



## 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 2010 Edition

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At the **November 4, 2010** SBMS meeting the "Tech Talk" will be by John, KJ6HZ on the topic of sequencers. 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.

### REMINDER- NO PARKING IN THE CHURCH LOT

#### Scheduling:

December 2 SBMS meeting Jeff, KN6VR on his new Agilent Portable Spectrum analyzer.  
December 11 SBMS Christmas Party at Dennis, N6DQ QTH  
January 7, 2011 SBMS meeting  
Jan 22-24, 2011 ARRL January VHF Sweepstakes  
June 11-13, 2011 ARRL June VHF QSO Party  
July 16-17, 2011 CQ WW VHF contest

**Last meeting-** Mel, WA6JBD talked about his "new" 10 GHz rig as being a 6<sup>th</sup> in a series of rigs he has built. This one is in more modular approach so any piece can be field replaced if something goes wrong. It includes a 0.5 dB NF front end and a 30 w TWT on the back end. This runs in the back of his truck or whatever vehicle he happens to be using at the time. Most of it runs off 12 vdc but the TWT power supply wants to have an additional battery for -24v. There is a 4ft dish, 85 pound tripod, and 13 feet of flex waveguide that gets set out on the ground. There is also 60 pounds of sand bags to keep the tripod from tipping over in the wind. The front end has a 0.5 dB NF module and waveguide switch which mounts at the dish. The FT817 sits in either the front or back of the vehicle with cables long enough to allow operation on the road with the slot antenna on top of the car. There are a couple of 440 MHz liaison antennas that connect to two rigs for full talk around operation. Mel uses a Costco deep cycle battery for operations. The rig requires 5 amps in transmit and 2 amps in receive. The TWT takes -24v at 10 amps when in operation. Mel keeps a log book of signal levels of each module so when there is a problem he can check out where things might have gone wrong. The FT817 runs 5w all the time and is padded down in the transceiver so he doesn't have to remember how to set it up in the field. Thanks Mel for some good ideas. Pat, N6RMJ talked

about final adjustments that were happening for the upcoming MUD 2010. Marty Woll, N6VI was our visitor and new member. Marty is the ARRL SW Division vice director. Doug, K6JEY had a nice Chinese multi-meter/scope (UNI-T UT81A/B \$180) to show off. ATV check ins included K6BNN, KB6CJB and several others I didn't catch the calls of. 21 people present.

**Activity reports** from the October SBMS meeting: Pat, N6RMJ did a lot of roving and had fun; Larry, K6HLH worked from home during the contest and had 79 Q's; Rein, W6SZ had 30 contacts on the last Saturday of the contest; Chris, N9RIN had a 140 Q's; Brian, AF6NA has some 38 Q's in his first 10 GHz contest; Mel, WA6JBD and Tisza KI6DBR had a good time roving and did some FM mobile Q's running down the Hwy 15; Stan, KE6ZC went to the TAPR conference; Michelle, N5NYV had fun in her first 10 GHz contest with some 40 Q's; Ed, W6OYJ indicated the SGMG had a number of new amateurs on 10 GHz and he had 65 Q's; Bill work only 4 hours of the contest and made 16 Q's; Chuck, WA6EXV worked from home and had fun; Dick, WB6DNX took 3 others in to the Chino Hills for the contest; John, KJ6HZ worked Mel on 10 GHz FM mobile; Dave, WA6CGR worked 10 and 24 GHz from the "LAB" and had over 60 Q's.

**One MUD 2010 report-** MUD 2010 was great. The tour of JPL in Pasadena turned into a super walk about with all the lab displays and new MARS Survey Lander spacecraft in its assembly area. We missed part of the tour due to the Southern California Shake out that occurred mid tour. All the lab people were out into the parking lots for it. The talk on how Goldstone big dish was overhauled was super with all kinds of details that made our group in on some of the "how to do it stuff". The tech talks during the MUD conference were great with all kinds of photographs by the authors. Lots of things for us to think about for the home rigs. The spouses had a good time in their events. The banquet had good food, a great speaker in Dr. Kate Hutton, K6HTN and over 1000 prizes. Jeff, KN6VR won the Agilent spectrum analyzer. Will, W0OEM received the Don Hilliard award for technical achievement. A second Hilliard award went to Dick Kolbly, K6HIJ (SK) who has helped many of us over the years. Dick's award was received by Phyllis and Kenneth Kolbly. Among the prizes were a 78 GHz transceiver from Nori of Japan, several DB6NT items, Dubus gifts, RF devices, and many parts. The 2011 MUD will be in Enfield CT (Hartford area) on October 13-15. Thanks to our SBMS members taking charge: Pat, N6RMJ and Doug, K6JEY co-chairmen; Dave, WA6CGR prizes; Mel, WA6JBD measurements and surplus tour; Tisza, KI6DBR spouses events, banquet cake radio and table prizes; Dick, WB6DNX treasurer; Tony, KC6UQH JPL tour; Frank, WB6CWN talks and proceedings; Phyllis Kolbly registration; Gary, W6KVC ATV/internet; Linda and Judy, KC6UTF registration helpers.



**AND THE WINNER is**

**Jeff, KN6VR.** The Agilent 9340B Spectrum Analyzer covering 100 KHz to 3 GHz was presented to Jeff by Dave, WA6CGR the MUD 2010 prize chairman. Thank you to Agilent for their GREAT donation.



The measurement adjusters Dave, WA6CGR and Doug, K6JEY.

The main measurements guy Mel, WA6JBD with his great tools.



We saw the JPL spacecraft assembly area with the Mars Scientific Laboratory, Curiosity in various stages of fit check and operational checks. During the tour we got to see many of the development and test areas for the new probe to Mars. We also learned about the current robotic probes on Mars: Spirit and Opportunity. Interesting tales of robots that were suppose to live for 3 months and six years later still giving us data about the red planet.



Dr. Doug presenting the Don Hilliard Technical

Achievement Award for Dick Kolbly, K6HIJ (sk) to son Kenneth and wife Phyllis Kolbly during the MUD banquet. Dick had developed and built many microwave devices for both amateur and professional use.

Our MUD 2010 banquet speaker Dr. Kate Hutton, California Institute of Technology Seismologist “the Earthquake Lady”, K6HTN and Dr. Peter Lyman, K6PTL former JPL Director of Interplanetary Communications Group.



#### **Wants and Gots for sale.**

**For Sale** 5 GHz system- FT817+ DB6NT transverter + dish. 3GHz system- FT817+DB6NT transverter + amplifier+ loop yagi. Pat [N6RMJ@sbcglobal.net](mailto:N6RMJ@sbcglobal.net) 661-755-1773 cell.

**For Sale** 30w 1296 MHz amplifier kit \$50 + \$5 for US shipping Chris Shoaff [cshoff@yahoo.com](mailto:cshoff@yahoo.com)

**For Sale** TS-403 2-4 GHz signal generator \$10 Bill WA6QYR [bburns@ridgenet.net](mailto:bburns@ridgenet.net)

**For Sale** 10 GHz slotted waveguide antennas \$60 kit, \$85 assembled plus shipping Dan W6DFW [W6DFW@apex-scientific.com](mailto:W6DFW@apex-scientific.com)

Email thread: **Radome material** -- off MW list

Looking for suggestions for material to make a cover for the feed horn on my 1296 EME dish. Have an OK1DFC septum feed which has a square opening of about 6.5 inches. My first thought was to use polycarbonate sheet (Lexan) cut slightly larger than the opening and seal around the outside edge with silicone caulk. But I have concerns about what effect that dielectric will have on the pattern.



Other materials I have handy are acrylic (Plexiglas), glass epoxy (G10 I think), and ABS. I also have foam insulation which I could cut and stick in the opening like some old TVRO feeds I've seen, but that really concerns me. After all the work I've done to optimize this setup, I don't want to do anything stupid that will compromise performance even a small bit. Thanks 73, Larry - W7IUV

As thin as possible, and be aware that a window will change the pattern of the feed (it's a dielectric). Very thin layers of Kapton are popular. Mylar might work as well. Don't forget to vent it! (A small hole in the feed, for instance) Go for thin and strong. Foam is commonly used... (Rohacell, e.g.) It's mostly gas, so the dielectric effect is small. The trick is weather and UV resistance. AND, whether it picks up water. Polystyrene foam (Styrofoam(r)) works, but isn't very rugged, and it seems to pick up water. jimlux [jimlux@earthlink.net]

Think thin. And then test for RF losses in the microwave. Put a cup of water in the microwave to keep it loaded. If the plastic heats it's lossy. Lexan weathers well, plex doesn't all that well. G10 is beginning to be lossy at 1296, abs varies a lot. Look at polystyrene from the hobby shop. Or polyethylene or teflon. 73, Jerry, K0CQ

Hi, tested up to 47 GHz with no measurable loss: Extruded polystyrene 73 Dom

Hello Dom. Styrofoam has no effect as far as I can tell on the pattern of my feed. You say that is true up to 47 GHz. I've only tried it to 10 GHz. I will check against sun noise with and without the Styrofoam to confirm that. It may have some dielectric effect but without specifically checking my sun noise I cannot say. I use the low density foam and I have never suspected that it absorbs water or that it deteriorates very fast. Anyway, it's easy to change in a minute if it gets crumbly from the sun. Most feeds point down and away from the sun anyway. Someone who can access the sun now will be very helpful if they would do that for us. My polar mount won't hit the sun for 6 months. That's the downside of the polar mount, otherwise I'm very happy with my very simple mount and extremely simple control system which is no more than a pulse generator that bumps the motor every two min or so. No Az El. No computer, Dark Age's technology! Tracks horizon to horizon. 73 Steve Gross N4PZ / W9OJI

Larry, If you can get a thin large enough piece of Teflon, that is probably the best you can do for UV and weather resistance with practically no loss at all. Water tends to bead and run right off it. It should be thinner than a tenth of a wavelength, preferably even thinner than that. White Styrofoam is almost completely loss-less. The colored stuff has a tiny bit of loss because it includes a fire retardant. But all foam is damaged by UV and the birds like to grab it and pick at it. Most plastics degrade in UV (sunlight). If you don't have and can't get Teflon sheet, I would offer the same advice - try it in the microwave. Tom

Expanded polystyrene foam. no , expanded polystyrene takes water , is picked by birds , and eaten by rodents. Extruded is much better. 73 Dom

Larry, I have some firsthand experience with this subject. First, the polycarbonate (Lexan) is a really robust and easy to work material. I use two 1/2" thick pieces to support various feeds from 23 to 3cm along with a 25 pound TWT for the higher bands. The support is a clear material, 22 inches in diameter with a 6 1/2" cutout for the 23cm feed. All other feeds are smaller and fit the same 6 1/2" opening. The cover is also polycarbonate sheet, 1/8" thick. It is formed into a cylinder 22" in diameter and 24 "long with the rear end covered with a flat piece of the material. I used black color to help with u.v. resistance and look good.

I see no measurable degradation of the system due to use of the plastic support and cover. I would use the material in future projects with no reservations at all.

If you think about it, even if the support and cover blocked the entire projected area, it is so small compared to the dish area as to be insignificant.

Hope to hear you on one of the higher bands soon! 73, Gerald K5GW

What about Kapton? I've made some microwave circuits by placing conductors on Kapton, and they didn't appear to have excessive loss. The thing I really like about Kapton is its high temperature characteristics that allow me to solder directly to the conductors without melting the dielectric. It comes in thin materials of various thicknesses, and it can be shaped and molded into more rigid structures if you have some way to get it hot enough. Ben/K4QF

Check out Rexolite. It is polystyrene widely used for radomes. Not super cheap, but predictable performance and low loss.\*<http://www.sdplastics.com/rexolite.html>\*<http://www.rexolite.com/list.html> -Tony KC6QHP

Some radomes are made with Rohacell. It's used also to build RC glider's wings. 73 David F1URI

First of all I would like to thank all those who responded with info and suggestions both on the lists and direct. Too many to respond to individually so I will do it through the lists.

I guess I wasn't clear in my original post because everyone addressed transmission loss rather than what I was really interested in. When I was working, I had to "opportunity" to test radomes made from all of the mentioned materials and some that weren't. I've run them through anechoic chambers, wind tunnels, temp/altitude/altitude/salt fog chambers, shot them from cannons, dropped them from aircraft, and who knows, could be a few still in orbit someplace. But in all that time I never have seen a radome that was in direct contact with the actual radiator. The radome itself was ALWAYS spaced out away from the horn/dipole/patch/whatever by some free air or vacuum.

So by experience I have I think a pretty good handle on both the physical properties and the transmission loss of the various materials. My concern is what happens to the radiation pattern of the open waveguide used as the feed horn when some dielectric material is in direct contact with the open end. I have gone through some effort to insure that the dish is uniformly illuminated and the rear radiation from the open waveguide is minimal by using a choke ring. The effectiveness of the choke ring was evident by the 0.5 dB increase of sun noise / cold sky even though the choke ring increased the dish blockage by 4%. My waveguide theory is nil. I know that there is RF behind the opening on the outside of the waveguide. I know that the choke ring minimizes the "bad" effects caused by this. But what happens when you place something with a dielectric constant different than air in direct contact with the end of the waveguide? Does it screw up the choke action? Does it even matter? Could be I'm worrying about nothing. I do that a lot.

As far as physical properties, polyethylene and polystyrene in all their forms are great for RF but suck for survival in a hostile environment. Teflon is great in all regards except you can't use adhesives to hold it in place. Kapton is neat stuff but is picky about adhesives and not easy to work with in thin sheets of the size I need. If I wanted to replace the thing every time a bird flew by, I could raid the kitchen for some food wrap (Saran Wrap), itself sticks nicely. Fiberglass in one form or another is probably used for more radomes worldwide than any other material except for possibly Norel (and its cousins). My choice barring any negative experiences from anyone would still be polycarbonate sheet (Lexan). It is easy to get, virtually indestructible, can be "glued" Easily, and I know that at least 28 GHz shoots through it like prunes through a raccoon. (Personal experience with the polycarbonate, not the Raccoon!) Again, I don't know what will happen when I put a gob of silicone caulk on the outside edge of the waveguide to hold the sheet in place (and yes there are weep holes already strategically placed in the horn).Further discussion about the pattern deformation (or lack of) would be appreciated.73, Larry

Larry, why are you planning to cover the feed out in front? I can see a need to protect the feed points, preamp and t/r relay and that can be done by a cover that has the snout of the feed and choke in front of the cover. The feed will never be in a position that rain can get into it, right? 73 de K5GW

The drafting material is probably Mylar. I worked in satellite communications and large sheets of a paper thin Mylar like material covered the xmt feed horns which were pressurized to .3 PSI causing the material to bow outward. Don't know if this was Mylar, but surely looked like it. Jim, NN4AA

Kapton is good. I'd lean towards mounting it by bending over the sides of the horn and clamping it with metal or maybe Lexan strips. Kapton is available from McMaster-Carr at: [http://www.mcmaster.com/#polyimide-\(kapton\)-sheets/=94xxcg](http://www.mcmaster.com/#polyimide-(kapton)-sheets/=94xxcg)  
73, Jerry, K0CQ

A gob of silicone seal unless it's the special variety that doesn't exude acetic acid while curing will corrode the horn. Like I said a few minutes ago, I'd rather see a mechanical connection, e.g. a strap held down by some screw (which might be tapped into the wall of the horn with lengths chosen or filed off so they are flush on the inside, and maybe using Lexan for the clamp strap. If the lens is very thin it's not going to have appreciable effect on focus and beam spread. So pick a material that has the best sturdiness while think, like Kapton or Mylar. Forget the gobs of silicone; they will have more significant unwanted effects.73, Jerry, K0CQ

The Frazier x-band beacon has been running in excess of 12 years. Now at 8000 feet into a 0.1 inch thick wall PVC, 6 inch diameter sewer pipe radome. It measured about 1/2 dB loss. It's cheap and readily available most anywhere. On 10 GHZ it's got to be lower on 1296. Kapton sheet is even lower and is also readily available... weather proof. Heat resistant and glue able..., I glue it over the Slots on our 10 GHz beacon antennas. 73 Chip N6CA



**Dave, WA6CGR** getting ready to auction copies of the Japanese “QST” magazine during MUD 2010. 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 in 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 or, [bburns@ridgenet.net](mailto:bburns@ridgenet.net), or phone 760-375-8566. The newsletter is generated about the 15<sup>th</sup> of the month and put into the mail at least the week prior to the meeting. This is

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