



## 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 July 2011 Edition

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At the **July 7, 2011 SBMS meeting** we will have **Dave Glawson, WA6CGR and Doug Millar, K6JEY** with a few calibrated 10 GHz power meters to the July meeting and support a power output "party". Members can bring their RF head or entire rig to the meeting and get an accurate measurement of output power. Measurement should be taken at the point where the 10 GHz leaves the final amplifier stage and enters the "feed system" wave guide or coaxial transition. This will help members prepare for the 2011 Contest and ensure consistency in the readings at microwave tune-up. 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.

**The Annual Tune Up Party** prior to the ARRL 10 GHz and Up contest will take place at the Costa Mesa Fairview Park shelter as in previous years. July 30 is the date. Start time is about 9 am. Dick, WB6DNX has reserved the area with SBMS funds. There is NO Alcohol to be consumed in the park. Kerry and Ed from the San Diego Microwave Group will provide the measuring equipment for 10 and 24 GHz. As before you will have a signal to measure how low you can still hear it for minimum discernable signal level. Then you will transmit to measure your power output. An estimate of your antenna gain is needed or at least its size so an overall system performance can be calculated. Ed will publish the results so you can see where your rig stacks up against other member rigs.

**Last meeting:** The pre-meeting activity was a stuff give-away provided by Kerry Banke. Chris Shoaff called the meeting to order with the reciting of the pledge of allegiance. Dick decided to wait for the projector to go on sale. Dick reserved the park for the Tune-Up event. Tom Board and Dennis Kidder did not contact each other about where to put the new screen, how to put it up and when to get the screen to those that put it up. The change of ARRL insurance carriers was not discussed. Dick and others were to get more information for the July meeting. Brian's suggestion the previous month that we have a pre-tune-up event was put into action this month by his announcement that the July meeting will have power meters available. (Dave Glawson will bring them.) You are invited to bring your transmitter to rehearse the tune-up process. The tech talk was by Kerry Banke from our sister microwave club in San Diego. It was on Five Methods for Noise Figure Measurement. Gain Method; Signal Generator Method; Sun Noise Method; Y-Factor Method; and Calibrated Noise Source Method. The easiest is probably the sun-noise

method. An excellent software package for the Y-Factor method is software from vk3um.cm  
[http://www.vk3um.com/Reference%20Data/G3LTF %20Paper%20Intergrated%20R3.pdf](http://www.vk3um.com/Reference%20Data/G3LTF%20Paper%20Intergrated%20R3.pdf)

#### **Scheduling:**

**July 16-17, 2011** CQ WW VHF contest

**July 29-30** Central States VHF Conference Irving, TX

**July 30** Tune Up Party Fairview Park Costa Mesa, CA 9 am to end.

**August 4** Contest preparation.

**Aug 6-7** ARRL Aug UHF (222 MHz up).

**August 20-21** ARRL 10 GHz and Up contest first half

**September 1** planning for next contest outing.

**September 10-11** ARRL September VHF QSO Party

**September 17-18** ARRL 10 GHz and Up contest second half.

**October 6** TBD

**Oct 13-16** Microwave Update 2011 Crowne Plaza Hotel Enfield, CT [W1GHZ@arrl.net](mailto:W1GHZ@arrl.net)

**Oct 22-23** EME 50-1296 MHz round 1 contest

**November 3** TBD

**Nov 19-20** EME 50-1296 MHz round 2 contest

**December 1** TBD

**Dec TBD** SBMS Christmas Party

**January 5, 2012** TBD

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

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

**For Sale:** 10 GHz slotted waveguide antennas \$70 kit, \$95 assembled plus shipping Dan W6DFW [W6DFW@apex-scientific.com](mailto:W6DFW@apex-scientific.com)

**For Sale:** 10 ft channel master TVRO dish. Mesh good to 12 GHz. 0.3 f/d \$50OBO Brian 909-226-2015  
[brian.thorson@sce.com](mailto:brian.thorson@sce.com)

**For Sale-** Uniden Pro340XL 40 ch HT CB unit \$10; McGraw-Edison 2620T2 700-2000 rpm small bench top drill press \$25 Bill WA6QYR 760-375-8566 [bburns@ridgenet.net](mailto:bburns@ridgenet.net).

**For Sale:** a classic secretary desk with fold down main door. It has several compartments to place transceiver, tuner, and power supply with wires in back. You can put the whole station in a dark reddish wooden cabinet out of sight when door is closed. It is out and useful when door is opened. 18" Deep x 52" tall x 34" wide. \$30 new condition. Can be delivered to SBMS meeting. Bill WA6QYR [bburns@ridgenet.net](mailto:bburns@ridgenet.net)

**Activity reports--** Dick Bremer's report on a box he and Ed Murashie made to load power supplies that are frequently used by UHF and microwave hams. Walter demonstrated progress in his learning about LNBs as microwave radiometers. Brian Thorson reported on a news item concerning the health risks associated with UHF and microwave frequencies. George, K6MBL announced that he has a presentation ready on the history of local microwave ham activities. (We are coming up on 51 years of SBMS.)

Check out this page!

<http://www.microwaves101.com/encyclopedia/ham.cfm> Wayne KH6WZ

#### **LMR coax cable issues.**

When I removed the connectors I found the aluminum foil and shield had oxidized indicating water penetration. I guess but this is where I get to say: I-told-you-so. Normal LMR is fine indoors. Outdoors it is just a time bomb. It's insidious, because the cable does not get real bad - it still had the braid - but the aluminum is baby powder and the loss goes up. No matter how hard I try, I cannot make a totally waterproof connector and even if I did, the cable "breathes" through the jacket anyway (it says so on the Times Microwave web site, in fact).

I just replaced all my feeders on my satellite setup with LMR-400 from low loss RG-8/9913 stuff. Now you have me worried that I made a mistake.

I have 1296 and 2304 loops up there as well and was considering hard line, but had bought some LMR for it, but have not put it up as yet. I am going to try and listen on the loops till I get my dish up this summer. If what you say is right then maybe I should put up some 7/8 instead?  
Bill Booth VE3NXX Sundridge ON, Canada

Umm... LMR will fail in wet environments. Read the Times environmental notes on this. I live in an extremely damp location and won't use the stuff, thanks to the honesty of TMR's publications. Corrosion can begin with just high humidity at the time of installing the connectors to it. Heat of soldering accelerates the electrolysis and then it just continues over time.

This is possibly why some folks claim to have outstanding reception on paper but in fact do not. It is possible their problems lay in their phasing harnesses...in front of their calculations. And another plug for ladder line feeders :) EcoCable is a superior product, but their notes still request change outs every ten years. It is also expensive and heavier...Jeremy "No Bull Crap Amateur Radio" [www.w7eme.org](http://www.w7eme.org)

I think there are very good weather proofing techniques utilized in the cellular industry. I personally have watched them evolve since the early eighties to the football sized wrappings of today. The LMR product will in some environments allow moisture to enter directly thru the jacket, not your connector efforts. This is why it is never utilized in even shallow water, or burial in even gentle sands or aggregates.

Again, Times will tell you this. Ken's reasoning is sound. It is an economical product with decent performance and inherent flaws. Sure it may not always do this and if it's what you can afford I suppose that's the way to go.

Anyway, that's my opinion... Jeremy

Gents: Don't be so quick to discard LMR-type coax (I have no association with Times Microwave Company except as a fully satisfied customer).

I used LMR-400 for the short runs (1-3m) and LMR-600 for longer phasing line runs on my 2m EME array (8 x X-pol long yagis) and had it installed in Wisconsin where we get severe freeze/thaw cycles yearly.

My line was installed for six years and when I de-installed the system to move QTHs; all connections where I removed the weather-proofing were like new with no moisture ingress and the unwrapped connections from six years earlier looking like brand new coax and connectors. The lines I removed all test just the same as the day they were brand new (excellent low SWR and great performance).

What weather-proofing technique did I follow?

Tightly (stretch-fit) fully over-wrap all type N "sealed" connections including their adjacent "water-tight sleeves" with 3M Scotch #70 Self-fusing Silicon Rubber tape (creates weather barrier). This has to be stretched/tight-wrapped to fully encapsulate the connections (single layer over all is sufficient). Then over-wrap a single layer of all of the #70 area with 3M Scotch #88 to seal it against UV and abrasive knicks, etc.

It's not the cheapest solution, but it is an excellent value considering the cost of my time and the labor to install the system, and the results speak for themselves.

Kind regards, 73, David Schmock, KJ9I Sullivan, Wisconsin

### **Turn off LNA during transmit?**

The 1296 station I'm scrambling to put together has a LNA and an AMP, Both paired up on the antenna mast with a pair of relays surrounding them. The LNA will be switched out of line during transmit, but should I also kill power to it during transmit?  
Thanks! Tyler KM3G

Tyler & the "learned" Group,

Here are my views on Powering down RX Pre-amps during a TX sequence.

I personally DO NOT remove the DC on any of my Preamps... ever!!

The reason, it is my belief that a correctly Biased FET/Bi-Polar RX Preamp Input device will better handle any excess Tx RF that finds it's way from the Tx path into the Rx path. This problem however is usually due to poor Tx/Rx Isolation on the Antenna Coax Relay handling the high Power RF O/P from the PA.

So, the "correctly biased" Input device will usually be driven into Saturation ( $P_{sat}$ ) & it can generally be expected to survive the excess RF within the Maximum limits of that device.

Conversely, if the same Input device is NOT correctly biased... then the way an unbiased Input device (Gate or Base junction) responds to "excess" RF is usually not predictable.

If the Input "junction" rectifies the excess RF Input, then the uncontrolled Peak DC voltages that result from this process could cause the Input device to fail with an "overvoltage" scenario.

This is my personal belief.

If anyone (else) has conflicting/supporting arguments... then I would be glad to hear about them.

Cheers and thank you, Alan - VK3XPD.

Alan Devlin - RETIRED. Melbourne, Australia.

One less thing to switch! I'm not sure how much isolation I have in the relay. I'll live with it.

Thanks!

Tyler KM3G

That's been debated on this forum and others in the past few years. It really depends on the active device and the isolation of both the relays. If there's RF on the gate, will it break down sooner if biased to normal bias (forward or reverse whether enhancement mode or depletion mode FET) because the operating bias is between zero and the gate breakdown voltage (and the gate breakdown voltage may be symmetrical around zero), or will the gate survive better at zero bias to allow the maximum voltage swing. And the same wonders can be applied to the source-drain circuit. Then one wonders if a large swing on the gate might cause an excessive swing on the drain and so cause damage if the device has gain from being powered and biased normally? Then if the power is going to be switched on and off, is the sequencing for the negative biased part absolutely positively going to have gate bias before the drain supply is enabled? A simple transistor circuit can ensure that. Then if left powered while being switched out of the transmission line, is there a possibility the LNA could see terminations that make it oscillate somewhere between the operating frequency and deep IR if powered for the relay transition times and then out of the circuit? We can fiddle with line lengths to the relays but with an active device having gain from HF to 20+ GHz, there's some frequency for any practical combination of lengths that can show loads to the device suitable for oscillation. I agree with Alan to some extent, that probably the device will stand abuse better when biased, but the FET gate is fully insulated and so won't rectify. Unless the LNA has an isolator (terminated circulator) between it and its output relay and another on the input side, its going to see essentially unloaded highly reactive terminations on both ends during the relay transition times and since the 10 milliseconds of relay transfer time is over 12 million cycles at 1296 MHz, and 200 million cycles at 20 GHz where most modern low noise devices have full gain, there are plenty cycles for a power oscillation build up and to create a drain voltage swing exceeding the capabilities of the device. Then if the relay is terminated in the out of circuit position with a short the phase angle of the terminations (that was open while the relay was

Moving) changes and gives another operating condition for possible oscillation. It's sure a LNA with an isolator on the input side is out of the question, so there's some chance of the device oscillating even with an isolator on the output.

There are those with considerable LNA design, development, and use experience that will say, "Power it down, the device will last longer"

And that's probably due to these other factors causing oscillation and self destruction rather than damage from leakage unless the relay isolation was really poor.

I know that a preamp can't stand transmit power on its output when the sequencer isn't timed right (or one was depending on hitting PTT before closing the key or talking and NEVER hitting PTT on FM and that the rig's relay output was present before the RF which hasn't been true in some of my rigs).

Its possible that the device may be a hair more rugged when not biased for operating and when not biased its certain it's not going to oscillate at some frequency where its not loaded. So I'm about to join the group that says power it down, it will last longer than if powered. Data sheets don't usually show the do not exceed drive on input or output when the biases are zero. That's information we need and to get that experimentally costs devices from having to drive them to damage. 73, Jerry, K0CQ

I'm guessing the discussion is not about running QRO, or the comment "I'm not sure how much isolation" would get you in trouble.

When I ran 2m-eme at 150w isolation was not an issue since probably less than 100w reached the tower-mounted TR relay. 100w = 50 dBm and my relays were rated 48-dB isolation so max power into the preamp was +2 dBm.

But in the last year I increased power to 1000w with 700w at the relay. That is about 59 dBm and results in +11 dBm to the preamp. Now running 1500w that becomes 61.7 dBm (13.7 dBm into the preamp = 24mw). Pretty good chance that will blow the hardest

Device. The mgf-1801 that I ran for years (1999) failed about six

Months ago after I increased power. The mgf-1801 is a small power device so can handle higher RF levels.

I replaced my TR relays with those having 80-dB isolation. And so doing, it will not matter if switch-off the preamps in TX (which I do). Since my new preamps use HJ-Fet with max RF input spec at 0 dBm, keeping the input near -8dBm gives some room for error. These devices are designed for 2-18 GHz, so it's important to suppress conditions that can cause/support mw oscillation. Ed - KL7UW

Tyler et. al.

I measure the isolation of any used RF relay - in fact any relay - at the frequency of interest and at least one or two harmonics of that frequency before putting it into service as T/R near an LNA. Some preamps have good out of band rejection and some of the lowest noise figure ones have limited or no out of band rejection. A relay that gives you 40 dB of isolation at 432 might have only 30 dB at 800 and even less at higher harmonics.

It does take some equipment to measure isolation, but not a lot. Most clubs have someone with the right stuff.

Tom WA1MBA

I am casting my lot with the "turn-off" camp. Two years ago, I handled a customer complaint involving an 800um GaAs pHEMT LNA (ATF-54143). The device's OIP3 degraded from 37dBm to 31dBm in a LTE/3G base-station. It turned out the problem was caused by a TX leakage into the LNA input of 7dBm. We could replicate the defect in the lab by subjecting the device to 2 minutes exposure of 7dBm 1.9 GHz signal. Other parameters like NF and gain remained good - this fits with Sam G4DDK's observation "I have yet to ... detect any degradation in noise figure...". The funny thing about this OIP3 degradation was that it appeared to recover after the overdrive is removed and the device is allowed to "rest" for a while. However, I suspect they will become more susceptible to subsequent overdrive although I have not investigated this. I based my suspicion on the better known phenomenon where output power appears to recover when the overdrive is removed but subsequently degrade at even lower power threshold. Years ago when I was a newbie micro waver, my salt mine Elmer, Al W5LUA, impressed upon me the importance of measuring gate current versus RF over-drive because device lifespan is shortened by metal migration. The ATF-54143 gate current rises exponentially with RF drive above 0dBm. An unbiased LNA has a comparatively lower gate current during RF overdrive than a turned-on LNA. Another good reason for powering off.

> Then if left powered while being switched out of the transmission

> line, is there a possibility the LNA could see terminations that make

> it oscillate somewhere between the operating frequency and deep IR if

> powered for the relay transition times and then out of the circuit?

Won't designing for unconditional stability ( $k \geq 1$ ) take care of the stability concern? Newer LNA devices such as MGA-633P8/634P8/635P8 are designed for  $k \geq 1$  from HF to 20 GHz even though they are meant for VHF/L/S bands service, respectively.

> Data sheets don't usually show the do not exceed drive on input or >output when the biases are zero. That's information we need and to >get that experimentally costs devices from having to drive them to >damage.

The ATF-54143 data-sheet does specify the max drive under zero bias:

"Pin max. (OFF mode,  $V_d=0$ ,  $I_{ds}=0A$ ) RF Input Power = 20dBm".

73, Chin-leong, 9W2LC

Design HEMT LNA's here for a living and run through analysis both for On and Off states, the LNA is more robust when off to overdriven in the off mode given the following conditions in that the  $V_{ds}$  must be = 0 volts and gate tied to ground thru a bias divider so that the gate is also at 0V potential in respect to ground..

In my microwave setup, I use a sequencer to power off LNA before I go into TX mode, get about 7 to 10dB improvement in overdrive from the analysis modeling the off device as a diode looking at reverse voltage and forward current for rectification. If one overdrives too hard into the device, the device retains a memory (changed id) due to charging the region of the gate, over time, the device returns to normal. If one thermal cycles the device, the Id versus  $V_g$  setting. Usually goes back to normal as charged traps are relieved at the surface of the gate due to the passivation holding a charge over the region of the gate in the active region of the device. Mike

Excellent!!! Now we know the reason for shutting bias off and what too much RF can do in the short run even if it doesn't melt the device. 73, Jerry, K0CQ

> Doesn't that analysis usually consider the ports to be terminated 50 or 75 ohms from DC to light?

Indeed, the Rollett stability definition is calculated from 50ohm measurement data - the s-parameters. However, the theory says when the conditions  $k > 1$  and  $\Delta < 1$  are met, the two-port will be stable with any termination having a positive real part. In other words, any termination within the Smith chart unity circle ( $S \leq 1$ ) will not make the amplifier oscillate.

- > My concern is when the ports are open some multiples of a half wave
- > (including matching networks) from the active device or shorted at odd
- > multiples of a quarter wave giving an open circuit or very high
- > impedance at the device terminals. No matter what length of
- > connections from device to relays there is some frequency between 500
- > MHz and 20 GHz that will provide those high impedances at the device
- > terminals, unless there is resistive loading, like a series resistor
- > in the drain connection, or a ferrite bead. Some designs do use those
- > drain circuit loads, some don't and achieve higher gain and seems to
- > me lose good stability. Relays are nearly always open circuit while
- > switching and some terminate the LNA with a short (better isolation that way) or an
- > open, or a few with 50 ohms. Those that don't maintain a 50 ohm load
- > during switching are the ones that I think give the best chance of a LNA oscillating.

Beside the relay example above, almost everything that interfaces with the LNA, such as aerials, filters, circulators and isolators, are also highly reflective outside their intended frequencies. Hence, the requirement for the stability criteria to be satisfied beyond the intended operating frequency.

73, Chin-leong, 9W2LC

### **Microwave Update 2011**

Joint Conference Announcement and Call for Papers Microwave Update 2011 & The 37th Eastern VHF/UHF Conference Both sponsored by the North East Weak Signal Group  
October 13 - 15, 2011

Holiday Inn, 1 Bright Meadow Blvd, Enfield, CT, 06082 USA

This year the premier amateur radio microwave conference and the Eastern VHF/UHF conference will include tours, hospitality, swap session, equipment for measuring and tweaking, banquet and of course technical presentations.

Please visit <http://www.microwaveupdate.org/> for the latest updates, registration and hotel information.

Papers must be submitted by September 15, 2011. Please contact Paul Wade W1GHZ [w1ghz@arrl.net](mailto:w1ghz@arrl.net) <<mailto:w1ghz@arrl.net>> as soon as possible for paper and talk arrangements.

Tom WA1MBA



**Brian, AF6NA** talks about his company, Southern California Edison, and their efforts to keep hams safe in putting up antennas. 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 your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

San Bernardino Microwave Society newsletter  
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