2022-01-17 Hamlet Net - Grey Line

Announcements:

- Test Session Info
    - Had a very successful test session Sunday. All 8 candidates passed the exams that they came for. There were five new Technicians, 2 Tech to General upgrades, and one General to Extra upgrade.
- The next LARC General Meeting is this Wednesday, January 18th. The topic will be a pre-recorded presentation by Ralph Bilal on his Isotron HF antenna. His web site advertises these antennas as being able to "solve virtually any restricted space problem" without the need for radials or an antenna tuner.

  This will be a first for LARC as we are running this as a hybrid meeting! You can attend in person at 350 Terry Street, or via Zoom. The meeting will start with socializing at 6:30pm with the meeting starting at 7pm. The meeting room is on the second floor, and there is an elevator.

- Winter Field Day is coming up. Bob, N0ZFV, and Dick, KE0VT, are putting together a LARC Winter Field Day site at noon, Sat Jan. 28th in the Clover Building. Come join the fun, and if you haven't made an HF contact yet, this would be a perfect opportunity, as there will be a lot of activity on the bands, as well as experienced hams to help you out. You don't even have to be licensed (or be a General or Extra Class licensee) to use the radio - we will have plenty of licensed control operators on site.

- 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!

- January 21st is the NCARC Winter Hamfest at the Larimer County fairgrounds at The Ranch in Loveland. Doors open to the public at 8am, and admission is only $7. There is a free license test session at 9:30am as well as three tracks of technical forums, exhibits and demonstrations and of course, prizes. They are looking for volunteers to help out - you'll get in for only $4 as a volunteer. Additionally, Chuck is looking for volunteers to help with the LARC tables we'll have where we are selling silent key and some donated equipment. For more information on the hamfest, go to ncarc.net (november-charlie-alpha-romeo-charlie) and click on the "Hamfest 2023" link on the top menu bar.

- 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.
- 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: Grey Line

- Steve, N0FTI, had a question on a previous net about what greyline was.
- You've probably seen ham web sites that display the world map and include shading to indicate daytime and nighttime
- You may have even seen an electro-mechanical wall display called a GeoChron, which also shows this information and retails for over $3000 - but why do they show this?
- The main mode of propagation for HF radio operation is ionospheric propagation
- This occurs when radio waves encounter the atmosphere and are bent or refracted back towards the earth
- Depending on conditions and properties of the waves, they may then reflect from the Earth and refract off the ionosphere again
- This behavior allows HF communications beyond direct line-of-sight between two stations
- There are several regions in the ionosphere, some of which attenuate the radio waves, and others which refract the signals
- This behavior depends on many things - the time of year (which affects the tilt of the earth by almost 50 degrees), the date in relation to the sun's roughly 11 year solar cycle, and solar activity such as sunspots and coronal mass ejections as well as the time of day and the frequency of the radio wave
- There are two terms that are used when referring to frequencies: MUF and LUF

a. MUF is the Maximum Usable Frequency, and represents the highest radio frequency that can be used for transmission between two points via reflection from the ionosphere (skywave or "skip" propagation) at a specified time

    - Transmitting at a frequency higher than the MUF will cause your transmission to pass through the atmosphere and continue out into space without being refracted

    - A website showing current MUFs is: https://prop.kc2g.com/

b. LUF is Lowest Usable Frequency, and represents the lowest frequency that can be used for transmission between two points

    - Using frequencies lower than the LUF will result in the signal being attenuated in the lower level of the atmosphere, preventing successful communications

    - The LUF is dependent upon the stations at either end of the path

    - Their antennas, receivers, transmitter powers, the level of noise in the vicinity, and so forth all affect the LUF

    - The type of modulation used also has an effect, because some types of modulation can be copied at lower strengths than others

    - In other words the LUF is the practical limit below which communication cannot be maintained between two particular radio communications stations

- Transitions from daylight to darkness or darkness to daylight result in fairly drastic changes in the ionosphere

- The sunrise/sunset line is referred to as the terminator, the twilight zone, and the gray line

- This gray line is actually a circle around the Earth

- For period ranging from minutes at low and high frequencies such as 160 and 10 meters to one to two hours at intermediate frequencies such as 20 meters, with suitable ionospheric conditions, stations on the gray line can communicate with any other station located on the gray line

- This is called "working gray line" and occurs because the maximum usable frequency, or MUF, is rising rapidly on the sunrise side of the line, and is simultaneously still high on the sunset side.

- The D layer of the ionosphere, which is the lowest layer and which attenuates radio signals passing through it, is rapidly dissipating on the sunset side, and is not yet energized on the sunrise side, meaning it has minimal impact on the signal
- These changes occur because sunlight does not start (or stop) hitting all layers of the atmosphere at the same time
    a. The ionosphere is around 570 miles deep - when the sun starts to set, the lower layer (the D layer) stops receiving solar energy while the upper layers are still being energized
    b. The opposite happens when the sun starts to rise - the lower layer is the last to become energized
- This gray line behavior can result in rare DX contacts which you may otherwise have difficulty achieving
- There are also effects called the sunrise and sunset enhancements which affect signals coming from the west and east, respectively
    a. These do not occur on the gray line, and are thought to be due to a focusing effect from refractions from the E and F layers of the ionosphere
- Note that due to a variety of variables the gray line propagation does not exactly follow the day night terminator as seen on the earth's surface, but it can still be used as a rough guide
- One way you can observe gray line effects for yourself is to run WSPR (which is weak signal propagation reporter)
    a. This is a digital mode that alternately transmits and receives
    b. When transmitting, your station sends your call sign, grid square, and output power
    c. When receiving, the sent information as well as received signal strength is reported to an internet database which is then used to generate a web page at wsprnet.org
    d. You can go to that web page and see where your signal is being received around the world by clicking on the Map link
    e. You can also get a rough estimate of relative signal strengths at different locations

- For detailed greyline info, the https://www.voacap.com/greyline/ performs three sets of calculations

    a. By default, the page will show sunrise and sunset times for various locations around the globe (for US locations, scroll down to the W's - look for a W followed by the call area you are interested in (for example, Denver is W0)

    b. To display sunrise and sunset times for a given 6-character grid square, enter it in the "Locator" field, enter any date in the desired year in the "Date" field, click the "Calendar" checkbox, and click the "Go" button

    c. Finally, to calculate gray line conditions from your grid square to other locations around the globe, fill in your 6-character grid location, the date you want to analyze, make sure the "Calendar" box is not checked, and click the "Go" button

- So if you're looking for a new challenge, try operating HF in the twilight hours in the morning or early night and see if you snag any new DX!

Questions:

- **The question for the week is:** Have you ever utilized gray line propagation to make a QSO or listen to a remote station?

- **In my case,** while I've read about it and what it's supposed to do, I've never actually tried working the greyline to see it in action.

More Info:

- VOACAP Greyline User Manual: http://voacap.blogspot.com/2016/11/voacap-greyline-user-manual.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