The SPARC NEWSLETTER
April 2026

A publication of the Southern PA Amateur Radio Club

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Fox Hunting Failure

by
W3IHM

One thing that used to help regulate the ham bands from excessive unlicensed operation, was the relatively difficult way of getting on the air in any fashion. Transmitters and receivers had to be built, stolen (!), or cost lots, and then the skill of actually operating was not trivial. This required a bit of determination and discipline of learning. Most people just did not “pop” on the air by waving a pile of cash. For instance, to get on 2 meter FM in the early 1970’s usually required someone to convert a used commercial rig, or spend big bucks on the few transceivers available. At the minimum, you had to at least find out what local repeaters existed, then purchase and install crystals for that frequency. Vendors also “scrutinized” customers, like asking what your call was, or who your Elmer is. Any QRM was probably limited to a ham gone awry. Not so anymore.

With the proliferation of ultra cheap, easily procurable FM transceivers on the market, QRM and jamming will inevitably become more and more of a thing for us hamsters to reckon with. On the local level, any kid can get on line, and buy a swell walky-talkey for like $20, and start to listen to things. It’s not just FM. GPS and cell phone jammers are readily available on your favorite web site. Sooner or later, easily-bought things will transmit, license or no. Realistically, being a teenage, or teenage-at-heart, Homo-Sapiens-Sapiens, they will go in for squatting on

repeaters, and jamming sooner or later.

I look at the bright side, though! At least these people are interested in radio! That's something! Maybe these will be the next bunch of radio nerds. So let us break these wild horses, and provide for the future. But first we have to catch them.

So what to do? Locally, over the past 25 years, it seems that the W3RRR and W3HZU clubs have put on hidden transmitter hunts every now and then. This past month W3RRR had one. Molly, W3NY, asked me if I was interested in hunting, so I thought why not. I had done the W3RRR fox hunt a couple times before with my daughter, Clara. She and I had some fun, trying to catch the Fox, so I was game again. Well, Clara is engaged now, and was not wanting to give up her weekend to spend with her eccentric dear old dad. It's a good thing Molly asked me!

I also had some past history of QRM and jammer hunting back in the mid 1970's in Cincinnati,

so I wanted to regain some of that past youthful skill. But being realistic, my last three fox hunts turned out not so successful. I came in dead last each time, so please don't expect much from me. Let me pass along what I learned though, so that maybe you will not get lost as I did. I do remember one thing: that doing fox hunting regularly can make for a skilled hunter.

Although there is plenty of gadget articles, there are paltry few articles I could find that help a person understand *what* is happening with the radio signals on their way to our receivers. So I mean to notate that here. I am not a good fox hunter, so I am not passing along any secret techniques, but more so, I am just opening up my notebook and sharing some of my observations with some who may care. I also hope to lure a few in who are shy.

From my past article searches, I have come across all kinds of information on building various magic gadget devices to help in finding signals out in the wild. I also notice that these mainly deal with the construction of various contraptions that will take advantage of basic radio principles to help locate the whereabouts of a theoretical fox type or QRM'mer transmission. Some of these contraptions are:

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Portable beam antennas
Loops, Adcock and other goiniometer type antennas
Two element Time Delay discriminator direction finding devices
Doppler "Scantenna" arrays
"Kracken" SDR arrays
Ancillaries, like attenuators, detectors, filters, and log amps
Any and all above, with data integrated across the web.
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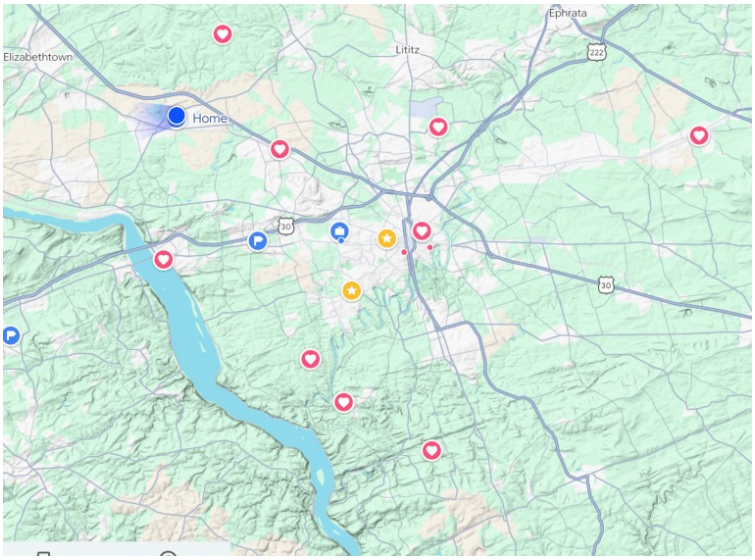
These, and other contraptions all have the goal of finding transmission bearing information, ultimately yielding location. Once various bearings are found, we can triangulate on a location. This is great, but it sometimes does not work out so easy. Oh, here's my infernal contraption I used this time. Whatever, Sam…..

It is just a yagi, and attenuator, with a smaller second harmonic yagi for "close in" use, all stuck

on a bed slat. I have never actually needed that little Yagi, though. Another one of Sam's silly ideas.

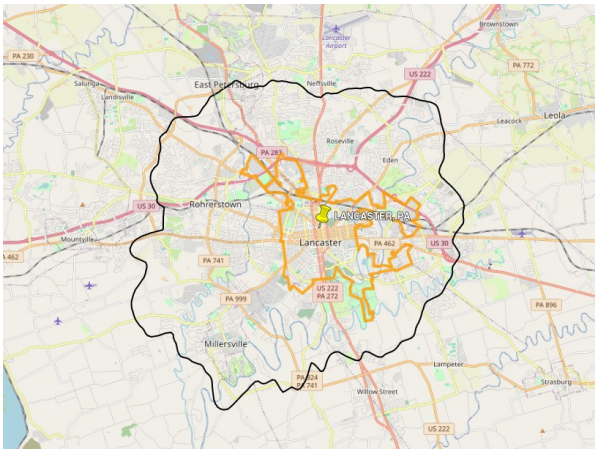
We fox hunted by driving around in a car to places we chose that might yield fox information. Molly and I would usually pull over to some high place, after consulting the Google elevation map, and pick a place to make a reading. I would break out this infernal contraption, Molly would try to hear it with her HT, and then we would sketch it on a map. This did not go as easy as all that, though.



Like, on Iron Hill, we could not get any readings at all, at first, because there is a pesky broadcast transmitter up at the park. Luckily, my old HT has a staunch front end, and diode detector in it for the S-meter, so it will peg, even if the squelch doesn't open. I saw this pegged meter, and soon realized that I had to go down one side of the hill to get a reading. Maybe I will build a RX with some serious front end and a log amp the next time. Also, this Google map is not as illustrative about elevation as I would like. So yes, your wide band SDR may not be the best thing for fox'ing on Iron Hill.

Radio signals do some exciting things sometimes. Like, by the particular characteristics of the bearing signal, we can tell a bit more about what we are hearing. First, though, we need to hear the fox. Any signal is a good signal. If you are not hearing anything, then you can deduce nothing. Having a good receive antenna is nice. Nothing beats gain. So the Yagi-Uda may be absolutely necessary in your fox finding toolbox. Little quarter waves didn't cut it most of the time. Molly could not hear anything on her HT, but the Yagi delivered.

Here's a signal map of F&M's radio station WFNM, a 100 W 89.1 MHz FM broadcast radio station, that my son talks on every Saturday. This is the traditional college radio station. The black line shows where the massive 100 watt transmitter and dipole antenna should produce a 60 uV/m signal. A strength of 60 is enough for a car AM/FM radio, the FCC supposes. So, according to the FCC, you can hear my son John around here:

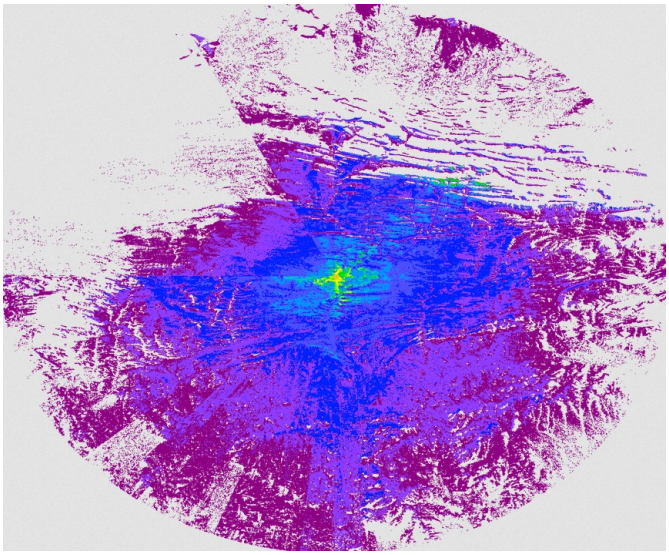


Notice it is not a perfect circle. Also, notice that Neffsville seems to be the northern limit. Down towards the southwest, though, it goes to Millersville easily. This means the terrain does something to the signal. Like what? Radio is an electromagnetic wave, so it does some things when it interacts with matter. These are:

Absorption.... (and sometimes a different re-radiation)
Transmission through....
Reflection off of...
Some of all the above at the same time.

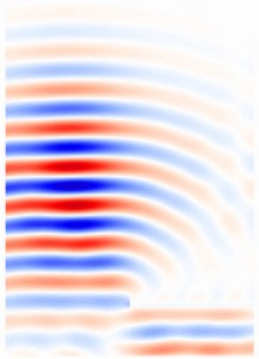
So, that means our bearing may be off when we make measurements to find our fox. This will not be so easy, then. Also, notice that the 60 uV does not come close to Mount Joy, but with my big honking FM DX yagi, on a good day, I can hear it sometimes at the W3IHM FM DX site. But other days, WFNM gets wiped out by WGMS, the 89.1 MHz classical station in Hagerstown, MD. Even with the beam, I can't put a null on Hagerstown, and still hear WFNM. So there is interference and conditions. But a sharp beam may help you fox hunt.

Look at this signal strength map for the mighty 927.9875 MHz W3IHM 33 cm repeater, that has a 30 W PA and a 10 dB gain omnidirectional vertical antenna on my chimney:

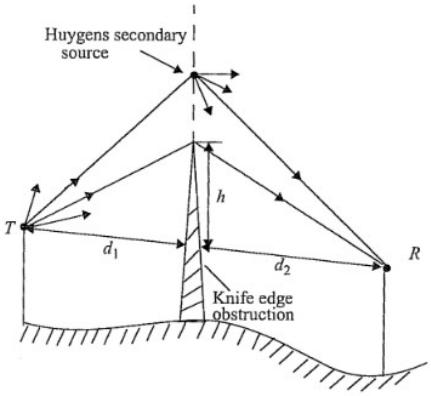


It looks like some sort of paint splotch or something, eh? (Actually, it's a 30 mile radius simulation from SPLAT) Remember that we are getting close to 1 GHz, so maybe "line of sight"? Well, not really. Each ridge will have a signal on one side, and maybe a bit on the other side. Every hole may get some RF down into it. Oh, a signal strength index is also helpful:

See how towards the north east, there is the Cornwall ridges. You may go over the ridge, and the repeater will completely drop out, but if you keep heading north to Reading, you may actually hear it again, weakly. This is called "knife edge" diffraction. See this picture of a simulation: (From Wiki)



It's like when a bright light shines around a corner, you can see some of it at the edge, even if you are completely behind the wall. That is why signals in valleys will "creep" out, even if you are below the edge. (Illus. from Prof. Sean Victor Hum)

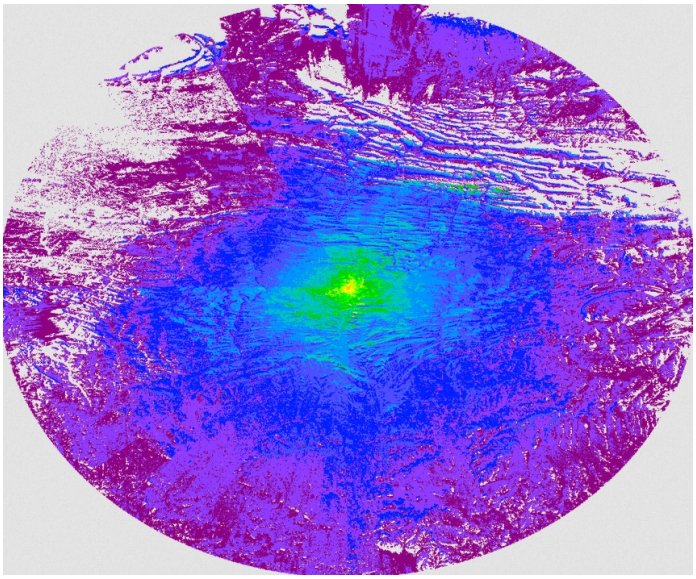


The whole edge lights up. Bearings become obscured and widen. Sure, it's better to not be in a hole, but it is not completely dismal if you are. This kind of knife edge signal will seem directionally broad, and weak, when trying to get a "fix" on it. Seeing this means that we are "between" a ridge(s) and the fox, and can only get a general direction for us to use. The yagi sharp null will get broad. I noticed this, but kept dismissing it then. Now, post-facto, I realize

what I was seeing. Whoops.

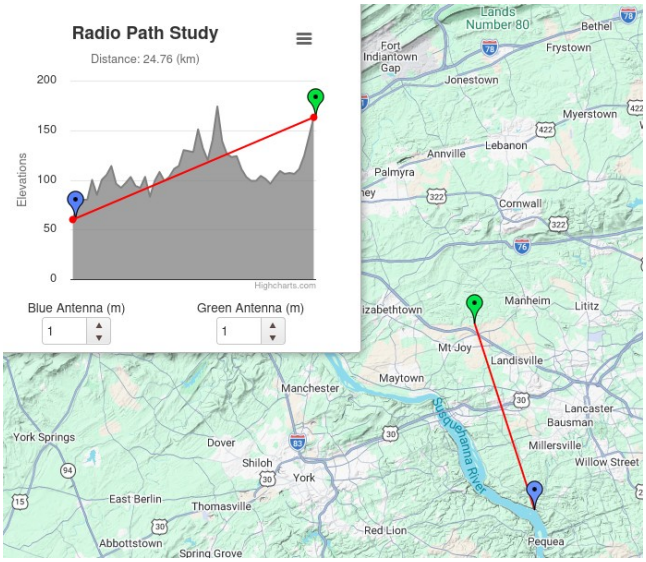
Also, notice how the strength dies off gradually around the corner? And notice the “curve” in the lines. So peaking your beam or maximizing your SDR direction on this will probably throw your phase or time delay measurements off. It means that the signals will “bend” around objects, making you wonder what is up. Now, looking back, I can see that I needed to pay *much more* attention to how broad the signal peak was on our little Uda-Yagi or loop antenna.

Since these SPLAT simulations are all models, or mathematically backed “pretend”, let’s just change the frequency on the mighty 33 cm repeater to 146.565 MHz, and leave everything else the same, to see what happens:

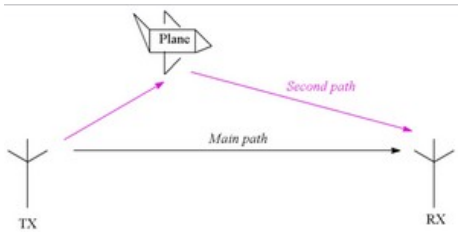


Now, a lot more signal is getting over the Cornwall ridge in the north. Since we have increased the wavelength, the ridges do not look as “tall” at this lower frequency, so more signal gets over. OK, so frequency (wavelength) matters, too. So if I learn fox hunting on one frequency, then I will probably have to re-learn somewhat, on another frequency, even if it is the same terrain.

Here’s another contour, showing an elevation contour between the Strickler Road graveyard, and the Safe Harbor bridge. This was the first place Molly and I heard the fox. Notice that once we get a little south, there starts to be lots of hills in between us. Still, I was able to hear a 1 watt fox on 146.565 MHz from this distance. Radio signals find a way sometimes.

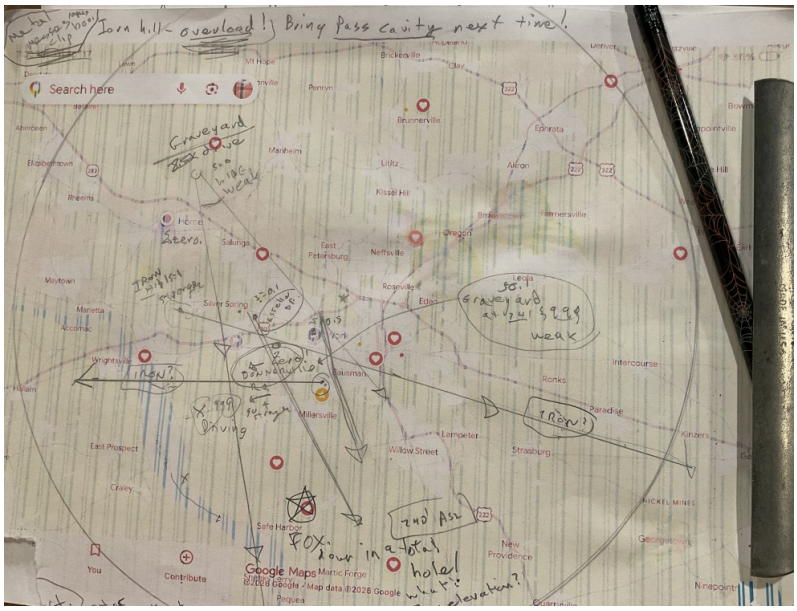


Notice that most of this contour is “underwater”, but there is a large place around the graveyard where it is above the terrain. The fox beam heading was wide and diffuse, and had some severe multi-path fading. What”s that? Well, multi-path is fading due to the signal going on, well, multiple paths. See this:



One signal path goes along the ground, but another goes via a bounce off the airplane, or whatever. These two signals meet at the receiver and sometimes form a “beat” note, because they are offset by the difference it took between them. At 2 meters, or about 6 feet, it takes only about 6.8 nS time difference for light to travel this distance. So 6 feet difference is all it takes.

Still, it was exciting to hear anything, and now that I realize how far away and ugly the RF terrain was between the fox and us, it strikes me as incredible we could even hear the fox at all from 15 miles away. This was my first bearing, and matches the actual bearing shown above. It was actually pretty good, but it was very broad, so I drew two arrows at the limits. I then plotted the bearing with a protractor, right angle, and pencil on this lousy little paper map printout. Yes, my printer is dying again.

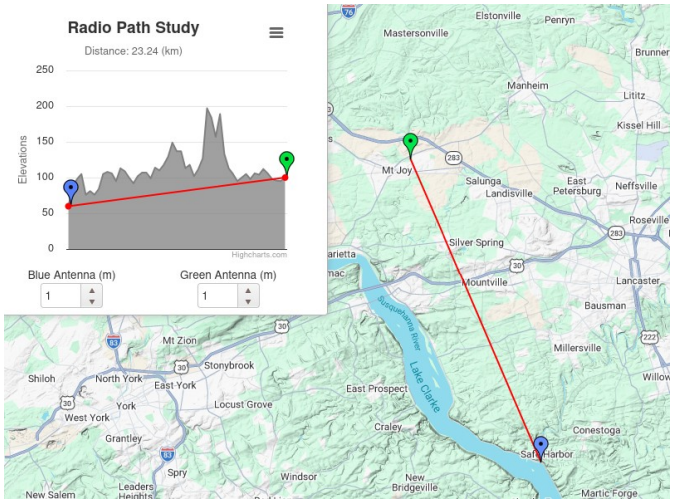


Well, after awhile, instead of using this old school protractor and paper map nonsense, I used a super fancy computer application on my Ipad that uses the Ipad's flux gate compass, integrated with a map function. It was much better on all accounts, compared to my smudged map. "Great!" I thought.

But, if you look at this picture, there is a metal clipboard clamp to hold down the paper, plus metal parts on my infernal Yagi contraption. A few times, I took bearings with the Ipad's flux-gate compass sensor right up next to this clip board metal clamp. So, a few times, I had odd directions heading east and west.

Thus, unknowingly being misled by our own equipment, Molly and I thought the fox must be somewhere between these arrows, as we had an east and then a west direction. We wasted a lot of time and expensive gasoline in this fog of confusion. Finally we noticed the sun. Wasn't it supposed to be in the west? ...Yeah. Right. Grrr….. Sometimes fancy isn't any better, only worse. Next time, I am going back to a plain old compass and paper map, and will fix my printer for a big paper map.

Here is another signal path contour simulation, this time from my front yard to the same fox on the Safe Harbor bridge. This time, I could hear nothing, from here, even though I was only 150 feet lower. I was also less than a mile from the Strickler Road graveyard, but the terrain was enough to completely block out any signal. Notice that everywhere is uphill from my front yard. Yes, I do live in a hole, but some metal tower, or even climbing up on my roof can help and make up for this.



So it does not have to be line of site, but elevation helps. One time, we were on Estelle Drive, and could hear the fox strong, even on Molly's HT. We figured it was just south of us, so we went down to Donnerville, and NADA! What happened to it? We were in a valley. That threw us. We were on a general trend of getting stronger signals, then nothing. What happened to the fox? Did they turn it off?

About this time, We started to suspect our wonderful compasses.

We headed towards Bausman, and found it's signal at the corner of 741 and 999, but it was no stronger in the big graveyard there. Still, it seemed to beckon southward, so we headed out 999. No stronger, but no weaker, so we headed down Prospect road. The further south we went, the stronger the signal seemed to get, but not that strong. When we were on River road, and could still hear the fox, that let me know it was either on the river somewhere or across it. Molly said the signal must be going up the river valley somehow. She was right, although I don't know how that would work. The river twists and turns, so how can the signal do that? Waveguide?

As we went further south, the signal kept getting stronger, sometimes coming in even when we were surrounded by ridges in all directions. I know we were finally close now. Sometimes, not, though. Even at the close proximity it was still a bit of trial and error.

We stopped trying to get directional fixes and relied only on signal strength by then. The signals were bouncing all over the place in the valleys, so it was pointless to play with the protractor and the yagis. We poked up the Turkey Hill nature preserve road, right along the river, and got a peak at the end of the road, but ran out of road, so we had to go back. Then I was looking for any parks along the river. We were sequentially checking each for a strong signal without antenna.

Creswell park? Nope. Nice ball diamond, though. Chestnut Grove? Nope. So we just kept on River road, and ended up on the Safe Harbor north side road, and could pull off the antennas

and get a signal. So we went to the end of the road, but found that was no good, so Molly said it was on the other side. She was right. Her knowledge of local roads and parks was immense. I didn't even know there was "two sides", much less, what parks down this way even existed, so she was invaluable. Google maps is definitely not better than having been down there yourself. She grew up around here. She knows. Not me. I grew up in Cincy.

Way down in the hole, along the Safe Harbor bridge, was a little green box with a quarter wave antenna poking out of it. We were the dead last hunters to find the fox. Wow. Still, I was happy to finally find it.

If you have ever been down to Safe Harbor, sit on the bridge, and look at the terrain around you. You are down in a hole! Walls are around you. Yet, that 1 watt measly signal made it all the way up north of Mount Joy, up to the Strickler Road graveyard. Impressive. What a journey! So, I can sit at the Strickler Road graveyard, and talk to someone on the Safe Harbor bridge with my little Yagi… maybe…..

OK… So why did it take 3 hours for Molly and I to find the fox? Well, because what we have **here** is called hindsight engineering. I can run contours, and signal strengths from things AFTER the fact, but when I DON'T KNOW where the signal is coming from, it becomes rather tricky to determine whether a signal is a reflection or multi-path off a high ridge, a knife-edge diffraction, or a weak one-watt signal leaking out from under a metal trash can right around the block.

Remember, we are allowed no information as to what the fox will look like, or what kind of location it is in. But, that is good. You would not be privy to this information normally.

Another note to myself is that when using a tape measure Yagi in a windy cornfield, the elements will probably collapse sometime, when aimed into the wind. Although the tape measure elements are easy to chuck in the car, next time I will have to use a solid element Yagi.

Also, next time, I will have to build up a much better RX, with a solid front end and log amp on the IF. Also, maybe bring a cavity or helical filter along, too. Oh, and compass and maps…. Yeah.

Remember, to question all of your readings. Don't just blindly read things and write them down, but reconnoiter what you are measuring to see if that actually makes any sense. I would have not wasted so much time chasing my clipboard around if I did this.

So that is some of the bits I learned from this fox hunt. It seems every fox hunt I attempt brings me more insights and knowledge. But then, a few years pass by, and I forget what I did. So this time, I am writing some of it down, so I can reference it next time the fox gets loose. I also hope you can benefit from my mistakes as well.

I like to compete in these radio things, but I also want to start everyone on a mostly level playing field. So I share what I learn. It is no victory to win against someone who doesn't even

know how to use a compass. Big deal for your ego.

Also, there is a great element of luck involved with all of this. If you happened to head out your shanty down by Safe Harbor with your Baofeng, and immediately tripped over some little fox box thingie, good for you, but you were totally lucky. Again, big deal for your stubbed toe. Lucky? Admit it. Luck is not skill. Next time it may not be the same, even if you bring your lucky magic crystals. Actually an easy fox find would not give you any practice.

Ultimately, our skill at finding a QRM source, GPS, PD, or cell phone jammer, terrorist drone control point, or a downed plane, will not improve if we stop trying to meet real challenges. EM countermeasures are becoming key to our society that relies so heavily on RF communications. This silly fox hunt game is actually really important. It is a skill that only comes through practice and training in every odd situation. Sharing what we have and learn will make us useful as a group, too. We can then be used by the greater society as a good. Let us prove ourselves. Then, viva la hamsters.

-...-

Website Updates

by
Matt, N3NTJ

Have you checked out the website lately? Supposing you wanted to see a past newsletter. Well, you are now in luck. I created a “SPARC Newsletters” page on the website and have most of the 2025 newsletters already posted. It is under the “About SPARC” tab on the website. Now, you can go back and peruse past newsletters at your leisure. That brings up another thing….

SPARC Market Place

by
Matt, N3NTJ

Do you know that you can sell things directly to the club members? Sure, but it has to be ham radio related. For instance, the new Marketplace page I created on the SPARC website already has some items. It’s for members who have stuff for sale or are looking for items. We already have three items listed. There’s a tab at the top of k3ir.org for members to easily find the page.

The club currently has these three items for sale to help pay for the solar system, and ultimately reduce our power bill. So you can buy something, and feel good about contributing to the club’s well-being, too. Check the website, for more recent items listed/sold.

1. **Tokyo HC-2000 HF Antenna Tuner.** With the price of eggs nowadays, the eggs are not included. Sorry. Tuner only. $400. For sale by SPARC. Contact Harry at **hbauderrm@gmail.com**

2. **Icom AH-4 Remote Tuner.** HF+6m. New – still in box. $425. For sale by SPARC. Contact Harry at: **hbauder@gmail.com**

If you're a member of SPARC and have an item for sale or an item that you are looking for, contact us to place your ad here.

Meeting Night

Like most clubs, there sets in a sort of monthly pattern of meetings, etc. Like, for SPARC, the usual average monthly general membership meeting is held the fourth Tuesday of the month, at 7:00 PM, at Lancaster County Public Safety Training Center (LCPSTC). Sometimes these things change, especially in the winter. Why are you looking at this newsletter for such information? Go to K3IR.org and check the calendar

tab.

License Test Sessions

Want to upgrade your license? How about get a license? You will need one to be a ham operator. There IS a test. You are required to know something. It's not just a $$$ thing. Demonstrating that you indeed know something is another matter altogether. So you will need to study some materials. There is plenty of on-line information to help you get your license. Ask us. We are here to serve. Go to k3ir.org and ask for help.

Usually, testing is conducted at the SPARC site on the first Tuesday of every month. The fee to take the exam is usually $14.00 payable on the K3IR website or in person, cash or check only. Go to K3IR.org and check the calendar tab to make sure.

If you do not already have one, go to fcc.gov and register for a FRN (Federal Registration Number). You will need this to interact with the FCC.

You can also pre-register to take the technician test, or upgrade, at Hamstudy.org. There is also a link on the K3IR web site to follow. Check the k3ir.org website for the latest in fashionable ham test news.

Upcoming Hamfests

by
K3KMT, et. al.

I have never been, but here's a fest from Harry, N3FMO:

Greetings!
Hamfest season has begun and the Clearfield County Amateur Radio Club, CCARC, is busy preparing for the 2026 Central Pennsylvania Hamfest at Clearfield PA.
Our 2025 event was our first hamfest ever. It was a learning experience, but overall a success with over 200 paid entries at the front gate. We're taking the lessons learned from last year and building a better hamfest for 2026.
On the CCARC web site is a downloadable PDF document with details about the 2026 Central Pennsylvania Hamfest. We respectfully ask that you distribute this to your membership however possible. If you have a club newsletter, please include it with a future issue. Here's the link: https://clearfieldcountyarc.net/hamfest/
Thank you for your assistance and please reach out with any questions.

John N3SPW
Secretary, Clearfield County Amateur Radio Club

So, if you are into a drive, try this one out. And, as usual, did you know that Ralph keeps a list on his worldwide corporate website of local hamfests? He has a more complete, updated list than anyone else I know of, on this website:

https://www.qsradio.com/index.html

This is great, because I don’t have to do this anymore! Go here to this web site and have a look.

But, alas, if you are not able to click the mouse because of arthritis, here’s the ones from Mike’s list last month that have not occurred:

04/25 - York Hamfest
Location: Glen Rock, PA

04/26 - MMARC Spring Ham Fest
Location: Odenton Volunteer Fire Department, Odenton, MD

References: FaceBook Group - HAMFEST (CT,DE,MD,NJ,NY,PA)

Volunteer – The club needs you.

SPARC currently has 131 “active” members on the roster. We have a lot to offer to our members. At this time we have a dedicated group of hardworking volunteers who keep the site running. Some say this is typical with most organizations. I don't think SPARC should be “typical” We need more real active members. Jobs range from the highly technical to the mundane but ALL are important. Please look at the list below and see if there is a place for you.

IT Team

Tower climbers and ground help

Operating building maintenance and cleaning

Operating building equipment maintenance and improvement

Porta Potty cleaning (not Pumping!)

Adopt a Highway crew

Elmers and Elm’ettes

Hamfest help, planning, etc.

Meeting programs and talks

Antennas! ...always more, bigger, higher.

Someone to take the trash home and pitch it when it’s full.

Someone else to either eat or toss the old stuff in the fridge.

Someone to put the 6 meter beam up on a rotor.

Solar power wizard experts.

Fiscally rigorous scrupulous bean counters.