ANOMALOUS PROPAGATION

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

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Annual Society membership is $ 12.00. Please make checks payable to Gerd Schrick

MIDWEST VHF-UHF SOCIETY

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

Contents

A Happy Thanksgiving
&
A Very Merry Christmas to All!
The Editors
and Oficers of MVUS

Pres. Tom Holmes, N8ZM
Vice Pres. Bob Mathews, K8TKQ
Secretary, Steve Coy, K8UD
Treasurer, Gerd Schrick, WB8IFM

The Midwest VHF/UHF Society has **noise sources** available in two frequency ranges: 50 MHz to 3 GHz, and 3 GHz to 11 GHz. Both versions are fully assembled and tested with ENR data provided. The lower frequency version is currently in stock at $50 including shipping in the USA. The 11 GHz version is $95, but delivery is about 8 weeks ARO. Contact N8ZM at **n8zm@mvus.org** for more details.

DE N8ZM

I am always amazed at how fast the last few months of a year fly by. Maybe it's because I've been keeping busy with work, home projects, VHF contests, and a couple of ham radio related conferences. I mentioned Microwave Update last month, but really didn't say much about the TAPR Digital Communications Conference in September. Gerd has been after me to write something up about it, so later in this issue I will hopefully have remembered enough to provide a useful report, as well as entice you to consider attending next September's conference currently planned for Austin, TX. This ought to be enough notice for you to get it on your calendar. End of shameless plug including the obligatory full disclosure since I am a TAPR member and the Treasurer.

If I stayed home more I might get more done on a couple of MV US projects, notably the replacement TX for the 1296 beacon so that W8RKO can have his 817 and transverter back, and a design for a 2304 beacon antenna so that we can proceed with that project as well. Also, there is interest in putting up a 432 beacon which may only require us to build the TX portion as the 1296 beacon antenna seems to radiate pretty well there too. Probably just the SWR putting the current on the outside of the coax and since that is exposed and 800 feet in the air, it radiates. The pattern might be a bit strange and the polarization a tad mixed up, but if it works…

I have also been working to keep the 900 MHz repeater project moving along, even if at a snail's pace (which seems to be pedal to the metal for MVUS projects). Some Motorola radios have been programmed and will soon be on their way back from California, and Mike, N8QHV, is working on the Johnson radio conversion. K8UD has offered his office building for a temporary site for check out and debug. It can live there until we find a higher and more permanent place for it. I know some of you wonder how much it will be used but as there are not any other 900 Repeaters in the area (at least none are shown in the OARC directory any closer than Cincinnati), it will add to the local capability.

What I would really like to find is another money-making project for us. We have done many different things over the years from selling a boatload of surplus radar detectors and parts therefrom, to the noise sources. (BTW, I still have maybe a couple dozen radar detectors in storage if anyone has any ideas). The noise sources have sold pretty well but I don't expect to sell very many more of them. A beacon takes around $1000 to put together unless we just happen to have all the pieces handy. The 900 MHz repeater will will likely total less than $200 hundred since we really should not have to invest in much hardware. The idea is for each project to put a few extra sheckles in the bank to fund the next one. But I need some help with ideas. If I can find the list we made several years ago which contained a number of suggestions for projects (the noise source won out that time), we can revisit the other ideas and see what might be next on the list. Something to think about.

Well, that's enough for now. See you all on the 22nd at the MCL.

73, Tom, N8ZM.

This and That 11-13

Supersize This. It's not just the American people who have been getting fatter-their animals have been too. The National Pet Obesity Survey recently reported that more than 50 percent of cats and dogs-that's more than 80 million pets-are overweight or obese. [CBSNews.com]

Chicken Nuggets. Take, for instance, the chicken nugget. A paper by The American Journal of Medicine looked at two nuggets from two different, unidentified national fast food chains: Each was comprised of just 50 percent or less muscle tissue, which is what we typically define as chicken, Reuters reported. The rest of the pair of nuggets was made up of a hodgepodge of pure fat, blood vessels, and pieces of bone, nerves and cartilage.

Asteroids Earth is not prepared for the threat of hazardous rocks from space, say astronauts who helped formulate the U.N. Measures adopting an Asteroid Defense Plan.

Engineering It is a great profession. There is the satisfaction of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men. Then it elevates the standards of living and adds to the comforts of life. That is the engineer's high privilege. [Herbert Hoover]

The Fools. A common mistake that people make when trying to design something completely foolproof is to underestimate the ingenuity of complete fools. - [Douglas Adams]

HE-Washers. That would be "High Efficiency" washing machines. Of course, you will need HE-detergent for those. Why? Because the manual says so! That is what we call the military approach. Just follow orders! Well, it turns out that regular detergent foams too much, needed for the old washers. The foaming "agent" is a salt, could be your regular table salt! Leave it our and you got HE-detergent. Of course, when leaving this out they have to charge you more. Remember when they took the lead out of the leaded gasoline. Had to cost more? Of course! [Gerd, WB8IFM]

Golden Oldies. "It's the conceit of every generation that its music is the only music fit for human eardrums and all music that follows is just so much noise." [D. L . Stewart]

Quiet Cooling. Silent air-cooling is not a fan, since it does not use a rotating blade to move air. It uses an electric field and charged air to create airflow. [Jennifer Hand and Comsol]

Fat Cats. And fat dogs... American pets have been getting fatter... more than 50% of cats and dogs -that's more than 80 Million pets- are overweight or obese. [CBSNews.com]

Trophies Everywhere. "Trophies were once rare things," but manufacturers now churn out $ 3 billion worth of them a year. In one California youth soccer league, every player gets at least one trophy, and a third get two. [Ashley Merryman, NYT]

100 years Ago. Here are the 10 greatest inventions from the period of the last 25 years prior to 1913: 1) Wireless Telegraphy, 2)Airoplane 3)X-ray machine 4)Automobile 5)Motion pictures 6)Reinforced Concrete 7)Phonograph 8) Incandescent electric lamp 9) Steam turbine and 10) Electric car. (What a selection! Ed.) [From the Scientific American Nov 1913]

Brain Washing. Not what you think! "The brain physically cleans itself during sleep, essentially running a nighttime rinse cycle that flushes out toxins that build up during the day."
[Neurologist Maiken Nedergaard]

India launches spacecraft to Mars 5 November 2013

India has successfully launched a spacecraft to the Red Planet - with the aim of becoming the fourth space agency to reach Mars.

The Mars Orbiter Mission took off at 09:08 GMT from the Satish Dhawan Space Centre on the country's east coast.

The head of India's space agency told the BBC the mission would demonstrate the technological capability to reach Mars orbit and carry out experiments.

The spacecraft is set to travel for 300 days, reaching Mars orbit in 2014.

If the satellite orbits the Red Planet, India's space agency will become the fourth in the world after those of the US, Russia and Europe to undertake a successful Mars mission.

In order for the MOM to embark on the right trajectory for its 300-day, 780-million km journey, it must carry out its final orbital burn by 30 November.

What ordinary Indians think of the country's mission to Mars

Some observers are viewing the launch of the MOM, also known by the informal name of Mangalyaan (Mars-craft), as the latest salvo in a burgeoning space race between the Asian powers of India, China, Japan, South Korea and others.

The last few numbers of the countdown came over the tannoy. Three, two, one, zero. Then silence. A second later, a white-hot fireball rose above the tree line shrouding the launch site from the watching media. Then came a roar of sound and India's first ever mission to Mars was on its way.

Some of the journalists clapped and cheered as the rocket soared higher, a trail of white smoke bubbling behind. No one was interested here in questions about India's priorities. First stage normal, intoned the countdown announcer.

The fireball was becoming a distant speck in the sky above the Bay of Bengal. Camera crews and reporters were already starting to pack their gear. India's Mars probe is not due to reach the atmosphere of the Red Planet until next September, but the first stage of the mission went as planned.

Prof Andrew Coates, from University College London's Mullard Space Science Laboratory, told BBC News: "I think this mission really brings India to the table of international space exploration. Interplanetary exploration is certainly not trivial to do, and [India] has found some interesting scientific niches to make some measurements in."

Those niche areas include searching for the signature of methane (CH_4) in the Martian atmosphere, which has previously been detected from Martian orbit and telescopes on Earth. However, Nasa's Curiosity rover recently failed to find the gas in its measurements of atmospheric gases.

CH_4 has a short lifetime in the Martian atmosphere, meaning that some source on the Red Planet must replenish it. Intriguingly, some 95% of atmospheric methane on Earth is produced by microbes, which has led some to propose the possibility of a biosphere deep beneath the Martian surface. But the gas can be produced by geological processes too, most notably by volcanism.

Definitive conclusions are likely to be elusive, but the spacecraft's Methane Sensor for Mars (MSM) instrument will aim to make measurements and map any potential sources of methane "plumes".

The spacecraft will also examine the rate of loss of atmospheric gases to outer space. This could provide insights into the planet's history; billions of years ago, the envelope of gases around Mars is thought to have been more substantial.

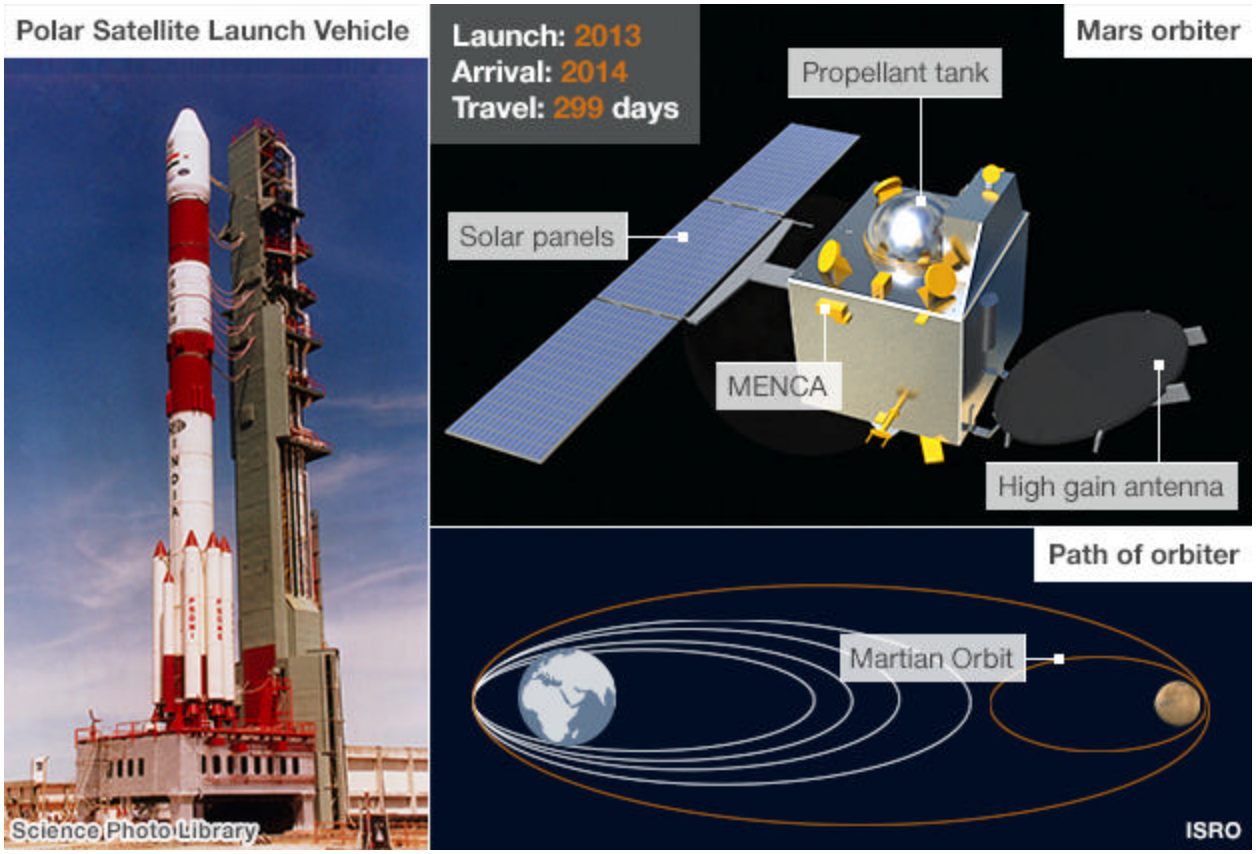
At $72m (£45m), the mission is comparatively cheap, but some commentators have still questioned whether a country with one of the highest rankings for childhood malnutrition in the world should be spending millions on a mission to the Red Planet.

In one sense, India was left with reduced options because of the failure of its most powerful launcher, the first choice to loft the MOM into orbit. That left the country's space agency without a means to fire the satellite directly out of Earth's atmosphere.

As a fuel-saving alternative, the spacecraft will circle Earth in an elliptical orbit for nearly a month, building up the necessary velocity to break free from our planet's gravitational pull.

The formal name for the route MOM will take to Mars is a "Hohmann Transfer Orbit". The spacecraft takes advantage of a favourable planetary alignment, carrying out six small engine burns over November to lift it to a higher orbit before a final burn sends it off on an interplanetary trajectory.

The difficulty of visiting the Red Planet will not be lost on Indian officials; just under half the total attempts to reach Mars have succeeded. But Prof Coates said the planned mechanics for getting to Mars were on a sound footing, and that the probe stood a good chance as long as its engines fired correctly.



Mars mission history

The USSR, Russia, US, Britain, Europe, Japan and China have all launched missions to Mars

- There have been around 40 missions (but the total depends on how they are added up)
- More than half the world's attempts to reach the Red Planet have failed
- Only the US, USSR and Europe have been successful to date

Those who defend India's current direction in space exploration say the technological development required to mount this mission could indirectly benefit the country's other activities, including poverty reduction.

Nisha Agrawal, chief executive of Oxfam in India, told the BBC: "India is home to poor people but it's also an emerging economy, it's a middle-income country, it's a member of the G20. What is hard for people to get their head around is that we are home to poverty but also a global power.

"We are not really one country but two in one. And we need to do both things: contribute to global knowledge as well as take care of poor people at home."

K Radhakrishnan, chair of the Indian Space Research Organisation (Isro), told the BBC's India Business Report: "Why India has to be in the space programme is a question that has been asked over the last 50 years. The answer then, now and in the future will be: 'It is for finding solutions to the problems of man and society.'

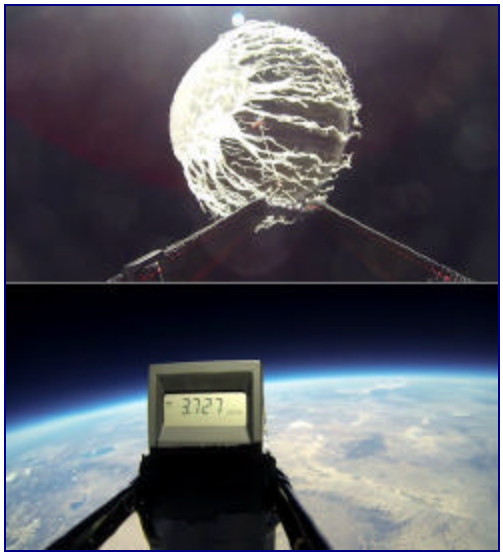
He added: "A great revolution has taken place over these last 50 years in the country by a meagre expenditure that has been put into the space programme."

Mr Radhakrishnan played down talk of a race between China and India in space, commenting: "We are not in a race with anybody, but I would say we are in a race with ourselves. We need to excel, we need to improve, and we need to bring new services."

But a successful launch would allow India to surge ahead of regional rival China, at least in the exploration of Mars. China's Yinghuo-1 spacecraft was to have reached Martian orbit in late 2012. But it was piggybacked on the Russian Phobos Grunt spacecraft, which became stranded in low-Earth orbit shortly after launch in November 2011.

The MOM was to have been launched as early as 28 October, but rough weather in the Pacific forced officials to postpone lift-off.

SPACE WEATHER BALLOON UPDATE : Members of the Earth to Sky Calculus science club have recovered the space weather balloon they launched on Oct. 27th. The payload, which landed in a remote area of California's Inyo Mountains, carried two high-energy radiation sensors into the stratosphere. These pictures show the erupting balloon and one of the sensors at the apex of the flight, 27 km (90,500 feet) above Earth's surface:



The reading on the LCD screen shows a dose rate of 3.7 uSv/hour, more than 20 times higher than radiation levels at the launch site. Another independent sensor was contained inside a thermally insulated capsule. Working together, the two sensors measured a complete profile of ionizing radiation from 2.8 km to 27 km above Earth's surface.

This experiment was prompted by a recent NASA report concerning the effects of space weather on aviation. Like astronauts, ordinary air travelers can be exposed to significant doses of radiation when the sun is active. The Oct. 27th flight showed that it is possible to count x-rays, gamma-rays, alpha particles and beta particles using relatively inexpensive equipment. Such data can be used to check and improve research models of radiation percolating through Earth's atmosphere.

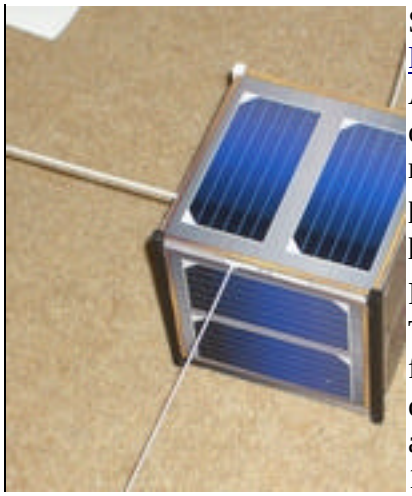
Another balloon flight could be in the offing. Solar activity is high, and a new fusillade of X-flares could trigger a radiation storm around Earth. If so, the student scientists plan to send their sensors back to the stratosphere for another look. [NASA Spase News, 11-2-2013]

Ham Radio in Space :

Massive Satellite "Cluster" Launch Set for November 21

A *Dnepr* launcher set to lift off from Dombarovsky, near Yasny, Russia,on November 21 will carry more than two dozen satellites from 13 countries. Individual satellite teams are now in Yasny preparing their payloads for launch. Several of the satellites will carry Amateur Radio payloads, marking this as the largest single deployment of ham radio satellites. Paving the way for this month's event was the August 22 *Dnepr* launch of the KOMPSAT-5 satellite from Korea -- the first *Dnepr* launch in 2 years. This month's launch had been postponed for more than a year to work the wrinkles out of the Dnepr program. The DubaiSat-2 Earth-imaging satellite will be the principal payload of this cluster mission.

Some of the satellites headed into orbit will be contained within the Italian UniSat-5 microsat package. UniSat-5 will include a pair of UHF transceivers operating 9k6 GMSK AX25 protocol. From "PocketQube" launchers, UniSat-5 will deploy several smaller satellites, and one of the smaller satellites will release yet another satellite, reminiscent of decorative Ukrainian eggs within eggs. UniSat-5 will deploy Eagle-1 (BeakerSat-1), Eagle-2 ($50Sat), QubeScout S1, estar-2 (CW and 1k2 AFSK UHF downlink), Wren, and PUCP-Sat-1, which in turn will disgorge Pocket-PUCP, a tiny spacecraft built by students in Peru that will carry four temperature sensors and transmit the data using a 10 mW CW UHF transmitter using 30 kHz FSK.



Scheduled to be among the other Amateur Radio-payload carrying satellites is FUNcube-1, a 1U CubeSat that is a collaboration between AMSAT-UK and AMSAT-NL. It will carry an "educational beacon" (1200 baud BPK -- daytime operation) and a 20 kHz wide U/V inverting SSB/CW transponder running 300 mW PEP (nighttime operation). A project begun in 2009, FUNcube-1 will provide a signal *directly* to schools, with the "target audience" students at the primary and secondary levels.

FUNcube-1 is the middle 1U CubeSat of three sharing a 3U launch vehicle pod. The other two are ZACUBE-1 -- the first South African satellite -- and HiNCube from Norway, which will identify and transmit housekeeping data in the 70 centimeter band in CCSDS protocol. ZACUBE-1, in addition to carrying VHF and UHF communication equipment, has a 20 meter beacon that will transmit on 14.099 MHz.

Another Amateur Radio satellite, Delfi-n3Xt, is a 3U CubeSat developed by the Technical University of Delft in the Netherlands. It will feature a 40 kHz wide U/V transponder that will be activated after other experiments are completed, as well as a high-speed S-band downlink.

Triton-1 and Triton-2 are 3U CubeSats each carrying a science mission and an Amateur Radio payload. Triton-1 includes two single-channel U/V FM-to-DSB transponders. Triton-2 will a single-channel U/V FM-to-DSB transponder and a single-channel U/S FM-to-FM transponder. The science mission is expected to last 3 months, after which the Amateur Radio payloads will be activated. Read more. -- *AMSAT-UK, AMSAT-NA,* Gunter's Space Page, Nader's Satellite Blog

What's New in VHF/UHF and Up? By Gerd, WB8IFM

As a doorprize at MUD (Microwave Update) I picked the proceedings of the Central States conference that was held back in July.

The papers presented give you a good snapshot what occupies the hams at this point in time regarding the higher frequencies. So I'd like to pick a few articles and briefly describe them. Maybe you get some ideas of your own.

1) With the computer, sri, I mean all the digital gadges some of them with “wireless” links, there are invariably emissions that interfere with what we are doing as hams.

The article is : “Slaying the Grimm Reaper of Internet Router Noise on 6m.” by Joel Harrison, W5ZN. Joel experienced an elevated noise level (10db) and birdies all over the 6 m band. Discussing this problem, Ward Silver, N0AX, suggested I review 'RFI, Ferrites and Common Mode Chokes For Hams' by Jim Brown, K9YC, [audiosystemsgroup.com/publish.htm] After reading and applying the information from Jim's article I was extremely pleased with the result of eliminating all the Internet router birdies in addition to a reduction in my noise floor.

2)There are two papers dealing with towers, the first one by Phil Theis, KI3TUF, is titled: “How to be Safe when Installing and Maintaining – Antennas, Towers and Support.” In 48 slides, Phil thouroughly illuminates all the aspects of the subject. Let me just print the opening slide:

First some Questions:
Where is the First Aid Kit
Does everyone have a Hard Hat
Where is the Phone to call 911
` What is the Work Plan
Has someone inspected the Anchor Points

I think you realize that Phil gives you a thourough list what to consider!

3) EME, the ham equivalent of what is a trip to Mecca for a Muslem, is the subject of two papers: “Small Station EME” by Al K2UYH and “Working Small Stations on 10 and 24 GHZ EME using WSJT” by Al Ward, W5LUA. In both papers, the use of the WSJT computer program is part of the success. The other, of course, is the presence of a pool of stations around the world with larger antennas and more power, eager to work another station. Nevertheless here you read about how to do it and what thrill it is to get it done!

Using a standard satellite station for EME.

By Gerd, WB8IFM 11-12-2013

Every so often one has to stop and think about where we stand and where we want to go. We've been passing out a page "Amateur Satellites" for years. In it we describe how radio amateurs and satellites work and as an aside it is mentioned, that using Oscar 0, that's what we call the moon, is the ultimate accomplishment.

I just went to the MUD (microwave update) conference in Kentucky, listened to all the presentations and then for a door prize picked the proceedings of the Central States conference that took place just a few weeks prior in Illinois. Both conferences with their cross section of treated subjects gave me a good feeling of where we stand and where we might go. Two articles in particular caught my attention: They dealt with relatively simple satellite set-ups that were used to make EME (earth moon earth) contacts.

Presently you can make contacts using one of the many birds (approx 20 or more at any one time) as a training ground to learn the ropes, which involves building antennas, learning about polarization, maybe even trying circular. Then you learn about "low noise preamplifiers", how to avoid long coax cables, and moderate power amplifiers, meaning in the 50 to 100W range. A most important thing is the timing and position tracking of the satellite. This latter task, of course, is done by computer, which simplifies it to the point that it is easy to keep the antennas on the satellites as they move past your QTH. All these Ham Radio satellites now in orbit fly low and fast, so every second counts. Furthermore there is the Doppler shift on both the up link and down link. Fortunately, this also can be taken care of by computer. But still communication is limited to the essentials. I never was attracted to this type of operation. So I am one of the many old timers that are in "standby" mode, waiting for a decent dx bird, like we last had with Oscar 40.

So here is my suggestion: as we are waiting for P3E, why not try EME with Oscar 0. You see, the possibility to do this with an amateur radio satellite set up has existed for years. The dirty little secret for this is actually all persuasive around us everyday! It is digital data compression and signal processing! And the digital receiver development has many hams made aware of some fantastic features of the new equipment! Compression saves bandwidth and with this you have less noise to compete with, and signal processing algorithms actually allow us to pick up signals many s-units **below** the noise level. As an example, how do you think we communicate with the Voyager spacecraft billions of miles out. The size of the antenna on the spacecraft is only in the range of a few feet and the power is also nothing to brag about. Of course, for the ground station here on earth we do have some big antennas and lots of power but still not nearly enough to copy a signal the usual way. So signal strength is traded for time, you have to give the signal time to build up readability.

Claude Shannon developed the formula for this back in 1938 and the simple equation

$$C=B \times \log_2 (1 + S/N)$$

indicates what the rules are! C is the channel capacity in bits per seconds, B is the bandwidth in Hz, S is signal and N is noise.

Now one of the question: what do we learn from satellite radio that helps us to communicate using the moon? Of course, like with a magician there is a trick: 1) a computer program from the WSJT family (weak signal software by K1JT) was used and 2) the other station was a decent regular EMEer. As everybody knows, if the other guy has a big antenna and lots of power, you can hear him well and your flea power is no big deal as his ears are geared for weak signals. And the WSJT programs are specifically designed for EME and weak signal communication. In fact they do provide processing gain and can decipher signals several S-units below the noise which helps both stations.

The things Sat Radio could offer the EME community: umpteen tracking programs and , of course , rotors that routinely are cranked in AZ and El. But something that to this day really plagues the EME is the unpredictable polarization of the signal returned from the moon. For this in satellite communication circular polarization is being used. So whatever happens to the polarization, you are prepared. The matrix below details the "interaction of various polarizations". As you can see there is a penalty of three dB at all combinations vs the linear case, however, without the circular polarization the penalty varies between zero and infinity. What would you rather have?

Whenever I brought this idea up to EMErs the argument for not using "circular" was, that only half of the antenna is being used and that seemed to be a lot. As their antennas are usually BIG. On my side the argument was, so you loose 3 dB, BUT you always have the correct polarization. If you use a WSJT program , however, a 3db loss should not be much of a sacrifice for the advantage to eliminate moon polarization for good.

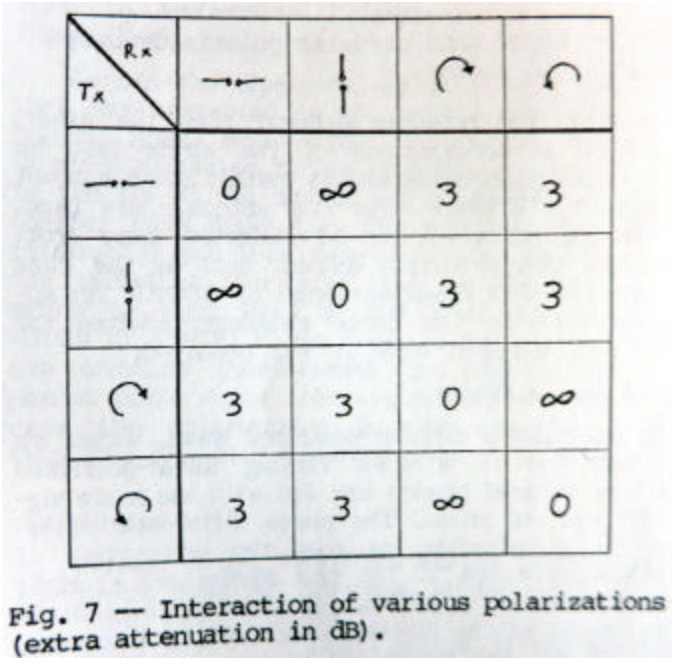


Fig. 7 — Interaction of various polarizations (extra attenuation in dB).

Fig. 7 from page 153 in the ARRL Antenna Compandium Vol 1