



SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED
TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

W6IFE Newsletter November 2005 Edition

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At the **3 November meeting**, someone will arrange a visit from Microwave Company reps on latest microwave developments. Door prizes!

The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1900 hours local time on the first Thursday of each month. Check out the SBMS web site at <http://www.ham-radio.com/sbms/>.

Pre-meeting dinner place. The usual pre-meeting dining place has closed its doors. We will try House of Ribs BBQ Restaurant at 451 Magnolia Ave Suite 103 in Corona CA. web site www.houseofbbqribs.com. Take the I-15 south of the 91 interchange to Magnolia Exit and travel on Magnolia until it crosses Ontario Ave. Then continue about a block and find the House of Ribs on your right.

Owens Valley Radio Observer Project

Dr. Mark and I removed the Receiver that they had been using and we installed the SBMS System at the focus. Moved the 28V DC power supply to the Alidade room and ran a test to make sure that the polarity was correct at Focus. Installed the control line interface panel in the TP and connected the control lines to the Red Block. Ran tests on the four coaxial lines from the TP to Focus and after some hassle had everything hooked up properly. The 10GHz rig came right up and the TWT was putting out the power that we expected. I did not have a transceiver for the 1296MHz system, so could not check it out, besides Mark needed to get to a Soccer Game.

Since the last time I had been at OVRO the heater/cooler for the housing failed. With two transmitters on board there has to be some way to keep them cool. I have a high air volume blower that is being made ready to replace the heater/cooler. If all goes well, I will be going to OVRO this weekend to make some Moon surface measurements on 10GHz.

Chuck, WA6EXV



The 40-meter dish at OVRO on the left. Mark in the fore ground moving the transverter assembly at the feed and Chuck, WA6EXV with the winch in upper left holding the package.



Left- Mark is moving the package from the feed area to the side to be lowered to the ground. And it goes to the ground via the winch cable.

The Saturday message-

W6IFE will be on the 40m dish at OVRO this weekend and the next weekend of the ARRL EME contest. We have Internet at the site, but of course will not take schedules. We will be on 1296.025 listening plus or minus 5Khz. Our moon window starts at 0530z on UT Saturday. We will post the results on Moon Net. QSL's and reception reports to K6JEY. We hope to map the moon at 10ghz and after that will have a special weekend of 10ghz activity. (30 watts) We will announce it later. We should be able to work stations with 4' dishes, perhaps 2' and 10-20 watts. Thanks, Doug K6JEY

And some of the message traffic during the first tests---
Anyone heard these guys.??

Yes, I worked them. They have a very nice signal. I believe they can hear "anything". However, since they run low power, they are not any stronger than most of the big guns like HB9BBD or DL0SHF. A small dish or a very long loop yagi and 100 W should be enough to work them. Good luck! 73, Marc N2UO

Then later reports indicated over 50 contacts and even one audio file sent from Europe with excellent signals from the other end of the contact. Super event! Second half to follow in November.

Scheduling.

1 December- History of Radio Astronomy- We hope to have a guest speaker.

10 December- Christmas Party at The Lab and Gift Exchange

5 January 2006- OVRO-SBMS Update and Report. Details of the Owens Valley Radio Observatory project with

pictures and sound.

2 February 2006 - 1296Mhz High Power Amplifiers. Members will share their projects and results. Want to build an amp? Join us for a presentation by those who have had experience building them. Both solid state and Tubes

"Wants and Gots for sale"

Want manual for HP 8621B sweeper 100 MHz to 6 GHz Chuck WA6EXV 760-377-4972

For Sale light weight tripod, wood classic 1950's with ball type head \$50 pick up at SBMS meeting or Huntington Beach QTH Wayne 714-846-1230 kh6wz@arrl.net.

Need General Radio power head N4240 type or HP 487 or 8487 power head for HP 432 power meter Doug K6JEY 562-424-3737 dounghelen@moonlink.net

Last meeting Lots of discussion on the MUD05 event. Lots of folks had worked on gear or built new stuff. Reports were given by folks on the last half of the ARRL 10 GHz and Up contest. 23 people present

The question on email.

I'm using a T match feed on my Yagis, but although I'm convinced I made them exactly correct, I never seemed to get the SWR down low. I got all of them down to between 1.5 and 1.2 and felt that was the best that could be done? I'm now rebuilding them using copper driven elements and redoing all the feeds from scratch. My question is how does one go about tuning the T match? Is there a procedure that I should have followed but didn't know about. Any help would be appreciated before I get to that stage which hopefully will be soon. Also is there a cheap source in the UK for purchasing LMR400 coax? about 12feet?

Thanks and 73's de Paul M0EME

432MHz EME 4 times FO19, FT847, MGF1302, 100 Watts at feed, Spectran.

Initials 432MHz #2 CW #4 JT65 <http://myweb.tiscali.co.uk/m0eme>

TO: M0EME, The Microwavers, & the EME'ers.

DE: Dick, K2RIW

RE: Impedance Matching a Dipole (with or W/O a Yagi present).

Dear Paul, et al.,

PERFECT IMPEDANCE MATCHING of a DIPOLE by Dick Knadle, K2RIW 09/09/05

INTRODUCTION -- It is amazing how well kept the secret is, that I'm about to tell y'all. You can understand the concept either in a Graphic manner, or by just memorizing the words. Each person I tell this to has his own way of remembering it. In later years they often tell me how much they appreciated the information.

GRAPHICALLY -- Open any edition of the McGraw-Hill "Antenna Engineering Handbook" by Jasik (1st ed. 1961), Jasik & Johnson (2nd ed. 1984), or Johnson (3rd ed. 1993) and look at the Graphs on pages 4-7 and 4-8, Figure 4-3 and Figure 4-4, respectively. All issues have the material on the same page number. These Graphs tell you the Impedance of essentially all Monopole Antennas, for all reasonable Lengths and Diameters.

A DIPOLE = 2 MONOPOLES -- First, remember that a Dipole is simply two Monopoles back-to-back. Therefore, all Impedances and Lengths (in degrees) that you read from these Graphs should be doubled when considering a Dipole. Figure 4-3 tells you the Resistive Component of the Impedance versus Length (in degrees). Figure 4-4 tells you the Reactive Component of the Impedance versus Length (in degrees).

THE GRAPHS SAY IT ALL -- When you study those Graphs, you will notice something very interesting. The Resistive Component always gets Larger, as the antenna is made Longer, up to 180 degrees for a Monopole, which is equal to 360 Degrees (One Wavelength) for a Dipole. Therefore, you do not need any fancy Impedance Matching Networks in order to get a perfect match for your particular Dipole, and it doesn't matter if you are using a 35, 50, 70, 200, or 300-ohm transmission line. Choose the correct Length of the Dipole, and you will achieve that exact Resistive Component, anywhere from 1 ohm to over 1,000 ohms.

THE REACTIVE COMPONENT -- Then from Figure 4-4 you will notice that there usually is a Reactive Component left over. You will notice that for almost all Diameters of the antenna, the Reactive component goes through zero at about 85 degrees of Length (for a Monopole), which equals 170 degrees for a Dipole. For shorter Lengths the Reactive Component is (-) [Capacitive], and for longer Lengths the Reactive Component is (+) [Inductive].

LOW R IS BETTER -- I find that it is easier to live with the Inductive case. Therefore, any method that lowers the natural Resistive Component of the antenna's Impedance (relative to the transmission line) is desirable. This can come about by using a fat Dipole, high impedance transmission line, or an impedance-lowering device, such as a Delta Match or a T Match.

LONGER IS INDUCTIVE -- Once you have created a case where the feed point of the antenna has a lower Resistive Impedance than the transmission line you're using, that will force you to lengthen the Dipole so as to raise its Resistive Component. This, in turn, will cause the Dipole's feed point to become Inductive. Then, all you have to do is to create a small Shunt Capacitor at the feed point, and you have a perfect match (1.0:1 VSWR), or a Reflection Coefficient (S11) of -30 dB, if that's what you desire.

EASY PROCEDURE -- The first time this is explained to you, it may seem complicated. Once you have performed the procedure once or twice, you will say, "why hasn't someone told me this sooner?" A skilled operator, who is watching the Reflected Power on a Bird Watt Meter, a Directional Coupler, or the screen of Network Analyzer, can perform the procedure in about 3 minutes. Be sure your instrumentation has High Directivity, or else the "perfect tuning" will be a "false perfection".

TUNING TRICKS -- Here are some additional tricks. You can always electrically lengthen your Dipole by placing small pieces of Copper Tape on the tips of the Dipole, or by placing sliding pieces of tubing in that area. You can create a Shunt Capacitor at the antenna's Feed Point by placing pieces of Copper Tape across the terminals of the feed point, after first insulating them with some paper tape. Your intention here is to prove to yourself that you can achieve a perfect impedance match to your Dipole. Once achieved, it is a simple matter to convert your "gimmick capacitors" into permanent fixtures that are mounted to the antenna in a weatherproof manner.

INDUCTIVE Z IS BETTER -- I like the Shunt Capacitor approach because it is very easy to create a variable capacitor by way of Copper Tape. The capacitor can easily be tuned under working conditions by poking the Copper Tape with a thin diameter wooden stick, as you stand out of the way of the antenna's field. This also is the way to tune the pieces of Copper Tape that are placed on the tips of the Dipole.

CAPACITIVE Z IS HARDER -- If you make the Dipole electrically shorter than ~ 170 degrees, that will force the antenna's Reactive Component to be Capacitive, and this will require a Shunt Inductor to be placed at the Feed Point. I find that it is more difficult to make a variable Shunt Inductor gimmick tuning device. But, maybe some of the smarter EME'ers will also solve that problem.

YAGI TUNING -- One last note about Yagi antennas. Many amateurs worry that gimmicky devices placed on the Driven Element will decrease the Gain, or change the Pattern of an otherwise well-designed Yagi. As long as loss less devices are used, this is not a problem. For a Yagi to work well, all that is required is for the Driven Element to:

- (1) Radiate in a Dipole-like manner.
- (2) Present a good impedance match to the transmission line.
- (3) Present no Common Mode Currents that flow on the outside of the coaxial transmission line.
- (4) And for all the Parasitic Elements to be the right length, and be placed in the right position.

PROBLEM: YAGI TUNING WITH THE DIRECTOR OR REFLECTOR -- You can use the First Director (or two), or the Reflector, for adjusting the Impedance Match of the Driven Element. However, when you do this you are simultaneously changing the Yagi's Pattern, and it's Front-to-Back Ratio. Tuning the Yagi, and tuning the Impedance Match of the Driven Element, are two separate operations. If you are smart enough, one operation doesn't have to contaminate the other.

A really smart technologist will use two pieces of instrumentation, or he will set up his Network Analyzer so there are two traces on the screen (in different colors). Then he can simultaneously display the Gain and the Impedance

Match as he does the tuning of the individual Yagi elements. You will be amazed how often an adjustment of a Director will make the Gain jump up 1 dB, at the same time that Driven Element VSWR goes from a 1.0 to a 1.5 (a loss of 0.18 dB). The smart technologist will leave the tuning at the High Gain position, and then he will work on the Driven Element to bring the VSWR back down. At the end of this tuning procedure he will have a Yagi that has maximum Gain, and the best VSWR, without allowing one operation to contaminate the other.

LOSS TEST -- If there is any doubt about whether there are lossy components within an antenna, a simple test will reveal that fact very fast. Simply put 100 watts into the antenna for 5 minutes. Then turn off the RF and quickly go over and touch the components of the antenna. The heat radiated by the lossy components will reveal themselves very quickly with that test.

CONCLUSION -- I hope you find this "secret" information to be useful. I think I have earned a small fortune over the years by using these techniques to tune the antennas for my consulting clients. They were amazed that I could achieve a 1.05 VSWR (and better), sometimes over a considerable bandwidth -- but that's another story. There are modern sophisticated receiver circuits that only perform well when such extremely low VSWR's are present.

73 es Good VHF/UHF/SHF/EHF/EME DX,Dick, K2RIW



On the left are the YL's at work prior to the dinner making items for the decorations at the dinner. On the right are the 150 + people at the MUD05 Dinner.



On the left Kerry, N6IZW checks the readings on the horn antennas at the receiving site. On the right Greg Bailey checks looks on. The transmitting source is on the hotel roof just over Greg's head.



Dave, WA6CGR had a display of historical microwave tubes.



Dick, K6HIJ arranged a display of SBMS historic equipment.



More of K6HIJ's display of historic SBMS gear.



On the left is Dick K6HIJ's 1960's portable Rocklok rig. On the right is the "SBMS Perpetual Flang Award" for contest miss doings. Mel WA6JBD received his 2004 award for a 24 GHz antenna and rig being blown over and destroyed by a dust devil. Chris, N9RIN received the award for 2005 when he powered up his 12v transverter with a 48-volt power supply.



Some folks take their roving seriously. A bus seen at MUD 2005.

The **San Bernardino Microwave Society** is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs from Hawaii and Alaska to the east coast and beyond. Dues are \$15 per year, which includes a badge and monthly newsletter. Your mail label indicates your call followed by when your dues are due. Dues can be sent to the treasurer as listed under the banner on the front page. If you have material you would like in the newsletter please send it to Bill WA6QYR at 247 Rebel Road Ridgecrest, CA 93555, bburns@ridgecrest.ca.us, or phone 760-375-8566. The newsletter is

generated about the 15th of the month and put into the mail at least the week prior to the meeting. This is your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

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