3D Printed Feedhorns for 10 GHz

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3D printed horns have been shown to work quite well[1], and are not hard to make. The plastic horn is printed on a 3D printer, and then coated with metallic paint. There is a bit of technique involved in getting good conductivity, but Glenn Robb, KS4VA, described it well[2].

One problem is getting a coax connector attached to a plastic horn or waveguide. I have made circular waveguide transitions[3] using ¾" copper water pipe, and made feedhorns by fitting a metal corrugated horn onto the copper pipe. Why not 3D print the complicated part, the corrugated horn, and fit it onto a copper pipe transition?

I reviewed my previous feedhorn simulations and selected corrugated horns which provided good feed performance: one for offset dishes and one for prime-focus dishes. I modified the dimensions slightly, increasing the wall thicknesses for better 3D printing. A quick simulation suggests that the performance is not changed significantly. STL files for both horns are available.

The metallized corrugated horn should slip over the copper pipe. The offset horn should be adjusted so that the rim of the pipe forms a corrugation at which lines up at the same angle as the others. The prime horn position is adjusted for different f/D – the corrugations should be nearly flush with the rim of the pipe for shallower dishes, and further back for deep dishes.

Getting the corrugated horn to slip over the pipe may take a bit of fiddling, as many 3D printers do not print to exact dimensions. For instance, my cheap printer prints about 2% undersize, so I adjust the scaling in the slicer program (I use CURA).

Many hams and most makerspaces have 3D printers. If you don't, there are also services that will print a file for a reasonable cost, and files for thousands of printable objects may be found at thingiverse.com.

Notes:

1. Paul Wade, W1GHZ, "3D Printed Horns," (Microwavelengths), ***QST***, January 2019.
2. Glenn Robb, KS4VA, "3D Printing Microwave Antennas", *VHF Super Conference 2019 Proceedings*.
3. Paul Wade, W1GHZ, "Understanding Circular Waveguide—Experimentally," ***QEX***, January/February 2001, pp 38-48.