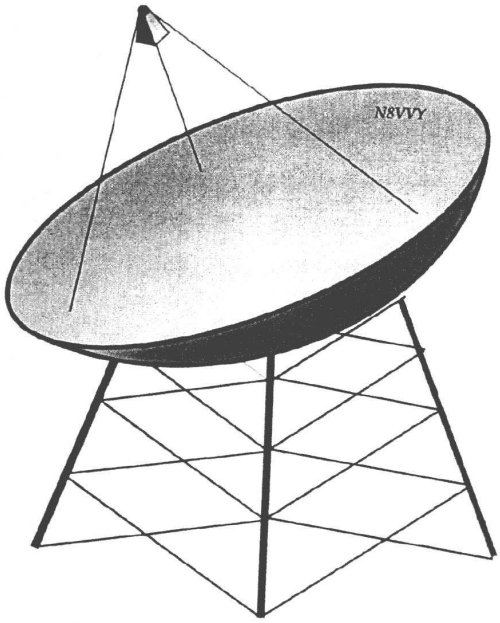
ANOMALOUS PROPAGATION

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



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MIDWEST VHF-UHF SOCIETY

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

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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 K4TO daily. 1W @ 5,760.000 MHz

Contents

Wishing all of you “Happy Thanksgiving” and a “Very Merry Christmas”

DE N8ZM.

Seems like the last month has gone by pretty quickly. Maybe it was the 3 week work/vacation trip to California that caused that effect. Maybe it was that driving nearly 6000 miles to get there and back numbs the mind to passing time. Doesn't matter, I suppose, since we had a great time and saw many friends, ham and otherwise, along the way. Camped at the Grand Canyon and Big Sur. Highlight of the trip: getting to see the Very Large Array in person in New Mexico. I seem to have an obsession with dish type antennas so this place is really hits the spot. I'll send Gerd a couple of pictures to include in this issue of Anom Prop.

I will say that for being out in the middle of nowhere and an hour drive from anything resembling modern civilization, this place really puts on a nice show for the visitors. They have a very nice Visitor's Center and Gift Shop, and the self-guided walking tour is well organized and includes some very interesting things to see besides just the array of dishes, such as the Ron Bracewell Sundial. Google it. There is also a 25 minutes movie about the VLA and radio astronomy in general, narrated by actress Jodie Foster. Apparently after she filmed parts of her movie Contact there, she wanted to do something special as a thank you gesture.
Another interesting display is a working 7 GHz receiver mounted on a steerable feed horn, with the output feeding a simple analog voltmeter. Visitors can aim the feed over a large portion of the sky and observe the received noise level on the meter. As an experiment, I held my hand about 6" in front of the horn to see what would happen. The reading went from about 1.25 Volts to about 2.1 Volts! Physicists will tell you that any warm body radiates at not just infra-red frequencies but actually over the whole spectrum, so this is proof that I am actually alive. OR, there was enough LO leakage that I created a substantial SWR with my hand. I prefer the first explanation.

Having been on the road so much, I haven't really been keeping up with the progress of MVUS matters, so won't have much to say (you should stop cheering now or you'll miss the rest of my message).
The November meeting is planned for the Friday after Thanksgiving (the 28th) so that you can maintain your fighting weight AND your tryptophan addiction for another day. Did we decide that the 26th was too close to Christmas for the December meeting? Let me know. BTW, I will miss the November meeting as my family scheduled our feast for Friday night to accommodate all of the various 'other families' involved. Do try to stay out pf trouble and remember to tip the nice young ladies who keep our glasses filled and clean up after us.

de Tom, N8ZM.

Rover Report from Lloyd, NE8i/R (Sep/Oct)

On Sat Sept VHF morning was the Grand Rapids swap. KF8QL/R, K8DOG/R and I were set up near the door. Usually one of us was there to answer questions, provide tours. I rovered around with them.

The Sept. VHF produced quite a bit of activity and we enjoyed that. 8Grids, and 150 or so contacts. 6M, a tiny bit of sporadic but mostly quiet. Weather was perfect.

In Oct we will be at OP hill, EN82em Milford/New Hudson Mi. Was there in Sept. with K8RAY.
In Nov we have to see what the weather will do. From Dec to April we will work from home.

For the Sept. 10 GHz cumulative it was windy, rainy and cold. Wind makes microwave paths difficult. It takes lots of brute force. I found my main station did not work well. Too many problems. Bill, W3IY, promoted MAD as a chance to try out equipment. Try things. Fix and repair things. W9ZIH said about wind: it makes microwave paths rough! It's best to find something else to do. Go walk the cat, etc...

Saturday drove down to GP Hill, EN82em, operated with WA8UPD. Wind was 20mph+ rough on microwave paths. It's also difficult to aim and keep antennas aligned. Cont. pg 10

This and That 11-14

Learning. "Give a student something to do, not something to learn; and the doing is of such a nature as to 'demand thinking'; learning naturally results." [John Dewey]

Audio Compression. "Lossy" audio compression typically achieves far greater compression than "lossless" compression. (non essential parts of the audio are left out, so you may not recognize the voice, but you still understand every word. Ed.) Lossless still has 50 to 60 % of the original data, while the lossy compression gets the stream down to 5 to 20 %. [Wikipedia]

Research into the vernacular turns up far more synonyms for "enemy" than for "friend." For "drunk" than for "sober'. For "death" than for "birth". Explain the why of that. [L.M. Boyd]

War. "The grim fact is that we prepare for war like precocious giants, and for peace like retarded pygmies." So said Canada's Prime Minister of the1960s, Lester Bowles Pearson. [L.M. Boyd]

The Uneducated. Three out of five prison inmates can't read or write. [L.M. Boyd in 1995]

Fusion. The elusive process of nuclear fusion, so far only demonstrated with the hydrogen bomb is coming. Lockheed Martin announced it is building a compact fusion reactor (would fit on the bed of a small truck) and plans to test in less than a year. In ten years it will be ready for marketing. [Jaime, Elektor Labs]

Kilimanjaro. The highest (~6km almost 20,000 ft.) mountain and the only place in Africa, where you can find snow year round, is losing it. There is also a huge crater on top, telling about the mountains volcanic history. At this point roughly 90% of snow has melted and it is expected that by 2030, the last snow will be gone. [Film on DW-TV]

15W X-Band High Power Amplifier. The MAAP-015036, a two stage 8.5 – 10.5 GHz GaAs MMIC power amplifier, has a saturated pulsed output power of 42 dBm, a large signal gain of 17 dB and a typical 43 % power added efficiency. The power amplifier can be biased using a direct gate voltage or using an on-chip gate bias circuit. Furthermore, the device offers dual sided bias architecture for optimum flexibility in assembly and board design. [Microwaves and RF Update, 11-10-2014]

Awards given like Candy. "If 98% of kids think lying is morally wrong, why do 98% of kids lie?" [D.L. Stewart]

Lithium Battery. If your Lithium battery loses its charge quickly, like in a day or two, the battery might be at the end. There is one thing everybody should learn about Lithium batteries: they do not like to be completely discharged. So keep an eye on this situation. [Gerd, WB8IFM].

Where is the USA? An Amateur moon mission (M4) piggyback on a Chinese rocket in October, a landing of a German robot on a comet in November (Rosetta), and a (sri two) Phase 4 transponders planned by the Quatary Radio club (supported by Germany with the building of the transponders) in late 2016 . Unfortunately the footprint will be centered over 26 degree East, thus not covering the US. [Gerd, WB8IFM]

Interstellar. As one review stated: complicated, but well worth seeing. My assessment: A cinematographic masterpiece! A piece of art! What does art do for you? It makes you "Think!" You see the dust bowl, von Braun wheel, the 5th dimension, experience wormholes and black holes, professors, their blackboards. Human frailty, weakness, relativity, time travel where you can easily make it to 124 years; also, ham related: binary beats Morse and no problems whatsoever with "com". Almost forgot the robots: out of this world. [Gerd, WB8IFM]

POLAR BEARS. The polar bear population dropped 40% in the area north of Alaska and northern Canada in the last decade.. [HuffPost]

Weak Signal Communication Software (from the WJSJT Homepage)

WSJT, MAP65, WSPR, and WSJT-X are open-source programs designed for weak-signal digital communication by amateur radio. Normal usage requires a standard SSB transceiver and a personal computer with soundcard. SDR-style hardware including the SDR-IQ, Perseus, SoftRock, and FUNcube Dongle is supported by MAP65 and WSPR. SimJT is a utility program that generates simulated signals for test purposes. Ready-to-run Windows versions of all programs are available for free download, and the programs (except SimJT) can also be compiled and used under Linux, OS X, and FreeBSD. For details about source code and operating systems other than Windows, see the Program Development page.

WSJT ("Weak Signal Communication, by K1JT") offers specific digital protocols optimized for EME (moonbounce), meteor scatter, and ionospheric scatter, at VHF/UHF, as well as for HF skywave propagation. The program can decode fraction-of-a-second signals reflected from ionized meteor trails and steady signals 10 dB below the audible threshold. Check the WSJT page and links therein for details about modes JTMS, FSK441, ISCAT, JT6M, JT65, and JT4.

WSJT-X implements JT9, a new mode optimized for weak-signal communication on the LF, MF, and HF bands. JT9 is about 2 dB more sensitive than JT65 and uses less than 10% of the bandwidth. A beta release of Version 1.4 of WSJT-X was released on October 1, 2014; further program enhancements are under active development . Plans call for the eventual inclusion of the other popular modes now supported in WSJT.

MAP65 implements a wideband receiver for JT65 signals, optimized for EME on the VHF/UHF bands. It can be used together with Linrad (by SM5BSZ) or SDR-Radio (by HB9DRV), or with direct input from a soundcard or FUNcube Dongle. The program decodes all JT65 signals in a passband up to 90 kHz wide, producing a band map of callsigns sorted by frequency. In a dual-polarization system, MAP65 optimally matches the linear polarization angle of each signal, thereby eliminating problems with Faraday rotation and spatial polarization shifts.

WSPR (pronounced "whisper") stands for "Weak Signal Propagation Reporter." This program is designed for sending and receiving low-power transmissions to test propagation paths on the MF and HF bands. Users with internet access can watch results in real time at WSPRnet. Version 2.11 of WSPR includes FMT, a package of command-line utilities that can help you make highly accurate frequency measurements without expensive laboratory equipment. Experimental version WSPR-X is also available, offering an optional mode WSPR-15 with 15-minute transmissions and better sensitivity by about 9 dB.

SimJT generates JT65 and CW test signals with user-specified signal-to-noise ratio. It is useful for testing the JT65 decoder and the relative capabilities of these two modes.

Home Contact K1JT

VSWR: Why It Does Not Mean As Much As You Think

By Dr. Al Torres, KP4AQI

Most hams are obsessed with the Voltage Standing Wave Ratio (VSWR) of their antennas. It drives them crazy not having a very good VSWR. So let us take a look at the VSWR concept. In order for proper radiation from an antenna, two essential items must take place. You must feed the antenna with RF Power and then the RF Power must be transferred to free space. How good you transfer the RF Power to the antenna is what we call VSWR; how well the antenna transfers the RF Power to free space we call Antenna Efficiency. So let us first address VSWR. What is a good VSWR? Is 2:1 good enough? Most hams will say no. They want a number better than 2:1. So how much "RF power" have we transferred with a VSWR of 2:1? The power transferred is shown by Table 1.

Table 1: VSWR vs Power Transfer Percentage

VSWR	POWER TRANSFER (%)
1.0:1	100
1.25:1	99
1.5:1	96
1.75:1	93
2.0:1	89
2.25:1	85
2.50:1	82
2.75:1	78
3.0:1	75

A 2:1 VSWR is approximately 89% (not bad); even at 3:1 we are transferring approximately 75% of the transmitter power. If you do not want 2:1 how about 1.5:1 which is approximately 96% power transfer. Unfortunately, VSWR is also dependent on the antenna frequency bandwidth so it is not going to be same for all the frequencies over the antenna frequency domain. Even broadband antennas have a small VSWR variability.

The second area of consideration is "antenna efficiency". Antenna Efficiency is for most hams very hard to measure or estimate. A very simple way for measuring antenna efficiency is to use the "Wheeler Cap" method, which I have used many times. The explanation of the Wheeler Cap method is outside the scope of this article but it can be best summarized by saying that you want to have the higher radiation resistance with the lowest ohmic resistance. High ohmic resistance makes the antenna very inefficient while high radiation resistance makes the antenna very efficient. Antennas made from good low loss materials (like Copper) are more efficient than antennas made from Aluminum. Antennas with traps are less efficient than antennas with no traps. Some examples of antenna efficiency are shown by Table 2:

Table 2: Typical Antennas and Antenna Efficiency

Antenna Type	Efficiency
Monopole: Copper Wire	93%
Dipole: Copper Wire	92%
Most Antennas: Aluminum	50-60%
Rubber Ducks:	15-20%
Dummy Load:	1%

So if you have a ¼ wave 2 meters monopole made from Copper with a VSWR of 2:1, and then you have a Rubber Duck antenna with a VSWR of 1.5:1, and finally you have a Dummy Load with a VSWR of 1.0:1, which do you think will perform the best? The 2 meters ¼ wave is 93% efficient x VSWR of 2:1 (89%) which gives you a total efficiency of 83%. The Rubber Duck is 20% efficient x a VSWR of 1.5:1 (96%) for a total efficiency of 19%. The Dummy Load is 1% efficient x a VSWR of 1.0:1 (100%) for a total efficiency of 1%. So the conclusion here is that VSWR does not mean as much as you think; you must take into account the radiation efficiency of the antenna in addition to the VSWR uniquely.

A word of caution: ***the lowest VSWR will not produce the best antenna performance; the optimum value is very close to the lowest VSWR. You can determine this value by using a field strength meter for peak radiation value while adjusting the VSWR with a matching unit. It will not be the lowest VSWR!***

So start with a good efficient antenna (Copper material or Silver if you can afford it). Eliminate lossy components (baluns, right angle connectors e.g. elbows, etc.); select the best performing feedline, adjust the antenna for a low VSWR but not the lowest and measure the performance with a field strength meter. **Now, declare victory!**

2014 Microwave Update (MUD)

by Joe Muchnij N8QOD

I drove to Rochester NY for MUD and met a number of interesting Hams --the only ones there I knew previously were Jeff Kruth, WA3ZKR, and Kent Britain, WA5VJB. Kent and I had some interesting discussions over Friday's dinner, but I'll keep their content priivate.

Several people discussed recent 78 GHz activities: Alan Devlin and David Smith, VK3XPD & VK3HZ, set new Australian SSB and digital DX records. Tom Williams, WA1MBA, related various successful DX attempts between New England mountaintops. And Al Ward, W5LUA, discussed his failed attempt during last year's MUD to make a 77 GHz EME QSO with Sergei in Russia using the Morehead University 21m dish. Path loss calculations were promising, and they both heard their own echoes, but were unable to hear each other. Al postulated that, since they were both under-illuminating the moon, they were pointed at different locations. He wants to try again, with better coordination. Al was awarded the 2014 MUD founder's award.

Paul Wade, W1GHZ, described, and passed around, simple filters for 432–1296 MHz built into Altoids cans using semi-rigid coax resonators. He continued with small, cheap VHF/UHF pre-amps and broadband power amps, and explained feed horns for parabolic dishes.

Dennis Sweeney, WA4LPR, gave a treatise on the Phase Locked Loop; I've used them since my teens, but never appreciated how complex they were from a formal analysis viewpoint; I've always just experimented with values until it worked good enough.

J. H. Kelly gave a virtual tour of the University of Rochester's Laser Fusion Lab and discussed some issues in attempting to achieve controlled nuclear fusion - -mainly synchronizing picosecond pulses from several dozen IR laser beams. The optical modulator he described was amazingly similar (identical?) to what my daughter-in-law created to optically switch network packets for her PHd thesis at MIT a few years ago. They use RF/microwave techniques, splitting an infra-red beam into two sub-beams, passing them through semiconductor phase shifters, then recombining them; you get low insertion loss with matched phase, and high loss with 180 degree difference. When I asked him about the similarity, he replied they were different because the lab operated at a slightly different IR wavelength than commercial communication networks.

Turn Out Those Lights! In Electronic Design

Don Tuite 2014-10-28

[About the “D” in LED. You can turn these on and off to your hearts content! Ed.]

Once again, most of the media missed the point. If you will indulge me, the whole point of Akasaki, Amano, and Nakamura’s blue LEDs is that you can turn them OFF and on again fast. It’s nice that they have high luminous efficacy. However, regardless of the few watts it takes to squeeze out a lumen, white LEDs are doing their best for the environment when they’re dark.

Look at a nighttime photo of the Earth from space. The place looks like a circus midway. Four-fifths of it is covered in ocean, with a heck of a lot of desert. Despite that, the planet positively shimmers, regardless of where the dark side is at any given hour.

The reason for that shimmer stems from the use of so much sodium and mercury vapor lighting – and the fact that we rarely turn those lights off, whether we happen to need them at the time or not. That’s because it simply takes too long to turn them on. It’s necessary to generate plasma and strike a high-voltage arc through the light in order to make photons. If you turn one off, it takes time to turn it back on. Even with tungsten lamps, you don’t want to turn them on and off very often due to added mechanical stress on the filament.

In contrast, with an LED, you’re just forward-biasing a diode when you turn it on, so you’re not creating much heat in the process. (And you can tune the color-rendering index for a psychologically appropriate value by fooling with the phosphors inside the bulb.)

But the main point is that you can turn area lighting on and off as often as needed without a penalty. If nobody is on the fourth floor of the parking garage at 2 am, the lights can be out. If I come in late to pick up my car, a proximity sensor can turn them on **(it turns out the police like the lights coming on, because it tells them where there’s “action”).**

The same principle holds for street lighting. No cars, no pedestrians, no need to burn the juice. Give the sergeant at the local precinct a tablet to turn them on. Give the beat cop an app to do the same thing. There are probably several hundred applications begging to be developed, with interesting engineering challenges in terms of monitoring and security to make them challenging and differentiable. For design engineers, tons of opportunities are lurking, especially on the communications side of the fence.

I have, in fact, been impressed with the rate at which surrounding communities are switching over to LED street lighting. However, it’s also disappointing to see it on all night long. That’s because turning the things out when there’s nobody around would mean somebody’s saving my tax money, a consummation to be wished devoutly.

Anyway, at least we’re keeping the people on the ISS awake.

Researchers make breakthrough discovery, thanks to some state-of-the-art technology

This could smash solar efficiency records 10/15/2014

Researchers from the University of Cambridge have developed a new method for harvesting energy from particles known as "dark" spin-triplet excitons (found within organic semiconductors) and transferring said current to organic semiconductors for general usage.

The method is close to 100% efficient, setting the way for hybrid solar cells that could far surpass current efficiency limits.

In the natural world, excitons are a major part of the photosynthesis process: light photos are absorbed by pigments which, in turn, generate excitons; the energy produced is then carried throughout the plant.

This process is pretty much the same in a solar cell — in a silicon semiconductor, when a photon is absorbed, one free electron is formed and subsequently extracted as current.

In pentacene, however, which is an organic semiconductor, the absorption of light actually leads to the formation of two electrons. The problem with pentacene electrons, though, is that they're not "free" and are actually pretty difficult to extract. This is because they're bound up within "dark" triplet exciton states.

Diving into this a little deeper, it's first important to understand that there are two types of excitons: spin-singlet and spin-triplet. The former is bright and pretty easy to harvest in your everyday solar cells. Spin-triplet excitons, on the other hand, are dark, and the way in which the electrons spin makes it difficult to harvest the energy they're carrying.

Despite the headache associated with harvesting the energy of spin-triplet excitons, researchers have been actively seeking a way to transfer its energy into more widely used inorganic semiconductors like solar cells.

"The key to making a better solar cell is to be able to extract the electrons from these dark triplet excitons," said Maxim Tabachnyk of the University's Cavendish Laboratory and lead author of the study, which was published in Nature Materials. "If we can combine materials like pentacene with conventional semiconductors like silicon, it would allow us to break through the fundamental ceiling on the efficiency of solar cells."

To achieve this Holy Grail of combinations, the researchers used state-of-the-art femtosecond laser spectroscopy techniques. This approach led to the development of a method in which the aforementioned triplet excitons could be transferred into inorganic semiconductors with 95% efficiency. Once settled within the inorganic material, the team discovered the electrons from the triplets are easily extracted.

Pentacene semiconductor Picture

As light is absorbed in pentacene, the resulting singlet excitons quickly undergo fission into pairs of triplets, which can now be transferred onto inorganic nanocrystals.

"Combining the advantages of organic semiconductors, which are low cost and easily processable, with highly efficient inorganic semiconductors, could enable us to further push the efficiency of inorganic solar cells, like those made of silicon," said Dr. Akshay Rao, who led the team behind the work.

Immediately speaking, the team will now look into how the transfer of spin-triplet excitons can be extended to other organic / inorganic systems. They are also working on a cheap organic coating that could possibly boost the power conversion efficiency of silicon solar cells.

Via Cambridge University By Jeffrey Bausch

Amp Achieves Flat Gain to 12 GHz

Oct 17, 2014 Jack Browne | Microwaves and RF

Monolithic GaAs amplifier model GVA-123+ covers 10 MHz to 12 GHz with 16.9 dB gain at 2 GHz and flat gain across the frequency range.

Broadband communications applications can cover large portions of bandwidth in small packages, often requiring multiple amplifiers to provide gain. But when one amplifier can deliver suitable gain across a wide-enough bandwidth, that one amplifier may be sufficient to handle multiple applications within a single product.

Such is the case with the model GVA-123+ monolithic amplifier from Mini-Circuits. Based on gallium arsenide (GaAs) heterojunction-bipolar-transistor (HBT) technology, it covers 10 MHz to 12 GHz with 16.9 dB typical gain at 2 GHz and typical gain flatness of ±0.7 dB from 50 MHz to 8 GHz. This economical amplifier is supplied in an SOT-89 housing for excellent thermal stability.

The RoHS-compliant model GVA-123+ (see figure) provides a frequency range covering many of the wireless communications bands in a single amplifier, including cellular and WiMAX frequencies, and it is also well suited for use in satellite communications (satcom) systems and in test equipment.

The amplifier exhibits typical gain of 16.2 dB at 50 MHz, 16.9 dB at 2 GHz, 16.4 dB at 6 GHz, 16.3 dB at 8 GHz, and 12.5 dB at 10 GHz, dropping to 7.1 dB at 12 GHz. The output power at 1-dB compression is typically +15.9 dBm at 50 MHz, +16.2 dBm at 2 GHz, +13.4 dBm at 6 GHz, +10.3 dBm at 8 GHz, and +7.4 dBm at 10 GHz, again dropping to +5.1 dBm at 12 GHz.

The output third-order intercept point (IP3) is typically +30.2 dBm at 200 MHz, +29.9 dBm at 2 GHz, +24.5 dBm at 6 GHz, +21.8 dBm at 8 GHz, +19.1 dBm at 10 GHz, and +14.9 dBm at 12 GHz. Although this is not meant as a low-noise amplifier, the noise-figure performance is respectable, with typical noise figures of 3.8 dB at 200 MHz, 4.0 dB at 2 GHz, 4.4 dB at 6 GHz, 4.9 dB at 8 GHz, and rising somewhat to 6.9 dB at 12 GHz.

The model GVA-123+ features good input and output return loss without additional external impedance-matching components, and with input/output return loss of typically 20 dB at 2 GHz. The reverse isolation is typically 20.7 dB at 6 GHz. The compact, broadband amplifier is rated for 0.34 W maximum power dissipation and draws 52 mA typical current at +5 VDC, with maximum current consumption of 100 mA at +5 VDC. The robust amplifier is designed for use at operating temperatures from -40 to +85°C, maintaining good gain stability across that temperature range.

Mini-Circuits, P.O. Box 350166, Brooklyn, NY 11235-0003; (718) 934-4500, FAX: (718) 332-4661

Cont. from pg. 3

On Sunday WA8UPD returned to GP Hill. Heavy rain, but not much rain scatter. Planned to operate from Ludington SP. It was too rainy. Drove south to Muskegon SP and operated with WB8TGY from under a picnic shelter on lake Michigan. Wind and rain made everything "brute force". Worked mostly K9PW, W9SNR & K3SIW. Tried 24 GHz with K9PW but could not make it across the lake! … Lot's of things to work on, and try out next MAD. I had three loaner 10 GHz stations with me, two interested Ops, ?? too much rain, choose to stay home. Had so many problems with my main station, wound up using one of the loaners!..... Every 10 GHz weekend has had different weather and consequently different condx/results.