF)
K1SM	"	692,265	695	399
WX1S	"	423,258	392	318
N1MD	"	380,640	507	305
NC1CC	"	376,030	578	310
AA1O	"	328,950	393	255
W1SS	"	306,660	493	285
KR1CW	"	257,754	406	266
				(OP:W1CTN)
W1TO	"	242,292	340	244
WK1J	"	195,808	339	211
N6EE	"	193,050	249	198
W2DAN	"	190,292	423	226
W1SJ	"	183,920	381	209
NV1Q	"	149,730	322	210
W1HBR	"	131,202	308	222
WA2HIP	"	76,752	231	144
NG1I	"	58,875	209	125
K1RO	"	51,054	197	127
WB1AEL	"	40,341	142	119
K3IU	"	31,240	126	110
KV1J	**14**	**22,374**	**172**	**113**
***W1ARY**	**A**	**415,896**	**565**	**312**
*KB1LRL	"	238,854	394	242
*KA1C	"	232,440	422	260
*NN1D	"	200,859	356	213
*W1DYJ	"	161,408	299	194
*N1API	"	118,784	232	232
*NA1S	"	92,565	209	153
*KG1V	"	83,398	216	161
*AE1T	"	41,890	153	118
*AB1ZQ	"	40,710	166	115
*AA1SU	"	39,055	154	107
*KC1SA	"	36,153	175	117
*W1MJ	"	25,245	135	99
*WA1N	"	3,520	50	44
*K1LHO	"	3,071	47	37
*W1ZFG	"	1,296	28	27
*K1ECU	"	825	16	15
*KJ1J	"	336	14	12
***AB1J**	**14**	**45,675**	**180**	**145**
*K1NZ	"	112	8	8

District 2

K2NV	**A**	**903,150**	**790**	**446**
N2CU	"	701,362	740	386
K2RET	"	610,368	661	374
WS9M	"	568,480	755	352
K2RB	"	515,680	632	352
KB2CKN	"	292,575	492	249
WB2WPM	"	286,620	469	281
WC2L	"	254,358	374	234
W2YK	"	247,687	341	253
WB2PJH	"	174,867	387	231
NT2A	"	98,236	193	164
KE1IH	"	88,060	243	170
W2LE	"	85,470	211	165
K2QB	"	84,838	242	169
W2JK	"	54,016	184	128
KA2AEY	"	38,350	168	118
K2PAL	"	34,452	127	108
K2XA	"	9,512	45	41
KC2LST	"	2,988	42	36
KC2KZJ	"	1,482	21	19
N2MM	**14**	**879,660**	**834**	**486**
WW2DX	"	857,760	819	480
W2DFC	"	3,500	58	50
W2TT	"	3,243	59	47
K2UF	**7**	**206,496**	**290**	**216**
WR2G	"	11,660	58	55
***KF2O**	**A**	**1,067,392**	**733**	**496**
*NY6DX	"	852,550	873	425
*N2HMM	"	633,204	734	396
*KA2D	"	519,183	570	369
*NS2N	"	300,852	441	274
*K2AL	"	260,308	451	236
*WB2COY	"	243,273	440	249
*KC2WUF	"	155,820	315	196
*KS2G	"	149,100	327	210
*WA1FXK	"	143,902	355	211
*AC2OC	"	111,834	272	171
*WA2QAU	"	111,300	302	175
*N2FF	"	86,636	204	179
*WB2NFL	"	82,852	231	154
*K2DAR	"	56,028	164	161
*W2JV	"	52,745	177	137
*ND2K	"	39,804	147	107
*K3UK	"	36,108	165	118
*W2DXE	"	23,166	115	99
*KD2DVW	"	12,610	86	65
*K2TV	"	12,561	92	79
*W2XK	"	9,420	67	60
*AG2AA	"	8,874	68	58
*AH2O	"	6,100	61	50
*K2YR	"	5,883	63	53
*AK2S	"	5,104	55	44
*K1NY	"	3,515	40	37
*AC2QH	"	2,356	33	31
*W2KYM	"	1,980	37	36
*KD2DXJ	"	1,696	35	32
*WO2N	"	1,144	25	22
*KB2URI	"	3	3	3
***KU2M**	**14**	**398,195**	**511**	**367**
*WB2NVR	"	72,160	210	176
*N2YBB	"	62,757	199	171
*N2MUN	"	55,242	202	162
*N1IBM/2	"	16	4	4
***W2VTV**	**7**	**209,720**	**307**	**214**
***K2DFC**	**3.5**	**73,114**	**214**	**139**

District 3

AA3B	**A**	**6,363,225**	**2311**	**857**
N3QE	"	3,576,573	1711	693
W3FV	"	2,817,944	1459	652
KA3GIK	"	2,190,460	1275	620
				(OP:W3FIZ)
K2LNS	"	1,462,447	1084	521
W2CDO	"	1,337,628	969	474
AA3S	"	973,352	867	421
K3MD	"	921,120	875	456
W2GPS	"	494,490	548	318
AB3CV	"	420,985	420	269
N3XL	"	297,184	465	251
NF3R	"	266,252	405	257
WA3AAN	"	214,136	398	232
KW3A	"	206,944	381	223
N8WXQ	"	206,205	404	233
K3AU	"	170,310	325	210
				(OP:K2YWE)
K3PP	"	153,135	290	205
KG4USN	"	131,744	273	184
W8LYJ	"	120,109	273	179
NN3RP	"	79,315	233	145
K3ATO	"	60,060	214	140
N3FJP	"	48,070	154	115
W3GVX	"	40,940	120	92
K3UL	"	36,736	158	128
KC3DRZ	"	32,745	163	111
K3TEF	"	24,832	119	97
WN3I	"	21,080	108	85
N3DUE	"	20,114	110	89
KD3TB	"	11,466	79	63
W3MF	"	3,024	28	28
K3OQ	"	1,188	22	22
4U1WB	**14**	**123,750**	**461**	**225**
				(OP:AJ3M)
NY3B	**7**	**128,128**	**230**	**176**
N3ZP	"	14,396	73	61
***WW3S**	**A**	**959,104**	**813**	**472**
*W3RGA	"	854,700	858	385
*K3RWN	"	491,808	676	327
*N3ATE	"	386,316	490	294
*KB3LIX	"	249,755	413	239
*K3AJ	"	213,192	364	216
*KE3GK	"	205,994	347	254
*K3URT	"	175,112	379	212
*KQ3F	"	138,567	277	209
*KE3ZT	"	121,824	326	188
*K3NDM	"	103,680	283	160
*KA3FZN	"	95,931	229	187
*N3HEE	"	93,073	260	163
*AJ3DI	"	81,322	219	146
*ND3R	"	78,814	211	157
*WA3ZSC	"	75,118	209	142
*AJ3C	"	69,185	208	137
*AB3XJ	"	69,000	182	138
*W3KB	"	59,850	147	133
*K3STL	"	54,696	198	129
*N3CHX	"	40,064	198	128
*N5TB	"	34,814	135	103
*NE3R	"	33,078	149	111
*NC3P	"	29,488	118	97
*NG3Y	"	27,250	159	109
*N3WT	"	25,344	116	99
*AI3KS	"	23,364	119	99
*KA3PMW	"	18,144	111	81
*KN3A	"	17,328	91	76
*N3VN	"	16,942	129	86
*NS3X	"	15,075	102	75
*N3MWQ	"	12,160	98	80
*AB3SX	"	11,830	82	70
*WA3MD	"	10,921	76	67
*N3WMC	"	10,362	95	66
*KX2S	"	6,776	64	56
*N3RDV	"	4,956	48	42
*WS3C	"	4,922	54	46
*W3BUI	"	3,705	42	39
*N3JIX	"	2,340	31	30
*W3DQT	"	1,100	22	22
*AA3EE	"	798	20	19
*K3LT	"	594	23	22
*N3WD	"	532	21	19
*K3UA	"	78	6	6
***W3IDT**	**7**	**83,808**	**207**	**144**
*W3FA	"	2,288	28	26

District 4

K4GMH	**A**	**1,793,704**	**1180**	**484**
N6AR	"	1,590,924	1100	569
NR4O	"	1,349,964	1192	462
K5EK	"	1,342,632	963	516
WS6X	"	1,218,150	1045	450
K4FX	"	1,114,920	937	456
AD4EB	"	1,035,776	981	448
N4QS	"	1,004,625	827	475
AA4DD	"	969,848	922	428
KT4Q	"	890,416	957	464
K8AC	"	864,860	894	415
WJ2D	"	662,075	652	373
N4ZZ	"	601,725	668	355
W1IE	"	593,135	633	379
NS4X	"	519,435	799	315
K4XL	"	519,048	504	324
W4GKM	"	460,600	729	329
AF4RK	"	458,920	622	308
K2WK	"	444,242	533	302
AI4WW	"	411,220	558	290
AD4TJ	"	406,144	556	304
K5VIP	"	397,823	450	313
KA1AF	"	396,900	546	300
WB4YDY	"	392,660	541	290
N4CF	"	380,770	511	290
K4NV	"	354,548	490	302
W1GKT	"	324,318	537	283
K8LF	"	319,658	441	277
W4UK	"	309,600	568	258
K4GM	"	304,896	500	256
KM3U	"	274,833	502	261
KY4NA	"	270,137	401	259
				(OP:KE4KY)
N4CW	"	254,012	317	251
W3SA	"	227,916	426	234
W3YY	"	199,272	298	228
NY4I	"	194,238	366	218
N4WW	"	181,008	353	216
K4KGG	"	151,657	265	187
NR3X	"	150,258	324	237
				(OP:N4YDU)
NI7R	"	144,724	320	194
K4VD	"	133,770	255	182
W2YE	"	117,120	252	192
AA4CF	"	113,032	270	199
K4MI	"	101,440	228	160
K4AFE	"	101,024	259	164
K8KI	"	82,044	247	159
N4BCB	"	75,123	206	153
W4UT	"	64,308	229	138
N2LEE	"	56,914	216	143
N4UEZ	"	51,943	156	127

KC4SAW	"	50,407	205	133
K4RO	"	49,440	204	120
NJ4F	"	24,816	102	88
W4BCG	"	21,165	98	85
W4UEF	"	21,160	121	92
N3KN	"	19,210	104	85
KN4BIT	"	17,355	124	89
NR4C	"	16,960	101	80
WD9GMK	"	15,228	97	81
ND4G	"	12,480	67	64
W4VIC	"	8,832	91	69
WX4W	"	5,665	59	55
KG6MC	"	4,680	46	40
NA4W	**28**	**1,457**	**32**	**31**
				(OP:K4WI)
W9IL	**14**	**51,471**	**174**	**133**
KT4O	"	4,312	44	44
K9OM	**7**	**2,380,644**	**1075**	**603**
K4WW	"	498,324	493	317
WA2PCN	"	1,632	24	24
KT4RR	**3.5**	**374,550**	**514**	**275**
				(OP:W5MX)
***KK9A**	**A**	**3,844,440**	**1931**	**724**
*AA2MF	"	942,028	1021	428
*W4LC	"	663,995	720	395
*AB4SF	"	459,792	572	309
*W4PJW	"	422,712	642	309
*KF4FC	"	422,196	623	302
*KG4IGC	"	342,649	490	277
*K8RGI/4	"	288,850	508	265
*AA4LS	"	286,464	461	256
*KK4HEG	"	272,552	487	248
*KC4WQ	"	263,088	430	261
*KS4YX	"	240,714	446	258
*KW4J	"	233,716	381	238
*KS4S	"	209,397	429	223
*WB4YDL	"	195,720	390	210
*K2PS	"	172,144	351	212
*K2MK	"	153,252	362	198
*NU4E	"	146,880	309	180
*KD4ADC	"	123,192	268	174
*KU4V	"	116,512	276	176
*KM4FO	"	115,710	314	174
*AI4GR	"	111,540	306	169
*K4FJW	"	110,505	288	159
*KJ4M	"	92,904	284	158
*W4TM	"	81,162	250	162
*N3CKI	"	80,640	260	144
*KQ4LA	"	76,587	202	147
*NC4MI	"	71,248	235	146
*K4MIL	"	67,635	195	135
*K4WQ	"	63,315	204	135
*WA8OJR	"	61,134	198	138
*W4JSI	"	59,040	197	144
*K1GU	"	51,118	136	122
*N4UC	"	50,116	187	134
*AE4Y	"	45,313	192	113
*W5VS	"	45,000	150	120
*K2TE	"	42,036	160	124
*W4JHU	"	41,328	148	112
*K4JNT	"	40,768	167	112
*NO4Y	"	36,273	142	113
*AAØO	"	34,662	139	106
*WB8SKP	"	31,411	139	101
*N4AU	"	27,972	130	108
*KN4DXT	"	27,170	135	95
*AA4JQ	"	26,728	129	104
*N1RM	"	26,378	143	109
*KF4QFJ	"	24,464	100	88
*WJ4HCP	"	23,403	123	87
*KA3MTT	"	22,790	137	86
*N5SMQ	"	20,010	105	87
*W4EE	"	19,680	93	82
*WW4DD	"	19,360	92	80
*KC3EF	"	18,675	94	83
*W4DAN	"	17,290	130	91
*W4NBS	"	15,504	79	68
*KY4KD	"	14,600	75	73
*KG3V	"	14,560	69	65
*W4PFM	"	14,058	85	66
*KK4R	"	10,320	73	60
*AJ4UQ	"	10,143	73	63
*NE4EA	"	9,114	55	49
*NQ4K	"	8,835	80	57
*KC4EZN	"	8,024	66	59
*WK9M	"	7,370	61	55
*W4TIJ	"	7,200	57	50
*K4VBM	"	6,720	65	56
*WN8Y	"	6,534	62	54
*N4LF	"	6,200	61	50
*K4KZ	"	5,450	63	50
*AK4HB	"	4,042	56	47
*W4WNT	"	3,648	42	38
*N4TL	"	3,003	42	39
*K4LPQ	"	2,904	38	33
*N9DIX	"	2,898	47	42
*NU4N	"	2,160	36	30
*K3YDX	"	2,079	35	33
*N3CZ	"	2,046	34	31
*KS4X	"	1,820	32	28
*K3KZU	"	1,104	25	23
*KM4MK	"	924	22	22
*KE4QCM	"	540	20	18
*KD4LEM	"	252	12	12
*KX4KU	"	221	13	13
*K4IIY	"	140	10	10
*K4RKY	"	64	8	8
*K4QR	"	42	6	6
*KU4PY	"	2	1	1
***W4UAL**	**21**	**3,354**	**47**	**43**
				(OP:K4CWW)
***W4RRE**	**14**	**40,800**	**160**	**136**
*NØSMX	"	1,053	33	27
***KS4AA**	**7**	**413,400**	**423**	**300**
*WN4AFP	"	84,940	208	155
*KSØCW	"	50,600	143	115
*K4FT	"	29,988	118	98
*KO8V	"	5,292	44	42
*W6SAI	"	3,822	39	39
				(OP:K4CWW)
		District 5		
K5DU	**A**	**2,402,848**	**1771**	**631**
N5HC	"	1,252,679	1190	527
AD5XD	"	1,120,419	1265	459
NT5V	"	1,042,930	1148	470
WM5DX	"	579,348	684	363
W5PF	"	482,436	753	324
AC4CA	"	412,296	579	328
K5XH	"	331,100	584	275
N5XJ	"	330,270	602	303
W2GS	"	217,251	354	239
KE5OG	"	213,157	567	259
K5GZR	"	163,976	389	199
N5DD	"	91,680	239	160
W5NE	"	79,515	284	155
N6GR	"	72,668	243	148
AG5S	"	67,144	265	154
K5CI	"	66,430	214	146
KF5VRD	"	41,114	204	122
WA5LXS	"	32,132	173	116
N5ATM	"	31,992	166	124
KD5R	"	22,264	115	92
KK5I	"	10,160	95	80
				(OP:K5CM)
KK5OQ	"	3,150	36	35
KZ5MM	**28**	**1,680**	**34**	**30**
				(OP:W5PR)
WQ5OO	**7**	**2,371,200**	**1157**	**600**
WBØTEV	"	414,176	513	301
***WB5TUF**	**A**	**451,400**	**686**	**370**
*K8LS	"	376,567	667	289
*NN5T	"	308,610	528	254
*N5KWN	"	300,188	571	284
*K5DHY	"	218,694	455	254
*NN5O	"	159,790	342	190
*KC5WX	"	142,006	434	202
*N5RLM	"	138,128	296	194
*W5CMM	"	119,880	329	180
*AC5AA	"	112,404	364	174
*WØZW	"	111,996	322	183
*W5LA	"	109,431	294	193
*WB5BHS	"	107,085	326	165
*WQ5L	"	106,760	296	170
*AE5P	"	103,360	294	170
*K5WW	"	78,375	333	165
*WA5LFD	"	78,312	269	156
*K5TXM	"	60,060	275	156
*KE5LQ	"	58,801	210	127
*N5EKW	"	55,675	235	131
*N5YT	"	47,291	190	131
*KØGEO	"	45,840	208	120
*K5CRJ	"	44,000	184	125
*WK5T	"	40,608	240	141
				(OP:N2IC)
*KC5RGQ	"	35,712	191	124
*WB5K	"	31,065	159	109
*KF5BA	"	29,044	147	106
*KG5WJZ	"	25,344	124	96
*AF5CC	"	24,459	150	93
*KG5LRP	"	21,808	160	94
*N5KXI	"	21,146	133	97
*WBØRUR	"	14,960	100	80
*AJ4F	"	14,040	105	78
*AD5LU	"	13,527	116	81
*N5XE	"	13,500	96	75
*WA9AFM/5	"	13,280	101	80
*K7ZYV	"	12,312	98	76
*N5UWY	"	8,236	101	71
*KD5J	"	7,668	64	54
*NA5J	"	5,564	59	52
*AE5MM	"	4,108	60	52
*KG5U	"	3,780	56	45
*N5KAE	"	1,584	37	36
***KD5CFB**	**14**	**1,260**	**33**	**30**
***KG5THG**	**7**	**108,896**	**228**	**166**
*K5IB	"	106,760	240	170
		District 6		
WQ6K	**A**	**2,084,808**	**1524**	**596**
				(OP:N6IE)
NW6P	"	1,692,141	1530	517
				(OP:W9KKN)
K9YC	"	1,600,043	1371	503
NB6U	"	892,470	1063	426
				(OP:N6ZFO)
W6SX	"	828,181	1034	389
NF6A	"	510,085	490	289
				(OP:K6XX)
K6TD	"	505,680	796	344
WX6V	"	477,964	647	331
K6OK	"	440,685	664	315
WB6JJJ	"	424,560	702	305
AK6M	"	422,550	744	313
				(OP:K6MM)
N3RC	"	367,040	732	296
N6QQ	"	359,078	519	302
AG1RL	"	343,910	621	289
				(OP:W1SRD)
WE6Z	"	315,840	634	282
W6RC	"	278,384	602	274
NC6R	"	241,530	558	249
K6TQ	"	188,880	526	240
WA6I	"	182,427	478	219
N6HE	"	173,557	434	197
K6EU	"	160,262	384	227
KO6LU	"	149,100	415	210
K6RC	"	137,685	365	201
K5OA	"	134,724	397	206
K6HGF	"	117,055	418	205
NN6XX	"	116,127	401	207
AI6O	"	107,146	286	169
W6OQI	"	106,622	319	178
K6RIM	"	101,032	324	173
NA6O	"	96,496	327	163
K6MI	"	94,221	309	171
W6RKC	"	92,708	261	172
N6WT	"	92,049	296	183
W6IA	"	86,716	271	163
ND2T	"	74,740	314	185
W6TK	"	58,830	226	159
NT6F	"	52,096	207	128
K6ELE	"	51,512	226	137
NE6I	"	48,230	210	130
W6MOB	"	41,992	162	116
NK6A	"	33,840	173	120
AG6AY	"	33,300	164	111
AF6SA	"	33,124	140	98
W6JBR	"	30,870	146	105
K6ZH	"	27,550	109	95
W6GSQ	"	27,378	159	117
W6FB	"	25,900	148	100
KE3BK	"	22,660	150	103
KM6I	"	18,288	111	72
NN6NN	"	15,870	103	69
				(OP:W6XK)
WA6URY	"	11,323	81	67
WU6K	"	7,080	73	59
K6MR	"	5,808	57	48
NJ6G	"	2,838	38	33
K6DAJ	"	2,291	34	29
W6RIG	**14**	**380**	**20**	**19**
WX5S	**7**	**1,640,640**	**1010**	**480**
				(OP:N6DE @W6YX)
***KM6Z**	**A**	**268,319**	**616**	**251**
*NG6O	"	260,355	543	255
				(OP:K6GHA)
*KE6GLA	"	180,978	451	217
*AE6JV	"	103,916	339	166
*N6LL	"	95,931	283	171
*KW6S	"	85,512	271	168
*KE6SHL	"	68,295	263	145
*N6JNL	"	56,290	214	130
*AI6V	"	47,790	248	135
*N6GP	"	40,300	196	130
*KØXB/6	"	28,428	169	103
*K6BIR	"	25,410	158	105
*N2CJN	"	20,250	131	90
*KE6QR	"	18,816	140	98
*W6SR	"	17,974	129	86
*K6MUG	"	16,464	110	84
*AA6MK	"	15,738	123	86
*AG6AG	"	11,792	86	67
*KM6HB	"	10,478	86	62
*KA6W	"	8,357	77	61
*KF6F	"	7,370	77	67
*N6OIL	"	6,200	52	50
*W6SFI	"	4,717	61	53
*N6UTC	"	3,276	51	39
*N9BD	"	2,964	41	39
*K6QCB	"	2,760	49	40
*AJ6CY	"	1,518	27	23
*N5YJZ	"	774	18	18
*WM6T	"	576	23	18
***KF6RY**	**14**	**141,705**	**431**	**235**
				(OP:W6ZL)
*N6BHX	"	620	21	20
*KD6GWH	"	45	5	5
		District 7		
WK7S	**A**	**2,647,040**	**1888**	**640**
				(OP:K6LL)
KO7SS	"	1,453,998	1301	546
WZ7ZR	"	1,053,504	936	472
				(OP:W7ZR)
W7YAQ	"	993,738	1043	437
WA7AN	"	978,147	1216	433
				(OP:K9DR)
K7AR	"	576,288	718	368
N9NA	"	542,188	827	356
WC7Q	"	418,806	766	318
W7XQ	"	354,300	651	300
W7VO	"	336,753	671	279
W7CT	"	247,345	466	259
KI6QDH	"	241,175	528	275
WU6W	"	231,710	517	235
K7JQ	"	199,836	489	234
WR7Q	"	196,666	514	214
AK7O	"	194,640	512	240
N7UVH	"	193,600	556	242
W7QDM	"	185,313	421	223
KZ1W	"	169,884	336	198
K7GS	"	165,770	381	242
AD7XG	"	126,690	296	206
K7BVT	"	103,228	301	197
KN7K	"	81,840	276	165
W7VXS	"	77,506	248	143
W7BP	"	58,976	233	152
NG7M	"	58,725	215	145
KO7I	"	52,752	252	157
KX7L	"	47,790	212	135
K6UM	"	45,864	189	126
K7EG	"	40,626	143	122
KB7AZ	"	37,823	176	109
KT7G	"	29,484	153	108
W7ZB	"	28,512	138	108

KØIP	"	27,913	140	103
N7EPD	"	27,820	138	107
K2RD	"	26,892	115	83
KM6CQ	"	24,087	145	93
N7NM	"	20,367	135	93
W7WP	"	17,934	123	98
KØJJ	"	14,134	99	74
W7SLS	"	12,880	102	70
KY7M	"	10,875	108	87
KF7U	"	8,236	75	58
WG7X	"	5,520	64	48
W9PL	"	3,556	38	28
W6OAT	"	1,656	28	24
AA7V	**14**	**172,974**	**446**	**254**
W7PU	"	51,883	257	169
K7XC	"	7,869	66	61
KI7DG	"	4,590	63	54
K7HPT	"	3,825	46	45
K8IA	**7**	**1,334,742**	**983**	**447**
N6SS	**3.5**	**373,632**	**529**	**278**
KW7MM	"	96,600	267	161
***K7TQ**	**A**	**299,088**	**613**	**268**
*W8WOM	"	253,500	649	250
*AK6A	"	179,316	402	204
*W7CD	"	167,760	409	233
*N7ESU	"	91,816	338	184
*W7CO	"	70,686	268	154
*NG7Z	"	54,981	271	149
*N7ZUF	"	54,208	229	154
*K7AZT	"	46,863	198	123
*N7XCZ	"	44,958	202	127
*W7WSV	"	38,759	179	113
*NE7O	"	37,120	192	116
*K7VAP	"	34,720	179	124
*N7VS	"	34,521	163	111
*AA4Q	"	33,784	171	103
*N1JM	"	33,245	174	109
*AF7NX	"	31,058	154	106
*WA7YAZ	"	28,994	152	109
*K7RR	"	28,160	161	110
*WS7V	"	26,532	127	99
*K6DGW	"	26,316	160	102
*WAØWWW	"	25,092	153	102
*KB7ABJ	"	22,264	122	88
*KD7RUS	"	21,462	158	98
*KF7GMV	"	18,758	126	83
*KB7AK	"	16,878	133	87
*N7AME	"	16,638	129	94
*KC7V	"	15,800	101	79
*WQ3U	"	14,948	100	74
*WA7SHP	"	14,696	118	88
*K7MY	"	14,596	105	89
*N7NTQ	"	14,457	103	79
*K7MK	"	12,956	98	82
*K6ST	"	12,160	100	76
*WA7BRL	"	11,935	104	77
*KJ9C	"	9,588	69	68
*N7UJJ	"	8,568	96	72
*K7RBT	"	8,320	77	64
*K7GGG	"	7,440	62	60
*KK7MA	"	7,424	68	58
*KE7GKI	"	6,496	66	56
*WA7CPA	"	5,264	72	56
*AF7QD	"	4,815	54	45
*K7JSG	"	4,418	50	47
*N7GOA	"	2,856	44	42
*K7CCC	"	2,774	43	38
*K7MM	"	1,325	27	25
*N7JI	"	1,100	26	25
*KU7Y	"	975	27	25
*KW7WP	"	925	29	25
*KR7X	"	819	25	21
*N7VEA	"	510	18	17
***NK9I**	**14**	**30,870**	**209**	**126**
*W7JSD	"	1,536	39	32
*AA7EA	"	896	28	28
*WB7BWZ	"	364	15	14
***K7HKR**	**7**	**20,000**	**90**	**80**
*WB3JFS	"	19,440	88	72
*AG7CC	"	468	14	13
***KU7T**	**3.5**	**11,926**	**78**	**67**
		District 8		
N8BJQ	**A**	**1,828,528**	**1179**	**596**
W8TWA	"	685,410	703	402
N8CWU	"	574,228	776	356
NQ8O	"	311,589	484	267
K8RCT	"	211,395	412	255
AB8RL	"	184,260	353	222
WA8MCD	"	176,410	390	230
KA8G	"	153,081	335	219
W8JWN	"	137,632	311	187
K8PK	"	132,300	280	196
KD8FS	"	48,706	192	142
W8KEN	"	43,818	144	109
KF8MZ	"	35,192	156	106
KE8Y	"	30,996	151	108
W8AKS	"	26,462	120	101
WX8C	"	13,132	87	67
W8CAR	"	6,954	84	61
KC8VC	"	16	4	4
KG9Z	**14**	**3,450**	**50**	**46**
K8YE	**3.5**	**26,208**	**118**	**91**
***K3JT**	**A**	**390,728**	**641**	**289**
*KE3K	"	331,338	546	294
*NX8G	"	327,744	515	288
*N8VV	"	176,660	310	242
*N8FYL	"	176,472	392	216
*AA8OY	"	124,656	294	196
*WB8JUI	"	102,422	282	166
*KD8AJK	"	97,513	264	169
*K8AJS	"	78,186	206	157
*WA8KAN	"	76,050	256	150
*KB8TL	"	69,788	219	146
*AA8SW	"	50,800	191	127
*K8SIA	"	47,388	178	132
*N8TCP	"	46,996	165	124
*W8EH	"	34,632	170	111
*K8ZR	"	25,228	127	106
*K8LY	"	21,576	120	87
*AC8JW	"	19,758	121	89
*N4EL	"	18,480	138	88
*N8CM	"	18,480	105	80
*K7DR	"	17,958	102	82
*NV8N	"	13,804	98	68
*WA8YVF	"	13,359	91	73
*WA8RR	"	8,235	75	61
*KD8VMM	"	6,370	50	49
*NF8M	"	4,708	52	44
*AE8TF	"	3,740	51	44
*AA8MA	"	1,288	29	28
*K8GT	"	832	19	16
*KD8COO	"	220	11	11
***KK8MM**	**7**	**148,104**	**311**	**198**
		District 9		
W9IU	**A**	**1,936,792**	**1280**	**572**
N2BJ	"	1,384,734	1136	533
AC9S	"	704,880	812	396
WT9U	"	621,030	696	381
W9OA/9	"	335,880	431	311
WE9V	"	314,916	435	276
WT2P	"	291,750	525	250
KZ9DX	"	188,032	406	226
AA9BD	"	128,880	293	179
K9JWI	"	112,112	302	176
KEØYI	"	99,280	283	170
N9OK	"	97,686	257	162
N9LD	"	57,408	190	138
AG9S	"	51,262	159	142
KC9EOQ	"	38,533	179	113
K9NW	"	38,456	112	92
NJ9R	"	16,614	97	78
KC9K	"	6,864	54	52
NX9G	"	1,540	33	28
W9ILY	**14**	**337,625**	**431**	**365**
W9PA	**7**	**373,920**	**394**	**304**
KC9EE	"	137,616	315	183
AD9I	**3.5**	**1,984**	**31**	**31**
**K9NR*	*A*	*1,067,472*	*1148*	*432*
***N9CK**	**"**	**347,820**	**464**	**310**
*K9CW	"	326,880	542	288
*W9JWC	"	320,597	579	263 (OP:KD9LSV)
*AIØY/9	"	319,808	586	263
*K9IG	"	256,785	405	265
*WB9TFH	"	232,532	482	244
*N9SJ	"	217,920	405	227
*KOØZ	"	202,410	400	234
*KW9U	"	172,515	340	217
*KG9X	"	142,295	370	191
*N9LQ	"	127,092	307	178
*AA9L	"	112,056	313	184
*N9VPV	"	107,970	279	177
*K9PY	"	84,168	242	167
*W9TAM	"	77,592	248	159
*WA9LEY	"	61,984	223	149
*N9SB	"	56,342	220	143
*WD9CIR	"	54,400	193	128
*KC9WIB	"	46,860	196	132
*N9KJU	"	44,722	183	118
*N9UA	"	44,187	143	143
*KB9DVC	"	39,852	189	123
*K9LC	"	39,751	178	127
*W9KG	"	39,672	162	114
*KE9UA	"	37,296	150	111
*K9AWM	"	34,424	156	104
*K9QQ	"	33,390	153	106
*N9YLZ	"	32,436	140	102
*W9VQ	"	26,880	116	105
*NR9K	"	26,600	131	100
*N9WG	"	24,735	105	85
*KU9Z	"	24,717	126	107
*N9ID	"	23,634	133	101
*N9LJX	"	16,352	101	73
*N9LYE	"	15,246	106	77
*KB9OWD	"	9,112	80	68
*N9BT	"	7,336	68	56
*W9SE	"	2,752	50	43
*K9PG	"	1,932	28	23
*KC9PKF	"	525	20	15
*WB8RFB	"	50	5	5
**N9TF*	*14*	*40,588*	*146*	*146*
***KK9DX**	**"**	**33,360**	**145**	**120**
*KB9S	"	11,004	108	84
***WK9U**	**7**	**324,480**	**519**	**260**
*W9AKS	"	61,372	200	134
*NE9M	"	31,350	155	95 (OP:KEØL)
*KC9YL	"	50	5	5
*KG9IL	"	30	5	5
***WB8BZK**	**3.5**	**266,960**	**480**	**235**
*AB9YC	"	55,620	174	135
*W9RF	"	26,040	115	84
		District Ø		
ACØC	**A**	**4,734,210**	**2329**	**793**
KZØUS	"	2,256,961	1548	641 (OP:W7RY)
N7WY	"	1,522,855	1331	515
KRØP	"	1,367,089	1421	493
KI6DY	"	1,317,833	1263	517
NØXR	"	1,205,804	1076	502 (OP:@NØNI)
KIØF	"	937,265	1075	427
KØKX	"	926,590	655	427
WØMB	"	608,400	875	360
NØAT	"	526,592	762	352
W5AP	"	498,560	614	328
NØBUI	"	344,322	596	282
WRØH	"	333,025	537	275
KØWA	"	313,600	608	280
KØJJR	"	242,952	318	318
KØAD	"	223,016	531	244
NOØL	"	172,356	415	212
NØKQ	"	147,936	394	201
NUØW	"	111,554	306	193
KØTLG	"	99,102	358	199
WØVM	"	98,091	265	189
NFØN	"	87,780	260	165
KØTC	"	83,106	289	162
NØAJN	"	22,704	109	88
KØVG	"	16,019	108	83
WBØWIV	"	9,306	70	66
KSØAA	**7**	**280,374**	**498**	**249**
K7SCX	"	196,656	306	204
KØAP	"	63,020	196	137
NØOK	**3.5**	**31,878**	**134**	**99**
***K7MKL**	**A**	**160,425**	**441**	**207**
*WTØO	"	132,090	394	210 (OP:KØTI)
*WBØN	"	129,024	331	192
*WXØZ	"	125,625	300	201
*NØCDA	"	124,434	412	223
*AD1C	"	113,712	251	184
*WØDC	"	87,672	304	156
*WBØMCO	"	71,540	246	140
*WZØW	"	68,688	249	144
*WAØBSW	"	66,555	237	145
*NØGOS	"	50,828	252	131
*NNØG	"	44,980	200	130
*KØYB	"	44,289	202	133
*NØLLH	"	33,166	145	103
*ACØE	"	30,738	155	109
*KEØPX	"	26,442	183	113
*N5TU	"	21,472	104	88
*WAØLIF	"	20,072	140	104
*KØRC	"	19,440	128	81
*NYØJ	"	13,572	104	78
*KDØWUQ	"	12,792	104	82
*AAØK	"	11,780	96	76
*WB9QAF	"	4,998	60	49
*NRØL	"	4,653	53	47
*KØJP	"	2,881	49	43
*AAØYY	"	1,200	25	24
*KØTNT	"	775	26	25
*KEØBRZ	"	150	10	10
*KCØFUE	"	35	5	5
***WSØI**	**14**	**31,374**	**177**	**126**
*AEØDM	"	609	24	21
*KFØIQ	"	510	15	15
***ADØTZ**	**7**	**1,092**	**21**	**21**
***KEØSTT**	**3.5**	**8**	**2**	**2**
		Alaska		
KL7SB	**A**	**696,377**	**797**	**319**
AL7LO	"	105,930	260	165
KL7JVD	"	66,679	211	131
KL2R	*14*	*52,955*	*197*	*119 (OP:N1TX)*
		Belize		
V31FO	**A**	**159,954**	**218**	**159 (OP:DH8BQA)**
V37DX	**14**	**2,396,328**	**1497**	**696 (OP:DH8BQA)**
***V31AT**	**A**	**21,970**	**79**	**65**
		Canada-District 1		
VA1XH	**A**	**1,138,440**	**744**	**424**
***VE1RSM**	**A**	**200,070**	**292**	**190**
***VE1OP**	**7**	**112,420**	**171**	**146**
		District 2		
VE2FXL	**A**	**1,288,686**	**883**	**427**
VE2GSO	"	1,209,780	910	423
VE2FK	"	604,252	582	341
VE2SCA	"	27,846	99	91
VE2RYY	**14**	**1,051,974**	**850**	**506**
VE2EBK	**7**	**452,212**	**406**	**262**
***VE2BVV**	**A**	**791,056**	**646**	**392**
*VE2DSB	"	200,508	326	231
*VE2PI	"	165,490	306	190
*VA2QR	"	130,720	248	172
*VE2QV	"	65,098	189	121
*VE2CSM	"	54,692	148	113
*VA2FW	"	32,242	125	94
*VA2CZ	"	29,798	118	94
*VO2AC	"	2,604	32	28
***VE2NCG**	**14**	**37,723**	**150**	**119**
		District 3		
VE3NNT	**A**	**609,631**	**563**	**353**
VE3UTT	"	190,848	250	192
VE3SS	"	113,197	229	157
VA3PC	"	109,252	206	191
VA3WW	"	32,310	125	90
VE3EEJ	"	19,434	88	82
VE3MZD	"	11,658	72	67
VE3FJ	**14**	**87,864**	**229**	**168**
VE3GYL	**7**	**184,072**	**257**	**173**
VE3NZ	**3.5**	**425,500**	**416**	**250**
***VA3DF**	**A**	**2,086,236**	**1100**	**564**
*VE3DZ	"	1,343,160	894	455
*VE3PJ	"	446,630	504	295
*VE3JI	"	429,286	497	286

*VE3CV	"	319,280	404	260
*VE3LVW	"	233,590	365	235
*VE3BR	"	147,420	267	162
*VA3MJR	"	114,570	242	134
*VE3XNS	"	88,064	213	128
*VA3WB	"	87,265	215	155
*VE3SST	"	73,250	202	125
*VE3PQ	"	71,375	184	125
*VA3IK	"	63,602	169	118
*VE3XAT	"	18,960	85	79
*VE3FZ	"	18,352	93	62
*VE3SCN	"	10,304	66	56
*VA3JHQ	"	10,192	74	56
*VE3FWF	"	4,672	35	32
*VA3FN	"	1,620	23	20
*VE3EJ	"	1,380	25	23
***VE3TM**	**14**	**166,852**	**303**	**236**
*VE3CWU	"	4,515	51	43
District 5				
VE5MX	**A**	**4,748,328**	**2246**	**684**
District 6				
VE6BBP	**A**	**822,120**	**876**	**340**
***VA6RCN**	**A**	**43,610**	**158**	**98**
District 7				
VA7ST	**A**	**852,192**	**922**	**352**
VA7FC	"	429,216	601	272
VE7IO	"	328,647	498	253
VA7RN	"	107,172	310	156
VE7SZ	"	102,672	237	144
VE7BC	"	18,544	96	76
VA7KO	"	11,008	68	64
VE7CC	**3.5**	**305,592**	**356**	**214**
***VE7KAJ**	**A**	**79,560**	**243**	**156**
*VA7MAY	"	45,202	139	97 (OP:@VA7MM)
*VE7JMN	"	6,916	61	52
*VE7BGP	"	4,180	45	44
District Ø				
VYØERC	**A**	**233,766**	**348**	**222 (OP:VE1RUS)**
Costa Rica				
***TI2OY**	**A**	**616,050**	**652**	**333**
Cuba				
***CO6RD**	**A**	**865,908**	**735**	**359**
*CO2RQ	"	387,972	394	234
*CM7OK	"	139,920	214	165
*CO2YQ	"	125,400	225	165
*CO2ER	"	13,216	64	59
*CO8BYT	"	2,220	40	37
***CO2AJ**	**14**	**63,492**	**203**	**148**
***CM8NMN**	**7**	**135,150**	**198**	**159**
Dominican Republic				
HI8PJP	**A**	**48,972**	**187**	**132**
Grenada				
***J35X**	**7**	**421,400**	**388**	**245**
Guadeloupe				
TO7D	**A**	**413,896**	**377**	**266**
Guatemala				
TG9IN	**A**	**123,349**	**289**	**173**
TG9AXF	"	121,635	233	153
***TG9ANF**	**A**	**1,114,232**	**989**	**404**
*TG9ADQ	"	159,774	342	186
Mexico				
XE1HG	**A**	**500,992**	**630**	**304**
XE1EE	**14**	**56,565**	**206**	**135**
***XE2FGC**	**A**	**241,173**	**418**	**211**
*XE2B	"	104,310	242	183
*XE2YWB	"	98,420	222	148
*XE2AD	"	73,980	195	135
*XE2AU	"	48,640	161	128
*XE1CT	"	46,434	159	109
*XE1CQ	"	42,210	168	105
*XE1USG	"	29,216	109	83
***XE2OK**	**7**	**175,440**	**253**	**170**
Puerto Rico				
KP4/K6DTT	**A**	**1,320,042**	**715**	**453 (OP:K6DTT)**
***KP4JFR**	**14**	**11,222**	**69**	**62**
***KP3LH**	**7**	**369,846**	**370**	**243** (OP:KP3LR)
*WP4WW	"	31,600	89	79 (OP:KP4JRS)
St. Kitts & Nevis				
***V4/W3UL**	**A**	**209,145**	**344**	**219 (OP:W3UL)**

AFRICA

Canary Islands				
EA8DED	**A**	**24,396**	**91**	**76 (OP:OH2BP)**
ED8W	**14**	**2,158,180**	**1202**	**610 (OP:EA8DO)**
***EF8O**	**A**	**962,340**	**640**	**373 (OP:DJ1OJ)**
*EA8PT	"	917,228	650	403
*EA8AQV	"	170,405	235	173
***EA8BGO**	**14**	**56,573**	**154**	**139**
Ghana				
***9G2HO**	**14**	**21,420**	**91**	**84 (OP:9G5SA)**
Madeira Islands				
***CT3FW**	**14**	**57,288**	**148**	**132**
Morocco				
***5C5W**	**14**	**1,573,769**	**985**	**541 (OP:CN8KD)**
South Africa				
***ZS6C**	**A**	**3**	**1**	**1**

ASIA

Asiatic Russia - District 9				
RK9AX	*A*	*1,986,127*	*975*	*473*
UC8U	**"**	**876,534**	**720**	**417**
RA9AEA	"	716,472	537	321
RO9A	"	644,385	529	357
RA9SN	"	187,008	281	192
RM9I	"	107,164	176	146
R9CD	**14**	**65,250**	**161**	**145**
RT8O	"	40,356	132	114
RK9AY	**7**	**330,052**	**281**	**218**
UA9TO	"	2,596	22	22
***RT9S**	**A**	**3,490,368**	**1386**	**588**
*RA9AU	"	1,949,360	1070	472
*RZ9AD	"	1,029,802	685	367
*R9AAL	"	132,114	223	194
*RL9I	"	101,260	198	166
*RK9UE	"	57,984	165	128
*RK9DO	"	45,500	122	100
*RZ9UO	"	22,274	99	86
*UB8QAR	"	1,975	25	25
***R9SN**	**14**	**508,724**	**530**	**356**
*UF8T	"	83,916	191	162
*RA9AFZ	"	43,440	128	120
*R8LO	"	12,512	70	68
*RA9UEP	"	987	21	21
*RA9MLR	"	363	11	11
*RC9W	7	3,510	29	27
District Ø				
UAØOK	**A**	**240,096**	**373**	**246**
RUØLL	"	182,451	349	183
UAØZK	"	90,576	251	136
RAØQD	"	62,976	180	128
RDØA	**14**	**576,459**	**601**	**379**
UCØA	"	388,364	470	316
UAØSR	"	289,130	404	290
RMØW	"	132,912	257	208
RYØA	"	76,500	194	153
RAØAM	"	23,040	98	90
RAØFF	**7**	**123,540**	**191**	**142**
UAØAGI	**3.5**	**90,972**	**134**	**126**
***RWØSR**	**A**	**222,410**	**331**	**230**
*RØUT	"	114,896	255	167
*RØCD	"	54,778	211	122
*UAØZEO	"	37,044	160	84
*UAØZC	"	29,853	119	93
*RØAS	"	12,240	65	60
*UIØA	"	11,704	63	56
*RØCK	"	4,847	55	37
***RØCW**	**14**	**74,646**	**249**	**143**
*RQØC	"	35,956	175	101
*RWØAJ	"	15,554	82	77
*RØSBZ	"	7,980	62	57
***RAØACM**	**3.5**	**12,150**	**49**	**45**
*RAØWHE	"	132	6	6
Asiatic Turkey				
TA3LKC	**7**	**12,936**	**52**	**49**
TA4CS	"	3,456	27	24
***TA7I**	**A**	**1,255,680**	**688**	**384**
*TA7OYG	"	826,848	537	319
*TA4RC	"	65,817	121	103
*TA4SO	"	1,908	18	18
***TA7AL**	**21**	**774**	**19**	**18**
***TA4PR**	**14**	**28,060**	**105**	**92**
*TA7AMF	"	91	7	7
China				
BD3CB	**A**	**227,934**	**367**	**201**
BA7QT	"	13,420	107	61
BG5IFW	**14**	**12,606**	**90**	**66**
BG1DX	**7**	**18,960**	**72**	**60**
***BA1PK**	**A**	**127,710**	**256**	**165**
*BD7OXR	"	125,664	281	154
*BH6KWC	"	41,019	152	113
*BA5AB	"	8,733	48	41
***BA3MM**	**14**	**91,936**	**238**	**169**
*BD5BPA	"	19,929	130	73
*BD4UJ	"	16,685	111	71
***BG8NNG**	**7**	**34,128**	**90**	**79**
*BH4OUF	"	2,750	32	25
*BH4WPN	"	204	6	6
*BG6SNJ	"	156	6	6
Cyprus				
***H2X**	**14**	**427,350**	**457**	**330 (OP:5B4ALX)**
India				
VU2DED	**A**	**199,310**	**276**	**190**
VU2ZMK	"	95,172	199	154
VU2IBI	"	35,696	114	97
***8T8S**	**A**	**48,990**	**137**	**115 (OP:VU2AE)**
*VU2EEI	"	4,256	36	32
*VU2DCC	"	225	9	9
VU2YQ	*14*	*7,473*	*54*	*53*
Israel				
***4Z5MY**	**14**	**264**	**11**	**11**
Japan-District 1				
JF1OPL	**A**	**976,332**	**748**	**413**
JM1XCW	"	724,724	622	364
JN1THL	"	480,810	511	282
JA1AYO	"	323,323	423	247
JF1LMB	"	219,504	311	204
JH1RFM	"	213,525	305	195
JR1EMO	"	148,789	257	191
7L4IOU	"	123,508	244	154
JA1QOW	"	116,160	222	165
JH1OAI	"	101,760	207	159
JH1CTV	"	94,952	208	143
JA1SJV	"	92,250	184	150
JJ1NYH	"	88,892	168	142
JI1TSH	"	15,946	84	67
JA1WSK	"	14,688	69	54
JR1BAS	"	13,475	65	55
JS1NDM	"	5,832	38	36
JH1XUM	**14**	**81,012**	**190**	**157**
7K4VPV	"	67,792	176	152
JK1LUY	"	6,480	51	48
JH1BIU	"	555	15	15
JE1LFX	**7**	**43,648**	**111**	**88**
JA1PIG	"	2,684	22	22
***JH8KYU/1**	**A**	**859,875**	**672**	**375**
*7N2UQC	"	330,336	452	248
*JM1MTE	"	303,178	382	241
*JA1IZ	"	100,566	209	151
*JE1RRK	"	84,960	191	144
*JF1WNT	"	63,041	168	121
*JA1SCE	"	61,755	179	115
*JA1DDZ	"	45,900	127	102
*JH1KYA	"	42,642	124	103
*JA1AZR	"	42,085	147	95
*JA1PCM	"	38,830	128	110
*JI1AVY	"	36,320	106	80
*JA1IE	"	33,215	120	91
*JA1HFY	"	31,304	140	91
*JA1XS	"	29,160	111	90
*JQ1CIV	"	27,666	102	87
*7K1III	"	25,425	109	75
*7K1PYG	"	24,846	105	82
*JA3GZE/1	"	20,793	112	87
*JJ1KZZ	"	17,810	70	65
*JS1KKY	"	12,320	67	55
*JQ1COB	"	11,554	72	53
*JR1AQI	"	11,480	73	56
*JF1WCK	"	10,836	81	63
*JL1QDO	"	10,600	60	53
*7N4JXR	"	6,150	56	50
***JF1OVA**	**28**	**80**	**6**	**5**
***JI1BBN**	**21**	**1,122**	**23**	**22**
*JA1DBG	"	760	20	19
***JF1TEU**	**14**	**59,631**	**169**	**139**
*JA1UII	"	52,197	151	137
*JK1HIY	"	14,214	72	69
*JK1NSR	"	1,960	28	28
*JE1GZB	"	1,782	30	27
*JF1CKO	"	1,219	26	23
*JA1JNM	"	1,166	22	22
*JH1WOY	"	171	9	9
*JL1CNY	"	84	6	6
*JR1LNM	"	55	5	5
***JA1GQC**	**7**	**10,998**	**52**	**47**
*JH1APK	"	5,340	33	30
District 2				
JA2XYO	**A**	**708,750**	**595**	**350**
JA2FSM	"	347,423	431	263
JG2REJ	"	273,360	344	240
JA2AXB	"	85,974	181	138
JR2PMT	"	63,665	153	119
JF2FIU	"	29,316	117	84
JR2BCF	**14**	**4,680**	**45**	**39**
JH2BTM	**7**	**21,080**	**62**	**62**
***JE2BOM**	**A**	**52,530**	**142**	**103**
*JA2GHP	"	31,383	122	99
*JR2MIO	"	17,629	82	61
*JE2CPI	"	4,389	38	33
*JA2QWN	"	675	15	15
***JH2MYN**	**21**	**4,746**	**48**	**42**
***JA2JNC**	**14**	**27,225**	**112**	**99**
*JR2MIN	"	10,773	72	63
*JA2KCY	"	6,000	53	48
*JK2AQT	"	2,025	28	27
*JA2HYD	7	65,182	117	109
District 3				
JN3SAC	**A**	**195,083**	**282**	**203**
JA3HBF	"	189,420	300	205
JL3JRY	"	54,972	165	108
JR3RIY	**21**	**2,349**	**33**	**29**
JI3BFC	**14**	**114,190**	**230**	**190**
JH3QFY	"	28,025	109	95
JK3NSD	"	420	12	12
JH3FUK	**7**	**284,142**	**248**	**213**
***JH3WKE**	**A**	**136,752**	**254**	**168**
*JA3JM	"	89,424	216	144
*JA3MIB	"	44,928	138	108
*JR3GPP	"	33,291	116	81
*JA4XHF/3	"	30,378	99	83
*JO3JYE	"	24,612	104	84
*JG3SVP	"	16,776	91	72
*JG3WDN	"	12,208	65	56
*JH3BYX	"	7,774	52	46
*JE3TAT	"	6,644	48	44
*JO3QVT	"	2,054	28	26
*JH3GMI	"	1,520	22	19
*JG3OML	"	966	21	21

***JA3RAZ**	**21**	**570**	**15**	**15**
***JF3PLF**	**7**	**32,706**	**106**	**79**
*JA3HKR	"	768	12	12
***JF3BFS**	**3.5**	**12,960**	**86**	**60**
		District 4		
JH4UTP	**A**	**1,749,384**	**1021**	**504**
JN4MMO	"	1,744,642	952	529
JG4AKL	"	552,874	550	322
JR4CTF	"	98,648	248	152
JI4WAO	"	38,500	128	100
JR4VEV	**7**	**54,468**	**110**	**102**
***JE4MHL**	**A**	**10,452**	**59**	**52**
*JA4ENY	"	6,888	62	42
*JA4RWN	"	4,674	44	38
***JA4RMX**	**14**	**7,850**	**58**	**50**
***JH4FUF**	**7**	**2,808**	**27**	**26**
***JM4WUZ**	**3.5**	**2,240**	**35**	**28**
		District 5		
JH5MXB	**A**	**227,908**	**354**	**227**
JE5JHZ	**7**	**624**	**12**	**12**
JA5NSR	**3.5**	**1,008**	**22**	**18**
***JR5XPG**	**A**	**119,290**	**243**	**158**
*JH5HDA	"	18,837	76	63
*JA5OXV	"	1,280	20	20
		District 6		
JA6BCV	**A**	**30,086**	**109**	**98**
JA6BZI	"	2,852	31	31
***JA6GCE**	**A**	**890,967**	**738**	**399**
*JE6TUP	"	7,267	53	43
***JH6WHN**	**21**	**8,700**	**73**	**58**
***JH6QIL**	**14**	**41,480**	**157**	**122**
		District 7		
JA7IC	**A**	**688,860**	**614**	**356**
JA7ACM	"	577,257	520	317
JO7KMB	"	223,776	312	216
JA7GYP	"	107,010	200	145
JA7LLL	**14**	**113,876**	**224**	**196**
JH7RTQ	"	75,300	198	150
JH7QXJ	"	5,546	48	47
JG7PSJ	**7**	**156,880**	**185**	**148**
JK7CJM	"	1,232	18	14
***JA7MWC**	**A**	**51,584**	**152**	**104**
*JA7ZP	"	37,240	129	98
*JA7FDA	"	1,155	23	21
***JA7HMZ**	**14**	**1,456**	**27**	**26**
*JR7IWC	"	98	7	7
		District 8		
JA8TR	**A**	**275,157**	**374**	**237**
JA8KSF	"	250,376	328	238
JA8IDS	**21**	**9,760**	**69**	**61**
***JA8DNV**	**A**	**28,392**	**107**	**84**
*JM8FEI	"	19,698	99	67
*JA8CEA	"	4,800	40	40
*JA8KGG	"	2,070	25	23
***JK8PBO**	**14**	**51,604**	**154**	**133**
***JA8UON**	**7**	**11,872**	**61**	**53**
		District 9		
JA9CCG	**A**	**33,936**	**127**	**101**
JA9CWJ	**14**	**227,592**	**316**	**261**
***JA9LX**	**A**	**51,528**	**154**	**113**
*JR9TUG	"	49,714	209	106
*JH9CEN	"	19,944	87	72
*JA9EJG	"	12,921	73	59
		District Ø		
JHØILL	**A**	**113,774**	**209**	**163**
JHØGHZ	"	47,380	118	103
JHØMJY	"	29,532	102	92
JAØGCY	**14**	**68,609**	**175**	**157**
***JRØDZH**	**A**	**24,124**	**102**	**74**
*JRØBNF	"	21,459	103	69
*JAØBZY	"	18,144	66	63
*JAØBJY	"	13,504	71	64
*JRØGXA	"	6,760	49	40
***JHØEPI**	**14**	**140,239**	**252**	**209**
***JAØGCI**	**3.5**	**966**	**21**	**21**
		Kazakhstan		
UN8PC	**A**	**117,780**	**200**	**151**
UN7JX	"	104,760	164	135
UN4Q	**14**	**290**	**11**	**10**
				(OP:UN2G)
UN4PG	**3.5**	**164,952**	**191**	**158**
***UN6TA**	**A**	**394,305**	**423**	**291**
*UN7ZAF	"	359,660	373	245
*UN5GV	"	67,456	176	136
***UN6LN**	**14**	**548,595**	**535**	**365**
*UN7LV	"	201,663	316	231
*UN7PGA	"	68,912	177	146
*UN7EG	"	45,486	136	126
		Lebanon		
***OD5YA**	**7**	**633,920**	**411**	**280**
		Mongolia		
***JT1YL**	**14**	**1,690**	**29**	**26**
***JT1DN**	**7**	**22,168**	**75**	**68**
		Republic of Korea		
HL5YI	**A**	**46,400**	**121**	**100**
HL2WA	"	12,688	62	61
HL4CEL	"	1,863	27	23
***HL2ZED**	**A**	**137,229**	**327**	**149**
*HL2CFY	"	101,232	239	144
*DS4GQR	"	44,826	116	93
*HL4CCM	"	44,547	119	93
*DS5DNO	"	26,588	92	68
*D9ØM	"	5,216	39	32
				(OP:HL3AMO)
*HL2ASZ	"	336	10	8
		Saudi Arabia		
HZ1TT	*7*	*842,340*	*487*	*303*
***7Z1SJ**	**7**	**1,288,468**	**576**	**386**
		Singapore		
***9V1XX**	**A**	**98,420**	**207**	**140**
		Taiwan		
BV1EK	**A**	**281,034**	**438**	**234**
***BU2EC**	**A**	**24,948**	**117**	**81**
*BV3UF	"	17,821	107	71
*BU2BE	"	17,181	118	69
***BU2BO**	**14**	**12,736**	**94**	**64**
		Thailand		
HS5NMF	**A**	**291,695**	**473**	**227**
				(OP:HS55RAST)
E2ØWUE	"	45,486	143	114
HS6VW	"	7,332	63	52
HSØZED	**14**	**272,688**	**399**	**276**
E21YDP	**7**	**405,040**	**318**	**244**
***HS5SRH**	**A**	**706,768**	**661**	**326**
*HS5ZLD	"	10,150	53	50
*HS4UEL	"	9,512	78	58
*HS8HEX	"	8,100	46	36
*HS6MYW	"	3,534	36	31
*HS7WMU	"	2,075	33	25
***E21FYK**	**14**	**4,830**	**46**	**42**
		Vietnam		
XV9ZT	**A**	**44,626**	**193**	**106**
				(OP:SP2GCJ)
		West Malaysia		
9M2WAN	**A**	**3,800**	**36**	**19**
***9M2TDX**	**A**	**33,990**	**120**	**66**
*9M2MSL	"	4,192	34	32
***9M2MRS**	**14**	**95,654**	**241**	**169**
***9W2SAF**	**7**	**144,354**	**188**	**147**
***9M4DXX**	**3.5**	**2,000**	**20**	**20**
				(OP:JE1SCJ)
*9M2ZAK	"	42	3	3

EUROPE

		Austria		
OE5BGN	**A**	**951,048**	**680**	**408**
OE2LCM	"	610,644	500	337
OE9GHV	"	303,450	339	255
OE3DXA	"	98,271	216	183
***OE2E**	**A**	**1,605,285**	**945**	**495**
				(OP:OE2GEN)
*OE1CIW	"	200,644	280	206
*OE6STD	"	175,028	252	188
*OE1TKW	"	103,887	185	153
**OE2IGP*	*3.5*	*263,320*	*296*	*227*
		Balearic Islands		
***EA6ZS**	**A**	**126,368**	**222**	**176**
*EC6DX	"	104,248	211	166
		Belarus		
EV1R	*A*	*2,498,903*	*1167*	*619*
EW8DX	**"**	**1,404,222**	**874**	**454**
EW8OM	"	511,784	489	296
EU6AF	**14**	**21,385**	**101**	**91**
EU4E	**3.5**	**903,000**	**584**	**375**
***EW4R**	**A**	**1,010,391**	**698**	**417**
*EU8A	"	749,414	593	367
*EW1NM	"	218,400	326	224
*EW7A	"	194,670	292	206
*EW1P	"	34,823	114	97
***EW7BA**	**14**	**218,430**	**362**	**270**
***EU8F**	**7**	**159,456**	**229**	**176**
*EW6DM	"	87,680	154	137
*EU6AA	"	2,544	25	24
		Belgium		
OT2X	**A**	**229,908**	**288**	**204**
***ON5GQ**	**A**	**1,555,113**	**980**	**497**
*OO4O	"	710,520	591	382
*ON4AMP	"	179,139	264	211
*ON2AD	"	62,238	144	123
*ON5IA	"	44,550	123	110
*OPØJ	"	26,160	101	80
				(OP:ON5GF)
*ON4LY	"	9,344	70	64
*ON6LR	"	3,910	34	34
***OQ4B**	**14**	**191,439**	**331**	**239**
				(OP:ON4BHQ)
***ON4CT**	**7**	**357,760**	**342**	**260**
*ON6FC	"	111,000	194	148
*OR2A	"	67,440	139	120
				(OP:ON1DX)
		Bosnia-Herzegovina		
E7TT	**7**	**620,816**	**461**	**322**
***E78T**	**A**	**461,244**	**448**	**289**
*E73KM	"	218,348	297	221
***E74EB**	**28**	**24**	**4**	**4**
***E74HJ**	**7**	**82,844**	**160**	**139**
***E77EA**	**3.5**	**724,880**	**533**	**340**
*E77D	"	70,750	151	125
		Bulgaria		
LZ5K	**A**	**6,206,922**	**2032**	**822**
				(OP:LZ5DB)
LZ1QZ	"	195,104	292	208
LZ4AE	**21**	**1,488**	**26**	**24**
LZ6Y	**14**	**1,326,378**	**989**	**582**
				(OP:LZ1KU)
LZ2ZG	**3.5**	**63,984**	**134**	**124**
***LZ2YO**	**A**	**573,903**	**565**	**363**
*LZ1QV	"	461,856	408	283
*LZ2ZY	"	386,692	420	277
*LZ3LZ	"	58,870	168	145
***LZ2JA**	**14**	**618,412**	**674**	**412**
**LZ1NYK*	*7*	*396,228*	*343*	*267*
***LZ5XQ**	**3.5**	**845,880**	**568**	**371**
		Crete		
SV9COL	**14**	**62,310**	**194**	**155**
		Croatia		
9A4WY	**14**	**46,287**	**150**	**111**
9A2NO	**3.5**	**384,616**	**374**	**262**
***9A1CBM**	**A**	**380,430**	**380**	**270**
				(OP:9A5ST)
*9A5HZ	"	78,804	165	132
*9A7KR	"	24,409	90	77
***9A6KZH**	**14**	**92,752**	**225**	**176**
***9A1FL**	**7**	**187,460**	**243**	**182**
*9A9TT	"	175,780	238	187
*9A3CJW	"	63,232	155	128
***9A1AA**	**3.5**	**61,180**	**135**	**115**
		Czech Republic		
OL9A	**A**	**7,501,256**	**2281**	**868**
				(OP:OK2ZAW)
OK1DBE	"	120,300	203	150
OK2SG	"	102,336	176	156
OK1DOY	"	82,992	203	152
OK1C	"	42,745	116	103
OK6CX	**14**	**44,555**	**156**	**133**
OK1MSP	**7**	**434,520**	**357**	**284**
OK2EQ	"	311,040	313	240
OL4C	**3.5**	**2,907,656**	**1137**	**604**
				(OP:OK1NP)
***OK1HEH**	**A**	**585,499**	**507**	**317**
*OK5NW	"	509,392	462	316
*OK1PX	"	342,408	355	264
*OLØC	"	327,152	348	254
*OK2HFC	"	193,256	274	203
*OK2BXW	"	132,834	204	169
*OK2VIR	"	112,992	184	176
*OK2TBC	"	108,576	214	174
*OK1XGB	"	77,924	184	154
*OK1BJ	"	58,179	153	123
*OK2BEN	"	57,200	143	104
*OK7KW	"	53,448	154	131
*OK1SI	"	47,672	116	101
*OK1SLA	"	38,496	110	96
*OK4RQ	"	36,860	113	97
*OK1VK	"	33,884	97	86
*OL8M	"	25,344	95	88
*OK7N	"	12,204	55	54
*OL7O	"	7,632	57	53
				(OP:OK1FIK)
*OK1DRQ	"	3,210	31	30
*OK1DRY	"	0	0	0
***OK1TFH**	**14**	**44,892**	**158**	**129**
*OK6AB	"	2,697	31	31
*OK1FIM	"	1,120	21	20
***OK2RU**	**7**	**677,758**	**466**	**349**
*OK2UHP	"	160,512	221	176
*OK1PMA	"	60,720	129	115
*OK2SWD	"	1,596	21	21
***OK4GP**	**3.5**	**728,460**	**504**	**355**
*OK2HBR	"	484,942	426	289
*OK2VV	"	348,634	358	253
		Denmark		
OZ3ØEU	**A**	**2,217,936**	**1058**	**574**
OZØJD	"	1,889,146	1081	518
OZ1LFI	"	95,990	196	145
OU1E	"	60,770	148	118
5P9X	**14**	**250,738**	**390**	**283**
				(OP:OZ9GA)
***OZ1DAE**	**A**	**641,358**	**546**	**321**
*OZ1AOO	"	208,437	295	201
*OZ6AGX	"	127,908	225	171
*OZ1QX	"	80,730	180	135
*OUØPOLIO	"	49,234	125	103
*OZ4FF	"	48	4	4
***OZ4NE**	**7**	**143,936**	**216**	**173**
*OZ1JVX	"	135,538	205	169
		England		
G2F	*A*	*5,453,461*	*1863*	*793*
				(OP:MØCKE)
M7T	**"**	**2,485,311**	**1267**	**597**
				(OP:G3YYD)
GX4RFR	"	1,862,217	1077	501
				(OP:YO4RDW)
GØHDV	"	386,100	419	270
G1SCT	"	284,325	346	255
G4LPD	"	123,695	215	173
M2G	"	117,018	265	198
				(OP:G4RCG)
G3PXT	"	108,696	218	168
GØHOF	"	46,830	122	105
G3PHO	"	37,673	111	101
MØOIO	"	30,798	109	87
G3WYW	"	30,294	109	99
G4RRM	"	10,920	69	65
G4CTY	"	7,084	47	44
M3I	**14**	**24,411**	**109**	**103**
				(OP:GØORH)
MØUNI	**7**	**287,364**	**290**	**231**
G4PIQ	"	209,280	242	192

MXØSNB	"	16,120	62	62
				(OP:MØTAZ)
***G4NBS**	**A**	**568,575**	**492**	**315**
*G1P	"	389,776	425	272
				(OP:MØIEP)
*G4OZG	"	385,792	420	274
*G7WHI	"	381,762	403	254
*G4HBI	"	343,886	384	278
*MØORD	"	333,105	368	265
*MØIHT	"	326,688	385	249
*MØTQR	"	239,547	342	231
*GØHGH	"	234,048	310	212
*G4DDL	"	204,624	297	203
*GØCKP	"	196,730	260	191
*M1SJE	"	142,680	240	174
*G4SGI	"	140,650	250	194
*G4WGE	"	136,383	234	169
*G3YCH	"	125,430	222	185
*G3SNU	"	96,228	191	162
*GØC	"	89,082	188	147
				(OP:GØCER)
*2EØYAO	"	87,822	175	153
*G8GHD	"	86,655	193	159
*G8NRY	"	83,049	190	141
*G4NDM	"	77,629	191	149
*G4IDF	"	71,280	147	132
*GØHEU	"	70,144	179	137
*G4BWP	"	59,930	136	130
*G6EES	"	59,169	149	121
*G4ZVB	"	54,918	139	113
*G4SJX	"	46,176	122	104
*GØOOD	"	41,856	129	109
*MØDPK	"	32,968	120	104
*G3VMY	"	28,365	109	93
*G4GMS	"	28,336	99	88
*G8VPE	"	25,179	80	77
*G3KNU	"	24,910	115	94
*MØTKM	"	16,965	77	65
*G3RTU	"	10,920	60	56
*M6YTU	"	10,920	74	65
*GØWWD	"	10,266	65	59
*G3OMB	"	9,450	50	45
*GØMTN	"	6,674	50	47
*M6RSB	"	4,320	38	36
*MØMPM	"	2,550	25	25
***M7P**	**21**	**2,844**	**38**	**36**
				(OP:G6NHU)
***G8X**	**14**	**519,870**	**562**	**390**
				(OP:G4FJK)
*G3Y	"	25,544	113	103
				(OP:G3YBY)
*G4NXG/M	"	5,220	46	45
*MØDVV	"	1,200	25	24
***G2W**	**7**	**552,598**	**451**	**293**
				(OP:G4DBW)
*G4ZOB	"	295,868	314	229
*2EØCVN	"	199,200	248	200
*2EØLXE	"	71,250	149	125
*G3L	"	43,200	117	96
				(OP:G3LHJ)
***G6N**	**3.5**	**334,158**	**349**	**249**
				(OP:GØGDU)
*M6BIR	"	147,060	225	171
		Estonia		
ES1BH	**A**	**50,813**	**146**	**119**
***ES5RY**	**7**	**795,142**	**496**	**379**
		European Russia-District 1		
RU1AT	**A**	**224,037**	**329**	**219**
***RA1ALC**	**A**	**523,075**	**554**	**305**
*UA1COA	"	68,180	171	140
*RN1AO	"	6,678	60	53
*R1LN	"	4,550	36	35
*RK1NA	"	4,050	45	45
***R1BBL**	**7**	**11,448**	**57**	**54**
		District 3		
RM3DA	**A**	**2,165,328**	**1285**	**528**
RC5Z	"	1,212,048	874	443
RA3NC	"	400,780	469	290
RC3C	"	292,950	400	270
RL3A	"	251,990	312	226
				(OP:RN3DNM)
R3YC	"	167,056	301	197
RV3TG	"	136,344	244	184
RT5C	"	42,105	121	105
R5AJ	"	25,191	95	81
UA5C	**14**	**1,566,600**	**1159**	**600**
RU5TT	"	495,720	578	405
RA3TT	"	13,350	79	75
***RN5AA**	**A**	**866,048**	**775**	**398**
*RW3LB	"	342,838	432	257
*R2XM	"	333,078	412	258
*RU5X	"	323,563	386	257
*R2DGN	"	219,611	309	229
*RZ3AV	"	194,460	302	210
*RA3E	"	193,456	253	226
*R3WA	"	163,800	243	182
*UA3XO	"	156,348	266	202
*RV3YR	"	148,248	329	213
*R2PU	"	129,425	217	155
*RX3VF	"	118,674	220	171
*UC5D	"	107,085	235	177
*R2UZ	"	95,211	188	149
*UA3PI	"	95,151	227	161
*RT2H	"	90,160	187	140
*RK3DSW	"	88,998	219	163
*R3AQ	"	87,548	242	172
*RD3FV	"	61,238	154	134
*RJ3F	"	49,852	144	121
*RW3ZA	"	45,652	142	113
*UA3UBT	"	34,578	117	102
*RA3V	"	24,153	98	83
*R3AIR	"	23,433	85	73
*R3OR	"	19,844	99	82
*R3DCB	"	16,906	83	79
*R3PW	"	16,008	68	58
*RK2M	"	13,832	70	56
*RW3ADB	"	12,017	67	61
*RW3Z	"	8,232	50	49
*RX3MM	"	6,966	49	43
*RA3THN	"	12	2	2
***R5ACQ**	**14**	**276,318**	**438**	**301**
*RX3ASQ	"	240,992	410	272
*R3LC	"	36,176	140	119
*RA3LJ	"	20,646	105	93
***RQ2Q**	**7**	**316,712**	**320**	**244**
*UA3YCX	"	46,852	120	106
***UA5F**	**3.5**	**271,200**	**299**	**240**
*RA3QH	"	23,100	80	75
		District 4		
R4HC	**A**	**2,335,632**	**1146**	**591**
RA4HL	"	1,037,330	869	406
RA4LW	"	156,146	264	202
UB4W	"	77,274	206	162
***RW4S**	**A**	**1,056,555**	**859**	**443**
				(OP:RU4SS)
*UA4HJ	"	453,312	534	288
*RX4HJ	"	273,600	376	240
*RU4PH	"	265,370	361	238
*RA4FUN	"	214,656	257	208
*UC4I	"	140,010	251	195
*UA4WJ	"	53,856	157	132
*R4CI	"	40,643	129	97
*R4WT	"	27,528	114	93
*RN4HAB	"	2,160	28	27
***RU4LM**	**14**	**102,588**	**225**	**206**
*UA4SJO	"	63,896	192	163
*UA4WGM	"	25,724	118	109
*RK4S	"	11,658	73	67
*RA4L	"	8,645	67	65
***RU4I**	**3.5**	**297,600**	**319**	**248**
		District 6		
R7CD	**A**	**2,257,232**	**1288**	**568**
UA6CE	"	1,684,164	934	586
RA7M	"	147,169	242	187
R7RIB	"	46,360	152	122
RV6ASU	"	690	16	15
RW6CR	"	4	1	1
UC6N	**14**	**363,747**	**497**	**339**
RA6GW	"	280,088	428	314
***R7MM**	**A**	**1,599,520**	**990**	**520**
*UC6A	"	1,386,232	939	482
*RW7M	"	960,300	811	396
*RT6DI	"	532,684	536	326
*RQ7R	"	464,970	506	330
*R7BN	"	331,724	409	254
*R7NZ	"	330,000	397	250
*R7KBV	"	209,880	304	220
*R6LAQ	"	169,761	291	213
*UD7G	"	120,032	216	176
*R7LY	"	100,646	210	158
*RX6ACJ	"	54,240	147	120
*RJ7J	"	46,848	137	122
*RW6APC	"	43,670	131	110
*RT6DX	"	40,479	143	131
*R6KEE	"	38,280	138	120
*RA6AAW	"	14,625	68	65
***RA6LIS**	**14**	**115,200**	**284**	**200**
*R7MT	"	59,055	180	155
*R7MU	"	3,827	45	43
***RA6C**	**7**	**518,562**	**440**	**297**
		District 9		
***UA9XL**	**A**	**208,260**	**351**	**260**
***R8XF**	**14**	**174,947**	**337**	**251**
*RA9XSL	"	774	20	18
		European Turkey		
***TA1BX**	**14**	**12,118**	**97**	**83**
		Fed. Rep. of Germany		
DR1D	**A**	**3,379,119**	**1493**	**669**
				(OP:DK4EE)
DP6M	"	3,206,245	1281	707
				(OP:DK9IP)
DM5TI	"	2,514,642	1211	626
DKØEE	"	2,179,710	1110	598
				(OP:DL4MDO)
DL5JS	"	2,001,072	996	564
DQ1P	"	1,908,007	976	563
				(OP:DK1IP)
DR7B	"	1,657,370	989	494
				(OP:DL2JRM)
DK1FW	"	1,611,039	911	527
DLØHMK	"	1,602,255	966	479
				(OP:DF2HN)
DL5AXX	"	1,402,569	774	543
DK1KC	"	1,220,247	807	441
DHØGHU	"	1,162,544	703	452
DF4XX	"	1,138,079	754	467
DF8QB	"	1,080,660	765	434
DJ5MW	"	1,032,395	718	455
DJ8VH	"	1,030,400	622	448
DL7VOG	"	1,029,159	737	423
DL7URH	"	996,507	624	421
DL6DH	"	960,741	708	409
DL1QW	"	957,957	678	429
DP8M	"	952,204	641	418
				(OP:DL6NDW)
DJ6TK	"	915,416	672	424
DH8WR	"	884,730	630	385
DL9GTB	"	864,612	590	438
DL3DW	"	734,400	544	408
DL9NCR	"	727,334	597	359
DL4CF	"	725,085	596	369
DL1NEO	"	715,806	492	399
DK9ETM	"	699,999	575	353
DK2LO	"	665,808	507	388
DJ9KM	"	659,088	564	368
DL4ME	"	657,030	573	330
DL2SWW	"	618,345	560	315
DF6QV	"	500,220	482	315
DF1LON	"	439,485	394	353
DK6CQ	"	431,750	430	314
DK1LRS	"	422,085	428	285
DL5ST	"	392,460	394	310
DF5BX	"	377,804	403	262
DL5YM	"	345,150	411	295
DJ2YE	"	320,045	387	253
DF2LH	"	248,148	301	226
DJ8EW	"	246,240	295	240
DK2AT	"	193,556	295	212
DL1DAW	"	153,126	242	181
DL1STG	"	151,508	249	196
DJ2IA	"	148,200	244	200
DL9DAN	"	136,644	245	193
DG7JB	"	129,130	219	185
DG8KAD	"	125,044	212	172
DF2RG	"	118,851	207	173
DL5RMH	"	116,960	213	170
DL8RDL	"	112,832	176	164
DL6DJ	"	111,054	209	166
DL5ZK	"	109,032	201	154
DAØT	"	108,232	209	166
DF3VM	"	103,656	219	168
DL3XM	"	101,712	173	156
DL5JAN	"	84,825	178	145
DJ5IW	"	81,380	164	130
DL5QS	"	66,270	154	141
DL1LOD	"	55,814	143	118
DL4ABR	"	50,511	135	113
DK8ZZ	"	44,464	141	112
DJ2YA	"	39,270	107	102
DL5ASK	"	38,955	115	105
DK3AX	"	36,380	133	107
DL1DBR	"	25,315	97	83
DH6DAO	"	21,128	80	76
DF3IS	"	16,600	91	83
DL7CX	"	3,080	29	28
DL3BQA	**14**	**575,331**	**602**	**389**
DL1DTL	"	286,431	400	307
DM6DX	**7**	**2,298,772**	**942**	**551**
DL9EAH	"	189,336	265	196
DJ5TT	"	43,884	112	106
DL7LX	"	8,190	46	45
DM5JBN	"	5,712	34	34
DF8XC	**3.5**	**1,342,692**	**777**	**453**
DP6A	"	182,508	238	201
				(OP:DL8OH)
DK7ZT	"	109,392	192	159
DL9NDV	"	62,678	143	121
***DL3SYA**	**A**	**1,365,210**	**882**	**462**
*DL1FCU	"	676,985	575	355
*DL1ZBO	"	553,419	525	309
*DL4ZA	"	516,461	476	319
*DL5ARM	"	509,020	490	310
*DR7T	"	455,040	387	288
				(OP:DF1DN)
*DL6SFR	"	431,262	416	291
*DM2RM	"	426,288	423	321
*DL6NWA	"	403,480	424	308
*DL4PT	"	400,078	445	287
*DF3EH	"	364,958	415	313
*DL2RNF	"	350,244	418	282
*DFØSX	"	344,896	388	272
				(OP:DL1CW)
*DL3DRN	"	331,002	385	259
*DJ2AX	"	315,018	372	258
*DL1EAL	"	284,260	345	244
*DH6BH	"	237,000	316	237
*DL2KWA	"	216,736	299	208
*DM5WH	"	207,360	315	192
*DG2BWG	"	198,171	287	227
*DL1NHW	"	192,720	284	220
*DB2BJT	"	187,800	280	200
*DK2WU	"	171,094	258	202
*DJ6OZ	"	160,816	255	184
*DK6IM	"	158,415	240	177
*DB8AH	"	155,701	240	203
*DG9BEO	"	150,696	244	184
*DF7JC	"	145,054	243	182
*DM2Ø25C	"	142,870	244	182
				(OP:DG7EE)
*DF2WF	"	142,692	248	188
*DH1TST	"	140,336	221	179
*DB1KK	"	119,852	217	166
*DL1RTS	"	119,064	215	164
*DK7TM	"	103,520	208	160
*DJ7UC	"	103,125	205	165
*DG5MLA	"	97,614	197	153
*DK4IO	"	96,876	194	162
*DD5MA	"	93,060	161	141
*DJ4WM	"	87,906	175	147
*DF5AN	"	87,843	180	141
*DM5JL	"	77,064	172	156
*DL4FNM	"	76,950	171	135
*DJ5NN	"	76,176	163	138
*DL7YS	"	75,240	164	132
*DK2VM	"	71,982	161	129
*DL4NER	"	71,103	155	137
*DL8ZAJ	"	68,961	157	127
*DB9OH	"	67,298	157	133

*DJ9MH	"	66,960	157	135
*DK7TY	"	65,340	153	135
*DG3FAW	"	63,222	148	123
*DL7UGN	"	62,375	140	125
*DB2KT	"	60,180	148	118
*DJ1MM	"	60,112	146	136
*DK3PM	"	60,060	141	140
*DL9ZWG	"	60,016	150	121
*DF4ZS	"	58,250	151	125
*DL3FBB	"	56,088	150	123
*DM5SB	"	54,992	137	112
*DL4KW	"	53,340	136	127
*DF5EM	"	45,360	129	105
*DK1AUP	"	37,878	120	107
*DL4HCF	"	37,835	134	115
*DM3PKK	"	36,360	114	101
*DO9ST	"	35,908	105	94
*DL4MFM	"	34,592	111	94
*DL6RBH	"	32,736	109	93
*DL1JPF	"	31,960	107	94
*DL9FB	"	31,929	103	87
*DF1LX	"	30,728	101	92
*DL1EHG	"	29,580	102	85
*DL2GMK	"	26,631	111	99
*DL5ALW	"	25,800	80	75
*DO4WLL	"	25,200	89	80
*DL3OH	"	24,518	91	82
*DC2CB	"	23,660	100	91
*DL5GAC	"	22,517	99	89
*DL5JBW	"	22,436	94	79
*DF2UA	"	22,240	90	80
*DK9MH	"	22,000	95	88
*DM6CS	"	21,680	89	80
*DM2DLG	"	21,141	91	81
*DL1DXF	"	19,390	80	70
*DK8EY	"	18,954	93	78
*DL8LDN	"	18,278	88	74
*DL6FBK	"	15,246	71	66
*DM5DX	"	14,465	64	55
*DL1EJD	"	14,144	73	64
*DL2ART	"	13,797	70	63
*DL1DQJ	"	13,570	59	59
*DLØLN	"	11,968	74	64
				(OP:DC2CB)
*DK5TX	"	11,872	60	53
*DK4EF	"	8,360	51	44
*DK9ZE	"	7,968	49	48
*DL4APJ	"	7,546	55	49
*DL1ONI	"	7,335	49	45
*DL8ARJ	"	2,424	24	24
*DJ6TB	"	1,656	24	23
*DH2WQ	"	1,024	16	16
*DO7ES	"	988	20	19
*DL8ULF	"	901	18	17
*DL3EBQ	"	517	11	11
*DL1STV	"	108	6	6
***DH7SA**	**14**	**208,475**	**335**	**269**
*DL3KVR	"	160,035	294	235
*DF4WC	"	133,760	273	209
*DL4FCH	"	113,629	247	199
*DM7ØGER	"	33,858	125	114
				(OP:DJØMY)
*DL1AKL	"	26,300	123	100
*DL2BQV	"	18,228	98	84
*DL5AWI	"	16,590	84	70
*DL1FMG	"	5,355	55	51
*DL1THB	"	2,541	39	33
*DG1HXJ	"	1,674	31	27
*DF1AN	"	702	18	18
*DG9AK	"	100	10	10
*DL5KUD	7	296,000	302	250
*DL2HYH	"	258,970	270	235
*DL8ZU	"	223,992	277	204
*DL1SO	"	50,328	124	108
*DM7CW	"	33,852	99	91
*DL2ZA	"	32,508	98	86
*DL9NEI	"	20,160	75	70
*DL2LDE	"	10,028	48	46
*DC6MT	"	24	3	3
***DF1MM**	**3.5**	**901,600**	**613**	**400**
*DO1ISE	"	169,600	245	200
*DO2XX	"	7,820	51	46
		Finland		
OH3OJ	**A**	**1,988,466**	**1132**	**543**
OH1Z	"	1,459,758	942	446
				(OP:OH1LEG)
OH3FM	"	961,494	776	382
OH8WR	"	798,112	668	392
OH6K	"	675,591	599	371
				(OP:OH6FSG)
OH7KBF	"	410,656	483	313
OG2P	"	263,208	299	264
OH5EAB	"	166,752	269	193
OH1TM	"	88,608	184	142
OH2BBT	"	30,411	118	109
OH6BA	"	28,712	104	97
OH5UQ	**7**	**207,672**	**249**	**204**
OG7A	**3.5**	**842,496**	**548**	**384**
				(OP:OH6MW)
OH8CW	"	119,316	187	163
***OG3P**	**A**	**923,292**	**660**	**412**
				(OP:OH3P)
*OG95AA	"	493,000	517	340
				(OP:OH8KVY)
*OG8T	"	486,972	496	334
				(OP:OH8TV)
*OH1NOA	"	216,910	309	218
*OH2LNH	"	125,560	241	172
*OH8EJW	"	97,399	211	173
*OH8KA	"	42,588	134	117
*OH3GLY	"	35,900	124	100
*OG4M	"	26,481	107	97
*OH8GET	"	16,048	75	68
*OH6XY	"	576	13	12
***OH2BEN**	**7**	**138,510**	**199**	**171**
*OH1FFN	"	8,742	47	47
*OH2ECG	"	4,224	33	33
		France		
F5OAM	**A**	**1,019,187**	**742**	**403**
F4FDR	"	817,235	630	365
F6CBL	"	547,626	538	321
F5OHM	"	353,700	363	262
F6CXJ	"	320,124	352	259
F6AUS	"	141,906	249	201
F8CDM	"	116,336	210	176
F4FEP	"	99,072	206	172
F5JFU	"	85,008	159	138
F4FET	"	12,980	68	59
F5NBX	**14**	**18,130**	**87**	**74**
F4HJO	**7**	**1,358,940**	**751**	**435**
F4ESV	"	232,416	244	216
F5SDD	"	79,864	148	134
F4CWN	"	36,080	96	88
***TM3Z**	**A**	**4,807,728**	**1689**	**718**
				(OP:F4DSK)
*F8BDQ	"	1,157,940	725	420
*F1RCH	"	1,072,216	758	404
*F6EQZ	"	935,750	669	394
*F1IWH	"	615,664	516	322
*F6GCI	"	432,696	446	298
*F5OYC	"	292,094	361	242
*F4HAB	"	217,119	283	211
*F4GWY	"	204,609	318	241
*F6BQG	"	189,900	283	211
*F8FHI	"	170,500	263	220
*F4VSQ	"	163,986	247	181
				(OP:SQ6MS)
*F5PVJ	"	163,620	244	180
*F4DVX	"	109,319	202	161
*F4IFO	"	71,651	175	137
*F4DBD	"	47,190	145	121
*F1TRE	"	34,216	107	91
*F6IRA	"	30,856	97	76
*F8CPA	"	28,036	102	86
*F4BRZ	"	20,880	92	80
*F4FHV	"	16,380	74	70
*F1VEV	"	7,439	45	43
*F4BKT	"	1,178	19	19
*F4DZR	"	660	15	15
***F5KAQ**	**14**	**4,185**	**45**	**45**
				(OP:F5SAZ)
***F1HMR**	**7**	**143,724**	**208**	**174**
*TM5CQ	"	18,904	75	68
				(OP:F4FRG)
		Greece		
SV2ESW	**A**	**713,472**	**691**	**384**
SV3EXU	"	523,556	523	326
SV6JHA	"	188,580	259	210
SV1QN	"	113,816	199	164
J42P	**21**	**476**	**15**	**14**
				(OP:SV2BXA)
SX73SC	**14**	**742,118**	**752**	**442**
				(OP:SV2BFN)
SV1PMR	"	333,993	513	319
SV1JG	"	241,500	410	276
SV2BXA	*3.5*	*788,900*	*561*	*350*
***SV1BJW**	**A**	**629,805**	**612**	**347**
*SV2KF	"	381,888	453	288
*SV8OVH	"	323,144	386	248
*SV1DOO	"	321,216	377	239
*SV1JFL	"	94,248	226	153
*SV8PMM	"	69,000	141	125
*SV2/SV7CUD	"	37,142	111	98
				(OP:SV7CUD)
*SV1MO	"	9,675	55	45
***SV2HXV**	**14**	**155,610**	**315**	**234**
*SV4RNT	"	3,237	44	39
		Guernsey		
***GUØSUP**	**A**	**686,810**	**517**	**397**
		Hungary		
HAØHW	**A**	**289,560**	**335**	**228**
HA8JV	"	70,564	142	118
HA2VR	"	18,104	69	62
HG8R	**14**	**1,726,112**	**1059**	**646**
				(OP:HA8JV)
HA8BQ	"	69,960	195	159
HG5D	**7**	**1,656,272**	**807**	**488**
				(OP:HA8QZ)
HA1AD	"	112,308	182	147
HA8BT	**3.5**	**1,020,936**	**606**	**412**
***HG8C**	**A**	**1,218,944**	**799**	**428**
*HA7MB	"	389,550	409	294
*HAØMS	"	350,523	387	261
*HA6PJ	"	255,816	313	228
*HA1TNX	"	217,800	283	220
*HA1DD	"	168,675	264	195
*HG3FMZ	"	36,456	98	93
*HA3FMR	"	1,292	19	19
***HAØLW**	**14**	**69,300**	**181**	**154**
*HAØBW	"	60,894	178	153
*HA1LZ	"	3,654	45	42
***HA8WY**	**3.5**	**592,116**	**465**	**318**
*HA1WD	"	109,440	188	152
*HA8BE	"	11,544	55	52
		Iceland		
TF2CT	**A**	**123,954**	**228**	**219**
***TF3DC**	**A**	**11,352**	**69**	**66**
*TF2MSN	"	9,633	63	57
**TF3AO*	*14*	*10,880*	*73*	*68*
		Ireland		
EI7KD	**14**	**206,092**	**348**	**268**
***EI3CTB**	**A**	**127,737**	**237**	**171**
*EI4GAB	"	40,082	120	98
		Italy		
IK2YCW	**A**	**1,946,644**	**1016**	**518**
IØWBX	"	1,870,960	1025	514
IC8SQS	"	1,823,178	1034	523
IZ1AVA	"	1,543,204	959	503
I3VJW	"	1,339,128	759	504
I1JTQ	"	1,147,860	773	420
I2SVA	"	951,460	690	421
I2DJX	"	585,980	495	353
IK1BPL	"	536,406	492	338
IW1PNJ	"	527,171	484	317
IW3FVZ	"	411,220	394	290
IN3EQD	"	381,598	398	281
IZ3XEF	"	380,607	403	293
IV3WMS	"	349,536	361	264
I2WIJ	"	285,525	316	243
IZ4FUE	"	270,912	342	249
IK2QIN	"	267,336	337	237
I1NVU	"	218,440	282	215
IK5FKF	"	214,720	300	244
IZ3KUY	"	199,350	305	225
IZ1PLH	"	187,425	256	225
IK2RZP	"	160,200	240	178
IZ4VSD	"	122,610	248	201
IZ2ZQP	"	114,234	199	158
I2OGV	"	107,315	215	169
IW1CHX	"	86,458	185	139
IK5PWS	"	76,583	176	137
IK2AHB	"	56,074	130	106
I1YGQ	"	21,716	96	89
IWØSAF	"	14,700	84	75
IK2GZU	"	11,440	63	55
IK2IKW	"	1,496	23	22
I4LCK	**21**	**124,435**	**266**	**205**
I5MXX	"	55,622	164	137
IZ8ESX	"	13,277	78	71
IO1NGM	**14**	**1,230,428**	**909**	**556**
				(OP:IW1AYD)
IU4CHE	"	713,904	679	417
IZ1PKV	"	131,018	274	218
IKØYUT	"	69,641	196	143
IZ4NIC	**7**	**4,987,776**	**1381**	**744**
IZ4ZZB	"	1,441,706	693	469
IK5UAN	"	567,892	423	326
IQ2XZ	"	415,250	379	275
				(OP:IW2ETR)
IZ5EME	"	284,896	272	232
IU1JCZ	"	252,778	301	211
IZ4DZD	"	109,744	183	152
IK2AQZ	"	79,608	163	124
IKØLNN	"	47,808	113	96
IZ2DII	"	22,862	77	71
IK4ZHH	"	14,616	64	58
IQ1RY	**3.5**	**2,780,558**	**1112**	**599**
				(OP:IZ1LBG)
IZØKBR	"	1,567,392	796	464
IZ3SQW	"	1,471,808	791	464
IK3ORD	"	767,382	541	363
I4AVG	"	289,800	293	230
IK3SSJ	"	113,568	193	156
***IK6VXO**	**A**	**5,471,250**	**1732**	**750**
*IT9RGY/4	"	4,846,776	1702	726
*IK3TPP	"	1,962,378	988	583
*IKØCHU	"	1,797,070	1013	527
*IU3FBL	"	1,515,932	937	524
*IU8HPD	"	1,390,884	829	492
*IK1RGK	"	697,368	596	392
*IU8DKG	"	540,834	455	326
*IW1CBG	"	425,056	424	296
*IK2BUF	"	420,112	430	308
*IC8FJX	"	412,888	453	292
*IZ4OSH	"	314,736	389	249
*IØGIA	"	276,480	341	240
*IW4EJK	"	275,776	330	248
*IZ3XNJ	"	246,225	319	245
*IK3YBX	"	205,091	295	241
*IW4ECF	"	196,248	277	204
*IZ2GRG	"	186,745	274	221
*IV3BCA	"	180,675	258	225
*IV3XNF	"	163,020	249	209
*IU1GNA	"	154,477	232	179
*IZ2EAS	"	141,680	223	176
*IKØHTP	"	140,637	234	181
*IK8IOO	"	130,468	248	193
*IU4JIC	"	129,564	233	183
*IZ2JPN	"	125,488	226	184
*IK5QPS	"	122,998	213	178
*IK5BSC	"	122,000	253	200
*IZ3EIN	"	120,912	218	176
*IK4QJF	"	103,842	211	162
*IZ5IMB	"	99,900	186	150
*IWØGYC	"	99,200	198	155
*IK1DFH	"	94,668	177	147
*IW5EIJ	"	93,399	191	163
*I2BZN	"	91,337	176	149
*IK2OVT	"	80,352	172	144
*IK2AUK	"	66,285	162	135
*IK2SAR	"	62,248	149	124
*IZ5FSA	"	59,605	148	131
*IZ2JQP	"	54,936	154	126
*IK4XQT	"	36,888	124	106
*I2ORX	"	35,464	107	104
*IK8ARF	"	33,708	113	106
*IZ8XXE	"	33,048	120	108

*IK4RQJ	"	28,704	108	96
*I6FDJ	"	27,192	104	88
*IKØISD	"	26,166	100	89
*IU1LCU	"	22,440	87	85
*IW8PJI	"	22,274	88	74
*IW2JRV	"	22,253	86	77
*IV3UHL	"	19,832	76	67
*IK4HPS	"	18,240	90	80
*IK3MLF	"	18,104	75	73
*IZ7XNB	"	12,654	60	57
*IK2EBP	"	11,685	60	57
*IU4FKR	"	6,720	43	42
*IN3FHE	"	5,738	39	38
*IZ2BVC	"	4,940	38	38
*IU1JYM	"	4,469	45	41
*IU4CZW	"	1,944	28	27
*I1DXD	"	1,880	20	20
*IX1HPN	"	1,116	18	18
*IW1DUS	"	588	14	14
*IK3CST	"	136	8	8
*IZ8CLM	"	16	2	2
*IZ1MHY	"	10	2	2
***IKØPRP**	**21**	**13,794**	**80**	**66**
*I3FGX	"	12,276	75	66
*IK2TDM	"	6,272	53	49
***IZ8EFD**	**14**	**396,535**	**496**	**355**
*IK5AMB	"	392,080	489	338
*IK4LZH	"	291,078	424	309
*IK4DCX	"	62,424	173	153
*IV3AEB	"	39,375	142	125
*IK2SGF	"	29,898	119	99
*IZ5IOS	"	22,705	98	95
*IW1RLS	"	11,690	76	70
*IW2NEF	"	1,500	25	25
***I3PXN**	**7**	**909,828**	**587**	**381**
*IN3FOI	"	703,836	507	343
*IW7DBM	"	588,436	487	314
*IW2MXY	"	563,550	436	325
*IU4HRJ	"	556,068	442	311
*IK4RVG	"	419,020	374	287
*IN3EYI	"	345,800	357	247
*IK1SOW	"	275,652	278	234
*IK4OMO	"	271,678	282	233
*IP9IPY	"	197,208	249	198
*IU4IBC	"	136,448	200	164
*IV3IXN	"	58,032	117	117
*IZ8GNR	"	47,380	112	103
*I4EWH	"	43,888	107	104
*IK2CMI	"	41,516	103	97
*IZ4RCF	"	30	5	5
***I1WXY**	**3.5**	**634,920**	**502**	**330**
*IX1CLD	"	455,182	414	287
*IZ3KKE	"	420,320	385	284
*IW2HUS	"	229,512	281	219
*IZ4AKO	"	185,180	247	197
*IZ5OQX	"	11,088	61	56
*IK2LOL	"	6,004	39	38
*IKØEIE	"	4,680	37	36
Kaliningrad				
RN2FQ	**A**	**75,350**	**177**	**137**
***RN2FA**	**A**	**6,601**	**51**	**41**
***RA2FB**	**14**	**24,576**	**110**	**96**
***R2FBZ**	**3.5**	**227,696**	**266**	**214**
Latvia				
YL1S	**A**	**2,243,822**	**1138**	**581 (OP:YL1ZF)**
YL6W	"	1,805,988	982	534 (OP:YL2GD)
YL5T	"	879,359	628	391 (OP:YL3DQ)
YL9T	"	870,430	654	386
YL5X	"	307,024	356	248
YL/ES5ZF	"	48,880	117	104 (OP:YL1ZF)
YL2CI	**14**	**909,606**	**811**	**474**
YL7A	"	518,580	575	387 (OP:YL2GM)
YL3CU	"	258,912	399	288
YL2KF	**7**	**116,000**	**197**	**145**
***YL2JR**	**A**	**216,508**	**287**	**226**
*YL2NK	"	32,946	108	102
*YL2IP	"	32,334	112	102
***YL2QV**	**14**	**54,908**	**164**	**148**
***YL2QG**	**3.5**	**356,160**	**347**	**265**
Lithuania				
LY4OO	**A**	**681,291**	**538**	**351**
LY2BAA	"	190,045	281	199
LY1R	**14**	**624,105**	**669**	**405**
***LY6A**	**A**	**2,532,050**	**1270**	**569**
*LY5T	"	965,088	628	432
*LY4K	"	471,608	414	334
*LY2F	"	46,830	126	105
***LY2CG**	**14**	**84,708**	**211**	**181**
***LY2EW**	**3.5**	**136,224**	**211**	**172**
Luxembourg				
LX2LX	**A**	**798,553**	**620**	**379 (OP:LX1NO)**
LX7I	"	106,500	196	142 (OP:DF7EE)
LX1HD	**14**	**42,656**	**149**	**124**
***LX5IGRY**	**A**	**1,512,480**	**875**	**460 (OP:LX1ER)**
Macedonia				
***Z32U**	**A**	**108,188**	**186**	**148**
***Z37DX**	**7**	**328,636**	**333**	**242 (OP:Z33F)**
*Z39A	"	198,018	251	193
***Z33F**	**3.5**	**4,356**	**34**	**33**
*Z35TUN	"	112	7	7
Malta				
***9H1CG**	**A**	**152,536**	**250**	**184**
Moldova				
ER4A	**A**	**4,658,812**	**1898**	**766 (OP:UT5UDX)**
***ER1PB**	**A**	**1,093,036**	**796**	**379**
Montenegro				
***4O3A**	**A**	**3,917,716**	**1482**	**662 (OP:4O9TTT)**
***4O4A**	**3.5**	**60,840**	**129**	**117**
Netherlands				
PB7Z	**A**	**818,120**	**593**	**362**
PE1BNF	"	260,820	339	270
PAØVHA	"	173,926	262	199
PC4H	"	122,265	205	171
PG3N	"	31,061	102	89
PA1CW	"	25,994	99	82
PA5WT	"	21,728	102	97
PA5KT	"	1,375	25	25
PA4B	*14*	*127,058*	*259*	*202*
PA4O	**7**	**76,880**	**160**	**124**
***PA7WW**	**A**	**851,816**	**680**	**392**
*PD1RP	"	494,801	444	311
*PA3AIN	"	407,265	407	285
*PA3DBS	"	304,678	377	242
*PA3GCU	"	269,010	341	245
*PD9X	"	259,205	326	235
*PA3T	"	252,327	333	241
*PD7RB	"	170,660	249	230
*PA2CVD	"	161,001	263	201
*PAØCMF	"	155,169	250	189
*PD2GSP	"	137,799	222	183
*PAØALG	"	134,140	258	190
*PE1FTV	"	125,999	212	163
*PA3EWG	"	109,115	194	157
*PC9T	"	105,248	213	176
*PA4DN	"	104,489	199	161
*PDØMHZ	"	98,010	206	165
*PD8DX	"	97,340	183	155
*PE5O	"	92,412	198	151
*PF6HPP	"	92,253	199	161 (OP:PA5WT)
*PC3T	"	89,280	169	144
*PAØPIW	"	88,637	192	151
*PA3CDN	"	82,436	189	148
*PD1RO	"	75,504	148	132
*PG1R	"	72,618	172	147
*PBØACU	"	63,495	184	153
*PC5D	"	56,644	149	119
*PDØME	"	47,792	142	116
*PDØWR	"	43,505	126	113
*PE1CPJ	"	36,708	134	114
*PA8KW	"	30,102	101	87
*PA2VS	"	28,305	103	85
*PA3HGF	"	27,896	100	88
*PA3CXB	"	27,579	98	87
*PA4GDR	"	26,622	104	87
*PG6F	"	22,695	97	85 (OP:PAØGRU)
*PA6ANT	"	19,434	95	82
*PH4E	"	17,043	77	69
*PA3HGP	"	12,012	74	66
*PA1LEX	"	11,532	72	62
*PD3ALX	"	9,405	57	55
*PAØMJM	"	6,958	50	49
*PA3GDD	"	6,314	44	41
*PDØMWG	"	4,320	37	36
*PE1RWL	"	1,558	21	19
***PD7DX**	**14**	**5,720**	**54**	**52**
*PE1ORG	"	600	15	15
***PG7V**	**3.5**	**65,212**	**137**	**119**
Northern Ireland				
MIØSLE	**3.5**	**958,188**	**627**	**366**
***MIØI**	**A**	**363,944**	**468**	**268**
*MI1A	"	480	15	15
***MIØM**	**14**	**989,097**	**847**	**487 (OP:MIØSAI)**
Norway				
LA1TV	**A**	**1,520,532**	**937**	**468**
LC1C	"	954,890	720	410
LA9TY	"	629,004	514	318
LA7VK	"	379,464	433	291
LA3TK	"	12,540	64	60
LC9S	**14**	**134,616**	**298**	**213 (OP:LA9GSA)**
LA8CJ	"	20,203	90	89
LB6KC	"	3,698	45	43
LA7JO	"	2,635	33	31
LC2C	**7**	**284,088**	**317**	**228 (OP:LB1HI)**
LN5O	"	44,160	118	96 (OP:LB3RE)
LA3BO	**3.5**	**552,050**	**451**	**305**
***LA5LJA**	**A**	**658,260**	**566**	**345**
*LA3BPA	"	293,624	346	254
*LA2HFA	"	74,266	167	142
*LA2XNA	"	40,544	120	112
*LA8OKA	"	24,928	96	82
*LA3CLA	"	18,354	80	69
*LB2WG	"	15,939	74	63
*LC9T	"	9,200	50	46 (OP:LA9VKA)
Poland				
SN7Q	**A**	**7,327,350**	**2279**	**855 (OP:SP7GIQ)**
SN5N	"	297,810	390	270 (OP:SP5KP)
SP3HUU	"	177,984	267	216
SP9MZH	"	63,546	131	119
SQ9PUZ	"	42,874	115	97
SP1KM	"	9,792	57	51
SP3DIK	**7**	**135,456**	**194**	**166**
SQ9DXT	"	14,880	66	60
SP1JQJ	"	1,600	20	20
SP8K	**3.5**	**1,084,020**	**654**	**406**
SP5DL	"	696,672	495	354
SN2M	"	32,384	96	88 (OP:SP2XF)
***SO9M**	**A**	**3,428,040**	**1454**	**636 (OP:SQ9UM)**
*SQ2WHH	"	1,267,520	793	466
*SP9JZT	"	409,108	396	266
*SQ5ZG	"	374,010	396	273
*SP3LGF	"	348,880	370	280
*SP6EIY	"	344,916	378	268
*SP6MLX	"	341,922	346	294
*SQ3MZ	"	313,908	376	259
*SQ8W	"	311,484	363	257
*SP6JZP	"	289,345	346	245
*SP3MEO	"	281,184	330	232
*SQ3MZU	"	248,378	308	233
*SP9CXN	"	233,892	305	219
*SP8CGU	"	183,918	252	203
*SP9KB	"	172,179	265	189
*HF4ØSTOK	"	161,182	262	203
*SP6FXY	"	129,752	235	196
*SP6AXW	"	122,739	204	163
*SO5WD	"	89,640	183	135
*SP5GDY	"	70,840	155	140
*SP2MKZ	"	66,660	168	132
*SP1DSZ	"	48,642	158	134
*SP5GNI	"	41,265	121	105
*SQ7LQJ	"	41,128	109	106
*SQ5TDZ	"	36,855	135	117
*SP3GAX	"	35,778	103	89
*3Z6O	"	32,857	123	103
*SP3DOF	"	27,209	100	91
*SP9HZW	"	26,487	93	81
*SP9KJU	"	21,827	80	73 (OP:SP9MDY)
*SQ2MO	"	20,880	81	72
*SO1RON	"	20,217	89	69
*SP5BUJ	"	15,128	66	61
*SQ9FMU	"	14,500	71	58
*SN1A	"	14,160	62	59
*SP4GDC	"	13,312	68	64
*SP2SGN	"	12,600	82	70
*SQ1KW	"	10,600	56	53
*SQ2OMK	"	10,476	58	54
*SP9DEM	"	9,516	54	52
*SP3JDZ	"	7,830	47	45
*SP9IHP	"	7,770	54	42
*SP2WGB	"	6,930	47	45
*SP2DKI	"	5,616	38	36
*SQ9NFQ	"	3,332	34	34
*SP6IHE	"	1,275	16	15
*SP2QCW	"	144	8	8
***SP4DC**	**21**	**207**	**10**	**9**
*SNØR	"	4	2	2 (OP:SQ9IAU)
***SQ1X**	**14**	**164,802**	**289**	**242**
*SP3A	"	157,734	293	207
*SP2FOV	"	16,264	89	76
*SQ1WO	"	15,300	86	75
*SP5XOV	"	510	15	15
*SP6MQO	"	242	11	11
***SQ7CL**	**7**	**746,232**	**551**	**354**
*SP9BNM	"	336,296	329	254
*SQ6ELV	"	261,960	283	222
*SP6BEN	"	122,796	186	162
*SP1I	"	55,000	117	110
*SP4BPH	"	49,220	118	107
*SP9DNO	"	40,512	100	96
*SP9WPN	"	6,160	41	35
*SQ9GOL	"	4,288	34	32
*SP4Z	"	2,912	26	26
***SQ4NR**	**3.5**	**1,036,112**	**654**	**406**
*SO1211R	"	245,532	293	222 (OP:SP6CES)
*SP5VIH	"	228,060	286	210
*SQ9PPT	"	45,136	119	104
Portugal				
CR6T	*21*	*141,588*	*281*	*228 (OP:CT1ESV)*
***CT7AJL**	**A**	**1,877,580**	**1107**	**513**
*CT1BXT	"	907,872	664	386
*CT7AUP	"	713,640	590	380
*CS25FOQ	"	154,585	272	215 (OP:CT1FOQ)
*CT1FKN	"	146,110	201	190
*CT2JMR	"	26,100	102	90
*CT7AKW	"	9,686	66	58
***CR6A**	**14**	**72,270**	**188**	**165 (OP:CT1IUA)**
Romania				
YO9HP	**A**	**4,646,763**	**1747**	**753**
YO3RU	"	1,243,778	846	461
YQ6A	"	983,970	706	435 (OP:YO6BHN)
YO4FPF	"	329,708	441	278
YO3VU	**7**	**1,431,776**	**781**	**443**
YO5CUQ	**3.5**	**56,726**	**130**	**113**
***YO6HSU**	**A**	**760,656**	**612**	**368**

*YO9CWY	"	208,620	308	228
*YO2LXW	"	176,475	256	181
*YO7CVL	"	136,152	224	183
*YO4UQ	"	87,162	187	146
*YO6DBL	"	61,366	137	122
*YO4RST	"	55,626	147	127
*YO8AAZ	"	51,831	138	117
*YO4SI	"	47,936	137	107
*YO4DW	"	31,450	92	85
*YO2LEA	"	22,464	83	72
*YO9IOE	"	22,327	92	83
***YO2IS**	**14**	**149,408**	**294**	**232**
***YO4BEW**	**7**	**127,820**	**189**	**166**
*YO4CVV	"	85,936	160	131
***YO6FPW**	**3.5**	**107,388**	**179**	**157**
*YO8DHA	"	49,820	127	106
		Sardinia		
**ISØCAK*	*A*	*29,744*	*99*	*88*
		Scotland		
GM2V	**21**	**8,784**	**66**	**61**
**GMØOPS*	*A*	*647,328*	*579*	*352*
***GM4JKZ**	**"**	**109,280**	**206**	**160**
*GM3A	14	95,046	230	186
				(OP:MMØJOM)
*MM2T	"	65,286	190	162
***MM1PTT**	**7**	**108,936**	**177**	**153**
		Serbia		
YTØZ	**21**	**25,004**	**105**	**94**
				(OP:YU1ZZ)
YU1AU	**7**	**2,204,488**	**1019**	**517**
***YT1TX**	**A**	**603,372**	**507**	**308**
*YU1KT	"	562,122	481	306
*YT3H	"	538,464	464	316
*YU7RIM	"	254,100	308	210
***YT8A**	**21**	**14,544**	**86**	**72**
***YU5RY**	**14**	**157,373**	**297**	**241**
*YU1NR	"	96,455	245	191
***YT2AAA**	**3.5**	**975,154**	**613**	**391**
*YT2T	"	310,244	325	242
*YU8NU	"	294,056	318	236
		Sicily		
IT9ESW	**A**	**702,630**	**689**	**370**
IT9JQY	"	31,899	103	93
IT9ZMX	**14**	**725,560**	**754**	**440**
IT9RZU	**7**	**839,160**	**514**	**378**
***IT9VCE**	**A**	**1,426,620**	**987**	**465**
*IT9CIL	"	118,370	239	190
*IT9ACJ	"	76,320	176	144
***IT9BLB**	**21**	**663**	**17**	**17**
***IW9FDD**	**14**	**436,482**	**576**	**354**
*IT9KXK	"	326,673	481	327
***IR9K**	**3.5**	**807,750**	**553**	**359**
				(OP:IT9AHI)
		Slovak Republic		
OM2VL	**A**	**4,572,454**	**1656**	**733**
OM7PY	**14**	**32,890**	**134**	**115**
OM2AGN	"	26,000	103	100
OM3CW	**7**	**146,960**	**203**	**167**
***OM7KW**	**A**	**1,481,610**	**922**	**435**
*OM3R	"	905,625	658	375
				(OP:OM3CFR)
*OM3IAG	"	674,560	514	340
*OM2DT	"	224,672	288	224
*OM2WX	"	119,000	201	175
*OM7AG	"	92,871	185	153
*OM3TLE	"	64,728	160	124
*OM8PG	"	27,258	92	77
*OM7YC	"	7,700	51	44
***OM8JP**	**14**	**69,120**	**194**	**160**
***OM8HG**	**7**	**29,760**	**89**	**80**
***OM3ZWA**	**3.5**	**915,356**	**611**	**377**
		Slovenia		
S53X	**A**	**4,809,946**	**1551**	**733**
S57YK	"	248,272	344	263
S53R	"	140,080	210	170
S57DX	**14**	**1,430,860**	**991**	**580**
S53TM	"	353,772	476	317
S53M	**7**	**4,239,172**	**1277**	**707**
				(OP:S51FB)
S51CK	"	2,027,880	914	516
S58Q	**3.5**	**471,576**	**394**	**294**
***S57U**	**A**	**1,671,047**	**1001**	**469**
*S55BA	"	987,552	697	381
*S51I	"	527,386	489	334
*S56A	"	418,606	389	311
*S57SWR	"	372,000	390	248
*S57X	"	84,102	158	131
*S57KM	"	15,686	79	62
**S58L*	*14*	*9,198*	*67*	*63*
***S5ØB**	**7**	**174,636**	**222**	**189**
***S53NW**	**3.5**	**445,356**	**414**	**278**
*S52WD	"	241,108	293	218
*S53BB	"	102,102	186	143
		Spain		
EA5FIV	**A**	**547,475**	**531**	**359**
EA2XR	"	526,285	526	335
EA1WX	"	405,920	411	295
EC5CR	"	371,348	416	254
EA7TG	"	331,702	408	266
EF5Y	"	215,460	290	210
				(OP:EA5FR)
EA1WS	"	186,030	327	234
EA5GIE	"	33,561	121	99
EA3EZD	"	31,104	126	108
EB2RA	"	16,704	72	64
EA2OK	"	6,912	59	54
EA5FID	**21**	**14,784**	**90**	**77**
EA3OH	"	3,293	37	37
EF1Z	**14**	**872,534**	**744**	**481**
				(OP:EA1BD)
EA2KU	"	168,240	353	240
EC1RS	"	98,623	248	193
EA1EPM	"	9,248	72	68
EB1DMQ	"	2,196	39	36
EA1XT	**7**	**993,672**	**586**	**373**
EA3AQ	"	89,440	156	130
EB1IC	"	54,000	117	108
EA1DA	"	44,650	120	95
***EA4BAS**	**A**	**800,793**	**665**	**399**
*EA4GOY	"	769,776	604	348
*EB5CUZ	"	256,300	357	233
*EA1IYK	"	253,565	367	235
*EA5HYJ	"	222,640	331	230
*EA7GV	"	194,970	308	201
*EA5HRT	"	185,640	312	204
*EA3HKA	"	154,587	294	227
*EA4AAZ	"	142,128	240	189
*EB1EB	"	113,828	199	143
*EA3HWE	"	106,582	206	161
*EC7AT	"	63,992	194	152
*EB5CS	"	48,951	133	111
*EB3EKZ	"	46,979	136	109
*EA1EWY	"	25,284	107	86
*EA5ERA	"	12,903	81	69
*EB1BCG	"	12,154	66	59
*EA4CRP	"	4,403	40	37
*EA4FIT	"	540	12	12
***EF3C**	**14**	**91,509**	**213**	**177**
				(OP:EA3CV)
*EA5/OH2HOD	"	83,772	215	179
				(OP:OH2HOD)
*EA1BDX	"	76,736	194	176
*EA7ZC	"	42,588	142	126
*EA7AH	"	19,936	98	89
*EA7IA	"	12,075	81	75
*EA2CCG	"	5,661	55	51
***ED4T**	**7**	**439,704**	**366**	**279**
				(OP:EA4CWN)
*EA2BNU	"	320,640	322	240
*EA3CI	"	145,280	209	160
*EB7KA	"	64,350	141	117
*EA7JZZ	"	45,696	106	102
***ED3Y**	**3.5**	**285,348**	**301**	**237**
				(OP:EA3EGB)
*EA4DB	"	64,560	136	120
		Sweden		
SM6UQL	**A**	**1,085,440**	**802**	**424**
SM5ILE	"	1,061,764	780	409
SB7W	"	701,480	650	380
SM5EPO	"	265,853	339	233
SM6YEC	"	62,377	154	133
SM6MVE	"	61,776	163	132
SM6NET	"	61,090	167	149
SM7IUN	"	7,095	49	43
SM6VVT	**14**	**111,321**	**253**	**189**
SA6U	**7**	**2,438**	**23**	**23**
SM3LBP	"	1,512	18	18
***SE4E**	**A**	**1,131,936**	**807**	**416**
				(OP:SM4DQE)
*7S5S	"	500,511	502	319
				(OP:SM5CSS)
*SM5S	"	468,958	465	287
				(OP:SM5SIC)
*SM6I	"	246,330	329	238
				(OP:SA6CMO)
*SM7BHM	"	246,196	342	244
*SM7CIL	"	151,430	238	190
*SM6FZO	"	146,400	259	183
*SM5EFX	"	97,812	196	156
*SFØZ	"	96,200	199	148
				(OP:SMØHEV)
*SE6N	"	68,511	164	123
				(OP:SA6AXR)
*SM6GBM	"	43,056	146	117
*SK6QA	"	42,420	122	101
				(OP:SM6PVU)
*SF5M	"	34,216	113	104
				(OP:SM5SYO)
*SM5DXR	"	30,527	115	89
*SM6GKT	"	30,081	125	111
*SK5ØHD	"	18,000	85	72
				(OP:SA6AQP)
*SD6M	"	16,827	86	79
*SFØD	"	6,068	43	41
				(OP:SMØDSF)
*SM5ACQ	"	5,043	44	41
*SM5VTP	"	864	18	18
***SM6IQD**	**3.5**	**2,024**	**23**	**23**
		Switzerland		
HB9AVK	**A**	**131,698**	**206**	**161**
HB9ØOCR	"	121,109	219	163
				(OP:HB9OCR)
HB9CAT	"	35,672	99	91
HB9DVZ	"	27,950	101	86
***HB9CNY**	**A**	**214,720**	**296**	**220**
*HB9ØAWS	"	178,821	254	179
				(OP:HB9AWS)
*HB9MXY	"	136,416	213	174
*HB9LF	"	89,435	203	155
				(OP:HB9CRV)
*HB9TZU	"	23,310	85	74
*HB9ØTOC	"	17,262	72	63
				(OP:HB9TOC)
*HB9HFM	"	11,571	63	57
*HB9ØGKM	"	270	10	10
				(OP:HB9GKM)
		Ukraine		
UW1M	**A**	**4,853,499**	**2006**	**723**
				(OP:UR5MW)
EMØI	"	4,314,363	1834	713
				(OP:UT2IZ)
UZ1WW	"	2,260,995	1128	579
UV5U	"	2,033,120	1104	524
				(OP:UX1UA)
UV7V	"	1,433,124	871	484
				(OP:UX1VT)
UY5VA	"	1,329,999	918	451
UT3RS	"	1,311,380	926	476
UWØK	"	1,243,000	725	452
				(OP:USØKW)
UZØU	"	1,048,172	783	428
				(OP:UY5ZZ)
UR5CN	"	901,407	742	377
UR5R	"	862,150	656	430
				(OP:UTØRM)
UX5UO	"	605,917	589	367
UR4EI	"	485,268	495	318
UZ5ZU	"	453,568	481	304
UT2UB	"	285,250	376	250
UT5ECZ	"	189,711	281	197
UT3UV	"	47,092	151	122
US2YW	"	39,930	127	110
UR7R	"	3,225	45	43
UY5QZ	"	525	16	15
UT7E	"	120	8	8
				(OP:UV5EOZ)
EM2G	**14**	**1,774,326**	**1153**	**678**
				(OP:UR7GO)
US7IY	"	118,818	274	207
UR5FBM	"	36,720	130	120
UT4U	**7**	**1,507,488**	**706**	**492**
				(OP:UT5UJO)
UY1HY	"	1,264,384	684	449
UT7FA	"	598,104	472	324
UT5LA	"	227,392	276	209
US1IV	"	103,008	172	148
UX2X	**3.5**	**2,278,100**	**1002**	**550**
				(OP:UT2XQ)
UT2AU	"	419,440	395	280
UT3N	"	212,716	289	214
				(OP:UT3NK)
***UW6E**	**A**	**2,355,029**	**1196**	**563**
				(OP:UR6EA)
*UX1UX	"	1,709,840	1035	536
*UT5EPP	"	1,576,988	1074	476
*UX7QV	"	940,752	806	376
*UT7IS	"	860,200	723	391
*UT8EL	"	858,526	734	394
*UT3SO	"	654,288	564	344
*UR7CB	"	606,210	571	334
*UR6IM	"	583,375	595	359
*UR7CT	"	535,516	525	332
*UR6QS	"	440,412	483	294
*UT5UN	"	401,841	443	297
*UR4LBG	"	396,429	434	293
*UY5UF	"	393,907	403	289
*UR7EC	"	353,700	411	270
*UR3PA	"	319,084	375	241
*UR5ZGY	"	306,153	443	261
*UR5LY	"	269,724	313	247
*UY5TE	"	263,624	365	248
*UR4LG	"	259,650	354	225
*UT2SQ	"	240,720	308	240
*UT5CL	"	236,520	299	219
*UR3QTN	"	232,388	314	218
*UTØCK	"	221,778	332	222
*UT2QQ	"	219,240	313	232
*UR4CU	"	198,260	292	230
*UR7QM	"	197,344	304	224
*US5CDH	"	179,270	274	197
*UV3RT	"	169,388	265	212
*UX1VX	"	162,240	251	192
*UR5ZDZ	"	160,752	277	197
*UT8AS	"	158,760	262	180
*UW5U	"	155,246	243	182
				(OP:UY2UA)
*UT4UQ	"	144,786	246	177
*UR4MG	"	140,686	250	182
*US7IB	"	128,505	257	195
*UT7MR	"	126,400	235	158
*UT8IK	"	117,490	219	155
*UTØNT	"	99,358	198	151
*UT3IA	"	98,343	204	147
*UT1UL	"	71,687	157	133
*UY5QQ	"	65,100	150	150
*UT4UFU	"	64,896	152	128
*US5QUB	"	54,210	141	130
*UX4CR	"	50,941	144	121
*US5LOC	"	28,644	108	93
*UX5UN	"	24,548	84	76
*UR5XMM	"	23,004	91	81
*UT5UHX	"	18,942	89	82
*UX7VA	"	16,020	93	89
*US7IID	"	10,044	65	62
*UT9UZ	"	7,740	47	45
***UR5QU**	**21**	**31,752**	**130**	**108**
***UR2Y**	**14**	**428,922**	**535**	**351**
				(OP:USØYW)
*EM9Q	"	359,597	494	329
				(OP:UR9QQ)
*UY7C	"	337,608	462	324
				(OP:UR3CMA)
*UT1AA	"	195,027	375	251
*UT2EF	"	135,072	272	224
*UR8QR	"	105,252	246	196

*US5AT	"	101,595	242	195
*UT5PQ	"	52,780	159	145
*UX4AA	"	35,588	139	124
*UR3AC	"	34,920	132	120
*UR5ZEP	"	27,560	126	106
***US7KC**	**7**	**784,728**	**586**	**346**
*UR5WCQ	"	743,208	500	358
*US6CQ	"	595,326	465	317
*UR4MVK	"	305,000	316	250
*UZ4U	"	212,576	250	208
*UT3QD	"	98,208	171	144
*EO3Q	"	35,948	104	86 (OP:UR3QCW)
*UR8EQ	"	18,354	71	69
***UZ2HZ**	**3.5**	**880,896**	**598**	**384**
*UT5PY	"	613,760	504	320
*UR5FQB	"	192,608	251	208
*UY8IF	"	90,804	177	141
Vienna Intl Ctr				
***4U1A**	**A**	**1,104,450**	**746**	**398 (OP:HB9RB)**
Wales				
GW5NF	**A**	**1,004,805**	**755**	**405**
GWØA	"	342,713	407	283
***MW9W**	**A**	**689,409**	**606**	**353 (OP:GWØKRL)**
*MW6M	"	334,552	435	284 (OP:GW4BVJ)
*GW4JBQ	"	43,120	125	110
*GW4TSG	"	11,596	60	52

OCEANIA

Australia				
VK4QH	**A**	**200,736**	**285**	**164**
VK7BO	"	32,508	101	84
VK4BRT	"	16,530	70	57
VK4SN	**14**	**144,308**	**302**	**172**
***VK3TNL**	**A**	**5,355**	**39**	**35**
East Malaysia				
***9W6EZ**	**A**	**1,701**	**23**	**21**
Hawaii				
KH6ZM	**A**	**2,357,355**	**1410**	**429**
KH6TU	"	1,799,680	1205	380 (OP:AD6E)
***KH6CJJ**	**A**	**581,166**	**646**	**249**
***KH6GMP**	**14**	**34,365**	**134**	**87**
Indonesia				
YBØNDT	**A**	**822,624**	**743**	**352**
YF9CDL	"	203,263	365	181
YC6RMT	"	190,302	383	161
YB2IQ	"	75,480	184	136
YBØCOU	"	22,360	112	65
YC2HML	"	7,656	83	44
YB8AK	"	4,389	49	33
YE3WIL	"	4,026	48	33
YB2BBZ	"	2,912	36	28
YC3BLJ	**21**	**5,412**	**50**	**41**
YC9SBP	**14**	**4,070**	**49**	**37**
YC2EEE	**7**	**16,704**	**89**	**58**
YC3VRY	"	2,756	31	26
YCØNGA	"	1,978	29	23
YB4IR	**3.5**	**3,808**	**30**	**28**
YF3CYT	"	120	10	6
YF3CYS	"	84	7	6
YF3DFB	"	40	5	4
***YFØTUR**	**A**	**250,640**	**379**	**208**
*YC4HQ	"	239,590	338	190
*YC2YIZ	"	229,596	337	212
*YB8RW	"	132,486	310	142
*YC4FIK	"	112,320	252	130
*YD9ATS	"	110,040	198	131
*YB7OO	"	83,959	188	113
*YB1BML	"	83,080	203	134
*YC2CAA	"	74,624	200	128
*YB7SKM	"	69,660	196	108
*YB1AD	"	62,116	150	106
*YCØBAS	"	53,560	178	103
*YB2BNN	"	52,640	182	112
*YB2GV	"	45,200	137	100
*YB8UM	"	31,160	113	82
*YB7WR	"	26,726	110	83
*YD2CPQ	"	22,839	102	69
*YB1BJV	"	19,695	78	65
*YC1KK	"	18,096	102	78
*YC8OBM	"	17,199	86	63
*YB2VYY	"	16,800	90	75
*YC3DXG	"	15,925	103	65
*YG3FBV	"	14,410	94	55
*YG9DFK	"	14,101	89	59
*YD8MKA	"	12,760	94	55
*YD2KJC	"	11,128	75	52
*YD1EMV	"	8,213	78	43
*YCØMAT	"	8,041	50	43
*YD2DSV	"	7,686	69	42
*YC3ATK	"	7,650	74	45
*YD8UYJ	"	7,406	56	46
*YC4KAR	"	7,350	65	42
*YC1PZ	"	4,995	59	37
*YB3HQM	"	2,834	40	26
*YD1IGJ	"	2,772	37	28
*YC1BA	"	2,072	35	28
*YC3BGM	"	1,872	31	26
*YB1IM	"	1,743	36	21
*YD1TJJ	"	1,452	25	22
*YC2JIS	"	1,197	31	19
*YB3BME	"	1,188	28	22
*YC2YEN	"	738	20	18
*YC2CAB	"	731	17	17
*YB9BCS	"	399	20	19
*YD1WCK	"	374	13	11
*YD9KXX	"	120	8	6
*YD1OCG	"	16	4	4
***YF5YUD**	**21**	**7,592**	**56**	**52**
*YB9QP	"	7,590	74	55
*YG2UFA	"	2,871	33	33
*YB1UUN	"	1,296	25	24
*YD1LIQ	"	104	9	8
***YB1AR**	**14**	**239,955**	**339**	**255**
*YB2MM	"	160,792	283	202
*YB1HDR	"	9,222	62	58
*YB1ELP	"	3,264	35	34
*YE4IJ	"	1,452	24	22
***YF7SPN**	**7**	**167,184**	**236**	**162**
*YCØRI	"	129,630	203	149
*YD2YSW	"	56,964	139	101
*YB2WA	"	47,840	142	92
*YD7YGR	"	41,452	106	86
*YD2YDX	"	25,944	106	69
*YD9DE	"	11,424	66	48
*YD1NXR	"	10,080	71	48
*YC1APR	"	7,216	61	41
*YD8MJG	"	6,080	52	40
*YD1IDC	"	6,006	66	39
*YC1JQC	"	5,530	55	35
*YCØRLX	"	5,112	53	36
*YC1BON	"	4,032	56	32
*YDØSCZ	"	2,916	41	27
*YD9DRB	"	1,764	36	21
*YCØOSX	"	1,672	27	22
*YDØEGA	"	1,640	25	20
*YG5YZW	"	2	1	1
***YC2VOC**	**3.5**	**1,520**	**27**	**20**
*YC9CT	"	340	15	10
*YG3EOY	"	60	6	5
*YG3EOQ	"	50	5	5
*YG3FKD	"	18	3	3
*YG3FZT	"	2	1	1
New Zealand				
ZL3IO	*A*	*292,536*	*268*	*204*
ZL2RX	**"**	**48,546**	**109**	**93**
ZL4NR	"	4,514	43	37
***ZL3VZ**	**A**	**24,414**	**88**	**78**
Philippines				
DU1IVT	**A**	**126,720**	**257**	**160**
DU1R	**7**	**86,328**	**148**	**109 (OP:DU1UGZ)**
***DU1JM**	**A**	**409,734**	**463**	**221**
***DU1/PG5V**	**14**	**846**	**19**	**18**
*DV1YZD	"	220	10	10

SOUTH AMERICA

Argentina				
LU5VV	**A**	**170,805**	**297**	**193**
LU1BJW	"	149,100	280	175
LU6VEK	"	127,072	244	176
LU8DZJ	"	680	17	17
**LQ7E*	*A*	*30,597*	*116*	*93 (OP:LW3DN)*
***LU5DF**	**"**	**24,101**	**102**	**77**
*LU4HK	"	8,466	58	51
***L77D**	**21**	**45,235**	**148**	**109 (OP:LU6DC)**
*LU3MAM	"	44,944	148	106
***LO7H**	**14**	**90,147**	**207**	**151**
Aruba				
P49X	**A**	**10,754,846**	**3095**	**782 (OP:WØYK)**
Bolivia				
***CP6UA**	**A**	**38,200**	**132**	**100**
Brazil				
PY5ZHP	**A**	**168,675**	**290**	**195**
PY2RKG	"	11,328	65	59
PY2SHF	**21**	**30,199**	**111**	**101**
PY2KJ	**7**	**48,960**	**96**	**90**
ZW85LABRE	"	10,668	43	42
***ZZ2T**	**A**	**2,290,635**	**1219**	**545 (OP:PY2MNL)**
*PY2CAT	"	17,612	89	74
*PY7BC	"	4,284	41	36
*PY2VCP	"	3,996	39	37
*PY2VZ	"	2,670	33	30
*PY2MIA	"	2,666	35	31
*PY2OSD	"	1,904	29	28
***PX2A**	**21**	**704,184**	**664**	**366 (OP:PY2XV)**
*PY2UD	"	585,273	570	349
*ZV2C	"	561,120	574	336 (OP:PY2CX)
*PY2XC	"	63,315	170	135
*PU2TRX	"	50,142	160	122
*PU2WDX	"	21,300	99	75
*PU2UAH	"	1,081	23	23
*PY1IR	"	656	17	16
*PU4CGT	"	25	5	5
***PY2NY**	**14**	**452,952**	**479**	**324**
*PY2FRQ	"	37,985	126	107
*PY4XX	"	16,188	80	71
***PP7DX**	**7**	**28,826**	**77**	**71**
Chile				
3G1B	**14**	**86,688**	**193**	**168 (OP:CE1UMY)**
CE3DNP	"	36,166	125	107
XQ1KZ	**7**	**1,161,352**	**567**	**358**
***CE1LTL**	**A**	**111,303**	**247**	**149**
*CE2MT	"	8,232	52	49
***XQ3UP**	**21**	**20,303**	**93**	**79 (OP:XQ7UP)**
***CE7VPQ**	**14**	**26,460**	**106**	**90**
*CE7KF	"	1	1	1
Curacao				
PJ2T	**A**	**4,382,626**	**1715**	**626 (OP:WI9WI)**
Equador				
***HC1JQ**	**14**	**156,822**	**302**	**177**
Suriname				
PZ5RA	*A*	*258,570*	*301*	*221*
Uruguay				
CV7S	**21**	**805,560**	**715**	**392 (OP:CX7SS)**
Venezuela				
YV4ABR	**A**	**60**	**5**	**5**
***YW6CQ**	**A**	**166,080**	**214**	**173 (OP:YV6BXN)**
***YV1SW**	**21**	**18,174**	**85**	**78**

QRP

F5BEG	**A**	**1,263,072**	**778**	**446**
DK7HA	**"**	**1,181,768**	**749**	**449**
OK2FD	**"**	**1,017,144**	**651**	**408**
IK2XDE	**"**	**919,224**	**681**	**408**
MM3AWD	**"**	**774,060**	**640**	**380**
YU1ANO	**"**	**493,800**	**460**	**300 (OP:YU1LM)**
DD2ML	"	429,852	389	339
K2YG	**"**	**325,125**	**498**	**289**
EW8G	**"**	**203,889**	**294**	**219**
WE4M	**"**	**171,589**	**400**	**209 (OP:N2QT)**
LZ3RR	**"**	**146,496**	**247**	**192**
W6QU	**"**	**130,529**	**330**	**203 (OP:W8QZA)**
SN2WOSP	**"**	**117,624**	**206**	**156 (OP:SP2UUU)**
OH2LZI	**"**	**113,696**	**237**	**176**
DL8TG	"	106,880	211	167
IK1XPK	"	100,951	195	157
EA1GT	**"**	**98,580**	**197**	**159**
PE2K	**"**	**90,882**	**211**	**162**
CM3EFM	**"**	**84,058**	**181**	**122**
DO4NT	"	70,216	149	131
DF5RF	"	67,584	151	132
Z35Z	**"**	**63,630**	**149**	**126**
A96A	**"**	**60,393**	**138**	**123 (OP:A92AA)**
RA3DJA	**"**	**60,288**	**161**	**128**
K2YGM	"	60,248	177	136
G4FPA	**"**	**57,462**	**148**	**122**
RU6YJ	**"**	**55,896**	**174**	**137**
RV3DBK	"	48,906	149	114
KI9S	**"**	**45,408**	**214**	**129**
VE6EX	**"**	**38,862**	**155**	**102**
W3IQ	**"**	**37,642**	**193**	**118**
OP4A	**"**	**32,040**	**99**	**89**
JK1TCV	**"**	**29,766**	**107**	**82**
DJ3GE	"	29,281	99	89
DDØVS	"	26,240	91	80
CO2XK	"	24,601	93	73
DH5MM	"	23,384	85	74
RT4W	**"**	**22,776**	**97**	**78**
DL2DWP	"	20,910	96	85
Z35M	"	18,288	76	72
KC9NBV	"	15,808	107	76
DU1AVC	"	14,168	76	56
YB2TS	**"**	**11,908**	**79**	**52**
SP3IOE	"	11,236	56	53
YBØANN	"	10,608	80	51
N6MA	**"**	**10,360**	**98**	**70**
W1IG	**"**	**10,200**	**72**	**60**
K1SX	"	10,146	58	57
W6GMT	**"**	**9,261**	**77**	**63**
OK1FWG	"	8,325	49	45
YO4AAC	**"**	**8,322**	**59**	**57**
HK3W	**"**	**8,016**	**49**	**48**
N8URE	"	7,722	91	66
N6HI	"	6,608	74	56
AI9K	"	6,264	67	54
RAØAY	**"**	**5,661**	**45**	**37**
YC1HBP	"	5,425	57	35
W4ZGR	"	5,280	49	44
JA1GZK	"	4,500	45	36
K8ZT	"	4,324	51	47
YB2NDX/1	"	2,700	40	27
GW1YQM	**"**	**2,673**	**33**	**33**
DG8MG	"	2,632	28	28
EE2A	"	1,742	26	26 (OP:EA2SN)
G7PVZ	"	1,512	22	21
OK1DMP	"	1,425	25	25
YB2VMC	"	1,239	29	21
E71EZC	**"**	**1,092**	**22**	**21 (OP:E77AB)**
VE3WZ	**"**	**828**	**18**	**18**
YB3FTD	"	672	24	14
BG1REN	"	340	10	10
JE1ILP	"	70	9	7
DQ5M	"	50	5	5 (OP:DK6SP)

JH3DMQ	28	21	3	3
CO6EC	"	2	2	2
JR1NKN	21	840	21	21
HG3C	"	799	18	17
IZ3NVR	"	242	11	11
DL2TM	"	12	3	3
YC3RJL	"	8	2	2
IZ7FLP	14	629,880	651	435
A71AE	"	349,279	433	287
HG3IPA	"	124,020	263	212 (OP:HA3JB)
UX8ZA	"	40,040	151	130
WE6EZ	"	37,960	183	146
JH1APZ	"	30,906	121	102
NP4AW	"	10,899	74	63
RA3XEV	"	5,150	52	50
YC8AO	"	1,512	31	27
IU2IGX	"	1,350	28	25
RW3AI	"	1,250	25	25
N1VVV	"	1,178	31	31
EA3FHP	"	1,173	25	23
UAØSBQ/QRP	"	1,155	21	21
N9EP	"	120	12	12
YO8SMV	"	84	6	6
XE1TRY	"	28	4	4
DL5RK	7	538,986	447	313
LZ2TU	"	195,456	257	192
EE3X	"	185,220	234	189 (OP:EA3KX)
YT5DEY	"	171,720	236	180
R9FBT	"	150,144	218	184
OK1NG	"	127,280	203	172
KH6KG/W5	"	107,146	235	169 (OP:KH6KG/W5)
CO8RCP	"	89,244	160	134
R7RAG	"	72,898	148	127
YO9GSB	"	68,696	142	124
YU1ZMT	"	63,984	139	124
WD9FTZ	"	60,836	177	134
ON3DI	"	50,096	109	101
S56ZVD	"	43,890	118	105
UT4UEI	"	20,880	77	72
KP2DX	"	15,812	68	59 (OP:KP2BH)
TB7BIY	"	14,308	51	49
DL3ZID	"	11,130	58	53
OL12ØAB	"	10,608	52	51 (OP:OK4RM)
M2M	"	8,624	48	44 (OP:GØWAT)
JF1RYU	"	7,052	45	41
YL3FW	"	6,806	43	41
JH7BMF	"	4,440	30	30
Z32ID	"	4,422	33	33
W4ER	"	4,070	39	37
YB6DE	"	2,784	27	24
S57LR	"	2,700	27	27
JE1CAC	"	2,352	21	21
DU9CA	"	696	13	12
DF7DR	"	552	12	12
N4RLI	"	308	11	11
YDØRXA	"	176	8	8
JRØBUL	"	6	1	1
YO9BCM	3.5	282,978	305	237
YO8WW	"	96,570	167	145
YT5YTT	"	67,704	142	124
SQ2NNN	"	65,268	143	126
US3IW	"	57,348	132	118
N9SE	"	37,800	160	105
JM1NKT	"	5,796	64	42
JG1LFR	"	5,494	59	41
PAØAWH	"	3,080	28	28
KB2HSH	"	2,280	34	30
SP9RQH	"	1,748	23	23
KK7A	"	1,242	26	23
ES3VI	"	756	14	14
YG3FZR	"	24	4	3
YD3UX	"	4	2	2

MULTI-OPERATOR
SINGLE TRANSMITTER HIGH POWER
NORTH AMERICA

	United States		
W4MLB	1,261,379	1219	491
WV4P	1,159,368	1066	469
KM4OQO	589,157	596	353
AA4YL	132,273	269	213
K5RZA	532,860	746	321
WU6TT	143,374	380	209
KZ7X	3,347,888	2242	664
NV9L	5,172,516	2320	828
NXØI	1,053,308	1317	428
AK9D	557,648	916	364
	Belize		
V31YN	1,028,970	946	370
	Canada		
VA3LML	611,694	610	306
VE7KW	1,156,858	1104	397

ASIA

	Japan		
JA1ZGO	396,200	448	283
JHØMUC/Ø	76,310	195	130
	West Malaysia		
9M2TO	218,688	295	201

EUROPE

	Croatia		
9A5D	7,577,856	2408	897
	Czech Republic		
OK7O	4,607,442	1772	717
OK1KSL	4,071,375	1647	693
	European Russia		
RK3DXW	1,470,269	1100	503
	Fed. Rep. of Germany		
DR5N	6,936,615	2110	855
DP6K	1,856,634	1073	507
DF5MA	1,704,528	1002	534
DM3X	791,879	641	373
	Finland		
OH2HAN	3,677,955	1507	683
OH2KW	1,895,398	1146	521
OH5Z	375,552	406	288
	Greece		
SZ1A	4,825,316	1909	734
	Hungary		
HG1S	8,441,062	2467	938
HG7T	6,878,075	2128	895
	Italy		
IQ2CU	1,327,293	835	451
IQ3PN	119,880	239	185
	Poland		
SP2KPD	1,076,306	772	406
	Romania		
YO3GNF	156,416	253	188
	Serbia		
YT6T	98,826	239	181
	Slovak Republic		
OM4Q	1,186,844	789	428
	Slovenia		
S52X	9,838,584	2659	972
S59T	59,623	122	109
	Sweden		
SK7K	2,621,808	1306	578
SJ3A	720,918	578	363
	Switzerland		
HB9ØTTK	3,674,240	1546	640
	Ukraine		
UZ2I	6,701,338	2409	826
UV7U	358,449	415	273
UZ4E	39,140	117	103

OCEANIA

	Australia		
VK5GR	569,772	498	306
	Indonesia		
YE1C	309,760	453	256
	Philippines		
DX9EVM	6,201	46	39

SOUTH AMERICA

	Bonaire		
PJ4Z	8,016,843	2416	823
	Uruguay		
CX5A	1,345,352	896	424

MULTI-OPERATOR
SINGLE TRANSMITTER LOW POWER
NORTH AMERICA

	United States		
*NG1R	842,160	781	440
*KN4DUA	93,694	263	158
*KD6TR	115,291	365	223
*ADØLI	115,206	350	211
	Mexico		
*XE2N	16,660	129	98

AFRICA

	Canary Islands		
*EB8AH	7,818,720	2304	840
	Cueta & Melilla		
*ED9E	5,274,636	1828	667

ASIA

	Asiatic Turkey		
*TC7G	2,103,582	1013	447
	China		
*BH2RO	131,716	305	149
	Japan		
*8N1UEC	3,680	48	40
*JK2VOC	49,005	147	121

EUROPE

	Belgium		
*OT6M	3,566,196	1401	657
	Croatia		
*9A7T	3,851,712	1340	743
*9A7B	141,939	235	189
	Czech Republic		
*OK1RPL	388,188	414	263
*OK1OFM	3,432	37	33
	Estonia		
*ES5YG	218,763	310	223
	European Russia		
*RA3Y	1,937,920	1156	512
*RK3PWR	1,758,834	1210	517
*UA6KAC	240,030	397	270
	Fed. Repulic of German		
*DQ4W	2,242,800	1129	560
*DG7RO	452,960	458	304
*DQ4X	219,008	318	236
*DJ1XT	183,872	280	208
*DL7ØBRD	78,546	181	159
*DL19RIC	14,823	66	61
	Lithuania		
*LY5W	2,150,448	1051	568
	Macedonia		
*Z33A	277,610	339	230
	Netherlands		
*PI4CG	2,089,790	1126	530
*PI4VAD	811,966	606	362
	Poland		
*SP9ZHP	735,128	611	344
*SN9A	148,185	247	185
*SNØUNESCO	8,448	52	48
	Serbia		
*YU7KMN	38,318	132	119
	Slovak Republic		
*OM3KSI	61,347	169	143
	Slovenia		
*S51DX	314,430	355	235
	Spain		
*ED3D	1,469,093	956	479
*EA4URE	767,618	563	422
	Ukraine		
*UR4RWW	170,016	245	184

OCEANIA

	Indonesia		
*YE1ZAZ	28,282	129	79
	Philippines		
*4D3X	840,408	763	291

SOUTH AMERICA

	Brazil		
*PR2E	361,760	481	272
	Chile		
*CB3ET	124,148	265	164

MULTI-OPERATOR
TWO TRANSMITTER
NORTH AMERICA

	United States		
KE1S	2,823,680	1415	640
KB3VQC	2,291,460	1496	633
W4CDA	15,045	100	85
K5MXG	332,766	587	278
NX6T	1,101,672	1352	429
KT7E	2,464,020	2008	585
KB8O	2,786,488	1825	632
K9CT	8,789,400	3430	950
NCØDX	4,603,284	2581	756
W7II	1,376,845	1188	509
	Cuba		
T43MY	299,820	427	228

AFRICA

	Madeira Islands		
CR3DX	24,254,241	5003	1111

ASIA

	Hong Kong		
VR2CC	711,624	760	298

		Japan		
JA6ZPR		**1,847,560**	**1112**	**520**

EUROPE

		Andorra		
C37URA		**4,405,040**	**1757**	**680**
		Fed. Rep. of Germany		
DP9A		**8,815,636**	**2647**	**892**
DP7D		8,478,900	2580	900
DLØCS		3,482,850	1590	642
		Lithuania		
LY9Y		**8,055,696**	**2585**	**876**
		Norway		
LM45ØC		**116,320**	**201**	**160**
		Poland		
SP5KCR		**498,344**	**468**	**308**
		Slovak Republic		
OM3KFF		**1,342,224**	**842**	**468**
		Slovenia		
S549APR		**8,813,808**	**2649**	**873**
		Spain		
ED2C		*2,133,472*	*1190*	*551*
EA3MR		**334,887**	**378**	**259**

OCEANIA

		Indonesia		
YB3ZBD		**12,220**	**68**	**52**
		Philippines		
DX3H		**119,301**	**290**	**133**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

		United States		
NR4M		**8,264,608**	**3179**	**886**
AA5AU		6,915,392	2823	893
NA5NN		**3,570,905**	**2238**	**685**
WV6I		**2,967,636**	**2189**	**618**
KU1CW		**2,939,696**	**2150**	**626**
KA6BIM		941,460	902	426
		Canada		
VA5AA		**771,060**	**915**	**355**

EUROPE

		Bulgaria		
LZ6ØKAA		**7,224,150**	**2498**	**850**
		Croatia		
9A1A		**18,965,990**	**4254**	**1154**
		European Russia		
UB6B		**10,614,186**	**3187**	**963**
		Fed. Rep. of Germany		
DGØRO		**4,191,894**	**1751**	**714**
DR3W		**2,467,839**	**1206**	**583**
		Lithuania		
LY2W		**9,164,328**	**2804**	**907**
		Slovenia		
S5ØA		**4,622,298**	**1366**	**733**
		Spain		
ED2V		**304,554**	**382**	**263**

ROOKIE

		United States		
KN4BIT	**A**	**17,355**	**124**	**89**
***W9JWC**	**A**	**320,597**	**579**	**263**
				(OP:KD9LSV)
***AA4LS**	**"**	**286,464**	**461**	**256**
***AJ3C**	**"**	**69,185**	**208**	**137**
***AA8SW**	**"**	**50,800**	**191**	**127**
***KB7AK**	**"**	**16,878**	**133**	**87**
***W2XK**	**"**	**9,420**	**67**	**60**
***KG5THG**	**7**	**108,896**	**228**	**166**
***K7HKR**	**"**	**20,000**	**90**	**80**
***ADØTZ**	**"**	**1,092**	**21**	**21**
*AG7CC	"	468	14	13
***KEØSTT**	**3.5**	**8**	**2**	**2**
		DX		
IU2IGX	**14**	**1,350**	**28**	**25**
XE1TRY	**"**	**28**	**4**	**4**
YO4FPF	**A**	**329,708**	**441**	**278**
VU2ZMK	**"**	**95,172**	**199**	**154**
S53TM	**14**	**353,772**	**476**	**317**
IU1JCZ	**7**	**252,778**	**301**	**211**
***IU8HPD**	**A**	**1,390,884**	**829**	**492**
***S55BA**	**"**	**987,552**	**697**	**381**
*S51I	"	527,386	489	334
*UA4HJ	"	453,312	534	288
***SV8OVH**	**"**	**323,144**	**386**	**248**
***SQ8W**	**"**	**311,484**	**363**	**257**
*SP9KB	"	172,179	265	189
***HA1DD**	**"**	**168,675**	**264**	**195**
*IU4JIC	"	129,564	233	183
***R2PU**	**"**	**129,425**	**217**	**155**
***R7LY**	**"**	**100,646**	**210**	**158**
***9M2TDX**	**"**	**33,990**	**120**	**66**
*ISØCAK	"	29,744	99	88
***DO4WLL**	**"**	**25,200**	**89**	**80**
*YD2CPQ	"	22,839	102	69
*IU1LCU	"	22,440	87	85
***YO9IOE**	**"**	**22,327**	**92**	**83**
*SQ2MO	"	20,880	81	72
***MØTKM**	**"**	**16,965**	**77**	**65**
*M6YTU	"	10,920	74	65
***VE3SCN**	**"**	**10,304**	**66**	**56**
*VA3JHQ	"	10,192	74	56
***YD1EMV**	**"**	**8,213**	**78**	**43**
*YCØMAT	"	8,041	50	43
*YD2DSV	"	7,686	69	42
*YD8UYJ	"	7,406	56	46
*IU1JYM	"	4,469	45	41
*IU4CZW	"	1,944	28	27
*YD1TJJ	"	1,452	25	22
*IX1HPN	"	1,116	18	18
*DO7ES	"	988	20	19
*IW1DUS	"	588	14	14
*IZ8CLM	"	16	2	2
***YG2UFA**	**21**	**2,871**	**33**	**33**
***PU2UAH**	**"**	**1,081**	**23**	**23**
*YD1LIQ	"	104	9	8
*PU4CGT	"	25	5	5
***PY2FRQ**	**14**	**37,985**	**126**	**107**
***VE2NCG**	**"**	**37,723**	**150**	**119**
***RQØC**	**"**	**35,956**	**175**	**101**
***HA1LZ**	**"**	**3,654**	**45**	**42**
***JT1YL**	**"**	**1,690**	**29**	**26**
***IU4HRJ**	**7**	**556,068**	**442**	**311**
*IN3EYI	"	345,800	357	247
***9W2SAF**	**"**	**144,354**	**188**	**147**
***YCØRI**	**"**	**129,630**	**203**	**149**
***2EØLXE**	**"**	**71,250**	**149**	**125**
***EA7JZZ**	**"**	**45,696**	**106**	**102**
*YD2YDX	"	25,944	106	69
***JA8UON**	**"**	**11,872**	**61**	**53**
*YC1APR	"	7,216	61	41
***SP9WPN**	**"**	**6,160**	**41**	**35**
*YD1IDC	"	6,006	66	39
*YC1JQC	"	5,530	55	35
*SQ9GOL	"	4,288	34	32
***DC6MT**	**"**	**24**	**3**	**3**
***R2FBZ**	**3.5**	**227,696**	**266**	**214**
***DO1ISE**	**"**	**169,600**	**245**	**200**
***Z35TUN**	**"**	**112**	**7**	**7**
***YG3EOY**	**"**	**60**	**6**	**5**
*YG3EOQ	"	50	5	5
*YG3FKD	"	18	3	3

TRIBANDER/SINGLE ELEMENT

		United States		
KI9S	A	45,408	214	129
W3IQ	"	37,642	193	118
N6MA	"	10,360	98	70
WE6EZ	**14**	**37,960**	**183**	**146**
N1VVV	"	1,178	31	31
W4ER	7	4,070	39	37
N9SE	3.5	37,800	160	105
N3QE	**A**	**3,576,573**	**1711**	**693**
KO7SS	**"**	**1,453,998**	**1301**	**546**
NR4O	**"**	**1,349,964**	**1192**	**462**
W2CDO	"	1,337,628	969	474
KI6DY	**"**	**1,317,833**	**1263**	**517**
N5HC	**"**	**1,252,679**	**1190**	**527**
WS6X	"	1,218,150	1045	450
AD5XD	"	1,120,419	1265	459
WA7AN	"	978,147	1216	433
				(OP:K9DR)
AA3S	"	973,352	867	421
K3MD	"	921,120	875	456
NB6U	**"**	**892,470**	**1063**	**426**
				(OP:N6ZFO)
KT4Q	"	890,416	957	464
K8AC	"	864,860	894	415
W6SX	"	828,181	1034	389
N2CU	**"**	**701,362**	**740**	**386**
K1SM	**"**	**692,265**	**695**	**399**
WT9U	**"**	**621,030**	**696**	**381**
K2RET	"	610,368	661	374
WM5DX	"	579,348	684	363
NS4X	"	519,435	799	315
WX6V	"	477,964	647	331
AK6M	"	422,550	744	313
				(OP:K6MM)
AD4TJ	"	406,144	556	304
K5VIP	"	397,823	450	313
NØBUI	"	344,322	596	282
W7VO	"	336,753	671	279
WRØH	"	333,025	537	275
K5XH	"	331,100	584	275
K8LF	"	319,658	441	277
KØWA	"	313,600	608	280
K4GM	"	304,896	500	256
KB2CKN	"	292,575	492	249
NF3R	"	266,252	405	257
W2YK	"	247,687	341	253
KØJJR	"	242,952	318	318
W1TO	"	242,292	340	244
WU6W	"	231,710	517	235
WA3AAN	"	214,136	398	232
K7JQ	"	199,836	489	234
WK1J	"	195,808	339	211
W1SJ	"	183,920	381	209
N6HE	"	173,557	434	197
K3AU	"	170,310	325	210
				(OP:K2YWE)
K6EU	"	160,262	384	227
NØKQ	"	147,936	394	201
K5OA	"	134,724	397	206
KØTLG	"	99,102	358	199
W6RKC	"	92,708	261	172
W2LE	"	85,470	211	165
NT6F	"	52,096	207	128
K1RO	"	51,054	197	127
NE6I	"	48,230	210	130
KX7L	"	47,790	212	135
K6UM	"	45,864	189	126
KA2AEY	"	38,350	168	118
KB7AZ	"	37,823	176	109
KF8MZ	**"**	**35,192**	**156**	**106**
AF6SA	"	33,124	140	98
WA5LXS	"	32,132	173	116
W8AKS	"	26,462	120	101
W6FB	"	25,900	148	100
NJ4F	"	24,816	102	88
NJ9R	"	16,614	97	78
W7SLS	"	12,880	102	70
K6DAJ	"	2,291	34	29
W9ILY	**14**	**337,625**	**431**	**365**
AA7V	**"**	**172,974**	**446**	**254**
W9IL	**"**	**51,471**	**174**	**133**
KI7DG	"	4,590	63	54
K9OM	**7**	**2,380,644**	**1075**	**603**
K8YE	**3.5**	**26,208**	**118**	**91**
***W3RGA**	**A**	**854,700**	**858**	**385**
*NY6DX	"	852,550	873	425
***W4LC**	**"**	**663,995**	**720**	**395**
***KA2D**	**"**	**519,183**	**570**	**369**
*K3RWN	"	491,808	676	327
*AB4SF	"	459,792	572	309
***WB5TUF**	**"**	**451,400**	**686**	**370**
*W4PJW	"	422,712	642	309
*KF4FC	"	422,196	623	302
*K8LS	"	376,567	667	289
***KE3K**	**"**	**331,338**	**546**	**294**
***K9CW**	**"**	**326,880**	**542**	**288**
*NN5T	"	308,610	528	254
*NS2N	"	300,852	441	274
***KM6Z**	**"**	**268,319**	**616**	**251**
*NG6O	"	260,355	543	255
				(OP:K6GHA)
*K2AL	"	260,308	451	236
*KB3LIX	"	249,755	413	239
*KS4YX	"	240,714	446	258
*WB9TFH	"	232,532	482	244
*KE6GLA	"	180,978	451	217
***AK6A**	**"**	**179,316**	**402**	**204**
*N8FYL	"	176,472	392	216
*KW9U	"	172,515	340	217
*W7CD	"	167,760	409	233
***W1DYJ**	**"**	**161,408**	**299**	**194**
***K7MKL**	**"**	**160,425**	**441**	**207**
*KC2WUF	"	155,820	315	196
*KS2G	"	149,100	327	210
*N9LQ	"	127,092	307	178
*KJ4M	"	92,904	284	158
*N2FF	"	86,636	204	179
*W4TM	"	81,162	250	162
*WA5LFD	"	78,312	269	156
*W9TAM	"	77,592	248	159
*NC4MI	"	71,248	235	146
*WA9LEY	"	61,984	223	149
*AI6V	"	47,790	248	135
*W8EH	"	34,632	170	111
*W1MJ	"	25,245	135	99
*AF5CC	"	24,459	150	93
*AI3KS	"	23,364	119	99
*N5SMQ	"	20,010	105	87
*KC3EF	"	18,675	94	83
*K7DR	"	17,958	102	82
*K6MUG	"	16,464	110	84
*KC7V	"	15,800	101	79
*W4NBS	"	15,504	79	68
*NYØJ	"	13,572	104	78
*K2TV	"	12,561	92	79
*N3MWQ	"	12,160	98	80
*WA3MD	"	10,921	76	67
*KJ9C	"	9,588	69	68
*KB9OWD	"	9,112	80	68
*AG2AA	"	8,874	68	58
*N7UJJ	"	8,568	96	72
*AH2O	"	6,100	61	50
*NA5J	"	5,564	59	52
*K7JSG	"	4,418	50	47
*AK4HB	"	4,042	56	47
*KØJP	"	2,881	49	43
*K6QCB	"	2,760	49	40
*KS4X	"	1,820	32	28
*N3WD	"	532	21	19
***KF6RY**	**14**	**141,705**	**431**	**235**
				(OP:W6ZL)
***N2YBB**	**"**	**62,757**	**199**	**171**
*N2MUN	"	55,242	202	162
***AB1J**	**"**	**45,675**	**180**	**145**
***W4RRE**	**"**	**40,800**	**160**	**136**
*N9TF	"	40,588	146	146
***WSØI**	**"**	**31,374**	**177**	**126**
*N6BHX	"	620	21	20
***WB7BWZ**	**"**	**364**	**15**	**14**
***KS4AA**	**7**	**413,400**	**423**	**300**
***WK9U**	**"**	**324,480**	**519**	**260**
***KK8MM**	**"**	**148,104**	**311**	**198**
***K5IB**	**"**	**106,760**	**240**	**170**
*WN4AFP	"	84,940	208	155
***W3IDT**	**"**	**83,808**	**207**	**144**

*W9AKS	"	61,372	200	134
*NE9M	"	31,350	155	95
				(OP:KEØL)
*KO8V	"	5,292	44	42
*W3FA	"	2,288	28	26
*KC9YL	"	50	5	5
***AB9YC**	**3.5**	**55,620**	**174**	**135**
*W9RF	"	26,040	115	84
		DX		
DK7HA	A	1,181,768	749	449
IK2XDE	"	919,224	681	408
SN2WOSP	"	117,624	206	156
				(OP:SP2UUU)
RA3DJA	"	60,288	161	128
OP4A	"	32,040	99	89
DH5MM	"	23,384	85	74
Z35M	"	18,288	76	72
DU1AVC	"	14,168	76	56
YC1HBP	"	5,425	57	35
JA1GZK	"	4,500	45	36
YB2NDX/1	"	2,700	40	27
GW1YQM	"	2,673	33	33
YB2VMC	"	1,239	29	21
DQ5M	"	50	5	5
				(OP:DK6SP)
IZ3NVR	21	242	11	11
YC3RJL	**"**	**8**	**2**	**2**
EE3X	7	185,220	234	189
				(OP:EA3KX)
R9FBT	**"**	**150,144**	**218**	**184**
CO8RCP	"	89,244	160	134
R7RAG	**"**	**72,898**	**148**	**127**
JF1RYU	**"**	**7,052**	**45**	**41**
JM1NKT	**3.5**	**5,796**	**64**	**42**
JG1LFR	"	5,494	59	41
YG3FZR	"	24	4	3
YD3UX	"	4	2	2
DP6M	**A**	**3,206,245**	**1281**	**707**
				(OP:DK9IP)
DM5TI	"	2,514,642	1211	626
M7T	**"**	**2,485,311**	**1267**	**597**
				(OP:G3YYD)
UZ1WW	**"**	**2,260,995**	**1128**	**579**
YL1S	**"**	**2,243,822**	**1138**	**581**
				(OP:YL1ZF)
OZØJD	**"**	**1,889,146**	**1081**	**518**
DR7B	"	1,657,370	989	494
				(OP:DL2JRM)
DK1FW	"	1,611,039	911	527
DLØHMK	"	1,602,255	966	479
				(OP:DF2HN)
UV7V	"	1,433,124	871	484
				(OP:UX1VT)
UT3RS	"	1,311,380	926	476
VE2FXL	**"**	**1,288,686**	**883**	**427**
YO3RU	**"**	**1,243,778**	**846**	**461**
DHØGHU	"	1,162,544	703	452
VA1XH	**"**	**1,138,440**	**744**	**424**
DF8QB	"	1,080,660	765	434
F5OAM	**"**	**1,019,187**	**742**	**403**
GW5NF	**"**	**1,004,805**	**755**	**405**
YQ6A	"	983,970	706	435
				(OP:YO6BHN)
LC1C	**"**	**954,890**	**720**	**410**
DP8M	"	952,204	641	418
				(OP:DL6NDW)
OE5BGN	**"**	**951,048**	**680**	**408**
UR5CN	"	901,407	742	377
LX2LX	**"**	**798,553**	**620**	**379**
				(OP:LX1NO)
DL1NEO	"	715,806	492	399
LY4OO	**"**	**681,291**	**538**	**351**
RO9A	**"**	**644,385**	**529**	**357**
OE2LCM	"	610,644	500	337
I2DJX	**"**	**585,980**	**495**	**353**
IK1BPL	"	536,406	492	338
XE1HG	**"**	**500,992**	**630**	**304**
UR4EI	"	485,268	495	318
UZ5ZU	"	453,568	481	304
DF1LON	"	439,485	394	353
VA7FC	"	429,216	601	272
IW3FVZ	"	411,220	394	290
HAØHW	**"**	**289,560**	**335**	**228**
IZ4FUE	"	270,912	342	249
IK2QIN	"	267,336	337	237
DF2LH	"	248,148	301	226
DJ8EW	"	246,240	295	240
JO7KMB	**"**	**223,776**	**312**	**216**
VU2DED	**"**	**199,310**	**276**	**190**
JN3SAC	**"**	**195,083**	**282**	**203**
JA3HBF	"	189,420	300	205
IZ1PLH	"	187,425	256	225
R3YC	**"**	**167,056**	**301**	**197**
V31FO	**"**	**159,954**	**218**	**159**
				(OP:DH8BQA)
DL1DAW	"	153,126	242	181
LU1BJW	**"**	**149,100**	**280**	**175**
7L4IOU	**"**	**123,508**	**244**	**154**
IZ4VSD	"	122,610	248	201
JA1QOW	"	116,160	222	165
VE3SS	**"**	**113,197**	**229**	**157**
AL7LO	**"**	**105,930**	**260**	**165**
JH1CTV	"	94,952	208	143
DL5JAN	"	84,825	178	145
SM6YEC	**"**	**62,377**	**154**	**133**
SM6MVE	"	61,776	163	132
IK2AHB	"	56,074	130	106
YL/ES5ZF	"	48,880	117	104
				(OP:YL1ZF)
ZL2RX	**"**	**48,546**	**109**	**93**
DK8ZZ	"	44,464	141	112
VU2IBI	"	35,696	114	97
JA9CCG	**"**	**33,936**	**127**	**101**
IT9JQY	**"**	**31,899**	**103**	**93**
JA6BCV	**"**	**30,086**	**109**	**98**
JF2FIU	**"**	**29,316**	**117**	**84**
VE2SCA	"	27,846	99	91
PA5WT	**"**	**21,728**	**102**	**97**
VE7BC	**"**	**18,544**	**96**	**76**
EB2RA	**"**	**16,704**	**72**	**64**
YC2HML	**"**	**7,656**	**83**	**44**
UR7R	"	3,225	45	43
IK2IKW	"	1,496	23	22
EA5FID	**21**	**14,784**	**90**	**77**
EA3OH	"	3,293	37	37
V37DX	**14**	**2,396,328**	**1497**	**696**
				(OP:DH8BQA)
EF1Z	**"**	**872,534**	**744**	**481**
				(OP:EA1BD)
SX73SC	**"**	**742,118**	**752**	**442**
				(OP:SV2BFN)
IU4CHE	**"**	**713,904**	**679**	**417**
RU5TT	**"**	**495,720**	**578**	**405**
UC6N	**"**	**363,747**	**497**	**339**
DL1DTL	**"**	**286,431**	**400**	**307**
JA9CWJ	**"**	**227,592**	**316**	**261**
JI3BFC	**"**	**114,190**	**230**	**190**
EC1RS	"	98,623	248	193
7K4VPV	**"**	**67,792**	**176**	**152**
SV9COL	**"**	**62,310**	**194**	**155**
LX1HD	**"**	**42,656**	**149**	**124**
OM2AGN	**"**	**26,000**	**103**	**100**
M3I	**"**	**24,411**	**109**	**103**
				(OP:GØORH)
RAØAM	**"**	**23,040**	**98**	**90**
YC9SBP	**"**	**4,070**	**49**	**37**
JK3NSD	"	420	12	12
IT9RZU	**7**	**839,160**	**514**	**378**
MØUNI	**"**	**287,364**	**290**	**231**
IZ5EME	"	284,896	272	232
LC2C	**"**	**284,088**	**317**	**228**
				(OP:LB1HI)
UT5LA	**"**	**227,392**	**276**	**209**
G4PIQ	"	209,280	242	192
VE3GYL	**"**	**184,072**	**257**	**173**
IZ4DZD	**"**	**109,744**	**183**	**152**
LN5O	"	44,160	118	96
				(OP:LB3RE)
F4CWN	**"**	**36,080**	**96**	**88**
YC2EEE	**"**	**16,704**	**89**	**58**
DL7LX	**"**	**8,190**	**46**	**45**
SM3LBP	**"**	**1,512**	**18**	**18**
IZ3SQW	**3.5**	**1,471,808**	**791**	**464**
EU4E	**"**	**903,000**	**584**	**375**
SV2BXA	"	788,900	561	350
IK3ORD	"	767,382	541	363
SP5DL	**"**	**696,672**	**495**	**354**
S58Q	**"**	**471,576**	**394**	**294**
UT3N	**"**	**212,716**	**289**	**214**
				(OP:UT3NK)
UN4PG	**"**	**164,952**	**191**	**158**
YF3CYT	**"**	**120**	**10**	**6**
YF3CYS	"	84	7	6
YF3DFB	"	40	5	4
***ZZ2T**	**A**	**2,290,635**	**1219**	**545**
				(OP:PY2MNL)
***IK3TPP**	**"**	**1,962,378**	**988**	**583**
***CT7AJL**	**"**	**1,877,580**	**1107**	**513**
***S57U**	**"**	**1,671,047**	**1001**	**469**
***OE2E**	**"**	**1,605,285**	**945**	**495**
				(OP:OE2GEN)
***R7MM**	**"**	**1,599,520**	**990**	**520**
***UT5EPP**	**"**	**1,576,988**	**1074**	**476**
***ON5GQ**	**"**	**1,555,113**	**980**	**497**
***LX5IGRY**	**"**	**1,512,480**	**875**	**460**
				(OP:LX1ER)
***IT9VCE**	**"**	**1,426,620**	**987**	**465**
***DL3SYA**	**"**	**1,365,210**	**882**	**462**
***VE3DZ**	**"**	**1,343,160**	**894**	**455**
***F8BDQ**	**"**	**1,157,940**	**725**	**420**
***SE4E**	**"**	**1,131,936**	**807**	**416**
				(OP:SM4DQE)
***4U1A**	**"**	**1,104,450**	**746**	**398**
				(OP:HB9RB)
***ER1PB**	**"**	**1,093,036**	**796**	**379**
***EF8O**	**"**	**962,340**	**640**	**373**
				(OP:DJ1OJ)
*RW7M	"	960,300	811	396
*UX7QV	"	940,752	806	376
***OG3P**	**"**	**923,292**	**660**	**412**
				(OP:OH3P)
*EA8PT	"	917,228	650	403
***VE2BVV**	**"**	**791,056**	**646**	**392**
***MW9W**	**"**	**689,409**	**606**	**353**
				(OP:GWØKRL)
***GUØSUP**	**"**	**686,810**	**517**	**397**
***TI2OY**	**"**	**616,050**	**652**	**333**
*UR7CB	"	606,210	571	334
***YT1TX**	**"**	**603,372**	**507**	**308**
***KH6CJJ**	**"**	**581,166**	**646**	**249**
*IU8DKG	"	540,834	455	326
*OG95AA	"	493,000	517	340
				(OP:OH8KVY)
*OG8T	"	486,972	496	334
				(OP:OH8TV)
*SM5S	"	468,958	465	287
				(OP:SM5SIC)
*DM2RM	"	426,288	423	321
*IW1CBG	"	425,056	424	296
*IK2BUF	"	420,112	430	308
*S56A	"	418,606	389	311
*IC8FJX	"	412,888	453	292
***PA3AIN**	**"**	**407,265**	**407**	**285**
*DL6NWA	"	403,480	424	308
***G1P**	**"**	**389,776**	**425**	**272**
				(OP:MØIEP)
***HA7MB**	**"**	**389,550**	**409**	**294**
***CO2RQ**	**"**	**387,972**	**394**	**234**
*S57SWR	"	372,000	390	248
*DF3EH	"	364,958	415	313
***SP6MLX**	**"**	**341,922**	**346**	**294**
*MW6M	"	334,552	435	284
				(OP:GW4BVJ)
*MØORD	"	333,105	368	265
***7N2UQC**	**"**	**330,336**	**452**	**248**
***RU5X**	**"**	**323,563**	**386**	**257**
*PA3DBS	"	304,678	377	242
*JM1MTE	"	303,178	382	241
*DL1EAL	"	284,260	345	244
*IW4EJK	"	275,776	330	248
***RU4PH**	**"**	**265,370**	**361**	**238**
*IZ3XNJ	"	246,225	319	245
*OH1NOA	"	216,910	309	218
***OZ1AOO**	**"**	**208,437**	**295**	**201**
*IK3YBX	"	205,091	295	241
***EW7A**	**"**	**194,670**	**292**	**206**
*IV3BCA	"	180,675	258	225
*DJ6OZ	"	160,816	255	184
*CS25FOQ	"	154,585	272	215
				(OP:CT1FOQ)
***9H1CG**	**"**	**152,536**	**250**	**184**
*DG9BEO	"	150,696	244	184
*SM6FZO	"	146,400	259	183
*DF7JC	"	145,054	243	182
*UT4UQ	"	144,786	246	177
*UC4I	"	140,010	251	195
***JH3WKE**	**"**	**136,752**	**254**	**168**
*IK8IOO	"	130,468	248	193
***EI3CTB**	**"**	**127,737**	**237**	**171**
*IK5QPS	"	122,998	213	178
*IT9CIL	"	118,370	239	190
***RØUT**	**"**	**114,896**	**255**	**167**
***YC4FIK**	**"**	**112,320**	**252**	**130**
***Z32U**	**"**	**108,188**	**186**	**148**
***EC6DX**	**"**	**104,248**	**211**	**166**
*DK7TM	"	103,520	208	160
*DJ7UC	"	103,125	205	165
*IWØGYC	"	99,200	198	155
*PD8DX	"	97,340	183	155
*SFØZ	"	96,200	199	148
				(OP:SMØHEV)
*DD5MA	"	93,060	161	141
*IK2OVT	"	80,352	172	144
***VE7KAJ**	**"**	**79,560**	**243**	**156**
*IT9ACJ	"	76,320	176	144
*VE3SST	"	73,250	202	125
*PG1R	"	72,618	172	147
*DL4NER	"	71,103	155	137
***SV8PMM**	**"**	**69,000**	**141**	**125**
*DL8ZAJ	"	68,961	157	127
*UY5QQ	"	65,100	150	150
***EC7AT**	**"**	**63,992**	**194**	**152**
*JF1WNT	"	63,041	168	121
*IZ5FSA	"	59,605	148	131
***OK1BJ**	**"**	**58,179**	**153**	**123**
*YO4RST	"	55,626	147	127
***JE2BOM**	**"**	**52,530**	**142**	**103**
***JA7MWC**	**"**	**51,584**	**152**	**104**
***JA9LX**	**"**	**51,528**	**154**	**113**
*JR9TUG	"	49,714	209	106
***8T8S**	**"**	**48,990**	**137**	**115**
				(OP:VU2AE)
*OK1SI	"	47,672	116	101
*PDØWR	"	43,505	126	113
*GW4JBQ	"	43,120	125	110
***BH6KWC**	**"**	**41,019**	**152**	**113**
*R6KEE	"	38,280	138	120
*SV2/SV7CUD	"	37,142	111	98
				(OP:SV7CUD)
*DM3PKK	"	36,360	114	101
*EW1P	"	34,823	114	97
*SF5M	"	34,216	113	104
				(OP:SM5SYO)
*IK8ARF	"	33,708	113	106
*JA1IE	"	33,215	120	91
***YL2IP**	**"**	**32,334**	**112**	**102**
*DF1LX	"	30,728	101	92
*SP9HZW	"	26,487	93	81
*OG4M	"	26,481	107	97
*OPØJ	"	26,160	101	80
				(OP:ON5GF)
***LA8OKA**	**"**	**24,928**	**96**	**82**
***ZL3VZ**	**"**	**24,414**	**88**	**78**
*UR5XMM	"	23,004	91	81
*DL5GAC	"	22,517	99	89
***JM8FEI**	**"**	**19,698**	**99**	**67**
*UT5UHX	"	18,942	89	82
*JJ1KZZ	"	17,810	70	65
*PH4E	"	17,043	77	69
*SD6M	"	16,827	86	79
*JG3SVP	"	16,776	91	72
*OH8GET	"	16,048	75	68
*S57KM	"	15,686	79	62
*SP5BUJ	"	15,128	66	61
*JA9EJG	"	12,921	73	59
*IZ7XNB	"	12,654	60	57
*JS1KKY	"	12,320	67	55
*JG3WDN	"	12,208	65	56
*OK7N	"	12,204	55	54
*PA3HGP	"	12,012	74	66
***JE4MHL**	**"**	**10,452**	**59**	**52**
*DK4EF	"	8,360	51	44
***CE2MT**	**"**	**8,232**	**52**	**49**
*SP2WGB	"	6,930	47	45
*IU4FKR	"	6,720	43	42

*JA8CEA	"	4,800	40	40
*JE2CPI	"	4,389	38	33
*VU2EEI	"	4,256	36	32
*VO2AC	"	2,604	32	28
*JA8KGG	"	2,070	25	23
*I1DXD	"	1,880	20	20
*JA7FDA	"	1,155	23	21
***PY2XC**	**21**	**63,315**	**170**	**135**
***L77D**	**"**	**45,235**	**148**	**109 (OP:LU6DC)**
***UR5QU**	**"**	**31,752**	**130**	**108**
***YV1SW**	**"**	**18,174**	**85**	**78**
***YT8A**	**"**	**14,544**	**86**	**72**
***IKØPRP**	**"**	**13,794**	**80**	**66**
*I3FGX	"	12,276	75	66
*IK2TDM	"	6,272	53	49
***M7P**	**"**	**2,844**	**38**	**36 (OP:G6NHU)**
***IW9FDD**	**14**	**436,482**	**576**	**354**
***UR2Y**	**"**	**428,922**	**535**	**351 (OP:USØYW)**
***IZ8EFD**	**"**	**396,535**	**496**	**355**
*IK4LZH	"	291,078	424	309
***R5ACQ**	**"**	**276,318**	**438**	**301**
***EW7BA**	**"**	**218,430**	**362**	**270**
***OQ4B**	**"**	**191,439**	**331**	**239 (OP:ON4BHQ)**
***VE3TM**	**"**	**166,852**	**303**	**236**
***DL3KVR**	**"**	**160,035**	**294**	**235**
***YO2IS**	**"**	**149,408**	**294**	**232**
*DF4WC	"	133,760	273	209
*DL4FCH	"	113,629	247	199
***MM2T**	**"**	**65,286**	**190**	**162**
*IK4DCX	"	62,424	173	153
***JK8PBO**	**"**	**51,604**	**154**	**133**
***RA9AFZ**	**"**	**43,440**	**128**	**120**
*R3LC	"	36,176	140	119
***UA4WGM**	**"**	**25,724**	**118**	**109**
***9G2HO**	**"**	**21,420**	**91**	**84 (OP:9G5SA)**
***KP4JFR**	**"**	**11,222**	**69**	**62**
*RA4L	"	8,645	67	65
***JA4RMX**	**"**	**7,850**	**58**	**50**
***EA2CCG**	**"**	**5,661**	**55**	**51**
***G4NXG/M**	**"**	**5,220**	**46**	**45**
***DU1/PG5V**	**"**	**846**	**19**	**18**
***SP5XOV**	**"**	**510**	**15**	**15**
***UR5WCQ**	**7**	**743,208**	**500**	**358**
***OK2RU**	**"**	**677,758**	**466**	**349**
***IW2MXY**	**"**	**563,550**	**436**	**325**
***ED4T**	**"**	**439,704**	**366**	**279 (OP:EA4CWN)**
***KP3LH**	**"**	**369,846**	**370**	**243 (OP:KP3LR)**
***Z37DX**	**"**	**328,636**	**333**	**242 (OP:Z33F)**
*EA2BNU	"	320,640	322	240
***DL5KUD**	**"**	**296,000**	**302**	**250**
***2EØCVN**	**"**	**199,200**	**248**	**200**
*Z39A	"	198,018	251	193
***CM8NMN**	**"**	**135,150**	**198**	**159**
***VE1OP**	**"**	**112,420**	**171**	**146**
***MM1PTT**	**"**	**108,936**	**177**	**153**
*OK1PMA	"	60,720	129	115
*IV3IXN	"	58,032	117	117
***YB2WA**	**"**	**47,840**	**142**	**92**
***JF3PLF**	**"**	**32,706**	**106**	**79**
*WP4WW	"	31,600	89	79 (OP:KP4JRS)
***PP7DX**	**"**	**28,826**	**77**	**71**
*JH1APK	"	5,340	33	30
***JH4FUF**	**"**	**2,808**	**27**	**26**
***EU6AA**	**"**	**2,544**	**25**	**24**
*JA3HKR	"	768	12	12
***SQ4NR**	**3.5**	**1,036,112**	**654**	**406**
***DF1MM**	**"**	**901,600**	**613**	**400**
***UZ2HZ**	**"**	**880,896**	**598**	**384**
***OK4GP**	**"**	**728,460**	**504**	**355**
***E77EA**	**"**	**724,880**	**533**	**340**
*UT5PY	"	613,760	504	320
***IX1CLD**	**"**	**455,182**	**414**	**287**
***S53NW**	**"**	**445,356**	**414**	**278**
*IZ3KKE	"	420,320	385	284
***RU4I**	**"**	**297,600**	**319**	**248**
***UA5F**	**"**	**271,200**	**299**	**240**
*S52WD	"	241,108	293	218
*IW2HUS	"	229,512	281	219
*SP5VIH	"	228,060	286	210
***M6BIR**	**"**	**147,060**	**225**	**171**
***LY2EW**	**"**	**136,224**	**211**	**172**
***HA1WD**	**"**	**109,440**	**188**	**152**
*S53BB	"	102,102	186	143
***EA4DB**	**"**	**64,560**	**136**	**120**
***9A1AA**	**"**	**61,180**	**135**	**115**
*SQ9PPT	"	45,136	119	104
***JF3BFS**	**"**	**12,960**	**86**	**60**
*IZ5OQX	"	11,088	61	56
*IK2LOL	"	6,004	39	38
***Z33F**	**"**	**4,356**	**34**	**33**
***9M4DXX**	**"**	**2,000**	**20**	**20 (OP:JE1SCJ)**
***YC2VOC**	**"**	**1,520**	**27**	**20**
***JAØGCI**	**"**	**966**	**21**	**21**
*YG3FZT	"	2	1	1

CHECK LOGS

4O6GAS, 9A6TT, CA5GRF, CO6HZ, CX2AQ, D9K, DJ6YX, DL4ZBY, DL5FU, DL7AU, DM3BJ, DM4JK, DO4TP, E71AP, EA1AY, EA4IE, EA5NB, F6GEU, GM4UQG, IØMOM, I2BRT, I4UUL, IK2MXM, IQ2CJ, IT9CLN, IV3HAX, JG2GSY, K1EJL, KB8ECG, KC1ERO, KC3FCB, KC8MUE, KEØTT, LA4NL, LZ1JZ, LZ1KDP, LZ1YF, N2LK, OE5TKM, OE6FTE, OH3LQK, OK1FAK, OK2BHD, OK2BZ, OK2PAD, OK3PJ, OM5CD, OM5NA, OZ/E78KM, PA3I, PE1FJN, R2PA, RA3FD, RA4DB, RM4W, RN4CA, RV3LO, RWØA, RW3RN, RW4NN, RY6AAG, S5/E75IBH, SM5MX, SO3O, SP2MKT, SP4W, SP6CES, SP6CZ, SP6GCU, SV1PMQ, SV3QUP, UA3RAB, UA4NCI, UA6JQ, UIØL, UN7LAN, UT7UX, UW5RG, UX2IN, UY5HF, UZ7HO, VE7LGP, WA2IVD, WA8CLT, WO4O, XE1RF, YD3RJL, YL2VW, YO2CMI, YO5PBF, YT9A, YU/E74DE, YU4OIZ

LY9Y's antenna farm.

Andy, LY9Y, and son Andy, LY7Z, operate as LY9Y and take 6th place in Multi-Two.

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

* Results: 2019 CQ World Wide 160-Meter Contest
* The Kits of Dayton
* QRP: Powering Up With Lithium

Plus...

* Rules, 2019 CQ World Wide DX Contest

Upcoming Special Issues

October: Emergency Communications
December: Technology
February: QRP
June: Take it to the Field

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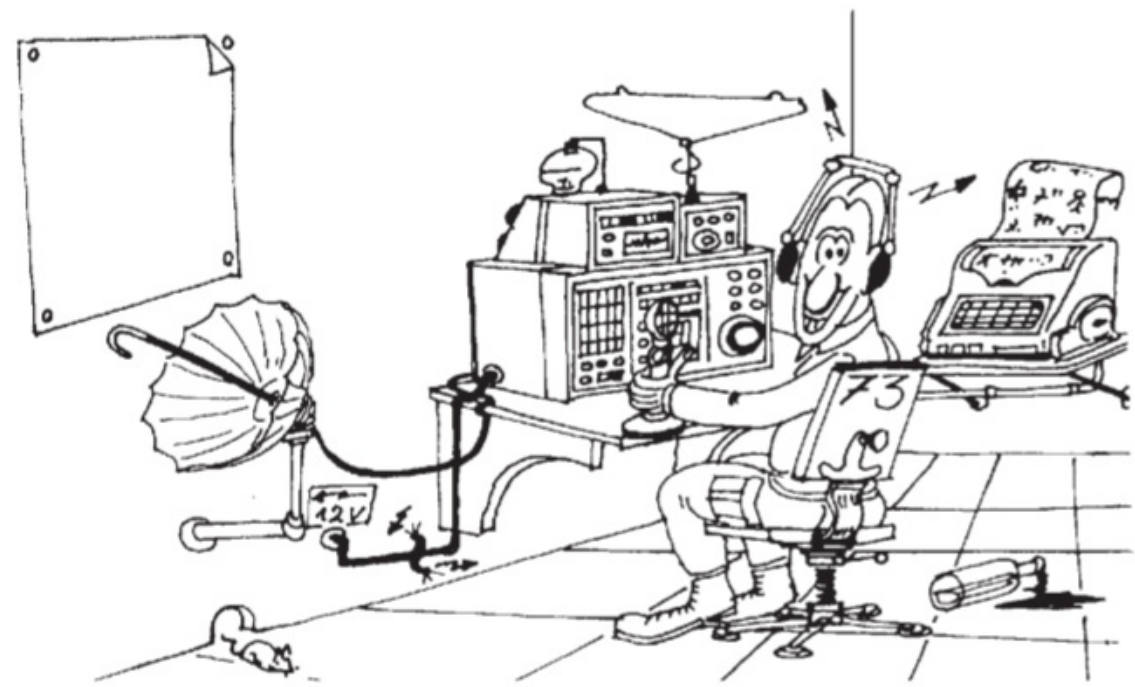

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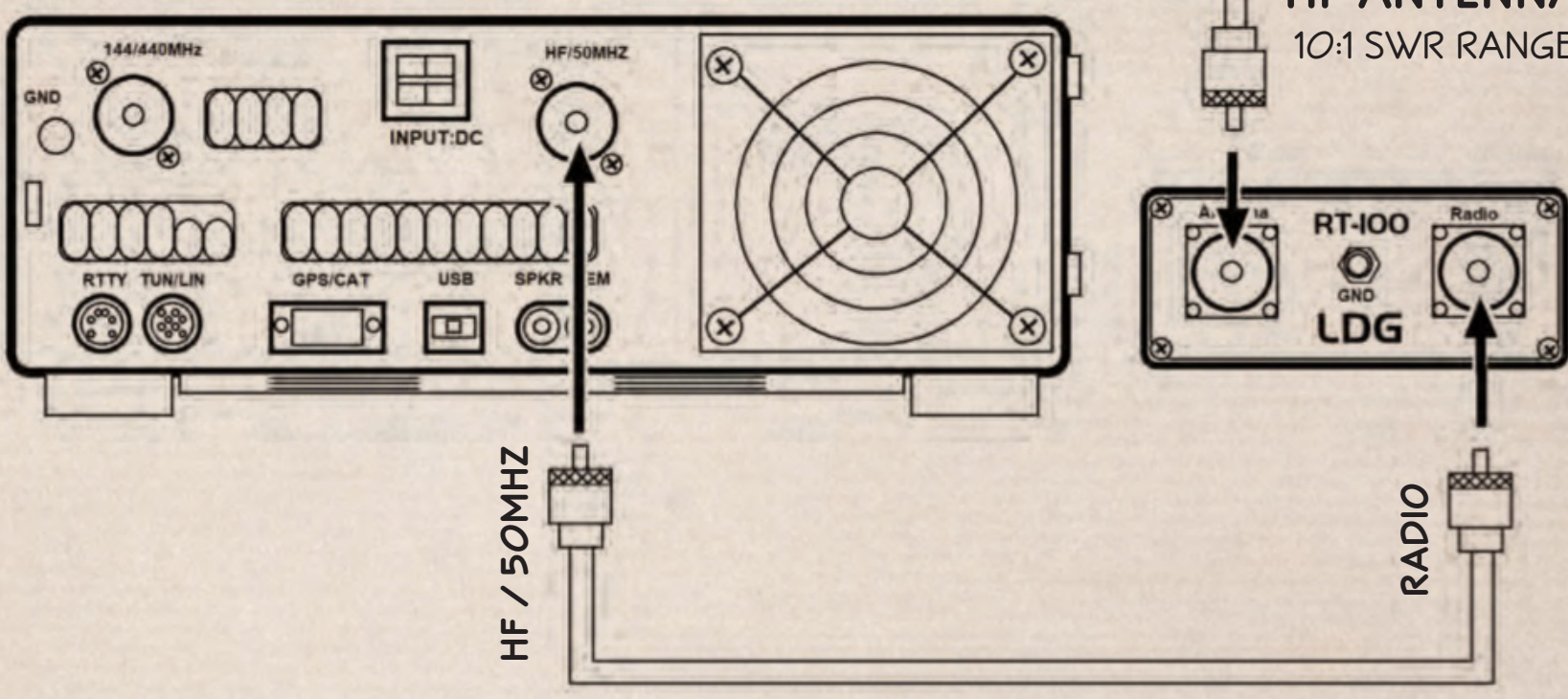

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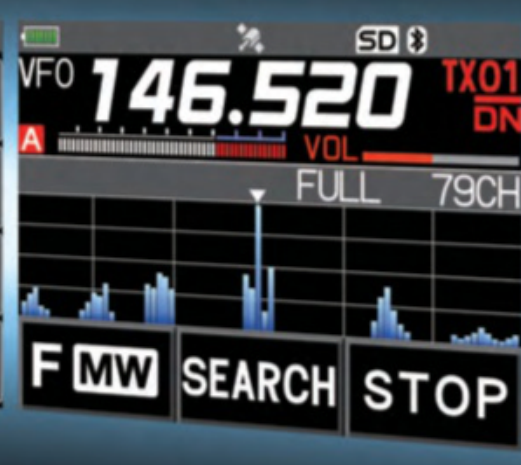

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