



ROUNDTABLE

The Denver Radio Club Newsletter

Since 1917

January 2017

PRESIDENT'S MESSAGE

By Gerry Villhauer, W0GV

Hello DRC Members,

It is hard to believe that this is the January 2017 issue of the Round Table...Where did the time go? Our Annual Holiday Party was a great success! Thanks to Robert White (K0RCW) for a terrific presentation on Iceland. It was very interesting and well presented in Robert's usual entertaining style. Robert has traveled all over the world and I hope we can get another presentation from him at a later time. Our attendance count for the party was 81. I believe that is our largest attendance yet; which brings us to another milestone and a problem. It appears we have outgrown the location where we have had the party for the last several years; I know it was crowded and stuffy. We will be looking for a new venue for our 2017 party. Some ideas have surfaced already and we will be investigating those and other suggestions.

Our January program will be radio oriented but not ham radio oriented. I don't think any of us realize what goes into the planning and frequency coordination for events like Bronco football games, Colorado Rockies games and really huge events like the Super Bowl or an event like the Democratic National Convention. We have invited Mr. Jim Schoedler to come tell us how these types of events are coordinated to minimize RF interference when hundreds of transmitters are in use at a large event. You can read more about Mr. Schoedler and his qualifications and experience in this issue of the RT. This will be another "Don't Miss It" presentation...So Don't Miss It! That will be January 18th, 2017.

2017 will be a very special year for the Denver Radio Club. It will be our 100th Anniversary. Can you believe our club was formed in 1917...WOW! We will be planning some special events for this year. Your help is needed! I have a few members volunteering to help with this Milestone Event but it will take more than 3 or 4 people for this task. Please let me know if you are willing to help and any ideas are also welcome. Just email me with your name and contact information. W0GV@hotmail.com

Thanks to all of you who recently joined and made the DRC "Your Club". Please stay active on the air, come to meetings, programs and events. Your name and call will be listed in the body of the Round Table.

73 for now and HAPPY NEW YEAR TO ALL!

Gerry (W0GV)
President



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DECEMBER MEETING – WHAT'D I MISS?

By Brennan Pate, AD0UZ

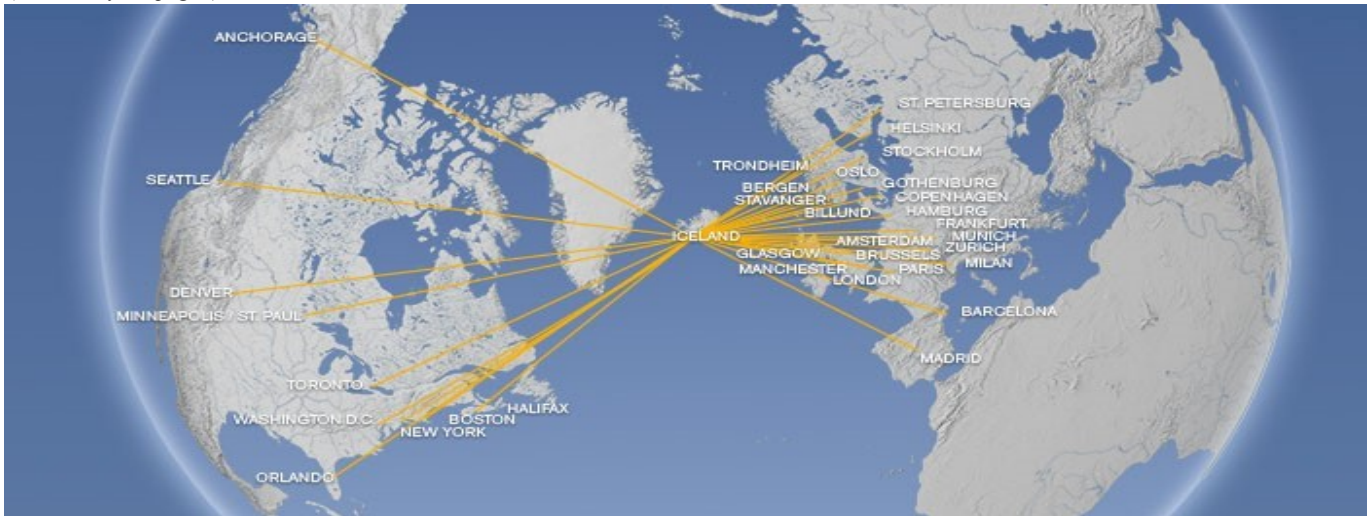
It was a full house at the annual club Christmas party at the Golden Corral. After everyone had had a chance to take advantage of the bountiful buffet, President Gerry Villhauer (W0GV) got things kicked off. He had a couple guests introduce themselves and found one recent upgrade. He then had everyone else introduce themselves, including several spouses. Overall about 81 people were in attendance.

Robert White (K0RCW) then did a well-rounded presentation on Iceland. He provided a bunch of various facts about the people, food, topography, volcanic elements, history, utilizing local geothermal activity and much more. The presentation included a few photos that both he and Bill Rinker (W6OAV) provided from their respective trips. Robert provided insight into the harsh and beautiful elements of a dynamic country that is about the size of Kentucky, or about 40% the size of Colorado.



(Continued on page 3)

(Continued from page 2)



Who's New In The DRC?

By Bob Willson, KC0CZ

The DRC is a very active club in the Denver metro area and we'd like to have all of our members listen for these new calls and personally to make them feel welcome. Welcome to our newest members.

Richard W. Froiseth	WD6DOK
Glen Saraduke	KA3RIQ
Art Larson	N0ARC
Darryl Hedges	KD9AUK
Roger Hassell	AD0WG

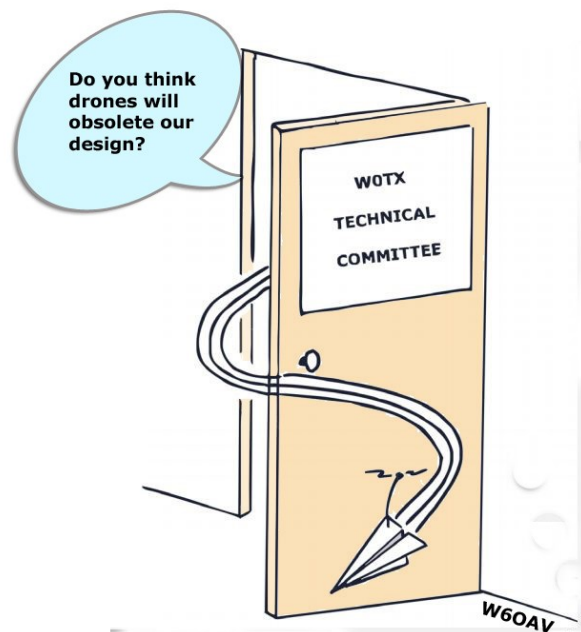
We have a number of activities throughout the year and we'd like very much for you to participate in serving your community. If you have questions please feel free to ask on any of the repeaters or see the contact information on the last page of this publication. Also please join us once a month at the regular club meeting on the 3rd Wednesday at 7:00 p.m. For new hams we have the Elmer session which starts at 6:00 p.m. before the regular meeting.

More information can be found on the Denver Radio Club website at www.w0tx.org.

TECHNICAL COMMITTEE REPORT

By Bill Rinker, W6OAV

The technical committee did not meet in December, due to the club Christmas party.



WHAT IF THE WEATHER CHANGES?

If we should experience a turn in the weather on the day of our monthly DRC meeting it may be necessary to cancel the meeting. If this should happen listen for meeting status reports on 145.49 or 448.625 MHz repeaters during the afternoon on the day of the meeting.

~ Editor's Note: The Technical Committee meeting is open to members of the DRC. It is held in the Arvada room, starting at 6:00 p.m. on the evening of the DRC monthly meeting.

JANUARY MEETING PRESENTATION

By Jim Schoedler

Game Day Frequency Coordination

At sports stadiums, large concerts, and some other public venues preventing and/or troubleshooting radio frequency interference is the primary job of the event frequency coordinator. The NFL uses multiple frequency coordinators, known as Game Day Coordinators, at every football game. Whatever the title, the job starts well before the event with building a database of users and frequencies and finishes when the last use of RF at the event is completed. In between the job requires a variety of people and technical skills. I will discuss the range of frequencies used at a typical venue, the methods used for coordination, the tools used at the venue, and some of the pitfalls and successes I have experienced in my 10 years of performing frequency coordination.

Jim Schoedler's Bio

Jim Schoedler of Denver, CO is a technology consultant with clients in the television, radio, and associated communications industries. In that capacity he performs RF analysis, design, and FCC license applications for fixed microwave, satellite, and terrestrial television and FM radio licensees. He is the SBE radio frequency coordinator for Denver and the Front Range of Colorado, and is a game day RF coordinator for the NFL Broncos and the Colorado Rockies Baseball Club. In 2008 he was the on-site frequency coordinator for the Democratic National Convention, held at the Pepsi Center. In 2014 and 2015 he was a frequency coordinator at the NFL Super Bowl.

Previously Mr. Schoedler was Chief Technology Officer for Rocky Mountain PBS. Before moving to Colorado he was a Senior Project Director for National TeleConsultants, Inc of Glendale, CA and prior to that Chief Engineer for KNBC-TV in Burbank, CA. He began his career in television as editor and engineer at Videomith, a Philadelphia post-production company. He then moved to Westinghouse Broadcasting in Philadelphia and Stamford, CT where he wrote and installed automation software for the Group W Satellite Center, Westinghouse television stations, and the Nashville Network.

Mr. Schoedler holds the Master of Science degree in Systems Engineering from the University of Pennsylvania Moore School of Electrical Engineering, and the B.S. degree in Electronic Physics from La Salle College in Philadelphia, PA. He is past chairman of the Rocky Mountain Section of the Society of Motion Picture and Television Engineers (SMPTE) and the Denver Chapter of the Society of Broadcast Engineers (SBE). He is a Life Member of the Institute of Electrical and Electronic Engineers (IEEE) and a member of IEEE's Broadcast Technology Society. In 2013 Mr. Schoedler was elected a Fellow of the SBE. In 2015 he became a Life Member of SMPTE.

ARRL ROCKY MOUNTAIN DIVISION ANNOUNCEMENT

Provided By Paul Veal, N0AH

Congratulations to 19 year-old Skyler Fennell (KD0WHB) for funding a service monitor at New Mexico Technical University. Skyler is well-known for his promoting of ham radio 24/7. There is a GoFundMe page ([GoFundMe](#)) which explains his situation. He reactivated their school club and has signed up, via demonstrations +50 members, one-half who have now passed their exams. He did extensive repeater work while here in Denver and was the 2016 AR Newsline Young Ham of the Year. He also has a very active YouTube channel with how-to videos. ([Skyler's YouTube Channel](#))

Paul (N0AH), ARRL Assistant Director- RM Division

**Don't forget to join in Wednesday nights at 7:30p.m. for the
DRC Learning Net on 145.49/448.625 Repeaters!**

LEARNING NET REPORT

By Fred Hart, AA0JK

Thanks goes out to our Net controllers: Gary (KD0SQA), Larry (K0LAI), Alex (W2PBR), and Steve (KDOWMO).



December Topics:

- BrandMeister: Wiki [CLICK HERE](#).
- Super Antenna MP1: Website [CLICK HERE](#) and eHam Review [CLICK HERE](#).
- Radial Systems for Elevated and Ground mounted Vertical Antennas.
- Great article by SteppIR.com: [CLICK HERE](#).
- The Mystery of Radials: Website [CLICK HERE](#).
- Trap dipole antennas: ARRL Information [CLICK HERE](#).
- Yaesu FT-100: eHam Review [CLICK HERE](#).
- RT Systems Software: Company website [CLICK HERE](#).
- Icom ID-880: eHam Review [CLICK HERE](#).
- W2AEW Videos: YouTube [CLICK HERE](#).

Great topics from our group. We certainly enjoy everyone's participation. Thanks to all. If you are listening and don't yet have your license, you can contact us at the [W0TX](#) web-site, w0tx@w0tx.org or elmer@w0tx.org. If we don't have the answer here on the net, we have a lot of experienced hams in the club that can help.

Questions can also be submitted on the YAHOO Learning Net web page groups.yahoo.com. Here you will also find information from past activity that you might find of interest. Getting that first Technician license? Upgrading to General or Extra? We're here to help. We would encourage those who have been Hams for several years to also join us. Your experience and input is welcomed.

What topics would you like to discuss? Join us Wednesday nights, 7:30 PM, 145.490/448.625. (Note: The third Wednesday of the month is devoted to the DRC club meeting. See the [W0TX](#) web site for additional information.)

73,

AA0JK
Fred

EmComm Note

By Brennan Pate, AD0UZ

One significant part of EmComm is the establishment of MOU(s) between an amateur radio club, or organization like the ARRL, and the entity being served. A memorandum of understanding (MOU) is an agreement between the two organizations outlining what services the amateur radio group will provide, and when those services will be called upon. It is used to help engender confidence that the ham group is organized and capable, as opposed to being, well, rank amateurs.

The ARRL has established MOUs with several organizations. A few of them are between the ARRL and the: American Red Cross, Boy Scouts of America, Civil Air Patrol (CAP), Federal Emergency Management Agency (FEMA), Salvation Army & SATERN, and SKYWARN (National Weather Service). To see the full list and get additional info, visit the [ARRLs Served Agencies and Partners webpage](#).

~ GET PUBLISHED ~

We welcome and encourage all members to share their experiences and stories so that we can all learn from one another. It can be long or short. If we can't fit it into one newsletter, we can split it across multiple issues. Not a writer? We have volunteers that will listen to your story and put it into an article, and of course you will have the opportunity to review and approve prior to publication. Your contribution to the club is welcomed and appreciated. ~Editor

SMALL TRANSMITTING LOOPS (STLs) DEMYSTIFIED

By Bill Rinker, W6OAV

One highly misunderstood antenna is the Small Transmitting Loop (STL), also known as the Magnetic Transmitting Loop. This antenna can perform as well as, or sometimes better, than many traditional HF antennas.

Introduction

An event happened several years ago that got me interested in STLs. One day I put the 17 meter Hustler antenna on my car and took off down the road. I soon discovered that the band was dead. So, I started calling CQ hoping to get a response from a local ham. After a few calls, I received a reply from a ham with a very strong signal. I asked him where he was located in Denver. He replied that he was in Seattle! I asked him what antenna system was providing such a strong signal. He replied that he was running 25 watts to an STL sitting on his dining room table. (Figure 1).



Figure 1

WOW! I had to find out more about STLs. Several weeks later I worked a ham in New Jersey who was running 50 watts into an STL sitting on a tripod in his ham shack. That did it! I had to find out more about the STL!

The objective of this article is to provide practical information about STL's. This article will cover the following topics:

- Why STLs are so popular.
- What are STLs.
- Pros and cons of STLs.
- Radiation patterns.
- Construction considerations.

- Commercial examples.
- Home brew examples.
- Audio demo comparing my homebrew STL with a G5RV and a Ground Plane.

Why are STLs so popular?

STLs, being relatively stealthy and efficient, have been very popular in Europe for years because so many European hams live in condos and apartments. STLs are becoming very popular in the USA because more and more hams live in covenant restricted areas. An STL can easily be mounted on a table top, hidden in an attic, on an outdoor porch, a patio balcony of a high-rise apartment, rooftop, or any other small space site.

What are STLs?

An STL is a parallel tuned circuit with the large inductor acting as a radiator. An STL consists of:

- A single metallic loop with a circumference of < 1/3 wavelength at the highest frequency.
- A capacitor to resonate the circuit.
- An impedance matching circuit between the coax feed line and the parallel tuned circuit.

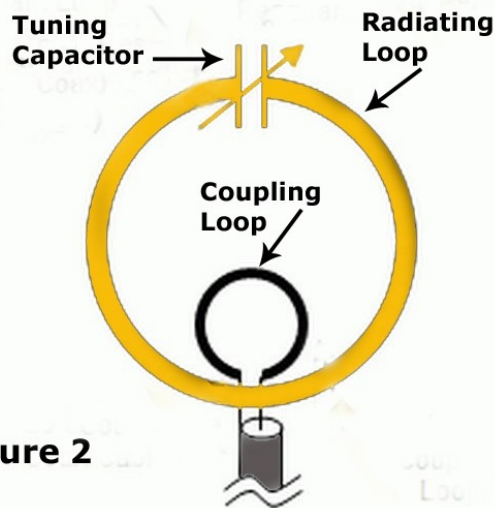


Figure 2

Figure 2 shows the physical layout of an STL.



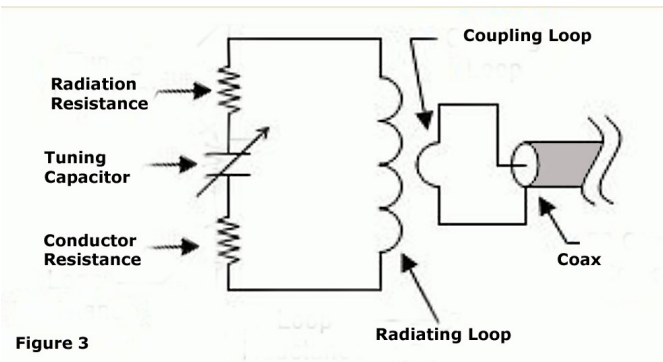
The Denver Radio Club
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Special Service Club
Support your hobby
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Figure 3 shows the equivalent schematic of an STL.



The pros and cons of STLs

STLs have many pros and a few cons. The following is a list of the pros and cons, which will be detailed later in this document.

The pros of STLs are:

- Small but with efficiency close to that of a dipole on 20 meters and above.
- Outperform most antennas on 30 meters and below.
- Relatively stealthy.
- Multiband - 2:1 frequency range (10 meters to 20 meters).
- Do not require radials.
- Work well when just a few feet above ground.
- Provide a very good receive signal to noise ratio compared to a dipole or vertical.
- Have narrow bandwidth putting a “filter” in front of the receiver.
- Ground conductivity isn’t a critical factor due to the STL’s near magnetic field (H).
- Low and high angle radiation pattern, good for both low angle DX and high angle NVIS.
- Unlike electric field (E) antennas (dipoles), work very well indoors because the STL’s near H field isn’t absorbed by house wiring, plumbing, etc.

The cons of STLs are:

- Require remote tuning due to the STL’s narrow bandwidth.
- Have very low radiation resistance resulting in:
 - Very high currents and voltages.
 - Requirement for welded conductor joints and special capacitors.

STL Radiation Patterns

Vertical STL Radiation Pattern

When mounted vertically, the STL works well as a low angle radiator and also as a high angle NVIS radiator. The STL has a figure eight pattern at low angles in the

plane of the loop with a deep null perpendicular to the plane of the loop. This null is good for removing interfering signals. As the angle increases the vertical polarized H field in the plane of the STL decreases and the horizontal polarized H field perpendicular to the plane of the STL increases. This results in an almost omni pattern at high angles. Figure 4 shows the low angle pattern.

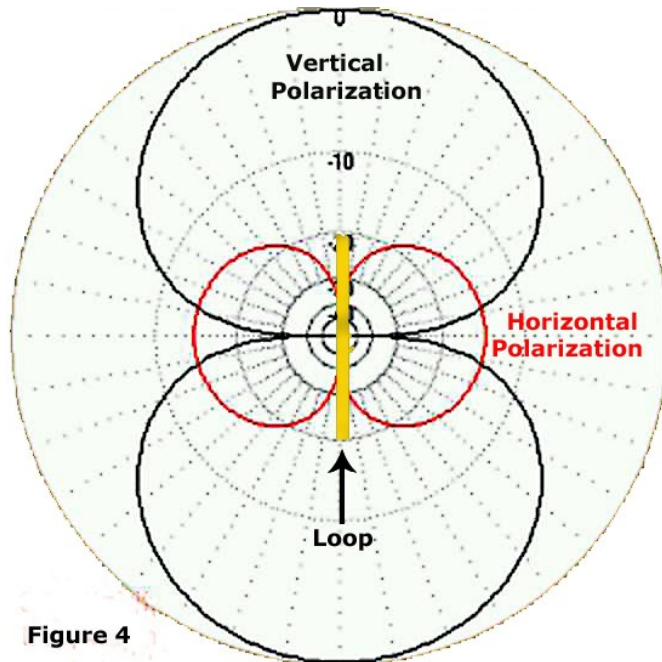


Figure 4

Figure 5 shows the high angle pattern.

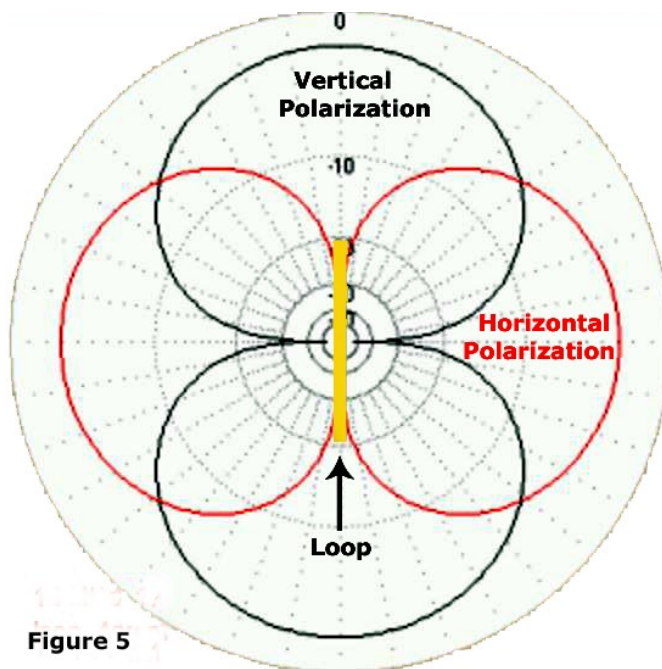


Figure 5

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Figure 6a shows the radiation pattern when looking down the plane of the STL (end view).

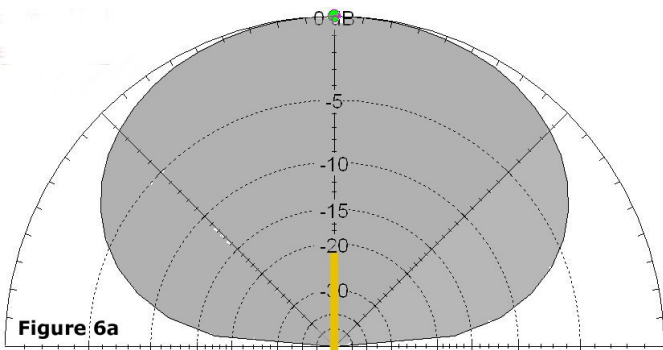


Figure 6b shows the pattern when looking perpendicular to the plane of the STL (side view).

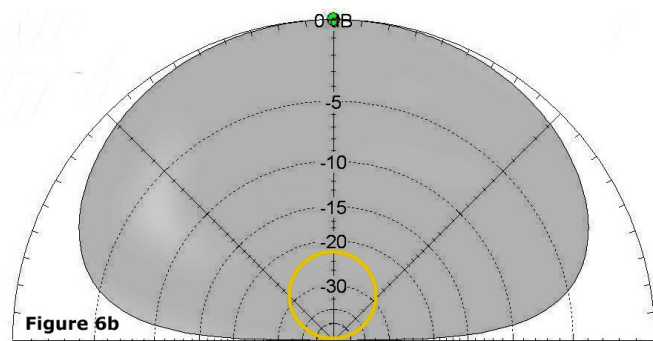


Figure 6c shows the pattern when looking down at the plane of the STL at a 45 degree angle. These figures show how the STL makes a good low angle radiator as well as a good NVIS radiator.

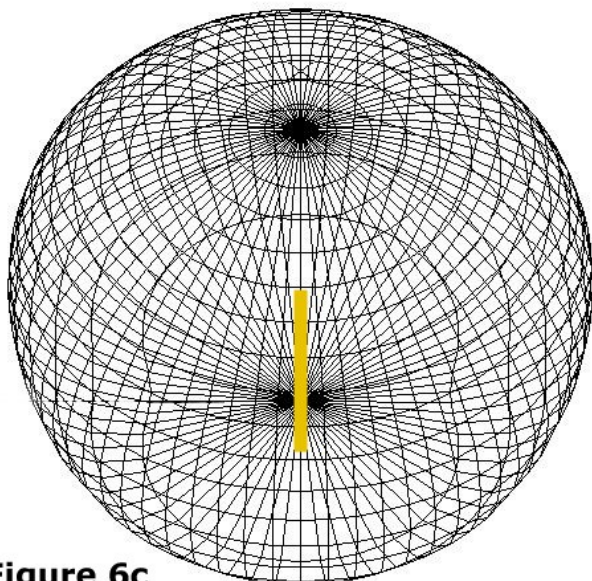


Figure 6c

Raising a vertical STL above ground has little effect on the pattern. This property is what makes the STL outperform most horizontal antennas at 30 meters and below. Horizontal antennas have to be quite high above ground to obtain the low take off angles that a low STL provides. For a good discussion of STLs on the low bands read "A Small Loop Antenna for 160 Meters" by W1LYO in the June 1993 issue of QST.

Horizontal STL Radiation Pattern

When mounted horizontally, the STL has a donut shaped pattern as shown in Figure 7.

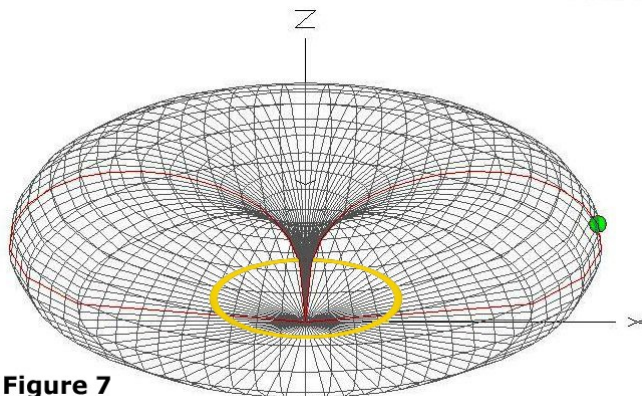


Figure 7

The take off angle is the same as a dipole relative to height above ground as shown in Figures 8a (1/4 wave length height) and 8b (1/2 wave length height) . It is not common to see an STL mounted horizontally.

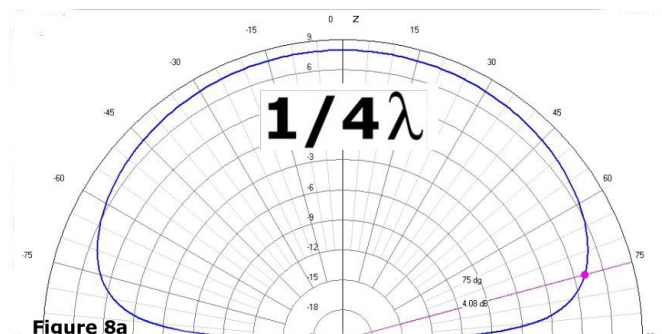


Figure 8a

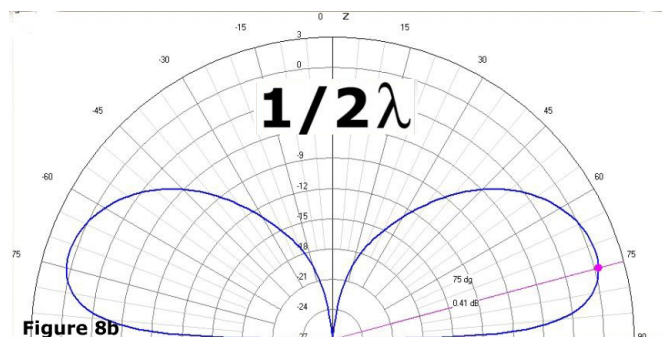


Figure 8b

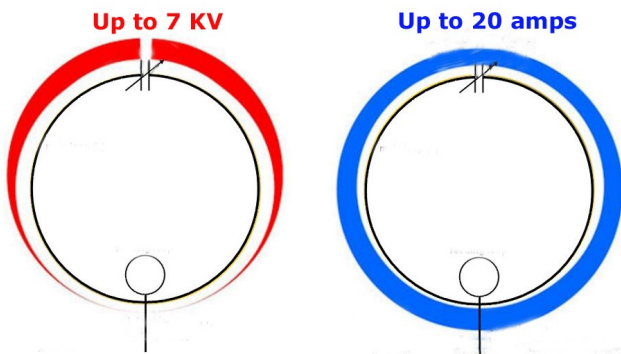
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Construction considerations

Commercial STLs are expensive for the reasons detailed below. However, if homebrew STLs are properly constructed they will work as well as commercial STLs and will be less expensive.

As shown in Figure 9, due to the extremely low loop radiation resistance (typically 0.065 ohms), large voltages and currents result. Because of this, extremely low resistance welded construction is imperative and special low resistance/high voltage capacitors are required. Let's look at the various components.



TYPICAL VALUES WITH 100 WATTS INPUT

Figure 9

Capacitors

Standard Capacitors

Standard capacitors cannot be used. Figure 10 shows a typical standard transmitting capacitor. Sliding contacts and plates pressed into the tuning shaft are resistive and will cause extreme loss at high STL currents.

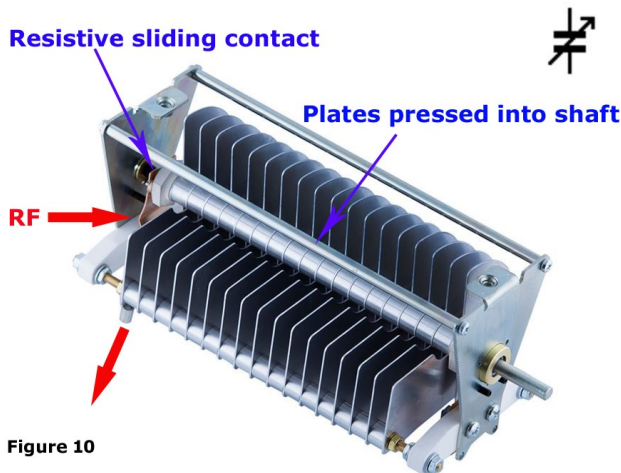


Figure 10

Butterfly Capacitors

Butterfly capacitors as shown in Figure 11 are preferred because there are no sliding contacts. A Butterfly capacitor is variable capacitor with two independent banks of stator plates opposite each other. As the butterfly-shaped rotor turns, the capacitances between the rotor plates and each bank of stator plates changes equally. The RF flows from one stator bank to the other stator bank via the capacity of the rotor plates. Note, the plates must be welded to the rotor shaft.

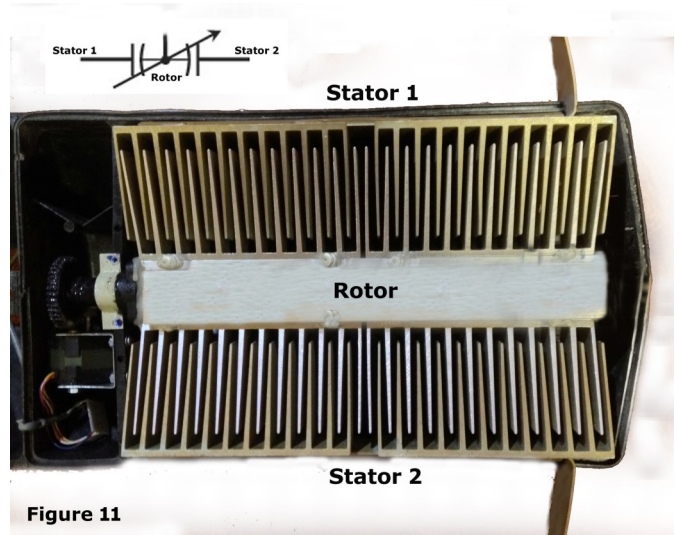


Figure 11

Split Stator Capacitors

Split Stator capacitors as shown in Figure 12 are also preferred because there are no sliding contacts. A Split Stator capacitor is variable capacitor with two independent sets of stator plates at opposite end of the capacitor unit and two mechanically linked sets of rotor plates. As the rotor turns, the capacitances between the rotor and each stator changes equally. The separation of rotor plates induces some loss since the RF current has to pass through the rotor axis instead of flowing straight through each rotor vane as occurs with the Butterfly capacitor. Again, the plates must be welded to the tuning shaft.

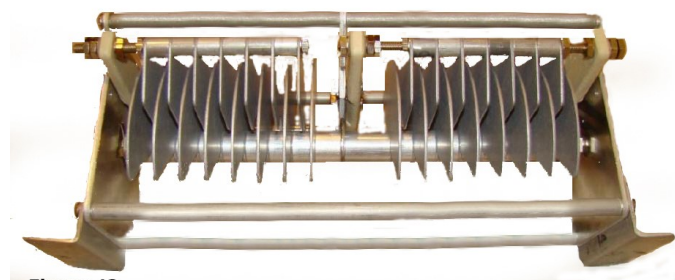


Figure 12

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Vacuum capacitors

Vacuum variable capacitors as shown in **Figure 13** are most preferred though expensive. A vacuum variable capacitor uses a set of plates made from concentric cylinders that can be slid in or out of an opposing set of fixed cylinders. The capacitor has a high vacuum as the dielectric instead of air allowing for a higher voltage rating in a small total volume. They also have much less internal signal resistance.



Figure 13

Loop Construction

Loop diameter

The larger the loop conductor diameter, the less the loss and the more efficient the loop. Copper is best having lower loss than other materials such as aluminum. All joints must be soldered or welded. Let's examine charts which show the importance of the above construction statement. (Note: the charts were developed using AA5TB's online STL calculator). These charts show the loss of a 4' in diameter STL compared to a dipole between 1 and 30 MHz for various loop conductor sizes. **Figures 14, 15 and 16** compare STLs having 0.25", 0.5" and 1.0" diameter conductors. For example, at 20 meters, the 0.25" diameter has 3 dB of loss compared to a dipole, the 0.5" diameter conductor has 1.5 dB loss compared to a dipole and the 1.0" diameter has 0.9 dB loss compared to a dipole. Note that the size of the conductor has very little affect on bandwidth.

~ Ham Tip ~

If you have knowledge of a **GREAT** ham radio related website or just a general tip, let us know and we will share it with the rest of the DRC membership here in the RoundTable.

Send to drc.editor@gmail.com.

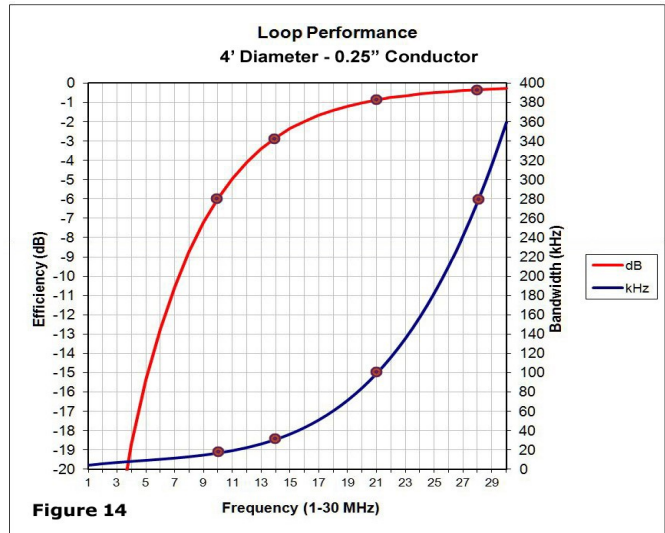


Figure 14

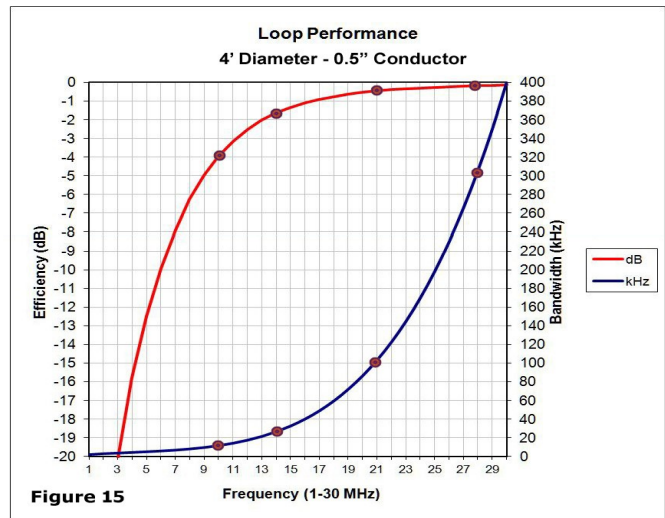


Figure 15

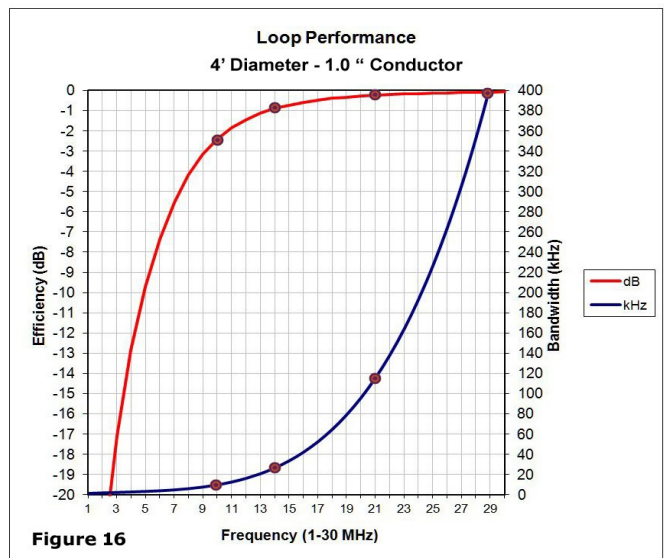
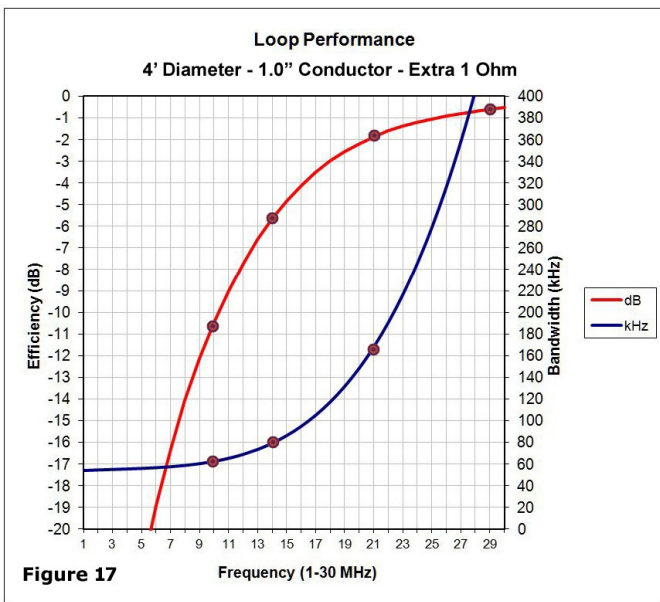


Figure 16

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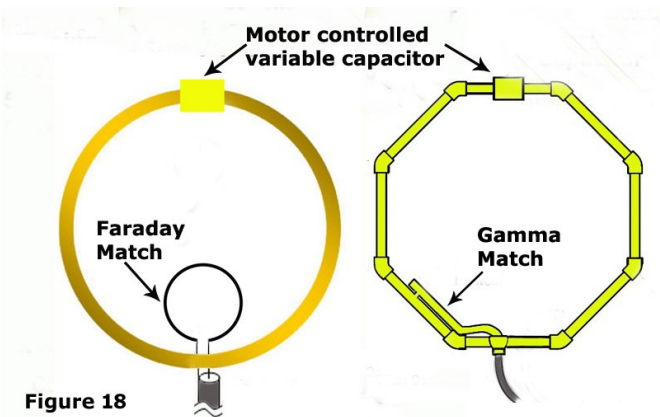
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As mentioned earlier, due to the very low radiation resistance (typically 0.065 ohms) all joints must be soldered or welded. **Figure 17** shows the devastation caused by 1 ohm of additional resistance in the 1.0" diameter loop. The loss at 20 meters increased from 0.9 dB to 5.8 dB!



Loop shape

The shape of the loop can be a circle, octagon or square. **Figure 18** shows the circle and octagon STLs, the former with a Faraday matching network and the latter with a Gamma matching network. (These matching networks will be covered next topic).



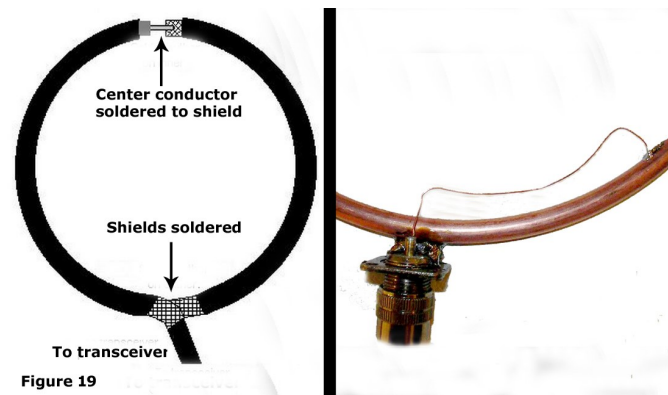
Each loop shape has its pros and cons:

- Circular – The circular shape has the most gain and a conductor with less loss compared with the other loop shapes. However, depending upon the copper material it may be difficult to properly bend without kinking the copper tube.
- Octagon – The octagon shape has about 0.75 dB more loss compared to the same sized circular STL. The advantage compared to circular is that it is easier to shape. However extreme care must be taken when soldering the 45 degree elbows to keep the loop resistance minimal.
- Square – The square shape has about 1.5 dB more loss compared to the same sized circular STL. However extreme care must be taken when soldering the 90 degree elbows to keep the loop resistance minimal.

Note: The above loop efficiencies were derived from the program "RJLOOP1" by G4FGQ.

Matching Network

There are two common matching systems. **Figure 19** shows both the Faraday and Gamma matching networks and their construction. The Faraday matching network is the most common and is constructed as shown. The advantage is that the Faraday network can be moved relative to the main loop to optimize the matching. The Gamma match provides somewhat greater frequency coverage. However, construction involves a bit of experimenting. Basically, the tap is connected to the 50 ohm point on the loop and the distance between the gamma match and the loop is adjusted for the best SWR.



THE ROUNDTABLE ARCHIVE

Have you been looking for a back issue of the Roundtable? Many are available on the DRC web site.

<http://www.w0tx.org/RoundtableAccessPage.htm>

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Radio amateur ON6YC (<http://www.on6yc.eu/>) suggests the following formula for constructing the Gamma match:

- Length of the Gamma match wire = Circumference of the loop/10. The diameter of Gamma match wire = diameter tube loop/3. The distance between Gamma wire and loop tube = Circumference of the loop/70.

Tuning the STL

Tuning an STL is relatively easy. To begin, connect a receiver to the STL and tune the receiver to the desired frequency, such as 14.250 MHz. Then tune the STL capacitor until the noise level peaks. Since the STL is a high Q antenna, noise will be heard close to the STL's resonant frequency. Once the antenna is tuned for maximum noise, measure the SWR using an SWR meter or an antenna analyzer. Adjust the matching network as described in the paragraph above for the best SWR.

Examples of commercial ham STLs

Figure 20 shows K6DUX's MFJ STL (<http://www.mfjenterprises.com/Product.php?productid=mfj-1786>).



Figure 20

Figure 21 shows the Alex STL (<http://www.alexloop.com/>).

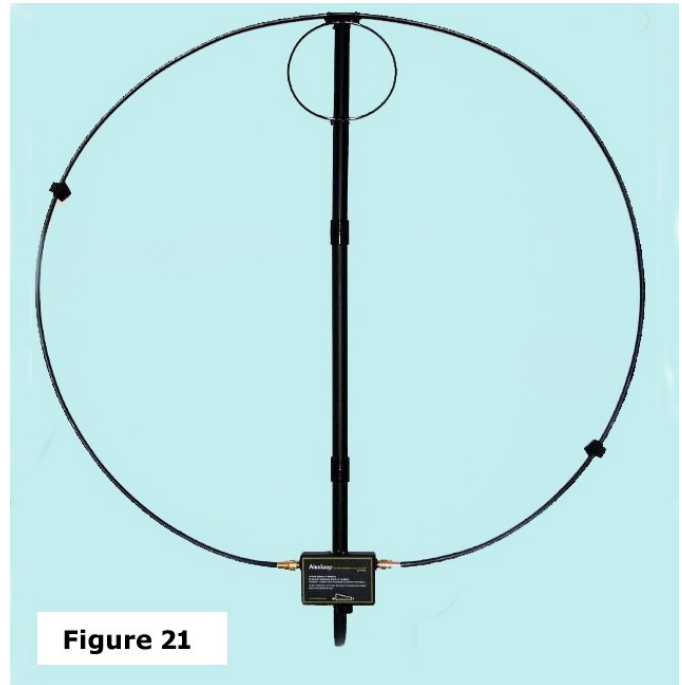


Figure 21

Figure 22 shows W6OAV's AEA STL (<http://www.radioexperimenter.us/rm-1992-10/the-aea-isoloop.html>).



Figure 22

(Continued on page 13)

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Figure 23 shows the “innards’ of the AEA STL. Note the large Butterfly capacitor which measures approximately 11” long and that all is welded.

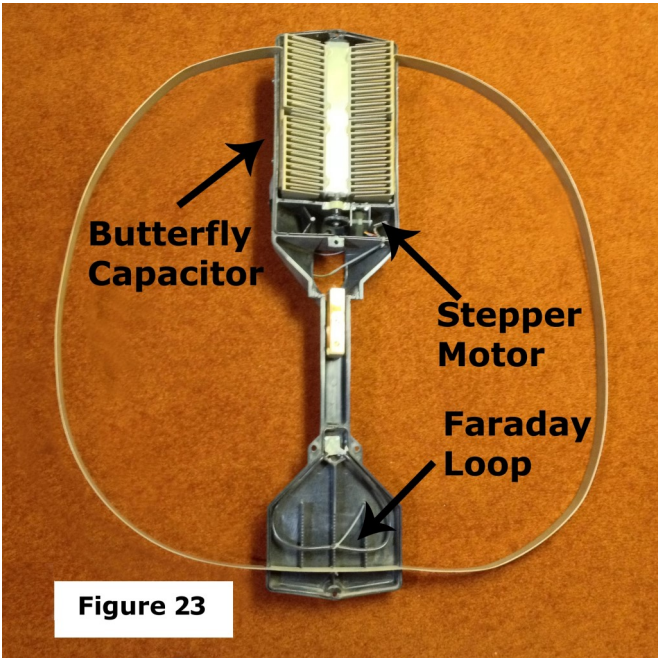


Figure 23

Examples of commercial mobile STLs

Several companies make mobile STLs which are used mainly for NVIS and short range communications, especially in remote areas. One popular STL is shown in Figure 24.



Figure 24

It is the ST-940B made by Stealth Telecom FZC in the United Arab Emirates (<http://www.stealth.ae/>). Another commercial STL shown in Figure 25 is made by SMC in England (<http://www.smc-comms.com>). They are sold in the US by HilomastDebary. Both STLs cover 3 to 15 MHz.



Figure 25

A third commercial STL loop is shown in Figure 26. The STL is manufactured by Bennet Communications located in Australia (<http://www.barrettcommunications.com.au/>). The STL covers 3.9 MHz to 12.2 MHz. The STL is sold in the US by Bennett Communications in Rochester, NY. All STLs have a motor which tilts the STL horizontally into the roof rack when not in use.



Figure 26

Examples of homebrew amateur mobile STLs

Many hams have built mobile STLs, mostly to be used for NVIS communications.

(Continued on page 14)

Continued from page 13)

A good example is K4HKX's mobile STL shown in **Figure 27**. Paul's STL covers 40 meters and above. Paul has provided a great write up on this STL and others on his QRZ page. It is very worth reading.



Figure 27

Another good example shown in **Figure 28** is Z21LV's STL which covers 40 meters. Check his QRZ page for more information.



Figure 28

Examples of amateur homebrew STLs

Google "Magnetic Loops" or go to YouTube and enter "Magnetic Loops" for plenty of information on different STL construction methods. There are many ways of constructing efficient capacitors to avoid buying expensive Butterfly or Vacuum Variable capacitors. Two examples are:

- W6OAV's trombone capacitor: [CLICK HERE](#).
- VK3YE's coax/circuit board capacitor: [CLICK HERE](#).

A collection of 105 very interesting YouTube STL videos can be found at: [CLICK HERE](#).

Demonstrations

Demo of STL Signal to Noise Ratio

As mentioned before, STL's have a better signal to

noise ratio (SNR) than other types of antennas. Some years ago when I lived in San Jose, I ran a test on 10 meters FM with a station in the Seattle area. At the time the power line transformer behind my house was arching and generating strong noise. I figured this was a good time to compare the SNR of my homebrew STL mounted in the garage rafters with a ground plane and a G5RV mounted above the house. I recorded the test. The link to the recording below shows the test results.

At the beginning of the test I switched between the various antennas as the Seattle station was talking to another station. You will hear me announce the various antennas as I switched between them. Later, I transmitted to the Seattle station asking him to note the signal strengths of the various antennas. The second part of the recording documents his observation. To hear the recording click the link: [DRC Extras](#).

K6WH's demo comparing a STL's SNR to that of a vertical on 20 meters is available at: [CLICK HERE](#).

Demo of STL Operation Indoors

As mentioned before, due to the STL's H near field, they work very well indoors. The following YouTube video provides a good demonstration of using an STL indoors: <https://www.youtube.com/watch?v=Ah2HAFZcdtY>

References

Good Tutorials:

http://www.nonstopsystems.com/radio/frank_radio_antenna_magloop.htm#match
<http://www.kk5jy.net/magloop/>

<http://www.brisdance.com/vk4amz/files/Download/SMALLLOOP.htm>

Magnetic Loop Design Calculators:

<http://www.zerobeat.net/G4FGQ/page3.html>

<http://www.iw5edi.com/software/magnetic-loop-calculator>

www.saunalahti.fi/hohtola/ham/magnetic-loop-for-80m/loop-calculator.xls

www.aa5tb.com/aa5tb_loop_v1.22a.xls

ELMER SESSION START TIME

The Elmer Session Starts at 6 p.m. before the regular 3rd Wednesday DRC Meeting! All are welcome. Meet in Hearing Room 2.

Come join in on the sharing of information.



THE SWAPFEST



Adams County Fairgrounds
Sunday February 19, 2017
9:00 am - 1:00 pm



For Additional Information
 Wayne Heinen N0POH
 303-699-6335
 Email: Info@n0ara.org

ARRL V.E. Testing at 10 AM
For Info call 303-360-7293

\$5.00
 ADMISSION
 Doors open at 9 am
 Tables Advance Purchase.....\$10.00
 Tables at the Door\$15.00
 (No guarantee of "at the door" availability!)

P R E S I D E N T S *O* F A Y

TALK-IN ON 147.15/R (+) 100 Hz CTCSS

Vendor Setup begins at 7:15 am
 You will receive email confirmation prior to February 11, 2017
 (or snail mail if you don't have email)

ADVANCED TABLE PURCHASE ORDER FORM

NAME _____ **CALL** _____ **PHONE** _____

Email for confirmation: _____

If no email: SNAIL MAIL

ADDRESS _____ **CITY** _____ **STATE** _____ **ZIP** _____

#OF Advanced Tables: _____ **\$10.00=** _____

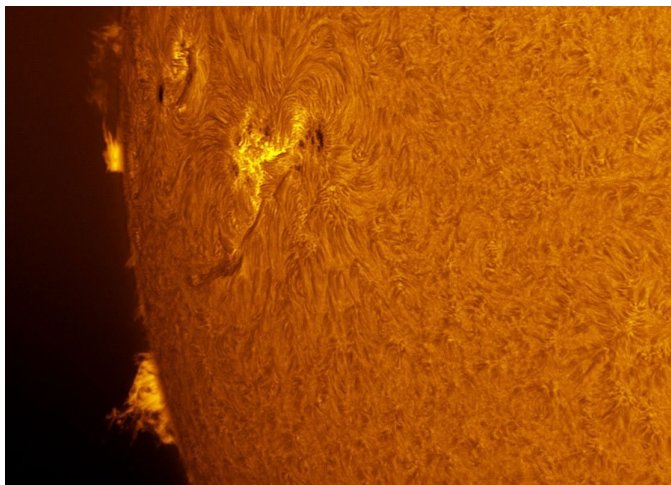
#OF Vendor Admissions: _____ **@ \$5.00=** _____

TOTAL ENCLOSED: \$ _____

Please mail all registrations with payment to: ARA, P.O. Box 471802, Aurora, CO 80047-1802

SOLAR UPDATE

Provided By Fred Hart, AA0JK



signs of decay on Wednesday, but was appearing to be generating a couple of small spots within the central section of the group. Minor C-Flares remained possible with a chance for isolated M-Flare while the sunspot group continued to evolve in the southeast quadrant. All other regions were quiet.

Thursday, Dec. 1, 2016

SLIGHT CHANCE OF FLARES: NOAA forecast a 20% chance of M-class solar flares on Dec. 1st. The source, sunspot AR2615, was facing Earth so any eruptions would be geoeffective. Likely effects included minor radio blackouts on the sunlit side of Earth.



LATEST GOES SATELLITE NOW IN SUCCESSFUL ORBIT; RE-DESIGNATED GOES-16
Thursday, December 01, 2016 21:47 UTC:

On November 29, 2016, the newest GOES satellite was successfully placed into geostationary orbit (approximately 22,000 miles away from Earth) and has been re-designated as GOES -16. Testing and calibration of the newest GOES satellite was expected to begin directly. GOES -16 will provide forecasters with better data, allowing for significant forecast improvements.

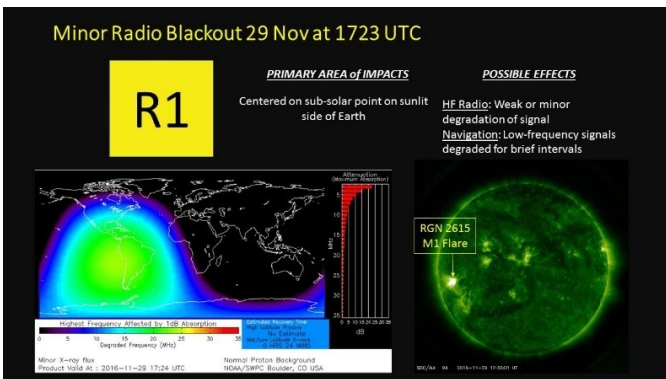
Advanced imagery and increased spatial resolution will lead to more accurate watches and warnings, better situational awareness and enhanced space weather forecasting.

Observing the Sun

NASA is currently implementing Project Solar Shield to provide warnings to vital systems after an Earth-affecting CME occurs. This allows satellites and power transformers to be shut down if necessary for a short period of time. The result is a short-term, controlled blackout rather than a longer one caused by the destruction of vital equipment.

Similarly, several satellites keep the sun under constant observation. NASA's Solar & Heliospheric Observatory

(Continued on page 17)



Last week of November closes with a R1 Radio Blackout.

Sunspot AR2615 surprised forecasters when it suddenly erupted, producing an impulsive M1-Class solar flare. A few hours later it happened again, a M1.2 class flare, causing the short-lived radio blackout.

December:
Week One:

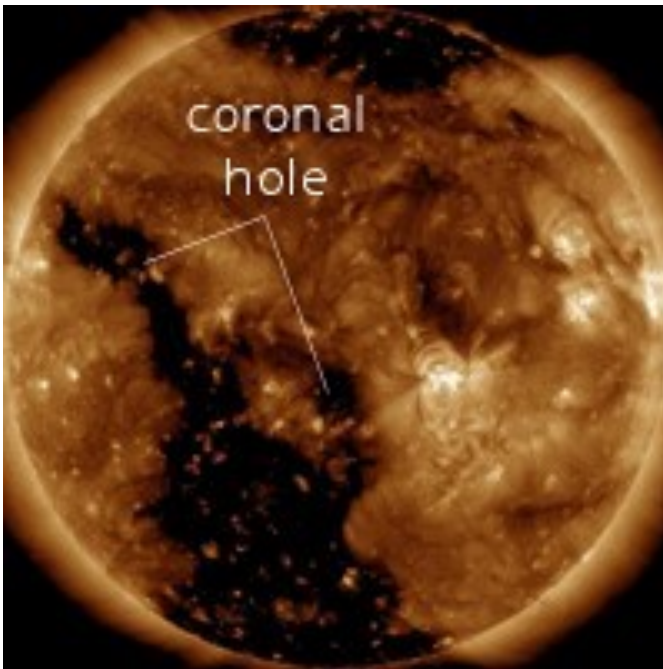
Average daily sunspot number for the week of December 1-7, were 40.9, up 10 points from the previous seven days. Average solar flux changed little, moving from 82.6 to 82.2.

No matter if we observe smoothed 3-month average sunspot numbers or monthly averages, the downward trend in activity has been obvious and undeniable.

December 01, 2016 @ 02:00 UTC
Moderate Flare Activity / Region 2615
Solar activity declined to lower levels as region 2615 became a little more stable. The region did show slight

Continued from page 16)

(SOHO) spacecraft studies the sun, while the Solar Dynamic Observatory (SDO) focuses on solar atmosphere. And the Advanced Composition Explorer (ACE) samples particles from the sun as they stream toward our planet. These programs bring a greater understanding of space weather effect on Earth.



A large coronal hole is turning toward Earth. Credit: NASA/SDO.

Monday, Dec. 5, 2016

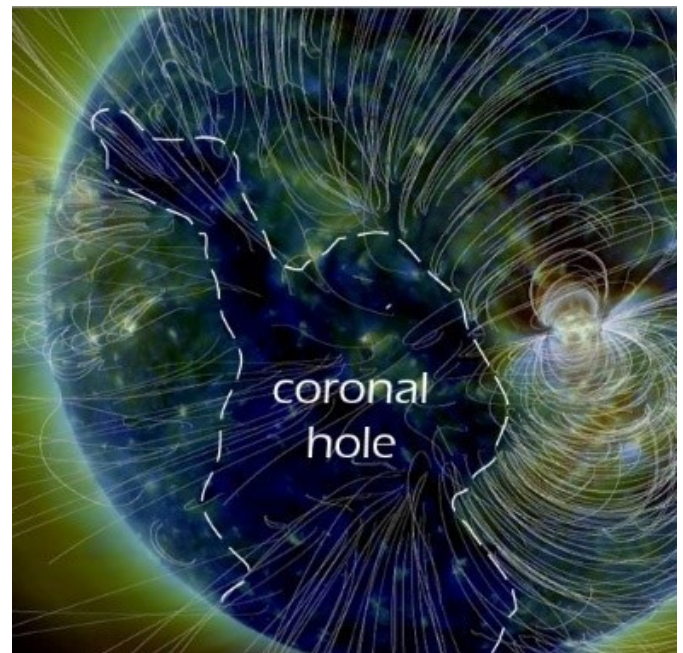
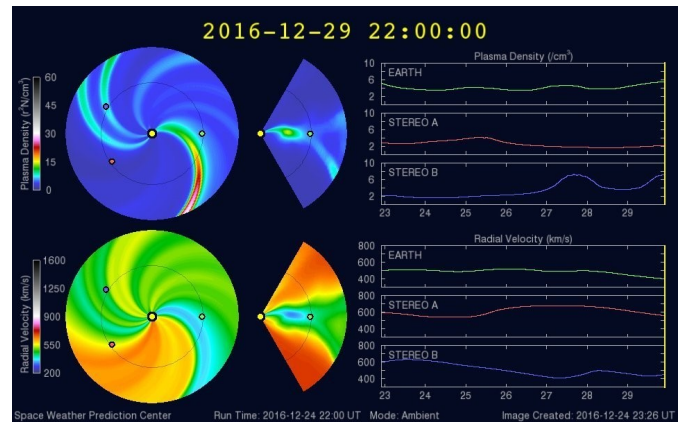
HERE COMES THE SOLAR WIND:

A solar wind stream was approaching Earth with wind speeds as high as 700 km/s. First contact with the fast-moving gas on Dec. 7th and 8th could produce G1-class geomagnetic storms. This was a "coronal hole"--a region where the sun's magnetic field opened up, allowing solar wind to escape. Because this hole was broad, the emerging stream of solar wind was broad as well. It was expected to influence Earth for several days after it arrived.

December 7, 2016 @ 00:55 UTC

Geomagnetic Storm Watch

A minor (G1) geomagnetic storm watch was in effect for the following three days. Coronal Hole #43 was to become geoeffective and a high speed solar wind stream flowing from this zone was expected to reach Earth.



Coronal Holes: 09 Dec 16

Earth is inside a stream of solar wind flowing from this large coronal hole. Credit: NASA/SDO.

SOLAR WIND CONTINUED TO BLOW: For the third day in a row, a fast-moving stream of solar wind was blowing around Earth. Wind speeds in excess of 600 km/s were disturbing our planet's polar magnetic field. NOAA forecasters estimated a 20% chance of G1-class geomagnetic storms on Dec. 10th.

December 10, 2016 @ 17:50 UTC

Solar Update

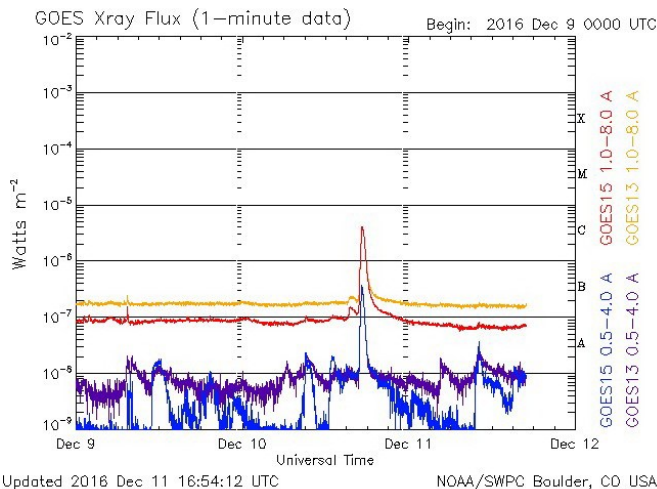
An eruption measuring C4.0 was observed around departing region 2615, located behind the west limb. A coronal mass ejection (CME) was associated, but was directed away from our planet. The solar wind continued

(Continued on page 18)

above 600 km/s, but was expected to gradually decrease during the following 24-48 hours. A minor (G1) storm watch remained in effect for the following 24 hours.

Week Two:
 Sunday, Dec. 11, 2016

SOLAR WIND CAUSING MAGNETIC UNREST: This weekend, solar wind is blowing around Earth faster than 600 km/s -- more than twice as fast as usual. This is causing magnetic unrest.



Solar Storms and Aurora's explained video (https://soho.nascom.nasa.gov/classroom/nordlys_english.mp4)

Monday, Dec. 12, 2016
EXITING THE SOLAR WIND STREAM: After four days inside, Earth was exiting a stream of solar wind that had been buffeting our planet's magnetic field.

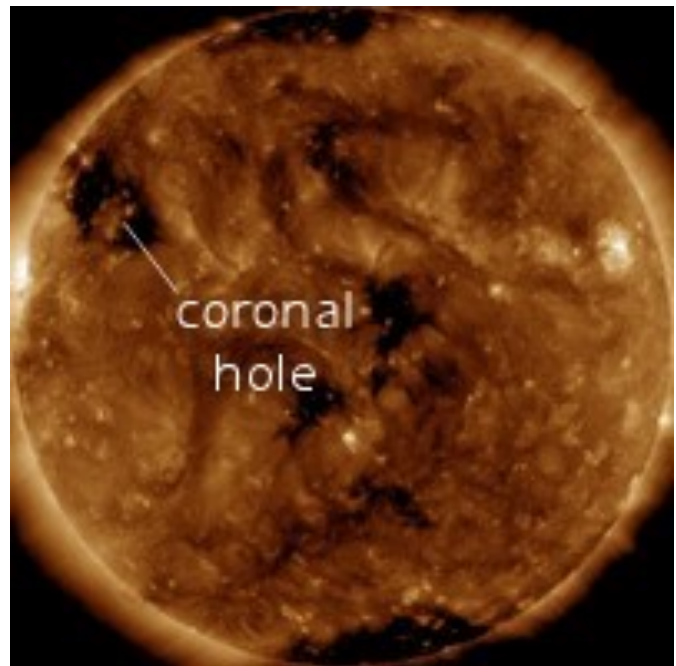
Wednesday, Dec. 14, 2016
 A solar wind stream was heading for earth. The gassy stream was flowing from a hole in the sun's atmosphere.

Coronal Holes: 14 Dec 16

Taking note of a new coronal hole that was emerging over the sun's northeastern limb.

Two eruptions back to back launched a part-Earth directed solar storm! Grazing blow late Dec 19-20. Expected to wreak havoc with amateur radio bands.

Week Three:
 Sunday, Dec. 18, 2016
 Earth was about to enter a solar wind stream that could disrupt the amateur radio bands from Dec. 20th through 25th. Geomagnetic storming was most likely on Dec. 21st and 22nd with peak storm levels near G2.



The source of the solar wind was a gigantic hole in the sun's atmosphere, directly facing Earth. NASA's Solar Dynamics Observatory photographed the structure, which covers nearly 1/3rd of the solar disk: We've actually seen this coronal hole before--at least twice. It is rotating around with the sun, strobing Earth like a lighthouse every ~27 days. The last two times we experienced its solar wind (Oct. 25-28 and Nov. 23-26), G1- and G2-class magnetic storms wreaked havoc with amateur radio bands. A repeat performance was likely in the week ahead.

December 18, 2016 @ 10:10 UTC
 Solar Update: The visible disk was no longer blank as a pair of sunspots were forming in the northeast quadrant. The chances for noteworthy solar flares would remain low in the short term.

A coronal hole solar wind stream was now beginning to move past our planet and expected to increase within the next several days. Enhanced geomagnetic activity, possibly including isolated periods of minor (G1) storming were possible during the upcoming week.

Tuesday, Dec. 20, 2016
APPROACHING THE SOLAR WIND STREAM: Dec.20th, Earth was expected to enter a stream of solar wind flowing at high speed from a large hole in the sun's atmosphere. This could set in motion days of magnetic unrest around the poles. NOAA forecasters estimate a 60% chance of minor G1-class geomagnetic storms on Dec. 21st, increasing to 65% on Dec. 22nd.

(Continued on page 19)

(Continued from page 18)

December 20, 2016 @ 01:10 UTC
 Coronal Hole Updated / Geomagnetic Storm Watch
 On the sun, middle latitude coronal hole #47 was becoming geoeffective over the following 24-72 hours. A minor (G1) geomagnetic storm watch was in effect after December 20th once a high speed solar wind streamed past our planet.

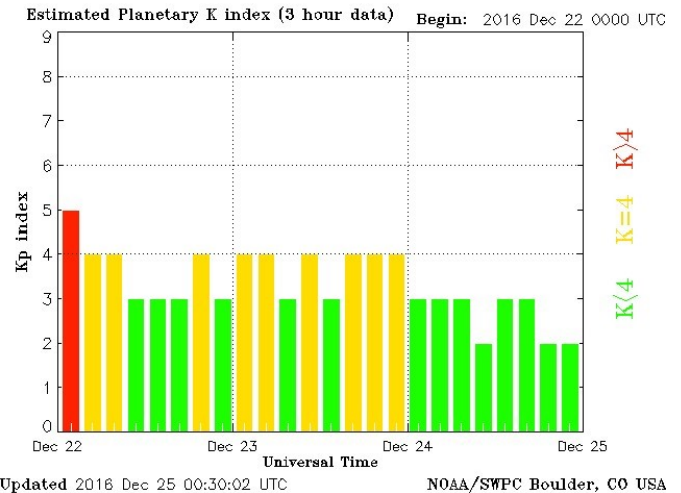
December 20, 2016 @ 22:00 UTC
 Interesting Sunspot; A new sunspot forming in the southwest quadrant was numbered 2620 and was not considered a threat for strong solar flares.

The most interesting aspect of the spot is that it had a predominantly South (negative) leading North (positive) magnetic polarity, which is opposite of what southern hemisphere sunspots in the current solar cycle are supposed to be. Sunspots which indicate regions of strong magnetic fields, contain both north and south poles, and are normally opposite between the northern and southern solar hemisphere. A magnetic flip also takes place when one solar cycle transitions into the next. Cycle 24 sunspots are typically South leading North polarity in the northern hemisphere, and North leading South in the southern hemisphere. The upcoming Cycle 25, still several years away, will see northern hemisphere sunspots reverse to North/South in the northern hemisphere and again the opposite South/North in the southern hemisphere. This well-known event takes place for each and every 11 year (average) solar cycle. So is this sunspot an early sign for the next solar cycle? Well, technically no. Although less common, this does happen from time to time along the course of a cycle. Still an interesting feature at a time of low solar activity.

December 21, 2016 @ 19:50 UTC
 Geomagnetic Storming Observed: An anticipated coronal hole stream containing periods of southward Bz was moving past Earth. A period of Moderate (G2) geomagnetic storming was observed at higher latitudes on Wednesday. A minor (G1) storm watch was expected to remain in effect over the following 24 hours.
 EXTENDED WARNING: Geomagnetic K-index of 5 expected

When it's this big & constant, it's no longer substorming. This is a full blown geomagnetic storm! The fast moving solar wind is definitely here!

Saturday, Dec. 24, 2016
 THE SOLAR WIND CONTINUED TO BLOW: For the third day in a row, Earth was inside a stream of solar wind blowing out of a large hole in the sun's atmosphere. This was causing magnetic unrest around the poles. NOAA forecasters were estimating a 35% chance



of G1-class geomagnetic storms on Dec. 24th.

December 24, 2016 @ 01:30 UTC
 Spotless Sun
 The Earth facing side of the sun was void of sunspots once again. Region 2620 was nearly spotless before rotating onto the southwest limb. Solar activity was expected to remain very low over the Christmas Holiday. Geomagnetic activity on the other hand remained at enhanced levels (Kp4) thanks to a high speed solar wind streaming at above 650 km/s. A coronal hole responsible for delivering the stream was moving out of a geoeffective position and geomagnetic activity was expected to gradually decrease over the following 24-48 hours. An isolated period of minor (G1) storming was still possible for locations at very high latitudes within the following 6 to 12 hours.

December 25th
 Merry Christmas & Have a Great New Year



(Continued on page 20)

(Continued from page 19)

Sunday, Dec. 25, 2016

For the second day in a row, the sun is blank--no sun-spots.

THE SOLAR WIND CONTINUES TO BLOW: For the fourth day in a row, Earth is inside a stream of solar wind blowing out of a large hole in the sun's atmosphere. This is causing magnetic unrest and unsettled HF radio bands. Wind speeds are expected to exceed 600 km/s.

Forecast...

Solar activity is expected to be at very low levels during the forecast period (25-27 Dec).

73,
AAØJK
Fred

A POSSIBLE LITHIUM ION BATTERY VOLTAGE ISSUE

Submitted By Bill Rinker, W6OAV

The following is an interesting article that points out an important fact about using Lithium Ion batteries in an 8 or greater cell battery packs. The total voltage will be higher than when using other type of cells. This could be an issue.

This article is courtesy of the Rockwell Collins Radio Club.

LITHIUM BATTERY EXPERIMENTS

By John Champa, K8OCL

Energizer® and other battery manufactures are producing the latest technology in consumer batteries: Lithium Ion. While that is nothing new, the wide scale availability of them in AA and AAA size is more recent.

These are not inexpensive cells. Home Depot® is selling them for approximately \$9 (USD) per four-pack! However, the manufacturer claims an average life span of 7x greater than conventional alkaline cells.

Since many Radio Amateurs use a battery pack of alkaline cells to back-up their HT rechargeable Nickel Metal Hydride (NiMH) battery or Nickel Cadmium (NiCad) pack, I decided to investigate. I need to determine whether these new Lithium Ion cells are worth the extra investment. The research is ongoing, so please consider this an initial report and your feedback is welcome.

My first observation was a significantly longer shelf life claim. Typically manufactures claim a minimum 10-year

shelf life for Lithium cells. This new package of Energizer e2 Lithium cells was labeled with an expiration date of 2020. That is a 13-year span from the current date of 2007! A similar package of new Energizer alkaline cells right next to it had an expiration date of 2013, or about a 6-year span.

That is a big difference, but only about double the shelf life for the Lithium cells. So where does the "7x" claim originate? Under load?

The next observation was a significantly higher voltage output:

BATTERY TYPE INITIAL	OUTPUT VOLTAGE*
Recharged New AA NiMH	1.417 VDC
New Alkaline AA Cell	1.602 VDC
New Lithium Ion AA Cell	1.765 VDC

These may appear to be only slight differences, but when these cells are placed in an 8-10 pack, it makes for a large difference in battery output voltage. Does it also translate into a longer operating time under load.

Hopefully, but more sophisticated testing and further research under actual field conditions is needed to establish that data. The question raises is, until a better solution than NiMH comes along, should we even bother with rechargeable cells at all?

Please send me your observations and input: k8ocl@arri.net.

*Radio Shack® Digital Multimeter with PC Interface Catalog Number 22-812

Article courtesy of the Rockwell Collins Radio Club



amazon smile
You shop. Amazon gives.

Search for Denver Radio Club @ smile.amazon.com



**The Denver Radio Club
Is an ARRL
Special Service Club
Support your hobby
Join the ARRL TODAY**



LOOKING BACK AT THE DRC, PROVIDED BY WOODY LINWOOD (W0UI)

ROUNDTABLE, September 1960 - New code oscillator and Club meeting at Sabin Hall

September, 1960



The Round Table

The Denver Radio Club, Inc.

ELECTION MEETING SET FOR SEPT. 21

The following eight members of the Denver Radio Club have been named by the Nominating Committee as candidates for the four openings on the board of Directors:

Chic Cotterell, W0SIN
Tillie Currington, K0RGU
Russ Hendrickson, K0EPD
Bernie Jacobs, W0MYB
Fontaine LaRue, W0RQI
Chet Lewis, K0KZJ
Roy Raney, K0OVQ
Norv Sample, K0IYC

NEW CODE OSCILLATOR AVAILABLE TO GROUPS

The Denver Radio Club has acquired a large code practice machine which uses inked tapes. Designed for large group instruction, the machine is being made available to any group of five or more people who wish to learn or practice the code.

Frank Vail, K0HF0, has offered to organize the first group. Sessions will be held at his home at 1472 Madison St. at any time convenient to the participants. Interested parties are invited to call Frank at FR. 7-1534.

The September meeting of the Denver Radio Club will be headlined by the annual election of the Board of Directors. In accordance with the by-laws of the club, four new directors must be selected for the eight-man board. Directors serve two-year terms, which are staggered so that only four memberships expire each year.

A nominating committee appointed by the president has presented a list of eight nominees for the four openings. Selection will be made by plurality vote of the members present at the September meeting. The list of candidates appears in the box at left. After selection of four members, officers will be elected.

Traditionally, the names of the out-going board members appear in the list of nominees. However, two of the out-going members have declined re-nomination. Mike Lyons, W0PG, and Ralph Asbury, W0VDY, both expressed a desire to step aside to allow room for "new blood" on the board.

Members of this year's nominating committee were Carl Smith, W0BWJ, Larry Hodgson, W0LO, and Frank Wallace, K0EBV.

Date of the meeting is September 21 at 7:30 p.m. Meeting place is Sabin Hall of Colorado General Hospital as usual. Refreshments will be served after the meeting.

Ø—Ø—Ø

Deadline for **The Round Table** is the day preceding the first Thursday of each month. All advertising and copy **must** be in by that time.

This puzzle is provide courtesy of Chris Codella - W2PA. The URL for his website is w2pa.com. The solution for the puzzle is on page 23.

Receiver Pathways

Across

- 1. Superhet preceder
- 6. BCD followers
- 10. UA missile made famous by YI
- 14. ____ loop
- 15. Meadow mouse
- 16. LA capital
- 17. ___ to back...
- 18. Part of LAN
- 19. Nit hatchlings
- 20. Teetering swizzle stick?
- 23. Golf ball position
- 25. Polite partner of TU
- 26. Sensors using RF
- 27. Antelope array element?
- 30. CW preposition
- 31. VS9H middle name
- 32. Employs
- 34. "___ that special?!"
- 38. Supermarket scanner?
- 41. What a non-ham might call rigs
- 42. Prefix with -line
- 43. I-land wine
- 44. CW T
- 45. Told to wait, on CW
- 46. Thicker
- 50. Function switch label
- 52. Double curve
- 53. Salt shaker?
- 57. Lone entry class
- 58. G-land YL title
- 59. Label on a PS, possibly
- 62. Like a xmtr in stby
- 63. And others, for short
- 64. RCA synonym
- 65. Rig
- 66. Pound brass, say

1	2	3	4	5	6	7	8	9	10	11	12	13
14					15				16			
17					18				19			
		20			21				22			
23	24				25			26				
27			28	29			30					
31					32	33			34	35	36	37
38					39				40			
41					42				43			
				44				45				
46	47	48	49			50	51			52		
53						54			55	56		
57					58				59		60	61
62					63				64			
65					66				67			

67. Next to Quebec

Down

- 1. Foxhunt activity (abbr.)
- 2. Ending, with engin-
- 3. Go on DXpeditions, far and wide
- 4. IT9 volcano
- 5. NCL-2000 mfr.
- 6. Olympic swimmer Janet
- 7. ___-12 antennas
- 8. High spirits
- 9. Whiplash preventer
- 10. State with transistors
- 11. Possible Bahamas prefix
- 12. Worrier's worry
- 13. Action people

21. MI, MO and MT, QP mo.

- 22. ARRL DX test mo.
- 23. #44, #47 and others
- 24. Become accustomed (to)
- 28. Poor ops
- 29. F H2O
- 30. Word with line or point
- 32. W7 state
- 33. The Flex, e.g.
- 34. Desktop feature
- 35. /MM quarters
- 36. Big bangs
- 37. Lock of hair
- 39. Hand game
- 40. ZS dir. from W2
- 44. Stg. before AF amp.

45. W4 sect.

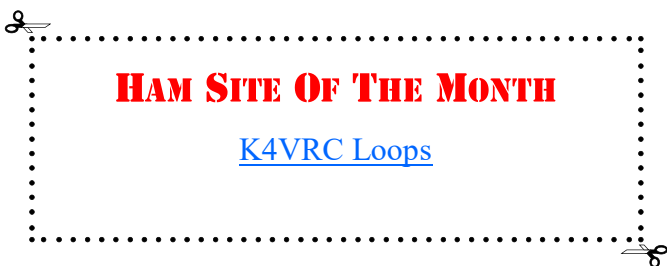
- 46. A series cap. blocks it
- 47. Eat away
- 48. African owner of 27-across
- 49. Upper or lower user
- 50. Isle ____ (GD)
- 51. ____ Day
- 54. Calling in after the sked
- 55. Pioneer digital comm. org.
- 56. EME sound
- 60. F-land one
- 61. "___ bad!"

FACT OF THE DAY

Maximizing Battery Performance

The most common reason for poor rechargeable battery performance is tarnished contacts. Batteries may not reach full charge if their contacts or the connectors that connect to them are tarnished, because tarnished contact resistance reduces charging current and battery voltage during charging. Even if batteries do eventually reach full charge, tarnished contact resistance will be in series with the discharge load. That will reduce the voltage available to the equipment being powered at all times during the discharge cycle and will cause the operational failure voltage to be reached sooner. Tarnished contacts can be cleaned with an eraser or with alcohol on a cotton swab if adjacent components will not be damaged by alcohol. Be sure that fragments of the eraser or cotton do not remain on the contracts after cleaning.

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THE ROUNDTABLE ARCHIVE
 Go to: <http://www.wotx.org/roundtables.htm>

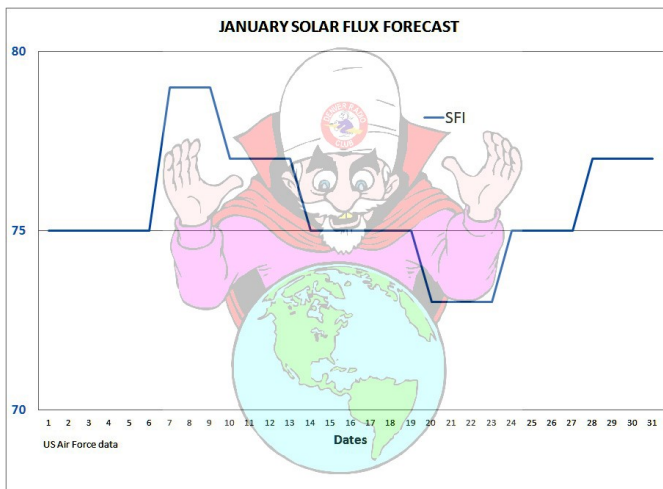
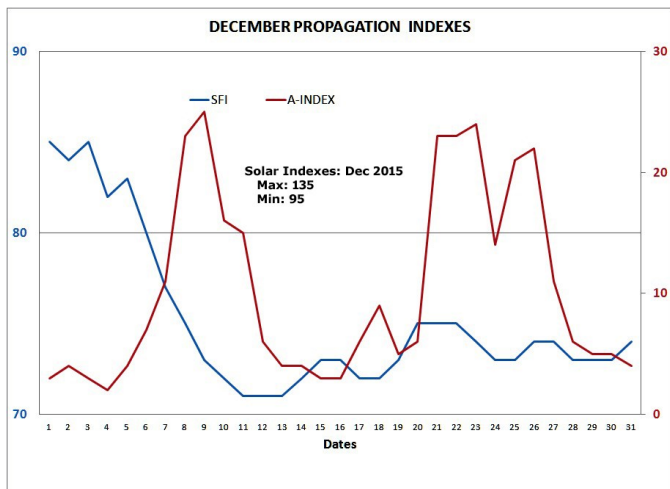
THE ROUNDTABLE ARTICLE INDEX
 Go to: <http://www.w0tx.org/RoundtableArchive/-RoundTables-Index.pdf>

PAST & FUTURE PROPAGATION CONDITIONS

By Bill Rinker, W6OAV

The charts below show the Solar Flux and "A" indexes for last month and the forecast for this month's Solar Flux index.

Refer to the September 2010 *Roundtable* for more complete information on interpreting these charts. Issues of the *RoundTable* are available at [http://www.w0tx.org/RoundtableArchive/2010-RoundTables/RT201009\(SEP\).pdf](http://www.w0tx.org/RoundtableArchive/2010-RoundTables/RT201009(SEP).pdf)



UPCOMING EVENTS
HAMFESTS & CONVENTIONS

Event	Date	Location	Sponsor Website
Winter Hamfest 2017	01/14/17	Larimer Cnty Fairgrounds	Northern Colorado ARC
The Swapfest	02/19/17	Adams County Fairgrounds	Aurora Repeater Assn., Cherry Creek Young ARC, & Rocky Mountain

UPCOMING ARRL CONTESTS & EVENTS [ARRL CONTEST CALENDAR](#)

Contest	Start Date	Start Time	End Date	Stop Time	Notes
Straight Key Night	1/1/17	0000	1/1/17	2359	Event, not contest.
Kids Day	1/7/17	1800	1/7/17	2359	Event, not contest.
RTTY Roundup	1/7/17	1800	1/8/17	2400	
January VHF	1/21/17	1900	1/23/17	0359	

UPCOMING QSO PARTIES

The following are the Contests not sponsored by the ARRL. Please submit additions for future issues.

State/Province	Start Date	End Date	Sponsor Website	Notes
Montana	01/28/2017	01/29/2017	Flathead Valley Amateur Radio Club	Based on 2016 date.
Vermont	02/04/2017	02/05/2017	Radio Amateurs of Northern Vermont	Based on 2016 date.
Minnesota	02/04/2017	02/04/2017	Minnesota Wireless Association	Based on 2016 date.
British Columbia	02/04/2017	02/05/2017	Orca DX and Contest Club	Based on 2016 date.
South Carolina	02/25/2017	02/26/2017	Columbia Amateur Radio Club	
North Carolina	02/26/2017	02/27/2017	Raleigh Amateur Radio Society	Based on 2016 date.

ATTENTION

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DRC REPEATERS

BAND	Freq / Shift / PL Tone	Additional Information
6m	53.090MHz (-1MHz) 107.2Hz PL	
Packet	145.05MHz<>14.105MHz	2 meter / 20 meter gateway. Useable by Technicians on 2 meters. See January 2015 RT.
2m	145.490MHz (-) 100Hz PL	Linked to the 70cm - 448.625MHz machine.
2m	147.330MHz (+) 100Hz PL	Local Area, Members Auto-Patch Does Not TX a PL!
2m	147.330MHz (+) 131.8Hz PL	Test Mode Operation. Send signal reports to Tech Committee.
1.25m	224.380MHz (-) 100Hz PL	
70cm	447.825MHz (-) DCS~073; NB 12.5; +/- 2.5	Saint Anthony's Note: This is a narrow band repeater requiring DCS.
70cm	448.625MHz (-) 100Hz PL	Linked to the 2m - 145.490MHz machine.
70cm	449.350MHz (-) 100Hz PL	Wide area coverage with Echolink Node # 4140.
70cm	449.775 MHz (-) 100Hz PL	Yaesu Fusion Digital / Analog, 100 Hz Tone Required for Analog.
70cm	446.7875MHz (-)	BrandMeister Repeater Slot 1 – Wide Area Traffic, Slot 2 – Local Traffic



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JANUARY 2017		<i>DRC Net Sunday's at 8:30 p.m. on 145.490 / 448.625 (No PL)</i>				
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 ARRL Straight Key Night Begins 0000 UTC Ends 2359 UTC 	2	3	4 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	5  First Quarter	6	7 ARRL Kids Day Begins 1800 UTC Ends 2359 UTC ARRL RTTY Roundup Begins 1800 UTC
8 ARRL RTTY Roundup Ends 2400 UTC	9	10	11 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	12  Full Moon	13	14
15	16 	17	18 DRC Meeting Elmer 6:00 p.m. General 7:00 p.m.	19  Last Quarter	20 	21 ARRL January VHF Begins 1900 UTC
22	23 ARRL January VHF Ends 0359 UTC	24	25 Learning Net 7:30 p.m. 145.490 / 448.625 (No PL)	26	27  New Moon	28
29	30	31				

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Please Let Us Know

Over the years we occasionally hear from hams who have read the RoundTable in other states and countries around the world. We appreciate the comments and we would like to know where you are located. So if you live outside the Front Range or Denver Metro Area and read the newsletter either online, email or hard copy please send a short note via email with your *City, State or City, Country*.

We will publish it at a later date in our new regular feature called RoundTable RoundWorld.

To respond to this request send your information to drc.editor@gmail.com.

Subject: I'm located in...

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DRC members - this is your newsletter. Please email your club or amateur radio related suggestions to the editor. Members are the heart of The Denver Radio Club, so if you have an expertise or an interest in a particular segment of ham radio that you'd like to write about, you may email your submissions to drc.editor@gmail.com. The submission deadline is the 20th of the Month. ~ Editor