



## 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 August 2006 Edition

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At the **3 August 2006** meeting, - August is the usual contest preparation 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/>.

### REMINDER- NO PARKING IN THE CHURCH LOT UNTIL CLAIRIFICATION IS MADE.

**From the Prez:** The 2006 ARRL 10 GHz and Up Cumulative Contest is nearly upon us! The August meeting should have some interesting discussions on contest plans. I want to extend my thanks to Miguel, W6YLZ, for "leading the way," into Mexico as 4B2HWP. He will be joined by Frank, WB6CWN/4C2HWH, Bernardo, XE2HWP and Antonio, XE2HWH. Many thanks go to Dr. Carlos Levy, President of FMRE, who was instrumental in assisting our members in obtaining permission to operate in Mexico for the contest.

With the contest in mind, and in support of our members trekking to Mexico, we need to get as many radios on the air as is possible! So, if you have an old 10 GHz radio gathering dust in your closet, consider activating it or possibly loaning it to another microwaver in need. There are a lot of folks interested in participating but have no equipment. I look forward to seeing you at the August meeting and on the air during the contest. 73, -Dennis W6DQ

**Last meeting-** Dick, K6HIJ presented a good tech talk on directional couplers. See later in text. Pat N6RJM is married!!!! Pat reported that the Front Range group in Colorado won the 2 GHz and up contest with some 150K points over the SBMS 50K points. Nothing new on the church parking lot parking. Dennis W6DO reported the OVRO Out reach project was a great success on 18 June visit of Scouts and Students. Next planned event is 12 August. Great echoes on 1296 MHz and a one way on 10 GHz with WA6EXV. Reminder of the tune up party at Fairmont Park. Ed W6OYJ reminded everyone to know your dish diameter or gain number, power out put, and have a name for your rig(s). The San Diego Microwave Group would like some operating help for the measuring. Dick,

K6HIJ would like to see a preferred parts list for constructing microwave boxes. He is willing to make the list if some folks would pass to him their favorite CURRENT parts. ONE of those comments made at the meeting—one goes to a swap meet and brings home stuff you have to store. One goes to Las Vegas and doesn't have to worry about stuff coming home.

#### **Emails of note**

Hello Microwavers, The results of the recent Tune-Up Party at Fairview Park, and the earlier one at N6IZW's QTH in La Mesa are now posted on the SBMS web pages. Kerry Banke has presented the results in spreadsheet form, for the tests on 10 and 24 GHz. Go to: <http://www.ham-radio.com/sbms/sd/>. Then scroll down to MDS/ERP Event Results.

We had a good turnout on a really hot day at the park. Thanks to the guys who helped with the setup. 73s from Ed Munn, W6OYJ [w6oyj@amsat.org](mailto:w6oyj@amsat.org)

Subject: [Old books of interest for hams for which the copyright has expired

Here's an interesting site that with over 1 GB of old books of interest for hams for which the copyright has expired, including some Radio Amateur's Handbooks, Radio Handbooks, etc., all in PDF format. Most are from the pre-solid state era. When you log on to the site at [http://www.pmillett.com/tecnical\\_books\\_online.htm](http://www.pmillett.com/tecnical_books_online.htm), note the misspelling of "technical".

Dan Bathker JPL (Ret) [dbathker@att.net](mailto:dbathker@att.net)

Subject: [Mw] 2304 linear feed needed

I'm trying to find info to build a 2304 MHz linear feed for an offset feed dish. I have a 1.2-meter dish with the feed in the long axis. My understanding is that the F/D is about .7. I tried to locate the parts for a W2IMU dual mode feed but was unsuccessful. If anyone has available a feed that would fill the bill and is willing to sell please let me know. Also any info on building one would be appreciated. Thanks Jack W4AD ...Jack if construction is your thing, here is a place to start <http://www.trevormarshall.com/biquad.htm>  
This may work as is for you. It is simple to make. 73Ben W4SC

Bill, I should have sent you news of the first 10,368 MHz CW 2-way contact made in Alaska during the June VHF Contest. There are some details with photos on the Alaska VHF Up Group web page: <http://www.qsl.net/al7eb/avg.htm> Also some coverage on the ARRL Contest soapbox.

Contact was made with DEMI xvttrs between KL7FZ/R and KL7UW/R, five miles over water (Turn again Arm) in grid BP50. KL7FZ used a 2W DEMI PA to a 1-foot dish and KL7UW used 10mw to a 22-dB horn. Both were on shorelines near sea level. Not a big deal except it's a first in Alaska. WE both have two other xvttrs for use as loaners. We will do a demo at the July 15th Kenai Peninsula Ham fest and hoping to encourage some others to borrow our loaners either in the 10-GHz+ Contest or the Sept. VHF Contest.  
73's Ed - KL7UW BP40iq, Nikiski, AK <http://www.qsl.net/al7eb> 50-144-222\*-432-927-1296-2304\*/3456\*

I live in Charlottesville VA and I'm about to put up a 1.2 GHz repeater. There are a group of us here that are interested in 1.2 GHz and above and we are slowly stepping our way up to each new band. I am currently searching for 1.2 GHz equipment, especially something like an Icom IC-120. Would you kindly make an announcement at your next SBMS meeting announcing that I'm looking for spare gear? Mike DiGiralamo W4XN [w4xn@arrl.net](mailto:w4xn@arrl.net) 434-977-6377.

#### **Scheduling.**

August 5 - 6 ARRL UHF Contest

August 19 - 20 ARRL 10 GHz and Up Contest

September 9 - 11 ARRL September VHF QSO Party

September 16 - 17 ARRL 10 GHz and Up Contest

**Activity reported** at the 6 July SBMS meeting; Mike, W6YLZ had 6 contacts on Field Day; Joonho, KG6MQS is working on 10, 24, 47, and 76 GHz rigs; Dick, K6HIJ collecting books on microwave and is working on a 10 GHz rig (HURRAY); Peter, K6PTL fired up parts of his 10 GHz rig; Charles, K6PIP did some system board work; Doug, K6JEY made a HP 5372A counter purchase and some 2304 MHz sequencer work; Ray, WA6OWM purchased and is fixing a JEY rig; Chris, N9RIN along with Greg Bailey did some kiting of 1296 30w amplifiers. Several have

been built successfully, 13 dB gain 28v2a; Pat, N6RMJ had 5 10 GHz contact on Field Day; Wayne, KH6WZ had field day contacts and is rebuilding a couple of parts in his connectorized 10 GHz rig; Don, KF6QWC did some pic processor and digital radio work; Jeff, KN6VR reworked his 10 GHz rig and had fun at OVRO; Bill WA6QYR built a Jupiter GPS interface board, was at OVRO, and now has a Sampson quickset mount; Tom, WD6UZZ fixed his 2 mtr IF radio, mounted a dish and modified an LNB for preamp; Ed, W6OYJ made 75 HF contacts on field day and 2 10 GHz contacts, the Mt Miguel repeater is now working for san Diego contacts, a 3456.010 MHz beacon is running in San Diego with a 5760 MHz one under construction; Mel, WA6JBD did some site visits and Cactus radio work; Dennis, W6DO reported on OVRO fun and had some Field Day contacts. 21 people present.

The 6 July Tech Talk by Dick K6HIJ on couplers.

**THE SAN BERNARDINO MICROWAVE SOCIETY**

## **DIRECTIONAL COUPLERS DEMYSTIFIED**

**July 6, 2006**

### WHAT IS A DIRECTIONAL COUPLER?

A directional coupler is a 4-port network that samples power traveling in one direction.

### WHY DO I WANT ONE?

Directional couplers are used to measure power, SWR, inject test signals, combine and split RF energy.

### ARE THEY DIFFICULT TO USE?

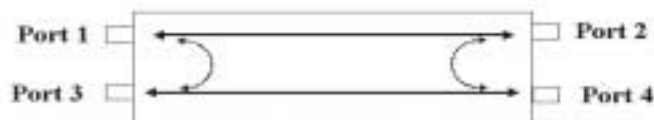
No. They are forgiving of mistakes, but can give erroronious readings if mis-interpreted.

### CAN I MAKE ONE?

Probably. There are a wide variety of designs. Some can be made with only a drill and a soldering iron.

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### THE DIRECTIONAL COUPLER AS A NETWORK



For an ideal 10 dB coupler:  
(All ports are perfectly matched)

With 0 dBm (1 mW) into port 1, you will have:

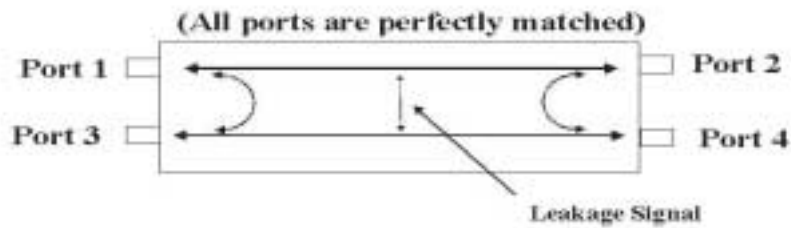
Port 2: -0.5 dBm (0.9 mW)

Port 3: -10 dBm (0.1 mW)

Port 4: Nothing!

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## THE NON-IDEAL DIRECTIONAL COUPLER



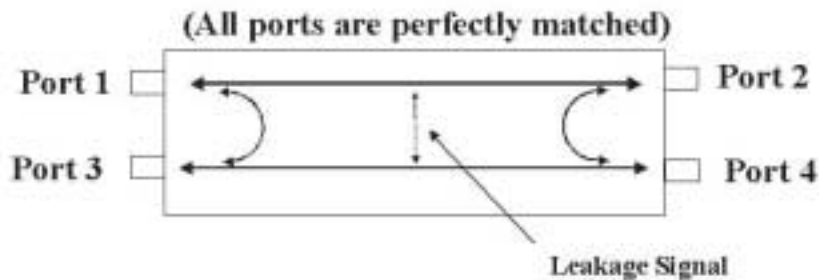
The "Leakage Signal" will cause errors. This signal can come from any number of errors, including:

- a. Internal mismatches
- b. incorrect coupling
- c. machining tolerances, etc.

With 0 dBm (1 mW) into port 1, you could have:

- Port 2: -0.45 dBm (Not much change)
- Port 3: -10.1 dBm (~0.1 mW)
- Port 4: -20 dBm (Directivity signal)

## DIRECTIVITY



Directivity is defined as the power difference between port 3 and port 4 with a signal injected into port 1, and all ports are perfectly terminated.

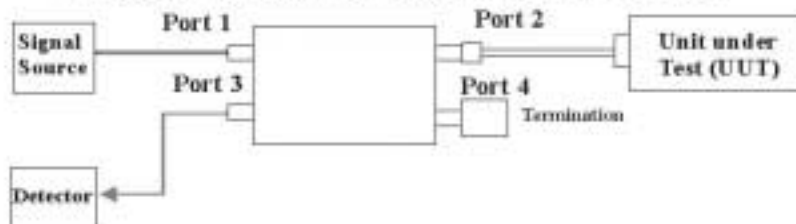
Directivity has little effect on using a coupler for sampling or injecting signals; i.e. measuring forward power.

It is critical in measuring VSWR and return loss!

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## HOW CAN WE IMPROVE DIRECTIVITY?

### A Typical test setup to measure return loss:



The easy fix:

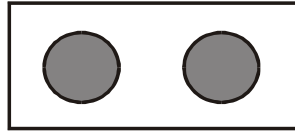
1. Put a tuner in series with a very good load at the test port (Port 2) and tune for a minimum at the detector.
2. Replace the good load with the Unit Under Test (do not remove the tuner) and read return loss.

This is only good at one frequency and references to your good load.

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## TEM (COAXIAL) DIRECTIONAL COUPLERS

1. These generally rely on combination of electric and magnetic coupling between two lines.



$$c = \frac{\frac{Z_{oe}}{Z_{oo}} - 1}{\frac{Z_{oe}}{Z_{oo}} + 1} \quad \text{and} \quad Z_o = \sqrt{Z_{oe} Z_{oo}}$$

$c$  is the voltage coupling: i.e. -20 dB has  $c = 0.1$

A little algebra:

$$Z_{oe} = Z_o \sqrt{\frac{1+c}{1-c}} \quad Z_{oo} = Z_o \sqrt{\frac{1-c}{1+c}}$$

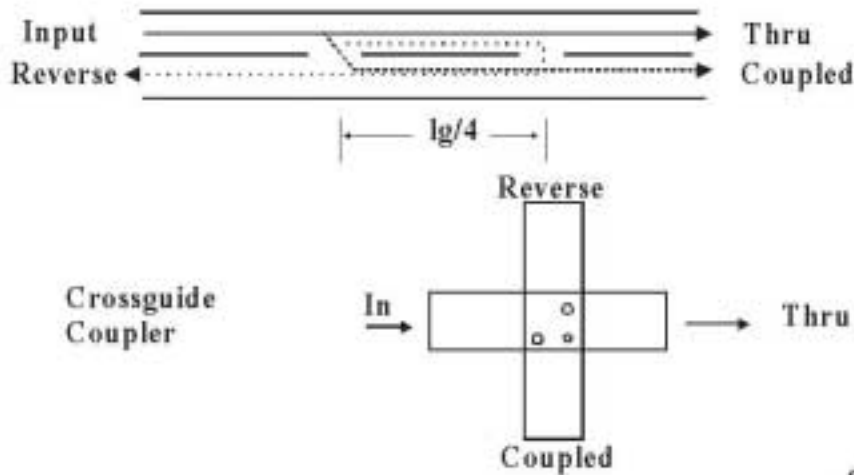
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## CLASSIFICATION OF DIRECTIONAL COUPLERS

- I. TEM (Coaxial)
  - A. Loose ( > 10 dB)
  - B. Tight ( < 10 dB)
- II. Waveguide
- III. Construction Technique
  - TEM Mode
    - Coaxial
    - Microstrip/Stripline, etc.
  - Waveguide
    - Multi-hole
    - Cross-guide

## WAVEGUIDE DIRECTIONAL COUPLERS

1. These rely on coupling between holes connecting two waveguide lines.



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### “Wants and Gots for sale.

For Sale; Amateur Radio Station: All equipment is in "mint" condition.

1. Kenwood TS-440S, 10m-160m Transceiver
2. Kenwood PS50, Power Supply
3. Dentron 160-10m Super Tuner, Model 506y
4. Yaesu 2m-440, FT 8100, FM Transceiver
5. Tristao Tower w/Winch, 60 feet
6. Alpha Delta Inverted V Antenna, 10m-160m
7. Hustler Mobile Antenna, CGT-144, 143-149 MHz
8. Hustler Colinear Fixed Station Antenna, G6-144A
9. Hustler Mobile Mast w/10m-40m-75m Resonators
10. Cushcraft 2m Mobile Antenna
11. Electrovoice Microphone, Model 729S
12. All Manuals, feedlines

Will sell as a package only for \$900. Jack Warren, KE6AP jwarren5@bak.rr.com

For Sale: 30W 1296 amplifier kit. Cost \$45, plus \$5 if sent by mail to cover cost of shipping and packaging. In So Cal, can arrange for pickup. Email [1296Amp@cox.net](mailto:1296Amp@cox.net) for more info. Chris Shoaff n9rin

For Sale- various VHF/UHF wattmeters- no Birds. For list email Doug K6JEY dmiller@moonlink.net.

For Sale- WR90 large waveguide relays, 24v tested \$30 each Wayne KH6WZ 310-357-2396.

For Sale 10 MHz OCXO's tested, various types and voltage requirements priced from \$35-40 each. Ask for list Wayne KH6WZ 310-357-2396.kh6kine@earthlink.net





**Dick, K6HLJ** talking at the July meeting about directional couplers.

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](mailto:bburns@ridgecrest.ca.us), 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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