PCARA Update

Volume 19, Issue 6 Peekskill/Cortlandt Amateur Radio Association Inc. June 2018

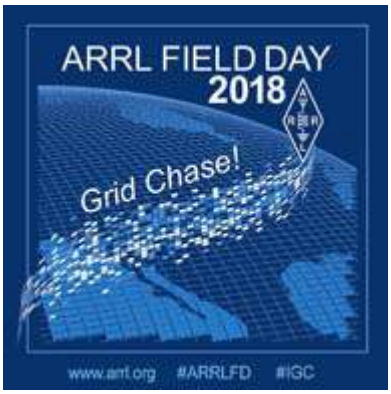
Oh say can you 501(c)(3)?

PCARA has filed for tax-exempt status as provided under section **501(c)(3)** of the Internal Revenue Code, courtesy of David K2WPM. Updates to follow soon! Thanks David!

The most recent **PCARA Foxhunt** was held on Saturday May 12, 2018, and the role of Fox was played by Candlewood Amateur Radio Association (CARA) members Jay N1NRP and Marlon KC1EHW. The Foxes secreted themselves in the parking lot of Mercy College on Strang Boulevard in Yorktown Heights, NY, near the intersection of Rt. 202 and the Taconic State Parkway. First to find the Fox was Mike N2EAB at 3:39 p.m., followed by Malcolm NM9J at 3:55 p.m. Third Place was captured by CARA teammates Ken NE1CU and David KB1LTW. A post-Foxhunt gathering was held at the Rt. 202 Diner where certificates were awarded. A full report can be found in this month's edition of the *PCARA Update*.

Another successful **PCARA Breakfast** was held on Saturday May 19, 2018 at Turco's in Yorktown Heights, NY. Nine members came along, despite the parallel attraction of Dayton Hamvention® that same weekend. The next PCARA Breakfast has been scheduled for June 16, 2018 at 9:00 a.m. at Turco's. Please join us!

ARRL Field Day is on June 23-24, 2018 this year. Thanks to WA2MCR, PCARA has received permission from the Lakeland Central School District to once more hold Field Day operations at Walter Panas High School, 300 Croton Avenue in Cortlandt Manor, NY. PCARA's site already appears on the ARRL Field Day Locator Map. Plans regarding antennas and accommodations will be finalized at the June 3rd meeting. Please bring along your ideas and suggestions. Of course, plan on spending time with us on ARRL Field Day 2018!



Upcoming **Hamfests** in our region include the Mount Beacon Amateur Radio Club (MBARC) 'Spring into Summer Hamfest' on Sunday June 3, 2018 at the Employee Recreation Center, 83 Red Schoolhouse Road in Fishkill, NY. For more information, please visit MBARC's web site at: http://wr2abb.org/. On July 1, 2018 the Metro 70 Network will be featuring the Metro 70cm Hamfest at the Knights of Columbus, 139 North Broadway in White Plains, NY. Please visit their web site at: https://metro70.org/hamfest-070118 for more information.

Our next regularly scheduled membership meeting is on June 3, 2018 at 3:00 p.m. at NewYork-Presbyterian/Hudson Valley Hospital in Cortlandt Manor, NY — I look forward to seeing each of you there. N.B. Just a reminder that the June 3rd meeting is the last monthly membership meeting until Sunday September 9, 2018. Watch for your membership renewal notice and enjoy the Summer!

- 73 de Greg, KB2CQE

Contents

PCARA Officers

President:
Greg Appleyard, KB2CQE; kb2cqe at arrl.net
Vice President:
Joe Calabrese, WA2MCR; wa2mcr at arrl.net

Net night

Peekskill/Cortlandt Amateur Radio Association holds a weekly net on the 146.67 MHz W2NYW repeater on Thursdays at 8:00 p.m.

Join net control Karl, N2KZ for news and neighborly information.

Adventures in DXing

- N2KZ

A Whole New World

The world of amateur radio is one of constant change and innovation. The magic of sending messages through the air fascinates every day! After more than a hundred years of continuing development and refinement, we have now taken a momentous step forward. No longer do we require humans at each end of a QSO. We can literally work ourselves!

I may be very late to this revelation, but indeed… it is true! Combining the abilities of software defined transceivers and Internet remote control, I can sit in my radio shack and hear my signals arrive hundreds or thousands of miles away. I don't even need to have ears! I can see my Morse code or modulated transmissions on a full color waterfall display, rolling along in real time on my computer screen.

Add to these fascinating technologies complete remote access of distant transceivers. I can use a laptop to reply to myself! One question: Who sends who a QSL? Isn't it amazing how far we have come? My first shortwave radio had no Internet connection and used just four tubes. Now we can literally listen to and operate radios all over the world with just a keyboard and a mouse!

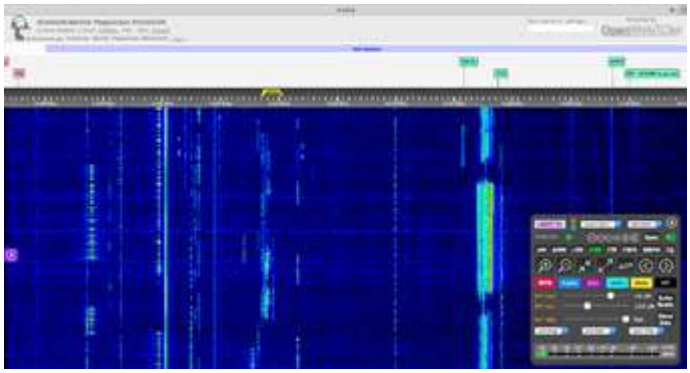
The possibilities are endless. On Sunday mornings, I check into a net that serves Michigan's Thumb region on 3950 kHz LSB. Using an application called RCForb*, I operate my friend Tony's transceiver in New Buffalo, Michigan. Sitting at my workspace in Stamford, Connecticut, I listen in and participate just as if I were sitting in Tony's shack hundreds of miles to the west. When I check-in to the net, people are always amazed at what I am doing. I recently had someone on this net comment that I should update my QRZ.com biography. He really thought I was transmitting from my new home in Stamford, Connecticut — not remoting in over the web!

[* For details, see: http://www.remotehams.com/ *-Ed.*]

The KiwiSDR is a software defined radio receiver covering 10 kHz to 30 MHz. The unit is installed on a Beagle Bone single board computer connected to your LAN via Ethernet. The built-in web interface (OpenWebRX) can then provide browser access for 1-4 users.

Remote access to software defined radios has no boundaries. Amazing things can be heard from many, many places around the world. A great place to start is the very popular website https://www.sdr.hu/. With over 200 receivers to choose from, you can listen in on radios from almost anywhere. Just a few mouse clicks will connect you to New Zealand, Iceland, Ireland and even New Jersey! Another fine site to try is http://websdr.org/. You'll find many diverse and interesting SDRs to listen to and enjoy!

If you want to monitor your own signal, look at the list of receivers at https://www.sdr.hu/ and select an SDR. Receivers between 500 and 1500 miles away from your QTH usually provide your 'best bet' to hearing yourself. Click the link and you will immediately see the SDR's full color waterfall display across your screen along with a control panel in the bottom right corner.



Waterfall display from a KiwiSDR receiver located in Carlow, Ireland and listed on sdr.hu. Web interface and audio were accessed over the Internet by Karl.

Make sure to sweep the 'Welcome' box away on the left. Move your mouse pointer over the waterfall and click to instantly tune the radio — or — simply enter a frequency into the top left box of the control panel and hit <Enter>. You'll notice the strongest signals on the waterfall will appear yellow or even red. Click plus and minus icons in the control panel to change the span of the waterfall display. Try each button to learn what features it provides. With just a little practice, you'll gain familiarity with the system and really appreciate its streamlined design!

Close-up of the KiwiSDR control panel.

Hearing yourself as DX

When you are familiar with operating the remote SDR, enter the frequency where you will transmit into the SDR receiver's control panel and click <enter>. Tune to the same frequency on your transceiver and send a signal announcing your call sign. Important: *Only operate on frequencies where you are authorized!* If you are lucky, your signal will appear as a vertical line on the waterfall display. When you listen to your own signal, you will notice a slight delay between your live voice or CW and the audio you'll hear from your computer. This is normal. It takes a short time to travel through the air to the remote site and then longer to find its way back to you over the Internet.

Monitoring your own signals is revelatory. You can actually see where your signals are reaching and where they are not. If you don't see your signals on the first receiver you try, pick another SDR and try again. Having this ability will teach you a lot about what frequencies are active and where you can be heard around the country or around the world. After you discover where you are being heard the next step is the hardest. Find a real live human ham to return your call!

How you use remote access SDRs is limited only by your imagination. You can compare your transceiver's reach into a specific area trying different bands and antennas. You can use the remote receivers as a profoundly distinct advantage to hear and work stations you otherwise would not hear at your QTH. For example, if I was having a hard time hearing a QRP CW signal from South Carolina but I knew they could hear me, using a SDR closer to their QTH might bring their signals in with ease making the QSO possible.

Similarly, if you wanted to take both transmitting and receiving to another place to work rare DX, nothing would stop you! Give careful thought to the legitimacy* of contacts originating from transceivers far afield from your home QTH. Always mention you are remoting in via another ham's rig and mention their call sign. Using your home identity, without disclosure, while operating a remote transceiver is not an honest practice. Always remark that you are using remote facilities and mention the owner's call sign and location. No one likes an imposter!

[*See *QST* Nov 2001 p 48 and message from Bill Cross of the FCC, both available at the W7DXX site: http://w7dxx.com. - *Ed.*]

Also, be quite respectful of using other people's equipment. Some SDRs and remote transceivers require you to pre-register your identity and call sign and gain owner approval before use. Always ask if you can tune a remote radio and make very sure you are connected to a proper antenna before you tune up. Tuning up a rig is a quite essential courtesy. Never forget that you are being allowed to borrow the facilities of another ham. Always be humble and appreciative of these kind favors!

Most receive-only SDRs allow more than one person to use the radio concurrently. As you look down a list of available SDRs, you will probably see a notation of current use. '2/4' means that two people are using the unit out of a possible four spots. SDRs are so miraculous. Not only can you see the entire spectrum of the receiver by watching the waterfall display, you can see where signals are coming in without endless searching, jumping up and down the bands looking for signals. Everything becomes so fast and efficient, it is almost unnerving!

Lately, I have been spending time with a receiver in Otradalur, Iceland. It is located in a remote area of the west fjords of Iceland where man-made noise is virtually non-existent. The receiver is a Kiwi SDR connected to a TCI model 701-1 antenna array weighing more than 15 tons! The owner and operator of the site is Thorvaldur Stefansson, TF4M.

Thorvaldur Stefansson, TF4M

Thor is a remarkable ham and a seasoned operator. Dare to dream: At about 2,500 miles distant from my home QTH, could I possibly register a signal on his SDR? I haven't been able to see myself in his waterfall display yet but I will keep trying!

Iceland is a very curious place to listen. I hear a multitude of amateur radio stations from Germany, France and the United Kingdom. Medium wave reception features a blend of stations from along the entire

Iceland sits in the middle of the North Atlantic Ocean.

west coast of Europe and beyond into Arabia combined with some stations from Atlantic Canada and the coastline of the United States. For instance, I heard 1500 kHz WFED Washington, DC during my first browse of Thor's SDR.

Another excellent SDR found on sdr.hu is located in Carlow, Ireland. This is a great location to hear familiar broadcast stations from Europe, the Middle East and Africa. If you tune in during our American afternoon, dial up the low bands (40, 80 and 160 meters) and enjoy all sorts of amateur radio DX traffic.

There are many, many types of software defined radios. Some are just a simple magical card that you can install into a desktop computer. Some are self standing rigs with direct connection to an Internet link. Some are accessories to laptop computers. SDRs are not your father's or grandfather's radio! They are sophisticated and agile broadband receivers that are intended to amaze!

If all of this were not enough, consider another possibility with SDRs. In this age of terabyte hard drives, the entire spectrum received by SDRs can be recorded for endless replay and review. If you witness a huge shortwave or FM DX opening, you can record the entire event and then pore over the results, frequency by frequency, at your leisure. The on-screen waterfall display will show you where the strongest signals appear at any given moment.

This article is written only to pique your interest. There are many, many different SDRs available and a multitude of techniques, modifications and add-ons to become familiar with. The sdr.hu site concentrates on the very popular Kiwi SDR card. Answer all of your Kiwi questions by visiting http://kiwisdr.com/. A recent addition to the fray is the ELAD FDM-S3 announced last year. Take a look at their entire line at http://www.elad-usa.com/. Very popular with the broadcast DXer crowd is the Perseus SDR considered one of the very best SDRs available. See it at: http://www.ssbusa.com/perseus.html.

Elad FDM-S3 has a 24.576 MHz I/Q stream and allows the whole 88-108 MHz FM Band to be sampled.

Give SDR listening and operating a try! No application or additional software is necessary to operate the receivers available at sdr.hu.

Perseus SDR covers 10 kHz - 30 MHz.

Simply go to the site and click a link pointing to the receiver of your choice. You will understand my fascination with this technology immediately. Happy trails and good DX de N2KZ 'The Old Goat.'

Repeater move

Readers of the *PCARA Update* newsletter may recall that in April 2017 the N2CBH UHF repeater on 448.725 MHz was moved to a new site courtesy of Barry, K2BLB. The Yaesu Fusion DR-1X repeater gave a very good account of itself throughout 2017, with much improved coverage.

In February 2018 access to the repeater suddenly became a lot more difficult and the transmitted signal was very low. Bob N2CBH paid a visit to the site on February 25 and diagnosed a problem with the antenna feeder or the antenna itself. The repeater was switched off to avoid damage.

A good deal of other tower work has been taking place at the repeater site. On May 5, 2018 Bob paid another visit, checked the antenna connection once again, and unfortunately noted no improvement in the high VSWR. PCARA's repeater equipment was therefore removed and is currently operating from a temporary site courtesy of Bob, N2CBH.


Bob re-checks operation of the N2CBH UHF repeater just prior to relocation on May 5, 2018.

In case you want to check access at the new location, parameters for the N2CBH repeater are — output frequency 448.725 MHz, offset -5.00 MHz, PL tone 107.2 Hz.

Spring Foxhunt 2018

Friendly foxes

During PCARA's fall Foxhunt of September 2017, first place had been awarded to the guest team from **Candlewood** Amateur Radio Association, based in Danbury, CT. CARA's Vice President **Jay** N1NRP and **Marlon** KC1EHW were first to find the PCARA fox, who was hiding out at Charles Point Park, overlooking the River Hudson.

Since then, Candlewood ARA's interest in Foxhunting has grown. Karl N2KZ gave an encore presentation of his "Foxhunt University" to CARA at their October 13th meeting. On October 21, CARA held a workshop to construct tape-measure Yagis, with outdoor barbecue and encouragement from visiting PCARA members. A live foxhunt took place on November 12, followed by socializing at a Danbury diner. (Does any of this sound familiar?)

L to R: At the October meeting of CARA, Al K2DMV presents Marlon KC1EHW and Jay N1NRP with their certificate for first place in PCARA's fall Foxhunt of 2017. [K2DMV pic.]

PCARA's latest foxhunt was organized for Saturday May 12, 2018, during *CQ Magazine* Foxhunt Weekend. Since the first competitor to find the fox is invited to assume the role for the next event, an invitation had been sent to Jay, N1NRP asking if he would like to revisit Peekskill/Cortlandt on May 12. Jay's answer was "yes", once again accompanied by Marlon KC1EHW.

A few days before the event, Jay consulted PCARA's President Greg, KB2CQE in order to select a suitable location for the fox's lair and to decide on a nearby diner. As Greg was now privy to confidential information he planned to stay away from hunters and would keep the CARA foxes company at their secret rendezvous.

Hunters from home and away

Saturday May 12 began cool and overcast, with a rainy morning. Fortunately the worst of the rain stopped around noon, with just a hint of 'Scotch mist' as hunters began arriving at the Beach Shopping Center around 2:20 p.m. Representing PCARA were Karl N2KZ with daughter Laura, followed by Mike N2EAB, plus your editor, who was busy signing in the other competitors. (We also had a visit from Jake, KD2MVN who came by to express interest in the proceedings.)

A large contingent of guest hunters came in from Connecticut. Teams representing CARA included David KB1LTW with Ken NE1CU; Jeff KB1MZL with Lawrence AB1JC plus Charles KC1IBR with David KB1ZAC.

One of the first guest hunters from Connecticut at the Beach Shopping Center was Lawrence, AB1JC.

Some interesting antenna designs were on view, including an Arrow II 146-3 portable 3-element Yagi with removable elements made from aluminum arrow shafts in anodized purple finish. (See: http://www.arrowantennas.com/arrowii/146-3ii.html.) David KB1LTW had an Elk Antennas 2M/440L5 5-element log-periodic Yagi which covers both 146 and 440 MHz. This was mounted on a length of PVC pipe poking through the sunroof of his vehicle. (See: https://elkantennas.com/product/dual-band-2m440l5-log-periodic-antenna/)

David KB1LTW adjusts his sunroof-mounted log-periodic by Elk Antennas shortly before the hunt.

They're off. Or are they?

A few minutes before 3:00 p.m. the fox appeared on 146.565 MHz with the first transmission, lasting five

minutes. Jay N1NRP and Marlon KC1EHW were taking turns with the microphone, keying the transmitter for short periods as they talked, rather than leaving the carrier on continuously. The signal was reasonably strong at the Beach Shopping Center and alert hunters began swinging their antennas around for the best direction. Maximum signal appeared to be coming from due east.

Some of the guest hunters were so engrossed in discussions that they failed to notice the early start to the fox's first appearance on-air. Five minutes later at approximately 3:02:30 p.m., the first transmission ended — your editor shouted to the unwary that they could move off now — and if they had missed taking a bearing, the suggested direction was roughly 110 degrees.

Map shows locations featured in PCARA's Spring foxhunt, starting from the Beach Shopping Center at left and ending just east of the Taconic SP at right.

After the fox

Mike N2EAB told your editor that he set off down Route 202 making a first stop at Toddville Plaza for the next fox transmission, lasting just 3 minutes. He then proceeded to Walter Panas High School to obtain a cross bearing. Next stop was the BJ's parking lot on Route 202. Mike crossed under the Taconic State Parkway then turned left into Strang Boulevard. From there he entered the Mercy College parking lot and looking around, found some interesting vehicles at the highest point of the lot, 520 feet above sea level. Mike's time to find the fox was 39 minutes.


Mike N2EAB (right) was first to find the foxes, played by both Jay N1NRP (left) and Marlon KC1EHW — seen operating inside Jay's vehicle. [KB2CQE pic.]

Your editor followed a similar route eastward, but with more stops than Mike. My second bearing was taken just off Route 202 to confirm the direction. This was followed by a visit to Lincoln Titus Elementary School. Both Walter Panas and Lincoln Titus schools have been employed by PCARA foxes in the past. Next stop was at the Yorktown Golf and Baseball Center, near the intersection of Route 202 and Lexington Avenue. With my beam still peaking east, Marlon KC1EHW was reading out material about the history of Peekskill and Cortlandt — but with no obvious clue to the fox location. Continuing eastward, my next stop was at Old Crompond Road, near 'Signs Ink'. The signal was really strong now, and I needed an additional 10 dB attenuator to augment the switched 22 dB attenuator in the antenna lead. The direction to the fox was now northeast, indicating a location on the other side of the Taconic State Parkway.

I followed Mike's route into Strang Boulevard and copied the 3:50 p.m. transmission from the north end of the Mercy College building. By now, the heading had swung around to west of south so I continued round to the main parking lot behind the Northern Westchester Executive Park building. Tucked away in the southwest corner, looking over the Taconic State Parkway, I saw Greg's Subaru alongside Jay's vehicle. The fox antennas were mounted horizontally on the southern side of Jay's GM Equinox.

As I left the fox location, I spotted David KB1LTW's vehicle just turning into Strang Boule-


Malcolm, NM9J found the foxes in the Northern Westchester Executive Park at 3:55 p.m. [KB2CQE pic.]

vard from Route 202. David's team had been taking a grand tour of FDR State Park, on the south side of Route 202. (One of the FDR parking lots was previously used by Mike N2EAB for hiding the fox in 2016.)

David KB1LTW, assisted by Ken NE1CU found the foxes at 4:12 p.m. [KB2CQE pic.]

Another echo of the 2016 hunt was subsequently voiced by Karl N2KZ. On that previous occasion, many hunters had worked their way from the Beach toward Mohansic Golf Course, with very strong signals coming from the direction of FDR State Park. Unfortunately, the Taconic State Parkway acts as a physical barrier, and prevented any hunters from reaching the park in time. Two years later, with the 4:30 p.m. end time approaching, Karl and Laura were searching Quarry Drive, off Stoney Street, north of Route 202. Karl found very strong signals coming from the southeast, but with precious little time to cross the Taconic State Parkway and explore the Executive Park.

Entrance to Northern Westchester Executive Park/Mercy College off Rt 202.

Hunt over

As I left the Mercy College campus, Jay and Marlon were giving a clue to their location. "A little hint — we are in a place where they have higher education." At 4:30 p.m. Jay declared the hunt over, announced the winners and advised hunters to meet at the **202 Diner**, located at 3825 Crompond Road. Here is Jay's listing of hunters and teams who found the fox:

Posn.	Time	Hunter/team
1st	3:39 p.m.	Mike N2EAB
2nd	3:55 p.m.	Malcolm, NM9J
3rd	4:07 p.m.	David KB1LTW, Ken NE1CU
4th	4:12 p.m.	Laurence AB1JC, Jeff KB1MZL
5th	4:30 p.m.	Karl N2KZ, Laura

Refreshment time

Participants began arriving at the 202 Diner from around 4:15 p.m. I asked for a table to seat six to eight people — but more and more participants began arriving, so extra tables had to be added. The total number of hunters, foxes and assistants was **twelve** — possibly a record for a PCARA *après-hunt* activity. Notes were compared, routes were recalled and antennas were evaluated. The certificate for first place was awarded by Jay and Marvin to **Mike N2EAB**, then some excellent food from the diner was consumed by hungry hunters.

A large party of foxes and hunters from CARA and PCARA joined together at the 202 Diner to compare notes. Karl and Laura are in the foreground

First place certificate was awarded by Marvin and Jay to Mike N2EAB (left).

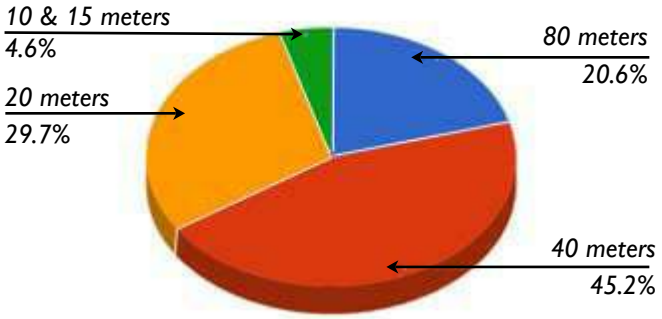
Thanks to all who took part, especially to our guest foxes and to the sizeable contingent of hunters from Connecticut. Despite being on unfamiliar ground, they made great efforts to find the Candlewood foxes.

Here's to next time when Mike N2EAB will be invited to play the fox.

- NM9J

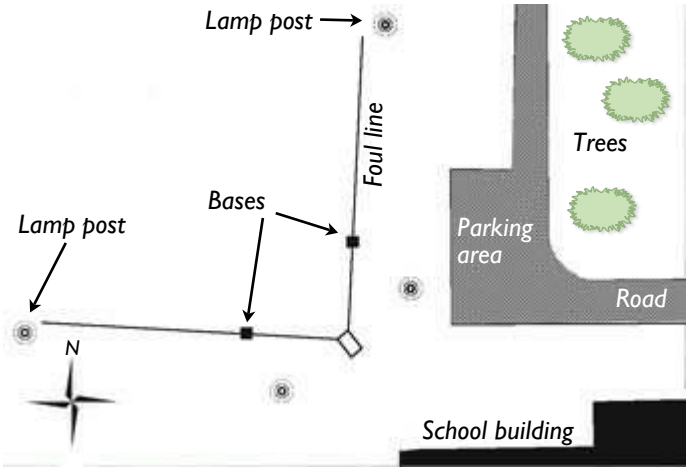
A closer look at 40 meters on Field Day - KD2ITZ

Heat, rain, wind, and lightning are dangerous threats to PCARA's Field Day. While the weather conditions in the Hudson Valley are unpredictable, the solar conditions in the last few years have been consistently difficult for HF propagation. During the 2017 Field Day, less than 5 percent of the HF QSO's were on frequencies above 21 MHz. Nearly half of the HF contacts were made on one band: 40 meters. This popular band is active 24 hours a day, despite the scarcity of sunspots. Although hams can't change the weather, PCARA can improve its 40 meter operation.



PCARA Field Day QSOs 2017. Most HF activity was on 40 meters. (147 out of 715 QSO's).

Most readers are familiar with the layout of the club's station surrounding the baseball field at Walter Panas High School. The location offers high ground and tall lamp-posts to support antennas.

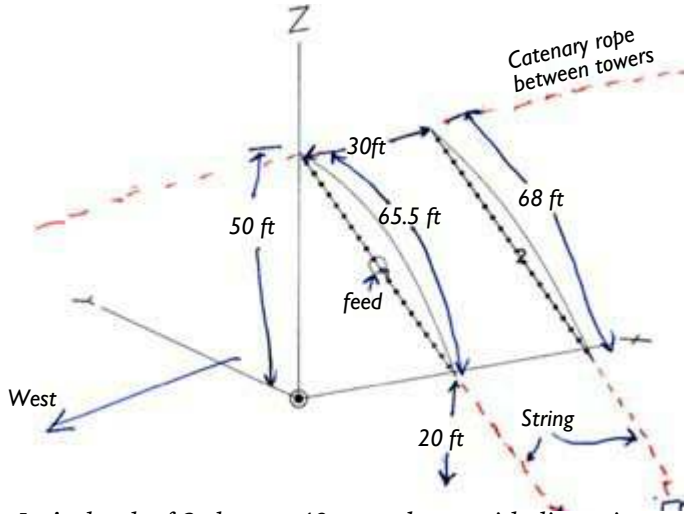


High School campus map Circles denote location of light-posts. The lights along the base lines are approximately 150 feet apart, while the lights over the batter's box are about 120 feet apart.

In 2017, PCARA operated a G5RV dipole which ran roughly north-south, parallel to the first base line. A fan dipole was placed northeast-southwest, above the batter's box.

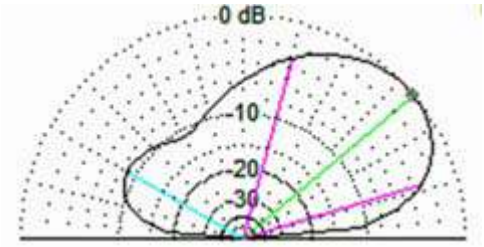
Field Day 2017. Note position of fan dipole and G5RV antenna, emphasized in white. [Pic NM9J]

PCARA has recently welcomed Jay NE2Q at several club activities. He has a lifetime of experience in amateur radio and has enjoyed a successful career in electronics design and manufacture. Jay has built numerous Field Day stations as the former president of the Greater Norwalk Amateur Radio Club. He was invited to offer suggestions for the upcoming PCARA Field Day at Panas. Many antenna configurations are possible at the site, but wires directly over the baseball diamond must be avoided in case a game is scheduled during our event. Jay emphasized the importance of operating 40 meters and maximizing signals to the west where most of the other stations will be located nationally. He proposed a 2-element 40 meter wire beam pointing west with 7.7 dB of gain at 40 degrees elevation.



Jay's sketch of 2-element 40 meter beam with dimensions.

A catenary rope can be suspended in a roughly east-west axis, between the light-posts along the third base line. The 68 foot reflector would be spaced 30 feet from the driven element. One end of the antenna elements would be affixed to the rope, and the other ends would slope down into the field behind the base line. Several PCARA members have discussed moving the

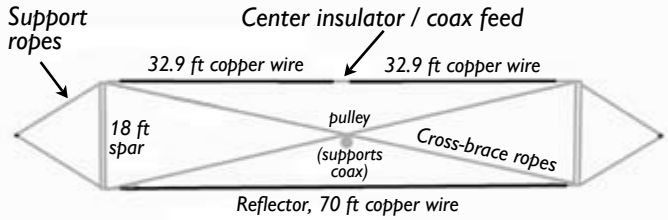


EZNEC+ elevation plot for 2-element beam on 7.15 MHz calculated by NE2Q. Max gain 7.7 dBi at 40° elevation.

operating position to this field, taking shelter in tents instead of vans. Unfortunately, the far post is situated behind a fence on ground that is overrun with thorn bushes making the rope placement for the NE2Q beam very difficult.

An alternative site for a 40 meter antenna would be the location of last year's G5RV, north-south along first base. One of the most compact beams is the Moxon Rectangle, which is comprised of two folded elements. Malcolm NM9J published an excellent article describing this design in the October 2016 *PCARA Update* newsletter. L. B. Cebik W4RNL encouraged hams to build wire Moxons for Field Day operation in the June 2000 issue of *QST*. A 40 meter Moxon would measure 51 by 18 ft. Cebik advised mounting antennas of this size at all four corners. This may be possible at Panas. The light-posts can support the driven element and the trees to the East can support the reflector.

Our Connecticut neighbors at the Stamford Amateur Radio Association do operate a 2-element 40 meter wire-beam, but unlike Cebik, support it from only two masts. Andrew N2CN describes this ingenious Yagi in the June 2018 issue of *QST*. A driven element and a 70 foot reflector are spaced 18 feet apart and supported by two spars. The spars are cross braced with Dacron rope and the feedline is secured by a pulley at the intersection of the bracing. The ends of each spar are harnessed to a single tie point on each side. At a total length of 95 feet, the antenna is well suited to the position where PCARA's G5RV was placed along first base.



N2CN 40 meter Yagi. Driven element and 70 foot reflector are spaced 18 feet apart and supported by two spars.

These three designs are by no means the only ways to improve the PCARA Field Day station. All participants are encouraged to take a second look at Walter Panas High School. Perhaps it will lead to new innovations that would be admired both by the the operators of the club's station and the editors of *QST*.

– Lou, KD2ITZ

Daffy ducks and wiry whips

Best antennas from 2003. L to R: IC-Z1A stock, Pryme RD-98, MFJ-1712 ¼-wave telescopic and ½-wave telescopic.

Long ago and far away

An article in the June 2003 edition of *PCARA Update* compared the performance of rubber-duck and whip antennas for dual-band handi-talkies. Most HT antennas of the time had **BNC** connectors for use with the typical Icom, Kenwood and Yaesu radios of 15-20 years ago.

Looking back at the recommendations from 2003, the four best antennas were the stock whip supplied with a Yaesu IC-Z1A, the Pryme RD-98 flexible whip, the MFJ-1712 ¼-wave telescopic antenna and a generic ½-wave telescopic antenna, similar to the mono-band MFJ-1714.

Modern whips

Coming up-to-date, the amateur HT world has changed significantly. Digital voice modes such as DMR, D-Star and C4FM are all competing with analog FM. Modern HT designs from Japanese manufacturers have shrunk in size and changed from BNC to SMA connectors, with a conventional male SMA at the base of the antenna. Low-cost Chinese handi-talkies have been taking market share away from the big three Japanese manufacturers. Chinese radios employ a *reverse-polarity* SMA connector with a female 'socket' at the base of the antenna.

Apart from the connector, basic antenna design for hand-held transceivers has not changed much since 2003. Some brands such as Pryme and TSC are no longer available. But Comet, Diamond and Opek are still going strong, with many of their earlier designs still current.

Testing technique

The previous article attracted some criticism suggesting my antenna testing technique was flawed — sadly I do not have a professional antenna testing range nor professional grade test equipment for absolute measurement of field strength. I was just using available amateur radio test equipment to compare relative performance.

Cracking whips

I have a collection of duck and whip antennas for handi-talkies and scanners fitted with BNC or SMA connectors. Each antenna was first evaluated while plugged into an MFJ-762 step attenuator. This device has 50 ohm BNC sockets at each end, and offers attenuation levels of 0-to-81 dB in 1 dB steps. My original plan was to use the attenuator to compare receive performance of each antenna but this approach did not work out in practice.

MFJ-762 step attenuator.

Instead, I used the MFJ-762 as a fixed **support** for the antennas during SWR and field strength tests. The MFJ-762 is roughly the size of a large handi-talkie and it could be clamped vertically for consistent measurements. Multiple ferrite chokes were arranged around the coaxial cable at the bottom end to prevent the cable acting as part of the antenna system. Bear in mind that when using a hand-held transceiver, **you** become part of the antenna system as RF energy is coupled through the case into your hand and arm.


MFJ-762 as support for testing dual-band HT antennas. (Keep attenuation at 0dB to avoid damage.)

I used a Daiwa dual-band power/SWR meter to measure SWR as each antenna was fed with a steady carrier on either 146.565 or 446.000 MHz. The resulting signal strength was measured using simple absorption wavemeters located nearby.


Daiwa CN-465M cross-needle SWR/power meter for 146 and 440 MHz.

As a separate step, resonant frequency and complex impedance were measured with the antenna plugged *directly* into an MFJ-259 SWR Analyzer using a suitable adapter. VFO frequency was adjusted for minimum SWR in the region of 146 MHz, then the frequency was noted. The complex antenna impedance in ohms was recorded at a fixed frequency of 146.5 MHz.

Results

1. Antennas with BNC connectors.

Resonant frequency / impedance (146.5) / whip length

	Reson f MHz	Imped Ω	Length inch
BC125AT rubber duck	164	200	6¼"
Icom IC-W32 stock antenna	146	40	8"
Quarter wave home-brew	146	40	19½"
Comet BNC24	151	52	16¼"
Diamond RH77CA	152	49	15"
MFJ-1712 ¼-wave	139	80	19"
½-wave type	145	70	42"
Opek HR-12	152	55	15¼"

SWR and relative Field Strength (146/446 MHz)

	SWR 146	FS 146	SWR 446	FS 446
BC125AT rubber duck	4:1	1	2:1	2
Icom IC-W32 stock antenna	1.1:1	7	1.8:1	6
Quarter wave home-brew	1.0:1	9	1.0:1	7
Comet BNC24	1.2:1	10	1.1:1	5
Diamond RH77CA	1.2:1	9	1.0:1	5
MFJ-1712 ¼-wave / 5/8	1.0:1	10	1.7:1	7
½-wave type	1.0:1	4	2.5:1	1
Opek HR-12	1.2:1	10	1:1	6

2. Antennas with SMA connectors.

Resonant frequency / impedance (146.5) / whip length

	Reson f MHz	Imped Ω	Length inch
Yaesu FT-70R stock antenna	141	500	7"
Comet SMA503	156	10	8½"
Diamond SRH519	146	55	8¼"
Comet SMA24	149	60	16"
Comet SMA24J (female)	148	48	15"
Kenwood THF-6 stock ant	146	48	7¾"

SWR and relative Field Strength (146/446 MHz)

	SWR 146	FS 146	SWR 446	FS 446
Yaesu FT-70R stock antenna	3:1	2	1.5:1	5
Comet SMA503	2.5:1	5	1.2:1	5
Diamond SRH519	1.1:1	6	1.2:1	5
Comet SMA24	1.1:1	8	1.1:1	5
Comet SMA24J	1.1:1	8	1.1:1	4
Kenwood THF-6 stock ant	1.1:1	6	2.5:1	1

Antenna notes

The 'rubber duck' used in the BNC tests was *not* designed for 144/440 MHz. It is the stock antenna supplied with a Bearcat BC125AT scanner, consisting of a wire helix covered with synthetic rubber (neoprene).

Resonant frequency for this 'duck' was the highest of all the high-band antennas tested so it is hardly surprising that performance in the amateur bands is relatively poor. Conclusion — don't use a rubber duck intended for frequencies well outside the amateur band!

Flexible antennas with BNC connectors included in the test. L to R: BC125AT duck, Icom IC-W32 stock, Comet BNC24, Diamond RH77CA and MFJ-1712.

Even when a helical antenna *is* designed for 144 MHz, frequency response is narrow, resonance is affected by closeness to the body and impedance can be unpredictable on a hand-held radio.

Flexible antennas with SMA connectors included in the test. L to R: Kenwood THF-6 stock, Diamond SRH519, Comet SMA503, Comet SMA24J and SMA24.

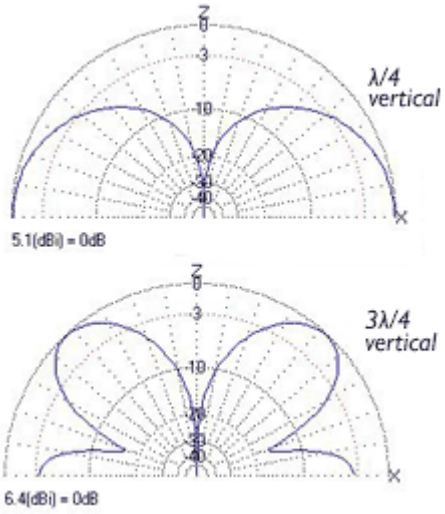
For operation on 2 meters *only*, a quarter wave whip roughly 19½" long is a good HT antenna. Impedance will be approximately 36Ω but the match to a 50 ohm feed can be improved by extending the antenna slightly. The home-brew quarter wave whip and the MFJ-1712 telescopic antenna both had good performance.

Our flexible friend

One problem with a telescopic antenna is the lack of flexibility and likelihood of damage when hitting other objects. You can purchase *highly flexible* quarter wave whips for 2 meters from Richard, KD7BBC at https://signalstuff.com/ . These antennas are made from **nitinol** nickel/titanium alloy (NiTi), covered in heat-shrink polymer. The surprisingly flexible and resilient nitinol alloy has a 'shape memory' effect which has proved useful in aerospace and medical applications. Another use — under the trademarked name 'Flexon' — is in flexible eyeglass frames.

Super-elastic Signal Stick ¼-wave antenna with BNC connector. (SMA is available.)

For dual-band handi-talkies, a quarter wave antenna for 146 MHz will provide a better match to 50 ohm feeder at *three times* the frequency, or 440 MHz. At the higher frequency, the antenna acts as a ¾-wave vertical with maximum radiation going upwards at roughly 45 degrees. This may or not be a problem depending on terrain. On test, my quarter wave 2 meter whip performed quite well on 440 MHz.



Elevation plots for ¼-wave vertical antenna (top) and same antenna used at 3× frequency — where it becomes a ¾-wave (below). Note the high-angle radiation from the ¾-wave. Software for plots: MMANA-GAL.

Quarter wave improvement

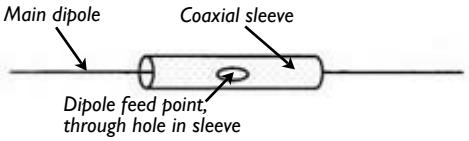
That theoretical elevation plot for a ¾-wave vertical antenna may look problematic but bear in mind that it will also be influenced by the size of the HT, by orientation of the antenna and by proximity to the user's body.

Fortunately, there are a couple of ways to *improve* the elevation plot for a ¾-wave antenna. One method is to coil up the first ⅛-wave at the bottom end of the vertical whip into a series inductor. This results in a base-loaded ¼-wave vertical at 146 MHz and a ⅝-wave antenna at 440 MHz. The ⅝-wave design concentrates RF energy at a low angle. This is the approach used in the MFJ-1712 telescopic antenna which acts as a ¼-wave on 2 meters and as a ⅝ -wave on 440 MHz. This same principle is used in

5/8-wave mobile antenna with series inductor at the base.

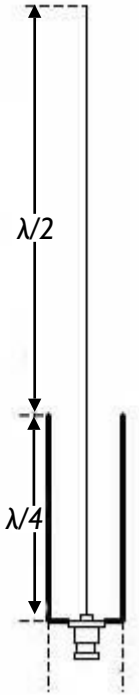
some short, dual-band mobile antennas.

Another method of optimizing a ¾-wave whip involves a **sleeve** antenna, derived from the coaxial-sleeve dipole. The dipole antenna shown alongside has a coaxial sleeve around the middle of the half-wave central dipole. The sleeve couples to the inner radiating element and provides an additional resonance at a higher frequency, dependent on sleeve and element dimensions.



Horizontal coaxial sleeve dipole, resonant on more than one frequency.

If we take one half of a coaxial sleeve dipole and turn it around so it is vertical, the result is known as a ***sperrtopf*** antenna (German for *choke-pot*) or a ***fietspomp*** antenna (Dutch for *bicycle pump*). When the design is applied to a 144/440 vertical whip antenna, the first quarter wave (at 440 MHz) of the whip is surrounded by a coaxial shield, connected to 'ground' at the lower end only. On 146 MHz, this antenna acts as a shortened quarter wave. On 440 MHz, the open ended sleeve cancels radiation from the lower part of the antenna, leaving just the top half-wave to radiate. The sleeve also matches the high impedance of the exposed half wave to the 50 ohm coaxial feedpoint. When correctly-matched, an end-fed half-wave vertical antenna is highly efficient. German constructors like to build these antennas using a **beer can** for the sleeve *(bierdosenantenne)*. When mounted outdoors, an insulating cover is required over the open top of the beer can to keep rain and bugs out.



'Sperrtopf' vertical antenna with open-top sleeve.

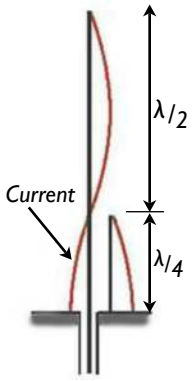
As far as I can tell, this sleeve approach is adopted in the Comet BNC24 / SMA24 and Diamond RH77CA / SRH77CA antennas. The clue is in the slight **bulge,** in the first 5-6 inches of the 15-16 inch long whip antenna. A significant difference between the Comet and Diamond antennas is wire thickness. The Comet antenna uses flexible eyeglass wire (like the Super-elastic Signal Stuff antennas) while the Diamond antennas have a much thicker radiating element similar to coaxial cable, putting more strain on the connector when waved about. Diamond actually describes their antenna as a: '¼-wavelength (2m), ½-wavelength radialless (70cm)'. In addition to amateur transmission on 2 meters and 70 cm, Diamond recommends this antenna for wideband scanner reception within the mobile radio bands between 120 MHz and 900 MHz.

Bierdosen-antenne.

Slight bulge in Comet BNC24 whip.

I carried out an experiment with my home-brew quarter wave whip antenna, adding an open sleeve over the bottom 4½" of the whip using braid stripped from a length of coaxial cable, insulated by polyethylene foam stripped from the same cable, with the braid connected to the shell of the BNC plug at the base. Performance was similar to the Comet BNC24 antenna — though appearance was not as pretty.

The open sleeve design makes another appearance in the **J-antenna**, where the coaxial matching sleeve is changed to a ¼-wave of open wire transmission line. This matching stub may appear as a short rod alongside the main radiating element, grounded at the bottom end.



J-antenna

Conclusions

The best overall choice of duck or whip antenna for a dual-band HT is not so different from the results of June 2003. Performance of radio manufacturers' stock antennas and other short antennas (6"- 8" long) can be variable, though the Icom stock antenna seems better than most. An improvement over these short radiators can be obtained with antennas that are roughly ¼-wave long on 2 meters such as the 19½" whip, the Comet BNC24 / SMA24 (which is a modern equivalent of the older Pryme RD-98 flexible whip) and the somewhat thicker Diamond RH77CA / SRH77CA. The MFJ-1712 telescopic antenna is also a good performer with dual-band handi-talkies, radiating efficiently on both 146 and 440 MHz. - NM9J

Best dual-band HT antennas of 2018. Top to bottom: Icom stock whip, MFJ-1712 telescopic, Diamond RH77CA and Comet BNC 24. SMA versions are also available.

Peekskill / Cortlandt Amateur Radio Association

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Archive: http://home.lanline.com/~pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place the first Sunday of each month* at 3:00 p.m. in Dining Room B of NewYork-Presbyterian/Hudson Valley Hospital, Rt. 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. *Apart from holidays and July/August break.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Sun Jun 3: PCARA meeting, NewYork-Presbyterian /Hudson Valley Hospital, 3:00 p.m.
Sat Jun 16: PCARA Breakfast, Turco's, Yorktown Hts. 9:00 a.m.
Sat/Sun Jun 23-24: ARRL Field Day, Grounds of Walter Panas High School.

Hamfests

Sat May 26: Bergen ARA Spring Hamfest, Westwood Regional HS, 701 Ridgewood Rd, Township of Washington, NJ. 8:00 a.m.
Sun Jun 3: Mt Beacon ARC Hamfest, Employee Rec. Center, 83 Red Schoolhouse Rd., Fishkill, NY. 8:00 a.m.
Sun Jul 1: Metro 70cm Network Hamfest, Knights of Columbus, 139 North Broadway, White Plains NY. 9:00 a.m.

VE Test Sessions

Jun 3: Mt Beacon ARC Hamfest, Employee Rec. Center, 83 Red Schoolhouse Rd., Fishkill, NY. 9:00 a.m.
Jun 10: Yonkers ARC, Will Library, 1500 Central Park Ave, Yonkers NY. 1:00 pm. Pre-reg. John WB2AUL, (914) 969-6548.
Jun 14: WECA, Westchester Co Fire Trg Center, 4 Dana Rd., Valhalla, NY. 7:00 p.m. S. Rothman, (914) 949-1463.
Jun 18: Columbia Univ ARC, 531 Studebaker Bldg, 622 W 132nd St, New York. 6:30 pm, Alan Crosswell (212) 854-3754.
Jun 23: PEARL Field Day Test Session, Sycamore Park 790 Long Pond Rd, Mahopac NY. 10:00 a.m. Michael Troy (845) 225-4650.

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