2025-08-19 Hamlet Net - Multi-Radio Interference

Announcements:

- Test Session Info
    - Next VE session is this Saturday, August 23rd in the Clover Building at the Boulder County Fairgrounds, and starts at 10 am. It is an ARRL session, so there is a $15 fee to test. For more info, and to pre-register, see the Licensing/Testing page on the club web site, https://w0eno.org/, under the Education menu.
- Club Activities
    - The August LARC Event will be a POTA activation on August 23 after the test session. If you can participate, get in touch with Chuck to discuss and help plan the location.
    - Breakfast Saturday at 7:30 - 8:00 am at the Hidden Cafe.
    - LARC Members can now check out Club equipment via the Club web page at: https://w0eno.org/ - click on the 'LARC Equipment Check Out Form" link on the "LARC Equipment" menu item at the top of the web page once you log in.
- St Vrain State Park, noon to 4pm.
- Upcoming General Meeting Topics
    - This Wednesday, August 20th - Violetta Latham (KN2P) - ARRL Section Youth Coordinator for Colorado will talk about an upcoming DXpedition to the Manihiki Atoll in the North Cook Islands. Please plan to attend in person if you can, or at least via Zoom so we can show her a good turnout!

      I've recently acquired a few copper J-pole antennas from another ham who bought them from KB9VBR Antennas (https://www.jpole-antenna.com/). I've seen Michael talk about these antennas on his Youtube channel (https://www.youtube.com/@KB9VBRAntennas). I plan to bring them to the meeting tomorrow night, so if you're at all interested in this type of antenna (or have never seen a N-type coax connector before), plan to be there!
    - Sept 17th - Fred Nichols (AF4BY) - Demonstrating setup of the club's Spiderweb Antenna. The meeting will include an outdoor picnic with food provided.
- Upcoming Club Volunteer Opportunities:

    - HAMCON Colorado 2025 for Rocky Mountain Division is October 23-26, 2025 in Grand Junction. For more information and to register, see their web site at: hamconcolorado.com They are also looking for presenters.

- RMHAM is running the summer swapfest at the Adams County Fairgrounds on Sunday August 24th from 9am to 1pm. Admission is just $6, so plan on dropping by! Tables are also available for $13 in advance, and $20 at the door. For more info see: https://www.rmham.org/the-swapfest/

- If you are interested in find out more about the Amateur Radio Emergency Services (or ARES) in the local area, check out the Boulder County ARES web site at https://bouldercountyares.org/

  They have a VHF net on Monday nights at 8:00pm, as well as a DMR net on the 2nd, 3rd, and 4th Mondays at 8:30pm.

- If you are an ARRL member, remember that you have digital access to four magazines - QST, On the Air, QEX, and National Contest Journal.

- We have a new net on the LARC repeaters. It's run by Timothy Moss, KFØLAR, on the 22nd of every month at 6pm. The 22nd was chosen to highlight the average of 22 vets who commit suicide each day. While the purpose of the net is to connect veterans, non-vets are welcome to participate as most all of us have friends or family who are or have served.

- The ARRL Colorado Section Net occurs on the second Monday of the month from 7 to 8pm. The net is run by Amanda Alden, K1DDN, our Colorado ARRL section manager, and is open to hams and non-hams alike. This net is a place where Colorado hams can ask questions of ARRL leadership and request help, guidance, club support, and technical support. This net meets on the second Monday of each month at 7:00 pm Mountain time. The net is on the Colorado Connection, Rocky Mountain Ham Radio DMR Talk Group 700, The Fun Machine, WE0FUN, and the NCARC Buckhorn Repeater 447.700 – with 100 Hz tone.

- We have some volunteer opportunities available where you can help out LARC:

    - Photographer / videographer - record team activities and upload to web site / YouTube

    - Newsletter Editor - put together the monthly Splatter newsletter

    - Event Coordinator

- Time's up for this year, but you can earn your 2026 membership or future renewal by acting as NCS for at least 5 nets next year. You can run either this Tuesday night net or the Thursday night net (or both). We have scripts available for both, so all you need is a

good connection into the repeater, and somewhere to keep track of names and call signs as people check in. If you're going to be on the net anyway, why not save some dough at the same time!

- Chuck has set a goal for the Club of running at least one activity a month. This can be a hands-on construction activity, an operating activity like Field Day, a fox hunt, or a special event station. The goal is to get people together to have fun with amateur radio! We have multiple locations at our disposal, as well as lots of Club equipment, so if you have an idea for something you think others hams would like to do, please let us know, and if you're willing to run it, even better!

- The Club is also looking for presentation topics for 2025. If you have any ideas, or better yet, would like to present, please let Chuck know and we'll get you on the schedule! We would like to get some presentations from club members on stuff they've been doing, projects they're working on, or just things that interest them.

- All club activities are open to anyone - members and non-members. If you have questions, ask them on a net or **send email to elmer@w0eno.org**

Presenter: Bryan, AF0W

Topic: Multi-Radio Interference

- Something that you may not run into with your home operations, but may encounter during larger operating events such as Field Day, is running multiple radios in close proximity

- Even when operated on different bands, strong transmitters can feed RF energy into nearby antennas for other bands and cause noise or even complete overload into the receivers of other radios

    a. If you have at least one Baofeng, you can try listening to the LARC repeater on 2m on the Baofeng and transmitting into the repeater using a second nearby radio. You will likely not hear anything on the Baofeng when the other radio is transmitting, but will hear the squelch tail when the other radio stops transmitting.

    b. This is because while the second radio is transmitting, it completely overwhelms the receiver or front end on the Baofeng so it is unable to "hear" the output of the repeater, until the other radio stops transmitting, at which time it can hear the squelch tail.

    c. This can be very confusing if you are not aware of this issue as the Baofeng obviously has the correct frequency and CTCSS tone settings because it can hear the squelch tail.

    d. If you separate the two radios, at some point, the Baofeng will "magically" start to hear the repeater.

- If two radios are operating on the same band, for example, one in the CW portion of the band and another in the voice portion, there will be even more interference, since both antennas will be efficient on that band, and the radios may not have selective enough filtering on their front ends.
- Repeaters simultaneously receive and transmit on the same band, but they have large banks of filters to prevent the transmitter from interfering with the receiver. Your HT or base station radio is not equipped to deal with this situation.
- Does this mean you cannot have stations on the same or harmonically-related bands running at the same time?
    a. Not at all - it just means that you have to put in some extra effort (and possibly expense) to make it happen
- I came across an article in the ARRL's National Contesting Journal from a club that operated a Field Day site in 2021 which included multiple radios running CW, digital, and SSB on the same HF bands without significantly interfering with each other.
- They controlled interference by utilizing radios with good transmit and receive performance, antenna isolation methods including cross-polarization, and ultra-sharp filters to separate signals on the same band
- Their operation consisted of one radio each for CW and digital, as well as 4 radios for phone
- They operated on the 80, 40, 20, 15, and 10 meter HF bands

Transmit and Receive Performance

- Transmitter purity is important when operating same-band stations
- If your radio is sending out spurious emissions off-frequency, those will likely interfere with other operators on the same band
    - I just watched a Youtube video today (https://www.youtube.com/watch?v=6gb819DvPVM) Where a club that worked a large Field Day operation was interviewed. They mentioned that while they encourage hams to bring their own radios (so they'll be operating something they're familiar with), they didn't allow ICOM 7300s because they said they've experienced white noise being transmitted across the band when those radios transmit, which interferes with other stations on the same band.

- Receive performance is also important - filtering, pre-amplification, and other aspects can make a big difference, especially with same-band signals
- One characteristic of a receiver is its noise floor - this includes noise generated by the radio circuits themselves. If you have a "noisy" radio, no amount of external filtering is going to be able to address it
- There are measurements and calculations that can be made to indicate how much antenna attenuation or isolation is needed based on the characteristics of a particular radio
    - In the article, they determined that 71 dB of antenna isolation was required for their Yaesu FTDX10, and 81 dB for their Kenwood TS-2000

Antenna Isolation

- Antenna isolation methods include physical separation, antenna polarization, and minimizing pattern overlap
- Antenna polarization is essentially the plane in which the electric component of the RF wave vibrates
    a. For example, FM voice communication in the 2m and 70cm bands is typically vertically polarized, while SSB signals in those same bands is horizontally polarized
    b. I've heard figures of 20-30 dB attenuation or signal loss from cross-polarized antennas for FM satellite communication, so it is not an insignificant amount
    c. An example of cross-polarizing antennas would be a vertical antenna and a horizontal dipole on the same band.
- As RF energy decreases with the square of distance, another way to attenuate signals between antennas is to increase the space between them
    a. For example, the club in the article set up three clusters - one multiband trapped dipole for digital, a multiband inverted V fan dipole for phone, and two multiband verticals for CW
    b. These clusters were installed in a rough line, each being 250 feet away from the next
    c. Since digital and CW operate on nearby frequencies, the CW and digital antennas were separated by the farthest distance

d. The inverted V was in between the other two, and was mounted 90 degrees from the other antennas for cross-polarization

e. The inverted V made use of an 80/40/20 meter triplexer and associated band-pass filters, similar to the setup LARC has for our SpiderBeam antenna

f. The construction of the inverted V consisted of three dipoles, but instead of running each dipole element directly to a single connection point, they were widely spaced on a 2 foot by 4 foot center insulator to improve performance in terms of SWR bandwidth and reduce tuning interactions between the bands

    - SWR bandwidth refers to the range of frequencies at which the antenna will present a usable SWR

Ultra-Sharp Filtering

- The other technique used by the group was ultra-sharp band pass filtering
- Band pass filters are used to allow signals to pass for a given band, and to decrease or attenuate signals on all other frequencies

    a. When filtering a signal, there is generally a curve associated with the filter's response

    b. For example, a band pass filter for 40 meters will not just allow a 7.0 MHz signal to pass with no attenuation, and completely block a 6.99 MHz signal.

    c. If it did, then a plot of the filter's response over a range of frequencies would look very digital - no signal below 7 MHz or beyond 7.3 MHz, and 100% signal in between

    d. In reality, the filter's performance will have a slope or curve at both ends

    e. The sharper the filter, the more vertical the curve, so an ultra-sharp filter will tend toward a shorter, steeper curve, meaning it will be better at rejecting out-of-band signals

- An example of the filters used by this club include receive filters to suppress the CW portion of the band by 20 to 40 dB while passing the phone band with only a few dB of loss
- These were used on the 80, 40, and 20 meter phone stations to block CW signals
- As these filters were meant for receive only use, relays were needed to bypass them when the voice stations were transmitting

- Another type of filters were made to be used for both transmitting and receiving, and were used on the CW radios to suppress spurious emissions that would have interfered with the voice stations

    a. LARC now owns a set of bandpass filters covering all the HF bands. These filters can handle transmit power, although I'm not sure what power level ratings are.

Results

- The club performed a lot of testing and measurements on the antennas and overall radio performance
- For example, a CW station would transmit at 100 watts near the CW band edge, and then operators on the phone and digital stations on the same band would listen for interference
- With the radio, antenna, and filter setup used, there was virtually no interference detected on the voice and digital stations
- Another test consisted of measuring the received signal levels across a dummy load with an oscilloscope on the inverted V while again transmitting 100 watts of CW. The ends of the dipoles were then moved to minimize the signal strength
- During Field Day, very little interference was observed
- They did have some pictures of their setup - the filters they used were homemade and some of them were fairly large - they looked to be just about as wide as their Kenwood TS-2000 transceiver
- They also installed the radios close to their antennas so they didn't have to worry about long coax runs to a central point contributing to the RFI at the site
- The article also commented that they spent time on things like power supply isolation, and bonding and grounding in the stations, so it sounds like really quite the effort!

LARC

- This year, I spent most of my time talking in-person as opposed to on the radio at Field Day, so I can't really comment on how our setup performed
- I know we set up the Club's large multiband wire antenna in a corner of the park away from the main Field Day setup and antennas. I believe it was used primarily for digital modes.

- Unlike previous years, the Club's new generator was very quiet - in fact, when I showed up to the site, I didn't even realize it was running! This is a far cry from previous years where the generator noise made it hard to work the radios.
- We've also run into issues at our radio in the park activity, but we have very closely spaced antennas there, so this is not too surprising
- Most of us are not going to have enough space in our suburban, HOA-controlled yards to implement many of these ideas, but we also probably don't have the need for running simultaneous HF stations either
- If you are interested in more information on this topic, another class of multi-radio stations are contesting stations, so look for information on these.
- The reason I covered this topic, in addition to seeing the Youtube video about a multi-station Field Day site, is to possibly spark some interest in volunteers to help plan out next year's LARC Field Day setup, perhaps taking into account some of these ideas.
- If this sort of exercise sounds interesting, be sure to let us know! I'm not sure if we've identified a lead for 2026's Field Day yet, but whoever that is, I'm sure they'll appreciate the help!

Questions:

- **The question for the week is:** Do you ever use more than one radio at a time, and if so, are they on the same band, and do you experience any interference?
    a. **In my case,** I've got a bunch of HF and VHF/UHF radios, but have never really had the need to operate them simultaneously. Probably the closest I've come is to have a scanner going while I operate a digital mode, and while I've used this back in the JT65 days, I don't really have time to do it anymore with the fast cycle times of ft8!

       I don't recall seeing any sort of overloading on the scanner when transmitting on HF. My scanner antenna is a mag mount mobile antenna from Radio Shack that is sitting on a metal filing cabinet in my radio room, so it is a fair distance away from my HF antenna.

More Info:

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Email to elmer@w0eno.org

- If you have ideas for net topics or general meeting topics / presenters, please let us know! Tell us on a net, or send email to k0itp@w0eno.org

Email to elmer@w0eno.org

1. AFØW - Bryan - Longmont
2. WAØJJC - Bob - Boulder

3. AEØDO - John - N of Longmont
4. KFØUWK - James Miller - N Boulder

End: 7:55pm

Possible Club purchase - label maker