PVRC Newsletter
September

Newsletter Editor: John K3TN jpescatore@aol.com
Website: http://www.pvrc.org
Meeting Info: http://www.pvrc.org/chapters.htm
Facebook: https://www.facebook.com/groups/PotomacValleyRadioClub/

President's Letter – Mike N4GU

WRTC Update

Back in July and August we put out a plea to raise donations to support teams for WRTC 2022 in Italy. There are 9 PVRC members represented on 7 teams. Unlike previous WRTC competitions, we can choose to sponsor specific teams versus a random station sponsorship as in the past. Thanks to your generosity we have raised enough money to sponsor three teams to date (NA3 – KD4D, KE3X; NA6 – K5GN, N4YDU, and YT5 – W4IPC + teammate). Thank you!

But that doesn't mean we can't do more. We still have a small amount left over to start on a fourth team sponsorship. All of the PVRC crewed teams now have sponsorship, but there are plenty of other teams that don't. The Ukrainian team of UR0MC and US2YW don't currently have sponsorship, for example. We will continue to collect contributions in hope we can sponsor another team. WRTC is still almost a year away (thanks, COVID…). Send contributions to our Treasurer with a note that it is for WRTC sponsorship.

CQ Contests

In the early part of August, I was approached by K1AR on behalf of the North Coast Contesters (NCC). They were drafting a letter to CQ Magazine to request that they remove the prohibition of contest score credit and recognition for Russian and Belarus stations in CQ sponsored contests. The central argument was that it penalized a group who had no influence on their government's policy and actions. They requested that PVRC sign on as a supporting organization.

Knowing that this was a contentious issue, the officers and Trustees were polled for their opinions. It was roughly 2/3 in favor with 1/3 opposing PVRC supporting the letter. I chose to agree to supporting the letter, as I felt that it was really the right thing to do. In addition to PVRC, the letter was ultimately supported by the following clubs:

- Arizona Outlaws Contest Club
- Bavarian Contest Club
- Florida Contest Club
- Italian Contest Club
- Society of Midwest Contesters
- Tennessee Contest Group

I have not seen the official word on the reaction from CQ Magazine, but unofficially I do not expect that there will be any changes to the CQ sponsored contests this year. So Russian and Belarus stations will most likely still be excluded. Sadly, our Ukrainian friends are also likely to be off the air for another year.

NAQP

The North American QSO Party contests were dropped from the 5M and Olympics awards for this season due to the lack of a club competition with the ending of the NAQP Club Competition, which was **not** run by the NAQP contest sponsors. The officers are still working behind the scenes to revive the NAQP Club Competition. The first rule of the 5M program is that the purpose of the program is to encourage and support PVRC in club competitions.

Recent reflector traffic indicates significant interest in the NAQP contests, which is a good thing! We are exploring ideas for incorporating the NAQPs in our award programs and welcome ideas. With a little luck, the NAQPs may return to either the 5M and/or the Olympics programs in 2023.

73, Mike N4GU

How to Drop From #1 to #2 in Three Easy Steps – Rob K4OV

In 2021, N1BA and I *almost* won ARRL Sweepstakes Phone Multi-Op as K4OV. We had the highest reported score after the contest, but fortunately we managed to knock our score down enough to come in #2 in the final score listings. Read on, and you will see how you, too, can snatch defeat from the jaws of victory.

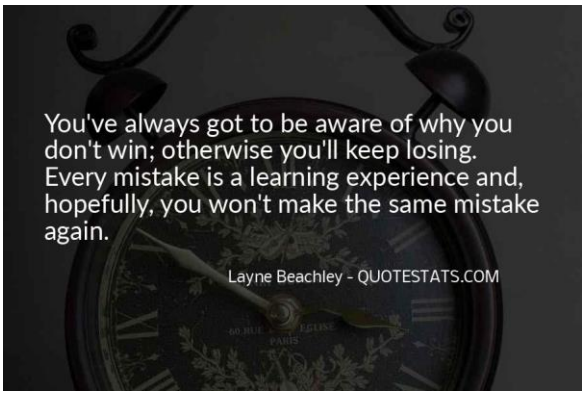
K4OV reported 4 Q's more than ND7K when the contest ended. But we were able to include enough errors in our log to drop to second place by 5 Q's. So, the first way to avoid the winner's circle is to get lazy with your listening during the contest. You're not sure if the other station said "fifty" or "sixty"? Just take a guess and log it! There's QRM on your frequency? You don't have to struggle to copy stations. If they're sort of loud, they are 'B' (high-power). If you can't really hear them, they are 'A' (low power). Focusing hard with your listening is for winners - don't do it!

An even easier way to avoid a top score is to not operate for the full time. As Guy K2AV always says, "Butt in Chair (BIC) is the most important ingredient for contests. You don't make QSO's if you're not operating." So, take some extra breaks, sleep in, linger over your coffee on Sunday morning. For a 24-hour contest, work only 23.6 hours. It will do wonders to keep your score down.

And finally, here's a safety net you can employ just in case the first two methods aren't enough to lose. Typos! Log some stations like "W 5 Zero R C" instead of "W 5 O R C". Or log K8MBC instead of K8BMC. It's really cool to type and talk fast at the same time. Who cares if you're not getting everything in the log correctly?

Now, once you master these three basics of dodging the top spot (we've been practicing for 20 years), you can get more advanced. This year, we had the ARRL help us land in second place. Working K4MOV in the contest prompted the log checking software to report that it was a busted call, and "the correct call you worked is K4OV." We even got them to dock us an extra penalty QSO for that!

So: 1) listen carelessly, 2) take extra time off from operating, and 3) type poorly. Practice these, and you won't ever have to worry again about winning.



Chasing the Fred Fish Memorial Awards Grids on 6 Meters – Mike W3IP

A few years ago I decided to see if I could qualify for the Fred Fish Memorial Award (FFMA) award sponsored by the ARRL. This award requires you to contact and confirm a 6 meter contact with an amateur station in every 4 digit grid square that touches the continental United States.

The award was created in 2008 and is named after W5FF (SK), the first US ham to confirm having worked all 488 grids on 6 meters. Fred did this from his home in New Mexico, cajoling stations to get on the air, getting rovers to travel to seldom activated grids, and collecting QSL cards by using snail mail and the telephone. None of the current widely used digital modes for terrestrial communications were available when he worked and confirmed his final grid in June 1995. Fred worked all 488 grids using SSB or CW! It was 15 years before a second station (W5OZI) qualified for the award in 2010. At this writing, 35 hams have now qualified for the award, many more are actively seeking the award.

Some seldom activated grids:
EL84 - Dry Tortugas Island (west of Key West Florida) - ferry/seaplane access
EL58 - Louisiana Delta - no roads, private boat access only
DL88 - Southern tip of Big Bend National Park and border area (West Texas), extreme temperatures
DM31 - Southern Arizona desert, mostly tribal land and border area, extreme temperatures
DM02 - San Clemente Island (west of San Diego) - restricted Military base
CM93 - SW corner of Santa Rosa Island (Channel Islands National Park, west of Los Angeles) - boat access only, hike to hilltop
CM79 - Northern California seacoast, no road in grid, 1.5 mile hike in only

At the start of the quest for the FFMA award, I hadn't given much thought to how hard it might be to achieve. I knew some grids probably didn't have a lot of hams active on 6 meters but that was about it. I soon found out that the geography of the "Continental United States" in the context of the FFMA included 3 grids that are mostly water surrounding a small island in the grid that had no bridge or road access to the mainland, and 2 grids on the mainland that have no road access. Of course, you could operate from a boat bobbing in the water and in the grid. A few rovers have actually done that. There are no currently licensed hams in grids DL79 and DL88 (Southwest Texas). Grid DN02, in Southeastern Oregon, only has one ham listed in QRZ.com with a residential address in the grid, and, you guessed it, he is not active on 6 meters. In contrast, there are 5,000 hams listed with an FM19 address. Bottom line, there are a lot of grids with very little or no 6-meter activity.

I soon discovered there is a community of like minded hams interested in the FFMA award. Some, like me, were looking for stations to work in all the grids, others (called rovers) were interested in travelling to grids with little 6 meter activity and putting them on the air. Without these rovers on the air, no one would be able to work all 488 grids. One thing I learned was that many of the rovers operating far from power lines and houses have incredibly low receiver noise. These rovers hear far better than most of us do in urban environments. Our challenge is to figure out how to reduce the noise in our own neighborhoods.

Propagation: There are several propagation modes that can be used to work FFMA grids. The effectiveness of these modes varies with time of day (random meteor scatter), the calendar (meteor showers), weather patterns (tropo), and complex interactions in the upper atmosphere between meteor dust, upper atmosphere winds, and free electrons (Sporadic E).

Bottom line: do your research on when these propagation modes are likely to happen, the direction of the expected propagation, and be ready to point your beam and get on the air. Check out the ARRL handbooks for general information about the various propagation modes. K5ND has a good getting started in 6 meters guide here There are several astronomy related web sites that have meteor shower calendars. Take a look at W3LPL's YouTube talks on 6-meter propagation and antennas (there are several to choose from). Frank has previously sent Power Point presentations about 6-meter antennas and propagation to the PVRC reflector.

Equipment: Like most ham radio activities, you can use a very modest station to get started chasing the FFMA grids. A SSB, CW, and data transceiver that puts out ten or more watts, some coax, and a wire hung in the air somewhere, and you are ready to start. You will be able to work your own grid, and likely a few nearby grids, but working distant grids will be difficult, requiring good propagation conditions that don't happen often.

A better starting point would be to use one of the many 100-watt transceivers available today that covers 6 meters, and a small (3 to 5 elements) rotatable yagi that is between 30 and 50 feet in the air. With this setup, and a bit of patience, you should be able to work most of the stations that you hear. Speaking of hearing well, if you have never been on 6 meters before, external interference may initially be a problem. Reducing or eliminating unwanted noise sources under your control may be necessary for best results. There have been lots of articles written about finding RFI problems and useful mitigation methods in QST (the September 2021 QST cover article for example), ARRL publications (Grounding and Bonding for the Radio Amateur), or here.

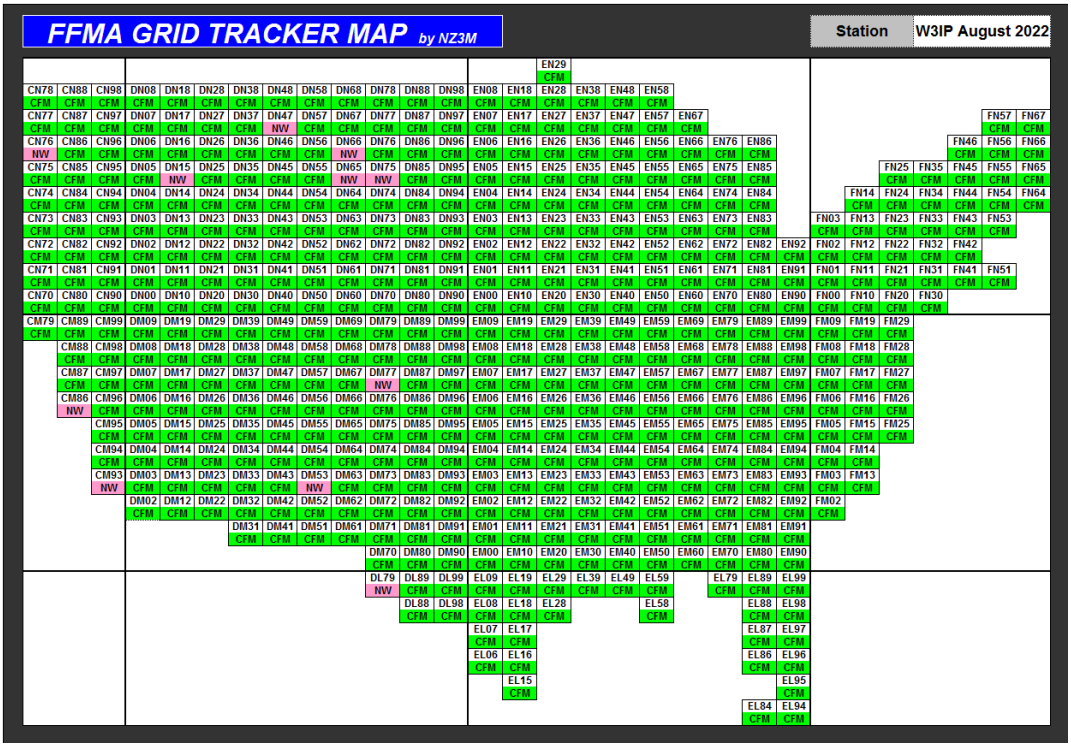
A top-of-the-line station may include a power amplifier to boost the transmit power to 500 or 1000 watts and a larger (7 to 9 element) yagi. Interestingly, an antenna higher than about 50 feet will not usually result in stronger signals and better performance when looking for FFMA grids. There are two reasons. First, a higher antenna may also pick up more noise sources from neighboring buildings and power lines. Second, antennas interact with the ground below them which causes peaks and nulls in their elevation pattern. 6 meter antennas higher than 50 feet are more likely to have nulls in the direction of some of the incoming sporadic E signals.

Rovers: The rovers are a key part of chasing FFMA grids. Some rovers go out and activate several grids during the major VHF contests, other rovers travel during the peak sporadic E or meteor shower seasons. Some of the rovers are equipped with generators, high power, large beams, and have the beams near optimum height (35 feet usually works well for both sporadic E and meteor shower propagation). Other rovers use more modest equipment, with the resulting decrease in performance. It is worth keeping track of where and when the rovers are operating.

Tools: There are many on-line tools available today to stay aware of rover schedules and 6-meter activity in the various grids. These tools include packet clusters, chat rooms, email reflectors, and digitally oriented spotting systems. Not everyone contributes to every available tool, so it helps your situational awareness to watch (and participate) in more than one.

- **Packet clusters:** There are many to choose from - but there are very few active spotters outside of peak contest or sporadic E times. As I write this in early August, the only active automated CW spotter within ground wave range of my northern Virginia QTH is N2QT in FM07 (as seen on the reverse beacon network).

- **Chat rooms:** The most active chat rooms include ON4KST.com, vhf-chat.slack.com, and PingJockey.net. These sites each have multiple rooms to choose from, depending on your immediate interest.
- **Email reflector:** The most active email reflector for FFMA activity is ffma@groups.io. Register for free through the groups.io website. The web site also has a calendar of upcoming rover activities (accessible only to registered users).
- **Spotting systems:** The Reverse Beacon Network, PSKReporter.info, DXMaps.com and hamspots.net all provide near real time information about both propagation activity and station activity on the band. You can use this information to track the rovers and to anticipate possible band openings to your specific location. You can also configure these networks to see where your transmitted signals are being received.
- **Keeping track of it all:** There are also tools available to help keep track and visualize your progress of how many of the 488 FFMA grids you have worked and confirmed. The Logbook of the World (abbreviated LoTW - the ARRL's on-line QSL system) is the means by which most (but not all!) 6 meter hams confirm completed contacts. The ARRL also has a process in incorporate paper QSL cards into the LoTW data base, but it can be slow (takes a couple of months), and requires you to send the cards to ARRL headquarters in Connecticut or to show the cards to an ARRL approved card checker.If you are a visual person, NZ3M has written a tracking tool in Excel. Enter your confirmed grids into his spread sheet (here) and you will see the geographic relationship of the grids you have confirmed. Another visual tool is GridTracker (https://gridtracker.org/). You can automatically download your LoTW confirmations and see the geographic distribution of the grids you have worked on individual bands.



After confirming a couple of hundred FFMA grids, you may want to compare your progress to that of others. Francis, KV5W has written an extensive database tool. You can email him at his QRZ e-mail address, and he will provide you with the instructions on how to include your

data into the overall database. This tool will allow you to see which are the "harder" grids to work. Your information (specifically, the grids you haven't worked yet) will also help rovers plan for future grid activations. There are over 180 current participants in this database.

Operating: If you have read this far, you may have noticed there has been no previous mention of FT8. It is by far the predominant operating mode on 6 meters today. Other digital modes (FT4, MSK144, and Q65) are used to a lesser extent. SSB and CW remain popular during contests and are also a good source of new grids to work.

Several of the more experienced rovers will QSY off the commonly used frequencies especially during times when the band is crowded. Watch/listen for real time on the air instructions (e.g., QSY 303) or instructions on a chat room. Many rovers will also publish sequencing information in advance on chat rooms or reflectors. This information sometimes differs from standard practices for the mode being used.

Expectations: Most of the 35 FFMA award recipients reside towards the middle of the country. However, stations near both coasts (Washington state, California, and Georgia) have now qualified for the FFMA award. At least 10 PVRC members (most living in the Mid Atlantic area) currently have over 400 FFMA grids confirmed according to a recent ARRL FFMA standings chart. All have a good chance of working all 488 grids in time.

Reflections: In 2018, I got serious about the chasing the FFMA award. At about the same time, I registered for LoTW and began uploading old logs still on my main shack computer (mostly from VHF contests). 200 confirmed grids were in the LoTW system and waiting for my uploads. This inspired me to go back to find my old paper logs, contest logs on floppy disks (remember them?) and retired hard drives. This resulted in another 20 confirmed grids, with the oldest dating back to 1987. Today, I have 478 confirmed grids, less than 10 were originally from paper QSL confirmations.

Along the way, I have experimented with antenna types, height and placement. After several changes, I have settled on a 7 element yagi at 37 feet above the ground. I have tried to work with the local power companies (there are power lines of 3 different companies within 2 miles of my QTH) to reduce external noises due to poorly maintained power lines. This has only been partially successful. Even though the power companies are required to mitigate RF interference problems, it is very low on their respective priority and resource lists. Only one of the power companies that I called had even the most basic direction-finding tools available to locate noise sources, the other two companies relied on eyeballs and the "just go tighten up all the connections" attitude.

The summer of 2022 brought out a lot of rovers. A few of them roved in Montana, Idaho, and Nevada and “went the extra mile", travelling along back roads to operate from outstanding locations (several thousand feet elevation, with a view of forever) within the grid square that they were activating. Their signals could be copied on the east coast far more reliably than the typical home station in those areas.

In summary, FFMA is a challenging operating award that will acquaint you with many of the propagation modes of the "Magic Band". Just like the DXCC Honor Roll, FFMA requires skill and commitment to know when to be active on the band for best results.

Thanks to K3YDX and N3FL for their review and comments of this article.

Thanks for Supporting PVRC Scholarships – Frank W3LPL, Dan K2YWE

Thank you for your generous support of the PVRC scholarships. We thought you would enjoy reading the attached letters of thanks from the recipients of our two scholarships.

William Ferguson, KJ4EYZ
1564 Flanagans Lane
Virginia Beach, VA 23456
wtf8hu@virginia.edu

July 11, 2022

Dan Zeitlin, K2WYE
Potomac Valley Radio Club
1036 Skyview Drive
Annapolis, MD 21409

Dear Mr. Zeitlin:

I would like to thank you for your generosity in support of furthering my education at the University of Virginia in Charlottesville, VA. I am currently a rising fourth-year undergraduate student at the University studying Chemical Engineering preparing for graduate school.

I have been a licensed ham radio operator since the age of seven and obtained my DXCC at nine years old; in 2018, I obtained my Extra-license. Ham radio has been helpful in my life in two major ways. Firstly, it has prepared me with a problem solving and analytical mindset that has allowed me to think through some of the toughest problems not only faced in the classroom. Secondly, ham radio has provided me with the soft skills to be able to connect to many people of different generations and origins. I will carry both of these skills throughout my life.

I attribute much success from my exposure to Ham-Radio at a young age and from the help of older-generation amateur radio operators. I hope someday I will be able to pass on the knowledge I learned from them and help younger operators bridge the gap between theory they learn in school and ham radio practice.

Again, I am so grateful for your generosity and I promise you that I will utilize my scholarship fund to further pursue my educational interests and pursuits and maintain a high-level of standard.

Sincerely,

William Ferguson, KJ4EYZ
757-803-3770

73

6-July-2022
Potomac Valley Radio Club-

Hello, my name is Spencer Packard and I plan to study software engineering at NC State University in Raleigh, NC. I have enjoyed learning about electronics, software, and ametuear radio from an early age, thanks to my dad. I was initially licensed as a technician level and after competing in the VA QSO party a couple times, I decided to earn my general class license. As a general class, I have enjoyed participating in worldwide contests, helping the PVRC club competition scores. While my time is limited due to work and school, I am able to get a few contacts in to help increase the participant multiplier.

I plan to study software engineering because I deeply enjoyed problem solving and constantly learning during coding in my high school computer science courses. This scholarship will help me further study the concepts of computer software and interfaces.

I would like to thank the donors of the Potomac Valley Radio Club for helping fund this scholarship and I am extremely grateful for the opportunity to study at university with the support of my favorite radio contest club.

Sincerely,

Spencer Packard

Colonial Chapter Members at Field Day 2022 – Jerome K8LF

McKenzie KO4GLN new Colonial Capitol member operating SSB station at K4RC FD 2022.

McKenzie KO4GLN using antenna launcher with father Steve KO4ENU behind. Both Steve and McKenzie are new 2022 PVRC Colonial Capitol PVRC members.

Steve KO4ENU managed an ISS contact with an astronaut as one of his FD satellite contacts for FD 2022.

PVRC 6 Meter DXCC Standings – Frank W3LPL

Below are the 6M DXCC totals for PVRC members, transcribed from the ARRL DXCC data as of the 20th of each month or so. Thanks to Frank for the data each month to make this a regular feature. Please report any omissions or errors to Frank.

CALL	DXCC	CALL	DXCC
K1HTV	169	W3DF	113
W4DR	169	W3EKT	111
W3BTX	167	N4DB	111
W3LPL	157	K3AJ	110
AE3T	156	W3IP	110
W3UR	153	W4PK	109
N4MM	152	K3KO	108
N4BAA	144	N4VA	106
K4SO	138	W2YE	106
W3LL	138	K3ZO	103
K4CIA	136	N3DB	103
N2QT	135	W3OR	103
AB3CV	135	N4PY	102
K2PLF	133	W4FQT	102
WX4G	133	K3WC	101
K5EK	133	W3XO	100
KG7H	132	W4TJ	100
W3KX	131		
K4SN	131		
K3SX	126		
NW5E	123		
N4TL	121		
AK3E	120		
K3XA	119		
W3XY	117		
K5VIP	117		
N4JQQ	114		

Membership News – Tim N3QE

Chapter leaders please remember to complete the Meeting Attendance Report. Members can check and update their roster details via the Roster Lookup.

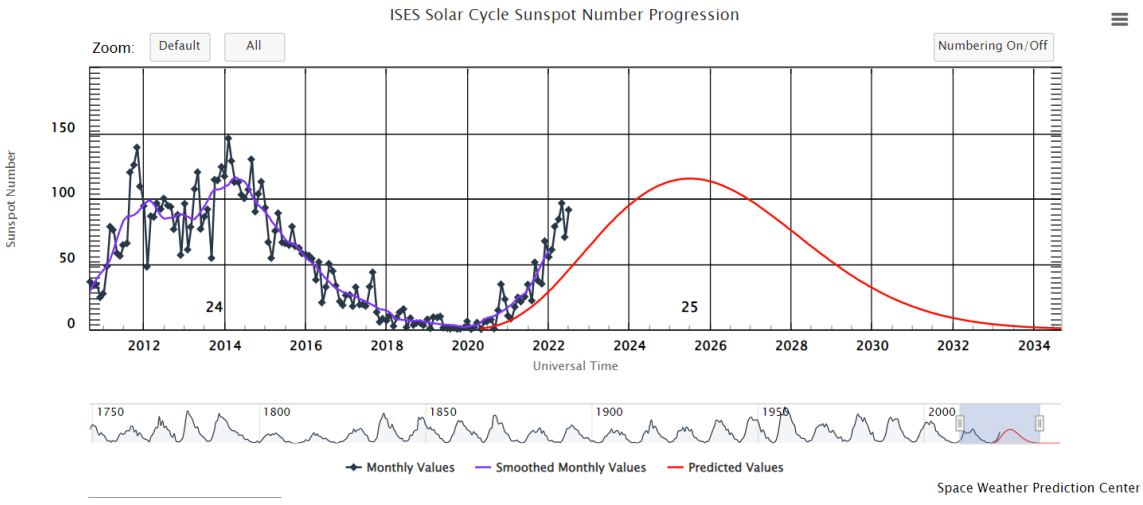
Upcoming Contests – from WA7BNM

September 2022	
All Asian DX Contest, Phone	0000Z, Sep 3 to 2400Z, Sep 4
CWOps CW Open	0000Z-0359Z, Sep 3
CWOps CW Open	1200Z-1559Z, Sep 3
CWOps CW Open	2000Z-2359Z, Sep 3
WAE DX Contest, SSB	0000Z, Sep 10 to 2359Z, Sep 11
ARRL September VHF Contest	1800Z, Sep 10 to 0300Z, Sep 12
North American Sprint, CW	0000Z-0400Z, Sep 11
North American Sprint, RTTY	0000Z-0400Z, Sep 18

Editor's Last Word – John K3TN

Thanks to K4OV, W3IP, W3LPL. K2YWE and K8LF for contributions to this issue of the PVRC newsletter.

The quality and usefulness of the PVRC newsletter depends on contributions from members. If you have photos from club meetings, screen shots of new contest software, or brief writeups on station improvements or contest war stories, send them in any format to jpescatore at aol dot com.



From the PVRC Treasurer – Ted WA3AER

PVRC has chosen not to implement an annual dues requirement. We depend on the generosity of all our club members to finance our annual budget. In addition, active PVRC members are expected to participate and submit logs for at least two PVRC Club Competition contests per year.

When contemplating your donation to PVRC, each member should consider the benefit you are receiving from PVRC and its many opportunities for your personal growth in our wonderful hobby, then donate accordingly.

Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:

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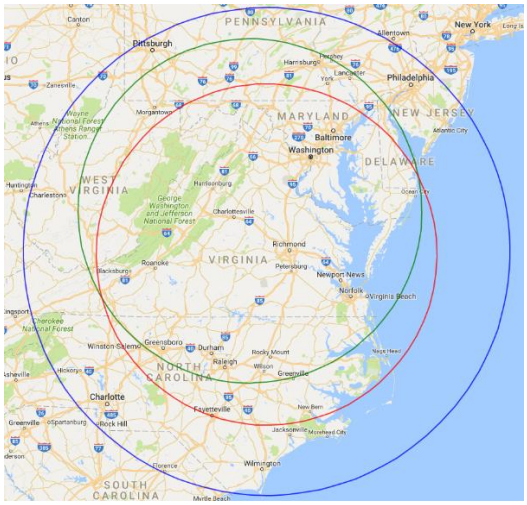
Donations to PVRC are not tax deductible

Eyeball QSO Directions

The latest info on local club meetings and get togethers will always be sent out on the PVRC reflector and posted on the PVRC web site.



Green: ARRL VHF Circle
175 mile radius
Around 38.075N,
78.171W

Red: ARRL HF Circle
175 mile radius
Around 37.43168N,
77.858482W

Blue: CQ HF Circle
250 mile radius
Around 37.43168N,
77.858482W

Now a Word From Our Sponsors

PVRC doesn't ask for dues, but the Club does have expenses. You can also support the Club by buying from the firms listed who advertise in the newsletter!

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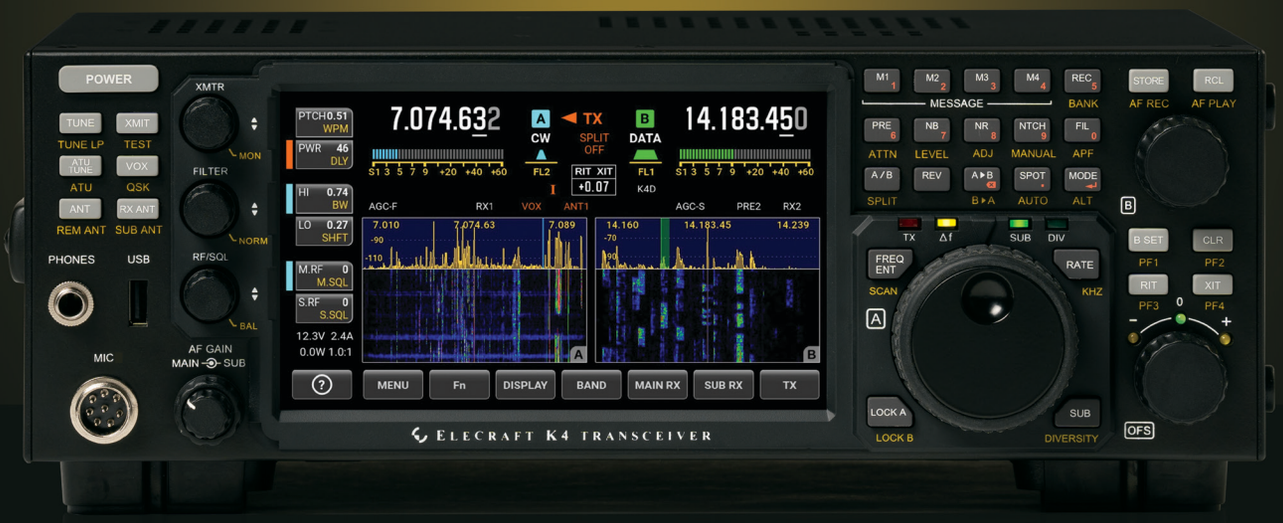

A direct-sampling SDR you'll love to use

Our new K4 transceiver harnesses advanced signal processing while retaining the best aspects of the K3S and P3. It features a 7" touch display, plus a rich set of dedicated controls. Per-VFO transmit metering makes split mode foolproof. Band-stacking registers and per-receiver settings are versatile and intuitive. Control usage information is just one tap away thanks to a built-in help system.

Modular, hybrid architecture adapts to your needs

The basic K4 covers 160-6 m, with dual receive on the same or different bands. The K4D adds diversity receive, with a full set of band-pass filters for the second receiver. (Thanks to direct RF sampling, there's no need for crystal filters in either the K4 or K4D.) The K4HD adds a dual superhet module for extreme-signal environments. Any K4 model can be upgraded to the next level, and future enhancements–such as a planned internal VHF/UHF module–can be added as needed.

Single or dual panadapter, plus a high-resolution tuning aid

The main panadapter can be set up as single or dual. Separate from the main panadapter is our per-receiver *mini-pan* tuning aid, with a resampled bandwidth as narrow as +/- 1 kHz. You can turn it on by tapping either receiver's S-meter or by tapping on a signal of interest, then easily auto-spot or fine tune to the signal.

Comprehensive I/O, plus full remote control

The K4's rear panel includes all the analog and digital I/O you'll ever need. All K-line accessories are supported, including amps, ATUs, and our K-Pod controller. The USB display output supports its own user-specified format. Via Ethernet, the K4 can be 100% remote controlled from a PC, notebook, tablet, or even another K4, with panadapter data included in all remote displays. Work the world from anywhere–in style!

K4 KEY FEATURES

- Optimized for ease of use
- Modular, upgradeable design
- 7" color screen with touch and mouse control
- ATU with 10:1+ range, 3 antenna jacks
- Up to 5 receive antenna sources
- Full remote control via Ethernet

The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

'The performance of their products is only eclipsed by their service and support. Truly amazing!' **Joe - W1GO**

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FTDX101MP | *200W HF/50MHz Transceiver*

• Hybrid SDR Configuration • Unparalleled 70 dB Max. Attenuation VC-Tune • New Generation Scope Display 3DSS • ABI (Active Band Indicator) & MPVD (Multi-Purpose VFO Outer Dial) • PC Remote Control Software to Expand the Operating Range • Includes External Power With Matching Front Speaker

FTDX10 | *HF/50MHz 100 W SDR Transceiver*

• Narrow Band and Direct Sampling SDR • Down Conversion, 9MHz IF Roofing Filters Produce Excellent Shape Factor • 5" Full-Color Touch Panel w/3D Spectrum Stream • High Speed Auto Antenna Tuner • Microphone Amplifier w/3-Stage Parametric Equalizer • Remote Operation w/optional LAN Unit (SCU-LAN10)

FT-991A | *HF/VHF/UHF All ModeTransceiver*

Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO

FTDX101D | *HF + 6M Transceiver*

• Narrow Band SDR & Direct Sampling SDR • Crystal Roofing Filters Phenomenal Multi-Signal Receiving Characteristics • Unparalleled - 70dB Maximum Attenuation VC-Tune • 15 Separate (HAM 10 + GEN 5) Powerful Band Pass Filters • New Generation Scope Displays 3-Dimensional Spectrum Stream

FT-891 | *HF+50 MHz All Mode Mobile Transceiver*

Rugged Construction in an Ultra Compact Body • Stable 100 Watt Output with Efficient Dual Internal Fans • 32-Bit IF DSP Provides Effective and Optimized QRM Rejection • Large Dot Matrix LCD Display with Quick Spectrum Scope • USB Port Allows Connection to a PC with a Single Cable • CAT Control, PTT/RTTY Control

FTM-300DR | *C4FM/FM 144/430MHz Dual Band*

• 50W Reliable Output Power • Real Dual Band Operation (V+V, U+U, V+U, U+V) • 2-inch High-Res Full Color TFT Display • Band Scope • Built-in Bluetooth • WiRES-X Portable Digital Node/Fixed Node with HRI-200

FT-2980R | *Heavy-Duty 80W 2M FM Transceiver*

• Massive heatsink guarantees 80 watts of solid RF power • Loud 3 watts of audio output for noisy environments • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users

FT-818ND | *HF/6M/2M/440 All Mode Portable Xcvr*

• Ultra-Compact/Portable • Multi-Color Easy to See LCD • 208 Memory Channels/10 Memory Groups • Built-in Electronic Keyer • Internal Battery Operation Capability • Two Antenna Connectors • Built-in High Stability Oscillator ±0.5 ppm

FTM-400XD | *2M/440 Mobile*

• Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band

FT-70DR *C4FM/FM 144/430MHz Xcvr*

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

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

• High-Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth© Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Supports Simultaneous C4FM Digital • Micro SD Card Slot

FT-65R | *144/430 MHz Transceiver*

Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flashlight, Alarm and Quick Home Channel Access

FTM-6000R | *50W VHF/UHF Mobile Transceiver*

• All New User Operating Interface-E2O-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset

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