



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 December 2012 Edition

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At the **December 6, 2012 SBMS meeting** will have a talk by Doug, K6JEY on setting up your own lab. 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.

Last meeting. - Rein, W6SZ talked about the WSPR mode from some notes on observations. He had a schematic on the computer to radio interface. WSPR works on two minutes cycles for transmit/ receive. The world wide mode operates on 20, 30 and 40 meters. There is a 144.489 MHz mode in the bay area. SOCA has 10,368,405 Hz as a temporary frequency. The reporting on the world wide frequencies is on the internet. Two hundred hertz is the bandwidth for each of these bands. The annual SBMS Christmas Party will be at Dennis' house W6DQ in Fullerton on 15 December. The dinner is pot luck with a gift exchange. There was a discussion on how SBMS should be helping with advancing the state of the art for hams in microwave: - One thought was to put out user friendly information for the average ham on microwave rigs and operations; Need more home stations; Maker Fair booths; help college students like those UC Davis who spoke at MUD; have a display at technical museums like the one on the Queen Mary ship; more talks to local clubs.

Scheduling:

December 15 SBMS Christmas Party at W6DQ home.

January 3, 2013 SBMS meeting "Can radar"

February 7 SBMS meeting Rhode & Schwarz- new technology

March 7 SBMS meeting -nomination of officers- Maker Faire

April 4 SBMS meeting- election of officers-Near field antenna range with Dan Slater.

Wants and Gots for sale.

For Sale: 30w 1296 MHz PA kit \$50 + \$5 for US shipping Chris Shoaff, N9RIN cshoaff@yahoo.com

For Sale: 10 GHz slotted waveguide antennas \$55 kit, \$80 assembled plus shipping Dan W6DFW W6DFW@apex-scientific.com

For Sale: Microwave Solutions 3.4 GHz PA 1mw in6w out 12vdc Matry N6VI 818-773-9655.

Want: 60 to 100 feet of EW90 waveguide Pat N6RMJ@sbcglobal.net 661-755-1773

FOR SALE: Leupold 3-9 VARI X-II scope. Optically perfect but the reticule does not adjust properly. Would be great for aiming at mm frequency dish or an optical system. Make me an offer. Jeffrey Fort 760-948-7227 JNJFORT@VERIZON.NET

NEED- HP 8694 8-12 GHz sweeper plug-in for 8690 main frame Chuck WA6EXV 760-382-0709

For Sale: EIP counter model 548 10 Hz to 110 GHz Doug drzarkof56@yahoo.com

Want- an X-band plug-in for HP8620 sweeper. Bill WA6QYR bburns@mediacombb.net

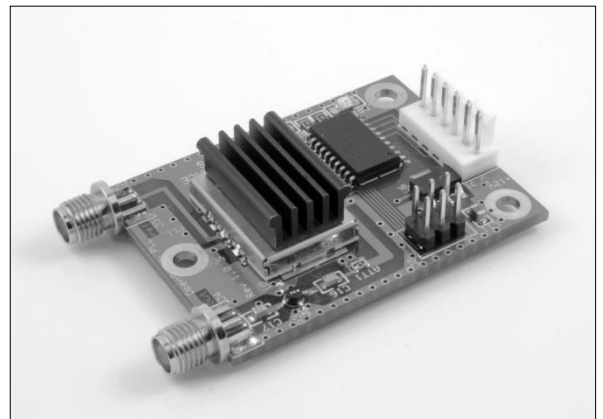
Activity reports from the 1 November SBMS meeting-Dick, WB6DNX is working on his 10 GHz rig; Bill, WA6QYR went to MUD; Walt separated some ions from radiation; Courtney, N5BF went to MUD and is working on some 1296 MHz gear; Dennis, W6DQ went to MUD and picked up a 10 GHz transverter; Wayne, N6NB pulled his tower trailer around the east coast for some 8K miles and made lots of contacts; Dan, W6DFW is building parts for a rig; John, KJ6HZ picked up a new counter; Doug, K6JEY went to MUD and picked up a 10 MHz to 40 GHz signal gen; Mel, WA6JBD went to MUD and picked up some parts; Jeff, KN6VR had some tripod problems; Rein, W6SZ has been listening to beacons from his QTH; Larry, K6HLH went to MUD and had DB6NT transverter problems; Chris, N9RIN cleared his work bench; ATV Don KE6BXT reported some 9 people listening to the meeting on internet.

60 degrees North Electronics Company. I am starting up a kit making service for assembling certain kits made by Down east Microwave. For those that do not want to make their own kits or maybe it's gotten too difficult, or just don't have the time or want assembled kit faster than DEMI can supply it. This one-man business so I will only be able to build a limited number per month. My price is the same as offered by DEMI assembled, plus shipping which should be medium-size flat-rate priority mail in the US. I am expecting to be able to deliver within 30 days of receipt of paid order. I am not carrying any inventory so this allows shipping time to obtain kits and any other materials, and time to test the finished product plus ship to the customer. At this time I am limiting this to the VHF/UHF 25w Transceiver kits. In a couple months I hope to add three amplifier kits from Communications Concepts, Inc. If there is a something special you want assembled contact me. My professional credentials are at: <http://www.k17uw.com/60NE.htm> Ed Cole



Introducing the **OpenSynth** line of frequency synthesizer kits. Available in standard frequencies of 2556, 2952, 2160, 1152, 3312, 3006 MHz, also available from 400 MHz to 3500 MHz.

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Thread on making $\frac{3}{4}$ copper pipe to WR90 waveguide transitions.

With heat it might be possible to soften and flatten the end of a $\frac{3}{4}$ -inch polystyrene rod to about 0.4 x 0.9-inches to fit inside WR-90. I suspect that if you tapered the rectangular section to a pyramid a couple of wavelengths long, and the round section to a conical shape for about the same distance, the VSWR and loss would not be too bad.

Some in our club (SBMS) are getting interested in WSPR mode on 10 GHz because it is something you can do at home if you have a tower. But they don't want to raise their rigs to the top because they want to be able to go on the road with them. The solution is to run round copper pipe up the tower. That means a lot of guys are going to be needing round to WR90 transitions.

In the MUD proceedings from last weekend, there was an article for doing that by merely stepping down with the right spacing. It looks easier than a traditional taper, but not as cheap-n-easy as a butt joint and inserting a chunk of plastic.

I can't quite picture what you are describing. (One day when they computerize email, we might be able to insert pictures..... Nah. that's asking too much of the technology.)

I take it the taper of the plastic is on both ends and the thickest part is right at the joint? Is it OK to have a half an inch of straight between tapered ends to have a good fit? Do you think it can be pyramidal on both ends? Might be easier to make.

Walt

The original article and later ones have suggested smashing the $\frac{3}{4}$ water pipe into the rectangle that fits into a WR90 flange. I suspect that the dimensions of WR90 were developed from standard $\frac{3}{4}$ " water pipe so it could be made quickly without major factory changes where copper pipe is made. It can be a help to anneal the copper before smashing with the vice. Heat it red and cool it. Slow or fast, unlike steel the cooling rate doesn't affect the annealing of copper. It only work hardens.

Then it wasn't hard to make a coax to $\frac{3}{4}$ " transition and there is a need for a septum up top to hold the polarization and then to adjust the feed angle at the bottom to account for unpredictable polarization changes caused by bends and ellipticity of the pipe. Original article was in Eastern VHF/UHF conference 22nd conference. It was reproduced in the ARRL UHF/Microwave Projects Manual Volume 2. I don't if it's been published since; I've been looking for more recent reproductions to refer others to them.

Those unpredictable polarization tilts can be mostly ignored by going to circular polarization in the pipe rather than liner. Takes one of the circular polarization schemes used for dish feeds in round guide. Posts, dielectric septum, metal partial septum, or two probes and right angles fed through a quadrature coupler.

For long runs it might be interesting to look at the concepts pushed by tallguides.com where they get much lower loss, at the cost of considerable more copper. That concept has also been applied to cylindrical guides, just depends on the cost of RF gain. And the flyswatter concept is quite workable, as espoused by W1GHZ and others.

There is always the hazard of coupling the primary mode to higher order modes in the plastic and not coupling back in phase at the other end of the plastic. I'm not at all sure what it takes to force or prevent the higher modes with the standard guide filled with plastic having dielectric constant 2.5 to 4.5 allowing 2nd to 4th order modes.

With air filled guides it's important that they be sealed and filled with dry air or dry nitrogen under a bit of pressure, otherwise they will breath with diurnal temperature changes and humidity will condense inside leading to corrosion and significant insertion loss from slugs of water in the low spots.

Dry air isn't hard to produce, just use a tire pump or small compressor and run the air through a container of silica gel. Andrews used to make a pump where the container of silica gel surrounded the cylinder of their version of the long stroke tire pump. I think they like 3 psi for coax and waveguide.
73, Jerry, K0CQ

In lieu of making a hardwood mandrel, I took a WR 90 flange with me down to the used/surplus tool store, and sorted through the rectangular cold chisels. I selected one which just fit into the flange (in both planes) and part way up the rectangular portion of the chisel. Scribe a mark on the chisel at the correct interface point with the WR 90 flange and then insert it into the open end of the 3/4" schedule M copper tube. Now using a combination of first the hammer and then a vise you can quite easily form the end into a perfect rectangle and adjust the taper as required. Start to finish about 5 minutes (YMMV).
GL es 73, Chuck, W7CS

About twenty years ago I made a crude WR90 to pipe transition to feed the circular waveguide on a Gabriel 6 foot dish. All I can attest to is the transition worked noticeable better receiving sun noise than just butting a WR90 flange to the circular dish feed waveguide.
Here are a few pics:
https://dl.dropbox.com/u/15095569/w4dex/wr90_circular_wg_a.jpg
https://dl.dropbox.com/u/15095569/w4dex/wr90_circular_wg_b.jpg
Dex

Forget the dielectric, I just used a large hammer and just squared the copper water pipe until it tapers down to a WR90 flange. Nice return losses, I believe Kent, WB5VJB did a microwave update paper on this 10 years or so back. If Kent publishes it, it works!
W3SZ has my old feed operational (with 3/4" to wr90 adapter) on 10GHZ EME.
His web site has pictures of the 10GHZ water pipe to wr90 adapter about half way down the web page.
Roger has other good 10 GHz stuff here too.
<http://www.nitehawk.com/w3sz/W3SZ-10GHzEME.htm>
73 Steve, N3FTI

See MUD 89 pages 188 and 189.
73, Jerry, K0CQ

Need to ask... are you going from actual WR90 to 3/4" Cu pipe or from coax to WR90 transition to 3/4" Cu pipe? If it's from coax to WR90 transition, why not use a transition to 3/4" Cu pipe directly? Paul, W1GHZ, documented such in Proceedings of Microwave Update, 1999, pg 235 ff. See figure 17, pg 254. (Note: the label on the figure is reversed... it's obvious, though, if you think about it for a couple of seconds.)

Saves a lot of bang'n and pound'n if you don't NEED to....

73 Donn
WA2VOI/0

I've found that the openings in available bare WR 90 flanges seem to come in two sizes. The size with the larger opening dimensions will accept the outside dimensions of the modified copper tube insert and solder. The smaller openings are the same dimension as the ID of the round to rectangular copper pipe adapter; solder it to the outside edge of the flange opening. I've also found that WR 90 W/G flanges come in at least six different shapes, sizes, and mounting hole patterns,

You can go to Harbor Freight and purchase one of their small compressor and tank combinations (\$39.99 when on sale), a low pressure gauge with adjustable valve and then a small refillable desiccant cylinder or just buy one of the refillable air tanks (7 or 10 #), again with the valve, gauge and desiccant cylinder, and connect this configuration to one of the W/G connectors which has an air inlet. Make certain that the far end of the W/G is sealed air tight. As I recall the recommended W/G pressure is in the 2 to 3 # range.

BTW, a very inexpensive replacement for Silica Gel is to use the type of Kitty Litter that consists of clear/opaque crystals. A life time supply costs, if you don't also use it for its intended purpose, only a couple of dollars. Be sure and store it in a water proof sealed container.
GL es 73, Chuck, W7CS

Use a chisel at the correct interface point with the WR 90 flange and then insert it into the open end of the 3/4" schedule M copper tube.

That's what I do, but it's not easy.

The width of the chisel (in my case of aluminum) is wider than the diameter. You have to pound the chisel in backwards. But that doesn't taper the tube. You have to use a combination of pressure from the outside at an angle and the mandrel on the inside.

I hear all these suggestions that it is easy, but somehow people come to me instead of doing it themselves.

The best suggestion so far is from Dr. Jerry. Annealing does not need a slow cool down. Just heat it and quench it. Pound a little, then heat and quench again.

Walt

Well, in a Crawford Hill note dated 1989, W2IMU told us to make a wooden mandrill and beat the copper into shape with a hammer and to make the transition four inches long. The Crawford Hill Notes were reproduced in the 1999 MUD proceedings and in the 2010 International EME conference proceedings. That EME proceeding is available from lulu.com and today and tomorrow if you use the coupon code JEKYL, it's worth a 20% discount.

Other MUD and VHF conference proceedings have included articles of value from older vintages and Kent's may have shown up that way. So maybe Steve you don't remember perfectly wrong, just I'm the better elephant.

I thought I've seen them at ntms.org or wa5vjb.com but I don't find them this evening.

[www.ve1alq.com/W2IMU-K1RQG/w2imu notes.html](http://www.ve1alq.com/W2IMU-K1RQG/w2imu%20notes.html) doesn't have the extended unnumbered notes which are where the waveguide transition fits.
73, Jerry, K0CQ

The way I read Kent's procedure, you only need to form the end of the pipe to fit the flange. The taper will come automatically without needing any mandrill or hammering.

None of the references I have mention annealing the copper, but that surely makes the process easier though it probably leaves the inside surface with some scale that isn't a benefit.

73, Jerry, K0CQ

At 05:12 PM 10/25/2012, you wrote:

>I use a fish tank pump and a pressure switch to control it. I use a
>Ball jar with brass tubes for in and out air filled with silica Gel.
>You can by Silica Gel at stores like Hobby Lobby and Michaels. They
>sell it to dry flowers.

>

>Do a good job sealing the connectors and the volume of air from the
>fish tank pump will do a great job. I set the pressure switch to 3/4
>psi. All you need is a positive pressure in the waveguide. Using a
>fish tank air manifold I have 2 7/8" air dielectric coax runs of 70
>feet each and a 70 foot run of 6 Gig waveguide.

Wes WA5TKU

In his article in MUD 1999 (pages 235 to 259), "Understanding Circular Waveguide -- Experimentally," W1GHZ analyzed many coaxial probes for 10 GHz in 3/4" copper. It was also published in QEX in 2001, and that version is on line at:

[www.w1ghz.org/QEX/circular wg.pdf](http://www.w1ghz.org/QEX/circular%20wg.pdf)

In K2RIW's article in the same proceedings titled, "Circular Waveguide Frequencies More Accuracy, More Experimental Data" pages 351 to 356; he reports on tests of WR90 to 3/4" water pipe transitions on page 353. He says, "Our 'Elegant Transition' was a carefully constructed slow transition (over a 1 foot length) from rectangular to circular. It had an S11 of -35dB (VSWR = 1.04). A 'sloppy transition' was made by crushing one end of a 3/4" copper pipe in a vise and forcing it into a WR90 WG flange. It had an S11 of -23 dB (VSWR = 1.15). To make these measurements we used that Super WR-90 20 dB coupler (50 DB of

Directivity) I described on the Reflector on 5/28/99 (A Singer/Alfred Model 950786)."

Note that with the more common 20 dB couplers with 20 or 30 dB directivity, you can see great VSWRs but can't believe them because the directivity will show -20 or -30 dB reflected power on a PERFECT load.

It takes a load mismatched by that much at the right distance to make the detector on the coupler see more of a dip in reflected power. The mismatched load and distance has to cancel the forward power coupled by the imperfect directivity.

Note also that typical microwave industry VSWRs for products including transitions is more like 1.5:1 or return loss of about 16 dB.

What Knadle said is, you guys are too worried. It's not all that critical. IT WORKS if bashed, or squeezed, or with the most precise manufacturing possible. Get on with more troublesome issues.

73, Jerry, K0CQ



A 47 GHz rig at MUD 2012 was of nice design with an FT817 IF radio sitting on top.



Ed, KL7UW and Janet from Alaska were at MUD 2012. 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@mediacombb.net, or phone 760-375-8566. The newsletter is generated about the 15th of

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