Transitions for Small Waveguides

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Coax cable is not normally used at 24 GHz and above since losses are very high and suitable connectors are hard to come by. Recently, however, I had a couple of requests for transition dimensions for waveguides smaller than I had covered in my recent ***QEX*** article[1]. The reason for using a transition is to make connection to an active circuit which uses coax or microstrip – it's hard to get a transistor operating inside a waveguide.

I used the same technique described in the article to calculate dimensions for waveguides as small as WR-10 at 76 GHz, with results shown in the table below. I have not built or tested any of these, but they should be pretty close.

Waveguide	**Freq** GHz	**Probe** Dia	**Probe** Length	**Backshort** Distance
WR28	24	0.5mm	2.4mm	2.14mm
WR28	38	0.5	1.76	1.7
WR28	47	0.5	~1.8	~1.8 ***
WR22	38	0.5	1.5	1.5
	47	0.5	1.43	1.35
WR10	76	0.25	0.735	0.714

*** WR28 NOT RECOMMENDED at 47 GHz. (The book range is 26.5 to 40 GHz.) With the transition probe in the center of the guide, there is a large resonance at ~50 GHz, upsetting the transition operation at 47 GHz enough so that there is no probe dimension that gives decent return loss.

1. P. Wade, W1GHZ, "Rectangular Waveguide to Coax Transition Design," ***QEX***, Nov/Dec 2006, pp. 10-17. (available at www.w1ghz.org, including corrections)