70cm eme frequencies

Listen to a recording of DL7APV SSB EME QSO in the ARI EME Contest 2020-04-04 at 21:30 UTC, which I was able to record with my single 19 el. GTV 70-19m and TGN SULNA: Don't you see a player opening up here? .. oh, sorry, ... Your browser does not support the HTML 5 audio player tag. Follow this link to download the track and run from your PC audio player. Station • Antenna: 1 x GTV 70-19m • CCTV camera for manual moon tracking, see tube in H frame • Coaxial relay: Relcomm RDL SR012 • LNA: TGN Technology Prototype 2018 True Low Noise Series 2 Stage, 0.34 dB NF at 32 dB gain • Coax for TXing: 22 m 5/8 inch Flexwell, DIN 7/16 Connectors plus jumper cables • PA: GS35b in DJ3FI coaxial cavity • TRX: Kenwood TS-811e NC1I get on 2017-01-01 with best -8 dB with this setup Easy QSO with my only 4.2 m boom Yagi and modest output power This is a 4 x 20 ele. DL6WU design sold as 'F20' by Co. Konni antennas, electric length just under 6 wl. (4.1 m) with modified balun and D1 by DG7YBN. With the experience in recent years, I have removed and replaced the poor circuit board and inferior coaxial balun by a balun made of RG142 PTFE with direct connections. If we look at this DL6WU design in the 432 MHz VE7BQH G/T table, we find that it's not bad at all. Sensitive is the way the dipole box and the balun were made by Konni-Antennnen in the early 1980s. See the old and new Balun A length of 2.00 m RG213mil with even 30 years old N-connectors lead from each DE to a 1/4 wave shard made of brass + copper (FM reports? / looks like those sold by WiMo). Patch coax from splitter to coaxial relay is approx. 1.3 m H100. To overcome the stiffness problem of the H100, I have arranged a wide arc around the elev. axis of the rotor. TRX I use an ordinary Yaesu FT-736R. No extras built-in, no modification performed. The frequency stability is fine as long as I start it about 15 minutes before the start of operation. The RX is quite deaf to 70 cm, I am thinking about building a second stage high IP Preamp and Bandpass filter to follow the mast mounted LNA. Coaxial Relay and LNA The Mast Switch Box includes a RelComm RDL SR012 (insert loss .02 dB / port isolation > 90 dB at 432 MHz) and a directly connected TGn technology ULNA 3013 EME, which comes with a measurement protocol indicating an NF of .28 dB. For details on this switch box, click here. From here I use separate RX and TX coaxes. RX is approx. 28 m from RG213, TX is 24 m of 5/8 Flexwell with 7/16 connectors patched with a 0.5 m RG213 from 7/16 to N and to get it right into the switching box. A larger switching box with x 7/16 Coaxial relay suitable for direct connection and splitter with 7/16 socket. A Andrews Heliax 5/8 Patch Coax is already waiting Elevation & Moon Tracking Rotor is a common Yaesu G-5500 combination. Moon tracking is by hand. I have a 2.4 GHz GHz Camera installed in a plastic drain pipe with cross lines made of flower binding wire. This gives me an additional sound floor when on 1 dB about and works with the HPBW (12 degr. ca.) of this bay with a known big drawback: Although IR-sensitive moon is 'away' when behind heavy clouds ... , not to mention daylight .. Hello.. Power Amplifier This is a GS35b PA cavity design (production of DJ3FI). Due to the high Q of this anode cavity, its low power gain is above 13.5 dB, so that the driving force of my FT736R can almost explore the legal limit power here (> 600 W). This is sufficient for the N-connections at the pole. An LDMOS driver can follow when a larger switch box is mounted with a coaxial relay for all 7/16 ports. Coax Feedlines 7/16 Connectors TX; 5/8 in Flexwell and 1/2 in Andrews Patch Coaxial with 7/16 connectors in hut (connectors by Oliver, DL2ARD from DL0GTH's Helmut, DG9YIH by DF0MU tnx!) Sun Noise With the EME Calc by Dough, VK3UM my RX system as described above should have a sun noise of 10.5 dB at sfi = 146 . I measure 9..10 dB in my rather noisy position. () sfi is a measure of solar current (density) at 10.7 cm or 2.8 GHz. This figure is of limited use for quantifying the actual flow to 432 or 144 MHz. In smart programs such as the VK3UM EME Calculator, solar flow numbers are collected for a frequency range and lined up with an algorithm to derive relatively good calculated numbers for the amateur bands. In my article: Notes to VHF/UHF antenna G/T, Dubus 2/2012 & Dubus technique XII show that in an explicit way with sfi vs. frequency diagrams added. From mean mfi as F10.7 for 3.4 GHz to sfi F70cm? Open the VK3UM EME Calc and press the Get IPS Data button now press Current IPS Flux data and read out for 144 or 432 MHz. In the sample we find an Sfi, F10.7 = 68 and an Sfi, F70 cm = 31. That sfi = 31 is now the correct number for our 432 MHz in terms of all derivatives due to time delay between you and the last measurements by the IPS and the interpolation in the EME Calc program. RX wise First 'SWL' activities with old array of 4 x 20 ele. DL6WU of Konni antennas with outdated balun and dipole box .. also with coarse sound card in/output rates ... • 2014-04-12: Received NC1I as a special call W1AW/1 (48 rear mounted 15 ele. Yagis + QRO) with up to -6 dB and very clear speaker copy link to click .wav sound page, note that this is NOT through a narrow CW filter, but full SSB 2.7 kHz audio Here is a link to click OK1TEH 432 MHz EME Stations Gallery • 2014-04-12: Receive HB9Q (15.3m bowl + 2kW PA) with -12 .12. -10 dB in bad lunar position with beam scratches Click here is a link to OK1TEH 432 MHz EME Stations Gallery • 2014-11-07: Receive OK1DFC, Zdenek (10 m bowl + 1.5kW PA) with -14 .. -11 dB • ARRL EME Contest, 8/9 November 2014: Received QSO between HB9Q (10 m shell + 1.5kW PA) and UA3PTW (20 x 15 ele. mod. DJ9BV) • ARRL EME Contest, 8/9 November 2014: Received DL7APV CQing (16 x 13wl DJ9BV) with up to -7 dB • ARRL EME Contest, 8/9 November 2014: Received SM2A CQing (4 x 32 ele. - 13wl) • ARRL EME Contest, 8/9 November 2014: and a little stack to rise ding je1TNL - UT5DL (8 x 7.7 wl DJ9BV, 600 W ?) 7 3, Hartmut, DG7YBN EME (Earth - Moon - Earth) Page composed by K7XQ (Click on the moon to get the current moon phase information) The moon reflects only about 7% of the signal during a moon bounce !!! The phase of the moon has little to no effect on the EME signals The moon is usually about 238,000 miles from Earth !!! A Lunar Day is 27 days 7 hours 43 minutes The exact same side of the moon is always facing the Earth The moon rotates around the Earth every 27 days 7 hours 43 minutes The moon goes from new moon to new moon every 29 days 12 hours 44 minutes The moon diameter is 2.16 0 miles It takes about 2.7 seconds, until a radio wave travels from Earth to the moon and back to Earth The moon takes only 0.5 degrees from the full 180 degree sky. The fact that the moon appears larger at the moon rise and the moon set is just an optical illusion. What is EME ???: EME (Earth - Moon - Earth) , or also commonly called Moonbounce, is a type of communication that occurs when two stations point their antennae at the moon and try to reflect their signals from the moon to try to make a contact. The moon is used as an RF reflector similar to how the ionosphere is used to reflect radio waves. EME is one of the most demanding aspects of amateur radio and requires a lot of patience when receiving the very, very weak signals. EME operation takes place from the 6-meter band to the tens range of the gigahertz frequency range. 2 Meters is the most popular band because it is much easier to get the equipment to set up an EME station, and it has the highest number of EME operators. Equipment required for EME: Antennas : EME can be done with a single Yagi antenna, 15 dBd gain and 100 watts, but it is much better to have something like a set of 4 Yagis. This is because it will be much easier to hear and work more stations. Typically, a total antenna gain of 18 dBd is a good starting point. The more the antenna gain is increased, the better the operator will be able to work more stations. Antenna polarization : The typical polarization used by most EME operators is horizontal polarization, but it has been shown that a switchable polarization from horizontal to vertical or polarity diverse can be a major advantage when operating EME. As the radio waves travel to the moon and are reflected back to Earth, they tend to alter polarization. This phenomenon is Faraday Rotation . Polarization is never really known exactly when it is received, and it cannot be predicted. Many EME operators have recently proven that the ability to switch polarization for the best signals provides the best results for an EME contact. Some EME operators now use the switchable polarization or Polarity Diverse switching antenna systems. Polarity Diverse Switching makes it possible to receive signals at any angle in 45-degree increments, allowing the EME operator to achieve optimal EME signal strength during reception and transmission. The Polarity Diverse Switching antennas usually consist of several cross-polarized yagis and a special phasing harness with multiple switching schemes, which are constructed with several remotely controlled coaxial switches. The operator can select any polarization in 45-degree increments for the best signals with this antenna type. An example of polarity Various antenna circuits is shown here with images of VE3KH with the M2 2MPX28 Cross Polarized 2 meter Yagis >>> Polarity Diverse System M2 Antenna inc's Special EME Array, the 2MPX20, The polarity different antenna practically eliminates the effects of the most complained problems of EME, Faraday Rotation and Spatial Fading >>> 2MPX20 antenna of M2. The 2MPX28 is the same antenna, but longer and has 8 more elements. More typical EME arrays used for EME consist of a set of 4 or more horizontally polarized antennas, each 3 to 5 wavelengths (20 to 35 feet) at 2 meters and about the same lengths for the higher bands, which will translate to much higher wavelengths. The Big Guns run 8, 12, 16, 32 or 48 of these Yagis !!! Here is a table of data that compares most 2 meter Yagis used for EME. It shows the antenna gain, G/T, antenna temperatures and 4-bay Total Gains >>>Ant comparisons understanding antenna and antenna array design There are some things to consider if you decide to design or upgrade an up-to-date antenna system. These things can also be used to criticize an existing antenna system. Let's take a look at some of these: 1. The more elements an antenna has, the greater the bandwidth (too many elements can cause a degraded pattern or the antenna to be too loud/high antenna temperature). 2. The fewer elements, the narrower the bandwidth that the antenna becomes, which also increases the gain with the same boom length. (Too few elements can lead to a very touching/filigree pattern, increase SWR or become too tight). 3. The longer the boom length, the higher the profit. Adding and of elements with the same boom length changes the bandwidth considerably and the gain slightly. 4. When using EME, it is better to have less longer boom antennas than several shorter boom antennas. Many suffered too many losses due to phasing lines, phasing lines, and stack losses. One or two dB can only be lost in a single phasing line and power divider before it reaches a mast mounted preamplifier. Many experienced excellent results with less longer boom antennas and in many of these cases, better profit and sample numbers. 5. For each double boom length increase, there is a 2.2 dBd improvement in Forward Gain (and Visa aversa). 6. A single reflector element is less noisy than a multiple reflector element. 7. Folded dipoles and T Match Driven Elements have a slightly wider bandwidth than gamma matches. 8. Higher frequency antennas in the immediate vicinity are strongly influenced by lower frequency antennas (especially if they are harmoniously related), but not as much as Visa aversa. 9. Antenna phasing lines lengths are best cut in half wavelength intervals (repeats 50 ohms impedance point), but will work OK when at random lengths. All phasing lines MUST have the same exact lengths. 10. Elements centered by the boom have a slightly cleaner pattern than elements that sit or are mounted on the side of the boom. Better even if the elements are isolated from the boom. 11. Aluminum antenna materials are more weatherproof than copper materials (corrosion, loss of conductivity, increased skin effects / resistance and rust in time) . 12. Larger element measuring devices (rod and hose material) provide better radiation results (due to some skin effects in FM/UHF) then smaller measuring devices (such as wire elements). 13. An Optimized Antenna (one that has optimized element lengths and distances) delivers much better results than an Equalized Antenna (one that has the same element lengths and distances). Optimized antennas have a lower antenna temperature, higher amplification, a better front-back ratio and a cleaner pattern. 14. For each antenna array that is doubled, the total array gain increases by 3dBd (assuming good divider and phasing line losses) 15. Note that 1 dBd of increased antenna amplification can take a signal from non-copyable in noise to Q5 from the noise in EME/Weak Signal Work. It also goes in both directions... sending side also on the opposite end. All of the above points have been proven by many amateurs who are heavily active in EME and other weak signaling work. A good balance most of the above elements make for a good antenna design. It's better to start with an antenna system that has been proven to work than to listen to a neighboring ham making contacts while you're not even listening to the station. Especially with the cost of antenna systems these days, better to make an investment that works. Analyze carefully what is considered when viewing an antenna system. Remember, the key to a successful amateur station are the antennas that are used. The proof is all-round. Moon Tracking Programs : Moon Tracking : To know where the moon is, it helps have a program to track the moon. This is needed to know where and when to show the antenna. Simple Dos Tracking Program, Moonbrat, written by W5UN >>> Moonbrat There are a few other programs written by W5UN that can be found on its website at: W5UN Homepage F1EHN's Moon Tracking and Sky Temperature Program >>> F1EHN There is also a satellite tracking program that includes Moon Tracking, EME Signal Degradation and Sky Noise Calculations on each tape. This program is called NOVA for Windows and can be found at: NOVA for Windows N1BUG wrote an excellent program that also makes ERP Link calculations plus tracking >>> N1BUG RF power amplifiers: Although EME was made with only 50 watts of power, a good starting point would be 350 - 1000 watts. It is best to run the full legal limit so that you can be heard from many other stations. Amplifiers like the 8877, dual 4cx250 /4cx350, 3cx400 and the 3cx800 and other tube amplifiers are the most popular types of amplifiers used. Receiver Noise Figure/Receiver Sensitivity : Always keep the receiver noise figure as LOW as possible (at least lower than the sky noise for the band used). The intoxication figure is expressed in Degrees Kelvin or in FdB's. Sky noise is noise generated by the sun and other celestial objects in the sky and space. Even the ground produces some noise, which is sometimes used as a reference to determine the antenna noise temperature. The higher the frequency band, the lower the Sky Noise for that band. Lower noise levels will be more important at higher frequencies. Another way to easily view the noise count is the ability for the receiver to dig out weak signals in the noise. As a rule, the noise count on most bands should be 1 dB or lower. Some Gaasfets on the market can be as low as 0.2 db !!! Transmission line : Always use the lowest loss cable between the antennas and the radio. Any loss that occurs between these two ADDS more loss on the noise number if the preamplifier is not mounted directly on the antennas. This means that if your preamplifier is in the cabin at 1 dB and there is 2 dB loss in the transmission line, your resulting noise count of your receiving system will be !!! There must be as little loss as possible between the preamplifier and the antenna array. This loss can severely affect the ability to hear weak signals from the moon. In addition to this problem, you also lose some of the output power to the antennas. Hardline is the most common type of loss due to its extremely low loss properties transmission line used in EME operation. This makes it possible to keep the preamplifier low in the hut, as most preamplifiers cannot handle the high performance of a pipe amplifier. Belden 9913 is slightly marginal on the lower frequency bands and should be avoided above 2 meters. Standard RG-8 RG-8 all of them can be avoided together. Try to use high quality N type connectors if possible. Standard SO-259 connectors have more loss than N connectors. SO-259 connectors also make a bad weather seal compared to N' type. Water in the connectors and transmission line can also greatly degrade the signals from the moon and degrade your output power to the antennas. Each 1/10th of a dB loss in your antenna system can !!! up to a full dB of system power Phasing Harnesses and Power Splitters : Phasing Harnesses and Power Splitters are used to add additional antennas to form an EME antenna array. The phasing harness must be properly matched to the antenna, otherwise the antenna gain of the entire array will be dismantled. This also applies to the power divider. If the power divider does not divide the power evenly between the antennas or the power divider has an improper impedance, the entire antenna array gain is degraded. These deteriorations mean that EME signals are sometimes completely lost in the loss of degradation. EME, it is FM, SSB or CW ??? : EME is primarily carried out in CW. This is because CW is best copied under extremely weak conditions. CW can be copied much better if it is directly on the sound floor than SSB. FM is never used. SSB has been performed, but is rarely used unless the conditions are extremely good or if one or both stations have a sufficiently large station in both power and antenna size. What to hear : EME signals are extremely weak in most cases and most of the time, directly on or just above the sound floor. The smaller the antenna array used, the weaker the signals become. When searching for an EME signal, point the antenna directly to the moon (especially during moonrise and moonsunset when an additional 3 - 5 dB of Ground Gain is reached from the signal). This is because the ground helps channel the signals when the moon is near the horizon. The ground gain effect begins to drop above 10 degrees or less, depending on the height of the antenna array. Ground gain is best achieved when the antenna array is just above the ground and it becomes less effective when the antenna array is at a higher altitude above the ground. Adjust the VFO dial carefully and slowly over the EME frequency band and listen to CW signals directly at the noise level. Using a DSP or audio filter improves the ability to hear the weak signals. If an antenna from 12 to 15 dBd is used, chances are that signals will be heard if there is any activity on the moon, when some large guns are in operation (big guns are called amateur stations with a lot of antenna and/or a lot of power). EME frequencies : Some operators claim that 144.020 is the EME call frequency at 2 meters, but in general random signals appear over 144.010 - - Too much time is planned in advance and the exact frequency is known. The EME frequency segments are 50,000 - 50,050 at 6 meters, 144,000 - 144,050 at 2 meters, 222,000 - 222,025 on 222 MHz, 432,000 - 432,070 on 70 cm and 1296,000 - 1296,050 on the 23 cm band. EME can also be found on all other bands above 1296 MHz. As already mentioned, the highest population of EME operators can be found on the 2-meter band, then 70 cm second then 1296 thirds then 6 meters and the higher bands. The importance of sequencing during an EME QSO : In almost all cases, EME contacts are made around what is called sequencing. Sequencing refers to the exact time at which EME stations are transmitted or received. It is important to have a kind of time clock that shows the exact time up to the next second. This can be a digital clock or a computer. The time is tuned with WWV or via a time standard service by telephone. When you edit an EME schedule or edit random contacts outside the moon, each station needs to know exactly when to transmit and when to receive it. It is always the EASTERLY station that starts the sequence. The reference point is the International Date Line. If it is a pre-arranged schedule, each sequence would be for a period of two minutes, with each station alternating between each sequence. Normally, a pre-arranged schedule takes only 30 minutes. If it is a random contact, the sequence will last for one minute or 60 seconds (although sequencing during a random contact is not mandatory, but preferred by most) until the contact is complete or if it is determined that the conditions are not good enough to continue. The purpose of sequencing is to allow the completion of a contact. It also allows the EME operator to carefully adjust to listening to the super weak signals. Let me stress the importance of coordinating the clock to the next second during sequencing. This can make the difference whether the contact is completed or not completed. The EME Sequence : The following is necessary to make an EME contact... Example QSO K7XQ with K5GW on 2 mtrs Time First 1-1/2 Min Last 30 seconds Information about the individual sequences 0800-0802 K7XQ de K5GW K7XQ de K5GW K5GW starts QSO 0802-080 4 K5GW de K7XQ K5GW de K7XQ does not have both calls 0804-080 6 K7XQ de K5GW OOOOOOOOOO K5GW hears both calls 0806-0808 K5GW de K7XQ K5GW de K7XQ K7XQ listens O's but not both calls 0808-0810 K7XQ de K5GW OOOOOOOoOOOO K5GW listens both calls 0810-0812 ROROrorOrO K 7 Calls and O's 0812-0814 RRRRRRRRR RRRRRRRRRRRRRR K5GW copied RO's 0814-0816 ROROROROROROR K7XQ copies r's RRRRRRRRRRRR RRRRRRRRRRR K5GW copies RO's 0818-0820 RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRrRRRKQXQ hears R's QSO is complete OR 0818-0820 73737373 7373737 3 K7XQ listens to 73'and or R's QSO is complete 0820-0822 737 73 737373737373737373737373737373737373737373737373737373 7373 37373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373737373 Listen to your own radio signal echoes from the moon. It takes about 2.7 seconds for a radio wave to lead from Earth to the moon and back to Earth. This propagation delay can allow the EME operator to hear this own echo signal from the moon. This is also a great tool for the EME operator to check its own setup. Roughly, if the EME operator can hear its own echoes, then it is certain that other eME contacts will also enable. Note: The stations that can hear their own echoes are more likely to occur when a station is running over 500 watts and has an antenna system amplification of 18 dBd or more. It becomes less likely when the power and the gain are at a lower level. Also, just because one station can't hear its own echoes doesn't mean that other stations don't. Stations should not be deterred from trying EME if they cannot hear their own echoes. In some cases, big guns even have difficulty hearing their own echoes !!! The importance of Sky Noise at work EME : When a station works in front of the moon, the amount of noise with the signal makes a big difference in how well the moon will go into contact. This noise usually originates behind the moon in the solar system and from deep space. These noise levels have already been calculated and mapped. Many moon software packages have an option to view Sky Noise. Its levels refer to the frequency band that is used. The higher the frequency, the lower the sky noise. If the sky noise level is too high, it can overcome the signal received by the moon. For this reason, most operators choose to operate when the sky noise is at the lowest levels, along with the shortest distance and the nearest declination (when the moon is at the highest point in the sky at the station location). How to calculate the power of EME Station with Solar noise and Cold Sky: Measuring the difference in signal levels between solar noise (sun) and Cold Sky is one way to determine the performance of the EME station. This is done by pointing the antenna array at the sun, noting the signal level, then cold sky and performs a notation of the signal level. The RF signal level is usually displayed in the last IF stage of the receiver directly before the and the RF-DC level is measured unit. Many operators will do this to calibrate their setups and check for a deterioration of their equipment. This is almost like measuring the noise of a reception system with natural sources of noise. This is most useful at the higher frequencies because a higher signal-to-noise ratio can be measured. Because at higher frequencies there is lower sky noise and usually higher antenna amplification, especially for stations with very large arrays. A Procedure to measure System Noise Temp I measure my system temperature by placing a 50 Ohm room temperature resistor on the input of my preamplifier. With an ideal preamplifier that gives you a 290K noise input with a good GaAs Fet, it's probably about 350K noise temperature. I put the receiver on ssb and measure the audio output rms noise voltage with an ac dvm. Then I look into the sky and find your minimal noise at high altitude and measure the rms noise voltage again. The RF power in a fixed bandwidth is proportional to the temperature, so it goes temp like the square root of the measured noise voltage. Ie. If the noise voltage in the sky is 2x more than the resistor, the sky temperature of the system is 4x350K or 1400K. You also need to be sure that your agc is not working on the noise signals. So keep them low at S0 so that they don't decrease the If gain when the noise signal is increased... Courtesy of Dave , KO6RS Monthly Moon Condition Report W5LUU's 2001 Moon Condition Calendar >>> Typical Q Questions and Answers. What is the minimum requirement for working EME ??? A. EME has worked with as little antenna as a 12-foot boom for 2 meters and 50 watts. Also a 14-foot boom and 400 watts on 432 MHz. Q. Which mode is EME ??? A. EME is mostly CW running at 13 WPM on average with the big stations running occasionally SSB. No FM has been reported yet. Q. How many stations can I work with just one 14 feet Of Yagi and 100 watts at 2 meters ??? A. With patience (and maybe several attempts) to multiple stations. Some of them include W5UN, KB8RQ, IK3MAC, K5GW, F3VS, SM5FRH, HB9Q and many others depending on conditions. Q. Can I work EME with an antenna without height functions, ??? A. YES If stations are to be worked within the antenna pattern during Moonrise and Moonset. The importance of switchable polarization work EME Over the past decades, most EME stations have run a large number of yagis in the horizontal position, however, it has been found that the number of successfully achieved contacts can increase dramatically when an antenna nat antenna is used by cross-polarized antennas. This is due to the that the signals of the moon (especially at 2 meters) constantly change the polarization when they are reflected back to Earth. This puts the stations stuck with horizontally polarized antennas at a disadvantage when the signals are received extremely weakly or unworkable, when Polarization is at or near 90 degrees. Recently, many stations that have become cross polarized have reported success rates that EXCEED the capabilities of traditional horizontal antenna arrays that are more than twice or three times the size. A 3 dB signal loss can occur when the signal levels are only 45 degrees eflated and above 20 dB when 90 degrees out. 3 dB is enough to take a signal from fully copyable to far below the sound floor. The condition, known as Faraday Lockout, occurs when the signal never becomes copyable because signal polarization is never directed to the antenna pattern (see also Spatial Polarization Loss in EME Terms). Crossed Polarized antennas can also be configured to work in 45-degree increments. This requires little more hardware and configuration. If you look at these mere facts, it is easy to see that the advantage that cross-polarized antennas can have a big advantage. This information should be taken into account when planning or reconstructing an EME station. Some EME terms: Spatial polarization loss: The signal loss in db's as a result of the polarization differences between two stations via the EME signal path. Imagine you're on the moon and you have a horizontal beam that looks at Earth. If one station is on one side of the Earth and another station is on another side of the Earth, the signal polarizations of these stations will not be the same because of the curvature on Earth. It is this difference of polarizations that will lead to a loss of signal strength. This is the loss of spatial polarization. If both stations are at the same latitude, then the loss will be next to nothing. Faraday Rotation: The rotation of the polarization of the signal path caused by the Earth's magnetic field. This is usually a great contribution to signaling QSB on EME signals. It is more pronounced in the lower EME bands. Libration Fading: Fading of EME signals due to the reflected properties of the signal. This is due to the rough surface of the moon. The moon actually wobbles in its orbit, so when signals are reflected from the moon, they are reflected over the rough terrain on the lunar surface, making the reflected signals inconsistent. This fading is extremely pronounced on the higher EME bands (such as 1296 MHz and higher) and is barely noticeable on the lower bands. Half Diameter (SD): The apparent radius of the moon when considered a disk from Earth. Right ascent (RA) :D ie angular distance of the moon measured eastward from the equinox along the to the moon's hour circle expressed in degrees or hours. Doppler Shift: The frequency offset from the transmitted signal due to the speed factor. The velocity factor is determined by the rate of change in the EME signal path distance. The earth and and move constantly, sometimes closer to each other and other times further apart. The greater the change in the distance rate, the greater the Doppler shift. The higher the EME frequency band, the greater the Doppler shift will be. Another thing to note is that the Doppler shift will be higher from the original frequency as the distance becomes closer and the lower as the distance continues. Antenna Temperature (Ta) : The noise temperature of the signal received by the antenna. This noise comes not only from the main flap of the antenna, but also from all the small rags and the back of the antenna. The combined noise of all these sources becomes the total noise temperature of the antenna or antenna temperature. An example is that the moon usually runs at a temperature of about 210 degrees Kelvin. If this is all the antenna saw, then 210 degrees would be the antenna temperature. This becomes a critical parameter when designing a good antenna for eME usage. The idea is to design an antenna that will not contribute noise from other directions that will contribute to the deterioration of the signal received from the moon. G/T or (antenna amplification over system noise temperature) : This is the ratio of antenna gain over system noise temperature. Signal-to-noise ratio is comparable to this ratio and is related. This is also a very important parameter when designing a good EME station. An easy way to describe this is to make the antenna gain as high as possible and the noise count as low as possible to increase the signal-to-noise ratio. The higher the G/T, the better. If you look at the G/T of an antenna itself, it is the factors of antenna temperature, gain and the antenna pattern that make up the G/T of an antenna. Declination : The term used to describe the lunar position relative to the Earth's equator. If the declination is minus 8 degrees, then the moon would be 90 degrees above head at 8 degrees south latitude on Earth. GHA or Greenwich Hour Angle : The term used to describe the lunar position in relationships with Earth's longitude. If the moons GHA was at 20 degrees, then the moon would be directly above 20 degrees West Longitude. EME Degradation : Basically it is the amount of degradation in dB's due to sky temperature, moon distance and declination. Usually from 0 dB to -2.5 dB maximum . Most would agree that the smallest loss of degradation would be with the lowest sky noise, the highest declination, and the moon in Perigee. Moon Perigee : When the moon is at its closest distance from Earth. Moon Apogee : When the moon is furthest from Earth Is. Sky Noises : This is the term used to describe the background noise behind the moon or the noise temperature on and around the moon. It's measured in degrees Kelvin. If the moon is at or near a high noise area such as the Milky Way or the Sun, the sky noise would be high compared to the area in the sky, which has the lowest noise temperature known as cold skies. Moon Elevation : The term used to describe the height of the moon at the observer position relative to the horizon. A height of 10 degrees would mean that the moon is 10 degrees above the horizon at the observer position. 90 degrees high would be directly overhead. Azimuth of the Moon : The term used to describe the compass heading of the moon measured in degrees at the observer position. 90 degrees azimuth would be exactly east. Phase of the Moon : The term used to describe the illumination of the moon by the sun. A full moon would mean that the entire disk of the moon would be illuminated at the site of the observers. A new moon would mean that the lunar disk at the site of the observers is completely dark. The phase of the moon does NOT affect EME reproduction. EME HF Weekly Net : Listen or participate with the EME Bunch (newcomers are very welcome) on Saturdays and Sundays at 1500 utc for the 432 Mhz and higher group and 1600 utc for the 2 meter EME group on 14.345 MHz hosted by VE7BQH, Lionel. The network is designed to create timetables for EME contacts and to discuss the experiences of EME operators during their contacts. Join the EME Reflector by e-mail: Join the EME Reflector and receive regular email postings from HAM's that spend a lot of time on EME. There is much to learn here, just as it is a great opportunity to meet with others and create schedules. You are a lot of good people here who are willing to help set up a station and get started. To subscribe, go as follows: go to listserve@vm.stlawu.edu and within the body type of the message, enter subscribe to Moon-net. When and where to listen to EME signals: Listening to EME signals can be a very difficult task if there is no intelligence, if any stations are transmitted at all on the moon. Here are some good tips that will make hunting for EME signals much easier: 1) Weekend activity has a much higher probability of activity due to the fact that many are at work. Both weekends and sometimes holidays are good times to listen to (especially when the holidays are celebrated worldwide) 2) Competitions such as the EME competitions and sometimes VHF/UHF competitions have a higher probability of EME activities. Pay attention to activities, especially during eME competitions. 3) Common window of Europe. That is, if there is a moonrise to the USA and Europe can be seen at the same time as the moon. This does not mean that other continents are not active, but simply means that Europe is the most widely heard. 4) High Declination, Low Sky and Low Solar/Sky Noise seems the most popular for EME operators. Pay attention to activity, especially if all of these criteria are met (See monthly lunar state report above). This happens about a week a month and e-month. 5) Ground Gain, especially at 6 and 2 meters, provides more signal amplification anywhere from 3 to 5 db due to improved ground conduction of signals due to low altitude positions of the moon. Soil gain deteriorates sharply when the moon rises above about 5 to 10 degrees. 6) The BEST assurance that signals will be heard is when a known EME schedule occurs. The good thing is that there is a program that contains most of the schedule information needed to know where and when to listen. This is a program called SKD81A written by N1BUG, AF9Y and W9HLY. It includes an excellent package of EME schedules, EME Operator Station Info, Moon Tracking and many other features. To get this program, go to AF9Y website here >>> AF9Y. The programs SKED File, Vhfsched.skd , is updated weekly, so it is important to get weekly downloads and updates from this location. This program does not include every single schedule that exists, but it will contain a large amount of schedule activities. 2 meter EME schedules (Current !!!) . Times in UTC >>> Skd81A Skeds BTW: If you want to create a schedule with a different EME operator, check in the weekly HF EME Net described above or send an email to the EME reflector. EME and AF9Y's FFTDSP Program : There is a program that works as a real-time audio spectrum analyzer from Mike Cook, AF9Y. With this program it is possible to detect EME and other weak signals with ease by using nothing but this program, a computer sound card and the speaker output jack of the radio. It allows the EME operator to detect, find and adjust EME signals, in some cases well below the audiobar area of the human ear. This becomes very useful because in some cases trying to find stations is extremely difficult, especially when a station enters and exits into the sound floor that applies to most EME signals. It is possible to monitor both sides of an EME QSO without having to tune the radios VFO back and forth. It has an audio bandwidth up to 3 KHz. One of the best applications for this program is to search for activity on the moon for random contacts. This program and more information can be found on Mike's website here >>> FFTDSP Program Working EME On Single Yagi's or Standard Tropo Setups : It is very possible to work EME on a single Yagi or Standard Tropo setup. It has been done and it can be done. is a small list of stations that should be editable with a single Yagi (or antenna systems with at least 10 dBd amplification) at 2 meters: W5UN, SM5FRH, VE7BQH, KB8RQ and possibly many others. Working on these stations can but there is no reason why these stations cannot be operated. This is due to their very high ERP antenna systems. What does Single yagi ??? mean Many operators will describe that they have worked stations on a single Yagi, but sometimes do not explain in detail about the antenna. It is very important to explain this because the Sanian winning numbers that can hold individual yagis. A single Yagi can be anything from a 2 element, 3 footer, which has a amplification of only 6 dBd to a 19 element 42 feet yagi, which has a amplification of 17 dBd. You can see a huge difference in the profit here, so if someone mentions that they have worked a station with a single yagi, it is important to also consider the winning number of the antenna. This is to illustrate any confusion about what the definition of a single Yagi is under these conditions. The list of stations above will probably be difficult, at best or even impossible (never say impossible ???) to work on a 2-element beam, but should be practicable on something like a 12 foot 9 or 10 element under the right conditions. EME Tools The W5UN Array Power Analyzer / Troubleshooter >>> W5UN Active EME Stations with Antenna and Power Info List of the most active EME stations >>> EME DUBUS List Active 2 meter EME stations >>> 2 meter stations Active 432 Mhz to microwave stations >>> 432 mhz and via EME : 432 MHz and via EME schedule info can be found here >>> 432 MHz and higher Skeds Real Time 432 EME Activity Chatroom >>> 432 EME EME EME Antenna Gallery 432 MHz and higher from W6/PA0ZN sources for 432 MHz, 1296 MHz and higher EME Equipment (including VE4MA/W2IMU Feedhorns, 2C39 Cavities and Power Supplies, Hybrid Combinators, Antenna Combinators, etc.) : VE1ALQs Excellent EME Equipment Page >>> 23 and 13 CM EME Source by VE1ALQ PA4FP EME Source >>> PA4FP PA3CSG's EME Modifications Info Page >>> PA3CSG DL4MEA's 12 96 2C39 Amplifier Page >>> DL4MEA GM4JJJ it 2 meters Dual 4CX250B W1SL Power Amp Page >>> GM4JJJ G3SEK's EME Equipment Building Info Page >>> G3SEK Other EME'ers Homepages : AF9Y Mike's WebPage Mikes has a great website containing a cool Helix antenna design for the Moon Prospector, a DSP software program used for EME and a program used to use skeds including full station info for EME. AL7OB 432 EME Big Gun Station 30 foot Dish from Alaska KB8RQ Gary's website of Ohio HB9Q Dan/Marks EME website IK2DDR Francesco's EME web page IK5QLO Andrea's 432 EME website JH2COZ EME 2 Mtr antenna image KJ7F Terry's website PE1OGF Johns website SM5 BSZ Leif website SM7SJR Bjorns website VE3KH Kevins W0PT Bills Website W6/PA0ZN Here is one of the most complete and best websites I found in the weak signal subject W5UN homepage Download a list of all active EME'er by call sign, take a look at the world's largest EME array, learn how to with only one yagi no height and 50 watts. 7M2PDT 432 EME website of Japan 9A9B Branimr's website of Croatia EME ACTIVITY LOGGER Click here to create an EME schedule or check an EME activity in real time.

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