REPEATER RAG

Vol. 51, Number 2
April, 2025

Denver Radio League's
Quarterly Newsletter

From The Editor

NEXT MEETING - APRIL 17, 2025
Bemis Public Library

News about private drones flying near wildfires and interfering with aircraft fighting fires made everyone aware of the danger of ignoring FAA rules. Those rules are meant to keep all aircraft safe. At the very least, illegal drone flights delay blaze control efforts. At worst they inflict damage on other aircraft.

Similarly, the Federal Communications Commission created rules regulating radio transmissions that are designed to keep airwaves free from abuse and interference. When people willfully violate those rules they, too, can endanger public safety.

Actions taken last year by the FCC against a Ham operator are an example of enforcing a rule meant to keep first responders safe. The story about this FCC action appears on the next page.

It's a reminder that FCC regulations exist for a reason. Amateur radio operates under a subset of those regulations. We are obliged to comply with all of them.

Jim KEØNRE
Editor

To submit an article for publication, email it to the Editor: KEØNRE@ARRL.NET

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Visit our website for up-to-date information

http://denverradioleague.org

FPGA

In This Issue

FCC News

The Federal Communications Commission fined Jason Frawley WA7CQ, an Idaho ham radio operator, $34,000 for causing interference with communications during a fire suppression effort. FCC amateur radio regulations make it clear that Hams can't interfere with public safety communications. It poses a severe risk to public safety.

In 2021, Frawley willfully and repeatedly operated without authorization and interfered with radio communications of the U.S. Forest Service while it was attempting to direct operations of fire suppression aircraft working a 1,000-acre wildfire on national forest land near Elk River, Idaho. over a twoday period, Frawley transmitted eight times without authorization on a frequency allocated to government use. The Forest Service complained about transmissions on 151.145 MHz, the frequency that was being used by the Forest Service and the Idaho Department of Lands to coordinate the firefighting.

In his defense, Frawley said that he didn't interfere with government communications. Rather, he was trying to help. He claimed he made the transmissions in good faith, that he hadn't been given a warning before being fined, that he had a history of compliance, and that he can't afford to pay the penalty.

Frawley said his actions should not be handled like someone who had malicious intent or who deliberately jammed signals. He argued instead a warning would be a more appropriate action.

The FCC disagreed and imposed a base fine of $10,000 for each of the two days that Frawley operated without a license on 151.145 MHz and $7,000 per day that he caused interference to authorized stations.

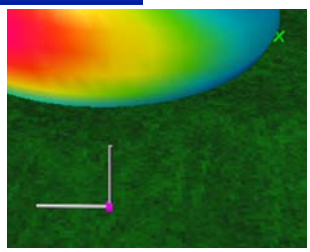
The Federal Communications Commission is operating under the direction of a new chairman, Brendan T. Carr. One of Carr's first actions has been to solicit suggestions on which current FCC rules are out of date and should be eliminated or which ones ought to be modified to improve efficiency. This is the time to communicate your Ham radio rule wishlist to the FCC.

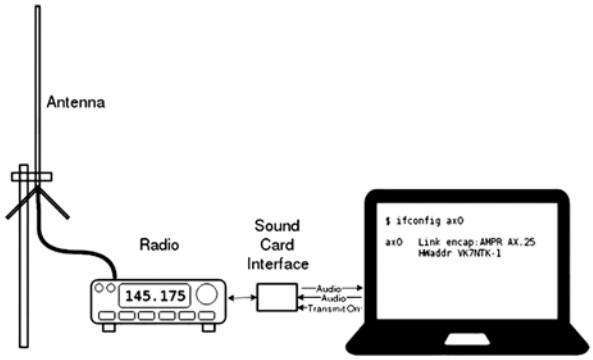
DRL Meeting Activities

January Meeting Summary

Jim KEØNRE discussed the role of a Community Reception Center during an actual radiation emergency and described the uses of radio communication in its operation.

Jim also presented the antenna he will use for Winter Field Day. It's a vertical whip that needs only one radial. He's expecting to make DX contacts with the help of this vertical antenna.





April 17th Meeting Preview

What's old is new again. Before the Internet, PC owners used analog modems, local landlines and custom software to send text messages for free across the nation. Soon after, Hams replaced telephones with radios and Packet radio was born.

The same protocols and concepts are still in use today. Dave KC7MP and Dan NØPUF will give an overview of the technology and show how to use the DRL's packet repeater for messaging.

Summer Field Day Preview

Field Days happen twice a year. ARRL Field Day is June 28-29, 2025. Once again the DRL expects to participate. Our April meeting not too soon to begin planning for it.

Repeater Update

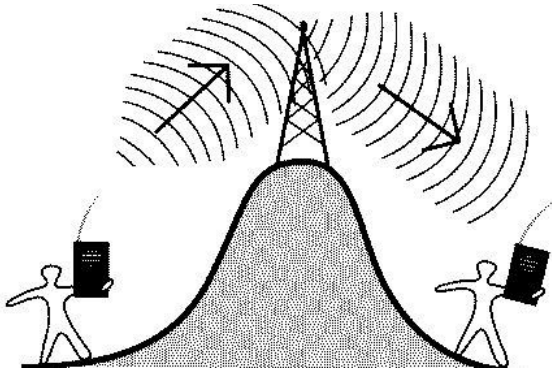
Maintenance and Repairs

Denver Radio League repeaters are fully operational.

DRL FUN NET

The DRL Fun Net convenes Thursday evenings at 7:30 PM local time on the 146.880 repeater. We discuss anything related to amateur radio.

All licensed Hams are welcome to join in. You don't need to be a DRL member to participate.



DRL REPEATERS

Since 1967, the Denver Radio League has operated several repeaters for the benefit of the Denver amateur radio community. Today, we operate and maintain four repeaters covering the Denver metro area. DRL repeater use is restricted to properly licensed Hams.

VHF KEØNCQ
145.050 MHz, packet only
146.640 MHz, -600 kHz
146.880 MHz, -600 kHz

UHF KEØNCQ
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 encounter a problem with our repeaters, contact a Board member to report it.

Repeater Activity

Listen to any of Denver's dozens of FM repeaters and chances are you'll hear… crickets.

Twenty years ago, Hams listened to local analog repeaters and were anxious to talk. Apart from a few evening nets and occasional drivetime conversations, repeaters stay mostly silent.

Where have Hams and their conversations gone?

Hams are still here. Colorado has more than 20,000 of them. Most are alive and well. Thousands around Denver are still active in the hobby. Why aren't they talking on repeaters?

People have more ways to communicate than they did a generation ago. Cell phones are ubiquitous. Hams no longer need to carry an HT to reach each other. Mobile phones let them contact Hams or anyone else any time and anywhere.

A cell phone is smaller than an HT and does so much more. Voice phone calls are immediate or asynchronous via voicemail. Sending texts or emails is another communication option. Smartphones serve up social media and even encrypted messaging. One selfie is worth a thousand words.

Life became busier, too. Driving is more stressful. There's more to do for work and greater responsibilities at home. Less leisure time with more choices to fill it. The peak of solar Cycle 25 tempts Hams to try DX-ing, dabble in contesting or get outdoors with POTA. All those mean less time for repeater chats.

Repeater digital modes including DMR, DSTAR and System Fusion further compete for Ham attention. But without the appropriate HT code plug or hotspot some local repeaters are inaccessible.

What can increase repeater activity?

Linking several repeaters together. One Ham's call is heard simultaneously on those linked repeaters. The geographic area and number of potential listeners increases proportionately. When one of those linked repeaters is also connected to the Internet, worldwide communication becomes possible. No need for the expense of HF equipment, an outdoor antenna or waiting for good propagation conditions.

Most repeaters aren't linked. So when you throw your call out, you may not receive a reply. It can feel like you're talking into a void. Hams may be listening but for one reason or another they're not anxious to talk at that moment.

Listen for a minute then repeat your transmission. This time, press the PTT button for two seconds before you speak, say your call sign phonetically and keep the PTT pressed for two seconds when you finish speaking. These steps keep the repeater active longer and permit connections between linked repeaters to function. Hams who scan multiple repeater frequencies will have a better chance to catch your call and respond.

Still no success? Try one more time before tuning to a different repeater and repeating the process.

There's one trick that worth trying before hanging up the mic. Some Hams may not be eager to engage in conversation when you want to. Asking for something specific like a radio check that someone can answer in a few seconds is likely to get a quick answer. Once someone responds, thank them and mention the reason you asked for a signal report. Is this the first time using this repeater from this QTH? Are you trying out a new piece of equipment? Maybe you changed transmit power or mic gain and you're curious how your rig sounds on the air.

Now that a conversation has started, go on to describe the equipment you're using. Perhaps add where you are or mention your other radio interests.

Greater use of Denver repeaters benefits all Hams. Corporations regularly petition the FCC to buy Ham bands for the benefit of their customers and investors. Radio tower owners may evict repeaters and rent that rack space to higher paying customers if they think Hams don't use them enough. Both are less likely to happen when Denver repeaters are actively used.

"On FT8, no one knows you're a dog."

Will You Be Seen At HAMCON Colorado 2025?

Whether you're a seasoned ham operator, a curious newcomer, or a tech enthusiast, this is the event you won't want to miss. Event Details:

Date: October 23-26, 2025
Location: Hilton Double Tree · Grand Junction, Colorado
Website: www.hamconcolorado.com

Why Attend?
Inspiring Keynotes – Hear from industry leaders and innovators in amateur radio.
Hands-On Workshops – Learn new skills, build kits, and get on the air with expert guidance.
Exhibits and Vendors – Explore the latest equipment, gadgets, and technologies from top brands.
Networking Opportunities – Connect with fellow radio enthusiasts and clubs.
Special Events – Participate in contests, prize drawings, and more!
DX University – Learn some of the biggest "trade secrets" from the best DXers in the business.

Who Should Attend?
Amateur radio operators (all levels)
Emergency communication teams
Electronics and tech hobbyists
Families and anyone curious about amateur radio

Mark Your Calendar and Register ASAP! Visit www.hamconcolorado.com for event updates, registration details, and hotel accommodations.

Don't miss out—HamCon Colorado 2025 is your gateway to the world of amateur radio!
Follow us on social media for the latest news and announcements.

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Website: www.hamconcolorado.com

Register early for $25

- **FORUMS**
- **VENDORS/EXHIBITS**
- **SPEAKERS**
- **HOSPITALITY SUITE**
- **PRIZES**
- **FOX HUNTS**
- **CONTESTS**
- **DX UNIVERSITY**
- **W1AW/Ø**
- **VE SESSION**
- **CLUB MEETINGS**

News From Space

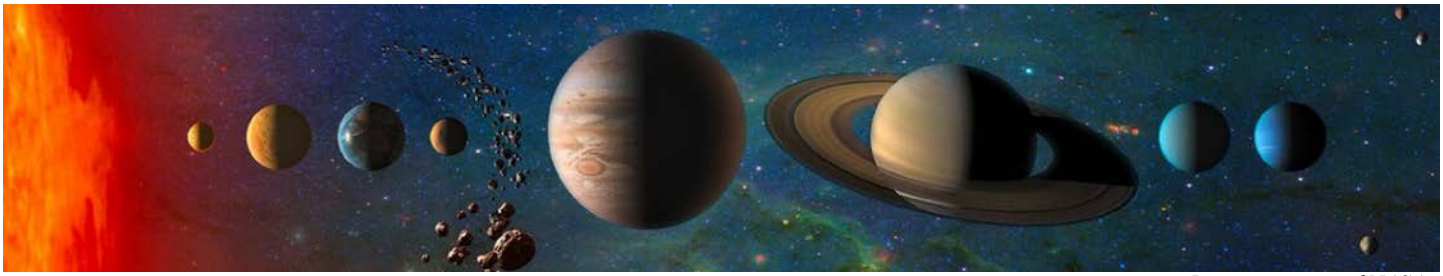
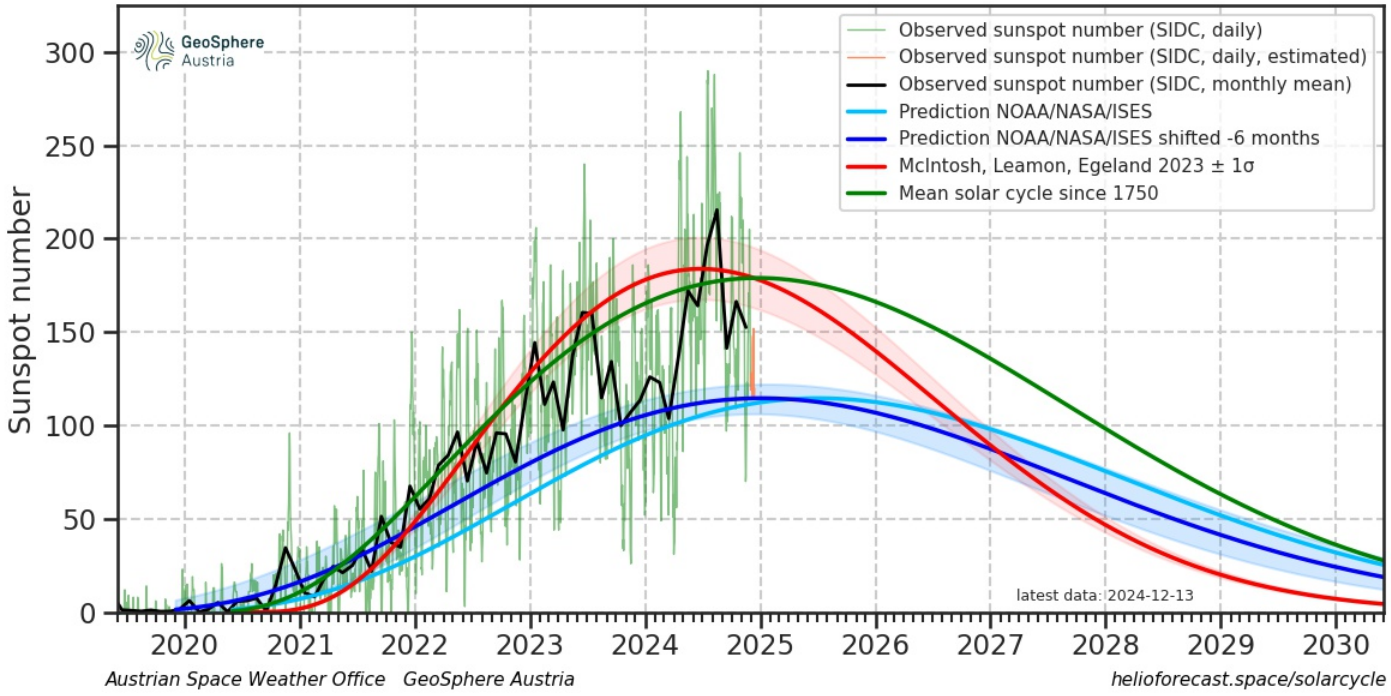


Image courtesy of NASA



Solar Cycle 25 has reached its peak and will begin to wane. Initial predictions had this cycle spawning fewer sunspots and producing poorer propagation conditions than Cycle 24. Just the opposite turned out to be the case. Cycle 25 is bigger and longer lasting than experts originally forecast. DX-ing was good throughout 2024 and should continue for the rest of this year. Ten meters performed far better than hoped for making Technician licensees delighted to be able to experience successful voice operation.

While sunspot numbers fluctuated wildly from week to week and solar flares caused occasional radio blackouts, there were many consecutive days when HF band conditions were excellent.

Whether any of the smooth curves in the graph above actually predicts what happens for the remainder of this cycle is anyone's guess. Average sunspot numbers are likely to remain above 150 for the rest of 2025. HF propagation should remain good as well. Fingers crossed, this solar activity will continue well into 2026.

Be on the lookout for a second Cycle 25 uptick sometime in the next two years. Cycles 21, 22, 23 and 24 awakened for a second time. The second peak sometimes delivers better propagation conditions than the first. QRP and DX hunting could experience a resurgence in 2026 if this pattern repeats itself. Give that linear a rest and run barefoot until 2027.

The threat of solar flares, CMEs, and the radio blackouts they cause will continue to be significant as long as sunspot numbers remain high.

How solar radiation affects the ionosphere remains under investigation. NASA awarded a research grant for "A HamSCI investigation of the bottomside ionosphere during the 2023 annular and 2024 total solar eclipses."

For current solar weather conditions and predictions, go to:

https://www.solarham.com
https://www.spaceweatherwoman.com

Winter Field Day 2025

Another polar express swept through the Denver region the weekend before Winter Field Day (WFD). Temperatures remained below freezing and overnight they dipped below zero most of the week. Weather drastically improved on Friday but snow and frigid temperatures returned overnight and persisted through most of the weekend.

We joke that the letter "F" in "WFD" stands for "Fortitude". WFD is intended to be an exercise of using radio skills under adverse conditions more than it is a traditional radio contest. The DRL team demonstrated its fortitude in 2023 by taking part in WFD and operating through snow and sub-freezing temperatures. Last year, WFD weekend was sunny and comparatively mild making it a pleasure to work outdoors in the Winter.

This year, team members felt that the letter "F" should stand for "Fun". They decided not to operate outdoors together (Category 5O) under the single DRL call sign. Rather, they opted to operate as solo participants from home (Category 1H) using disparate setups and their individual call signs.

A solar flux index near 200 and a planetary K of 1 or less for most of Saturday and Sunday forecast good HF propagation conditions. More than 1,400 stations registered for WFD and 2,100+ contact logs were submitted for scoring.

Jim KEØNRE writes, "Practicing two emergency methods while operating from home, I set up a temporary elevated-radial vertical antenna in the back yard Saturday morning and powered my IC-7300 and laptop computer exclusively from an LFE battery.

"Operating in the comfort of my home shack kept the fun in WFD and forced the cold and damp to stay outdoors.

"Vertical antennas have an inherently low takeoff angle favoring reception from distant places. Operating in the PSK-31 digital mode, I made more than a dozen 10 m contacts, all of them east of the Mississippi. After going outside to adjust the vertical antenna's whip and radial for the 15 m, I made more contacts from coast to coast.

"Snow and ice accumulation stopped me from extending the vertical's whip for 20 m so I switched to my home OCF inverted-L dipole to work 20 m for the rest of the afternoon. In the evening hours, I made 40- and 80-m contacts on my home antenna. QSB during the evening on those bands was bothersome on SSB."

John KIØH also took part in WFD from home. He writes, "Winter Field Day provided an opportunity to shake off the rust on my HF operations.

"I do little to no voice operations from my QTH, instead have been almost exclusively FT8. Field days (summer and winter) have been my occasions to do voice, always from a field location.

"With the club decision to operate individually due to the weather instead of from the field, I felt a pull to get on the air at least for a while. It took more than a couple minutes to reacquaint myself with my HF rig and set things up after a long absence.

"With an active tuner and a long-wire antenna, I was hoping to make contacts on several bands. Unsurprisingly, 20, 15, and 10 m were active during the day, and 40 and 80 m became active after sundown as the noise background abated. Over an an 8-hour period from late morning to evening, I was able to log 25 contacts total. Almost all were in response to CQ calls from other stations. Much better than I expected and the early success kept me going longer than I planned.

"High band contacts were sparse: one of each at 50 m, 2 m, and 70 cm. Two of these were in response to my CQ calls. Hopefully the other side logged those!

"If all the above come thru, then that would be a total of 8 bands - am hoping to at least get the 6-band objective. Contacts were from a total of 18 sections in 9 call areas, although I wasn't keeping score at the time.

"Although I didn't earn any moral points (or WFD objective credit) for operating outdoors and away from home, I was very happy to find that the rooftop tuner and antenna worked on a winter day after sitting unused for months."

Ham Musings

No Need to Shout to be Heard

One of the exciting and challenging aspects of amateur radio is communicating over vast distances with the push of a button. How far an HF signal can travel depends on the state of the ionosphere among other factors.

Measures like Solar Flux Index, Planetary A Index, and Planetary K Index offer clues about what's going on miles overhead. Favorable values of these indices increase the chances of communication success but there are no guarantees. Actually probing propagation conditions at the time of operation would give a more reliable idea about what to expect.

That's where the Weak Signal Propagation Reporter (WSPR) protocol comes in. WSPR is one of many digital protocols in the WSJT-X suite of weak signal digital modes. The entire suite leverages sophisticated digital communication methods which excel at extracting faint signal information buried in noise.

WSPR transmits a narrow band signal for about two minutes. It contains your call sign, transmitting power and Maidenhead square location. Then it listens for an equal amount of time for similar signals transmitter by other Hams. WSPR will send reception reports to websites like PSKreporter and WSPRnet. There they're plotted on a map showing where your transmissions have traveled.

The figure below displays the result one afternoon's 6-hr WSPR session. Scores of stations in the US and Canada running a WSPR session heard the 2-watt 15-meter signal from a dipole 25 ft in the air. That signal reached stations in Alaska, southeast Australia, and the West coast of Africa. Missing were reports from Hams in Central and South America.

On another afternoon, a 2-watt signal broadcast on the

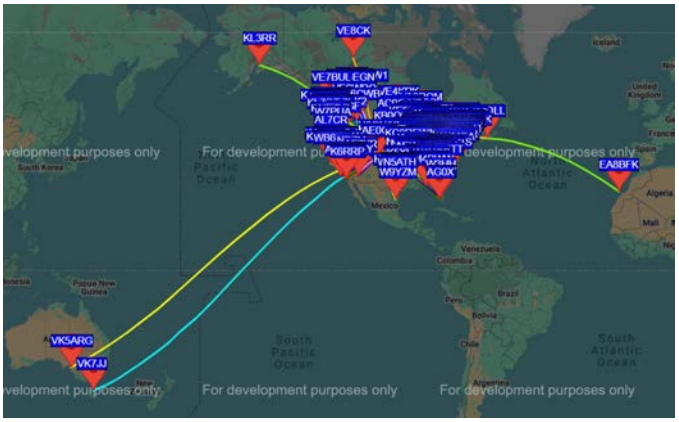
WSPR: 10 meters, 2 W for 1 hr. mid-afternoon.

10-meter band for one hour from the same dipole reached dozens of stations in the US and Canada. Those transmissions were also heard in Hawaii, Antarctica and by a German research vessel off the West coast of Africa as shown in the figure above.

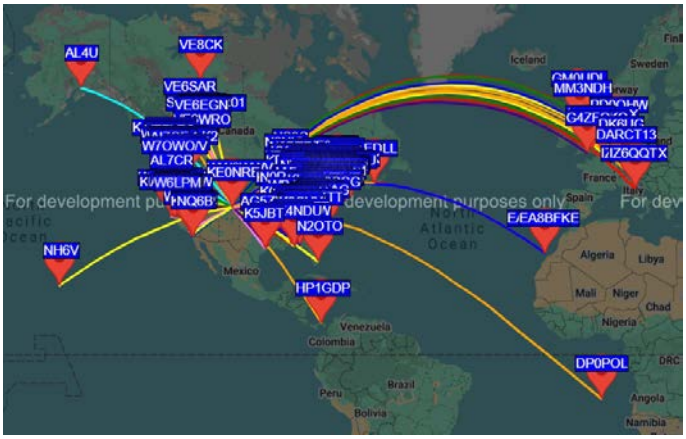
The map below shows the propagation successes found on the 12-meter band using the same antenna. Signals reached to England, Western Europe and most of North America.

Maps in these figures were rendered at:
https://www.wsprnet.org/drupal/wsprnet/map

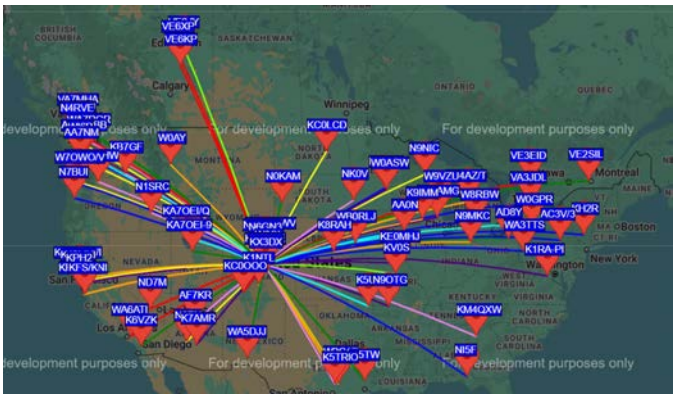
Enter your call sign, the band you are WSPR-ing on and this website will show where your transmission was heard.



WSPR: 2 W on 15 meters for 6 hrs mid-afternoon.



WSPR at 1.5 W on 12 meters for 6 hrs mid-afternoon.



WSPR: 1 W on 80 meters over night.

The 40-meter dipole antenna used in these tests can be forced to operate safely on 80 meters with help from an antenna tuner and with greatly reduced power. The map above shows results from one evening's testing. A 1-watt signal traveled more than 1,000 miles! Not too shabby for an unloaded one-eight wavelength antenna.

WSPR is not designed for rag-chewing. One WSPR message contains a station's call sign, Maidenhead grid locator, and transmitter power expressed in dBm. These data are crammed into a 50-bit packet and transmitted slowly over a two-minute interval. Receiving stations spend an equal amount of time listening for messages. These very long transmit/receive cycles give WSPR's protocol software time to extract and decode extremely weak signals from background interference.

In addition to assessing propagation, WSPR serves a second function. Antenna modeling programs like EZNEC predict where power radiated from an antenna will go. Simulations don't accurately take into account the influence of nearby conducting objects, vegetation or terrain. Model predictions become more confusing when an antenna works at frequencies other than its fundamental. Radiation patterns begin to look like the quills on the back of a frightened porcupine. A WSPR propagation report draws a realistic picture of where signals really travel.

When modifying an old antenna or installing a new one, it's helpful to see how the new compares to old. Running WSPR a few times before and after making an antenna change offers a basis for comparison.

Thousand of stations around the globe listen for WSPR transmissions and report what they hear to websites like PSKreporter and WSPRnet. Both sites plot reception reports on a world map. WSPRnet gathers many more reports than PSKreporter does. Reception patterns show where a signal reaches and where it doesn't.

As versatile as WSPR can be, it's not foolproof. Map information can be misleading. Only a tiny fraction of the amateur radio community monitors WSPR transmissions. Not all them listen or report 100% of the time. Many places on Earth are sparsely populated or they have few active Hams living there. A strong signal arriving in one of these places won't be heard or reported. That doesn't mean your signal didn't arrive there. Absence of evidence is not evidence of absence.

Conversely, a listening station that sports a high-gain directional antenna can hear signals other nearby stations can't. Such reports will give the mistaken impression that every station in that region could hear that same signal. That's simply not the case.

Use caution when interpreting where signals are heard and not heard. Try making reports at different times and on different days to get a truer picture of antenna performance.

Here's a link for more reading about WSPR:

https://www.qrz.com/articles/node_1734123754

A Ham Brain Teaser

Besides in Ham transceivers, you can find me at work in cars and cameras.

I'm fantastically flexible and fast.

I have a memory and some blocks inside of me.

If I don't do what you need, change me.

No one says my full name any more. They use a four-letter acronym.

What/who am I?

Answer on pg. 1

CURIOSITY CORNER

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

WhyAre There WARC Bands?

The first International Radiotelegraph Conference (IRC) was held in Washington, DC in 1927–28. There, the international amateur radio bands of 160, 80/75, 40, 20 and 10 meters that we enjoy today were established by treaty.

During the 1947 meeting of the IRC in Atlantic City, NJ the uppermost 300 kHz segment of the world allocation of the 10 meter band from 29.700 MHz to 30.000 MHz was taken away from amateur radio. Six years later, the 15-meter band was opened to amateur radio use.

In 1979, delegates to the World Administrative Radio Conference (WARC) held in Geneva, Switzerland allocated three new segments of the HF spectrum for use by amateur radio operators: 10.100–10.150 MHz (30 meters,), 18.068–18.168 MHz (17 meters), and 24.890–24.990 MHz (12 meters). Since that year, these have been called the WARC Bands. United States holders of a General, Advanced or Amateur Extra amateur radio license are allowed to use them.

Being just 50kHz in extent, 30 meters is the narrowest of the three WARC bands. Because of its small size, Hams operating on it agree to use only CW and narrow band digital modes. It is an excellent DX band and normally has propagation to somewhere in the world both day and night. Dipoles cut for 30 meters are 25% shorter than antennas resonant on 40 meters and are easier to deploy.

Propagation on 17 meters is similar to that on 20 meters. Although it is only 100 kHz wide, it can be easier to make DX contacts here than on 20 meters because this band isn't as busy. Be careful to use USB and avoid transmitting on the International Beacon Project frequency of 18.110MHz.

The highest frequency WARC band, 12 meters, can frequently provide good propagation even when 10 meters is closed. Antennas are smaller and this band is usually not busy. In good conditions it is an easy band for making DX contacts. When pile-ups get too thick on 15 and 10 metres, DXpeditions may move to 12 meters. Try calling CQ on this WARC band even when it appears dead.

WARC bands are not harmonically related to each other or to the other amateur radio HF bands. But with the right choice of balun and/or help from a wide range ATU, antennas made for the main Ham bands can work on one or more of the WARC bands. Antennas dedicated to work WARC bands are available from many manufacturers.

Sixty meters is not a WARC band. It was allocated in 2002 and initially available only in United States, United Kingdom, Norway, Finland, Denmark, Ireland, and Iceland. In 2017, the ITU authorized 60-meter band use worldwide. Unlike other HF bands, this one is divided into five discrete channels. Hams can use discrete 2.8 kHz-wide segments centered around 5.332, 5.348, 5.3585, 5.373, and 5.405 MHz. Amateur radio use is permitted on a secondary basis.

Thanks to widespread agreement in the amateur radio community, the WARC bands are not used for contesting. That makes them a relatively quiet refuge on contesting weekends.

A small controversy erupted in 2020 around that long standing agreement. The organizers of the Vermont QSO Party permitted FT8/FT4 contacts to be made on the WARC bands during that event. FT8 and FT4 each occupy only 3 kHz of spectrum. Together those digital segments consume one-eighth of the 30-meter band and half as much of 17 and 12 meters. Practically speaking, that’s not very much of each WARC band. But Vermont’s disregard for the non-contesting agreement sets a bad precedent potentially opening the door for future event and contest encroachment into the WARC bands.

A Tidbit of Electrical History

Hans Christian Oersted was born August 14, 1777 in Rudkøbing, Denmark. As a young boy he developed an interest in science while working for his father who was a pharmacist. He received an early education through self-study at home. Oersted went on to the University of Copenhagen. While there, he earned a doctorate in 1799.

Alessandro Volta's invention of the voltaic pile in 1800, inspired Oersted to investigate the nature of electricity. The next year, he received a travel award that enabled him to spend three years traveling across Europe getting to meet other scientists.

European scientists of that time had noticed many electrical phenomena and many magnetic phenomena. Most of them believed that electric and magnetic forces were distinct and unrelated to each other.

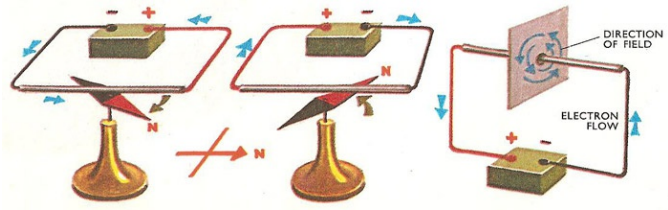
Throughout Germany, though, many scientists adhered to the philosophy of Emanuel Kant who strongly believed that there was a connection among all natural forces. While in Germany, Oersted met Johann Wilhelm Ritter, a physicist who believed electrical and magnetic forces were in fact related. That intriguing idea drew Oersted from the study of chemistry to the study of physics. He returned to the University of Copenhagen in 1806, became a professor there and pursued research on electric current and magnetism.

In 1820, Oersted published the observation that a compass needle was slightly deflected from magnetic north by passage of an electric current through a wire situated nearby.

As happens in science, Oersted wasn't the first to observe this effect. Gian Domenico Romagnosi, an Italian scientist, reportedly made the same discovery years earlier. Because Romagnosi's 1802 discovery was only reported in an Italian newspaper, European scientists never paid much attention to his observation. Consequently, Oersted was given credit for this discovery.

Hans Christian Oersted

Oersted's first explanation of the effect of current was that magnetism must radiate from all sides of a current-carrying wire. Three months later, he showed that an electric current produces a circular magnetic field as it flows through a wire. When he reversed the current, he found the needle deflected in the opposite direction.



Orsted experimented with various orientations of the needle and wire. Interestingly, he noted that the effect on the compass needle could not be shielded by placing an electrical insulator like wood or glass between them.

For his work, the Royal Society of London awarded Oersted the Copley Medal. Subsequently, the CGS unit of magnetic induction (oersted) was named for him.

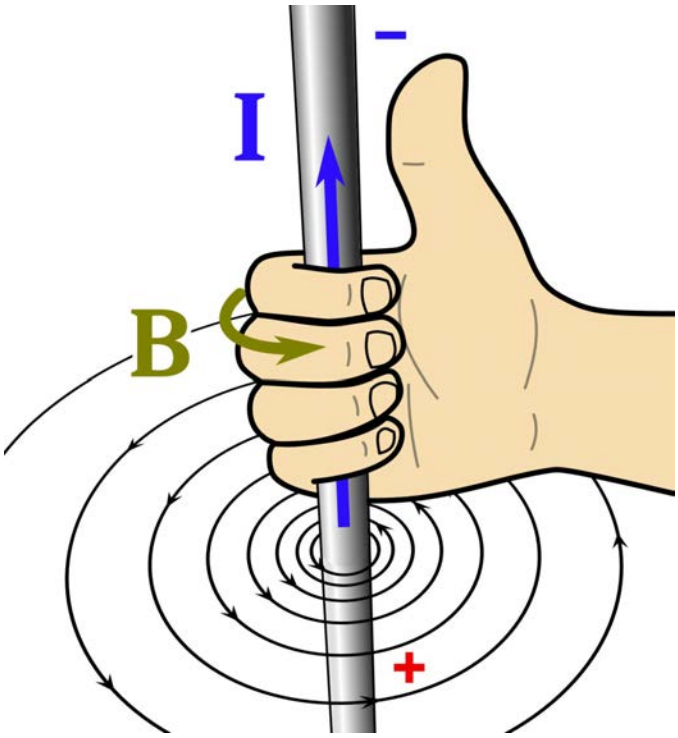
The oersted is not an SI unit. The equivalent way to express magnetic field strength in SI units is "amperes per meter" (A/m). One oersted is he strength of the magnetic field (H) inside a long solenoid wound with 79.5775 turns per meter of wire carrying 1 A of current.

Oersted's discoveries became the starting point for important subsequent work carried out by André-Marie Ampère and others in subsequent decades.

These relationships are summarized in what's come to be known as Oersted's Laws:

- *Magnetic field lines encircle a current-carrying wire*
- *Magnetic field lines lie in a plane perpendicular to the current-carrying wire*
- *When the direction of the current is reversed, the direction of the magnetic field reverses*
- *Magnetic field strength is proportional to the magnitude of the current*
- *Magnetic field strength is inversely proportional to the distance from the wire*

The direction of the magnetic field generated by an electric current flowing through a wire is illustrated in the figure (above right). Holding the wire in the right hand with thumb pointing in the direction of current flow, the fingers point in the direction of magnetic flux. This relationship is called the right-hand rule.



Right-hand rule.

Practical applications of Oersted's work soon led to the invention of the electrical relay, the electromagnet and the electric motor.

Ask anyone except a Dane who Hans Christian Oersted was and they'll likely confuse him with Danish author Hans Christian Andersen. Hams who watched children's television in the 1960s-70s may have learned Oersted's name while being entertained by morning TV cartoons.

The popular animated television series *The Adventures of Rocky and Bullwinkle* often included a segment titled *Peabody's Improbable History*. One of those *History* episodes featuring Hans Christian Oersted highlighted his passions for electricity and magnetism. You can view it (again?) at:

https://www.youtube.com/watch?v=1uCzusFzO-o&t=3s

Meeting Location

Edwin A. Bemis Public Library

The Denver Radio League meets quarterly at the Edwin A. Bemis Public Library:

6014 S Datura St, Littleton, CO 80120

We get together on the third Thursday of January, April, July and October in the meeting room on the lower level.

Our general meeting starts at 6:30 PM and ends promptly at 7:45 PM.

Members and guests are welcome to attend. Consult our website for last-minute updates.

https://denverradioleague.org

DRL Board meetings commence at 6 PM, immediately prior to our general meeting.

Between meetings, we gather Thursday evenings at 7:30 PM on our 146.880 repeater and discuss any topic related to amateur radio. All licensed operators are welcome to join us.

Who We Are

Founded in 1969, the Denver Radio League has operated continuously ever since. We are dedicated to promoting the art and science of radio communication. DRL is proud to be affiliated with the American Radio Relay League. We meet in person quarterly. We gather at 7:30 PM every Thursday on our 146.880 repeater for our Fun Net where we discuss topics related to amateur radio.

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.

Denver Radio League Membership Application / Renewal 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
(Your ARRL membership helps the club maintain its 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:

Thomas Dall
5630 S. Lowell Blvd.
Littleton, CO 80123
planeup@att.net