



# REPEATER RAG

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**Denver Radio League's**  
Quarterly Newsletter

## From The Editor

Everyone is tired of the pandemic. We've had to make adjustments in so many parts of our lives. Our last regular DRL in-person meeting was more than a year ago. Last June's Field Day outing was as close as we've come to how things used to be.

Zoom has helped us gather virtually. Meeting virtually has had some advantages. Weather and travel problems don't interfere meeting attendance. Still, you can't put your hands on a piece of equipment or appreciate how well it's built.

We'll continue to use Zoom until conditions improve. January's meeting is a virtual one. Perhaps April's meeting will bring us together once again, a sure sign things are close to normal.

Jim KEØNRE  
Editor

Submit your article for publication to the  
Editor: KEØNRE @ARRL.NET

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Visit our website for up-to-date information

<http://denverradioleague.org>

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## FCC News

The United States Senate in December confirmed Federal Communications Commission Chair Jessica Rosenworcel to head the FCC. Rosenworcel is the first woman to hold that position. She has previously served two terms as a Commissioner. Her term as Chair runs for five years.

As chair, Rosenworcel is expected to emphasize broadband access, net neutrality and expanding high-speed internet coverage in underserved areas.

Perhaps now progress will be made in replacing the symbol rate standard for digital HF communication in Part 97 with the more modern concept of permitted bandwidth recognizing substantial progress that's been made in this field in the last 20 years.

Sometimes in an organization the right hand doesn't know what the left hand is doing. When the FCC authorized cellphone carriers to deploy 5G service, they were not aware the Federal Aviation Administration was hearing complaints from the airline industry that 5G signals from cellphones aboard planes and from cell towers near airports were close to the frequencies used by some aircraft altimeters. The telecomms agreed to postpone their 5G plans until mid-January while more data is gathered on the issue.

Granted, this 5G controversy doesn't involve amateur radio. What it does is to highlight the intense pressure new uses are placing on a finite RF spectrum. When airline and telecomm giants tussle over spectrum, it's a bad sign for hams. Imagine who'll win when some industry giant wants to use a slice of the amateur radio spectrum. We have little leverage in the negotiation process except for our emergency communications response capabilities.

## Summary of October's Meeting

Tom KD4DT showed pictures of commercial VFH broadcast sites in the region he helps maintain and discussed maintenance activities. Some of them broadcast with less than 100 W. Their equipment resembles what ham radio operators are familiar with. Stations that pump out dozens of kW use greatly scaled up versions of the same stuff. It was fascinating to see how the same principles and considerations apply at various equipment scales.



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## Preview of January's Meeting



Dave KC7MP continues exploring novel applications for the Raspberry Pi in amateur radio. Most recently, he's built a world clock that does so much more than just show a gray line map of the world. Dave will demonstrate one and discuss how he put it together.

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## ZOOM-ing

If your computer lacks a video camera, you can still use the ZOOM app to watch and listen to virtual DRL meetings. There's even a ZOOM client for smartphones if that's a more convenient option.

No computer? No problem. There's a dial-in phone number so you can listen and comment.



# Repeater Update

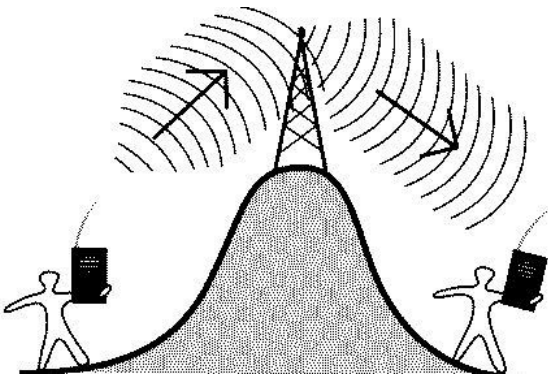


## Maintenance and Repairs

The DRL uses a remotely located FTM-300 to connect our 146.880 repeater to the internet. An internet connection is what enables the 88 repeater to offer C4FM and SkyHub services. The cooling fan in the FTM-300 is making troubling noises and needs replacement.

## More Repeater News of Interest

Rocky Mountain Ham Radio (RMHAM) received a grant of \$374,233 from Amateur Radio Digital Communications to expand and upgrade their 5 GHz system of linked repeaters through Colorado and New Mexico. Many of us use their repeater sites along the front range and elsewhere.



## DRL FUN NET

The DRL Fun Net airs every Thursday at 7:30 PM on the 146.880 repeater. During the Net we discuss anything related to amateur radio. We welcome all licensed hams to join in. You don't have to be a DRL member to participate in the conversation.

## DRL REPEATERS

Since 1967, the Denver Radio League has operated repeaters for the benefit of the Denver amateur radio community. Today we have four repeaters covering most of the Denver metro area. Repeater use is restricted to properly licensed hams.

### VHF

145.050 MHz, packet only  
146.640 MHz, -600 kHz, 100 Hz CTCSS  
146.880 MHz, -600 kHz, 100 Hz CTCSS

### UHF

445.600, -5 MHz, System Fusion, Wires-X

For additional information concerning location and coverage maps for each repeater location, refer to the DRL website:

<http://denverradioleague.org/repeaters>

If you detect a problem on a repeater, contact a Board member to report it.

# News From Space



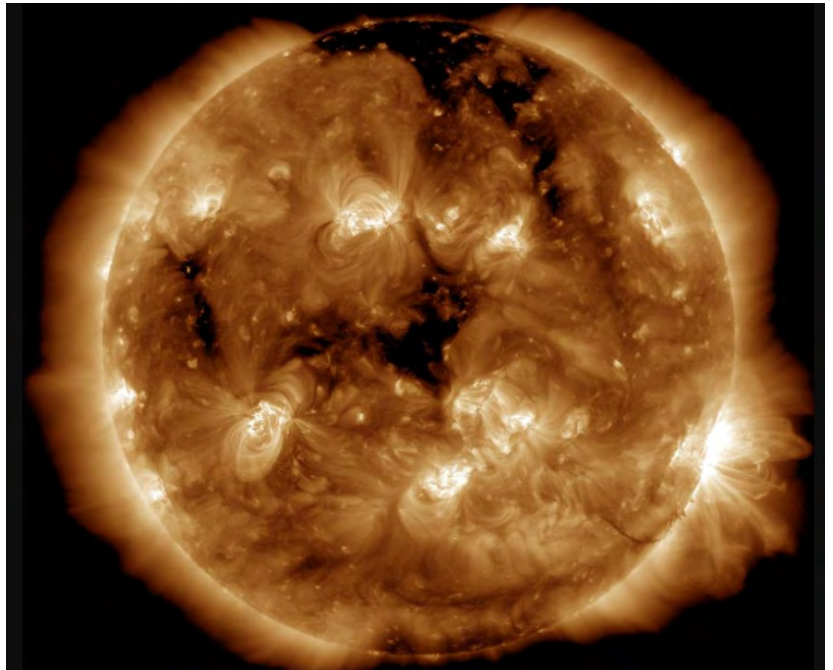
Image courtesy of NASA

## SOLAR TRENDS

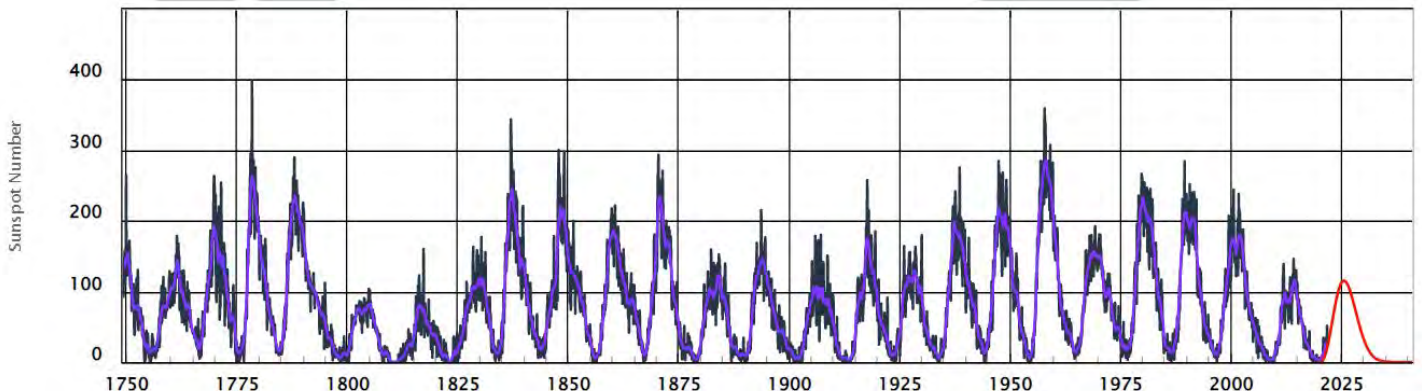
Solar Cycle 25 HF propagation conditions meanders between episodes of good, fair and poor.

Several times last fall, the solar flux index (SFI) surpassed 100. December saw several days when the SFI topped 110. On the 25th and 26th, the index peaked at 131 for the first time in a very long while. Ten- and 12-meter bands almost became crowded!

The image on the right of the solar surface taken the day after Christmas reveals more than 120 sun spots. Contrast this activity with 64 spotless days in 2021 and more than 200 spotless days the year before.



A graph below shows predicted Cycle 25 sunspot numbers and actual numbers observed over the last 270 years.



## More News From Space

The International Space Station (ISS) transmitted slow scan TV (SSTV) images from December 26 through December 31.

Several times a year crewmembers of the ISS send SSTV to the amateur radio community. Listen for them on 145.800 MHz FM. Pictures are sent using the SSTV mode PD-120.

Signals are strong enough to be heard on ordinary HTs. Adding an external antenna to an HT improves signal strength and can improve the quality of received images.

Cellphone apps are available that decode the sounds coming from the HT speaker and display SSTV image in real time.



Above is an image sent earlier in the year by a member of the ISS crew. Can you spot streaks of noise in a couple of horizontal raster lines of the picture?

Japan's OMOTENASHI, the world's smallest moon lander, will have an X-band and UHF communication system. It is set for launch sometime in February 2022 and will have a mission period lasting only 4 - 5 days.

The spacecraft has two components: an orbiting module and a surface probe. Each component has a separate communication system. Each transmitter has only 1 W of power.

The lunar orbiting module will transmit beacon or digital telemetry data on 437.31 MHz using PSK31. The moon lander will transmit digital telemetry on 437.41 MHz using FM modulation, PSK31 and PCM-PSK/PM.

## AMSAT

The Radio Amateur Satellite Corporation (AMSAT) is a worldwide group of hams formed in 1969. AMSAT has launch dozens of satellites since their formation. All of them go by the name OSCAR followed by a number.

For up to date information about AMSAT, you can sign up for their News Service Bulletins. To join their email list, visit:

<https://mailman.amsat.org/postorius/lists/ans.amsat.org/>

AMSAT's strategic plan prioritizes putting satellites into high-Earth orbits but they are not giving up on low-Earth satellites (FM CubeSats).

# CURIOSITY CORNER



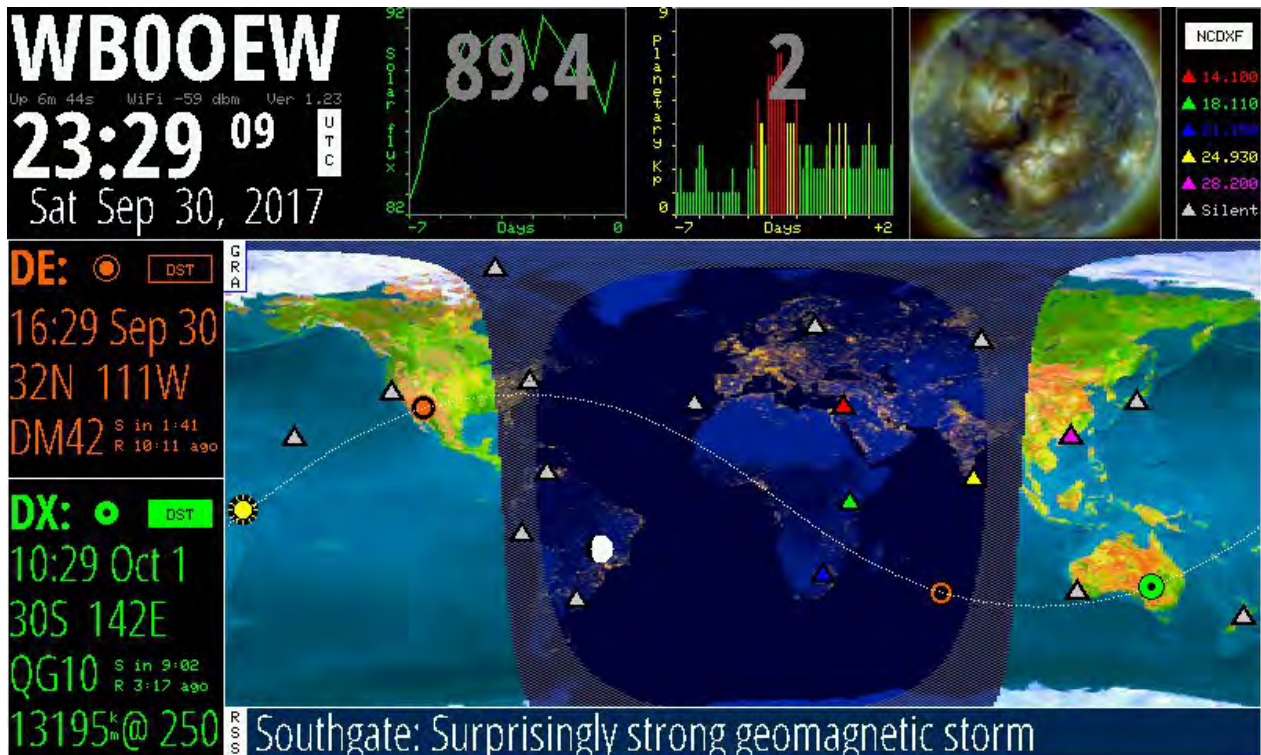
*We're Amateurs So There's Always More To Learn*

## Every good holiday ham needs a Raspberry Pi for Dessert!

Dave KC7MP

Ever want a 24 hour World Clock in your ham shack but thought they were too expensive? Well here is one possible solution. Build your own with a Raspberry Pi. I'd like to claim this idea as my own, but WB0OEW did it first.

I have built several of them now. I've found that all you need is a Raspberry Pi Zero W. The display takes a little time to catch up but it works fine for the clock. I would recommend the PI 2 Zero W, or A Pi 3 or 4 if you want to run the other ham software on this device as well. I have also used different distributions of Linux to make the clock.



The screen shot above is from the display of WB0OEW's finished project. There's more to it than the world clock.

The picture at the right was taken at my workbench. There's a Raspberry Pi 3 at the top and a Pi Zero W at the bottom. A 9V battery is there for size comparison.

The clock software is an image file that can be downloaded from [clearsky.com](http://clearsky.com). After downloading, burn the image onto a 32 GB Micro SD card. One program that is helpful in doing this is called Rufus. It's designed to burn files to SD or USB sticks.

And the instructions are on the site as well as a list of features for the clock.

Ham Clock ingredients are:

- 1 - Pi Zero W or greater
- 1 - 7" Raspberry Pi touch screen monitor
- 1 - Tidy Case 7" SmartPi display case
- 1 - 32 Gb Micro SD card
- plus Free software downloads

A second distribution I have tried is W3DJS Ham Pi which includes a clock and more. All known working ham software for Linux is included on that distro and they are all pre-configured! Just google HamPi. Download instructions are similar to the Clock alone.

I mounted my display in the case I obtained through Amazon, and attached the Pi on the rear. The case will handle any Pi but the 3B+ had a heat sink in the way of mounting. A little plastic nipping took care of the issue.

I have used other monitors and the software will accommodate some higher resolutions.

After you burn the image, the Pi will boot from the SD card. There is some mighty good software on here for free. The W3DJS HamPi software is a full-featured shack distro.



## More News

Books written by hams for hams are favorite reading material. They aren't the only source of information about the art and science of radio, though. Interesting descriptions of radio innovations and developments can turn up in unexpected places.

For ham WWII history buffs, a book by Erik Larson, *The Splendor And The Vile*, is worth a look. It's a biography of Winston Churchill during that war. Of particular interest to us are descriptions of the radio navigation methods used by German navigators to pinpoint bombing targets in England. They employed what was then state-of-the-art RF triangulation techniques to achieve unheard of accuracy.

If you're focused on only reading about this technology, there's a fantastic index at the end of the book that will help you locate accounts and descriptions of those methods.



A picture of RDF equipment in a WWII German aircraft.

A picture of German bomber shot down over England during WWII.



## RF Burns

We're all familiar with the danger of coming in contact with 110 VAC or 350+ VDC wires in our equipment. We know what precautions to take to avoid unpleasant or lethal shocks.

The hazards of touching a wire carrying RF current is different. Instead of causing muscle contraction or nerve stimulation, RF current entering the body can burn or puncture the skin. Insulated wire or insulated gloves may do little to reduce the risk of injury.

RF burn severity goes up as transmitter power increases. Touching the antenna of an HT transmitting at 5 W is generally harmless. Putting a hand on an antenna radiating 100 W will result in an injury.

Thanks to resonance, it's possible to get an RF burn from ground conductors, cables, or metal objects near but not touching a transmitting antenna.

RF burns happen because body tissues absorb RF energy and convert it into heat. When the tissues can't remove that heat fast enough burns and tissue damage happens.

RF tissue heating may be a hazard for hams but it has been harnessed for good uses in the practice of medicine.

For centuries, surgeons used hot metal rods and wires to cauterize and halt bleeding or to remove unwanted bits of tissue. In 1926, William T. Bovie, a biophysicist at Harvard Medical School, harnessed RF current to make the first commercial electrocautery in 1926.

Electrocautery works by passing an LF current with frequencies in the range of 300 kHz to 3 MHz from a small metal electrode into a desired piece of tissue. Heat is

produced where the RF current enters the tissue raising temperatures as high as 1,000°C.

The tissue in the vicinity of the electrode's tip vaporizes and blood in surrounding vessels is coagulated. A much larger ground plate diffuses the RF current and safely carries it out of the body.

Surgeons also use electrocautery make "bloodless" incisions through the skin and overlying soft tissues on their way to working more deeply inside the body.

When your hand comes in contact with a live RF wire, you're (accidentally) performing electrocautery. OUCH!



## Meeting Location



### Edwin A. Bemis Public Library

The Denver Radio League meets quarterly in person at the Edwin A. Bemis Public Library is located at 6014 S Datura St, Littleton, CO 80120. Meetings take place in the lowest level on the third Wednesday of January, April, July and October.

Our in person meetings start promptly at 7 PM and ends at 8:30 PM. Members and guests are welcome to attend.

Board meetings take place at 6 PM on the same day and at the same location. Consult our website for updated meeting information.

<http://denverradioleague.org>

Between meetings, we gather Thursday evenings at 7:30 PM on our 146.880 repeater. We'll discuss anything related to the hobby of amateur radio. All licensed operators are welcome to join in.

Until COVID-19 restrictions are fully lifted at Bemis Library, we will meet virtually on Zoom.

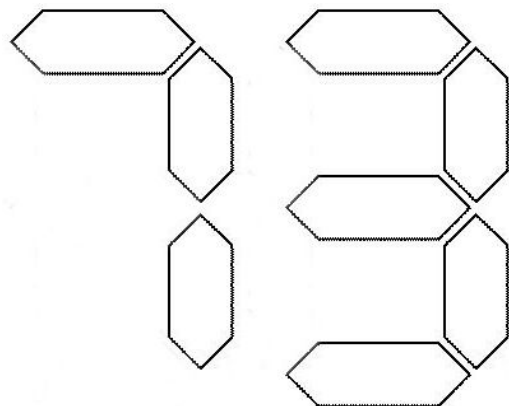
**You don't need a video camera to watch and listen to our Zoom meetings.**

### Who We Are

The Denver Radio League was founded in 1969 and has operated continuously ever since. We are dedicated to promoting the art and science of radio communication. DRL is a 501(c)(3) non-profit organization and is affiliated with the American Radio Relay League. We meet quarterly in person and weekly on the DRL Fun Net to share knowledge and experiences and to undertake a variety of radio related activities.

### Join or Renew Now

Membership in the Denver Radio League is open to all licensed amateur radio operators. Use the application form on the last page of this newsletter.



# DRL Membership Application Form

Name: \_\_\_\_\_ Call Sign: \_\_\_\_\_

License Class: \_\_\_\_\_ (Tech, General, etc.)

Street address (1): \_\_\_\_\_

Street address (2): \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ ZIP: \_\_\_\_\_

Primary Phone #: (\_\_\_\_\_) \_\_\_\_\_

Secondary Phone #:(\_\_\_\_\_) \_\_\_\_\_

Email address: \_\_\_\_\_

ARRL Member? Yes No

(ARRL membership helps the club maintain ARRL affiliation)

Denver Radio League dues: \$15.00 / year

Membership dues pay for 1 full year of membership

Please attach a check to this form (paying by check is strongly encouraged) made out to:  
Denver Radio League (check number \_\_\_\_\_) and bring to a club meeting or mail to:

David Mayzes, KC7MP  
8555 S. Field St.  
Littleton, Colorado 80128