2022-03-21 Hamlet Net - Meteor Scatter

Announcements:

- Test Session Info
    - Next VE session is this Saturday, March 25th. It is a Patriot VE session, so there is no fee to take the test. The test location is the Clover Building at the Boulder County Fairgrounds in Longmont.

      You must pre-register for the session - there is a link to the hamstudy site on the club website at w0eno.org at the Licensing/Testing link under the Education menu.

- Chuck is running a Tape Measure VHF Yagi next month - get in touch with him for more details. Probably April 22nd at the Clover Building. The cost will be $10.

- Chuck will be having a Yagi-only fox hunt in May - a perfect opportunity to put your newly-constructed antenna to good use!

- The QSOToday online ham expo is this weekend, Saturday and Sunday. The event includes multiple presentations, including one by our own Ed Mormon. For more information, see their web site at: https://www.qsotodayhamexpo.com/

- LARCFest is April 1 from 9am to 1pm at the Boulder County Fairgrounds in Longmont. For more information, see the club web site at: w0eno.org

- Field Day is coming up in June, and the club is starting to work on planning for this event. The ARRL have released the 2023 Field Day logo and rules on their web site at arrl.org/field-day

- This Saturday after the testing session, Chuck will have the GoBox up for a couple of hours in observance of Autism Awareness week. Currently have 60 countries, most continents, and all 50 states participating.

- You can start earning your 2023 membership or future renewal by acting as NCS for at least 5 nets this 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! There are four free memberships available for 2023, so don't wait to get started!

- 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 2023. If you have any ideas, or better yet, would like to present, please let Chuck know and we'll get you on the schedule!
- 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**
- Club breakfast Saturday mornings at 8am at the Hidden Cafe in Longmont
    - Come meet other Club members and discuss amateur radio

Presenter: Bryan, AF0W

Topic: Meteor Scatter

Thanks to Ed, WA7EM, for suggesting this topic - he sent me a couple of emails with a . If anyone has any ideas of topics they;d like to hear about, please let me know as this helps out a lot.

- First, some terminology
    a. Asteroids are small rocky bodies that orbit the Sun
    b. When asteroids collide, small pieces can break off. These pieces are called meteoroids, and can be thought of as "pebble-sized space rocks"
    c. When they travel through the atmosphere, it causes a meteor, which is the streak of light as a meteoroid is burning up in the atmosphere - sometimes called a "shooting star"
    d. While most meteoroids burn up completely, some make it all the way to the Earth's surface, in which case they are called meteorites.
    e. A meteor shower is when a large number of meteors occur, and they occur at regular intervals as the Earth passes through the trail of dusty debris left by a comet
    f. Comets also circle the Sun, but they are made of ice and dust, not rock.
- The streaks of light also cause an ionization trail that reflects radio waves, and can be used to propagate radio signals

- Trails do not last very long - anywhere from fractions of a second to a few seconds depending on factors such as the size and speed of the meteor and the frequency of the radio signal
    a. The resulting trails are typically in the range of 10 to 20 miles long with a radius of approximately 1 meter at the head
- Billions of meteoroids enter the atmosphere daily, and a small fraction are useful for point-to-point communications
- Military created COMET (COmmunications by MEteor Trails) in 1965 to communicate between NATO's European Headquarters sites in 6 countries.
- In a declassified government document on meteor burst communications, one of the advantages of meteor based communication is its ability to survive a nuclear war. Following a nuclear explosion, the nuclear fallout present in the D-Layer of the atmosphere would thwart HF communications. It is also likely that satellites and their ground terminals would be high priority targets. MBC, on the other hand, would fare much better. Meteors would continue to bombard the earth's atmosphere, creating trails required by MBC. MBC do not require large, fixed ground stations; therefore, they would be difficult to target. A nuclear detonation would, however, require an increase of operating power to penetrate the fallout present in the atmosphere's D-Layer."
- Amateurs can complete meteor scatter contacts using dipoles, verticals, or even mobile antennas
    a. Directional antennas are highly suggested
- 10m and 6m are good starting places - 50-100W using a 3 element Yagi
- 2m may require ~150W and a 10-element beam
- US uses mostly SSB, but there is some CW activity
- Europe uses high-speed CW (200 to 800 WPM)
- In 2001, the WSJT-X software implemented a protocol named FSK144, which was the first amateur digital mode designed specifically for meteor scatter operation
    a. It became widely used for VHF meteor scatter communications
    b. It supported a data transfer rate of approximately 147 characters per second
- In 2016, advances in computing power allowed the development of MSK144
    a. This protocol gave high priority to transmission speed, sensitivity, and decoding efficiency

b. The effective data rate is 250 characters per second and includes forward error correction, or FEC
    - Message frame of 144 bits (72 for message, 48 bits of error-correcting redundancy)
c. Can be decoded with SNR as low as -8 dB (FT8 will decode down to -21 dB, WSPR down to -31 dB)
d. Signals are transmitted using USB
e. QSO is similar to other WSJT-X digital modes - it is fixed and not "free-form"
    - Full QSO sequence is six 15-second transmissions
f. Has capability to operate in "offset QSO" mode where CQ is transmitted on a "calling frequency" and includes an offset that specifies where it will be listening for replies - the entire QSO moves to that frequency
    - Not the same as split mode - in split mode, one side always transmits on one frequency and listens on the other
g. It also has an optional short-message format that is used for communications at 144 MHz
    - This is because the duration of a "ping" is proportional to the inverse square of the frequency
    - This means that the 2 meters pings are about ⅛ the duration of those at 6 meters
    - The short messages are used to send signal reports and other QSO information after the callsigns have been exchanged
    - Instead of the full message length of 144 bits, the short messages are just 40 bits long

- Another meteor scatter use is SNOTEL (SNOw TELemetry)
    a. Network of over 900 automated data collection sites
    b. Located in remote, high-elevation mountains in the US
    c. Monitors snowpack, precipitation, temperature, etc.
    d. Transmits data to central database using cellular, satellite, or meteor burst telemetry

    e. **What is "telemetry?"**
        - **A one-way transmission of measurements at a distance from the measuring instrument.**
    f. Meteor burst mode allows communication up to 1200 miles over VHF frequencies
    g. Two ground stations in Ogden, Utah and Boise, Idaho capture the transmissions
    h. Data is sent from monitoring stations and ACK is received back if transmission is received completely
    i. Takes < 1/10 of a second

- There have even been successful experiments running 2 meter APRS packet traffic over meteor scatter - although it was found that using 6 meters provided better results
- The LARC Go Box, which is available for check out by members, contains an ICOM IC-7300 which covers HF and 6 meters.
- Unfortunately, the Wolf River coil antenna system does not cover 6m, but if there is interest, I'm sure the Club would be willing to obtain or build a 6m antenna system
- If you have a radio capable of receiving on 6m (such as an RTL-SDR USB stick), you can also just listen for meteor scatter signals such as MSK144, CW, or voice communications. There are also a number of 6 meter beacons you can listen for.
- You don't even need a ham radio - there's another source of continuously-broadcasting stations in the lower VHF range - and those are FM broadcast radios
    a. You can listen for over-the-horizon stations that are not normally heard at your location
    b. If you hear short transmissions from faraway stations, these are likely due to propagation via meteor scatter
- The Perseids are one of the most popular meteor showers of the year.
    a. It occurs from mid July to late August
    b. The peak this year will be around August 11th to 12th
    c. It should be much more visible than last year, as there will not be much illumination from the moon

Summary

- If you're already set up to run WSJT-X and have a 6 meter capable radio, why not give meteor scatter a try with MSK144?

Questions:

- **The question for the week is:** Have you ever used 6m, and do you have a radio capable of 6m operation? Does meteor scatter sound interesting, or more like a big hassle?

- **In my case,** I have not tried it. I do own an ICOM IC-706 MKIIg which is capable of 6 meter operation, but I don't have any 6 meter antennas, so have never tried it. I do think it'd be pretty cool to operate using meteor trail, however, so will probably give it a try sometime.

More Info:

- Simple Guide to Meteor Scatter/MSK 144: https://www.parkerradio.org/community/general/simple-guide-to-meteor-scatter-msk-144/

- Worldwide 6m beacon list: https://www.g0lgs.co.uk/showbeacons.php?band=6m&By=call

- The MSK144 Protocol for Meteor-Scatter Communication: https://wsjt.sourceforge.io/MSK144_Protocol_QEX.pdf

- SNOTEL on Wikipedia: https://en.wikipedia.org/wiki/SNOTEL

- Perseids: https://www.space.com/32868-perseid-meteor-shower-guide.html

Notes:

- 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. K0ITP - Chuck - Firestone
2. AF0W - Bryan - El Paso via Echolink
3. KM6SJA - Steve - Longmont
4. KF0KFJ - Laura - Loveland
5. K0IPH - Al - Loveland
6. KV0N - Raman - Lafayette
7. WA7EM - Ed - Erie
8. KF0FEC - Will - Boulder
9. K0DBL - Don - Mead

Meeting on Wednesday - had a nice turnout in person. Speaker didn't show up.

Club building up equipment for events. Has 3 radios. IC-706 and IC-7000 that will eventually go into GoBoxes and be able to be checked out.

K0DBL - Ed's talk is 11am local time on Saturday.

KV0N - Ed, Don, and Raman interested in learning CW - having an event or group to do it? Ed and Don try to meet on Friday nights.

Chuck and Dick - came up with QSO card for Field Day. Will also do a generic one for operating events. We have QSL and QRZ managers.