



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

April 2011 Edition

President John Oppen KJ6HZ 4705 Ninth St Riverside, CA 92501951-288-1207 john.d.oppen@boeing.com.
Vice President Doug Millar, K6JEY 2791 Cedar Ave Long Beach, CA 90806 562-424-3737 dmillar@moonlink.net
Recording Sec Larry Johnston K6HLH 16611 E Valeport Lancaster CA 93535 661-264-3126 k6hlh@sbcglobal.net
Corresponding Sec Jeff Fort Kn6VR 10245 White Road Phelan CA 92371 909-994-2232 jnjfort@Verizon.net
Treasurer Dick Bremer, WB6DNX 1664 Holly St Brea CA 92621 714-529-2800 rabremer@sbcglobal.net
Editor Bill Burns, WA6QYR 247 Rebel Rd Ridgecrest, CA 93555 760-375-8566 bburns@ridgenet.net
Webmaster Dave Glawson, WA6CGR 1644 N. Wilmington Blvd Wilmington, CA 90744 310-977-0916
wa6cgr@ham-radio.com
ARRL Interface Frank Kelly, WB6CWN PO Box 1246, Thousand Oaks, CA 91358 805 558-6199
fm.kelly@verizon.net
W6IFE License Trustee Ed Munn, W6OYJ 6255 Radcliffe Dr. San Diego, CA 92122 858-453-4563
remunn@earthlink.net.

At the **April 7, 2011 SBMS meeting we will have** Walter Clark telling us about Cassigrain reflector antennas and how they work with Walters unusual demonstrations of optics scaled down to microwave frequencies. 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

Last meeting: Doug, K6JEY gave a great tech talk on power measurement considerations followed by a workshop session on checking member instruments. There were 22 people present. Welcome to new members Tom, K7NII of Camp Verde, AZ; David NY7C of Aloha, OR; and David, N6HD of LA. Nominations were held for the upcoming elections in April for a new set of SBMS officers. Chris, N9RIN for president; Brian AF6NA for vice president; Walter for Secretary; Dick, WB6DNX for Treasurer; and Tisza, KI6DBR for social secretary. Seed money for MUD2011 was sent to Paul, W1GHZ and the first MUD 2011 page is on the web site. EME conferences for 2011 will be in England; and 2014 in Japan.

Scheduling:

May 5 Doug K6JEY will do a talk on beginner labs and what gear to get at the beginner and intermediate level to start your microwave lab.

June 2 Sidewalk EME by Doug K6JEY

June 11-13, 2011 ARRL June VHF QSO Party

June 17-18 trip to OVRO science trip will have a 10 inch telescope star party on 17th followed on 18th by a tour of the big dish. Contact is Doug, K6JEY.

June 18 ARRL Kids Day (good chance to introduce youngsters to microwave).

June 25-26 ARRL Field Day

July 7 Jacob Portukalian, KD5FEG has been studying engineering at UCLA and will have a program on what is going on in some of the microwave labs.

July 16-17, 2011 CQ WW VHF contest

August 4 Contest preparation.

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

September 10-11 ARRL September VHF QSO Party

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

Wants and Gots for sale.

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

For Sale Heathkit cantenna HN-31 \$10, Heathkit AM-2 VSWR meter \$5 , several long lengths of RG-11 donation, Radio Shack Patrolman PRO_77A VHF HI/LO scanner with crystals 153.845, 155.625, 147.15, 146.76, 162.650, 162.4, 146.64 \$15 Bill WA6QYR bburns@ridgenet.net

For Sale 10 GHz slotted waveguide antennas \$70 kit, \$95 assembled plus shipping Dan W6DFW W6DFW@apex-scientific.com

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. \$40 new condition.

Can be delivered to SBMS meeting. Bill WA6QYR bburns@ridgenet.net



A comparison of RF Power Measurement Accuracies

Doug Millar

SBMS March 3, 2011

RF Power Accuracy

- RF power measurement is made difficult because of the number of factors in measuring high frequency AC signals.
- Detecting an RF signal level is not difficult, but turning that into a relatively accurate measurement of power is.
- Doing so over a wide range of frequencies is even worse.

Diode Methods

- Using a diode detector and a voltmeter calibrated in watts is the most common, whether it is in a coupler or directly sampled. These can measure very high levels of power, but roll off in accuracy fairly quickly. 10% OFS typical.

- Diode systems need to be calibrated for frequency and power levels at frequent intervals. The meter inaccuracy also needs to be factored= K Factor and M factor.

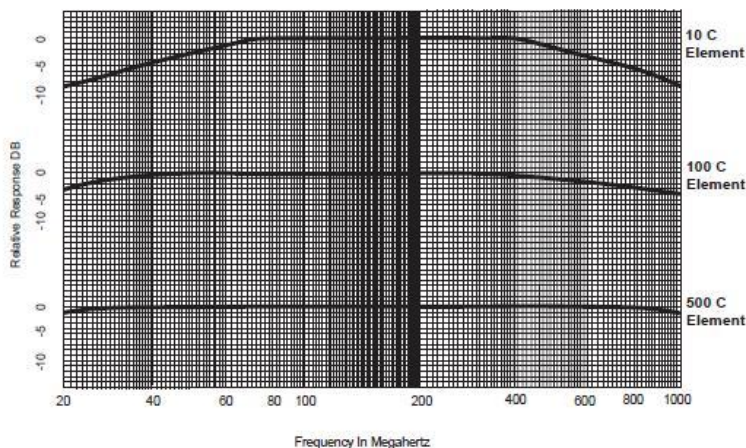
Calorimetric Methods

- If you measure the temperature rise in a fluid due to RF dissipation in a load, the power can be measured over a wide range of frequencies and levels.
- Doing so requires simultaneous measurements of input and output temperature, fluid flow, input resistance and fluid density.
- A calorimeter can be calibrated at DC.

Some Examples

- The first example is a Bird 43 meter. A simple diode directional coupler that is accurate over a narrow frequency range and power level. Bird extends the range by extending the accuracy 5% vs. 10% ofs.

Error vs. Freq



Bird 43 Elements

- Elements about 100 watts and up can be extended in frequency above and below their design frequency.
- A 400 to 1000MHz element can be used on 1296 and will read between 5-10% low in power ofs. (25watts at 250w)

Termaline Meters

- Bird Termaline meters have a capacitive voltage divider that feeds a diode and meter. Here are some diagrams.

Schematic of a Bird 61

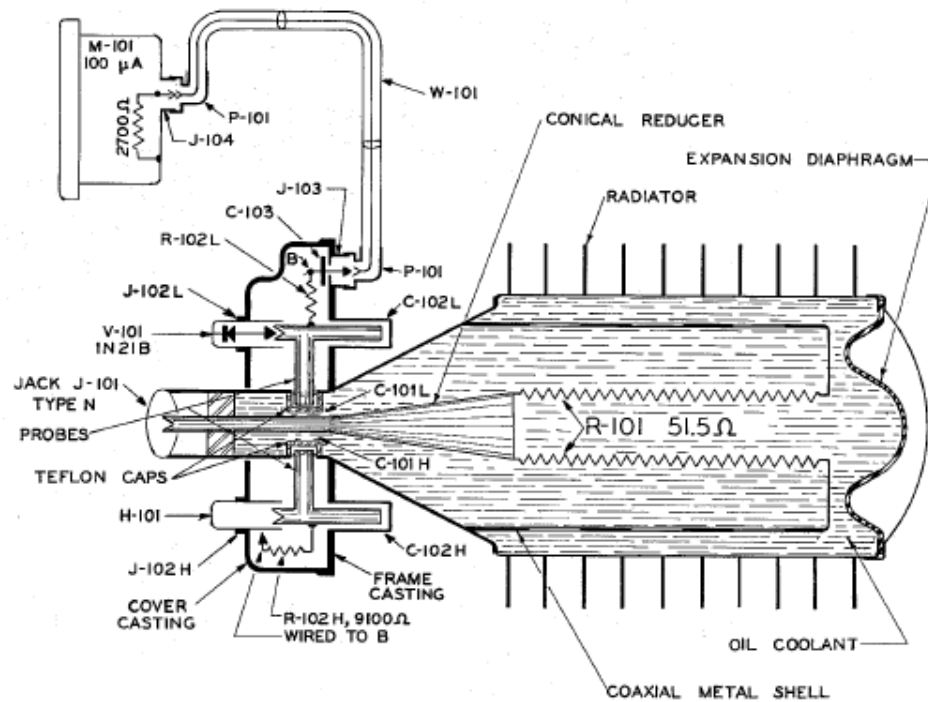
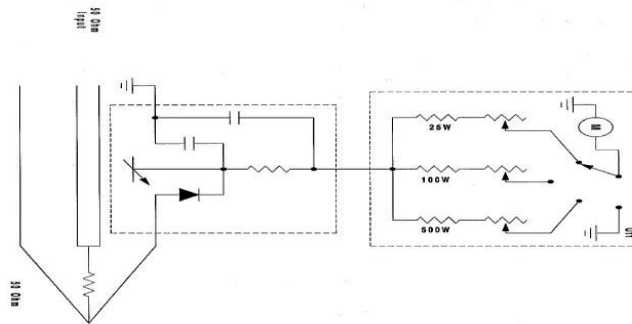


Fig. 2-4. Schematic Diagram, RF Wattmeter Model 61



Schematic of a Termaline

Termaline Freq. Response.

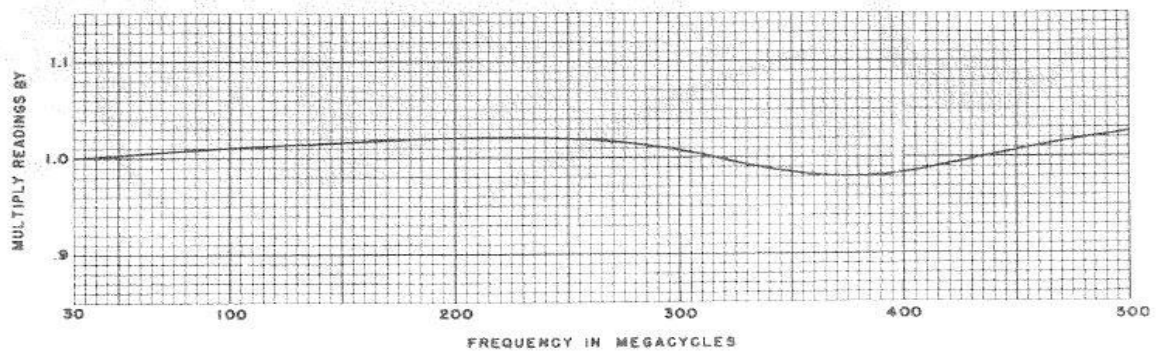


Figure 7-1. Typical Power Calibration vs. Frequency Curve (K factor)

Calorimetric Theory

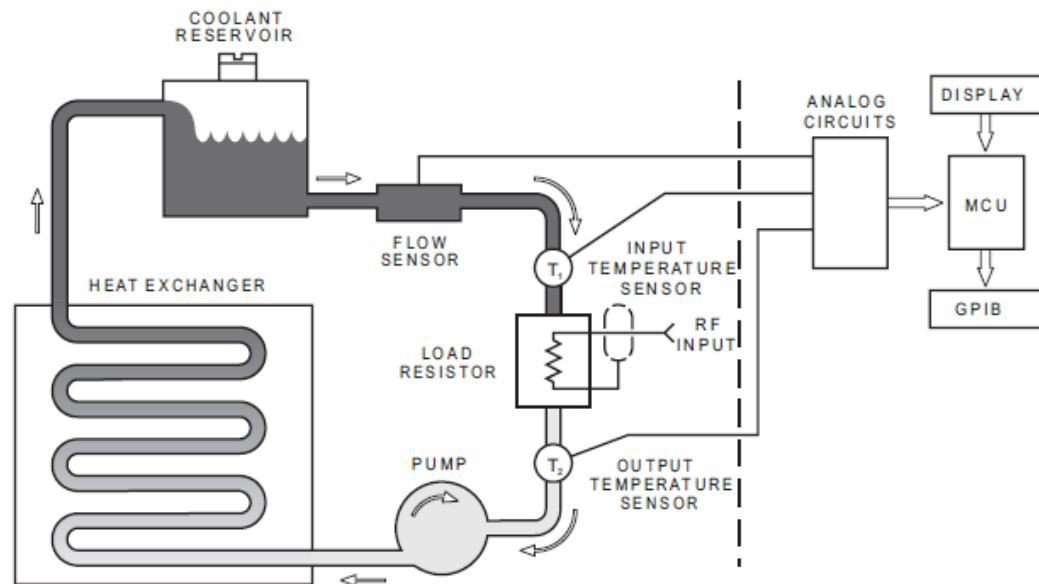
Calorimeter Overview The Calorimeter measures the amount of heat created when RF power is dissipated into a load resistor. The following paragraphs describe how the 6091/6091P Calorimeter performs an RF power measurement. Refer to the block diagram in figure 4 during the following discussion.

Calorimeter Functions An RF power source is attached to the RF input connector on the front panel of the Calorimeter. RF power is applied, through the front panel connector, to a precision internal 50-ohm load resistor. The internal load resistor converts the RF power to heat and transfers the heat into the surrounding coolant.

The center of the load resistor is hollow to allow liquid to flow through the resistor. The resistor core is connected in line with a closed loop pumping system. Coolant is continually pumped from the coolant reservoir, through the load resistor, to the pump. From the pump, the coolant is forced through an air-cooled heat exchanger and back into the coolant reservoir.

Bird 6091 Diagram

Figure 4
System Block
Diagram



Calorimeter Disadvantages

- Expensive/rare used.
- Takes a fluid
- Time lag of measurements dependent on thermal changes.
- Not exactly portable.

Calorimeters

- By measuring heat generated in a fluid for power measurements there are several benefits
- Calibration can be done at DC since $e^2/r=w$
- Accuracy is largely dependent on load SWR and resistance.
- Accuracies of 1.5% of reading can be had across the frequency range.

Other Meters

- Bird 4410 1.5% of wider frequency range per slug and better accuracy. (Uses a Thermistor bridge)
- MC Jones- cheap and cover wide frequency ranges. Also easy to change
- Struthers/Douglas. Awkward but easy to calibrate.
- Telewave- copy of Bird

Thanks

- Contact info: drzarkof56@yahoo.com
- Manuals for the Bird equipment listed are included on the SBMS website

Results

- Have a primary source for power measurement you trust. Or just have one meter.
- Know the limitations of the meter and use them.
- The Bird 43 seems to be the best option for high power 23cm measurement.



Dennis, W5DQ gets his power measuring instrument checked by Doug, K6JEY during the second half of the tech talk by Doug.



Larry, K6HLH has his Bird 43 checked out on the test equipment by Doug, K6JEY. Pat N6RMJ helps with equipment issues.



Jeff, KN6VR watches as Doug checks out the reading of his Bird 43 power meter.

Activity reports from the March SBMS meeting: Bill, WA6QYR has been working on power measurements at 1296 and sun noise measurements; Chuck WA6EXV lost his antenna range synchros (10 of them) to some power transit. The 10,368.070 MHz beacon destined for Heaps is on daily 8 am to 11 am at his home in Butter Milk acres; Dennis, W6DQ has been having FlexRadio problems; Ed W6OYJ had many folks to work from Mt Soledad. The 1296.300 MHz beacon is having antenna issues. WD6JEH went to the Palm Springs Hamfest and is working on a soft rock rig; Walter had his Cassigrain demo ready but will be the tech talk in April; Rein, W6SZ went to Palm Springs and is hearing signals on 10 GHz; Brian, AF6NA is hearing signals on 10 GHz; Bill, W5NN is working on some 900 MHz gear; Gary, W6KVC did some work for the Forest Service; Tisza, KI6DBR made some goodies to sell; Mel, WA6JBD did some HF work; Chris, N9RIN worked on an oscillator board; Jeff, KN6VR listened to the 1296 San Diego beacon; Jason W6IEE built a W1GHZ power monitor; Dave, WA6CGR was in Palm Springs and has "Lab" power measurement capabilities to 1%; Doug, K6JEY has a stable 2 m transverters and a 80 GHZ rig; Larry, K6HLH has been exploring the path between himself and Wa6EXV at 8 am and now has one of the Dubus 2 meter Kilowatt boards. He noted the problems drilling copper heat sinks; Pat, N6RMJ is building 1296 hardware; Ed, WX6DX did some circuit board work; ATV had check ins by K6BNN and Robbie, KA6DPS, W6KGE, AC6RB, WB6DNX, W6QIW, KI6BR, KJ6HZ.



Larry, K6HLH and Chuck, WA6EXV looks on as they go over the path data between their homes over several weeks that they have been testing for propagation phenomena.



Jason, W6IEE's RF detector project using W1GHZ parts (Down east Microwave kits parts) into an Altoids box. 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, 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.

San Bernardino Microwave Society newsletter
247 Rebel Road
Ridgecrest, CA
93555
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