New "Maker" Column, p. 54

Amateur Radio

COMMUNICATIONS & TECHNOLOGY

MARCH 2012

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CQ

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- Building Radio Arcala's Monster Yagis, p. 13
- CW Results, 2011 CQ WW WPX Contest, p. 22
- Fake Office, Real Ham Station, p. 34
- ARISSat-1 Silent Key, p. 82

On the Cover: Wayne Mills, N7NG, of Jackson, Wyoming. Details on page 90.

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Cushcraft R8 *8-Band Vertical*

Covers 6, 10, 12, 15, 17, 20, 30, and 40 Meters!

The Cushcraft R8 is recognized as the industry gold standard for multi-band verticals, with thousands in use worldwide. Efficient, rugged, and built to withstand the test of time, the R8's unique ground-independent design has a well-earned reputation for delivering top DX results under tough conditions. Best of all, the R8 is easy to assemble, installs just about anywhere, and blends inconspicuously with urban and country settings alike.

Automatic Band Switching: The R8's famous "black box" matching network combines with traps and parallel resonators to cover 8 bands. You QSY instantly, without a tuner!

Rugged Construction: Thick fiberglass insulators, all-stainless hardware, and 6063 aircraft-aluminum tubing that is double or triple walled at key stress points handle anything Mother Nature can dish out.

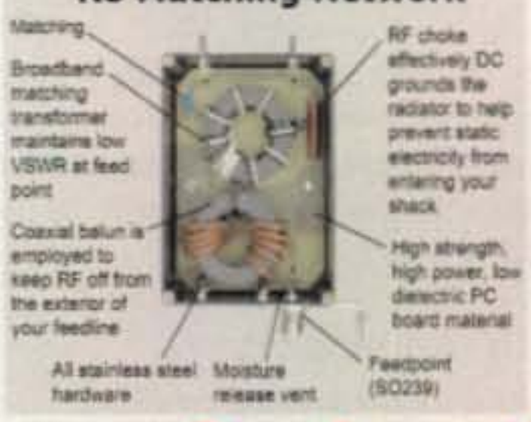
Compact Footprint: Installs in an area about the size of a child's sandbox -- no ground radials to bury and all RF-energized surfaces safely out of reach.

Legal-Limit Power: Heavy-duty components are contest-proven to handle all the power your amplifier can legally deliver and radiating it as RF rather than heat.

The sunspot count is climbing and long-awaited band openings are finally becoming a reality. Now is the perfect time to discover why Cushcraft's R8 multi-band vertical is the premier choice of DX-wise hams everywhere!

R-8GK, $56.95. R-8 three-point guy kit for high winds.

R8 Matching Network



R8's Rugged Design

MA-5B *5-Band* Beam

Small Footprint -- Big Signal

The MA-5B is one of Cushcraft's most popular HF antennas, delivering solid *signal-boosting directivity* in a bantam-weight package. Mounts on roof using standard TV hardware. Perfect for exploring exciting DX without the high cost and heavy lifting of installing a large tower and full-sized array. Its 7 foot 3-inch boom has less than 9 feet of turning radius. Contest tough -- handles 1500 Watts.

The unique MA-5B gives you 5-bands, automatic band switching and easy installation in a compact 26-pound package. On 10, 15 and 20 Meters the end elements become a two-element Yagi that delivers solid power-multiplying gain over a dipole on all three bands. On 12 and 17 Meters, the middle element is a highly efficient trap dipole. When working DX, what really matters are the interfering signals and noise you *don't hear*. That's where the MA-5B's impressive side rejection and front-to-back ratio really shines. *See* ***cushcraftamateur.com*** *for gain figures.*

Cushcraft 10, 15 & 20 Meter Tribander Beams

Only the best tri-band antennas become DX classics, which is why the Cushcraft World-Ranger A4S, A3S, and A3WS go to the head of the class. For more than 30 years, these pace-setting performers have taken on the world's most demanding operating conditions and proven themselves every time. The key to success comes from attention to basics. For example, element length and spacing has been carefully refined over time, and high-power traps are still hand-made and individually tuned using laboratory-grade instruments. All this attention to detail means low SWR, wide bandwidth, optimum directivity, and high efficiency -- important performance characteristics you rely on to maintain regular schedules, rack up impressive contest scores, and grow your collection of rare QSLs!

It goes without saying that the World-Ranger lineup is also famous for its rugged construction. In fact, the majority of these antennas sold years ago are still in service today! Conservative mechanical design, rugged over-sized components, stainless-steel hardware, and aircraft-grade 6063 make all the difference.

The 3-element A3S/A3WS and 4-element A4S are world-famous for powerhouse gain and super performance. **A-3WS, $499.95,** 12/17 M. **30/40 Meter** *add-on kits* available.

Cushcraft Dual Band Yagis

One Yagi for Dual-Band FM Radios

Dual-bander VHF rigs are the norm these days, so why not compliment your FM base station with a dual-band Yagi? Not only will you eliminate a costly feed line, you'll realize extra gain for digital modes like high-speed packet and D-Star! Cushcraft's A270-6S provides three elements per band and the A270-10S provides five for solid point-to-point performance. They're both pre-tuned and assembly is a snap using the fully illustrated manual.

Cushcraft Famous *Ringos* Compact FM Verticals

W1BX's famous *Ringo* antenna has been around for a long time and remains unbeaten for solid reliability. The Ringo is broad-banded, lighting protected, extremely rugged, economical, electrically bullet-proof, low-angle, and more -- but mainly, it just plain works! To discover why hams and commercial two-way installers around the world still love this antenna, order yours now!

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ARRL to Permit Use of LoTW for CQ Awards

Applicants for CQ's WPX award will soon be able to use ARRL Logbook of the World (LoTW) credits in their applications, under an agreement between CQ and the ARRL announced on January 24. Previously, ARRL had prohibited the use of its LoTW system by any outside organization. The target date for starting WPX support on LoTW is April 1, 2012. Support for additional CQ awards will follow, although no timetable has been set.

CQ Communications President and Publisher Dick Ross, K2MGA, said he is looking forward to making it easier for hams to apply for CQ awards. "We have had excellent results with electronic confirmation support from eQSL for several years," he said, "and I am glad that we are now able to begin expanding that convenience to those participants in our award programs who use Logbook of the World. We look forward to a smooth launch for WPX, and to the expansion of LoTW support to include the rest of our award programs as well."

Standard CQ award fees and ARRL LoTW credit fees will apply, and will be collected separately.

Major Solar Storm Hits Earth

The largest solar radiation storm since 2005 struck the Earth in late January, touching off radio blackouts, geomagnetic storms and aurora displays in upper latitudes. According to *CQ* Propagation Editor Tomas Hood, NW7US, a long-duration magnitude M8.7 (M9-class) X-ray flare erupted in NOAA Active Sunspot Region (AR) 1402 on January 23, peaking at 0359 UTC. This flare triggered a proton event, resulting in an S3 (Strong) Radiation (Proton) Storm and a Polar Cap Absorption (PCA) event over the polar regions.This PCA event caused a complete radio blackout over high-latitude and polar regions. This results in any trans-polar radio paths to become as dead as a rock. This solar proton radiation storm is the strongest of the current solar cycle.

In addition, NOAA's Space Weather Prediction Center said plasma from an associated coronal mass ejection was expected to arrive on January 24, with storm conditions extending into the 25th. At this writing, the specific effects of this solar storm were not yet known.

ARISSat-1 a Silent Key

ARISSat-1, the amateur radio satellite hand-launched from the International Space Station last August, reentered the Earth's atmosphere and burned up on January 4. The satellite represented several "firsts" for the amateur satellite program. For details, see this month's "VHF-Plus" column, beginning on page 82.

Yaesu Reorganizes, Announces Entry into Digital Voice/Data Market

Yaesu amateur radio equipment is once again being manufactured independently after four years as a subsidiary of Motorola. In a reorganization that took effect on January 1, Motorola took full control of the company's land mobile radio (LMR) line, while a newly-formed Yaesu Musen Co. began to manufacture Yaesu amateur gear and Standard-Horizon air and marine radios. The new company is wholly owned by members of the Hasegawa family, the founders of Yaesu.

Meanwhile, Yaesu announced its plans to enter the digital voice and data segment of the amateur market, introducing a new brochure on its website, titled "A Digital Communications Guide for Amateur Radio Operators." According to the brochure, Yaesu plans to introduce a handheld and a mobile radio later this year that will use the APCO-standard C4FM (4-level FSK) FDMA (Frequency Division Multiple Access) data format. This is *not* compatible with the D-STAR digital format. Yaesu's digital communications guide may be downloaded in PDF form at <http://bit.ly/tI86hj>.

Pop'Comm Launches Monitor Station Registration Program

Popular Communications magazine has launched the Pop'Comm Monitoring Station Program, reminiscent of the *Popular Electronics* WPE program dating to 50 years ago. Registrants receive monitoring station IDs beginning with WPC or KPC (in the US), followed by a digit and a two-to-three-letter suffix. If you're interested in learning about the program and for information on how to join, obtain a station ID sign and a Certificate of Registration, visit: <http://www.PopCommMonitors.blogspot.com/>.

ARRL Seeks Input on 60-Meter Band Plan

With the coming changes in FCC rules for 60 meters (which may have taken effect by the time you read this; but no date had been announced at press time), the ARRL is seeking input on a new 5-MHz band plan. Until now, only upper sideband had been permitted on the five specified channels in the band. The new rules will permit data, RTTY and CW as well as USB phone. They will also swap one channel for another and will increase maximum permitted power from 50 watts to 100 watts. With activity expected to increase after the new rules take effect, the *ARRL Letter* says the League is looking for user feedback on what modes and activities should be recommended for each of the band's five channels. Suggestions should be e-mailed to <hf-band-plan@arrl.org>.

FAR Seeks Scholarship Applicants

Amateurs pursuing higher education may be eligible for one or more of the 50 scholarships administered by the Foundation for Amateur Radio (FAR). Awards range from $300 to $5000 and may give preference to students from certain geographic areas or in certain courses of study. The application deadline for most awards is April 15, although a few have a May 15 deadline. Details and downloadable applications may be found on the FAR website at <www.farweb.org>. You may also request an application package by sending a letter or QSL card to: FAR Scholarships, P.O. Box 911, Columbia, MD 21044-0911.

Ham Radio Embracing "DIY" Community

A multi-pronged effort is under way to promote greater cooperation and closer relations between hams and do-it-yourselfers, also known as "makers." While launched independently, these efforts dovetail with each other.

CQ is launching a new "Makers" column as of this issue (see p. 54); the ARRL has released a "suite" of promotional materials aimed at introducing DIYers/makers to ham radio, according to the *ARRL Letter*, including a new video called "The DIY Magic of Amateur Radio." And the AMSAT News Service reports that Diane Bruce, VA3DB, has started a "ham radio-builder" e-mail list, on which members will be encouraged to contribute simple projects, with lots of photos and good instructions. Interested hams may sign up for the list at <http://diana.db.net/mailman/listinfo/hamradio-builder>.

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

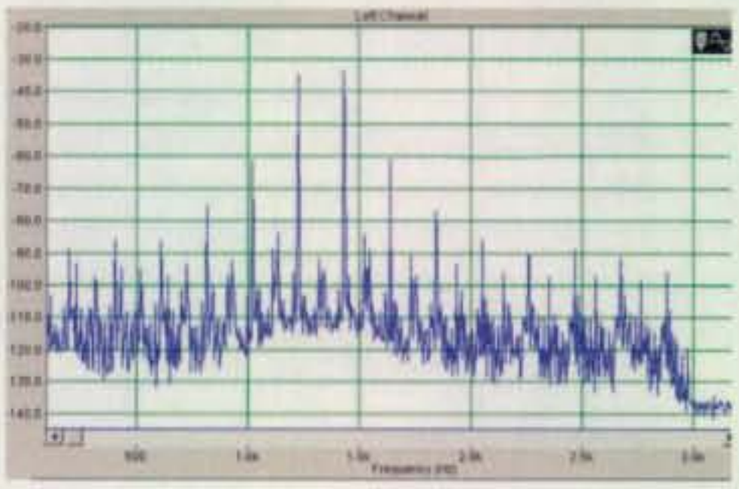
Noise Performance Characteristics of Direct Conversion Receivers

FlexRadio Systems PowerSDR™ Advantage

The Superheterodyne has been the staple of most receiver designs for the last 90 years due largely to challenges in implementing a direct conversion receiver. But today's technology can be used to exploit the advantages of a direct conversion design.

Superheterodyne Receivers

In a superheterodyne receiver, the desired RF signal is mixed together with local oscillators to create intermediate frequency stages (IF) before being demodulated to audio. Every mix creates both wanted and unwanted frequencies plus unwanted noise and distortion products. This outgoing noise can be seen in a two-tone intermodulation (IMD) test of a popular, respected amateur receiver shown in the figure below. Recently, expensive crystal "Roofing Filters" have been added to reduce IF noise but they too actually add to the overall distortion.

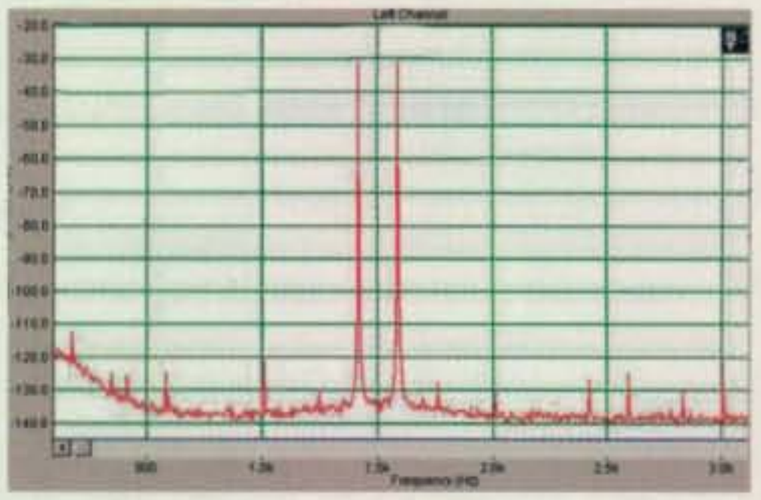


Direct Conversion Receivers

Direct conversion receivers avoid the cumulative non-linear effects that plague superheterodyne receivers by performing a single conversion from RF to baseband audio. No IF means no additional distortion from components and filters. It also means a wide range of signal levels must be handled in a single conversion stage. Previously this was a significant technical challenge, but the advent of HI-FI Analog to Digital Converters (ADCs) has made it possible to discern both strong and weak signals at the same time -- in other words, these ADCs have a very high dynamic range. The FLEX-5000 for example, uses a 192kHz 24-Bit sigma-delta ADC with a dynamic range of 123dB removing the need for roofing filters and the distortion they create.

The PowerSDR Advantage

Another difficult problem for direct conversion receivers is a conversion image that appears close to the desired frequency. FlexRadio solves this in three ways: First, an I/Q Quadrature Sampling Detector (QSD) is used instead of a traditional mixer or detector. The QSD acts like a mixer, but has natural image suppression better than -40dBc or 40dB below any carrier that would produce an image. Secondly, FlexRadio's PowerSDR™ software adjusts the QSD in real time resulting in image supression exceeding 100dB, moving images to the noise floor. Finally, PowerSDR employs a unique Automatic Gain Control Threshold (AGC-T) scheme that intelligently controls gain without amplifying unwanted noise. The results of a direct conversion receiver driven by PowerSDR can be seen in the IMD test on a FLEX-5000 receiver shown below. Notice how the distortion caused by the mixing of signals is significantly reduced as compared to the superheterodyne receiver shown in the first figure.



Summary

FlexRadio Systems QSD implementation provides superior noise performance to a superheterodyne receiver by reducing opportunities for mixing noise. Combined with the ability to easily lower the remaining background noise using the AGC Threshold (AGC-T) control, FlexRadio Systems receivers achieve a noise level that is significantly lower than that of the traditional superheterodyne resulting in less operator fatigue.

For more information or to download the full white paper on Direct Conversion Receivers, visit www.flexradio.com/DCRX

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CQ contents

MARCH 2012

p. 34

p. 13

features

Vol. 68 No. 3

p.64

departments

p. 22

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NEW!

PowerMaster II

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- Single and Dual Rack Mount available
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AIM *uhf* Analyzer

- Frequency range from 5 kHz to 1 GHz.
- Data plots include SWR, RL, R + X, series and parallel, magnitude, phase, and more.
- Dual Smith charts with rotation and 20 markers.
- Plots and calibration files can be saved and used anytime in CVS and dynamic formats.
- AIM 4170C is still in production covering 5kHz to 180 MHz.
- New TDR functionality

ACOM – Outstanding HF Power Products

ACOM 2000A

The ACOM 2000A Automatic HF Linear Amplifier is the world's most advanced legal-limit HF amplifier designed for amateur use. (160 thru 10m) (2x 4CX800A Tubes)

ACOM 1000
160-6m Amplifier

The world's best value in an amateur HF & 6m amplifier. Delivers 1000 watts output on all bands

(Single 4CX800A tube)

ACOM 1010
160-10m Amplifier

Economical 800 watt output 160-10m

(Single 4CX800A Tube)

ACOM 1011
160-10m Amplifier

Fast 30 second warm-up, 700 w output, 160-10m.

(2x 4CX250B Tubes)

Coming in 2012 ..

ACOM 800S Solid State Amplifier

160 through 6 M, 800 W from 1.8 to 54 MHz, no time limit

This Device has NOT been approved by the F.C.C. and my not be offered for sale or lease until approval of the F.C.C. has been obtained.

The information shown is preliminary and may be subject to change without notice or obligation.

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OptiBeam antennas are the best antennas you can buy. Whether it is an array of mono-banders or a multi-monobander antenna, you will more likely be first through a pileup with an OptiBeam. An OptiBeam is...

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- Electrical Properties
- Physical Properties
- Avoiding Disadvantages of Other Antenna Systems
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Measures impedance magnitude, phase and transmission parameters for antennas, filters, and discrete components - using one or two ports.

- Frequency range is 5KHz to 180MHz.
- Data plots include: impedance, SWR, return loss, S11 and S21.
- Plots can be saved for before and after comparisons.
- New TDR functionality

AIM 4170C Antenna Lab RF Analyzer

The AIM 4170C antenna analyzer measures the complex impedance (magnitude and phase) at each frequency of interest in the range of 5KHz to 180 MHz. A PC is used to calculate all RF parameters, including R +/-X, Magnitude and Phase, SWR, Return Loss, line loss, and more and plot the results in an easy to read graph and interactive Smith Chart.

- New TDR functionality

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YAESU
Choice of the World's top DX'ers℠

Choice of the

Covering HF and 6 meters the FT-DX9000 Series answers the call for the ultimate DX base station.

FT DX 9000MP

No other Amateur transceiver offers you 400 Watts of transmitter power for the biggest, cleanest voice on the bands. And switching to Class-A operation at 100 Watts of output, you enjoy the benefits of ultra low distortion others can't match at 100 Watts! Two pairs of Meters, plus LCD Window; Data Management Unit and Flash Memory Slot Built In. Main/Sub Receiver VRF, plus Full Dual Receive Capability, External 50V/24 A Switching Regulator Power Supply and Speaker with Audio Filters.

FT DX 9000D

The "Fully loaded" model represents the total FT DX 9000 experience. Included is the large TFT display, along with 1.8-14 MHz high-Q "μ" front-end RF tuning circuit, utilizing a large-diameter 1.1" (28mm) ferrite core and precision motor drive. Its Q of over 300 provides razor-sharp RF tuning-ideal for today's crowded bands! Large TFT, Data Management Unit and Flash Memory Slot Built In, Main/Sub Receiver VRF, plus Full Dual Receive Capability, Three μ-Tuning Modules for 160 – 20 M, 50 V/12 A Internal Switching Regulator Power Supply.

FT DX 9000 Contest

The FT DX 9000 gives you the opportunity to build up your radio to match your operating style and competitive requirements. World-class ergonomics combine with leading-edge performance to put more QSOs in your log faster. This is what Amateur Radio is about: building the best, so you can be your best! Two Pairs of Meters, plus LCD Window, VRF Input Preselector Filter, Three Key Jacks, and Dual Headphone Jacks, 50 V/12 A Internal Switching Regulator Power Supply.

FT-2000, FT-2000D, FT-950 and the FT-450D

FT-2000 and FT-2000D

This rugged DX hunter has power and performance to spare. The FT-2000 provides a full 100 Watts RF output on 160 through 6 meters with an internal power supply, but the FT-2000D version doubles down with 200 Watts and an external supply. The impressive feature list for both versions includes dual receive capability for effortless split frequency operation; a receiver front-end VRF (Variable RF Tuning) preselector; 1st IF roofing filters (3/6/15 kHz) for superb dynamic range; variable IF bandwith and IF Shift; receiver DSP with Auto-Notch, Manual Notch, Digital Noise Reduction; and a continuously-variable passband contour control.

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Top DXing Rig Picks

World's top DX'ers

FT DX 5000 Series

The FT DX 5000 Series HF/50 MHz 200 Watt Transceivers are a premium Class of Yaesu radios with 2 Independent Receivers plus many options and accessories designed for the serious DXer.

With 112 dB dynamic range and an IP3 [3rd Order Intercept Point] of +40 dBm (CW, 500 Hz BW), you'll find extra sharp roofing filters for VFOA/Main receiver are selectable between 300 Hz (optional on some versions), 600 Hz, 3 kHz, 6 kHz and 15 kHz.

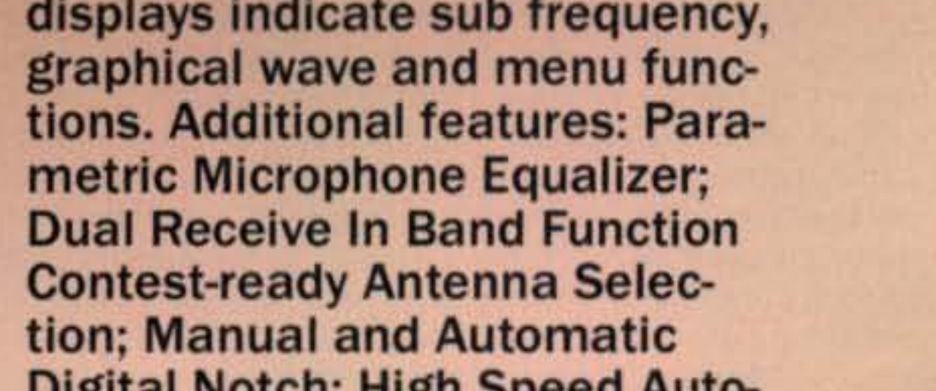
Three electro-luminescent sub-displays indicate sub frequency, graphical wave and menu functions. Additional features: Parametric Microphone Equalizer; Dual Receive In Band Function Contest-ready Antenna Selection; Manual and Automatic Digital Notch; High Speed Automatic Antenna Tuner; DSP Noise Reduction.

FT DX 5000MP
Station Monitor SM-5000 included; 0.05 ppm
OCXO included; 300 Hz
Roofing Filter included

FT DX 5000D
Station Monitor SM-5000 included; 0.5 ppm
TCXO included; 300 Hz
Roofing Filter optional

FT DX 5000
Station Monitor SM-5000 optional; 0.5 ppm
TCXO included; 300 Hz
Roofing Filter optional

FT-950



Whether you're a serious or casual DXer, the Yaesu FT-950 should be at the top of your list. The FT-950 packs a 100 watt punch on 160 through 6 meters and includes a built-in antenna tuner; triple-conversion superheterodyne receiver; three factory-installed 1st IF roofing filters; variable IF bandwidth and IF shift, manual IF notch filter, an Automatic Digital Notch Filter (DNF) and many other expanded features available with optional DMU-2000 Data Management Unit.

FT-450D

This easy-to-pack radio is a DXpeditioner's dream come true – a lightweight, high performance transceiver spanning 160 through 6 meters with 100 Watts RF output. When it's time to wade into the pileups, you'll appreciate the FT-450D's 10 kHz bandwidth roofing filter in the 68 MHz first IF, right after the first mixer. This filter provides outstanding selectivity when the going gets rough – a feature rarely found in rigs in this price range!

zero bias — a CQ editorial

BY RICH MOSESON,* W2VU

Reaching for Our Roots

Later this year, we will be observing the centennial of amateur licensing in the United States, so over the course of the year, I plan to look at some of the traditions that serve as foundations of our hobby and how they remain relevant today. We actually started last month, reviewing the ongoing (and apparently growing) interest in CW, five years after the FCC eliminated the Morse code exam as an amateur licensing requirement. This month, I'd like to revisit CW—although from a personal perspective rather than a statistical one—as well as two other "foundational" traditions: building and mentoring.

First, on CW, I'm one of those people whom Nancy Kott, WZ8C, of FISTS described in this space last month. I learned the code well enough to pass my exams, but have never felt comfortable enough with it on the air to get much real enjoyment out of operating CW. On the other hand, I have always felt compelled to periodically give it another shot, precisely because it is such an important part of our heritage. Over the years, I've looked for different ways to make it more fun for me, from various code "readers" to help fill in the spots that I've missed to trying to make some CW contacts in low-pressure contests, such as state QSO parties. Any success was short-lived.

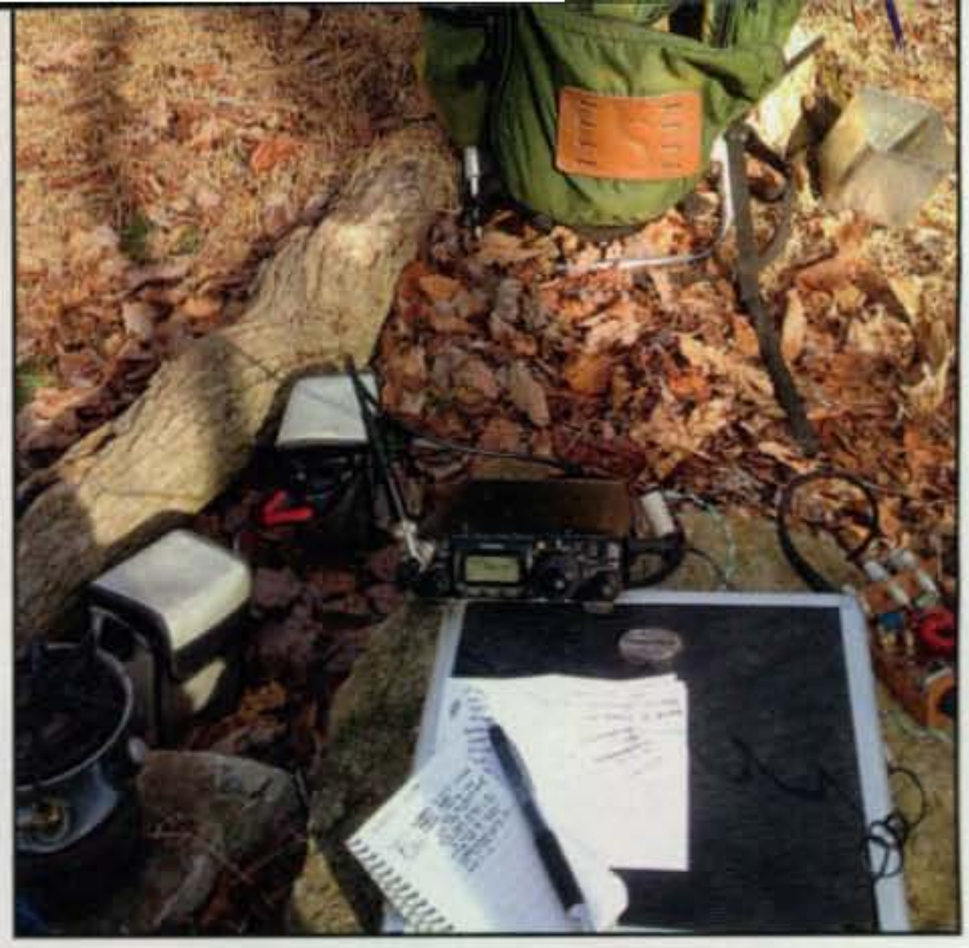
But over the past couple of years, the more I've read of N6GA's QRP column here in *CQ* and KI6SN's "Trail-Friendly Radio" column in our sister magazine, *WorldRadio Online*, the more I've been thinking that something like this might be the answer to my CW conundrum ... if I can wrap ham radio, and especially CW, into something *different* that I also enjoy, such as hiking or bicycling, then maybe I'll learn to enjoy CW more because I'll associate it with other pleasurable activities.

Over the holidays, an MFJ-9200 portable QRP CW rig managed to materialize in front of the fireplace and guess what? I'm having a ball, even from inside! I'm still no code whiz, and on a recent CW contest weekend, I quickly plugged in the 17-meter module in order to head to a "no-contesting" zone and stick with folks at my speed level. But for the first time in 40+ years as a ham, I can honestly say that I'm having fun on CW! Plus, especially at my proficiency level, working CW forces me to slow down, focus and put everything else out of my mind for the time being. It's very relaxing overall.

Another one of my self-perceived weak areas is building, yet another foundation of our hobby. It's not that I'm so bad at it; it just hasn't come easily. And I never seem to find the time. For example, about five years ago, I built a "Tuna Tin Two" QRP CW transmitter from QRP Maine. I could hear the signals in my "real" transceiver so I knew it worked. And then I put it aside, waiting to use it until I got a matching receiver. That happened about a year later ... but the "Sudden Storm" receiver kit sat in a box in my ham shack until about three months ago! That tug of our "roots" is strong, though ... I finally built it (and had a surprisingly good time doing it ... there I go, having fun again!) and now have a field-portable two-tuna-tin QRP station, and I've even been able to prove to myself that it really works by making (so far) one real, random, contact with a half-watt of output.

The best part of that was that the station I contacted, K3NG, was himself operating QRP-portable in the hills of Pennsylvania, activating a "Summits on the Air" (SOTA) hilltop (see photo). I've since worked Goody on a different hilltop (using the MFJ rig) and I'm afraid he's gotten me interested in SOTA-hunting. And who knows, maybe when the weather is warmer, I'll head out and become one of the hunted instead!

The third ham radio tradition I would put at the base of our hobby is the spirit of helping each other, or "Elmering" as we often call it. This is probably the most important of them all, since it helps support all the others. Example: when I finished building the Sudden Storm receiver kit, it didn't work. I called up my colleague, Richard Fisher, KI6SN, and he spent close to an hour on the phone with me, making suggestions and offering tips. Nothing worked, but we had a good time just working together to try to figure it out. I finally dropped an e-mail to kit designer Rex Harper, W1REX, who asked me if I had done a modification that was in the manual ... but that I thought didn't apply to me. "Do the mod," wrote Rex, "and it will work fine." So I did ... and it does!



The Summits-on-the-Air (SOTA) portable station with which Anthony "Goody" Good, K3NG, contacted W2VU, who was putting out a half-watt from a "Tuna Tin Two" transmitter. (Photo courtesy K3NG)

Now, making contacts with a half a watt isn't always easy, and to make sure the Tuna Tin Two was getting out farther than the antenna port on my receiver, I again turned to Richard for help. Being in California, he was a little too far away to tune in a 1/2-watt signal from New Jersey on 40 meters in the middle of the day, so he spent another hour or so, spread across a couple of days, listening for me on several internet-accessible receivers along the US east coast. He finally found me, and that gave me enough confidence in the rig's ability to be heard that I stuck with it and was eventually able to contact K3NG. I've got to tell you that there is nothing quite like making a contact with a radio that you've built yourself, especially at flea-power.

Doing it yourself, or DIY as it's often called today, is a tradition that's as old as ham radio itself, and the satisfaction it can bring is being discovered by a new generation of tech-savvy young people who are rebelling against the trend in consumer electronics toward sealed cases and "no user-serviceable parts inside." Many of them have gotten together under the banner of "makers" and "hackers" and have put together cooperative workshops called "hackerspaces" for building and experimenting. Amateur radio is a perfect fit for "makers" who are interested in electronics and wireless communications, but many of them are not familiar with ham radio, just as many hams are not familiar with maker groups and hackerspaces. They need our century of experience with building radios, and we need their youthful enthusiasm and 21st-century technical knowledge to strengthen the technical side of ham radio for the next generation.

There is a multi-pronged effort going on to try to bring the two groups closer together. The ARRL has just released a new DIY video (featuring our own Kit-Building Editor K0NEB) focused on introducing makers to ham radio, and here in *CQ*, we are introducing with this issue a "Makers" column to get hams better acquainted with the maker/hacker community (see page 54). We welcome maker columnist Matt Stultz, KB3TAN, to our staff. His column, along with our already-established kit-building and QRP columns, will continue to strengthen *CQ*'s commitment to promoting building as a major part of our hobby's present and future as well as its past.

Bottom line: If you haven't built anything lately, get out that soldering iron! If you've never built anything, find a fellow ham—or a maker group—and get some mentoring. If you haven't operated CW lately, spin that dial toward the bottom of the band. You'll find plenty of people happy to slow down to whatever speed is comfortable for you. If you've never learned code, find a fellow ham to teach you, or check your local club for code classes. You just might be surprised at how much fun you find yourself having with these old-but-still-new ham radio traditions.

73, Rich W2VU

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

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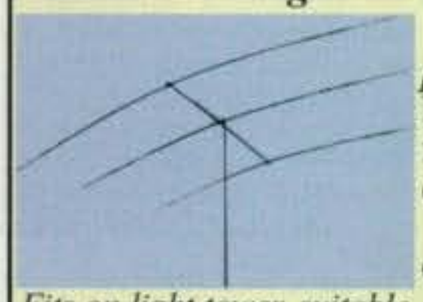

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TH-11DX	11	*For Gain and F/B ratio—See...*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	7			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5			1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	3			**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3			600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	2			**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
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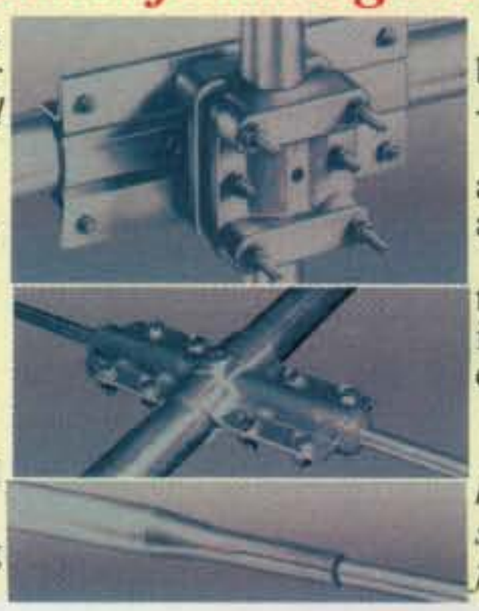

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announcements

•The following Special Event Stations will be on the air in March (also see the hamfest-associated stations noted below):

GREENSBORO, NORTH CAROLINA — The Greensboro Amateur Radio Association will air commemorative **Special Event Station NG4**, from 1200 UTC, Saturday, March 17, to 2200 UTC, Sunday, March 18, to commemorate The Battle of Guilford Courthouse in 1781. Frequencies: 14.315, 7.231, 21.315, and 3.900. QSL to: N4G – Special Event Station, P.O. Box 7054, Greensboro, NC 27417. Contact: David Macchiarolo, phone 336-420-9424; e-mail: <aj4tf@arrl.net>; <http://www.n4g-gch.org>.

MILWAUKEE, WISONSIN — The Milwaukee Radio Amateurs will air Special Event Station, **W9RH**, from 1500 UTC to 2100 UTC Saturday, March 31 in honor of its 95th anniversary. Certificates will be available by e-mail. Detail and frequencies are available at: <http://www.w9rh.org>.

• These hamfests are scheduled for March:

BIRMINGHAM, ALABAMA — The Birmingham Amateur Radio Club will hold the **BirmingHAMfest 2012** from 9 a.m. to 5 p.m. on Saturday, **March 3**, and 9 a.m. to 2 p.m. on Sunday, March 4, at the Zamora Shrine Temple, 3521 Ratliff Road. Contact: Bob Thomas, KC4AF, phone 205-283-4000; e-mail: <kc4af@arrl.net>. (Exams)

CAVE CITY, KENTUCKY — The Mammoth Cave Amateur Radio Club will hold the **36th Annual Cave City Hamfest** on Saturday **March 3,** starting at 7:30 AM, at the Cave City Convention Center. Contact: Larry Brumett, KN4IV, phone 270-651-2363; e-mail: <lbrumett@glasgow-ky.com>; <http://www.ky4x.org/activities/hamfest/>. (Talk-in 146.34/94 no tone; exams 9 a.m.)

ROSENBERG, TEXAS — The Brazos Valley Amateur Radio Club will hold the **Greater Houston Hamfest** and host the **ARRL South Texas Section Convention** from 8 a.m. to 1:30 p.m. on Saturday, **March 3**, at the Fort Bend County Fairgrounds. Activities include **Special Event Station W5H**. Contact: John Chauvin, K5IZO, e-mail: <k5izo@yahoo.com>, or Rick Hiller, W5RH, e-mail: <rhiller@sdicgm.com>; <http://www.houstonhamfest.org>. (Talk-in 146.940 [167.9 Hz]; exams)

LEVITTOWN, NEW YORK — The Long Island Mobile ARC will hold the **Long Island Hamfair & Electronics Show** from 9 a.m. to noon on Sunday, **March 4**, at Levittown Hall. Contact: LIMARC, P.O. Box 392, Levittown, NY 11756-0392; e-mail: <hamfest@limarc.org>.

IRVING, TEXAS — The Irving Amateur Radio Club, Inc. will hold its **10th Annual Hamfest** Saturday, **March 10**, 8 a.m. to 2 p.m. at the Betcha Bingo Hall. Contact: Coleta Taylor, KD5QFH, e-mail: <coleta.mt@verizon.net> or James Comer, KB5FVS, e-mail: <kb5fvs@gmail.com>; <http://www.irvingarc.org/iarchamfest.html>. (Talk-in 146.72–110.9; exams)

RAYNE, LOUISIANA — The Acadiana Amateur Radio Association will hold the **52nd Annual 2012 Acadiana Hamfest** and **ARRL Louisiana State Convention** on **March 9 & 10**,at the Rayne Civic Center. Contact: Acadiana Hamfest, P.O. Box 51174, Lafayette, LA 70505-1174; <http://www.w5ddl.org/hamfest/>.

CHARLOTTE, NORTH CAROLINA — The Mecklenburg Amateur Radio Society will hold the **2012 Charlotte Hamfest™** and **ARRL Roanoke Division Convention** from 8:30 a.m. to 5 p.m. on Saturday, **March 10** from 9 a.m. to 1 p.m., and on Sunday, **March 11** at the Cabarrus Arena & Events Center. Contact Mecklenburg ARS, phone 704-948-7373; <http://bit.ly/xeEAvn>. (Talk-in 146.655 [–600kHz], no tone; exams)

CLAREMORE, OKLAHOMA — Green Country Hamfest Inc., will hold the **Green Country Hamfest** on Friday, **March 9**, and Saturday, **March 10**, at the Claremont Expo Center. Doors open from 5 to 9 p.m. on Friday and 8 a.m. to 3 p.m. on Saturday. Includes the **ARRL Oklahoma Section Convention**. Contact: Green Country Hamfest, P.O. Box 470132, Tulsa, OK 74147-0132; e-mail: <tickets@greencountryhamfest.org>; <http://www.greencountryhamfest.org>. (Talk-in 147.090 [+.600] no PL.; exams)

MARIETTA, GEORGIA — The Kennehoochee Amateur Radio Club will hold the **59th Annual Kennehoochee Hamfest** from 8 a.m. to 3 p.m. on Saturday, **March 17**, at Jim R. Miller Park. Contact: Don Heppe, W5LGK, <w5lgk@bellsouth.net>. (Talk-in 146.880 [PL 100 Hz]; exams).

LINCOLN NEBRASKA — The Lincoln Amateur Radio Club will host the **End of Winter Hamfest** and the **ARRL Nebraska State Convention** from 8:30 a.m. to 4 p.m. on Saturday, **March 17**, at the Lancaster County Event Center. Contact: LARC, 402-770-9157; <http://www.lincolnhamfest.org>. (Exams; CW certification)

MIDLAND, TEXAS — The Midland Amateur Radio Club will hold its **57th Annual Saint Patrick's Day Hamfest** and **ARRL West Texas Section Convention** from 8 a.m. to 2 p.m., Saturday, **March 17**, at the Midland Lions Club. Contact: Randy Karch, N5OVH, phone 432-683-7328; <http://hamfest.w5qgg.org/>. (Talk-in 147.300 [no tone]; WAS & VUCC card checking, DXCC card checking, exams)

TOLEDO, OHIO — The Toledo Mobile Radio Association will hold the **Toledo Radio/Computer/Electronics Hamfest** from 8 a.m. to 2 p.m. on Sunday, **March 18**, at Owens Community College – Student Health and Activity Center. Contact: TMRA, P.O. Box 9673, Toledo, OH 43697-9673; <http://www.tmrahamradio.org>. (Exams)

BRAMPTON, CANADA — The Mississauga ARC and **Peel ARC** will hold **Ham-Ex 2012** on Saturday, **March 24** from 7 a.m. to 1 p.m. at the Brampton Fall Fair Grounds. Activities include a flea market, exhibits and demonstrations. **Special Event Station VE3XR** will broadcast 1300 UTC to 1800 UTC on 3.75, 7.269, and 14.265 MHz (±QRM). E-mail: <info@ham-ex.ca>;<http://www.ham-ex.ca>. (Talk-in 146.880 [no tone] or 145.430 [103.5 Hz]; DXCC card checking and Industry Canada Basic, Advanced, and CW Exams.

QUEBEC, CANADA — The **Club Radio Amateur Laval-Laurentides Hamfest** wil be held on Saturday, **March 24**, at Ecole Polyvalente Georges-Vanier. For more information call 514-708-8033; e-mail: <crall@ve2crl.qc.ca>. (Talk in 147.315+)

COLUMBUS, INDIANA — The Columbus (Indiana) Amateur Radio Club's 29th Annual Hamfest will be held from 8 a.m. to 2 p.m. on Saturday, **March 31**, at the Bartholomew County 4H Fairgrounds. Contact: Marion Winterberg, WD9HTN, 812-342-4670; e-mail: <mlw467@gmail.com>. (Talk-in 146.790 [PL 100 Hz]; exams 11 a.m.)

TIMONIUM, MARYLAND — The Baltimore Amateur Radio Club Inc. will hold **The Greater Baltimore Hamboree and Computerfest** from 7 a.m. to 3 p.m. on Saturday, **March 31**, at the Maryland State Fairgrounds. Contact: BARC, GBHC, P.O. Box 120, Reisterstown, MD 21136; phone: 443-590-1444; e-mail: <w3ft67@yahoo.com>. (Talk-in 146.67 [PL 107.2 Hz]; WAS and VUCC card checking from 9 a.m. to noon; exams).

*Please submit hamfest and special event announcements **at least three months in advance** by e-mail to <hamfest@cq-amateur-radio.com> or <specialevent@cq-amateur-radio.com>, or by postal mail to: CQ Magazine, Attn: Hamfests (or Special Events), 25 Newbridge Rd., Hicksville, NY 11801.*

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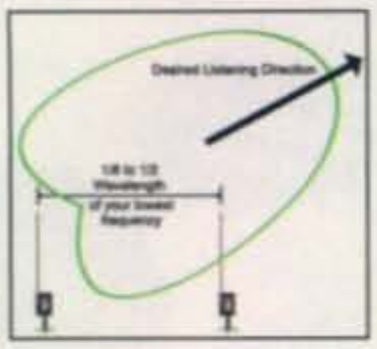

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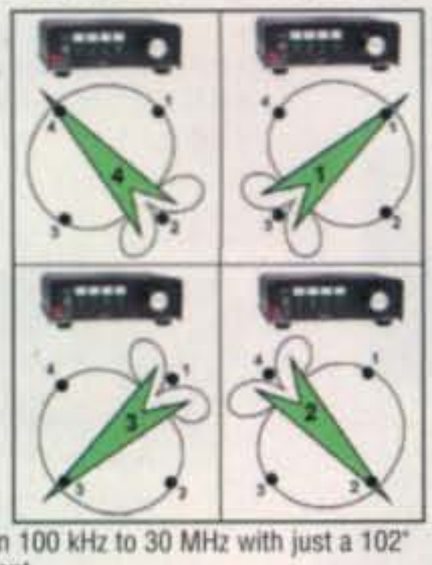

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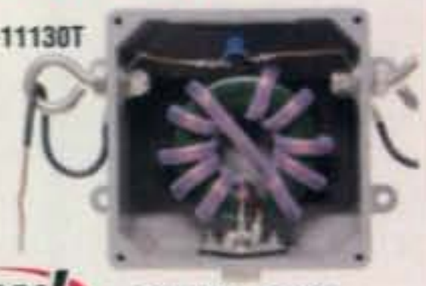

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Readers responding to our November issue survey about the articles in our Technology Special found the cover story on Radio Arcala to be the most interesting of them all. Here is some background on the 160- and 80-meter Yagis shown on November's cover, an engineering story that's nearly as massive as the resulting antennas.

Building Radio Arcala's Monster Yagis

BY TONI LINDEN,* OH2UA

Building a three-element Yagi for 160 meters and a five-element Yagi for 75/80 meters is not an everyday project. Even though it may not be something that would fit in your backyard (photo A), we hope that you'll find this article interesting, since it's a good example of amateur radio operators doing something extraordinary—something not seen before. Here, Radio Arcala took on the task at 65 degrees north latitude.

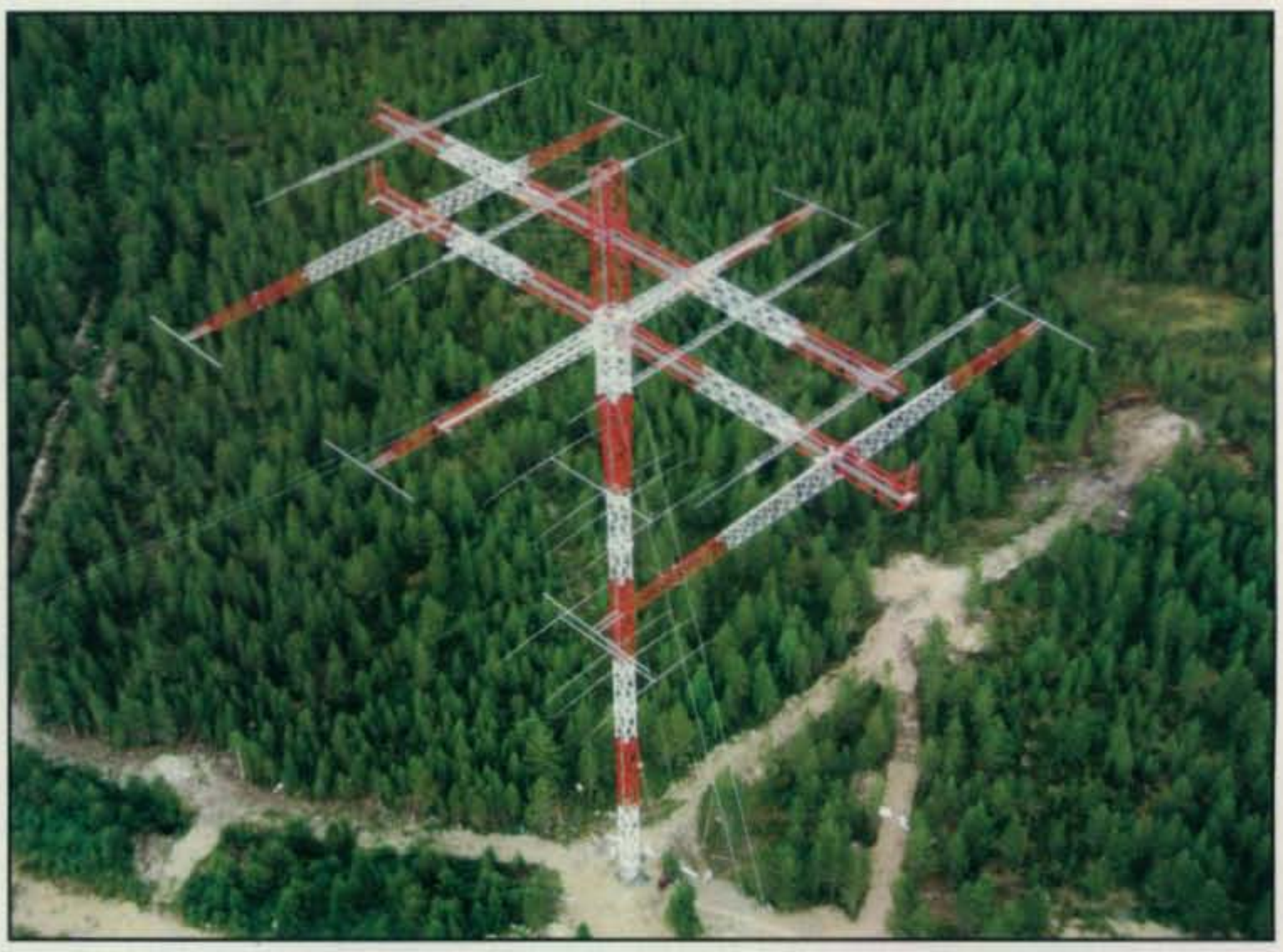

Photo A– Aerial view of 80- and 160-meter Yagis atop the 100-meter (330-foot) tower at Radio Arcala, OH8X, in Arcala, Finland. (All photos courtesy Radio Arcala)

The Background of the Project

Operating low bands at 65 degrees north is somewhat challenging, especially when there is aurora blocking the frequencies. Even during the days when the *A*-index is low, Radio Arcala is still next to Arctic Circle and the aurora. The bands are often just a quiet hiss, and even stations from Central Europe are hard to copy, to say nothing about North America.

However, the main reason for building such a large antenna array as a 3-element Yagi for 160 meters and a 5-element Yagi for 75/80 meters was not only to experience fancy DXing or break through pile-ups. We wanted to see if, after designing and simulating this complex system, we could also implement it mechanically and electrically in such a robust way that would perform in practice as planned. Therefore, verification of the antenna's performance after implementation was an essential part of the project. We also wanted to share all our learning with the amateur radio and scientific communities.

We believe that amateur radio operators are still able to provide new technical innovations and push the limits, even on high frequencies. Truly speaking, as well, in this project we were able to show the amateur radio community that although many of the technical details of antenna design are already well known, there are still new aspects to discover.

Early Planning Phase

As in every Radio Arcala project, we wanted to take the professional approach from the very beginning. It was clear that antennas this big cannot be made without detailed planning and responsibilities assigned to different people. The first step was to determine if it would even be mechanically possible to make such antennas to stay up with ice, snow, and high winds. It also would be necessary to understand if it would be possible to design the mechanical structures in a way that would accommodate the electrical design parameters. After numerous simulations with steel-structure design software, converting the results into the antenna simulation software, and tuning the structure, we ended up with a simulated prototype of the antenna.

The idea was to have straight elements on both 160 and 75/80 meters. Both antennas would have part of the elements made of lattice structure and the remainder made of tubes. On 160

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About Radio Arcala

Radio Arcala, OH8X, is a team of serious hams dedicating their efforts to interesting and novel areas of amateur radio. The group is a mixture of seasoned amateurs and those of more recent vintage, representing a range of expertise and many walks of life. They push issues to the extreme, and their contest team, "Arcala Xtremes," is used as the test lab to verify the results. Radio Arcala's executive offices are located at 65 degrees north latitude in the village of Arcala, Finland.

Radio Arcala contest team Arcala Xtremes members at the contest superstation. From left: OH6KN, OH2BH, OH8NC, OH2MM, OH7EA, OH1WZ, author OH2UA, and OH6UM.

meters the length of the elements would be about 89 meters (290 feet), and on 75/80 meters, 42 meters (140 feet). Both antennas should have a boom length of 60 meters (200 feet). The layout was designed for a 100-meter (330-foot) tall tower.

This was the first go/no-go point to keep on going or stop the project. We carefully considered whether the performance of the antenna and the mechanical design would make any sense: The simulated electrical performance, definitely yes. For the mechanical structure, maybe, but it would

Photo B– A major milestone in the project was when a local steel factory began to make the steel parts of the antenna array. It took six months. The total weight of the steel parts of the antenna array was 39 tons (80,000 lb.) and it took 600 liters (120 gallons) of paint for the tower and elements. Transporting the 12-meter (40-foot) long parts took seven trucks.

be huge. After long discussions, we made a decision: If we looked at the design only as an antenna, it wouldn't make any sense. If we thought of it as an interesting exercise, it would be the only one of its kind and definitely worth doing.

Prototype Elements

Building the prototype elements was based on the software design. We wanted to make the prototype elements first to validate both antenna and mechanical simulations and fine-tune the elements before making the actual parts of the antenna. We knew that no NEC-based simulation tool could

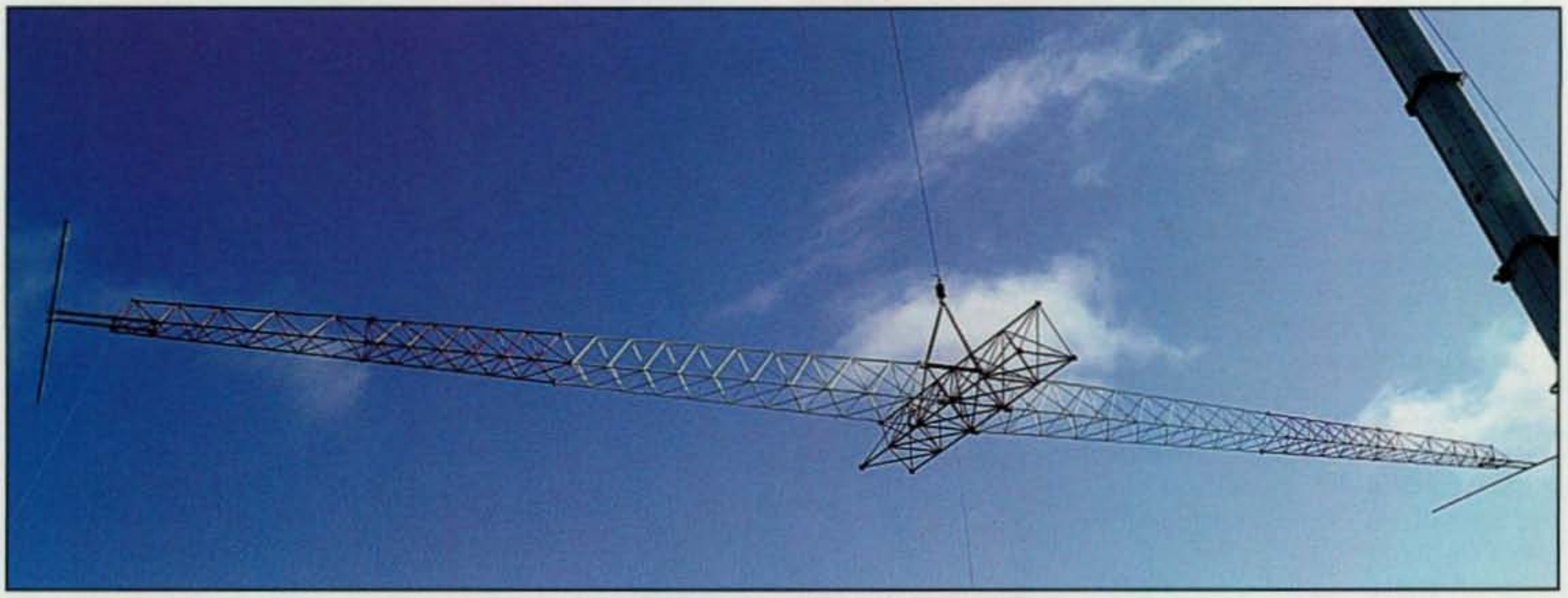

Photo C– A crane took each of the different elements up to 60 meters (200 feet), and we measured the reactance of the element with a VNA (vector network analyzer) just as was done with the prototype elements. We had the desired reactances on each target frequency and we were able to tune the elements exactly to the right value.

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Height and Weight of the System

Tower height: 100 m/330 ft
80m beam: 90 m/300 ft
160m beam: 80 m/270 ft
Total weight: 39,600 kg/80,000 lbs

Elements, gain and take off angles
160m: 3 elements, 12.9 dBi, 26
80m: 5 elements, 15.7dBi, 12

Front-to-Back ratio
160m: 20 dB
80m: 20 dB

Operating frequencies
1810–1845, 1845–1880 kHz
3500–3560 kHz, 3700–3800 kHz

160m elements
Weight: 1600 kg/3800 lbs each
Length: 59 m/190 ft
All elements: 12 m/36 ft capacitive hats
Each use 700 m/2100 ft of tubing
Relay switches for turning the antenna180°

80m elements
Length: 46 m/140 ft, longest
Max windload: 70m/s (160 mph)

Boom dimensions
160 m (length): 71 m/215 ft
80 m (length): 60 m/200 ft
The triangular 160 m boom: 2.2 m/7.3 ft

Turning gear
Weight: 2000 kg/6000 lb
11-kW motor
Inverter-driven soft start/stop

Largest guy-ring bearing
Weight: 3300 kg/7300 lbs
Ring diameter: 3.8 m/13 ft

Guy wires
Total length: 2300 m/6900 ft
Phillystran/element guys: 1150 m/3450 ft

Final touch
600 liters/120 gallons of paint

Antenna design
160m: Pekka, OH1TV
80m: Olavi, OH5BR
Switching Systems: Lauri, OH8LK

Additional Arcala team members working on the project:
Juha, OH8NC
Veijo, OH6KN
Martti, OH2BH
Toni, OH2UA

correctly simulate the lattice structure of the elements. Therefore, our aim was also to match the simulation with real element behavior in order to make the final element design as accurate as possible.

It was an exciting moment to see the 89-meter (290-foot) long 160-meter full-size element for the first time. The element was lying in a big field waiting for the measurements to begin. A crane took the element up with the vector network analyzer connected to coax. With shaking hands, the first scan over the frequency range was started. The curves were seen on the display just as we had hoped. However, when the frequency reached the design resonant frequency, we noticed that everything was not as it should have been.

What a disappointment it was to realize that the prototype element did not correlate with the simulations, as we had hoped. The problem was that the reactance of the element didn't reach the positive (inductive) side at all. Normally, with half-wavelength elements at the resonant frequency, the reactance does come from the negative to positive side, but with our element it stayed on the negative side. In other words, our element wasn't resonating.

After all the simulations and planning, we couldn't make a half-wave dipole resonate. It would be impossible to make a Yagi antenna with such elements. For some reason, the element was acting like there was a big capacitor at the feed point. The same problems were noticed on the prototype 75/80-meter element as well, but not as clearly as on the 160-meter element. Back to the drawing board we went.

Soon after analyzing the prototype element measurement data, playing around with antenna simulation models, and going to the literature, we came up with a theory: There was not only one, but two different issues causing the elements to act as they were. The first was that the ends of the lattice sections were closely spaced at the feed point. This is not an issue with normal Yagi elements, but in our case the base of the element is a 2-meter (6.5-foot) sideways "tower," and therefore it could be seen as a large capacitor. The other issue was that the diameter of the element was constantly changing, making the impedance of the element change as well. The same effect is well known with normal Yagi elements made of different-size tubes. However, in our case we had a big jump in element impedance when going from lattice structure to the tubing. These discontinuities caused too many reflections and appeared as increased capacitive reactance at the feedpoint.

After understanding the reasons for

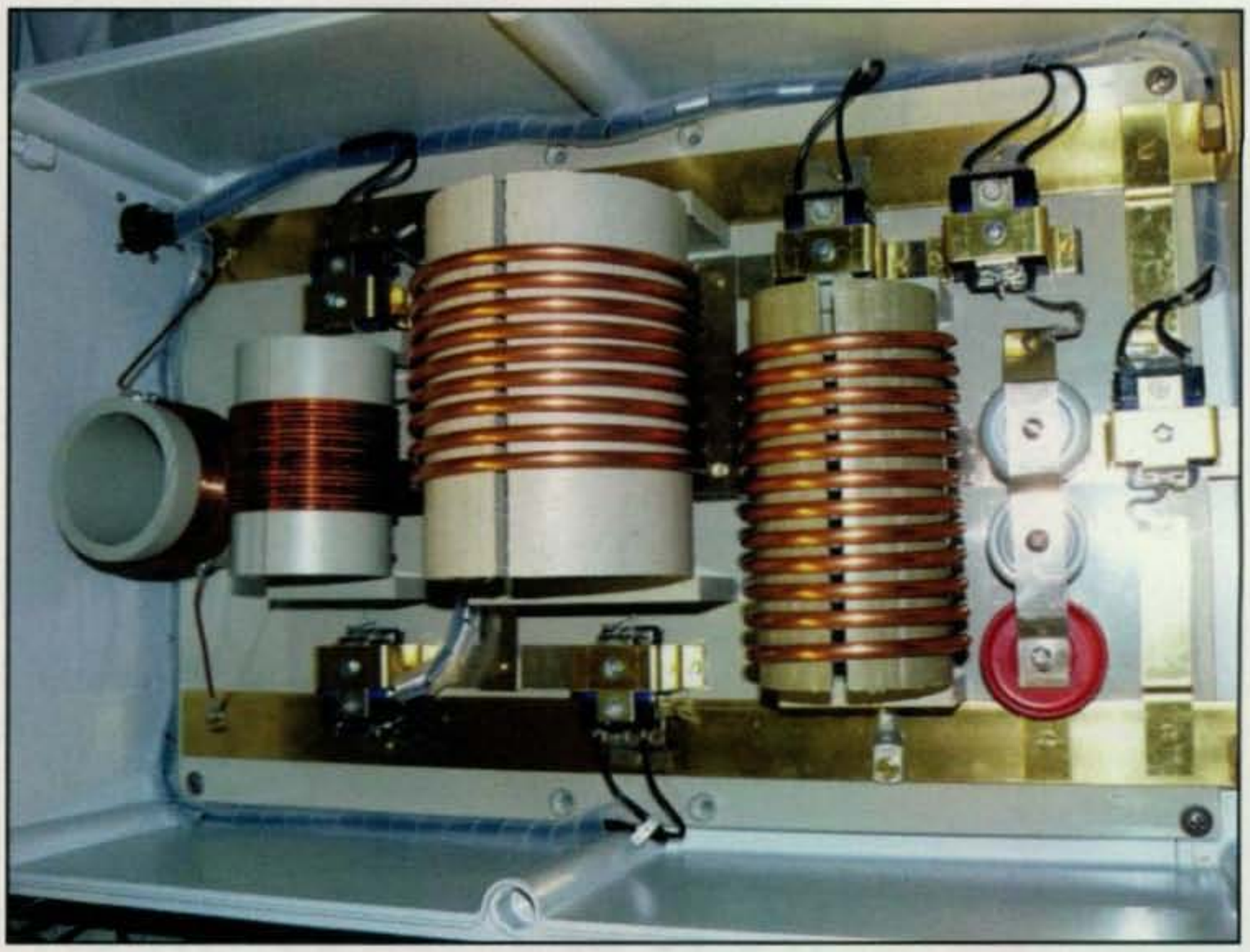

Photo D– Interior view of the 160-meter tuning unit. Managing all of the resonances of the matching units and making all the desired functions once again required hours of simulations. Also, the mechanical issues needed to be taken into account. These boxes would be mounted up on the tower where the ice load can easily be 1 ton per meter (2000 lb per 3 ft).

the odd behavior of the prototype element, it was time for some modifications. On 75/80 meters the fix was easy, since the size of the lattice part of the element is rather small and therefore the element was already close. On 160 meters, though, we had to move the central point of the elements farther away to reduce the capacitive loading of the feedpoint. We also had to make the lattice section of the elements a bit longer and change the last part of the elements from straight tube to capacitive loading with T-hats.

Changing the structure of the 160-meter element was actually a very good change for the mechanics. Instead of having 17 meters (55 feet) of straight tube at the end of element, we used much shorter tubes, making the element more stable. Also, using the capacitive loading made the current of the passive elements higher, making the Yagi actually perform better in simulations. With these modifications we could make the prototype elements correlate with the simulation model, and thus we were ready for the final design.

Building the Elements

This was our last chance to back away from the project. However, since we all were sure, based on experience from the prototype elements, that the antennas were doable both mechanically and electronically, we began the last phase of the project—making the antennas and towers.

Modifications to the element-to-boom mountings were made necessary by the capacitance issue. The lattice parts of the 160-meter elements were then stretched by 6 meters (20 feet) to match with T-loading instead of straight elements.

So How Well Does it Work?

On 160 meters the gain is 12 db, which is 1dB less than in simulations, and we're 7dB short of predicted front-to-back ratio, giving us 16dB of F/B (see fig. 1). The take-off angle of the 160-meter Yagi is 26 degrees.

In the target modeling, it was assumed that the antenna material would be aluminum, but the actual antenna was built of steel, which has both ohmic and ferromagnetic losses. This is the main reason for the missing gain.

The main reason for reduced F/B is that currents running in passive elements are lower than expected. Target modeling showed that extended boom length can be used and still have 50% current in parasitic elements. However, measurements show that it is not the case, but currents are about 40% of driven element current. This is the main reason for missing front-to-back attenuation. The solution would be shortening the boom, but for 7dB it may not make sense. Another option could be redesigning the feed system and changing the reflector and director to be active-fed as well. This can be done, since all the elements are mechanically the same.

The 75/80-meter Yagi works close to predictions, having a gain of 15 dB and 20-dB F/B (fig. 2). On 75/80 meters the maximum radiation is achieved at 12 degrees. Average deviations from the simulation model of current amplitudes were 6.6% and phase 13 deg. That is the reason for differences in radiation patterns.

Root causes for differences are difficulties in modeling lattice structures of this scale and the above-referenced change in material definition. We also noticed that detuning the 160-meter antenna has a significant influence on the performance of the 75/80-meter Yagi. Without detuning, the 75/80-meter Yagi performs much worse than when 160-meter detuning is active.

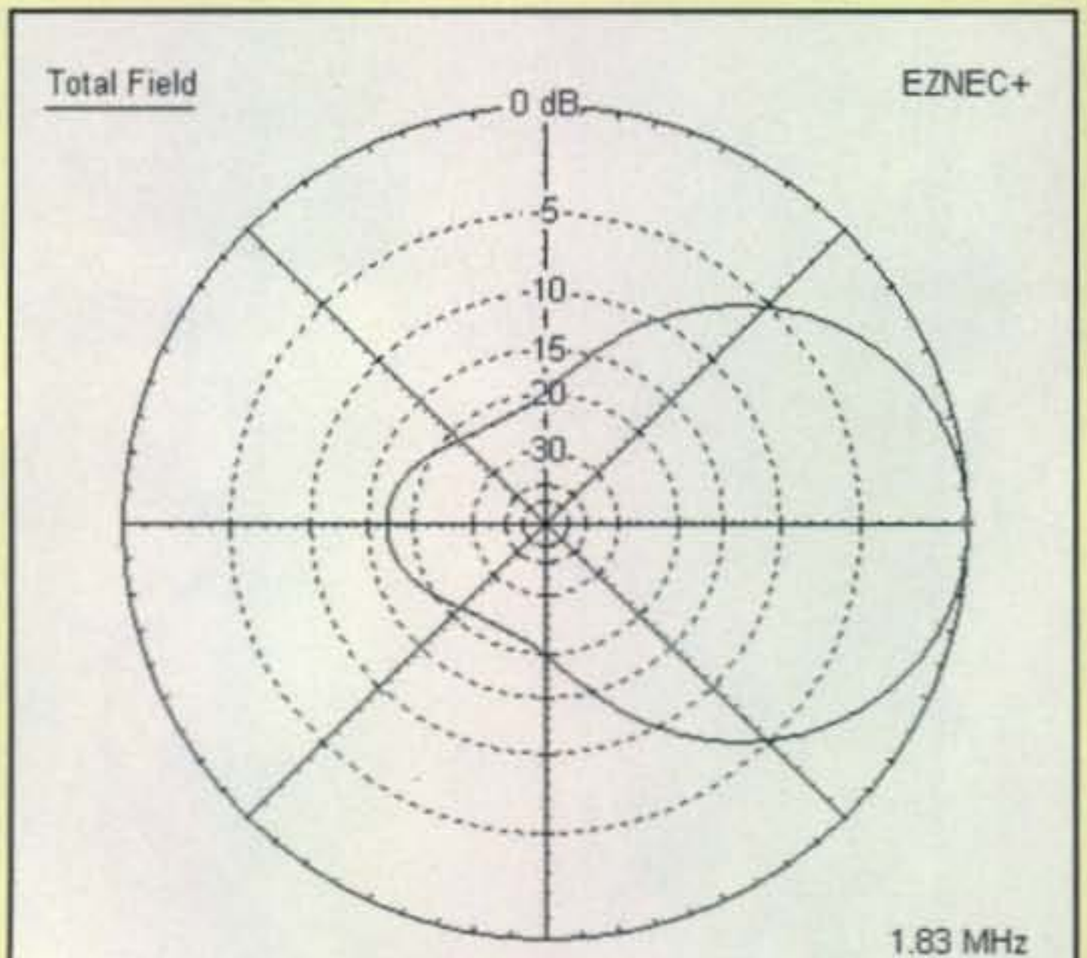

Fig. 1– Azimuth plot of measured radiation pattern of the 3-element 160-meter Yagi at OH8X.

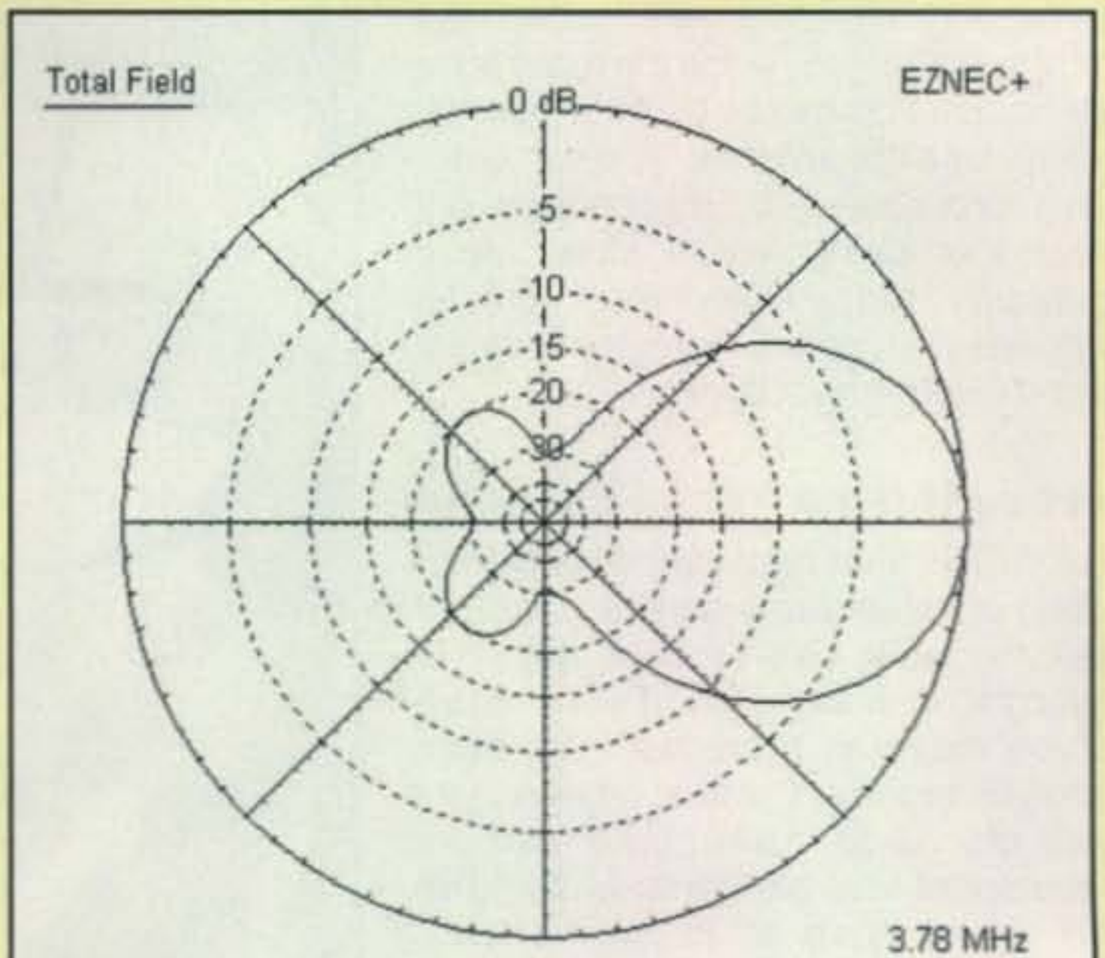

Fig. 2– Azimuth plot of measured radiation pattern of the 5-element 75/80-meter Yagi at OH8X.

Photo E– Building the tower and antennas took some three weeks, using two cranes. The smaller crane fed the parts to the bigger crane, which then lifted the parts to the men up on the tower, who mounted the pieces together. Photo on left shows the tower base being lifted into place, while photo on right shows upper section being moved into place.

Some small changes were made to element spacing, etc., since the more accurate simulation model made it possible to fine-tune the antenna. The same iterative process—with mechanical and electronic design—was done again (photo B). Since everything interacted with everything else, many more design rounds were needed.

Measuring the Actual Elements

Before the final installation, one more round of measurements was done with real elements. Even though the simulation model was matched with the prototype element, there were so many small changes in the final design that it was crucial to make sure that the behavior of final elements was known. We would need to know the exact behavior of the elements in order to design the matching units for each element.

These measurements couldn't be done in Arcala, since all the other antennas and towers might have affected the measurements. Fortunately, we found a large field 8 km (5 miles) away, which was more than a mile away from the closest manmade buildings, power lines, etc. On 160 meters all three ele-

Photo F– For actual measurements we needed a two-port VNA. One port was feeding the antenna just like a transmitter would normally do. To the other port we'd connect a current transformer (shown in photo) and that transformer would be connected to the element we were measuring. The first measurement would be for feed element in order to get reference of phase and current. After this we'd measure all the other elements, normalize those values to driven element values, and compare normalized results with simulated ones. Measuring the antennas this way seems to be quite novel.

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Ham Radio's smallest and lightest 22 Amp continuous power supply is also its best selling!

22 Amps continuous/25 Amps max at 13.8VDC. 5-way binding posts on front, 5A quick connects on back. 85-135/170-260 VAC input. 2.9 lbs. 5¾Wx3Hx5¾D".

MFJ-4125P, $94.95. Adds 2-pairs *Anderson PowerPoles*™.

22 Amp Continuous

MFJ-4225MV
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22 Amps continuous, 25 Amps maximum. Like MFJ-4125 but adds Volt/Amp meters, cigarette lighter plug. Adjustable 9-15 VDC Output. 5¼Wx 4½Hx6D in. Weighs 3.7 lbs. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

40 Amp Continuous

MFJ-4245MV
$149.95

40 Amps continuous, 45 Amps max. Adjustable 9-15 VDC output. Volt/Amp meters, cigarette lighter plug, front 5-way binding posts, two rear quick connects. 5.5 lbs. 7½Wx 4¾Hx9D inches. Use 85-135 VAC or 170-260 VAC input. Replaceable fuse.

70 Amp Continuous

MFJ-4275MV
$249.95

75 Amps maximum and 70 Amps continuously. Adjustable voltage 4.0-16 VDC. Short circuit, overload and over-temperature protection, 10.5 lbs. 9¾Wx5½Hx9½D". Great for Ameritron's ALS-500M mobile amplifier!

High Current Multiple DC Power Outlets

Power multiple Transceivers/accessories from a single DC power supply . . . Keeps you neat, organized and safe . . .Prevents fire hazard . . . Keeps wires from tangling up and shorting . . . Fused and RF bypassed . . . 6 foot, 8 gauge color coded cable . . .

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$59.95

MFJ-1112
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MFJ-1117
$64.95

MFJ-1128
$104.95

MFJ-1126
$84.95

MFJ-1129
$114.95

MFJ-1124
$64.95

Versatile 5-Way Binding Posts

MFJ-1118, $84.95. Power two HF and/or VHF rigs and six accessories from your main 12 VDC supply. *Built-in 0-25 VDC voltmeter.* Two pairs 35 amp 5-way binding posts, fused and RF bypassed for transceivers. Six pairs RF bypassed binding posts provide 15 Amps for accessories. Master fuse, ON/OFF switch,"ON" LED. 12½x2¾x2½ in.

MFJ-1116, $59.95. 8 pairs binding posts, 15A total.Voltmeter, on/off switch.

MFJ-1112, $44.95. 6 pairs binding posts, 15 Amps total.

MFJ-1117, $64.95. Powers *four* transceivers simultaneously (two at 35 Amps each and two at 35 Amps combined). 8x2x3 inches.

***All PowerPoles*™**

MFJ-1128, $104.95. 3 high-current outlets for transceivers. 9 *switched* outlets for accessories. Mix & match included fuses as needed (one-40A, one-25A, four-10A, four-5A, three-1A fuses installed). 0-25 VDC *Voltmeter*. *Extra* contacts, fuses. 12Wx1¼Hx2¾D".

MFJ-1126, $84.95. 8 outlets, each fused, 40 Amps total. Factory installed fuses: two 1A, three 5A, two 10A, one 25A, one 40A. *0-25 VDC Voltmeter*. Includes *extra PowerPoles®*, *extra* fuses -- *no extra cost*. 9Wx1¼Hx2¾ inches.

PowerPoles*™ *AND 5-Way Binding Posts

MFJ-1129, $114.95. 10 outlets each fused, 40 Amp total. 3 high-current outlets for rigs -- 2 *PowerPoles®* and one 5-way binding post. 7 *switched* outlets for accessories (20A max) -- 5 *PowerPoles®* and 2 binding posts. Fuses include (1- 40A, 2-25A, 3-10A, 3-5A, 2-1A installed). *0-25 VDC Voltmeter*. Includes extra *PowerPoles®* and fuses, 12½Wx1¼Hx2¾D inches.

MFJ-1124, $64.95. 6 outlets each fused, 40 Amps total. 4 *PowerPoles®*, 2 high-current binding posts, Installed fuses: 1-40A, 2-25A, 2-10A, 1-5A, 1-1A. Includes extra *PowerPoles®* & fuses -- *no extra cost.*

15 Amp Continuous

MFJ-4115
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15 Amps continuous, 17 Amps max at 13.8 VDC. Over-voltage, over-current protection. 5-way binding posts. Load fault indicator and automatic shutdown. 90-130 VAC input. 1½ lbs. Tiny 3¾Wx2¼Hx3¾D inches fits easily in an overnight bag.

30 Amps Continuous

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ments were similar, so only one element with one short section of boom was built. On 75/80meters all the elements were different, so all five elements were built and measured (photo C).

Then measurements were again compared to the simulation model and the model was fine-tuned to match the real elements. The values from the simulation model were still needed as an input for matching network design work. At this point, we were not interested in actual physical dimensions of modeled elements, since we already had the elements done. It was only important to match the reactance curves of the model and real elements.

Design and Production of the Matching Network

After learning the final behavior of the elements, it was time to design the matching networks (photo D). The 160-meter Yagi was designed with symmetrical construction so we could swap the radiation pattern of antenna 180 degrees by changing the reflector to director and vice versa. We also wanted to have two frequency bands on 160 meters, one for CW and one for SSB. Of course, it was also desirable to have a direct 50-ohm feed to the antenna.

The distance between the 75/80-meter and 160-meter Yagis is only 10 meters (30 feet). Simulations clearly showed that the 160-meter antenna would affect the performance of the 75/80-meter antenna. Therefore, the 160-meter antenna needed to be detuned to 1.6 MHz while not in use. Also, placing antennas on a 100-meter (330-foot) high tower could make them good targets for lightning and static, so all the elements had to be DC grounded.

On 160 meters the passive elements actually are too long to work as directors, so we needed to "shorten" each element with capacitors when acting as the driven element and lengthen it with a coil for use as a reflector. On the 75/80-meter Yagi, the matching network would only make the CW/SSB switching and DC grounding for elements. Additional inductive reactance for the reflector would be generated with help of a coil.

Building the Tower and Antennas

Building the tower and antennas mainly was done in November when sun barely rises above the horizon, and the length of a day is about five hours (photo E). The temperature is mostly below freezing, but our iron men stood strong.

The most exciting day was when clouds were hanging on at 50 meters (160 feet) and the crane had to operate without visibility to the top of the tower at 100 meters (330 feet). The men on the tower were giving orders by walkie-talkie, and the crane operator was operating "blind." Quite bit of teamwork!

Validating the Antenna

From the very beginning of the project, it was clear that the performance of the real antenna should be validated and compared to simulation results. The first idea was to make the radiation pattern measurements by using a helicopter as a signal source and plotting received signal strength of the antenna. However, this method would only determine the radiation pattern. It would not determine the actual gain, and if there was no correlation with simulated patterns, it would be impossible to figure out why the antenna was not behaving as simulated.

After more research, we ended up measuring the phase and current of each element (photo F). Once the phase and current of each element were known, we could enter the measured values into the simulation model and calculate the real radiation pattern. The advantage of this method was that if there were differences between the simulated model and the real antenna, it would be possible to determine the reasons for those differences.

The first measurement session was not successful. The results were not correlating at all, and we were confused, not knowing if the antenna was somehow broken or if there was something wrong with the measurements. The measurement location was on the 160-meter boom at 80 meters (270 feet) above ground level. After 11 hours up on the tower, it was time to give up and come down with all the equipment (photo G).

There was some RF current on the shield of the coaxial cable we were using for measurements and we suspected that was the reason for the incorrect results. We added some ferrite cores on the coax to prevent current on the shield, and we were back in business for a couple more days of measurements. Finally, everything was behaving as it should be.

On the Air

On 160 meters, there was 1 dB less gain and 7 dB of missing front-to-back ratio compared with the simulations. The main reason for the differences is that

Photo G– Author OH2UA walking through one of the antenna elements with measurement gear. The first day of measurements took 11 hours and did not produce satisfactory results. See text for details.

the simulations were made assuming the lattice parts of the elements to be aluminum, but in fact, steel was used. That made currents in the parasitic elements run about 20% lower than expected. This could be fixed two ways—either shortening the boom or changing the feed system. Shortening the boom would not make any sense for a couple of dB. However, changing the feed system to a version in which all the elements were fed by coaxial cable would have the same effect, and the currents and phases would be easy to manage. This could be done, since all the elements were physically equal. The plans for changing the 160-meter feed system were already made, but not yet implemented as of this writing.

At OH8X there is also a 160-meter 4-square antenna. When comparing these two antennas, the three-element Yagi is better most of the time. On very low-angle signals, though, the 4SQ generally performs better than Yagi. These two antennas (three-element and 4SQ) make a very good pair, and both of them are needed. In summary, though, it can be said that the three-element 160-meter Yagi works, and one can get a feeling of operating with a Yagi, just as on higher frequencies.

On 75/80 meters the five-element Yagi is outstanding, and it works very close to simulations. It's almost always better than the other Yagi array (two over two) at Arcala. The radiation pattern of the 75/80-meter Yagi is very clearly making its own long path to California at sunset! With this antenna one really has the feeling of hearing and being able to work everything on the band—as long as no aurora appears which, unfortunately, it does for more days than not.

More information as well as Eznec files of the antennas are available on Radio Arcala's web page: <www.radioarcala.com>. Also see the sidebar "So How Does it Work?"

Conclusions

In this project it was shown that three-element 160-meter and 5-element 75/80-meter Yagis are doable, and the performance of the actual antennas meets simulations. This might not be a first 160-meter antenna project for someone to build, but Radio Arcala has opened the game and now we're waiting to see who will be the first to build stacked Yagis on 160!

There has been great interest in this antenna, so the next step at Radio Arcala might be building an elevator on the tower and have a fully featured sauna on the boom of the 160-meter Yagi. When that happens, we'll let you know how to book your trip. . . .

Results of the 2011 CQ WW WPX CW Contest

BY RANDY THOMPSON,* K5ZD

"Who ever said that contesting is for wimps? I am simply amazed at the willingness of my fellow CW contesters to sit [through] the extremely challenging conditions this weekend and I am proud to be a part of this brotherhood."

– Andy, DL3YM

The 32nd edition of the CQ WW WPX CW Contest was held on May 28–29, 2011. This was just 60 days after the fantastic propagation experienced in the SSB event. In the battle between man and technology vs. nature, things don't always work out the way we want. For the second year in a row, WPX CW had some bad luck.

After a week of great conditions leading up to the contest, it was frustrating to have the solar storms begin just a few hours after the start. The poor conditions caused operators to revise their operating plans. Mike, KH6ND, operating at KH7X commented, "Seriously bad conditions from this part of the world. I was forced to take many hours of off time during what are usually our highest rate times of the day." Carol, N2MM, made the ultimate statement of rejection by a serious contester: "Things were so bad on Saturday morning that I [stopped] to mow the lawn." Other ops mentioned taking time off to attend holiday parties or watch the Formula One race or the Indianapolis 500.

Even so, there was still opportunity for those who stayed in the chair. Victor, VA2WDQ, focused on the positive: "I've improved my last-year result by 20%." Mike, VE3GFN, was happy: "My first WPX and it was amazing how the score rose to astronomical heights." John, VK4CT, was also pleased: "I enjoyed good competition and band conditions to reach a personal best." Steve, N2IC, found a nugget of propagation gold: "Outstanding propagation to VK and JA on 80 meters Saturday morning during the hours before sunrise–maybe the best I have ever heard."

In spite of the challenges, many stations reported scores equal to or better than 2011. One reason was the increase in multipliers. The LZ9W multi-multi entry set a new record for prefix multipliers, with 1365. They made this observation about where the multipliers come from: "Thanks to new Russian calls there were a good number of prefixes available from east. ... USA once again was the main source of multipliers. For example, prefixes we worked from Russia, Ukraine, and Japan counted together still does not match the number of USA prefixes worked."

We thank the following stations that helped provide some unusual callsigns and exciting multipliers in our logs: 8J4VLP, 8N3A/3, CD3A, D73A, DK150RB, DR11BUGA, DR40AGCW, HF800Z, HG15IPA, IP7U, JU1F, LZ2011KM, LZ855SRKM, OM50CDN, OM75IHWC, SD40JZ, SO100MSC, YR30DP, Z330F, and Z350MM. OM2011IIHF was a special event call for the 2011 Ice Hockey World Championship in Slovakia.

Single-Op All Band High Power

Valery, RD3A, once again returned to EF8M to set the top score for the Single Operator category. There was a South America shootout between John, W2GD, operating from P40W, and John, K4BAI, operating from PJ4A. W2GD had the experience advantage with over 25 years of contesting from Aruba. K4BAI was the defending record holder. It was an extra 200 contacts on 40 meters for PJ4A that provided the winning edge. Two travelling Russians faced off for fourth place, with Harry, RA3AUU, operating from P33W coming out ahead of Vlad, RK4FF/6W.

It was a very close race for top score in Europe. Pertti, OH2PM, piloted the Arkala station CR2X to first in Europe and 7th overall. Close behind was Sebastien, F8DBF, operating from TM6M. Stations to the south dominated the European Top Ten. IR4X, operated by Matteo, IZ3EYZ, and Ranko, 4O3A, finished third and fourth. Hrvole, 9A6XX, in fifth, led a close pack of stations all with over 6-million points.

e-mail: <k5zd@cqwpx.com>

Jorge, CX6VM, received help from his 11-month-old Francisco while operating as CW5W.

As usual, most of the top USA scores came from the Northeast. The winner this year was Krassy, K1LZ. Just a few extra prefixes made the difference over second place finisher Scott, K0DQ, operating from the well-equipped station of WW1WW. Paul, K8PO, used the call AJ1I to place third. In fifth, Alex, LZ4AX, lost some momentum at KC3R when the 40-meter beam failed on Saturday afternoon. The best scores from out West were Steve, N2IC, operating as WK5T, and Chris, KL9A, operating NK7U. Both were rewarded for their perseverance as Steve took home the plaque for high score in Zone 4 and Chris earned the plaque for high score in Zone 3.

Single-Op All-Band Low Power

For the second year in a row, the winner of the Low Power category was P49Y operated by Andy, AE6Y. His score is a new world record replacing a score set by CT3EE back in 2003. Talk about being in the right place at the right time to take advantage of the poor conditions! Second place was taken by 3V8SS in Tunisia operated by Ash, KF5EYY. Southern Europe was the place to be as IR1Y (op. Carlo, IK1HJS) finished just ahead of Mladen, YT6W, Andy, UU4JMG, and Milan, YU8A. Carlo made most of his contacts on 15 meters ,while the others had a more even distribution across all bands.

The battle for top USA score also favored stations to the south and was extremely close. Merrill, WK2G/4, in Florida, finished just 4000 points ahead of Marv, N5AW, in Texas; that's less than three DX contacts! This was Marv's first serious entry in WPX and he did very well, in spite of having to take a few hours off on Saturday afternoon to attend a holiday party. Another Floridian, Will, WJ9B/4, was just a few points back in third. Terry, N4TZ, operating from KS9K in Indiana, was the best of the northerners, just ahead of David, K3EL/2 in New Jersey, and neighbor K9QVB in Illinois.

Single-Operator Single Band

The top Single Band score in the contest was made by Pedro, HK1X, on 20 meters. Two-hundred more multipliers helped increase his score

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2011 CQ WW WPX CW TROPHY WINNERS AND DONORS

SINGLE OPERATOR ALL BAND

WORLD: Steve Bolia, N8BJQ Trophy. Won by: **EF8M operated by Valery Komarov, RD3A**
WORLD Low Power: Caribbean Contesting Consortium Trophy. Won by: **P49Y operated by Andrew L. Faber, AE6Y**
WORLD QRP: Bill Parker, W8QZA Trophy. Won by: **Joseph Presman, UU2CW**
USA: Dennis Motschenbacher, K7BV Trophy. Won by: **Krassimir Petkov, K1LZ**
USA Low Power: Ken Boasi, N2ZN Trophy. Won by: **Merrill Brown, WK2G/4**
USA QRP: John T. Laney, K4BAI Trophy. Won by: **Julius Fazekas, N2WN/4**
USA Zone 3 High Power: Northern California Contest Club Trophy. Won by: **NK7U operated by Chris Hurlbut, KL9A**
USA Zone 3 Low Power: Arizona Outlaws Contest Club Trophy. Won by: **AD7JP operated by BILL CONWELL, K2PO**
USA Zone 4 High Power: Society of Midwest Contesters Trophy. Won by: **WK5T operated by Steve London, N2IC**
USA Zone 4 Low Power: Society of Midwest Contesters Trophy. Won by: **Marvin Bloomquist, N5AW**
USA Zone 5 High Power: Paul Obert, K8PO Trophy. Awarded to: **WW1WW operated by Scott Redd, KØDQ**
EUROPE: Ivo Pezer, 5B4ADA/9A3A Trophy. Won by: **CR2X operated by Pertti Simovaara, OH2PM**
EUROPE Low Power: Vitor Santos, PY2NY Trophy. Won by: **IR1Y operated by Carlo De Mari, IK1HJS**
EUROPE QRP: Julius Fazekas, N2WN Trophy. Awarded to: **OK3C operated by Ludek Odehnal, OK2ZC**
AFRICA: Chris Terkla, N1XS Trophy. Awarded to: **Vlad Zaitsev, 6W/RK4FF**
ASIA: Rick Tavan, N6XI Trophy. Won by: **P33W operated by Igor Booklan, RA3AUU**
NORTH AMERICA: Louisiana Contest Club Trophy. Won by: **Felipe Hernandez, NP4Z**
NORTH AMERICA QRP: Dale Martin, KG5U Trophy. Won by: *no entry*
OCEANIA: Lloyd Cabral, KH6LC Trophy. Won by: **KH7X operated by Michael Gibson, KH6ND**
OCEANIA Low Power: Pacific DXers Trophy. Won by: **P29CW operated by Allan Bernard Mason, VK2GR**
SOUTH AMERICA: David Kopacz, KY1V Trophy. Won by: **PJ4A operated by John T. Laney III, K4BAI**
SOUTHERN CONE (CE,CX,LU): Tom Morton, K6CT Trophy. Won by: **CW5W operated by Jorge Diez, CX6VM**
CANADA: Radio Amateurs of Canada (RAC) Trophy. Won by: **VY2ZM operated by Jeffrey T. Briggs, K1ZM**
CANADA Low Power: Contest Club Ontario Trophy. Won by: **Bruce Wade, VE1NB**
JAPAN: Simone Candotto, IV3NVN Trophy. Won by: **Masaki Okano, JH4UYB**

SINGLE OPERATOR, SINGLE BAND

WORLD 28 MHz: Steve Hodgson, ZC4LI Trophy. Won by: **PW2D operated by Thomas Carlsson, PY2ZXU**
WORLD 28 MHz Low Power: Six Stars Contest Station LS1D Trophy. Won by: **Dale Green, CE2/VE7SV**
WORLD 21 MHz: Andrei Stchislenok, NP3D Trophy. Won by: **Jorge Luis Prieto, HK1R**
WORLD 14 MHz: Gene Walsh, N2AA Trophy. Won by: **Pedro Claver Orozco, HK1X**
WORLD 7 MHz: 6Y1V Contest Station Trophy. Won by: **Ivan Mastilovic, YU1LA**
WORLD 7 MHz Low Power: Neal Campbell, K3NC Trophy. Won by: **Eugeniusz Moroz, SP4JCQ**
WORLD 3.5 MHz: Ranko Boca, 4O3A Trophy. Won by: **9A40Y operated by Sasa Pokorni, 9A3NM**
WORLD 1.8 MHz: Dusko Dumanovic, ZL3WW Trophy. Won by: **Tomislav Polak, 9A2AJ**
USA 28 MHz: Paul Beringer, NG7Z Trophy. Won by: **Pat Whelton, KZ5J**
USA 21 MHz: Charlie Wooten, NF4A Trophy. Won by: **WN1GIV/4 operated by Bob Patten, N4BP**
USA 14 MHz: Kansas City DX Club Trophy. Won by: **NR5M operated by Bill Bradford, K5GA**
USA 7 MHz: Darin Divinia, WG5J Trophy. Won by: **NG5A operated by CHRISTOPHER TERKLA, N1XS**
USA 3.5 MHz: Wes Printz, W3SE / ZL3TE Trophy. Won by: **Victor A. Shields, K9UIY**
EUROPE 28 MHz High Power: SKY Contest Club Trophy. Won by: **Slaven Galic, E77A**
EUROPE 21 MHz High Power: SKY Contest Club Trophy. Won by: **CS2C operated by Jiri Pesta, OK1RF**
EUROPE 14 MHz High Power: SKY Contest Club Trophy. Won by: **E73W operated by Ivica Matkic, E73O**
EUROPE 7 MHz High Power: SKY Contest Club Trophy. Awarded to: **Saulius Zalnerauskas, LY5W**
EUROPE 3.5 MHz High Power: SKY Contest Club Trophy. Awarded to: **Igor Plugatarev, RW3WA**
EUROPE 1.8 MHz High Power: SKY Contest Club Trophy. Awarded to: **IR4E operated by Filippo Fragni, IK4ZHH**

SINGLE OPERATOR ASSISTED

WORLD: D4C Station Trophy. Won by: **TO8A operated by Valery Petrov, R5GA**
USA: Ron Sigismonti, N3RS Trophy. Won by: **WU3A/1 operated by Gene Shablygin, W3UA**
EUROPE: Martin Huml, OL5Y Trophy. Won by: **EF5Y operated by Yuri Sakalouski, EA5GTQ**
Canada: Anthony Ratajczak, VE1ZA Trophy. Won by: **VA2WA operated by Victor Androsov, VA2WDQ**

OVERLAY CATEGORIES

WORLD Tribander/Single Element: Helmut Mueller, DF7ZS Trophy. Won by: **3V8SS operated by Ashraf Chaabane, KF5EYY**
USA Tribander/ Single Element: Paul Newberry, N4PN Trophy. Won by: **WS2T/4 operated by Paul Newberry, N4PN**
EUROPE Tribander/ Single Element: WPX Contest Committee Trophy. Won by: **T70A operated by Ivo Pezer, 9A3A**
WORLD Rookie: Val Edwards W8KIC Memorial (K3LR sponsor) Trophy. Won by: **OH8R operated by Mikko Silvola, OH8FKU**
NORTH AMERICA Rookie: Chris Kantarjiev, K6DBG Trophy. Won by: **Michael Moran, K2CYE**

MULTI-OPERATOR SINGLE-TRANSMITTER

WORLD: Steve Miller, NØSM Trophy. Won by: **CQ3A operated by OE1DIA, OM3GI, OM3RM, OM7JG**
USA: Phil Allardice, KT3Y Trophy. Won by: **NY4A operated by AA4FU, N4AF**
AFRICA: Rhein Ruhr DX Association Trophy. Awarded to: **J25DXA operated by J28AA, J28AP, J28JV, J28RO, J28WR**
ASIA: W2MIG Memorial (NX7TT Sponsor) Trophy. Won by: **C4N operated by 5B8AD, 5B4AGM, RV6LNA, RA6LFO, R7LV, R7LP, UA9CDV**
EUROPE: Andy Ruse, YO3JR/YR1A Trophy. Won by: **E7DX operated by 9A5K, E70R, E70T, E74IW, E76C, E77DX, E77E, E77WM**
NORTH AMERICA: Jim George, N3BB Trophy. Won by: **KP2M operated by KT3Y, K9VV**

MULTI-OPERATOR TWO-TRANSMITTER

WORLD: UA1DZ Memorial (W3UA Sponsor) Trophy. Won by: **CR3L operated by DJ2YE, DJ8DS, DJ9IE, DK3QZ, DL1XW, PA0R**
USA: Florida Contest Group Trophy. Won by: **KD4D/3 operated by KD4D, NN3W, K3RA, K3WI, W2CDO, W3KX, K3MM**
AFRICA: Walter Skudlarek, DJ6QT Trophy. Won by: *no entry*
EUROPE: Tom Georgens, W2SC Trophy. Awarded to: **II9T operated by IT9GSF, LY2IJ, YL2KL, YL3DW**

MULTI-OPERATOR MULTI-TRANSMITTER

WORLD: Steve Merchant, K6AW Trophy. Won by: **LZ9W operated by LZ1ZD, LZ1ANA, LZ1FG, LZ1GL, LZ1PJ, LZ1PM, LZ1UQ, LZ2BE, LZ2CJ, LZ2HQ, LZ2GL, LZ2PL, LZ2TU, LZ2UU, LZ2PO, LZ2UZ, LZ3FM, LZ3UM, OK1FDR**
USA: Jim Reisert, AD1C Trophy. Awarded to: **NR4M operated by KE3X, K4EC, K4GM, K4ZW, KC4D, K7SV, N2YO, N3UA, NR4M, WK3W, W4PRO**
EUROPE: David Robbins, K1TTT Trophy. Awarded to: **DR1A operated by DB6JG, DF6JC, DJ7EO, DJ7WW, DK2CX, DK9IP, DL3DXX, DL5CW, DL5LYM, DL6FBL, DL8DYL, DL8LAS, DL8WPX, DL9DRA, DL9EE, SV2KBS, JK3GAD, PC5A**

CONTEST EXPEDITION

WORLD: Phil Goetz N6ZZ Memorial Trophy. Won by: **Franc Bogataj, ZA/S59AA**

COMBINED SSB/CW

WORLD Single Operator Total Score: Yuri Blanarovich, K3BU Trophy. Won by: **Jeffrey T. Briggs, K1ZM**
USA Single Operator Total Score: Bill Fisher W4AN Memorial (KM3T Sponsor). Won by: **Krassimir Petkov, K1LZ**
WORLD Single Operator Total Prefixes: Norm Koch, WN5N Memorial by Gail Sheehan, K2RED Trophy. Won by: **Ranko Boca, 4O3A** (2327 total)
WORLD Club Score: *CQ* Magazine trophy. Won by: **Bavarian Contest Club**

from last year by over 40% to set a new record for South America. Second place on 20 meters went to YW4D, operated by Paolo, YV1DIG. Steve, ZC4LI, showed that fighting cancer was not going to slow down his contesting with a fine fourth place finish. In Europe, it was E73OW (op Ivica, E73O) just getting by Ivo, S57AL, for the win. The top 20-meter score in the USA was by Bill, K5GA, operating from NR5M.

The experience on 10 meters varied greatly depending on where you were. The top score was from PW2D operated by Thomas, PY2ZXU, with over 2-million points. Rene, LU7HN, was second with 1.4 million. As usual, WPX CW served up some interesting sporadic-*E* in Europe. Slaven, E77A, made over 1100 contacts to win Europe and place third overall. Alex, RU7A, was close behind. The top North American score was by Joe, W5ASP, at the controls of ZF1A. There was only one entry from the USA, by Pat, KZ5J.

Continuing the theme of winners from South America was Jorge, HK1R, on 15 meters. He finished ahead of the 15-meter powerhouse ZX5J operated by Carl, AI6V. Jiri, OK1RF, operated from Portugal as CS2C to finish third. The top USA score was made by Bob, N4BP, using his old Novice call WN1GIV/4. Very close second was from Eric, NM5M, sharing the NR5M station.

Ivan, YU1LA, enjoyed his favorite band and took the win on 40 meters. Second and *third* place were from the north, with Sam, LY5W, just getting ahead of Dmitri, UA2FB operating UA2F. The world top ten was dominated by European stations except for the top two USA scores. Chris, N1XS, operated from NR5M using the call NG5A to take first in the USA and number 7 in the world. Just 40k points behind was Andy, K2LE, using the call KW2O. Dealing with summer static and the strange conditions, it was logging accuracy that determined the order of finish between Chris and Andy.

The champion on 80 meters was Sasa, 9A3NM, operating from the 9A1CCY club station under the call 9A4ØY. There were many thunderstorms in southeastern Europe to deal with on the first night. Second place went to Victor, R9TV, with a nice score far from the population centers of Europe and a new UA9 record. Igor, RW3WA, also had a nice score to finish in third. The USA winner was NC6CC operated by Bill, N6ZFO.

It was a close race for the top position on 160 meters. Tom, 9A2AJ, and Filippo, IK4ZHH at IR4E, ended up only 3 QSOs and 6 multipliers apart! Tom got the win due to his extra prefixes. Bolmar, HK1MW, put in a valiant effort to break the South American record that had been set by YV1OB back in 1986! The USA winner was Charlie, NØTT.

Single-Op Single Band Low Power

The highest Low Power Single Band score was made on 15 meters by Martin, OK1FUA, operating from KV4FZ using the call NP2/OL5Y. Second went to Cesar, LU5FR. Milovan, YU1AU, represented the best from Europe and was third. Andy, WB4TDH, was well ahead in the race for top USA score on the band.

The winner on 10 meters was a call that had some participants scratching their head. Dale, VE7SV, operated 10 meters single band from Chile as CE2/VE7SV. At the same time, his station back in British Columbia was active as a multi-op using the call VE7SV. Second on 10

2011 CQ WW WPX CW WORLD TOP SCORES

SINGLE OPERATOR HIGH POWER
ALL BANDS

EF8M (RD3A)	17,256,785
PJ4A (K4BAI)	16,272,730
P40W (W2GD)	14,206,600
P33W (RA3AUU)	11,307,568
6W/RK4FF	11,082,730

28 MHz

PW2D (PY2ZXU)	2,100,886
LU7HN	1,455,807
E77A	776,424

21 MHz

HK1R	5,133,440
ZX5J (AI6V)	4,383,960
CS2C (OK1RF)	3,798,404

14 MHz

HK1X	7,254,266
YW4D (YV1DIG)	5,903,471
4L8A	5,809,104

7 MHz

YU1LA	4,262,934
LY5W	2,877,192
UA2F (UA2FB)	2,749,968

3.5 MHz

9A4ØY (9A3NM)	1,098,720
R9TV	863,825
RW3WA	501,456

1.8 MHz

9A2AJ	205,403
IR4E (IK4ZHH)	202,160
SP9ATE	161,952

SINGLE OPERATOR LOW POWER
ALL BANDS

*P49Y (AE6Y)	11,008,296
*3V8SS (KF5EYY)	4,861,320
*IR1Y (IK1HJS)	3,938,781
*YT6W	3,706,561
*UU4JMG	3,648,316

28 MHz

*CE2/VE7SV	916,272
*PY2MTS	394,286
*EA5AER	318,336

21 MHz

*NP2/OL5Y (OK1FUA)	1,889,778
*LU5FR	1,387,050
*YU1AU	1,361,241

14 MHz

*RX9AF	1,580,091
*UA9LAO	1,499,510
*4K6FO	1,171,296

7 MHz

*SP4JCQ	1,515,360
*VE1NB	1,457,528
*OM3ZWA	1,430,583

3.5 MHz

*S57DX	583,490
*LY2GW	527,095
*HA4FV	383,910

1.8 MHz

*YT4A (YT1AA)	119,848
*OL1A (OK1CW)	65,934
*UX5NQ	60,528

SINGLE OPERATOR ASSISTED HIGH POWER
ALL BANDS

TO8A (R5GA)	11,038,950
RG9A	9,215,552
FM5CD	7,151,445
VP5CW (W5CW)	7,048,951
EF5Y (EA5GTQ)	6,421,738

28 MHz

9K2RA (9K2RR)	1,384,560
TA2ZAF (OK1MU)	1,379,664
HK1NA (HK3TU)	720,875

21 MHz

PY1NX	5,225,754
IP7U (IK7JWY)	2,039,916
S56M	1,589,805

14 MHz

YT9A	3,846,269
EO3Q (UR3QCW)	3,153,904
S53F	2,968,038

7 MHz

HK1N	3,812,421
S52AW	3,684,478
PY1NB	3,381,597

3.5 MHz

HA3LI	780,066
OH6MW	717,220
E71A	664,759

1.8 MHz

IKØHBN	128,334
YR5N (YO5PBF)	122,169
DF2UU	120,772

SINGLE OPERATOR ASSISTED LOW POWER
ALL BANDS

*5B/US7IDX (RN3QO)	4,948,784
*V26E (AB2E)	4,872,526
*IO4T (IK4VET)	4,623,804
*PP5BZ	4,212,870
*RT9S	3,385,266

28 MHz

*SVØXBZ/9 (YL2VW)	401,305
*HGØR (HAØNAR)	220,011
*DH8BQA	182,970

21 MHz

*UK8AR	1,094,460
*UN8GV	907,092
*YT8T	766,800

14 MHz

*YU1R (YT1NP)	2,078,271
*RM2M	1,738,842
*CE3AA (XQ4CW)	1,627,552

7 MHz

*PY2SEX	3,103,786
*YT8A (YU1EA)	2,687,130
*UX4U (US7UX)	2,220,330

3.5 MHz

*UR3LPM	414,422
*UT3L	381,036
*LY1G	329,832

1.8 MHz

*YO2AQB	33,120
*4L4/UT5EO	4,108

SINGLE OPERATOR QRP
ALL BANDS

UU2CW	1,135,956
OK3C (OK2ZC)	1,091,496
TM3T (F5VBT)	1,089,680
S52P	1,055,215
N2WN/4	902,940

28 MHz

LU7HZ	94,248
IØUZF	90,885
LY2LF	22,078

21 MHz

HG15IPA (HA3JB)	280,080
JE2UFF	77,644
IV3AOL	39,182

14 MHz

HA6NW	480,684
UA6LCJ	303,887
LY5G	282,348

7 MHz

YU1WC	749,480
9A3JH	711,784
SP9NSV/7	344,760

3.5 MHz

HG6C (HA6IAM)	236,292
SP4GL	192,046
OK1FKD	119,412

1.8 MHz

SS3AR	35,624
LY4BF	26,378
HA5KHC	5,665

ROOKIE
ALL BANDS

*OH8R (OH8FKU)	1,604,665
*UD3D (UB3DAY)	1,535,180
*SV2HWR	1,368,836
*UW1WU	1,116,960
*DO3QQ	325,268

28 MHz

*ER2RM	66,732
*RN6LMK	3,015

21 MHz

*RZ9UMA	329,640
*EY7BJ	78,288

14 MHz

*UR5EFL	94,132
*AG6V	48,216

7 MHz

*NX9G	19,926
*YO2MJZ	5,412

3.5 MHz

*ZL2GQ	682

TRIBANDER/SINGLE ELEMENT
HIGH POWER
ALL BANDS

FM5CD	7,151,445
ED8A (EA8AY)	6,754,856
T7ØA (9A3A)	6,227,775
DM1A (DL1IAO)	4,973,469
S5ØC (S53CC)	4,585,332

28 MHz

UR2VA	103,416
SV2BOH	85,033
9A4W	83,763

21 MHz

WN1GIV/4 (N4BP)	1,133,900
UN4PG	784,836
ZS1EL	451,350

14 MHz

ZC4LI	4,479,840
IKØYVV	2,965,114
EA1DX/5 (EA5FID)	1,034,968

7 MHz

KU8E/4	990,776
KF6T	863,247
IZ5DIY	467,250

3.5 MHz

HA3LI	780,066
E71A	664,759
G3XTT	488,300

1.8 MHz

SP9ATE	161,952

TRIBANDER/SINGLE ELEMENT
LOW POWER
ALL BANDS

*3V8SS (KF5EYY)	4,861,320
*RT9S	3,385,266
*VE2XAA	3,001,790
*OM5X (OM5XX)	2,811,600
*OK2ZI	2,658,306

28 MHz

*DH8BQA	182,970
*UT8EU	133,874
*S54A	109,568

21 MHz

*NP2/OL5Y (OK1FUA)	1,889,778
*YU1AU	1,361,241
*UN8GV	907,092

14 MHz

*CE3AA (XQ4CW)	1,627,552
*UA1AFT	794,561
*DL9ZP	649,490

7 MHz

*M5E (GØCKV)	1,765,056
*YT2B	932,790
*DL5KUD	727,463

3.5 MHz

*RA7Y	133,021
*RAØWU	100,776
*RO1B	90,909

1.8 MHz

*YT4A (YT1AA)	119,848

MULTI-OPERATOR
SINGLE-TRANSMITTER

CQ3A	26,093,210
C4N	19,174,584
RF9C	16,678,870
PX2W	14,623,875
KP2M	13,611,765

MULTI-OPERATOR
TWO-TRANSMITTER

CR3L	22,199,075
J7A	19,532,400
PW7T	17,602,470
II9T	15,283,920
9A1A	15,004,032

MULTI-OPERATOR
MULTI-TRANSMITTER

LZ9W	21,403,200
DR1A	20,591,118
LU4FM	16,698,132
NR4M	15,071,104
NO4I	13,415,522

**Low Power*

meters was Matheus, PY2MTS. Javier, EA5AER, had the top European score ahead of Matija, 9A3VM. Ed, KN4Y, hung in there until conditions improved on Sunday to take the USA win.

The competition on 20 meters was between two Asiatic Russian stations. Vlad, RX9AF, had 14 more multipliers. Eugene, UA9LAO, had 4 more QSOs. Both had extremely accurate logs. The extra multipliers gave RX9AF the victory. The top European score was by Avinir, UA1ZZ, with RZ4AG and RA1OT close behind. The best USA score was by Jeff, N8II, who juggled family priorities while also putting in 12 hours of operating time.

The Low Power category on 40 meters always presents some of the toughest competition in the contest. Gene, SP4JCQ, worked 1094 contacts to have the highest QSO total and the victory. Bruce, VE1NB, was just 60k points back in second. Bruce took advantage of proximity to Europe and the USA to achieve an excellent score with only 60% as many contacts as Gene. Juraj, OM3ZWA, was only 27k, back in third place. Francisco, YV1FM, operated as 4M1W to post the next best non-European score. Richard, W2EG, was well clear of his competition for the top USA score.

The Stanford University club station, located on a ridge overlooking the San Francisco Bay,, was active under the call ND2T.

It was another close race on 80 meters. Slavko, S57DX, operated 29 hours to set the world high score. Arturas, LY2W, may be wishing he had operated more, as he finished less than 60k behind Slavko with only 20 hours of operation. The best score from outside Europe was WP2/OLØA operated by Petr, OK1CZ from the location of KV4FZ. This was Petr's first experience operating from the Caribbean and he took home the North American record. The top USA score on low power was by Vic, K9UIY. Since he beat the High Power leader, he earned the USA plaque for 80 meters!

On 160 meters, Vemic, YT1AA, operated YT4A to a score that would have finished fourth in the high power category! OL1A and UX5NQ had a close finish for second. Best score outside Europe was made by Yuri, UN7CH. Top USA was NA4W by Courtney, K4WI.

Single Operator QRP

You have to admire the attitude of QRP operators. No matter what the conditions, they appreciate every QSO. The winner of the QRP

2011 CQ WW WPX CW USA TOP SCORES

SINGLE OPERATOR HIGH POWER ALL BANDS

K1LZ	7,448,658
WW1WW (KØDQ)	7,020,783
AJ1I (K8PO)	6,922,242
WC1M	6,601,146
KC3R (LZ4AX)	6,339,496

28 MHz

KZ5J	34,928

21 MHz

WN1GIV/4 (N4BP)	1,133,900
NM5M	1,071,036
W4SVO	549,504

14 MHz

NR5M (K5GA)	2,486,866
WB5AAR (N5RZ)	1,622,092
N2MM	1,606,230

7 MHz

NG5A (N1XS)	1,505,172
KW2O/1 (K2LE)	1,469,354
KU8E/4	990,776

3.5 MHz

NC6CC (N6ZFO)	21,070
KX9DX	6,527

1.8 MHz

NØTT	7,198

SINGLE OPERATOR LOW POWER ALL BANDS

*WK2G/4	2,335,581
*N5AW	2,331,771
*WJ9B/4	2,277,864
*KS9K (N4TZ)	1,626,350
*K3EL/2	1,569,482

28 MHz

*KN4Y	23,625
*K2PS/3	18,392
*AD5MN	1,380

21 MHz

*WB4TDH	445,612
*W4UAL (K4CWW)	145,167
*W2AW (N2GM)	91,260

14 MHz

*N8II	398,184
*W8IQ	279,725
*K7ZD	272,082

7 MHz

*W2EG	831,432
*NA8V	386,559
*AB1J	267,264

3.5 MHz

*K9UIY	99,372
*K4FT	3,960

1.8 MHz

*NA4W (K4WI)	1,696

SINGLE OPERATOR ASSISTED HIGH POWER ALL BANDS

WU3A/1 (W3UA)	5,540,945
NY3A	5,448,006
WK1Q (K1MK)	4,189,915
WR3Z	3,633,945
NK5Q (K5WA)	3,269,332

28 MHz

W2RR (WA2AOG)	2,550

21 MHz

NN3L (N3RS)	955,164
KZ7X (K6LL)	334,650
N6ML	315,423

14 MHz

N6JV	702,084
W4CU	637,920
K9NW	473,396

7 MHz

KF6T	863,247
W6RLL/7	40,740

SINGLE OPERATOR ASSISTED LOW POWER ALL BANDS

*NØSXX	870,012
*KØKX	636,300
*K8BL	551,502
*WL7E/WZ7	392,092
*NE5LL (N1CC)	388,278

28 MHz

*N1VVV	1,711

21 MHz

*N6EE	38,216

14 MHz

*NW4V	200,160
*N8HP	60,690
*AG6V	48,216

7 MHz

*W1WBB	222,981
*N2JDQ	154,093
*N7MAL	88,200

3.5 MHz

*W8AEF/7	89,250

SINGLE OPERATOR QRP ALL BANDS

N2WN/4	902,940
N7IR	582,750
W6QU (W8QZA)	361,820
K4QPL	323,528
NQ4RP (W4QO)	319,200

28 MHz

W5GAI	10,419

21 MHz

WY6DX	12,096

14 MHz

NZ5A	26,962
WB2LQF	21,522
KM9R/5	19,186

7 MHz

K4CNW	150,265
N2JNZ	54,252
NE6M	51,724

3.5 MHz

K3TW/4	22,950
K7DD	7,296

ROOKIE ALL BANDS

*K2CYE	265,203
*AB1OD	120,582
*K5VAR	61,353
*AB4G	31,030
*WA1N	5,936

TRIBANDER/SINGLE ELEMENT HIGH POWER ALL BANDS

WS2T/4 (N4PN)	2,603,720
N1WR/3	2,245,446
NF4A	2,032,640
NA4K	2,004,695
KYØW/6 (K6SRZ)	1,795,311

28 MHz

KZ5J	34,928

21 MHz

WN1GIV/4 (N4BP)	1,133,900
NE8P	335,738
KZ7X (K6LL)	334,650

14 MHz

W4CU	637,920
W7WW	32,512
KK9V	10,275

7 MHz

KU8E/4	990,776
KF6T	863,247
W6RKC	6,407

3.5 MHz

KX9DX	6,527

TRIBANDER/SINGLE ELEMENT LOW POWER ALL BANDS

*K3EL/2	1,569,482
*K9OM	1,204,476
*KV8Q	902,192
*NØSXX	870,012
*WD4AHZ	720,632

21 MHz

*WY6DX	12,096
*KN8D	2,628

14 MHz

*W8IQ	279,725
*K7ZD	272,082
*NW4V	200,160

7 MHz

*AB1J	267,264
*W1WBB	222,981
*N2JDQ	154,093

3.5 MHz

*W8AEF/7	89,250
*K7DD	7,296

MULTI-OPERATOR SINGLE-TRANSMITTER

NY4A	6,290,480
NY6N	5,414,913
KX7M/6	3,862,010
NI6T	2,573,550
WQ6X	2,139,930

MULTI-OPERATOR TWO-TRANSMITTER

KD4D/3	10,959,228
NR3X/4	8,907,225
N4WW	8,424,271
KC7V	6,048,767
ND2T/6	5,264,900

MULTI-OPERATOR MULTI-TRANSMITTER

NR4M	15,071,104
NQ4I	13,415,522
NR6O	6,747,776
NX5M	6,085,145

*Low Power

category for all bands was Joseph, UU2CW, with 1165 QSOs and 543 prefixes. Close behind was Ludek, OK2ZC, operating as OK3C. Ludek had 17 more contacts, but 9 fewer multipliers than Joseph. Just 2k points behind Ludek was TM3T operated by Rudolf, F5VBT. Goran, S52P, rounded out the scores over 1-million points. Fifth place in the World was also the top USA score —Julius, N2WN/4. Julius had set a goal of 700 QSOs and 300+ multipliers, which he easily exceeded.

In the Single Band QRP categories, it was Pedro, LU7HZ, and Francesco, I0UZF, within a few points on 10 meters. 15 meters was easily won by the nice prefix HG15IPA operated by Gabor, HA3JB. Gyula, HA6NW, led everyone on 20 meters, with Victor, UA6LCJ, and Vitas, LY5G, in the chase. The biggest Single Band QRP scores were on 40 meters. There was a close competition between winner Vladimir, YU1WC, and second place Andrea, 9A3JH. Each had an amazing 460 prefix multipliers! The winner on 80 meters was HG6C operated by Gulyas, HA6IAM. Branko, S53AR, managed 152 contacts running QRP on 160 meters!

Single-Operator Assisted

The Assisted category is for single operators who used any help other than their own two ears to find and work stations. There were 917 entries in the Assisted category this time. Valery, R5GA, operated from the island of

Julius, HA6NY (front), and Anti, HA3OV (back), operating HG6N multi-two from a former shortwave broadcast station "Pusztamonostor."

HG6N antennas included independent HRRS 4/4/1 arrays (vertically and horizontally steerable 32-ele arrays with 1/2-wavelength separation with the lowest element at 1 wavelength). This was one of the last operations for these antennas. →

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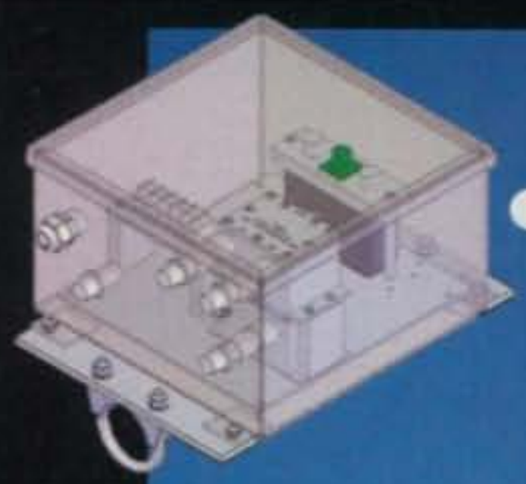

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ANTENNAS POSITIONERS ACCESSORIES

2011 CQ WW WPX CW EUROPE TOP SCORES

SINGLE OPERATOR HIGH POWER
ALL BANDS
CR2X (OH2PM) 10,498,800
TM6M (F6DBF) 10,126,012
IR4X (IZ3EYZ) 8,238,300
4O3A 8,158,976
9A6XX 7,209,675

28 MHz
E77A 776,424
RU7A 660,240
EMØX (UT2XQ) 399,588

21 MHz
CS2C (OK1RF) 3,798,404
YU1KX 1,835,044
ED3T (EA3AKY) 1,819,692

14 MHz
E73W (E73O) 3,574,032
S57AL 3,362,515
YTØZ (YU1ZZ) 2,894,830

7 MHz
YU1LA 4,262,934
LY5W 2,877,192
UA2F (UA2FB) 2,749,968

3.5 MHz
9A4ØY (9A3NM) 1,098,720
RW3WA 501,456
S57C 414,687

1.8 MHz
9A2AJ 205,403
IR4E (IK4ZHH) 202,160
SP9ATE 161,952

SINGLE OPERATOR LOW POWER
ALL BANDS
*IR1Y (IK1HJS) 3,938,781
*YT6W 3,706,561
*UU4JMG 3,648,316
*YU8A 3,565,464
*LY9A 3,447,815

28 MHz
*EA5AER 318,336
*9A3VM 272,691
*YR3ØDP (YO8AXP) 217,217

21 MHz
*YU1AU 1,361,241
*UX4FC 482,532
*UA3ABJ 385,810

14 MHz
*UA1ZZ 782,304

*RZ4AG 753,642
*RA1OT 679,185

7 MHz
*SP4JCQ 1,515,360
*OM3ZWA 1,430,583
*EA3GXJ 1,383,892

3.5 MHz
*S57DX 583,490
*LY2GW 527,095
*HA4FV 383,910

1.8 MHz
*YT4A (YT1AA) 119,848
*OL1A (OK1CW) 65,934
*UX5NQ 60,528

SINGLE OPERATOR ASSISTED HIGH POWER
ALL BANDS
EF5Y (EA5GTQ) 6,421,738
ER4A (UT5UDX) 6,156,798
YQ9W (YO9WF) 5,763,342
S59ABC (S51DS) 5,738,684
UA5A (UA5C) 5,705,232

28 MHz
EO4M (UR5MW) 665,640
ED5W (EA5DWS) 524,984
YT2T 461,580

21 MHz
IP7U (IK7JWY) 2,039,916
S56M 1,589,805
9A5D (9A3Y) 1,357,401

14 MHz
YT9A 3,846,269
EO3Q (UR3QCW) 3,153,904
S53F 2,968,038

7 MHz
S52AW 3,684,478
9A5MT 3,272,107
UA3MIF 2,691,200

3.5 MHz
HA3LI 780,066
OH6MW 717,220
E71A 664,759

1.8 MHz
IKØHBN 128,334
YR5N (YO5PBF) 122,169
DF2UU 120,772

SINGLE OPERATOR ASSISTED LOW POWER
ALL BANDS
*IO4T (IK4VET) 4,623,804
*ES6Q (ES5RY) 2,824,877
*YQ8Q (YO8TTT) 2,823,951
*OM5X (OM5XX) 2,811,600
*I2WIJ 2,465,830

28 MHz
*SVØXBZ/9 (YL2VW) 401,305
*HGØR (HAØNAR) 220,011
*DH8BQA 182,970

21 MHz
*YT8T 766,800
*IT9ORA 349,200
*DJ2MX 241,060

14 MHz
*YU1R (YT1NP) 2,078,271
*RM2M 1,738,842
*UT3IZ 1,451,619

7 MHz
*YT8A (YU1EA) 2,687,130
*UX4U (US7UX) 2,220,330
*M5E (GØCKV) 1,765,056

3.5 MHz
*UR3LPM 414,422
*UT3L 381,036
*LY1G 329,832

1.8 MHz
*YO2AQB 33,120

SINGLE OPERATOR QRP
ALL BANDS
UU2CW 1,135,956
OK3C (OK2ZC) 1,091,496
TM3T (F5VBT) 1,089,680
S52P 1,055,215
RT4W 901,530

28 MHz
IØUZF 90,885
LY2LF 22,078
LZ1MG 21,125

21 MHz
HG15IPA (HA3JB) 280,080
IV3AOL 39,182
RZ6HX 28,380

14 MHz
HA6NW 480,684
UA6LCJ 304,296
LY5G 282,348

7 MHz
YU1WC 749,480
9A3JH 711,784
SP9NSV/7 344,760

3.5 MHz
HG6C (HA6IAM) 236,292
SP4GL 192,046
OK1FKD 119,412

1.8 MHz
S53AR 35,624
LY4BF 26,378

ROOKIE
ALL BANDS
*OH8R (OH8FKU) 1,604,665
*UD3D (UB3DAY) 1,535,180
*SV2HWR 1,368,836
*UW1WU 1,116,960
*DO3QQ 325,268

28 MHz
*ER2RM 66,732

21 MHz
*US2IVR 2,520

14 MHz
*UR5EFL 94,132
*SP7JLH 48,100

7 MHz
*YO2MJZ 5,412

TRIBANDER/SINGLE-ELEMENT
HIGH POWER
ALL BANDS
T7ØA (9A3A) 6,227,775
DM1A (DL1IAO) 4,973,469
S5ØC (S53CC) 4,585,332
MD2C (MDØCCE) 4,471,544
9A1AA 4,348,464

28 MHz
UR2VA 103,416
SV2BOH 85,033
9A4W 83,763

21 MHz
ES4RD 175,134
OH7FKV 87,324
UR5MBA 69,350

14 MHz
IKØYVV 2,965,114
EA1DX/5 (EA5FID) 1,034,968
ON1CB 981,734

7 MHz
IZ5DIY 467,250
G1N (G3MZV) 452,140
HB9CIC 299,325

3.5 MHz
HA3LI 780,066
E71A 664,759
G3XTT 488,300

1.8 MHz
SP9ATE 161,952

TRIBANDER/SINGLE-ELEMENT
LOW POWER
ALL BANDS
*OM5X (OM5XX) 2,811,600

*OK2ZI 2,658,306
*I2WIJ 2,465,830
*9A6B (9A2EU) 2,410,107
*EW1IP 2,020,337

28 MHz
*DH8BQA 182,970
*UT8EU 133,874
*S54A 109,568

21 MHz
*YU1AU 1,361,241
*UA3ABJ 385,810
*IT9ORA 349,200

14 MHz
*UA1AFT 794,561
*DL9ZP 649,490
*YO5AVN 473,620

7 MHz
*M5E (GØCKV) 1,765,056
*YT2B 932,790
*DL5KUD 727,463

3.5 MHz
*RA7Y 133,021
*RO1B 90,909
*ER1OO 61,759

1.8 MHz
*YT4A (YT1AA) 119,848

MULTI-OPERATOR
SINGLE-TRANSMITTER
E7DX 10,297,133
RU1A 10,064,537
HG6N 10,041,866
OM7M 9,327,856
E73M 8,270,608

MULTI-OPERATOR
TWO-TRANSMITTER
II9T 15,283,920
9A1A 15,004,032
OL4A 13,901,640
DO4W 12,688,858
OL3Z 11,236,525

MULTI-OPERATOR
MULTI-TRANSMITTER
LZ9W 21,403,200
DR1A 20,591,118
DAØHST 12,798,864
SK3W 12,658,800
OH4A 11,842,362

*Low Power

Martinique as TO8A to outrun everyone and set a new record for North America in the All Band High Power category. Last year's winner RG9A (op Yuri, UA9AM) had to settle for second. The competition in Europe was between Yuri, EA5GTQ, operating as EF5Y, and Sergei, UT5UDX, operating from ER4A. The race for top USA score was "electric" between WU3A/1 (Gene, W3UA) and Steve, NY3A. Gene was happy that the local power company had fixed most of his noise problems. Steve had the thrill of experiencing a nearby lightning strike during storms on Friday evening.

The Assisted Single Band High Power categories were also hotly contested. On 10 meters, two stations finished just 0.3% apart! Faisal, 9K2RR, drove 9K2RA past Pavel, OK1MU, operating from TA2ZAF. Faisal's score is a new record for Asia and just short of the World record set back in 2001. On 15 meters, Soni, PY1NX, more than doubled the score of second place finisher IP7U (op Arturo, IK7JWY). There was a quite a bit of competition on 20 meters, with Boban, YT9A, leading the pack. Ruslan, UR3QCW, used the call EO3Q, to finish ahead of Vinko, S53F. Forty meters was won by Jaime, HK1N, who was narrowly ahead of Drago, S52AW. Felipe, PY1NB, also posted a very good score to finish third. Alajos, HA3LI, took the prize on 80 meters ahead of Ari, OH6MW. It was a pack of three stations on top band, with Sante, IKØHBN, just getting by YR5N and DF2UU.

The Assisted Low Power category is becoming increasingly popular among competitors and casual DXers alike. In the All Band category, Sergey, RN3QO, operated 5B/US7IDX to the win. This was a callsign that was copied incorrectly many times. Darrell, AB2E, went back down to V26E for the contest again this year and finished a very close second. Darrell's big band was 40 meters. The top USA Assisted All Band score was by Gary, NØSXX, from deep in the propagation black hole of South Dakota.

Overlay Categories

The WPX Contest has two overlay categories that are scored as separate contests within the contest. Single Op and Assisted entries are combined into High and Low Power classes. The Tribander/Single-Element category is for stations that use a triband antenna for 10-20 meters and single-element antennas on the low bands. The winner of the TBSE High Power All Bands category was Michel, FM5CD. Second place was ED8A operated by Luis, EA8AY. Ivo, 9A3A, made a lot of people happy with his operation from T7ØA to finish third. 3V8SS was the winner for Low Power All Bands, followed by Yuri, RT9S.

The second overlay category is for operators who have been licensed less than three years. We had 36 Rookie entrants this year. The champion for the second year in a row was Mikko, OH8FKU, operating as OH8R. First licensed in 2008, this is Mikko's last year in the Rookie competition. Second place was Sergey, UB3DAY, who gave everyone a nice multiplier with the callsign UD3D. Sergey is 14 years old, has been

The Sun Disrupts WPX CW

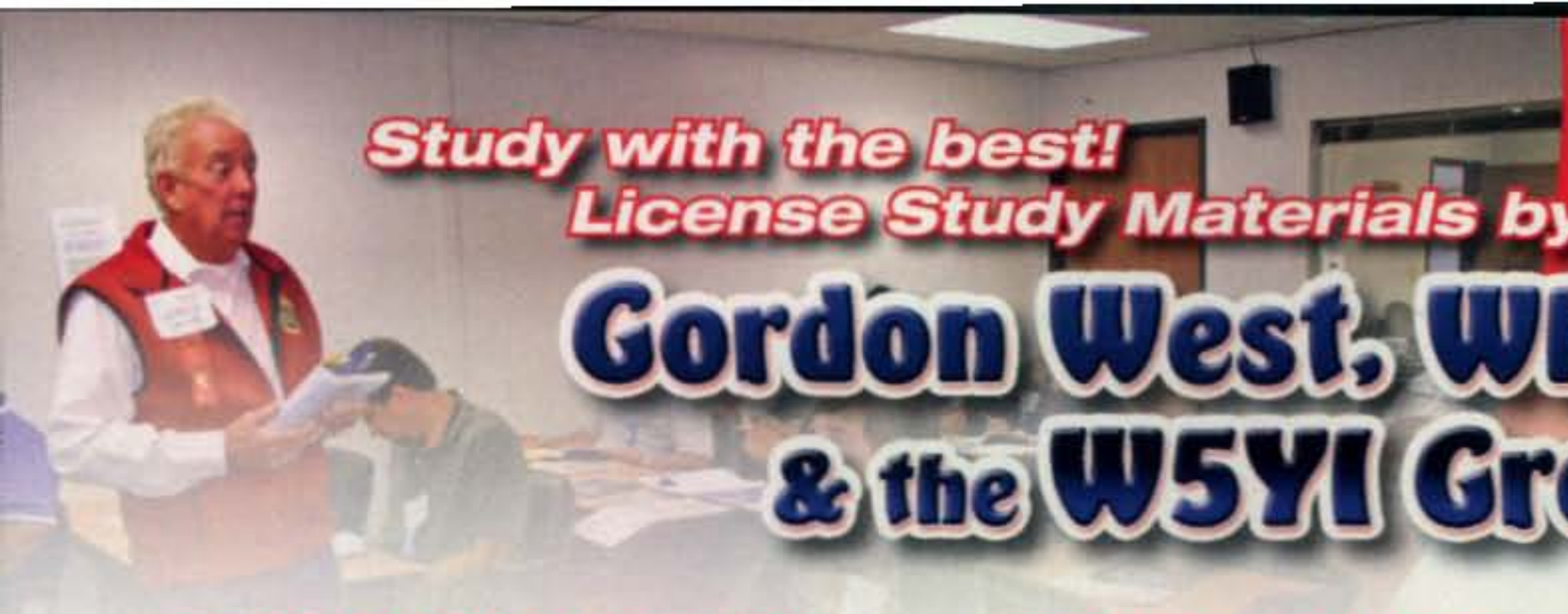
By Carl Luetzelschwab K9LA

Old Sol played a nasty trick on the 2011 running of the CQ World-Wide WPX CW contest on May 28 and 29. For the days up to the contest, the *K* index was at or below 2. And with the 10.7 cm solar flux in a steady rise, propagation was expected to be very good.

But then a CME (coronal mass ejection) from an earlier solar eruption interacted with the Earth's magnetic field. This drove up the *K* index on both days. On the Monday after the contest the geomagnetic field was already returning to normal.

Thankfully this wasn't a major geomagnetic storm, but it did impact the ionosphere enough to drive the MUF (maximum usable frequency) down at least one band (most noticeably from 15m to 20m) during the contest period. For example, the Millstone Hill (Massachusetts) ionosonde showed a 3000 km maximum MUF of about 23 MHz early in the first day of the contest (the 28th), but then it took a significant nose dive for the remainder of the day. The *F2* region began its recovery at the end of the contest.

Hopefully this year's event will fare better!



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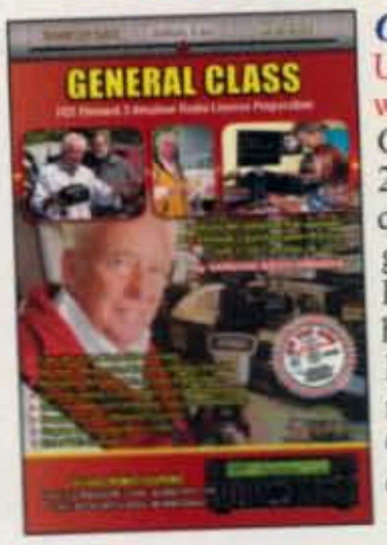

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CQ

licensed for less than one year, and yet made over 1.5-million points!

Multi-Operator

The top Multi-Operator Single-Transmitter score was also one of the few World records set this year. CQ3A from the island of Madeira was driven by the operating team of OE1DIA, OM3GI, OM3RM, and OM7JG to over 5200 contacts in 48 hours! Repeating their second place finish from a year ago was the 7-operator team at C4N in Cyprus. The competition for top score in Europe was fierce, with three scores just over 10-million points. The winner was E7DX, followed closely by RU1A and HG6N. RU1A had 400 more contacts than the others, but could not match the multiplier or DX QSOs of the stations farther south. In the USA, it was NY4A repeating as the champions over a valiant effort from NY6N out on the West Coast.

The Multi-Operator Two-Transmitter competition was a worldwide affair with the top four scores coming from four different continents! It was the German team operating CR3L that earned the victory. They were interviewed during the contest by the local TV station! Second place went to the short call J7A, a field day style DXpedition to the island of Dominica. A band-

2011 CQ WW WPX SSB & CW COMBINED CLUB SCORES

UNITED STATES

Club	Entries	Score
POTOMAC VALLEY RADIO CLUB	102	213,570,606
NORTHERN CALIFORNIA CONTEST CLUB	113	154,720,033
YANKEE CLIPPER CONTEST CLUB	70	142,548,771
FRANKFORD RADIO CLUB	50	72,055,206
SOUTH EAST CONTEST CLUB	36	70,594,037
CENTRAL TEXAS DX AND CONTEST CLUB	27	68,614,803
FLORIDA CONTEST GROUP	48	59,385,250
SOUTHERN CALIFORNIA CONTEST CLUB	43	51,560,700
SOCIETY OF MIDWEST CONTESTERS	56	44,004,618
WESTERN WASHINGTON DX CLUB	34	38,851,484
TENNESSEE CONTEST GROUP	45	35,548,739
ARIZONA OUTLAWS CONTEST CLUB	69	34,401,827
MAD RIVER RADIO CLUB	23	27,537,807
CTRI CONTEST GROUP	13	26,040,785
NORTH TEXAS CONTEST CLUB	12	23,404,666
GRAND MESA CONTESTERS OF COLORADO	25	21,876,346
NORTH COAST CONTESTERS	11	21,488,007
OKLAHOMA DX ASSOCIATION	3	20,085,493
HUDSON VALLEY CONTESTERS AND DXERS	29	18,343,859
WILLAMETTE VALLEY DX CLUB	31	17,390,719
ALABAMA CONTEST GROUP	24	13,748,411
MINNESOTA WIRELESS ASSN	44	13,451,649
IOWA DX AND CONTEST CLUB	4	9,139,530
ORDER OF BOILED OWLS OF NEW YORK	11	6,278,800
ROCHESTER (NY) DX ASSN	9	5,938,078
LOUISIANA CONTEST CLUB	8	5,460,847
KANSAS CITY CONTEST CLUB	4	4,212,711
NORTHERN ROCKIES DX ASSOCIATION	5	4,030,120
SOUTHWEST OHIO DX ASSOCIATION	5	3,332,774
BERGEN ARA	11	2,583,828
SPOKANE DX ASSOCIATION	13	2,520,748
NORTHERN ARIZONA DX ASSN	5	2,284,975
DELARA CONTEST TEAM	8	2,112,710
MISSISSIPPI VALLEY DX/CONTEST CLUB	8	1,287,291
ALLEGHENY VALLEY RADIO ASSOCIATION	3	1,282,747
NORTH CAROLINA DX AND CONTEST CLUB	4	1,246,780
NASHOBA VALLEY AMATEUR RADIO CLUB	6	1,241,900
EASTERN IOWA DX ASSOCIATION	4	1,218,658
NORTHEAST WISCONSIN DX ASSN	3	1,186,685
BRISTOL (TN/VA) ARC	10	1,062,735
CAROLINA DX ASSOCIATION	9	1,058,033
MERIDEN ARC	5	1,027,700
HILLTOP TRANSMITTING ASSOCIATION	4	956,169
DELAWARE LEHIGH AMATEUR RADIO CLUB	3	936,392
TEXAS DX SOCIETY	3	899,679
MISSOURI DX/CONTEST CLUB	5	865,044
STERLING PARK AMATEUR RADIO CLUB	7	843,208
UTAH DX ASSOCIATION	7	807,723
WEST PARK RADIOPS	10	573,612
METRO DX CLUB	7	498,933
SKYVIEW RADIO SOCIETY	7	470,036
WESTERN NEW YORK DX ASSOCIATION	7	456,489
PORTAGE COUNTY AMATEUR RADIO SERVICE	7	410,983
CENTRAL OREGON DX CLUB	3	400,619
CENTRAL ARIZONA DX ASSOCIATION	3	374,754
KANSAS CITY DX CLUB	6	338,665
GREAT SOUTH BAY AMATEUR RADIO CLUB	3	301,526
LOW COUNTRY CONTEST CLUB	5	274,377
SOUTH JERSEY DX ASSOCIATION	4	214,795
RARITAN BAY RADIO AMATEURS	3	181,386
CHESAPEAKE AMATEUR RADIO SERVICE INC	3	2,836

DX

BAVARIAN CONTEST CLUB	180	300,426,671
LU CONTEST GROUP	60	210,296,769
RHEIN RUHR DX ASSOCIATION	137	194,937,849
ARAUCARIA DX GROUP	45	177,720,383
CROATIAN CONTEST CLUB	51	138,412,799
SLOVENIA CONTEST CLUB	39	131,953,952
URAL CONTEST GROUP	35	131,694,253
UKRAINIAN CONTEST CLUB	107	120,550,475
RUSSIAN CONTEST CLUB	81	118,893,196
CONTEST CLUB ONTARIO	66	107,535,564
CONTEST CLUB FINLAND	40	77,000,666
KAUNAS UNIVERSITY OF TECHNOLOGY RADIO CLUB	50	63,562,094
HUNGARIAN DX CLUB	14	61,953,621
BLACK SEA CONTEST CLUB	82	61,163,110
VK CONTEST CLUB	18	56,476,948
LES NOUVELLES DX	16	56,169,454
FORTALEZA DX GROUP	5	56,070,283
DXARC DX COLOMBIA AMATEUR RADIO CLUB	11	53,974,850
LATVIAN CONTEST CLUB	31	50,800,697
WEST SERBIA CONTEST CLUB	8	46,743,214
BOSNIA AND HERZEGOVINA CONTEST CLUB	11	41,819,044
SOUTH URAL CONTEST CLUB	16	38,519,086
ORCA DX AND CONTEST CLUB	16	37,672,078
LITHUANIAN CONTEST GROUP	10	31,473,995
YU CONTEST CLUB	24	30,786,019
RIO DX GROUP	22	27,889,758
BELARUS CONTEST CLUB	19	27,541,950
SKY CONTEST CLUB	8	27,350,960
TARTU CONTEST TEAM	5	26,954,186
BELOKRANJEC CONTEST CLUB	8	26,783,950
WORLD WIDE YOUNG CONTESTERS	19	26,130,047
CONTEST GROUP DU QUEBEC	15	21,556,637
CHILTERN DX CLUB	10	21,202,926
CANTAREIRA DX GROUP	13	19,585,765
IRKUTSK RADIO CLUB	5	19,404,755
LA CONTEST CLUB	6	19,009,809
BRITISH COLUMBIA DX CLUB	6	18,565,994
SP DX CLUB	68	16,592,759
RADIO CLUB HENARES	11	14,779,871
CE CONTEST GROUP	13	14,682,295
FOX CONTEST CLUB	5	14,121,488
MARITIME CONTEST CLUB	15	11,531,662
VYTAUTAS MAGNUS UNIVERSITY RADIO CLUB	13	9,925,171
CS PETROLUL PLOIESTI	9	9,228,157
ARA AMIGOS RADIO ALTOARAGON	3	8,990,920
BESSARABIAN CONTEST CLUB	16	8,736,404
RADIOCLUBUL RADU BRATU	4	8,712,611
CENTRAL SIBERIA DX CLUB	8	8,302,541
CE DX GROUP	3	7,590,495
YO DX CLUB	24	7,132,823
ALRS ST PETERSBURG	13	6,743,435
TEMIRTAU CONTEST CLUB	9	5,977,420
ARCK	20	5,948,823
ATCC	7	5,757,925
NICOSIA CONTEST GROUP	3	5,509,282
SHAKHAN CONTEST CLUB	8	4,894,534
RADIO CLUB VENEZOLANO	7	4,875,029
CSTA BUCURESTI	4	4,817,853
LOMA DEL TORO CONTEST CLUB	3	4,712,050
ARIMI DX TEAM	3	4,702,762
YAROSLAVL CONTEST CLUB	7	4,345,536
UA2 CONTEST CLUB	7	4,246,386
SP CONTEST CLUB	7	4,111,812
GUARA DX GROUP	11	4,098,000
Z37M CONTEST TEAM	5	4,009,615
STAVROPOL REGION CONTEST CLUB	6	3,906,825
RU-QRP CLUB	11	3,607,480
VERENIGING VAN RADIO ZEND AMATEURS	5	3,563,034
TRANSILVANIA CONNECTION	5	3,359,388
SK7OA SWEDISH SOUTHCOAST RADIOAMATEUR SOCIETY	3	3,211,272
YAMAL RADIO CLUB	5	2,752,801
DANISH DX GROUP	9	2,742,374
ARGO	6	2,726,506
SARATOVSKAYA OBLAST RADIO CLUB	10	2,701,498
NOVOKUZNETSK RADIO CLUB	14	2,655,170
RUSSIAN CW CLUB	13	2,613,902
SERPUKHOV RADIO CLUB	5	2,364,111
DONBASS	9	2,363,033
CZECH CONTEST CLUB	4	2,286,722
SK6AW HISSINGENS RADIOKLUBB	4	2,262,661
GIPANIS CONTEST GROUP	7	2,224,320
OREL RADIO CLUB	3	2,204,052
LOW LAND CRAZY CONTESTERS	3	2,175,240
FALKOPINGS RADIOCLUB	6	2,170,268
ORENBURG CONTEST CLUB	4	1,978,270
GRUPO DXXE	6	1,922,224
SAMARA RADIO CLUB	6	1,900,622
CDR GROUP - HORNET DX TEAM	5	1,844,317
VRHNIKA CONTESTERS	10	1,790,863
TOP OF EUROPE CONTESTERS	6	1,689,317
VLADIMIR RADIO CLUB	12	1,596,354
ANTWERP CONTEST CLUB	3	1,580,570
RTTY CONTESTERS OF JAPAN	3	1,495,923
ARKTIKA	5	1,442,386
SAO PAULO CONTEST GROUP	3	1,409,728
MOSCOW RADIO CLUB	9	1,379,978
OBNINSK QRU CLUB	8	1,321,512
DNEPR CONTEST GROUP	5	1,293,027
SASKATCHEWAN CONTEST CLUB	4	1,242,354
CSM BAIA MARE	8	1,172,358
GMDX GROUP	3	1,165,322
SIAM DX GROUP	4	1,087,243
EAST COAST CONTESTERS	3	1,082,226
BASHKORTOSTAN DX CLUB	8	945,995
OMSK RADIO CLUB	4	942,505
KEMEROVO RADIO CLUB	6	875,904
HAROS RADIO CLUB	4	864,061
IVANOVO DX CLUB	4	849,020
SPORT CLUB MIERCUREA-CIUC	6	809,360
599 CONTEST CLUB	4	794,277
PODOLSK	7	712,819
SK6LK BORAS RADIOAMATORER	3	672,931
VERON HOOGEVEEN A-26	3	669,696
UPPSALA RADIOKLUBB	3	595,878
BEEMSTER CONTEST CLUB	4	569,599
TURKISH SPECIAL WIRELESS ACTIVITY TEAM	4	561,580
SK0QO SODERTORNS RADIOAMATORER	3	524,704
VOLYN CONTEST GROUP	6	516,857
GERMAN DX FOUNDATION	4	492,340
NOVOSIBIRSK CONTEST CLUB	6	487,526
KIEV RADIO CLUB	3	469,853
ACTIVITY SMOLENSK GROUP	3	454,917
MAYCOPSKIJ RADIO CLUB	5	448,248
KALININGRAD RADIO CLUB	3	444,158
CLUB DE RADIO EXPERIMENTADORES DE OCCIDENTE	4	437,301
ARI LA SPEZIA	3	404,969
VERON TWENTE	3	313,680
CWJF GROUP	5	307,524
MICHURINSK CONTEST GROUP	3	298,167
R4F-DX-G	5	277,361
CS AEROSTAR BACAU	3	268,114
UR-QRP-CLUB	4	252,475
CS SILVER FOX DEVA	5	247,455
LKK LVIV SHORTWAVE CLUB	6	234,457
VU CONTEST GROUP	5	231,843
STRUMBLE HEAD DX AND CONTEST GROUP	3	226,655
EDIT14	4	214,962
ARJ ARAD	4	189,462
WYTHALL RADIO CLUB	3	131,801
VORONEZH RADIO CLUB	4	61,219
RADIOCLUBUL QSO BANAT TIMISOARA	3	15,686

change error during a very high rate period cost PW7T valuable points and moved them down into third. Fourth place and the top Europe score came down to II9T in Sicily over 9A1A in Croatia. An extra 500 QSOs for II9T on 10 and 15 meters was too much for the 9A1A team to overcome. The USA winner was KD4D/3 operating from the station of N3HBX. These guys always do a great job in the WPX on both modes.

The Multi-Multi category features operating teams attempting to extract every point available from the bands. This year it was the team at LZ9W that won the world over their friendly rival DR1A. The members of the Radio Club Rosario in Argentina did a great job reactivating LU4FM and achieving third place. NR4M dodged thunderstorms and NQ4I worked with only six operators in their battle for top USA score. This year it was NR4M getting the bragging rights.

Club Competition

The overall winner of the club competition was the Bavarian Contest Club from Germany.

CQ WW WPX CW CONTEST ALL-TIME RECORDS

The contest is held each year on the last full weekend of May. The All-Time Records are updated and published annually. Data shown below is: callsign, year of operation, total score, and number of prefix multipliers.

WORLD RECORD HOLDERS

Single Operator

1.8	IH9/OL5Y('98)	341,068	182
3.5	TM5Y ('08)	1,983,366	567
7.0	3V8CB('10)	10,758,020	805
14	UP2L('09)	7,928,886	1043
21	ZX5J('05)	7,061,000	920
28	ZX5J ('02	6,787,440	857
AB	EF8M('10)	18,395,154	1026
Assisted	CN3A('09)	12,900,240	943

Multi-Operator Single Transmitter

CQ3A('11)		26,093,210	1285

Multi-Operator Two Transmitters

EF8M('07)		33,324,192	1256

Multi-Operator Multi-Transmitter

HC8N('99)		54,697,072	1264

U.S.A. RECORD HOLDERS

Single Operator

1.8	K1ZM('95)	40,446	107
3.5	W3BGN('08)	641,092	332
7.0	KG1D('05)	3,594,822	651
14	N2NC('06)	5,418,630	915
21	NU5A('99)	4,411,299	789
28	WW4M('01)	2,547,046	674
AB	KC3R('09)	9,597,400	806
Assisted	K3WW('04)	5,997,446	806

Multi-Operator Single Transmitter

K1LZ('09)		10,691,724	964

Multi-Operator Two Transmitters

KM4M('04)		16,283,745	1095

Multi-Operator Multi-Transmitter

WE3C('09)		21,910,252	1274

CLUB RECORD

Bavarian Contest Club('11)	300,426,671

WPX (Prefix) RECORD

LZ9W('11)	1365

QRP/p RECORD

P4ØW('97)	4,018,208

CONTINENTAL RECORD HOLDERS

AFRICA

1.8	IH9/OL5Y('98)	341,068	182
3.5	7XØRY ('08)	1,701,260	407
7.0	3V8CB('10)	10,758,020	805
14	6W1SJ('09)	6,755,364	924
21	5X1Z('01)	6,362,352	782
28	ZS4TX('01)	4,602,028	722
AB	EF8M('10)	18,395,154	1026

ASIA

1.8	4X4NJ('96)	259,420	170
3.5	TAØ/Z33F('02)	1,452,552	348
7.0	ZC4LI('10)	4,770,336	632
14	UP2L('09)	7,928,886	1043
21	A45XR('99)	6,557,697	843
28	HZ1AB('02)	3,669,994	659
AB	4LØA('09)	12,560,363	967

EUROPE

1.8	SN7Q('08)	339,542	307
3.5	TM5Y('08)	1,983,366	567
7.0	CT1JLZ('09)	6,075,936	816
14	4O3T('06)	5,313,554	986
21	9HØA('02)	5,389,008	933
28	9HØA('01)	3,965,315	841
AB	CR2X('11)	10,498,800	1040

NORTH AMERICA

1.8	VA1A('99)	103,680	120
3.5	FM5BH('97)	833,490	315
7.0	V26BA('97)	6,227,550	659
14	N2NC('06)	5,418,630	915
21	ZF1A('99)	5,330,129	799
28	FM5GU('01)	2,849,769	621
AB	VY2TT('09)	12,878,826	1054

OCEANIA

1.8	KH6ND('07)	22,100	50
3.5	KH6ND('09)	596,673	231
7.0	ZM3A('09)	6,437,695	737
14	KH6ND('03)	4,126,690	730
21	KH6ND('99)	6,107,256	813
28	KH6ND('00)	1,523,008	424
AB	KH7XS('09)	9,124,899	879

SOUTH AMERICA

1.8	HK1MW('11)	18,300	50
3.5	YX3A('89)	1,004,060	305
7.0	LU1IV('97)	7,671,456	702
14	HK1X('11)	7,254,266	1006
21	ZX5J('05)	7,061,000	920
28	ZX5J('02)	6,787,440	857
AB	PJ4A('11)	16,272,730	1018

MULTI-OPERATOR SINGLE TRANSMITTER

AF	CQ3A('11)	26,093,210	1285
AS	P33W('08)	21,314,175	1145
EU	RU1A('09)	13,838,256	1236
NA	8P4A('02)	18,516,960	1056
OC	AH2R('01)	11,541,420	957
SA	P49V('01)	19,760,744	1034

MULTI-OPERATOR TWO TRANSMITTER

AF	EF8M('07)	33,324,192	1256
AS	C4I ('09)	14,632,800	1005
EU	ES9C('08)	18,557,028	1266
NA	6Y1V('08)	20,507,972	1108
OC	ZL6QH('05)	13,312,768	952
SA	HC8N ('03)	30,928,268	1187

MULTI-OPERATOR MULTI-TRANSMITTER

AF	CQ3L('10)	28,736,154	1173
AS	A61AJ('02)	42,766,232	1244
EU	DR1A('08)	24,285,248	1313
NA	6Y2A('02)	38,821,328	1274
OC	ZL6QH('04)	16,143,840	1010
SA	HC8N('99)	54,697,072	1264

QRPp

AF	5Y4FO('92)	649,057	311
AS	ZC4BS('02)	2,515,388	521
EU	LY5A('01)	2,331,414	646
NA	TI5X('01)	2,568,470	615
OC	FO8JP('86)	572,131	259
SA	P4ØW('97)	4,018,208	632

Their 180 entries set a new all-time club score record with over 300-million points. The LU Contest Group continues to grow and moved up into second place. The Potomac Valley Radio Club pulled together 102 entries to take the top USA club spot. The Northern California Contest Club conducted some intra-club competitions to motivate their members and finished second. Of the 106 USA clubs that appeared in the logs, 45 did not meet the minimum of 3 entries to be listed in the results. Think about using the WPX as an activity project for your club to get people on the air and having fun.

Final Thoughts

The WPX Contest Committee is not pleased to issue so many yellow and red cards. With the rules available on the website in all major languages, there really is no excuse for participants not to know and understand the rules. If you aren't sure about something, please ask! Fair play and following the rules is in everyone's best interest.

There are many people who work to help make the WPX contest such a success. Thanks to DO4HAM, JH5GHM, K1PX, KN3A, VA3UG, and W2JU for their help in typing all of the paper logs. Ken, K1EA, keeps implementing improvements in the log checking software. F6BEE maintains the club name database. Jim, WI9WI, provided many hours of invaluable log-checking assistance. Thanks to Barry, W5GN, for handling the printing and mailing of over 1500 certificates.

Doug, K1DG, does a great job managing the award plaques. There were 65 plaques on offer for the WPX CW contest. The Assisted categories continue to grow in participation and popularity, but we only have four plaques available for these categories. Please contact Doug (k1dg@cqwpx.com) if you are interested in sponsoring a plaque.

Not everyone enjoys dancing with the e-mail robot to submit their contest log. Tzetzo, LZ2FQ, helped create a new web page that provides a friendlier alternative for uploading and checking your log. Try it at <http://www.cqwpx.com/logcheck/>. There is also a web page to convert your ADIF format log into the proper file for submitting as a contest log. Expanded results of the contest are at <www.cq-amateur-radio.com>. Rules for the 2012 contest are also there, and in the Feb. issue.

The 2012 WPX CW Contest will be held on May 26 and 27. There are some small rule changes for the 2012 contest so please read the rules very carefully and also visit the frequently asked questions page on the CQ WPX Contest website (www.cqwpx.com). The log deadline is June 20, 2012. Submit your log through the upload page on the website or by e-mail to <cw@cqwpx.com>.Let's hope for better conditions in 2012!

73, Randy, K5ZD

(Continued on page 104)

Logging Accuracy

We received a record 3,869 logs for WPX CW 2011 containing 2,243,673 total QSOs. The log checking software very patiently cross-checked each callsign and exchange in every log against the other received logs. An amazing 84.2% of all QSOs were able to be cross-checked with 95.6% of those being confirmed as good calls and exchanges. That's an amazing level of accuracy by everyone!

There were 17,177 QSOs with unique callsigns. A unique call is one that appears in only one log. History has shown that many of these callsigns are the result of copying errors. Between the computer checking and some manual investigation by the log checking team, we were able to confirm 73.9% of these were indeed errors. This extra level of checking definitely rewarded those stations that copy and log information accurately.

Even with this high level of checking, 1080 entries, or about 30%, experienced score reductions of 5% or less. The median score reduction is 8.4%. Everyone who submitted a log should have received an e-mail with their log-checking report. If not, please send a request to <director@cqwpx.com>.

There were 162 stations that produced logs with no score reductions. The top "golden" logs (with number of QSOs) were: KØRC (473), RA3FD (357), RO9O (303), JE2UFF (231), and HA5LZ (229).

It was a little more difficult on the transmitting side. Stations that caused no errors in other logs were: K8VUS (76), N3JNX (74), LA5HPA (53), DL7UXG (46), and DJ1CW (35).

Dima, UA3AGW (center), attended the Dayton Hamvention® and then went on to operate WPX CW from Alaska using the call KL3/AB8CK. He is joined here by Frank, WL7O (left), and Randy, KL7Z.

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Suggested Retail

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There are no tubes, no tube heat, no tuning, no worry rugged -- just turn on, select band and operate. 600 Watts PEP/500W CW -- lets you talk to anyone you can hear!

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Includes ALS-600PS transformer AC power supply for 120/220 VAC, inrush current protected. 32 lbs., 9½Wx6Hx12D inches.

ALS-600 Amp with Switching Power Supply
***New!* ALS-600S, $1599.** ALS-600 amplifier with 10 lb. ALS-600SPS switching power supply combo.

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Works with all ALS-600 amplifiers. Extremely lightweight, just 10 lbs. Superb regulation, very low radiated noise. 9Wx6Hx14½D in.

From QST Magazine, March, 2005

". . . the ampifier faulted only when it was supposed to. It protected itself from our boneheaded, sleep-deprived band changing manuevers . . . "

"I found myself not worrying about damaging this amplifier. It seems quite capable of looking out for itself. . . . Kudos to Ameritron."

"I couldn't hear any noise at all from the SPS (*switching power supply*) on the vertical or quad…"

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"The ALS-600S makes it possible to pack a transceiver and a 600 Watt amplifier, that together weigh less than 30 pounds."

AMERITRON *mobile* 500 Watt *no tune* Solid State Amp

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Ameritron's ALS-500M solid state *mobile* amp gives you 500 Watts PEP SSB or 400 Watts CW output! Just turn on and operate -- no warm-up, no tuning, instant bandswitching. Fits in very small spaces. *New* ALS-500RC, $49 *Remote Head* lets you mount ALS-500M amplifier *anywhere* and gives you full control. Select desired band, turn On/Off and monitor current draw on its DC Current Meter. Has power, transmit and overload LEDs. RJ-45 cables plug into Amplifier/Remote Head.

Covers 1.5-22 MHz, (10/12 Meters with $29.95 kit, requires FCC license).

Virtually indestructible! *Load Fault Protection* eliminates amplifier damage due to operator error, antenna hitting tree branches, 18-wheeler passing by. *Thermal Overload Protection* disables/bypasses amp if temperature is excessively high. Auto resets.

Typically 60-70 watts in gives full output. ON/OFF switch bypasses amplifier for "barefoot" operation. Extremely quiet fan comes on as needed. Excellent harmonic suppression, push-pull output, DC current meter. 13.8 VDC/80 Amps. 3½x9x15 in. 7 lbs.

ALS-500M, $849, 500 Watt mobile amp.
ALS-500MR, $879, ALS-500M/Remote Head
ALS-500RC, $49, Remote head for ALS-500M (for serial # above 13049).
ARF-500K, $179.95, Remote kit for ALS-500M serial # lower than 13049. Includes AL-500RC Remote Head, filter/relay board for ALS-500M, cables, hardware, instructions.

Free online manuals! Ameritron brings you the finest high power accessories!

ARB-704 amp-to-rig interface. . . $59.95

Protects rig from damage by keying line transients and makes hook-up to your rig easy!

RCS-4 Remote Coax Switch. . . $159.95

Use 1 coax for **4** antennas. No control cable needed. SWR <1.25, 1.5 - 60 MHz. Useable to 100 MHz.

RCS-8V Remote Coax Switch. . . $169.95

Replace **5** coax with 1! 1.2 SWR at 250 MHz. Useable to 450 MHz.<.1 dB loss, 1kW@ 150MHz.

RCS-10 Remote Coax Switch. . . $179.95

Replace **8** coax with 1! SWR<1.3 to 60 MHz.**RCS-10L, $219.95** with lightning arrestors.

New! RCS-12C Fully Automatic Remote Coax Switch Controller. . . $239.95

Band data from transceiver auto selects antennas. Antenna memories. No hotswitching. Rig-to-amp interface. For 3/4 BCD, 1 of 8 relay boxes. **RCS-12, $309.95**, auto controller with 8 coax relay box, to 60 MHz. **RCS-12L, $349.95**, with lightning arrestors.

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Safely tune up for full power, best linearity. Prevents overheating, tube damage, power supply stress, component failure.

ADL-1500 Dummy Load with oil . . . $74.95

Oil-cooled. 50 Ohms. 1500 Watts/5 minutes. SWR< 1.2 to 30 MHz. Low SWR to 400 MHz.

ADL-2500 fan-cooled Dry Dummy Load, $219.95

Whisper quiet fan, 2.5kW/1 minute on, ten off. 300W continuous. SWR< 1.25 to 30 MHz.<1.4 to 60 MHz.

SDA-100 Mobile Screwdriver Antenna

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AL-811H, $949. Plugs into 120 VAC outlet. All HF bands. Hi-silicon transformer, heavy duty tank coils, tuned input, operate/standby switch, Xmit LED, ALC, lighted meters, 32 lbs. 13¾Wx8Hx16D in.
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A television sound stage is a pretend world. Production designers create fake homes and offices in which fictitious characters live and work. So it's all the more unusual—and interesting for our hobby—that the ham shack on the set of ABC-TV's "Last Man Standing" is a real, functioning station.

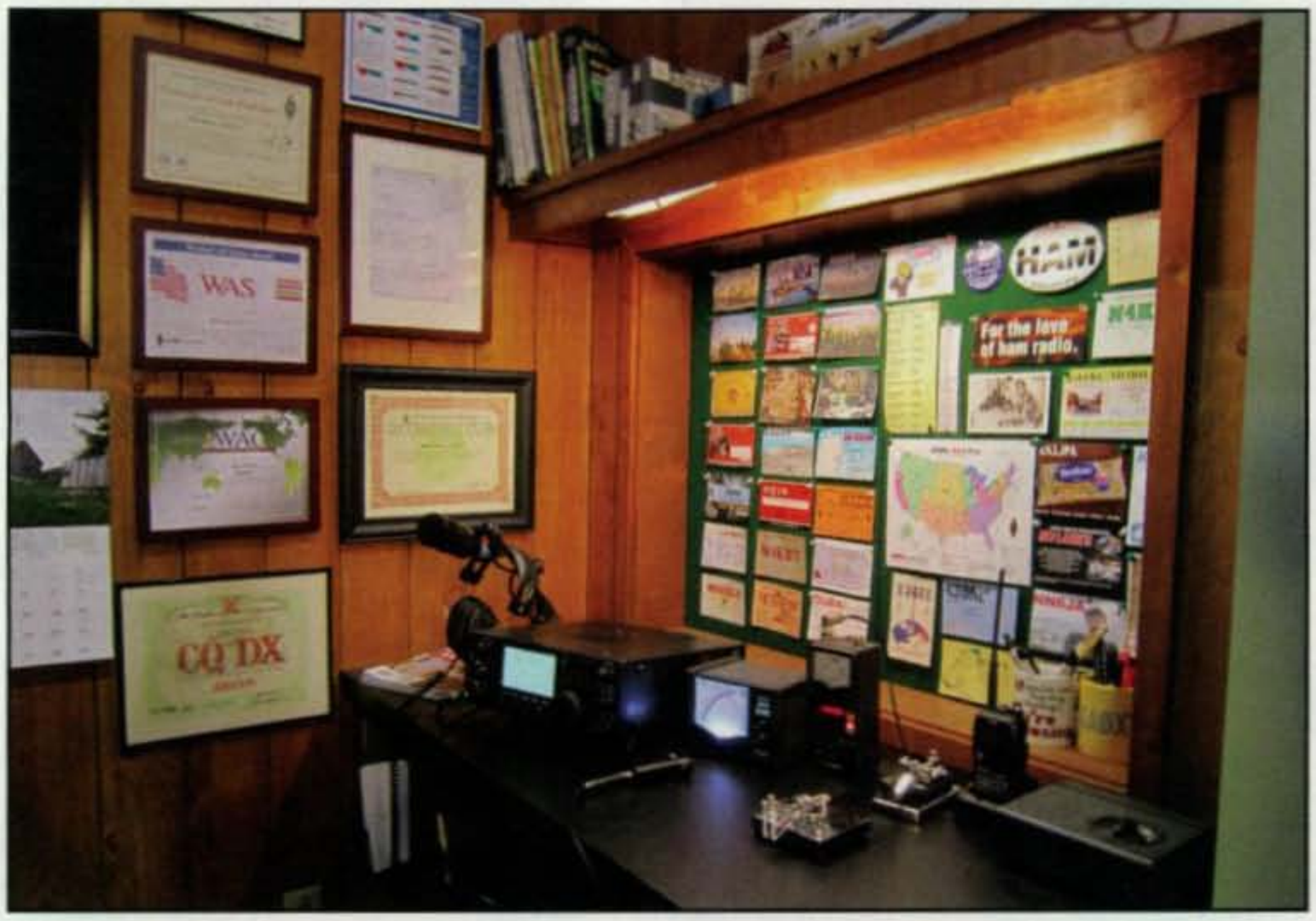

Photo by Billy McLellan, KJ6RVA

Fake Office, Real Ham Station

Building a Working Amateur Station on a TV Sound Stage

BY JOHN AMODEO,* NN6JA

I've been a ham for about 40 years and a TV producer living in Los Angeles for about the last 20. We television producers are a nomadic bunch, moving from show to show as they are launched and eventually cancelled. When I had the chance to produce "Last Man Standing," the new Tim Allen comedy about a "man's man" in a house full of women, I jumped at it.

A "Man's Man" ... and a Ham

Early in the development of "Last Man Standing," we discussed Tim Allen's character, "Mike Baxter," as a "man's man." Mike is well-versed in camping, hunting, fishing, boating, and all the technology that now goes with these activities. I asked, "What about ham radio?" Tim said, "Absolutely." Tim is a very smart guy and knows a lot about a lot of things. He's fascinated by all kinds of technology and loves radio.

Once we decided that Mike would be a ham (photo A), I knew it would give us the opportunity to show the hobby in a positive and accurate way. Although the ham radio thread would only be a small part of Mike's character profile, I wanted to make it interesting for our ham fans.

To assist our set-dressing department, I set out to design and build a station for the show. Because I have a love for radio, and there are eight other licensed amateurs on the show, I thought it would be fun if the station could be "practical," which is to say actually work. As far as I know, this has never been done on a TV show.

A Variety of Challenges

We were faced with several obstacles from the very beginning of the ham radio station project:

First, there was no budget for radio equipment!

Second, there was the potential of interference. "Last Man Standing" is produced by 20th Century Fox Television for the ABC Television Network, but we shoot it on Stage 9 at CBS Studio Center in Studio City, California. (This is the legendary "Seinfeld" stage, a fantastic 22,000-square-foot stage.) FOX, ABC and CBS all are federally licensed broadcasters. Our stage is close to the CBS broadcast center from which all of

*Producer, "Last Man Standing"
e-mail: <JAmodeo.TV@gmail.com>

the network's West Coast transmissions originate. Also problematic, there are many other shows shooting on the lot. Each show has its own multiple communications frequencies, wireless microphones, wireless video feeds, etc. Strict compliance with FCC rules would be necessary and no RF interference could be tolerated.

Third, "Last Man Standing" is a family comedy, not a ham radio drama. The story lines would be about Mike at home with his family and Mike at work with coworkers. How would we wedge ham radio into it?

Photo A– "Last Man Standing" star Tim Allen, as fictional ham Mike Baxter, KAØXTT, tunes the ICOM IC-9100 that is the centerpiece of his on-set ham station. (Photo courtesy ABC-TV)

Overcoming the Obstacles

To solve the budget complication, Billy, KJ6RVA, who works in our production office, contacted several amateur radio equipment manufacturers to see if any of them could help us. This was harder than you would think, and it took a while for us to establish relationships between our TV show and the amateur radio manufacturing community.

In time, Ray Novak, N9JA, from ICOM America came to our aid by loaning us an IC-9100 transceiver. In addition to HF, the IC-9100 includes 2 meters and 70 centimeters, and has D-STAR and 23-centimeter capability. That's a lot of bands in one radio! ICOM also contributed an IC-92AD handheld, also with D-STAR capability.

Mick Stwertnik, KB6JVT, from NCG Companies helped us out with a Comet CHV-5X rotatable dipole that covers 40, 20, 15, 10, and 6 meters and a Comet GP-1 base antenna to cover 2 meters and 70 centimeters. NCG also loaned us a CAA-500 antenna analyzer and a Daiwa CN-801 SWR/Power meter.

I already owned an Arrow Antennas GP146 2-meter ground plane, and Tim Chapman, KB7MDF, from Arrow made us a custom GP435, 70-centimeter ground plane. There are four antenna outputs on the IC-9100, and I wanted an antenna for the IC-92AD as well.

Ham viewers wanted the "shack" to have both a straight key and paddles, so the show found a few dollars to purchase the final bits and pieces. I raided my garage and found an old rotator and a bunch of coax and a few other necessities, too.

Building the Station

Within a few weeks we had the equipment we needed to build our station. What fun opening the boxes, and then assembling and testing the equipment. We built the antennas in our production office and did a full tuning pass. Once tuned, we moved them up into "the perms." (On a sound stage, a lot of the pipes and wooden beams are movable so the stage can be reconfigured. The wooden beams at the highest part of the stage are structural and permanent, therefore "perms.")

This is a tough place for an antenna to live. There are a lot of metal pipes, chains, air-conditioning ducts, and such up there (see photo B). Of course, we retuned all the antennas once they were installed in their new home. Ultimately, we achieved near flat SWR across all our bands.

The world of "Last Man Standing" consists mostly of Mike's house and "Outdoor Man," his workplace. I knew the gear would be seen more frequently if I put it in Mike's workplace. We rarely shoot in Mike's home office or basement set. After enlarging Mike's Outdoor Man office set, we took over the rear corner of his office for the radio gear (photo C).

To gain approval to transmit from the lot, I enlisted the help of Tim Holly, N6QJ. Tim is a long-time friend and just happens to be a member of the CBS Studio City sound department. Most importantly, he is the lot frequency coordinator.

We went through the station to test for spurious emissions, harmonics, and the like. Working for a major broadcaster, Tim has a lot of cool test equipment, including a few things I'd never seen before.

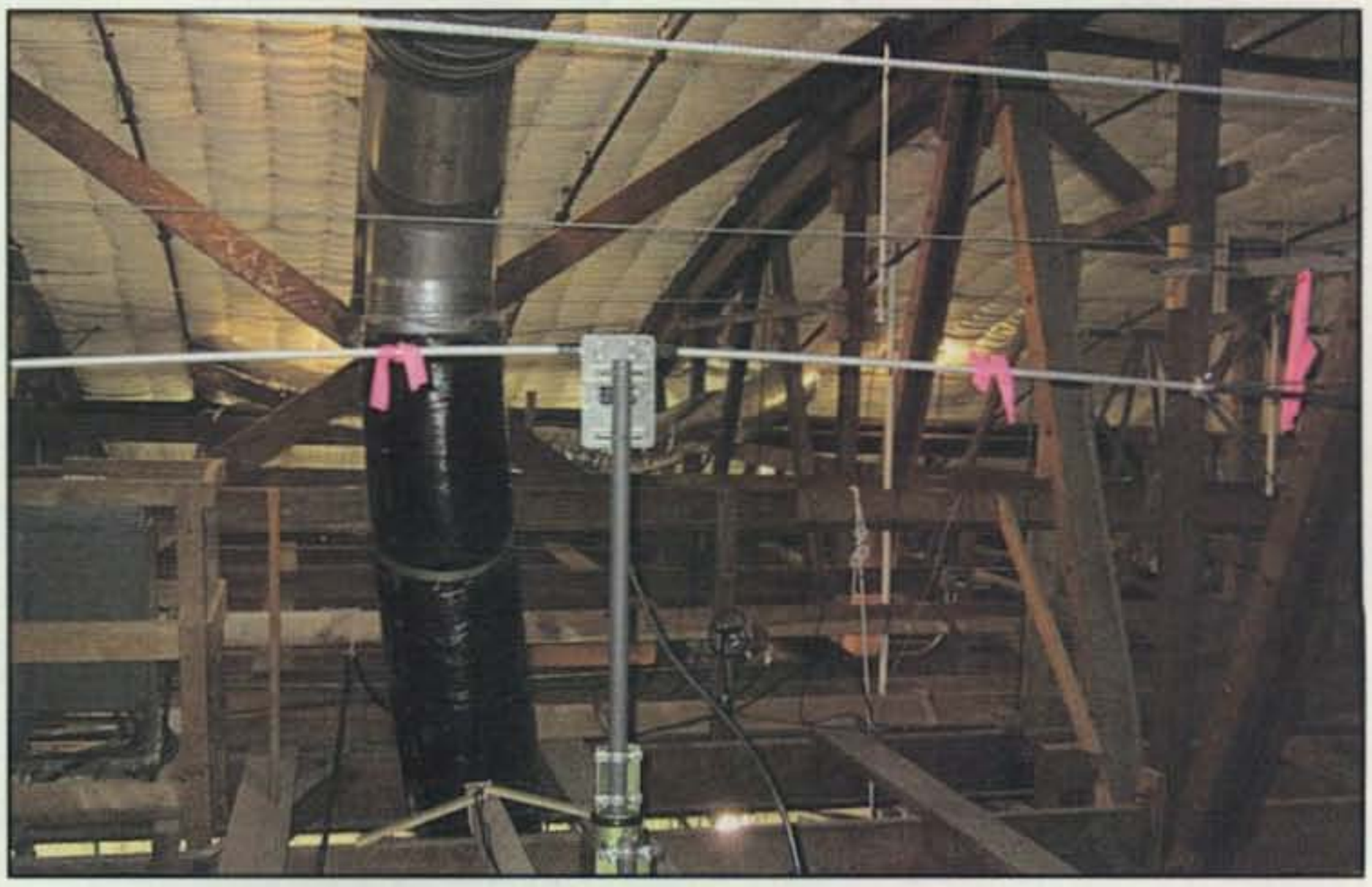

Photo B– The Comet CHV-5X rotatable dipole shares space in the rafters of Studio City Stage 9 with pipes, ducts, and other antenna-unfriendly objects, but it still works! (Photo by John Amodeo, NN6JA)

Photo C– The back corner of Mike Baxter's "office" has been set up as his ham shack. (Photo by Billy McLellan, KJ6RVA)

Photo D– Local hams were invited to put the "Last Man Standing" ham station on the air. From left, CBS Frequency Coordinator Tim Holly, N6QJ, Sound Mixer Laura King (future ham), Producer and author John Amodeo, NN6JA, event coordinator Norm Goodkin, K6YXH, and event participant Elly Levenson, KG6GMQ, discuss the operation behind the scenes on Stage 9. (Photo by Brian Corpuz, KJ6RVB)

Like any good station, the goal is to run as little power as needed. An added challenge to transmitting from the set is that the stage is shielded for RF interference. There's a fine metallic mesh from the floor up to about 20 feet, making a Faraday Cage. Luckily, the mesh becomes more like chicken wire as you get above 20 feet. Our antennas are between 45 and 50 feet above the stage floor, but still inside the stage.

In a short time we gained permission to transmit from our stage as long as we didn't interfere with any other production.

A Fake License for a Fictitious Ham

To give the station a real look, in addition to the radio gear our art department created a replica Extra Class license for Mike Baxter as KAØXTT. Both CQ and the ARRL provided very cool certificates and publications.

Maybe the most fun part of the process was that we asked hams to send us their QSL cards and they did. We displayed

Photo E– Local ham Naomi Goodkin, WB6PHW, operating from the "Last Man Standing" ham station. (Photo by Brian Corpuz, KJ6RVB)

as many cards as we could fit on the wall behind Mike's radio gear. We had KAØXTT QSL cards printed so we could return the favor to anyone who sent one to us.

With everything in place, all radios on, frequencies dialed in, and antennas connected, there was a big smile from Tim the first time he saw it. We even brought in hams from the community to put it on the air (see photos D and E; additional photos on our Facebook page—see below).

The Biggest Challenge

The real challenge actually will be getting radio story content into the scripts. A half-hour TV comedy is actually about 21 minutes long once you subtract the commercial breaks, so every second that ticks by is precious.

Remember: family comedy, not a ham radio show!

It occurred to me that what would get the studio, the network, and our writers interested in Mike's "radio hobby" would be if it could actually affect our ratings. There are about 700,000 licensed hams in the U.S., and we'll need to demonstrate that some of them are actually watching our show. You can help us with this one.

Recently we established a Facebook page for Mike's ham station at <http://www.facebook.com/KA0XTT>. Hopefully you'll check it out, maybe even hit the "like" button on our page. If you send Mike your QSL card, we'll send you his in return. Here's the address: Mike Baxter, KAØXTT, Last Man Standing – Bungalow 17, 4024 Radford Ave., Studio City, CA 91604.

Tune in to ABC some Tuesday night at 8:00 PM Eastern or Pacific and give the show a chance. I hope we can entertain you and show amateur radio in a positive way. Maybe we can interest some more people in radio. Maybe we can get a few to get their licenses.

More importantly, I hope we get more hams to watch the show. After all, I'm not just a ham, I'm also a producer.

References

For more on author NN6JA's TV career, visit: <http://www.imdb.com/name/nm0025127/>.

The "Last Man Standing" website is at <http://beta.abc.go.com/shows/last-man-standing>.

More about CBS Studio City may be found at <http://www.cbssc.com/index.htm>.

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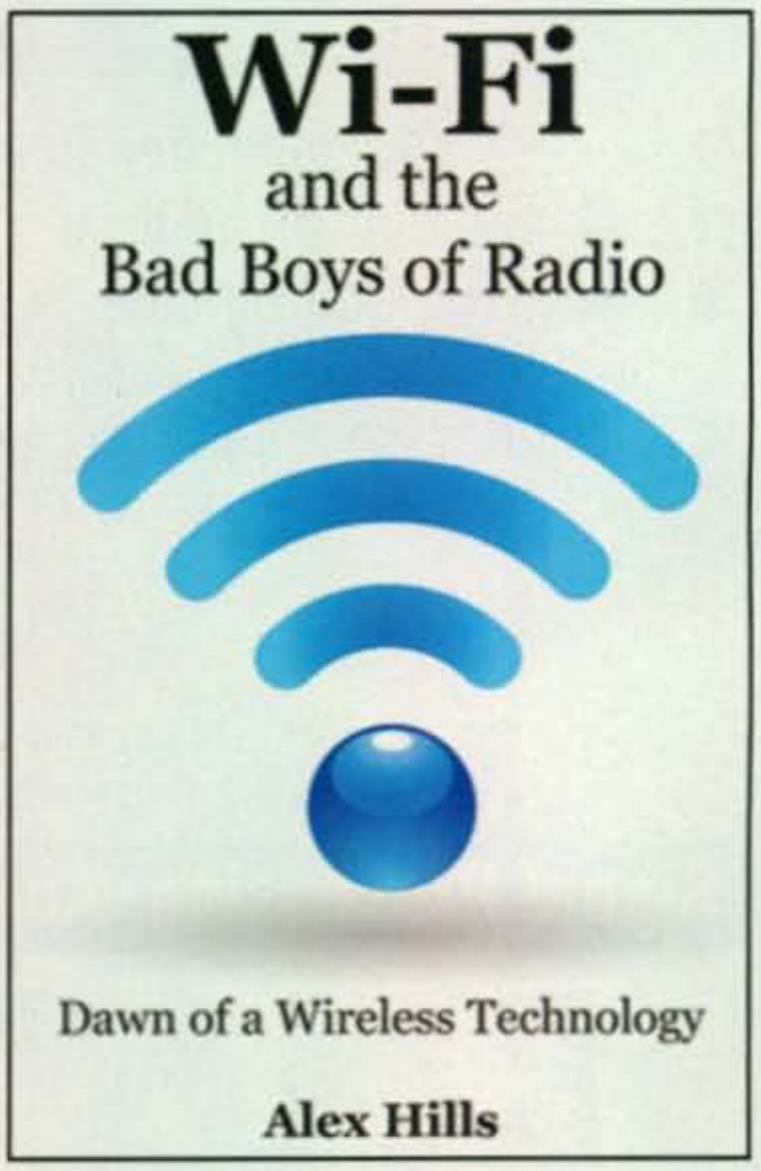
CQ Book Review:

"Wi-Fi and the Bad Boys of Radio: Dawn of a Wireless Technology"

By Alex Hills, AL7K

REVIEWED BY BILL KLYKYLO,* WA8FOZ



This fine book, the memoir of a pioneer in the development of Wi-Fi, *will* interest a wide variety of readers: hams, technogeeks and students of the history of technology, fans of rural and public broadcasting, and anyone in search of a good read. Alex Hills, AL7K, a ham since 1957 when he became KN2ZMO, is a highly-honored academic (Distinguished Service Professor at Carnegie Mellon University) who has been a broadcast engineer, researcher, teacher, consultant, and entrepreneur. He is able to speak about technology and its applications to a broad audience, and this book demonstrates that talent. He writes beautifully, with an appealing style of clarity and authority. He is also humble, eschewing the title of inventor of Wi-Fi that some have given him. However, he has much to be proud of.

The first chapter, "Discovering Radio," is a remembrance of life as a teenage Novice in northern New Jersey. This chapter alone will be worth the price of the book to those of us of a certain vintage, and I commend it to our newbies. What we are is determined in considerable part by what we have been. In this chapter, as in the rest of the book, Hills demonstrates his ability to weave in explanations of technology that are accessible to lay readers, while pleasing in their elegance to those in the know. This book is a tutorial of how to talk to others about what we do.

The next chapter, "Broadcasting to Eskimos," describes the author's experiences as an engineer, announcer, technician, and general factotum at a public radio station in Kotzebue, Alaska. He also led a bush telephone field crew, charged with establishing VHF telephone service in isolated villages. Here Hills began to grapple with the "bad boys" of space wave propagation: shadowing, diffraction, scattering, reflection, and refraction. This experience presaged his efforts in the 1990s to expand then-embryonic wireless LAN technology into a campus-wide wireless network at Carnegie Mellon, the first of its kind in the world.

Hills's achievement required a wide array of skills: assessment of existing technology, including hardware and software; team-building, management, and public relations; communication with national and international colleagues; and practical engineering. When it became obvious that theoretical models could not predict propagation patterns within buildings, Hills sent out technicians with transmitters and field strength meters to roam the halls! I believe that Hills' experience as a ham enhanced all these skills.

At one time, possessing an amateur radio license was tantamount to being ready for state-of-the art technology. While this is no longer the case, amateur radio still provides a basis for a career in technology. Hills' achievements illustrate that experience as a ham can also yields other assets. I had the pleasure of a conversation with Alex, in which his acuity and amiability were both apparent. He stated that he sees ham radio as providing a foundation in at least three areas: technology, certainly; service, the attitude that our skills and privileges should be used in the public interest; and professionalism. The last of these may not be so obvious, but shows up in many ways: the management skills of leading a club, running a net, or coordinating a RACES activity; personal enhancement through license advancement and self-education; developing colleagues through "Elmering," the mentorship that is essential to our hobby, through writing, or by teaching classes; skill in communication; and teamwork, necessary in so many things we do on and off the air.

I have been a ham for nearly fifty years and a professional for thirty five. I find myself looking back at what I have done, and considering what made it possible. While I am in a profession that is not visibly connected to radio, I can see many things that were enhanced by my identity and experience as a ham. This book has clarified this examination for me. It should help readers appreciate what they have done and might yet do, and how being a ham could help.

The final chapter of the book, "Wi-Fi Finds the Frontier," describes Hills' recent experience in a small town, Palmer, Alaska, where, as in so much of the country, Wi-Fi is everywhere. There is a well-deserved tone of satisfaction in this section that is balanced at the very end by an account of the Wi-Fi overload and system failure when the late Steve Jobs introduced the iPhone4 at a 2010 event. The very last paragraph recounts the antenna problems of the first iteration of that device, and the themes return: propagation and antennas; what we have done and what we yet might do.

Wi-Fi and the Bad Boys of Radio: Dawn of a Wireless Technology was published in 2011 by Dog Ear Publishing in Indianapolis, ISBN 978-145750-560-7. List price is $16.95 and it may be ordered through Hills' website at <http://www.dralexhills.com/>.

*e-mail: <klykylo1@cs.com>

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What You've Told Us...

Our December survey asked about our new digital editions (November was the first issue of *CQ* to be available in digital form, so these numbers are very preliminary and are mostly from readers who had yet to see a digital edition). Nearly three-quarters (73%) of the readers who responded to the survey were already aware that we had launched a digital edition; 63% of them had read about it in *CQ*, 27% had been notified by an e-mail from us, and the remainder were split between the *CQ* website, the *CQ* Facebook page, non-CQ websites, on-air news reports and hearing about it from friends.

Eighty-six per cent of survey respondents were reading the print edition, although among those responding to our survey online, 53% were reading the print edition, 25% were reading the digital edition and 22% were responding to the survey without having the magazine in front of them.

The vast majority of respondents received the December issue by mail subscription (86%) with the remainder divided among digital subscribers and single-issue purchasers. Asked how likely you would be to buy a digital subscription, 54% said they would consider it (and among online respondents, that figure was 74%); and nearly one in ten already had a digital subscription.

The chief potential benefits our respondents see from a digital subscription are extra storage space from not having to collect back issues in paper form, greater flexibility in how they read each issue, and reduced delivery issues vs. postal delivery. This month's free subscription winner is Martin Huyett, KØBXB, of Burlington, Wisconsin.

Reader Survey March 2012

We'd like to know more about you—about who you are, where you live, what kind(s) of work you do, and of course, what kinds of amateur radio activities you enjoy. Why? To help us serve you better.

Each time we run one of these surveys, we'll ask a few different questions and ask you to indicate your answers by circling numbers on the Survey Card and returning it to us. As a bit of incentive, we'll pick one respondent each month and give that person a complimentary one-year subscription (or subscription extension) to *CQ*.

This issue introduces our new "Maker" column (p. 54), so we'd like to find out more about you and "making" stuff.

Please answer by circling the appropriate numbers on the reply card or by going to the following web link <www.surveymonkey.com/s/CQMar12> [From the digital edition, just click on the link].

1. Do you consider yourself a "maker" (someone who designs, builds, modifies and/or fixes things)?
- Yes 1
- No 2

2. What sort(s) of things do you "make"? (Check all that apply)
- Ham radio gear & electronic accessories 3
- Non-electronic ham shack accessories (e.g., shelf units, furniture) 4
- Computer-related projects (hardware or software) 5
- Robotics 6
- Other electronic projects 7
- Crafts 8
- Woodworking 9
- Other 10
- None 11

3. How recently have you designed, built, modified and/or fixed something?
- Within the past week 12
- Within the past 6 months 13
- Within the past year 14
- 1–5 years ago 15
- More than 5 years ago 16
- Never 17

4. Do you agree that hams and makers have a lot to offer each other and that both groups could benefit by working together?
- Yes 18
- No 19
- Not sure 20
- No opinion 21

5. Are you aware of a maker/hacker organization in your community?
- Yes, and I am a member 22
- Yes, and I have visited but am not a member 23
- Yes, but I have not visited/joined 24
- No 25

6. Has your ham radio club made efforts to work with any maker/hacker groups in your community?
- Yes, and we have established a relationship 26
- Yes, but only initial contacts at this point 27
- Yes, but the maker group wasn't interested 28
- No, ham club wasn't interested 29
- No, not aware of maker/hacker group in my community 30
- Don't know 31
- Don't belong to a ham radio club 32

Thank you for your responses. We'll be back with more questions next month.

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math's notes

BY IRWIN MATH,* WA2NDM

The Optical Communications Domain

In the past we have described various means of communicating through the use of optical wavelengths, and this month we thought it would be a good idea to give you a "feel" for where all of this lies. Many of us are familiar with the "standard" frequencies that constitute the 160-meter through 2-meter amateur bands (roughly 1.8 MHz to 150 MHz). We also are familiar with the terms used to describe the various regions, such as 80 meters, 40 meters, 10 meters, and 2 meters (which basically apply to wavelength). Many of us are aware of the much higher UHF and microwave regions. Well, optical communications is quite a bit higher in frequency (or shorter in wavelength) than all of that!

The are we are talking about is in the THz region. You might think that 1 GHz (1000 MHz) is a high frequency, but 1 THz is equal to 1000 GHz! The frequencies in this region are so high that they are almost always referred to in terms of wavelength. While 1 GHz (as a point of reference) is equal to a wavelength of 300 millimeters, 1 THz has a wavelength of 300 microns (0.3 millimeters). If you are wondering what a micron is, it is one millionth of a meter. The visible light range begins at deep red, which has a wavelength of 700 nanometers (0.7 microns) and a frequency of 428 THz, and ends at violet, which has a wavelength of 400 nanometers (0.4 microns) and a frequency of 750 THz. Obviously, the electromagnetic spectrum extends below (all the way down to DC) and above (??) this region. Fiber-optic communication systems normally use wavelengths of 850 nanometers (350 THz), 1300 nanometers (230 THz), and 1550 nanometers (200 THz). These are much lower in frequency than visible light, but of course are still extremely high.

In optical communication systems we usually turn a laser diode or LED on and off for digital signals or vary its intensity (AM) for analog signals. This actually is not unlike the spark transmitters of the early days of radio. At that time huge bands of frequencies, produced by the spark, were turned on and off. With lasers and LEDs, even larger bands of frequencies are manipulated. Although a laser can produce an output of a so-called "single wavelength," the bandwidth of the "single frequency" is actually 1–2 nanometers wide. This, in terms of frequency, is hundreds or even thousands of MHz in width. When the time comes to obtain true stable FM (which could be thought of as "color modulation" in the visible light range), optical communications will really come of age. Imagine how much information could be transmitted on carefully controlled narrow-bandwidth THz carriers!

Working with optical signals is a whole different story from working with conventional RF. Because the wavelengths are so small, conventional wires and even waveguides do not work. Lenses, mirrors, and fiber-optic conductors are used. In fact, fiber-optic conductors are often called "optical waveguides." The only place that conventional electronics play a part is in the driving circuitry for the optical light source and to process the electrical output of the optical detector.

In an optical communications system the light source, as we have stated, is usually a laser diode or LED. The output from this emitter is then either coupled to an optical fiber for transmission to another part of the circuit or to a lens/mirror arrangement for transmission through free space. At the receiving end, the incoming light is directed to a photodiode that converts it back into an electrical signal. Keep in mind that the photodiode receives the entire block of frequencies transmitted from the emitter and detects it much like the chunk of galena (or lead sulfide) did years ago in a simple crystal radio. The only "tuning," as such, in this region is special optical filters or gratings which can be manufactured to pass narrow wavelengths on the order of a micron or so. These are usually placed in front of the photodiode. Certain crystals, such as lithium niobate, exist which have non-linear response to certain optical wavelengths, and these can be used as optical mixers. As a result ,super-heterodyne circuitry is certainly possible, but the laser-driven local oscillators that would be needed really are not yet stable enough for routine use.

This entire THz (and above) region seems to me to be a great area for experimentation, as in some ways it is very similar to the days of the spark system, as we have already mentioned. Many types of emitters are readily available (lasers. LEDs, etc.) to the experimenter, and detectors (photodiodes, photo transistors, etc.) also are readily available. Even lenses, mirrors, and fiber-optic conductors are relatively easy to find. Sophisticated detector crystals, variable tuning methods, stable light sources, and the like are areas that remain to be developed and improved upon. Perhaps simple existing crystals such as quartz, various precious and semi-precious stones, or even old-fashioned galena have potential. These all are unique interesting areas for experimentation.

Those of you who think such endeavors are only possible in large, well-equipped research labs should consider what was available in the days of spark. Quite often the unknown, ground-breaking component was discovered by experimentation (or even accident). Remember, the vacuum tube easily could have been built by Thomas Edison well before Fleming and DeForrest (and, in fact, was), but it was not applied to radio because he was looking for a way to make his lamp more efficient. Early pioneers had various sorts of ways to achieve wireless communications (look up Mahlon Loomis), but Marconi experimented, developed, and eventually popularized radio as we now know it. Also, remember that in those early days the frequencies (or wavelengths below 200 meters) were considered useless until the amateurs and experimenters of the day demonstrated the propagation that was possible. Who knows what unknown propagation modes exist in the areas beyond the visible wavelengths? Someone will eventually find out, that is for certain!

If you keep an open mind and think "outside of the box," perhaps you, too, can be one of those pioneers who comes up with groundbreaking results.

73, Irwin, WA2NDM

*c/o CQ magazine

washington readout

BY FREDERICK O. MAIA,* W5YI

Getting Information about the Amateur Radio Service:

Available Online and Here's Where to Find It

It appears that most radio amateurs would rather ask someone about an FCC policy, rule, or procedure than get their answer from the FCC's Amateur Section or other websites. This month let's talk about where to get the answers to your questions by consulting the various information web pages located online.

Amateur Radio is one of the radio services handled by the FCC's Wireless Telecommunication Bureau. The primary objective of the WTB is to develop the regulations and procedures for fast licensing of all of the wireless radio services.

The bureau oversees nearly two-million licenses in more than fifty radio services. Rick Kaplan is its bureau chief. The bureau is further broken down into several divisions with the various licensed and unlicensed radio services falling under the Mobility Division. Roger Noel is the Division Chief.

The Mobility Division oversees all of the wireless mobile communication services. These include amateur and commercial radio; cellular radio telephone, paging, aviation, and maritime radio; personal radio (citizens band, radio control, general mobile, and family radio); and the Part 90 Industrial and Business land-mobile radio services. Part 90 radio includes hospitals, churches, film/video production, forestry, motor carriers, construction, manufacturers, petroleum, power, railroad, taxicabs ... and many other two-way radio users. As you can see, wireless communications is a very big category.

You can find a list of links to all the wireless services by entering <http://wireless.fcc.gov/services/> into a web browser. *Bookmark this link*, because it is your starting point to getting information about any of the FCC's mobile radio services, including ham radio.

You will notice that the eighth one down on the list is the Amateur Radio Service. Click on this link. On the left side you will find a list of links explaining amateur radio; the various operator classes; domestic, international, and reciprocal licensing arrangements; the call sign systems; club stations; common filing tasks; and the license examination system. Accessing these links will get you the answer to just about any amateur radio policy or procedure question you might have.

Most of the questions we get from readers involve Amateur Rules and Licensing, including using the Universal Licensing System (ULS)—the various call sign systems and license examinations. Also, almost all could have been answered

*1020 Byron Lane, Arlington, TX 76012
e-mail: <w5yi@cq-amateur-radio.com>

Amateur Radio Service Subparts

Subpart A. General Provisions: Contains fifteen sections, numbered 97.1–29.

Defines a number of terms relevant to amateur radio and establishes the amateur service as a "voluntary, noncommercial communications service." It also covers amateur licensing and limitations on station equipment and power output.

Subpart B. Station Operating Standards: Contains eleven sections, numbered 97.101–121.

Details the standards of communication conduct, including the types of transmissions authorized and prohibited by the FCC, limitations pertaining to third-party and international communications, and the on-air station identification requirements.

Subpart C. Special Operations: Contains eleven sections, numbered 97.201–221.

Covers the rules pertaining to auxiliary and repeater stations, message forwarding, earth/space communications, telecommand, telemetry, and automatic station control.

Subpart D. Technical Standards: Contains nine sections, numbered 97.301–317.

Covers amateur radio frequency allocations, the emission modes allowed, and the technical standards according to which they may be used.

Subpart E. Emergency Communications: Contains four sections, numbered 97.401–407.

Covers basic standard operating procedures to use in case of an emergency. It also establishes the Radio Amateur Civil Emergency Service (RACES), a civil defense communications service intended for activation in times of war or threat to national security.

Subpart F. Qualifying Examination Systems: Contains twelve sections, numbered 97.501–527.

Details the examination system whereby amateur radio operators are licensed. This includes the structure and conduct of Volunteer Examiner Coordinators (VECs) and volunteer examiners (VEs) who administer test elements to prospective licensees.

Part 97 also has two appendices: **Appendix 1**—Places where the Amateur Service is Regulated by the FCC, and **Appendix 2**—a list of the 13 VEC Regions.

Table I– The Part 97 Amateur Radio Service subparts.

by accessing the FCC's online Amateur Section web pages. Following are some of the highlights of how ham radio works administratively. They cover most of the inquiries we get, but to get the full story you need to read the entire section.

Part 97 Rules

The actual Amateur Radio regulations can be found by entering "FCC Part 97 Rules & Regulations" into any search engine. Part 97 contains the FCC rules that pertain to amateur radio and the conduct and activity of ham radio operators. It consists of six subparts (A through F) and two appendices (see Table I). Part 97 is a part of "Title 47 Telecommunication" of the Code of Federal Regulations (CFR) and has the force of law. *Bookmark these rules.*

Amateur Licensing

Operation of an amateur station requires an amateur operator to be granted a license from the FCC. Before receiving a license grant, you must pass one or more examinations administered by a team of three volunteer examiners (VEs). The VEs determine the license operator class for which you are qualified through the testing of your skills and abilities in operating an amateur station. You can contact a VE team in your community to make arrangements for being administered the examination elements you need.

If you need assistance in finding a VE team in your area, contact a Volunteer Examiner Coordinator. A VEC organizes the activities of its VE teams. The two largest are the ARRL-VEC (American Radio Relay League, Newington, CT; tel: 860-594-0300; e-mail: <vec@arrl.org>) and the W5YI-VEC (Dallas, TX; tel: 800-669-9594; e-mail: <NB5X@w5yi.org>).

After you successfully complete the exam, the VEC collects your license application and paperwork from your VE team and forwards the information to the FCC for processing. If the applicant does not have an FRN (FCC Registration Number), the VEC will automatically register an examinee with the FCC and an FRN is assigned. Every licensee is required to have a 10-digit identifying FRN.

Your operating authority begins when your licensing information appears in the amateur service licensee database of the Universal Licensing System. ULS is another very important link that you need to bookmark. This is the site you will use to manage your licenses and applications. You will find it at <http://wireless.fcc.gov/uls/>.

Call Sign Systems

Sequential Call Sign System. A unique call sign is assigned to each amateur station during the processing of its first license application. Each new radio amateur is assigned a Group D (2-by-3 format) call sign in order using the sequential call sign system, which is based on the alphabetized regional-group list for the licensee's operator class and mailing address.

Every ham radio call sign has either a one-letter prefix (K, N, W) or a two-letter prefix (AA–AL, KA–KZ, NA–NZ, WA–WZ) and a one-, two-, or three-letter suffix separated by a numeral (Ø–9) indicating the geographic region. Certain combinations of letters are not used. When the call signs in any regional-group list are exhausted, the selection is made from the next lower group.

Canceling the Call Sign of Deceased Licensee
New rules eliminate use of the SSDI

The license of a deceased amateur must show a status of expired or cancelled in the licensee database before it can be reassigned. *See Section 97.31(a)*. This is accomplished by submitting a request to the FCC that includes a death certificate, a dated obituary, and up until recently, data from the Social Security Death Index (SSDI) that shows the licensee has died.

This documentation is sent to: FCC, Amateur Section; 1270 Fairfield Road; Gettysburg, PA 17325-7245 so that the call sign may be cancelled. The information for cancellation of a call sign must be submitted prior to filing the vanity application.

By far, the most common documentation used to prove a radio amateur's death is the SSDI. Up until December, it had been found online on the Rootsweb Ancestry.com website: <http:// search-es.rootsweb.ancestry.com/ssdi.html>. However, this website, and others like it, no longer publishes the Social Security Number (SSN) on its SSDI records.

Social Security Death Index

The Social Security Death Index is a database of death records created from the U.S. Social Security Administration's (SSA) Death Master File (DMF). Most persons who have died since 1962 who had a Social Security Number (SSN) and whose death has been reported to the Social Security Administration are listed in the SSDI.

Unlike the Death Master File, the SSDI is available free online and is a popular tool among genealogists because it contains valuable biographical data. Among the information included is the name of the deceased, the date of birth and death, and (until recently) the Social Security Number (SSN) held. The FCC matches the data up with the SSN it had on record to confirm the death of the licensee.

The records held by the Social Security Administration are public government records that are disclosed under the Freedom of Information Act (FOIA). Financial institutions also use the SSDI to prevent fraud so that no one can steal the identity of a dead person. However, the data is also used by ID thieves and therein lies the problem.

Alhough the SSDI is not available online from Social Security, the U.S. Department of Commerce's National Technical Information Service (NTIS) offers a subscription service containing public death information for online queries. The SSDI data posted on these private websites is not endorsed by Social Security, nor can Social Security confirm that the information is up-to-date or accurate with SSA death data.

Recently, Rep. Sam Johnson (R-Texas) introduced the "Keeping IDs Safe Act of 2011," (also known as the KIDS Act). Rep. Johnson claims that thieves have been using the Social Security Death Index (SSDI) "to access Social Security numbers, file bogus tax returns to the Internal Revenue Service, and collect refunds."

By closing the Death Master File (SSDI) to the public, Johnson claims that thieves will no longer be able to steal the identity of deceased children and claim them as dependents on tax returns.

Private SSDI websites still exist, such as <http://www.genealogybank.com/gbnk/ssdi/>, but it is no longer listing the SSN on deceased records, leaving the FCC with no way to confirm that a radio amateur has indeed died. Effective, December 19, 2011, the FCC will only accept a death certificate or a dated obituary to cancel the call sign of a deceased radio amateur.

The call sign groupings are Group A: (Extra Class, 4-character call signs with a one- or two-letter prefix and a two- or one-letter suffix, or a two-letter prefix with first letter A.) Group B: (Advanced Class call signs contain a two-letter prefix and two-letter suffix.) Group C: (Technician and General Class call signs contain a one-letter prefix and a three-letter suffix.) And Group D: Call signs are issued to first-time licensed radio amateurs and clubs. Any amateur may hold a call sign from a lower group.

The station is reassigned its same call sign upon renewal or modification of its license, unless the licensee specifically applies for a change to a new sequentially assigned or vanity call sign. There is no charge to obtain a new sequential call sign—that is, the next call sign in alphabetical order.

Vanity Call Sign System. The vanity call sign system offers you the opportunity to request a specific call sign for your primary station and for your club station. A vanity call sign is selected by the FCC's computer from a list of call signs requested by the station licensee or club trustee.

There are all sorts of complex rules that apply when selecting a vanity call sign. For example, you can select an available call sign or one you formerly held that is appropriate for your license class. You may also obtain the call sign of a close relative now deceased. Clubs can obtain the call sign of a deceased former holder "In Memoriam." Vanity call signs may be selected from any geographical region.

A vacant call sign normally is assignable two years plus one day following license expiration, surrender, revocation, set-aside, cancellation, or death of the grantee. Special cancellation rules applying to the call sign of an amateur deceased more than two years took effect last November. Former holders and close relatives do not have to wait the two-year period.

Special Event Call Sign System. When transmitting in conjunction with an event of special significance, an amateur station may temporarily transmit the identification announcement using a special event call sign. These one-by-one call signs contain one letter (K, N, or W), a numeral Ø–9 and one-letter suffix (except X). There are 750 of them and you don't have to hold any specific license class to use one.

Substituting a special event call sign may help call attention "on-air" to a station's participation in the special event and to the unique opportunity for the amateur radio community to exchange greetings with the station.

The above information on sequential, vanity, and special event call signs is very basic. There are a lot more rules that apply than are stated here. Consult the FCC's Amateur Radio Service section for more details. It is more complicated than you think.

Common Filing Tasks

Once initially licensed, individual radio amateurs may perform many standard filing tasks in the ULS, including changing an address, checking your license and application status, renewing or replacing a license, or obtaining a vanity call sign. Except for obtaining a vanity call sign, there is no cost to complete these filings.

This is accomplished by using your computer to log into the Universal Licensing System with your FRN and password. (An FRN and password are provided to every licensee by separate FCC letter soon after being licensed.)

It is especially important that you keep your address up to date. Revocation of your license may result when correspondence from the FCC is returned as undeliverable because you failed to provide the correct mailing address.

Clubs must use a Club Station Call Sign Administrator (CSCSA) to establish, modify, or renew a club station license. A CSCSA is a volunteer amateur radio organization that has agreed to process applications for clubs.

License Examinations

Operation of an amateur station requires an amateur operator license from the FCC. There are three license classes, each authorizing privileges corresponding to the qualifications required.

The classes of license from lowest to highest are: Technician Class, General Class, and Amateur Extra Class. Before being granted a license, you must pass a multiple-choice examination administered by a team of three volunteer examiners (VEs) who have been accredited by a VEC. These exams are administered by VEs scattered across the U.S. and in several foreign countries.

There are three written-examination elements; Elements 2, 3, and 4. (Element 1, Morse code tests, were discontinued five years ago.)

The beginning Technician (Element 2) exam contains 35 multiple-choice questions. (26 correct passes). The General license requires that applicants additionally pass Element 3—again, 26 correct out of 35 passes. The Amateur Extra license requires that you pass all three tests: Elements 2, 3, and 4. There are 50 questions in Element 4 (37 passes).

Each set of exams is taken verbatim from pools of questions maintained by the VECs' Question Pool Committee. Each pool contains at least ten times the number of questions required for a single examination. These pools are revised and updated every four years to incorporate the latest rules, new technology, and interests of the Amateur Radio Service community. A new Element 4 (Extra Class) question pool takes effect on July 1 of this year.

The VEC collects your exam results from your VE team, and after screening, electronically forwards the information directly into the FCC's computer so that an Amateur Service operator/station license may be granted by the FCC.

You can begin using your new privileges once the FCC's ULS database shows the new license information. Since it already has a station call sign, upgrading licensees may begin using new privileges without waiting for the information to appear in the database. This immediate operating authority is granted based on a CSCE (Certificate of Successful Completion of Examination) issued by the VE team.

Your VE team may charge you a re-imbursement fee for out-of-pocket expenses incurred in preparing, processing, administering, or coordinating your examination.

Summary

There you have it, a capsule run-down of the Amateur Radio Service and how it works. However, you need to carefully review the Part 97 regulations, the FCC's online Amateur Section, and the write-up on the Universal Licensing System to learn all of the details and gain a better understanding of ham radio's legal and administrative side. 73, Fred, W5YI

public service

BY RICHARD FISHER,* KI6SN

Why HF Really Matters in Emergency Situations

"It's a good thing you had that radio. Otherwise we would have found you in the spring. Nobody comes up here this time of year."

—Mono Lake Sheriff's Office official

It was 10 PM and Henry Schleichkorn, K9KDE, was reaching for his transceiver's power button to call it a night. Then, a faint call. "Someone was lost and needed help," he said. "Naturally, I would stick around to hear more. After all, this is one of those rare moments many hams live for."

As the drama unfolded, Schleichkorn learned that Ron Jones, KB6UF, from Kentwood, Louisiana, was not only lost in the Sierra Nevada mountains of central California, but his truck was stuck, as well.

"While driving alone from Louisiana to California to visit his grandkids for the Thanksgiving holiday, the 68-year-old missed the exit where he was scheduled to stay at a hotel," K9KDE wrote. "So he turned to his GPS (navigation system)."

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Photo A– From his Chicago, Illinois, amateur radio station, Henry Schleichkorn, K9KDE, was one of a group of 40-meter phone operators who came to the rescue of Ron Jones, KB6UF, who was lost and stuck in a ditch on the side of the road in California's Sierra Nevada mountains in late November. (Courtesy of Aaron Schleichkorn)

"It instructed Ron to turn here and go there," Schleichkorn said, noting that a GPS "is not always perfect." *(**IN DEPTH:** For more information about Global Positioning Satellite navigation, visit: <http://bit.ly/znqQr1>.—ed.)*

The road turned to gravel. Jones knew something was wrong. "Ron felt like he was going in circles." As it turned out, KB6UF was eight miles from the main road.

"It was pitch black and there were no street lights for miles," K9KDE wrote. "Ron hit a ditch. The front wheels of his small truck were in the air and it was clear he was going nowhere fast. He checked his cell phone." There was no access.

KB6UP's truck has a 2-meter radio in it, but there were "no answers on any local repeaters. He turned to 40 meters, remembering there is usually a bunch of hams on 7.195 MHz."

Schleichkorn reported that within minutes, "multiple hams were offering advice: Use the low gear . . . Fill in the hole with brush and sand . . . Rock the truck back and forth."

"Somebody asked if Ron's GPS was working," K9KDE wrote. "It was. Ron gave out his coordinates over the air. Now as many as 100 hams monitoring the frequency knew Ron's exact location: in the hills near Mono Lake, near the Nevada-California border."

Dave Leath, N5SDO, of Bloomfield, New Mexico, "stepped up and became net control," Schleichkorn said. "Everyone, including Ron, could hear Dave. Dave assessed Ron's predicament by asking pertinent questions: Are you alone? How much fuel do you have? Do you have food or water? Is there somebody we can call for you?

KB6UF gave N5SDO an 800 number to the Mono Lake Sheriff's office. Dave tried the 800 number, but it wasn't working.

"I thought about that non-working 800 number for a second," Schleichkorn recalled. "Maybe the Sheriff's office discontinued the 800 service due to budget cuts. So I Googled the 800 number and found the local dispatch number to Mono Lake Sheriff's office. I called it.

(***OVERVIEW:*** To learn more about the Mono Lake region of California, visit: <http://bit.ly/wRpdjK>. —ed.)

"I had to explain I'm a ham radio operator in Chicago and I'm monitoring a man stranded and lost in hills near Mono Lake. The dispatcher said she would bring this info to her sergeant. Ten minutes later the sergeant returned my call. I quickly explained what had been happening over the past 90 minutes."

The sheriff asked Schleichkorn if Jones needed "a tow or is this a search and rescue?"

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NEW! AT-1000Proll

Building on the success of the AT-1000Pro, LDG Electronics has refined and expanded its flagship 1KW tuner with optional external 4.5" analog meter. The new AT-1000Proll keeps many of the same features of the previous model, but simplifies the operation. With the two-position antenna switch, there are 2,000 memories that store tuning parameters for almost instantaneous memory recall whenever you transmit on or near a frequency you've used before. Includes six-foot DC power cable.

Suggested Price $539.99; Optional M-1000 external analog meter $129.99

AT-600Pro

The AT-600Pro handles up to 600 watts SSB and CW, 300 on RTTY (1.8–30 MHz), and 250 watts on 54 MHz. Matches virtually any kind of coax-fed antenna and will typically match a 10:1 SWR down to 1.5:1 in just a few seconds. You can also use it with longwires, random wires, and antennas fed with ladder line just by adding a balun. Two antenna ports with a front-panel indicator, and separate memory banks for each antenna. LED bar-graph meters shows RF power, SWR and tuner status, tactile feedback control buttons and an LED bypass indicator. Operates from 11–16 volts DC at 750 mA. Includes six-foot DC power cable. ***Suggested Price $359.99***

- *RF Sensing*
- *Tunes Automatically*
- *No Interface Cables Needed*

AT-100Proll

This desktop tuner covers all frequencies from 1.8–54 MHz (including 6 meters), and will automatically match your antenna in no time. It features a two-position antenna switch with LEDs, allowing you to switch instantly between two antennas. The AT-100Proll requires just 1 watt for operation, but will handle up to 125 watts. Includes six-foot DC power cable.

Suggested Price $229.99

- *RF Sensing*
- *Tunes Automatically*
- *No Interface Cables Needed*

AT-200Proll

The AT-200Proll now includes LEDs to show antenna position and if the tuner is in bypass. A two-position antenna switch stores 2,000 memories per switch. Handles up to 250 watts SSB or CW on 1.8 to 30 MHz and 100 watts on 54 MHz. Rugged and easy to read LED bar graphs simultaneously show RF power and SWR. Includes a six-foot DC power cable.

Suggested Price $259.99

Z-100Plus

Small and simple to use, the Z-100Plus sports 2,000 memories that store both frequency and tuning parameters. It will run on any voltage source from 7 to 18 volts; six AA batteries will run it for a year of normal use. Current draw while tuning is less than 100ma. The Z-100Plus now includes an internal frequency counter so the operating frequency is stored with tuning parameters to make memory tunes a blazingly fast 0.1 seconds; full tunes take an average of only 6 seconds. Includes six-foot DC power cable.

Suggested Price $159.99

Z-11Proll

Designed from the ground up for battery operation. Only 5" × 7.7" × 1.5", and weighing only 1.5 pounds, it handles 0.1 to 125 watts, making it ideal for both QRP and standard 100 watt transceivers from 160 through 6 meters. The Z-11Proll uses LDG's state-of-the-art, processor-controlled, Switched-L tuning network. It will match dipoles, verticals, inverted-Vs, or virtually any coax-fed antenna. With an optional LDG balun, it will also match longwires or antennas fed with ladder-line. Includes six-foot DC power cable. ***Suggested Price $179.99***

radio not included

Z-817

The ultimate autotuner for QRP radios including the Yaesu FT-817(D). 2,000 memories cover 160 through 6 meters. Also functions as a general purpose antenna tuner with other QRP radios. Just transmit a carrier and press the Tune button on the tuner. Powered by four AA internal alkaline batteries (not included), so there are no additional cables required.

Suggested Price $129.99

Designed to handle the higher power of the Tokyo Hi Power HL-45B.

Z-817H

The ultimate autotuner for QRP radios including the Yaesu FT-817(D) with addition of the Tokyo High Power HL-45B. Interfaces to the CAT port (ACC) on the back of the radio with the provided cable. One button push on the tuner and the Z-817H takes care of the rest. Will also function as a general purpose antenna tuner with other QRP radios or QRP radios with up to 75 watt HF amps. Powered by four AA internal alkaline batteries (not included). 2,000 memories cover 160 through 6 meters. ***Suggested Price $159.99***

YT-100

For Yaesu FT-857, FT-897 and FT-100 (and all D models) an integrated tuner, powered by the interface. Press the Tune button on the tuner, and everything else happens automatically. ***Suggested Price $199.99***

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Photo B– The region around Mono Lake, California, in the eastern foothills of the Sierra Nevada Mountains, east of Yosemite National Park, can be desolate and forbidding, especially for a radio amateur stuck in a ditch in the dark of night. (Courtesy of Ron Reiring via Wikimedia Commons)

"I relayed the question to Dave, who then asked Ron. Ron said he was requesting an officer. As soon as the sheriff heard 'requesting an officer,' he said someone will be there in 30 minutes.

"When Ron announced on the radio he could see the lights of the sheriff's car approaching," Schleichkorn recalled, "many hams monitoring the frequency cheered on air." The sheriff and Jones doubled a nylon rope the sheriff had "in an attempt to pull Ron's small truck out of the ditch. The rope snapped. Luckily, there was a piece long enough to triple fold the line and that proved strong enough to pull Ron's vehicle free. Again, hams cheered on the air as Ron was following the sheriff back to town."

"It's a good thing you had that radio," the sheriff said. "Otherwise we would have found you in the spring. Nobody comes up here this time of year."

High-frequency radio "was the only way Ron was able to get help," Schleichkorn wrote. "Thank goodness he had a good HF mobile or he might have been out there for days—or much longer.

Schleichkorn said that following the night's rescue drama, several operators said: "That does it. I was thinking about putting an HF rig in the mobile, but now I'm convinced and going to do it."

"Thanks to all the hams who helped a fellow ham in need," K9KDE said. Especially Dave Leath, N5SDO, in New Mexico; Nick Ashley, W9ZXT, of Geneseo, Illinois; Jerry Kaspar, NØVXE, of Salida, Colorado; and Dave Smith, W7DBS, of Boulder City, Nevada, "and, of course, the Mono Lake Sheriff's office."

Photo C– Map courtesy of U.S. Forest Service.

EmComm Scholarship Offered to Hams in Illinois

Named for the team founder and first Emergency Coordinator (EC) of

DuPage County, Illinois, The R. Kent TeVault Scholarship In Emergency Communications has been established "to further emergency communications within amateur radio," according to Michael J. Schulz, W9MJS, EC of DuPage County Amateur Radio Emergency Service®.

The grant "has been designed to offer a scholarship to encourage EmComm training in general, and for the benefit of the DuPage County ARES® team specifically."

This scholarship will reimburse "selected amateur radio operators who take and successfully pass the ARRL Introduction to Emergency Communications Course (EC-001)."

For more information and to obtain an application, visit: <http://bit.ly/wjAt0c>.

Radio Amateurs Honored at Public Safety Awards Program

Four southern California radio amateurs were honored for their volunteerism and communications skills at the 2011 Public Safety Awards ceremonies at the Regional Conference Center in San Bernardino. Certificates in recognition of "communications expertise and volunteerism" were presented by California 62nd District Assemblywoman Wilmer Amina Carter to:

- Jim Eason, AD6IJ, for volunteer work with San Bernardino County Fire Department. He is president of the Citrus Belt Amateur Radio Club (CBARC).
- Jon Montgomery, K6FZZ, CBARC treasurer, for volunteer work with San Bernardino County Fire Department.
- Louis Johnson, K6UMX, volunteer with the Fontana Police Department. He is an ARRL Volunteer Examiner and is affiliated with the Fontana (CA) Amateur Radio Club.
- Joe Martinez, NJ6OE, volunteer with the Rialto (CA) Fire Department, and President of the Rialto (CA) ARC, as well as webmaster for K6RIA.net, and an ARRL VE.
- Carl Gardenias, WU6D, ARRL Orange Section Manager, praised the radio operators for service to their communities.

This month we highlighted only some of those who have contributed to the public service part of amateur radio. If you have a story to tell, please e-mail me at <ki6sn@cq-amateur-radio.com>. "When all else fails" . . . amateur radio comes through.

73, Richard, KI6SN

We Are Makers

BY MATT STULTZ,* KB3TAN

CQ "Maker" columnist Matt Stultz, KB3TAN, at the 2010 Dayton Hamvention®. (Photo by Joe Eisenberg, KØNEB)

Introducing a New Column and a New Columnist

We are proud to introduce the "Makers" column as of this issue, as well as columnist Matt Stultz, KB3TAN.

The "maker" movement is a growing do-it-yourself (DIY) phenomenon among mostly younger, tech-savvy individuals who enjoy hands-on tinkering and experimenting with electronics, crafts, and similar projects. Many "makers" are not familiar with amateur radio, even though hams have been "makers" since the dawn of radio. It is the goal of this column to help build and strengthen bridges between the ham radio and "maker" communities. It will appear quarterly, in the March, June, September, and December issues.

Matt Stultz, KB3TAN, is the founder of "HackPittsburgh," a "hackerspace" or community workshop for makers in Pittsburgh, Pennsylvania. He has been a ham since 2009 and has integrated amateur radio into many of HackPittsburgh's activities. He recently moved to Rhode Island to begin a new job as a web developer for Makerbot Industries. Matt can be reached via e-mail at <kb3tan@cq-amateur-radio.com>.

—*W2VU*

A word about the word hacker. To some people, the term instantly brings to mind the images often portrayed in the media of evil computer hackers trying to steal your credit cards, but we take the hacker name from where it started, an amateur or tinkerer trying to seek out knowledge through often nontraditional means.

Amateur radio has had a long tradition of members in the community tinkering and designing equipment and systems to further the hobby. In the early days of amateur radio, great engineers *(and non-engineers—ed.)* designed and built their own receivers and transmitters. Later, companies such as Heathkit came around, offering well-documented kits for those interested in learning about electronics and radio by building their own.

Even today, with the high quality of commercial equipment available there are thousands of amateur radio kits and designs available on the internet. This helps continue to encourage hams to build their own gear and teach the fundamentals to new amateurs getting their feet wet in the hobby.

Beyond the creative aspect of learning electronics through building your own equipment, amateur radio is also one of the few resources available to those who want to experiment with RF. Most other radio services, even if unlicensed, require the use of unmodified FCC-approved devices. Hams are not only permitted, but encouraged to design, build, and modify gear for on-air use.

This combination of a history of creating tools to help others learn about RF electronics and the legal "sandbox" to play in throughout the years have attracted many a "maker' to the hobby, long before that term existed in its current use. Today, a new breed of makers, hackers, citizen scientists, and amateur engineers are coming together to create a DIY (Do It Yourself) revolution.

New kit makers such as Adafruit Industries (http://adafruit.com/) and Wayne and Layne (http://www.wayneandlayne.com/), among many others, create easy-to-build kits, with fantastic documentation, that teach their customers the basics of working with electronics and programming microcontrollers. Another member of this family of kit creators is MakerBot Industries (http://makerbot.com/), which makes a kit allowing customers to build a 3D printer capable of creating objects out of plastic (You can find my own design for a Yaesu FT-817 cranker knob at <http://www.thingiverse.com/thing:5752>).

These companies have followed in the footsteps of the open-source software movement and created all of their projects as open-source hardware. As part of this, they release all of the details to allow anyone to create these products on their own. This includes schematics, board layouts, parts lists, and any source code that might be needed for the software side of things. Despite essentially giving away their products, many of these companies are hugely successful, with customers preferring to buy kits from these makers instead of copying their work. The high quality of kits that they produce, and the level of support they provide for their customers, encourages repeat business and customer loyalty.

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e-mail: <kb3tan@cq-amateur-radio.com>

Photo A– Teaching students to solder at HackPGH by building a clone of the low-cost Arduino microcontroller board. (Photo courtesy Marty McGuire)

The big thing I realized at Dayton was how much the hacker/maker movement was similar to the amateur radio hobby—and how much we owe the amateur radio community for leading the way.

The real heart of the maker movement, though, is hackerspaces. Hackerspaces are independently run workshops in many cities throughout the world. Members share the cost of rent and utilities, along with tools, test equipment, and other materials needed for members' projects. The website <http://Hackerspaces.org> contains a map listing many of the hackerspaces and where they can be found (see <http://hackerspaces.org/ wiki/List_of_ Hacker_Spaces>). In these spaces, members collaborate to work on the fun and unique projects that they dream up. While some of these workshops specialize in what they work on, such as DIY biology or software development, most of them generalize. This generalization creates an atmosphere in which members' diverse backgrounds and talents create projects that reflect these different skills.

"Hackers on a Plane"

Hackerspaces are nothing new in Europe, and there were a few shops like them in the U.S. in the past. They really took off in the U.S. in 2007, after a group of makers and hackers from around the states flew to Europe for the Chaos Communications Camp. While there, they went to see some of the European hackerspaces. This trip was dubbed "Hackers on a Plane" and has

been followed up with numerous other trips around the world, with more in the works. When this original troop of makers arrived home, they knew they had to form their own hackerspaces in the US. Soon spaces sprang up in Washington DC, New York City, San Francisco, and other cities. These shops helped inspire others to create their own spaces, and the movement continues growing today.

A word about the word hacker. To some people, the term instantly brings to mind the images often portrayed in the media of evil computer hackers trying to steal your credit cards, but we take the hacker name from where it started, an amateur or tinkerer trying to seek out knowledge through often non-traditional means.

Starting My Own Space

My experience with hackerspaces began in 2009, when I co-founded HackPittsburgh in Pittsburgh, Pennsylvania. HackPittsburgh has a workshop conveniently located near downtown and many of Pittsburgh's universities. The space is split up into areas for storage, relaxing, sewing and crafting, cooking, work tables, and a tool shop. The shop is an eclectic mix of recycled parts from old electronics, reference books, storage for raw materials, and tools that allow members to build the projects on which they are working (see photo A).

Long before I was licensed, I had an interest in amateur radio. My curiosity was piqued in 2003, when I began tinkering with my own WiFi antennas. I decided to go to a hamfest that I discovered was going on near my home at the time in Florida. I stopped in to try to find antenna parts: coax cable, SMA connectors, TNC connectors. What I found was a home for my tinkering heart. Vendors were selling an assortment of components and tools that before I had only read about on the Iinternet. As I walked by booths beeping out tones of receivers picking up CW signals I was enthralled. I knew one day I was going to have to sit down, study, and become a licensed amateur radio operator.

After I formed HackPittsburgh, I decided to go to the Dayton Hamvention®. I had heard of the plethora of vendors selling any component you could ever want, and from Pittsburgh it was an easy drive. I once again fell in love with the hobby and decided I shouldn't wait anymore. When I got home, I started studying right away. Soon afterward, I had my first license. The big thing I realized at Dayton was how much the hacker/maker movement was similar to the amateur radio hobby—and how much we owe the amateur radio community for leading the way.

I decided that it would be great to try to get the members of HackPittsburgh involved with amateur radio. I started telling everyone about what I had seen at Dayton and some of the things you could do with amateur radio. Many of them were already interested from having experiences similar to mine, or had friends and family already involved.

The idea of building radios that fit inside Altoids® tins, but could still connect with others around the world, excited some of the other members of the group. Enhancing WiFi equipment with high-speed multimedia capabilities piqued more interest from our friends. It was not long before I began running study sessions to help members get their licenses. Soon we had over 15

Photo B– Moments before release of HackPittsburgh's A2 balloon, our entry into the "Hackerspaces in Space" competition. This activity cemented ham radio's role in our maker group. (Ballooning photos by and courtesy of Jonathan Speicher)

licensed amateurs in the club, and many of us were going on for our General and Extra Class licenses.

With so many members now licensed, we began thinking of fun things to work on that involved ham radio. Some of us began building Softrock SDR kit radios; others worked on Yagi antennas for contacting satellites. We invited experienced amateurs such as Harry Bloomburg, W3YJ, and Bill Kristoff, N3BPB, to teach us about digital modes and Morse code.

Building Bridges

When we went out to a Makerfaire, or other meet-ups where makers tend to gather, we would run into people from other spaces who were also getting involved with amateur radio. Often, though, we would also meet people in the community who just didn't get what the draw was. Even within our group, many members just didn't see what the appeal of amateur radio was for those of us already in the hobby.

Finally, a challenge came along that really made being a ham useful. Another hackerspace, Workshop 88 in Chicago, Illinois, created a competition for hackerspaces around the globe—"Hackerspaces in Space." The competition consisted of each workshop building a weather-balloon system, launching it into the upper atmosphere, taking pictures of the curvature of the Earth, and successfully recovering the payload. The team that could do it the lightest, the fastest, and the cheapest was the winner. Knowing that other radio amateurs had done projects like this in the past, we set off to learn what they had done. We soon became engrossed in APRS and AX.25 protocols, building low-power transmitters for trackers, learning how to get high-altitude GPS units, and building parachutes that would bring the whole thing home safely. Working on this project, more than any other, helped to convince some of the remaining unlicensed members of the group (such as my wife) that there was fun to be had in the amateur radio hobby. (See photos B, C, D, and E.)

After doing well in the Hackerspaces in Space competition (we came in fourth), we began showing off the high-altitude balloon work we were doing at some of our local hamfests.

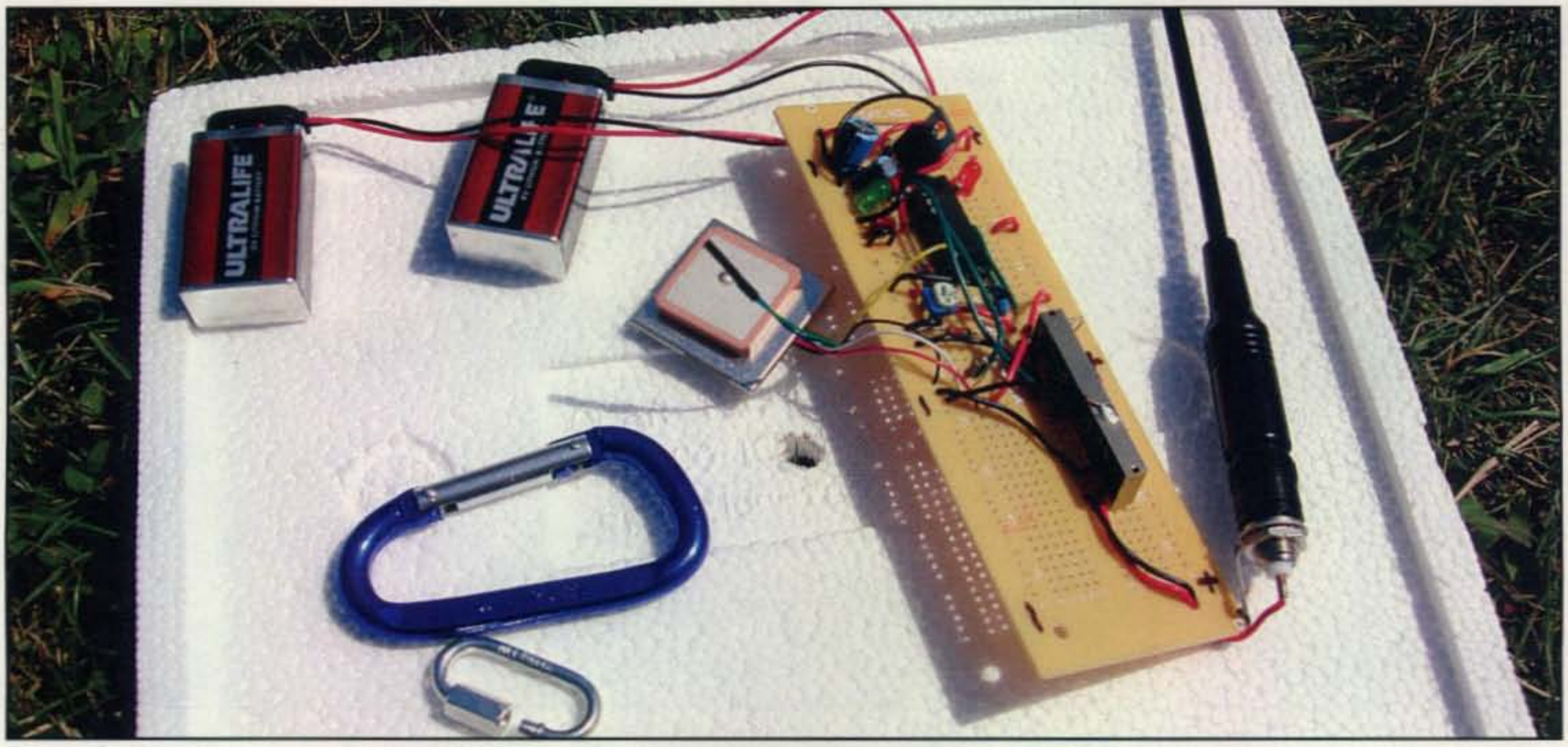

Photo C– The low-cost homebrew APRS tracker in the A2 and successive HackPGH balloon launches.

Here we ran into experienced hams who had never heard of our organization, but really enjoyed seeing what we did with the balloons. When we tried to explain to them some of the other projects and activities in which our shop participated, though, many of them became confused.

Why would we make an LED sign that automatically showed Twitter messages sent to the shop from the outside world (photo F)? Why would we modify a children's toy car into a racing vehicle to take on other hackerspaces in a silly race that looks like something out of a video game or a movie from the 1970s? I've often heard the expression "One man's junk is another man's treasure" used to describe items, but the same goes for hobbies.

I think the high-altitude balloon project is a great example for skeptics in both groups. Other maker groups have tried launching their balloons with cellphones that let them know where the balloon was when it landed, but they could not communicate through the entire flight. We took advantage of our group's amateur radio skills to use an APRS tracker that allowed us to follow our balloon through its entire flight. Being able to follow the balloon in real time led us to have the fastest time from launch to recovery in the competition. Our hacking skills also came into play, allowing us to modify the firmware of an off-the-shelf camera to take the required time-lapse photos inexpensively and without special equipment. We also were able to modify our APRS tracker to help bring down the cost and weight. We now have successfully test-flown a new tracker that is based on the Arduino open-source hardware project that will further diminish the cost and weight.

Photo D– Tracking the A1 balloon launch with our home-brew 2-meter tape-measure antenna.

While we have encountered some skepticism from both hams and makers, it is not present across the board for both groups. Obviously, as mentioned, HackPittsburgh is heavily involved in amateur radio, as are many of the other groups that competed in the balloon competition. HackPittsburgh's friends at Interlock in Rochester, New York, have also run study sessions to help encourage their members to join the hobby. Many experienced hams have also seen the possibilities in hackerspaces and have helped our space and some of our friends' workshops go further in their endeavors by mentoring us along the way.

These collaborations are an amazing thing, and I think we all would benefit by continuing them further. Amateur radio needs to continue to bring younger generations into in the hobby. The young hackers are looking for knowledge and expertise. The diverse backgrounds of many seasoned members of the amateur radio community, as well as the hobby's helping culture, can readily provide that assistance.

It has also been argued that many hams could benefit from getting back to their DIY roots. Learning more about electronics and how your system works will only make you a better operator. Building your own gear is fun and often a great economical solution compared to off-the-shelf equipment. Many of the new digital fabrication techniques being used by members of the maker community enable users to create their own parts with ease.

Getting Involved

How can hams get more involved with the maker community to help expand these collaborations? My first suggestion is to find a hackerspace near you. If you live anywhere near a major city, there is very likely a chance that there is one there. See what its open hours are and visit it to see how you

Photo E– An image of the Earth taken by the A2 balloon launched by HackPittsburgh on August 8, 2010. (Photo by HackPittsburgh)

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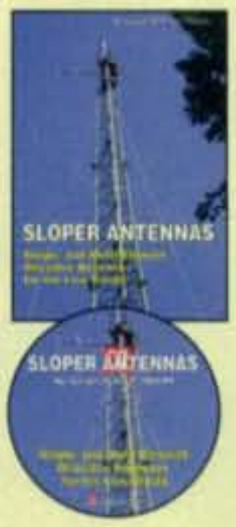

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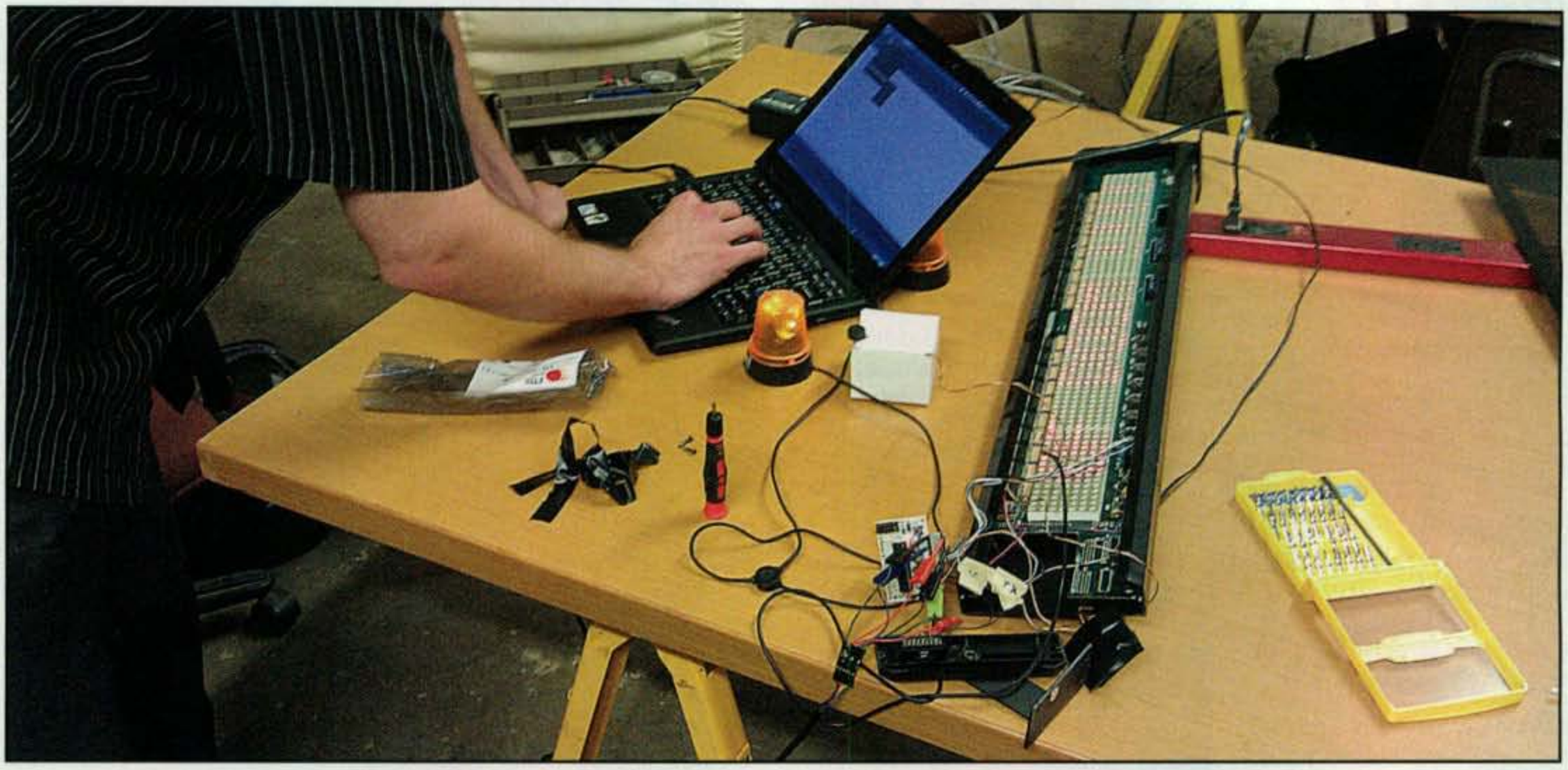

Photo F– HackPGH members working on another shop project, the conversion of a 20-year-old LED sign to display Twitter messages sent to HackPGH. (Photo by Matt, KB3TAN)

can get involved like other members, or if they specifically need licensed amateurs to help them. Most hackerspaces are open to anyone with an interest to join. Some require some kind of sponsorship from an existing member or a trial membership time, but if you come with an open mind you quickly will be embraced into the community.

If you live too far away to get involved with a hackerspace, you can still get involved with some of the maker community's big festivals. Makerfaires, like hackerspaces, are popping up all over the world. They are a combination of a classic science fair, an off-the-wall art bazaar, and a modern craft festival. There are currently three large official Makerfaires, one in the San Francisco Bay area, one in Detroit, and one in New York City. There are also many smaller, unofficial faires, with new ones being added every year. Going to one makes a great family trip (there are almost always kids' activities), and nearly all have an amateur radio presence that could either use your help or could be expanded if you have something great to show off.

Of course, in today's world you also can participate virtually. Websites such as the Make Blog (http://blog.makezine.com) and Hack A Day (www.hackaday.com) often feature ham radio projects submitted by their readers. These sites have a great penetration into the maker world, and the more amateur radio projects they can show, the better the exposure for the amateur radio world.

Shared Traits

The maker movement and the amateur radio community share many of the same traits, often just working toward different end goals. We all are makers, both hackers and hams. The more we work together and learn from each other, the better we can make both of our communities for the future.

Is your radio club involved with a local maker group? Do you have project nights in which non-hams might be able to participate? I'd like to hear about your activities and share them with the readers of CQ. Please contact me by e-mail at <kb3tan@cq-amateur-radio.com>. 73, Matt, KB3TAN

kit-building

BY JOE EISENBERG,* KØNEB

"Opening a Fortune Cookie"

Building the Chinese KN-Q7A Transceiver

The last fortune cookie I opened said, "You will begin a new project." How prophetic that cookie was! I have made kits that hail from places such as Singapore, Hong Kong, the UK, Finland, and of course, the USA.

My first kit from China is the KN-Q7A, a 10-watt, 40-meter SSB transceiver from CRKits.com (photo A). This kit is assembled using the stage-by-stage method, allowing the builder to test each stage before the final assembly. The KN-Q7A is packed with a matching case and knobs, and you can order an optional microphone to go with it or wire it for your favorite mic. Like most kits, you will need an external speaker and a 12-VDC power supply.

The supplied PC board is a high-quality, double-sided board with components marked on the board. The unusual thing about the board markings is the lack of the usual component nomenclature. Instead of C1, C2, R7, Q3, etc., for parts identification, the actual component values are printed on the board. There is a big exception to this, however, and that is the .1-µF capacitors, which are by far the most numerous part in the kit. Those simply are marked with the capacitor symbol with no value next to the marking. The 1N4148 diodes also are simply marked with the diode symbol on the board with no value shown.

The other difference from most other kits I have assembled is that the resistors supplied with this kit have five color bands instead of the usual four. The parts list has the color codes listed for each resistor. The extra band on the resistors allows for an extra significant digit in the component value. There are also three rectangular holes in the PC board (see photo B). These holes are for mounting transistors with higher power dissipation, utilizing the case for a heat sink.

To prepare the case, a drilling template is available for downloading and printing. I used my Dremel® rotary tool to start each hole to be sure it was close to the exact position needed, and then enlarged the holes using my regular drill. There are also four holes for mounting the rubber feet, a nice touch when most other kits use adhesive rubber feet. The PC board simply slides into the case and is held in place by the front and back panels. The front and back panels are made from PC board material and replace the plain plates that cover the ends of the case when it is shipped. When building this kit, you should be sure that you have trimmed all of the leads below the board to be sure they are as short as possible. There is not much clearance between the board and the bottom of the case, but there is more than adequate space as long as you keep the bottom leads trimmed closely.

For alignment, be sure you have a good insulated tuning tool with a small regular straight blade, along with a signal generator or a good antenna, and a wattmeter and dummy load. The frequency coverage of this kit is a 20–25 kHz segment of the 40-meter phone band, but it can be widened. You can order the kit with a choice of segments. My kit covers the top part of the 40-meter phone band. The directions caution that if the VXO is adjusted for wider coverage, it may come at the cost of less stability in the VXO. Therefore, try experimenting with the bandwidth of the VXO for optimum bandwidth versus stability, and be sure you calibrate your tuning knob so you do not transmit over the band edge. Without a signal generator, it still is possible to align the receiver using a known receiver and comparing what is received in each. I have found by turning down the RF attenuator pot, it is easier to peak the bandpass filters for best receive performance. The audio gain is adjusted by the front-panel IF gain control. The design of this kit has the audio amplifier with a fixed output, but varying the gain of the IF controls the audio volume as well as the sensitivity.

Technical support is provided via a Yahoo! Groups page as well as by directly e-mailing the kit manufacturer. I found both resources to be quite responsive and very helpful with suggestions.

The most often talked about modification for this kit is an internal speaker, which, if carefully positioned, will fit inside the case. A few things I might add include a power switch and maybe an LED to

Photo A– The KN-Q7A 40-meter transceiver kit from CRkits.com in China may be ordered directly or from a U.S. distributor.

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

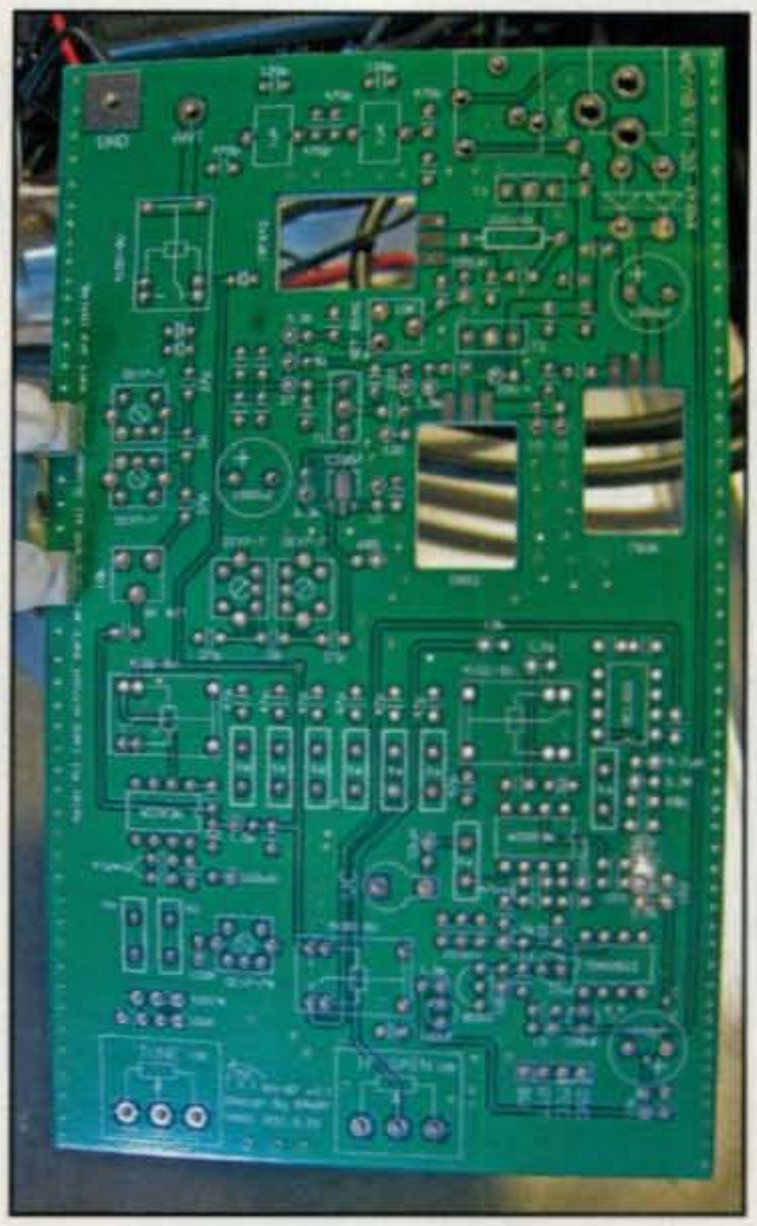

Photo B– KN-Q7A board ready to begin. Note the holes for mounting high-power-dissipation transistors. See text for details.

indicate when it is in the transmit mode, although you can easily hear it change modes. The KN-Q7A has four relays to change from receive to transmit, so during the transition you will hear four relays click when you key the PTT.

Assembly time for this kit is a couple of afternoons, and taking it slowly will assure you of the best chance of success. The completed kit is shown in photo C. Check out <http://www.crk-its.com> to order this or other kits by Adam Rong, BD6CR. In addition, these kits are now being distributed in the U.S. by QRVTronics (see <http://www.QRVTronics.com/HAM-Radio>).

The QSYer

Another kit that caught my eye is the QSYer (photo D). As I have mentioned before, sometimes the only way to make an affordable item for the amateur radio market is to bring it out in kit form. The QSYer fits this description perfectly. The QSYer looks just like a telephone keypad, but is a lot more. This kit allows the user to add direct-frequency entry to a number of popular HF radios that do not come with this capa-

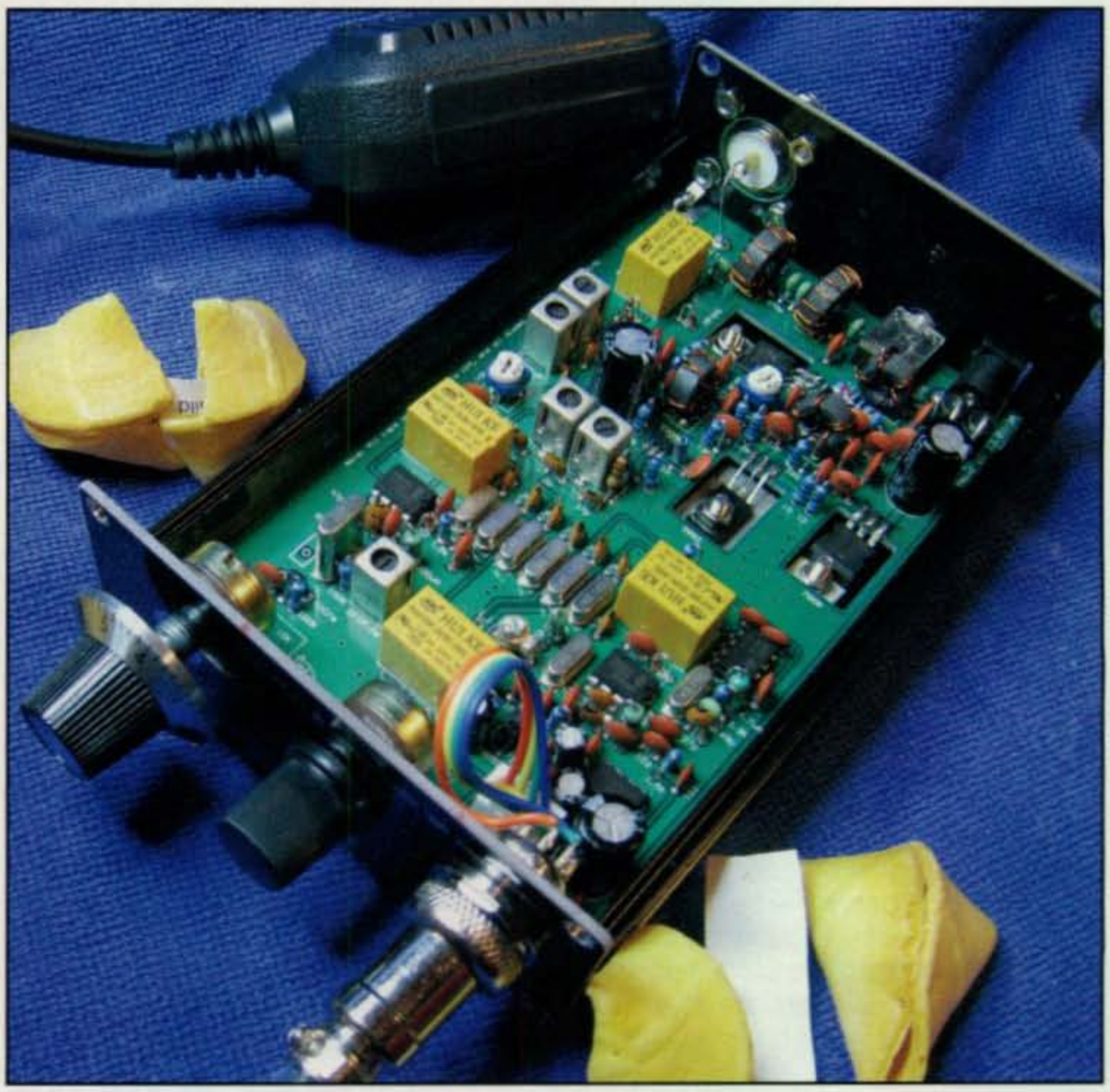

Photo C – The completed KN-Q7A kit. Fortune cookies are for size comparison.

Photo D – The QSYer by W2FS allows direct frequency entry on many rigs that do not offer this as a standard feature.

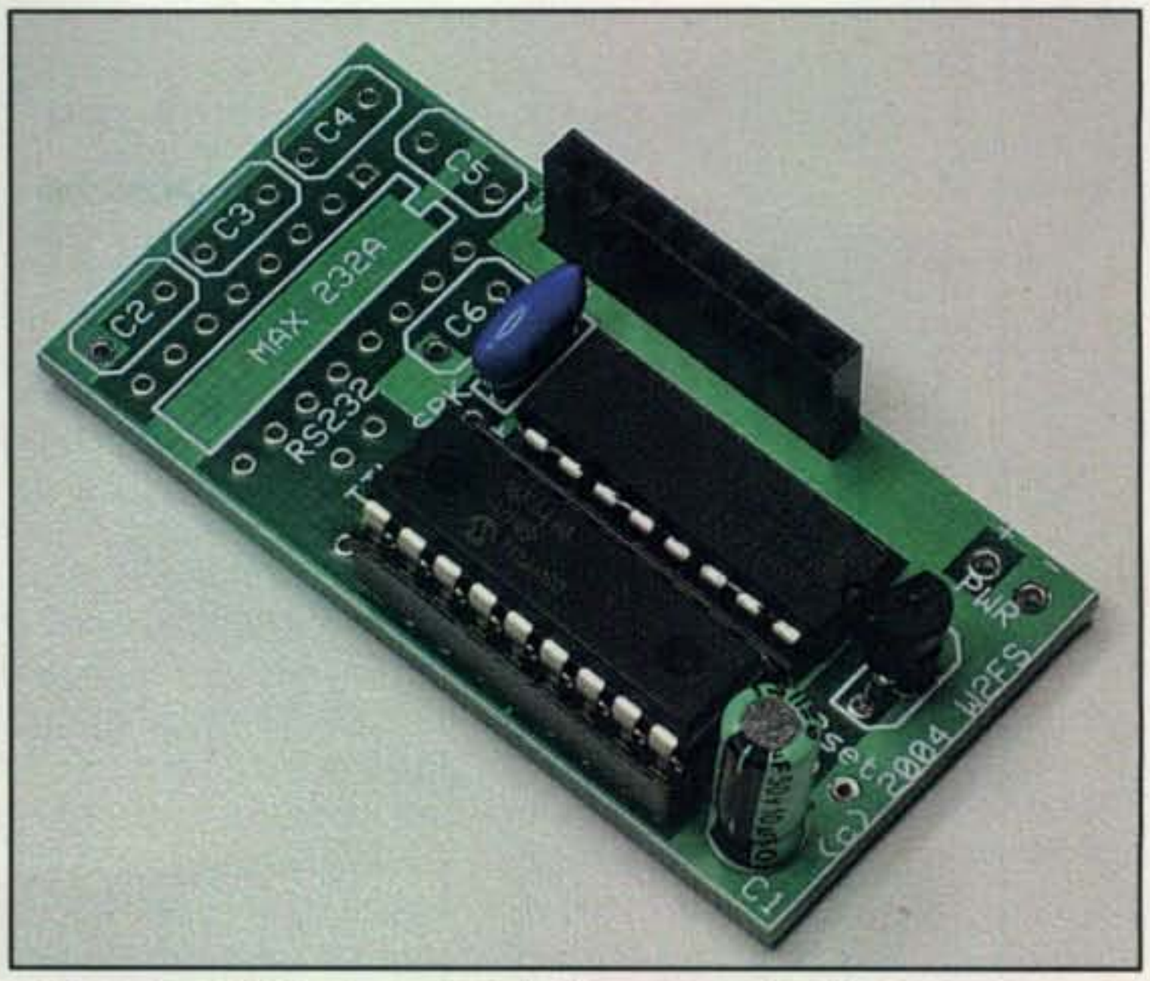

Photo E– QSYer board with all parts stuffed before wires and battery holder are added.

bility. Most notably, this kit works with the popular Yaesu FT-817, which has room for very few front-panel controls. By simply entering the desired frequency, the radio will change to the desired frequency! A lot of smaller HF rigs do not have this capability, a feature reserved for larger-size radios with room for a keypad on the front panel. The QSYer is programmable to change its output, so it is compatible with several different radios. All you need to do is enter the correct code for the new radio and plug it in. The parts count is a grand total of six board-mounted components (photo E) in addition to the needed wires and battery connector. There is space for an RS-232 interface chip to be added to the board for possible future expansion in the firmware to accommodate radios that can be controlled via the serial port.

Assembly of the QSYer is easily possible in less than an hour, making it a great first-time kit as well as a great group kit-building experience. Make sure you have a hot-glue gun handy, such as those often found in craft stores. The hot glue is used to secure the PC board in the keypad case. John Hansen, W2FS, is the creator of the QSYer, and you can order it at <http://www.qsyer.com>.

Until next time . . .

73 de KØNEB

SUCH A HAM

No use sitting around sulking while I'm in the shack, Mavis.

learning curve

BY RICH ARLAND,* K7SZ

Sea-Double-You: The Original Digital Mode

I haven't quite figured it out as yet, but I have a lot of fun with Straight Key Night (SKN) every New Year's Eve. SKN is not a contest, but an operating event, with the main idea being to get on the air using a straight key (a hand key, no paddles or electronic keyers allowed) and leisurely work other SKN participants for about 24 hours. All in all, it is a great time to be a ham! There is a certain excitement involved when using an original piece of telegraph/CW apparatus like a straight key. Some SKN aficionados even go so far as to drag out old vacuum-tube gear (lovingly referred to as "boatanchors") and use these radio relics in conjunction with their straight keys during this operating event.

This year's SKN event found me in Tampa at our daughter's home celebrating the New Year. Thankfully, Gwen's yard contains a couple of palm trees of the proper height that I have utilized on more than one occasion to support a multi-band dipole antenna. It took about 45 minutes to erect the 40–15 meter dipole and set up the station.

Originally I had planned to use my 1960s vintage Drake 2B receiver (with the 2B-Q speaker/Q-multiplier accessory) and a clone of the Ameco AC-1 two-tube, crystal-controlled transmitter for SKN this year (photo A). With the revelation that we would be traveling over 400 miles south to Gwen's place in Tampa, I had to rapidly change my plans regarding radio gear for SKN 2012. Having procured an HB-1A tri-band (40-30-20 meters) CW QRP transceiver earlier in 2011, I quickly decided to take that radio and my Bencher RJ-2 straight key on our journey south (photo B).

My SKN operations were split between on-air time and family time. After nearly 50 years in this hobby, I have learned (sometimes the hard way) that you don't put your hobby ahead of your family. Using the HB-1A and the dipole antenna, I first worked a German station on 40 meters. I followed this with half a dozen stateside SKN QSOs, each lasting well over 30 minutes. This is one of the things that draw hams to operate SKN—an unhurried contact with a fellow CW operator. Code speeds vary, but seldom are they over 15 words per minute (wpm), which makes for some very leisurely, interesting, and informative QSOs. Speed is *not* a factor. Having a comfortable, enjoyable QSO and honing your basic CW skills are the main ideas behind SKN.

A few years ago a group of enterprising hams got the idea that SKN should not be limited to just once per year. Therefore, they founded the Straight Key Century Club (SKCC): <http://www.skccgroup.com/>. The SKCC has several thousand members who regularly gather on the air to swap membership numbers, work towards a rather interesting series of awards, and promote ham radio through the use of straight keys and bugs—*no*, not those kinds of bugs, semi-automatic CW sending devices. We'll cover bugs a bit later.

*770 William St. SE, Dacula, GA 30019
e-mail: <k7sz@live.com>

Photo A– The Drake 2B receiver (circa 1960) on the far right hooked to my clone of the Ameco AC-1 two-tube crystal-controlled transmitter (middle) was my first choice to operate on SKN 2012. The Drake 2BQ-speaker/Q-multiplier is the black box on the extreme left of the picture. However, plans changed and I ended up using the gear seen in photo B.

Photo B– Shown here is the HB-1A 40/30/20-meter CW Trail Friendly Radio (TFR) that I took to Tampa for SKN 2012. The Bencher RJ-2 chrome straight key is shown on the right. This rig and key garnered several SKN contacts, including one European DX QSO!

So, with all this emphasis on low-speed CW contacts and the use of straight keys, have I whetted your appetite yet? Whaddaya mean? You don't know Sea-Double-You?! We'll talk about learning CW in a minute, so relax and get ready to have some fun; real fun, right out of the days of ham radio yesteryear!

We have mentioned straight keys several times in the previous paragraphs. What is a "straight key"? Simply put, a straight key is a communications device dating back to the very beginning of electronic/electrical communications that is used to make dots and dashes in the form of Morse code, first on land-line telegraph then later over radio circuits. The key is what makes the dots and dashes used in code (CW) transmissions. When we refer to a key used with radio equipment, we are actually talking about a switch, of sorts, that turns the transmitter on and off in step with the dots and dashes we send to form a message. Looking at a basic straight key you can see that one contact is connected to the transmitter keying circuit and the other contact is "grounded." When the key is depressed, it completes a circuit within the transmitter and produces RF output. In short, it "keys" the transmitter.

In the days of yore, when we used vacuum-tube transmitters, it was common practice to key the transmitter's final-amplifier cathode circuit to produce this output. It was simple to implement and normally didn't have any nasty habits such as chirps or clicks on the output. The down side: Full transmitter output current was present at the key terminals, so one had to be very careful not to come in contact with the terminals where the key was tied to the transmitter. The results were somewhat startling, if not downright scary, to those who "forgot" or got careless and managed to contact the key terminals!

Thankfully, solid-state transmitters don't have that problem, so you can put your hands anywhere on the key without incurring any electrical shocks or RF burns. That's called progress!

Many hams, especially CW aficionados, collect keys and all sorts of telegraph/CW accessories (photo C). Keys that people couldn't give away at hamfests 20 years ago are bringing top dollar today on internet auction sites! Go figure. My advice on selecting a straight key: Stay with models from well-recognized manufacturers such as the J-37, J-38, & J-44 military keys; the Bencher RJ-1 or 2; J.H. Bunnell straight keys; Nye Viking Speed X key; the Ham Key HK-3; and the Vibroplex straight keys. There are also a large number of imported keys hitting the market. The Chinese heavy-duty K4 and K5 models, as well as British and Canadian military keys, can regularly be found on internet auction sites. One of my "go to guys" when I need a key, some CW accessories, or just want to chat about CW is Marshall Emm, N1FN, who owns Morse Express (http://www.mtechnologies.com/), a CW emporium of galactic proportions! Marshall is a great guy, and he is always available to answer questions regarding CW, keys, bugs, paddles, and accessories. He maintains a great selection of domestic and imported CW keys for sale. Hit Marshall's site and check out the "CW eye candy"; you'll be glad you did!

We've talked a lot about straight keys, and I am sure that provided you are observant you've noticed several adjustments on these keys. So exactly how does one adjust a plain-vanilla straight key? It's pretty simple, actually. Rather than spend the time and column space on detailing how to adjust a straight key, go to: <http://www.mtechnologies.com/misc/keyadj.htm#Straight> and follow the excellent instructions outlined there courtesy of N1FN. Once there, you'll notice that there are also sections devoted to adjusting a paddle set and semi-automatic CW keys, more fondly called "bugs."

Get the insecticide, Martha! We're infested with BUGS!

We'll devote the majority of another column to keyers and paddles for CW. I'd like to wrap up this column talking about semi-automatic keys, or "bugs," and my thoughts on learning the code.

Photo C– I don't collect keys or paddle sets. . . . Well, OK, maybe I have a small collection! Shown here are my three straight keys left to right: HamKey HK-3, WW II British key, and the Bencher RJ-2. All perform well and are a blast to use.

Probably the best known "bug" manufacturer is Vibroplex, which has been around the telecommunications industry for almost 100 years. Why would someone want or need a bug? Good question, so hang on and we'll talk about that.

Vibroplex got its start in land-line telegraphy way back around the turn of the century. Commercial message-traffic handlers, military operators, and press telegraphers routinely handled hundreds of messages a day. One figure I recently heard was 20,000 *characters* per shift, per operator! That's a lot of "brass pounding," which ultimately led to a condition called "glass arm." Today we call it carpal tunnel syndrome. Remember, this was all done with straight keys (see example in photo D). That up/down "pump handle" motion took a toll on telegraphers, and not in a good way.

In order to reduce the workload placed on telegraph operators, in 1904 Horace G. Martin patented a device that would allow dots to be made automatically while the dashes were made manually. Thus was born the Vibroplex! In 1915 Vibroplex was incorporated and has been a main stay in amateur radio and the telecommunications industry for a long time!

Now before you run right out and buy a Vibroplex bug, there are a couple of things you need to know. First, they are not cheap. Vibroplex is still in business turning out several models of their bugs along with paddle sets and straight keys. The prices start around $200 for the "Original Standard" model. Secondly, bugs are not easy to learn how to use to send good CW. How do you get to Carnegie Hall? You practice, practice, practice. This goes double for learning how to use a bug correctly. It takes a lot of practice, and many people just don't want to devote the time. Third, bugs are "buggers" to adjust. True, Marshall Emm has furnished detailed instructions on his website as to how to properly adjust a bug, but nevertheless it is a time-consuming process. Of course, with Edsel Murphy hanging around the shack, it takes only one inquisitive child or grandchild playing with the bug to ruin a great alignment! Finally, bugs don't work the same way paddle sets do. I use a model PJ-6 single-lever paddle set (http://www.k8ra.com/index_025.htm) from Jerry Pittenger, K8RA, who makes some stunningly beautiful paddles. Dots and dashes are made automatically depending upon which side you push the paddle lever toward. Not so on a bug. Normally your thumb presses the dot paddle while your index finger presses the dash paddle. Learning to utilize both a keyer with paddle set *and* a bug can result in a pretty steep learning curve. It's best to utilize a code practice oscillator while learning how to correctly form letters and numbers in

Photo D– Recently I decided I needed a bit of turn-of-the-century nostalgia for the front room (my wife Pat says I can!), so I purchased an antique J.H. Bunnell telegraph sounder with straight key. This device was used in the days of land-line telegraph to transmit Continental Morse code (different from the International Morse we use in ham radio). In place of a tone in a receiver the operator copied "clicks" produced by the sounder. This one works; a 9V transistor radio battery is all that is needed to sample what it must have been like in the "old days."

Morse code with your new bug *before* you hit the airwaves and embarrass yourself beyond redemption! I know. . . I've been there!

If you want to procure a bug for your shack, whether or not you really intend to use it on the air, try the internet auction sites. Don't forget ham radio flea markets, swap meets, or your local ham club. Of course, there is always the option of buying a new one from Vibroplex (http://www.vibroplex.com/) or some other manufacturer. I picked up a nice Vibroplex Champion, circa 1944, with case for $70 on eBay a few years ago. I procured it primarily to go with my vintage military ham station consisting of some ARC-5 command sets. The excellent condition of this bug coupled with what I felt was a good price led me to bid and win that auction. Just don't get sucked into a bidding war for a piece of CW history that you can live without!

We've pretty well covered the hardware end of CW (keyers and paddles not withstanding), so let's close out the column with information on how to learn the International Morse code and increase our speed.

Learning the Code

In talking with my editor at *CQ*, Rich Moseson, W2VU, I was apprised of the fact that there has been a terrific upsurge in hams wanting to learn CW! It's only been a few years since the FCC dropped the CW requirement for obtaining a ham radio license, so I think it's amazing that now, since it is no longer a hurdle to cross, people are flocking to CW as a mode of communications. Who woulda' thunk it?

Learning the International Morse code takes practice, practice, and more practice. It has been my experience that women learn CW more quickly than men. Ditto with people who are musically inclined. There are many programs on the internet that will teach you the International Morse code. There are all manner of "systems" designed to help you not only learn the code from scratch, but to dramatically increase your code speed once you have the alphabet and numbers down pat. My advice is to find the CW operators in our local ham club, tell them you want to become CW proficient, and ask for their suggestions and help in attaining your goal. Be prepared for some diverse feedback. It would be best if you could actually try several CW learning programs before spending any money. There are some freeware CW tutorial programs out there on the net. Find one that works for you and stick with it. One

thing for sure, CW is *not* easy; anyway, it certainly wasn't for me. I struggled to crack 10 wpm for what seemed like years (actually about six months), but I finally made it. If I can do it, anyone can!

Chuck Adams, K7QO, is a CW icon. He is one of my "Ham Radio Heroes," to be sure. Chuck is a blindingly fast CW op who copies in excess of 80 wpm! He holds several records for his ability to copy Morse and is on a one-man crusade to ensure that CW does not perish in this day of digital everything. Chuck partnered with FISTS, a worldwide CW operators organization (http://www.fists.org/) that's been around since 1985. Chuck produced a complete code tutorial that not only instructs you on learning the International Morse code, but works to increase your speed quickly to become a better CW operator. In this way you can rapidly start enjoying this wonderful mode of communications. Chuck's code course is on the FISTS site and is available for download or on CD. Check the site for details.

As long as we are talking about FISTS, I'd like to emphasize the group's unofficial motto: "accuracy transcends speed." What does that mean? It basically means chop the throttle, hit the speed brakes, crank in full flaps, and lift the nose . . . in other words, *slow down!* Unlike voice or "phone" contacts, CW QSOs take more time, and if you have to keep repeating the same information over and over again because you are sending fast but inaccurate CW, what's the point? Slow down, spend the time sending perfect CW, and you'll be doing everyone a favor. Don't forget, most hams will come back to you at the same speed you initially contacted them. If you start transmitting machine-gun-like CW at twice the speed you can comfortably copy, don't be surprised if the other station comes back at you using the same speed. Should you ever find yourself in that predicament, remember these six CW characters: PSE QRS. I know, as I've been there, too!

That's all for this segment, gang. Next month I get to pontificate about one of my all-time favorite facets of ham radio—QRP! What's QRP? You are just going to have to read next month's "Learning Curve" column to find out. Until then, get a CW program, start learning the code, and look for me around 7030 or 3560 kHz at night. When I am working in the shack, I normally have the K3 turned on and set on one of those two frequencies, so lets' get together and have a CW QSO!

73, Rich, K7SZ

Dick Bentley, K2UFT, regularly demonstrates Morse code at hamfests and technical gatherings. This photo was taken on January 14th at the Atlanta area Tech Fest, which draws hams and non-hams alike. Dick's display includes telegraph sounders (I furnished my new sounder/key; see photo D) along with straight keys, Cootie keys, and bugs. Everything is hooked up to a code practice oscillator (CPO) for people to give telegraphy a try.

GPS at the Hip

BY GORDON WEST,* WB6NOA

Kenwood, ICOM, and Yaesu all have handhelds with GPS receivers and patch antennas as part of the package. Each manufacturer builds the GPS receive antenna into the top of the HT, with ICOM and Yaesu also offering the GPS receiver and antenna on the top of the speaker/mic. This makes good sense for the least body attenuation at 1575 MHz getting the antenna "in the clear." Not to say hams are chubby . .
.

Thus, our classroom students did some testing among the Kenwood D-72, the new ICOM ID-31, and the Yaesu VX-8GR, all three units with an internally mounted GPS engine and patch antenna. We tested them against the ICOM IC-92AD with the optional GPS speaker-microphone and the Yaesu VX-8DR with the optional GPS antenna unit in the mic. How big a difference would there be between a GPS antenna on an external mic and a built-in one hanging on a belt?

We found no noticeable degradation of GPS reception when hanging on the belt, in the clear as well as under trees. Never did we find we had to take an HT off our belts and hold it skyward for better GPS reception.

However, the tendency to rest one's hand on the top of a handheld with internal GPS reception indeed caused our GPS lock-on to drop out. Therefore, if you have a new HT with the GPS receiver and antenna unit built in to the top of the unit, the issue of some of your body blocking some of the GPS incoming signals may be no issue as long as you are moving around, giving that HT a shot at seeing a different portion of the sky. Luckily, GPS signals come in from a wide variety of direc-

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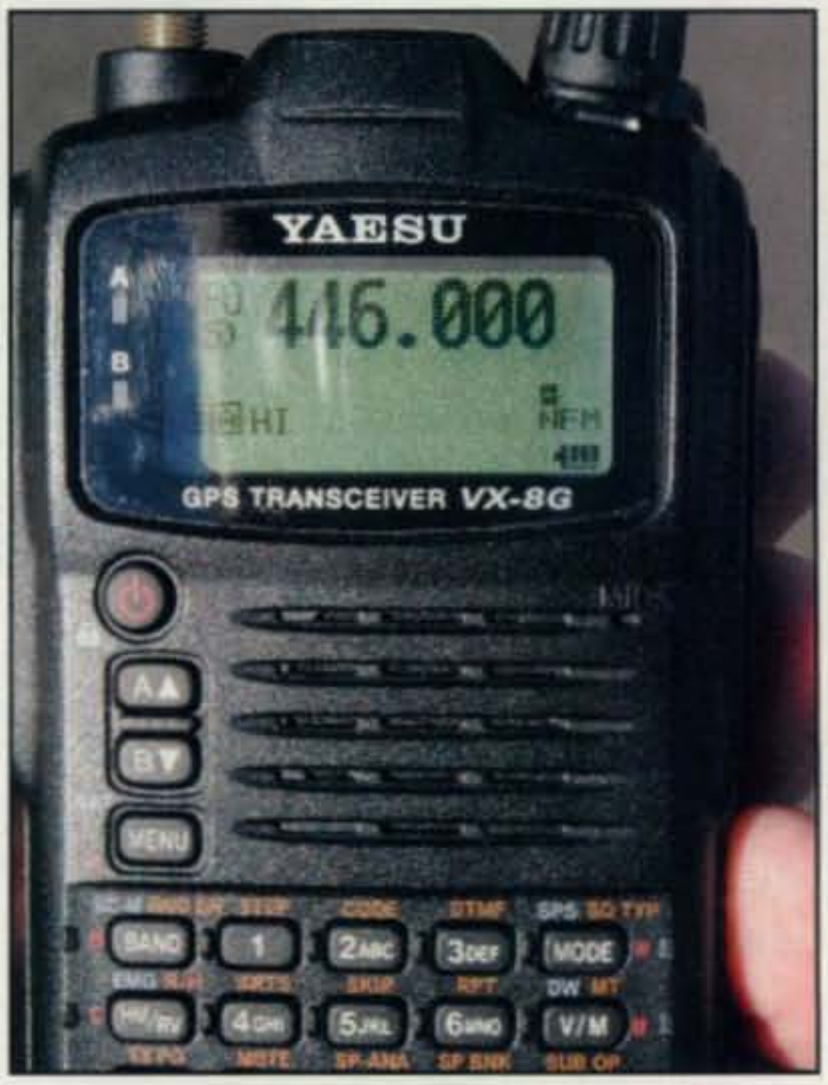

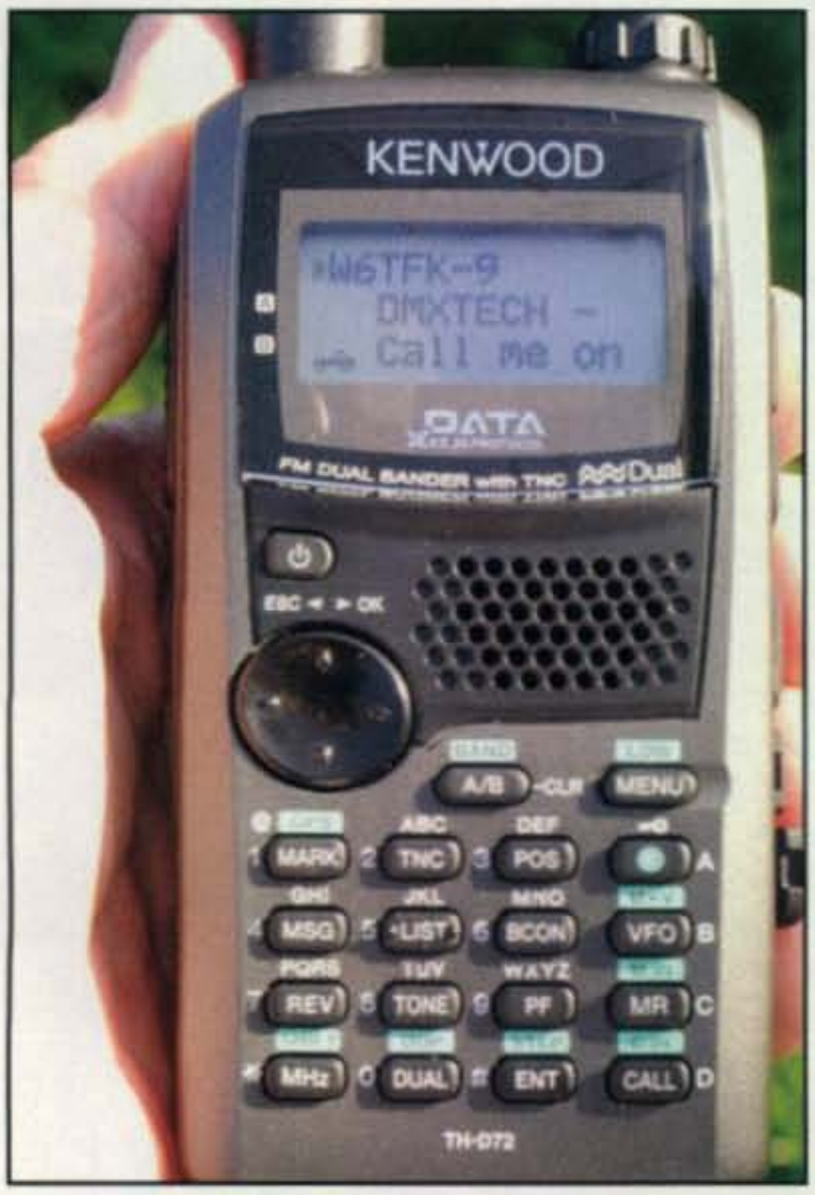

The Kenwood D-72 builds the GPS engine and antenna into the tip top of the HT. We found no loss of GPS signals from these HTs worn on the belt vs. those with external GPS antennas, as long as you keep your hand off the top of the radio!

The new Yaesu VX-8GR (top) builds the GPS engine and antenna into the top of the hand held; the older VX-8DR offers an external GPS unit that can be plugged into the top of the unit or matched into an external microphone.

An antenna trap offers high impedance to the frequency that is not allowed to travel farther down the antenna aluminum or wire.

This trap is defective from the manufacturer, which did not scrape off the outside shellac. This results in an open circuit between the coil wire and the riveted element. A simple visual inspection and an ohm meter check is all it takes to find obviously bad antenna traps. If the trap was burned up, you could see it and smell it!

This coil is what's underneath the outer trap cover. It develops a high-impedance LC circuit for signals at certain frequencies.

Here is where traps fail. The simple hose-clamp connection between elements develops high resistance.

Make sure the black trap boots are in place and are not cracked. They keep out insects! Replacement boots are easy to change.

tions and elevations, so the new ham equipment with internal GPS, along with older gear with an external GPS antenna in the mic, will work well on something such as a parade route. Just keep your hand off the top of the HT if the GPS antenna is built-in.

Work Those Traps

Beams and vertical antennas with LC traps sometimes may need some simple spring maintenance. Take your battery-operated SWR analyzer up to the roof and sweep for antenna resonance. If 10 meters and 20 meters "drop in" with low SWR on the band, but 15 meters is whacko, suspect the second trap out from the feed point as your first area for inspection. On the beam are the rain drain holes pointed down? If there is water in the trap, or a gaggle of critters, blow out everything with an air hose.

If the trap boots (which seal out varmints) are in place, and the trap innards are dry as a bone, loosen up the hose clamp and inspect for corrosion at the slip-in connection. If you treated the connection with black conductive goo, give it a re-lube and then check with an ohmmeter for *no* resistance.

Many times, aluminum telescopic sections mysteriously go to open rather than closed. Sometimes just servicing these slip-joints and redoing a stubborn hose clamp for a nice tight connection will get the job done.

At the end of the elements, that little tiny hose clamp may not be enough compression to squeeze closed the tip element. Clean up everything and go with a new pair of stainless-steel tiny hose clamps to get the job done.

Inspect the feed point to ensure moisture has not crept down the coax, and if everything looks good on the SWR analyzer, reconnect the coax that leads down to the shack. Now, down at the shack again sweep your multiband antenna for resonance on each band and note the SWR in your logbook.

If you're running barefoot, the chance of the actual trap arcing over or just "going bad" is remote. A simple multimeter check will confirm continuity of the internal coil and continuity at one end of the capacitive sleeve that covers the coil.

Always wear safety equipment aloft, including hardhat, safety glasses, and fall-preventing harness. Also make sure the coax is disconnected at the transceiver so no one accidentally keys up

when you're on the business end of antenna maintenance.

The Big Not-Good Pulse

My visit to Christmas Island, T32GW, offered an up-close look at atmospheric atomic testing equipment used during the Cold War. Stories of old tube radio sets mysteriously dying after the high-altitude testing were heard many times by the local residents.

The nuclear EMP (electromagnetic pulse) at high altitudes emits Gamma rays that interact with Earth's magnetic field, zapping nearly anything electronic down here on our planet.

As we approach the peak of solar Cycle 24 in 2013 or 2014, a huge coronal mass ejection (CME), like the one in 1859, has the potential of wiping out our power grid. If it is plugged in, it could be toast! *(It should be noted that such a huge CME, directed at Earth, is theoretically possible but highly unlikely—ed.)*

Should the worst happen, our spare ham gear could end up as the last working communications devices if they have been properly protected from an EMP. You could build your own Faraday Cage out of copper or aluminum or stainless steel, making sure that this enclosure is well grounded, too, to dissipate any EMP currents trying to get through to your gear. On the inside, I would use an old dry rubber wetsuit to wrap up my HT and alkaline battery pack (NOT connected), a shortwave receiver, and a separate alkaline battery set, and maybe an old HF radio with some lantern batteries. Button up the enclosure and keep it in a dry place, well grounded. Every few months exercise the gear inside the enclosure. Don't expect any repeaters to survive an EMP, so start your own simplex net with fellow hams in preparation for the unimaginable. I'll meet you on 20 meters, 14.300 MHz!

Young Cloner

Sixteen-year-old Elijah Derryberry, WA6EMD, one of the regular radio ops aboard the *Queen Mary*, W6RO, delights in radio programming.

His favorite radios are the complicated-to-hand-program Wouxun, TYT, and Baofeng. This young ham entrepreneur is also a source for this Chinese gear, and pre-programs a new ham's local repeaters, simplex, weather, and public-safety (receive) frequencies in new or customer-supplied HTs.

He is a kid-whiz at loading in the hot channels for anywhere in the country. His e-mail address is <Elijah@wouxun.us>.

Elijah Derryberry, WA6EMD, has a side business of programming the new Chinese hand held transceivers ... after he completes his school work.

Yaesu Adding Digital

Yaesu's President/CEO Jun Hasegawa has announced the reorganization of the company to better serve the amateur, marine, and air-band business. "After four years of joint venture with Motorola, we have decided to transfer the Vertex Standard land mobile radio business to Motorola and focus on amateur, marine radio, and air-band equipment," comments Hasegawa.

The newly independent company is now named Yaesu Musen Co., Ltd., and the U.S. subsidiary is Yaesu USA, Incorporated, wholly owned by the founder's family. The new company's logo will be YAESU, and in smaller print below it, "The radio." The marine division will remain Standard Horizon, and I am proud to be the early employee of Standard who dreamed up the product name "Horizon," based on VHF line-of-sight to the HORIZON!

Dennis Motschenbacher, in charge of amateur radio sales for Yaesu, has announced the company's entry into digital communications for the amateur radio market.

"Our 4 level FSK (Frequency Shift Keying) circuit is called 'C4FM modulation,' comments Motschenbacher, citing APCO P-25 using this modulation, as well as European and Asian markets using the same modulation as DMR (Digital Mobile Radio). A 15-page super-illustrated document, "A Digital Communications Guide for Amateur Radio Operators," is found on the Yaesu website, along with the announcement that the company plans to release new C4FM amateur radio handhelds as well as a C4FM mobile transceiver later this year, with a likely preview at the Dayton Hamvention™.

The new Yaesu digital system requires twice the bandwidth (12.5 kHz) as the ICOM D-STAR digital modulation at 6.25 kHz, with the wider bandwidth purported to double transmitted data speeds. Digitally speaking, it will be interesting to see how these individual non-compatible modes will frequency-fit on our ham bands.

See you at Dayton!

73, Gordo, WB6NOA

BY WAYNE YOSHIDA,* KH6WZ

A Most Sensitive Topic and the Pre-Estate Sale Idea

One of the hardest things to think about for all of us is what to do with all of our possessions when we die. It isn't a nice subject to think about, but, after going through some problems and arguments with relatives because of those who passed away without a will, I decided to make my "final plan documents" to decrease stress and provide guidance for my family, since it is a very difficult and time-consuming task to sort through and distribute or dispose of someone else's things.

I thought about friends and relatives who have either passed away or are octogenarians and older. Some of them are hams and many are not, but all of them had or have storage rooms full of "stuff"—various things that had some kind of value (monetary or sentimental) to them.

As far as ham equipment is concerned, some questions immediately come to mind: Who would want any of these items? What is any given piece of equipment worth? Should it be sold, given away, or donated, and to whom? Since electronic stuff is often considered "hazardous waste," where can we dump it? Would it be a good idea to sell the items to raise money, rather than give them away, in order to help settle any tax, debt, or legal obligations?

These thoughts became more important to me as I started a massive clean-up effort around my house, sorting through over 35 years of ham gear, test equipment, parts, magazines, and books. At the moment, stacks of stuff are stored in my garage, spare rooms, and closets. I am slowly decreasing the amount of items in and around my shack, rather than making more space or rearranging space to put things in (see **photo 1**).

I call this concept of reduction rather than storage a "pre-estate sale." The term "sale" is used loosely, since many of the things I have can be given away or donated to local charity organizations. Some items can be recycled at the scrap-metal yard. But the basic idea is to find new homes for the "good" items, where they will be used and enjoyed by someone, rather than being hidden away in a storage location, doing nothing except gathering dust. For example, I am giving away old magazines to new hams, or leaving them in waiting rooms at my various doctors' offices. The local library refuses to take them due to a lack of storage space. The final alternative is to place them into the recycle paper bin, but to me, magazines are information resources that should be read and shared.

I realize there are many collectors of these items, and I think it is very acceptable to sell or give stuff to these collector-people. Remember, the basic idea is to eliminate the items, or at least designate a final resting place for an item. Of course, soon after an item is sold or given away, an immediate need for that same item will certainly come up. When this happens, the solution is simple: Find another one.

Larger or more expensive items such as the HF transceiver and microwave radio systems are

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Photo 1– What's going to happen to all this stuff after I am gone?

Photo 2– Sorting by a component's first significant digit is a good way of storing, sorting, and selling multiple values of similar items. Here is box "5" of one-quarter–watt resistors. Values go from one-half ohm to 5.6 megohms.

another matter. Some day a lucky and deserving individual will receive these items.

What About the Small Stuff?

For some reason, every ham radio person I know has accumulated a collection of various electronic and electromechanical parts. Even those who are not really into building their own projects have at least one box of parts stashed somewhere. Whether they are spare parts that may eventually go bad, or some internal or external accessory to the main radio, there is always something stashed away in a closet space, garage, attic, or basement. Vacuum tubes, dial cords, pilot lights, spare battery packs, filters, or a spare microphone are typical examples. How many of these "just in case items" never failed during the owner's lifetime? Judging from the amount of "new old stock" items that appear everywhere equipment is sold, many of these spares were never needed.

A good idea for getting rid of lots of small parts is to group them into kits or assortments. Label the containers or bags to make it easy to find a particular value. For example, resistors can be sorted by their first significant digit and then sub-divided into their specific values (see **photo 2**). Establish a reasonable value, such as ten dollars for entire sections or assortments of values.

By the way, size is not necessarily a good way to estimate the value of something. For example, small-wavelength (higher frequency) microwave and millimeter-wave components are tiny compared to their HF counterparts, and yet are many times more expensive. Since you know the value of such specialty items, you must establish what you think is a fair "estate sale price" rather than making your executor guess or make up some arbitrary value. This is a good reason to include notations for the value of each item.

The Good and the Bad

I have seen some great bargains at estate sales. For example, a mid-end all-solid-state HF transceiver with general-coverage receiver, in good operating condition, recently sold for under $100. The original price was in the $1500 range and eBay auctions show winning bids as high as the $600 range. This makes me happy and sad at the same time—happy because it is a great deal for someone and because the unit will be put to good use. On the other hand, these sales make me sad because there often is a lot of emotional pain associated with the previous owner's family, and they may not be

Item No.	Manufacturer	Model No.	Description	Condition: Excellent/ Good/Poor/ Not Working	Purchase Date	Price Paid	Value/ Value Range	Notes
1	Motorola	Spectra	FM mobile, 900MHz	Not Working, low power output	July 2008	$50	Give away	1. Keep as a complete set – control panel, microphone, mounting bracket, main radio unit 2. Special frequencies are programmed – to be sold only to a local club member
2	American Optical	None visible. Property tag number 0009878934	Stereo inspection microscope	Excellent	June 2004	$195	$150	Make sure eye pieces are in place
3	Weller	WTCPT	Soldering station	Good	1985	Don't recall	Give away	Include spare Weller tips and parts in storage cabinet 3
4	Various	None	1/2W resistors	Excellent, new, unused	Unknown	Don't recall	$10 for 1,000 assorted values	Sell components in batches. $10 for 1,000 assorted values. Accept any offer over $30 for "entire lot" in storage cabinet 1
5	KH6WZ	None	Home made 12V power supply with meters	Good	Unknown	None	$20	Home made unit, heavy duty, works

Table I– Here is an example of a list of ham station and related equipment. It would be a good idea to update the document at regular intervals or as needed as you acquire and sell items.

receiving the true monetary value of the unit. This happens many times, especially if the family members are not interested in ham radio and the equipment and are under pressure to get rid of all the "junk."

A Legal Document for Everyone

Important note: I am not qualified to offer any legal assistance and cannot answer any questions for your particular situation. These are very general guidelines based on my limited personal experience with this situation. In any case, even if you are not ready to do anything along these lines, it would be a good thing to consider doing someday soon.

First, make your wishes known for all of your belongings—including your ham gear—in a will or a living trust. This is a legal document that will be the guide for everyone to follow. Sometimes a death in the family can be very destructive to family relationships.

Make a list of all of your equipment and its condition, including a description of what it is and how to identify a particular item, such as model number and serial number. Include purchase price and a reasonable value for the item. Equipment values can be established using various resources, such as completed online auctions and ham radio classified ads.

It would be a good idea to have an electronic file of this list, in either a word-processing or spreadsheet format. Don't forget the antenna system and tower if there are one or several. Antennas are usually the hardest things to dispose of, since they may be hazardous to people and property (especially the act of taking them down and disassembling them). Refer to Table I. This list would also be very useful for your homeowners' or ham station equipment insurance.

Print a copy as a backup and update the record when you buy or sell anything on the list. Values may be reviewed once a year or so. Pictures or even a video of the equipment would be excellent supplemental documentation, since images show much more than words can.

References and Resources

A website to help you create your own legal documents, including wills and living trusts, advertises on the broadcast AM stations in my area. It might be a good reference for anyone looking into making their will or living trust. I have not used their services, nor do I endorse this company in any way: Legal Zoom, Corporate Headquarters, 101 N. Brand Blvd., 11th Floor, Glendale, CA 91203; telephone 323-962-8600; <http://www. legalzoom.com>.

A now-closed discussion called "Managing Ham Radio Estate Sales" started by Jack Ritter, WØUCE, appeared several years ago on the eHam.net website. Go to the following link to see some opinions about ham radio estate sales: <http://www.eham.net/articles/22548>

Summary

This column is a departure from my usual topics, being more of a personal nature. However, it touches on a very sensitive topic that I hope everyone considers adding to the "must do" list.

73, Wayne, KH6WZ

BY JOHN WOOD,* WV5J

March Signals Start of Antenna Weather

Yes, April showers can bring all the May flowers they want, but March heralds the arrival of spring and with it the antenna weather we've been longing for all winter. Clear days and warmer temperatures are all the excuses most of us hams need to get outside and tune up our skyhooks or install the new antenna that was purchased months ago and has been waiting in the corner for those freezing temps to break.

Light Beam Antennas

If you have to deal with covenants, height restrictions, or complaining neighbors, you may find a solution for your situation when you review and evaluate the products of Light Beam Antenna and Apparatus, LLC of Canandaigua, New York. Light Beam Antenna offers a line of antenna products that are compact, lightweight, and designed to operate at the height of 30 feet (photo A).

The Light Beam and Light Beam Plus antenna products are designed for high performance in the amateur radio band from 20 to 10 meters, depending on the model. They are very compact with a very short turning radius and a low surface area. Comparing antennas designed for a given ham band, the Light Beam antennas are said to be a fourth of the width of a normal dipole or Yagi and are half the size of a full-wave quad antenna.

Depending on the band you select, Light Beam antennas are small and light enough to easily be mounted on a rooftop tripod or can even be positioned within an attic space. A simple pole structure can also be used to support the antenna at the optimum 30 feet. No heavy-duty tower is required. Flexible mounting methods, combined with Light Beam's design of an extremely strong and lightweight support structure, result in an antenna system with the high efficiency you need to work DX but low visual impact that should delight your neighbors.

To learn more about Light Beam Antenna and its products, visit <www.LightBeamAntenna.com>, call toll free 1-855-349-6442, or e-mail Wayne Freiert at <WFreiert@LightBeamAntenna. com>.

DXE-ATSA-1 Stealth Antenna

If you enjoy having a selection of stealth antennas to pick from, please consider this new stealth antenna from DX Engineering designated as the DXE-ATSA-1. DX Engineering says that this new antenna allows amateur radio operators living in antenna-restricted neighborhoods to get on the air easily with a short, nearly invisible 26-foot wire and operate on all bands 40 meters and up. A 45-foot wire will extend coverage to 80 meters. This complete system includes an autotuner, ATSA MatchBoxx™, stainless-steel radial plate, antenna wire, bias tee, two insulators, radial wire, and all hardware.

The low-profile remote tuning unit (photo B) is designed to be hidden in the bushes or in a garden. Just "plant" it in the bushes or shrubs with supplied spikes, says DX Engineering, and lay out the minimum length radials. You can further camouflage the controller with a plastic boulder or other items available at most landscaping stores.

The ATSA-1 contains 20,000 non-volatile memories. It features an L-network with wide matching capability, 1.8- to 30-MHz coverage, heavy-duty 10-amp/1000-volt relays, and is rated at 200 watts SSB/CW. The included bias tee is used to insert 12 VDC from a user-supplied power source on the coaxial cable to the remote tuner.

DX Engineering includes the ATSA MatchBoxx™ module, which allows use of almost any length of wire you choose—no more "forbidden" lengths as with other end-fed systems. An optional DXE-SA80-AOK add-on coil kit allows for the

Photo A – Light Beam Antenna is particularly proud of its Light Beam and Light Beam Plus designs wich can operate on 20, 17, 15, 12, and 10 meters at a height of 30 feet while still providing a low surface area.

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e-mail: <wv5j@cq-amateur-radio.com>

Photo B– The key to the effectiveness of DX Engineering's low-profile remote tuning unit is that it can easily be hidden in bushes with only a 26-foot piece of wire that extends vertically and is practically invisible but allows you to operate on the 40-meter band and up.

adjustment of feedpoint impedance to achieve the lowest SWR on the 80-meter band without affecting operation on the higher frequency bands.

Price of this stealthy wonder? $459.95 and for the optional DXE-SA80-AOK 80-meter coil kit, $49.95. For more information or to order, visit <www.dxengineering.com>.

Organize Those QSL Cards

Despite the arrival of the month of March, it still may be a little too cold in your region to go outside to work on your antennas. If that is the case, it might be a good idea to tackle an indoor project that you may have been putting off, such as organizing your QSL card collection. If that is the case, you'll be happy to hear that the good people at DX Engineering are now offering the DXE QSL Scanning Kit, and it's able to store your cards and display them in rotation on an attractive, compact screen display. The kit consists of one compact digital scanner, a 7-inch LCD digital picture-frame screen, plug-in power supplies, and a 2-MB SD card.

To operate, feed QSL cards individually through the scanner. A slider guide adjusts easily to accommodate non-standard QSL sizes. The scanner accepts card sizes from 2 by 2 inches to a maximum of 4 by 6 inches, and images are saved in JPEG format. A PC is not required for the scanning process. To view the QSLs, simply plug the SD memory card into the digital picture frame. It's great for the ham shack, living room, or office.

Now you can easily reminisce with friends about your past QSOs or simply show off your collection to fellow hams or future hams. Up to 2000 QSL card images can be stored on the included SD card—more with larger capacity memory cards. The DXE QSL Scanning Kit lets you reclaim the ham shack wall space that you may be devoting to QSLs collected in your pursuit of WAZ, DXCC, WAS, or other certificates. Price for the DXE QSL Scanning Kit is $89.95.

Comtek W2FMI Series Baluns

Here's another product from DX Engineering that might persuade you to improve and upgrade your antennas. It's the Comtek W2FMI Series baluns (photo C), which are engineered to provide an efficient match between unbalanced coax and balanced antennas. The baluns are inspired by designs from antenna expert Jerry Sevick, W2MFI (SK), with modern improvements by DX Engineering's balun R&D department.

Comtek current baluns force equal current to flow through your antenna and prevent high values of common mode feedline current, eliminating pattern distortion, unpredictable performance, RFI, and noise pickup from nearby sources such as TV sets and computers.

Typical insertion loss is less than 0.2 dB, with power handling ranging from 3 kW continuous to 5 kW+ intermittent from 1.8 to 54 MHz , and reduced power ratings at 54 MHz.

Comtek baluns are sealed in a weatherproof 4" × 4" × 2" NEMA box. They're

Photo C– Comtek is debuting a line of W2FMI series baluns that handle 3 KW continuous power ((and 5 KW intermittent) from 1.8–54 MHz. Various case styles are available.

constructed with durable stainless-steel hardware, including 1/4-inch studs, star washers for lasting electrical connections, and large fender washers which distribute fastener loading to preserve case integrity. SO-239 connectors are silver-plated, with Teflon® insulation.

The baluns are available in 1:1 and 4:1 versions with several different configurations: side studs, top studs, side eyebolts, plus side and top eyebolts. An optional DXE-BMB-4P bracket lets you mount the balun on a boom or pipe.

The baluns are priced in the range of $49.95 to $69.95. For more information about DXE QSL Organizing Kit, the Comtek baluns or any other DXE product, contact DX Engineering by mail at P.O. Box 1491, Akron, OH 44309, or call 1-800-777-0730. You may also visit DX Engineering on the web at <www.dxengineering.com>.

Antenna Work from Inside

If sunny skies and gentle breezes are not enough to tempt you to venture outdoors to at least perform some maintenance on your existing antennas, you can stay indoors and check them out via coax with one of the new YouKits FG-01 antenna analyzers now available through their exclusive U.S. distributor, Ten-Tec, your old friend from Sevierville, Tennessee (photo D).

Measuring less than four inches high, with the ability to take power from either its wall-mounted power supply or an optional internal lithium battery pack, the FG-01 is an easy-to-use, easy-to-carry, antenna testing solution.

Using the latest advances in SMT technology, the FG-01 provides a lightweight, rugged, tool for amateurs at home or in the field. The FG-01's color graphics display provides SWR and impedance information for any antenna under test from 1 to 60 MHz, taking the guesswork out of antenna design and adjustment, and providing the amateur with maximum performance and efficiency under any operating circumstance. The YouKits FG-01 is competitively priced at $249.00.

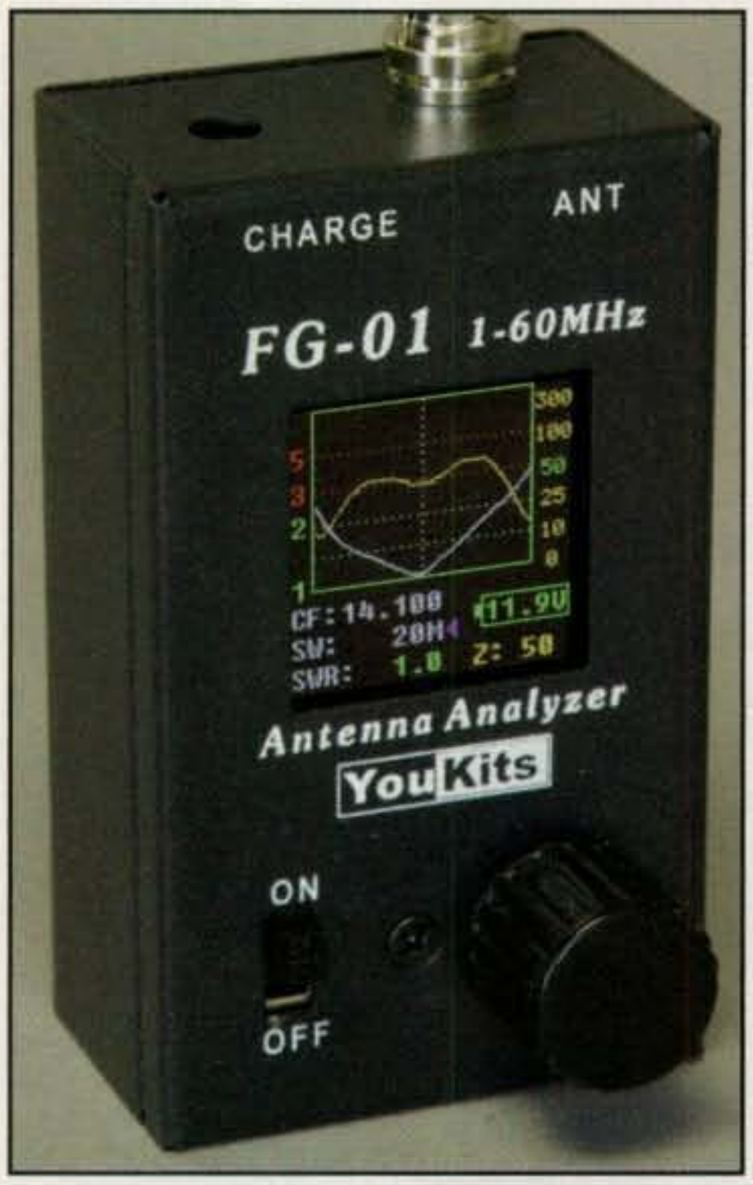
YouKits QRP Transceiver

Ten-Tec also wants you to know about another YouKits product designated as the HB-1B, Ten-Tec nomenclature for its new four-band CW QRP transceiver (photo D). Following up on the success of the popular R4020 and R4030 two-band CW QRP transceivers, Ten-Tec has become the exclusive U.S. distributor of the YouKits HB-1B Four Band CW QRP transceiver that is priced at

$299. Using the latest advances in SMT (surface mount technology) and DDS (digital direct synthesis) technology, the HB-1B provides 80-, 40-, 30- and 20-meter CW transmitting with 3.2 through 16 MHz general-coverage receive capability, all in a rugged, lightweight package.

Features include a variable four-pole crystal filter, receiver incremental tuning (RIT), 30-frequency memory storage, and an automatic CQ and callsign sending function. Power consumption is only 60 mA on receive and 800 mA on transmit. The HB-1B can operate from an external 12- to 14-VDC regulated power source or an optional internal lithium battery pack. Weighing just 14 oz., the HB-1B is advertised as an excellent "go to" radio for amateurs interested in taking their operation out of the home and into the field.

For more on the YouKits FG-01 antenna analyzer or HB-1B QRP transceiver, or to order, visit Ten-Tec online at <www.tentec.com>, or call 1-800-883-7373.



A Ham App for Your iPhone

Looking for new ham radio apps for your iPhone? How about a link to a new ham radio oriented iPhone application that calculates the grid square and enables you to tag the location with your own definable category? Yes, it does exist, and its name is MtagIt (photo E). To see for yourself, click on <http://itunes.apple.com/us/app/mtagit/id482471632?ls=1&mt=8>.

Want to Reach New Heights?

For all of the rovers out there seeking a new source for pneumatic masts, you might want to take a look at China's PHT Manufacturing, found easily on the internet at <www.phtmfg.com>. PHT is particularly proud of its Series 9 telescoping mast that can elevate to 30 meters, has an automatic locking-collar style, and supports a maximum head load of 500 kilograms, or over 1000 pounds. Air pressure on the mast can be removed after full elevation. PHT also offers Series 7 and Series 8 telescoping masts

Photo D– Ten-Tec of Sevierville, Tennessee, is now offering a wider variety of amateur radio products with the introduction of an antenna analyzer and a QRP radio made by YouKits of Canada and distributed in the U.S. by Ten-Tec.

Photo E– MtagIt is the name of a new ham app for your iPhone. It calculates your grid square and enables you to tag the location with your own definable category.

Photo F– The "ARRL Exam Review for Ham Radio" Platinum Edition on CD.

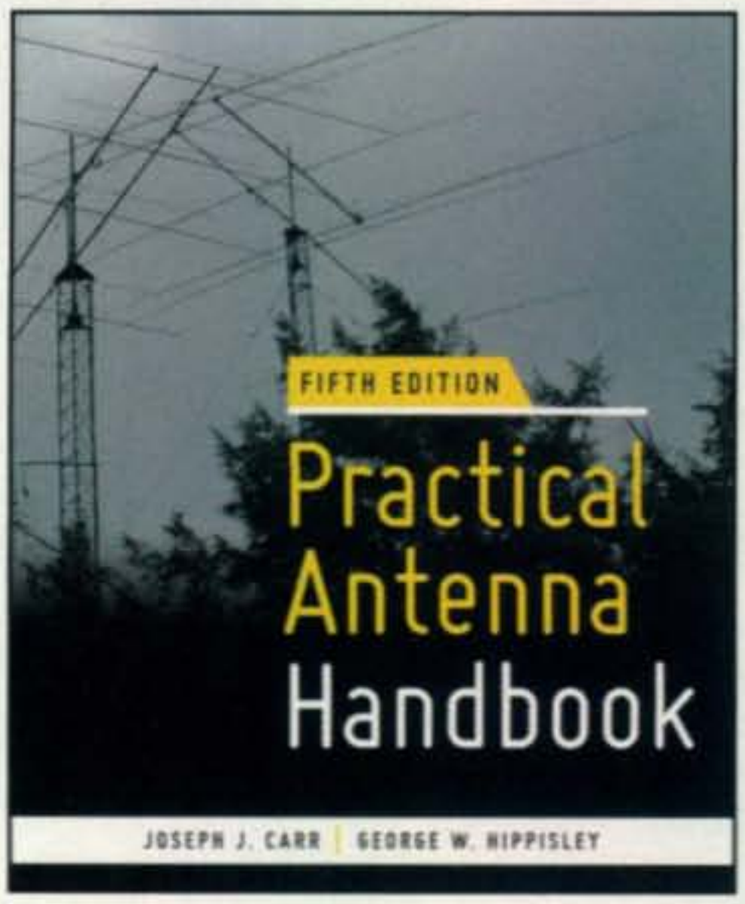


Photo G– The Practical Antenna Handbook. (See text for details.)

and a vehicle roof-mounted pneumatic-mast lighting system. If you don't have internet access but are okay with an international phone call, you may also call PHT's headquarters in China at 0086-512-8999-2286.

Book Corner

ARRL Exam Review for Ham Radio. When you attend a VE session in hopes of earning a higher class amateur radio license, you want to be as prepared as possible for whatever test is presented to you. One of the best ways to do that is to practice with the "ARRL Exam Review for Ham Radio" Platinum Edition on CD (photo F).

The "ARRL Exam Review for Ham Radio" is a software tool you can use to prepare for all three amateur radio license examination levels: Technician, General, and Amateur Extra. The CD includes review questions, answers, and short explanations to help make sure you understand the answers given. Set up this CD on your computer to generate practice tests from the actual examination question pool so that on test day you'll be prepared for whatever awaits you.

To order your copy of the "ARRL Exam Review for Ham Radio" on CD, priced at $39.95, visit <www.arrl.org> or order by phone by calling 860-594-0200.

Practical Antenna Handbook. If you want to design and build your own antennas, you might want to have available a copy of the Practical Antenna Handbook (photo G). This fifth edition has been updated and revised to provide clear answers to antenna questions frequently asked by hobbyists and electronic technicians.

Described as the definitive antenna reference, this edition covers a wide variety of antennas—including dipoles and inverted-V wire antennas; quads, deltas, and NVIS loops; wire arrays, including bobtail curtains, half-square and rhombic, verticals and shunt-fed tower antennas; rotatable Yagi beams; MF and HF receiving antennas including flags, pennant, K9AY, and Beverage, mobile and portable antennas; VHF/UHF/microwave antennas; and many more.

For more information about this fifth edition of the Practical Antenna Handbook, which is priced at $50, visit <www.MNProfessional.com>, where you can order a copy of the book, read the author's blog, view additional photographs and schematics, access tables of worldwide geographic coordinates and antenna dimensions versus frequency, and follow links to tutorials and specialized calculators.

That's "What's New" for this month. If you have a product you would like to see featured in this monthly column in CQ, please e-mail me at <wv5j@cq-amateur-radio.com>. You'll be glad you did!

73, John, WV5J

Note: *Listings in "What's New" are not product reviews and do not constitute a product endorsement by CQ or the column editor. Information in this column is primarily provided by manufacturers/vendors and has not necessarily been independently verified. The purpose of this column is to inform readers about new products in the marketplace. We encourage you to do additional research on products of interest to you.*

BY JOE LYNCH,* N6CL

ARISSat-1 Silent Key

To begin this month's column, the following piece is from the Winter issue of *CQ VHF* magazine's "Amateur Radio Satellites" column by Keith Pugh, W5IU:

As ARISSat-1 approached its fifth month of service, it continued to perform very well. The pre-launch predictions of two to three months of service proved to be pessimistic. With its better than expected life, predictions began to turn optimistic, forecasting a re-entry in late January or sometime in February 2012.

After discovering that the broken 70-cm antenna was still long enough to be usable and that full operation in sunlight was still possible after the battery failure, operation settled down to a routine. The only major casualty was the Russian Kursk Experiment. To be successful, Kursk needed whole orbit data, and this was no longer possible with the satellite shutting down when in eclipse.

Unfortunately, however, hopes for that optimistic extended life expectancy began to dim in mid-December. By December 21, 2011, from its initial altitude of about 380 km, the satellite's perigee had deteriorated to 270 km and was sinking fast. As the satellite encountered denser atmosphere, the rate of decay increased until the inevitable occurred. On January 4, 2011, AMSAT News Service issued the dreaded special bulletin: "ARISSat-1/KEDR Goes Silent." Here are some of its contents:

Reception reports indicate that ARISSat-1/KEDR has stopped transmitting on Wednesday, January 4, 2012. The last full telemetry captured and reported to the ARISSatTLM web site at 06:02:14 UTC on January 4 was received from ground stations as the satellite passed over Japan. . . .

Telemetry reports showed that the temperature aboard ARISSat-1/KEDR had been rising as atmospheric drag began to affect the satellite. . . .

Konstantin, RN3ZF sent a reception report of his copy of the 0842 UTC pass that indicated that "the telemetry was absent, voice messages were not legible, very silent and interrupted. Most likely, I saw last minutes in the life of the satellite." Dee, NB2F reported, "Nothing heard from ARISSat-1/KEDR on any frequency during the first USA pass at 16:00 UTC, January 4."

ARISSat-1's life was now over.

The satellite was deployed from the International Space Station on August 3, 2011 during EVA-29 on by Cosmonaut/Flight Engineers Sergei Volkov, RU3DIS, and Alexander Samokutyaev. It lasted five months and part of one day. Here is more from that special bulletin:

Excerpt specs

The satellite carried a student experiment from Kursk State University in Russia which measured atmospheric density. Students from around the world provided the voices for the FM voice announcements.

e-mail: <n6cl@sbcglobal.net>

VHF Plus Calendar

March 1	First quarter Moon
March 3-4	First Weekend of DUBUS EME Contest.
March 8	Full Moon
March 10	Moon perigee
March 15	Last quarter Moon
March 22	New Moon
March 26	Moon apogee
March 30	First quarter Moon
March 31-April 1	Second Weekend of DUBUS EME Contest.

—EME conditions courtesy W5LUU

The amateur radio payload aboard ARISSat-1/KEDR achieved many "firsts" for amateur radio in space:

• First flight test of AMSAT Software Defined Transponder which transmitted simultaneous:

* FM voice downlink cycling between student messages, spoken telemetry and SSTV from cameras on the spaceframe.

* 16 kHz bandwith linear transponder,

* CW beacon with telemetry and call signs of radio amateurs noting their significant contributions to amateur radio in space.

* Robust, forward error corrected 1K rate BPSK downlink with satellite telemetry and Kursk experiment telemetry.

• Development and release of the ARISSatTLM software for PC and Mac platforms enabled amateur stations worldwide with reliable reception of the BPSK telemetry, CW telemetry, display on the station's computer, and automatic upload of received data via the internet to the ARISSat engineering team.

• A new Integrated Housekeeping Unit was developed and successfully flown.

• A new Power Management System was developed and successfully flown.

AMSAT President Barry Baines, WD4ASW, noted: "ARISSat-1/KEDR marked a new type of satellite which has captured the attention of the national space agencies around the world for the unique educational opportunity we have been able to design, launch, and operate. By designing an educational mission aligned with NASA's Science, Technology, Engineering, and Mathematics (STEM) goals, amateur radio operators around the world have been able enjoy a new satellite in orbit."

ARISSat-1/KEDR Project Manager, Gould Smith, WA4SXM stated: "Dozens of amateur radio volunteers, AMSAT, ARRL, NASA, and Energia teamed up for this successful mission to bring you the most unique and innovative amateur radio satellite mission. Congratulations to all who made ARISSat-1 successful!"

Amateur radio operators and non-ham students, and other listeners, continued to use ARISSat-1 to the greatest extent possible while it was with us. After a rough start, ARISSat-1 turned out to be a "Star Performer."

The telemetry system continued to work very well. Thanks to over 70 telemetry contributors in over 41 countries, and Douglas Quagliana, KA2UPW/5's software and servers, it was possi-

ble to easily look at near real time telemetry on one's iPhone, notebook, or home computer at any time.

Now that ARISSat-1 has reached the end of its life, amateur radio operators who received telemetry from ARISSat-1 at any time over the last few months are urged to forward all .CSV telemetry files to the telemetry website: <http://arissattlm.org>.

Summary Results of the K5N Winter DXpedition

The following is from Marshall Williams, K5QE, via the FFMA list:

The K5N Winter DXpedition is now history. Operators were George de Montrond, NR5M, Bill Musa, K5YG, Bill Simpson, N5YA, and myself, K5QE. In addition, we had helping us Warren Watkinson, W4FN, and our local host, Alex Dula, KE5PWJ. Both were a big help, especially during setup and tear down.

Here is a summary of the results of the K5N Winter DXpedition to the DL99-DM90 grid line:

The total number of QSOs was 254. There were a few duplicates in there, as people made "insurance" contacts with us when nothing much was happening. We also had a few duplicates with people who were helping us test out the system and correct the problems. Thanks there go to Bill Tynan, W3XO/5, and to Danny Cristina, N5OMG. We had five CW contacts, including one made with a guy running 50 watts in Hempstead, Texas. We had one "pseudo-EME" contact. That occurred when we were running JT65B and pointed SW, but worked a W4 on backscatter. We had 248 QSOs on meteor scatter and SSB.

The entire group arrived on site at about 8:30 a.m. on Tuesday, Dec. 27. We were set up and running before noon. It was pretty cold, but we got down to business and started running on meteor scatter. Our first EME slot was 7 p.m. to 9 p.m. on Tuesday. People were hearing us in the –22 to –25 range, but we did not hear anyone. After that, I took the all-night session running meteor scatter.

Things were pretty slow and only a few contacts were to be had. In the early morning hours of Wednesday, Dec. 28, things improved quite a bit. Beginning about 3 a.m. and ending at 6:57 a.m. I ran with Robert Brown, KR7O, a distance of 1241 miles. I believe that was the longest contact made. After logging Robert, several QSOs were made in short order during the morning meteor peak.

We kept slugging away until our next EME slot, which was 8 p.m. to 10 p.m. local time on Wednesday. Again, folks were hearing us well and we were hearing nothing. We had one signal report of –19! That is pretty good considering the smallish antenna we were running. I ran meteors that night until 2:30 a.m., completing two 1100+ mile contacts. Then I died and went to bed at the motel. The next morning, the two Bills ran some meteor scatter and made a few CW contacts.

Finally, all agreed that we needed to reconfigure the system—we just were not hearing well. We came down to a single antenna (we found out that one of the antennas had an SWR of 3:1) and a single amp. This cut out the splitter and the combiner, which is where we "think' the problem was located. Things improved significantly from then on.

Some of the improvement was in the equipment, but the band also decided to cooperate and we got a really nice *Es* opening that lasted for 10–12 hours!! We continued running until 8 a.m. on Friday, Dec 30. At that time, we broke camp, packed up all the gear and antennas, and drove out for home.

We did have some equipment problems, but in true ham fashion, we worked around them. We will be sure that we have a "tower mounted" pre-amp with a separate RX line the next time we go out. That arrangement will eliminate the problem of the RX going through the combiner/splitter/amplifiers.

I want to make a special mention of all the assistance given by our on-location host, Alex Dula, KE5PWJ. He gave us invaluable assistance throughout this adventure. Alex was able to secure permission from the landowner for us to be right on the DL99-DM90 line. This was really a big deal, as finding a suitable spot otherwise would have been nigh impossible. He helped us set up and tear down. He was there every day and brought us some home-baked goodies that his wife had made up. Those were really good eating. He provided us a BBQ beef lunch from one of his own cows—also very good eating. We owe Alex a lot. So, a very big *thank you* goes out to Alex.

Remember that Joey Fiero, W5TFW, is our QSL Manager. Send him an SASE together with your card and he will return our QSL card right away. Remember, too, that it will take us several weeks to get the cards designed and printed up. Please do *not* send QSL requests to the traveling members of the group, as we will not have blank cards to return. JD Dupuy, NØIRS, of Grid Bandit fame, is in charge of the card design and web activities.

Thanks to everyone who worked us and to those who tried so hard, but were not successful. It is pretty lonely out there without someone on the other end, so give yourself a pat on the back.

73 de Marshall, K5QE. Member: K5N Grid Activation Group, a Grid Bandits DXpedition. For more information on the Grid Bandits, see: <http://www.kcvhfgridbandits.com/kcvhfgrid_bandits_042.htm>.

Student D-STAR Satellite to Launch Late this Year

The following is from Southgate Amateur Radio News:

Students at the Université de Liège are hoping their D-Star GMSK satellite OUFTI-1 will be launched towards the end of this year. An update on the satellite is published in the January 2012 issue of the OUFTI-1newsletter at: <http://www.leodium.ulg.ac.be/cmsms/uploads/OUFTI-1%20Newsletter%204.pdf>.

From the Nanosatellite Project website is the following:

The objective of the nanosatellite project is to provide hands-on experience to students in the design, construction, and control of complete satellite systems that will ultimately serve as the basis for a variety of space experiments. The first satellite in the series is called OUFTI-1: it is a CubeSat, which is a cube with a size of 10 × 10 × 10 cm and a weight of at most one kilogram. It will be launched in late 2012.

The key, innovative feature of OUFTI-1 is the use of the D-STAR amateur-radio digital-communication protocol. This means of radiocommunication will be made available to ham-radio operators worldwide. In the future, it will also be used to control space experiments. The telecomands and telemetry will be sent to the satellite with the AX.25 amateur radio protocol. In case of the AX.25 system won't work properly a reliable telegraphy beacon should still be functional.

This project is a student project. Students are thus warmly encouraged to join the project! Please contact us for further information at: <http://www.leodium.ulg.ac.be/cmsms/index.php?page=contact>.

Current Contests

The **European Worldwide EME Contest 2012**: Sponsored by DUBUS and REF, the EU WW EME contest is intended to encourage worldwide activity on moonbounce. Information for this contest is available at the following website: <http://www.marsport.org.uk/dubus/>.

Calls for Papers

Calls for papers are issued in advance of forthcoming conferences either for presenters to be speakers, or for papers to be published in the conferences' *Proceedings*, or both. For more information, questions about format, media, hardcopy, email, etc., please contact the person listed with the announcement. The following organizations and/or conference organizers have announced calls for papers for their forthcoming conferences:

Southeastern VHF Society Conference. Technical papers are solicited for the 16th annual Southeastern VHF Society Conference to be held in Charlotte, North Carolina on April 20–21, 2012. Papers and presentations are solicited on both the technical and operational aspects of VHF, UHF, and Microwave weak-signal amateur radio. In general, papers and presentations on non-weak-signal related topics such as FM repeaters and packet will not be accepted but exceptions may be made if the topic is related to weak signal. For example, a paper or presentation on the use of APRS to track rovers during contests would be considered. For further information about the conference *Proceedings* deadline, see the society's website: <http://www.svhfs.org>.

Central States VHF Society Conference. Technical papers are solicited for the 46th annual Central States VHF Society Conference to be held in Cedar Rapids, Iowa. For more information please see the society's website: <http://www.csvhfs.org>.

Current Meteor Showers

The γ-*Normids* shower is expected to peak on March 14. For more information on the above meteor shower prediction please see Tomas Hood, NW7US's "Propagation" column, as well as visit the International Meteor Organization's website: <http://www.imo.net>.

And Finally . . .

The short-lived ARISSat-1 satellite provided lots of excitement and learning opportunities. One of the exciting parts was watching the launch of the satellite live on NASA TV. Viewers wondered if the satellite would ever leave the International Space Station (ISS). Viewers also worried about the effects of the missing 70 cm antenna. All was well, however, when the first tests proved that many of the satellite's features would be operational for the time that it would be in orbit.

Among the learning opportunities were missed opportunities. In particular, the education component was a failure. The anticipated penetration into the classroom did not materialize when there was little curriculum available for use for the targeted student population.

Now, AMSAT is rolling out Fox-1 with the following bulleted features on its website (www.amsat.org):

• Fox-1 is designed to operate in sunlight without batteries once the battery system fails. This applies lessons learned from AO-51 and ARISSat-1 operations.

• In case of IHU failure Fox-1 will continue to operate its FM repeater in a basic, 'zombie sat' mode, so that the repeater remains on-the-air.

· Fox-1 is designed as the immediate replacement for AO-51. Its U/V (Mode B) transponder will make it even easier to work with modest equipment.

• From the ground user's perspective, the same FM amateur radio equipment used for AO-51 may be used for Fox-1.

• Extending the design, Fox-2 will benefit from the development work of Fox-1 by adding more sophisticated power management and Software Defined Transponder (SDX) communications systems.

Hopefully, curriculum will be developed before its launch so as to not miss another opportunity. Again, according the AMSAT website:

On November 15, 2011, AMSAT submitted a proposal to NASA for its CubeSat Launch Initiative, known as the "Educational Launch of NanoSat" (ELaNa) program...

AMSAT, working with ARRL, highlighted the educational merit of the project including the incorporation of Fox-1 into the ARRL Teacher Institute seminars. ARRL also provided a letter of support for the project that was a key component of our proposal.

The Clay Center for Science and Technology at the Dexter and Southfield schools in Brookline, MA, also provided a letter of support that was an important part of our proposal. The Clay Center noted that they use AMSAT satellites such as ARISSat-1 in their educational activities for K-12 students and that they look forward to making use of Fox-1.

NASA was expected to select its winners by January 30, 2012. Hopefully, with the above backing, AMSAT should have a great opportunity ahead of itself in Fox-1.

Thank you again for your ongoing support for this, your column. Until next month . . . 73 de Joe, N6CL

BY TED MELINOSKY,* K1BV

Addendum to Previous Columns, plus DG5JFY Awards

USA-CA Honor Roll

500		1500	
LY3W	3556	DK2OY	1532
RA1AOB	3557		

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

This time we start out with some additions and corrections to previous columns. Then we move on to an interesting awards series sponsored by DG5JFY.

Additions and Corrections

Bob Hallock, K7TM, completed USA-CA Mixed Modes way back in December 1979. He was awarded the ALL CW endorsement November 25, 2011. USA-CA is basically a one-time award, but we are always willing to recognize special achievement for those who finally work all counties on one mode or band.

In the October 2011 issue of *CQ*, we featured the Worked U.S. Territories award. One minor change is that if you are at the top of the ARRL DXCC Honor Roll, you automatically qualify for the award without having to send copies of QSL cards. You must write "Top of The DXCC Honor Roll in *QST* August (current year)" on the application.

Next, David Greene, WWØW, writes that due to the nature of his job, he frequently moves within the USA. He asks whether many awards require all contacts used in an application have to be made within the same location, state, or country.

Answer: In my experience of having reviewed the rules of several thousand awards, I would say that *very, very few* contain a restriction requiring all contacts be made from the same location, or even the same country. A quick review of CQ awards shows that the WAZ and WPX Awards require all contacts be made from the same "entity" (country). DXCC is the same, although years ago, there was a mileage restriction for all contacts. In fact, for the past few years I don't recall even one new set of award rules limiting valid contacts to a specific location, area, state, or country. Just read the rules, and if there is any question, it's usually very easy to send the sponsor an e-mail inquiry. This has the added benefit of ensuring that an answer will likely confirm the fact that the award is still valid, as well.

DG5JFY Awards Series

The awards whose rules I include in this column have almost always been sponsored by national organizations and clubs. This month, I found an interesting award series created by Victor, DG5JFY. His awards are interesting because the certificates reveal something of the interests of the sponsor, who enjoys fine art, history, religion, and car racing. It's an interesting combination, indeed.

The latest in this series pictures the likely portrait of Lisa Gherardini, wife of Francesco del Giocondo, also known as the Mona Lisa painted by Leonardo da Vinci, completed in the early 16th century and on permanent display at the Musée du Louvre in Paris. Even a DXer of modest achievement should be able to earn most of the awards.

General Requirements. All bands and modes OK. No time limitations for the contacts. SWL OK. Send GCR list plus fee as noted below in the individual rules (IRCs are not desired). Apply to: Victor Ganin, DG5JFY, A-Kivi-Str. 17, D-18106 Rostock, Germany. E-mail: <dg5jfy@gmx.de>; Internet: <http://dg5jfy-awards.narod.ru/>.

Eternal Cities Award. This award may be earned by amateurs and SWLs for contacting cities that were established before the time of Christ. The requirements are to earn 50 points for Europe and Asia, all others 25. A city founded 100 years or one century before Christ = 1 point, 200 years = 2 points, 300 years = 3 points, etc. All bands and modes OK. No date limitations. Send GCR list and fee of 5

Athens SV 15	Delhi VU 10	Marseille F 6	Rome I 8
Ankara TA 7	Feodosia UB 6	Milan I 5	Samarkand UK 4
Beirut OD 17	Geneva HB 1	Malaga EA 11	Sparta SV 7
Bologna I 6	Istanbul TA 7	Nicosia 5B 7	Tunis 3V 10
Barcelona EA 3	Jerusalem 4X 2	Piraeus SV 15	Tashkent 1
Belgrade YU 5	Kerch UB 6	Paris F 1	Valencia EA 2
Koln DL 1	Lisbon CT 2	Peking BY 15	Eriwan 4L 8
Damascus YK 11	Lyon F 1	Plovdiv LZ 4	Zaragoza EA 27

Table I– List of the most ancient cities of the world, country prefix and their award values for the Eternal Cities Award.

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

Euros or $US10 to: Victor Ganin, DG5JFY, Aleksis-Kivi-Str 17, D-18106, Rostock, Germany.

See Table I for a list of the most ancient cities of the world, country prefix and their award values.

Formula I Award. Issued for confirmed contacts with at least 20 of the following list of 22 countries in which the Formula 1 races have been held since 1980. All contacts must have been made after 1 January 1980. Each of the countries may be worked only one time.

Formula I Racing Sponsor Countries: Argentina, Australia, Austria, Belgium, Brazil, Canada, France, Germany, Great Britain, Holland, Hungary, Italy, Japan, Malaysia, Mexico, Monaco, Portugal, San Marino, South Africa, Spain, Switzerland, USA.

Send GCR list plus award fee of 10 Euros or $US12.

The Mona Lisa Award. The award is issued for confirmed contacts from stations located in cities or specific areas where Leonardo da Vinci's Mona Lisa was painted, stored, or displayed in museums. The following are the locations and contacts required:

1. Italy—one station in each of these cities: Florence, Rome, and Milan.

The Eternal Cities Award, sponsored by DG5JFY, may be earned by amateurs and SWLs for contacting cities that were established before the time of Christ.

The Formula I Award is issued for confirmed contacts with at least 20 of the 22 countries in which the Formula 1 races have been held since 1980.

2. France—Departments 12, 37, 75, 77, 78, and 82. The department identifier may be found on French QSLs as the first two digits of the Postal Code.

3. Japan—Tokyo.

4. Russia—Moscow.

5. USA—New York City and Washington, D.C.

A total of 13 contacts is needed. Send GCR list plus fee of 10 Euros for Europeans and $12 for all others.

Travels of the Apostle Paul. This award is sponsored in commemoration of Paul the Apostle's three Christian missionary journeys. It is issued for confirmed contacts with the following countries and cities which Paul the Apostle visited during his journeys: Crete (SV9), Cyprus (5B4), Damascus (YK), Greece (SV), Jerusalem (4X), Lebanon (OD), Malta (9H), Rome (I), Sicily (IT), Turkey (TA).

Ten QS0s are required, one from each of the listed countries/cities. Award fee is 5 Euros for Europe or $US10 for all others.

We are always interested in learning of new awards for publication in this column. Please contact me with details and a sample of the certificate. 73, Ted, K1BV

The Mona Lisa Award is issued for confirmed contacts from stations located in cities or specific areas where Leonardo da Vinci's Mona Lisa was painted, stored, or displayed in museums.

The Travels of the Apostle Paul Award is sponsored in commemoration of Paul the Apostle's three Christian missionary journeys. It is issued for confirmed contacts with countries and cities that Paul the Apostle visited during his journeys (see text for list).

dx

BY CARL SMITH,* N4AA

DX and 60-meter News, plus New DXCC and QSL Manager Awards

Well, now, what's happening? As I write this in early January, the holidays are over and we are into a new year. Obviously, as you read this column, things may be much different, but here's what been happening in the world of DXing and what should have occurred by now.

DX Operations

We will already have seen the **Malpelo, HKØNA** operations come and go. I hope you worked them on all the bands/modes you needed them. I will have been in there looking for some CW contacts on a few bands and some digital contacts on a lot of bands. If history is any indication, and it usually is, the next major operation from Malpelo will be at least ten years in the future.

The relatively short operation from **Sable Island, CYØ** should also have come and gone by now, and I hope you were able to work them as well. There have been several operations from Sable, but it is a difficult place to get into and out of. Also, there's always the possibility that access to the island could become more difficult as government regulations restrict those who can come and go to places like this.

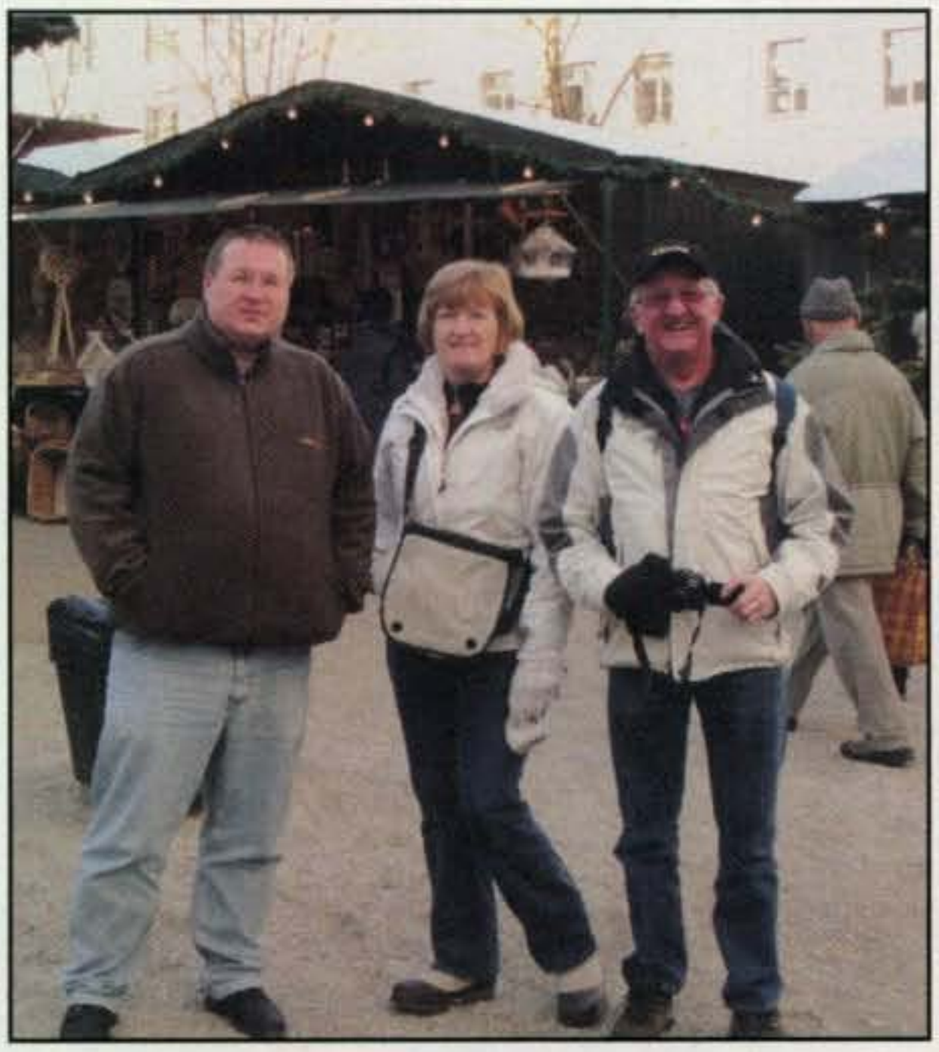
Frosty, K5LBU, is off on another of his African safari trips. He is going to take a group to **Botswana** in March and usually arranges a side trip to the Kruger wildlife park. I'm told that is always a highlight of his trips.

Guinea Bissau, J5. The Verona Section of the Italian Radioamateurs Association is organizing a group with humanitarian and ham radio purposes to go to Guinea Bissau in late March. It is one of poorest countries on Earth, and for DXers it is needed on RTTY/CW and has never been activated on EME. The group plans to be on the air from March 24 to April 6 operating from Cumura. Their website is showing "on-line log" and more. Check it out at: <http://www.ari.verona.it/veronadxteam/en/index.htm>.

Congo, TN2T will see action "sometime" in 2012. The website given was still under construction the end of December, so not much is known at this time. Check the website: <http://www.tn2t.be>.

Trevor, VKØTH, is on **Macquarie Island** until the end of April and promised to be "very active" until his departure. He works SSB, Hellschreiber, PSK-31, and RTTY at various times and on various bands, so keep listening and/or watching the cluster for spots.

*P.O. Box DX, Leicester, NC 28748-0249
e-mail: <n4aa@cq-amateur-radio.com>



Joe, W8GEX (right), and his wife Janet, W8CAA (center), love to travel. Here they are shown with Markus, DL9RCF (left), at the Christmas market of Passau in Bavaria last December. (Photo courtesy of Markus, DL9RCF)

60 Meters News

There has been a lot of interest in 60 meters by hams in general and DXers in particular, as it can be very challenging, especially with the limited power regulations and all. In late December the FCC indicated it was looking at expanding 60 meters to allow CW and RTTY. Joe Pater, W8GEX, is always on top of things relating to 60 meters and he released the following:

With the anticipated announcement of FCC approval of CW and RTTY on 60 meters, the ARRL has formed a committee to look at a gentlemen's agreement for a band plan. Hopefully that plan will be out in a few weeks. With only five channels and soon three modes, we will need every operator's cooperation in following this plan.

I received the following from Bruce KØBJ from the ARRL:

A story will go on the ARRL Web probably some time next week. It will explain the R&O, effective dates, etc. Then it will publicize the email address to submit essay. It will also have a URL to the Zoomerang survey.

If you could put a link to the ARRL news story on (http://60meters.net/) once it appears, it would help in getting serious users, and CW/Digi contemplators, directed to submit their input.'

DX worldwide has been on Channel 5 since we were given the band in June of 2003. As far as I know, every

country on the band has allocated 5.403.5 as one of its frequencies. This channel is the only one common to all of us, and why the DX is there.

In the future, it would be most helpful if we don't have long conversations at night on that channel and leave it for DXing. Over the years of issuing the "60m DX Newsletter," all of the complaints I received are about rag chewing on Channel 5. As you know, DXpeditions are about QSO rates, and if they hear Ch 5 busy, they just leave and sometimes never come back. Being thousands of miles away, the DX station can't break the conversations.

May I ask your help in only calling the DX on Ch. 5, and if you hear rag chewing, kindly ask the operators to relinquish the channel to the DX. If this is done in a nice courteous way, I would hope you would be successful.

I don't think most of the offenders are getting my newsletter and are not DXers, so passing the word to them of the forthcoming band plan is very important.

HSØAC, Thailand

For news of the devastating flooding that took place in Thailand, take a look at the RAST website: <http://www.net/rast>. The pictures are heart-breaking to anyone seeing the condition of the equipment that was destroyed. For two months the club station in Bangkok was flooded with water up to seven feet deep. The club's towers and antennas survived, but there are no surviving radios/amplifiers or accessory items. Ironically, while the club station was under water, RAST members provided extensive disaster communications assistance and food packet deliveries, using their own personal 2-meter radios, vehicles, and boats. All possible sources, official and voluntary, will be approached for donations, as well as radio manufacturers and dealers worldwide. Anyone with contacts that might help, and all donations, will be warmly welcomed.

Luis, XE1L, stands at the grave of Father Moran, 9N1MM, at St. Xavier's cemetery, Godavari, Kathmandu, Nepal. Luis is wearing the hat Father Moran gave him when he visited Mexico City many years ago. (Photo courtesy of Luis, XE1L, and Rick, NE8Z)

A New ARRL DXCC Award

If you haven't heard about this yet, here's the story from the ARRL website:

2012 is the 75th anniversary of the

The WPX Program

CW

3272.....ISØUWX

SSB

3111.....K2OAK
3112.....IK2RPE
3113.....ISØEBO

Mixed

2176.....NK5O
2177.....K8LE
2178.....ISØEBO
2179.....GI4DOH
2180.....W5NYC

Digital

68.....FG4NO
69.....ISØBZR
70.....ISØEBO

CW: 900 JH6JMM. 2850 S51NR. 3200 I7PXV. 5950 K2VV. 6150 K9QVB.
SSB: 1150 MUØGSY. 1550 IK2RPE. 2400 W6AFA. 2800 I3ZSX.
Mixed: 450 ISØEBO, 500 K9OHI. 700 ISØEBO, GI4DOH. 1900 G3OCA. 2500 AB1J, NFØN. 3500 KC9ARR. 4250 WA5VGI. 6800 K2VV.
Digital: 350 K9OHI. 400 ISØEBO. 600 FG4NO.

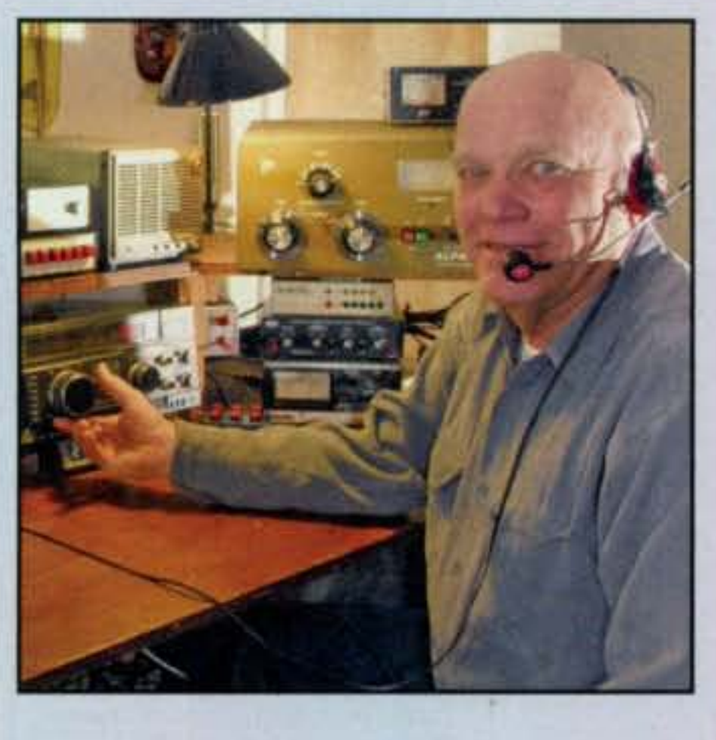
20 Meters: K9OHI, ISØUWX
17 Meters: HA2ESM
15 Meters: ISØUWX
12 Meters: HA2ESM
10 Meters: K3JHT, HA2ESM

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MDD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GO, W4BQY, IØJX, WA1JMP, KØJN, W4VQ, KF2O, WB8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, N4NQ, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, WB6ZRL, WA8YTM, SM6DHU, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, DK4SY, UR2QD, AB9O, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8UB, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POA, N6JV, W2HG, ONL-4003, W5AWT, N3XX, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MS, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, IK2ILH, DEØDAQ, I1WXY, LU1DOW, N1IR, IK4GME, VE9RJ, NN1N, HB9AUT, KC6X, N6IBF, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, WZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, I7PXV, S53EO, DF7GK, S57J, EA5BM, DL1EY, DJ1YH, KUØA, VE2UW, 9A9R, UAØFZ, DJ3JSW, OE6CLE, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, KT2C, UA9CGL, AE5B, KØDEQ, DKØPM, SV1EOS, UAØFAI, N4GG, UA4RZ, 7K3QPL, EW1CQ, UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UT9FJ, UT4EK, K9UQN, UR5FEO, LY2MM, N3RC, OH3MKH, RA3CQ, UT3IZ, S55SL, RU3ZX, YO9HP, RA3DNC, K8ZT, KE5K, JH8BOE, TF8GX, S58MU, UX1AA, AB1J, DM3FZN, AG4W, UA3QNS, RX3AGD.

160 Meter Endorsements: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8ILC, K9BG, W1CU, G4BUE, LU3YL/W4, N4NQ, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK5AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR2QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N6JV, ONL-4003, W5AWT, N3XX, F6BVB, YU7SF, DF1SD, K7CU, I1POR, K9LJN, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, NN1N, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA1CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, DJ1YH, KUØA, VR2UW, UAØFZ, DJ3JSW, OE6CLD, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, CT4NH, EA7TV, LY3BA, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT, S53MJ, DL2KQ, RA1AOB, UA9CGL, SM6DHU, KØDEQ, DKØPM, SV1EOS, N4GG, UA4RZ, 7K3QPL, EW1CQ, UA4LY, RZ3DX, UA3AIO, UA4RC, N8BJQ, UA3BS, UA9FGR, UT3UY, WA5VGI, UR5FEO, N3RC, UT3IZ, RU3ZX, YO9HP, RA3DNC, K8ZT, KE5K, JH8BOE, S58MU, UX1AA, DM3FZN, AG4W, UA3QNS, RX3AGD.

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. Other electronic QSL confirmation means are not accepted.

*Please Note: The price of the 160, 30, 17, 12, 6, and Digital bars for the Award of Excellence are $6.50 each.



On the Cover

CQ DX Hall of Fame member Wayne Mills, N7NG, "home on the range" outside Jackson, Wyoming. A dedicated DXer since getting his General Class license in 1956, Wayne has been on too many DXpeditions to count and spent over six years as the ARRL's Membership Services Manager, during which time he oversaw the development and deployment of the League's Logbook of the World (LoTW) electronic confirmation system.

Back in Wyoming for the past five years, Wayne has focused most of his energy on DXing, especially on 160 meters, for which he has installed a vertical (for 160 and 80) and a full-size radial field. He also has a 4-square receiving antenna for top-band (as well as 80 meters). His investment in antennas has allowed him to earn 160-meter DXCC from Wyoming in just three years.

The antennas you see behind Wayne in the cover photo are his TH-6DX and Moseley 40-2 CD on a 55-foot U.S. Towers tower, which also supports an 80-meter dipole. The mountains behind him - about 15 miles away, are in Grand Teton National Park.

Inside, Wayne has a new Yaesu FT-DX 5000 as well as a long-serving FT-1000D and an Alpha 89 amplifier that he purchased after using it on a DXpedition to Burma in 1985. When asked what one ham radio experience stood out for him, Wayne answered without hesitation, "Albania," referring to the 1991 ZA1A operation which brought amateur radio back to that country after decades of being banned under a Communist dictatorship. Even better than operating the radio, he said, was helping to create a structure for amateur licensing in the country and the ability to "sit and talk world politics" with the Albanians and to hear their different perspectives. "I haven't run into anything yet that can beat that," he said.

(Cover photo by Larry Mulvehill, WB2ZPI)

ARRL's DXCC Award. The world's preeminent DXing award continues to be DXCC, so reaching the "Diamond milestone" is an event that we all want to celebrate. Going back to the roots of the award, and specifically reading the 1937 DXCC List (January, 1937 *QST* pages 52-3) to learn what countries were counted at the onset led us to create the Diamond DXCC Challenge.

The country list we will use for the Diamond DXCC Challenge is based upon the list of 231 places shown in 1937. We tried to find corresponding entities today that would represent the places listed in 1937, but there are four places (Baluchistan, British Cameroons, Canal Zone, Hejas) which were on the oldest list that just don't exist today in a form that could even loosely be represented by someplace current. The Diamond DXCC List represents 227 of the 231 1937 "countries." The list is fascinating and leads us to learn more about world history and how geopolitics has changed leading up to today.

The Diamond DXCC Challenge is an "Honor Award" and will not require acquisition or inspection of QSLs or proof of confirmation, although it still will be fun and useful to seek out cards or LoTW confirmations. We will provide forms online to use at your operating position to track what you have worked and forms for applying for awards and endorsements.

The Diamond DXCC certificate will be available for working 100 of the 226 entities, and will be endorsable at 5 levels: 125, 150, 175, 200 and 225. If anyone works all 226, there will be a special award for that remarkable achievement!

See the Diamond DXCC web page for the rules on the Diamond DXCC Challenge and more information and to read updates during 2012.

5 Band WAZ

As of January 1, 2012, 865 stations have attained the 200 zone level and 1755 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:

UT7UJ W4II

The top contenders for 5 Band WAZ (zones needed, 80 or 40 meters):

N7US, 199 (18)
N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40)
IK1AOD, 199 (1)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W3NO, 199 (26)
RU3FM, 199 (1)
N3UN, 199 (18)
W1FZ, 199 (26)
SM7BIP, 199 (31)
N4NX, 199 (26)
EA7GF, 199 (1)
JA5IU, 199 (2)
RU3DX, 199 (6)
N4XR, 199 (27)
HA5AGS, 199 (1)
N5AW, 199 (17)
JH7CFX, 199 (2)
K7LJ, 199 (37)
RA6AX, 199 (6 on 10)
RX4HZ, 199 (13)
S58Q, 199 (31)
G3NKC, 199 (31 on 10)
K8PT, 199 (26)
N8AA, 199 (23)
HB9ALO (1)
IZ1ANU, 199 (1)
IN3ZNR, 199 (1)
IK4CIE, 199 (1)
K2FF, 198 (18, 23)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
F5NBU, 198 (19, 31)
W9XY, 198 (22, 26)
KZ2I, 198 (24, 26)
W9RN, 198 (26, 19 on 40)
W5CWQ,198 (17, 18)
UA4LY, 198 (6&2 on 10)
JA7XBG, 198 (2 on 80&10)
JA3GN, 198 (2 on 80&40)

The following have qualified for the basic 5 Band WAZ Award:

F8DHE (151 zones) HA1ZH (170 zones)

5 Band WAZ updates:

K3XA (180 zones)
DKØPM (200 zones)
WB5JID (200 zones)
K5EK (200 zones)
K9CT (200 zones)

***Please note: Cost of the 5 Band WAZ Plaque is $100 shipped within the U.S.; $120 all foreign (sent airmail).**

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, Floyd Gerald, N5FG, P.O. Box 449, Wiggins, MS 39577-0449. 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 Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

QSL Manager of the Year

The Golist QSL Manager Data Service is reviving its QSL Manager of the Year

The WAZ Program

6 Meters

108.....PE5T (26 zones)

10 Meters SSB

595.....WC6DX

12 Meters SSB

42.....WA5VGI 43.....S54E

15 Meters SSB

652.....W6AEA

12 Meters CW

58.....WB6RSE 59.....K2FF

15 Meters CW

344.....JH1RNI 345.....W6AEA

30 Meters CW

103.....K8VFV

80 Meters CW

90.....W2LO

160 Meters

393.....SP3IBS (40 zones) 394...YO3APJ (40 zones)

160 Meter Updates

WB6RSE.....(40 zones) NX4D.....(40 zones)

All Band WAZ
Mixed

8849.....N5KAE
8850.....ZS2CR
8851.....ZS2DK
8852.....VA7JW
8853.....KØNW
8854.....OE8TLK
8855.....W9FFC
8856.....RN3QQ
8857.....HB9DHG
8858.....GØMTN
8859.....W5VY
8860.....KA2NBB
8861.....W3NJ
8862.....SP7OMS
8863.....SP3DV
8864.....SP3CFM
8865.....DK1AX
8866.....G8DX
8867.....IK6GQC
8868.....SP6DNZ
8869.....W8HMK
8870.....VK2HV

SSB

5192.....N6BM 5193.....K9EZZ

CW

654.....JF1QQK 656.....N1WQ
655.....JH2GSW 657.....DL99MDW

RTTY

222.....K6FW

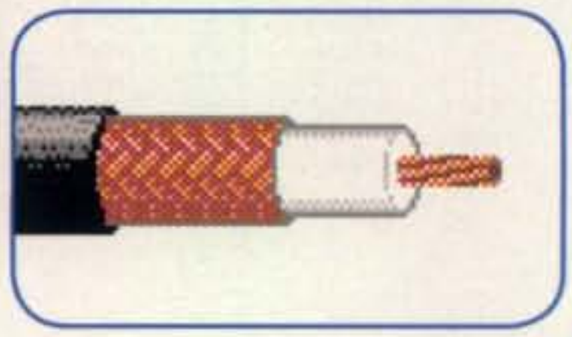
Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, P.O. Box 449, Wiggins, MS 39577-0449. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

The DX Store

No BS. Just good old fashioned customer service.

We specialize in quality products from quality manufacturers. *"You Can't Fix Cheap."* The products we carry and the companies that make them share our philosophy on quality. Whether you're a beginner or seasoned DX'er/contester, if you have a question or need advice, we are glad to help. No BS, just old fashioned customer service.

Visit us at **www.dxstore.com** or call us toll free at **866.899.DXIS** (3947).



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CQ DX Awards Program

CW

1129 .....K8ME

SSB

2575.....W4TTO
2576 .....VK2HV
2577 .....K2HJM
2578.....FG4NO
2579 .....K8ME

Endorsements

28 MHz.....N3RC
28 MHz.....K2HJB
1.8 MHz.....K8ME

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Please make checks payable to the Award Manager, Keith Gilbertson. Mail all updates to Keith Gilbertson, KØKG, 21688 Sandy Beach Lane, Rochert, MN 56578-9604. We recognize 342 active countries. Please make all checks payable to the award manager. Photocopies of documentation issued by recognized national Amateur Radio associations that sponsor international awards may be acceptable for CQ DX award credit in lieu of having QSL cards checked. Documentation must list (itemize) countries that have been credited to an applicant. Screen printouts from eQSL.cc that list countries confirmed through their system are also acceptable. Screen printouts listing countries credited to an applicant through an electronic logging system offered by a national Amateur Radio organization also may be acceptable. Contact the CQ DX Award Manager for specific details.

Award. The purpose of this award is to recognize the service of QSL Managers worldwide for the service they provide to the worldwide DX Community. Nominations for this award will be

The CQ DX Field Award Program

Digital

21 .....N4MM

MIXED Endorsements

200.....NI6T

Digital Endorsements

100 .....JN3SAC

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 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

6469.....9A2AA
6177.....K2VV
5797 .....W1CU
5303 .....9A2NA
5013.....EA2IA
4785.....N4NO
4407 .....S53EO
4399 .....YU1AB
4344 .....VE3XN
4290 .....I2PJA
4229.....I2MQP
4201 .....KF2O
4187 .....KØDEQ
4158.....N6JV
4129.....S58MU
4129....WA5VGI
4022.....N9AF
4005 .....W9OP
3967 ...ON4CAS
3892 ...YU7BCD
3813 ..WB2YQH
3773.....IK2ILH
3628...SM6DHU
3540 ...KC9ARR
3475 .....N8BJQ
3305....JH8BOE
3238.....K1BV
3231 .....W2OO
3207 .....W9IL
3116 ....JN3SAC
3104 .....K9UQN
3091 .....9A4W
3007 .....W2WC
2922 ...OZ1ACB
2716 .....W3LL
2544 .....W6OUL
2530.....YO9HP
2499 .....VE6BF
2493 .....I5RFD
2476 .....K5UR
2445 .....AB1J
2428.....N6QQ
2338.....I2EAY
2116.....AE5B
2192 .....N2SS
2106 .....KØKG
2084...WD9DZV
2004.....W2FKF
1954 .....W7CB
1936 .....AG4W
1862 .....VE9FX
1818.....KX1A
1727 .....N3RC
1667 .....SQ7B
1655 ....SV1DPI
1593.....S55SL
1463.....NE6I
1462 .....DL4CW
1446 .....DF3JO
1383 ...IWØHOU
1337.....K6UXO
1322 .....AA4FU
1269 .....K5WAF
1116 .....YU7FW
1066 ....JA1CKE
976 .....KM6HB
964 .....K8ZEE
815 .....KL7FAP
808 .....W6PN
781 .....V51YJ
726.....K5IC
725 .....WK3N
723.....KØDAN
712.....ISØEBO
707 ..W1/E74OF
684 .....FG4NO
682.....AI8P
662.....JA7OXR
653 .....KK3Q
650.....N3YZ
649 .....RA9OO
647 .....PAØQRB
644 .....KWØH
636.....ZS2DL
634.....
UA3LMR/QRP
620.....PI4DHV
616.....DL5JH
600.....IK1RKN
600 ....KB9OWD

SSB

5169 .....IØZV
4663.....K2VV
4606 .....VE1YX
4584 .....F6DZU
4567 .....OZ5EV
4238 .....I2PJA
4208.....9A2NA
3962.....I2MQP
3741.....EA2IA
3557 .....N4NO
3387.....KF2O
3323...OE2EGL
3259...CT1AHU
3108.....I4CSP
3101 .....KØDEQ
3022 .....I8KCI
2903 .....IN3QCI
2857.....4X6DK
2779 ..YU7BCD
2761 .....KF7RU
2741 ...WA5VGI
2711 ...LU8ESU
2652 .....I3ZSX
2595.....EA1JG
2497 .....S58MU
2459 .....W2OO
2451...EA3GHZ
2449..SM6DHU
2416.....W3LL
2333.....W9IL
2326 .....CX6BZ
2310 .....KI7AO
2294 .....N8BJQ
2275 ....IK2DZN
2271 ..SV3AQR
2209....IK2QPR
2201 .....NQ3A
2107 .....N6FX
2098 .....K5UR
2094.....I8LEL
2093.....W2WC
2076 .....K2XF
1986 ...DL8AAV
1971 .....W2FKF
1935...SV1EOS
1927 .....AE5B
1889 .....N6QQ
1879.....K3IXD
1844 .....YO9HP
1825 .....KQ8D
1782 ....W6OUL
1776 ...JN3SAC
1719.....K9UQN
1623.....VE9FX
1612 .....AG4W
1611 .....W2ME
1561 .....PT7ZT
1550 ....IK2RPE
1534 .....AE9DX
1480.....AB5C
1464 ..VE7SMP
1463.....I2EAY
1410 .....S55SL
1386 ....IK4HPU
1377 .....EA3NP
1258 .....N1KC
1146 .....SQ7B
1145...EA3EQT
1089 .....IZ8FFA
1083.....KX1A
1042 ....IZØBNR
1031 ....IK8OZP
1022 .....NW3H
1012 .....KU4BP
1117 ..WD9DZV
978 .....EA7HY
976 .....NE6I
965.....VE6BF
883 .....WA5UA
875.....K7SAM
758.....IV3GOW
724 .....W3TZ
717 .....KØDAN
690.....W6PN
640 .....UA9YF
637.....K5WAF
600 ....WA2BEV

CW

5752.....K9QVB
5522 ..WA2HZR
5483 .....K2VV
4316.....N4NO
4182.....N6JV
4024 .....LZ1XL
3918.....VE7DP
3780 .....EA2IA
3750 ...VE7CNE
3722 .....9A2NA
3676.....S58MU
3587....WA5VGI
3471 .....KØDEQ
3145 .....W8IQ
3132 .....KF2O
3046 ...YU7BCD
3042 .....I7PXV
3025 ..SM6DHU
2843.....N8BJQ
2730 ....IK3GER
2723....EA7AZA
2721 .....K9UQN
2701....JN3SAC
2692.....KA7T
2647.....IØNNY
2632.....W2ME
2502....JA9CWJ
2473 .....OZ5UR
2434 .....W9IL
2424 .....W2WC
2373 .....VE6BF
2365.....W2OO
2342 .....N6FX
2245 .....W9HR
2178 .....I2MQP
2010 .....K5UR
1990.....W6OUL
1983...EA7AAW
1848 .....I2EAY
1827 .....AC5K
1665 .....YO9HP
1548 ..WD9DZV
1461 .....WO3Z
1445.....EA2CIN
1424 .....N6QQ
1336 ..WA2VQV
1312 .....K6UXO
1223 .....KX1A
1220 .....AA4FU
1210 .....DL4CW
1160 .....AA5JG
1125 .....IØWOK
1145 .....VE1YX
1102 .....IT9ELD
1049 .....K5WAF
821 .....HB9DAX
813 .....VE9FX
794 .....LA5MDA
753.....F5PBL
749 .....AE5B
732 .....SQ7B
695.....S55SL
629 .....IV3GOW
615 .....JH6JMM
600.....IK2SGV

DIGITAL

1700.....W3LL
1408 .....N8BJQ
1133.....N6QQ
1066.....YO9HP
1056..WD9DZV
1049 .....W2OO
1009 ..GUØSUP
894 .....AG4W
886.....KØDEQ
866 .....SQ7B
800.....KF2O

They call it "wireless," but you can't do without "wire." Here we find the coaxial "delay lines" for both a 4-Square and an 8 Circle array at the QTH of Dave, K4SV. He says both are very directional and are "hearing" well. (Photo courtesy of Dave, K4SV)

accepted by the Golist from DX and contest clubs, worldwide, for the year of 2012. Each DX club and contest club is encouraged to poll its members for their nominations for the top five QSL Managers for 2012.

The definition of a QSL Manager for this award is any person who confirms contacts via printed QSL card for any station other than their primary callsign.

Each club should tabulate the votes of its members and submit to the Golist the top five vote getters, as voted by members of their club. Votes should be tabulated and sent to the Golist by August 1, 2012, to be eligible for the QSL Manager of the Year award. Each club worldwide may only send one submission for voting purposes. Records of submission will be maintained by the Golist.

A plaque, donated by DX Publishing, Inc., publisher of QRZ-DX and *The DX Magazine*, will be awarded to the QSL Manager of the Year selected at the W4DXCC Convention held in Pigeon Forge, Tennessee in September 2012.

The recognized format for your club's submission is as follows: Club Name; Club Officer (Name, Call Sign, club office, and e-mail address); Top 5 QSL Manager Nominees (list name and callsign). In the subject line of your official email: "QSL Manager of the Year-2012" and send to: <golist@gmail.com>. The ending date is August 1, 2012.

That's the DX news for now, with much more to come this year. Until next time, enjoy the chase and all means Have Fun!

73, Carl, N4AA

QSL Information

GMØB via MMØBHX
GM3PYE/P via G4HUN
GM3VLB/P via GM3VLB
GM5XW via G5XW
GM7TJV via VR2XMT
GP4BRS via GWØANA
GQ6YB via G3SWH
GR5MS via G4PLY
GS3PYE/P via G4HUN
GT4BRS via GWØANA
GT6BRC via GWØANA
GT6BRS via GWØANA
GU/DJ6QT via DJ6QT
GUØVNK via DJ8NK
GU1OCN via G5XW
GU3HFN via DJ6QT
GU5XW via G5XW
GU6YB via G3SWH
GV2CJCG4PLY
GWØGRC via GØRC
GWØVNK via DJ8NK
GW2L via G8ATD
GW4BRS via GWØANA
GW4VXE via G3SWH
GW5XW via G5XW
GW6WRW/P via GW6WRW
GW6YB via G3SWH
GW7K via GWØANA
GW7X via GW3SQX
GW8K via GWØANA
GX4KPT/P via MØDOL
H27T via YU1FW
H2E via 5B4AGE
H4ØAT via IZ8CCW
H4ØFK via DG1FK
H4ØFN via HA8FW
H4ØMS via DL2GAC
H44AT via IZ8CCW
H44GC via K2PF
H44KA via K2PF

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

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	272	W6OAT	213	K8OOK	196
W1CU	244	VE3ZZ	207	N4NX	192
HAØDU	240	JN3SAC	207	ON4CAS	191
VE7IG	239	HA5WA	206	HA9PP	190
VE3XN	234	F6HMJ	206	BA4DW	188
HA5AGS	228	KF8UN	205	HB9DDZ	188
9A5CY	227	OK1AOV	205	K2AU	183
N8PR	223	RW4NH	203	K2SHZ	182
HA1RW	220	N4MM	202	K1NU	180
HA1AG	218	W4UM	202	W5ODD	177
KØDEQ	216	IV3GOW	201	NØFW	176
K8SIX	215	NI6T	200		

SSB

W1CU	224	VE7SMP	190	JN3SAC	177
W4ABW	202	N4MM	186	NØFW	176
KØDEQ	192	W4UM	184	DL3DXX	175

CW

DL6KVA	233	JN3SAC	202	N4MM	179
W1CU	233	W4UM	197	N4NX	177
DL2DXA	209	OK1AOV	196	N7WO	175
KØDEQ	207	HB9DZZ	186		
DL3DXX	203	OK2PO	184		

BY GEORGE RANOS,* N2GA

Most Influential Mentor

Many contesters from around the world feel strongly about their mentors, or as we hams tend to call them, our "Elmers." As in other areas of amateur radio and life, these contesters feel it is important to have someone to "show you the ropes." These are some of their stories.

SV2KBS and N2OO

Victoria Panagiotou, SV2KBS, met her mentor, Bob Schenck, N2OO, while at the VK9LA Lord Howe DXpedition in 2009. He turned out to be "the Elmer that would shift me to the higher gear in my beloved hobby!" Panagiotou is from Serres, a small town in northern Greece, while Schenck, N2OO, is from New Jersey. "My history with the code wasn't the brightest; in 2005 I failed my first 5-wpm exam. I managed to pass it half a year later with the maximum number of errors allowed, so although I really admired the guys around who could whistle the code, I never really believed that I could become one of them and enjoy CW over the air," SV2KBS said. "However, Bob had a different opinion. I spent most of my off-shift times with Bob, listening to what he listened to while on the radio, watching him as he was working the pile-ups. When the pile-up got thin, he'd even let me type in what I could hear and he'd fill the gaps; his positive and supporting attitude had an incredible effect on my confidence. Ever since, I have been hooked with daily CW practice, and it didn't take long until I became literally addicted to it. Now thanks to Bob's generosity and kindness, CW has become not only my preferred mode of operation, but something much deeper than a regular hobby. QRQ (high-speed) CW is endless, since there's always room for improvement. Last but not least, what I would like to share with you is that CW is a wonderful mode of operation that absolutely anybody [can] learn provided that he/she will stick with a consistent practice routine for a few weeks. After that, once you master the code, only then you will realize what you were missing while you were hesitant to touch a CW key!"

KH6LC and WA6UZA

Some hams meet their mentors on the air, such as Lloyd Cabral, KH6LC, from Keaau on the Big Island in Hawaii. "I met my most influential mentor, Dave Rowley, WA6UZA, then N6RZ (now a SK), on the air in 1972," Cabral said. "I'd just moved to Santa Cruz, California for a job, I'd purchased my first home and was finally able to put up antennas again. Dave was a great operator, very active and about my age. We hit it off well and became close friends. At the time, Dave had to be one of the most intense people I'd ever met and this carried over to his operating. He took it all very seriously. I can well remember him telling me: 'If you want to contest with us, you need to get proficient in CW.' If there was one thing Dave did for me, it was to introduce me to the Northern California Contest Club. In the early 1970s, the NCCC was about the most fun I've ever experienced in ham radio. It was a bunch of the most friendly, enthusiastic individuals you could ever want to meet. The meetings were so much fun and so informative you didn't want to miss one . . . did I mention the pizza and beer? Making the mid-week Bay Area meetings was always tough from geographically challenged Santa Cruz County. What's interesting is that most

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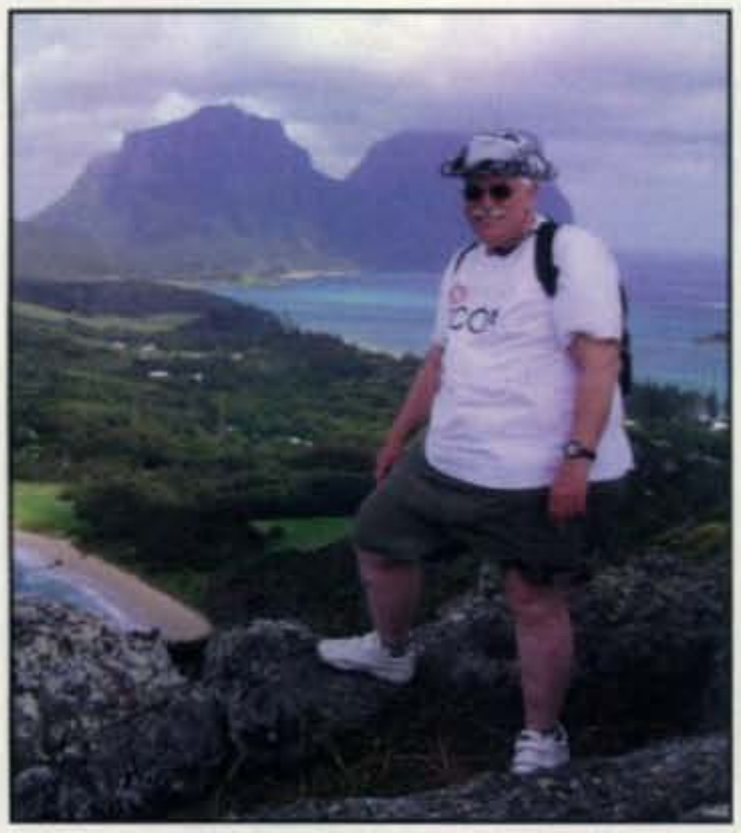
e-mail: <n2ga@cq-amateur-radio.com>

Calendar of Events

All Year	**CQ DX Marathon** (http://bit.ly/vEKMWD)
Feb. 24–26	**CQ 160M SSB Contest** (http://bit.ly/uB0wFb)
Feb. 25–26	North American RTTY QSO Party (http://www.ncjweb.com/naqprules.php)
Feb. 25–26	REF SSB Contest (http://concours.ref-union.org/contest/?page_id=2)
Feb. 25–26	UBA CW DX Contest (http://www.uba.be/hf/contest-rules/uba-dx-contest-rules)
Mar. 3–4	ARRL SSB DX Contest (http://www.arrl.org/arrl-dx)
Mar. 6	AGCW YL-CW QSO Party (http://www.agcw.org/en/?Contests:YL-CW-Party)
Mar. 10	AGCW QRP Contest (http://www.agcw.org/en/?Contests:QRP-Contest)
Mar. 10–11	EA PSK63 Contest (http://bit.ly/4XIiX1)
Mar. 10–11	RSGB Commonwealth CW Contest (http://www.rsgbcc.org/hf/rules/2012/rberu.shtml)
Mar. 11	North American RTTY Sprint (http://www.ncjweb.com/sprintrules.php)
Mar. 11	Wisconsin QSO Party (http://www.warac.org/wqp/wiqp_ rules.htm)
Mar. 17	10-10 Mobile QSO Party (http://bit.ly/cWgCpa)
Mar. 17–18	Russian DX Contest (http://www.rdxc.org/asp/pages/rulesg.asp)
Mar. 17–19	BARTG HF RTTY Contest (http://www.bartg.org.uk/hfrttycontest.asp)
Mar. 24–25	**CQ WW WPX SSB Contest** (http://bit.ly/hKqJjG)
Mar. 26	QRP Homebrewer Sprint (http://www.njqrp.org/data/qrphomebrewersprint.html)
Mar. 31–Apr. 2	Missouri QSO Party (http://www.w0ma.org/mo_qso_party.htm)
Apr. 7–8	SP DX Contest (http://www.spdxcontest.info/reg/reg_g.html)
May 26–27	**CQ WW WPX CW Contest** (http://bit.ly/hKqJjG)

Victoria Panagiotou, SV2KBS, at the station of her friend, SV2BFN. (Photo courtesy of SV2KBS)



Bob Schenck, N2OO, at Lord Howe. Bob is the mentor of Victoria Panagiotou, SV2KBS. (Courtesy SV2KBS)

Dave Rowley, N6RZ, during a 1988 trip to the Galapagos Islands for the CQWW CW Contest. Dave was mentor to Lloyd Cabral, KH6LC. (Photo courtesy of KH6LC)

of the active guys then are still very much in the game today."

LU5DX and LU6EBY

Martin Monsalvo, LU5DX, was born and raised in Lujan, a small town near Buenos Aires in Argentina. His most influential mentor in contesting is his father, Carlos Alberto Monsalvo, LU6EBY. Martin said, "I discovered both ham radio and contesting through him when I was 14 years old. He helped me get started and allowed me to enter several contests from his station, which is still located at his workshop. After a couple of CQ WW DX and CQ WPX CW tests people started to invite me to operate from their stations, including LU4FM, ZPØY, etc., back in the early 1990s, all the way through LT1F, ZW5B, LP1H, CW5W, LR4E, LU4DX, etc. He also helped me get ready for the two WRTCs I entered as a competitor (Slovenia 2000 and Brazil 2006). In 1989, he introduced me to Jorge Bozzo, LU8DQ (SK), who by then, and to this day, was the most renowned contester in LU. A most important influence is the fact that he also helped me get started with CW, which turned out to be my mode of preference. He is mainly active on SSB, so this year we both entered our first contest together as Multi Single in the ARRL 10 Meter contest. He's 70 years old now and I really had a blast seeing his enthusiasm and passion for the hobby remains the same. I really doubt I would have developed the love I feel for our hobby if it was not for his support and help. My father also mentored several other hams in my hometown. Some of them developed a preference for DXing, some others for electronics."

WØMU and KØRF/KØGU

Mike Fatchett, WØMU, of Castle Rock, Colorado, said that there was no way he could limit this to just one person and lists Chuck Cullian, KØRF, of Longmont, CO, and Jay Kesterson, KØGU, of Wellington, CO, as his two main influences. Fatchett said, "My first exposure to big-time contesting was when Chuck, KØRF, invited me up to his station to operate in one of the big DX contests. We got together a number of times ahead of the contest to get familiar with the station and maintain, build and fix various antennas and pieces of equipment. I was probably around 16 or 17 at the time. I was driving, as I remember, filling my car with all my gear. This would have been in the early 1980s. I was first licensed in 1978. When I arrived for the contest, I was paired with George, WØUA, on the 15m station. I chased mults while he ran. I also got to meet KØGU, N2IC, WØZV (now W4ZV), and WØYK while contesting at Chuck's. The amount of knowledge, guidance, and teaching I received was mind boggling!" WØMU continued: "Jay, KØGU, and I would later team up and operate

1988 Galapagos Islands contest team (left to right): Lloyd Cabral, KH6LC (then AA6T), DL7AV, W6NV, N6TU, N6RZ, NH6V (then WB6SHD). They finished fifth in the world in the Multi-Multi class. This location was on a knoll adjacent to where HC8N is located today. (Courtesy of KH6LC)

Carlos Alberto Monsalvo, LU6EBY, flanked by his two sons, Martin, LU5DX, and Carlos, LU2DJY. (Photo courtesy of LU5DX)

the ARRL DX contests from St. Kitts as VP2KBU and V47M in the 1980s. Jay and I have never operated together again in a contest, but we have always stayed in touch. Jay probably provided me with the most help over the years with software, computer, and antenna designs, explaining why certain things would not work or why they would. I can still remember practicing with the Doctor DX trying to improve our CW as we were phone guys and discussing it on 2 meters."

AA4NU and N4KG

Billy Cox, AA4NU, from Murfreesboro, Tennessee, lists Thomas Russell, N4KG, of Harvest, Alabama as his mentor. According to Cox, they first met "[a]round 1980 or so, in Alabama, on 2 meters, and then I stopped by Tom's QTH when I was in the area." Cox was already active in contesting, but connected with Russell because of common ideas. Cox said that what drew them together was "contesting, antenna theory debates (and) operating strategies." Cox said his biggest influence was that his mentor was a great sounding board on new ways and testing out those ideas.

KU5B and NX5M

"I met Bob Pack, NX5M, in July of 2004 (at the age of 16) after I had sent an e-mail to the local contesting reflector inquiring if any local stations needed ops for the IARU HF contest," said Colin Jenkins, KU5B, of Houston, Texas. Jenkins said, "Bob answered the e-mail and asked me to come out to the NX5M station in Somerville, TX. I gladly accepted the offer and had a blast operating with a good group of guys over the weekend. I've now been contesting from the NX5M station for seven years. The majority of the station is homemade (antennas, phasing boxes, interfaces), and I can still tell that even after almost 15 years of the station's existence, he's still proud of the homemade equipment. Bob has taught me quite a lot in those seven years, both about contest operating and station maintenance. Although I was an Extra when I first ventured up to Somerville, I'd had very little electronic and homebrewing experience. Bob has shown me how to fix and create countless antennas, phasing boxes, and sound-card interfaces and my knowledge of electronics has grown immensely. Additionally, Bob has offered the station to me for many single-op as well as multi-op efforts, and I've done very well thanks to his hard work in keeping the station going and motivation during the contests. He's taught me quite a lot about propagation in general, and specifically 10m propagation. He's helped me along many times in my contesting career, pushing me to keep going during a contest when I'd all but given up. The amount of contest-oriented knowledge I've gained over that time is immense. I feel a lot more comfortable about making decisions during a contest because of watching Bob and the other operators during my early years at the station. Bob has not only become a contesting mentor but a great friend. I've gotten to know his wife and two daughters (the youngest I've known since she was just a couple of months old), and they've become a second family to me. Throughout the course of coming up to Somerville, I'd also discovered that Bob shared the same passion for severe weather that I'd had since I was in elementary school. We've now chased storms together in the heart of Tornado Alley for the last two years with great success."

Mike Fatchett, WØMU, operating from St. Lucia as J6M. (Courtesy of WØMU)

W3TX and K4VX/K3LR

Scott Johns, W3TX, of Fairview, Pennsylvania, lists Lew Gordon, K4VX, and Tim Duffy, K3LR, as his mentors. Johns said, "When I was in my teens I was drawn to contesting. There was no internet back then. K4VX's station was doing

Thomas Russell, N4KG, at Bill Cox's Murfreesboro, Tennessee QTH. (Courtesy of AA4NU)

Colin Jenkins, KU5B, and Bob Pack, NX5M, in front of the Tornado Intercept Vehicle in Austin, TX. They operated the Texas QSO Party mobile from this vehicle! (Courtesy of KU5B)

Back row: Ken Wolff, K1EA; Duke Brown, W1ZA; Stu Santelmann, KC1F (SK). Front: Jim Idelson, K1IR; Fred Hopengarten, K1VR. (Courtesy of K1IR)

Bill Cox, AA4NU, from Murfreesboro, Tennessee. (Courtesy of AA4NU)

very well and was churning out exceptional operators. I'd listen to them operate to learn new techniques. One year I wrote to Lew for advice. He actually wrote back. That started many years of letters and phone calls back and forth that definitely cemented my interest in contesting—station building in particular, which is my ultimate radio passion! I had lost my station my sophomore year of college to a vandal who cut the guy wires on my tower at home. Then and there, amongst the rubble, I vowed to rebuild a station with a tower that could not be cut down. My Bertha dream was born. I built my first SuperBertha in 1999, the culmination of years of personal research and engineering. Soon I was contacted by K3LR, who visited my station and then asked me to speak at the Dayton Hamvention® Antenna forum. We became fast friends! Tim has mentored me for many years, helping me raise the bar of station engineering and building. Because of this association I've had the opportunity to build many stations for individuals centered upon the SuperBertha towers and K3LR/ WA3FET OWA Yagis. Along the way, Tim has provided me the opportunity to serve the contesting community by helping him with Contest University, the Dayton Contest Dinner, and contest-related events at Hamvention®. I've also had the privilege of operating at K3LR on 80m daytime SSB during CQWW—not a very easy appointment, but an important contribution to the entire team!"

K1IR and Four Elmers

Jim Idelson, K1IR, of Sudbury, Massachusetts, also lists multiple mentors. "I claim all of these guys—Ken Wolff, K1EA; Duke Brown, W1ZA; Fred Hopengarten, K1VR, and Stu Santelmann, KC1F (SK)—as my most influential mentors!" Idelson said, "I met Kenny, K1EA, when I was in high school around 1974. He was living in Harvard Square Cambridge, winning CD Parties from a pieced-together station connected to a few wires. We did a couple of multi-op efforts in SS from that location. Kenny also became a professional mentor as I worked my way through college and early career pursuits. I learned from Kenny that great technology (CT, antennas, and a station that really works) can give a great op a serious competitive leg-up in contesting."

Of Duke Brown, W1ZA, Idelson said, "Duke invited me to participate in his DX contest multi-op efforts in the late 1970s. I learned from Duke about the pleasures of building a technically complex station capable of dominating the bands in a DX contest. He also showed me what it meant to assemble and lead a winning team. Duke's mentoring has lasted. It has led me to become a devoted multi-op station builder and team leader."

K1IR says of Fred Hopengarten, K1VR, "I met Fred at the first general-interest radio club I ever attended in 1972. Fred was the only ham in that club who was into 'big-time' ham radio—contesting and DXing—and listening to him speak had me hooked! We've been doing contesting-related stuff together ever since."

Lastly, K1IR mentioned Stu Santelmann, KC1F (SK). "Stu Santelmann set my standard for operating and ethical excellence. Dominating a run frequency or scanning a band for multipliers, Stu did it with ease. Stu defined the term 'nice guy.' He didn't know the meaning of 'frequency fight' or 'rubber clock.' He was a pure op. There was no one you would rather spend a contest weekend with than Stu."

Summary

Our mentors help us become the people and contesters we are meant to be. Ham radio would not be the same without them. They merit our appreciation and respect. Have you considered being a mentor to another ham? There is nothing better than helping others for the satisfaction it provides. By doing so, you will do your part to continue the tradition of Elmering and fellowship in amateur radio.

73, George, N2GA

propagation

BY TOMAS HOOD,* NW7US

Chaotic Space Weather

A Quick Look at Current Cycle 24 Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, December 2011: 73
Twelve-month smoothed, June 2011: 53

10.7 cm Flux
Observed Monthly, December 2011: 141
Twelve-month smoothed, June 2011: 111

***Ap* Index**
Observed Monthly, December 2011: 2
Twelve-month smoothed, June 2011: 7

One Year Ago: A Quick Look at Solar Cycle Conditions

(Data rounded to nearest whole number)

Sunspots
Observed Monthly, December 2010: 15
Twelve-month smoothed, June 2010: 16

10.7 cm Flux
Observed Monthly, December 2010: 84
Twelve-month smoothed, June 2010: 80

***Ap* Index**
Observed Monthly, December 2010: 3
Twelve-month smoothed, June 2010: 6

As solar activity continues to rise during this current phase in Cycle 24, space weather becomes more chaotic, with an increasing number of X-ray flares, coronal mass ejections, filament eruptions, and other solar phenomenon such as coronal holes. This causes a rise in the occurrence of geomagnetic storms and ionospheric disturbances, making for rapidly changing propagation conditions. While the ionizing energy of the Sun is increasing, improving radio signal propagation on higher shortwave frequencies, these storms and disturbances make DXing challenging at times. How is it that the Sun has so much influence on the geomagnetic field that it can degrade HF communications so significantly?

The Sun and the Interplanetary Magnetic Field (IMF)

The Sun, and each planet, has a magnetic structure. The Earth has a north pole and a south pole, much like the familiar bar magnets we learned with in school. Magnetic field lines run from pole to pole, forming a donut shape of magnetic flux energy (fig. 1). The Sun has a magnetic structure, as well. It can become quite complex, with several intertwined poles. The Sun even reverses its north and south pole 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, arching back again along this sheet to return to the sun's other pole. These magnetic field lines therefore have polarities that change from north (plus) to south (minus). An IMF flux line that is oriented "northward" is one oriented toward the Sun, while one oriented "southward" is one directed away from the Sun. The huge solar current sheet that expands away from the sun is 10,000 km 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 sixteen 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 around (fig. 2). As Earth orbits the Sun, it dips in and out of the main structure of this wavy current sheet. On one side of this sheet, the Sun's magnetic field lines point northward, or

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LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for March 2012

	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 14, 17-18	A	A	B	C
High Normal: 1-3, 5-7, 9-10, 12-13, 15-16, 19, 22-24, 26-30	A	B	C	C-D
Low Normal: 4, 8, 11, 20-21, 25, 31	B	C-B	C-D	D-E
Below Normal: N/A	C	C-D	D-E	E
Disturbed: N/A	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing in *The New Shortwave Propagation Handbook* by George Jacobs, W3ASK; Theodore J. Cohen, N4XX; and Robert B. Rose, K6GKU.

2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 2 will be fair on March 1–3, poor to fair on March 4, fair on March 5-7, etc..

3. As an alternative, the Last-Minute Forecast may be used as a general guide to space weather and geomagnetic conditions through 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 conditions. In general, when conditions are High Normal to Above Normal, signals will be more reliable on a given path, when the path is ionospherically supported.

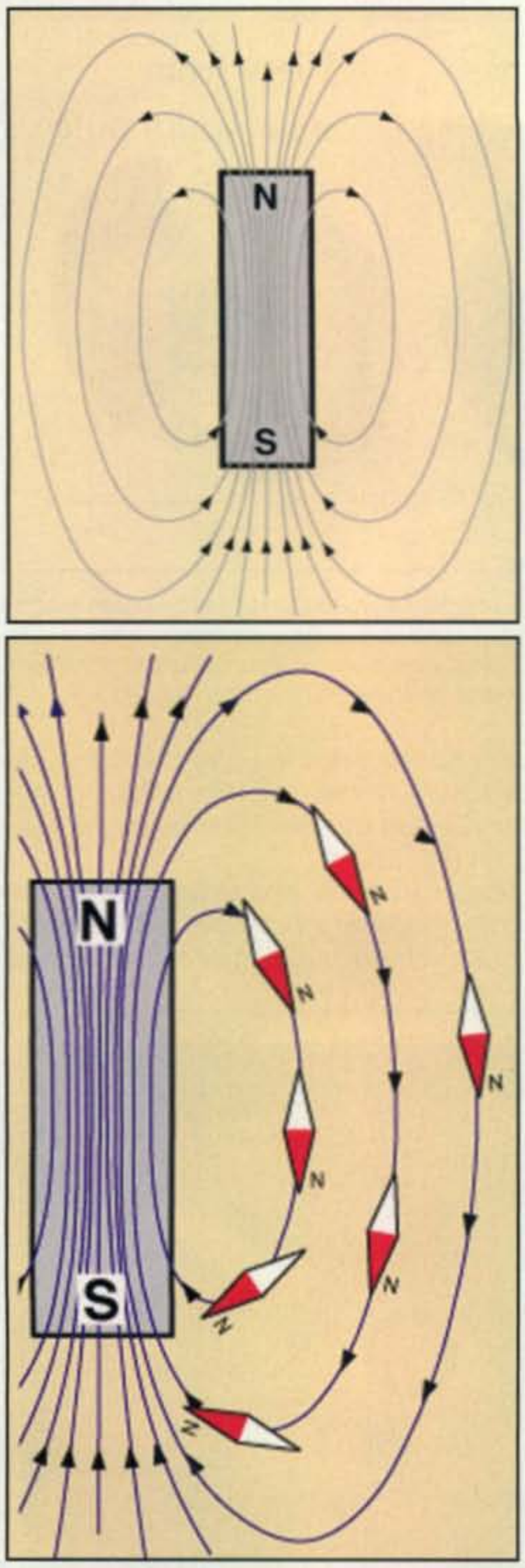

Fig. 1– The lines of magnetic field from a bar magnet (top) form closed lines. By convention, the field direction is taken to be outward from the north pole and into the south pole of the magnet. The magnetic field lines of a bar magnet can be traced out with the use of a compass (bottom). The north pole of a magnet will tend to line up with the magnetic field, so a suspended compas needle will rotate until it lines up with the magnetic field. Unlike magnetic poles attract, so the north indicator of the compass will point toward the south pole of a magnet. In response to the Earth's magnetic field, the compass will point toward the geographic North Pole of the Earth because it is in fact a magnetic south pole. The magnetic field lines of the Earth enter the Earth near the geographic North Pole. (Source: Georgia State University)

toward the Sun. On the other side they point southward, or away from the Sun.

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 north pole against the other bar's south pole). Solar wind energy can then penetrate the local space around our planet and fuel geomagnetic storms. (We report IMF orientation using the B_z ("B sub Z") index. When the B_z is negative, it indicates a southerly-oriented IMF).

Solar Wind

Riding the IMF is the solar wind. The Sun is a huge ball of energy. The solar wind is always streaming away from the Sun because the Sun is always releasing that energy out away from the Sun through various events and mechanisms. Erupting filaments and prominences, coronal mass ejections, and coronal holes are just some examples of the release of energy and material from the Sun out into the heliosphere (fig. 3).

Scientists observe the solar wind and the IMF using special instruments like the Solar Wind Ion Composition Spectrometer (SWICS) and the Solar Wind Ions Mass Spectrometer (SWIMS) instruments on board the Advanced Composition Explorer (ACE) satellite <http://www.srl.caltech.edu/ACE/>. These instruments are optimized for measurements of the chemical and isotopic composition of solar and interstellar matter. Both instruments are time-of-flight mass spectrometers with electrostatic analyzers, though each is optimized for different measurements. This data provides us with the orientation of the IMF, the wind speed and density, and more.

Coronal Holes and Coronal Mass Ejections

The atmosphere above the Sun's surface is divided into layers (much like Earth's atmosphere has a troposphere and so on). One of the sun's layers is called the corona, under which is the chromosphere and the photosphere (the photosphere is where sunspots exist).

Coronal holes are regions where the corona is dark, and exist where the solar magnetic structure is weaker than the surrounding area. It is not a real "hole" as in a dip in some surface (fig. 4). The corona is not part of the Sun's surface; it is part of the sun's atmosphere (like our troposphere, stratosphere, and so on). Coronal holes are associated with "open" magnetic field lines and are often

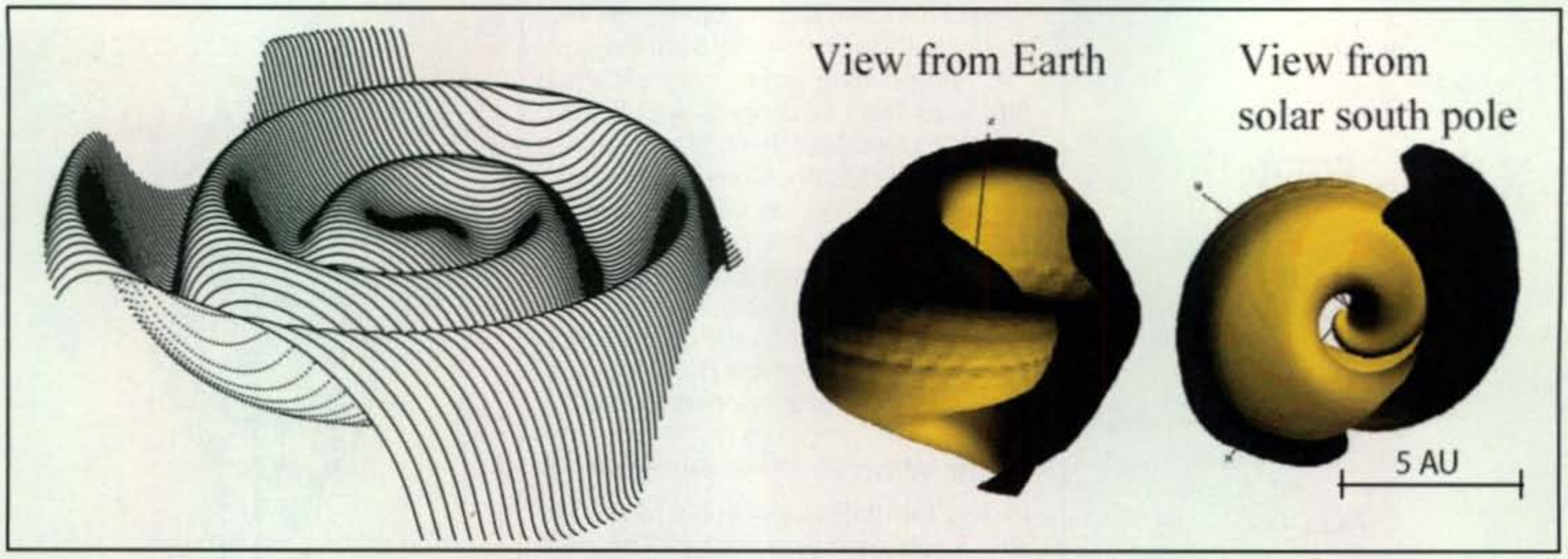

Fig. 2– (Left): The heliospheric current sheet is shaped like a ballerina's skirt. The heliospheric current sheet extends to the outer reaches of the solar system, resulting from the influence of the Sun's rotating magnetic field on the plasma in the interplanetary medium. On this sheet rides the solar winds (see text). (Credit: J. R. Jokipii, University of Arizona) (Right): The shape of the heliospheric current sheet in March 2000 as calculated by the Blue Horizon supercomputer using data from several space craft. (Source: NASA)

found at the Sun's poles. Because of this weaker magnetic area, coronal plasma escapes the Sun's gravity, no longer held by the Sun's strong magnetic fields. This plasma streams out away from the Sun and enhances the solar wind by increasing its wind speed, density, and even temperature.

A coronal mass ejection (CME) is created by one of several complex and dramatic events. Often, coronal mass ejections are created by the huge breaking up of the magnetic structures above active sunspot regions. When these magnetic fields snap, a huge cloud of solar plasma spews outward away from the Sun (fig. 5).

Coronal mass ejections can occur at any time during the solar cycle, but their occurrence rate increases with increasing solar activity and peaks around solar maximum. Coronal

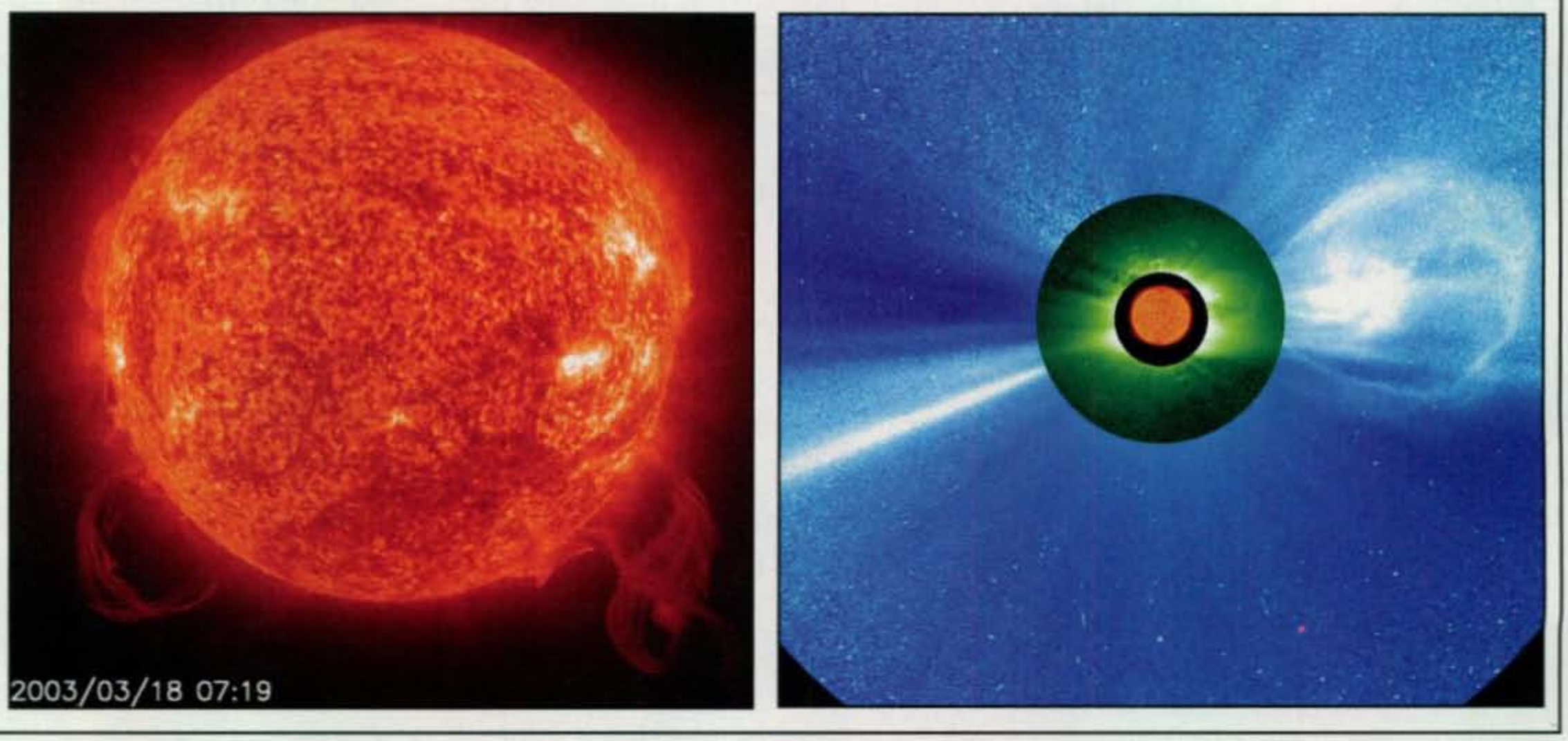

Fig. 3– (Left): This image captures two large solar prominences in extreme ultraviolet light (ionized helium at 304 Angstroms) roughly the same size but quite different in structure that appeared on the Sun on March 18, 2003. The observation of two large prominences in one image makes this one of the most spectacular images captured. Prominences are large clouds of relatively cool, dense plasma suspended in the Sun's hot, tenuous corona. (When these structures are seen with the Sun as a backdrop, they are called filaments; they are the exact same type of structure as a prominence). Magnetic fields built up enormous forces that propelled particles out beyond the Sun's surface. The one on the right, and possibly both, was associated with a flare and a CME that blasted away from the Sun at about the time of this image. The twisting nature of the one on the right is of interest to some solar physicists who believe that eruptive events like this are the Sun's way of getting rid of magnetic fields that are twisted up too tightly. For a sense of scale, the prominences extend about 20 Earths out from the Sun. They both had disappeared by the time the next image was taken 6 hours later. (Right): A CME observed by STEREO on December 12, 2008. The CME is the white "cloud" of plasma ejected away from the Sun's corona. A CME takes anywhere from two to four days to arrive at the Earth, if it is directed toward us. Using the STEREO Ahead and Behind spacecraft, scientists can analyze these plasma clouds and how they move through interplanetary space. As this plasma rides the solar wind away from the Sun, some of it arrives at Earth. Special instruments aboard scientific research spacecraft record the passage (see text). (Source: NASA/STEREO/SDO/AIA)

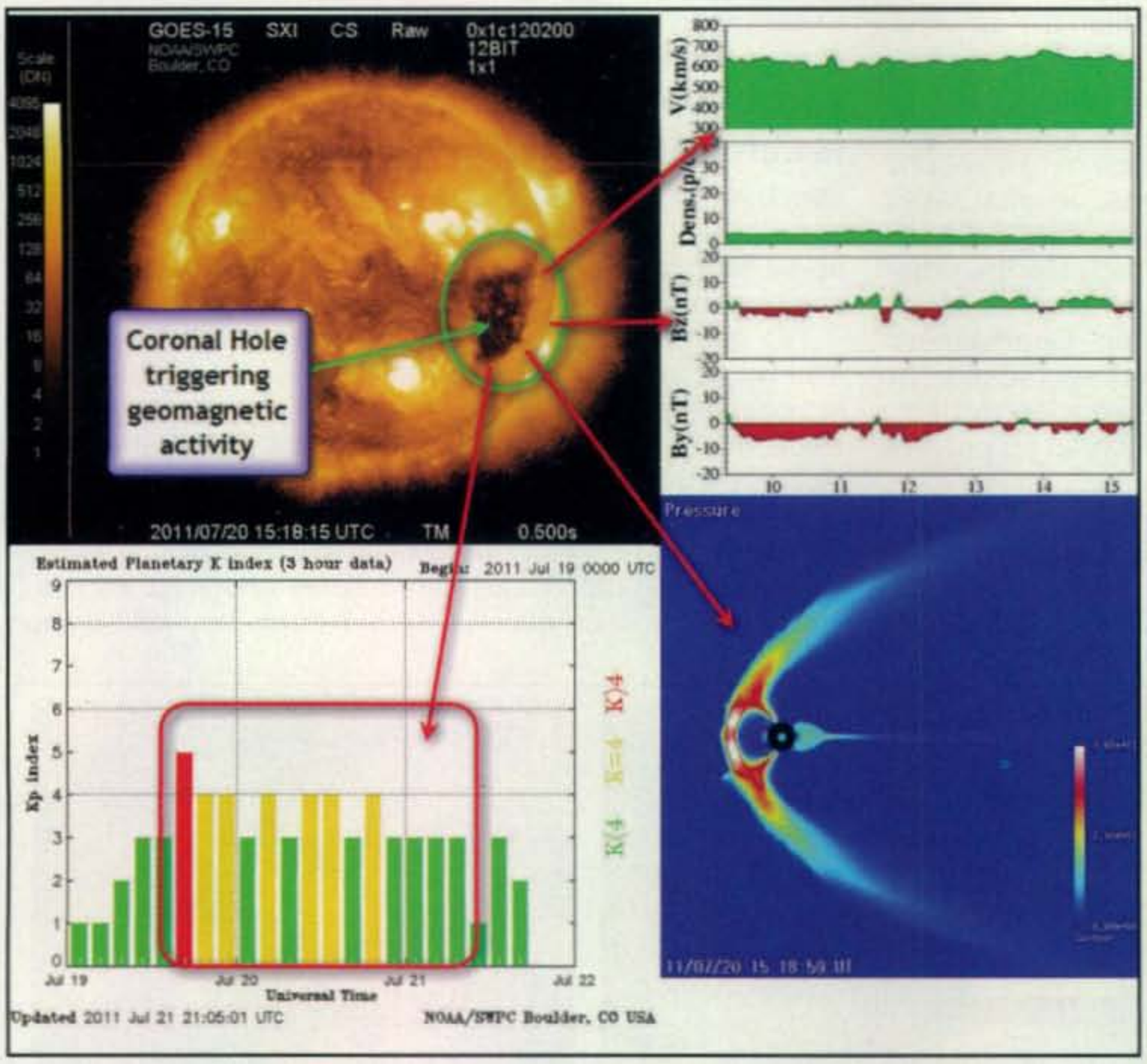

Fig. 4– At the 193-Angstrom wavelength, the Solar Dynamics Observatory's Atmospheric Imaging Assembly filters capture a coronal hole on July 18, 2011. A coronal hole is an area of weaker magnetic structure in the Sun's corona, where the solar plasma escapes the gravitational pull of the Sun and escapes out away, riding on the ever-present solar wind. Because of the weaker magnetic "hole", the solar wind streams away from this hole at a higher speed than from the rest of the corona. When such a hole is in just the right position, as is this one, it has a "connection" with the Earth and can influence geomagnetic activity. This coronal hole is said to be "geo-effective" because it has rotated into the region where its streaming solar wind and plasma material is lined up to intersect with the Earth. Sure enough, it triggered geomagnetic activity for about two days, causing a degradation in shortwave communications. Expect this type of solar weather during October, too. (Credit: Source: Solar Dynamics Observatory [SDO]/Atmospheric Imaging Assembly [AIA])

holes also increase in number and migrate more toward the equator as the solar cycle approaches its maximum phase.

Since the Sun completes a full rotation every 27 to 28 days, the same coronal hole may rotate into view roughly every month. Additionally, since active sunspot regions can last more than a month, when such a long-duration active region rotates back into view, any flaring activity will once again affect radio propagation.

While the exact processes involved in the release of CMEs are still being explored to gain a better understanding, we know a lot about how they affect the Earth. The result of a well-placed CME is a bombardment of plasma into our magnetosphere (the magnetic force field that in part protects us from lethal doses of solar energy), as well as an increase in the density, power level, and speed of the solar wind.

When the solar wind, which contains magnetic field lines, reaches the magnetosphere, one of two things may happen. If the magnetic lines in the solar wind are oriented just right, or in a southerly orientation, they will combine in a way that nullifies the magnetosphere at that point, causing a "window" to open, allowing solar plasma to enter our atmosphere. If the magnetic lines in the solar wind are not oriented this way, they will combine with the magnetosphere in a way that enhances the magnetosphere, strengthening the force field. When plasma does makes it through, the geomagnetic fields as well as the ionosphere become highly disturbed (and you will see higher Ap and

Kp readings). When the plasma and radiation are blocked, we have quieter geomagnetic conditions (Kp readings less than 4).

As the reader knows, geomagnetic storms cause a degradation of radio signal propagation as a result of ionospheric recombination. This recombination is similar to what takes place during the hours of darkness, with a lowering of the frequencies each ionospheric layer can refract. On the other hand, a stormy geomagnetic field can spark auroras, which can support Aurora-mode VHF propagation. Geomagnetic storms can cause long-term (hours to days) degradation, or depression, of the maximum usable frequencies (MUFs), reducing the critical frequencies by as much as 50 percent of normal.

March and April are months when the passage of high speed solar wind and the bombardment of coronal mass ejections cause a greater degree of change in the geomagnetic field. This is because of the Earth's position in relation to the Sun. Expect an increase in the number of geomagnetic storms and periods of degradation on HF propagation.

March HF Propagation

March is one of the optimal DX months. As the Spring Equinox approaches, the grayline begins to run straight north and south. With the return of sunlight to the polar north, north to south openings on 10 through 20 meters are again improving.

Ten and 15 meters will still stay open into the evenings. You will occasionally find 15 meters open all night long into regions in the other hemisphere. Daytime paths will not significantly degrade until midsummer. You will experience early closures if you live closer to the North Pole, if any openings occur at your latitude.

Twenty and 17 meters will remain in excellent shape. Both short- and long-path circuits are reliable and solid. All nighttime paths are open during March, though they will be short

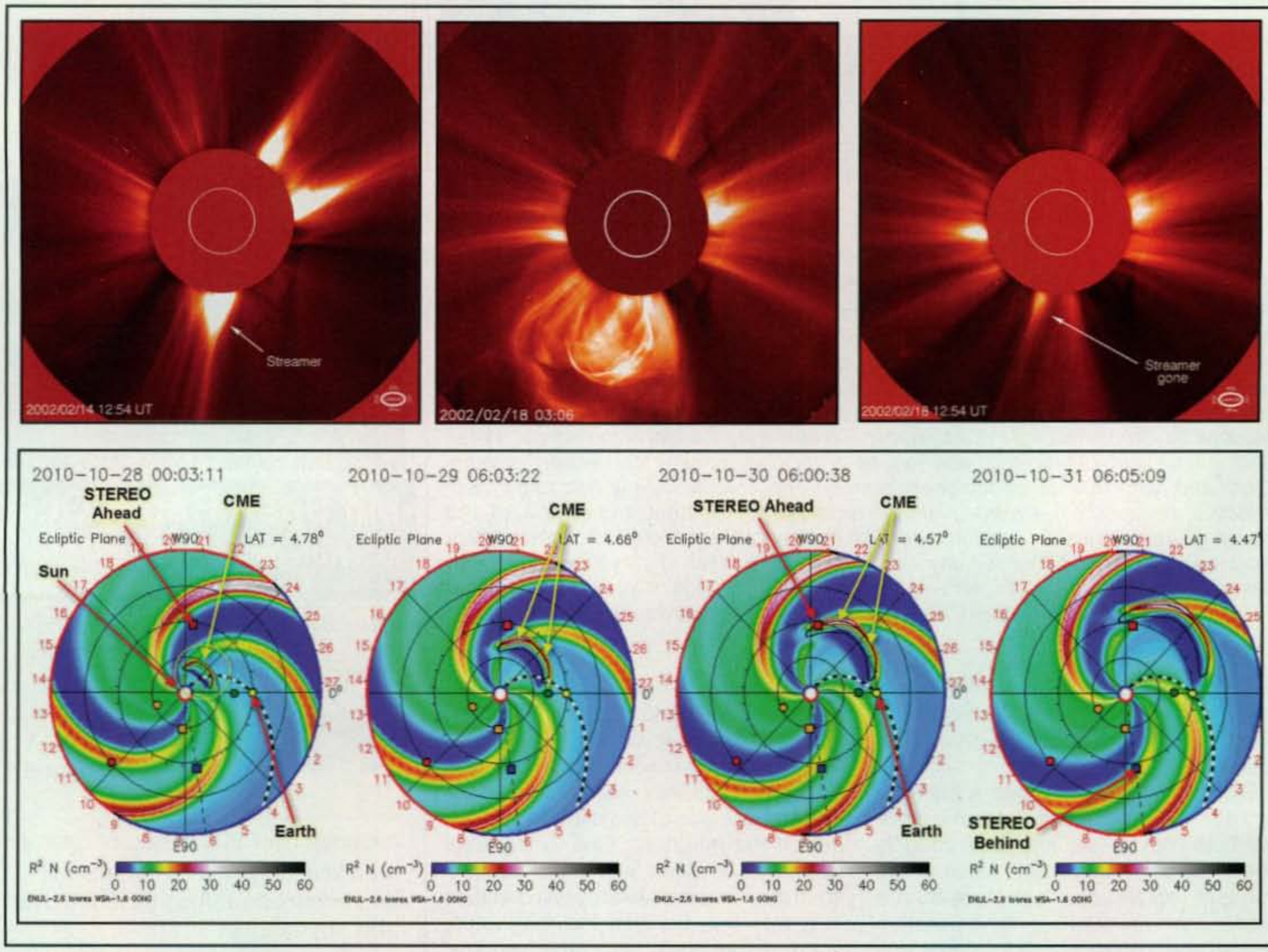

Fig. 5– Top: Three images showing a coronal mass ejection in progress. The first image (left) shows a streamer of solar plasma escaping the Sun on February 14, 2002. On February 18 (center), this area erupted as magnetic fields broke down, releasing a huge CME cloud of solar plasma. After this powerful release, the streamer is gone (right). The CME is 'shot' out away from the Sun and rides the Interplanetary Magnetic Field and solar wind, and when the Earth is in the way of its passage, it affects radio signal propagation (see text). Bottom: A series of snapshots of the special modeling analysis tool that allows scientists to predict the passage of an interplanetary coronal mass ejection. These snapshots are from the perspective of STEREO-A (the "Ahead" spacecraft). Starting in the left-most frame, we see a plasma "cloud", the coronal mass ejection (CME), leaving the Sun on October 28, 2010. As we move left to right from frame to frame, we can see how the CME just glances the Earth. Such a glancing blow typically causes only minor geomagnetic disturbances. But, if a CME were to fully "hit" the Earth, it would cause major geomagnetic storms, and trigger aurora. (Source: SOHO/STEREO/NASA/SDO/AIA/SWPC)

and weak. The prime evening hours in the United States are sunrise hours across Russia, Africa, and both the Near East and Far East. Expect occasional short- and long-path DX from these areas of the world.

Between sunset and midnight, expect occasional DX openings on all bands between 15 and 40 meters. Conditions should favor openings from the east and south. These bands should peak for openings from Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 30 through 80 meters, and occasionally, 160 meters. Conditions should favor openings from the west and south. Some rather good openings on 17 and 20 meters should also be possible from the south and west during this time.

Noise levels are slowly increasing as we move toward the Spring season. Geomagnetic storms will increase, disrupting the mid- and high-latitude ionosphere. During the spring equinox, Earth's magnetic field is sufficiently perturbed by solar wind particles flowing into the auroral zone (between 50 and 70 degrees north geographic latitude) to cause the ionosphere to be depleted. During days of high solar activity (coronal mass ejections, high-speed solar winds, flares, and so on), an increase in aurora and geomagnetic storms will shut down many paths, while VHF openings off of the auroral zone may increase.

Daytime MUFs continue their seasonal drop (due to Earth's position in relation to the Sun) and the planetary A index (Ap) is on the rise, so take advantage of the current conditions, and hunt for those weaker signals. Look for grayline DX in the mornings and evenings on lower frequencies. Transequatorial propagation will be more likely toward sunset during days of high solar flux and a disturbed geomagnetic field (look for days with an Ap greater than 15, or a planetary K index (Kp) greater than 3). Sporadic-*E* openings should be increasing, for shorter-range openings.

VHF and Above

Check for low-VHF short-skip openings during the daylight hours. Some short-skip openings over distances of about 1200 to 2300 miles may occur. The best times for such openings are during the afternoon hours.

Auroral activity often occurs during periods of radio storminess on the HF bands. Look for days where the Ap is climbing, when the Kp reaches 4 or higher. These are the days on which VHF auroral-type openings are most likely to occur.

Check out the *CQ VHF* magazine "VHF Propagation" column for an in-depth look at propagation on VHF and above.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for December 2011 is 73.0, down from November's 96.7. This is a sharp decline from the steadily rising activity over the previous three months, but is typical of the fluctuation expected during the rise of any solar cycle. The lowest daily sunspot value of 38 was recorded for December 15. The highest daily sunspot count was 108 on December 4. The 12-month running smoothed sunspot number centered on June 2011 is 53.2, up from May's 47.6. A smoothed sunspot count of 82, give or take about 9 points is expected for March 2012.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 141.2 for December 2011, down from November's 153.1. The 12-month smoothed 10.7-cm flux centered on June 2011 is 110.9, up from May's 105.6. The predicted smoothed 10.7-cm solar flux for March 2012 is 136, give or take about 9 points.

The observed monthly mean planetary A-Index (Ap) for December 2011 is 2, and for November 2011 is 3 (adjusted down from the reported 4 as published, last month). The 12-month smoothed Ap index centered on June 2011 is 7.3, much the same as the previous few months. Expect the overall geomagnetic activity to be varying greatly between quiet to stormy during March; refer to the Last-Minute Forecast for the outlook on conditions during this month.

I welcome your thoughts, questions, and experiences regarding this fascinating science of propagation. You may e-mail me, write me a letter, or catch me on the HF amateur bands. Please come and participate in my online propagation discussion forum at <http://forums.hfradio.org/>.

Remember, "Like" CQ Magazine on Facebook at <http://www.facebook.com/CQMag>. For space weather and radio propagation information on Facebook, please "Like" this columnist's dedicated page at <http://www.facebook.com/spacewx.hfradio>.

Also, be sure to follow this this columnist's Twitter account. By doing so, you will receive educational space weather and propagation information, as well as a fair amount of other informative "tweets." Of course, you can also interact with me and ask questions, which might become a topic of discussion in this column. Additionally, you can follow @hfradiospacewx for hourly "tweets" of space weather and radio propagation data like the 10.7-cm radio flux and so on.

With all the new solar cycle activity, I'll be keeping my ears to the radio, hoping to hear you on the air. Happy DX!

73, Tomas, NW7US

Number groups after call letters denote following: Band (A = all), Final Score, Number of QSOs, and Prefixes. An asterisk (*) before a call indicates low power. Certificate winners are listed in boldface. (Note that the country names and groupings reflect the DXCC list at the time of the contest.)

2011 WPX CW RESULTS
SINGLE OPERATOR
NORTH AMERICA
United States

K1LZ	**A**	**7,448,658**	**2633**	**938**
WW1WW	*	7,020,783	2600	921
			(OP: KØDQ)	
AJ1I	*	6,922,242	2559	894
			(OP: K8PO)	
WC1M	*	6,601,146	2356	907
AK1W	*	5,409,504	2237	864
			(OP: K5ZD)	
NW7R/1	*	5,059,015	2195	845
			(OP: K1ZZ)	
W1UJ	*	784,787	792	419
NM1JY	*	548,250	670	375
K1NEF	*	449,980	490	298
KM1W	*	217,617	307	251
			(OP: W1KM)	
W1RM	*	185,194	252	206
KQ2M/1	*	144,759	292	219
KB1ODO	*	54,144	180	144
W5WMU/1	**21**	**341,506**	**553**	**361**
W1OHM	**14**	**6,903**	**63**	**59**
KW2O/1	**7**	**1,469,354**	**814**	**502**
			(OP: K2LE)	
***W2JU/1**	**A**	**420,078**	**521**	**318**
*W1CCE	*	391,716	569	324
*K1PU	*	274,050	439	270
*N1NN	*	118,000	290	200
*NM1J	*	66,080	181	140
*W1END	*	40,817	140	119
*AA1O	*	32,856	148	111
*W1TO	*	31,290	118	105
*AB1HL	*	29,484	141	108
*KB1NHV	*	2,664	40	37
***W1/CT1AGF**	**14**	**240**	**16**	**15**
***AB1J**	**7**	**267,264**	**371**	**261**
NV2G	**A**	**4,832,406**	**2298**	**821**
			(OP: K2TJ)	
WN2O	*	306,912	435	276
			(OP: N2GC)	
K2NV	*	190,670	294	230
KI2P	*	153,573	302	213
KD2HE	*	87,936	262	192
K2YR	*	81,567	210	171
W2FUI	*	32,409	142	117
N2MM	**14**	**1,606,230**	**1214**	**661**
KR2AA	*	608,844	740	452
WS9M/2	*	137,852	285	241
KC2RG	*	22,791	136	107
WA2JQK	**7**	**53,841**	**143**	**131**
***K3EL/2**	**A**	**1,569,482**	**1122**	**554**
*K2UF	*	960,190	851	430
*NW2K	*	200,340	434	265
*K2XE	*	85,462	226	173
*N2SO	*	66,742	200	151
*KD2MX	*	43,188	163	122
*KM2O	*	42,840	146	126
			(OP: K2XA)	
*WA2MCR	*	36,716	164	134
*N2KPS	*	5,712	56	51
*WA2CLP	*	3,608	45	44
*KV2X	*	3,337	53	47
*K1SXD/2	*	3,052	30	28
*WA2BMH	*	1,120	20	20
*K2JF	*	24	3	3
***W2AW**	**21**	**91,260**	**239**	**195**
			(OP: N2GM)	
***W2AAB**	**14**	**213,150**	**371**	**294**
*N2JJ	*	11,154	78	78
***W2EG**	**7**	**831,432**	**629**	**404**
*NE2C	*	37,800	109	105
*WB2AIV	*	319	12	11
KC3R	**A**	**6,339,496**	**2723**	**929**
			(OP: LZ4AX)	
AA3B	*	6,201,900	2547	900
K3ZO	*	3,409,568	1552	752
N1WR/3	*	2,245,446	1378	639
N3UM	*	1,280,933	911	499
KB3UHN	*	870,200	889	458
NJ3I	*	174,400	296	218
NN3RP	*	162,480	384	240
NA3F	*	143,144	338	232
K3RMB	*	74,889	225	159
KW3A	*	64,584	208	156
WB4PWZ/3	*	45,990	146	126
KD3TB	*	15,484	99	79
***KB3LIX**	**A**	**504,113**	**604**	**331**
*W3DQN	*	341,052	491	291
*W3CQB	*	269,576	415	248
*K3STL	*	119,660	291	193
*WA3YUR	*	107,010	284	205
*AB3IC	*	83,680	247	160
*ND3R	*	78,387	200	159
*WA2VQV/3	*	66,248	200	169
*K3NK	*	63,591	169	123
*W3IUU	*	63,344	192	148
*AF3I	*	43,692	169	132
*N3NZ	*	34,968	152	124
*N3JNX	*	9,179	74	67
*K3UA	*	7,820	57	46
*K3GW	*	7,100	53	50
*K3FH	*	3,640	40	35
*KB3MXM	*	3,388	48	44
***K2PS/3**	**28**	**18,392**	**105**	**88**
***NJ3K**	**14**	**106,848**	**355**	**224**
***WO3Z**	**7**	**214,137**	**281**	**231**
*AI3G	*	4,888	53	47
NN4US	**A**	**3,496,424**	**2130**	**799**
			(OP: N5WR)	
K4RO	*	3,253,500	2143	750
KM9P/4	*	2,694,514	1812	734
			(OP: KØEJ)	
WS2T/4	*	2,603,720	1786	680
			(OP: N4PN)	
KM4MK	*	2,206,344	1767	644
			(OP: N4UU)	
NA4K	*	2,004,695	1533	635
WZ4F	*	1,870,268	1524	667
			(OP: K4AB)	
K4PV	*	1,496,508	1371	543
N4NO	*	1,453,683	1184	539
WW4R	*	1,091,679	1129	501
			(OP: N4ZZ)	
NN4MM	*	941,655	803	439
			(OP: K9MUG)	
K7CS/4	*	764,820	777	420
K4PB	*	357,714	469	306
K4HAL	*	353,934	515	318
K4DJ	*	342,168	495	318
W2YE/4	*	281,936	402	263
N5SQ/4	*	220,585	467	281
W4NZ	*	181,249	329	211
AD4EB	*	159,562	413	247
W2OO/4	*	120,467	233	179
W9WI/4	*	112,815	291	207
AD4L	*	83,496	230	168
W4XD	*	78,368	214	158
K4EU	*	72,660	173	173
K7OM/4	*	64,800	216	160
N3KN/4	*	60,384	197	148
KG4CUY	*	52,578	171	127
N4AAI	*	49,876	175	148
NE8J/4	*	48,422	213	142
NA4C	*	37,146	165	123
N4GI	*	28,420	162	116
N4DXI	*	21,534	113	97
AI4WW	*	12,460	79	70
WN1GIV/4	**21**	**1,133,900**	**1213**	**580**
			(OP: N4BP)	
W4SVO	*	549,504	802	432
AC4TT	*	236,236	453	308
			(OP: W1MO)	
K4FJ	*	139,062	271	231
KU8E/4	**7**	**990,776**	**800**	**457**
***WK2G/4**	**A**	**2,335,581**	**1608**	**621**
*WJ9B/4	*	2,277,864	1592	612
*N4PSE	*	996,363	794	447
*NJ4I	*	962,880	1085	472
			(OP: K4LTA)	
*WD4AHZ	*	720,632	915	431
*W4YE	*	707,130	617	405
*N3GD/4	*	506,176	591	352
*N4XL	*	458,104	672	346
*KN4QD	*	376,740	474	315
*NV4B	*	353,455	519	317
*K4ORD	*	337,851	485	291
*WØQQG/4	*	273,745	411	265
*K4OSO	*	271,890	411	265
*N9CM/4	*	259,974	446	286
*KE4KY	*	253,953	435	261
*AE4O	*	211,404	377	237
*W4GDG	*	198,324	422	252
*NB4M	*	171,938	336	221
*K4PG	*	165,418	322	206
*WF7T/4	*	143,376	315	206
*K4NC	*	127,032	335	201
*KN5S/4	*	117,303	275	183
*W1BO/4	*	88,938	233	162
*N4TB	*	84,420	314	180
*WC4E	*	80,600	209	155
*W3SA/4	*	71,176	219	164
*AA4KD	*	59,909	205	139
*K4FJW	*	59,784	223	159
*K4NP	*	59,566	208	158
*NM2L/4	*	55,062	210	161
*K4EDI	*	52,836	189	148
*K3MZ/4	*	49,168	145	112
*ND1Y/4	*	48,762	164	126
*W4BCU	*	48,024	160	138
*KM4JA	*	47,816	184	139
*W6UB/4	*	41,796	163	129
*W3WW/4	*	38,857	113	91
*KI4CBN	*	36,360	134	120
*N3TG/4	*	34,556	127	106
*AB4G	*	31,030	134	107
*KS4L	*	30,303	132	111
*AE4Y	*	29,580	164	116
*AC6NN/4	*	29,106	127	99
*AA4N	*	23,129	130	101
*K8LF/4	*	23,085	114	95
*ND4V	*	22,578	119	106
*KA4R	*	21,762	105	93
*KQ4Y	*	20,293	107	91
*WB4SQ	*	16,730	84	70
*AI4UN	*	14,432	120	88
*KI4EZC	*	13,912	102	94
*KI3O/4	*	11,730	89	69
*W4BCG	*	10,585	92	73
*WBØPOH/4	*	10,143	81	63
*N4MM	*	9,720	62	60
*N4TL	*	6,600	69	60
*WA4MIY	*	6,216	59	56
*AD8J/4	*	5,814	63	57
*AA4H	*	4,512	49	48
*N4AU	*	4,120	41	40
*W4EBA	*	3,318	43	42
*W4BK	*	1,800	34	30
*N4FY	*	476	14	14
*N4SR	*	32	4	4
***KN4Y**	**28**	**23,625**	**136**	**105**
***WB4TDH**	**21**	**445,612**	**676**	**404**
*W4UAL	*	145,167	335	249
			(OP: K4CWW)	
*KC4ABC	*	8,694	60	54
***K4SV**	**7**	**122,949**	**199**	**171**
*NO4K	*	1,258	17	17
***K4FT**	**3.5**	**3,968**	**48**	**44**
***NA4W**	**1.8**	**1,696**	**34**	**32**
			(OP: K4WI)	
WK5T	**A**	**5,633,212**	**2792**	**853**
			(OP: N2IC)	
KT2Z/5	*	4,086,636	2552	764
			(OP: K5NA)	
KT5J	*	3,399,432	2295	719
			(OP: K5OT)	
KZ5D	*	1,773,070	1605	593
WQ5L	*	897,961	959	443
K7IA/5	*	767,312	1007	442
WS1L/5	*	594,277	854	409
N4OGW/5	*	331,380	530	315
N5VU	*	247,884	471	273
NM5O	*	145,848	396	206
			(OP: K5ME)	
KD5JAA	*	112,515	382	195
KM5PS	*	100,240	282	179
KM4DR/5	*	88,433	433	191
NT5C	*	75,440	296	184
			(OP: N3BB)	
WA5LFD	*	61,830	184	135
KE1R/5	*	2,775	41	37
KZ5J	**28**	**34,928**	**184**	**118**
NM5M	**21**	**1,071,036**	**1149**	**564**
NR5M	**14**	**2,486,866**	**1684**	**809**
			(OP: K5GA)	
WB5AAR	*	1,622,092	1416	677
			(OP: N5RZ)	
NG5A	**7**	**1,585,172**	**1019**	**515**
			(OP: N1XS)	
***N5AW**	**A**	**2,331,771**	**1772**	**663**
*W5RYA	*	773,352	1046	414
*AE5X	*	392,955	706	345
*WI5ID	*	251,870	476	283
*WD5K	*	247,456	449	304
*N5YT	*	189,185	442	241
*KØGEO/5	*	140,698	400	206
*NF5Y	*	114,400	313	200
*K5PI	*	109,180	385	206
*N5KWN	*	102,820	321	212
*KE5AN	*	77,000	273	175
			(OP: K5LG)	
*KV5Q	*	73,920	254	176
*KK5JY	*	58,032	232	156
*W5JBO	*	25,750	152	103
*WA5VSK	*	19,943	93	77
*AA5TB	*	17,892	92	84
*W5PQ	*	16,443	120	87
*WD5IYT	*	15,372	106	84
*KD5JHE	*	14,276	115	86
*W5QLF	*	1,980	35	33
***AD5MN**	**28**	**1,380**	**24**	**23**
*KD5J	*	290	11	10
***NV5M**	**21**	**48**	**6**	**6**
NF6A	**A**	**2,987,292**	**1796**	**671**
			(OP: K6XX)	
W6TK	*	1,117,200	1129	490
W6SX	*	1,068,592	1286	464
NO6F	*	908,550	1054	450
			(OP: K2RD)	
WA6KHK	*	694,476	974	404
W6FA	*	288,000	499	300
WA6URY	*	162,526	347	247
NW6H	*	125,460	322	205
			(OP: K6RB)	
AE6RS	*	98,736	307	204
K6GEP	*	94,656	321	174
K6LRN	*	92,336	263	199
K6DGW	*	60,196	217	149
N2NS/6	*	43,206	149	114
WW6D	*	38,280	148	132
WB6JJJ	*	33,972	154	114
KB6A	*	24,108	131	98
K6ANP	*	19,780	103	92
N6AN	*	16,731	122	99
AF6T	*	11,607	92	73
			(OP: K6TD)	
WF6C	*	11,172	102	84
			(OP: N6XI)	
W4NJK/6	*	5,096	63	52
W6SZN	**21**	**25,585**	**134**	**119**
W6RKC	**7**	**6,407**	**45**	**43**
NC6CC	**3.5**	**21,070**	**133**	**98**
			(OP: N6ZFO)	
***WN6K**	**A**	**583,509**	**886**	**353**
*NN6CH	*	227,664	506	272
*NC6V	*	207,616	462	256
*N6MU	*	172,744	302	302
*KA3DRR/6	*	155,925	390	225
*N6MI	*	134,670	329	201
*W6ZBA	*	119,826	272	189
*KG6N	*	118,560	343	195
*AA6EE	*	55,264	238	157
*NU6N	*	51,976	246	146
*K6CSL	*	36,208	183	124
*NZ6Q	*	27,913	150	103
*W7TR/6	*	16,016	109	88
			(OP: KH2TJ)	
*W6ZQ	*	15,496	136	104
*W6FG	*	14,160	98	80
*W6CT	*	10,952	100	74
*K7SDW/6	*	10,375	111	83
*W6OUL	*	7,228	61	52
*K9JM/6	*	7,006	71	62
*N6CHU	*	6,392	73	68
*KD6NR	*	6,324	72	62
*KU6W	*	5,005	60	55
			(OP: N6GQ)	
*N6QZS	*	2,624	45	41
*K6KQV	*	2,135	37	35
*NC6Q	*	888	26	24
*K6HTN	*	884	28	26
***WA6FGV**	**21**	**37,391**	**173**	**139**
***KM6Z**	**14**	**172,800**	**401**	**270**
*KJ6MBW	*	138,990	324	246
			(OP: VK2IMM)	
*N6BHX	*	850	28	25
*N6DO	*	800	25	25
NK7U	**A**	**4,893,250**	**2514**	**851**
			(OP: KL9A)	
KW7Y	*	2,959,110	1883	735
			(OP: K7RL)	
KM7W	*	2,469,600	1734	700
			(OP: N9RV)	
KY7M	*	881,280	1054	480
K7QQ	*	858,977	1051	443
W7IJ	*	729,144	737	456
NG7Z	*	727,684	1009	436
K7HP	*	716,106	896	426
K7JQ	*	521,280	800	362
W6AEA/7	*	443,124	753	373
W7YS	*	397,794	623	334
WO7A	*	337,212	620	323
			(OP: AA7V)	
KS7T	*	316,680	607	312
NI7R	*	292,632	529	274
K7AR	*	288,358	424	301
KE2VB/7	*	266,733	610	267
KI7Y	*	263,840	553	272
NR7OX	*	242,208	530	288
			(OP: K7ABV)	
W7SW	*	238,620	500	246
NU7J	*	200,984	390	259
N3RC/7	*	180,544	415	248
W7VXS	*	127,880	394	230
N7CW	*	114,270	338	195
N6TW/7	*	62,622	202	147
N7QS	*	53,439	203	141
N6KW/7	*	40,138	167	122
KD7H	*	36,297	162	111
K7KU	*	31,875	165	125
			(OP: KØKR)	
K07AA	*	21,888	146	114
KK7X	*	5,640	69	60
W7ON	*	3,999	47	43
KF7P	*	3,168	48	44
K7EG	*	2,408	30	28
WA7LT	**21**	**105,009**	**286**	**213**
K7ZZ	**14**	**285,381**	**511**	**333**
N7IX	*	44,243	187	151
N7DOE	*	30,688	164	137
K7FA	**7**	**121,636**	**230**	**188**
N7KQ	**1.8**	**64**	**10**	**8**
***AD7JP**	**A**	**1,258,524**	**1222**	**516**
			(OP: K2PO)	
*KE7X	*	1,122,854	1319	509
*K7WP	*	914,475	1033	445
*W7YAQ	*	296,018	503	283
*NX1P/7	*	196,968	512	242
*N6NR/7	*	196,420	470	244
*N7XU	*	165,984	397	247
*WX7A	*	155,694	385	231
			(OP: N7BAN)	
*NQ7R	*	142,200	340	237
*AB7RW	*	123,610	254	235
*N3AIU/7	*	120,840	310	190
*AF7S	*	119,280	362	210
*AE6RG/7	*	116,025	363	195
*WC7Q	*	102,765	344	195
*WO7V	*	91,980	294	180
*K7ZG	*	82,770	338	186
*KD7MSC	*	71,925	273	175
*N7VS	*	63,960	268	164
*W7QN	*	46,008	205	142
*AA5TL/7	*	37,647	131	89
*WU6W/7	*	32,520	168	120
*K7ULS	*	31,964	147	122
*K6WSC/7	*	30,622	166	122
*WAØWWW/7	*	28,665	137	117
*AK7O	*	22,581	150	117
*N7VEA	*	20,592	126	99
*WA7SHP	*	901	19	17
*AD7JX	*	48	6	6
***K7MH**	**21**	**6,804**	**68**	**63**
***K7ZD**	**14**	**272,082**	**469**	**331**
*W7MTL	*	40,176	190	144
*WØPAN/7	*	1,628	37	37
*K7AMS	*	960	25	24
***K7BX**	**7**	**62,000**	**198**	**155**
*KX7L	*	36,125	161	125
*WA7NWL	*	14,399	85	77
K1LT/B	**A**	**1,555,975**	**1172**	**571**
K8GL	*	1,074,944	847	494
K8JQ	*	570,570	840	390
K3JT/8	*	563,882	745	361
K8MP	*	368,592	551	336
KB8O	*	63,832	210	158
W8PN	*	58,016	199	148
NF8J	*	57,660	204	155
NS8O	*	49,067	176	139
NC8C	*	34,720	139	112
			(OP: K8MR)	
NE8P	**21**	**335,738**	**551**	**349**
N8BJQ	**14**	**990,698**	**866**	**551**
KO8Z	**7**	**142,524**	**316**	**214**
***KV8Q**	**A**	**902,192**	**937**	**452**
*N8VV	*	459,540	648	345
*N9AUG/8	*	291,870	443	282
*WB8TLI	*	178,789	302	221
*WA8REI	*	138,306	314	222
*W8TM	*	137,116	263	166
*K8MEG	*	127,866	276	211
*W8DHG	*	90,915	219	165
*NF8M	*	60,590	205	146
*K8GT	*	33,019	108	89
*AC8HN	*	15,990	94	78
*W8WTS	*	15,288	103	84
*K8VUS	*	11,680	76	73
*W8KNO	*	1,058	23	23
***KN8O**	**21**	**2,628**	**39**	**36**
***N8II**	**14**	**398,184**	**497**	**376**
*W8IQ	*	279,725	463	335
*WA8RCN	*	91,080	277	207
*K8BTU	*	34,830	152	129
*N8SBE	*	176	9	8
***NA8V**	**7**	**386,559**	**470**	**309**
*WB8JUI	*	233,613	366	257
K3WA/9	**A**	**1,513,120**	**1370**	**560**
W9RE	*	1,193,096	999	509
NS9I	*	830,599	854	469
W9QP	*	770,560	841	430
K9MA	*	353,248	539	304
K9WWT	*	219,373	506	259
K9CT	*	202,125	339	231
KG9N	*	177,712	398	232
W3HDH/9	*	88,970	197	155
N9WKW	*	76,950	228	162
KK9V	**14**	**10,275**	**82**	**75**
WX9U	**7**	**664,306**	**611**	**386**
KX9DX	**3.5**	**6,527**	**82**	**61**
***KS9K**	**A**	**1,626,350**	**1242**	**550**
			(OP: N4TZ)	
*K9QVB	*	1,352,868	1193	554
*K9OM	*	1,204,476	1046	546
*W9CPI	*	291,952	500	284
*KB9OWD	*	140,980	396	212
*K9PMV	*	134,606	307	214
*K9MY	*	106,196	251	191
*W9OA/9	*	51,246	168	146
*NV9X	*	43,851	180	141
*WR9Y	*	33,390	174	126
*KI9E	*	31,248	163	126
*W9TTT	*	23,896	129	103
*N9DD	*	14,025	95	75
*N9BT	*	5,408	59	52
*WQ9T	*	5,250	55	50
*W9ILY	*	3,773	56	49
*K9PLX	*	2,888	42	38
*KE9EX	*	2,668	30	29
*KB9YGD	*	210	14	14
***K1TN/9**	**14**	**192,376**	**400**	**278**
*N9GBB	*	2,331	38	37
*AJ9C	*	154	11	11
***K9UIY**	**3.5**	**99,372**	**348**	**196**
*AA9IV	*	805	24	23
KGØF	**A**	**3,664,272**	**2204**	**776**
			(OP: WØUA)	
KU1CW/Ø	*	3,581,955	2240	785
KCØMO	*	1,563,355	1493	565
			(OP: KØOU)	
NAØCW	*	1,473,600	1299	600
KX0A	*	1,022,626	1166	517
			(OP: K9DU)	
WØBH	*	607,975	970	415
WØTT	*	415,638	636	358
NEØF	*	327,813	682	339
			(OP: KØEU)	
WØRAA	*	111,398	314	218
KØKT	*	104,907	257	187
KØDEQ	*	88,308	307	198
KØXTR	*	51,888	221	138
WT7TT/Ø	*	49,136	244	148
			(OP: WØZA)	
NØHF	*	32,895	178	129
WØKIT	*	20,700	115	92
KØAP	*	2,464	30	28
ACØE	*	50	5	5
WØTY	**14**	**3,913**	**45**	**43**
NØTT	**1.8**	**7,198**	**84**	**59**
***KTØR**	**A**	**932,358**	**1143**	**474**
			(OP: KØAO)	
*NAØN	*	845,692	1048	452
*WØETT	*	483,456	687	384
*KØRC	*	320,628	473	308
*NEØS	*	318,092	536	281
*KØVBU	*	215,988	520	246
*WØUY	*	137,634	304	203
*KR7C/Ø	*	105,395	392	197
*NØGOS	*	99,372	364	196
*N7DR/Ø	*	92,340	215	135
*AFØE	*	84,372	269	178
*KSØM	*	78,727	249	187
*KOØA	*	74,029	249	181
			(OP: NØAX)	
*KØITC	*	63,910	220	154
*WØPC	*	54,096	235	138
*KØVM	*	24,380	148	115
*ABØS	*	22,464	128	96
*WGØM	*	17,017	123	91
*KSØT	*	5,989	58	53
*W9ELN/Ø	14	4	2	2
***ACØDS**	**7**	**123,993**	**326**	**207**
*KØPK	*	57,771	175	147
*N9HDE/Ø	*	24,420	136	110
***W7DRA/Ø**	**1.8**	**121**	**12**	**11**

Alaska

KL2R	**A**	**441,441**	**512**	**343**
			(OP: N1TX)	
AL1G	**14**	**39,326**	**182**	**106**

Bahamas

***C6ABR**	**A**	**525,198**	**535**	**323**
			(OP: OH2BR)	

Belize

***V31JP**	**A**	**112,378**	**248**	**161**

Canada

VYØZM	**A**	**9,552,842**	**2889**	**922**
			(OP: K1ZM)	
VY2TT	*	8,722,920	2770	942
			(OP: K6LA)	
VA1MM	*	1,836,008	1100	514
VE9HF	*	562,790	623	334
VE1JBC	*	150,696	283	207
VE1DT	**7**	**176,958**	**193**	**174**
***VO1HP**	**A**	**759,066**	**623**	**371**
*VE1ZA	*	237,896	339	227
*VY2LI	*	56,115	149	129
***VE1NB**	**7**	**1,457,528**	**685**	**446**
*VE1RGB	*	818,844	468	362
VA2EW	**A**	**4,502,229**	**1826**	**731**
VE2FK	*	230,120	315	220
***VE2AWR**	**A**	**509,218**	**542**	**289**
*VE2SG	*	150,846	260	186
*VA2TTA	*	52,822	130	98
*K2NV/VE3	*	42,400	119	100
*VE2QV	*	4,305	42	41
			(OP: VE2FFE)	
***VE2HLS**	**14**	**58,408**	**174**	**149**
VE3JM	**A**	**5,707,260**	**2134**	**810**
VE3EJ	*	1,052,610	723	390
VA3AR	*	406,326	475	281
VE3CX	**14**	**28,676**	**117**	**107**
VE3WT	**7**	**82,689**	**149**	**129**
***VE3KAO**	**A**	**489,024**	**524**	**283**
*VE3GFN	*	388,260	476	270
*VE3FH	*	290,950	408	230
*VE3EY	*	281,728	402	248
*VE3GSI	*	241,500	348	210
*VE3OM	*	135,975	255	185
*VE3PWA	*	126,553	237	179
*VE3NR	*	108,644	195	157
*VA3XOV	*	80,620	204	139
*VA3EC	*	69,500	178	139
*VE3RCN	*	63,384	169	139
*VA3FN	*	51,684	157	118
*VE3DZ	*	43,320	127	95
*VA3ATT	*	26,319	117	93
*VE3XAT	*	19,402	97	89
***VE3TG**	**14**	**338,372**	**421**	**322**
*VE3FJ	*	199,680	311	260
*VE3AUO	*	3,870	45	43
***VE3IAE**	**7**	**305,486**	**311**	**229**
*VE3DUS	*	10,442	46	46
VE4EAR	**A**	**594,064**	**618**	**347**
***VE4YU**	**A**	**357,053**	**485**	**277**
***VA5LF**	**A**	**5,390**	**50**	**49**
VE6TL	**14**	**63,801**	**212**	**139**
***VE6SQ**	**A**	**123,018**	**295**	**174**
*VE6DJT	14	98	7	7
VA7KO	**A**	**771,210**	**844**	**342**
VE7JKZ	*	175,147	298	191
VA7DZ	*	70,742	212	163
VE7XF	**21**	**152,324**	**310**	**226**
VA7RR	**14**	**2,030,832**	**1349**	**648**
***VA7CPC**	**A**	**30,502**	**124**	**101**
*VE7BGP	*	8,374	72	53
***VE7MID**	**14**	**132,544**	**282**	**218**
*VA7MM	*	5,832	56	54
***VE7MR**	**7**	**8,400**	**42**	**42**

Cayman Islands

ZF1A	**28**	**476,612**	**655**	**326**
			(OP: W5ASP)	

Cuba					
*CO2JD	7	796,384	572	328	
*CO6CAC	"	74,997	161	117	
Dominican Republic					
*HI3EPR	21	114,270	236	195	
*HI3TT	7	266,463	310	213	
Greenland					
*OX3JZ	A	3,080	42	40	
Grenada					
*J39BS	A	2,040,016	1372	536	
Honduras					
*HQ9R	21	977,340	979	455	(OP: WQ7R)
Mexico					
XE1MM	A	1,167,460	972	434	
XE2S	"	947,542	849	383	
XE2WWW	14	13,728	105	66	
*XE2MX	A	249,900	318	245	
*XE1AY	"	223,514	465	226	
*XE2AJ	"	110,100	262	150	
*XE1FZE	"	4,760	44	40	
Puerto Rico					
NP4Z	A	8,292,468	2897	922	
KP4EJ	"	56,760	155	129	
KP4JRS	28	12	2	2	
U.S. Virgin Islands					
*NP2/OL5Y	21	1,889,778	1309	627	(OP: OK1FUA)
*WP2/OLØA	3.5	259,164	286	207	(OP: OK1CZ)
AFRICA					
Canary Islands					
EF8M	A	17,256,785	3997	1105	(OP: RD3A)
ED8A	"	6,754,856	2291	796	(OP: EA8AY)
EG8DDC	"	15,688	63	53	
*EA8BQM	A	914,112	673	432	
*EC8AFM	"	311,300	357	275	
*EA8CQW	21	67,340	157	148	
*ED8DA	14	451,484	453	341	(OP: EA8DA)
*EA8AVK	"	161,882	254	217	
*EA8NQ	3.5	28,492	74	68	
Morocco					
*CN8KD	A	3,410,343	1392	639	
Namibia					
*V55X	A	112,833	202	189	
Senegal					
6W/RK4FF	A	11,082,730	3178	1010	
South Africa					
ZS6RJ	A	442,860	474	305	
ZS1EL	21	451,350	436	354	
*ZS1JY	A	21,756	88	74	
Tunisia					
*3V8SS	A	4,861,320	2106	680	(OP: KF5EYY)
ASIA					
Asiatic Russia					
RC9O	A	7,566,604	2485	878	
UA9FGJ	"	1,509,228	862	477	
UA9XF	"	1,334,944	787	416	
R9QQ	"	755,820	626	340	
RA9SF	"	704,720	594	368	
RL9I	"	685,222	684	397	
UA9BS	"	607,807	631	397	
R8MC	"	449,625	540	327	
RW9XC	"	250,008	333	264	
UA9WOB	"	236,430	285	213	
R8TX	"	181,373	306	227	
R9WW	"	153,850	225	181	
UA9UPG	"	139,128	254	186	
UA9FM	"	51,584	145	128	
R9CD	"	12,351	76	69	
UA9UR	"	4,326	44	42	
RF9M	21	941,367	861	483	
RA9JP	"	141,816	353	228	
RA9AE	14	2,140,979	1187	661	
RV9JR	"	785,439	666	443	
RV9LM	"	761,600	650	425	
RU9LA	"	290,763	384	267	
RU9UC	"	74,576	166	158	
RA9SG	7	138,900	169	150	
R9TV	3.5	863,825	508	317	
*RW9JD	A	3,250,324	1549	671	
*RA9SN	"	1,490,412	889	462	
*R8XF	"	923,525	737	425	
*RX9FB	"	903,279	699	437	
*UA9AX	"	546,135	531	345	
*R9AX	"	504,686	527	413	
*RN9RF	"	423,148	498	326	
*RU9AZ	"	408,758	437	301	
*R8MD	"	367,686	431	297	
*RT9YA	"	300,564	434	253	
*UA8WAA	"	292,058	329	239	
*R9UG	"	189,104	307	223	
*UI8W	"	168,756	224	164	(OP: RW9WW)
*RA9AP	"	167,620	247	170	
*RX9DJ	"	112,918	237	202	
*UA9APA	"	79,240	151	140	
*UA9CHL	"	27,742	106	97	
*RA9OFA	"	27,270	127	101	
*RU9CD	"	12,096	56	54	
*RV9YZ	21	503,476	637	382	
*RA9UIV/9	"	198,180	417	270	
*UA9AFS	"	150,416	293	238	
*UA9QM	"	69,426	198	171	
*UA9UKL	"	54,793	194	157	
*UA9MW	"	22,256	116	107	
*UA9SAW	"	16,146	91	78	
*RU9WZ	"	35	5	5	
*RX9AF	14	1,580,091	972	579	
*UA9LAO	"	1,499,510	976	565	
*UF8T	"	572,033	552	391	
*RA9XU	"	452,540	479	374	
*RA9AFZ	"	99,552	208	183	
*RA9CCK	"	96,224	194	194	
*RK9DO	"	93,080	184	179	
*R8US	"	69,678	175	158	
*RF8R	"	30,368	112	104	(OP: RW9RW)
*RA9MX	"	25,970	108	106	
*UA9FEG	"	15,054	84	78	
*RV9CX	"	133	7	7	
*RZ9AE	3.5	238,612	235	187	
RWØCR	A	2,737,049	1502	679	
RNØSA	"	1,599,519	1188	489	
RØFA	"	946,827	1003	441	
RØ/KE5JA	"	338,352	824	228	
RAØFU	"	298,109	526	259	
UAØCNX	"	178,980	526	228	
UAØAKY	"	105,000	237	175	
UAØZAM	"	18,080	110	80	
RØAA	28	50,864	182	136	
UAØDC	21	259,671	540	303	
UAØSR	14	484,366	554	398	
RAØUF	"	27,346	136	113	
UAØW	"	22,477	103	91	
RUØLL	7	44,523	124	97	
*UAØOD	A	490,495	664	373	
*UAØIT	"	371,280	531	273	
*RWØLL	"	122,850	332	189	
*RUØA	"	90,652	248	173	
*UAØUV	"	87,057	201	153	
*UAØLSK	"	80,640	307	168	
*UAØLS	"	69,462	291	153	
*RUØST	"	49,856	152	152	
*UAØCMG	"	48,339	234	131	
*RWØUM	"	27,500	109	100	
*RAØLG	"	21,311	113	101	
*UAØLCZ	"	13,281	72	57	
*RWØOU	"	9,856	91	77	
*RNØCW	"	6,832	71	61	
*UAØZC	"	286	12	11	
*UAØOA	28	72	9	8	
*RWØLQ	21	22,914	121	114	
*RWØAJ	14	777,377	680	463	
*UAØKBG	"	32,809	137	109	
*UAØUK	"	11,972	93	82	
Asiatic Turkey					
*TA3X	14	420,714	477	318	
*YM3KB	"	87,101	193	161	(OP: TA3DJ)
Azerbaijan					
*4K9W	A	959,700	692	420	
*4K8M	28	1,430	26	26	
*4K6FO	14	1,171,296	886	498	
China					
BA1GN/8	A	452,661	602	363	
BA8AG	"	249,006	478	282	
BD2SH/7	28	40,764	259	129	
*BH4RQU	A	218,346	445	241	
*BD2OB/7	"	135,462	319	211	
*BA1SN	"	124,614	353	207	
*BG5RSO	"	100,534	243	167	
*B4VE	"	79,352	283	182	(OP: BA4VE)
*BD3OM	"	51,272	196	136	
*BA4SD	"	50,456	193	136	
*BH3AGU	"	46,948	170	121	
*BH1ERB	"	18,630	133	90	
*BD4JWU	"	15,687	129	83	
*BD8IK	"	12,792	91	78	
*BD3MH	"	9,088	79	64	
*BD7NWF	28	73,920	313	176	
*BA6IV	21	125,656	320	226	
*BD6JJX	"	89,376	295	196	
*BH4RRG	"	43,488	198	144	
*BA4QO	"	6	2	2	
*BD4QA	14	1,443	42	37	
*BA4CW	"	153	9	9	
*BD3RT	"	49	7	7	
*BG2AUE	7	108,965	255	155	
Cyprus					
P33W	A	11,307,568	3367	956	(OP: RA3AUU)
*5B/HA5PP	28	291,930	396	263	
Georgia					
4LØA	A	10,963,656	3282	981	(OP: UUØJM)
4L8A	14	5,809,104	2323	918	
*4L1MA	A	1,184,118	702	442	
India					
*VU2RMS	A	137,904	281	208	
Israel					
4Z5KO	A	86,112	194	156	
4Z1TL	"	65,360	172	152	
*4Z5OQ	14	90,650	192	175	
Japan					
JH1EAQ	A	2,780,136	1423	633	
JF1NHD	"	2,584,704	1444	636	
JA1JKG	"	945,952	772	412	
JE1LFX	"	412,698	581	286	
JA1HP	"	207,200	421	259	
JA1MJN	"	121,790	308	190	
JF1SEK	"	112,400	270	200	
JO1VRV	"	68,376	196	148	
JO1SIM	"	53,250	242	142	
JA1KZP	"	41,515	148	115	
JA1HMK	"	27,968	136	92	
JA1AGG	"	12,036	68	68	
JL1LNC	"	651	23	21	
JK1LUY	14	32,065	134	121	
JI1HNC	"	4,462	47	46	
JF1SQC	7	727,320	521	348	
*JI1RXQ	A	1,400,580	947	502	
*JA1BJI	"	1,260,924	1000	476	
*JS1OYN	"	337,272	505	282	
*JA1BNW	"	318,604	417	286	
*JA1CP	"	238,714	479	238	
*JH1FNU	"	234,864	426	252	
*JF1KWG	"	177,408	364	224	
*JH1SWD	"	170,563	367	191	
*JA1CJP	"	169,686	305	198	
*JE1REU	"	134,974	346	217	
*JH1SVO	"	121,924	247	187	
*JN1MSO	"	112,476	297	182	
*JA1AZR	"	91,188	277	153	
*JA1HNW	"	82,008	205	153	
*JA1IE	"	63,920	202	136	
*JN1IZK	"	62,980	254	134	
*JR1BTG	"	59,817	230	157	
*JA1EMQ	"	48,910	162	134	
*7N4QCQ	"	33,770	137	110	
*JP1SRG	"	29,106	109	98	
*JP1HUJ	"	24,661	126	91	
*JA1DCK	"	24,000	120	96	
*JF1TTN	"	23,788	92	76	
*JH1DJD	"	21,588	88	84	
*JJ1WWL/1	"	21,315	119	87	
*JA1OHP	"	20,376	90	72	
*JA1HG	"	19,866	102	77	
*JA1LZK	"	18,480	85	84	
*JJ1LRD	"	17,708	105	76	
*JE1RRK	"	16,683	103	83	
*JH1HMC	"	16,320	84	64	
*JI1LAT	"	15,352	80	76	
*JE1NVD	"	13,904	111	79	
*JA1CPZ	"	10,720	74	67	
*JR4PMX/1	"	10,660	75	65	
*JN1HYU	"	10,432	69	64	
*JF1VNR	"	9,620	86	74	
*JG1FKT	"	9,558	68	59	
*JO1KXP	"	6,272	80	64	
*JM1KNI	"	5,566	60	46	
*7L3DGP	"	5,520	52	46	
*JA1NGW	"	4,558	43	43	
*7N4CPT	"	4,368	49	39	
*JI1UDD	"	3,360	38	35	
*JL1MWI	"	924	35	33	
*JI1DSU	"	660	24	22	
*JK1SDQ	"	558	18	18	
*JA1DDZ	"	352	11	11	
*JA1FRQ	"	240	10	10	
*JR1UMO	"	84	6	6	
*JA1GFD	"	48	6	6	
*JH1XUZ	28	12,348	117	84	
*JA1PS	"	2,613	40	39	
*JQ1KRT	"	252	13	12	
*JO1LDY/1	"	30	6	5	
*JP1IXV	21	56,480	185	160	
*JI1AQY	"	34,544	152	127	
*7K1EQG	"	28,652	145	116	
*JI1ALP	"	12,080	103	80	
*JG1UKW	"	5,300	54	53	
*JI1BBN	"	4,400	50	50	
*JI1SAI	"	3,713	51	47	
*JK1NSR	"	3,713	48	47	
*JE1JAC	"	3,280	42	40	
*JF1PYJ	"	2,816	47	44	
*JH8SEG/1	"	864	29	24	
*JL7FBV/1	"	777	21	21	
*JG1WKM	"	315	15	15	
*JI1LAI	"	105	7	7	
*JJ1PTI	"	84	7	7	
*JN1BBO	"	45	5	5	
*JA1KEV	14	45,582	169	142	
*JA1BFN	"	25,652	114	106	
*7K4VPV	"	19,176	105	94	
*JL1QDO	"	4,185	47	45	
*JG1SWV	"	189	9	9	
*JH1NXU	"	140	11	10	
*JA1IZZ	"	65	5	5	
*JA1XMS	7	399,378	362	257	
*JA1VVH	"	8,950	58	50	
*JH8KYU/1	"	1	1	1	
*JE1TSD	3.5	600	10	10	
*JE1SPY	1.8	322	19	14	
JF2QNM	A	1,281,931	1097	499	
JA2XYO	"	493,506	512	342	
JA2VHO	"	353,720	486	296	
JA2DHF	"	64,448	211	152	
JR2PMT	"	37,506	130	114	
JF2IWL	"	3,185	38	35	
JA2IVK	28	33,930	204	130	
*JA2CUS	A	856,480	772	424	
*JF2OZH	"	480,080	639	340	
*JA2QVP	"	80,028	250	171	
*JI2MWH	"	76,752	242	164	
*JA2AXB	"	75,118	189	142	
*JA2KKA	"	49,569	172	123	
*JF2OHQ	"	35,425	158	109	
*JQ2OUL	"	34,986	154	119	
*JA2VZL	"	21,746	105	83	
*JR2BYJ	"	14,100	65	60	
*JR2PAU	"	195	17	15	
*JE2SOY	28	748	25	22	
*JA2KVB	21	212,430	390	291	
*JG2KKG	14	210,408	344	264	
*JM2LHB	"	756	20	18	
*JA2GTW	7	86,784	140	128	
*JA2PFO	"	18,500	107	74	
*JI2GZC	"	12,931	85	67	
*JF2FIU	"	406	16	14	
JJ3JJL	A	424,041	547	321	
JA3AVO	"	69,212	206	143	
JG3LGD	"	52,920	160	135	
JO3AGQ	"	5,704	58	46	
JH3AIU	21	660,231	690	429	
JA3DAY	14	31,270	115	106	
JF3LOP	3.5	22,270	117	85	
*JF3NKA	A	349,059	581	307	
*JA3JM	"	169,222	351	211	
*8N3A/3	"	161,325	355	225	(OP: JF3PLF)
*8N3U/3	"	72,996	349	154	(OP: JA3XOG)
*JG3CQJ	"	72,850	210	155	
*JE3CXJ	"	55,880	202	127	
*JG3WDN	"	54,534	206	122	
*JR3NDM	"	34,133	165	107	
*JN3DSH	"	15,762	87	71	
*JA3HBF	"	12,408	75	66	
*JI3OGI	"	5,217	55	47	
*JO3QVT	"	1,568	36	32	
*JA3NOJ	"	150	7	6	
*JL3MCM	28	10,164	93	77	
*JG3RPL	"	400	17	16	
*JF3BFS	21	239,250	441	290	
*JA3IKG	"	105,288	252	214	
*JA3UWB	7	12,180	75	60	
*JG3BXS	"	4,646	56	46	
*JE3EVI	3.5	70	8	7	
JH4UYB	A	4,485,113	1973	787	
JH4RUF	"	18,432	88	72	
*JE4MHL	A	527,505	706	345	
*JR4PDP	"	82,236	292	154	
*JI4JGD	"	24,932	154	92	
*JH4BTI	"	11,618	82	74	
*JA4UDN	"	9,610	69	62	
*JH1MTR/4	28	3,550	60	50	
*JH4CES	"	3,465	51	45	
*JR4FLW/4	21	9,384	80	68	
*JA4AVO	"	3,358	46	46	
*JA4CBX	"	9	3	3	
*JR4GPA	14	406,245	493	365	
*JA4AQR	"	1,988	29	28	
JJ5GSY	7	2,600	25	25	
*JG5DHX	21	69,420	229	178	
JA6LCJ	A	2,533,496	1451	644	
JA6BWH	"	268,786	403	263	
JH6QFJ	"	227,758	366	263	
JE6CAJ	"	117,876	336	209	
JR6AWQ	14	5,175	45	45	
*JA6CYL/6	A	151,580	354	220	
*JH6OPP	"	72,209	224	163	
*JA6FFK	"	21,749	95	91	
*JA6FOF	"	14,925	186	75	
*JH6WHN	28	54,194	240	158	
*JR6GIM	14	275,235	415	311	
*JJ6TWQ	"	7,865	56	55	
JA7DLE	A	1,887,758	1196	562	
JA7BME	"	866,910	743	426	
JE7YSS	"	110,474	260	182	(OP: 7N4TEN)
JA7WQJ	"	7,884	58	54	
*JE8KGH/7	A	351,860	529	292	
*JH7IXX	"	98,838	316	153	
*JH7QXJ	"	40,341	155	119	
*JE7HYK	"	25,235	133	103	
*JK7UST	"	22,422	87	74	
*JA7AEM	"	8,556	66	46	
*JI7JIH	"	7,920	70	55	
*JA7CPW	"	6,327	73	57	
*JH7RTQ	21	102,125	257	215	
*JH7CUO	14	112,812	238	204	
*JN7KRH	"	4,590	56	54	
*JF7VVL	7	300	13	12	
JH8GEU	14	57,183	159	147	
JA8MXC	"	7,315	55	55	
*JA8AJE	A	15,300	73	68	
*JL8MBF	"	6,566	71	49	
*JH8DBI	"	4,968	46	46	
*JJ8GFL	"	6	2	2	
JA9LJS	A	4,216	36	34	
JA9CWJ	21	236,451	381	293	
JA9FHB	14	9,089	62	61	
JF9MJU	"	396	12	12	
JHØINP	A	1,413,414	1071	527	
JHØNOS	7	62,361	126	117	
*JHØNEC	A	360,789	497	319	
*JAØQMT	"	7,440	66	62	
*JAØVTK	"	75	5	5	
*JRØBUL	28	2,925	50	45	
*JAØIOF	21	26,418	143	119	
*JHØEPI	14	110,152	263	196	
Kampuchea					
*XU7ACY	A	92,926	332	194	
Kazakhstan					
UPØL	A	9,766,800	3055	900	(OP: UN9LW)
UP2L	"	9,131,170	3004	859	(OP: UN4L)
UP4L	"	3,760,470	1603	630	(OP: UN7LZ)
UN9GD	28	415,128	599	353	
UN5J	"	2,394	47	38	
UN7QF	14	521,585	565	365	
UN8LWF	"	1,083	19	19	(OP: UN9LAB)
*UN6G	A	807,204	729	411	
*UP5ØF	"	454,664	550	322	
*UNØC	"	1,440	25	20	
*UP6P	28	107,212	338	196	(OP: UN6P)
*UN3Z	"	384	16	16	
*UN6LN	21	83,916	237	189	
*UN7CN	"	65,404	192	166	
*UN2C	14	441,612	494	348	
*UN4PD	"	351,525	412	327	
*UP15E	"	95,418	216	186	
*UN/R9XC	"	8,432	66	62	
*UN5C	"	2,640	30	30	
*UN7CH	1.8	1,995	26	19	
Kyrgyzstan					
EX2A	A	1,968,736	1152	517	
*EX2X	A	1,479,094	1101	541	
Mongolia					
JU1F	21	499,338	780	378	(OP: JT1DA)
JT1DA	3.5	1,825	25	25	
Qatar					
A71EM	A	1,735,470	1023	495	
Saudi Arabia					
*HZ1PS	A	33,708	111	106	
*7Z1SJ	7	537,370	339	290	
Singapore					
9V1YC	A	2,209,376	1445	611	
South Korea					
HL5UOG	A	146,575	460	205	
D73A	"	19,488	204	87	(OP: HL1IWD)
*HL1VAU	A	743,904	1007	369	
*HL5YI	"	90,376	257	158	
Taiwan					
BV1EK	A	336,384	483	292	
*BX4AD	A	36,400	169	130	
*BV4VQ	"	957	36	29	
*BX2AI	14	17,654	113	91	
Tajikistan					
*EY7BD	21	27,577	124	109	
Thailand					
HSØZDY	A	605,170	600	365	
HSØAC	"	555,648	820	384	(OP: OZ1HET)
HSØZDR	21	5,544	59	56	(OP: N4CT)
*E21YDP	A	724,394	730	418	
*HSØZEE	"	418,608	481	306	
*HS5AC	"	67,548	187	156	(OP: HS1NIV)
*E21EIC/4	28	55,748	249	154	
*E2ØWXA	21	22,089	121	111	(OP: HS4DDQ)
*HS8JYX	"	3,648	60	48	
*HS7AT	14	60,551	188	151	(OP: E21IZC)
*E2ØYLM	3.5	27	3	3	
UK Bases on Cyprus					
ZC4LI	14	4,479,840	2004	816	
Vietnam					
*XV4Y	28	651	24	21	
*3W3B	21	14,863	122	89	
West Malaysia					
9M2CNC	A	1,025,965	844	449	(OP: G4ZFE)
*9M2TO	A	309,575	496	305	
*9M2/KM9D	21	196,352	475	256	
*9M2/JI3OGQ	"	40	4	4	
*9M2ZAK	14	1,710	31	30	
EUROPE					
Albania					
*ZA/S59AA	A	1,616,340	1327	620	
Austria					
*OE1H	A	32,696	143	134	(OP: OE1TKW)
Azores					
CR2X	A	10,498,800	3712	1040	(OP: OH2PM)
Balearic Islands					
*EA6ZS	A	24,265	142	115	
Belarus					
EU1AZ	A	3,022,338	2020	759	
EW8DX	"	1,772,440	1674	607	
EW3LN	"	1,108,795	1079	515	
EW1EA	"	593,636	771	428	
EV25M	"	354,112	620	352	
EU7SR	"	3,404	42	37	
*EU6AF	A	1,370,000	1455	548	
*EW6CU	"	918,684	983	507	
*EW6GF	"	548,408	801	392	
*EW2ES	"	157,628	387	251	
*EU3AA	"	115,884	298	222	
*EU4CQ	"	96,126	303	222	
*EW1BA	"	67,320	193	153	
*EW6FX	"	957	32	29	
*EW6AF	21	259,000	558	350	
*EU2MM	14	594,711	816	507	
*EW6EW	"	167,008	405	307	
*EW8OG	"	46,980	203	174	
*EU4AA	"	31,640	152	140	
*EU1DX	"	9,636	78	73	
*EW2EG	7	3,239	44	41	
*EU6AA	3.5	111,305	243	197	
Belgium					
OQ5A	A	788,242	1054	497	
ON6MR	"	96,096	254	224	
OO8A	14	43,188	204	183	
OQ5M	7	2,227,225	1211	623	(OP: ON5ZO)
*ON3ND	A	915,648	1115	502	
*ON4CT	"	509,085	691	405	
*ON4CAS	"	219,342	384	278	
*ON4ALY	"	194,304	425	276	
*ON4VMA	"	149,382	399	258	
*OP5T	"	141,220	335	230	
*ON6MG	"	139,576	370	239	
*ON5JT	"	59,940	229	185	
*ON5SV	"	9,238	70	62	
*ON5HY	"	7,935	70	69	
*ON5WL	28	17,433	135	117	
*ON6LO	14	7,347	86	79	
Bosnia-Herzegovina					
E77A	28	776,424	1137	561	
E73W	14	3,574,032	2132	924	(OP: E730)
E73X	7	156,940	287	236	
E73ECJ	"	11,690	74	70	(OP: E73ZR)
*E73PY	A	294,840	487	315	
*E73MJ	"	1,242	27	27	
*E79SD	7	271,737	367	277	
*E75MJ	"	243,846	337	279	
Bulgaria					
LZ1BJ	A	2,421,990	1948	765	
LZ3FN	"	1,976,913	1490	657	
LZ1QN	"	308,098	590	373	
LZ9Z	"	9,545	93	83	
LZ66P	"	378	14	14	(OP: LZ1ZF)
LZ7J	28	370,760	676	403	(OP: LZ1CL)
LZ1DQ	21	165,228	354	281	
LZ2HR	14	390,096	644	432	
LZ2JR	"	231,990	429	330	
*LZ9R	A	2,415,267	1783	711	(OP: LZ3YY)
*LZ1FH	"	759,077	822	457	
*LZ1IKY	"	498,568	686	406	
*LZ1OJ	"	279,048	476	308	
*LZ1FJ	"	277,448	496	316	
*LZ1GE	"	123,952	322	244	
*LZ2DF	"	84,800	253	200	
*LZ1RN	"	31,860	172	135	
*LZ3TL	"	28,426	149	122	
*LZ1HW	"	15,015	81	65	
*LZ1IA	28	22,040	131	116	
*LZ1EP	"	11,136	97	87	
*LZ2FM	"	18	4	3	
*LZ2JA	21	368,016	595	408	
*LZ2PS	"	273,430	489	370	
*LZ2SX	14	8,378	75	71	
*LZ3ZZ	"	5,152	67	56	
Crete					
SV9COL	A	65,988	185	156	
*SV9/OK2BOB	3.5	2,178	33	33	
Croatia					
9A6XX	A	7,209,675	3014	971	

9AØ4JB	"	4,034,099	2305	881
				(OP: 9A3XV)
9A8CW	"	404,736	589	384
9A3QB	"	140,148	306	229
9A4W	28	83,763	307	227
9A3IH	14	240,828	420	282
9A4ØY	3.5	1,098,720	949	504
				(OP: 9A3NM)
9A2AJ	1.8	205,403	378	263
*9A2VR	A	891,478	896	518
*9A8A	"	224,064	429	288
*9A4AS	"	105,317	311	241
				(OP: DO6SR)
*9A6Z	"	31,992	145	129
*9A2GA	"	15,675	107	95
*9A3VM	28	272,691	626	369
*9A5ST	"	87,193	290	223
*9A8W	21	327,936	573	384
*9A4MF	"	40,755	181	165
*9A4R	14	35,164	168	149
*9A2VX	7	48,672	167	144
*9A2XW	"	1,050	26	25

Czech Republic

OK8DD	A	1,053,102	984	501
OK1AYY	"	696,420	799	438
OL4M	"	638,580	765	435
OK2QA	"	169,800	359	283
OK1JVT	"	148,200	336	260
OK1FRO	"	28,700	154	140
OK1XC	28	60,929	235	191
OK2ABU	"	14,040	116	104
OL9Z	14	2,054,448	1622	792
				(OP: OK2PVF)
OK7GU	7	466,716	442	356
OK1EP	"	284,796	342	293
OLØW	3.5	357,738	493	327
				(OP: OK1DSZ)
OK2SAR	1.8	95,160	269	195
*OL6P	A	2,747,750	1828	725
				(OP: OK2PP)
*OK2ZI	"	2,658,306	1841	758
*OK1TA	"	1,537,596	1160	621
*OK1CRM	"	982,940	979	490
*OK2QX	"	966,350	984	550
*OK2BUT	"	923,418	1023	522
*OK1BA	"	714,357	793	483
*OK1HEH	"	571,320	758	414
*OK2SGW	"	560,622	708	419
*OK2EA	"	506,751	729	409
*OK1QM	"	446,040	685	413
*OK1DKO	"	424,304	636	368
*OK1FCA	"	401,882	672	377
*OK1FMG	"	401,864	633	382
*OK2TDM	"	368,725	552	343
*OK1MKI	"	353,787	602	357
*OK2BNF	"	330,008	519	332
*OK2EC	"	315,810	480	319
*OK2SGY	"	256,743	471	333
*OK1MKU	"	202,708	337	271
*OK2BND	"	194,970	398	291
*OK2KFK	"	192,896	404	274
*OK1UKV	"	180,999	423	273
*OK3EQ	"	171,739	388	263
*OK1BLU	"	156,940	372	266
*OK3MO	"	122,766	307	237
*OK1SI	"	90,903	243	193
*OK2PBG	"	80,460	222	180
*OK4BX	"	67,694	231	187
*OK2BME	"	57,918	224	197
*OK1ABF	"	48,601	138	131
*OK2UQ	"	15,023	97	83
*OK1DRX	28	24,912	171	144
*OK2IU	21	27,440	156	140
*OL9M	14	166,284	348	298
				(OP: OK1MMN)
*OK1FGD	"	165,360	390	318
*OK2PTS	7	787,248	681	462
*OK2BRS	"	387,930	484	335
*OK1KZ	"	33,000	116	110
*OK2TEO	"	26,574	114	103
*OK2BJL	"	6,840	60	57
*OK1HGM	3.5	309,645	465	315
*OL1A	1.8	65,934	212	162
				(OP: OK1CW)
*OK1JOK	"	45,731	176	139

Denmark

OZ8SW	A	678,776	774	476
OZ2TF	"	408,480	684	368
OZ2BKK	"	236,992	457	322
OZ7EA	"	111,159	286	207
OZ6AGX	"	69,741	239	189
OZ8PG	"	33,655	147	127
OZ7YL	7	115,507	223	203
*OV3X	A	1,107,696	1007	564
				(OP: OZ8AE)
*OV5A	"	818,436	977	482
*OZ7BQ	"	547,776	714	432
*OZ4FF	"	356,448	596	376
*OZ5UR	"	147,245	349	245
*OZ3SM	"	59,850	220	171
*OZ1AAR	"	51,150	183	150
*OZ1DGQ	"	7,425	91	75
*OZ/DJ1XT	14	145,065	341	285
*OZ4RT	7	810	15	15

England

G6PZ	A	5,765,266	2626	922
				(OP: MØDXR)
G5W	"	3,958,164	2401	834
				(OP: G3BJ)
GØMTN	"	1,988,580	1776	660
G3RXP	"	1,737,150	1467	626
G4SGI	"	271,760	494	316
G4KFT	"	239,835	399	295
G4HZV	"	65,234	209	193
MØTRN	"	36,698	155	118
M7A	14	1,645,656	1461	718
				(OP: LY4Y)
M3I	"	715,360	913	526
				(OP: GØORH)
G1N	7	452,140	463	370
				(OP: G3MZV)
G3TXF	3.5	39,552	152	128
*G4FOC	A	428,120	625	385
				(OP: G3LIK)
*MØRYB	"	259,576	406	284
*G3JJZ	"	258,244	477	322
*G3RSD	"	247,842	435	294
*G3RIK	"	154,980	376	252
*G3ZHE	"	109,098	270	209
*M6ZSE	"	79,310	297	206
*G4RKO	"	46,816	223	176
*GØOKF	"	36,660	183	156
*G2HDR	"	24,897	150	129
*G4HBI	"	21,182	148	119
*G4DBX	"	9,869	77	71
*G3PND	"	9,440	100	80
*GØWHO	"	1,127	23	23
*G7TAT	"	18	3	3
*M/SP3CW	14	479,622	710	473
*MXØTWC	7	513,383	498	391
				(OP: G3TJE)
*G4ZOB	"	468,660	458	365
*MØMCV	"	15,862	87	77
				(OP: 2EØCVN)

Estonia

ES5RR	A	5,527,656	3051	942
				(OP: ES2RR)
ES2JL	28	9,776	102	94
ES2MC	21	542,168	848	488
*ES1CN	21	69,345	248	207
*ES1LS	14	94,601	298	247
*ES8DH	"	68,456	225	199

European Russia

RA1TU	14	879,424	1043	604
RN1ON	"	164,160	442	288
RV1CC	"	12,922	76	71
RA1TV	"	408	12	12
*RA1AL	A	1,547,663	1568	611
*UA1CUR	"	998,283	1090	507
*UA1CEC	"	461,448	724	377
*UA1OM	"	392,010	605	365
*UA1TGQ	"	369,171	602	363
*RZ1OK	"	151,960	357	262
*RN1NHF	"	149,492	363	266
*RW1AI	"	120,887	290	221
*UA6YH/1	"	103,246	269	209
*R1AUR	"	53,928	205	168
*RW1CX	28	3,763	61	53
*UA1ZZ	14	782,304	954	562
*RA1OT	"	679,185	836	559
*UA1ODM	"	141,000	334	282
*UA1OMS	"	94,350	265	222
*R1AL	"	3,478	54	47
*RU1QQ	7	549,936	561	402
*R1AZ	"	455,532	561	374
RM9I/2	14	2,000,745	1524	771
RL3A	A	5,838,623	2895	971
				(OP: RL3FT)
RG3K	"	5,009,445	2915	945
RM2U	"	3,761,145	2194	855
				(OP: RU3UR)
R3KM	"	2,328,480	1802	735
RK3ER	"	2,138,112	1826	696
RT3M	"	1,798,592	1584	628
RU5A	"	1,602,900	1626	650
RX3DBH	"	1,496,715	1435	579
RQ5D	"	1,203,475	1215	575
				(OP: UA3A)
RA3NC	"	976,638	987	494
RN3BO	"	858,270	861	469
RK3ZZ	"	490,400	697	400
R3OM	"	328,308	558	327
RK3BA	"	325,584	505	336
RW3SY	"	277,915	485	341
R2DW	"	255,780	373	348
RA3SU	"	250,666	454	311
UA3TN	"	117,588	335	239
RV3IC	"	93,120	248	192
R3CW	"	58,479	222	193
UA3DUJ	"	55,440	213	165
R3QF	"	44,069	151	127
RN3TT	"	26,000	140	125
RZ3EC	"	20,570	124	110
RX3AEX	"	16,032	111	96
UA3AIU	"	8,113	67	61
RZ3AV	21	162,582	391	294
R3BT	"	27,477	141	129
RT5K	14	1,919,997	1512	799
R2AB	"	12,600	115	100
RU5TT	7	1,099,280	833	520
				(OP: UA3TW)
RV3F	"	352,110	400	330
UA3PC	"	146,869	253	227
UA3QCB	"	53,676	161	142
RT5X	"	44,528	137	121
RW3WA	3.5	501,456	617	372
RT3N	"	33,744	131	114
RM5D	1.8	3,610	44	38
*RO3DX	A	1,794,366	1351	658
*R3QA	"	1,581,784	1756	596
*UD3D	"	1,535,180	1499	590
				(OP: UB3DAY)
*UA3DA	"	1,510,758	1405	606
*RM3Z	"	1,204,987	1188	553
*RV3LO	"	782,850	955	510
*RU3XY	"	634,728	818	424
*UA3RC	"	587,821	941	439
*RA3G	"	555,984	803	432
*UA3QAM	"	529,984	705	392
*RV3ZN	"	458,790	684	373
*RW3QTH	"	453,908	683	377
*UA3DCW	"	434,472	682	421
*RV3MR	"	374,625	597	333
*RM5D	"	366,976	572	376
*RA3TA	"	333,198	562	321
*RW3XZ	"	310,622	510	338
*RT2T	"	304,198	528	389
				(OP: RA3TT)
*RN3ADV	"	291,040	456	340
*RA3ID	"	290,460	536	309
*RX3AGQ	"	289,340	577	340
*R2LA	"	286,779	543	327
*RA3ATE	"	267,582	535	322
*RM2T	"	265,392	530	342
*RA3XCZ	"	261,450	533	315
*R3EA	"	258,876	512	324
*RX3VF	"	249,944	487	314
*RN3ZIC	"	211,012	432	284
*UA3DSS	"	171,094	329	242
*UA3RN	"	165,838	444	293
*UA3DKN	"	160,308	365	244
*RV3YR	"	139,650	396	266
*RZ3GV	"	136,776	316	246
*UA3TAO	"	116,130	293	237
*RU3VV	"	108,155	333	223
*RZ3QM	"	106,947	302	233
*RU3VT	"	95,760	296	210
*RQ3M	"	89,094	232	186
*RK3RX	"	76,912	268	184
*UA3H	"	70,272	214	183
*RN3AAB	"	33,153	140	129
*RL2A	"	31,030	136	107
*UA3UHZ	"	22,149	114	107
*RX3MM	"	21,186	118	107
*R3/UYØYU	"	20,412	91	81
*RU3MW	"	20,099	110	101
*UA3VLO	"	17,679	86	83
*RW3VA	"	14,550	98	75
*RA3IS	"	10,764	76	69
*RK2A	"	8,178	64	58
*UA3XAG	"	4,800	63	60
*UA3UNP	"	3,266	50	46
*RW3PF	"	2,250	32	30
*RZ3AUL	"	684	18	18
*RA3BQ/3	"	660	20	20
*R3DAU	"	561	12	11
*RA3TUT	"	336	15	14
*RD5O	28	35,882	207	154
*R3BB	"	28,296	181	131
*UA3EDQ	"	21,780	158	121
*RT3D	"	16,206	135	111
*R3LA	"	7,896	95	84
*UA3ABJ	21	385,810	593	410
*UA3AO	"	140,968	361	268
*UA3QR	"	23,650	119	110
*RN3DKE	"	10,880	90	85
*RA3UAG	14	467,006	646	478
*UA3VVB	"	407,644	640	446
*RL3T	"	68,060	249	205
*RW3WX	"	46,494	192	162
*RM5P	7	518,967	538	387
*UA3DCM	"	106,506	217	194
*RD3FP	"	97,196	232	188
*RM5Z	1.8	39,116	154	127
UA4W	A	4,714,248	2537	924
RK4S	"	736,848	920	476
RT4F	"	690,408	746	446
R4ID	"	424,152	728	387
RQ4N	"	390,951	494	363
RV4LC	"	247,561	340	281
RG4F	"	207,350	437	319
UA4HOX	"	135,991	320	239
UA4AAC	"	125,123	298	211
RU4CO	"	8,184	72	66
UA4NC	"	2,583	42	41
RJ4F	28	51,442	244	178
UA4CC	"	1,122	23	22
UA4WKK	21	179,760	366	280
R4WAA	7	278,369	392	299
*RU4SO	A	1,201,536	1137	576
*RN4SS	"	1,000,712	1138	536
*RA4ACX	"	772,620	888	474
*UA4AGO	"	503,750	754	403
*RD4CAQ	"	347,574	589	318
*R4II	"	318,546	537	347
*RU4LM	"	284,540	495	347
*UA4HIP	"	235,790	413	323
*UA4QK	"	178,740	361	270
*RN4CA	"	140,448	317	231
*RN4SM	"	133,518	317	238
*UA4FDL	"	127,368	316	232
*R4WT	"	91,374	264	194
*RN4CU	"	62,046	200	162
*RA4DR	"	36,015	196	147
*RA4FW	"	28,224	168	126
*UA4CNZ	"	25,610	161	130
*RW4F	"	11,929	88	79
*RU4SW	"	10,950	75	73
*RZ4WZ	"	7,378	64	62
*RA4DZ	"	6,105	58	55
*RA4UAT	"	4,949	53	49
*UA4AMT	"	4,368	45	42
*UA4CNJ	"	1,860	24	20
*UA4PAQ	"	384	12	12
*RZ4AG	14	753,642	895	562
*RX4W	"	368,900	590	434
*RN4SC	"	150,094	368	302
*UA4PL	"	99,840	299	260
*RK4R	"	67,308	248	213
*UA4NE	"	38,232	177	162
*RW4LQ	"	2,233	29	29
*RU4CR	"	1,911	39	39
RG6G	A	4,359,663	2702	891
RM6F	"	2,754,399	2077	789
RV6YB	"	770,250	936	474
R7FF	"	626,400	728	435
RX6AM	"	414,685	697	421
RA6GW	"	398,209	473	349
UA6G	"	335,552	635	392
RX6MR	"	131,075	318	245
R7AO	"	56,880	268	180
UA6LPN	"	42,496	145	128
RU7A	28	660,240	963	524
RW6AMP	"	33,152	199	148
RK6CM	21	5,311	50	47
RW6AM	14	912,945	1085	605
RW7B	"	538,920	785	499
R7HF	"	525,165	867	471
RM6J	"	60,348	227	188
R6MM	"	41,860	207	161
RA6EE	7	434,304	483	348
*R7MM	A	1,884,384	1775	648
*UC6A	"	1,422,014	1415	593
*RT7F	"	1,260,745	1118	577
*RM7M	"	972,910	1140	485
*RW6HJV/6	"	957,490	1026	529
*RA6AN	"	508,932	669	402
*RX6AKA	"	407,360	602	380
*RO7M	"	310,590	552	315
*RW6MBC	"	237,392	454	296
*UA6HFI	"	159,528	398	276
*RA6FUZ	"	59,808	227	178
*UA6AES	"	28,060	124	115
*R7AT	"	18,841	92	83
*RZ6DX	"	6,555	76	69
*RA6XB	"	6,426	68	63
*RA6AR	"	5,616	56	54
*RA7A	"	4,968	56	54
*UA6JFG	"	3,570	43	34
*RA6WF	"	3,128	49	46
*RN6DR	"	465	16	15
*UA6AK	28	121,704	333	264
*RN6LMK	"	3,015	47	45
*R6CW	"	2,773	48	47
*RW6AH	21	66,785	216	185
*RX6LOL	"	25,878	125	114
*R7MT	14	67,704	247	217
*RV6AAA	"	10,050	75	75
*UA6EZ	7	11,592	69	63
*R7AC	3.5	19,402	99	89

European Turkey

*TC1DX	A	6,030	72	67
				(OP: TA1DX)

Faroe Islands

*OY/PA2AM	A	988	27	26

Finland

OG2B	A	4,761,444	2706	894
OG8X	"	4,599,020	2788	908
				(OP: OH6UM)
OH1F	"	3,662,832	2505	822
				(OP: OH1NOA)
OG1M	"	807,534	998	493
OH2VZ	"	225,582	402	287
OH1B	"	130,255	328	239
				(OP: OH1BOI)
OH3FM	"	41,601	205	147
OH2BO	"	25,584	143	123
OH7FKV	21	87,324	315	228
OH5Z	14	2,088,408	1604	802
				(OP: OH5WH)
OG5A	"	1,258,812	1172	657
				(OP: OH5TS)
OH3RF	3.5	189,440	344	256
OH5NE	1.8	14,256	92	81
*OH3LB	A	709,500	1028	473
*OH5YU	"	289,572	599	354
*OH1XY	"	55,130	170	149
*OH6AC	28	5,246	66	61
				(OP: OH6GAW)
*OH6RC	7	30,475	126	115

France

TM6M	A	10,126,012	3478	1108
				(OP: F8DBF)
TM6X	"	5,144,573	2473	893
F/G4BJM	"	1,068,900	1201	525
F5CQ	"	192,266	299	251
F5NBX	28	16,280	138	110
*F3CW	A	989,781	1150	533
*F4WAX	"	326,652	546	326
*F6FTB	"	274,232	500	332
*F5BBD	"	273,456	495	324
*F5SGI	"	262,430	439	322
*F5VBU	"	143,013	362	247
*F/E73CQ	"	46,593	204	167
*F5QF	"	30,912	126	112
*F8NUH	"	24,336	137	117
*F5GGL	"	5,734	51	47
*F8AKC	28	98,576	305	244
*F5IHP	"	17,113	126	109
*F6HHR	21	8,800	89	80
*F8AEE	7	141,240	312	214

Germany

DL3YM	A	5,465,772	2555	916
DM1A	"	4,973,469	2543	863
				(OP: DL1IAO)
DK6XZ	"	4,675,850	2300	850
				(OP: E77XZ)
DK3GI	"	2,728,500	1780	750
DJ9DZ	"	2,146,319	1646	679
DL8QS	"	1,389,655	1246	619
DJ1MM	"	1,343,160	1138	546
DK5AD	"	1,189,840	1097	556
DL4ME	"	1,088,886	1135	523
DL5JS	"	1,043,350	1141	542
DL4UNY	"	711,525	848	537
DF5ZV	"	487,152	677	408
DL2AA	"	406,638	649	369
DF6RI	"	306,768	489	332
DJ2IA	"	296,037	513	333
DL5DBH	"	207,459	363	259
DC9ZP	"	150,021	347	237
DF3EH	"	123,420	323	242
DL8EAQ	"	104,112	318	241
DF8AA	"	102,485	247	199
DKØSU	"	78,343	176	157
				(OP: DF7SA)
DL4KCA	"	77,088	196	176
DL2DXA	"	51,192	209	158
DJ1ER	"	46,345	189	155
DL2MDZ	"	28,322	110	98
DL5AYI	"	25,654	144	127
DG9MDM	"	22,990	119	110
DFØUK	28	11,730	97	85
				(OP: DL7FG)
DJ6TK	21	13,299	98	93
DL8CA	"	855	19	19
DK7YY	14	519,216	784	464
DK5JM	3.5	388,437	571	349
*DP4X	A	2,614,808	1762	742
				(OP: DL1MGB)
*DF3AX	"	1,344,525	1272	591
*DJ8EW	"	1,252,214	1101	589
*DM2DX	"	868,680	969	508
*DF5BM	"	808,298	911	478
*DJ7AT	"	784,127	961	491
*DL3EBX	"	777,600	888	480
*DL9ABM	"	740,388	806	474
*DL3KWF	"	554,346	728	414
*DL4ZA	"	553,744	738	424
*DL4FDM	"	538,904	703	424
*DL2IAN	"	503,860	688	427
*DJ3XA	"	484,785	757	405
*DFØPWR	"	481,650	664	390
				(OP: DL6YAO)
*DL5JRA	"	479,988	690	402
*DL8ZAW	"	468,330	718	402
*DL4JYT	"	391,509	571	369
*DL1THB	"	388,586	609	374
*DL2NBY	"	372,490	645	386
*DL3FBB	"	368,151	585	373
*DJ4EY	"	354,240	573	369
*DM3FZN	"	330,708	574	381
*DL6DCD	"	328,020	522	355
*DO3QQ	"	325,268	527	349
*DL2AJB	"	283,038	472	322
*DL1RTS	"	270,627	506	343
*DO3D	"	264,860	520	340
				(OP: DK3WM)
*DL4ALI	"	261,792	500	324
*DH2URF	"	254,340	468	314
*DL5CD	"	249,280	489	320
*DL3KWR	"	247,050	447	305
*DL1EAL	"	243,006	464	303
*DM5Z	"	242,408	476	314
				(OP: DM5JBN)
*DQØA	"	237,389	438	277
				(OP: DK2DQ)
*DL3ZAI	"	217,932	389	286
*DL5YL	"	209,275	436	275
*DL5CL	"	203,310	350	270
*DL8DWW	"	198,144	380	288
*DF3OL	"	190,743	353	293
*DM2RN	"	187,803	387	271
*DJ3XD	"	175,440	370	258
*DL7UGO	"	173,118	373	258
*DL1NUX	"	170,910	423	270
*DF5LW	"	170,154	401	274
*DM2FDO	"	135,456	351	249
*DL6NWA	"	129,528	343	252
*DC9MA	"	127,508	361	254
*DF1LX	"	125,236	296	239
*DL1TPY	"	121,756	323	244
*DF5BX	"	102,342	293	222
*DL2ZA	"	101,990	290	217
*DL1VJL	"	97,716	271	204
*DK3PM	"	78,171	262	213
*DD3WW	"	76,540	211	172
*DP4M	"	75,992	271	184
				(OP: DJ4MH)
*DJ5IW	"	73,040	190	176
*DLØEKO	"	67,614	228	177
				(OP: DL8UKE)
*DK1LRS	"	64,638	232	171
*DL4VQ	"	59,724	190	158
*DR4ØAGCW	"	58,136	225	172
				(OP: DL1GBZ)
*DL5ZBA	"	56,320	244	176
*DF5MA	"	52,752	210	157
*DL7UMK	"	51,842	206	161
*DJ2FR	"	49,715	192	163
*DL4AC	"	49,170	193	165
*DL6UAM	"	49,005	190	165
*DAØHC	"	48,910	162	134
				(OP: DL8SAD)
*DM5JL	"	45,846	224	162
*DL1TS	"	40,964	180	154
*DKØIU	"	36,279	168	139
				(OP: DJ4KW)
*DL2AXM	"	36,182	184	158
*DL3RDM	"	30,140	153	137
*DO1MGN	"	25,254	151	122
*DH8MS	"	21,576	152	124
*DK4RL	"	21,090	126	114
*DK3YD	"	20,544	125	107
*DK6CQ	"	19,968	114	104
*DK7CH	"	19,332	129	108
*DK4WF	"	18,564	114	91
*DK4WO	"	17,850	117	105
*DF8XC	"	15,300	90	85
*DO1UZ	"	14,740	130	110
*DL1AWC	"	13,671	98	93
*DL4EAX	"	13,398	98	87
*DL4DZ	"	12,900	91	86
*DJ8RX	"	9,840	95	82
*DM3F	"	8,470	87	77
				(OP: DH5FS)
*DL3RCG	"	7,680	74	64
*DK3AX	"	7,383	80	69
*DL/HB9SVT	"	7,300	82	73
*DL9YAJ	"	6,496	60	58
*DM3RB	"	6,060	65	60
*DL1AWM	"	5,187	60	57
*DK3WJ	"	4,644	56	54
*DL5LWM	"	4,500	67	60
*DK5ZX	"	3,995	49	47
*DL1KUR	"	3,567	44	41
*DL1DTF	"	3,038	55	49
*DB3LO	"	2,982	42	42
*DF2AP	"	1,620	38	36
*DK9MH	"	1,484	28	28
*DL7VRG	"	513	19	19
*DL3DRN	"	442	20	17
*DL2MDU	"	168	13	12
*DK4EF	"	121	11	11
*DL1RIO	"	28	4	4
*DL7BY	28	87,690	305	237
*DL1ET	"	13,335	115	105
*DL1SBF	21	28,160	136	128
*DL1ARD	"	19,110	114	105
*DL9ZP	14	649,490	818	535
*DL1DTL	"	554,880	734	510
*DL9LM	"	515,000	662	500
*DL1BA	"	208,458	398	333
*DK5IM	"	204,125	450	355
*DL4XU	"	77,518	259	226
*DB7MA	"	67,080	271	215
*DL7VMM	"	64,272	239	206
*DAØT	"	19,581	114	107
*DH6YMC	"	9,282	97	91
*DL4AAE	"	5,084	44	41
*DL5KMS	"	3,312	52	48
*DKØXB	"	1,479	29	29
*DK2FG	7	949,960	727	508
*DL5KUD	"	727,463	639	451
*DL6KWN	"	390,065	466	353
*DL3FF	1.8	1,380	27	25

Greece

J48HW	A	2,279,112	1799	712
				(OP: HAØHW)
SX8V	"	1,364,636	1376	598
				(OP: SV1JG)
*SV3AWG	A	258,615	459	315
*SV7BAY	"	48,640	185	160
*SV1PS	"	5,100	53	50

Guernsey

*MUØFAL	21	58,255	275	191

Hungary

HG3R	A	6,888,444	2952	1004
				(OP: HA3NU)
HA1BC	"	1,661,250	1207	625
				(OP: DL1MAJ)
HA7LW	"	503,070	657	409
HA3OD	"	390,764	495	332
HA8TP	"	370,928	667	388
HA3PT	"	215,424	430	288
HA9SU	"	10,496	94	82
HA7GN	21	939,232	1008	599
*HA2MN	A	674,472	740	471
*HA8LLK	"	498,017	563	377
*HA6PJ	"	475,209	686	397
*HAØGK	"	239,430	483	345
*HA8TI	"	10,880	69	68
*HA5LZ	28	55,638	229	198
*HG8W	"	2,596	45	44
				(OP: HA8ZO)
*HA1SM	14	50,691	283	183
*HA5UY	"	32,109	150	139
*HG4F	7	1,227,660	940	518
*HA3MU	"	804,915	687	465

*HG2Ø11P	*	377,664	460	336
			(OP: HA5BA)	
***HA4FV**	**3.5**	**383,910**	**553**	**335**
Iceland				
TF3Y	**28**	**30,738**	**209**	**141**
***TF3DC**	**A**	**240**	**10**	**10**
*TF3SG	*	108	9	9
Ireland				
EI4DW	**A**	**102,520**	**289**	**220**
***EI7CC**	**A**	**28,356**	**168**	**139**
***EI4II**	**28**	**7,168**	**76**	**54**
***EI4HQ**	**7**	**370,560**	**386**	**320**
Italy				
IR4X	**A**	**8,238,300**	**3126**	**1050**
			(OP: IZ3EYZ)	
IK8YJQ	*	254,904	415	312
IK4ZGO	*	111,987	268	207
IZ3ETU	*	64,575	200	175
I2KBD	*	18,706	102	94
IK2SAU	*	1,980	33	33
IZ1RFL	*	1,887	39	37
IZ5DIY	**7**	**467,250**	**521**	**350**
IR4E	**1.8**	**202,160**	**372**	**266**
			(OP: IK4ZHH)	
***IR1Y**	**A**	**3,938,781**	**1921**	**867**
			(OP: IK1HJS)	
*IZ3DBA	*	1,040,355	1154	549
*IØZUT	*	588,306	683	426
*II2E	*	463,872	651	384
			(OP: I2CZO)	
*IK4UNH	*	399,669	562	381
*IK2YXB	*	120,745	248	205
*IK2NUX	*	81,840	209	186
*IZ2EEV	*	70,097	214	191
*I3TXQ	*	69,363	222	189
*IZ1DXS	*	40,870	146	122
*IV3DYS	*	35,840	168	140
*IR1X	*	35,815	159	145
			(OP: IZ1GLX)	
*IP2XX	*	30,645	150	135
*IW3HXR	*	26,840	131	122
*IK2NCF	*	20,240	133	115
*IK2WYI	*	19,488	133	112
*IV3YNB	*	17,370	104	90
*I2TFJ	*	14,550	105	97
*IZ3NPZ	*	7,788	70	66
*IK2IKW	*	5,096	59	56
*IZ5BSA	*	1,739	37	37
*IK2AUK	*	962	27	26
***IK5YZV**	**28**	**3,268**	**44**	**38**
*IK2GRA	*	1,680	36	35
*IKØYUT	*	35	5	5
*IZ1MHY	*	8	2	2
***IK5YJK**	**21**	**1,643**	**32**	**31**
***IR2ITA**	**14**	**147,900**	**349**	**300**
			(OP: IN3OWY)	
*I1EIS	*	139,620	336	260
*I3PXN	*	76,254	241	213
Kaliningrad				
RN2FQ	**A**	**97,228**	**274**	**218**
UA2F	**7**	**2,749,968**	**1395**	**678**
			(OP: UA2FB)	
***RA2FB**	**28**	**20,916**	**151**	**126**
***RA2FX**	**14**	**18,093**	**119**	**111**
***UA2FL**	**7**	**1,300,425**	**1058**	**525**
Latvia				
YL5W	**A**	**2,667,240**	**1958**	**717**
YL9T	*	1,778,134	1716	641
			(OP: YL2TW)	
YL2SW	*	780,297	997	511
YL5T	*	191,684	396	277
			(OP: YL3DQ)	
YL2PP	*	1,984	33	32
YL2SM	**21**	**929,885**	**1112**	**605**
YL3FT	**14**	**2,308,080**	**1649**	**815**
YL3FX	**3.5**	**259,840**	**413**	**280**
***YL2CV**	**A**	**1,376,110**	**1380**	**571**
*YL3DX	*	1,258,272	1391	544
*YL5M	*	1,226,856	1223	527
			(OP: YL2UZ)	
*YL2TB	*	423,280	621	370
*YL2BJ	*	181,545	368	285
*YL2IU	*	96,248	307	212
*YL2HK	*	39,040	195	160
***YL2NK**	**14**	**31,824**	**153**	**144**
Liechtenstein				
***HBØ/DL2JRM**	**A**	**198,376**	**420**	**274**
***HBØY/DO2XX**	**21**	**792**	**26**	**24**
Lithuania				
LY9Y	**A**	**4,036,284**	**2482**	**843**
LY2MM	*	2,137,278	1764	689
LY2T	*	308,778	563	318
LY2F	*	146,932	293	218
LY2NK	*	3,168	51	44
LY5O	**28**	**13,426**	**110**	**98**
LY8O	**21**	**1,277,386**	**1332**	**682**
LY5W	**7**	**2,877,192**	**1353**	**712**
LY5I	*	1,095,334	825	514
LY3ID	*	800,184	652	462
LY2OU	**1.8**	**101,061**	**261**	**197**
***LY9A**	**A**	**3,447,815**	**2294**	**805**
*LY3B	*	1,927,562	1703	637
*LY7Z	*	1,292,648	1310	574
			(OP: LY2TA)	
*LY4T	*	1,193,580	1198	570
*LY3QA	*	1,113,222	1158	501
*LY1BX	*	202,062	421	283
*LY2OM	*	129,792	353	256
*LY2N	*	71,307	221	171
*LY4K	*	64,620	210	180
*LY2BBF	*	30,545	194	149
*LY2DV	*	17,108	115	94
*LY5K	*	14,534	97	86
***LY1M**	**7**	**376,805**	**455**	**341**
*LY2AT	*	141,240	269	220
***LY2GW**	**3.5**	**527,095**	**615**	**389**
*LY3CW	*	305,522	453	314
***LY2ND**	**1.8**	**6,215**	**63**	**55**
Luxembourg				
***LX4A**	**14**	**13,266**	**110**	**99**
			(OP: LX1NO)	
Macedonia				
***Z35F**	**21**	**117,845**	**326**	**259**
*Z33ØF	*	113,050	333	266
***Z33A**	**14**	**361,988**	**678**	**418**
*Z31WW	*	86,636	278	242
***Z35ØMM**	**7**	**81,825**	**194**	**175**
Moldova				
ERØFEO	**A**	**280,160**	**502**	**340**
			(OP: URSFEO)	
***ER5AA**	**A**	**439,236**	**685**	**378**
*ER1DA	*	97,232	243	206
*ER5DX	*	36,507	144	129
*ER3ZZ	*	16,157	112	107
***ER1OO**	**3.5**	**61,759**	**189**	**151**
Montenegro				
403A	**A**	**8,158,976**	**3555**	**1099**
Netherlands				
PA5WT	**A**	**821,700**	**1036**	**550**
PA3AAV	*	256,432	489	341
PA1TX	*	244,372	445	307
PAØWRS	*	229,350	362	278
PA1BX	*	40,612	167	142
PA5TT	*	13,440	102	96
PAØJNH	*	8,316	74	66
***PG2AA**	**A**	**726,336**	**910**	**468**
*PA3GWN	*	628,082	811	442
*PA2W	*	469,600	730	400
*PA3CVI	*	336,030	570	345
*PA3DBS	*	271,999	560	343
*PAØGRU	*	220,039	492	313
*PA3AIN	*	215,450	472	310
*PA7RA	*	207,975	450	295
*PAØTCA	*	183,456	385	273
*PAØQRB	*	150,336	377	288
*PA2PCH	*	126,492	340	249
*PD5T	*	106,463	294	227
*PA3EEG	*	98,532	297	207
*PAØRBA	*	67,704	212	168
*PAØWLB	*	56,027	256	179
*PA2CHM	*	47,433	195	163
*PA2F	*	46,472	191	148
*PA3HCC	*	45,530	195	157
*PA5GU	*	41,850	195	150
*PAØWKI	*	39,760	175	140
*PA3CLQ	*	26,924	154	127
*PA3AFF	*	24,738	142	114
*PA3GEO	*	3,588	55	52
*PA3DAT	*	1,960	41	35
*PAØWYS	*	1,040	26	26
***PD1DX**	**28**	**87,822**	**336**	**238**
***PAØJED**	**21**	**52,626**	**194**	**179**
*PA3DRL	*	13,524	100	98
***PA2REH**	**14**	**33,150**	**165**	**150**
*PE3HG	*	3,132	56	54
Northern Ireland				
***GI4DOH**	**A**	**456,344**	**698**	**406**
*GI4BQI	*	8,109	57	51
Norway				
LN8W	**A**	**3,610,572**	**2412**	**811**
			(OP: LB1GB)	
LA5HPA	**14**	**3,484**	**53**	**52**
LA2AB	**7**	**763,379**	**665**	**433**
			(OP: SP2ASJ)	
***LG5LG**	**A**	**1,672,150**	**1675**	**631**
			(OP: W1NN)	
*LA2HFA	*	517,884	760	412
*LA6DW	*	81,459	264	189
*LA7SI	*	36,504	171	156
*LA1QDA	*	23,086	137	119
*LA9FFA	*	99	9	9
***LA9BM**	**21**	**68,016**	**298**	**208**
***LA4EJ**	**7**	**79,580**	**197**	**173**
Poland				
SN7Q	**A**	**5,903,100**	**2818**	**937**
SP2LNW	*	2,114,321	1580	671
SP9LJD	*	965,632	1015	512
SP9GR	*	909,454	1028	494
SN7F	*	410,254	618	403
			(OP: SP7LFT)	
HF8ØØZ	*	348,117	587	363
			(OP: SP6CES)	
SQ7B	*	274,752	518	324
SN2Q	*	221,370	395	282
SO4R	*	166,278	358	222
			(OP: SP4JCP)	
SP3IOE	*	87,945	257	205
SO8A	*	80,912	269	208
			(OP: SP8BRQ)	
SP2HMN	*	22,080	125	115
SP7IIT	**28**	**139,468**	**391**	**293**
SN2M	*	7,275	91	75
			(OP: SP2XF)	
SP5WA	**21**	**52,200**	**192**	**174**
SN3C	**14**	**250,223**	**447**	**359**
			(OP: SP3ASN)	
SP9RI	*	99,944	294	248
SO1ØØMSC	*	16,984	120	88
			(OP: SP2FAP)	
SO5A	**7**	**1,791,069**	**1106**	**609**
			(OP: SQ5M)	
SP9ATE	**1.8**	**161,952**	**333**	**241**
***SQ9UM**	**A**	**1,948,311**	**1655**	**639**
*SP1AEN	*	1,730,610	1478	603
*SN7O	*	1,513,482	1378	618
			(OP: SP7IVO)	
*SP5EOT	*	933,424	990	514
*SP3DOF	*	600,171	697	429
*SP5CGN	*	555,560	797	430
*SP8CGU	*	298,931	426	317
*SQ3VV	*	216,216	447	286
*SP7LIE	*	212,784	429	312
*SQ9IDE	*	180,500	395	250
*SP7FBQ	*	173,525	393	275
*SP2GMA	*	136,220	346	245
*SP5CJQ	*	115,168	311	236
*SP6ARE	*	102,258	342	247
*SQ9DXN	*	92,655	245	213
*SP6QKP	*	61,039	222	179
*SP9FOW	*	60,888	187	177
*SP6IEQ	*	60,140	190	155
*SQ8LEC	*	56,496	219	176
*SQ5JUP	*	54,855	206	159
*SP9OHL	*	51,653	185	157
*SP5GDY	*	47,196	169	138
*SP8BWE	*	47,040	181	160
*SQ7LQJ	*	46,080	180	144
*SP6BEN	*	26,162	108	103
*SP2MHC	*	13,366	94	82
*SP9VJ	*	13,286	96	91
*SP7OGP	*	12,816	98	89
*SP9ERL	*	10,512	78	73
*SP1MWN	*	6,790	71	70
*SP9IHP	*	3,852	38	36
*SN1Z	*	2,706	35	33
*SP3DSC	*	2,232	38	36
*SP2EWS	*	1,692	38	36
*SP6NIK	*	1,519	32	31
*SP6ZC	*	1,160	21	20
*SP9DEM	*	840	20	20
*SN9K	*	777	21	21
			(OP: SP9MDY)	
*SQ8LSC	*	693	21	21
*SP9MDY	*	12	2	2
***SQ9BDN**	**28**	**28,560**	**154**	**136**
*SP2AYC	*	22,876	167	133
*SP9BNM	*	19,065	141	123
*SP2EFU	*	3,381	49	49
*SP3CFM	*	2,812	38	38
***SP3GXH**	**21**	**108,052**	**268**	**238**
*SN9U	*	18,128	121	103
			(OP: SP9UMJ)	
*SP8LXE	*	192	16	16
***SP6A**	**14**	**419,083**	**632**	**437**
*SP6TGC	*	218,400	442	350
*SP7JLH	*	48,100	210	185
*SP9CXN	*	19,964	136	124
*SQ8MZW	*	13,024	92	88
*SP4AAZ	*	770	24	22
*SQ6LJV	*	3	1	1
***SP4JCQ**	**7**	**1,515,360**	**1094**	**560**
*SP6OJE	*	1,283,997	1006	533
*SP5CNA	*	838,992	709	462
*SP3DIK	*	195,804	300	252
*SN9I	*	179,816	297	247
			(OP: SP9EMI)	
*SN5B	*	34,336	131	116
			(OP: SP5SSB)	
*SQ1EUG	*	21,244	107	94
*SQ8GHY	*	14,628	104	92
*SP8GNF	*	6,815	50	47
***SP9DLY**	**3.5**	**153,636**	**296**	**236**
Portugal				
CR6K	**A**	**2,369,298**	**1564**	**662**
			(OP: CT1ILT)	
CT1AOZ	**28**	**113,270**	**350**	**241**
CS2C	**21**	**3,798,404**	**2320**	**943**
			(OP: OK1RF)	
***CR7ACO**	**7**	**12,750**	**83**	**75**
Romania				
YO7ARY	**A**	**114,575**	**224**	**168**
YO7BGA	*	31,920	132	112
YO9BPX	**14**	**306,900**	**575**	**372**
YO7LGI	*	26,733	149	133
YR8I	**7**	**737,000**	**675**	**440**
			(OP: YO8BIG)	
YO5AJR	**1.8**	**104,951**	**265**	**203**
***YO3FRI**	**A**	**859,770**	**855**	**466**
*YO2IS	*	613,283	834	439
*YO8SS	*	380,016	688	377
*YO5AIR	*	359,839	584	347
*YP6WFF	*	252,791	467	343
			(OP: YO6UO)	
*YO4SI	*	183,222	361	261
*YO8RFS	*	87,636	261	201
*YO9FYP	*	84,840	292	210
*YO2QY	*	63,048	175	148
*YO9HG	*	60,929	227	191
*YO2ARV	*	25,460	111	95
*YO7ARZ	*	16,241	114	109
*YO7AWZ	*	14,065	107	97
*YO3CVG	*	6,832	61	56
*YO4BTB	*	2,880	52	45
***YR3ØDP**	**28**	**217,217**	**510**	**341**
			(OP: YO8AXP)	
*YO4ATW	*	83,070	246	213
*YO8BFC	*	70	7	7
***YO4MM**	**21**	**52,675**	**191**	**175**
*YO5ALI	*	36,995	169	151
*YO6CFB	*	19,040	116	112
*YO9CB	*	9,108	69	66
***YO9AGI**	**14**	**317,292**	**529**	**386**
*YO9CWY	*	177,837	397	317
*YO5BXI	*	76,544	226	208
*YO5OAG	*	71,604	229	204
***YO2MJZ**	**7**	**5,412**	**42**	**41**
***YR6M**	**3.5**	**130,680**	**286**	**216**
			(OP: YO6MT)	
*YO6ADW	*	88,548	225	188
San Marino				
T7BA	**A**	**6,227,775**	**3120**	**933**
			(OP: 9A3A)	
Scotland				
GM5A	**A**	**2,024,655**	**1788**	**645**
			(OP: GM3WUX)	
MM3N	*	702,572	925	458
			(OP: GM4SID)	
MM2R	*	33,264	184	154
			(OP: GM3YOR)	
***GM4FAM**	**28**	**62,217**	**257**	**223**
***GM3C**	**14**	**111,923**	**341**	**271**
			(OP: GMØNBM)	
Serbia				
YU5R	**A**	**1,079,216**	**1078**	**592**
			(OP: YU1YV)	
YU1CC	*	7,182	60	54
YU1KX	**21**	**1,835,044**	**1457**	**772**
YT7Z	*	837,330	1010	565
			(OP: YU7EE)	
YU5A	*	405,216	602	402
			(OP: YU1EW)	
YTØZ	**14**	**2,894,830**	**1900**	**859**
			(OP: YU1ZZ)	
YT1A	*	1,991,760	1521	772
YT7W	*	1,756,603	1471	739
			(OP: YU2M)	
YT4W	*	1,058,960	1101	610
			(OP: YU1DW)	
YT1R	*	23,180	108	76
			(OP: YU1AN)	
YU1LA	**7**	**4,262,934**	**1694**	**806**
***YT6W**	**A**	**3,706,561**	**2199**	**799**
*YU8A	*	3,565,464	2169	798
*YT9M	*	1,193,751	1073	537
*YT3R	*	327,965	468	335
			(OP: YT1CC)	
*YU7FN	*	123,257	291	233
*YU3W	*	58,680	199	163
			(OP: YU1MM)	
*YU1ED	*	58,136	196	169
*YT1CC	*	3,476	48	44
*YU5GBT	*	1,711	30	29
*YT2CZM	*	1,305	30	29
*YU8PSB	*	1,152	24	24
***YU5ZM**	**28**	**136,838**	**362**	**277**
***YU1AU**	**21**	**1,361,241**	**1244**	**697**
*YU7KM	*	116,840	309	254
*YU5C	*	67,768	237	212
***YU7RQ**	**14**	**92,254**	**308**	**239**
*YU1QU	*	67,662	192	179
*YU5CW	*	1,911	40	39
*YT1MN	*	1,320	33	33
*YU1BN	*	100	10	10
***YT5N**	**7**	**356,720**	**430**	**343**
*YU1ARL	*	266,760	341	285
			(OP: YU1FG)	
*YT7IM	*	52,520	135	130
***YU1Q**	**3.5**	**25,250**	**120**	**101**
***YT4A**	**1.8**	**119,848**	**276**	**211**
			(OP: YT1AA)	
Sicily				
IT9INO	**A**	**868,496**	**1088**	**527**
***IT9AJP**	**A**	**76,320**	**235**	**212**
***IT9LKX**	**28**	**95,472**	**307**	**221**
***IT98XR**	**14**	**26,460**	**145**	**135**
***IT9IMJ**	**3.5**	**4,459**	**50**	**49**
Slovakia				
OM2VL	**A**	**6,763,416**	**2936**	**968**
OM6W	*	1,211,427	1206	603
			(OP: OK5MM)	
OM3IAG	*	1,076,196	1075	526
OM4KW	*	482,469	773	417
OM3TPN	*	191,115	417	279
OM3DX	**28**	**60,984**	**243**	**198**
OMØWR	**7**	**688,028**	**658**	**418**
***OM3BH**	**A**	**2,883,429**	**1896**	**761**
*OM8ON	*	838,323	722	509
*OM7AG	*	408,330	617	390
*OM4DN	*	362,960	569	349
*OM7LM	*	322,846	516	337
*OM75IHWC	*	286,700	538	305
			(OP: OM5NA)	
*OM2IV	*	190,742	389	283
*OM5UM	*	50,375	194	155
*OM2DT	*	36,315	160	135
*OM4J	*	5,187	59	57
			(OP: OM4JD)	
***OM3TYC**	**21**	**14,550**	**106**	**97**
***OM3TB**	**14**	**389,784**	**599**	**447**
*OM3BA	*	116,896	295	281
***OM3ZWA**	**7**	**1,430,583**	**1047**	**563**
*OM5WW	*	596,361	544	411
*OM5ØCDN	*	254,617	393	293
			(OP: OM3CDN)	
***OM5FA**	**3.5**	**199,080**	**398**	**252**
Slovenia				
S5ØA	**A**	**6,543,665**	**2745**	**965**
S53MM	*	5,347,625	2685	895
S52OP	*	4,876,120	2502	877
S5ØC	*	4,585,332	2508	834
			(OP: S53CC)	
S51F	*	4,221,840	2270	840
S58MU	*	3,257,052	1911	807
S51Z	*	978,639	976	527
S51NM	*	128,898	289	231
S53A	**28**	**312,445**	**641**	**395**
			(OP: S57S)	
S57AL	**14**	**3,362,515**	**2001**	**895**
S57C	**3.5**	**414,687**	**542**	**343**
***S57U**	**A**	**1,428,408**	**1419**	**612**
*S51J	*	602,536	697	451
*S58RU	*	46,046	196	154
*S53QD	*	23,540	114	110
*S53DIJ	*	672	21	21
*S56DX	*	200	11	10
***S54A**	**28**	**109,568**	**328**	**256**
***S52IC**	**14**	**651,672**	**752**	**504**
*S51MF	*	136,950	313	275
***S57DX**	**3.5**	**583,490**	**651**	**415**
Spain				
***EA1FAQ**	**A**	**1,565,355**	**1290**	**583**
*EA1JO	*	455,101	654	421
*EA1VT	*	36,765	153	129
*ED1A	*	23,958	147	121
			(OP: EA1AST)	
*EA1EA	*	10,795	102	85
*EA1AW	*	2,623	45	43
EE2K	**21**	**923,168**	**986**	**544**
			(OP: EA2SS)	
***EA2VE**	**14**	**38,808**	**190**	**147**
EA3AV	**A**	**108,057**	**258**	**181**
ED3T	**21**	**1,819,692**	**1495**	**756**
			(OP: EA3AKY)	
***EA3GBA**	**A**	**57,960**	**204**	**168**
*EA3AXM	*	15,334	95	82
*EB3CML	*	8,364	69	68
***EA3AVV**	**28**	**6,882**	**81**	**74**
***EG3VFE**	**14**	**945**	**28**	**27**
***EA3GXJ**	**7**	**1,383,892**	**908**	**554**
EA4DRV	**A**	**986,583**	**1258**	**533**
***EA4CWW**	**A**	**519,350**	**763**	**425**
			(OP: UY7CW)	
*EA4FLY	*	180,576	393	264
*EA4OA	*	20,099	115	101
*EA4XT	*	16,544	110	94
***ED4T**	**14**	**46,080**	**164**	**144**
			(OP: EA4CWN)	
EF5F	**A**	**4,037,712**	**2405**	**854**
			(OP: EA5FV)	
EA5ARC	*	625,606	708	421
EF5K	*	73,440	316	204
			(OP: EA5KB)	
***EA5DD**	**A**	**420,920**	**552**	**340**
*EA5FQ	*	296,088	525	338
*EB5CS	*	97,745	264	173
*EF5R	*	61,692	258	194
			(OP: EA5BWR)	
***EA5AER**	**28**	**318,336**	**722**	**384**
***EA5URV**	**14**	**357**	**21**	**21**
			(OP: EA5HFW)	
EF7R	**A**	**126,893**	**331**	**227**
			(OP: EA7AJR)	
EA7TG	*	32,421	119	101
***EA7AZA**	**A**	**105,570**	**304**	**230**
*EA7CWA	*	77,448	201	168
*EA7VJ	*	5,828	64	62
***EA7GV**	**21**	**78,729**	**217**	**161**
Sweden				
SEBX	**A**	**1,902,762**	**1545**	**666**
			(OP: SMØMDG)	
SE6Y	*	1,465,128	1347	567
			(OP: SM6DED)	
SM6BGG	*	1,208,880	1135	584
SM5QU	*	626,535	771	459
SC5AG	*	543,568	836	424
SMØBSO	*	416,245	659	415
SM7BHM	*	256,908	528	316
7S5Q	*	118,818	255	207
			(OP: SM5COP)	
SM6X	*	26,450	139	115
			(OP: SM6CLU)	
SM6DHU	*	15,930	100	90
***SC3N**	**A**	**1,292,193**	**1332**	**567**
			(OP: EA8CN)	
*7S5S	*	1,074,944	1247	544
			(OP: SM5CSS)	
*SM6FKF	*	991,648	1117	532
*SM4DQE	*	675,364	945	436
*SF3A	*	608,798	850	433
			(OP: SM3CER)	
*SA6G	*	571,470	708	443
*SI5Y	*	465,360	743	420
			(OP: SM5BKK)	
*SFØD	*	410,260	671	365
			(OP: SMØDSF)	
*SM7CIL	*	330,368	580	356
*SM5DXR	*	324,736	619	344
*SG6A	*	226,440	498	306
			(OP: SA6AQP)	
*SM7EH	*	110,385	293	223
*SM6NET	*	109,740	320	236
*SM3EAE	*	85,330	296	230
*SMØS	*	75,294	235	178
*SE6N	*	66,470	216	170
			(OP: SA6AXR)	
*SM6AHU	*	66,216	252	178
*SMØBDS	*	30,375	161	135
*SM7BVQ	*	27,136	154	128
*SM6GBM	*	24,510	165	129
*SE6C	*	14,700	118	105
			(OP: SM6CDN)	
***SM5C**	**28**	**1,440**	**36**	**35**
			(OP: SM5CBM)	
***7S3J**	**14**	**21,645**	**131**	**117**
			(OP: SM3DZH)	
*SM3AF	*	1,978	47	46
***SM6Q**	**7**	**87,325**	**199**	**175**
Switzerland				
***HB9ARF**	**A**	**1,178,055**	**1127**	**557**
*HB9HQX	*	124,425	320	225
*HB9CSM	*	43,792	189	161
*HB9WDY	*	5,640	61	60
***HB9ELD**	**21**	**2,530**	**47**	**46**
***HB9CPS**	**7**	**434,538**	**458**	**351**
Ukraine				
UZ2M	**A**	**6,935,460**	**3172**	**1029**
			(OP: URØMC)	
UV5U	*	2,543,356	1859	764
			(OP: UX1UA)	
UY4I	*	1,792,236	1693	641
			(OP: US3IZ)	
UW8SM	*	1,033,188	1047	537
UT1AA	*	998,455	1111	503
UT7NY	*	795,746	936	503
UU4JC	*	593,643	847	457
UT3N	*	447,627	731	393
			(OP: UT3NK)	
US7IVW	*	277,412	477	311
UY8IO	*	202,704	448	309
UR4EI	*	108,756	323	228
UR5AO	*	69,888	194	168
UR7VA	*	58,480	157	136
US4IRT	*	38,076	141	114
UX5UO	*	33,516	150	126
UT7X	*	32,568	145	118
US5LO	*	20,178	140	118
US1IV	*	9,648	78	72
UT2IW	*	7,000	55	50
UU3JX	*	6,930	79	70
UT3UX	*	6,192	46	43
UT4PZ	*	4,368	43	39
EMØX	**28**	**399,588**	**817**	**426**
			(OP: UT2XQ)	
UT2UB	*	67,568	238	206
UY5QO	*	16,748	119	106
UT8IO	*	7,475	75	65
UR6IJ	**21**	**375,912**	**553**	**414**
UR5WMM	**14**	**195,274**	**477**	**326**
UU1JO	*	27	3	3
UX5D	**7**	**2,284,875**	**1248**	**675**
			(OP: UT7DK)	
UR7QC	*	982,775	740	475
US5E	*	713,664	626	432
			(OP: UR7EQ)	
UY3AW	**3.5**	**137,170**	**281**	**215**
UT6EE	*	15,300	86	85
UU9CW	*	6	1	1
***UU4JMG**	**A**	**3,648,316**	**2384**	**812**
*UX1UX	*	1,762,040	1545	620
*USØHZ	*	1,662,179	1456	593
*UT5UIA	*	1,240,824	1176	582
*UY1U	*	1,192,515	1109	535
*UW7M	*	1,157,712	1150	534
			(OP: UR3MP)	
*UT4EK	*	1,141,155	1099	535
*UW1WU	*	1,116,960	1163	520
*UT7I	*	975,136	1097	496
			(OP: UT2IO)	
*UU5JW	*	837,600	1037	480
*UT3I	*	827,418	1018	478
			(OP: US2IHS)	
*UT8IA	*	820,134	1046	483
*UW2Q	*	772,590	926	455
			(OP: UR6QS)	
*UX1AA	*	751,450	836	475
*UY2UQ	*	650,482	863	479
*UY5TE	*	616,968	817	418
*UT1IM	*	616,473	811	429
*US8IM	*	601,639	748	409
*UR7QM	*	599,415	819	449
*UTØL	*	510,673	697	421
*UX3HA	*	479,325	711	385
*UT8IT	*	466,494	670	383

*UT5R	*	464,358	688	401
*US6CQ	*	438,694	706	401
*US7IB	*	419,650	651	385
*UR5ZTH	*	407,046	660	358
*UY5AA	*	389,862	531	363
*UR4IZ	*	332,996	529	332
*US7WW	*	332,640	499	330
*UV5ERY	*	307,461	563	363
*UT8UL	*	284,517	490	313
*UY2ZZ	*	278,656	521	311
*UU9JK	*	266,175	526	315
*UZ8I	*	258,538	496	313
			(OP: US7IY)	
*UY5AR	*	243,504	479	304
*UX6IB	*	235,060	436	292
*UT5ECZ	*	229,472	399	284
*US7IA	*	209,190	433	285
*UX1IB	*	207,400	414	305
*UT3UZ	*	168,504	325	236
*UT3Q	*	163,880	348	241
			(OP: UT3QT)	
*UR3QM	*	160,552	341	244
*UT4XU	*	152,684	362	266
*UU1JE	*	142,311	397	267
*UU2J	*	136,284	292	246
*UT4UP	*	136,240	339	260
*UY5YB	*	128,310	326	235
*UR5WX	*	128,040	353	264
*UR4IOR	*	106,977	300	211
*UT4NY	*	101,558	286	206
*UZ5U	*	85,848	286	196
			(OP: UT4UO)	
*UR5EIT	*	82,080	232	190
*UX8IW	*	81,955	251	185
*US2IW	*	70,616	223	194
*UR3PGW	*	58,312	180	148
*UT7HM	*	50,224	171	146
*UU7JD	*	48,960	197	160
*UT4UFU	*	37,929	163	141
*UX6IR	*	36,608	140	128
*UT7VR	*	34,391	137	119
*UR7HCX	*	31,611	160	123
*UT5UKY	*	31,347	142	129
*UT3WJ	*	30,226	150	127
*UT5UGQ	*	29,646	154	122
*UR9LD	*	27,000	146	120
*US8IUJ	*	22,627	154	121
*US7ISE	*	21,344	125	116
*US7UU	*	18,360	100	90
*UU2JA	*	8,050	56	50
*UTØCM	*	7,290	88	81
*UU7JN	*	6,903	64	59
*UW7CN	*	5,612	62	61
*UT5EDU	*	4,950	54	50
*UR5XMM	*	2,923	39	37
*UX2IJ	*	1,720	22	20
*US2MT	*	1,008	27	21
*UU4JQE	*	714	21	21
*UT4VV	*	455	13	13
*US5IIM	*	250	12	10
***UT8EU**	**28**	**133,874**	**358**	**271**
*UT2PX	*	40,500	202	162
*UY4F	*	31,257	170	151
*US3IP	*	14,600	108	100
*UW4SU	*	2,030	39	35
***UX4FC**	**21**	**482,532**	**689**	**474**
*UT3QU	*	278,692	517	361
*UT7NW	*	269,709	461	363
*UR3QNV	*	6,592	69	64
*UR5LBM	*	1,548	37	36
***UR5MM**	**14**	**485,374**	**626**	**482**
*US1PM	*	351,696	619	431
*UT5IZ	*	160,016	429	292
*UR5VR	*	110,288	305	244
*UR5EFL	*	94,132	287	233
*UT5CY	*	93,835	284	245
*US3WD	*	90,342	293	239
*UR5PG	*	54,760	202	185
*US8IB	*	33,020	136	130
*UT5PQ	*	23,180	126	122
*US4IPC	*	17,520	134	120
*UR5FEL	*	10,742	85	82
*UY7IS	*	319	11	11
***UW2F**	**7**	**655,872**	**637**	**427**
			(OP: UTØFT)	
*UR5KO	*	625,826	587	422
*UTØUM	*	621,148	571	418
*US7IID	*	365,840	484	340
*UT7LA	*	359,148	448	346
*UT3EK	*	302,022	375	306
*US2MW	*	159,372	273	228
*UR7MZ	*	133,238	276	217
*UT8QQ	*	79,716	208	182
*UT7MR	*	26,260	108	101
*UZ5UA	*	15,450	78	75
***UX7U**	**3.5**	**159,300**	**327**	**236**
			(OP: UX7UA)	
***UX5NQ**	**1.8**	**60,528**	**194**	**156**
*UT5PH	*	8,253	68	63

Wales

GW4BLE	A	2,178	35	33
GW5R	21	548,938	815	491
			(OP: GW3YDX)	

OCEANIA

Australia

VK2IIM	A	4,491,828	1753	684
VK2PN	*	665,448	622	357
VK3TDX	A	2,905,500	1331	596
*VK3FM	A	120,802	227	187
VK4CT	A	5,341,920	1881	718
			(OP: VK4EMM)	
*VK4TT	A	71,300	176	124
*VK4EJ	21	31,416	113	102
VK7GN	A	528,360	483	296
*VK7NET	A	250	10	10
*VK8AV	7	129,944	159	148

East Malaysia

9M6YBG	A	1,144,044	907	396

Guam

NH2T	A	4,501,739	1961	671
*WH2D	A	194,844	321	156
			(OP: K3UOC)	
*AH2/N2TTA	21	181,944	382	171

Hawaii

KH7X	A	6,599,845	2351	707
			(OP: KH6ND)	
WH7M	*	5,183,034	2185	631
			(OP: K1YR)	
NH7A	*	4,438,984	1977	584
			(OP: N6TJ)	
NH6P	*	53,679	116	87
*KH6OO	A	25,520	108	88
*KH7T	7	10,164	45	44

Indonesia

YB1AR	A	188,892	282	212
YB4IR	21	97,608	213	168
*YB3JBJ	A	37,730	124	98
*YC3TKH	*	36,569	120	97
*YC1BJX	28	29,392	116	88
*YG1CRR	*	15,552	88	64
*YBØAKM	21	464,013	489	327
*YB2EUZ	*	84,664	211	152
*YB8EL	*	16,344	79	72
*YB3BOA	7	36,852	96	74
*YD3SWV	*	288	8	8
*YB3XM	3.5	14,500	53	50

New Zealand

ZL2AL	A	16,456	81	58
ZM1A	21	993,816	818	428
			(OP: ZL1AIH)	
ZL3PAH	7	21,204	62	62
*ZL4NX	A	95,200	213	160
			(OP: JM1CAX)	

Papua New Guinea

*P29CW	A	1,223,910	931	405
			(OP: VK2GR)	

Philippines

DU1XX	A	3,712	38	29
DU1EV	7	8,853	41	39
*DV1/JO7KMB	14	189,773	300	223

SOUTH AMERICA

Argentina

LU1DZ	A	92,092	192	161
LU7HN	28	1,455,807	960	537
*LU3DAT	A	329,175	403	275
*LU5YF	*	130,020	219	165
*LW3DG	*	83,916	188	162
*LW1EUD	*	12,224	77	64
*AY9F	28	4,687	45	43
			(OP: LU5FZ)	
*LU7ADR	*	2,077	32	31
*LU5FR	21	1,387,050	919	525

Aruba

P4ØW	A	14,206,500	3521	1004
			(OP: W2GD)	
P43JB	*	683,761	574	353
*P49Y	A	11,008,296	3132	936
			(OP: AE6Y)	

Bonaire

PJ4A	A	16,272,730	3959	1018
			(OP: K4BAI)	
PJ4/K4IQJ	*	299,563	433	241
*PJ4LS	A	2,004,105	1040	555

Brazil

PS2T	A	9,406,824	2887	931
			(OP: N5ZO)	
PV8DX	*	1,503,326	1004	506
PV8ADI	*	561,600	683	325
PY2MTV	*	556,432	599	332
PS7DX	*	553,110	515	358
PV8ABC	*	69,583	188	149
PP5JY	*	17,612	86	74
PY2LCN	*	8,690	64	55
PY9BDA	*	84	9	6
PW2D	28	2,100,886	1185	619
			(OP: PY2ZXU)	
PP2EG	*	263,176	351	268
ZX5J	21	4,383,960	1812	840
			(OP: AI6V)	
PT3A	14	61,490	152	143
			(OP: PY3AU)	
PR7AR	3.5	194,931	214	179
PT3T	*	27,525	84	75
			(OP: PY3XX)	
*PY2NY	A	1,887,842	1067	538
*PY4HO	*	930,044	735	428
*ZX2F	*	920,991	747	433
			(OP: PY2FN)	
*PR7HR	*	398,560	419	265
*PY2IU	*	38,016	133	99
*PP5AX	*	24,528	101	84
*PY1CX	*	23,956	120	106
*PY3/PY1AMF	*	19,200	93	80
*PY2DA	*	11,352	76	66
*PY2RX	*	10,260	65	57
*PY2MR	*	1,917	27	27
*PY2MTS	28	394,286	587	274
*PY1MK	*	8,791	66	59
*PY1KO	*	7,248	57	48
*PY1CMT	*	882	18	18
*PY1KM	*	693	25	21
*PY1NSC	*	154	12	11
*PY2TIM	21	912,319	701	461
*PY4FQ	*	684,736	574	416
*PR3A	*	364,554	417	314
*PY1XW	*	66,249	165	153
*PY7YN	*	325	17	13
*PR7TW	*	280	10	10
*PY6/PY1JR	14	115,736	245	184
*PY4LH	*	46,956	136	129
*PY3GAD	7	936	20	18

Chile

XQ1KZ	21	3,253,635	1615	693
CA3KHZ	7	403,875	328	225
*CE2/VE7SV	28	916,272	748	432
*XR3A	14	338,086	449	266
			(OP: CE3DNP)	
*CE6VMO	*	1,000	20	20

Colombia

HK1R	21	5,133,440	2117	832
HK3Q	*	9,588	68	68
HK1X	14	7,254,266	2454	1006
HK1MW	1.8	18,300	68	50
*5K3R	28	36,084	137	97

Ecuador

HC2SL	21	3,761,856	1718	756

Paraguay

ZP6CW	A	141,491	251	203
			(OP: I1HJT)	

Suriname

PZ5RA	A	548,110	452	295

Uruguay

CW5W	A	9,114,525	2738	945
			(OP: CX6VM)	
CX9AU	*	1,047,454	724	439

Venezuela

YY4ALK	21	4	2	2
YW4D	14	5,903,471	2158	931
			(OP: YV1DIG)	
*YV5JGO	A	276,300	317	225
*4M1W	7	914,188	512	316
			(OP: YV1FM)	

ASSISTED

NORTH AMERICA

United States

WU3A/1	A	5,540,945	2181	895
			(OP: W3UA)	
WK1Q	*	4,189,915	1835	815
			(OP: K1MK)	
K1AR	*	1,734,462	1204	577
W1CU	*	1,216,224	774	492
K1CX	*	1,088,275	957	505
			(OP: K1GQ)	
AE1T	*	445,936	530	376
K3IU/1	*	440,860	472	335
K1DM	*	386,576	416	296
AD1L	*	186,864	300	229
K1TH	*	61,787	173	137
*W1MSW	A	213,720	368	274
*N1API	*	122,337	295	207
*AB1OD	*	120,582	268	198
*AA1AR	*	15,834	79	78
*W1MAW	*	6,944	64	62
*WA1N	*	5,936	58	53
*NF1O	*	1,890	30	30
*N1VVV	28	1,711	30	29
*W1WBB	7	222,981	278	233
KQ2F	A	1,349,304	877	538
			(OP: K2QMF)	
W2LE	*	700,335	622	395
WF2B	*	557,232	551	376
			(OP: K2ONP)	
AB3CX/2	*	491,043	528	349
N2KI	*	324,816	409	303
W2LK	*	259,408	353	248
AB2DE	*	202,340	317	268
W6XR/2	*	179,632	280	218
K2MK	*	176,330	300	229
K2ZC	*	90,347	208	167
W2RZS	*	82,947	168	129
			(OP: WB2NVR)	
W2UDT	*	10,500	78	70
NP3D/2	*	1,860	33	30
W2RR	28	2,550	36	30
			(OP: WA2AOG)	
N2YBB	14	45,216	161	144
*KA2D	A	364,504	424	283
*K2CYE	*	265,203	359	237
*WW2P	*	108,490	256	190
*K2DB	*	97,299	232	171
*N2FF	*	28,028	102	91
*K2DSL	*	20,500	115	100
*N2JDQ	7	154,093	377	223
NY3A	A	5,448,006	2293	866
WR3Z	*	3,633,945	1864	795
K3WW	*	2,657,972	1234	668
NA3M	*	1,520,730	928	554
K3MD	*	1,036,800	941	480
W3KL	*	1,022,037	786	461
NB3R	*	724,192	734	424
K3TN	*	416,970	512	339
W3FV	*	373,650	451	318
N3RD	*	347,498	431	293
N3XL	*	143,208	293	221
WX3B	*	93,313	224	187
N3ST	*	37,851	128	111
W6AAN/3	*	35,600	101	100
NN3L	21	955,164	843	548
			(OP: N3RS)	
*WA3KYY	A	387,803	566	299
*W4EE/3	*	372,400	481	304
*W3KB	*	330,639	476	307
*NK3Y	*	302,575	441	325
*W3SFG	*	127,704	259	204
*N3AM	*	113,460	258	183
*WA3AAN	14	16,490	104	97
NS1S/4	A	2,430,050	1431	655
			(OP: K1ZZI)	
WO4O	*	2,053,125	1666	625
NF4A	*	2,032,640	1527	640
K1GU/4	*	578,592	591	392
K2SX/4	*	523,770	613	390
N4GG	*	489,555	620	345
KR4F	*	448,716	492	366
N4DW	*	279,034	397	266
NE4M	*	253,800	452	282
N4QS	*	224,814	376	267
KG4W	*	192,449	277	223
AE4CW	*	159,432	288	219
K4LQ	*	142,688	220	208
NQ1W/4	*	124,960	261	220
			(OP: K1KD)	
N4NM	*	112,140	259	180
W1AJT/4	*	35,308	113	97
NS4X	*	32,832	142	114
W4VIC	*	14,544	77	72
N4TOL	*	4,140	57	46
K1SE/4	21	16,791	98	87
W4CU	14	637,920	716	480
WØNA/4	*	316,017	449	333
KB4FB	*	527	17	17
*N4WO	A	217,722	472	262
*W4KAZ	*	168,000	326	240
*N4ARO	*	159,537	292	213
*KE1F/4	*	92,456	236	182
*W4CWA	*	30,720	128	120
*AA4DD	*	6,560	55	41
*AD4YQ	*	6,174	56	49
*W4WNT	*	3,104	33	32
*W6IHG/4	*	816	17	17
*NW4V	14	200,160	351	288
NK5Q	A	3,269,332	2157	737
			(OP: K5WA)	
K2BA/5	*	449,814	560	366
K5MV	*	435,696	714	348
AA5AU	*	71,832	206	164
*NE5LL	A	388,278	711	333
			(OP: N1CC)	
*N5UI	*	124,173	341	189
*N5PV	*	34,800	174	120
*N5JR	*	32,226	126	123
*WBØRUR/5	*	15,908	115	82
*W4JHC/5	*	2,769	47	39
KYØW/6	A	1,795,311	1461	621
			(OP: K6SRZ)	
N6WIN	*	1,479,500	1242	538
N6QQ	*	1,223,201	1003	541
WX6V	*	1,013,328	908	454
KE1B/6	*	920,920	1070	506
AG6AU	*	716,420	959	452
			(OP: W1RH)	
WJ6O	*	301,602	518	301
			(OP: K6GT)	
NE6I	*	262,752	571	272
AK6M	*	251,980	527	293
			(OP: K6MM)	
K6TU	*	171,864	368	231
NO6T	*	99,198	370	198
			(OP: N6NC)	
NK6A	*	84,036	264	188
K6RIM	*	77,604	226	174
K6III	*	21,168	99	98
W6OAT	*	7,493	61	59
KD6WKY	*	3,969	64	49
N6AJR	*	1,274	28	26
N6ML	21	315,423	502	347
WM6A	*	278,070	448	310
			(OP: K6TA)	
N6JV	14	702,084	840	492
KZ5OM/6	*	31,506	123	118
			(OP: K6III)	
KF6T	7	863,247	838	407
*K6AAB	A	227,962	445	266
*W6KY	*	96,425	268	175
*KE6QR	*	81,312	306	176
*K6VAR	*	61,353	238	153
*NC6RJ	*	50,096	167	124
*AG1RL/6	*	12,506	77	74
			(OP: W1SRD)	
*NA6G	*	9,504	100	72
*N6EE	21	38,216	146	136
*AG6V	14	48,216	207	164
N6MA/7	A	1,221,700	1280	475
WI7N	*	633,046	714	433
AB7R	*	466,095	796	345
K7RF	*	437,660	577	395
WS7L	*	314,140	570	278
W7PP	*	153,201	382	229
NA2U/7	*	144,265	391	215
NW7E	*	85,702	155	146
KE7YF	*	76,479	256	159
K7VIT	*	73,920	240	165
KF7IQ	*	71,100	222	158
K7JJ	*	59,514	182	182
KC7PM	*	16,280	121	88
KZ7X	21	334,650	581	345
			(OP: K6LL)	
WZ7ZR	*	212,290	462	299
			(OP: W7ZR)	
W7WW	14	32,512	144	128
W6RLL/7	7	40,740	114	105
*WL7E/WZ7	A	392,092	622	332
*W7OM	*	262,570	468	310
*WU9B/7	*	188,811	385	243
*W7RV	*	145,125	329	225
*NQ6C/7	*	117,747	304	189
			(OP: W6NF)	
*K7GS	*	105,288	289	214
*ND8N/7	*	43,344	209	126
*K7LD	*	16,910	114	89
*K7EIQ	*	5,712	74	68
*N7MAL	7	88,200	223	168
*W8AEF/7	3.5	89,250	273	175
W8MJ	A	3,075,440	1916	740
W9KB/8	*	306,144	524	288
ND8L	*	276,944	396	304
N4ZR/8	*	242,416	363	278
K8PTT	*	43,561	160	127
K8ALM	*	15,147	53	51
*K8BL	A	551,502	609	378
*AA8IA	*	380,163	621	301
*N8HP	14	60,690	195	178
*NO8C	7	5,940	67	54
WN9O	A	1,895,156	1385	623
			(OP: W9IU)	
K9NR	*	1,223,220	1168	551
K9MMS	*	1,178,877	1080	511
N2BJ/9	*	325,304	482	296
WW9R	*	121,800	333	203
NF9V	*	83,160	207	168
K9EN	*	57,024	174	162
KØTQ/9	*	43,440	141	120
KA9FOX	*	1,955	34	23
K9NW	14	473,396	545	406
*K9CW	A	186,824	341	242
*K9DJ	*	138,296	279	236
*N9LJX	*	51,471	198	133
*K9AIH	*	14,448	102	84
*KO9A	28	4	2	2
*NX9G	7	19,926	93	82
KØPY	A	729,725	921	425
KEØUI	*	726,264	787	462
NØXR	*	98,460	282	180
NØOJ	*	44,020	245	142
AAØAW	*	24,231	160	123
WBØN	*	18,525	75	75
K4IU/Ø	*	17,952	116	96
NØBK	*	10,206	74	54
KØBX	14	46,720	132	128
*NØSXX	A	870,012	972	468
*KØKX	*	636,300	573	404
*NXØI	*	176,091	409	237
*AD1C/Ø	*	41,072	160	136
*WDØECO	*	16,393	132	97
*KFØIQ	14	23,493	137	123
*KEØL	7	2,479	43	37

Alaska

KL3/AB8CK	14	315,230	453	290
			(OP: UA3AGW)	

Antigua & Barbuda

*V26E	A	4,872,526	1732	766
			(OP: AB2E)	

Bahamas

*C6AWL	7	1,262,778	638	418

Canada

VA2WA	A	3,505,304	1617	653
			(OP: VA2WDQ)	
N2WQ/VE3	*	2,496,640	1285	640
VE2FXL	*	39,960	129	108
*VE2XAA	A	3,001,790	1432	638
VE3RZ	A	1,948,827	1072	543
VE3IQ	28	2,079	29	27
*VE3CWU	A	29,432	111	104
*VE3AJ	14	324	12	12
VE5MX	A	297,402	455	291
VA6XDX	7	48,708	127	99
			(OP: VE6LB)	
*VA6MM	14	840	24	24
*VA7ST	A	968,616	805	396
*VY1EI	14	17,172	111	81

El Salvador

YS1GR	A	289,548	396	252

Haiti

*HH2/PY1ZV	3.5	23,628	109	66

Martinique

TO8A	A	11,038,950	3588	999
			(OP: R5GA)	
FM5CD	*	7,151,445	2668	933

Mexico

XE1EE	21	7,535	58	55
*XE2B	A	53,584	170	136

Puerto Rico

*NP4G	14	68,080	216	148

Turks & Caicos

VP5CW	A	7,048,951	2940	923
			(OP: W5CW)	

U.S. Virgin Islands

*KP2B	A	609,348	548	348
			(OP: WP3A)	

ASIA

Asiatic Russia

RG9A	A	9,215,552	2781	926
R9SA	*	4,735,541	1842	779
UA9CTT	*	4,728,448	1896	697
RT9A	*	4,668,895	1796	737
RN9CM	*	4,560,192	1779	696
RL9AA	*	3,953,792	1785	736
R9DA	*	3,284,570	1570	695
RJ9J	*	1,755,582	1111	606
RM9RZ	*	836,334	732	479
RN9A	*	781,705	613	395
UA9AGX	*	770,572	605	422
RG8K	*	564,264	574	408
RO9O	*	245,160	303	216
R9XT	*	219,840	327	229
RM8W	*	110,448	217	177
R9WR	*	43,940	141	130
UA9OCQ	*	12,525	83	75
UA9YAB	*	2,516	38	34
RK9QWM	28	5,124	46	42
			(OP: RW9QU)	
UI9I	21	1,019,445	1001	511
			(OP: RU9I)	
RA9UN	14	343,995	428	323
RT8O	*	94,734	228	171
RK9DM	*	46,698	140	129
RK9AX	7	286,332	267	214
*RT9S	A	3,385,266	1497	642
*RA9A	*	2,382,720	1204	584
			(OP: UH8A)	
*RW9C	*	2,139,375	1179	525
*RK9UE	*	1,890,882	1275	602
*UD8A	*	1,614,018	980	498
*R9UC	*	446,424	569	356
*RV9UP	*	302,176	464	284
*UA9CNV	*	229,616	347	226
*RG8U	*	89,679	237	179
*UA9CBM	*	22,632	108	92
*UA9XBJ	*	7,182	57	54
*UA9R	28	43,320	152	120
*R9MC	21	456,000	568	375
*RZ9UMA	*	329,640	485	328
*RZ9CJ	14	51,291	142	139
*R9IR	*	8,792	58	56
RKØA8	A	1,365,726	972	501
RMØW	28	4,002	56	46
UBØA	21	119,350	315	217
UCØA	14	755,151	700	453
RKØUT	*	351,828	432	337
RØQA	*	248,248	412	286
RAØAM	*	20,915	97	89
RUØFM	3.5	79,910	219	122
*RAØANO	A	864	19	18
*RVØAE	21	21,012	111	103
*RAØWU	3.5	100,776	162	136

Asiatic Turkey

TA2ZAF	28	1,379,664	1004	468
			(OP: OK1MU)	

China

BA1KW	A	359,516	666	311
BD4CQ	*	93,696	255	183
BD3BD	7	1,144	22	22
*BG6CQZ	A	984	27	24

Cyprus

*5B/US7IDX	A	4,948,784	2125	688
			(OP: RN3QO)	

Georgia

4L5O	3.5	545,214	387	267
*4L4/UT5EO	1.8	4,108	28	26

Hong Kong

*VR2KW	21	137,214	347	242	

Israel

4Z5TK	A	2,383,722	1210	594	

Japan

JM1LPN	A	156,136	348	232	
JR1GJP	*	70,618	172	134	
JH1OVY	*	39,330	128	115	
JN1KWR	*	25,428	124	78	
JA1XUY	*	9,494	50	47	
JA1PTJ	*	4,760	41	40	
JG1SXP	*	1,431	28	27	
JA1OGT	28	1,230	31	30	
JH1ACA	14	50,895	159	145	
*JA1IST	A	195,502	345	239	
*JE1SGH	*	140,070	325	210	
*JH1DGQ	*	106,575	208	147	
*JH1FSF	*	35,405	105	97	
*JH1DYV	*	12,529	70	67	
*7L2OHM	28	45	5	5	
*JS1IFK	21	157,784	340	242	
*JI1BDQ	*	8,905	66	65	
*JH3LFL/1	14	34,117	140	109	
*JM1NKT	7	137,256	252	168	
JA2FSM	A	86,445	212	153	
*JK2VOC	A	85,824	259	149	
*JF2IAB	*	2,673	40	33	
*JE2HXL	21	11,218	87	79	
*JR2AAN/2	*	3,344	47	44	
*JA2KPV	14	5,700	55	50	
JG1EIQ/3	A	200,925	332	225	
JN3SAC	*	140,160	265	192	
*JA3PYC	A	140,976	283	198	
*JG3FEA	*	117,782	202	179	
*JF3SAD	*	75,405	219	165	
*JG3SVP	*	68,200	242	155	
*JA3VUI	*	35,088	137	102	
JO4CFV	A	39,795	139	105	
JH4UTP	*	23,690	136	103	
JN4MMO	28	3,015	52	45	
*JM4WUZ	A	274,455	511	285	
JA6BZI	7	658,438	438	346	
*JA6DIJ	A	668,886	665	393	
JA7ZP	A	62,823	167	129	
JP7AWQ	*	4,136	49	44	
JA7OWD	28	9,576	86	72	
*JI7OED/7	14	200	10	10	
JH8SLS	A	318,816	452	288	
JF9JTS	A	7,480	65	55	
JR9GMS	*	7,473	53	53	
JAØFVU	A	1,365,552	1057	522	
JAØGSG	*	2,484	49	36	
JJØMPI	21	1,100	28	25	
*JAØBJY	A	31,020	127	110	

Kazakhstan

UP5P	A	1,578,320	1010	545	(OP: UN7PL)
UN4PG	21	784,836	829	468	
UN2E	14	1,081,075	785	521	
*UN8GV	21	907,092	770	454	
*UP2F	*	15	3	3	(OP: UN8FM)
*UN9LU	3.5	130,650	175	150	

Kuwait

9K2RA	28	1,384,560	1011	540	(OP: 9K2RR)

Saudi Arabia

HZ1FI	A	1,927,275	1099	525	(OP: DL2RMC)

South Korea

DS5DNO	A	128,520	386	168	
HL1/WX8C	14	748	26	22	

Tajikistan

*EY7BJ	21	78,288	197	168	

United Arab Emirates

A65CA	A	2,957,248	1527	656	

Uzbekistan

*UK8AR	21	1,094,460	890	510	

Vietnam

XV1X	A	334,880	610	322	

West Malaysia

9M2ADX	A	349,479	466	309	

EUROPE

Aland Islands

OGØZ	A	3,458,308	2562	812	

Austria

OE3GCU	A	66,220	191	172	
OE3I	7	2,350,238	1181	674	

Belarus

EW2A	A	2,815,890	2024	759	
EV1R	*	2,528,331	1924	723	
EW8DJ	*	1,497,144	1267	583	
EU5M	*	1,424,160	1244	552	
*EW1IP	A	2,020,337	1726	649	
*EW7DK	*	3,105	48	45	
*EU6RD	7	86,376	205	183	

Belgium

OP4K	A	1,436,916	1248	604	
ON1CB	14	981,734	1027	619	
ON5KQ	7	456,544	557	352	
*OO9O	A	479,740	618	415	(OP: ON7SS)
*OR2F	14	252,222	469	381	(OP: ON8LDS)

Bosnia-Herzegovina

E77M	A	16,200	117	100	
E71A	3.5	664,759	646	421	
*E74WN	A	56,550	185	150	

Bulgaria

LZ1ONK	A	207,680	431	295	
LZ1QZ	14	17,538	114	111	
*LZ4AE	A	337,755	519	345	
*LZ5XQ	14	1,229,146	1237	706	
*LZ1QV	7	311,122	408	313	
*LZ2SC	3.5	196,091	331	257	

Crete

J49XF	14	15,042	117	109	(OP: SVØXBN)
*SVØXBZ/9	28	401,305	764	415	(OP: YL2VW)

Croatia

9A1AA	A	4,348,464	2291	876	
9A4WY	*	925,089	984	561	
9A2U	28	189,275	505	335	(OP: 9A3ZA)
9A5D	21	1,357,401	1313	669	(OP: 9A3Y)
9A3ST	*	3,080	36	35	
9A4KW	14	333,572	525	356	
9A5MT	7	3,272,107	1503	751	
9A5TO	3.5	11,315	73	73	
*9A6B	A	2,410,107	1456	731	(OP: 9A2EU)
*9A1CMA	14	26,666	170	134	(OP: 9A5TO)

Czech Republic

OK7Y	A	2,258,280	1597	697	(OP: OK1FDY)
OK1AOV	*	283,470	415	330	
OK1DUT	*	31,488	143	128	
OK7K	21	741,480	835	555	(OP: OK1GK)
OK6DJ	14	214,848	393	288	
OK7MT	7	775,536	613	453	
*OK6Y	A	2,103,514	1478	694	(OP: OK2PTZ)
*OK1JOC	*	1,586,835	1430	591	
*OK2BXE	*	974,400	940	525	
*OL1ØØVP	*	808,220	897	502	(OP: OK1AY)
*OK1TD	*	259,160	402	310	
*OK2BFN	*	171,216	326	246	
*OK1EV	*	76,800	263	200	
*OK2PCL	*	32,438	116	98	
*OK2NA	*	9,164	92	79	
*OK3R	7	1,537,290	877	589	(OP: OK1DVM)
*OK1UG	*	1,085,568	786	528	

Denmark

5P5L	A	1,976,940	1738	630	(OP: DD2ML)
*OZ6OM	28	342	19	19	
*5P3A	21	2,028	41	39	(OP: OZ3ABE)

England

G4IIY	A	342,432	491	348	
G6T	*	172,040	324	253	(OP: G4MKP)
M4U	14	34,200	179	150	(OP: GØDVJ)
G3XTT	3.5	488,300	576	380	
*G4WGE	A	257,397	496	309	
*GØAZS	*	51,040	213	160	
*2EØUAY	*	3,312	46	46	(OP: N2WKS)
*M/YO4RDW	14	216,433	440	343	
*M5E	7	1,765,056	1018	634	(OP: GØCKV)

Estonia

ES4RX	A	687,582	904	459	
ES4RD	21	175,134	440	303	
*ES6Q	A	2,824,877	1999	781	(OP: ES5RY)
*ES2BH	*	37,506	171	141	

European Russia

RD1A	A	2,358,542	1707	698	
RA1QD	*	1,200,465	1075	555	
*UA1AFT	14	794,561	825	589	
*RO1B	3.5	90,909	226	189	
UA5A	A	5,705,232	3153	984	(OP: UA5C)
RT3T	*	3,448,600	2187	860	
R3ZV	*	884,368	1016	496	
RJ3A	*	364,322	599	371	
R3QX	*	38,194	136	113	
RW3DOX	*	20,125	133	115	
RU3DM	*	9,000	68	60	
UA3QNS	28	198,755	462	313	
RK3SWB	14	1,340,952	1244	708	(OP: R3S)
RW3XM	*	58,093	250	193	
UA3MIF	7	2,691,200	1307	725	
RA3M	3.5	444,808	548	364	
RA3FD	*	212,799	357	267	
R3VA	1.8	73,350	213	163	
*R2SA	A	1,576,617	1394	579	
*UA3VQL	*	509,031	687	459	
*R2AT	*	328,300	592	350	
*UA3AMZ	*	320,739	552	323	
*RU3U	*	245,025	444	297	
*U3DI	*	241,164	479	297	
*RU3UW	*	109,200	315	200	
*R3RR	*	106,636	259	212	
*RK4HZ/3	*	96,135	268	195	
*UA3RW	*	36,465	173	143	
*RA3YC	*	2,664	37	37	
*RW3DY	*	1,764	36	36	
*R5ACQ	21	12,513	105	97	
*RM2M	14	1,738,842	1414	798	
*RX3DBG	*	161,271	361	297	
*RA3YZ	*	45,066	187	174	
*RV3LD	*	28,944	153	144	
*RA3VE	*	1	1	1	
*RK2T	7	321,360	396	312	(OP: RK3TD)
*UA3FX	*	202,215	313	255	
RT4RO	A	3,374,406	2233	791	
RW4W	*	2,012,100	1498	706	
RW4NJ	*	71,820	226	180	
RU4F	*	66,584	203	164	
RW4WZ	*	12,512	71	68	
RZ4HC	14	113,535	292	261	
UA4FCO	3.5	10,335	72	65	
*UA4ALI	A	1,492,784	1445	632	
*RV4AB	*	1,438,178	1203	602	
*RZ4PWL	*	311,330	511	326	(OP: RW4PL)
*RN4ZT	*	292,758	483	354	
*RA4AAO	*	211,932	366	252	
*RD4AAA	*	83,600	213	176	
*RU4SS	*	69,147	234	197	
*RX4CD	*	27,348	143	129	
*RZ4AA	*	2,000	29	25	
*RA4WC	28	13,365	93	81	
*RY4W	14	646,944	822	552	
*RA4HPI	*	43,566	166	159	
UC7A	A	2,247,102	1693	702	
RN7F	*	1,679,552	1376	644	
UA6AA	*	986,493	730	493	
R6AF	*	141,450	322	246	
RW6AN	*	82,536	199	152	
UA6XDX	*	16,992	104	96	
RC7A	14	1,605,120	1464	760	
RQ7M	3.5	350,124	479	326	
RY6Y	*	53,940	179	145	(OP: RA6YDX)
*RL6M	A	9,425	73	65	
*RA6YJ	*	1,426	25	23	
*UA6LCN	28	143,910	349	270	
*R7NA	*	5,005	58	55	
*R7AM	21	118,080	279	240	
*RV6LCI	14	417,902	628	446	
*UA6LUQ	*	359,898	545	418	
*RN6MA	*	349,024	667	416	
*RA7Y	3.5	133,021	284	217	

Faroe Islands

OY1CT	A	1,733,990	1945	634	
OY/PA2A	*	540,176	689	424	
OY6A	21	89,535	329	235	(OP: OY2J)

Finland

OG73X	A	3,226,125	1988	875	(OP: OH8LQ)
OG6N	*	2,458,638	1766	819	(OP: OH6NIO)
OG4T	*	2,212,185	1602	695	(OP: OH4MFA)
OH5DA	*	332,976	510	336	
OH6OS	*	138,306	341	267	
OH2KW	*	109,691	287	229	
OH2XX	*	96,180	301	210	
OG4X	*	23,205	142	119	
OH4MDY	28	14,852	113	94	
OH6RE	14	120,096	281	278	
OH2BN	*	725	25	25	
OH5TS	*	24	4	4	
OH6M	7	1,362,525	989	555	(OP: OH6LBW)
OH6XY	*	197,376	302	256	
OH6MW	3.5	717,220	735	436	
*OH8R	A	1,604,665	1359	659	(OP: OH8FKU)
*OH2LNH	*	211,837	440	289	
*OH7KBF	*	37,597	154	131	
*OH8T	*	23,364	138	118	(OP: OH8KA)
*OH2FHN	*	5,046	63	58	
*OH4KA	14	80	10	10	

France

F5VKT	A	922,950	870	525	
F8IDR	*	187,985	476	287	(OP: F5XX)
F5VML	*	23,280	143	120	
F5JFU	28	1,995	35	35	
F8BDQ	21	18,928	121	104	
F5IN	14	1,756,440	1381	738	
*F5VV	A	280,016	476	344	
*F6DZD	*	98,928	293	216	
*F4FEP	*	17,400	99	87	
*F4FDA	28	119,595	355	255	

Germany

DA2MORSE	A	2,913,543	2103	783	(OP: DL5SE)
DL6KVA	*	2,291,744	1477	787	
DAØI	*	1,976,076	1501	684	(OP: DK1II)
DJ9MH	*	1,940,120	1369	676	
DL8WEM	*	1,693,762	1383	674	
DHØGHU	*	1,681,553	1184	647	
DK15ØRB	*	1,641,171	1491	651	(OP: DL5YM)
DL1LOD	*	1,003,555	976	541	
DJ6QT	*	731,346	724	462	
DF9LJ	*	730,935	663	439	
DL8SCG	*	681,328	716	439	
DJ5AN	*	532,564	704	422	
DL2NOM	*	494,265	741	415	
DF2TT	*	449,820	572	420	
DL1NEO	*	407,484	557	378	
DL4CF	*	403,380	612	405	
DL1DVE	*	385,308	540	396	
DF2LH	*	294,760	435	339	
DM2DXA	*	168,474	333	258	
DL7JOM	*	125,984	334	254	
DL2OBO	*	78,234	221	177	
DL8NBJ	*	54,168	175	148	
DL8UAT	*	45,453	149	139	
DL9NDV	*	15,308	92	86	
DL1YFF	*	5,952	51	48	
DK6BT	*	1,961	38	37	
DO4DXA	28	1,476	37	36	
DF9ZP	21	561,756	714	507	(OP: DK8ZB)
DJ9AO	*	61,773	210	177	
DK1QH	14	212,317	439	343	
DKØDL	*	75,213	256	183	(OP: DH8VV)
DK4WW	*	66,066	200	182	
DJ4MZ	7	27,756	113	108	
DF2UU	1.8	120,772	296	218	
DL7CX	*	6,552	64	56	
*DK5DQ	A	1,455,438	1073	646	
*DK1KC	*	1,265,528	1058	584	
*DJ1OJ	*	874,258	914	539	
*DK8NT	*	721,644	826	484	
*DJ6OZ	*	658,138	841	442	
*DM3PKK	*	510,336	715	443	
*DKØA	*	505,470	585	415	(OP: DL7JAN)
*DL7URH	*	430,335	606	365	
*DF1HF	*	370,062	504	378	
*DL6NDW	*	304,320	475	317	
*DJ3CQ	*	245,955	448	285	
*DL5GAC	*	240,810	507	349	
*DF8UO	*	224,924	391	277	
*DL2YCA	*	223,641	481	297	
*DL3HWM	*	204,592	415	304	
*DJ3HW	*	199,675	320	245	
*DK3DUA	*	188,932	424	298	
*DK7ZH	*	182,585	433	265	
*DG7RO	*	134,550	302	225	
*DL5AOJ	*	125,490	352	267	
*DL5WS	*	36,144	193	144	
*DL8ZAJ	*	32,791	143	121	
*DM5DX	*	30,750	155	125	
*DL8AWK	*	21,131	132	113	
*DH9SB	*	18,832	123	107	
*DL1SVA	*	15,759	113	103	
*DO9ST	*	2,166	39	38	
*DK4US	*	435	19	15	
*DH8BQA	28	182,970	491	321	
*DJ2MX	21	241,060	399	340	
*DL1WA	*	71,545	247	205	
*DL2SWN	*	665	19	19	
*DL4FN	14	641,334	766	534	
*DK3WW	*	91,938	250	231	
*DL5KW	7	7,336	58	56	

Greece

SV1ENG	A	2,422,024	2020	748	
SZ6P	*	2,146,725	1471	725	(OP: SV1BJW)
SV2BOH	28	85,033	299	211	
*SV2HWR	A	1,368,836	1301	581	

Hungary

HG3A	A	3,298,337	2013	811	(OP: HA3MQ)
HA1TNX	*	1,778,504	1340	637	
HA3OU	*	550,560	597	444	
HA9PP	*	477,202	670	398	
HA8RH	21	619,892	800	524	
HA3DX	14	1,971,422	1520	782	(OP: HA3UU)
HG1A	*	1,633,884	1395	734	(OP: HA1ZN)
HG9X	7	1,140,451	730	481	(OP: HA9PP)
HG2Ø11EU	*	151,360	317	220	
HA3LI	3.5	780,066	789	453	
*HA5AGS	A	314,874	551	378	
*HA6NL	*	271,728	446	296	
*HA8CQ	*	125,552	337	236	
*HA2QW	*	8,296	72	68	
*HGØR	28	220,011	489	339	(OP: HAØNAR)
*HA5DO	*	63,832	243	202	
*HG8C	14	326,731	547	397	(OP: HA8EK)
*HG1X	*	208,603	419	337	(OP: HA1RS)

Ireland

EI2CN	14	2,224,128	1661	768	
EI2JD	*	62,988	190	181	
*EI7KD	A	1,539,756	1182	636	

Isle of Man

MD2C	A	4,471,544	2449	833	(OP: MDØCCE)

Italy

IR2C	A	4,483,340	2063	970	(OP: IK2JUB)
I3VJW	*	1,605,915	1248	635	
IO3X	*	1,008,896	965	563	(OP: IV3JCC)
IR3W	*	653,020	823	515	
IK3XJP	*	626,221	678	437	
IR4B	*	152,357	336	251	(OP: IK4AUY)
IZ8DVD	*	88,847	229	197	
IK2GZU	*	57,148	227	182	
IZ2DII	*	33,291	156	137	
IK5FKF	*	18,685	105	101	
IP7U	21	2,039,916	1587	778	(OP: IK7JWY)
IKØYVV	14	2,965,114	1795	883	
IK8TEO	*	908,970	990	615	
IK8UND	*	600,624	802	516	
IC8FBU	7	271,058	378	313	
IR4C	3.5	203,016	359	264	(OP: I3MU)
IKØHBN	1.8	128,334	286	219	
*IO4T	A	4,623,804	2233	972	(OP: IK4VET)
*I2WIJ	*	2,465,830	1634	755	
*IK2HDF	*	2,380,362	1499	734	
*IN3FHE	*	748,748	812	476	
*IZ1JLN	*	197,862	368	294	
*IZ2GRG	*	148,500	341	270	
*IZ1GIP	*	51,653	199	157	
*IZ3DVU	*	37,083	167	141	
*IZ2OBS	*	36,696	157	139	
*IK3ORD	*	4,212	57	52	
*IK3SCB	*	1,680	38	35	
*IW5ELJ	28	8,910	71	66	
*IV3XZG	21	1,739	37	37	
*IK6MNB	14	851,684	1052	596	
*IK3UNA/1	7	608,005	704	391	
*IZ8GCB	*	201,586	297	242	

Kaliningrad

*RK2FWN	A	3,627	42	39	(OP: UA2DC)

Latvia

YL2KO	A	3,983,056	2575	848	

Lithuania

LY6A	A	4,010,742	2545	867	
LY2J	*	1,886,082	1564	697	
LY5R	*	1,010,442	1031	498	
LY2KM	*	964,371	998	521	
LY2CO	*	88,938	211	183	
LY2FN	14	883,920	948	580	
LY2BKT	7	1,144,360	890	536	
LY5D	*	1,121,400	864	525	(OP: LY3BY)
LY7M	3.5	171,708	316	246	
*LY2K	A	968,550	1144	550	
*LY3CY	*	459,983	733	383	
*LY2BNL	*	26,180	137	119	
*LY5T	*	21,266	115	98	
*LY2TS	*	16,268	91	83	
*LY1G	3.5	329,832	459	324	

Luxembourg

*LX/K9EZ	A	113,850	300	230	

Macedonia

Z35G	A	374,523	589	381	
Z36W	21	1,357,236	1269	708	
Z35X	14	2,005,490	1512	799	

Moldova

ER4A	A	6,156,798	3068	1007	(OP: UT5UDX)
*ER2RM	28	66,732	249	201	
*ER6A	7	1,518,575	1043	575	(OP: ER1LW)

Netherlands

PA5KT	A	1,738,536	1377	677	
PAØLOU	*	341,185	542	377	
PA1CW	*	297,344	615	368	
PAØCYW	*	287,147	537	323	
PA1T	*	1,363	31	29	
PI4DX	21	433,512	691	446	(OP: PA3EVY)
PB2JJ	14	1,112,960	1069	640	
*PG7V	A	514,152	701	444	
*PD7BZ	*	239,904	480	336	
*PA4PS	*	59,856	230	174	
*PAØW	*	51,600	164	150	
*PA3HGF	*	30,888	190	143	
*PC3H	*	2,438	53	46	
*PAØMIR	21	109,185	286	251	

Northern Ireland

*GIØRQK	A	875,480	969	509	

Norway

LN9Z	7	264,770	342	290	(OP: LB1G)
*LA8OM	A	744,940	963	476	
*LA8AW	*	183,000	433	300	
*LA3ZA	*	90,720	263	180	
*LA4RT	*	45,090	215	167	
*LA6CF	*	4,280	45	40	

Poland

SO6I	A	1,049,148	957	579	(OP: SP6JIU)
SP5GH	*	20,577	64	57	
SP5XO	28	31,458	176	147	
SN2K	21	619,102	768	526	(OP: SP2HMT)
SO4M	*	449,647	649	451	(OP: SP4DEU)
SP1NY	*	37,995	170	149	
SQ9IAU	*	589	19	19	
SN8R	14	2,207,906	1645	802	(OP: SP8ONZ)
SP2KAC	*	20,740	130	122	
SP5ELA	3.5	612,535	696	407	
SP8LBK	1.8	33,176	145	116	
*SO8N	A	1,807,272	1397	648	(OP: SP8HZZ)
*SQ3RX	*	956,300	1057	524	
*SO7L	*	380,554	535	358	(OP: SP7UWL)
*SQ5STS	*	157,974	325	233	
*SP6FXY	*	138,436	287	212	
*SP8HXN	*	89,241	253	197	
*SQ8JLN	*	6,435	59	55	
*SQ9JKS	*	4,312	50	49	
*SP6IHE	28	13,728	107	96	
*SP5BMU	*	10,764	100	92	
*SP6DMI	21	41,891	186	163	
*SP1RKT	*	1,161	28	27	
*SP3GTS	7	746,158	650	446	
*SQ9FMU	*	114,036	227	204	
*SO8T	*	45,016	172	136	(OP: SP8TJU)
*SP9JZT	*	16,016	58	56	

Portugal

*CT1HMN	A	366,049	550	389	

Romania

YQ9W	A	5,763,342	2947	962	(OP: YO9WF)
YO9HP	*	3,902,528	2305	868	
YO3APJ	*	2,697,218	1805	794	
YO6A	*	1,673,412	1494	663	(OP: YO6BHN)
YO4DW	*	954,810	1032	515	
YO6PVK	*	746,194	895	509	
YO9SW	*	474,000	593	400	
YO9FLD	*	83,420	248	194	
YO5PBW	28	52,155	237	183	
YO5OHY	14	280,280	456	385	
YR9F	7	1,625,057	1017	581	(OP: YO9FNP)
YO8BOD	*	384,307	460	341	
YO4CSL	*	30	3	3	
YR5N	1.8	122,169	282	211	(OP: YO5PBF)
*YQ8Q	A	2,823,951	2112	741	(OP: YO8TTT)
*YO2GL	*	531,360	672	405	
*YO5CRQ	*	369,887	594	371	
*YO2LAN	*	14,852	88	79	
*YO8WW	28	60,384	283	204	
*YP5A	14	1,190,151	1233	669	(OP: YO5CBX)
*YO5AVN	*	473,620	675	476	
*YQ5Q	7	1,576,194	1077	593	(OP: YO5OHO)
*YO9OC	3.5	48,060	149	135	
*YO2AQB	1.8	33,120	143	115	

Scotland

GMØFGI	A	291,828	524	332	
*GM4UYZ	A	864	32	32	

Serbia

YT2AA	A	103,806	261	219	
YU7AF	*	29,280	145	120	
YU1AOT	*	208	13	13	
YT2T	28	461,580	822	471	
YT1T	*	244,545	566	357	
YU6DX	21	1,257,711	1244	663	
YT9A	14	3,846,269	2168	973	
YU1UN	*	845,856	1016	534	

YU1KT	"	411,944	619	442
YT6T	3.5	407,160	538	348
			(OP: YU7CM)	
*YU8NU	28	23,625	157	135
*YT8T	21	766,800	835	568
*YU1R	14	2,078,271	1481	837
			(OP: YT1NP)	
*YU2A	"	1,334,080	1232	704
*YT2AAA	"	1,145,484	1074	677
*YU2EZ	"	149,072	369	308
*YT8A	7	2,687,130	1366	730
			(OP: YU1EA)	
*YT2B	"	932,790	713	465
*YU2FG	"	152,691	262	231

Sicily

*IT9ORA	21	349,200	598	388
*IT9IZY	14	87,185	249	235

Slovakia

OM7PY	A	646,795	778	467
OM7AX	"	441,694	668	374
OM3AG	28	91,802	297	233
*OM5X	A	2,811,600	1816	792
			(OP: OM5XX)	
*OM6AL	"	685,948	841	446
*OM8DD	21	161,700	351	300
*OM3NI	14	204,400	436	350
*OM7YC	"	87,912	238	222

Slovenia

S59ABC	A	5,738,684	2493	931
			(OP: S51DS)	
S5ØR	"	3,950,840	1980	860
S51DX	"	339,825	628	345
S56M	21	1,589,805	1313	721
S53F	14	2,968,038	1824	911
S52AW	7	3,684,478	1552	791
S58Q	"	391,742	493	338
*S56A	A	1,318,040	960	664
*S52W	"	860,814	980	513
*S59EIJ	"	828	24	23

Spain

EF1A	A	1,499,958	1123	591
			(OP: EA1XT)	
EA1WX	"	261,750	489	349
EC1KR	"	64,965	208	183
EA2AZ	A	35,721	196	147
*EA2BNU	A	730,286	846	457
*EB2RA	"	8,806	79	74
EA3CEC	28	1,000	26	25
EE3J	21	149,424	384	283
*EA3GLB	A	63,578	215	166
*EA3VN	"	37,609	170	143
*EA3GYK	"	10,153	97	71
			(OP: DK7TM)	
*EA3NO	21	23,276	97	92
EF5Y	A	6,421,738	2938	1019
			(OP: EA5GTQ)	
ED5W	28	524,984	942	479
			(OP: EA5DWS)	
EA1DX/5	14	1,034,968	961	619
			(OP: EA5FID)	
EA5KA	7	873,126	649	414
*EA5DKU	A	288,535	456	299
*EA7MT	A	223,559	423	293
*ED7D	28	56,672	215	176
			(OP: EA7KJ)	

Sweden

SM6CNN	A	3,651,900	1981	925
SE6E	"	1,217,931	1224	561
			(OP: SM6FUD)	
SD4ØJZ	"	735,609	1006	483
			(OP: SM5DJZ)	
SA1A	"	716,412	981	454
			(OP: SM1TDE)	
8SØW	"	159,456	342	264
			(OP: SMØNJO)	
SM5CEU	21	128,790	317	270
*SMØQ	A	393,414	725	406
			(OP: SMØOGQ)	
*SM2BJS	"	320,208	633	336
*SB3W	"	99,684	353	234
			(OP: SM3RAB)	
*SM6WET	"	14,400	95	90
*SA5ACN	"	868	29	28
*SM6NJK	3.5	72,928	206	172

Switzerland

HB9CIC	7	299,325	459	307
*HB9DAX	A	263,712	455	328

Ukraine

EM2G	A	5,202,596	3021	994
			(OP: UR7GO)	
UT2UU	"	2,229,822	1782	694
UW3U	"	2,115,873	1567	699
			(OP: UT7UJ)	
UXØFF	"	1,590,795	1315	667
UTØRM	"	893,784	1187	501
US6EX	"	631,842	791	474
US7MM	"	439,301	561	383
UT7EZ	"	226,250	374	250
UT7NI	"	159,619	374	271
UR8RF	"	36,089	193	151
UU1CW	"	27,652	150	124
USØZK	"	5,415	63	57
UX3IO	"	969	20	19
EO4M	28	665,640	957	516
			(OP: UR5MW)	
UR2VA	"	103,416	297	248
UZ5Q	"	87,630	279	230
			(OP: UY5QZ)	
UZ5I	21	1,050,378	1105	623
			(OP: UY6IM)	
UR5IFX	"	732,915	942	549
UR5MBA	"	69,350	222	190
EO3Q	14	3,153,904	1990	944
			(OP: UR3QCW)	
UZØU	"	1,185,692	1174	643
			(OP: UY5ZZ)	
UR4L	"	3,264	50	48
UX1VT	3.5	376,290	524	333
US2IR	"	117,249	268	209
*UY7C	A	1,120,951	1192	529
*UT8IM	"	769,338	924	486
*UT5UQN	"	453,586	610	362
*UW7RV	"	312,120	554	340
*UZ5ZV	"	242,046	485	306
*UY5ZI	"	213,928	408	286
*US4L	"	16,328	127	104
			(OP: US4LGW)	
*UT2IV	28	84,710	278	215
*UT4WA	"	33,540	173	156
*UR5LO	"	6,144	62	48
*UR5IKN	21	103,737	266	229
*US2IVR	"	2,520	46	40
*UT3IZ	14	1,451,619	1230	741
*UX7QD	"	369,180	648	420
*UX4U	7	2,220,330	1191	679
			(OP: US7UX)	
*US2YW	"	20,460	106	93
*UR3LPM	3.5	414,422	529	353
*UT3L	"	381,036	505	339
*UR5IHQ	"	182,280	335	245
*UR9QQ	"	144,841	294	241

OCEANIA

Australia

VK2CA	A	77,322	173	147
*VK2BNG	A	37,824	118	96
*VK4FJ	21	39,900	128	114
*VK6DXI	3.5	60	4	4

French Polynesia

FO8RZ	A	537,572	576	263

Guam

KG6DX	21	1,318,270	947	482

New Zealand

ZM3T	14	778,545	684	395
			(OP: W3SE)	
*ZL3IO	7	37,772	92	76
*ZL2GQ	3.5	682	11	11

Philippines

DU1/JJ5GMJ	A	337,400	419	241
*DU1BP	A	1,004,049	783	369

SOUTH AMERICA

Argentina

AY5D	A	1,413,516	964	507
			(OP: LW6DW)	
LU6UO	"	692,550	617	405
LU6QI	"	65	5	5
*LW5HBR	28	64,186	175	134

Brazil

PY3DX	A	176,736	281	224
PY1NX	21	5,225,754	1947	921
PY2FFW	"	16,872	80	74
PY1NB	7	3,381,597	943	619
PX2V	"	40,255	89	83
			(OP: PY2KJ)	
*PP5BZ	A	4,212,870	1711	778
*PT7CG	"	74,613	150	133
*PY2WB	28	98,310	207	174
*PY2XC	"	31,110	126	102
*PY4XX	21	442,464	450	352
*PY7AHA	"	9,558	64	59
*PY2SEX	7	3,103,786	866	623

Chile

*CA3A	28	26,320	106	94
			(OP: XQ4CW)	
*3G3A	21	527,060	509	365
			(OP: XQ4CW)	
*CE3AA	14	1,627,552	999	562
			(OP: XQ4CW)	
*CD3A	7	1,720	20	20
			(OP: XQ4CW)	

Colombia

HK1NA	28	720,875	712	365
			(OP: HK3TU)	
HK1N	7	3,812,421	1089	619
HK3D	3.5	330,472	296	202

Uruguay

CW7T	A	95,804	210	172
*CX5TR	A	229,416	341	237

Venezuela

YW4V	14	108,600	203	181
			(OP: YV4DYJ)	
*YV8AD	A	380,321	389	277

QRP

UU2CW	A	1,135,956	1165	543
OK3C	"	1,091,496	1182	534
			(OP: OK2ZC)	
TM3T	"	1,089,680	1228	530
			(OP: F5VBT)	
S52P	"	1,055,215	1047	511
N2WN/4	"	902,940	834	447
RT4W	"	901,530	1039	530
US2IZ	"	876,032	1012	464
OL4W	"	812,820	934	460
			(OP: OK1IF)	
RA3AN	"	786,315	1049	465
VA3SB	"	661,986	612	351
YU1LM	"	589,950	822	437
N7IR	"	582,750	722	375
YL2PJ	"	495,510	782	415
DF5RF	"	445,008	671	381
LZ7H	"	437,552	624	368
UT5UUV	"	429,520	657	364
W6QU	"	361,820	591	316
			(OP: W8QZA)	
UN8PT	"	355,454	496	302
RW3AI	"	341,341	609	341
K4QPL	"	323,528	468	296
NQ4RP	"	319,200	517	285
			(OP: W4OO)	
VE3RSA	"	315,296	389	236
AA1CA	"	312,645	509	285
G3YMC	"	289,838	588	313
SP6LV	"	287,574	540	334
DR2Q	"	275,865	556	347
			(OP: DL8MBS)	
HA5BA	"	266,600	463	310
KT8K	"	246,326	477	274
VE3GTC	"	236,094	376	218
RC4F	"	235,770	479	290
			(OP: RK4FB)	
8J4VLP	"	223,839	517	231
			(OP: JA4MRL)	
UT5DJ	"	214,268	422	274
YO4AAC	"	203,991	457	291
EI8FH	"	194,532	399	258
UX8ZA	"	190,554	436	273
UA4LW	"	180,024	434	312
NN7SS	"	179,070	450	254
NG1R	"	175,306	276	206
			(OP: W1QK)	
N6BB	"	160,071	313	229
CT7/LZ3ND	"	153,928	343	271
OZ/DK3WE	"	145,824	362	248
			(OP: DK3WE)	
WA1LWS/3	"	143,226	371	219
RU4AA	"	140,418	331	261
OZ4CG	"	137,326	341	238
ND3D	"	132,506	353	209
K7HBN	"	130,480	319	233
W4UT	"	125,460	279	204
PY4ZO	"	120,650	237	190
RU3FB	"	116,150	320	230
OM3TLE	"	110,556	290	222
KS4X	"	109,200	262	200
BD4GNV	"	104,532	284	186
JK1TCV	"	96,192	221	192
PE2K	"	94,588	323	214
WC3O	"	80,640	242	168
DH5MM	"	79,278	272	219
RV3DBK	"	71,912	307	202
VE3LC	"	71,155	197	133
VA3RKM	"	69,513	191	141
OK2BLD	"	68,629	230	187
WQ8RP	"	62,720	247	160
NA6E/7	"	60,344	238	152
			(OP: WT6P)	
OK4JR	"	58,712	225	179
DJØMY	"	53,784	188	162
BD4WM	"	53,332	176	134
DL6ABB	"	50,868	201	162
W3PO	"	50,592	170	124
NA4BW	"	50,553	197	137
BD7APL	"	45,720	149	127
DHØJAE	"	43,168	185	152
KB4QQJ	"	41,396	159	131
RD9DX	"	38,150	122	109
PA3ANN	"	35,955	170	141
RAØAY	"	34,656	164	114
VE3SMA	"	32,689	110	97
SO2D	"	31,920	116	105
VE5AE	"	31,208	128	94
JA1KEB	"	30,832	132	94
N5XE	"	30,702	155	119
JA9MAT	"	29,890	152	98
DL3HQN	"	27,265	162	133
RU9UN	"	26,904	131	114
AI9K	"	26,076	145	106
RU3SF	"	24,990	135	102
KK1W	"	23,937	114	101
PA1B	"	22,448	145	122
KB7QOS	"	21,546	133	114
RD8O	"	20,412	97	84
K5ND	"	18,144	148	96
K3WWP	"	17,892	102	84
RK6AQM	"	17,500	110	100
WA5RML	"	16,744	123	91
LZ1WF	"	15,224	104	88
EA3GI	"	15,023	97	83
WA8HSB/4	"	14,240	80	80
IV3DRP	"	14,112	115	98
DL8LR	"	13,616	101	92
DJ6FO	"	13,024	106	88
W3TUA/2	"	12,835	106	85
AK7V/6	"	11,952	106	83
K8ZT	"	11,360	78	71
G7PVZ	"	11,088	98	77
VE2KOT	"	10,664	64	62
PAØRBO	"	10,500	98	84
UAØZS	"	10,432	81	64
R2AD	"	10,296	102	88
JG1MWW	"	10,074	84	69
JG1BGT	"	9,916	97	67
DL7YEC	"	8,532	100	79
UAØSBQ	"	8,496	63	59
EA2NA	"	8,436	89	74
G6CSY	"	7,020	58	52
W2JEK	"	6,708	59	52
JM1KLO	"	6,413	80	53
BG7NFM	"	6,327	64	57
JR6HMJ/1	"	6,160	81	56
JJ5HUD	"	5,929	60	49
DL3BVA	"	5,568	70	64
PC2F	"	5,508	54	51
JA9BGL	"	5,310	48	45
NQ2W	"	5,238	63	54
WB5NMZ/4	"	4,944	52	48
W5WZ	"	3,744	51	48
YO3FVR	"	3,649	42	41
AF9J	"	3,408	62	48
EA1AER	"	3,400	57	50
DJ5QK	"	3,266	50	46
DL6MWG	"	3,224	55	52
ES1WST	"	3,150	50	45
			(OP: WS4T)	
EA3FHP	"	2,714	49	46
JG1GPY	"	2,616	24	24
JE1ILP	"	2,548	28	26
JA1POS	"	2,262	31	29
K2HT/Ø	"	1,802	37	34
KB7ST	"	1,155	38	33
9A/OZ8A	"	777	24	21
YO3GLH	"	756	24	21
PU5UAI	"	704	17	16
SP9RQH	"	651	22	21
EX8BN	"	360	12	12
WX4RM	"	325	13	13
LU7HZ	28	94,248	231	154
IØUZF	"	90,885	283	219
LY2LF	"	22,078	161	133
LZ1MG	"	21,125	140	125
E72W	"	17,176	136	113
DL2TM	"	12,126	110	94
W5GAI	"	10,419	79	69
ZW2T	"	6,432	49	48
			(OP: PY2TI)	
G4DBW	"	5,727	74	69
RN4F	"	4,320	62	60
ERØI	"	2,508	40	38
GM4UBJ	"	1,505	40	35
PY1WW	"	1,012	23	23
9A4AA	"	660	22	20
JA2HBK	"	660	22	22
MØCEF	"	648	25	24
UT2AB	"	360	15	15
BA6QR	"	154	11	11
IZ1GQI	"	144	13	12
JL3OXR/1	"	91	7	7
JA4GNK	"	4	2	2
HG15IPA	21	280,080	533	389
			(OP: HA3JB)	
JE2UFF	"	77,644	231	188
IV3AOL	"	39,182	159	137
JR1NKN	"	36,696	173	139
RZ6HX	"	28,380	138	129
RA9MU	"	22,176	113	96
HC2A	"	21,962	101	79
HG5O	"	21,120	136	128
YO8RIX	"	18,810	121	114
JH3DMQ	"	15,834	106	91
OK1AIJ	"	12,705	111	105
WY6DX	"	12,096	87	84
DJ3GE	"	5,120	67	64
UN7EG	"	2,232	32	31
DL2SHR	"	280	21	20
JK6JAB	"	165	12	11
R9RA	"	16	4	4
HA6NW	14	480,684	657	492
UA6LCJ	"	304,296	538	409
LY5G	"	282,348	548	396
US5VX	"	230,912	415	352
SP4GFG	"	216,315	453	345
LZ1VB	"	209,752	405	334
G3LHJ	"	142,754	328	274
YO4BEW	"	141,900	357	275
HA5HRK	"	136,360	330	280
YU7RL	"	105,726	308	263
RA3XEV	"	82,432	268	224
UU7JF	"	74,241	259	219
E7ØLT	"	73,840	226	208
JR3RWB	"	67,894	204	166
DL1DXA	"	64,076	207	193
F5MPN	"	63,840	253	210
SP6BXM	"	41,772	199	177
NZ5A	"	26,962	158	122
9A8MM	"	26,132	150	139
WB2LQF	"	21,522	116	102
KM9R/5	"	19,186	136	106
YO6AEI	"	15,428	118	116
EA7OR	"	12,512	97	92
UA3LMR/3	"	10,502	93	89
W7JI/Ø	"	10,492	99	86
IZ2OKG	"	9,434	98	89
WA2ASQ/4	"	9,394	85	77
KIØG	"	8,023	81	71
W8EH	"	3,360	48	48
W9CC	"	3,220	48	46
OH2KI	"	3,108	42	42
WA7LNW	"	1,568	39	32
VA3RJ	"	1,173	24	23
UA7G	"	925	25	25
YU1IZ	"	812	32	29
AI4SV	"	713	25	23
IZ8JFL	"	638	23	22
YU1WC	7	749,480	647	457
9A3JH	"	711,784	590	461
SP9NSV/7	"	344,760	448	340
OK1WF	"	271,890	348	285
RT5R	"	202,608	321	268
K4CNW	"	150,265	256	205
F5UL	"	128,326	238	209
VK2CCC	"	121,429	169	133
N2JNZ	"	54,252	157	132
OK/LZ3SF	"	53,352	175	152
NE6M	"	51,724	163	134
E73TTT	"	50,160	148	132
DQ5Q	"	36,084	161	124
			(OP: DJ2RG)	
NS2X/4	"	32,946	132	114
IW3ILM	"	15,744	93	82
US5EFU	"	6,325	60	55
N3ZP	"	1,971	30	27
IZ3NVR	"	966	21	21
JK3AHS	"	513	23	19
KU7Y	"	352	16	16
DV1UBY	"	96	4	4
E74TV	"	72	6	6
DL8WJM	"	32	4	4
VE3HG	"	27	3	3
HG6C	3.5	236,292	396	291
			(OP: HA6IAM)	
SP4GL	"	192,046	346	262
OK1FKD	"	119,412	287	214
S55Z	"	90,585	243	183
SP6EIY	"	67,319	208	163
JH1OGC	"	26,307	101	79
K3TW/4	"	22,950	115	90
UR5FCM	"	10,695	74	69
K7DD	"	7,296	77	64
I/W9CF	"	6,480	62	54
N5NA	"	1,428	37	34
S53AR	1.8	35,624	152	122
LY4BF	"	26,378	127	109
HA5KHC	"	5,665	65	55

ROOKIE

United States

*K2CYE	A	265,203	359	237
*AB1DD	"	120,582	268	198
*K6VAR	"	61,353	238	153
*AB4G	"	31,030	134	107
*WA1N	"	5,936	58	53
*AG6V	14	48,216	207	164
*NX9G	7	19,926	93	82

DX

MØTRN	A	36,698	155	118
PU5UAI	"	704	17	16
JR6AWQ	14	5,175	45	45
*OH8R	A	1,604,665	1359	659
			(OP: OH8FKU)	
*UD3D	"	1,535,180	1499	590
			(OP: UB3DAY)	
*SV2HWR	"	1,368,836	1301	581
*UW1WU	"	1,116,960	1163	520
*DO3QQ	"	325,268	527	349
*BH4RQU	"	218,346	445	241
*EA4FLY	"	180,576	393	264
*SQ5STS	"	157,974	325	233
*M6ZSE	"	79,310	297	206
*BH3AGU	"	46,948	170	121
*OM2DT	"	36,315	160	135
*JO3QVT	"	1,568	36	32
*DL1RIO	"	28	4	4
*ER2RM	28	66,732	249	201
*RN6LMK	"	3,015	47	45
*RZ9UMA	21	329,640	485	328
*EY7BJ	"	78,288	197	168
*BH4RRG	"	43,488	198	144
*US2IVR	"	2,520	46	40
*PY7YN	"	325	17	13
*UR5EFL	14	94,132	287	233
*SP7JLH	"	48,100	210	185
*SQ8MZW	"	13,024	92	88
*JG1SWV	"	189	9	9
*YO2MJZ	7	5,412	42	41
*ZL2GQ	3.5	682	11	11

TRIBANDER/SINGLE ELEMENT

United States

WS2T/4	A	2,603,720	1786	680
			(OP: N4PN)	
N1WR/3	"	2,245,446	1378	639
NF4A	"	2,032,640	1527	640
NA4K	"	2,004,695	1533	635
KYØW/6	"	1,795,311	1461	621
			(OP: K6SRZ)	
K1LT/8	"	1,555,975	1172	571
N3UM	"	1,280,933	911	499
W1CU	"	1,216,224	774	492
W6TK	"	1,117,200	1129	490
W6SX	"	1,068,592	1286	464
K3MD	"	1,036,800	941	480
KXØA	"	1,022,626	1166	517
			(OP: K9DU)	
WX6V	"	1,013,328	908	454
KE1B/6	"	920,920	1070	506
NO6F	"	908,550	1054	450
			(OP: K2RD)	
WO5L	"	897,961	959	443
NS9I	"	830,599	854	469
W1UJ	"	784,787	792	419
KØPY	"	729,725	921	425
W7IJ	"	729,144	737	456
AG6AU	"	716,420	959	452
			(OP: W1RH)	
K7HP	"	716,106	896	426
W2LE	"	700,335	622	395
K2SX/4	"	523,770	613	390
K7JQ	"	521,280	800	362
AB3CX/2	"	491,043	528	349
KR4F	"	448,716	492	366
AE1T	"	445,936	530	376
W6AEA/7	"	443,124	753	373
K7RF	"	437,660	577	395
K5MV	"	435,696	714	348
K3TN	"	416,970	512	339
WØTT	"	415,638	636	358
K1DM	"	386,576	416	296
K4HAL	"	353,934	515	318
K4DJ	"	342,168	495	318
WO7A	"	337,212	620	323
			(OP: AA7V)	
KS7T	"	316,680	607	312
WS7L	"	314,140	570	278
WN2O	"	306,912	435	276
			(OP: N2GC)	
NI7R	"	292,632	529	274
W2YE/4	"	281,936	402	263
KE2VB/7	"	266,733	610	267
KI7Y	"	263,840	553	272
NE6I	"	262,752	571	272
AK6M	"	251,980	527	293
			(OP: K6MM)	
KT8K	"	246,326	477	274
AB2DE	"	202,340	317	268
KG4W	"	192,449	277	223
N3RC/7	"	180,544	415	248
AE4CW	"	159,432	288	219
W7PP	"	153,201	382	229
NA2U/7	"	144,265	391	215
WA1LWS/3	"	143,226	371	219
N3XL	"	143,208	293	221
ND3D	"	132,506	353	209
W7VXS	"	127,880	394	230
N4NM	"	112,140	259	180
KS4X	"	109,200	262	200
NO6T	"	99,198	370	198
			(OP: N6NC)	
NØXR	"	98,460	282	180
K2ZC	"	90,347	208	167
NW7E	"	85,702	155	146
NK6A	"	84,036	264	188
AD4L	"	83,496	230	168
NF9V	"	83,160	207	168
K2YR	"	81,567	210	171
WC3O	"	80,640	242	168
W4XO	"	78,368	214	158
KE7YF	"	76,479	256	159
K4EU	"	72,660	173	173
KF7IQ	"	71,100	222	158
KW3A	"	64,584	208	156
WQ8RP	"	62,720	247	160
W8PN	"	58,016	199	148
NF8J	"	57,660	204	155
K9EN	"	57,024	174	162
W3PO	"	50,592	170	124
WB4PWZ/3	"	45,990	146	126
NØOJ	"	44,020	245	142
N6KW/7	"	40,138	167	122
NS4X	"	32,832	142	114
N4GI	"	28,420	162	116
KB6A	"	24,108	131	98
N4DXI	"	21,534	113	97
W2UDT	"	10,500	78	70
NQ2W	"	5,238	63	54
WB5NMZ/4	"	4,944	52	48
W7ON	"	3,999	47	43
N6AJR	"	1,274	28	26
KB7ST	"	1,155	38	33
KZ5J	28	34,928	184	118
WN1GIV/4	21	1,133,900	1213	580
			(OP: N4BP)	
NE8P	"	335,738	551	349
KZ7X	"	334,650	581	345
			(OP: K6LL)	
N6ML	"	315,423	502	347
W6SZN	"	25,585	134	119
WY6DX	"	12,096	87	84
W4CU	14	637,920	716	480
W7WW	"	32,512	144	128
NZ5A	"	26,962	158	122
KK9V	"	10,275	82	75
W8EH	"	3,360	48	48
KB4FB	"	527	17	17
KU8E/4	7	990,776	800	457
KF6T	"	863,247	830	407
K4CNW	"	150,265	256	205
N2JNZ	"	54,252	157	132
NS2X/4	"	32,946	132	114
W6RKC	"	6,407	45	43

KU7Y	*	352	16	16
K7DD	3.5	7,296	77	64
KX9DX	*	6,527	82	61
*K3EL/2	A	1,569,482	1122	554
*K9OM	*	1,204,476	1046	546
*KV8Q	*	902,192	937	452
*N8SXX	*	870,812	972	468
*WD4AHZ	*	720,632	915	431
*WN6K	*	583,509	886	353
*K8BL	*	551,502	609	378
*KB3LIX	*	504,113	604	331
*AE5X	*	392,955	706	345
*W1CCE	*	391,716	569	324
*NE5LL	*	388,278	711	333
			(OP: N1CC)	
*WA3KYY	*	387,803	566	299
*AA8IA	*	380,163	621	301
*KA2D	*	364,504	424	283
*NEØS	*	318,092	536	281
*K4OSO	*	271,890	411	265
*WI5ID	*	251,870	476	283
*WD5K	*	247,456	449	304
*K6AAB	*	227,962	445	266
*KØVBU	*	215,988	520	246
*W1MSW	*	213,720	368	274
*AE4O	*	211,404	377	237
*NW2K	*	200,340	434	265
*NX1P/7	*	196,988	512	242
*WU9B/7	*	188,811	385	243
*WB8TLI	*	178,789	302	221
*K4PG	*	165,418	322	206
*N4ARO	*	159,537	292	213
*W7RV	*	145,125	329	225
*KØGEO/5	*	140,698	400	206
*N6MI	*	134,670	329	201
*K4NC	*	127,032	335	201
*N5UI	*	124,173	341	189
*KG6N	*	118,560	343	195
*AE6RG/7	*	116,025	363	195
*K9MY	*	106,196	251	191
*N7DR/Ø	*	92,340	215	135
*WO7V	*	91,980	294	180
*WC4E	*	80,600	209	155
*N2SO	*	66,742	200	151
*K3NK	*	63,591	169	123
*W3IUU	*	63,344	192	148
*AA6EE	*	55,264	238	157
*NU6N	*	51,976	248	146
*N9LJX	*	51,471	198	133
*W4BCU	*	48,024	160	138
*KM4JA	*	47,816	184	139
*AD1C/Ø	*	41,072	160	136
*K6CSL	*	36,208	183	124
*N3NZ	*	34,968	152	124
*W1TO	*	31,290	118	105
*W4CWA	*	30,720	128	120
*K6WSC/7	*	30,622	166	122
*N2FF	*	28,028	102	91
*K2DSL	*	20,500	115	100
*AA5TB	*	17,892	92	84
*W7TR/6	*	16,016	109	88
			(OP: KH2TJ)	
*AA1AR	*	15,834	79	78
*W4BCG	*	10,585	92	73
*K7SDW/6	*	10,375	111	83
*WA4MIY	*	6,216	59	56
*K7EIQ	*	5,712	74	68
*KU6W	*	5,005	60	55
			(OP: M6GQ)	
*AA4H	*	4,512	49	48
*KB3MXM	*	3,388	48	44
*W4EBA	*	3,318	43	42
*N4FY	*	476	14	14
*KN8D	21	2,628	39	36
*W8IQ	14	279,725	463	335
*K7ZD	*	272,082	469	331
*NW4V	*	200,160	351	288
*K1TN/9	*	192,376	400	278
*N8HP	*	60,690	195	170
*WA3AAN	*	16,490	104	97
*N2JJ	*	11,154	78	78
*N6DO	*	800	25	25
*W9ELN/Ø	*	4	2	2
*AB1J	7	267,264	371	261
*W1WBB	*	222,981	278	233
*N2JDQ	*	154,093	377	223
*ACØDS	*	123,993	326	207
*KØPK	*	57,771	175	147
*N9HDE/Ø	*	24,420	136	110
*WA7NWL	*	14,399	85	77
*KEØL	*	2,479	43	37
*W8AEF/7	3.5	89,250	273	175

DX

NORTH AMERICA

FM5CD	A	7,151,445	2668	933
VA2WA	*	3,505,304	1617	653
			(OP: VA2WDQ)	
N2WQ/VE3	*	2,496,640	1285	640
YS1GR	*	289,548	396	252
VE2FK	*	230,120	315	220
VE2FXL	*	39,960	129	108
KP4JRS	28	12	2	2
XE1EE	21	7,535	58	55
VA6XDX	7	48,708	127	99
			(OP: VE6LB)	
*VE2XAA	A	3,001,790	1432	638
*VE3GFN	*	388,260	476	270
*VE1ZA	*	237,896	339	227
*VE2SG	*	150,846	260	186
*VE6SQ	*	123,018	295	174
*V31JP	*	112,378	248	161
*VE3NR	*	108,644	195	157
*VY2LI	*	56,115	149	129
*VE3DZ	*	43,320	127	95
*VE7BGP	*	8,374	72	53
*XE1FZE	*	4,760	44	40
*OX3JZ	*	3,080	42	40
*NP2/OL5Y	21	1,889,778	1309	627
			(OP: OK1FUA)	
*VE7MID	14	132,544	282	218
*VY1EI	*	17,172	111	81
*VE3AUO	*	3,870	45	43
*VE3IAE	7	305,486	311	229
*HH2/PY1ZV	3.5	23,628	109	66

AFRICA

ED8A	A	6,754,856	2291	796
			(OP: EA8AY)	
ZS1EL	21	451,350	436	354
*3V8SS	A	4,861,320	2106	680
			(OP: KF5EYY)	
*V55X	*	112,833	202	189

ASIA

R9DA	A	3,284,570	1570	695
A65CA	*	2,957,248	1527	656
HZ1FI	*	1,927,275	1099	525
			(OP: DL2RMC)	
UP5P	*	1,578,320	1010	545
			(OP: UN7PL)	
UA9FGJ	*	1,509,228	862	477
UA9AGX	*	770,572	605	422
RL9I	*	685,222	684	397
UA9BS	*	607,807	631	397
JE1LFX	*	412,698	581	286
BV1EK	*	336,384	483	292
JA1HP	*	207,200	421	259
JG1EIQ/3	*	200,925	332	225
JN3SAC	*	140,160	265	192
UA9UPG	*	139,126	254	186
JA1MJN	*	121,790	308	190
JE6CAJ	*	117,876	336	209
JO1SIM	*	53,250	242	142
JH1OVY	*	39,330	128	115
JR2PMT	*	37,506	130	114
JH4UTP	*	23,690	136	103
JA1AGG	*	12,036	68	68
JF9JTS	*	7,480	65	55
JA9LJS	*	4,216	36	34
JL1LNC	*	651	23	21
UN5J	28	2,394	47	38
UN4PG	21	784,836	829	468
JA9CWJ	*	236,451	381	293
ZC4LI	14	4,479,840	2004	816
RA9UN	*	343,995	428	323
JA3DAY	*	31,270	115	106
JHØNOS	7	62,361	126	117
JJ5GSY	*	2,600	25	25
*RT9S	A	3,385,266	1497	642
*EX2X	*	1,479,094	1181	541
*JI1RXQ	*	1,400,580	947	502
*JA2CUS	*	856,480	772	424
*JA6DIJ	*	668,886	665	393
*JE4MHL	*	527,505	706	345
*JF2OZH	*	480,080	639	340
*RU9AZ	*	408,758	437	301
*JHØNEC	*	360,789	497	319
*JE8KGH/7	*	351,860	529	292
*JF3NKA	*	349,059	581	307
*JA1IST	*	195,502	345	239
*JF1KWG	*	177,408	364	224
*JH1SWD	*	170,563	367	191
*8N3A/3	*	161,325	355	225
			(OP: JF3PLF)	
*JA6CYL/6	*	151,580	354	220
*JE1SGH	*	140,070	325	210
*JH1SVO	*	121,924	247	187
*RX9DJ	*	112,918	237	202
*JN1MSO	*	112,476	297	182
*HL5YI	*	90,376	257	158
*JA2QVP	*	80,028	250	171
*JF3SAD	*	75,405	219	165
*JH6OPP	*	72,209	224	163
*JG3SVP	*	68,200	242	155
*HS5AC	*	67,548	187	156
			(OP: HS1NIV)	
*JG3WDN	*	54,534	206	122
*BD3OM	*	51,272	196	136
*JA3VUI	*	35,088	137	102
*HZ1PS	*	33,708	111	106
*JE7HYK	*	25,235	133	103
*JI4JGD	*	24,932	154	92
*JP1HUJ	*	24,661	126	91
*JF1TTN	*	23,788	92	76
*JA2VZL	*	21,746	105	83
*JJ1WWL/1	*	21,315	119	87
*JJ1LRD	*	17,708	105	76
*JH1HMC	*	16,320	84	64
*JI1LAT	*	15,352	80	76
*UAØLCZ	*	13,281	72	57
*JH1DYV	*	12,529	70	67
*JA3HBF	*	12,408	75	66
*JR4PMX/1	*	10,660	75	65
*JH8DBI	*	4,968	46	46
*7N4CPT	*	4,368	49	39
*JI1UDD	*	3,360	38	35
*JL3MCM	28	10,164	93	77
*XV4Y	*	651	24	21
*JG3RPL	*	400	17	16
*UN3Z	*	384	16	16
*UN8GV	21	907,092	770	454
*JA2KVB	*	212,430	390	291
*7K1EQG	*	28,652	145	116
*UA9SAW	*	16,146	91	78
*JI1BDQ	*	8,905	66	65
*HS8JYX	*	3,648	60	48
*JJ1PTI	*	84	7	7
*UP2F	*	15	3	3
*JR4GPA	14	406,245	493	365
*UN4PD	*	351,525	412	327
*JH7CUQ	*	112,812	238	204
*YM3KB	*	87,101	193	161
			(OP: TA3DJ)	
*7K4VPV	*	19,176	105	94
*JJ6TWQ	*	7,865	56	55
*JA4AQR	*	1,988	29	28
*JM1NKT	7	137,256	252	168
*BG2AUE	*	108,965	255	155
*JA2PFO	*	18,500	107	74
*JG3BXS	*	4,646	56	46
*E2ØYLM	3.5	27	3	3

EUROPE

T7ØA	A	6,227,775	3120	933
			(OP: 9A3A)	
DM1A	*	4,973,469	2543	863
			(OP: DL1IAO)	
S5ØC	*	4,585,332	2508	834
			(OP: S53CC)	
MD2C	*	4,471,544	2449	833
			(OP: MDØCCE)	
9A1AA	*	4,348,464	2291	876
9AØ4JB	*	4,034,099	2305	881
			(OP: 9A3XV)	
RT4RO	*	3,374,406	2233	791
HG3A	*	3,298,337	2013	811
			(OP: HA3MQ)	
EU1AZ	*	3,022,338	2020	759
EW2A	*	2,815,890	2024	759
RM6F	*	2,754,399	2077	789
YO3APJ	*	2,697,218	1805	794
EV1R	*	2,528,331	1924	723
J48HW	*	2,279,112	1799	712
			(OP: HAØHW)	
UC7A	*	2,247,102	1693	702
UT2UU	*	2,229,822	1782	694
OG4T	*	2,212,185	1602	695
			(OP: OH4MFA)	
SZ6P	*	2,146,725	1471	725
			(OP: SV1BJW)	
LY2MM	*	2,137,278	1764	689
GØMTN	*	1,988,580	1776	660
5P5L	*	1,976,940	1738	630
			(OP: DD2ML)	
HA1TNX	*	1,778,504	1340	637
YL9T	*	1,778,134	1716	641
			(OP: YL2TW)	
OY1CT	*	1,733,990	1945	634
HA1BC	*	1,661,250	1207	625
			(OP: DL1MAJ)	
RU5A	*	1,602,900	1626	650
EF1A	*	1,499,958	1123	591
			(OP: EA1XT)	
DJ1MM	*	1,343,160	1138	546
IO3X	*	1,008,896	965	563
			(OP: IV3JCC)	
DL1LOD	*	1,003,555	976	541
LY2KM	*	964,371	998	521
9A4WY	*	925,089	984	561
SD4ØJZ	*	735,609	1006	483
			(OP: SM5DJZ)	
DJ6QT	*	731,346	724	462
SA1A	*	716,412	981	454
			(OP: SM1TDE)	
MM3N	*	702,572	925	458
			(OP: GM4SID)	
ES4RX	*	687,582	904	459
OZ8SW	*	678,776	774	476
SM5QU	*	626,535	771	459
EA5ARC	*	625,606	708	421
DF2TT	*	449,820	572	420
LZ7H	*	437,552	624	368
SMØBSO	*	416,245	659	415
SN7F	*	410,254	618	403
			(OP: SP7LFT)	
DL1NEO	*	407,484	557	378
HA3OD	*	390,764	495	332
HA8TP	*	370,928	667	388
RK3BA	*	325,584	505	336
DF6RI	*	306,768	489	332
GMØFGI	*	291,828	524	332
R2DW	*	255,780	373	348
OH2VZ	*	225,582	402	287
G6T	*	172,040	324	253
			(OP: G4MKP)	
IR4B	*	152,357	336	251
			(OP: IK4AUY)	
OZ/DK3WE	*	145,824	362	248
OH1B	*	130,255	328	239
			(OP: OH1BOI)	
UR4EI	*	108,756	323	228
DL8EAQ	*	104,112	318	241
YT2AA	*	103,806	261	219
EI4DW	*	102,520	289	220
IZ8DVD	*	88,847	229	197
YO9FLD	*	83,420	248	194
DH5MM	*	79,278	272	219
G4HZV	*	65,234	209	193
DL8UAT	*	45,453	149	139
OH3FM	*	41,601	205	147
MM2R	*	33,264	184	154
			(OP: GM3YOR)	
OK1DUT	*	31,488	143	128
F5VML	*	23,280	143	120
PA1B	*	22,448	145	122
RZ3EC	*	20,570	124	110
UA6XDX	*	16,992	104	96
DL9NDV	*	15,308	92	86
US1IV	*	9,648	78	72
DU1XX	*	3,712	38	29
YO3FVR	*	3,649	42	41
UR2VA	28	103,416	297	248
SV2BOH	*	85,033	299	211
9A4W	*	83,763	307	227
LY2LF	*	22,078	161	133
GM4UBJ	*	1,505	40	35
MØCEF	*	648	25	24
UT2AB	*	360	15	15
ES4RD	21	175,134	440	303
OH7FKV	*	87,324	315	228
UR5MBA	*	69,350	222	190
DJ9AO	*	61,773	210	177
SP1NY	*	37,995	170	149
IKØYVV	14	2,965,114	1795	883
EA1DX/5	*	1,034,968	961	619
			(OP: EA5FID)	
ON1CB	*	981,734	1027	619
M3I	*	715,360	913	526
			(OP: GØORH)	
G3LHJ	*	142,754	328	274
M4U	*	34,200	179	150
			(OP: GØDVJ)	
IZ5DIY	7	467,250	521	350
G1N	*	452,140	463	370
			(OP: G3MZV)	
HB9CIC	*	299,325	459	307
US5EFU	*	6,325	60	55
IZ3NVR	*	966	21	21
HA3LI	3.5	780,066	789	453
E71A	*	664,759	646	421
G3XTT	*	488,300	576	380
YT6T	*	407,160	538	348
			(OP: YU7CM)	
I/W9CF	*	6,480	62	54
SP9ATE	1.8	161,952	333	241
*OM5X	A	2,811,600	1816	792
			(OP: OM5XX)	
*OK2ZI	*	2,658,306	1841	758
*I2WIJ	*	2,465,830	1634	755
*9A6B	*	2,410,107	1456	731
			(OP: 9A2EU)	
*EW1IP	*	2,020,337	1726	649
*LG5LG	*	1,672,150	1675	631
			(OP: W1NN)	
*ZA/S59AA	*	1,616,340	1327	620
*OK1TA	*	1,537,596	1160	621
*SN7O	*	1,513,482	1378	618
			(OP: SP7IVO)	
*S57U	*	1,428,408	1419	612
*EU6AF	*	1,370,000	1455	548
*S56A	*	1,318,040	960	664
*SC3N	*	1,292,193	1332	567
			(OP: EA8CN)	
*DK1KC	*	1,265,528	1058	584
*YL3DX	*	1,258,272	1391	544
*DJ8EW	*	1,252,214	1101	589
*YT9M	*	1,193,751	1073	537
*OV3X	*	1,107,696	1007	564
			(OP: OZ8AE)	
*UA1CUR	*	998,283	1090	507
*SM6FKF	*	991,648	1117	532
*UT7I	*	975,136	1097	496
			(OP: UT2IO)	
*OK2BXE	*	974,400	940	525
*RM7M	*	972,910	1140	485
*LY2K	*	968,550	1144	550
*OK2QX	*	966,350	984	550
*RW6HJV/6	*	957,490	1026	529
*SP5EOT	*	933,424	990	514
*OK2BUT	*	923,418	1023	522
*GIØRQK	*	875,480	969	509
*S52W	*	860,814	980	513
*DJ7AT	*	784,127	961	491
*DL3EBX	*	777,600	888	480
*LA8OM	*	744,940	963	476
*PG2AA	*	726,336	910	468
*DK8NT	*	721,644	826	484
*DJ6OZ	*	658,138	841	442
*RU3XY	*	634,728	818	424
*YO2IS	*	613,283	834	439
*SF3A	*	608,798	850	433
			(OP: SM3CER)	
*S51J	*	602,536	697	451
*IØZUT	*	588,306	683	426
*SA6G	*	571,470	708	443
*RA3G	*	555,984	803	432
*DL4FDM	*	538,904	703	424
*PG7V	*	514,152	701	444
*DM3PKK	*	510,336	715	443
*ON4CT	*	509,085	691	405
*DKØA	*	505,470	585	415
			(OP: DL7JAN)	
*OO9O	*	479,740	618	415
			(OP: ON7SS)	
*DL8ZAW	*	468,330	718	402
*SI5Y	*	465,360	743	420
			(OP: SM5BKK)	
*II2E	*	463,872	651	384
			(OP: I2CZO)	
*GI4DOH	*	456,344	698	406
*RW3QTH	*	453,908	683	377
*UA3DCW	*	434,472	682	421
*G4FOC	*	428,120	625	385
			(OP: G3LIK)	
*SFØD	*	410,260	671	365
			(OP: SMØDSF)	
*IK4UNH	*	399,669	562	381
*DL4JYT	*	391,509	571	369
*DL2NBY	*	372,490	645	386
*UA1TGQ	*	369,171	602	363
*LZ4AE	*	337,755	519	345
*SM7CIL	*	330,368	580	356
*RO7M	*	310,590	552	315
*DL6NDW	*	304,320	475	317
*R2LA	*	286,779	543	327
*UY2ZZ	*	278,656	521	311
*PA3DBS	*	271,999	560	343
*DL5GAC	*	240,810	507	349
*HAØGK	*	239,430	483	345
*ON4CAS	*	219,342	384	278
*PA3AIN	*	215,450	472	310
*DL5CL	*	203,310	350	270
*HBØ/DL2JRM	*	198,376	420	274
*DK3DUA	*	188,932	424	298
*UA3DKN	*	160,308	365	244
*RN4CA	*	140,448	317	231
*SP6FXY	*	138,436	287	212
*RZ3GV	*	136,776	316	246
*UU2J	*	136,284	292	246
*DM2FDO	*	135,456	351	249
*DG7RO	*	134,550	302	225
*DL6NWA	*	129,528	343	252
*EU3AA	*	115,884	298	222
*LX/K9EZ	*	113,850	300	230
*RU3VV	*	108,155	333	223
*SP6ARE	*	102,258	342	247
*YL2IU	*	96,248	307	212
*LA3ZA	*	90,720	263	180
*DP4M	*	75,992	271	184
			(OP: DJ4MH)	
*LY2N	*	71,307	221	171
*I3TXQ	*	69,363	222	189
*DL4VQ	*	59,724	190	158
*DL5ZBA	*	56,320	244	176
*PAØW	*	51,600	164	150
*DL4AC	*	49,170	193	165
*LA4RT	*	45,090	215	167
*PA5GU	*	41,850	195	150
*PAØWKI	*	39,760	175	140
*OH7KBF	*	37,597	154	131
*LA7SI	*	36,504	171	156
*DL8ZAJ	*	32,791	143	121
*UT5UKY	*	31,347	142	129
*IP2XX	*	30,645	150	135
*LY2BBF	*	30,545	194	149
*SMØBDS	*	30,375	161	135
*SM7BVO	*	27,136	154	128
*UR9LD	*	27,000	146	120
*IW3HXR	*	26,840	131	122
*PA3AFF	*	24,738	142	114
*LY2DV	*	17,108	115	94
*US4L	*	16,328	127	104
			(OP: US4LGW)	
*DL1SVA	*	15,759	113	103
*9A2GA	*	15,675	107	95
*SE6C	*	14,700	118	105
			(OP: SM6CDN)	
*EB2RA	*	8,806	79	74
*SP1MWN	*	6,790	71	70
*HB9WDY	*	5,640	61	60
*IK2IKW	*	5,096	59	56
*UT5EDU	*	4,950	54	50
*LA6CF	*	4,280	45	40
*IK3ORD	*	4,212	57	52
*DO9ST	*	2,166	39	38
*SN9K	*	777	21	21
			(OP: SP9MDY)	
*R3DAU	*	561	12	11
*G7TAT	*	18	3	3
*SP9MDY	*	12	2	2
*OH8BQA	28	182,970	491	321
*UT8EU	*	133,874	358	271
*S54A	*	109,568	328	256
*DL7BY	*	87,690	305	237
*SP9BNM	*	19,065	141	123
*UR5LO	*	6,144	62	48
*IK5YZV	*	3,268	44	38
*R6CW	*	2,773	48	47
*YU1AU	21	1,361,241	1244	697
*UA3ABJ	*	385,810	593	410
*IT9ORA	*	349,200	598	388
*UT7NW	*	269,709	461	363
*Z35F	*	117,845	326	259
*PAØMIR	*	109,185	286	251
*EA3NO	*	23,276	97	92
*R5ACQ	*	12,513	105	97
*RN3DKE	*	10,880	90	85
			(OP: UN8FM)	
*UA1AFT	14	794,561	825	589
*DL9ZP	*	649,490	818	535
*YO5AVN	*	473,620	675	476
*RV6LCI	*	417,902	628	446
*UA3VVB	*	407,644	640	446
*OZ/DJ1XT	*	145,065	341	285
*I1EIS	*	139,620	336	260
*S51MF	*	136,950	313	275
*IT9IZY	*	87,185	249	235
*I3PXN	*	76,254	241	213
*YO5OAG	*	71,604	229	204
*HA1SM	*	50,691	203	183
*ED4T	*	46,080	164	144
			(OP: EA4CWN)	
*RV3LD	*	28,944	153	144
*EU1DX	*	9,636	78	73
*ON6LO	*	7,347	86	79
*RW4LQ	*	2,233	29	29
*DKØXB	*	1,479	29	29
*OH4KA	*	80	10	10
*M5E	7	1,765,056	1018	634
			(OP: GØCKV)	
*YT2B	*	932,790	713	465
*DL5KUD	*	727,463	639	451
*UW2F	*	655,872	637	427
			(OP: UTØFT)	
*RU1QQ	*	549,936	561	402
*RM5P	*	518,967	530	387
*MXØTWC	*	513,383	498	391
			(OP: G3TJE)	
*HB9CPS	*	434,538	458	351
*EI4HQ	*	370,560	386	320
*YU1ARL	*	266,760	341	285
			(OP: YU1FG)	
*US2MW	*	159,372	273	228
*YU2FG	*	152,691	262	231
*F8AEE	*	141,240	312	214
*YB3BOA	*	36,852	96	74
*US2YW	*	20,460	106	93
*RA7Y	3.5	133,021	284	217
*RAØWU	*	100,776	162	136
*RO1B	*	90,909	226	189
*ER1OO	*	61,759	189	151
*YT4A	1.8	119,848	276	211
			(OP: YT1AA)	

OCEANIA

NH2T	A	4,501,739	1961	671
9M2CNC	*	1,025,965	844	449
			(OP: G4ZFE)	
9M2ADX	*	349,479	466	309
DU1/JJ5GMJ	*	337,400	419	241
VK2CA	*	77,322	173	147
ZM3T	14	778,545	684	395
			(OP: W3SE)	
VK2CCC	7	121,429	169	133
ZL3PAH	*	21,204	62	62
*ZL4NX	A	95,200	213	160
			(OP: JM1CAX)	
*VK4TT	*	71,300	176	124
*VK2BNG	*	37,824	118	96
*P29CW	*	1,223,910	931	405
			(OP: VK2GR)	
*AH2/N2TTA	21	181,944	382	171
*9M2/JI3QGQ	*	40	4	4
*DV1/JO7KMB	14	189,773	300	223
*VK6DXI	3.5	60	4	4

SOUTH AMERICA

PV8DX	A	1,503,326	1004	506
AY5D	*	1,413,516	964	507
			(OP: LW6DW)	
CX9AU	*	1,047,454	724	439
CW7T	*	95,804	210	172
YY4ALK	21	4	2	2
*CX5TR	A	229,416	341	237
*PY1CX	*	23,956	120	106
*PY2DA	*	11,352	76	66
*5K3R	28	36,084	137	97
*CA3A	*	26,320	106	94
			(OP: XQ4CW)	
*3G3A	21	527,060	509	365
			(OP: XQ4CW)	
*PY7AHA	*	9,558	64	59
*CE3AA	14	1,627,552	999	562
			(OP: XQ4CW)	
*CD3A	7	1,720	20	20
			(OP: XQ4CW)	

MULTI-OPERATOR SINGLE-TRANSMITTER

NORTH AMERICA

United States

NY4A	6,290,480	2388	940
NY6N	5,414,913	2691	851
KX7M/6	3,862,010	2255	758
NI6T	2,573,550	1923	665
WQ6X	2,139,930	1893	590
N7TT	1,570,207	1335	563
AE7EG	1,374,943	1258	527
WBØGAZ	782,340	1104	442
KA1IOR	589,125	619	375
W3LJ	268,240	458	280
WX7P	131,130	315	235
WDØGTY/5	39,620	183	140

Canada

VE7SV	4,497,530	1911	730
VE7GL	3,715,440	1677	685
VE6AO	230,632	418	254

Mexico

XE2AU	28,035	120	105

U.S. Virgin Islands

KP2M	13,611,765	3953	1065

AFRICA

Djibouti

J25DXA	7,012,476	2411	738

Madeira Islands

CQ3A	26,093,210	5235	1285

Oops...

The caption under the photo of the ICOM ID-31 on page 24 of February's "*CQ* Market Survey" article incorrectly stated that the radio operates on 2 meters. This D-STAR handheld actually operates on 70 centimeters (440 MHz).

Also in the February issue, in case you haven't already figured this out, the *CQ* Review of the West Mountain Radio RIGblaster Advantage was on page 48 as indicated in the Table of Contents, not on page 38, as shown on the cover.

Finally, in December's story on "Producing Ham Radio," we gave two new hams the same callsign in the photo caption on page 33. Matthew Baker is KJ6RVE; Brian Corpuz is KJ6RVB. Sorry, Brian!

Members of the Florida Contest Group activated J7A from Dominica in the Multi-Two category. Left to right are Dan, K1TO, Jim, WI9WI, George, K5KG, and Chris, NX4N.

ASIA

Asiatic Russia

RF9C	**16,678,870**	**4159**	**1105**
UA0S	**4,158,248**	**2040**	**712**
RK9CYA	2,260,291	1213	583
RK9Q	1,851,392	1111	512

China

BY5CD	**3,475,272**	**2045**	**712**
BY4DX	1,051,860	1113	470
BY3MM	877,680	1134	414
BY1CQ	23,712	174	114

Cyprus

C4N	**19,174,584**	**4952**	**1144**

India

VU2ARC	**4,026**	**34**	**33**

Japan

JA1ZGP	**190,269**	**365**	**243**
JA6ZPR	**202,864**	**359**	**248**

Mongolia

JT5DX	**4,948,818**	**2337**	**763**

EUROPE

Bosnia-Herzegovina

E7DX	**10,297,133**	**3924**	**1211**
E73M	8,270,608	3597	1168

Bulgaria

LZ855SRKM	**154,452**	**415**	**244**

Croatia

9A7A	**8,213,940**	**3361**	**1148**
9A3W	1,284,356	1122	587

Czech Republic

OL7C	**4,926,780**	**2674**	**909**
OL1B	154,880	353	256
OL2W	13,552	98	88

Denmark

OZ5E	**2,042,138**	**1625**	**733**
5Q2T	273,199	549	359

England

G5D	**4,997,718**	**2583**	**946**

European Russia

RU1A	**10,064,537**	**4361**	**1153**
RZ1AWZ	195,936	474	312
RK1QWX	59,730	215	181
RM5A	**5,492,214**	**3174**	**958**
RK3R	1,923,054	1691	651
RK3CQ	254,856	479	287
RK4HYT	**701,778**	**820**	**462**
RF4M	387,112	537	332

Finland

OH6CT	**4,040,793**	**2510**	**927**

Germany

DLØCS	**5,330,442**	**2564**	**962**
DL7ON	4,105,989	2199	907
DLØGL	3,144,990	1957	790
DL2A	2,535,258	1708	718
DL1NKS	1,199,658	1204	537
DD1A	1,007,419	879	497
DC2YY	123,241	301	251

Greece

SZ1A	**4,333,776**	**2618**	**904**
SX1L	4,129,960	2785	892

Hungary

HG6N	**10,041,866**	**3911**	**1123**

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4U1ITU	**16,533**	**106**	**99**

Isle of Man

GT8IOM	**2,379**	**39**	**39**

Italy

IR4M	**2,502,940**	**1603**	**734**
I1XSG	2,028,252	1677	692
IQ2MG	67,392	271	208

Latvia

YL8Y	**6,193,264**	**3503**	**968**
YL1ZS	834,976	886	538

Luxembourg

LX7I	**6,262,086**	**3101**	**986**

Poland

SN2B	**7,083,540**	**2973**	**1062**
SP2KPD	1,180,905	1147	561

Romania

YR1C	**6,817,275**	**3303**	**1025**
YR2X	155,760	313	240

Scotland

GM3ZBE	**713,790**	**974**	**495**

Sicily

IR9Y	**8,063,160**	**3635**	**1160**

Slovakia

OM7M	**9,327,856**	**3573**	**1142**
OM3RRC	3,477,775	2178	833
OM3KWZ	2,132,655	1671	665
OM2Ø11IIHF	1,339,764	1178	582

Slovenia

S59T	**14,190**	**100**	**86**

Spain

EA5YU	**2,079,266**	**1618**	**686**
EF7X	**8,121,204**	**3561**	**1036**

Sweden

SJ2W	**7,755,566**	**3484**	**1118**

Ukraine

UU4JWC	**16,665**	**115**	**101**
UR4IXM	396	12	12

OCEANIA

Indonesia

YE1C	**6,823,080**	**2515**	**792**

New Zealand

ZL2J	**2,011,100**	**965**	**455**

SOUTH AMERICA

Argentina

LS1D	**9,621,480**	**2778**	**985**
LU1UM	425,367	496	313

Brazil

PX2W	**14,623,875**	**3666**	**1125**

Chile

3G1R	**2,687,904**	**1418**	**612**

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J7A	**19,532,400**	**5142**	**1191**
KD4D/3	**10,959,228**	**3843**	**1099**
NR3X/4	**8,907,225**	**3610**	**1051**
N4WW	8,424,271	3757	1021
KC7V	**6,048,767**	**3178**	**863**
ND2T/6	**5,264,900**	**2796**	**815**
VE9ML	**1,552,801**	**914**	**569**

AFRICA

CR3L	**22,199,875**	**5124**	**1165**

ASIA

B7P	**6,865,380**	**2986**	**860**
JRSJAQ	**6,493,582**	**2634**	**883**
B1Z	4,418,469	2510	729
JE1CKA	**3,419,108**	**1750**	**748**
7J1YAJ	3,171,960	1832	712
RF9W	**29,393**	**182**	**91**

EUROPE

II9T	**15,283,920**	**5800**	**1290**
9A1A	**15,004,032**	**5338**	**1312**
OL4A	**13,901,640**	**4989**	**1240**
DQ4W	**12,688,858**	**4643**	**1211**
OL3Z	11,236,525	4291	1175
HG7T	**10,441,704**	**4287**	**1176**
RN3F	**8,530,137**	**4221**	**1089**
DR4A	8,276,424	3729	1066
SS2ZW	**8,215,675**	**3575**	**1105**
RT5G	7,770,194	4012	1042
S5ØXX	7,749,181	3617	1069
G5O	**7,508,512**	**3563**	**1028**
DR11BUGA	7,124,832	3408	1038
OL7D	6,144,816	3390	939
LN5O	**5,063,744**	**3200**	**889**
HB9ON	**3,283,656**	**2122**	**758**
LY2XW	**2,139,997**	**2042**	**677**
PA6Z	**1,789,494**	**1168**	**622**
RZ4CWW	**878,554**	**947**	**538**
EC4CBZ	**878,148**	**1097**	**564**
HB9CA	548,416	800	451

OCEANIA

DX1DBT	**286,254**	**474**	**171**

SOUTH AMERICA

PW7T	**17,602,470**	**4388**	**1179**

MULTI-OPERATOR MULTI-TRANSMITTER NORTH AMERICA

NR4M	**15,071,104**	**4947**	**1216**
NQ4I	13,415,522	4739	1202
NR6O	**6,747,776**	**3382**	**886**
NX5M	**6,085,145**	**3821**	**913**
VC7M	**4,807,700**	**2536**	**655**

ASIA

JA1YPA	**48,360**	**160**	**124**

EUROPE

LZ9W	**21,403,200**	**7742**	**1365**
DR1A	**20,591,118**	**7044**	**1357**
DAØHST	12,798,864	5143	1161
SK3W	**12,658,800**	**5573**	**1200**
OH4A	**11,842,362**	**5446**	**1134**
LY7A	**10,754,988**	**5445**	**1097**
IR1ITA	**1,787,560**	**1573**	**667**
UUØA	**501,239**	**863**	**437**
LZ2Ø11KM	312,320	547	305

SOUTH AMERICA

LU4FM	**16,698,132**	**4218**	**1132**
PT2CM	**6,295,017**	**2217**	**839**

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Red Card: LZ5R (ops LZ1YQ, LZ1CNN, LZ1ND, LZ1JZ, LZ1NK, LZ3UA, LZ4UU, LZ5ZM, LZ1AAM, LZ1RGT), RM3Q (ops RW3QJ, RL3KQ, UA3OPA, RV3KG, RV3QM), RY9C (ops UA9CGA, RW9CF, RU9CK, RA9DK), SN3R (ops DJØIF, SP3HRN, SP3LPG, SP3RBR, SP8NR), UT7L (ops UW7LL, UR7LY, UY5LW) – more than one signal [rule V.D(a)]
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Array Solutions	5	www.arraysolutions.com
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Bencher, Inc.	71	www.bencher.com
Buddipole Antennas	53	www.buddipole.com
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CQ Bookshop	59	www.cq-amateur-radio.com
CheapHam.com	81	www.CheapHam.com
Command Productions	73	www.LicenseTraining.com
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DIGITAL APCO P25 RECEIVER

- *Easy "Set-location" based programming - simply enter Zip Code/City or select the local systems you want to monitor!*
- Special requests? No problem – you can add favorite frequencies with the included PC software.
- The PSR-800 combines simple controls like those used in an MP3 player with the power and sophistication of a state-of-the-art scanning receiver!
- Designed to provide unprecedented ease of use, for beginners and experts!
- Includes a 2GB micro SD Card equipped with a special onboard library containing the entire USA and Canada database for all known digital & analog trunking systems and many conventional frequencies.
- Record up to 50hrs of Incoming Transmissions on to the 2GB MicroSD Memory card with expending capacity of up to 32GB.
- The media player type menu allows you to instantly access trunking systems and conventional frequencies used by Public Safety, Government, and Businesses throughout the United States (and Canada) without training, without a manual - even if you have never operated a scanner before.
- Select your state, your county and view a list of objects you can monitor. Select the boxes of the items you want to hear. It is very much like using a MP3 player - that is, if you could buy an MP3 player with all music already installed!

Visit your favorite GRE dealer today to find out more about the PSR-800!

PSR-500

PSR-600

For experienced scanner users, we suggest the PSR-500 handheld or PSR-600 desktop/mobile

GRE

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50 W 2 m/70 cm* DUAL BAND FM TRANSCEIVER

*70 cm 45 W

FT-7900R

2 m/70 cm DUAL BAND

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Best Selling, Reliable Mobile

55 WATTS

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ULTRA-COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER

FT-250R

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2 m MONO BAND

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The King of Mobile

75 WATTS

2 m MONO BAND

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FT-2900R

NEW

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Commercial Grade Field Radio Submersible Construction

COMPACT 5 W 2 m FM HANDHELD TRANSCEIVER

FT-270R

Size: 2.4" (W) x 4.7" (H) x 1.3" (D) Weight: 13.8 oz.

2 m MONO BAND

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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.

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