



# ROUNDTABLE

The Denver Radio Club Newsletter

Since 1917

100 years of amateur radio in Colorado

April 2017

## PRESIDENT'S MESSAGE

BY GERRY VILLHAUER, W0GV

Hello DRC Members,

The good weather news, we finally got some moisture. As usual, some of us got too much moisture and some too little. Here in my area we were on the too little side of the scale but, we did get some to settle the dust. Crazy Colorado weather for sure.

On the technical side of the club, we are planning to install the new antenna, in preparation for moving the Brandmeister repeater to its new mountain top location. I look for that to happen about mid month if the weather cooperates. Those of you on the Brandmeister DMR system will enjoy a new much larger footprint for this system. Also, we are getting close to installing Wires-X on the Yaesu Fusion repeater. There are no plans at this time to change locations for this system, but the Wire-X will enable connection to the internet and other Fusions systems worldwide.

Thanks to Scott Entekin from the National Weather Service office in Boulder for the great presentation and Weather Spotter class at our March meeting. It was fortunate for us to be able to use the large conference room for our meeting site; as there were, at best count, 115 attendees. Ham Radio operators and Public Safety personnel accounted for the large attendance. It is a valuable service to the public to have trained weather spotters out there where the action is. We will consider making this an annual event.

Our April program will be another very interesting one. Every day you hear something in the news about drones; or the proper name Unmanned Aircraft Systems (UAS). It is mind boggling how the popularity of these aircraft has grown in a very short time period. There are several types of UAS from the small indoor or backyard type to very large aircraft for a multitude of purposes, many of which you probably have never thought of or heard about. Allen Bishop is the CEO of Reference Technologies, located here in Colorado. He will be telling interesting stories and facts about the UAS aircraft they manufacture and some of the many tasks they perform and how they are controlled. This will be another don't miss program.

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 RoundTable.

73 for now,

Gerry (W0GV)



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W0TX

w0tx.org

### MARCH MEETING – WHAT'D I MISS?

BY BRENNAN PATE, AD0UZ

For March's face to face meeting Scott Entrekin of the NOAA presented his weather spotter training seminar. About 115 people were in attendance for the 3 hour event.



Scott started out by providing an outline of the NOAA's services related to storms and storm spotting. He then talked about how storms are created, the different types of storms, various storm patterns, lightning, tornadoes, hail, cloud types, etc. He also gave safety tips, showed pictures of various weather events and showed a few videos.

The presentation was broad and Scott did a good job at explaining it in layman's terms, while keeping it interesting for those with a more advanced knowledge of the subject matter.



You can obtain storm spotter materials here: [weather.gov/os/brochures.shtml](http://weather.gov/os/brochures.shtml)



### 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 member:

Stephen Venneman      KE0MJB

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.

**Don't forget to join in on Wednesday nights at 7:30 p.m. for the  
DRC Learning Net on the 145.49/448.625 (no PL) repeaters!**

## TECHNICAL COMMITTEE REPORT

BY BILL RINKER, W6OAV

The following is an overview of the subjects discussed at the February Technical Committee meeting. The project coordinators' call signs are in red. There was no March meeting due to the weather spotter training.

### DRC TRBO Upgrade to BrandMeister (K0HTX)

Goal: Monitor and "fine tune" the new BrandMeister repeater.

Status: The Tech Committee is monitoring and requesting reports, especially if any issues occur. W6OAV has integrated a W0TX BrandMeister zone into the latest Rocky Mountain Ham code plug for the MD-380. This code plug is available to anyone. Contact him at w6oav@arrl.net for a copy.

### AllStar Link Voter System (W0GV)

Goal: Establish an AllStar Link Voter network on 147.33.

Status: Four remote receiver sites are now on line and in the test mode. The Tech Committee is requesting reports, especially if any issues occur.

### AllStar Link Voter System (W0GV)

Goal: Locate possible remote sites.

Status: W0GV is looking for possible sites. W6OAV will develop propagation coverage maps to determine if the possible sites will fill in the 147.33 transmitter's "dead spots".

### DRC/TSA Aurora Site (W0GV)

Goal: Maintain contact with TSA relative to establishing a "communications room" for the DRC.

Status: W0GV is attempting to meet with the new TSA contact. K0TOR worked with Burnie and did locate some of our equipment stored there. The site is still being remodeled.

### Redesign Packet Gateway (W6OAV)

Goal: Replace the KAM and the TS-430, which perform marginally in the high power line noise at Site 4.

Status: AC0UA has given the DRC a long-term loan of a FT-950 transceiver. The DSP filtering in the FT-950 and in the club's PK900 should improve the gateway's performance. AC0UA has constructed the interface cables. W6OAV will assemble and test the combination. Replacements may occur in the spring depending upon the propagation conditions of the slowly diminishing Solar Cycle 24.

### Fusion Repeater Upgrade (AC0UA)

Goal: Equip the Fusion repeater with a Wires-X Link unit to connect it to the Wires network.

Status: AC0UA is testing the Wires X interface at home.

### DRC TRBO Move (K0HTX)

Goal: Move the TRBO repeater to Centennial Cone to

provide better coverage.

Status: CCARC approval has been obtained. Antenna has arrived. The move will occur when weather permits, probably in the spring.

### DRC TRBO Access to Station 4's Internet (KE0HFH)

Goal: Investigate the possibility of a microwave shot from St. Anthony's to Station 4 and to Centennial Cone.

Status: Investigation is in progress.

### Station 4 Remote Power Control (W0GV)

Goal: Investigate purchasing and installing Internet controlled power outlets.

Status: W0GV is investigating which pieces of equipment need remote power control and the best unit to purchase.

*~ 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.*

## WIRES-X UPDATE

BY JASON SMALLWOOD, AC0UA

We are planning to have installed Wires-X on our UHF Fusion Repeater by the time you read this article. Our Fusion repeater is on the frequency pair 449.775 with a minus 5 mhz offset. Here is a link to instructions for setting up Wires-X: [hamoperator.com](http://hamoperator.com). There is a "Fusion Help" hyperlink at the top of the page, through which you will find lots of information about setting up your radio. Fusion Wire-X is new to us at DRC. If you have a Fusion radio join in the fun and learn this new mode.

## INTERNATIONAL DX CONVENTION INVITE

PROVIDED BY MIKE FLOWERS, K6MKF

I would like to once again extend a personal invitation to you and Members of your Club to attend the International DX Convention 2017 in Visalia, California on April 21-22-23, 2017.

IDXC 2017 will be our 68th annual International DX Convention. DXers from around the world will gather once again to meet their fellow DXers, attend interesting and informative programs, see the latest in new products from the top vendors – and have a chance to win some great raffle prizes! This year Friday, April 21, 2017 will be a full day of training, presentations and vendor exhibits.

Over 500 DXers have registered to attend the Convention. DXers from around the world will be at IDXC 2017. We have registered DXers from Germany, France, England, Scotland, Hungary, Columbia, Japan, Norway, Isle of Man, Sweden, Puerto Rico, Brazil, St. Kitts & Nevis, Canada, Mexico and New Zealand - so far! Full details of IDXC 2017 are at: [dxconvention.com](http://dxconvention.com).

### APRIL MEETING ANNOUNCEMENT

BY ANONYMOUS

Please see President Villhauer's message for information regarding April's club meeting presenter and topic.

More information about Allen and his company can be found here: [referencetek.com](http://referencetek.com)



### UNDERSTANDING DMR CODE PLUGS

BY BILL RINKER, W6OAV

When first attempting to program a DMR code plug, one often "pulls out their hair" while trying to understand the various data fields, their relationships and the data field order required to program the code plug. Once one understands the above, programming becomes very easy.

The Central Idaho Amateur Radio Club web site has a very good, and easy to understand, tutorial on the MD-380 code plug structure. The information contained in the tutorial can be applied to other DMR model radios. The tutorial can be found at: [ciarc.org/resources/creating\\_dmr\\_code\\_plugs.shtml](http://ciarc.org/resources/creating_dmr_code_plugs.shtml)

Thanks go to Steve Cohen (KF0RW) for pointing out this site to me.

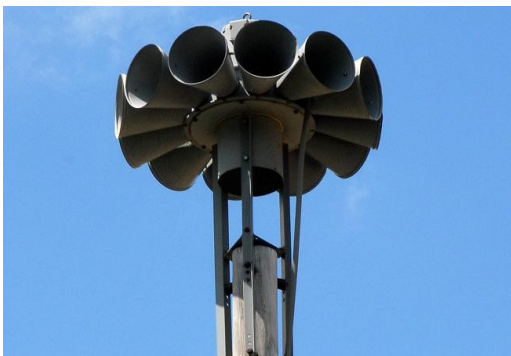
### EMCOMM NOTE

BY BRENNAN PATE, AD0UZ

As you know, the annual siren tests in Wheat Ridge and Lakewood are right around the corner, and we need your assistance.

At this point a single test day is planned for May 10th starting at 11 AM. A decision is still pending on whether all the sirens will be tested at the same time, or if they will do the tests separately. Regardless, since the tests will be on the same day we will need a greater number of participants (~50) than usual.

If you would like to assist with the test(s), then please call Jim (K0TOR, 303-798-2351) or shoot us an email ([emcomm@w0tx.org](mailto:emcomm@w0tx.org)) and let us know what hours you are available on that day. We will get you on our list and keep everyone updated as we hear more from the Wheat Ridge and Lakewood officials.



Source: [Boulder office of Emergency Management](http://Boulder office of Emergency Management)

### CALLING ALL QSLs...

BY BRENNAN PATE, AD0UZ

This month's QSL card was provided by Alex (W2PBR). He received it from Haroldo (PY7DJ), in Brazil.



If you would like to have your QSL card featured in an upcoming edition of the Roundtable please send a copy of it (PDF or JPG, etc.) to [drc.editor@gmail.com](mailto:drc.editor@gmail.com).

Alternatively, if you have received a unusual or exotic one in the past and would like to share it, then send it on over.

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**LEARNING NET REPORT**

BY FRED HART, AA0JK

Thanks goes out to our Net controllers:  
KD0SQA Gary, KØLAI Larry, W2PBR Alex, and KDØWMO Steve.



Topics discussed this past month:

Antenna Tuners:

Antenna Coupler / Transmatch

An antenna tuner, a matchbox, transmatch, antenna tuning unit (ATU), or antenna coupler is a device connected between a radio transmitter or receiver and its antenna to improve power transfer between them by the impedance of the radio to the antenna's feedline matching.

W9JUG Antenna tuner demonstration:

- Part One: <https://youtu.be/mAxOWcsF30k>

- Part Two: <https://youtu.be/pHjVIGge7iM>

Homebrew Antennas: DaveTadlock, KG0ZZ

ZZ work shop

<https://youtu.be/GLhNUmolKKY>

Considerations when stringing one's wire antennas: [radioworks.com/ninstallant.html](http://radioworks.com/ninstallant.html)

Skywarn:

[skywarn.org/](http://skywarn.org/)

[nws.noaa.gov/skywarn/](http://nws.noaa.gov/skywarn/)

PSK digital:

10 Tips for the PSK31 Digital Mode

[arrl.org/news/10-tips-for-the-psk31-digital-mode](http://arrl.org/news/10-tips-for-the-psk31-digital-mode)

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 via [w0tx@w0tx.org](mailto:w0tx@w0tx.org) or [elmer@w0tx.org](mailto: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 <https://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,

AAØJK

Fred

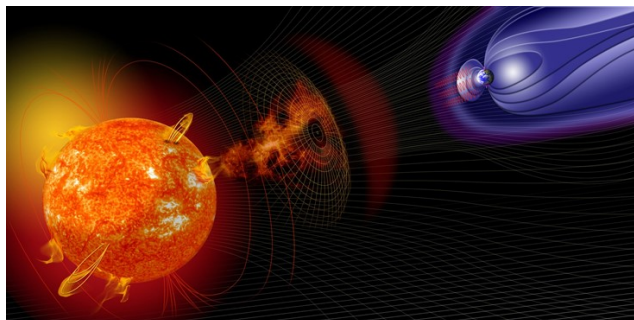
### SOLAR UPDATE

PROVIDED BY Fred Hart, AA0JK

#### Week One

March 1<sup>st</sup> - GEOMAGNETIC STORM: A polar geomagnetic storm was in progress as Earth entered a fast-moving stream of solar wind. The solar wind was flowing from a large canyon-shaped hole in the sun's atmosphere and was expected to influence Earth for the following two days.

Earth moved deeper into the stream, and wind speeds were expected to top 700 km/s before the day was over. March 1-2: NOAA forecasters estimate a 60% chance of continued polar geomagnetic storms.

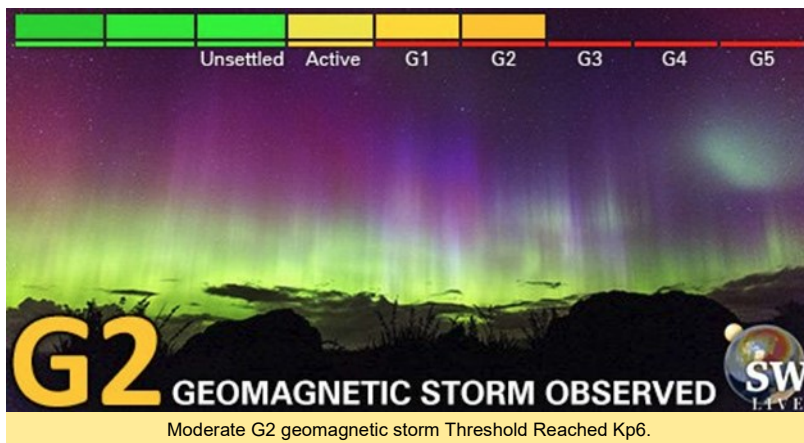


Saturday, March 4<sup>th</sup> - EXITING THE SOLAR WIND STREAM: After three days inside, Earth was beginning to leave the fast-flowing stream of solar wind.

#### Week Two

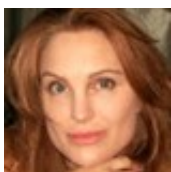
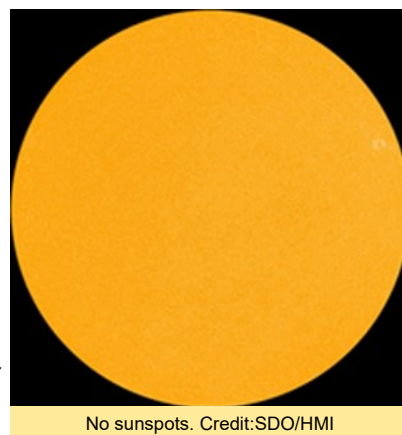
March 6<sup>th</sup> - The ongoing high speed solar wind stream would not let up. Another round of minor (G1) geomagnetic storming flared up at higher latitudes.

ALERT: Geomagnetic K- index of 5  
Threshold Reached: 2017 March 6<sup>th</sup>, 2000 UTC  
Active Warning: Yes  
NOAA Scale: G1 - Minor



Thursday, March 9<sup>th</sup> - SPOTLESS SUN: The sun was completely blank for 48 hours - no sunspots at all.

Space weather does not stop when sunspots vanish. Indeed, in many ways, it just gets more interesting.



Dr. Tamitha Skov

The Sun Finally Quiets Down: Solar Storm Forecast 03-09-2017: <https://youtu.be/uV-cUgbB3Ec>

Friday, March 10<sup>th</sup> - The sun's 11-year activity cycle is currently approaching solar minimum, and during this time powerful solar flares become scarce and coronal holes become the primary space weather phenomena – this one in particular initiated disturbances throughout the polar regions. Coronal holes are areas where the sun's corona appears darker because the plasma has high-speed streams open to interplanetary space, resulting in a cooler and lower-density area as compared to its surroundings. <https://youtu.be/Xa0v14kwx9k>

Solar Stretched Loops: [https://sdo.gsfc.nasa.gov/assets/gallery/preview/Loops\\_stretch.jpg](https://sdo.gsfc.nasa.gov/assets/gallery/preview/Loops_stretch.jpg)

When an active region rotated over to the edge of the sun, it presented us with a nice profile view of its elongated loops stretching and swaying above it (Mar. 8<sup>th</sup>-9<sup>th</sup>, 2017). These loops are actually charged particles (made visible in extreme ultraviolet light) swirling along the magnetic field lines of the active region. The video covers about

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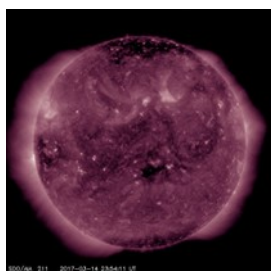
30 hours of activity. Also of note is a darker twisting mass of plasma to the left of the active region being pulled and spun about by magnetic forces. (Credit: Solar Dynamics Observatory, NASA.)

March 11<sup>th</sup> - Very Low Solar Activity: Quiet times on the sun again as the visible disk was void of sunspots for the 5<sup>th</sup> day in a row. Very low solar activity was expected to continue over the weekend.

Geomagnetic activity was also expected to be at fairly quiet levels through the weekend followed by several days of enhanced conditions thanks to a persistent solar wind stream.

**Week Three**

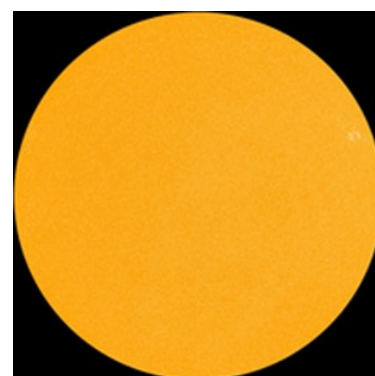
Monday, March 13<sup>th</sup> - Kp-Index: A coronal hole was facing Earth. Enhanced solar wind was expected to arrive in ~3 days -



Sunspot Cycle is Crashing: For the 7th Day in a row the Sun is completely Blank - No Sunspots.

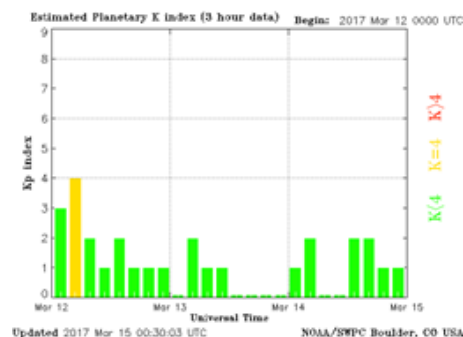
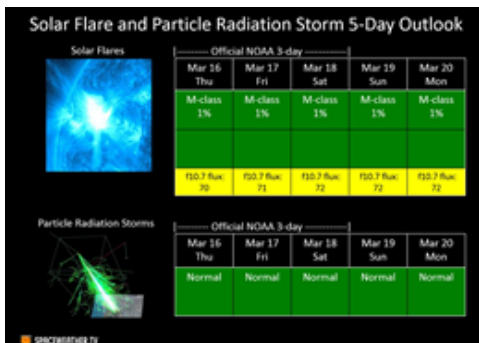
<https://youtu.be/XGskQdT5aXI>

Wednesday, March 15<sup>th</sup> - LONG RANGE FORECAST: A hole in the sun's atmosphere was swinging into geoeffective position during the last week of March. Solar wind flowing from the hole was expected to strike our planet's magnetic field and spark G1- to G2-class geomagnetic storms on March 28-29. (Source: [Dr. Tamitha Skov @TamithaSkov](#))



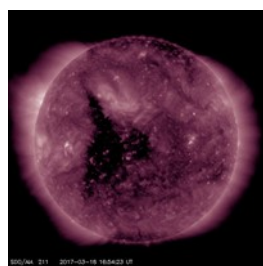
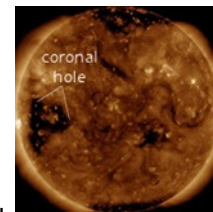
No sunspots. Credit:SDO/HMI

Flare & #Solar Radiation Storm Outlook: Solar flux low but improves by week's end. Expect slight issues with #hamradio propagation. #GPS ok.



Friday, March 17<sup>th</sup> - SPOTLESS SUN: The sun was blank for 9 straight days.

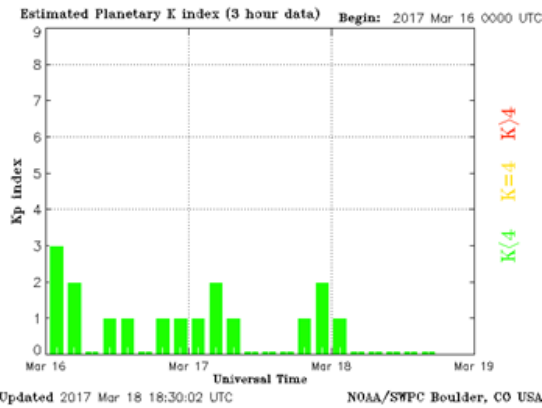
Solar wind flowing from the indicated coronal hole was expected to reach Earth as early as March 23<sup>rd</sup>. (Credit: NASA/SDO)



March 18<sup>th</sup> - REALLY BLANK SUN: The sun was blank, (no sunspots), for 12 consecutive days. If this day ends without a sunspot, the number will increase to 13, matching the longest stretch of blank Suns since April of 2010. This is yet another sign that the sunspot cycle is crashing toward a deep minimum expected in 2019-2020. Is space weather coming to an end? On the contrary, now is when things get interesting: Solar Minimum brings extra cosmic rays, and more.

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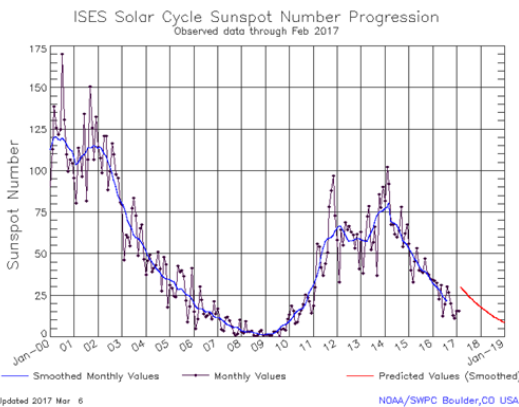


Enhanced geomagnetic activity. Storm levels were possible the following week when Coronal Hole #72 became geoeffective after March 21st.

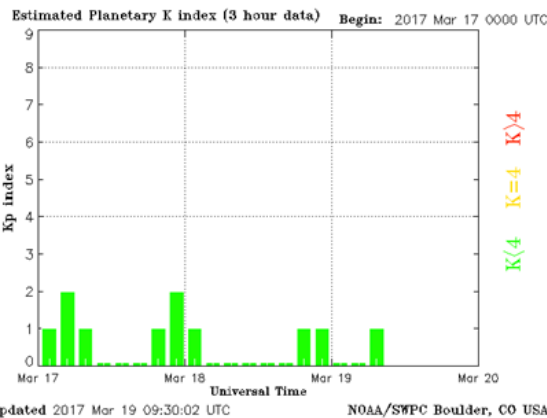
Large Coronal Hole TURNS Toward Earth - Longest Stretch of Blank Suns since April of 2010:  
<https://youtu.be/IXN1xtbK3Jc>

**Week Four**

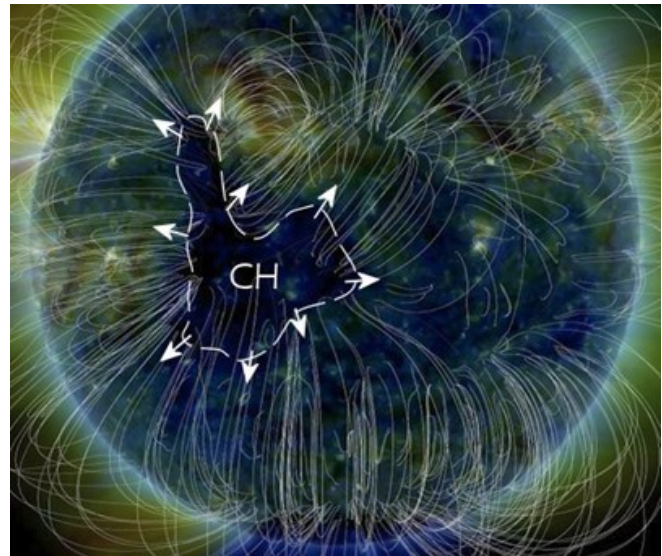
**Solar Cycle Sunspot Number Progression**



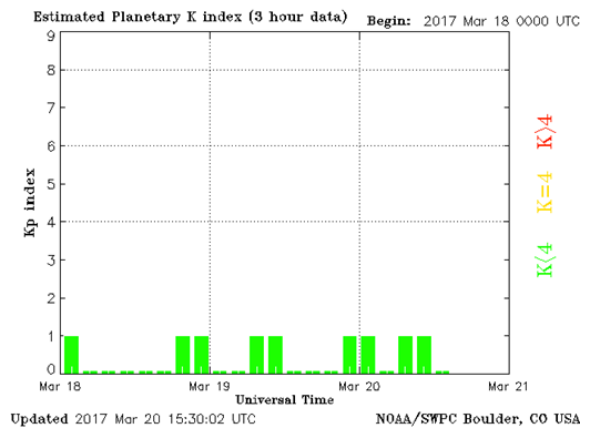
[swpc.noaa.gov/products/solar-cycle-progression](http://swpc.noaa.gov/products/solar-cycle-progression)



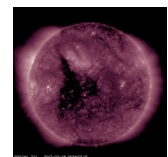
**Sunday, March 19<sup>th</sup> - CORONAL HOLE TURNS TOWARD EARTH:** Coronal holes are places - big places - where the sun's magnetic field opens up and allows solar wind to escape. A wide stream of solar wind flowing from this coronal hole was expected to reach our planet on March 23<sup>rd</sup>. The impact of the solar wind was expected to produce magnetic activity around Earth's poles.



**Monday, March 20<sup>th</sup> - SUNSPOT COUNTS REACH 7-YEAR LOW:** The face of the sun was blank, (no sunspots), for 13 consecutive days.



A coronal hole was facing Earth. Enhanced solar wind was expected to arrive within the following ~3 days.

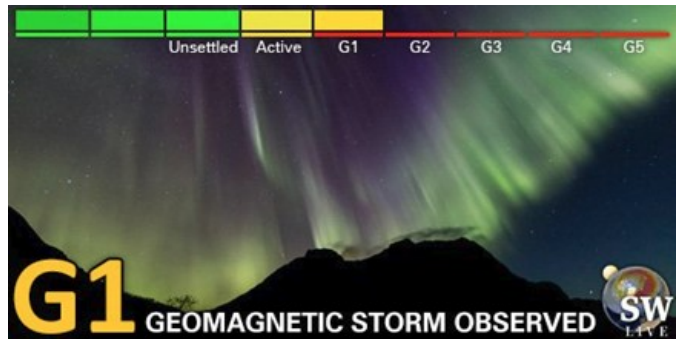
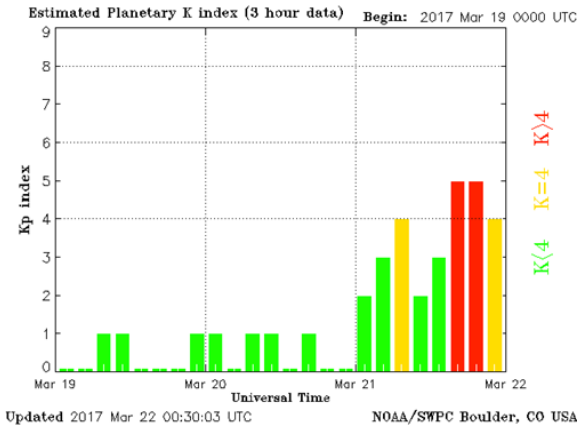


**Tuesday, March 21<sup>st</sup> - SUNSPOT COUNTS REACH 7-YEAR LOW:** The sun has now been blank (no sunspots) for 15 consecutive days. We can expect even longer interregnums broken from time to time by mostly small sunspots incapable of strong flares.



**GEOMAGNETIC STORM:** A G1-class geomagnetic storm was underway on March 21<sup>st</sup> as a high-speed stream of solar wind buffeted Earth's magnetic field. The stream was broad and Earth would remain inside it for the following three days.

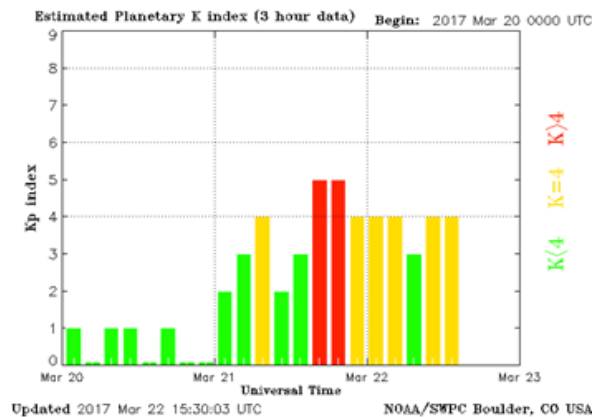
Minor (G1) geomagnetic storm conditions observed for several hours. A high speed solar wind stream above 600 km/s was flowing from a geoeffective coronal hole and was causing the disturbance. A moderate (G2) storm watch was also in effect.



**Wednesday, March 22<sup>nd</sup>** - Solar wind speeds were topping 600 km/s on March 22<sup>nd</sup> as Earth moved deeper into the gaseous stream. The action of the wind was expected to continue for 2 to 3 more days, with a 50% to 60% chance of G1-class geomagnetic storms until March 24th.



Earth's magnetic field working hard, protecting us from onslaught of solar wind.



**Thursday, March 23<sup>rd</sup>** - Earth was inside a fast-moving stream of solar wind. The ensuing calm would not last long. Another stream of solar wind was following close behind. G1- and G2-class geomagnetic storms were possible when it arrives on March 28<sup>th</sup>.

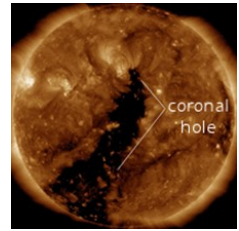
We have a sun spot, Sunspot AR2643 poses no threat for strong solar flares. (Credit: SDO/HMI)

Twin Ominous Dark Holes on the Sun: Storm Forecast 03-23-2017 (Source: Tamitha Skov), <https://youtu.be/TZxxkB0C4Yg>

**Saturday, March 25<sup>th</sup>** - POTENT CORONAL HOLE FACES EARTH: A canyon-shaped hole in the sun's atmosphere is facing Earth, and it is spewing a stream of fast-moving solar wind toward our planet. NASA's Solar Dynamics Observatory photographed the giant fissure on March 25<sup>th</sup>.

(Continued on page 10)

The fast-moving stream of solar wind flowing from the indicated coronal hole was expected to reach Earth as early as March 27<sup>th</sup> (although the 28<sup>th</sup> was more likely). (Credit: NASA/SDO)



Just as one coronal hole stream begins to slow down, another one was expected to kick into gear on March 27<sup>th</sup>. Coronal Hole #73 was turning into an Earth facing position and was expected to bring another round of geomagnetic storming.

Forecast: Prepared jointly by the U.S. Dept. of Commerce, NOAA, Space Weather Prediction Center. Updated 2017 March 26 0030 UTC

24 hr Summary... Solar activity was very low and Region 2643 (N08E16, Axx/alpha) exhibited minor decay this period. A new sunspot near N13E48 (at 25/1900 UTC) developed this period but was not numbered at the time of this writing. No Earth-directed CMEs were observed in available coronagraph imagery.

Solar activity is expected to continue at very low levels throughout the forecast period (26-28 Mar).

73,  
AAØJK  
Fred

### SHOULD I USE AN ANTENNA TUNER?

PROVIDED BY Fred Hart, AA0JK

We hear this question asked frequently. We'll try here to help you make the determination, do I, or do I not, need an antenna tuner. Without a lot of theory, math, or technical jargon, we'll start out by asking, when should I use an antenna tuner.

First, it is important to know that an antenna tuner doesn't really tune your antenna in the strict sense of the word. What an antenna tuner or transmatch does do, however, is transform the impedance at the feed line input to a value that your transceiver can handle (typically 50 Ohm). When thinking about antenna tuners and SWR, it's important to remember that the tuner has no effect whatsoever on the SWR between itself and the antenna. It's the SWR between the tuner and the transceiver that changes.



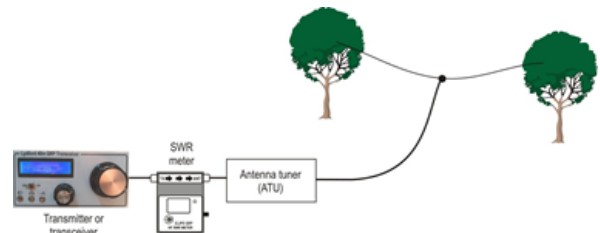
Use an antenna tuner (transmatch) if you want to feed your antenna with open wire line. Also called *ladder line* or *window line*.



Ladder / Window Line

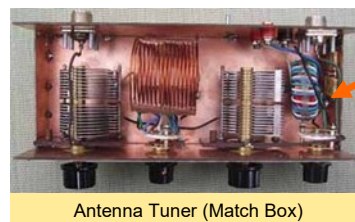


Coax Cable



Open wire line (or ladder line) offers extremely low loss at HF frequencies (much better than coaxial cable). One problem is that open-wire line is balanced while your transceiver output is unbalanced.

You will need to use an antenna tuner with a built-in balun to form a bridge between the balanced line and the unbalanced output of your radio.



Antenna Tuner (Match Box)

(Continued on page 11)

A balun is a type of transformer that converts balanced feed lines to unbalanced, or vice versa. (**BAL**anced to **UN**balanced). Most antenna tuners use 4:1 baluns that also convert the impedance of open-wire lines to a value that the tuner can handle.



Balun

Use an antenna tuner when you want to operate on bands other than those your antenna is designed for. When you attempt to use, say, a 40-meter dipole on 10-meters, a big mismatch will develop, along with a high SWR. By using a tuner, you may be able to create a 1:1 SWR at your transceiver (That's "may" because the mismatch can sometimes be so great that it is beyond the capability of your tuner to handle.). The high SWR may cause substantial loss in a coaxial feed line, but at least you'll radiate some power at the antenna.

### Use an antenna tuner if your antenna has a narrow SWR bandwidth on some bands.

Some types of multiband antennas do not offer low SWR bandwidth on some bands. That is, from one end of each band to the other. There is usually a range – expressed in kilohertz – where a SWR below 2:1 can be achieved. For example, a multiband trap dipole may offer a SWR of 2:1 or less from 3600 kHz to 3800kHz. That's a SWR bandwidth of 200 kHz. If you try to operate above 3800kHz or below 3600 kHz, you'll encounter a SWR higher than 2:1 and your radio may become distressed. With the antenna tuner, you can operate outside the SWR bandwidth and still load the full output of your radio into the antenna system.

### When the antenna tuner is not necessary

If your SWR is 1.5:1 or less at the frequencies you operate most often, then don't worry about using an antenna tuner.

A SWR of 1.5:1 or less is not serious and does not require the assistance of an antenna tuner. Most transceivers today will tolerate a 1.5:1 SWR with

no problem. The transmitter will be just fine at a SWR of even 2:1. If you are using a good-quality feed line, the loss caused by a SWR of 1.5:1 or even 2:1 isn't enough to worry about at HF frequencies. Many hams are obsessed with providing an absolute 1:1 SWR for their radios at all times. Apparently they also have money to burn!

Your antenna and feed-line depend on a number of factors. These include the length, operating frequency, height above ground, proximity of metal objects and even weather conditions (such as ice on the antenna).

### Impedance Matching

When high-frequency signals are carried over transmission lines of any significant length, care must be taken that the transmission line, (coax, ladder-line) achieves maximum power transfer. The line impedance must match the source and load impedance.

Your feed-line does more than simply connect your radio to your antenna. It acts as an impedance transformer. That is, the impedance of your antenna is transformed by the feed-line into the value your radio "sees." This system impedance acts as a load for the energy created by your radio.

Most of today's transceivers are designed for a load impedance of 50 ohms. What happens when the impedance isn't 50 ohms? Now there is a situation known as a *mismatch*.

When a mismatch exists, a certain portion of the power generated by your radio is *reflected* – like light is reflected by a mirror. This reflected power comes shooting back down the cable to your radio. When it reaches the radio, it is reflected back toward the antenna. The reflected power combines with the *forward* power being generated at the radio to create *standing waves* in the feed line.

With the use of a standing-wave-ratio (SWR) meter, you can measure both forward and reflected power. A 1:1 SWR reading indicates that no power is being reflected back to your radio. Good. On the other hand, an SWR of 3:1 or more means that a substantial amount of power is being reflected. *Very Bad*. A high SWR can cause considerable RF voltages to develop in the feed-line and in the output circuits of your radio. This is a dangerous condition for your transceiver. To prevent this, manufacturers use SWR

protection circuits. When the SWR gets too high, these circuits automatically reduce the output power or, in some cases, shut down the transceiver altogether.

If your antenna system presents a serious mismatch to your radio, what can you do? If you connect your transceiver directly, the protection circuitry will drop your output like a rock. Worse yet, you may find yourself on the receiving end of an expensive repair bill. You need to provide a 50-ohm load for your transceiver - regardless of what is really present. You can accomplish this by the use of an antenna tuner.

There is a great deal of mythology concerning antenna tuners, especially when addressing what they can and cannot do. They are useful devices when used in the right applications. The question is, deciding whether you really need one.

73,  
AAØJK  
Fred

## RADIO AMATEURS SHOULD KNOW HOW RADIOS WORK

BY DAN ROMANCHIK, KB6NU

About a month ago, [I opined](#) about why more than half of licensed radio amateurs never get more than a Technician Class license. I then combined that with a related post about discussions within the ARRL about a possible [new entry-level license](#) and sent this article to subscribers who then [published it in their club newsletter](#).

This morning, I got a reply from someone who read this latest column. He writes:

*Your article on why there are so many Technicians was very informative. The comment about not finding an Elmer was dead on. I was very happy being "just a tech" until some Elmers started nudging me to become a General and enjoy HF.*

*I am so grateful to them. They were there to push me to get to the next level. But more importantly they worked with me on becoming a very good radio operator. And boy do some of the new hams need to learn this is not "upgraded CB" land we are in.*

*Lastly I will add one more addition to your list. The study questions to move up each level are so obsolete its almost embarrassing. With the technology in today's radios most, and I mean most, will NEVER, EVER take it apart. There is no need to. Yet most of the questions are focused on what makes a radio work the way it does. Do we really need to know about resistors and capacitors to make us good operators? I don't think so.*

*Sadly I think that is why I won't become an extra any time soon. Too much information to learn that will be of little to no use as I grow in the hobby.*

*There is a huge thought difference between the old stogies (sic) of ham radio and the new people like me. And as long as the old stogies stand put in their ideas and ideals then yes you will not see as much growth in this hobby as there very well could be.*

*Thanks again for the great article.*

I was very happy that he found Elmers that encouraged him and helped him along the way. I almost couldn't believe it, however, when I read that he found no value in learning about resistors and capacitors. I replied:

*Thanks for taking the time to reply.*

*I was with you right up until you said, "The study questions to move up each level are so obsolete its almost embarrassing....Do we really need to know about resistors and capacitors to make us good operators?" The answer to that specific question is no, but radio amateurs—especially Amateur Extra Class licensees are supposed to be more than just operators.*

*Part 97.1 of the rules lists five "purposes" for amateur radio. Part 97.1(b) reads, "Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art." I take that to mean that radio amateurs should not only know about resistors and capacitors, but a heck of a lot more as well. While the question pool certainly needs updating, removing the questions that are "focused on what makes a radio work" is truly not the way to go.*

*It may not seem like it to you at this point, but knowing about resistors and capacitors, and how radios work, will make you a better amateur radio operator. Even if you never do take your radio apart, this knowledge will give you a better appreciation of what your equipment is doing and how to get the best out of it. And, of course, it will help you troubleshoot problems when (not if) they arise.*

*I really am very sorry to hear you say that you're not going to pursue the Extra Class license. It's not the piece of paper that's important, but the knowledge that you'd gain by doing so. Operating is fun, but that's only part of amateur radio. Understanding the technology that drives amateur radio makes it even more fun.*

If sticking to the idea that a radio amateur should understand how radios work makes me an old fogey, then I guess I'm an old fogey.

When he's not pondering questions about the amateur radio licensing structure, Dan blogs about amateur radio at KB6NU.Com, writes the "No Nonsense" amateur radio study guides, and teaches ham classes. You can contact him by e-mailing [cwgeek@kb6nu.com](mailto:cwgeek@kb6nu.com).

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

**Roundtable August 1960 - 6 meter report and letters to the editor**

**SIX METERS AND UP**

By GLENN, WØIJR

It seems that the summer bug has bitten a number of us on six meters. There still is quite a bit of activity but the mountain air and outside activities are getting the best of us. DX has been pretty rare this past month but we always hope for the best.

We sure will miss KP4AMN/Ø, Vic and family who will be leaving Denver. Vic is in the Air Force and is now heading for Japan, we hope to work him as a JA someday! We would like to welcome KØWJH, Lou, WØAJH, Roy, K5TLDØ, Fred, and also WØVZQ, John, who puts in a terrific signal from Morrison.

The C.A.P. is helping some of us to experiment with aeronautical mobile. KØRRC, Earl, made a trip to Limon and worked us all the way with only a "Sixer." Various points in the Colorado area and possibly over the borders will be attempted. Various tests with refraction will be conducted over the mountain areas. As most of us know VHF is line-of-sight operation but refraction is a means of bending an RF signal over any mountain-type object. This should prove quite interesting.

The Highbanders have voted to move the Calling and Net frequency from 50.3 Mc. to 50.55 Mc. Eight Mc crystals will be bought by the net and sold to the net members. A definite transfer time to the new frequency will be announced soon. We want to give everyone time to get set up with any modifications that may have to take place.

Here's a terrific modification that came to us from KØTSD, Perry, and has proven to be real helpful in controlling the known drift on the Heathkit "Sixer" and also allows operation with inexpensive 8 Mc. crystals instead of the higher-price 25 Mc. crystals. Instructions for the modification are as follows: Install a 24 mmf. mica condenser across the oscillator coil and change the coupling condenser to the final from a 4.7 mmf. to a 40 mmf. capacitor. Thanks, Perry; it sure helped your "Sixer."

Just a reminder to be around for the VHF QSO Party coming up September 17 and 18. See you then!

**Letters to the Editor**

Editor:

It has been my honor and privilege to serve as president of the Denver Radio Club for the 1959-1960 term.

This has been an outstanding year for the DRC, which has shown an increase in membership and a substantial gain in the club treasury. The overall picture has never looked so good.

We have had a greater participation in club activities, as evidenced in the Field Day and the Hamfest, which was the largest ever held in this area.

I want to personally thank the board of directors and those who were not on the board but eagerly volunteered their services to make this an exceedingly successful year. Without these people, it would not be possible to have a growing club.

At the same time, I want to urge your continued support of the Denver Radio Club under the next administration.

E. Fontaine LaRue  
President

Ø—Ø—Ø

"Club Characters," the monthly feature usually seen on page two of THE ROUND TABLE, does not appear this month because the author, Roy "Scoop" Raney, is on vacation.

**Private Intercom**

Doctors at the new Naval hospital at Great Lakes, Ill., are being equipped with pocket radio receivers, each tuned to a different frequency. The idea is to be able to reach each doctor instantly, and directly, without paging him or disturbing others. In case of emergency, what's your frequency, Doc?

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Page Seven

Editors Note: The current collection of crossword puzzles has been used. This is a trial run on a different puzzle type. Words will come from the Technician, General and Extra license manuals. Please let me know what you think: [drc.editor@gmail.com](mailto:drc.editor@gmail.com). The solution for the puzzle is on the next page.

S P L A T T E R U P Z  
 E R H K N I L O H C E  
 G A T E W A Y L D F R  
 I N D U C T O R M E A  
 E D I K E Y E R T M P  
 F I W O N D D E M M Z  
 A O D T O S M E A T H  
 R D N M A M T L R M G  
 A E A T H E R E L A Y  
 D I B O R M H C K Y H  
 A C L A R I F I E R B

**Word List:**

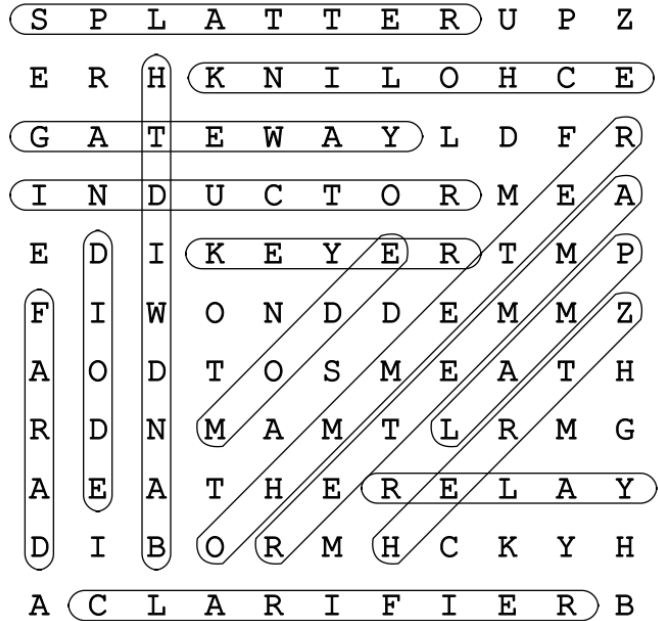
AMMETER	BANDWIDTH	CLARIFIER	DIODE	ECHOLINK
FARAD	GATEWAY	HERTZ	INDUCTOR	KEYER
LAMP	MODE	OHMMETER	RELAY	SPLATTER

**FACT OF THE DAY**

**Fiber Optics Transmission Distance**

Several factors control the distance information can be transmitted down a fiber optics line. Light signal attenuation is an obvious factor. Some light leaks out of glass fibers and some is absorbed by the glass, so the further light travels down a line the weaker it becomes. At some distance it becomes too weak to detect. Attenuation can be offset by higher light transmitting power, but high-power light transmitters are more expensive and tend to have narrower bandwidths. Pulse dispersion is another distance-limiting factor that is less-obvious. Light reflections off the inner walls of glass fibers cause light pulses to spread-out and increasingly overlap as they propagate down a line. That has the effect of reducing the transmission bandwidth. Consequently, the longer a fiber optics line is, the narrower its bandwidth is. At some length its bandwidth becomes too narrow to meet communication needs.

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**HAM SITE OF THE MONTH**  
[K7AGE YouTube Channel](#)

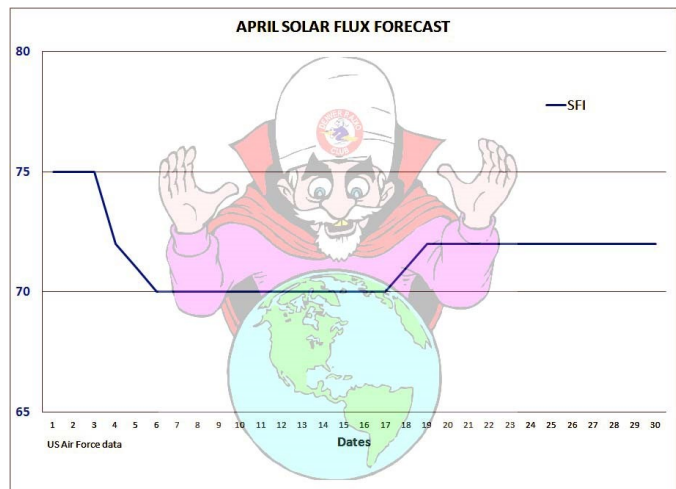
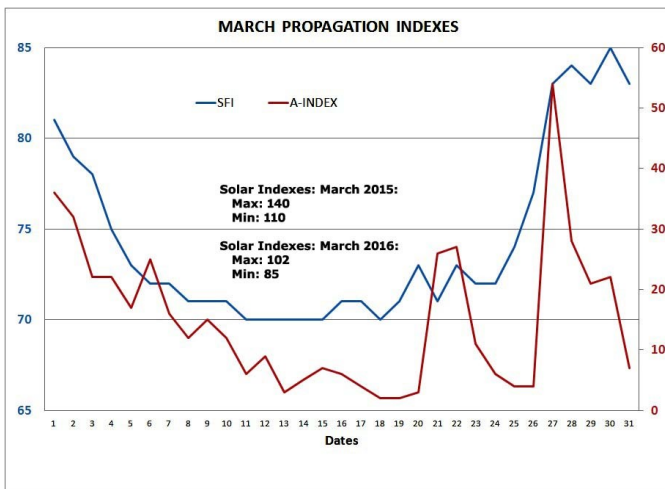
**THE ROUNDTABLE ARCHIVE**  
 Go to: <http://www.wotx.org/roundtables.htm>  
**THE ROUNDTABLE ARTICLE INDEX**  
 Go to: <http://www.w0tx.org/RoundtableArchive/-RoundTables-Index.pdf>

**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)



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**UPCOMING EVENTS**  
HAMFESTS & CONVENTIONS

Event	Date	Location	Sponsor Website
LARCFest	04/01/17	Boulder County Fairgrounds	<a href="#">Longmont Amateur Radio Club</a>

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

Contest	Start Date	Start Time	End Date	Stop Time	Notes
Rookie Roundup - SSB	04/16/17	1800	04/16/17	2359	

**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
Missouri	04/01/2017	04/02/2017	<a href="#">Boeing Employees' Amateur Radio Society – St. Louis</a>	
Mississippi	04/01/2017	04/02/2017	<a href="#">ARRL Mississippi Section</a>	
Georgia	04/08/2017	04/09/2017	<a href="#">Georgia QSO Party</a>	
New Mexico	04/08/2017	04/09/2017	<a href="#">Socorro Amateur Radio Association</a>	
Ontario	04/15/2017	04/16/2017	<a href="#">Contest Club Ontario</a>	
North Dakota	04/15/2017	04/16/2017	<a href="#">North Dakota</a>	2016 date
Michigan	04/15/2017	04/16/2017	<a href="#">Michigan QSO Party</a>	
Nebraska	04/22/2017	04/23/2017	<a href="#">QCWA Nebraska Chapter 25</a>	
Florida	04/29/2017	04/30/2017	<a href="#">Florida QSO Party</a>	

**ATTENTION**

**SUPPORT THE DRC FROM YOUR AMAZON PURCHASES**

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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	<b>2 meter / 20 meter gateway. Useable by Technicians on 2 meters. See January 2015 RT.</b>
2m	145.490MHz (-) 100Hz PL	<b>Linked to the 70cm / 448.625MHz machine.</b>
2m	147.330MHz (+) 100Hz PL	<b>Local Area, Members Auto-Patch. Does Not TX a PL!</b>
2m	147.330MHz (+) 131.8Hz PL	<b>Test Mode Operation. Send signal reports to Tech Committee.</b>
1.25m	224.380MHz (-) 100Hz PL	
70cm	447.825MHz (-) DCS~073; NB 12.5; +/- 2.5	<b>Saint Anthony's. Note: This is a narrow band repeater requiring DCS.</b>
70cm	448.625MHz (-) 100Hz PL	<b>Linked to the 2m - 145.490MHz machine.</b>
70cm	449.350MHz (-) 100Hz PL	<b>Wide area coverage with Echolink Node # 4140.</b>
70cm	449.775 MHz (-) 100Hz PL	<b>Yaesu Fusion Digital, Wires-X and analog. 100 Hz tone required for analog.</b>
70cm	446.7875MHz (-)	<b>BrandMeister Repeater   Slot 1 – Wide Area Traffic, Slot 2 – Local Talk Group 310804</b>



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<b>APRIL 2017</b>							<i>DRC Net Sundays at 8:30 p.m. on 145.490 / 448.625 (no PL)</i>
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
						1  	
2	3   First Quarter	4	5 <b>Learning Net 7:30 p.m.</b> 145.490 / 448.625 (No PL)	6	7	8	
9	10	11   Full Moon	12 <b>Learning Net 7:30 p.m.</b> 145.490 / 448.625 (No PL)	13	14	15	
16 <b>ARRL Rookie Roundup</b> – SSB 1800 UTC - 2359 UTC	17	18  	19 <b>DRC Meeting</b> Elmer 6 PM General 7 PM   Last Quarter	20	21	22  	
23  30	24	25	26 <b>Learning Net 7:30 p.m.</b> 145.490 / 448.625 (No PL)   New Moon	27	28	29	

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Web Master	N0LAJ	Bill Hester	Check Roster	Check Roster

**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](mailto: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](mailto:drc.editor@gmail.com). The submission deadline is the 20th of the Month. ~ Editor