

Waveguide Slot Antenna – Update 2009

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The waveguide slot antenna spreadsheet in the *W1GHZ Microwave Antenna Book – Online* has been used to successfully calculate dimensions by a number of hams. Some of them have reported having to trim, but few of them were made with enough precision to be sure.

Sometime in 2005, Petr Kauler (kauler@volny.cz) suggested that I had made an error in the spreadsheet calculations, in the slot offset in cell G36. The formula used is

$$=(WG_a/PI())*SQRT(ASIN(New_Y))$$

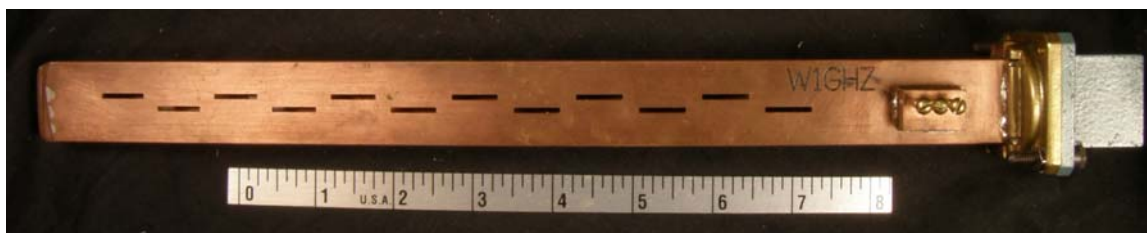
While the correct form based on the equation should be:

$$=(WG_a/PI())*ASIN(SQRT(New_Y))$$

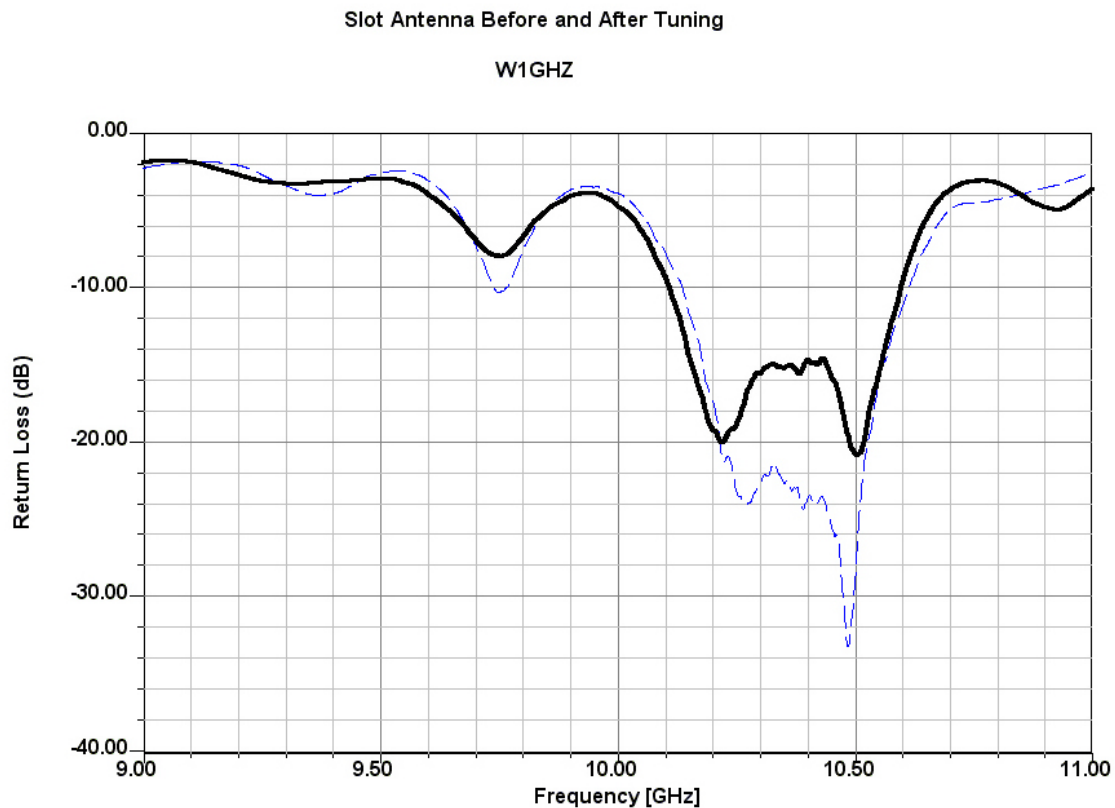
The difference in results is pretty small, and furthermore, previous versions of slot antenna spreadsheets by others had used the same form, so I figured it was close enough. Remember that some of the other numbers in the spreadsheet were found by eyeballing graphs in old papers, so they aren't accurate to six decimal places.

Earlier this year, Dan Welch, W6DFW, reported that he had built some 24-slot versions for 10 GHz using a precision CNC machine. These accurately machined antennas, calculated for 10.368 GHz, were centered at about 10.220 GHz.

I changed the formula in the spreadsheet, and Dan made a 24-slot antenna with the new, slightly different, dimensions. Dan measured this one as centered at 10.331 GHz, with about 20 dB return loss and about 200 MHz bandwidth, so it is good with no tuning. He sent another copy to me. It is a thing of beauty, and I have confirmed the results.



I measured the performance – with the tuning screws backed out, it has about 300 MHz bandwidth with about 15 dB return loss, the solid line in the plot below. Dan had adjusted the screws to improve the return loss to about 23 dB, or a VSWR under 1.2, shown as a dashed line.



The corrected spreadsheet is now at www.w1ghz.org/antbook/slotantenna.xls and <http://www.qsl.net/w/w1ghz/antbook/slotantenna.xls> – the corrected dimension is in cell G38.

The small difference in dimensions should not affect the antenna performance, only the return loss, so you don't have to throw away your old slot antenna. For those who made them with a drill and a file, there shouldn't be any difference – and I respect your ham spirit for getting the job done with what you have.