GAIN PATTERN SIMULATION FOR A CORRUGATED HORN ANTENNA

Horns are among the most widely used microwave antennas. Typical applications include feeding reflectors and lenses. Corrugations are often used to improve antenna efficiency by reducing diffraction from the aperture edges. In this example the gain pattern for a corrugated conical horn is determined using the EfieldFD MoM solver.

Definition of geometry

The antenna consists of a corrugated conical horn with a working range of 8-12 GHz fed by a coaxial transmission line as shown in Figure 1.

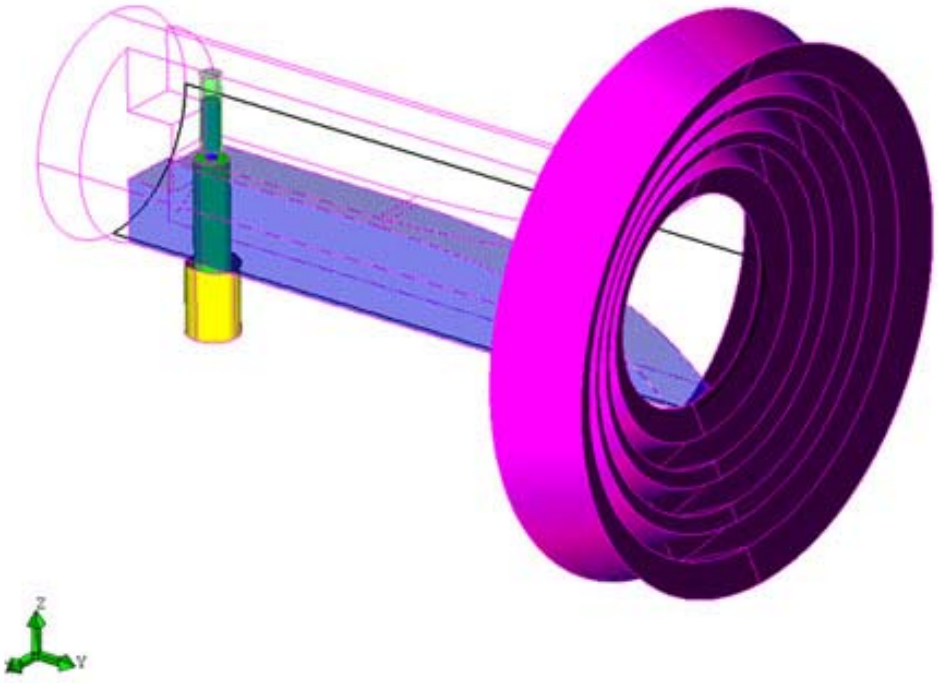

Figure 1: Corrugated horn antenna fed by coax

Simulation with EfieldFD MoM

EfieldFD MoM is used with TEM mode excitation in a waveguide port terminating the coaxial transmission line. The geometry is meshed using a mesh size between 0.5mm-3mm where the coarser mesh is used on the outside and the finer mesh is used to resolve the small features close to the feed, see Figure 2. The simulation data for the EfieldFD simulation is found in Table 1.

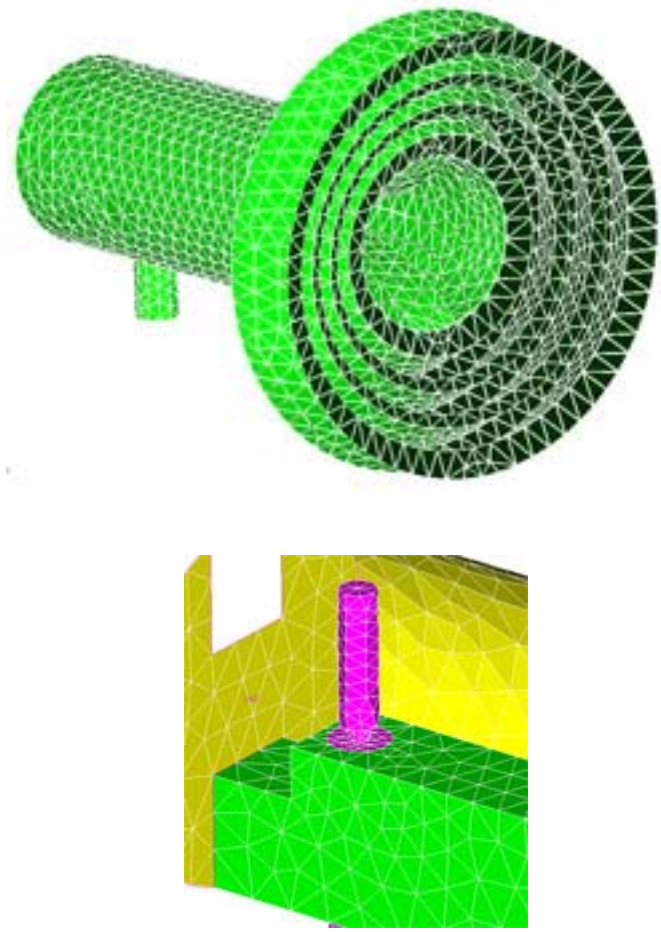

Figure 2: EfieldFD surface mesh, refined in the interior

Table: 1. EfieldFD MoM simulation data for corrugated horn

Description	Value
Mesh size	0.5mm-3mm
No. unknowns	14168
Frequency range	8GHz-12GHz
Frequency step	0.1GHz
Computer hardware	Opteron 285, 1xCPU
Total memory used	1.6GB
Time per frequency	15min
Total simulaion time	10hrs

Results

Figure 3 shows the surface currents in a cross section of the horn. In Figure 4 the three-dimensional gain pattern at 10GHz is shown. Figure 5 and 6 shows the corresponding patterns in the XY- and YZ-planes. In Figure 7 S11 for the TEM

waveguide mode excitation is shown. Figure 8 shows the maximum gain as a function of frequency over the range 8GHz-12GHz.

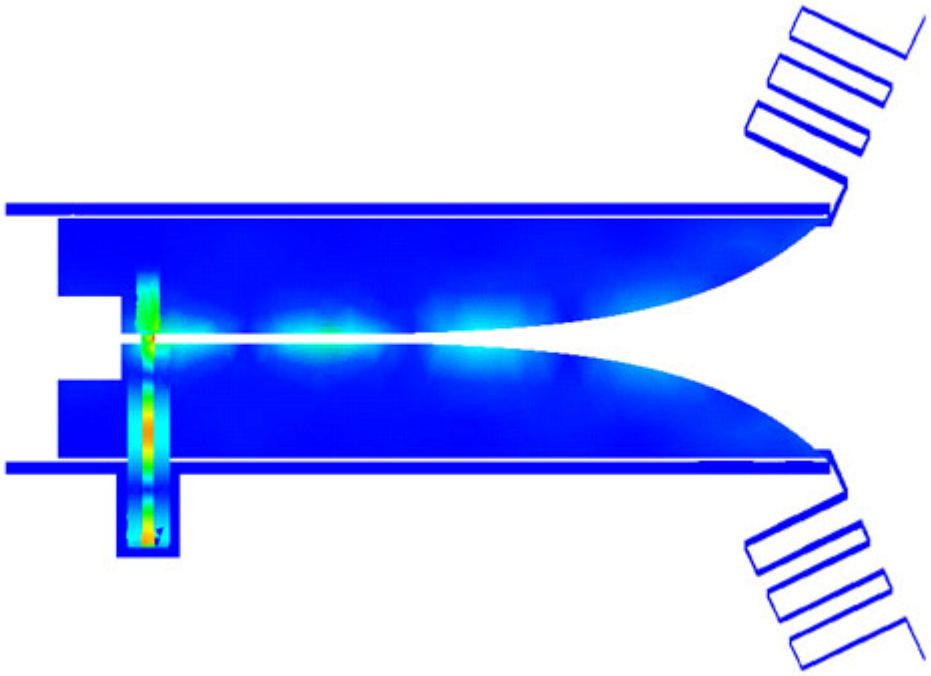

Figure 3: Corrugated horn surface currents at 10GHz

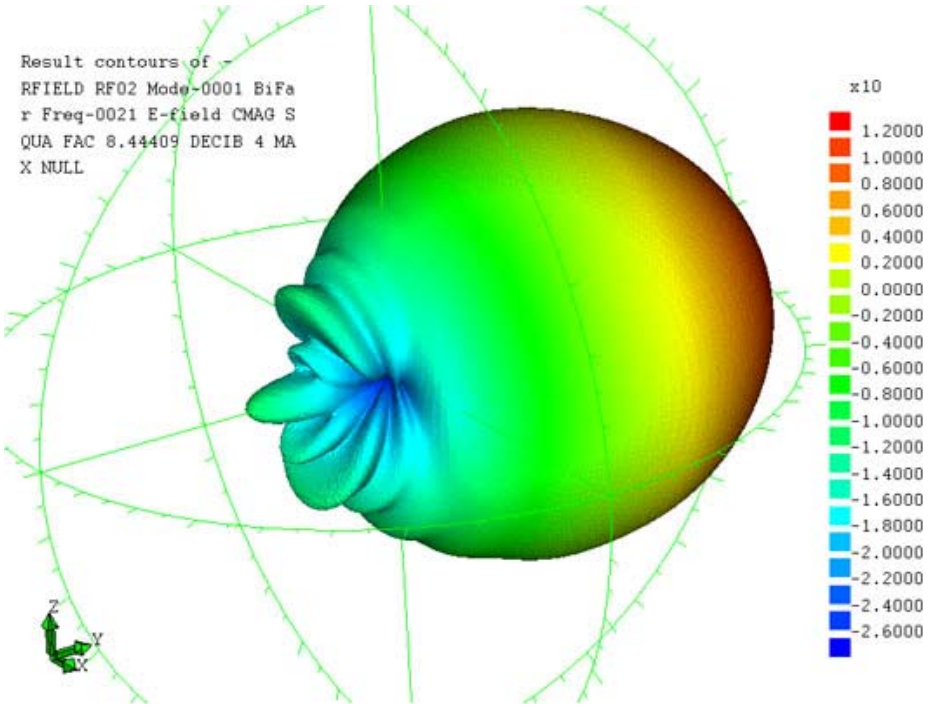

Figure 4: Corrugated horn 3D gain pattern at 10GHz

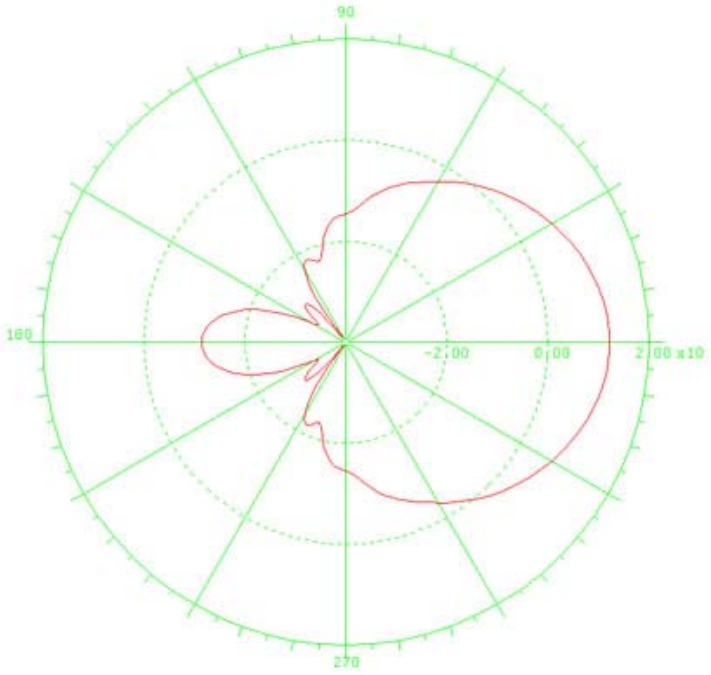

Figure 5: Corrugated horn gain pattern at 10GHz in the XY-plane

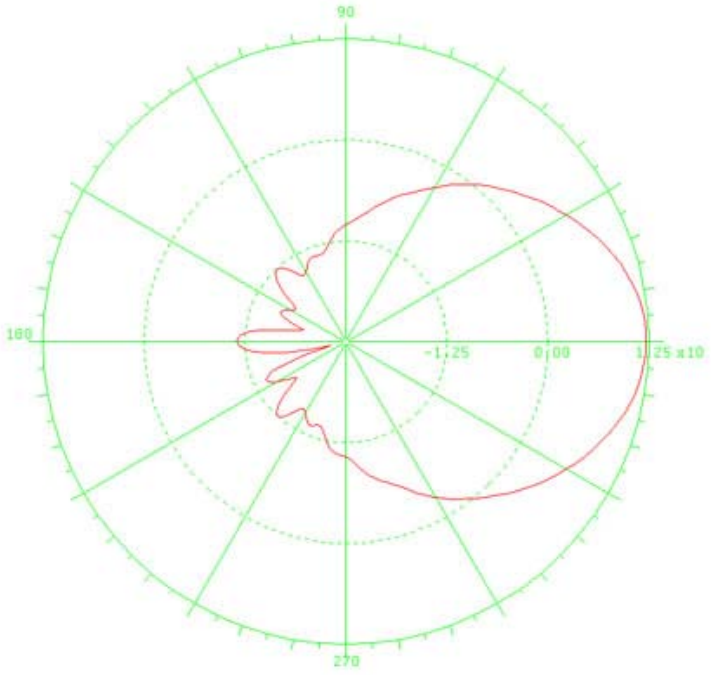

Figure 6: Corrugated horn gain pattern at 10GHz in the YZ-plane

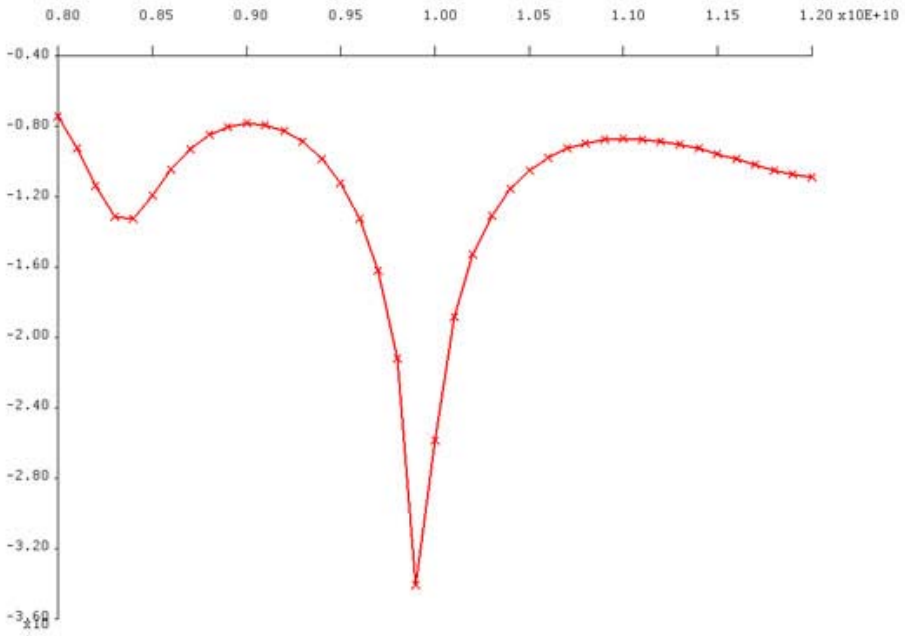

Figure 7: Corrugated horn S11 for TEM mode feed

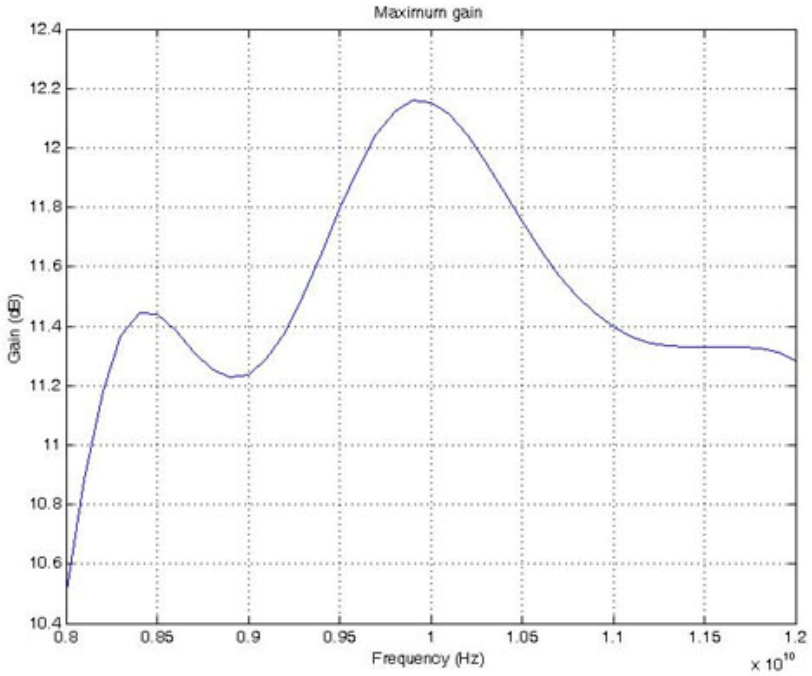

Figure 8: Corrugated horn maximum gain as a function of frequency

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