

A 10 dB WR42 Attenuator for 24 GHz

By

Dave Meier, N4MW

At the 1998 NEWS conference, I picked up a set of the up/down converters to get on 24 GHz. I have assembled these into a transverter system. At this point I realized that a beacon would be helpful to check out the transverter. At Microwave Update last fall I acquired an extra upconverter module to use as a beacon.

The major stumbling block in my project was the absence of 24 GHz power measuring equipment in my shack. Happily, I found a General Microwave power meter at a small local hamfest. It came equipped with three power heads, including WR-42 and WR-28 ones. After repairing the on/off switch, it checked out OK. (Harder to do than it sounds.)

In the subsequent days I connected the spare upconverter (as a frequency multiplier) to the power head. The head is limited to 10 mw, which I found could be easily exceeded with the upconverter. Not wishing to zap my new power head, I needed an attenuator or directional coupler to put in line. I have been asking around for a suitable WR-42 attenuator to use ahead of a detector, but have not come up with one. It was suggested that one could be fabricated, and I have accomplished this.

To make a 10 dB attenuator for 24 GHz, all you need is a short length of waveguide with flanges on both ends. Into this is inserted a suitable absorbing material. In my sparse collection of WR-42 pieces, I found a sampler device which was just a simple block about 10 mm thick with holes through it to make it a waveguide with mounting holes. These have been available at flea markets for the past year. Also, plain block "spacers" about 20 mm thick have been available really cheap. I chose the thinner sampler to keep the mounting screw length down. Now, what to insert into the waveguide to absorb 10 dB of power? I tried a squishy green Styrofoam "Cheeto" first, but it was inert (good for keeping bugs out, I suppose). I hit paydirt on the second try: a 1/4 inch rubber (not vinyl) grommet! Centered in the short section of waveguide, it absorbed 10 dB of power. So protect those power heads! I could have put the absorber in the waveguide part of the power head, except it had a foam filler which I decided not to disturb. Anyway, if you find you have excess power on 24 GHz (yeah, right), this might give you an idea how to deal with it.

While I am describing my efforts, I want to pass along one other observation. The upconverter module works as a doubler if provided with a 1/2 frequency "LO" input at sufficient level. For example, to get 24192 MHz, a 12096 MHz source is required. Not too hard to find a 12 GHz brick, I didn't have one handy. So I tried a 1/3 frequency input, 8064 MHz. Not so good, and not any easier to find. However, 1/4 frequency (6048 MHz) works great! +5 dBm into the upconverter module produced +10 dBm at 24 GHz and more drive (+12 dBm) increased the output to nearly +14 dBm. This is easily within the power output capability of a common 6 GHz Frequency West