Mtg. Fri 6:30 Oct. 28
at the MCL Cafeteria in Kettering

Oct.. 2016

ANOMALOUS PROPAGATION

Newsletter: ***The Midwest VHF/UHF Society***

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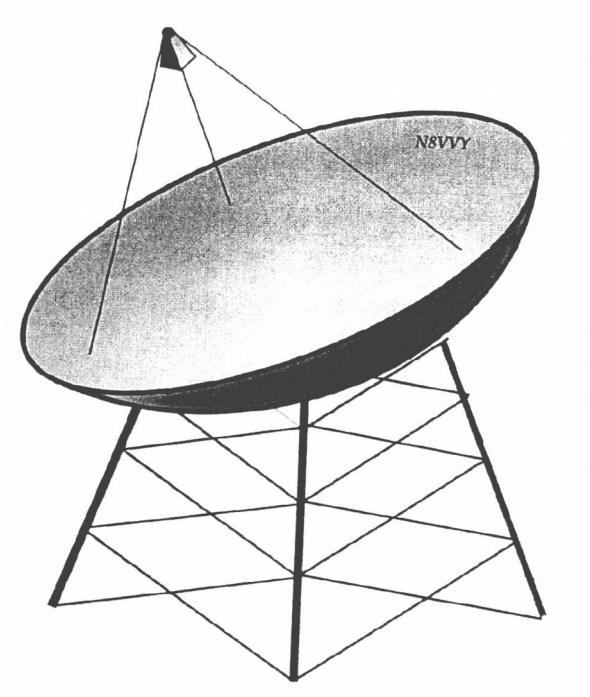

Annual Society membership is $ 12.00. Please make checks payable to Joe Muchnij

MIDWEST VHF-UHF SOCIETY

Vol. 30 No. 8 www.mvus.org Oct. 2016

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 K4TO daily. 1W @ 5,760.000 MHz

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AMSAT-NA will take to the water for its 2016 AMSAT Space Symposium.
The event will take place Nov. 10-14 aboard a Carnival Cruise Lines ship.
Departure from and return to Galveston, Texas.
The voyage will include 2 full days at sea and a 1 day port stop at Cozumel, Mexico.

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De N8ZM: Good Golly, Miss Molly, it is October already. If you've been reading my columns for the last 20-plus years, you know that the seemingly rapid passage of time is one of my favorite gripes. So I felt compelled to mention it again if only for tradition's sake. But enough!

This past weekend I attended the annual Microwave Update conference (MUD), this year in St. Louis. Along for the ride were Joe, N8QOD, Ed, W8BFT, and Joe, WA8OGS. The latter, Joe Burke, is one of the original members and founders of MVUS, and now that he has retired, he has the time and interest to get back into VHF and above hamming. Welcome back, Joe! During our drive to MO and back, Joe had a lot of questions and ideas about MVUS and things we could do as a club. I think you will all be interested in his thoughts, so hopefully he will be able to attend the meeting on the 28th so we can get to know him better and hear his thoughts.

MUD was, as always, an amazing get together since it attracts the best minds and operators in the world of microwave hamming. The talks covered many topics, from awards to 47 GHz beacons, and a lot in between. While mostly technical in nature, the talks were not over the heads of anyone with an interest in the much higher bands. Many are how-to's so you can see how easy it is to get on the air up there. Gerd tells me that he has N8QOD lined up to write an article about a lot of the details of the show so I won't spend much more on it here. Next year is planned for northern California, but on the way home we discussed the possibility of having the 2018 edition here or in Cincinnati. So give that some thought before the meeting as well. Nothing is locked in but the MUD oversight group has indicated that they are interested. That doesn't make it a sure thing as there may be other groups also looking to host it.

Among the activities at MUD was a noise figure measurement setup provided by Keysight (ex-Agilent/ ex-HP, like me) and manned by yours truly and Donn Baker, WA2VOI. Donn is an excellent partner for this as he is the extra eyes and ears that helps keep things on track and catches little fax paus like hooking up 12V to a 5V device. There was also a demo of 10 GHz EME on Thursday and Friday evenings done by Al Ward, W5LUA. He managed to work three stations each night despite some QRM from a beacon and some other local source he could not track down with certainty. QRM on 10 GHz?! Awesome!

As a reminder, the November meeting will be on the 25th, and December on the 23rd. This month, as mentioned above, will be on the 28th. I hope to see you there. De Tom, N8ZM

3cm EME during MUD 2016

By Al, W5LUA

We had a successful demonstration of 3 cm EME at the Microwave Update Conference in St. Louis, MO on Oct 13, 14 and 15. I was located in EM48ss inthe hotel parking lot. The antenna was a 1 m offset fed dish made by Winegard. Power was provided by a GaN device delivering 30 watts to the feed. I used a KX-3 IF and DEMI transverter locked to a 10 MHz Isotemp TCXO. I was not able to take advantage of measuring moon noise as a pointing assistance as there was a local beacon up the band that was getting into my GR-1216 noise meter. I plan to look into better ways of measuring moon noise over narrower bandwidths ...However I drug out the compass and was able to get reasonably close on azimuth and when we started hearing stations we could easily optimize the dish and establish a new azimuth reference. The theoretical 3 dB beamwidth of the 1 m dish at 10 GHz is 2.2 degrees.

My dishmount is calibrated in 1 degree increments making it easy to update once we find the moon. Elevation readout was provided by a Sears digital level placed on the offset dish feed support. Based on prior sun noise measurements, I determined that the arm angle was 3 degrees below the actual pointing angle of the dish. I requested that other stations who wished to call me do the mutual Doppler correction on both receive and transmit so that I could receive and transmit on 10368.050 MHz.

On the first moon rise, we did work on JT-4F G3WDG at 2257Z, OZ1LPR at 2305Z and OK1KIR at 0042Z, We attempted contact with K5GW on cw but it was confirmed later that Gerald had some tracking program issues and we gave up for the night. The attendees were able to copy K5GW calling us on cw so that provided a good demo to the guys. The tones from the other 3 stations were also heard in the loudspeaker. so despite the fact that we had to manually (with some luck) keep it on the moon without the help of moon noise, we did have success.

On the second night, we had a repeat QSO with G3WDG at 2342Z (thanks Charlie as you confirmed we were on the moon) and WA3LBI at 0023Z. I then ran a sked with K5GW with me doing the mutual Doppler correction on both receive and transmit and we established contact by 0130Z. We then went back to CQing on .050 hoping for further contacts. We were surprised and pleased to make a contact with G4CBW at 0135Z who was only running a 1.5m dish. We finished the evening with a nice contact with OK1CA.

Microwave Update 14/15 Oct. 2016

By Joe, N8QOD

Four of us drove to St. Louis together to attend MUD. This included Ed W8BFT, Tom N8ZM, Joe WA8OGS. We had planned to fly there in Ed's plane, but decided to drive instead. Driving gave me an opportunity to later continue onto Oklahoma and visit my daughter, so we went in two vehicles.

The venue was great, and there were a number of memorable presentations.

Ward Silver N0AX shared his thoughts on the continuing evolution and likely future of amateur radio, concluding that if the was to be any future, we all needed to go out and build enthusiasm for science in today's youngsters.

MVUS member Kent Britain WA5VJB gave a thought provoking presentation on Circular Polarization, concentrating on helical antennas. He began with "All antennas are elliptical." Circular and Linear, of course, are just the boundaries of Elliptical, and even with a properly constructed helical, radiation off the boresight is elliptical. He then common errors made in the design and construction of helical that damaged the beam.

Charlie Suckling G3WDG showed a 10GHz circular feedhorn he built, and results of experiments comparing the performance of Circular and Linear polarization, including cross-polarization.

MVUS member Jeff Kruth WA3ZKR discussed measuring antennas gain using three antennas. He presented the equations, and suggested that an Excel spreadsheet would ease the calculation drudgery

Barry Malowanchuk VE4MA told us that many modern auromobiles contain vehicle-following radar. While Ford dealers are required to return defective units, GM dealers are instructed to merely discard them. He's found that reclaiming them is a source of useful microwave components.

Barry also explained how to use sun noise to evaluate system performance.

Alan Devlin VK3XPD showed his multi-band transverters for 24GHz, 47GHz, 76GHz and 122GHz.

Finally, Tony Emanuele WA8RJF had a slide show of his "Second Annual Microwave Gulf Outing" making 10GHz contacts along the shore from Texas to Florida.

This and That 10-16

Computers. They are like the old testament: lot's of rules, no mercy!

Conflict. War and conflict are the natural order of things. [Heraclit]

Life. Life is one long process of getting tired. [Samuel Butler]

Brains. I can't give brains, but I can give you a diploma. [Wizard of Oz to the Scarecrow]

Popper's Principle. Testability should be the criterium/requisite of any theory.

Planck's Principle. New scientific truth is accepted only after opponents die – not because they see the light.

Law and Order. Most people believe in law and order as long as they can lay down the law and give orders. [unknown source]

More on Law. The law locks up he who steals the goose from the common, but lets the great felon loose who steals the common from the goose! [Richard Nixon]

Water. The *Mississippi river collects water from 41 States.*

Is Life Real? What if everything is an illusion and nothing exists; in that case I definitely overpaid for my carpet. [Woody Allen]

Banking. A bank is a place where they lend you an umbrella in fair weather and ask for it back when it begins to rain. [Robert Frost]

Business. Nothing is illegal if a hundred businessmen decide to do it. [Andrew Young]

Truth. The truth must be repeated again and again because error is constantly preached around us. [Goethe]

Success. What do you need to be a success: ignorance and selfconfidence. [Mark Twain]

Lesson: It cost a lot less if you learn early that all is vanity, and that most folks spend money they haven't got on things they don't need to impress people they don't like.
[Dr. Joseph Peck]

Contacts via a CubeSat.

By Gerd, WB8iFM and Keith, VA3KSF

On a recent trip we visited Keith Baker, KB1SF / VA3KSF, and he demonstrated to me how he made several contacts via one of the new Chinese CubeSats with linear transponders. In his backyard Keith has a satellite antenna arrangement similar to what we used to have for the old high elliptical orbit satellites, which used just such transponders. These satellites employed SSB with 70cm on the uplink and 2m on the downlink. The antennas Keith used were crossed Yagis for both those bands, driven by azimuth and elevation rotors.

There are, quite literally, hundreds of these CubeSats now in orbit. However, not all of them are for Hams. Most have low earth orbits and are in range only for brief periods of time, like 10 minutes. So the word “contact” describes the (quick) nature of the communication. Most exchanges are very brief and basically limited to introducing one another and exchanging a few bits of information.

In addition, these satellite contacts are *very* labor intensive. Because these satellites move fast, and at a relatively low altitude, it requires constant adjustment of the antennas. Furthermore there is an extensive Doppler shift on both the uplink and downlink signal to deal with, which requires yet another adjustment.

I remember that during a contact between a local school and the International Space Station, we had similar issues. For educational purposes, we delegated the adjustment of the antennas to three students, one had to read the AZ/EL data aloud from a computer program. Two others then adjusted elevation and azimuth of the combined antennas (uplink...downlink).

Keith was using a computer program as well, but his program simply controlled the movement of the antennas. However, he still had to deal with the Doppler shift, which Keith then controlled simply by using the RIT on the receiver.

It was all quite exiting. We both were wearing headphones, Keith was using one with a boom mike.

Contacts were made with several stateside stations…some of them Keith had contacted before.

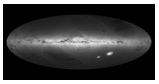
The matter of adjusting SSB automatically has been solved some time ago and there is even a patent for this. To my knowledge the military is now using this automatic tuning concept while I have yet to see an amateur transceiver use automatic SSB tuning.

AMSAT’s current satellite tracking software offering (SATPC-32) can be set up to both turn the rotators AND track the uplink and downlink Doppler shift for selected satellites. However, as I said, Keith was only using SATPC-32 to run his rotators, preferring to manually tune for Doppler.

New Billion-Star Map Reveals Secrets of the Milky Way

The first results from the Gaia mission are poised to rewrite astronomy textbooks, starting with an upgrade to the size of our galaxy.

- By Davide Castelvecchi, Nature magazine on September 14, 2016

 *Credit: ESA, Gaia, DPAC*

The European Space Agency (ESA) has released the largest, most detailed map of the Milky Way, pinpointing the 3D positions of 1.1 billion stars, 400 million of which were previously unknown to science.

ESA's Gaia space observatory mapped out the catalogue. It is expected to transform what astronomers know about the Galaxy—allowing researchers to discover new extrasolar planets, examine the distribution of dark matter, and fine-tune models of how stars evolve.

Hundreds of astronomers began to access the database as soon as it was made publicly available on September 14, says Gaia project scientist Timo Prusti, who works at ESA's European Space Research and Technology Centre in Noordwijk, the Netherlands. "My advice to the astronomical community is: please enjoy with us," he said at a press conference in Madrid.

Gaia has already found more stars than researchers expected, which suggests that the Milky Way may be slightly bigger than previously estimated, says Gisella Clementini, a Gaia researcher at the Bologna Astronomical Observatory in Italy.

But few new results were announced at the catalogue's unveiling, as Gaia's team were only allowed to do limited analyses before the data release—contrary to the norm for space observatories, where mission scientists often have up to a year's exclusive use of their data before sharing them with the world.

One notable result, however, is a new measurement of the distance of the Pleiades, a cluster of stars in the constellation Taurus that has been the subject of a long-running controversy. Where numerous measurements put the Pleiades cluster at a distance of about 135 parsecs (440 light years) from the Sun, Gaia's predecessor, the Hipparcos mission, found it to be about 15 parsecs closer.

Gaia measured 134 parsecs, give or take 6 parsecs—suggesting that the Hipparcos findings were inaccurate. Anthony Brown, an astronomer at the Leiden Observatory in the Netherlands who chairs Gaia's data-processing collaboration, stresses that the results are still preliminary and that they could change once Gaia collects more data. (Ultimately, Gaia should be able to measure the distances of individual stars in the cluster for the first time, rather than an average.)

But there's scant possibility that Gaia's results will be corrected so much that they agree with the Hipparcos results, thinks David Soderblom, an astronomer at the Space Telescope Science Institute in Baltimore, Maryland. "It's not impossible but it sure isn't very likely at this point," he says. "That to me is basically the answer." Soderblom expects that the trouble with the Hipparcos measurement may have been in corrections made to account for the unusual brightness of stars in the cluster.

Gaia launched in late 2013 and started its scientific mission in July 2014. The preliminary catalogue released today is based on its first 14 months of data-taking. ***Gaia does not take still exposures in the way of ordinary telescope cameras. Instead, it constantly spins on its axis every six hours, watching stars leave streaks along its 1-gigapixel detector.***

By comparing scans of the sky taken six months apart, researchers are able to triangulate and measure stars' distances, using a method known as parallax that dates back to ancient Greece. For more than two million stars, the catalogue also includes accurate measurement of the stars' distances from the Sun and their motion, obtained by comparing Gaia data with Hipparcos's. In future releases, the catalogue will grow to include the distances and velocities of more than a billion stars.

With more years of observation, Gaia's measurements will become so accurate that the distances of many of the galaxy's stars will be pinpointed to within 1%.

"What Gaia is going to do is going to be phenomenal," says Wendy Freedman, an astronomer at the University of Chicago in Illinois. "It will be the fundamental go-to place for astronomers for decades to come."

This article is reproduced with permission and was first published on Sept.14, 2016.

Driverless Trains and Planes First, then Automobiles

Oct 11, 2016 by Stephen Mraz in A Skeptical Engineer

There's a lot of buzz these days about driverless cars, with several companies currently testing the technologies that could be used to make them a widespread reality. But surely there are other transportation modes that would be easier and more straightforward to make driverless or autonomous.

Take trains, for example. The driver or engineer in a train does little more than apply the throttle and brakes. They don't steer, they have no direct control over switches or routing, and they don't have to monitor traffic. Certainly algorithms, a few more sensors, and computer controls can be developed to handle almost any foreseeable situation.

In fact, the technology to automate trains has been around for at least 20 to 30 years, according to David B. Clarke, director of the Center for Transportation Research at the University of Tennessee. Need proof? At least 48 fully automated metro trains operate in 32 countries. Positive train control, a system mandated for most trains by last year, uses track sensors and onboard controls to prevent train-to-train collisions, trains breaking local speed limits, and trains running through construction/maintenance zones or travelling through mispositioned switches.

Commercial airliners would be next on the list of transportation modes to go pilot-less. Autopilots already do much of the flying, and there's relatively little traffic compared with what most drivers handle daily. If the Soviet Union could design a space shuttle that doesn't need pilots, surely airliners could be developed in the same vein.

Mind you, this wouldn't be a simple task, nor would it eliminate aircraft accidents. But however difficult coming up with robust emergency procedures may be, once they're in place, the autopilot will follow them—unlike human pilots, who have an alarming trend of ignoring them either on purpose or in the confusion. Currently, 60% to 80% of aircraft accidents are attributed to pilot error.

One step on the route to pilot-less planes is already said to be onboard many Boeing airliners: the Boeing Honeywell uninterruptible autopilot system. It lets the plane be flown remotely, much like a drone. It even prevents any onboard pilot or hijacker from controlling the plane.

The most difficult transportation mode to automate is probably the personal car and truck, though it's the one that gets the most attention. The hype is likely generated by companies invested to the tune of several billion dollars in driverless cars. But can driverless cars handle weather? Do fog, snow, and dust storms confuse the tracking and detection systems? Does snow built up on the sensors render them useless? Can vehicles recognize the difference between a broad two-inch-deep puddle and an underpass with six feet of water in it?

Currently, driverless cars must have a driver ready to take control at a moment's notice. That's hardly anyone's idea of a self-driving car. If the driver can't read, make phone calls, watch a movie, or sleep, and must pay attention to the car and its surroundings, what's the purpose?

Many of the benefits of driverless cars only materialize if everyone has one and they are all networked. How long will that take? Who sets the standards? Will it be mandatory? Can the average person afford it? Will cars that need a driver be outlawed? And when your driverless car rear-ends my driverless car, who (or whose insurance) pays? These decisions need to be made before autonomous cars become common, and there probably needs to be federal laws and standards rather than state or local ones.

Perfecting and testing the technology takes time, as do passing legislation and educating the public. Let's hope it's done right if it's going to be done. And why jump to cars before tackling trains and planes? I have my suspicions.

Capture Area

Effective aperture is directly related to gain and operating wavelength of the system, nothing else. Physical size does not enter the equation, nor does conductor surface area. While certain very large antennas with very low loss may have a rough relationship between physical area and effective aperture, that relationship is more coincidental than a rule with typical antennas we use. Only certain structures, like parabolic reflector antennas, horn antennas, and mattress arrays, approach a 1:1 effective aperture to physical aperture relationship.

Using equations derived from or embedded in the above engineering text , we find the following effective apertures or capture areas:

Antenna type	**Formula**	**Effective Aperture is**	**Physical Aperture is typically**
Isotropic	$\lambda^2/4\pi$	.0796 wavelength squared	0
Short dipole, any length under .1λ	$1.5\lambda^2/4\pi$	.12 wavelength squared	<<.001 square wavelength
1/2 wave dipole	$1.64\lambda^2/4\pi$	.13 wavelength squared	<.001 square wavelength
full wave quad loop, 1/4λ on side	$2.1\lambda^2/4\pi$	.167 wavelength squared	.0625 square wavelength

Or using $Ae = \lambda^2G/4\pi$ where G is the "multiplication" (not in dB) we have $.13\lambda^2$ for a dipole.