OUR 25TH YEAR!

EPARA BEACON

Vol. 5, Number 2 The Official Newsletter of The Eastern Pennsylvania Amateur Radio Association February 2021

NEXT CLUB MEETING: FEBRUARY 11TH VIA ZOOM

Monroe County Public Safety Center, 100 Gypsum Rd Stroudsburg, PA 18360

Welcome to the EPARA Beacon! This newsletter is published monthly and is the official newsletter of the Eastern Pennsylvania Amateur Radio Association. EPARA has served the amateur radio community in the Pocono Mountains for over 25 years. We have been an ARRL affiliated club since 1995. We offer opportunities for learning and the advancement of skills in the radio art for hams and non-hams alike. EPARA supports Monroe County ARES/RACES in their mission of providing emergency communications for served agencies in Monroe County. Feel free to join us at one of our meetings or operating events during the year. The club meets on the second Thursday of every month, at the Monroe County 911 Emergency Control Center. The business meeting starts at 7:30 P.M. Anyone interested is invited to participate in our meetings and activities.

Final reminder - club dues are now overdue!

EPARA NETS:

Monroe county ARES/RACES – Sunday's 8:30 PM, 146.865 MHz, -PL 100.0 Hz
SPARK Information/Swap Net – Tuesday's 8:30 PM, 147.045 MHz, +PL 131.8 Hz
EPARA Tech net – Friday's 8:30 PM, 147.045 MHz, +PL 131.8 Hz

Due to the COVID-19 emergency we have moved our monthy meetings to Zoom. To join our Zoom Meeting please use the link below. Meetings begin at 7:30PM!
https://us02web.zoom.us/j/85463346031?pwd=bU1KcVZoaVZiVEUvdjRsUXlNNHZkZz09
Meeting ID: 854 6334 6031 Password: 244632

General classes are planned to begin at the end of March
More info will be available shortly…

What's INSIDE this ISSUE

From The President

February is here and so far the winter weather has been tame with only one major snow storm and that's just fine with me. This is the slow time for the club but we are still working on things. We are just about ready to launch our new Tech Net on Doug's DMR repeater. The talk group is 314273 and is on time slot 2. It may be accessed with a hot-spot if you are unable to reach the KG3I DMR repeater. It will run on Monday evenings at 8:30PM and I hope to start it on Monday February 8th. Since we are on the subject of nets, we still hope to start a digital HF net on 80 meters very soon. The last thing in the final stages is another General License class set to begin in late March. I am just waiting on the final approval for use of a classroom at the 911 center, as soon as I have that I will announce the dates. Our VE sessions continue and in January we had 3 new Techs and 3 new Generals!

Unfortunately we had to cancel our winter field day activities this year and the Red Cross has canceled the Run 4 The Red in May so we will not be involved with that public service event this year. For the time being we will continue to hold our meeting via Zoom. I encourage you to join us on Zoom as we have several great presentations lined up after the meetings. Its been a tough 12 months for all of us but I am optimistic for the summer and hold out hope for normalcy to return in time for field day in June, Elmer/Antenna Weekend in July, the West End Fair in August, and our Ham fest in September. Hang in there, it's going to be a good year after.

PS. Don't forget to pay your 2021 dues.....

73

CONTACT INFORMATION

President Chris Saunders AJ3C: aj3c@gmx.com	Vice President Bill Carpenter AB3ME: bill47@ptd.net
Secretary Kevin Forest W3KCF: w3kcf@outlook.com	Treasurer Scott Phelan KC3IAO: kc3iao@hobbyguild.com
Member at Large Eric Weis N3SWR: n3swr@ptd.net	ARES EC Kevin McCauley KB3EJM: kb3ejm@yahoo.com

Postal Address:	Web Site:	Send dues to:	Newsletter submissions to:
EPARA	https://www.qsl.net/n3is/	EPARA	Eric Weis, N3SWR Editor
PO Box 521	Email:	PO Box 521	EPARAnewsletter@ptd.net
Sciota, PA 18354	N3IS@qsl.net	Sciota, PA 18354	

Announcements
AND UPCOMING EVENTS

ARES/RACES
Charlie KB3JUF has taken on the responsibility of the Monroe County EC effective October 1st. ARES/RACES meetings are on hold until January due to Covid restrictions.

VE Sessions
There will be NO VE session held during the month of December. VE sessions will most likely begin again after the New Year.

EPARA Patches:
The club patches are ready to be ordered > we need a minimum of 25 patches to make this happen and worthwhile too. Get in contact with the club to place your order please!

EPARA Club Dues
Club dues are due January 1st. There are two (2) methods available to pay to help make this easy for all. Contact Scott KC3IAO via his email: KC3IAO@hobbyguild.com and you can send him a check or pay via PayPal.

Rule #1 of Amateur Radio, it is a hobby, unless you figured out a way to fashion a living out of it.
Rule #2 of Amateur Radio, life is not a hobby and typically carries heavy responsibilities of everything that is not a hobby.
Rule #3 of Amateur Radio, never give up a LIFE event for a Ham event. You may make some great memories at the Ham event, but the guilt you may carry missing a LIFE event can be a terribly heavy millstone.
Rule #4 of Amateur Radio, as technology moves forward, so does Ham Radio - do what makes you happiest, experiment with other elements of Ham Radio as LIFE allows.
Rule #5 of Amateur Radio, it is only Ham Radio, when confused always refer to Rule #1 through #4.

EPARA GENERAL MEMBERSHIP MEETING AGENDA

EPARA General Membership Meeting Minutes
January *14th 2021*

General Membership Meeting Minutes 7:30Pm

Open meeting:

Meeting called to order at 7:32 pm on January 14th 2021 by Chris AJ3C (Meeting via Zoom)
Declaration of Quorum.
Total members attending, 15 Visitors present: 1

Pledge of Allegiance / Moment of silence:

Membership Meeting - Minutes November 12, 2020:
Secretary - Kevin W3KCF:

Meeting minutes for November 2020 were posted on the EPARA website. Chris – AJ3C asked members if they had seen and read the minutes from our previous meeting. He then asked if there were any questions or objections to the minutes as they were presented. With no objections, Chris asked for a motion to accept the minutes as presented:

Motion to accept by AL - KB3OVB 2nd by Bill – AB3ME Motion Passed

Treasurers report:

Scott, KC3IAO was unable to attend the meeting. Chris AJ3C spoke for Scott and said there was nothing new to report at this time. He stated, we currently have $3,144.41 in the bank and have received $300.00 in Dues to date. Chris then mentioned that club dues were now due and needed to be submitted by January 31, 2021 to remain an active member in good standing. Cost of the dues are $15.00 for seniors (60+) and $20.00 for all others.

Dues can be submitted either by sending a check to the club's PO Box, or through PayPal by emailing Scott – KC3IAO:

Eastern Pennsylvania Amateur Radio Association
P.O. Box 521, Sciota, Pa 18354

KC3IAO@hobbyguild.com

Motion to accept reports by RuthAnn -W9FBO 2nd by Ron – N3GGT Motion Passed

Correspondence:
None

Reports of officers and committee's:

Bill AB3ME – Program Committee:

Bill mentioned Alex -KD2FTA would be doing a presentation on EME (earth/moon/earth) or commonly called moon bounce tonight after the meeting. He also spoke with Len – KC3OND regarding an individual Len knew, willing to give a presentation to our club members. His name is Donald Dickey (WV1V) and his website is: **WV1W.US** He has also written a book – Successful POTA (Parks On The Air) which can be found on Amazon. Bill said he was open to ideas, if anyone would like to give a presentation. If you're are interested, contact him or Chris – AJ3c.

EPARA GENERAL MEMBERSHIP MEETING AGENDA

Charlie KB3JUF – ARES/RACES:

Charlie indicated we would be holding an ARES meeting at the 911 center on Friday January 22, 2021 after the VE session (6:00pm). He mentioned, that things have been quite lax and we need to tighten up. He encourages everyone to get their training up to date and complete as many of the FEMA exams as possible. He would like us all to participate/or listen to as many ARES nets as possible to gain insight and experience in to how things are done around the area. In addition, he would like all those that have their county ID badges to wear them to the meeting. Charlie would like us to be as professional as possible and be able to participate at any time we might be called upon during unforeseen events.

Chris AJ3C -- Instruction and Training:

A general class will be held in March, but Chris said he would have to speak with the folks at the 911 center to see what dates are available and what regulations they currently have in place.

PIO

With Donald moving out of the area, the PIO (Public Information Officer) position is available and has not been filled. RuthAnn – W9FBO has shown interest in the position.

Chris AJ3C - Website

Membership list is updated, newsletters have been uploaded

Al, KB3OVB: Membership:

Current membership is currently at 63 members. Just a reminder that dues are now due.

Eric N3SWR – Newsletter and Communications:

Eric stated he was working on new stuff for the newsletter, but it was a lot more difficult because of the pandemic and not being able to meet in person. When Charlies comments about Windex meaning winlink, Eric said he now has some fodder to work with.

Sat-Com Group:

Alex and Bob spoke about the exciting world of satellite communications. They mentioned two websites to get a multitude of information on weekly updates and the latest news regarding satcom. The first website mentioned was **amsat.org** where you can get weekly updates and status reports on the satellites. The second website with a plethora of info is n2yo.com where you can get up to date tracking and more. Finally, they mentioned their superior skills at downloading images from the satellites, only to find out they were beaten out by Doug – kg3i.

Old business:

Embroidered Patches:

We are still accepting orders for club patches. When we have 25 prepaid orders, we will purchase the 50 patches. Chris -AJ3C mentioned that we have only sold 15 patches, so we need a minimum of 10 more. The cost of a patch is $10. PayPal is setup, so if you are interested in a patch, contact Scott KC3IAO

Winter Field Day:

Due to COVID-19 19 restrictions EPARA will be canceling winter field day this year. Chris – AJ3C threw out the idea that he'd like to encourage all of us to participate individually from home this year. Should be a lot of fun.

EPARA GENERAL MEMBERSHIP MEETING AGENDA

New business:

EPARA 2021 Budget:

2021 budget presented and reviewed by membership, motion to accept budget by Chris AJ3C
***See attached budget for reference**

Motion to accept by Len – KC3OND 2nd by Eric – N3SWR Motion Passed

Meetings:

EPARA meeting will continue to be virtual via Zoom until the infection rate subsides as the vaccine becomes widely distributed.

Tech Net on DMR:

EPARA will be starting a Tech Net on the KG3I DMR repeater, the net will be on Monday nights at 8:30 PM. A new talk group has been established on the KG3I repeater, the Talk Group is 314273 and is on time slot 2. We are hoping to start this net by the end of January or the beginning of February.

Comments were made about the 045 repeater and the unprofessional antics that are being used. One suggestion thrown out was to purchase an antenna to try and locate the individuals. Chris mentioned it is quite difficult and if we do it as a club, we could be sued for libel. Al and Chris both mentioned that Dick and Rick are very close to taking down their repeater. If this occurs, it is likely these same individuals would move to the county repeater. Causing problems there would certainly have consequences they would not like.

A conversation arose regarding DMR and how we would not experience the same problems we now face with the analog radios. Al asked how much these radios cost. Alex mentioned you could get into an HT for about $150 to $300 dollars. Two popular radios are the Anytone 878UV and the TYT Radio.

Any Other New Business

Votes / New members:

Announcements:

2021 dues are due January 1st, pay-pal payments are now accepted as well as check mailed to the clubs PO box. Dues must be paid by January 31st to remain in good standing, if dues are not paid by March 31st your membership will automatically be terminated as per the club bylaws

Any Additional Announcements

Adjournment…

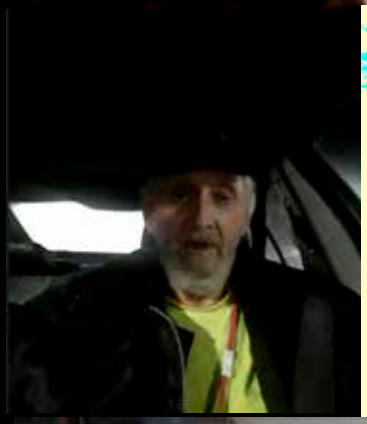
Meeting was adjourned at 8:29pm: Motion to close by Ruth Ann – W9FBO 2nd by Al – KB3OVB
Motion Passed

Presentation: Digital EME Communications on a Budget by Alex KD2FTA




ZOOM
MEETING

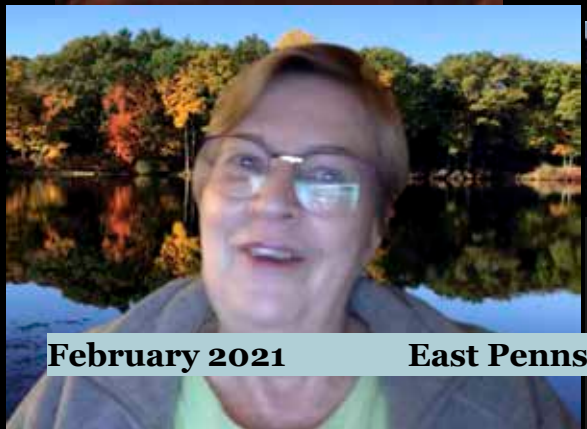




Windex





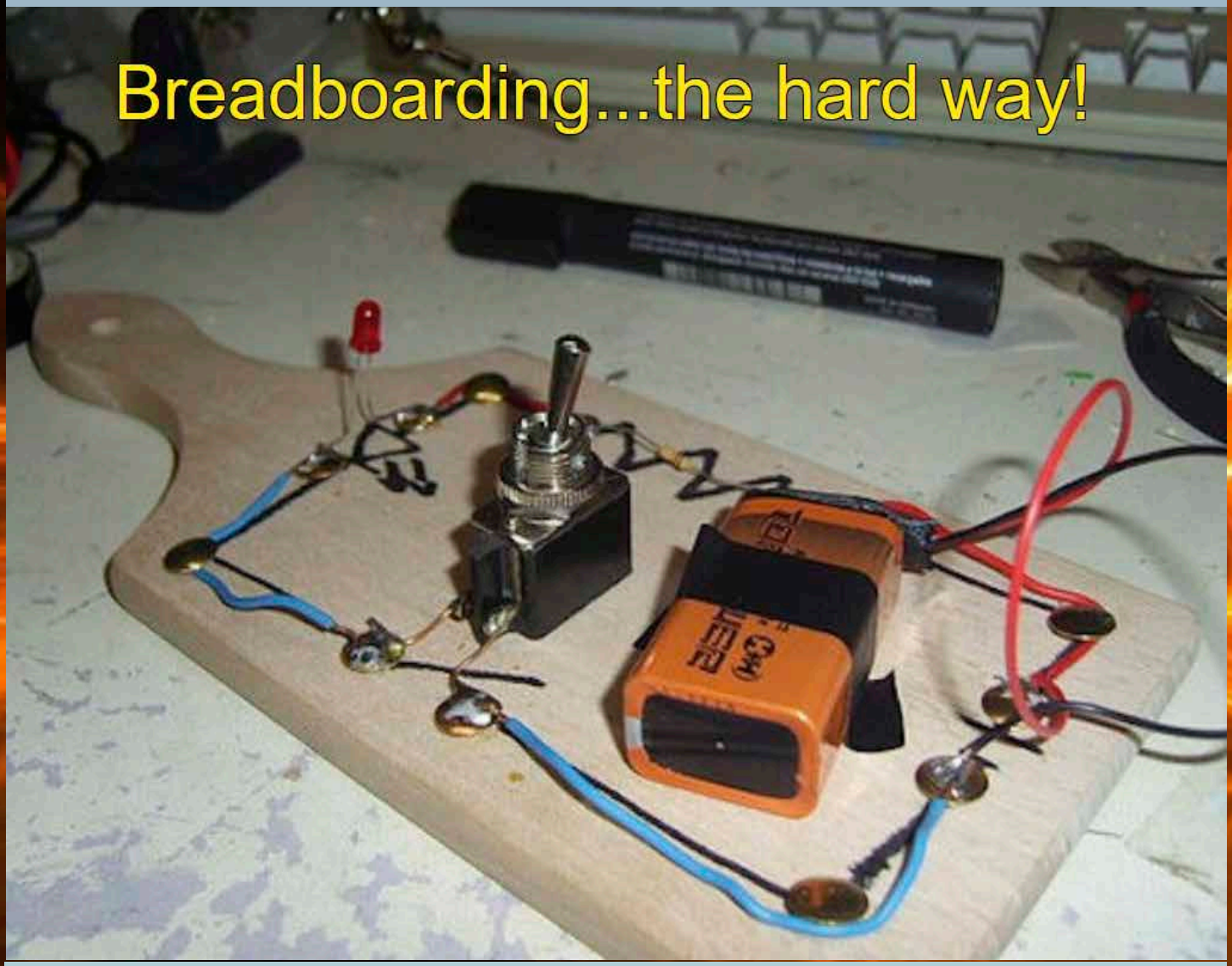


Ham Radio 101: What Does “Barefoot” Mean in Ham Radio?

In Ham-speak, the word “barefoot” has nothing to do with going shoeless in the shack. It means transmitting without the aid of an amplifier. When the topic of amps versus no amps is brought up, operators often divide themselves into opposing camps: those who amp up to help them bust through the pileups and those who go barefoot, hoping to get lucky when faced with louder signals or eventually get called through perseverance and use of a solid rig and multi-element Yagi.

For some, nothing beats the challenge and rewards of going barefoot on 100 watts or less. For others, a moderate amplifier is enough to get the job done without blasting away the competition. Then there are operators who prefer the barefoot route but crank up the amp when, after unsuccessfully battling other stations, they get cold feet and boost their signal. For many dyed-in-the-wool QRPers, barefoot is the only way.

Credit: https://www.onallbands.com/ham-radio-101-what-does-barefoot-mean-in-ham-radio/



TEST YOUR KNOWLEDGE!

Which of the following describes a common means of generating a SSB signal when using digital signal processing?

A. Mixing products are converted to voltages and subtracted by adder circuits
B. A frequency synthesizer removes the unwanted sidebands
C. Emulation of quartz crystal filter characteristics
D. The quadrature method

Last month's answer was, C. The two input frequencies along with their sum and difference frequencies

The Radio Amateur's Code

The Radio Amateur is

CONSIDERATE...He/[She] never knowingly operates in such a way as to lessen the pleasure of others.

LOYAL...He/[She] offers loyalty, encouragement and support to other amateurs, local clubs, the IARU Radio Society in his/[her] country, through which Amateur Radio in his/[her] country is represented nationally and internationally.

PROGRESSIVE...He/[She] keeps his/[her] station up to date. It is well-built and efficient. His/[Her] operating practice is above reproach.

FRIENDLY...He/[She] operates slowly and patiently when requested; offers friendly advice and counsel to beginners; kind assistance, cooperation and consideration for the interests of others. These are the marks of the amateur spirit.

BALANCED...Radio is a hobby, never interfering with duties owed to family, job, school or community.

PATRIOTIC...His/[Her] station and skills are always ready for service to country and community.

- adapted from the original Amateur's Code, written by Paul M. Segal, W9EEA, in 1928

Elmer's Notebook

Numbers Stations: Mystery Over The Airwaves

In the shadowy corners of the shortwave radio spectrum, you can often find mysterious mechanical voices counting off endless strings of numbers -- in English, Czech, Russian and German ... even Morse code. But who's listening?

The voices are coming from what are known as "numbers stations," and they've long been thought to be part of international espionage operations. In fact, the Russian spies recently captured here in the U.S. may have been getting orders from Moscow via a shortwave numbers station.

Mark Stout is the official historian at the International Spy Museum. He tells NPR's Guy Raz that the stations are unlicensed, which makes it hard to figure out where they're broadcasting from. And the mystery only deepens: No government has ever officially admitted to using numbers stations. No one's really sure when the stations began broadcasting, though they're most likely a Cold War-era invention.

Numbers stations are unlicensed, which makes it hard to figure out where they're broadcasting from.

And, Stout says, no matter how advanced modern computer cryptography is, good old shortwave is often the best option for getting messages to spies in the field.

"Because [a message] can be broadcast over such an enormous area, you can be transmitting to an agent who may be thousands of miles away," he says. And, he adds, computer communications almost always leave traces.

"It's really hard to erase data out of your hard drive or off a memory stick," he says. "But all you need here is a shortwave radio and pencil and paper."

Thousands of enthusiasts all over the world track numbers station broadcasts, but no one's been able to crack them yet. Stout says that's because the transmissions use an unbreakable encryption system called a one-time pad: encryption key is completely random and changes with every message.

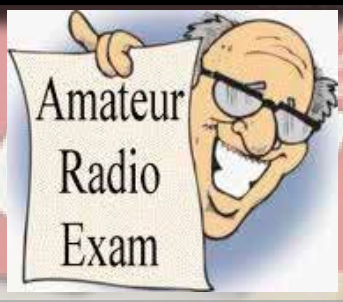
"You really truly cryptanalytically have no traction getting into a one-time pad system," Stout says. "None at all."

But if you still want to have a go at it, get a shortwave radio and start listening. Stout says there are plenty of websites that list the stations that may be on the air right now.

Credit: https://www.npr.org/templates/story/story.php?storyId=128586766

VE Testing & Classes

Anyone looking to take an exam is encouraged to contact Chris AJ3C to preregister at least one (1) week in advance of the test date. If you have any questions or to register, Chris can be reached via email AJ3C@GMX.COM. VE sessions are being held the 4th friday of each month at 6pm at the Monroe County 911 training center. Seating is limited for the time being so we can follow the health guidelines set forth by the county and state.



VE sessions are back - contact Chris AJ3C for further information!

Technician classes have come to a close and congratulations to all that have made it to the end. General license classes will begin around mid March so stay in touch if you're interested. Class schedules will be posted in advance.

ARES/RACES meetings are now being held on the fourth Friday of each month at 7PM. The meetings are being held using ZOOM at your PC at home for the time being. These meetings will serve as training sessions covering several aspects of amateur radio emergency communications. We will start with traffic handling and the use of Radiograms and the ICS 213 general message form. Future sessions will cover the use of several ICS forms and the setup and use of digital communication modes including Winlink, Packet Radio, APRS, and the FLDIGI software program. Meeting are open to all, you do not need to be an ARES/RACES team member to attend.

Don't forget to sign up with with ARES Connect if you haven't done so already and if you plan to attend the meeting or check-in to the weekly net remember to register you attendance on the ares connect page. To sign please use this link: https://arrl.volunteerhub.com/lp/epa

Want to Put Your Ham Radio Skills to Good Use? Get Involved in

EmComm!

One of the missions of the Amateur Radio Service is for amateur radio operators to provide public service and emergency communications (EmComm) when needed. We act as a voluntary noncommercial communication service and pitch in to help our communities and first responders.

So, what organizations are out there for community-minded amateur radio operators and what can we do to help?

Join In

One good entry point into public service and emergency communications is to join SkyWarn, a volunteer program run by the National Weather Service (NWS) with more than 290,000 trained severe weather spotters. These volunteers help keep their local communities safe by providing timely and accurate reports of severe weather to the NWS.

Not all of these weather spotters are amateur radio operators, but many are. Amateur radio communications can report severe weather in real time. When severe weather is imminent, SkyWarn spotters are deployed to the areas where severe weather is expected. A net is activated on a local repeater and SkyWarn spotters who are Hams check into that net. The net control advises the spotters when they might expect to see severe weather, and the spotters report conditions such as horizontal winds, large hail, rotating clouds, and even tornadoes.

To become a SkyWarn spotter, you must attend a class that teaches you the basics of severe weather, how to identify potentially severe weather features, and how to report them. The classes are free and typically last about two hours. Check your local NWS website for class schedules.

ARES/RACES/CERT

Another way Hams can become involved in public service and emergency communication is to join an ARES or RACES group. Technically, these are two separate services—the Amateur Radio Emergency Service (ARES) is run by the ARRL, while the Radio Amateur Civil Emergency Service (RACES) is a function of the Federal Emergency Management Agency (FEMA). Amateur radio operators who typically take part in one also take part in the other.

To participate in RACES, you'll need to take some self-study FEMA courses in emergency preparedness and emergency-response protocols. Classes may or may not be required to participate in ARES. These requirements are set by each individual ARES group. To get involved with either ARES or RACES, ask your local club members when they meet. You can also contact the Section Manager or Emergency Coordinator for your ARRL section. To contact them, click here and find the section that you live in.

Amateur radio operators belonging to ARES (and its predecessor, the Amateur Radio Emergency Corps) have responded to local and regional disasters since the 1930s, including the 9/11 attacks, and Hurricane Katrina and Hurricane Michael, among others.

The Community Emergency Response Team (CERT) program trains volunteers—both Hams and non-hams—how to be prepared for disasters that may impact their area. They provide basic disaster response skills, such as fire safety, light search and rescue, team organization, and disaster medical operations. CERT offers a nationwide approach to volunteer training and organization that first responders can rely on during disaster situations, allowing them to focus on more complex tasks.

What Gear Do You Need?

For most local needs, a 5-watt VHF/UHF handheld transceiver is sufficient for utilizing local repeaters to relay messages and report on conditions as they exist. Replacing the radio's stock antenna with a higher gain antenna or connecting it to a magnetic mount on a vehicle will increase range significantly.

Even better is a VHF/UHF mobile radio installed in your vehicle with 25 or more watts output and a good mobile antenna. In the event the repeater loses power, you can talk over a considerably larger area in simplex mode with the extra power and a good mobile antenna.

If you work with an ARES or RACES group, you may be asked to act as a county control station. In this capacity, you'd need both HF and VHF transceivers in a fixed location, such as your house, with a good antenna system and emergency power capabilities like a generator or batteries. This allows you to make contacts within your state and throughout the U.S.

Helping Hams

Ham radio can play a key role in emergency situations. Here are a few examples:

- Ham radio connected firefighters and police departments, Red Cross workers, and other emergency personnel during the 2003 blackout that affected the northeast United States.
- In 2017, fifty amateur radio operators were dispatched to Puerto Rico to provide communications services in the wake of Hurricane Maria.
- Amateur radio operators provided communications in the aftermath of the Boston Marathon bombing when cellphone systems became overloaded.

- During Hurricane Katrina, more than one thousand ARES volunteers assisted in the aftermath and provided communications for the American Red Cross.
- During the devastating Oklahoma tornado outbreak that began in May 1999, amateur radio operators—giving timely ground-truth reports of severe weather—played a critical role in the warning and decision-making processes at the NWS Weather Forecast Office in Norman, Oklahoma.
-
-

Credit: https://www.onallbands.com/want-to-put-your-ham-radio-skills-to-good-use-get-involved-in-emcomm/

How NIST Is Helping First Responders Stay Connected

What do first responders do? It's an easy question, and I used to think I knew the answer. Firefighters put out fires; police officers enforce the law; EMS workers treat injuries; 911 operators answer 911 calls and dispatch first responders to the scene. Simple, right?

I am a computer scientist at the National Institute of Standards and Technology (NIST) conducting research focused on human-centered computing and human-computer interaction. I have worked in the field for over a decade, researching ways to help people with their real-world technology problems. My research, by nature, requires me to learn about different communities in order to assess their technological needs. For public safety, I thought I had a pretty decent grasp of the community. After all, what they do is woven into all our lives.

As it turns out, I was wrong. I had no idea what I was in for when I joined the NIST Public Safety Communications Research (PSCR) usability team. PSCR aims to drive research and development of communication technologies for first responders, including user interface and user experience research. This research specifically focuses on ensuring that first responder communication tools are designed to meet their users' operational needs. Our team contributed to this portfolio by investigating the work of first responders to better understand those needs by examining their environments, the tasks they have to perform, and their communication needs. This way, we hoped to gain insight into how the usability of communication technologies can be measured, and ultimately improved.

What Do They Do? Everything

Beginning in 2017, we interviewed nearly 200 first responders across the country, including 911 call takers and dispatchers, EMS personnel, firefighters and law enforcement officers. In 2018 and into 2019, we sent out a nationwide online survey and received over 7,000 responses from first responders across public safety. This resulted in a TON of data.

So, according to their responses, what do they do?

Anything and everything … really. People call 911 for anything from five-alarm fires to requests for help changing a light bulb, from cardiac arrests to paper cuts, and from bomb threats to petty

disagreements. First responders are — as enumerated by one of our interviewees — "teachers, doctors, nurses, medics, moms, dads, coaches, counselors, mental health specialists, report takers, problem solvers, crime fighters." They are like human Swiss Army knives. And yet, first responders often consider themselves public servants first and foremost. They spoke of their passion for and dedication to helping their communities.

It's been an amazing opportunity to work on this project to further explore and understand how communication technology works — and does not work — for them in their environment. We found that first responders don't feel like they need new "gadgets" to do their jobs effectively. They are open to new technology, but it needs to be usable, work seamlessly with the technology they already use, and be practical, fulfilling a specific purpose.

Today's Tech, Just Better

One scenario that I don't have to imagine is when I dressed up in full firefighter gear, air tank and all, to get a better idea of the challenges that firefighters deal with when trying to use communications technology in the course of their jobs. I experienced firsthand the frustration and potentially scary situation of carrying a super heavy firehose while not being able to find the talk button on the radio because of the very necessary, standard issue, extremely bulky fire protection glove. This was, of course, made more difficult by the fact that I am a small person and don't have the same level of physical fitness as many first responders, and really, who among us does?

But what first responders expressed far more than wanting new technology was for the communications devices they already had to work better — to be more reliable, more usable, and interoperable. Imagine being a police officer responding to an active shooter scenario where several agencies are involved and not being able to communicate with the other responding units about your response plan. Imagine being a firefighter trying to help someone stuck in a building, but you're only getting static on the radio when trying to call for help. Imagine you're dispatching a paramedic to a rural location, and just as you're about to give that paramedic a critical piece of information, the call is disconnected due to poor cellular service. Imagine being an EMT who always needs to do the same task before you can help a patient, but it requires 10 steps on your computer instead of one.

Or, imagine that none of those scenarios happen because your communication technology works exactly as it should. User interfaces and device interactions are simplified. Communication devices are interoperable so different agencies can communicate even if they don't have the same equipment. There are fewer dead zones and dropped calls. You can clearly hear what your fellow responder is saying on the radio. Imagine your technology doing what it should!

While the gaps in public safety communication technology are being filled with exciting, new innovations, the devices that first responders currently use have plenty of room for improvement.

First Responders' Wish List

So, according to our findings, what did first responders say would be especially useful?

Several technologies that first responders want for their work already exist for consumers in the general public but are not used widely in public safety. Many first responders said that they would like to have a single login for their many applications to reduce the burden on the user having to remember different login and password information for each device or application they use. Another technology

pervasive in our lives yet lacking in public safety is GPS mapping and navigation. First responders would rather use their own devices to assist with incident response than the outdated standard-issue computers in their response vehicles. On their personal phones they can access mapping, satellite views, street views and other helpful applications like language translation. First responders think it would be hugely beneficial for services like these to be standard issue, as well as live images or a live video feed of the incident as it unfolds.

Emergency call takers and dispatchers said they would like to have automatic caller location data when people call 911 via a mobile device.

EMS workers would like to have the ability to automatically transmit a patient's vital information and other details to the hospital so that it is ready to receive the patient right when they come in the door.

Firefighters want to see the development of technologies like automatic vehicle location, which would let dispatchers know which fire engine is closest to the incident, not merely the closest station, allowing for faster response times. Firefighters also want augmented reality displays incorporated into equipment like their helmets, giving them information about things such as the temperature and oxygen levels.

Police officers said that they would benefit from having facial recognition software. They also want technology integrated into their vehicles using a display projected onto their windshield.

No matter the innovation, however, as long as first responders feel it will help them do their jobs better, and it is practical, reliable, easy to use, and works with the technology they already have, they will use it.

PSCR is working to address the communication technology problems and needs of first responders through its research and development efforts. But there is more work to be done.

This journey of understanding first responders better and amplifying their voices has been exciting. When I started, I did not fully understand the job of first responders and their responsibilities, but I am closer to understanding now. I'm excited for what our team will learn next.

Credit: https://www.kb6nu.com/nist-helps-first-responders-stay-connected/

From the Editor

Eric, N3SWR

The winter has definitely settled in and Winter Field Day begins today! I'm all setup and waiting to have some fun if I can. The high winds didn't bring down the antenna or tower so this last storm was a good test of sorts.

I've been making a good amount of contacts using FT8 on HF with the 160M doublet antenna. That's probably the best antenna design I've tested since I started this hobby. Tuning is no issue at all with most if not all of the bands giving me a near perfect match. All I need is Hawaii and my worked all states award is complete. DXCC , well that's going to take some time collecting 100 countries minimum for the award but I'm working on it!

I was having trouble figuring out what to put here until Faith W3INK sent me this....

Well I'm done! Not sure sure who Tim Whyatt is but he definitely has a following down under (get your dirty mind out of the gutter here); I left you a link to window shop for yourselves :)

73 and stay warm!!
https://www.pinterest.com/NobleWorks/tim-whyatts-cartoons/
Eric
N3SWR

"One man's "magic" is another man's engineering. "Supernatural" is a null word."
- Robert Heinlein

Topics of Interest

Have an idea you would like to share with your fellow hams? Interested in one of the new exotic digital modes and would like to get others interested in it too? Found a blog somewhere that you think others would find interesting? Members are encouraged to submit items of interest for publication. Submitted articles (are suggested) to be no more than a page or two in length and may be edited for content and grammar. The EPARA officers and newsletter editor reserve the right to determine which items will be included in The Beacon. The deadline for publication is the 15th of the month. The publication date will be at the end of each month. Copyrights are the property of their respective owners and their use is strictly non-profit/educational and intended to foster the spirit of amateur radio.

If you've taken pictures at an event and would like to submit them for possible inclusion in the newsletter, forward them to the newsletter editor. Please send action shots, if possible. Faces are often preferable over the backs of heads. Many hams may be way too overweight, so please consider using a wide-angled lens.

Disclaimer

The Beacon is not representative of the views or opinions of the whole organization, and such views and opinions expressed herein are of the individual author(s).

Magic Eye Tube EM34 & EM84


EM34 tuning eye

A magic eye tube or tuning indicator, in technical literature called an electron-ray indicator tube, is a vacuum tube which gives a visual indication of the amplitude of an electronic signal, such as an audio output, radio-frequency signal strength, or other functions. The magic eye (also called a cat's eye, or tuning eye in North America) is a specific type of such a tube with a circular display similar to the EM34 illustrated. Its first broad application was as a tuning indicator in radio receivers, to give an indication of the relative strength of the received radio signal, to show when a radio station was properly tuned in.

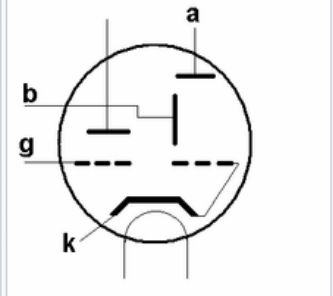
The magic eye tube was the first in a line of development of cathode ray type tuning indicators developed as a cheaper alternative to the needle movement meters. It was not until the 1960s that needle meters were made economically enough in Japan to displace indicator tubes. Tuning indicator tubes were used in vacuum tube receivers from around 1936 to 1980 before vacuum tubes were replaced by transistors in radios. An earlier tuning aid which the magic eye replaced was the "tuneon" neon lamp.

History


EM84 tuning indicator

The magic eye tube (or valve) for tuning radio receivers was invented in 1932 by Allen B. DuMont (who spent most of the 1930s improving the lifetime of cathode ray tubes, and ultimately formed the DuMont Television Network
The RCA 6E5 from 1935 was the first commercial tube.
The earlier types were end-viewed (see the EM34), usually with an octal or side-contact base. Later developments featured a smaller side-viewed noval B9A based all-glass type with either a fan type display or a band display (see the EM84). The end-viewed version had a round cone-shaped fluorescent screen together with the black cap that shielded the red light from the cathode/heater assembly. This design prompted the contemporary advertisers to coin the term magic eye, a term still used.
There was also a sub-miniature version with wire ends (Mullard DM70/DM71, Mazda 1M1/1M3, GEC/Marconi Y25) intended for battery operation, used in one Ever Ready AM/FM battery receiver with push-pull output, as well as a small number of AM/FM mains receivers, which lit the valve from the 6.3V heater supply via a 220 ohm resistor or from the audio output valve's cathode bias. Some reel-to-reel tape recorders also used the DM70/DM71 to indicate recording level, including a transistorized model with the valve lit from the bias-oscillator voltage.
The function of a magic eye can be achieved with modern semiconductor circuitry and optoelectronic displays. The high voltages (100 Volts or more) required by these tubes are not present in modern devices, so the magic eye tube is now obsolete.

Operation



Schematic diagram of a magic eye indicator tube: a = anode, k = cathode, g = grid, b = deflection

A magic eye tube is a miniature cathode ray tube, usually with a built-in triode signal amplifier. It usually glows bright green, (occasionally yellow in some very old types, e.g., EM4) and the glowing ends grow to meet in the middle as the voltage on a control grid increases. It is used in a circuit that drives the grid with a voltage that changes with signal strength; as the tuning knob is turned, the gap in the eye becomes narrowest when a station is tuned in correctly.

Internally, the device is a vacuum tube consisting of two plate electrode assemblies, one creating a triode amplifier and the other a display section consisting of a conical-shaped target anode coated with zinc-silicate or similar material. The display section's anode is usually directly connected to the receiver's full positive high tension (HT) voltage, whilst the triode-anode is usually (internally) connected to a control electrode mounted between

Magic Eye Tube EM34 & EM84

the cathode and the target-anode, and externally connected to positive HT via a high-value resistor, typically 1 megaohm.

When the receiver is switched on but not tuned to a station, the target-anode glows green due to electrons striking it, with the exception of the area by the internal control-electrode. This electrode is typically 150-200V negative with respect to the target-anode, repelling electrons from the target in this region, causing a dark sector to appear on the display.

The control-grid of the triode-amplifier section is connected to a point where a negative control voltage dependent on signal strength is available, e.g. the AGC line in an AM superheterodyne receiver, or the limiter stage or FM detector in an FM receiver. As a station is tuned in the triode-grid becomes more negative with respect to the common cathode.

Use in Radios

The purpose of magic eye tubes in radio sets is to help with accurate tuning to a station; the tube makes peaks in signal strength more obvious by producing a visual indication, which is better than using the ear alone. The eye is especially useful because the automatic gain control (AGC) action tends to increase the audio volume of a mistuned station, so the volume varies relatively little as the tuning knob is turned. The tuning eye was driven by the AGC voltage rather than the audio signal.

When, in the early 1950s, FM radio sets were made available on the UK market, many different types of magic eye tubes were made available, with differing displays, but they all worked the same way. Some had a separate small display to light up indicating a stereo signal on FM.

The British Leak company used an EM84 indicator as a very precise tuning-indicator in their Troughline FM tuner series, by mixing the AGC voltages from the two limiter valve grids at the indicator sensing-grid. By this means accurate tuning was indicated by a fully open sharp shadow, whilst off-tune the indicator produced a partially closed shadow.

Applications


6G5 Magic eye tube

Magic eye tubes were used as the recording level indicator for tape recorders, and it is also possible to use them (in a specially adapted circuit) as a means of rough frequency comparison as a simpler alternative to Lissajous figures.
A magic eye tube acts as an inexpensive uncalibrated (and not necessarily linear) voltage indicator, and can be used wherever an indication of voltage is needed, saving the cost of a more accurate calibrated meter.

At least one design of Capacitance Bridge uses this type of tube to indicate that the bridge is balanced.

The magic eye tube was also used on the cover of My Morning Jacket's 2011 album Circuital. The tube was shown as being almost fully lit.

Credit: https://en.wikipedia.org/wiki/Magic_eye_tube

Bruce Draper, AA5B, aa5b.corral@gmail.com

Contest Corral

February 2021

Check for updates and a downloadable PDF version online at **www.arrl.org/contest-calendar**.
Refer to the contest websites for full rules, scoring information, operating periods or time limits, and log submission information.

Start - Finish Date	Time	Finish Date	Time	Bands	Contest Name	Mode	Exchange	Sponsor's Website
1	0000	1	0100	3.5-14	K1USN Slow Speed Test	CW	Name, SPC, 20 WPM max	www.k1usn.com/sst.html
1	2000	1	2130	3.5	RSGB 80-Meter Club Championship, SSB	Ph	RS, serial	www.rsgbcc.org/hf
2	0100	2	0159	1.8-50	Worldwide Sideband Activity Contest	Ph	RS, age group (OM, YL, or youth)	wwsac.com/rules.html
2	0200	2	0400	3.5-28	ARS Spartan Sprint	CW	RST, SPC, power	arsqrp.blogspot.com
2	1700	2	1900	3.5-14	RTTY OPS Weeksprint	Dig	Other station's call, your call, serial, name	rttyops.wordpress.com
3	1300	3	1400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
3	1700	3	2000	144	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
3	1900	3	2000	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
3	2000	3	2100	3.5	UKEICC 80-Meter Contest	Ph	6-char grid square	ukeicc.com/80m-rules.php
4	0300	4	0400	1.8-28	CWops Mini-CWT Test	CW	Name, mbr or SPC	cwops.org/cwops-tests
4	1800	4	2200	28	NRAU 10-Meter Activity Contest	CW Ph Dig	RS(T), 6-char grid square	nrrlcontest.no/index.php
4	2000	4	2200	1.8-50	SKCC Sprint Europe	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
5	0145	5	0215	1.8-21	NCCC RTTY Sprint	Dig	Serial, name, QTH	www.ncccsprint.com
5	0230	5	0300	1.8-21	NCCC Sprint	CW	Serial, name, QTH	www.ncccsprint.com
6	0000	7	2359	1.8-UHF	Vermont QSO Party	CW Ph Dig	RS(T), county or SPC	www.ranv.org/vtqso.html
6	0001	7	2359	28	10-10 International Winter Contest, SSB	Ph	Name, mbr or "0," SPC	www.ten-ten.org
6	0300	6	1200	1.8-28	EurAsia HF Championship	CW Ph	RS(T), 6-char grid square	www.eurasia-contest.com
6	1200	7	1200	1.8	KCJ Topband Contest	CW	RST, JA Prefecture/District or continent	www.kcj-cw.com/e_index.htm
6	1200	7	1200	3.5-28, 144	F9AA Cup, CW	CW	RST, serial	www.site.urc.asso.fr
6	1200	7	2359	3.5-28	Mexico RTTY International Contest	Dig	RST, XE state or serial	www.rtty.fmre.mx
6	1400	6	2359	1.8-28	Minnesota QSO Party	CW Ph Dig	Name, county or SPC	www.w0aa.org/mnqp-rules
6	1400	6	2359	1.8-28	FYBO Winter QRP Sprint	CW Ph Dig	RS(T), SPC, name, power, temperature	arizonascqrpions.apps-1and1.com
6	1600	6	1800	3.5-28	FISTS Saturday Sprint	CW	RST, SPC, name, mbr or "0"	fistsna.org
6	1600	6	1900	3.5	AGCW Straight Key Party	CW	RST, serial, class, name, age	alt.agcw.de/index.php/en
6	1600	7	2359	1.8-28	British Columbia QSO Party	CW Ph Dig	RS(T), VE7 District or SPC	orcadxcc.org/bcqp_rules.html
6	2300	7	0300	3.5-14	North American Sprint, CW	CW	Other station's call, your call, serial, name, SPC	ncjweb.com
8	1300	12	2359	All, no WARC	ARRL School Club Roundup	CW Ph	RS(T), class (I/C/S), SPC	www.arrl.org/school-club-roundup
10	0130	10	0330	3.5-14	NAQCC CW Sprint	CW	RST, SPC, mbr or power	naqcc.info
10	1700	10	2000	432	VHF-UHF FT8 Activity Contest	Dig	4-char grid square	ft8activity.eu/index.php/en
10	2000	10	2130	3.5	RSGB 80-Meter Club Championship, Data	Dig	RST, serial	www.rsgbcc.org/hf
13	0000	14	2359	3.5-28	CQ WW RTTY WPX Contest	Dig	RST, serial	www.cqwpxrtty.com
13	1000	14	1000	1.8-28	SARL Field Day Contest	CW Ph Dig	RS(T), # of transmitters, category, QTH	www.sarl.org.za
13	1100	13	1300	7, 14	Asia-Pacific Spring Sprint, CW	CW	RST, serial	jsfc.org/apsprint/aprule.txt
13	1200	14	1200	1.8-28	Dutch PACC Contest	CW Ph	RS(T), province or serial	pacc.veron.nl
13	1200	14	2359	1.8-50	SKCC Weekend Sprintathon	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
13	1400	15	0200	All	YLRL YL-OM Contest	CW Ph Dig	Serial, RS(T), SPC	ylrl.org/wp/yl-om-contest
13	1500	14	1500	1.8-28	OMISS QSO Party	Ph	RS, SPC, mbr or "none"	omiss.net/Facelift/qsoparty.php
13	1900	13	2059	1.8-28	Feld Hell Sprint	Dig	RST, name, mbr, QTH, grid	sites.google.com/site/feldhellclub
13	1900	13	2300	1.8	RSGB 1.8-MHz Contest	CW	RST, serial, district code (if UK/EI)	www.rsgbcc.org/hf
13	2300	14	2300	1.8-14	AWA AM QSO Party	Ph	Name, SPC	antiquewireless.org/homepage
14	0000	14	2359	1.8-7	PODXS 070 Club Valentine Sprint	Dig	Name, OM/YL, SPC	www.podxs070.com
14	1300	14	1700	3.5, 7	Balkan HF Contest	CW Ph	RS(T), serial	arabih.ba
15	0100	15	0259	3.5-14	CQC Winter QSO Party	CW	RST, SPC	coloradoqrpclub.org/contests
15	0100	15	0300	1.8-28	4 States QRP Group Second Sunday Sprint	CW Ph	RS(T), SPC, mbr or power	www.4sqrp.com
15	2000	15	2130	3.5	RSGB FT4 Contest Series	Dig	4-char grid square	www.rsgbcc.org/hf
17	1900	17	2030	3.5	AGCW Semi-Automatic Key Evening	CW	RST, serial, 2-digit year first used a bug	alt.agcw.de/index.php/en
20	0000	21	2359	1.8-28	ARRL International DX Contest, CW	CW	W/VE: RST, SP Non-W/VE: RST, power	www.arrl.org/arrl-dx
20	1200	21	1159	1.8-28	Russian PSK WW Contest	Dig	RST, oblast or serial	www.rdrclub.ru
21	2100	21	2300	3.5-28	FISTS Sunday Sprint	CW	RST, SPC, name, mbr or "0"	fistsna.org
21	2300	22	0100	1.8-28	Run for the Bacon QRP Contest	CW	RST, SPC, mbr or power	qrpcontest.com/pigrun
24	0000	24	0200	1.8-50	SKCC Sprint	CW	RST, SPC, name, mbr or "none"	www.skccgroup.com
24	2000	24	2100	3.5	UKEICC 80-Meter Contest	CW	6-char grid square	ukeicc.com/80m-rules.php
25	2000	25	2130	3.5	RSGB 80-Meter Club Championship, CW	CW	RST, serial	www.rsgbcc.org/hf
26	2200	28	2200	1.8	CQ 160-Meter Contest, SSB	Ph	W/VE: RS, SP, DX: RS, CQ Zone	www.cq160.com
27	0600	28	1800	3.5-28	REF Contest, SSB	Ph	RS, department or serial	concours.r-e-f.org/reglements
27	1200	28	1200	3.5-28	FTn DX Contest	Dig	RST, SP or serial	europeanft8club.wordpress.com
27	1300	28	1300	3.5-28	UBA DX Contest, CW	CW	RST, serial, province (if ON)	www.uba.be/en
27	1500	28	0159	1.8-50	South Carolina QSO Party	CW Ph Dig	RS(T), county or SPC	scqso.com
27	1800	28	0559	3.5-28	North American QSO Party, RTTY	Dig	Name, SPC	www.ncjweb.com
27	1800	28	0559	3.5-28	NA Collegiate Championship, RTTY	Dig	Name, SPC	www.w9smc.com/nacc
28	1400	3	0800	1.8-144	Classic Exchange, CW	CW	Name, RST, SPC, rig manuf/model	www.classicexchange.org
28	1400	28	1700	3.5-28	High Speed Club CW Contest	CW	RST, mbr or "NM"	www.highspeedclub.org
28	1500	1	0059	3.5-144	North Carolina QSO Party	CW Ph Dig	County or SPC	ncqsoparty.org/rules

Amateur Radio Special Event Stations!

01/09/2021 | 2021 Daytona 500/Speedweeks

Jan 9-Feb 14, 0001Z-2359Z, N4DAB, Daytona Beach, FL. Daytona Beach CERT ART. 14.255 14.070 7.255 7.070. Certificate & QSL. DB CERT ART/Steve Szabo, WB4OMM, License Trustee, 536 Central Park Blvd., Port Orange, FL 32127-1136. See Web Page for QSL and Certificate information. High Quality laser printed certificate and photo quality QSL Card. Operating hours dependent on propagation and availability. Phone, CW, and Digital modes scheduled. www.n4dab.com

01/15/2021 | Alaska "RST" QSO Party

Jan 15-Feb 15, 0000Z-2359Z, KL7RST, various, AK. North Country DX Association. 28.450 21.350 14.250 7.250. QSL. John F. Reisenauer, Jr, 2573 Old Georgetown Rd. W., Kershaw, SC 29067. KL7RST, KL7RST/KL7, VY1RST/KL7, VE8RST/KL7 and VY0RST/KL7. Certificate by email for working any 3 of the above when you QSL. www.qrz.com/db/k7ice

02/01/2021 | JY1 Special Event Memorial Station 2021

Feb 1-Feb 28, 0000Z-2359Z, N9SES, Lake Station, IN. ArabQrz Club. 14.250 14.030 7.185 7.030. QSL. Ayman Azar, 2861 Decatur St, Lake Station, IN 46405. See website for participating stations from other countries. All HF/VHF/UHF, All Modes. Hamsphere Users can also participate in the event www.n9ses.com/?page_id=18

02/06/2021 | 100th Anniversary

Feb 6-Feb 27, 1800Z-2359Z, W6UW, San Jose, CA. Santa Clara County Amateur Radio Association. 21.320 14.250 7.250. Certificate. Don Village, K6PBQ, 3290 Woody Lane, San Jose, CA 95132. w6uw@arrl.net or www.qsl.net/sccara

02/06/2021 | Ground Hog Day Special Event

Feb 6, 0900Z-1500Z, K3HWJ, Punxsutawney, PA. Punxsutawney Amateur Radio Club. all modes, all bands. Certificate. Stephen Waltman, KB3FPN, 37 Clark St., Brookville, PA 15825. SASE for certificate. www.punxyclub.com

02/06/2021 | Shuttle Columbia Special Event

Feb 6-Feb 7, 1400Z-2359Z, K5C, Nacogdoches, TX. Nacogdoches ARC. 7.216 14.260 21.350 28.350. QSL. Army Curtis, 167 CR 2093, Nacogdoches, TX 75965. All contacts will be confirmed via LOTW. https://w5nac.com

02/07/2021 | Commemorating Howard E. Anthony, Father of Heathkit

Feb 7, 1200Z-2359Z, KD2FSI, Randolph, NJ. KD2FSI. 21.300 14.300 7.300 3.900. QSL. David R. Hackett, 3 High Ridge Road, Randolph, NJ 07869. On Sunday February 7, 2021 from 1200Z -2359Z, Amateur Radio Station KD2FSI will operate as a special event station using a variety of vintage Heathkit gear to commemorate the life and legacy of Howard E. Anthony, the father of the Heathkit brand of electronic kits. Starting in the morning with 75 meter SSB, we will work our way up to the 40, 20, 15 and 10 meter bands and then back down again towards the evening. I will post additional information on my public Facebook page as the event draws near and the actual operating frequencies and modes in real time the day off. We hope all amateur radio operators with any type of equipment (new or old) will join us as we commemorate Mr. Anthony, the person responsible for starting Heathkit, the finest electronic kit company ever. 73, Dave Hackett KD2FSI davehackett@cs.com https://www.facebook.com/dave.hackett.9085

02/13/2021 | George Washington's Birthday at his Boyhood Home, Ferry Farm VA

Feb 13, 1400Z-2000Z, W4B, Fredericksburg, VA. Stafford Amateur Radio Association (SARA). 14.225 7.195 447.275. QSL. Stafford Amateur Radio Association (SARA), PO Box 6331, Fredericksburg, VA 22403. SASE required for return of a QSL card. https://www.ws4va.org

Amateur Radio Special Event Stations!

02/13/2021 | George Washington's Birthday at Mount Vernon

Feb 13-Feb 14, 0800Z-1400Z, K4US, Alexandria, VA. Mount Vernon Amateur Radio Club. 14.260 14.074 7.040. QSL. MVARC, P.O. Box 7234, Alexandria, VA 22307. MVARC will be hosting a modified special event station to commemorate our first president's 289th birthday. Members will be operating remote stations this year due to COVID, with many broadcasting from the original grounds of the former plantation of George Washington and his wife, Martha Washington. k4us@mvarc.org

02/13/2021 | I Pluto Special Event

Feb 13-Feb 21, 0000Z-2359Z, W7P, Flagstaff, AZ. Northern Arizona DX Association. 14.290 21.290 7.290 14.090. Certificate & QSL. W7P - I Pluto Special Event, % Bob Wertz, NF7E, 6315 Townsend Winona Rd., Flagstaff, AZ 86004-1493. This will be an annual countdown S. E. to the 100th anniversary of the discovery of PLUTO, held every February, up to and including 2030. We are celebrating this historic discovery of Pluto, in 1930, by Clyde Tombaugh, at Lowell Observatory in Flagstaff, Arizona. Please note the frequencies will be + or- 10, as to not interfere with any nets operating during that time period. www.nadxa.com

02/13/2021 | Ice-olation Station WØJH

Feb 13-Feb 15, 1400Z-2355Z, W0JH, Stillwater, MN. Stillwater, MN Amateur Radio Association. 21.360 14.260 7.260 3.860. Certificate. Shel Mann, N0DRX, 1618 Pine St West, Stillwater, MN 55082. We will have multiple stations simultaneously operating on different bands and different modes. In keeping with COVID-19 social distancing protocols, we will operate from our individual QTHs this year. In a meager attempt to drive away the remainder of Minnesota winter, the Stillwater Amateur Radio Association will be generating as much RF as possible over the President's Day long weekend. Certificates will ONLY be sent via email in PDF format. (Send requests with standard QSL confirmation info via email to: Ice2021@radioham.org). There is no need to send a QSL card. Info: WØJH at www.QRZ.com & www.radioham.org. www.radioham.org

02/13/2021 | USS Midway Museum Ship Special Event: Raising Mt Suribachi Flag

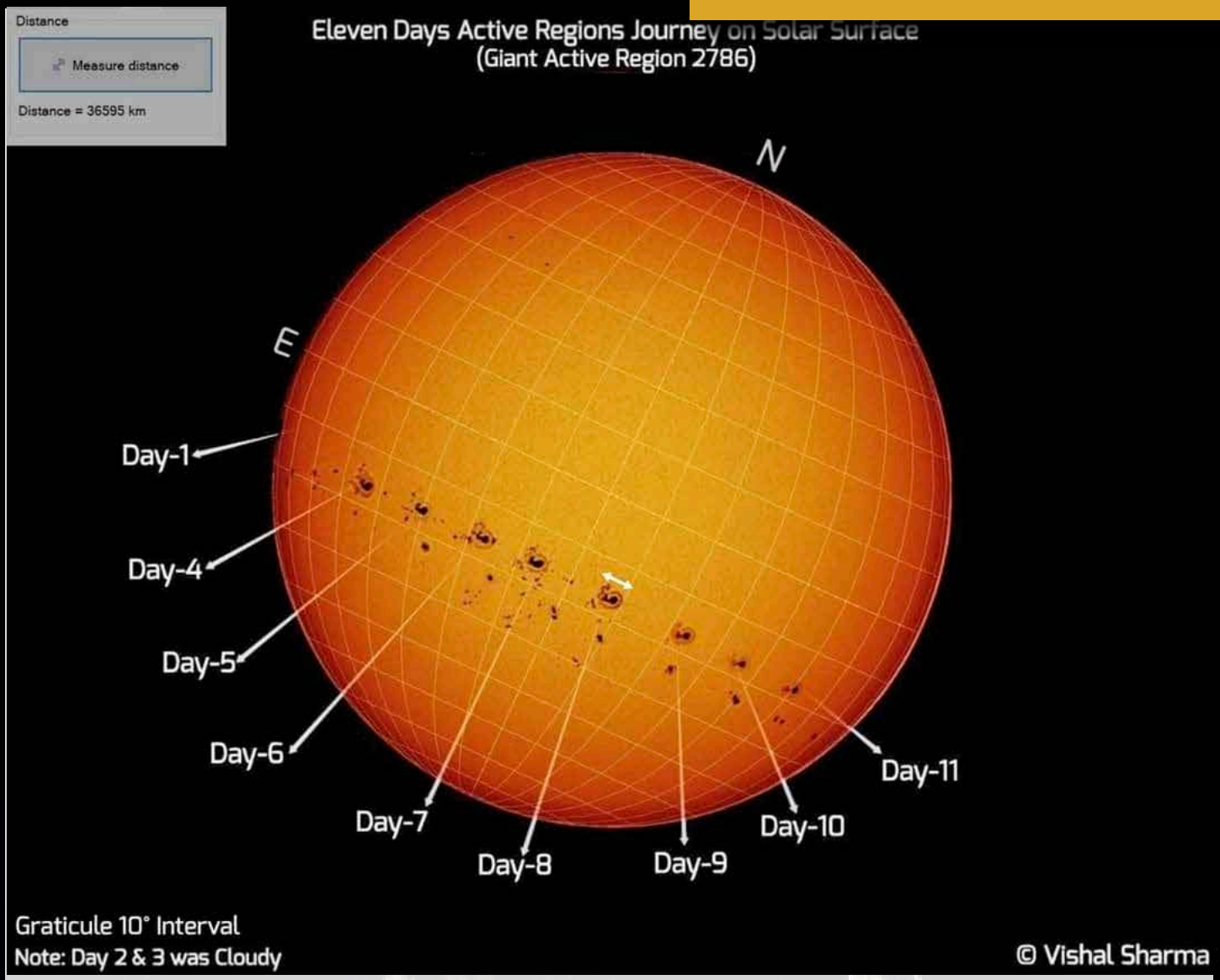
Feb 13, 1700Z-2359Z, NI6IW, San Diego, CA. USS Midway (CV-41) Museum Ship. 7.250 14.320 14.070 (PSK31) DSTAR via PapaSystem repeaters. QSL. USS Midway CV-41 COMEDTRA NI6IW, 910 N Harbor Dr, San Diego, CA 92101. SASE please.

02/20/2021 | George Washington's Birthday

Feb 20-Feb 22, 2000Z-2000Z, WS7G, George, WA. Columbia Basin DX Club. 14.322 7.222 3.855. QSL. Brian Nielson, 11650 Road 1 SE, Moses Lake, WA 98837. We will be commemorating George Washington's Birthday from the city of George, in the state of Washington. In February of 2021, our special event station will operate Saturday, February 20th, from 2000 Zulu through Monday, February 22nd at 2000 Zulu. You can find us on 14.322/14.255, 7.222/7.260, AND 3.855/3.960 plus/minus QRM. cbn.homestead.com/WS7G.HTML

02/27/2021 | 17th Annual "Freeze Your Keys" Winter Operating Event

Feb 27, 1400Z-2200Z, W0EBB, Leavenworth, KS. Kickapoo QRP Amateur Radio Club. 14.058 7.035 14.325 7.240. QSL. Gary Auchard, 34058 167th Street, Leavenworth, KS 66048. SASE please for return QSL cards. w0mna74@gmail.com or www.qrz.com/db/w0ebb



Tad Cook, K7RA, Seattle, reports: Solar activity quieted this week, with the average daily sunspot number declining from 57.6 to 28.9, and the average daily solar flux softening from 108.1 to 91.9. On December 8 – 10, the sunspot number was 11 on each day, which is the minimum non-zero sunspot number.

Sunspot group 2786 provided some great activity, but it is about to rotate off the sun's visible surface. But a look at STEREO satellite images on Thursday night (December 10) shows some magnetic complexity about to became geo-effective from the sun's southern hemisphere. This could mean more great conditions.

The average daily planetary A index went from 6.4 to 4.4, and average daily middle latitude A index went from 5.6 to 3.1.

Predicted solar flux for the next 45 days is 82 on December 11 – 12; 84 on December 13 – 14; 80 on December 15 – 18; 92 on December 19 – 24; 94 on December 25 – 28; 96, 94, and 92 on December 29 – 31; 90 on January 1 – 4; 88 on January 5 – 7; 86 on January 8 – 11; 84, 85, and 88 on January 12 – 14; 92 on January 15 – 20, and 94 on January 21 – 24.

The forecast for the planetary A index shows 12, 8, and 8 on December 11 – 13; 5 on December 14 – 18; 20 and 8 on December 19 – 20; 5 on December 21 – 22; 8, 10, and 8 on December 23 – 25; 5 on December 26 – January 5; 10 and 8 on January 6 – 7; 5 on January 8 – 13; 12, 20, and 8 on January 14 – 16; 5 on January 17 – 18; 8, 10, and 8 on January 19 – 21, and 5 on January 22 – 24.

Daily updates of these numbers are available, typically after 2120 UTC, from the Space Weather Prediction Center.

A coronal mass ejection on December 7 was expected to spark a geomagnetic storm on December 10-11, which is why the planetary A index was predicted at 40, 25, 8, and 8 on December 10-13. This was revised to the forecast of December 10, above. Minnesota Public Radio aired a story on what happened and how we missed the storm.

The ARRL 10-Meter Contest is this weekend, much anticipated because of recent increased solar activity. I was concerned about the forecast from earlier in the week, but now it looks like good conditions are expected. Around this time each December, sporadic-E activity is possible, as well as enhancement from the Geminids meteor shower. This year the shower does not peak until the day after the contest, December 14, but it's already under way.

Here's the geomagnetic activity forecast for December 11 – January 5 from F.K. Janda. OK1HH. The geomagnetic field will be: Quiet on December 13, (29,) January 12, 4

Quiet to unsettled on December 1416, 21, January 5

Quiet to active on December 12, 1718, 2223, 26, 30

Unsettled to active December (11, 24,) 2526, (27,) 31, (January 3)

Active to disturbed December 19 (-20,) 28

Solar wind will intensify on December (11, 19,) 2022, (23,)

27 (28-29, January 5)

Note: Parentheses mean lower probability of activity enhancement.

Credit: http://www.arrl.org/news/the-k7ra-solar-update-658

Fox Hunting—Getting Young People Hooked on the Adventure of Ham Radio

How do you convince a young person to drop the video controller, put away the smartphone, step out into the sunlight, and give Ham Radio a whirl?

Cue the Mission Impossible theme and try this pitch: There's a transmitter hidden somewhere in a field. It could be anywhere! The fate of the world depends on you finding it before the bad guys do. The clock is ticking, and all you have to work with is a directional antenna, a handheld radio, and your ultimate superpower—your brains. Are you up for the challenge?

Okay, maybe a little overdramatic, but those who love fox hunting understand there's nothing more exhilarating than the thrill of the chase and the rewards of using your wits to be the first to find the elusive transmitter (the fox) before the competition does.

To a youngster with a vivid imagination, it's a live action video game, the climactic scene from a superhero movie, or a chance to discover clandestine pirate treasure. For those with an inclination toward science, fox hunting is Pokémon Go without the anime, but with a lot more value in learning about radio signals, antennas, and electronics. To Elmers who want to share their awesome hobby, fox hunting can be an excellent portal to introduce a new generation—tomorrow's search-and-rescue operators—to the fun and usefulness of Amateur Radio.

What Exactly Is it?

In fox hunting, participants attempt to find a hidden transmitter, or transmitters, using handheld directional antennas within a designated area. Searches can be done on foot, in a vehicle, or even from your own shack in the case of fixed transmitter location hunts. Some hunts, often organized by local clubs, are just for kicks while others are highly competitive and offer prizes for the most skilled hunters. Competitive fox hunting is most popular in Europe and Asia, but the activity has gained a nice following of enthusiasts in North America.

How to Get Youth Involved

It doesn't take a huge effort on the part of your Amateur Radio club to set up a fox hunting event at your next picnic or at Field Day. Here's what you need:

- Ample space to allow your fox chasers to roam in search of the hidden transmitter(s).
- One or more handheld directional antennas—An affordable choice (and cool project to boot) is the popular homemade three-element, 2-meter tape measure Yagi antenna, featuring elements cut from your average steel tape measure, PVC pipe, hose clamps, and a hairpin match to the coaxial cable. You'll find numerous online tutorials and instructions about how to build them for about $20 plus the gas it takes to drive to the hardware store. Of course you can also use commercially available handheld directional Yagis that come with all the bells and whistles.
- Two-meter handy-talkies connected via coax to the antennas.
- Attenuators are not mandatory fox hunting equipment (especially for simple a Field Day demonstration), but your hunters will certainly appreciate having them. When you near the transmitter, its signal will be too much for the S-meter on the radio to handle. This can be mitigated with an attenuator connected to the antenna or HT. The attenuator reduces the signal strength and allows you to narrow your search when you're getting close to the prize. Read about MFJ's Step Attenuator here.
- Two-meter transmitters, such as the RigExpert Red Fox 144 ARDF Beacons available at DX Engineering.
- Finally, a group of enthusiastic kids and Ham Radio veterans eager to show them the ropes.

For Field Day 2019, the Portage County Amateur Radio Service (PCARS) hosted a successful fox hunting activity in which two teams of kids took turns hiding and finding the fox. PCARS president, Jim Wilson, AC8NT, gave these hints on how your club can get into the fox hunting spirit.

"First, we have an event to build a tape measure antenna that will be used in the fox hunts," he said. "This usually requires about three hours to complete and is great for a Saturday morning. Both adults and kids love a good hands-on event where something can be built and used. We also include an attenuator unit in the build and cover basic antenna theory as part of the event."

Second, hunters are trained how to use the Yagi antenna, attenuator, and the two-meter handheld to point in the direction of the fox.

"This is not as simple as it sounds," Jim, AC8NT, explained. "They learn that many factors affect the direction to the fox including reflections of the signals from water towers, buildings and other structures. You can get a lot of exercise finding a good bearing to the fox."

Then it's time for the actual hunt.

"One or more foxes are hidden in trees and other structures that must be found in a given order," he said. "We use foxes that all transmit on the same frequency but send out different Morse Code identifiers. We give the ID of the first fox which, when found, has the ID of 'fox two' and so forth. Each fox also has a written message that must be copied to prove it has been found. The first team to find all the foxes in the correct order wins. Even if you use only one fox, you can have a lot of fun with one of these events. At Field Day several kids spent hours running around the park finding a fox."

If your club is really ambitious, you can step up your game by hosting a long-distance fox hunt.

"Here an operator goes to a location and starts broadcasting the fox message, usually every couple of minutes," Jim, AC8NT, said. "The hunters start from another location and, as with all of these hunts, try to find the fox. Some sophisticated doppler equipment is usually used to locate the fox. It has a display that is supposed to point to the fox. Even with this equipment it takes some experience, skill and a little luck to find the fox. To give some idea of scale, the fox can often be many miles away from the hunt starting point and require some serious time to find. Still, it is great fun."

Based on his experiences, Jim, AC8NT, offered these words of wisdom to clubs looking to enjoy the challenge of fox hunting.

- Remember that building the antenna is a great start. It cuts the cost of entry and gives the builders a great sense of accomplishment. The leader of the build should be ready to answer questions and tune the finished products.

- If you are allowing unlicensed participants, use handhelds that can be easily modified to only receive. These modifications can be reversed when the operator gets his ticket.

- Start with simple hunts. Use a single fox and pick a park where you can plant the fox on one of the trails. You don't want anyone to get hurt or lost.

The Big Time

For many fox hunters, the ultimate challenge is Amateur Radio Direction Finding (ARDF)—a multi-transmitter, on-foot race over acres of forest or parkland. ARDF events test the participants' physical fitness, radio direction finding skills, and orienteering ability. The IARU 22nd IARU Region 1 ARDF Championships were held in Slovenia September 2-8. Teams from 28 countries, including a non-competing guest team from the U.S., hunted in the mountains of Zrece in northeastern Slovenia.

The 19th USA National ARDF Championship and 10th IARU Region 2 ARDF Championship were held near Raleigh, North Carolina, July 28 to August 4. Thirty-six competitors, ranging in age from 8 to 73, took part in the classic 2- and 80-meter fox hunting competitions. There were also foxoring events, which combine orienteering and RDF on 80 meters; and sprint events—an 80-meter challenge featuring short courses that require hunters to find two sets of five transmitters. Results of the championship will be considered when selecting the ARDF team to represent the U.S. in the 20th ARDF World Championship scheduled for fall 2020 in Zlatibor, Serbia.

Credit: https://www.onallbands.com/fox-hunting-getting-young-people-hooked-on-the-adventure-of-ham-radio/

Satellite Shorts From All Over

+ Reminders from Drew Glasbrenner about AO-92 and AO-91 - AMSAT-BB 1/6/2021:
"Today I turned AO-92's transmitter off after resetting the min-max readings. We've been watching the battery minimum voltage decline steadily over the last few days, and needed to give it a rest for a bit.
Immediately afterwards, there was an AO-91 pass. I turned on the transmitter, and a few moments later reset the min-max readings. The command team will monitor telemetry and determine if we can leave it on for a while.
Please remember to not transmit to either satellite while it is in eclipse.
If you do not use software that indicates eclipse state, just avoid the evening passes. We are in the endgame for both satellites, and your cooperation will give us more operational time over the coming months."

(ANS thanks Drew Glasbrenner, KO4MA, AMSAT VP Operations for the above information)

Sporadic-E...and How to Make Sporadic-E QSOs

Propagation that utilizes the E layer of the ionosphere. Since this layer is inconsistently ionized and is lower than the F layers that support more reliable HF propagation, such propagation is more rare. When it occurs (usually in the summer months) it can support long-distance QSOs especially on 6 meters. Sometimes known as E-Skip, a Sporadic-E opening can last from minutes to several hours, depending on the density of the ionized clouds. Click here for an OnAllBands article discussing Sporadic-E, Tropospheric Ducting, and Aurora. The article, by Sean, KX9X, talks about what equipment you will need to take advantage of this phenomenon.

"Sporadic-E QSOs can be made with very little transmit power, if the opening is strong. As far as antennas, while bigger is always better, smaller antennas can have excellent results during good openings. A dipole for 6 meters is only 9' 4" long; you can make it out of wire and hang it from a tree, or construct one using aluminum tubing, a mast plate and a feedpoint connector. Use hose clamps to tighten down the tubing, and adjust the length for best SWR. For domestic QSOs, a 6-meter antenna doesn't have to be very high; good results can be had with antennas only 15-20 feet above ground."

Credit: https://www.onallbands.com/sporadic-e-and-how-to-make-sporadic-e-qsos/

Staying at Home? There's No Reason Why Amateur Radio Operators Can't Stay Connected

While the COVID-19 outbreak gives Hams a chance to work on their stations alone and contemplate future projects in the solitude of the shack, there are still plenty of ways to keep your distance but still keep in touch with what's happening in the Ham Radio community. Here are a few suggestions:

Care for a Rag-chew?

Our hobby was made for social distancing. While we can't gather in person at hamfests and club meetings (yet), reaching out to Hams who may be isolated is as easy as finding a solid signal and responding to a CQ, or calling CQ and waiting to see who jumps in for a friendly conversation.
Right now everyone has a story to share about the pandemic. You could be there for an operator who needs a welcoming ear. Not into drawn-out exchanges? Making even the briefest of contacts with Hams in our communities, throughout the U.S., and around the world connects us all. In light of the many peripatetic DXers who are temporarily homebound, a popular DXpedition calendar (mostly vacant for April) said it best with this message: "MAKE BAND ALIVE. REDISCOVER THE PLEASURE OF QSOING EACH OTHER! #stayhome."

Participate in a Contest

As the wide world of college and pro sports grinds to a virtual standstill, Amateur Radio contesting continues to flourish. For those new to the contesting game, now's a great chance to get your feet wet. If you're using this time to hone your Morse code skills, take a moment to read these OnAllBands articles: CW Contesting: Getting Started and Making QSOs for Real and Tips on Better Scores. You'll find many CW contests—like the "Get Your Feet Wet Day" hosted by the CW FISTS Club—waiting for you, along with State QSO Parties and the Hamvention® QSO Party on May 16. Seasoned operators will want to take note of the CQ World Wide WPX Contest, CW, on May 30-31.

Take Part in Social Media

Visit DX Engineering's Facebook page and hit the "like" button to join the tens of thousands of Hams from around the world who regularly view DX Engineering posts on new products, Facebook Live feeds on digital Ham Radio and other topics, links to educational articles, and humorous memes that only Hams will understand. And when there's a hot topic or antenna/station/mobile radio photo worthy of comment, don't hold back. Be sure to add your opinion to the conversation. Remember, we're all friends here.

Join an Amateur Radio Club

Your local Amateur Radio club wants you! And even though they're likely not meeting in person at the moment, many still hold online presentations (via Skype, Zoom, etc.) on Ham Radio topics you may find useful. Best of all, when it's time again to gather, you'll have a welcome group of kindred spirits to share the hobby with and ask questions. Here are a few more reasons to pursue club membership. Looking for a local club to contact? Click here to find one near you from the more than 2,500 ARRL-affiliated clubs.
Join the ARRL: The American Radio Relay League is the largest membership association of Amateur Radio enthusiasts in the U.S. When you become a member, you're supporting a non-profit organization that has been working on behalf of Ham operators since its founding in 1914. In addition to publishing numerous reference books, QST magazine, and On The Air magazine for new Hams, ARRL gives voice to the concerns of Hams through lobbying the U.S. Congress and the Federal Communications Commission.

Stay Active and Think Forward

Take a good look at your station. Have your coaxial cables and connectors seen better days? Do you have the right tools to prep your coax for installation of connectors? Are you itching to add a UHF/VHF rig as you suffer through the less-than-stellar demise of Solar Cycle 24? Is this the year you finally buy that HF linear amplifier? Has the pandemic made you think more about upgrading your emergency preparedness with an HF or digital Go-Kit?
If you're a contester, check out this article from Ward Silver, N0AX, on small station upgrades that will make a big difference in performance, including adding INRAD and Heil headsets, antennas, radial systems, audio processors, voice keyers, and more.

Reach Out to a Friendly Voice

The DX Engineering team reports that during the COVID-19 outbreak, many customers—from newly licensed operators to DX veterans—have appreciated the opportunity to simply talk with another Ham. Feel free to reach out to DX Engineering's Elmers. Ask questions. Tell them about your plans for your dream station. Rest assured, they'll be available for you today and long after the crisis is over. After all, they're Hams, just like you.

Credit: https://www.onallbands.com/staying-at-home-theres-no-reason-why-amateur-radio-operators-cant-stay-connected%ef%bb%bf/

Kirchhoff's Laws:

Laying EE Foundations in Voltage, Current, and Spectroscopy

While most EEs are familiar with Kirchhoff's Laws of Current and Voltage, Kirchoff's research may have an even deeper impact on modern circuit analysis—and even quantum mechanics—than some may realize.

To appreciate where circuits are heading in the future, it is necessary to understand where the foundation was laid. A major contributor to the foundation of electrical engineering is that of Gustav Kirchhoff and his laws of circuitry and spectroscopy. These laws provided a cornerstone for future scholars and engineers to build off, leading us to the technology we have today.

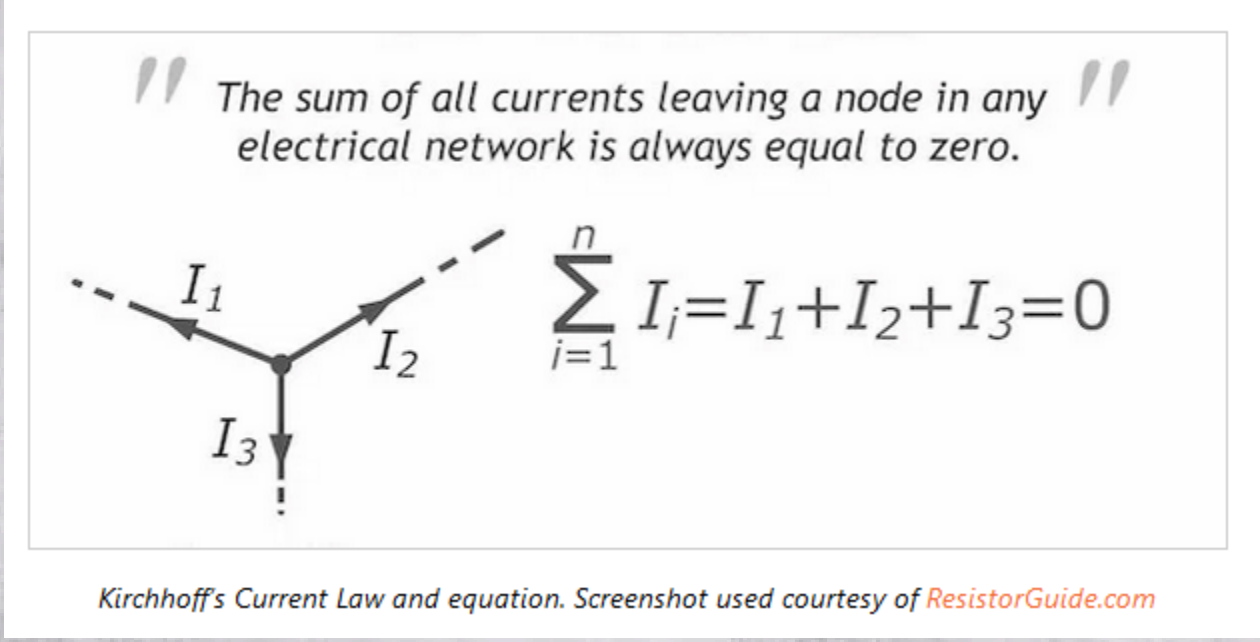
Portrait of Gustav Kirchhoff. Image used courtesy of the Library of Congress

Kirchhoff was a German physicist who helped develop the fundamentals of circuits, namely principles relating to current, voltage, and resistance. Kirchhoff attended the Albertus University of Königsberg, East Prussia (now Kaliningrad, Russia).

While there, he was taught by Franz Ernst Neumann, a German physicist and mathematician. Inspired by his professor's work on electromagnetic induction, Kirchhoff created his circuit laws while still a student in 1845, which elaborated on Georg Ohm's work.

Current Law or Junction Rule

Below is a basic definition of Kirchhoff's Current Law (KCL):

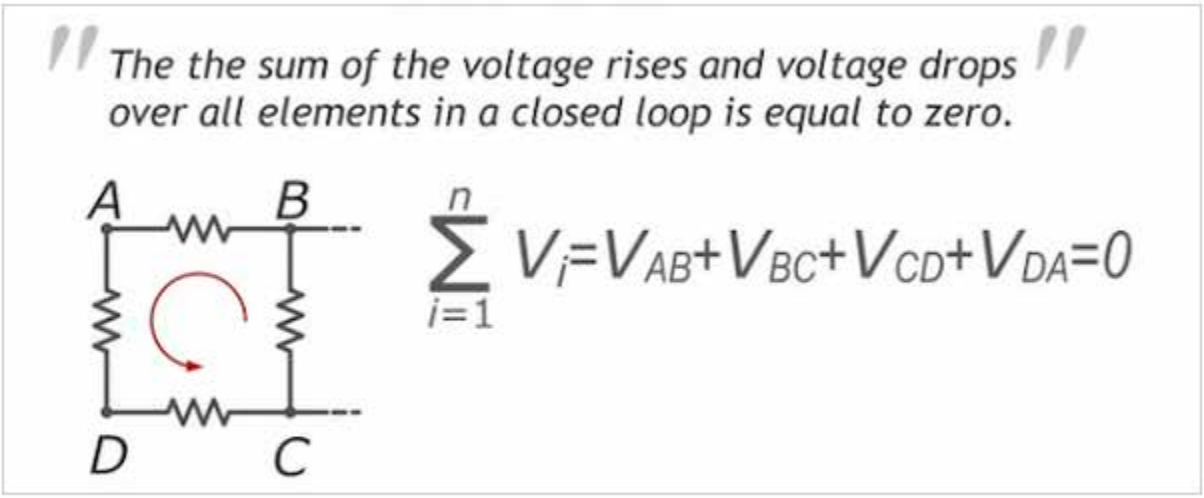


Kirchhoff's Current Law and equation. Screenshot used courtesy of ResistorGuide.com

Kirchhoff's Current Law states that as the current flows into a junction, it is considered positive (+). Respectively, the current flowing out of a junction is considered negative (-). These polarities are necessary because the current that flows in must equal what flows out.

Voltage Law or Loop Rule

Kirchhoff's Voltage Law (KVL) is as follows:



Kirchhoff's Voltage Law and equation. Screenshot used courtesy of ResistorGuide.com

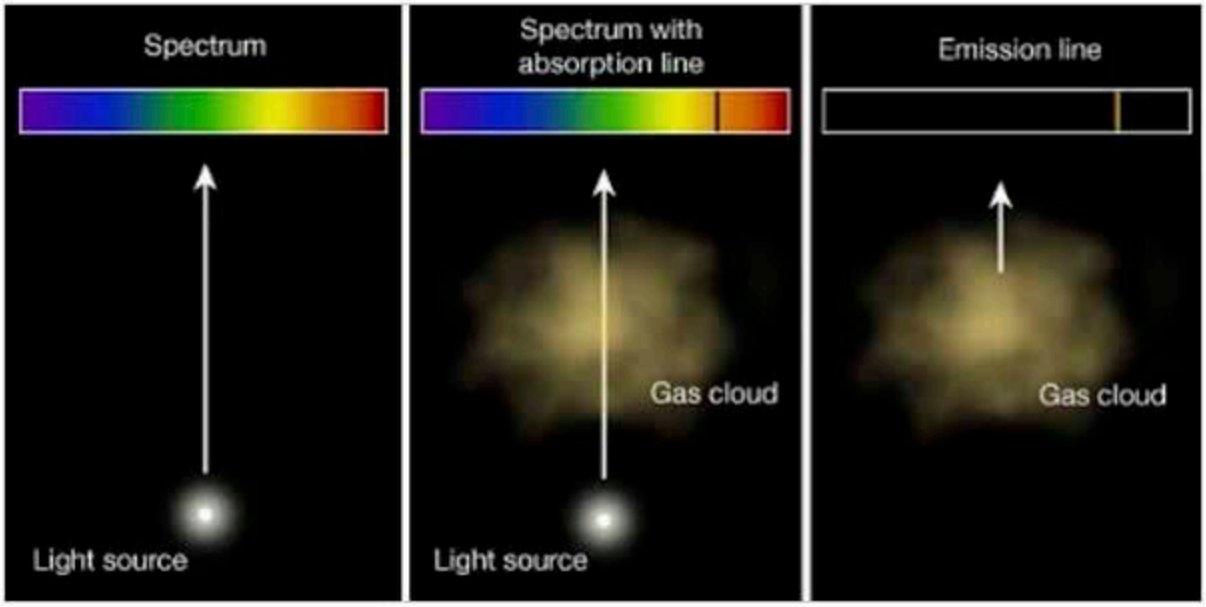
Kirchhoff's Voltage Law states that as the voltage travels across a circuit loop, the sum of the voltage at the end should equal the starting voltage, which is 0. This result is necessary because a single point cannot have two different voltages.

Laws of Spectroscopy: Work with Robert Bunsen

In 1851, Kirchhoff met and befriended Robert Bunsen, which led him to relocate to the University of Heidelberg in Germany, where he became a physics professor. With Bunsen, Kirchhoff not only made advances in electricity but in chemistry. They worked to develop what would be known as Kirchhoff's Three Laws of Spectroscopy.

Kirchhoff's Three Laws of Spectroscopy are when:

1. A hot solid, liquid, or gas is placed under high pressure, producing light with a continuous spectrum.
2. An object on the continuous spectrum is viewed through a cool gas under pressure, creating an absorption line spectrum.
3. A hot gas placed under low pressure produces light on the emission line spectrum



Visual of Kirchhoff's Three Laws of Spectroscopy. Image courtesy of Penn State Astronomy & Astrophysics

These three laws helped to explain the sun's spectrum and led to further research into thermal radiation. Through this experimentation, Kirchhoff and Bunsen discovered two elements: cesium and rubidium.

Innovations From Kirchhoff's Laws

With Gustav Kirchhoff's discoveries, many starting points, inspirations, and innovations engineers currently utilize and benefit from were able to come to fruition. Here are a few benefits resulting from Kirchhoff's laws:

- Kirchhoff's Laws of Spectroscopy helped James Clerk Maxwell learn that light was an electromagnetic phenomenon and furthered his study on electricity and magnetism.
- Kirchhoff's work has become fundamental in the creation of quantum mechanics, which is vital in miniaturizing technology.
- Kirchoff's Laws of Circuits have become an essential building block for all electrical engineers, thus providing engineers with the resources to improve and develop new technology.

Modern research and development teams in the electronics sphere stand on the shoulders of scholars like Gustav Kirchhoff to continue progressing. Are you partial to the work of a historical engineer or physicist you'd like us to cover next? Share your suggestion in the comments below.

CREDIT: https://www.allaboutcircuits.com/news/historical-engineer-gustav-kirchhoff-voltage-current-spectroscopy/

Ladder Line

http://kv5r.com/ham-radio/ladder-line/

Why Use Ladder-Line?

To efficiently feed a non-resonant multi-band antenna.

Antenna Mythology

Resonance

First, let's dispel the greatest myth in antenna theory: Antennas must be "resonant" to be efficient. Baloney! It just ain't so!

Please recognize that an antenna need not be resonant in order to be an effective radiator. There is in fact nothing magic about having a resonant antenna, provided of course that you can devise some efficient means to feed the antenna. Many amateurs use non-resonant (even random-length) antennas fed with open-wire transmission lines and antenna tuners. They radiate signals just as well as those using coaxial cable and resonant antennas, and as a bonus they usually can use these antenna systems on multiple frequency bands.

—ARRL Antenna Book, Ch. 2

As long as the length of the antenna is at least a half-wavelength at its lowest intended frequency, its efficiency is well over 90%, just like a resonant dipole. The problem is getting power to it—coax is very lossy (due to dielectric heating) unless terminated into its characteristic impedance, and this effect is what leads many hams to erroneously believe that non-resonant antennas are inefficient. But the problem isn't non-resonance, it's high SWR on coax.

On the other hand, ladder-line does not suffer from high losses at high SWR, so may be effectively used to feed an antenna that may, at various frequencies, present the feed-line with any SWR from 1:1 to ~12:1. So, with ladder-line you can completely forget about resonance and SWR, until you get to the radio, where you use a tuner to make the match to 50Ω.

To compare mismatched feed-line losses we have to start with the antenna's feed-point impedance, and the line's impedance, then calculate the SWR, and finally, the loss of each feed-line-type at a given frequency and length.

For a worst-case example, feeding a voltage node (like running 40 meters on an 80 meter dipole), let's say the feed-point impedance is 3500 ohms. With 100 feet of RG-8 coax at 7 MHz, that's a whopping 65:1 SWR, with a total loss of 78%. With 600-ohm open-wire line, the SWR is only 5.8, and the loss is 3%! Then, if we switch to 80 meters, the impedance is 50 ohms, the SWR is ~12:1, and the loss is 7%. In this case, 450-ohm line would be even better, because its characteristic impedance is closer to the geometric mean, so the SWR only varies from about 9:1 at 50 ohms to 7.7:1 at 3500 ohms. The total losses for 100 feet of 450-ohm windowed ladder-line, at 9:1 SWR, ranges from 5% at 3.5 MHz, to 14% at 28 MHz, and again, that's at the worst-case mismatch points.

line can *cross* a metal edge, like a window sill; you just don't want to run it right against metal for any significant length.

4. "It's too hard to bring into the shack!" Baloney. There are many waterproof ways to bring ladder-line into any shack. You can drill two small holes through the wall and bring two #12-#14 wires through, then caulk, and connect them to the balanced output of your tuner. Or better, mount your balun outside the wall and come in with a few feet of coax. I like that way better because the coax is easy to disconnect (at a bulkhead fitting) during storms.
5. "It flops around in the wind, and it breaks too easy!" (a) Windowed line should be twisted about one twist for every two feet to prevent wind-induced oscillations. (b) Make a good feedpoint connection, with proper strain-relief. It doesn't hurt to wrap the line over the top of your feedpoint insulator and then secure it to itself with cable ties. Also, the 14-gauge stranded is **much** more reliable than the 18-gauge solid line.

If you run an all-band dipole (with a tuner in the shack), you need ladder-line. Coax is **very** lossy when operated at high SWR. It's easy to lose 75% of your power in your coax when operating on bands where the non-resonant dipole presents a high feedpoint impedance to the feedline.

Notes:

1. There are 6 pages in this article.
2. There is much more information in the comments, below each page.
3. Please see the remaining pages, and their comments, before posting.

Ladder-Line Types

No one seems to know what to call it: ladder-line, windowed ladder-line, window line, "true" ladder-line, open ladder-line, open feeders, etc. etc.

- Twin-lead is the 300-ohm TV antenna line. Don't mess with it. A similar line is called tubular, the type of TV line that is oval and contains a foam dielectric. It's almost as lossy at high SWR as coax.
- Ladder-line uses mostly air as the dielectric. The wires are separated with spreaders or window-punched plastic.
- Windowed ladder-line (WLL) is just that: 1-inch twin-lead with windows punched in it. Some call it window-line.
- The "true" ladder-line is best called "open-wire feed-line," or simply open-line, to distinguish it from window-line. This is the type made from two parallel wires, separated by spreaders.

What to Get

Get the 16- or 14-gauge stranded window line from Cable-Xperts or Wireman. Don't get that 18-gauge solid-wire stuff—it breaks when repeatedly flexed. Well—some people swear it lasts forever. I guess it will if you completely immobilize your connections.

Brew Your Own

The one problem with window line is that it tends to change characteristics when wet, and the longer the run, the more tinkering you'll have to do with your tuner as the weather changes. The solution to make your own open-wire feeders. It isn't hard or complicated.

1. Get a 500-foot roll of #14 THHN or THWN insulated stranded (~~$20~~ ~$45 at builder's supply). Pick a color that blends with the background. Get some pressure-treated 4x4s, 12 feet long, and plant them in the ground every 50 feet or so. Many people do not use any poles; they just swag it from the tower to the eve of the house, and it works fine. Poles would be needed for runs over, say, 50 feet or so. It depends on what wire you use, how much ice you get, etc.
2. For spreaders, all you need is some kind of small, UV-resistant, semi-rigid plastic pipe, like 3/8" PEX. Cut them 4 inches long, and make enough to put one every 4 feet in tensioned spans, and every 2 feet in slack spans. You can notch, or drill holes, in each end of each spreader then glue them in place with Silicone caulk or hot-melt glue. You can also purchase pre-made snap-on wire spreaders called Ladder-Snaps. I used Zareba Ribbed Tube insulators, which are made for electric high-tensile fencing, placing them between the wires and running a thin zip-tie through the middle (twice) and around the wires. (See my 80-Meter Doublet article).
3. String up two strands of the wire, appropriate length, between trees. Pull them even. Install spreaders. You can make a 150-foot ladder line in a couple hours. It's a good idea to continue the same wires on past the spreaders, to form the dipole. Then you have no solder connections to seal or break. Another thing you'll need to have a 300-foot open-frame tape measure (~$20 at Harbor Freight).
4. Congratulations - you just made modern, high-quality "true" open-wire ladder-line, and you didn't even have to boil a bunch of wood dowels in paraffin!
5. Now attach it to your supports with little electric fence insulators (on wood posts) or PVC pipe stand-offs (up the tower), as needed.

Note: Some say you have to use bare wire - **baloney.** Why mess with wind static, rain static, and corrosion? The same holds true for all wire antennas. **Never use uninsulated wire.** It just isn't necessary. Of course, if you already have a bunch of it, feel free, and maybe spray paint it...

One more thing to consider: Bending ladder-line at sharp angles can cause problems on the higher bands. This is because the magnetic field around the line will interfere with itself at the bend. Or so say the books! I have never had any problems bending window line at 90-degree angles, and I've even fed a 2-meter beam with window line, bent 90 degrees 3 times, and it worked fine.

Spacing and Impedance

Don't worry about it. A non-resonant antenna will present a feed point impedance of perhaps 35-5000ω, at various frequencies, so who cares about the exact feed line impedance? Matching the antenna to the feed line simply has nothing to do with efficiency (unless you're using coax).

Anything from 1 to 6 inches is acceptable spacing. 1-inch #14 line is 370 ohms. 1-inch #18 line is 450. 6-inch #12 is about 600. It just isn't at all critical - and don't let any geezer or guru tell you different! The spacing should not be over 1 percent of the highest-frequency wavelength, and that's the only real consideration with ladder-line spacing. On the other hand, it needs to stand-off from metal at least 2-3 times the line's width, so wider lines need longer stand-offs. I think 4-inch open line, with 12-inch stand-offs, is a good place to start.

Length

As mentioned above, parallel feeders can pick up RF from the antenna and transport it into the shack as common-mode current (this means the two wires acting as one, in-phase). The way to avoid this is to avoid resonant lengths of ladder-line, and, if possible, bring the line away from the feedpoint perpendicular to the antenna (90°) for a far as possible before turning parallel to one side of the dipole. Setting your bend-point will also help you take up slack when using a non-resonant length, without having to cut off the excess.

In other words, measure your total run, then increase that to the next available "good" number, then route the line to take up the slack. A 300-foot (or 100 meter) open-reel tape measure is handy, and Harbor Freight has them for about $20.

Lengths to avoid (in feet): 32, 65, 96, 130, and 260 - and multiples of any of those. Don't let them make you buy 100 feet when you know that'll be too close to 96! Make them sell you 110 feet, for example.

Good lengths: Somewhere around 40, 80, 110, etc. This is from the ARRL Antenna Book.

Ladder-Line Length, Update 2019

Since writing this article in 2002, I've discovered there are several theories about calculating ladder-line length. It turns out that the ARRL Antenna Book is right about using non-resonant lengths, but that doesn't present the whole picture. Common-mode currents may be effectively blocked with a good 1:1 current choke/balun.

However, there's an even better reason to select non-resonant feed-line lengths, and that is: To avoid impedance extremes, and present an easy match to the tuner.

The Odd-Eighth-Wave Method

Various experts are now recommending that such systems should use **odd-eighth-wave multiples** of the antenna's fundamental frequency. The easy formula is:
LL(feet) = 123 ÷ MHz × VF, x1, x3, x5, x7, etc. Since full-wave (feet) = 984 ÷ MHz, eighth-wave = 123. If you want to get it really close, multiply that by the Velocity Factor, which is about .91-.92 for window-line, and about .95 for insulated open-line.

Example: Dipole resonant at 3.75: (123 ÷ 3.75) × .91 = 29.848 feet; x3 = 89.5; x5 = 149.24; x7 = 208.9; etc. Not to imply it's that critical — we just need to ensure that no current or voltage anti-node falls within any amateur band, to the greatest possible extent.

The reasoning is that such lengths will place impedance extremes *between* bands, and more moderate impedances *within* bands to make it easier on balun and tuner components. Or, put another way, keep the voltage and current anti-nodes out of the ham bands, and therefore, away from the tuner. For example, a certain length of line that is odd-eighth-waves of the fundamental will transform the low impedance of a current anti-node *up* to perhaps 500, and at double that frequency, transform the very high impedance of a voltage anti-node (like running an 80-meter dipole on 40 meters) *down* to around 500. So the tuner never sees an extreme mismatch, and we avoid both overheating things with high current, and arcing things with high voltage.

NOTE that I did NOT say using an odd-eighth-wave WILL give you 500 ohms on all the ham bands. I just picked 500 because it's the approximate geometric mean of antenna impedance extremes, to use examples to explain the concept. If you have a VNA, feel free to do some experiments and let me know what you found.

Transforming both low and high impedances to *medium* impedances is also desirable because antenna tuners are less efficient with low antenna-side impedances, and are the most efficient when the antenna side sees impedances around 500Ω. See also, charts in G3TXQ's Tuner Balun article.

For example, if our long and low dipole has a feedpoint impedance of around 25 ohms (a typical case for 75-meter dipoles well under 1/2-wave high) at resonance, and we duplicate that at the tuner end by using a half-wave of feed line, the tuner sees 25 ohms and its efficiency is a poor 60-70%. And if we use an odd-quarter, we invert the low impedance to extremely high, and things start arcing. But if we use an odd-eighth feed line, the tuner will see several hundred ohms, and its efficiency soars to around 95%! The extremes are still there, but they are an eighth-wave up the line, not at the tuner's terminals.

Now when we double the frequency (160 to 80, or 80 to 40), suddenly we are running a full-wave dipole, and feeding a voltage anti-node, with a very high impedance. If we duplicate that at the tuner (with a half-wave of line), we arc the capacitor plates with high voltage, causing tuner damage (and maybe amplifier as well). Not good! Odd-eighth-wave to the rescue—it will transform both low and high impedance to medium, right where the tuner is both safe and efficient! Nifty.

I used 5/8ths-wave with my 80-meter (130') doublet, and found that it tuned well on all but 10-meters, so I had to trim the line a little. There is no magic number or formula for ladder-line length, because every antenna is different. But the odd-eighth-multiple is a good place to start.

Tuner Manuals

From the MFJ-976 Balanced Line Tuner Manual:

"The following suggestions will reduce the difficulty in matching an antenna with a tuner:

- Never center feed a half-wave multi-band antenna with a high impedance feed line that is close to an odd multiple of a quarter-wave long.
- Never center feed a full-wave antenna with any feed line close to a multiple of a half-wave long.
- If this tuner will not "tune" a multi-band antenna, add or subtract 1/8 wave of feed line (for the band that won't tune) and try again.
- Never try to load a G5RV or center fed dipole on a band below the half-wave design frequency. If you want to operate an 80-meter antenna on 160 meters, feed either or both conductors as a long-wire against the station ground.
- To avoid problems matching or feeding any dipole antenna with high impedance open wire lines, keep the lines around these lengths. [The worst possible line lengths are shown in brackets]:
  160 meter dipole: 35-60, 170-195 or 210-235 feet [Avoid 130, 260 ft]
  80 meter dipole: 34-40, 90-102 or 160-172 feet [Avoid 66, 135, 190 ft]
  40 meter dipole: 42-52, 73-83, 112-123 or 145-155 feet [Avoid 32, 64, 96, 128 ft]
  Some slight trimming or adding of feed line may be necessary to accommodate the higher bands."

Several other balun and balanced-line tuner manufacturers offer similar numbers. Good advice from them, but to me it's just simpler to calculate an odd-eighth-wave multiple and put those impedance extremes between bands. What about 60 and the WARC bands? Well, you might not avoid an impedance extreme in *all* of them, but if you have trouble tuning a band, trim a little feed line and move the impedance extremes a bit. How much to add or subtract? An eighth-wave on the band that will not tune. Makes sense, eh?

What About "Skywire" Loops?

Myth (heard nightly): **"Horizontal loops only radiate straight up!"** Really? How is it then that many hams use them with great success, both regionally and, on the higher bands, for DX? The elevation pattern for a full-wave horizontal loop is almost identical to a dipole at the same wavelength high. High-angle NVIS on 160, 80, and 40; and lower angles on 20 and above. The loop also suffers in the azimuth plane from multiple nulls and lobes on the higher bands.

Keep in mind that a full-wave loop is resonant (~100*j*0 free-space, lower near earth) on **every** multiple, not just odd multiples like a half-wave dipole. That means that a 160 meter loop cut for ~1.78 MHz (1005 ÷ 1.78 = 564 feet) will be current-fed also on 80, 40, 20, and 10.

Like the big multi-band dipole, the big multi-band loop works best at about 68 feet high, where it's a half-wave high on 40 meters (but it's still okay at 30-45 feet), and ladder line feed. Please see NVIS Page 3 and the elevation angle plots therein.

Articles still abound, from the original *Loop Skywire* article decades ago, to the present, showing the "Skywire" fed with coax. And everyone I've ever known, or heard of, who did so was disappointed. But those that feed big loops with ladder line say they will never go back to dipoles, or coax.

Entry: Feed-Trough's and Lightening Arrestors

How to make your own spark-gap shunt ("lightning impulse arrestor"), waterproof ladder-line feed-through, and quick-disconnect for (hopefully) improved lightning safety, using common hardware. Or, how to possibly avoid the "billion-amp arc in the shack" scenario.

Disclaimer: All disclaimers apply. No guarantees. I am not an engineer nor expert in the field of lightening protection. I assume absolutely no liability for your use of this material. These ideas have not been tested. Use at your own risk! The actual effectiveness of these measures cannot be quantified. Lightning is dangerous, destructive, deadly, and unpredictable, due to rapid release of incredible power, and extremely wide range of variability.

My HF antenna is a 160 meter dipole, fed with 14-gauge windowed ladder-line. This arrangement should make a nice lightning collector, so I took special precautions on the entry path of the ladder-line.

In figure 1, notice the PVC standoff (one of two), made of half-inch PVC, about six inches long, and attached to the trailer with aluminum angle. The ladder-line proceeds down to the arc-shunt assembly, which is mounted directly on the ground rod. It then proceeds up to brass feed-through assemblies (Fig. 2). Once inside, it plugs into the tuner with banana jacks (Fig. 3), for quick disconnection.

The ladder-line is kept separate from all the other cables, which enter via a 1½-inch PVC nipple and coupling (inside) through the floor. The coupling is packed with paper towels (and a little boric acid powder) to keep out bugs. The arrangement provides a good seal that can be easily removed and replaced to allow passage of PL-259s intact.

2018 Update

In the spring of 2018 I went QRO, and put up a heavy-duty 80-meter doublet, fed with 4-inch open-line. I made three different entrances: (1) Wires through tubing through the wall; (2) twin coaxes through the wall; and finally, balun outside and coax through a bulkhead fitting in the wall. All worked well, but I like the last one best, for several reasons.

Please see 80-Meter Doublet in the 2018 section. Lots of pictures!

Ladder-Line Arc-Shunts

I constructed the shunts as follows: Using a piece of 1/8th-by-1 inch aluminum flat or angle stock, cut to about four inches long, drill three holes. Enlarge the two outer holes until you can force-thread two spark plugs into them. Use new, non-resistor-type plugs. Run a 1/4 x 4-inch bolt down through the center hole and place a nut underneath. Now grind a couple of flats on the last inch of the bolt, so it will clamp easily in your ground rod clamp.

Attach the ladder-line as follows: Measure and strip the incoming line and jumper lead. Crimp and solder uninsulated ring lugs. Apply a little grease and then place them under the spark plugs' caps. Tighten securely with pliers, but be careful not to twist off the small stud on the plugs! Seal the tops off with silicone caulk or Coax-Seal. Be sure to insulate all connections, particularly if you have curious children around, to prevent RF burns.

Note: A gap of .025 will not arc RF at 100 watts on any band. Higher power may require a wider gap, so watch your SWR meter carefully the first time you QRO on each band.

If you want the lightening arrestors to arc at a lower voltage, you'll need to obtain a couple of gas-filled arc shunts (commonly used in coaxial arrestors), or obtain commercial MOVs rated for RF service.

NOTE: No arrestor will protect your radio! All are meant to arc at a much higher voltage than your radio can stand. Always disconnect during storms! The arrestors shown here are meant to keep the disconnected jumper from arcing inside the house - **not** to protect the radio!

Figure 1 (Ooooo lookie! RF can change directions 180 degrees!)

How Does it Work?

I have not had a direct lightning strike. The spark plugs should arc across the .025 gaps and shunt inductive impulses (nearby strikes) to ground, and they probably have done so on many occasions. In a direct strike, the arc current will probably ramp up until it vaporizes the ladder-line, which being swagged from the tower, should fall open and might interrupt that leg of the pulse. The tower, about 50 feet away and also grounded, should then ramp up current until it is destroyed or the charge is dissipated. In other words, three successive failure modes are designed to interrupt part of the strike and channel the vast majority of it to ground, away from the operating position. Well, in theory! I do not hope to ever test that scenario. Still, it's probably better that no planning at all. Remember that, once a lightning arc starts, it converts the air into plasma, which is highly conductive, and nothing will open the arc until the energy dissipates to the point that the power flow will no longer support the plasma state, at which point it converts back to regular gas. (Plasma is simply gas that is so hot that the electrons are stripped from the nuclei. With most of the electrons being free, it becomes a highly conductive gas).

Note that an inductive impulse that would arc the plugs will still damage the radio if the feedline remains connected. Spark "arrestors" are not a replacement for disconnected feedlines! All spark-gap shunts work because the feedline is disconnected, providing a much wider gap (several inches) than the small gap of the device, thus forcing an arc at that path of lower resistance, before the voltage can climb higher. I assume that the plugs

should arc at about 10-15 kV, since they do so in engines. That will still ruin your radio if connected.

Possible Improvements

If I did it over, I'd plant a 4x4 post several feet (maybe 8-10) from the house, bring the ladder-line down it, and place the arrestor assembly there, with its own ground rod. This would carry a large, direct-strike pulse to ground at a greater distance from the house. The jumper would then cross to the operating position, suspended near the ground. This would be a tripping and mowing hazard, but would probably (in theory) shunt the arc to ground at a distance sufficient to keep it from vaporizing the side of the house.

Another idea I have not yet tried is to run the ladder-line underground, by twisting it, wrapping it in bubble wrap, and stuffing it into six-inch PVC sewer pipe. It should work, if the line is well balanced and kept centered in the pipe. This would be done to provide an easy full-stroke arc path to ground starting at some distance from the house, say, 20 feet. The pipe would have to be totally waterproof on both ends. Why not just use coax? Too lossy at high SWR's! We non-resonant antenna users benefit greatly from ladder-line, in spite of its drawbacks. The most important consideration is to try to keep it from becoming the path for a fat, billion-amp arc right into your operating position!

If you want to get fancy, mount the spark plugs in a piece of brass or copper busbar and then braze it directly to the top of the ground rod. If dampness or snow becomes a problem, just push 3-inch lengths of old garden hose up onto the threads of the plugs. Keep weeds and grass trimmed below. Making a plastic housing from a food container would be easy, but I have not found it to be necessary.

Are these ideas totally safe? No. Are they better than nothing? Probably, but that is just an untested assumption. The best lightning protection measure would probably be to design an entry point which opens with a window, so that you can just open the window and toss the whole feedline about 25 feet away from the house. My designs are probably a reasonable compromise between safety and convenience.

Watertight Entry Assemblies

This assumes your rig is near a window, and you know how to replace a window pane with plastic. I used a window because my trailer-home has metal siding. If your walls are nonmetallic, you can, of course, go through with long threaded brass rods. This may be easier than replacing a windowpane with polycarbonate.

Remove and disassemble the windowpane. Measure the glass, then discard and replace with polycarbonate of the same thickness. Many hardware stores carry small pieces, and one shouldn't cost over a few dollars. Cut the new plastic pane to the exact dimensions of the removed glass. Reassemble the window.

Plastic sheet is best cut with a circular, table, or radial-arm saw, using an 80-tooth finish blade (hollow-ground or carbide — do not use a "set-tooth" blade) and cool with a little trickle of water. Don't use a jigsaw, as they just make too much heat. Apply masking tape to avoid scratches during cutting. You may be able to find a store with a commercial panel cutter that will do this for you, and save all the mess and trouble. Take exact dimensions.

Note: It is possible, with a special bit, to drill glass. **Don't!** If a big storm comes along and a tree limb falls on your ladder-line, it'll probably rip out the window glass - not exactly desirable, particularly during a storm…

Fabricate the feed-through assemblies using 10-32 brass hardware as shown in Figure 2. You'll need (2) 10-32 x 1½ screws, 10 nuts, 4 brass washers, and 4 flat rubber sink faucet washers (as seals). Drill the two holes through the window, spaced the same width as your ladder-line. Attach the ladder-line on each end using soldered ring lugs. Split the rings open with wire cutters, place over the outside end of screws, then close the rings and tighten the nuts. Cover outside connections with Coax-Seal (see mine corroding?).

If you'd rather go through a wall (nonmetallic houses), get the appropriate lengths of small brass all-thread rod, and the same length of Tygon tubing (the thick-walled variety) to slip over and insulate the rods. Then get the appropriate extra-long drill bit (carbide-tipped for brick, if needed). Don't drill into a pipe or electrical wire! Drill the holes through the wall and insert the Tygon-insulated rods. Put double nuts and washers on each end. Caulk the outside entry points. Solder ring-lugs to the feedline and jumper. Grease the rings. Install and tighten. Waterproof the outside ends with silicone caulk or Coax-Seal. You'll then have a permanent ladder-line entry that'll last as long as your house.

Figure 2

Many people seem to miss the KISS principle. You can take a 1-by-4, cut to the width of your window, paint it with exterior house paint, wrap its edges with foam weather-stripping, put it in a window and close the window on it. Then cut a length of parting stop (door molding) to use as a jamb-stick to lock the window down against it. Then you can drill it to your heart's content and bring in all kinds of cables, all without drilling your house. Works great for renters.

The Quick-Disconnect Jumper

The short jumper on the inside goes from the feed-through bolts to the balanced output of the antenna tuner. Solder banana jacks onto the line and just plug them in. When thunder is heard, jerk them out and bend the line well away from equipment. This is a lot faster and neater than using the cross-bores in the binding posts, and will encourage you to disconnect at every sound of thunder. However, the bananas might not handle the high current of QRO operation. Since I run barefoot, this is not a problem. A good old-fashioned double-pole knife switch is an even better option - and they look so cool!

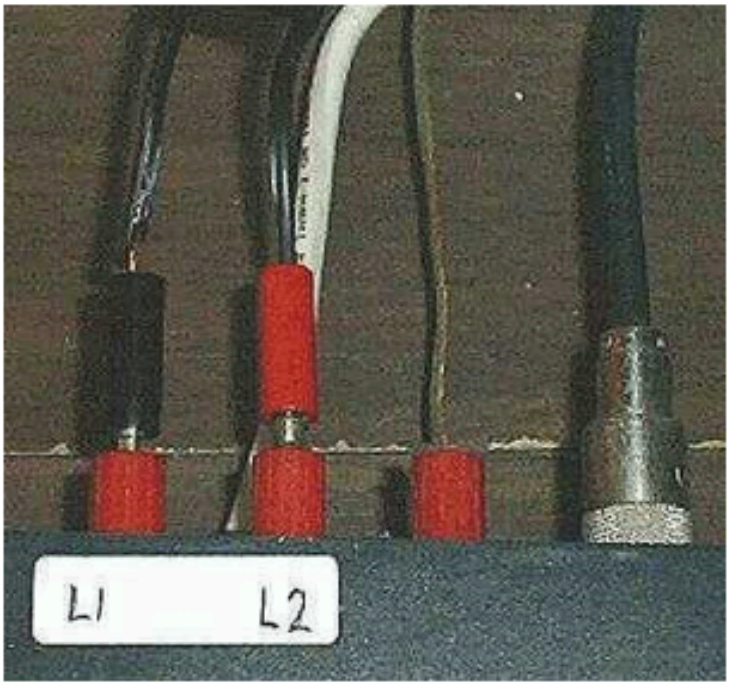


Figure 3

What is PSK31?

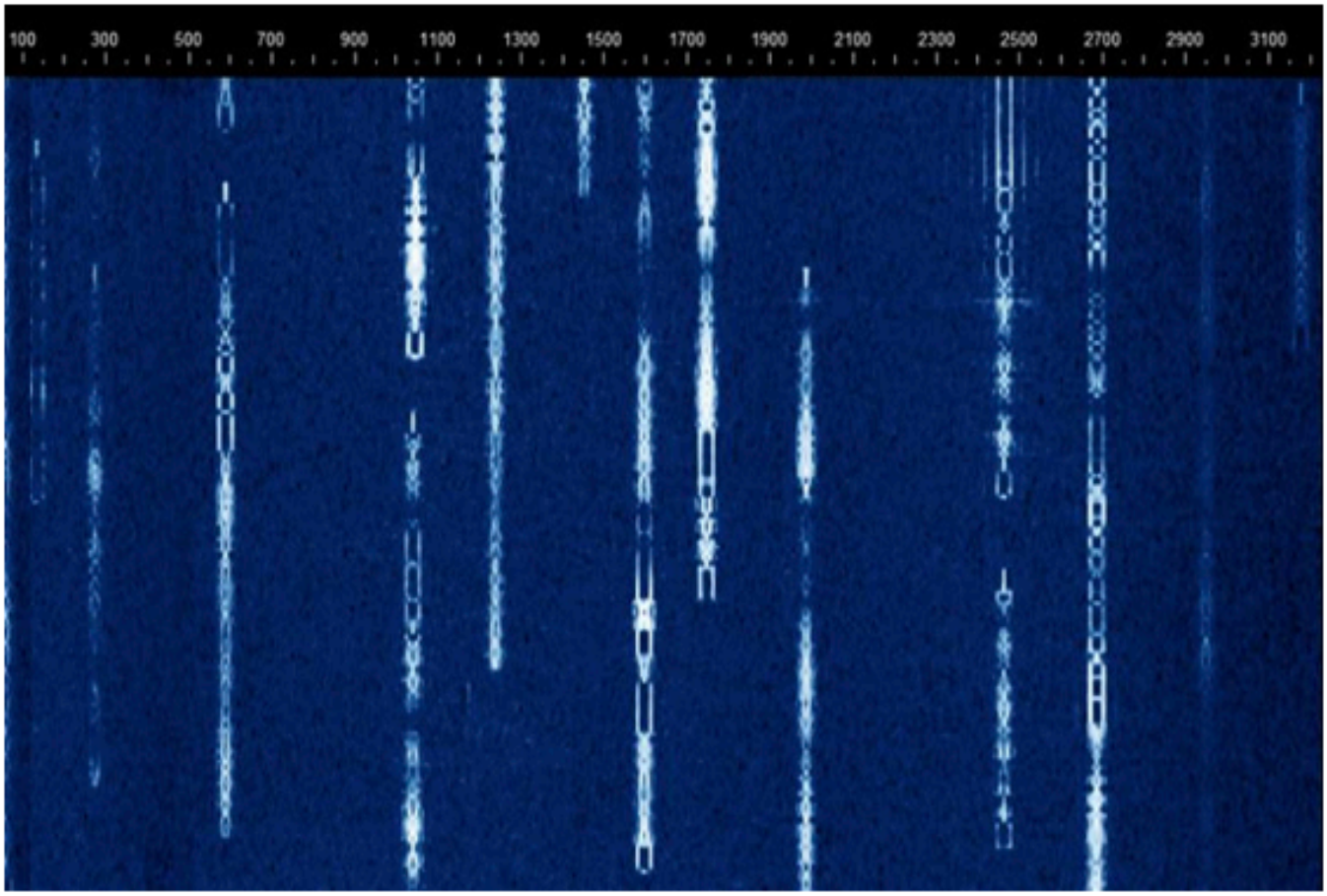
For Hams who operate without massive antenna systems or significant power but still want to work long distances despite poor propagation and interference, PSK31 (developed by Peter Martinez, G3PLX) has remained a popular mode since it emerged on the Amateur landscape in the late 1990s.

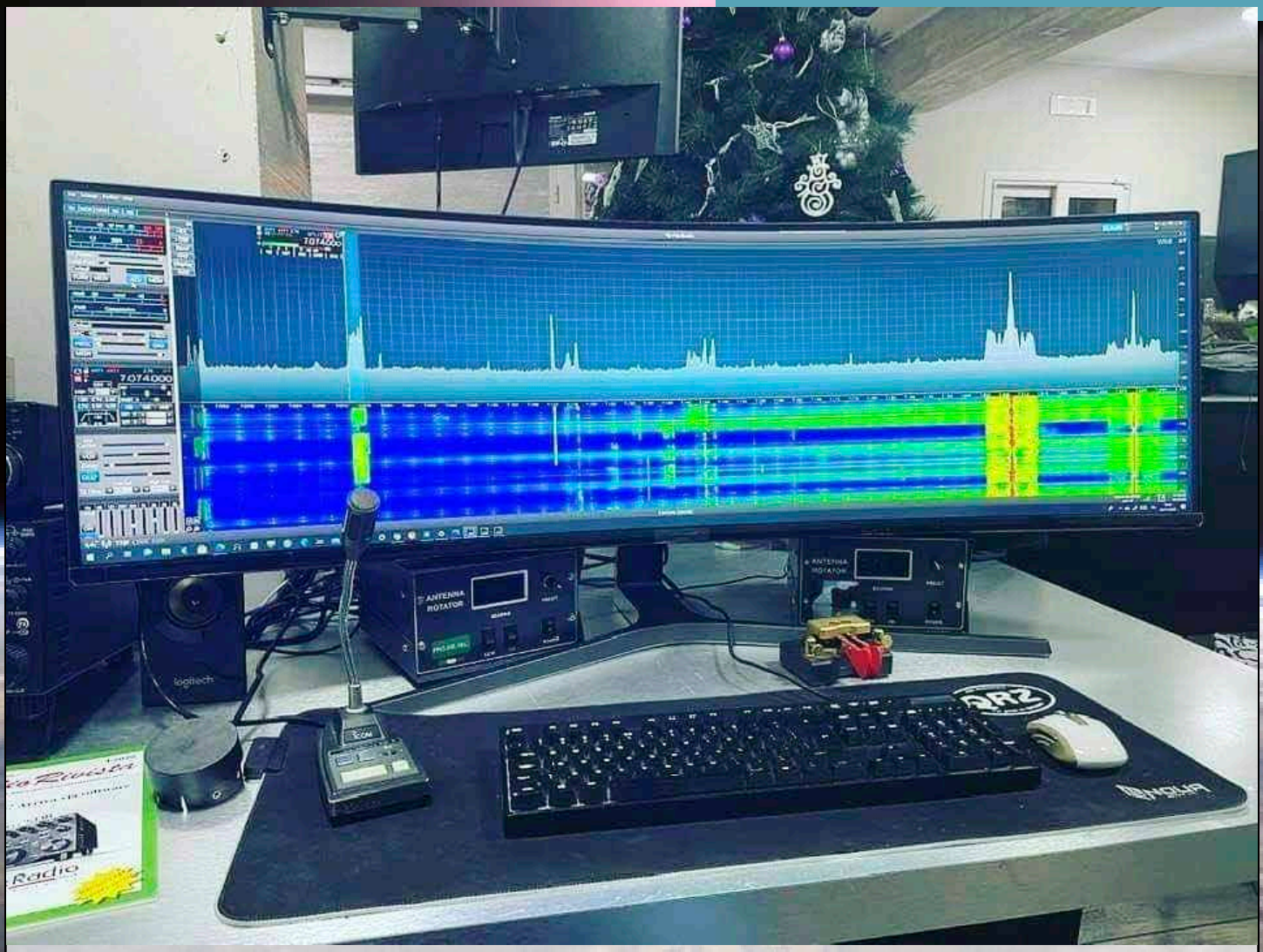
Known for its high efficiency, PSK31 (Phase Shift Keying 31 baud) allows Hams to work stations that may be transmitting the faintest of signals with a modicum of equipment—a transceiver that allows you to use Upper Side Band, computer with sound card, computer/radio interface, necessary cables, and software (e.g., free software such as PSK-31, FLDIGI, Digipan, and WinPSK).

Using skywave propagation, equipment with low power can be used to reach across the globe. It differs from RTTY in that characters in PSK31 mode (31 bits per second/bps) are formed by changing the phase of the sound wave. RTTY is a binary frequency shift keying modulation scheme that involves sending a two-toned audio signal. PSK31 also enables Hams to enjoy real-time keyboard-to-keyboard chatting. If you're looking to make contact with a rare DXCC entity, however, you're better off honing your CW skills or exploring FT4, FT8 and RTTY, which are the more common modes on DXpeditions.

To join other PSK31 enthusiasts, check out the PODXS 070 Club. The club is looking for operators with a "commitment to excellent operating practices, a willingness to learn new things, and a desire to have fun with PSK31!" Find membership requirements at its **official website**. It's free to join.

Credit: https://www.onallbands.com/what-is-psk31/





WSJT-X 2.4.0 to Introduce New Digital Protocol Q65

WSJT-X version 2.4.0 will introduce a new digital protocol called Q65, which, according to the Quick Start Guide, is designed for "minimal two-way QSOs over especially difficult propagation paths." The Guide said, "On paths with Doppler spread more than a few hertz, the weak-signal performance of Q65 is the best among all WSJT-X modes. Q65 is particularly effective for tropospheric scatter, ionospheric scatter, and EME on VHF and higher bands, as well as other types of fast-fading signals."

The new protocol uses 65-tone frequency-shift keying and builds on the demonstrated weak-signal strengths of QRA64, introduced in 2016. User messages and sequencing are identical to those in FT4, FT8, FST4, and MSK144. Q65 employs a "unique tone" to sync time and frequency. "As with JT65, this 'sync tone' is readily visible on the waterfall spectral display," the Guide said.

"Unlike JT65, synchronization and decoding are effective even when meteor pings or other short signal enhancements are present. Transmit/receive sequence lengths of 15, 30, 60, 120, and 300 seconds are available. According to the Guide, "Q65 will enable stations with a modest Yagi and 100 W or more and to work one another on 6 meters at distances up to ~1,600 kilometers at most times, in dead-band conditions."

Credit: https://qrznow.com/wsjt-x-2-4-0-introduces-new-digital-protocol-q65/

DIY 137 MHz APT Weather satellite antenna – Or, do we need a circular polarization?

What we are listening

At the moment there are three NOAA satellites available transmitting the APT weather pictures in LRPT format. They are operating in the frequency range of 137 MHz till 138 MHz. The satellites are transmitting the RHCP (Right Hand Circular Polarized) signal on the following frequencies.

NOAA-15	137.620 MHz
NOAA-18	137.9125 MHz
NOAA-19	137.100 MHz

Beside this three NOAA satellites there is also the Russian METEOR M N2 satellite transmitting weather pictures on 137.900 MHz. The band (137-138 MHz) is crowded with the other satellite signals. Usually you can find several strong ORBCOMM signals and wideband ORBCOMM 57k6 signal on 137.560 MHz, just bellow the NOAA-15 frequency. Do not be confused with the aeronautical VDL MODE 2 signal on 136.975 MHz. This can be decoded too, but this is not the topic that I will cover in this article.

Antenna polarization

As mentioned, the satellites are transmitting circularly polarized, RHCP signals. Obviously, to get the best performance, the receiving system should comply to that using the RHCP antenna. Widely used DIY projects include the helical end-fire helical antenna (helix antenna), back-fire helical antenna (QFH helix), crossed dipoles and turnstile antenna while the rarely used are spiral antenna and the lindenblad antenna. We can produce the LHCP or the RHCP with any of the mentioned antenna. Common to all mentioned antennas is the fact that the plane of polarization is rotating making one revolution per wavelength. Such antenna will radiate energy in all planes 0-360 degrees, including vertical and horizontal polarization. The number that describe the quality of the circular polarization is axial ratio. Circularly polarized field is created from two orthogonal fields equal in magnitude. If the magnitudes are equal the axial ratio is 1 or 0db. This give us perfect circular polarization which is difficult to achieve in practice. Axial ratio better than 1db is success, and can be kept within the narrow frequency range, depending on the antenna design. DIY designs will usually result with bad axial ratio mainly producing elliptical instead of circular polarization.

Can I simply check my antenna circular polarization? Yes you can. Transmit the signal using the circular polarization antenna. Use the second linear polarization antenna (simple dipole) in the far field measuring the strength of the signal in vertical polarization. Rotate the same dipole for 90 degrees and measure again the strength with the horizontal polarization. The ratio between this two signals is the axial ratio. It is important to keep the proper distance (far field) between the antennas where the minimum Fraunhofer distance can be calculated $L = (2D)^2/\lambda$. D is the maximum antenna dimension and the λ is the wavelength calculated from the antenna working frequency.

DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

Cross polarization

In a few words, what is the cross polarization? As the name says, it is the polarization orthogonal to the polarization of the interest, that we are using. If we are using the vertical polarization, the cross polarization is the horizontal and vice versa. Same goes for the circular polarization, if we are using the RHCP, the cross polarization is LHCP. Why is this important for us? Simply, if you choose the wrong polarization the cross polarization will be infinite, in theory. In practice, we can not construct the antenna ideally to radiate just vertical or just the horizontal polarization hence the cross polarization will not be infinite do imperfections but will have the values of 20-30dB. You can check that easily. Try to listen some radio using the vertical whip antenna and turn the whip then horizontally. There should be difference in the signal strength at least 20dB. Same way, if you miss to wind your helix antenna in proper direction the cross-polarization will be 20-30dB and you will end up with poor signal reception.

Let's review the polarization relationship regarding the cross polarization, in practice:

X- polarization	**Vertical**	**Horizontal**	**RHCP**	**LHCP**
Vertical	0dB	-20dB	-3dB	-3dB
Horizontal	-20dB	0dB	-3dB	-3dB
RHCP	-3dB	-3dB	0dB	-20dB
LHCP	-3dB	-3dB	-20dB	0dB

What does it mean for our weather satellite reception? Mentioned earlier, the satellite transmit the RHCP signal. Ideally, this signal should be received with the RHCP antenna. If we made a mistake winding the helix in a wrong direction creating the LHCP the received signal will be lower at least 20dB if not more than it should be received using the RHCP antenna. This will result in a poor signal quality, not acceptable. If we use the linear polarization, either vertical or horizontal the received signal will be 3dB lower then using the RHCP antenna. Mentioned before, achieving axial ratio on circularly polarized antenna lower than 1dB is not a simple task making the difference 2dB. Anybody tried to build the QFH antenna knows that precise replica to calculated values is not easy. All those design imperfections and not a proper phasing may lead to degradation in performance of 1dB easily. As a result, we end up with the RHCP antenna that is only a db or two better than a simple linear polarization antenna, vertical ground plane or horizontal dipole. If you are in the weak signal communications a dB or two is not a small and marginal value but if you are dealing with the strong signals, a dB or two will not make a significant difference. As per test I have done, the required S/n ratio required for the noisy free weather picture reception is 22dB as minimum. During the satellite pass the signal reach 45dB S/n ratio hence there is a lot of signal to cover the 2dB loss due to cross polarization. Would you trade the simple linear polarization antenna design and the -2dB for the complex QFH antenna design? I already did.

Selecting the right antenna

Sacrificing a few dB for the simple antenna design we can select on of the linearly polarized antenna. First we decide the polarization we prefer, vertical or horizontal. A simple vertical whip or even a ground plane vertical antenna may be a cheap and simple to build antennas.

DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

What are the pros for the vertical antenna? Simple design, omnidirectional pattern not requiring the antenna rotator, easy to achieve 50 ohms impedance, low radiation angle that can give us good reception when the satellite is low and distant on horizon. Almost perfect antenna for our satellite reception one may say, but let se the cons for such a design. The biggest problem is coming from the fact that most of the professional radio services and networks are using the vertical polarization too. This should be not a problem if we have a descent selectivity and high dynamic range receiver. The most of the users will use the standard DVB-t dongle grade SDR receiver lacking both, the selectivity and dynamic range. This problem can be solved partially by turning the gain down a bit, with drawback through increased noise figure and reduced S/n ratio. Nearby aeronautical radio service is also using the vertical polarization on the AM. Definitely the planes are the biggest blockers. They are simply 10-12km above us and transmitting usually 25W. You may note that problem through the raised noise floor resulting with the noise strips on the received picture. A vertical antenna will have a donuts shape radiation diagram where the signals above the antenna will be attenuated a lot. At high elevations the satellites are close enough and this drawback may be compensated a bit by shorter distance.

Let's review the opposite, horizontal polarization and pros for the simple dipole antenna. Cheap and simple to build also, but there is another advantage. If we look back to the polarization relationship between the vertical and horizontal polarization we can notice the crosspolarization of 20dB. This free of charge feature will attenuate all vertically polariyed signals from the commercial radios and aeronautical service for 20dB too. We can turn back the gain on our dongle resulting the better reception and picture. The QFH antenna will not give you this advantage. Checking the same crosspolarization table, we may note the difference of only 3dB to the vertical polarization if the circularly polarized antenna is used.
So far,so good. Let's see the cons using a simple dipole for the antenna. The main drawback is the dipole radiation diagram. Horizontal dipole is not omnidirectional antenna where radiation diagram is figure 8 shaped with the deep side nulls. All signals coming perpendicularly to the dipole are going to be attenuated a lot. Rotating a dipole for the best signal is not what makes dipole a simple antenna for our needs.

Both polarization have the problems with the radiation diagram where the vertical suffer from the strong commercial signals too. Considering all, the horizontal dipole is a better option.

Improving a dipole for the NOAA birds reception

Before we continue with the practical building of the dipole antenna let's check if there is any possibility to reduce the deep side nulls in the dipole radiation diagram. As mentioned before, the theoretical radiation diagram is figure 8 shaped. In practice, the side null are not so deep and the signal coming orthogonal to the dipole can be received too, but wekaer comparing to the front coming signals. To overcome this problem we can bend the dipole in a wing shape configuration with the angle of 120 degrees between the dipole legs. Such a configuration will result with the figure 0 (zero) radiation diagram and enhanced signal level coming orthogonal to the dipole. This can be good enough for our purpose.
During the day we should have morning and evening passes for each satellite, at least three good passes. We have three satellites active and there should be at least nine good passes. A good pass will have a high elevation and will give as the reception window up to 15 minutes. The NOAA satellites are almost polar orbiting birds with a northbound or southbound passes. For such orbit it is enough to point the dipole to have the maximum radiation North and South. We do not need to track the satellite as trajectory is almost polar. If you have a clear

horizon you will be able to receive the satellite starting a very low elevations passing overhead and declining the opposite pole direction.

Horizontal V-dipole

Ones we know how the antenna should look like just a simple dipole antenna calculations should be applied. Using the simple formula for the ½ wavelength dipole we get the following:

L(m) = 147 / F(MHz)

L(m) = 147 / 137.5

L = 1.068 m = 106.8cm

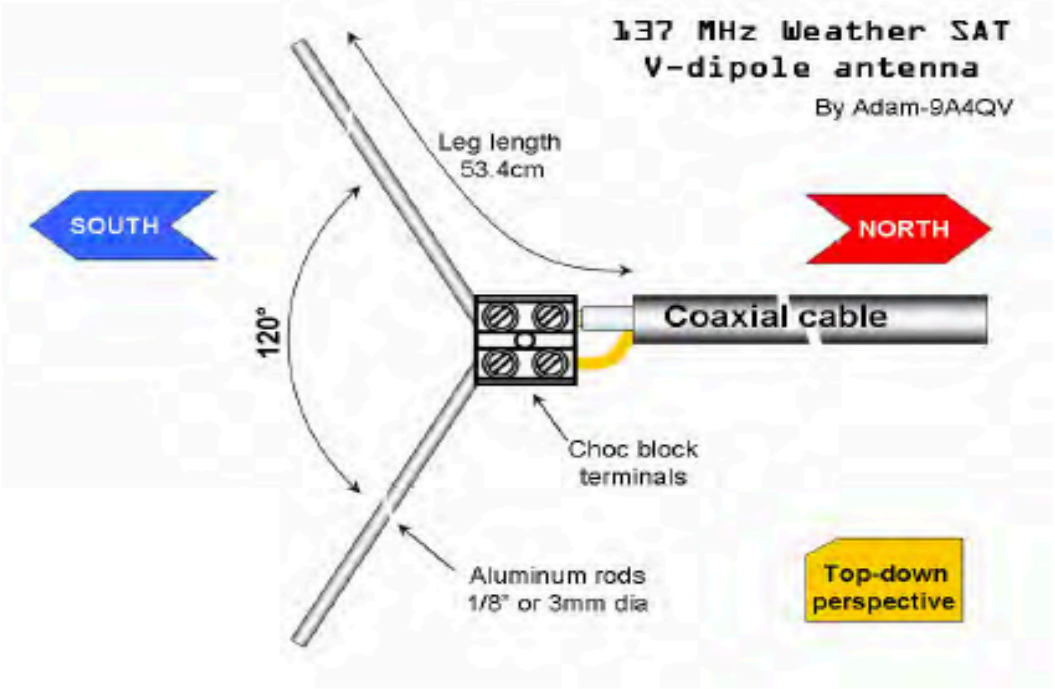
Each leg = 53.4 cm

Important: The length of the each leg should include the connecting wire's length up to the coaxial connector or coax. Keep this length as short as possible but it will be difficult to stay bellow 1.5 cm.

For a dipole legs I did use the 1/8" (3.25mm) aluminum rods. Do not use a ferromagnetic materials due to increased losses caused by the skin effect. The center of the dipole is made of Choc block terminals where the aluminum rods are secured on one side and the coax from

DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

the other side of the terminal. The center hole on the Choc block is used to secure the Choc block to the /mast bracket so the antenna can be easily mounted on the mast/pole. Run the 50 or 75 ohms coaxial cable to your receiving equipment. Bend the dipole legs to create a 120 degrees angle and point the antenna to the North-South direction. You are ready for the NOAA WX sat reception.



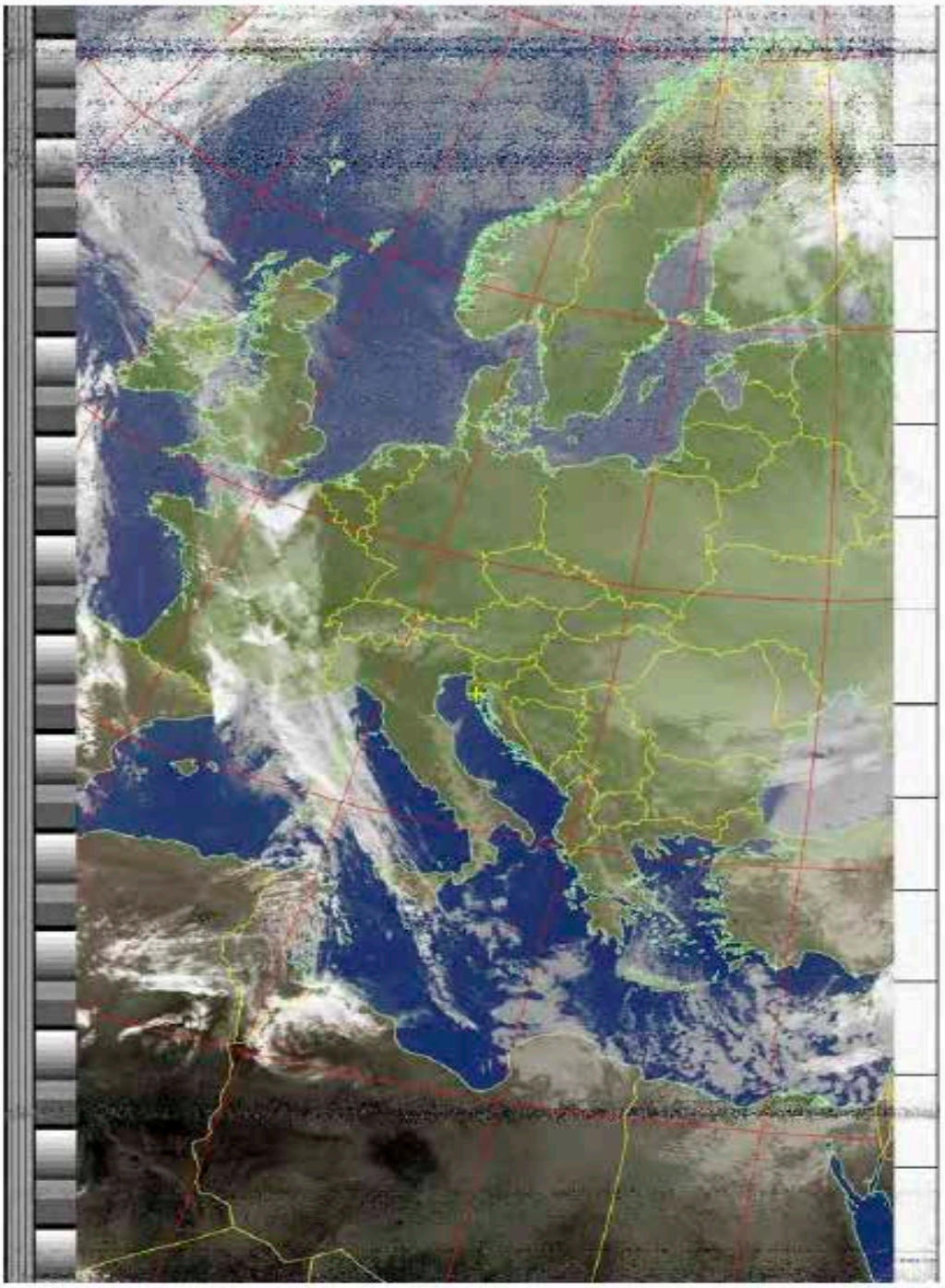
The results

My location is not a perfect but still very good for the satellite reception. I have a clear horizon to the North but hills and a high voltage power lines to the South limiting my south elevation to 7 degrees. The antenna is fixed on the roof antenna pole, 8 meters above the ground.

First test made was including the barefoot setup, usually used by the beginners looking to have fun and quickly receive the weather sat pictures. Starting from the antenna (V-dipole) there was 2 mtrs of RG-213 cable / N connector followed by N/N adapter and 12 mtrs of H-2000 cable. Another N/N adapter followed by 10 mtrs of RG-214 cable with another N/PL259 adapter. Finally, there was 1mtr of flexible but lossy RG-58 cable and BNC/SMA adapter to match the RTL.SDR dongle connector. All together, there was 25 mtrs of the mixed quality cables and 4 coaxial adapters. On the dongle side there was also SMA/SMA DC block used to isolate the DC from the dongle bias-t.
I was really pleased with the received picture quality despite the mentioned limitations. There is a noise in the picture present close to the horizon due to obstacles in the South and a weaker signals on the North. These are really remote parts of the World and the air masses from that areas are not affecting the weather where I am living. I found out that the Signal to

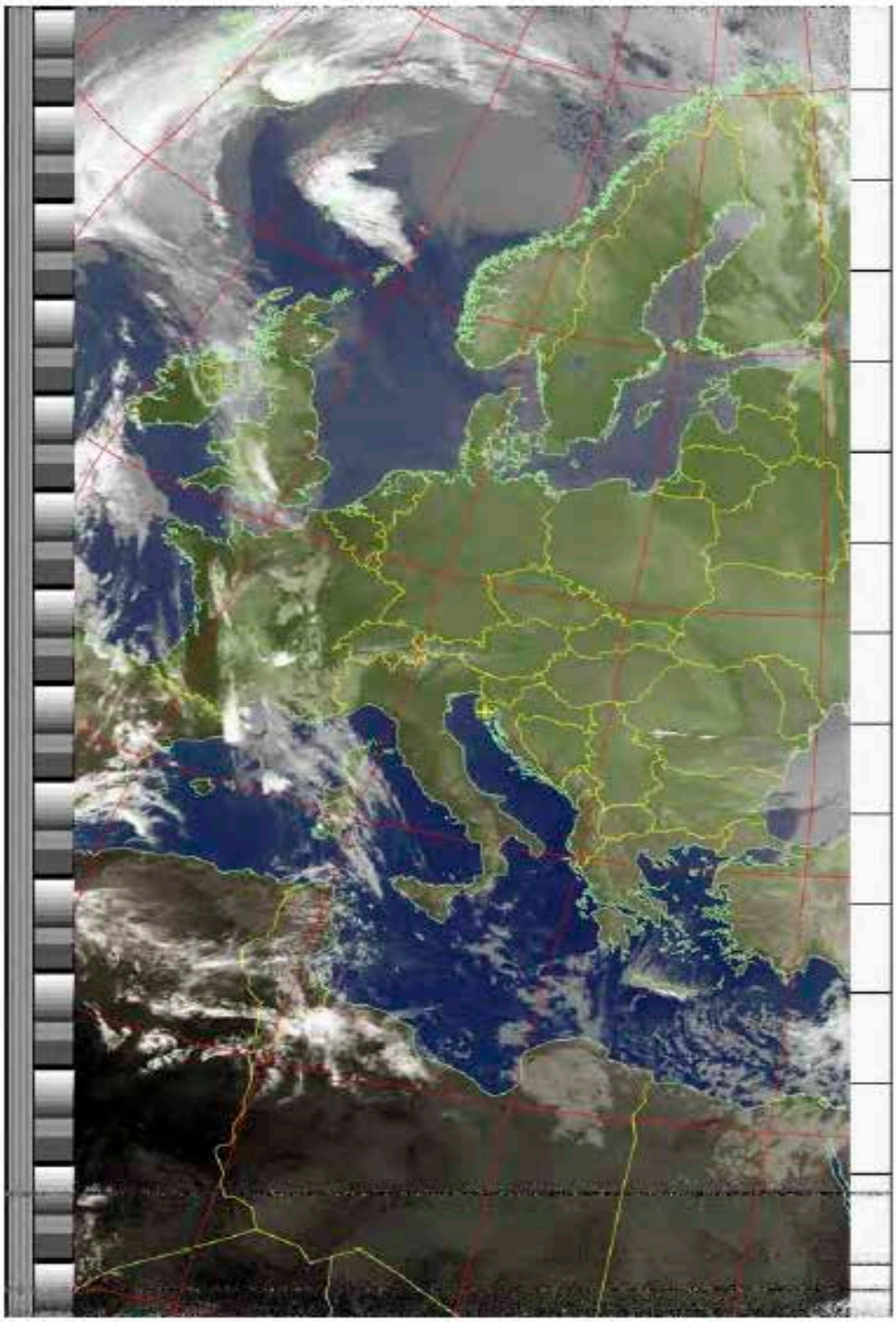
DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

noise ratio (S/n) required for the noise free picture is close to 22dB. Bellow that, the picture start to be noisy, resulting a black strips across the received picture.
First test conclusion, a simple DVB-T dongle and a 20 meters of the SAT-TV grade coaxial cable using the horizontal V-dipole can deliver quality and good enough picture.



DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

Second test was made using the advanced setup. V-dipole antenna and an FM-notch filter with the LNA4ALL with a Bias-t and ESD protection modification on the antenna. The same coaxial length and the RTL.SDR v.2 dongle.



DIY 137 MHz APT Weather satellite antenna
Adam-9A4QV

WXtoIMG was setup for 0 to 0 degrees elevation reception to get the complete pass and evaluate the location regarding the blind elevation spots. Performance and received picture was much better, mainly towards the North direction where the picture was received down to 0 degrees elevation. Towards the South, the problem with the hill and the power line is still present but less visible than using a barefoot setup. Another advantage is that the signal to noise is higher and the degradation in the picture caused by strong airplane signals in 137Mhz band is not visible as the S/n is still high, over 22dB to meet the requirements for the noise free reception. The top-notch setup should include the 137Mhz steep bandpass filter and the LNA on the antenna.

Presented V-dipole horizontal plane antenna is a simple DIY project that will deliver good results in receiving the 137 MHz weather satellite transmissions. All performed test delivered very good and excellent pictures despite using a home depot cheap materials and hand tools. This can be a beginner antenna project for all RTL dongle users where the success is guarantied.

CUSTOM WOOD PLAQUES DONE VIA CNC ROUTER!

Plaques and other projects are made to order. Contact Bill AB3ME for more info.

Prices do vary depending on the style ordered and start at $40 shipped locally to your door for a "basic plaque" Wood available is Butternut, Oak - light and dark, Black Walnut, Cherry and Hemlock Pine. Various fonts are also available. Local shipping via USPS is $8 and $15 for out of area. Construction time is expected to be a minimum of a few days due to the engraving and finishing process.

Keepsake boxes are also being offered using the same materials along with brass hardware and finger joint construction. Engraving for boxes is free up to 10 square inches and can be done on the top and inside of the boxes. Pricing starts at $225 per box. Work time is a minimum two weeks for construction. PayPal is the preferred method of payment, checks accepted however work will not start until your check clears my bank. My PayPal address for payment is... ab3me47@gmail.com

For more information please visit: Carpenterwoodworksusa.com

EQUIPMENT FOR SALE BY AB3ME

These items were purchased by myself for field day 2018 and have not been used since. Have been kept in weatherproof storage cases with desiccant since. I have kept the removed pluck foam for all weatherproof cases.

Additional items for sale:

1. 50 LF +- Belden #8267 (RG-213) PL 259 one end, will provide a PL 259 for other end.....
PRICE = $30.00

2. 50 LF +- Belden #8268 (RG-214 PL 259 one end, will provide a PL 259 for other end.....
PRICE = $40.00 (same as RG213 but with double shield)

3. 100 LF Cable Experts CXP138FCNM PL 259 ea end equivalent to Belden 9913 Low Loss.....
PRICE = $110.00 (new! this is $150 at HRO)

4. 1 each Triple Magnetic Mount - Black - 3/8-24 Base with 17 Feet of RG-58 Coaxial Cable.....
PRICE = $25.00 excellent condition.

5. 1 each Nagoya Heavy Duty 5" dia NMO, magnetic mount w/ 18 lf RG58A/U coax with PL 259.....
PRICE = $25.00 excellent condition.

6. 1 each Vertex (yaesu) MLS-100 external speaker w/mount, 6.5 foot wire w/ 1/8" connector....Price = $40.00 currently mounted to oak w/feet for indoor use

7. 1 each Dentron Tuner Monitor, 3000 watt, with meter, w/balun, wire or coax feeds, 5 star eham rating large cabinet, excellent condition
.....Price = $300.00 Image avail online

8. 1 each Dentron Super Tuner, 1000 watt, w/ balun, wire or coax feeds 5 star eham rating.....
Price = $155.00 see pic,excellent condition.

9. 1 each Dentron Junior Tuner, 300 watt, w/balun, wire or coax feeds 4.9 star eham rating.....
Price = $110.00 see pic, excellent condition.

10. 1 each TailTwister rotor and control box (my spare).....Price $450.00

MEMBERSHIP APPLICATION

E P A R A

Eastern Pennsylvania Amateur Radio Association
Address: PO Box 521, Sciota, PA 18354
Email: N3IS@qsl.net
Website: www.qsl.net/n3is

Date: _____

Name: _____ **Callsign** _____

License: Novice Technician General Advanced Extra

Address: _____

City: _____ **State:** _____ **Zip:** _____

Home Phone: _____

Cell Phone: _____

Email: _____

* **Note:** We do not publicize your phone or email information.

ARRL Member: _____ **Skywarn Spotter:** _____ **ARES/RACES Member:** _____ **VE:** _____

Interests:
DX _____ Contest _____ CW _____ QRP _____ Digital Modes_____ Antique Radio Equipment _____
Building Antennas _____ Electronic Repairs _____ Elmering _____ Kit Building _____ EmComm: ____

Others: _____

How did you get interested in Ham Radio?

_____

Please list any relevant qualifications or assets you have or are willing to share/contribute to the club.

Use reverse side if needed:

_____

_____

_____

Sponsored or Reviewed by: _____ **Callsign:** _____

Membership Rates,

Membership: **$20.00** per year Spouse: **$10.00** per year
Full time Student: **$15.00** per year Senior:(Over 62 years of Age): **$15.00** per year