N.E.W.S. LETTER

The Publication of the North East Weak Signal Group

JAN 2006 | VOLUME FIFTEEN | ISSUE ONE

NEXT MEETING
SATURDAY JAN 7TH AT THE CROWNE PLAZA IN ENFIELD, CT
POSSIBLE BEACON PROJECTS

IN THIS ISSUE

DON'T FORGET

THE NORTH EAST WEAK SIGNAL GROUP
2 METER VHF AND ABOVE NET
EVERY THURSDAY NIGHT AT 8:30 p.m. LOCAL
144.250
W1COT, WZ1V, OR K1PXE NET CONTROL

MEMBERSHIP in the N.E.W.S. Group is $15 per year. Apply to Bill Conner K5GMX, K5GMX@arrl.net. You may download an application from our web page http://www.newsvhf.com

PREZ SEZ
DE KA1OJ

Our next meeting will be Jan 7th, 2006 at the Crowne Plaza Hotel in Enfield, CT. According to Paul 'GHZ, this will guarantee a blizzard on that date. At the next meeting our featured presenter will be Tom Williams, WA1MBA, who will be reprising his fabulous Microwave Update 2005 talk, "Practical 78 GHz".

At the last meeting we asked the Hotel to provide a buffet. Unfortunately it was not a hit with the crowd, so the January pre-meeting lunch will be "order off the menu", for those not going to Friendly's.

I would like to encourage the membership to consider beacon projects during the winter/spring period. I have been working on a 24 GHz beacon for the past year and I hope to have something to show this summer. Beacons encourage activity on bands that are underutilized, providing an important signal source for those working on their transverters, feedline, and antennas.

73
KA1OJ

BOARD MEETING MINUTES
19 NOVEMBER 2005

Board meeting called to order at 11:47AM by Mark KA1OJ

Suggested dates for 2006 meetings:
1/7, 3/18, 4/22, 7/15, 8/26, 11/11

ARRL proposal: changes from cw bands to bandwidth limits

discussed topics for January meeting

NEWS MEETING MINUTES
19 NOVEMBER 2005

NEWS meeting called to order at 1:11PM by Mark KA1OJ

Discussion of suggested meeting dates for 2006
MOTION: - change November meeting 11/4 - approved unanimously
MOTION: - accept suggested meeting dates with Nov. change - approved unanimously
1/7, 3/18, 4/22, 7/15, 8/26, 11/4

Discussion - ARRL VHF/UHF advisory committee
MOTION: - NEWS to make recommendations for VHF/UHF advisory committee to each Division director in our area (NE and NY) - W1LE to report with recommendations in Jan - approved unanimously

W1MAP looking for members for Spectrum Committee - map@map.com

Discussion - ARRL proposal to change CW subbands to 100 Hz bandwidth possible affect on JT65 EME operation

Some gear from the estate of W1JOT was offered for sale

Duct tape auction - some treasures found new homes

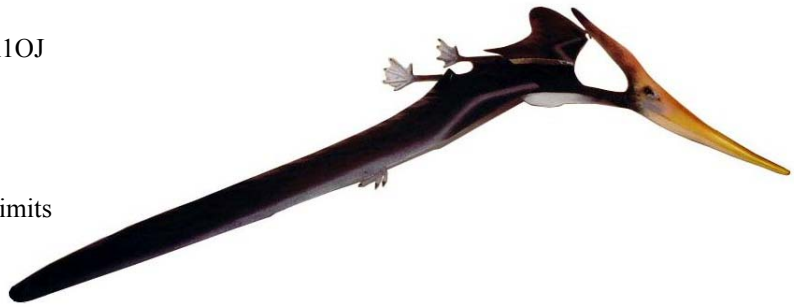
A short slide show of the Microwave Update tour of theNASA Deep Space Network at Goldstone by W1GHZ and WA1MBA

Discussion of new NEWS shirts - KA1OJ to bring sample next meeting

KT1J presented a slide show and description of the Gore Mountain (FN23) contest operation

adjourned 3:23PM

W1GHZ



What is it?

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Most VHF and microwave operators are active on multiple bands. While transmitting, it is reassuring to see some indication of output power. Some stations have a Bird wattmeter for each band, but there are simpler and cheaper solutions. The Down East Microwave1 RFPM indicator has a nice bargraph display, and it can be modified so that a single display can suffice for multiple bands.

At my station, I have transverters for 903 and 1296 MHz driven by a two-meter transceiver, with a switch selecting the desired transverter. Obviously, the two bands are mutually exclusive, so a common output power display will work. While only two bands are combined here, there is nothing to prevent expansion to more.

The output power is sampled with a directional coupler in the antenna feedline for each band. The sampled power, at a much lower level, is measured with an inexpensive RF power detector IC like my All-Band Power Meter2. The outputs from the detector chips are summed together; since one (or all but one) of them is off, its contribution is zero, so the sum is simply the output from the active band.

Where does one find a good directional coupler? For these bands, it is easy: 900 MHz cell tower surplus. I found some on the DEMI surplus page with -50dB coupling in one direction and -40dB in the other. Similar couplers are common at hamfests and on ebay. Very convenient: -40 dB from 10 watts yields 0 dBm, one milliwatt, which is perfect for the RF detector chips. For higher power, the -50 dB direction yields the same output at 100 watts. At 1296 MHz, the coupling is 3 to 4 dB weaker, which is close enough. Directivity is very good on both bands, so reflected power will not affect the coupled output. Directional couplers typically work very well at frequencies below the design frequency, but with weaker coupling. Similar couplers are common at hamfests and on ebay.

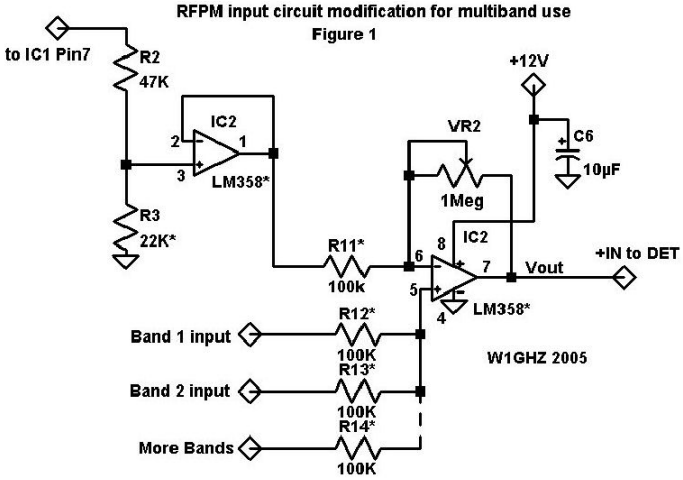
I had some small, postage-stamp sized, PC boards for various RF detector chips left from previous experiments. I tried several types and settled on the LTC5508 used in the All-Band Power Meter as having the right sensitivity for this application. Other types had less output at the available power level or were too sensitive – the LTC5534 used in my Homebrew Antenna Ratiometer3 gave a half-scale indication with the key up, from LO and carrier leakage. Another advantage of the LTC5508 is good performance from two meters through 10 GHz, at power levels from about -20 dBm to +10 dBm.

For lower frequencies and the same directional coupler, a more sensitive detector is required due to the weaker coupling. The AD8307 used in the low-frequency section of the All-Band Power Meter is good down to around -70 dBm at frequencies up to 500 MHz.

The RF detector chip may not be necessary if the rig already has an RF output detector – you could simply borrow that output voltage. Another choice might be a simple diode detector, though the sensitivity and stability may not be as good.

For my 903 and 1296 MHz setup, the detector output was about 0.8 volts key down and about 0.25 volts key up (these chips have an offset voltage with no RF applied). The bar graph driver IC, an LM3914, used in the RFPM needs about 1.3 volts for full-scale indication, so an amplifier is required. Since the RFPM also has a convenient dual opamp on the board, I chose to hack up the original op-amp circuit and make a summing amplifier, to sum the inputs from the two detectors as well as amplify them to the required voltage. I also wanted to compensate for the offset voltage, so I used the other section of the dual op-amp to buffer the LM3914 reference voltage and develop a compensating voltage.

RFPM input circuit modification for multiband use
Figure 1



The schematic of the hacked-up part of the RFPM is shown in Figure 1. Parts and values with an asterisk are new, not included in the original kit. The additional parts are placed as convenient, using existing pads on the PC board and cutting traces as needed. One thing I overlooked was that pin 5 of IC2 was grounded on both sides of the board, so cuts are needed on both sides to use the pin.

I replaced the original op-amp with an LM358, which is designed to work with a single power supply so that the negative supply in the kit is not needed. The op-amp section on the right in Figure 1 is the summing amplifier, with adjustable gain roughly equal to the ratio VR1/R11, so that the voltage gain can be as high as 10. The offset voltage is buffered by the second section, on the left. R3 is selected so that no bars are lit without RF.

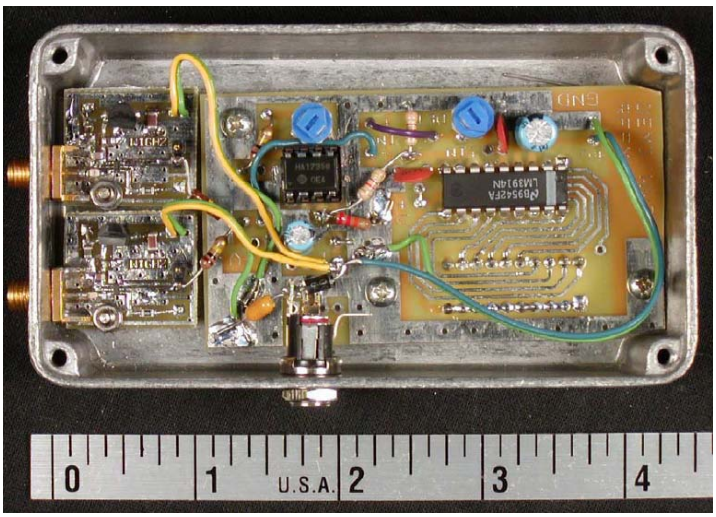


Figure 2

The RFPM board plus the two RF detector boards fit neatly into a standard die-cast aluminum box, shown in Figure 2. Edge-mounted SMA connectors on the detector boards are butted against the wall of the box. The rectangular hole that I filed for the bargraph display fits reasonably well, if you don't look too closely at Figure 3. The whole thing is simply supported on the directional couplers by semi-rigid coax. More than two bands would require a bigger box or externally mounted detectors.

Adjustment is pretty straightforward. Start with the detector with the lowest output. At full keydown power, adjust the amplifier gain, VR2, for roughly 3 volts output at pin 7 of IC2. Then adjust the bargraph input, VR1, so that 9 bars are lit. Then switch to another band and apply full power. Adjust R13 by trying different value resistors until 9 bars are lit on this band also. Repeat for other bands.

The intent is to have the same indication of full power on both bands, 9 bars. If fewer bars are lit, or all ten are lit, something has changed. For phone operation, the indicator has no meter lag, so peak power is shown on voice peaks – you don't have to overdrive the amp to make the meter move. I'm happy knowing that I have full power out, whatever it is, but you could calibrate the power bars if you care.

Another enhancement might be to add a second indicator for reflected power – say a green bar for forward power and a red one for reflected. Lots of green with little red would mean that all is well.

Summary

This is an easy way to make an output power indicator for multiple bands. The RFPM kit is available from DEMI, and I still have some RF detector boards left4. A little work with the soldering iron and X-Acto knife will do the trick.

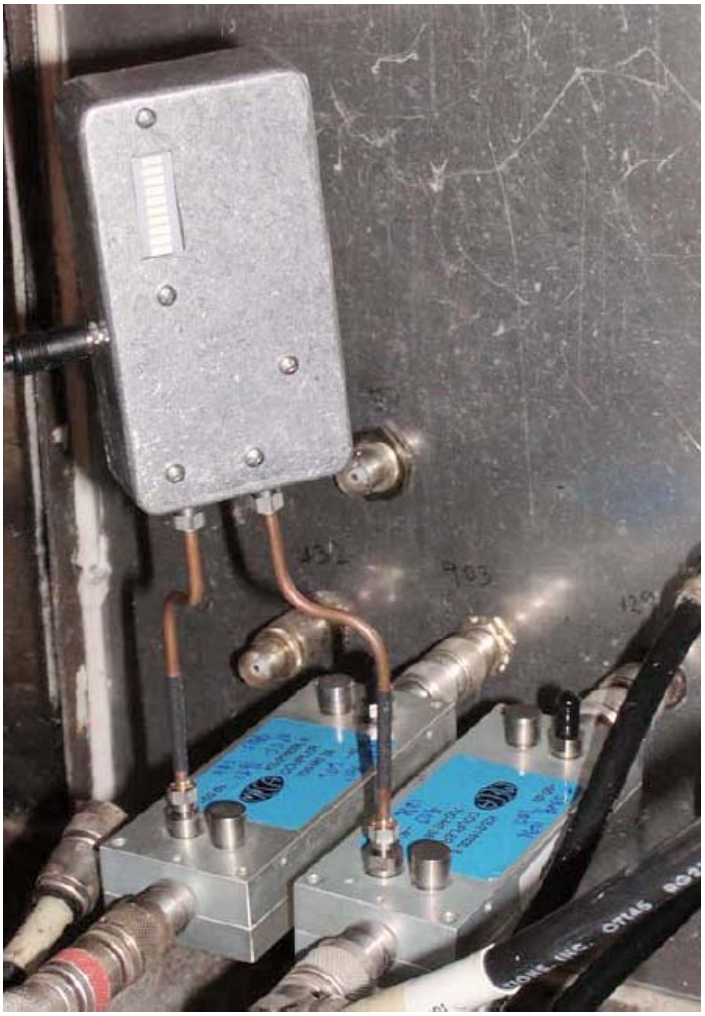


Figure 3

1. Down East Microwave, www.downeastmicrowave.com

2. Paul Wade, W1GHZ, "Portable RF Sniffer and Power Meter," Proceedings of the 30th Eastern VHF/UHF Conference, ARRL, April 2004, pp. 60-69. available at: http://www.w1ghz.org/new/portable_powermeter.pdf (kit also available as ABFM from DEMI)

3. Paul Wade, W1GHZ, "Antenna Ratiometry Measurements For the 21st Century Using a Homebrew Ratiometer" Proceedings of Microwave Update 2005, ARRL, 2005. available at: http://www.w1ghz.org/small_proj/small_proj.htm

4. w1ghz@arrl.net

NEXT MEETING

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NOTE: THE CROWNE PLAZA IS THE SAME PLACE THAT WAS THE RADDISON.

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