



REPEATER RAG

Vol. 46, Number 3
July, 2021

Denver Radio League's
Quarterly Newsletter

From The Editor

A ham once remarked, "Amateur radio is a hobby that contains a thousand hobbies within it." That's easy to appreciate when you consider all the ways hams have found to play with radio and technology.

On the other hand, there are many hobbies that incorporate radio uses into them. Front Range repeater traffic carries messages from hams who rescue marooned 4WD vehicles. Adults fly drones. Children steer their toy cars using RF-based controllers. Weather watchers relay local meteorological data to the National Weather Service. Space enthusiasts leverage their transceivers to contact the ISS crew.

When you tire of doing the same old thing, try something else. Explore another facet of amateur radio. Incorporate your equipment into a different hobby. Enjoy hiking? Bring an HT and try a SOTA activation. A change like that could refresh your interest in ham radio again.

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

On June 17, the FCC affirmed HobbyKing's fine of \$2,861,128 for marketing noncompliant RF equipment in the United States.

The fine resulted from an investigation initiated by the ARRL. They complained HobbyKing equipment was “blatantly illegal at multiple levels.”

The ARRL's EMC Committee discovered that HobbyKing's aerial drone TV transmitting equipment was being imported and marketed without FCC authorization.

ARRL's lab documented that the operating frequencies of these drone TV transmitters operated near the 1.3 GHz amateur band. Frequencies were dip-switch selectable to frequencies internationally assigned for use by Aeronautical Navigation, GPS, GLONASS L1, ATC Mode “S,” as well as to both the interrogation and reply frequencies used for Air Traffic Control Air-Route Surveillance “transponder” radar systems.

Transmissions from these drones would have caused harmful interference to these essential Navigation and ATC Radar systems and presented a dangerous threat to flight safety.

HobbyKing had denied that it was marketing its drone transmitters to US customers, but ARRL Laboratory Manager Ed Hare, W1RFI, was able to purchase two drone transmitters from HobbyKing and have them shipped to a US address for testing in the Lab.

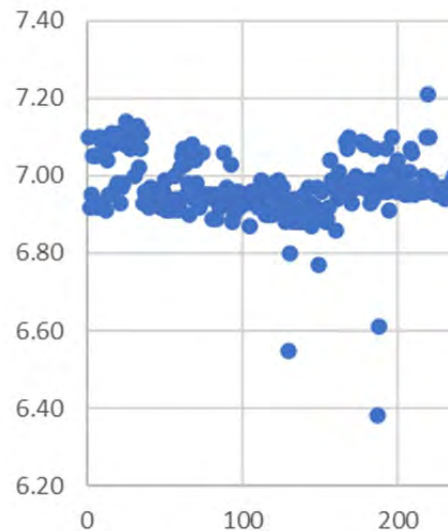
Amateur radio equipment used to telecommand model craft are limited to 1 W the ones but sold by HobbyKing operated at power levels up to twice as much.

The FCC said it found that dozens of devices marketed by the company transmitted in unauthorized radio frequency bands and, in some cases, operated at excessive power levels.

Summary of April's Meeting

Jim KEØNRE reported about impedance measurements from his off-center fed dipole's resonance frequency over the span of 15 months. Its resonant frequency exhibited a cyclical tendency. Jim analyzed the patterns found on 40- and 20-meters and discussed several possible explanations for this behavior.

The meeting ended with a fascinating roundtable discussion of the causes.



Preview of July's Meeting

Bemis Public Library will not be back to its normal evening operating hours in time for our next meeting. We'll meet virtually on Zoom instead.

July's program will feature a discussion of DRL's participation in Field Day 2021.

Summer Field Day 2021

DRL mounted an outdoor expedition for ARRL Field Day. Read more about it starting on Page 9 and hear about during our July meeting.



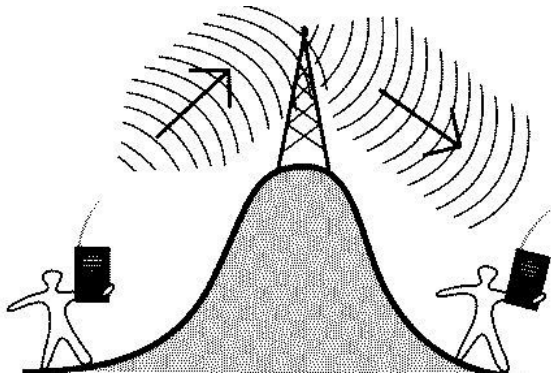
Repeater Update



Maintenance and Repairs

Our 145.050 packet repeater has been temporarily out of service. Dave KC7MP pinpointed the issue(s) and complete repairs. Testing has finished successfully.

The 145.050 packet system will be re-installed on Warren Mountain and soon back in service.



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

Even though Cycle 25 officially began last December, it's difficult to notice a consistent improvement in DXing.

Propagation on HF bands have not improved substantially since the initial rise of the Solar Flux Index (SFI) to more than 110 briefly last December. Since then, SFI has remained for the most part in the low- to mid-70s with occasional spikes into the mid-90s.

The majority of forecasts about Cycle 25 continue to place its peak, due to arrive in five years, at or below that of Cycle 24.

Even if most of the solar forecasts are spot on, there will still be occasional days of well above average SFI. Those spurts can give rise to particularly good DX opportunities.

Sporadic E layer openings for 6-meters popped up more frequently beginning in late April, through May and June and into July.

Stay vigilant and keep listening for unexpected far away contacts on all the bands.

HF Blackout

Briefly, on July 3, the first X-class solar flare in four years blacked out HF propagation for a few minutes.

An X1.5 major solar flare reached maximum intensity at 1429 UTC, the first X-class solar flare of Solar Cycle 25 and the first since 2017,

HF propagation blackouts happen when x-ray and extreme ultraviolet radiation from solar flares ionizes the D-region of the lower ionosphere,

Most X-class solar flares erupt when the solar flux index is greater than 90.

X-class major flares are measured on an open-ended scale. The strongest one ever recorded was an X28 flare in 2003. X10-class and stronger solar flares typically have effects that last for much of a day and affect the entire sunlit side of the Earth. Solar flares occur relatively rarely, only about once every 20 years.

Very severe HF propagation degradations are caused by coronal mass ejections (CMEs). HF propagation degradation resulting from a CME begins about 2 days after a solar flare.

The CME preceding the July 3 X1.5 solar flare will probably not effect us again because it has rotated off the visible disk of the Sun.

Hydrogen Is Calling

We're accustomed to sending signals hurtling toward the sky in hopes of bouncing them off the ionosphere and hearing an echo or reply. But there are signals arriving from the sky that hams didn't transmit.

Point a suitable antenna at the sky, listen on 1,420.405 MHz and you can hear what sounds like a transmitter's carrier.

It's not an alien civilization trying to contact us. It's something more fundamental.

These emissions arise from ionized hydrogen atoms in our galaxy returning to their neutral state. In the process, they release precisely tuned electromagnetic radiation. Astrophysicists call this signal the H I or hydrogen line.

In visual spectroscopy, excited atoms emit light that has a characteristic color. For example, Sodium gives off yellow light with a wavelength of about 589 nm. The wavelength of the hydrogen line is 21.106 cm, hundreds of thousands of times longer than visible light.

A very long wavelength means these emissions fall in the microwave range and they readily penetrate interstellar dust clouds when they travel through space. Listening for them means you can "hear" regions of space which are not visible with conventional telescopes.

Listening for H I signals is within the reach of us all. Inexpensive SDR dongles can tune to hydrogen's frequency. The signal is extremely weak, though. It's necessary to pair a

dongle with a directional waveguide and a low noise amplifier (LNA). This setup can detect and locate regions of ionized hydrogen. You can even make a map where H I is found in the sky. The following website gives some examples of how it's done:

<https://www.rtl-sdr.com/tag/hydrogen-line/>

Are you looking for something new to try? This might keep you busy for the months ahead.

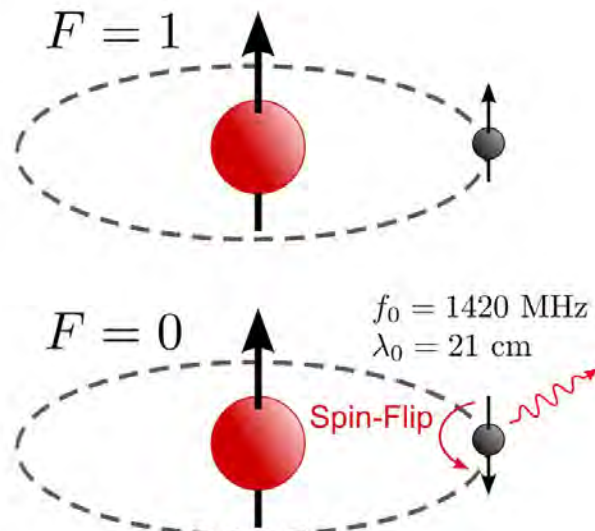


Image from Wikipedia, in the public domain

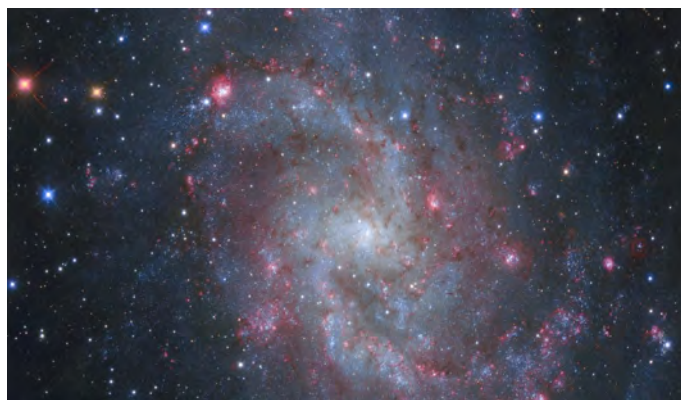


Image courtesy of NASA.GOV

CURIOSITY CORNER



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

Making A Battery Safer

Powering radio equipment with batteries when in the field is commonplace. When electricity in the shack goes out, having a battery can keep a station on the air. I've wanted a backup battery in my shack for emergency use. Participating in Field Day 2021 gave me a reason to finally get one.

After much deliberation, I went with a Bioenno LiFePO4 with screw terminals. Screw terminals readily accept bare wires, fork connectors and ring connectors. That versatility, I reasoned, could be handy in an emergency or in the field. See Figure 1.

When I took my battery to the field, DRL's Safety Officer, John KIØH spotted its exposed positive terminal and covered it with a strip of electrical tape. The downside of battery screw terminals is they're always exposed. If a piece of conductor shorts them, it can cause battery damage or worse. The same terminal shorting hazard exists in the shack as well.

Electrical tape is a good quick fix but I wanted a longer-term solution. Easy access to the screw terminals to add another connection was just as important to me as protect them from shorting.

Woodworking is a hobby I practice. When making a jewelry box, I'll often wrap a long $\frac{3}{4}$ "-wide elastic band around it to hold the sides together until the glue dries. One of those bands was the perfect length to stretch around the battery and pretty much cover over both screw terminals. It's neater than electrical tape. Figure 2 shows how that worked.

But how long would it last? Edges on the hexagonal screw heads could eventually wear through an elastic band exposing them and create a shorting hazard.

My second attempt was to make a wood cap enclosing both screw terminals and connectors. I drilled two $\frac{1}{2}$ -inch flat bottom holes into a $\frac{3}{4}$ inch thick block of hardwood. They lined up with the

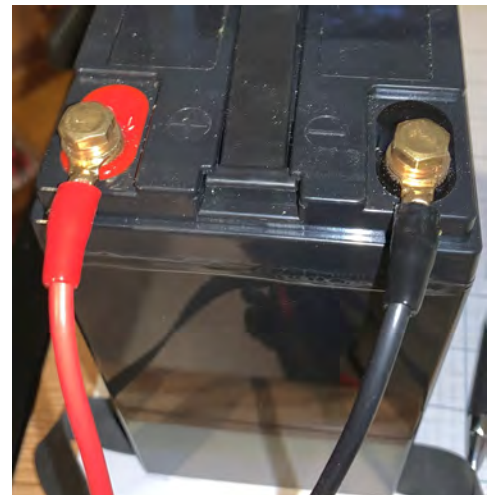


Fig. 1 Battery screw terminals



Fig. 2 Elastic band covers most of the exposed screw terminals

screw terminals. Then I carved a channel through the side of the block to meet each hole. This made room for wires to reach the screw terminal. See Figure 3. I placed this block over the terminals and used an elastic band to fix it in place.



Fig. 3 Wood cover for screw terminals

Dry wood is a good insulator. Wet wood conducts some electricity. A wood block wouldn't be well suited for outdoor use. A nonconducting plastic terminal cover would be better for field use. I didn't have the expertise to fabricate a plastic equivalent.

Coincidentally, a makerspace store opened nearby last month. Among its arsenal of tools are two 3D printers that fabricate plastic parts. Local public libraries may also have a 3D printer that its patrons can use. 3D printing a plastic terminal cover sounded exciting. It could be an opportunity to learn 3D printing and to make something I needed.

The first step in 3D printing is making a 3-dimensional virtual representation of an object. TinkerCAD is a free online virtual 3D modeling system. You drag and drop solid or hollow shapes (cubes, cylinders, spheres, cones, etc.), position and merge them to create a desired shape.

I began modeling with a solid cube and stretched it into a bar having the same dimensions as my wood block. Inserting hollow cylinders into the bar made two 13 mm blind holes spaced 65 mm apart. Moving small hollow bars through the side created channels for wire connections. Figure 4 is a screen shot of how the virtual model looks in TinkerCAD.

Then I brought my TinkerCAD model to my local makerspace store. They operated the 3D printer

for me. My plastic terminal cover took about an hour to print. Figure 5 shows the 3D printed terminal cover in place on the battery.

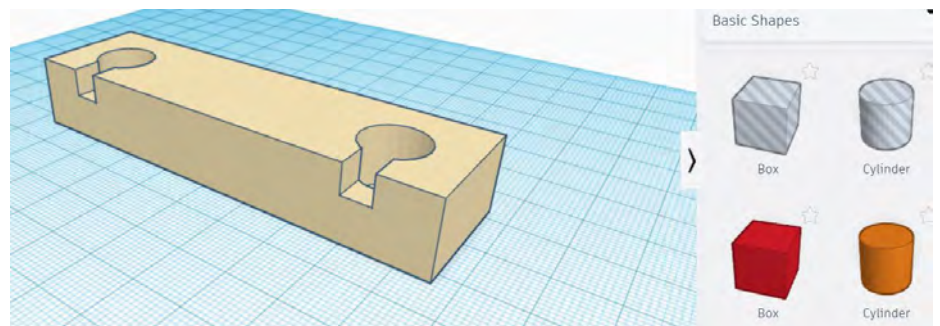


Fig. 4 TinkerCAD virtual model and menu of shapes to build with.

Give 3D printing a try. Once you see how simple it is you'll probably think of more uses.

There are free online libraries of per-made 3D objects. Start with one of them and edit it to make something that meets your need.

Replacement knobs, insulators, a miniature straight Morse key or a small plastic enclosure could soon be on my to-do list.



Fig. 5 Plastic cover installed over screw terminals

More News



Field Day 2021

The Denver Radio League's Field Day team gathered on the lawn at Bemis Public Library in Littleton to set up. Team DRL included Dan NØPUF, Dave KC7MP, Jim KEØNRE, John KIØH, Matt WØMKM and Roy KBØPNM.

Dave KC7MP arranged for the use of this venue. Jim KEØNRE organized publicity and handouts to give to visitors who dropped by. Team members flew a special banner explaining Field Day.

Team DRL members unpacked equipment, cables and supplies on a shady picnic table on the Bemis lawn. They quickly installed a 20m off-center fed dipole between nearby trees. Finding somewhere to suspend an 80m dipole took more time. Two trees more than 50 yds apart conveniently situated the feed point to remain close to the picnic table.

A telescoping painter's pole elevated the antenna's feed point to 20 ft. The dipoles together with antenna tuners made it possible to operate on permissible HF bands. Roy KBØPNM positioned a ham stick antenna 30 yds away to work 20m voice.

Rain was forecast for that afternoon. Team DRL deployed two popup canopies to be on the safe side.

The operating plan was to work two or more bands at the same time. Dave KC7MP planned to use his QRP uBitX for CW on 80m and 40m, Roy KBØPNM worked voice on 20m. Jim KEØNRE worked FT8 on 20m and 10m.

A 14Ah SLA battery box (Thank you, Tom KD4DT) powered the QRP rig. A 40Ah LiFePO4 battery powered an IC-7300 and a laptop PC connected to it. Roy's rig was powered by the battery in his truck battery.

John KIØH was Team DRL's Safety Officer. Before turning on the equipment, John inspected each RF and power connection to make sure electrons flowed only where they were supposed to. He marked off coax runs through the grass to alert visitors of a possible trip hazard.

Team DRL made their first voice CQ on 20-meters. Transmission modes switched back and forth between phone, digital and CW. Team member took turns. This was the first time John or Matt made HF voice CQs. Phone bands were very crowded so breaking pileups took patience and luck. CW and FT8 band segments were not as crowded so greater success was found there. The Team DRL combined laptop and paper to log contacts.





Team members kept an eye on the sky and tracked local weather reports. Storm clouds closed in at 3 pm. Temperatures dropped and the wind kicked up. Luckily, our canopies kept rain off the operating positions and thankfully the transceivers remained dry. Team DRL continued making contacts until 5 pm when Bemis Library closed for the day.

Team DRL made 19 contacts in all. That number isn't impressive compared to most other Field Day entrants. Bonus points for operating practices enhanced the point total appreciably. But achieving a high score wasn't the point.

Team DRL's objectives were to (a) practice quickly erecting effective antennas and (b) operate in the field using only emergency power. They met both objectives and accomplished more. Coping with adverse weather conditions and learning how to do contest exchanges added valuable skills as well.

Team DRL brought nearly everything they needed. One piece of equipment failed. Improvisation was key to moving forward. Despite setbacks, everyone agreed they had fun. They're all now looking forward to taking part in Field Day 2022.

LESSON LEARNED

- The more the merrier. Many hands make for easy work.
- Arrange publicity, handouts and banners 1-2 months ahead of time.
- Have a few different ways to put antennas up in trees.
- Push-up masts or telescoping painter's pole for feed point support or halyard routing.
- Prepare for wind, rain, hot or cold weather.
- Bring an ice chest. Hydrate and snack often.
- Easy-up (canopy) for shade/rain.
- Rope, paracord, twine and monofilament line are necessary.
- Use existing tables or bring one 6-ft or two 4-ft folding tables for each pair of operators.
- Have electrical tape, a VOM, a VNA, cable ties and assorted hand tools for adjustments and repairs.
- Ground rod/spike, grounding straps and hammer.
- Spare fuses (assorted ratings, round & flat).



- Label all cable and their attachments so they'll be connected properly.
- Assorted coax and power patch cords.
- Ideally, equip power cords with Powerpole connectors and a power distribution block.
- Assorted connectors and adapters (SMA-to-UHF, UHF-to-N, etc.) including double ended females and males.
- Ideally, antennas will be multi-band and easy to erect.
- Institute a band plan and an operating schedule to avoid mutual interference.
- Antenna tuners and/or a variety of baluns.
- Plastic tarp for added equipment protection.
- Trash bags for cleanup.



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.

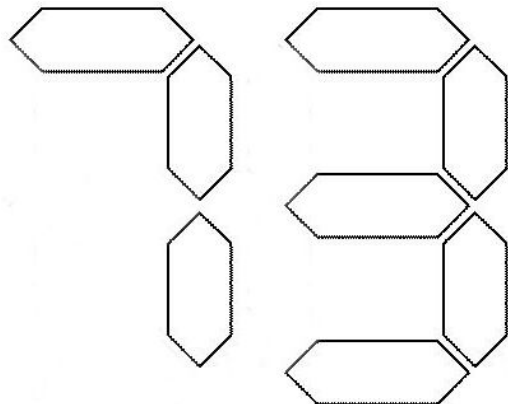
Until COVID-19 restriction are lifted at Bemis Library, the DRL will meet virtually on Zoom.

Who We Are

The Denver Radop 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