Simple RF Power Monitor

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For a recent transverter project, I wanted to monitor output power and display it on an LED bargraph[1], but I didn't want the size and complexity of a directional coupler. The power detector is an AD8307, a logarithmic power detector with output linear in dB, about 25 mv/dB. I remembered seeing something on the AD8307 data sheet (www.analog.com) – measuring power using a resistive tap, in Figure 41. The RF detector chip is connected by a 100K resistor, which forms a resistive divider with the 50 ohm input resistor at the detector, so that the RF voltage reaching the detector is roughly 60 dB down. The 100K resistor adds minimal loading to the 50 ohm circuit, and the stray capacitance is negligible at VHF. A quick test with a 47K resistor gave about 50 dB attenuation, so I used 10K, shown in the closeup photo, for this 30 watt module. Figure 2 shows the 10K resistor right at the output SMA connector with a short coax connection to an AD8307 detector board from China; they sell the whole board for less than the price of the IC alone. I set up the LED bargraph for about 2 dB per step, so the power range displayed is about 20 dB, roughly 0.4 watts to 40 watts.

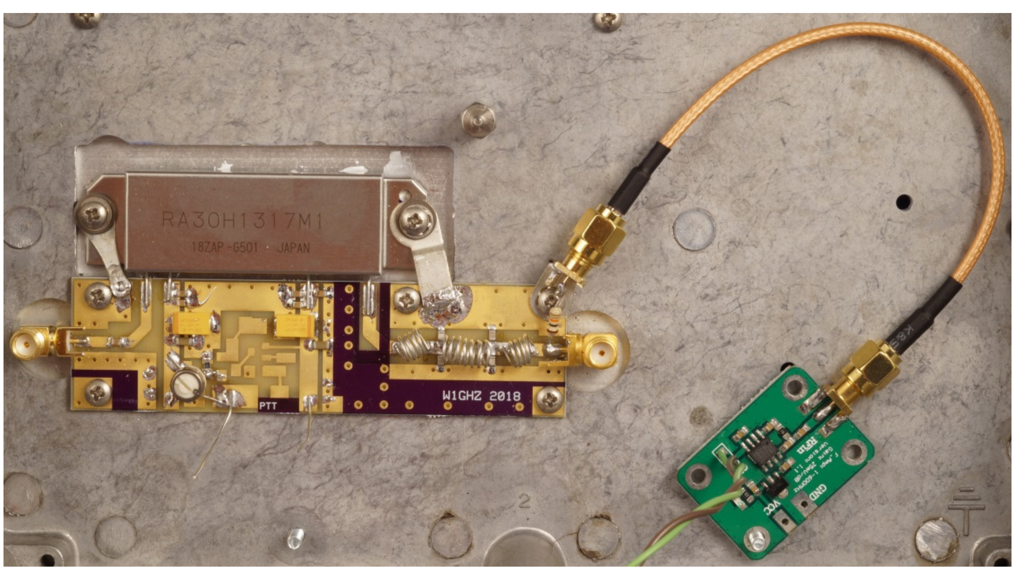

Figure 2 – Simple RF power detector with resistive divider

Resistive Coupling

After putting the transverter together, I was curious how well the resistive coupling worked. I cut a section of 50-ohm line from a spare PC board, put SMA connectors on each end plus one for the coupling tap resistor, a common ¼ watt resistor. Then I used my **miniVNA Tiny** to measure several values of coupling resistor, with results shown in Figure 3. The 47K and 100K resistors have large coupling values at low frequencies, but the coupling decreases with frequency. The 10K resistor has fairly flat coupling up to 200 MHz, around 43dB, which provides a couple of milliwatts output for 40 watts on the transmission line. Above 200 MHz, all the resistors have about the same coupling, decreasing with frequency – this suggests that stray capacitance through the resistor is dominating. A quick calculation suggests that the capacitance is just under 0.1 pf. Loss due to the resistive tap was too small to measure.

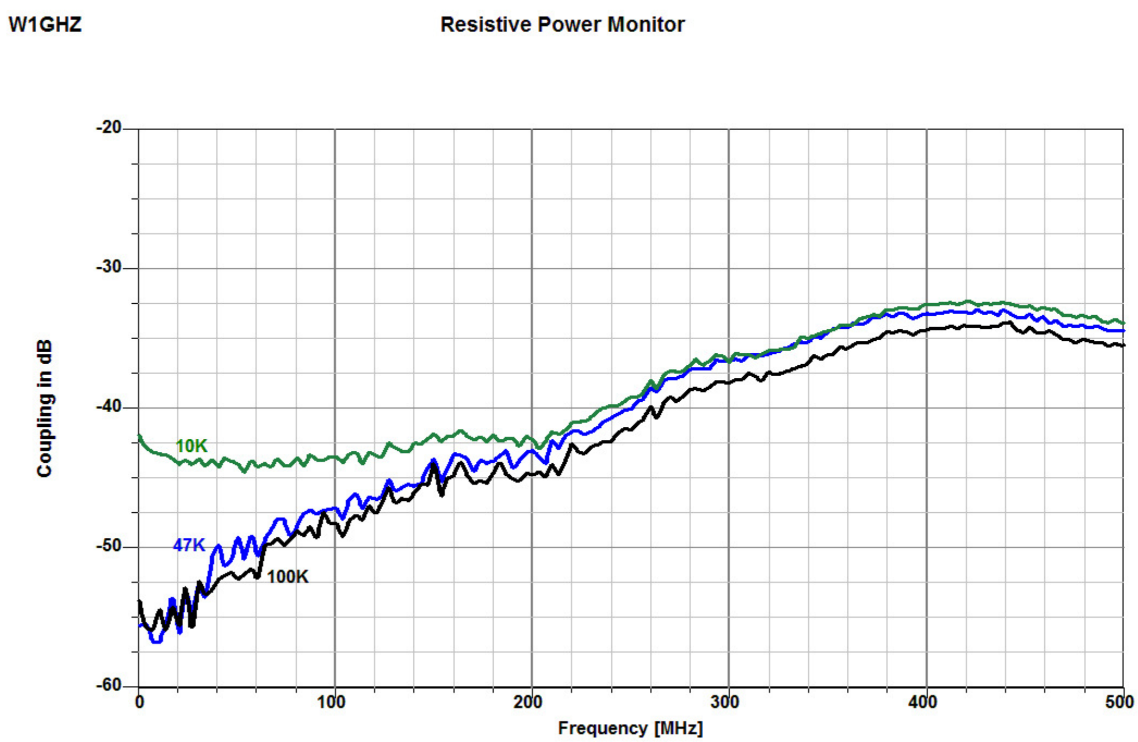

Figure 3 – Simple Resistive Power Monitor vs Frequency

The resistive tap is a simple, cheap way to monitor power at VHF and below. Higher frequencies might be possible with chip resistors.

Reference

1. www.w1ghz.org/PCBproj/bargraph.pdf