

Simulating a Horn Antenna in CST

Major Project 1

Experiment 2

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Horn Antenna

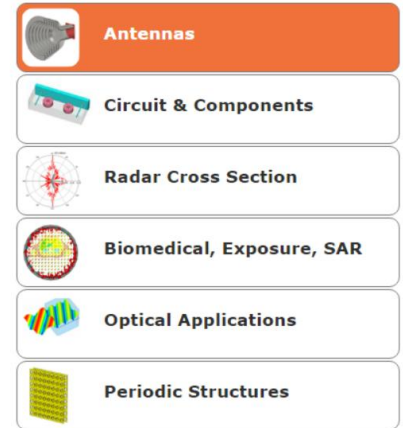
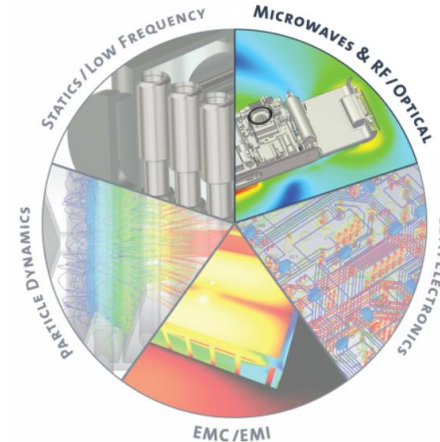
A horn antenna or microwave horn is an antenna that consists of a flaring metal waveguide shaped like a horn to direct radio waves in a beam. Horns are widely used as antennas at UHF and microwave frequencies, above 300 MHz. They are used as feed antennas (called feed horns) for larger antenna structures such as parabolic antennas, as standard calibration antennas to measure the gain of other antennas.

-Sourced from Wikipedia



Objective

To simulate a working 10 GHz Horn Antenna using the Microwaves & RF/Optical Builder tools in CST Software.



Setup

CST Studio Suite

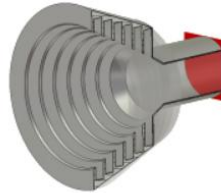
Create Project Template

MW & RF & OPTICAL | Antennas | Waveguide (Horn, Cone, etc.) | Solvers | Units | Settings | **Summary**

Please review your choice and click 'Finish' to create the template:

Template Name:

Antenna - Waveguide_1



Solver



Time Domain

Units

- Dimensions: mm
- Frequency: GHz
- Time: ns
- Temperature: Kelvin

Settings

- Frequency Min.: 0 GHz
- Frequency Max.: 10 GHz

Antennas which consist of waveguide elements or which transform energy from guided form (waveguide, coaxial line) to radiating by a gradual transition, e.g. horn or conical elements.

< Back

Finish

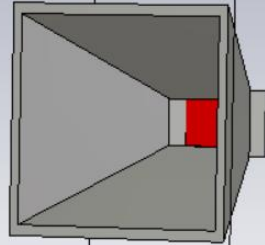
Cancel

Parameters

PARAMETER	VALUE
fctr	$180/\text{waveguide_width} = 9$
fmax	$200/\text{waveguide_width} = 10$
fmin	$160/\text{waveguide_width} = 8$
horn_length	30
Taper_angle	30
Wall_thickness	2
Waveguide_height	10
Waveguide_width	20

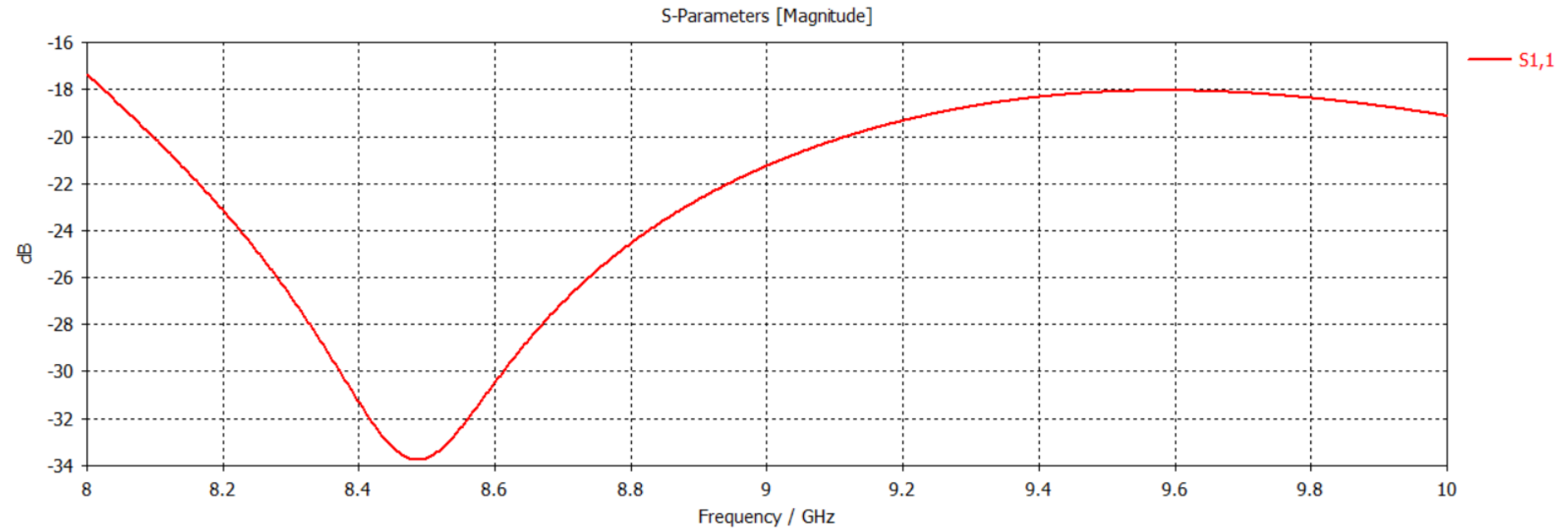
Simulation

 CST Studio Suite
Student Edition



Results

S- Parameters

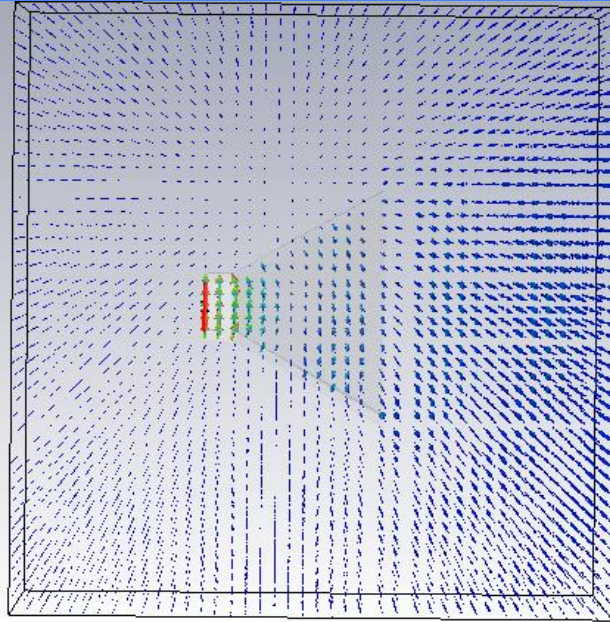


Results

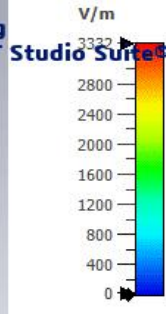
Electric Field

We can see the broadside radiation of the horn

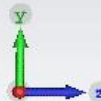
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e-field (f=8) [1]
Frequency 8 GHz
Phase 33.75 °
Maximum (Solver) 3332.06 V/m



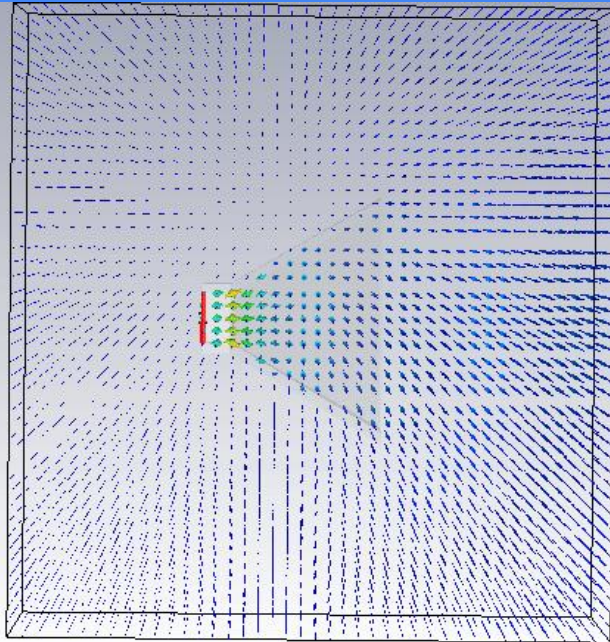
Results

Magnetic Field

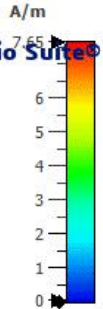
We can clearly observe the magnetic radiation pattern in this simulation.



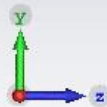
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h-field (f=fctr) [1]
Frequency 9 GHz
Phase 45 °
Maximum (Solver) 7.78441 A/m



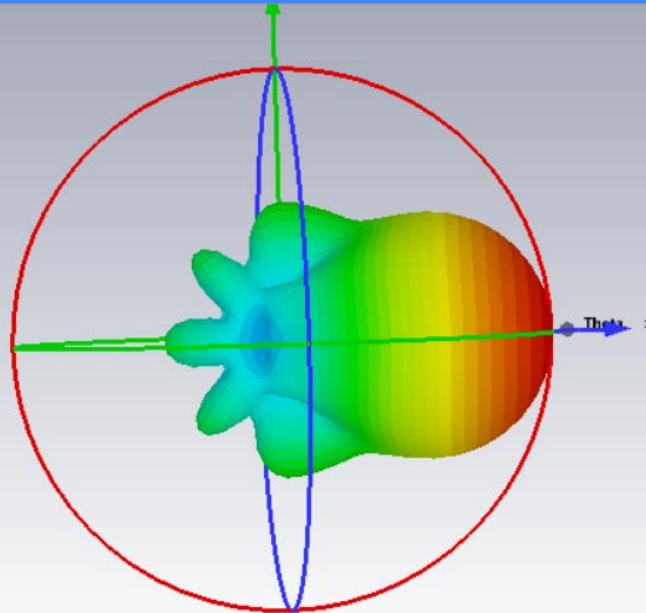
Results

Farfield

The 3D pattern of the farfield is shown in dBi



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dBi

12.6
8.95
5.31
1.67
-1.96
-5.6
-9.24
-12.9
-16.5
-20.1
-23.8
-27.4

farfield (f=8) [1]

Type	Farfield
Approximation	enabled ($kR \gg 1$)
Component	Abs
Output	Directivity
Frequency	8 GHz
Rad. Effic.	0.008322 dB
Tot. Effic.	-0.07239 dB
Dir.	12.58 dBi