

Mtg Fri 6:30 Jan. 22. at the MCL Cafeteria in Kettering

Jan. 2016

ANOMALOUS PROPAGATION

Newsletter: *The Midwest VHF/UHF Society*

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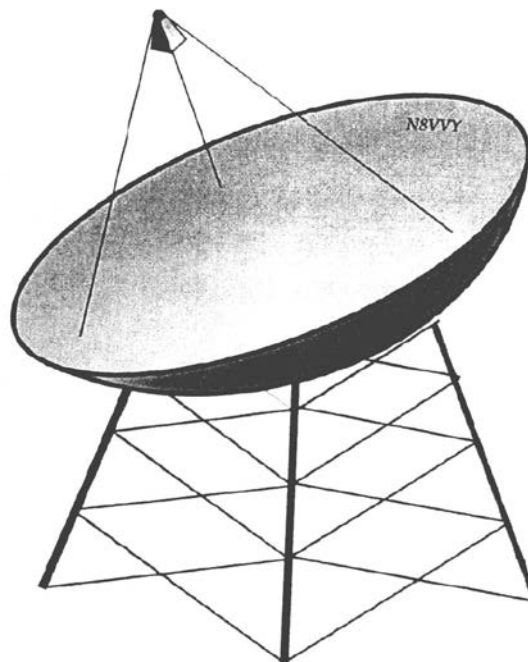
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Beacons: 1296.079 **W8KSE** EM79ur Dayton, OH---- 2W to Big Wheel at 800' AGL.

Listen for the **K9AYA Beacons** at EM79qk, 2W @ 10,368.000 MHz

Both are copied by K4T0 daily. 1W @ 5,760.000 MHz

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De N8ZM. Well, it looks like winter has made its late arrival. As I write this it is headed towards zero tonight, and plans to stay cold for at least a couple of days. I was getting along quite well seeing temps in the 40's frequently. Might be time to hibernate.

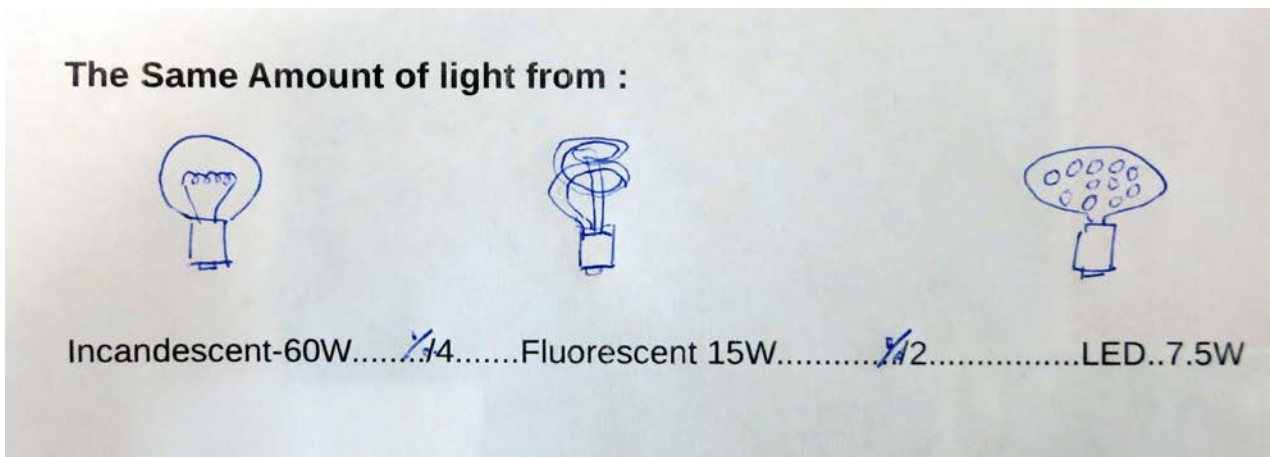
I hope you all had a great holiday season and Santa fixed you up with some radio toys. Or even non-radio toys, just so long as there were toys involved. For me, it was an LCD replacement display for my semi-ancient HP 8566A spectrum analyzer, which was suffering from a very dim CRT. The replacement from SimmConnlabs is really awesome. The designer, Xu Wang, has done a fantastic job of not only replacing the basic functionality of a monochrome screen, but added color! And it is a much sharper image than before. Remind me to show you a picture of it at the meeting. And ask Mike, W8RKO, to see the pictures of the display he put into his 8753B from the same source. So now you have a good reason to come to the meeting on the 22nd!

Yes, the next meeting is on the 22nd, as that is the 4th Friday this month. So don't mess up!

As the New Year is now arrived, I am going to quickly remind all of you that MVUS runs on your dues, so if you haven't caught them up recently, please do so. And, we'd really like to send Anom Prop to you via email, but if you would rather have a print copy, that's OK with us; just make sure we have a good mailing address for you. If the email version IS your thing, make sure we have a good one for you. Jim, WB8VSU, handles the task of keeping our mailing lists up to date, so for either delivery method, please let Jim know at j.bacher@ieee.org. WB8VSU@mvus.org might also work, but I don't know if that change is in the system yet. Thanks.

I don't know how many of you are ARRL members (I hope all of you), but if you are not for any reason, please consider this: We have a tremendous amount of freedom and opportunity within the amateur hobby in this country to explore and enjoy the capabilities of radio communications in almost any manner we can devise. NO, it's not perfect or totally unfettered by regulation, but today we have more frequencies and modes available to us than at any time in our past. Sure, we have lost a few MHz here and there, but we have also gained new bands. Considering the big bucks that our greedy government has collected from auctioning off chunks of spectrum, we have made out very well. Why? Because the ARRL has been there for us. Now maybe you still haven't gotten over incentive licensing, or losing part of the 220 MHz band only to have it go almost totally unused. That's really old news. We could have lost a lot more had the ARRL not been there to represent our interests to the powers that be. For less than \$50/year, that's pretty cheap insurance to keep us on the air. We could easily have had our VHF and up bands sold to the highest bidder literally overnight if there had not been the ARRL watching and acting to protect or frequency allocations. So quit being such a cheapskate and join. Why should some of us pay to protect our bands while others get a free ride? That's just rude!

OK, I'm done ranting for now. See all of you, I hope, on the 22nd! De Tom, N8ZM.



This and That Jan-16

Washington. “The buck stops here!” Read the sign on President Truman's desk, but he also said: “If you want a friend in Washington: Get a dog!”

Aging. “The aging process has you firmly in its grasp if you never get the urge to throw a snowball.”
[Doug Larson]

Busy Busy. “Its not enough to be busy. So are the ants. The question is , what are we busy about?”
[Henry David Thoreau]

Root-Canal. I didn't look forward to it. After I sat down in the operating chair, I was given a consent form, where all the things that can go wrong were enumerated. For a moment I said to myself, “ I must be crazy to sign this!” But I had made up my mind to go through with it. So I signed! Well it was not different from a regular dentist visit, and after not more than 15 minutes I was done. I had no pain whatsoever. I would have to come back in a month for a similar check-up session. That was too painless, I thought. Where is the catch? Well, on checking out I was presented the bill, which the insurance doesn't pay. And that's where the pain came in... [Gerd, WB8IFM]

Engineer. “Almost every engineer I've met exudes a love of tinkering, problem solving, and figuring out how stuff works.”
[Kasey Panetta, Editor ECN]

Striking Recovery. In 1919, Ray “Slim” Caldwell, a pitcher for the Cleveland Indians, was struck by lightning during a game. He was revived and continued to play. [Ripley's Believe it or Not]

Do the Right Thing. “Do what you feel in your heart is right – for you'll be criticized anyway.”
[Eleanor Roosevelt]

In the End. “In the end, we will remember not the words of our enemies, but the silence of our friends.”
[Martin Luther King Jr.]

Helicopter Parents. “Not only are we placing unreasonable demands on parents to be with their kids 24/7, but we are stunting the natural development of independent humans.” [Petula Dvorák]

Devils. “If from infancy you treat children as gods, they are liable as adults to act as devils.”
[P.D. James]

Stories. “After nourishment, shelter and companionship, stories are the thing we need most in the world.”
[Phillip Pullman]

Four new Elements. Four new elements have been added for the atomic numbers 113, 115,117 and 118. Their preliminary names: Ununtrium, ununpentium, ununseptium, and ununoctium. All exist for just a fraction of a second after lighter nuclei are slammed together in experiments. [TheVerge.com]

Talent. Can several talented people do more together than they can do alone? Some experts insist true talent always works best alone. Among those who think otherwise are movie producers, symphony conductors and football quarterbacks. [L.M. Boyd]

Handprint. If it looks like a miniature human handprint, it's either the footprint of a raccoon- or the handprint of a miniature human. [L.M. Boyd]

Contact Problems?

Or keep the battery connected.

By Gerd, WB8IFM

With the explosion of battery powered gadgets came “battery anxiety” and the installation of ac receptacles at airports for the many plug-in addicts. Of course, most of this is overkill and completely unnecessary. However, the party might have had a bad experience and doesn't want to run into this again. What might that experience be? Let me suggest: there may have been a **contact problem**.

You see, especially the smaller of the gadgets, like wrist watches, cellphones, cameras. They use a multitude of batteries and except for the ubiquitous 9v battery, there are the 1.5V AA or AAA cells, then you have dozens of different button cells to contend with. Here, in my experience is where contact problems reign supreme. And, of course, it irks you to replace a button cell when it is fairly new and cost you a good penny. I recently paid \$ 6 for such a cell for my trusted wrist watch.

Another case is the smoke detector, which could actually drive you bananas in the middle of the night! Our system was not too long ago “professionally” upgraded and it now has detectors in every bedroom, in the hallway and in the basement. Each detector is further connected to AC and ,of course, works of 9V batteries. It is recommended to change batteries once a year. It has caused a number of, what I call false alarms, when the hallway detector senses a whiff of smoke from the fireplace or kitchen. An then, the big problem is, to turn the thing off.

Here is what you do, when your gadget indicates it needs service (of course they want you to change batteries!) remove the battery(s). Clean the contacts then check the individual cells or battery with a VOM that has a battery check mode. I am using a Sperry 152A which is an old fashioned analog meter. The dial has a red, white, and green segment. If the needle is in the green, all should be OK. How much it is in the green gives you a rough indication how “full the battery” is. The rather small white part has a question mark in it . That is the range where the discharge curve angles downward and depending on the current draw is hard to predict how much longer the battery lasts. Some gadgets might run a few more days even weeks w/o trouble, it's up to you!. Of course, if the needle is in the red, you ought to stop gambling and change the battery. The meter has a build in load resistor which may not accurately represent your case. If you don't have such a meter you can figure out (or look up) this and set up your own “battery check”, using a regular VOM.

Before reinserting the battery, try to clean the contacts in the gadget. I use cotton swabs drenched in rubbing alcohol. Depending on the environment, an additional treatment would be to apply Vaseline liberally to the contacts. This forms a protective layer around the contact which prevents dust particles from getting in between the contact surfaces. Famously the Siemens Co was using this technique to coat the contacts of the telephone exchange “step by step” switches.*) The “Siemens Waehlerfat” in the Silver Tube (like a toothpaste tube) was a staple at one time at every Ham's workbench. These tubes are hard to find but ordinary Vaseline will work just fine!

*)The main reason for putting grease in ball bearings b.t.w. is the same: to keep the dust and grit out!]

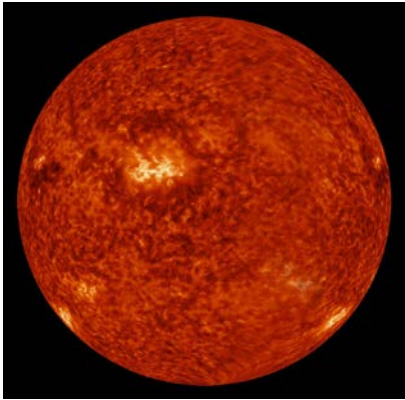
Aurora Opening.

Report from EN73. Sunday (12-20-15) major aurora opening: 5 to 10 PM EST. Some signals, 40 over S9. Strong enough to work stations on SSB. Very rough copy though. Easier on FM. Worked EN20/22/24 to the West, EM78/79 to the South, FN20/33/34/35/43 to the East. North EN35/75/85 FN35. 34 different stations in 30 grids. Too cloudy to see any visual aurora.

73, Lloyd NE8I, EN73mv (by e-mail)

NOAA /Science on a Sphere

Sun at the Helium Wavelength (AIA 304)



False Color Picture

The sun is often most interesting to observe at **Extreme Ultra-Violet (EUV) wavelengths** rather than visible wavelengths. In the EUV, the sunspots and active regions are bright instead of dark and the solar magnetic field can be observed as loops around the active region. Solar physicists and space weather forecasters watch the sun with special EUV cameras mounted on satellites. One such satellite, the NASA Solar Dynamics Observatory (SDO), carries the Atmospheric Imaging Assembly which images the solar atmosphere in multiple EUV wavelengths. By imaging the sun at a resolution of about 1 arcsecond and at a cadence of 10 seconds, this instrument is designed to provide an unprecedented view of the part of the solar atmosphere called the corona. At this resolution, each AIA image contains 2048 x 2048 pixels or 17 Megapixels. The primary goal of the AIA Science Investigation is to use these data to significantly improve our understanding of the physics behind the activity displayed by the Sun's atmosphere, which drives space weather.

This sequence shows the helium 30.4 nm channel which highlights the active network and filaments on the sun. Five days of data were collected from 5-9 September 2011 at a 2.5 minute cadence. These images were stretched and modified to create a more realistic display for the SOS format. It should be noted that the SDO imagers can only see one side of the sun so it is impossible to know what is going on around on the back side. In order to create a full 360 sequence of images, the central part of the sun, where the

resolution is the best, was repeated three times to create the appearance of the full sun. You can see that the bright active region appears three times and there is a region where each image overlaps its neighbor creating a slight blurring of the image.

During this sequence, there are several things to look for. First, the active network of the sun is constantly boiling and churning. Then there are long dark thread-like features called filament channels. There are the bright active regions with complex magnetic loops that shift and change. And then throughout this sequence, there are a number of solar flares that erupt from the brightest active region. You have to watch carefully to see them. When the flare erupts, the magnetic loops around the flare rearrange and change. And a blast wave expands across the surface of the sun emanating from the flare.

Solar flares often initiate a sequence of events called Space Weather. The solar flare itself can impact radio communication at Earth. The flare can initiate a Coronal Mass Ejection (CME) which travels at several million km per hour and, if it hits Earth, can create a lot of problems for satellites, airlines, electric power lines, and GPS. The CME can create a geomagnetic storm that produces aurora.

This sequence was created by undergraduate students in the NSF Research Experience for Undergraduates program in cooperation with NASA and the NOAA Space Weather Prediction Center.

Notable Features

- The quiet part of the sun is constantly boiling and churning.
- There are long dark thread-like features in quiet sun called filament channels.
- There are bright active regions with complex magnetic loops that constantly shift and change.
- Throughout this sequence, there are a number of solar flares that erupt from the brightest active region. They happen quickly in this time lapse sequence so you have to watch carefully to see them.

A Raspberry Pi QRP Transmitter Shield

By Joe Muchnij, N8QOD

Although it's not VHF or UHF, I thought I'd share something very interesting demonstrated at the recent TAPR Digital Communications Conference: a 20m transmitter built from a Raspberry Pi computer.

TAPR brought its developer, Zoltan Doczi HA7DCD to the conference from Budapest Hungary and will soon be selling his QRPi shield. Zoltan has made digital contacts throughout Europe, as distant as 2400 km (~1500 mi) from his QTH using a simple outdoor random wire antenna only 2m above ground and the digital WSPR mode, developed by Joe Taylor K1JT (the open source software he used can be downloaded from <https://github.com/JamesP6000/WsprryPi>).

The Raspberry Pi is an inexpensive (< \$40) computer available from many sources, including MCM. Zoltan added a tiny daughter board that plugs directly onto it containing two filters, a 10 dB FET amplifier and a protection diode; it outputs 100 mW on the 20 meter band.

A full technical paper is in the 2014 Conference proceedings, available from TAPR. Tom Holmes and John Ackerman were also at the conference if you have any questions.

A picture from the Archives:
Bruce, KA8EDE, with one of his cristal radio receivers
Receiving the "Magnetic Wave"



Arecibo Observatory continues advancing with new HF facility

Press Release of 13 Jan. 2016

The Arecibo Observatory, a facility of the National Science Foundation (NSF), has recently added a new high frequency (HF) facility, consisting of six high-power transmitters. With this upgrade, scientists will be able to study the ionosphere more in depth.

The HF facility illuminates the ionosphere, using the transmitters which feed three crossed-dipoles at a frequency of 5.1 MHz with up to 600 kW of power, creating fascinatingly complex scientific spectacles, hundreds of kilometers above the earth's surface. Just like astronomers bounce radar signals off an asteroid to study its rotation and orbital motion, physicists at the Arecibo Observatory shine a radar beam at the ionosphere to observe plasma phenomena that are impossible to study under laboratory conditions.

"All of these experiments enhance our basic understanding of the solar-terrestrial environment in both natural and artificial conditions," explained Dr. Joan Schmelz, Universities Space Research Association (USRA) Deputy Director at the Arecibo Observatory. "The ionosphere itself is a natural plasma physics laboratory".

One of the highlights of this facility is that it is able to make use of the 1000-foot dish as its antenna. Illuminating the entire dish efficiently while simultaneously allowing for radio and radar astronomy observations was a challenging design problem," explained Dr. Mike Sulzer, senior atmospheric scientist at Arecibo Observatory.

The new HF design was also restricted by the fact that no additional heavy equipment could be attached to the telescope's suspended platform. "We positioned the heavy dipoles at the bottom of the main dish, firmly attached to the ground," Sulzer continued. "They transmit up to a light weight sub reflector, down to the main dish and then up again in the form of a narrow beam that we use to illuminate the ionosphere."

The first observing campaign took place on November 9-15, 2015 when a dozen of atmospheric scientists from around the country worked with staff from the Arecibo Observatory on five specialized experiments designed to take advantage of the innovative new instrument. Their observations have already revealed previously undetected plasma waves traveling through the ionosphere.

Future experiments with the new HF facility include lunar and solar radar scatter, radio signal fluctuation studies using satellite beacons and stellar radio sources and radar scatter from plasma irregularities. Two of the participating scientists were Dr. Herbert Carlson, atmospheric scientist at Utah State University and Dr. Paul Bernhardt, an ionospheric physicist at the Naval Research Laboratory.

"We waited 17 years for the new HF," stated Carlson. "The Arecibo Observatory is the only place in the world this experiment can be done. It was worth the wait!" Located in Puerto Rico, the Arecibo Observatory is home to the largest and most sensitive single dish radio telescope in the world. The Arecibo Observatory is operated by SRI International in partnership with Ana G. Méndez University System-Universidad Metropolitana and USRA under a cooperative agreement with the NSF. The Arecibo Planetary Radar program is supported by NASA's Near Earth Object Observation program. ###

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Arecibo Adventure

By Daun Yeagley, N8ASB

I was very fortunate to have the opportunity to spend five weeks this past winter/spring at the Arecibo Observatory working in the engineering department with Dana Whitlow, where I was able to participate in several ongoing projects. Although I participated in other projects, including fiber optic links to the 12 meter dish (did you know there is a second dish at the observatory?), I'll concentrate on the HF Ionospheric "heater" transmitter.

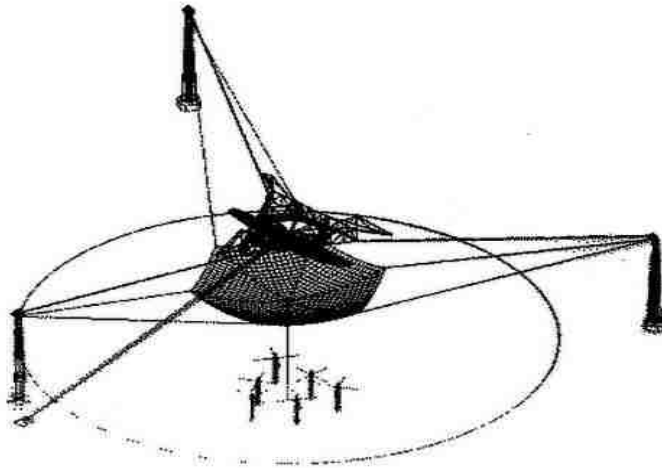
The HF transmitter uses six one hundred kilowatt transmitters driving three sets of crossed dipoles for each of two bands, on masts above the surface of the 305 meter dish. Above these dipoles is a hanging metallic mesh that acts as a Cassegrain sub-reflector that in turn illuminates the main dish, creating a circularly polarized vertical beam.

These transmitters are used in conjunction with the 430 MHz Ionospheric radar. The idea is to use the HF transmitters to excite the ionosphere and use the 430 MHz radar to look for changes in the reflections returned. The HF transmitted signal is always beamed straight up, but we can steer the 430- MHz radar beam over a limited range.

When you look at the pictures, you will notice that there are actually SIX sets of crossed dipoles, and that's because the project will use two bands, 5 MHz, and 8 MHz. The transmitters are shared between the two bands, so only one band can be active at a time. As of now, only the 5 MHz system is active.

The drives to these six dipoles need to be properly phased to create the circular polarization needed, and one of the projects I did was to build the digital phase shifter hardware we use to generate the proper phases to each of the transmitters. We also needed to control the length of the cables (and hence the phase relationship) between the transmitters and the antennas, a typical length of about 1300 ft. Dana and I measured and then trimmed the cables. Mind you, this is some pretty serious coax..... 3 inch Heliax. Running that much power is pushing the limits, and we've actually had trouble with arcing in the baluns. So that's one of the tweaks we'll need to be doing!

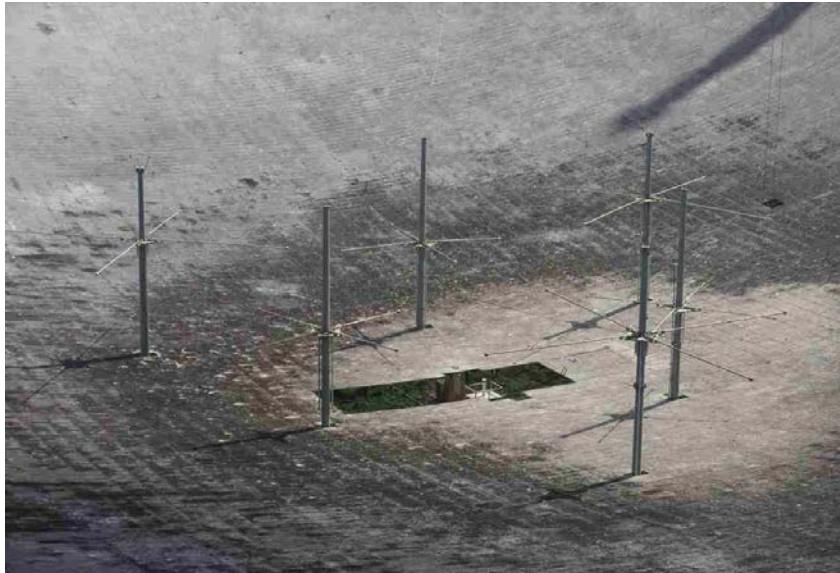
HF System Overview



HF Transmitters 5.1 MHz, max 600kW



HF Dipoles
(cross dipoles, circular polarized)



Daun's Phase Shifter Circuit Boards

