MAGELLAN SPACECRAFT SIMULATION

EMC Studio/EMCoS Antenna VLab

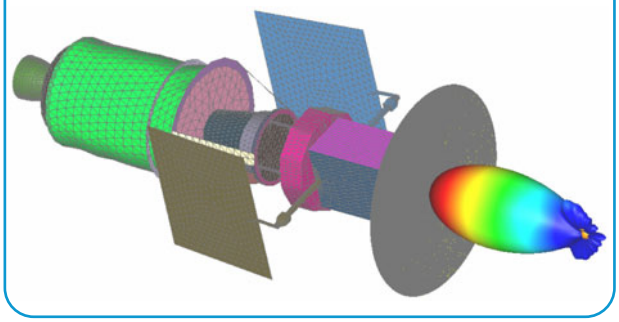
Introduction

This application demonstrates combination of MoM and physical optics approach (PO) on simulations of electrically large problems. Magellan spacecraft is fed by horn pattern at frequency 3 GHz. Simulations are performed using PO solution.

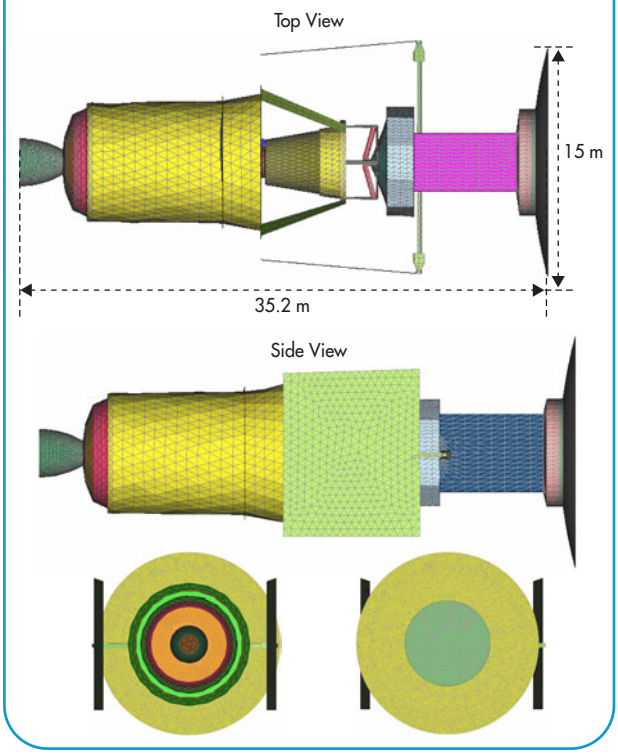
Simulation Workflow

- At the first step, far field pattern of a horn antenna is accurately modeled with MoM
- On the second step, far field pattern of the horn antenna is used as a specialized incident field source, and calculation of the currents on spacecraft geometry is done using PO approach
- On the third step, spacecraft is calculated and analyzed

Simulation Model



Spacecraft Dimensions



Magellan Spacecraft Geometry

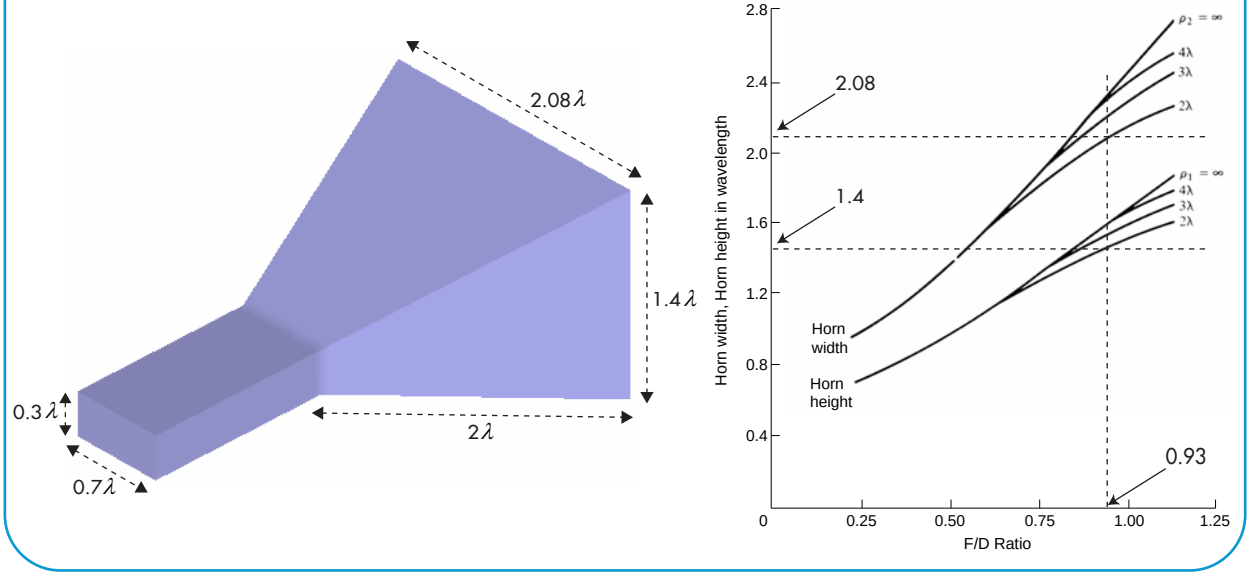
Spacecraft dimensions are the following:

- Number of triangles 63793
- Magellan spacecraft length is 35.2 m
- Magellan spacecraft width is 15 m

Design of Horn Antenna

The optimum parameters of the horn antenna for parabolic reflector were chosen. The parameters of horn antenna depend on parabolic reflector focus to diameter ratio, which is 0.93.

Horn Antenna Dimensions
(optimum horn dimensions versus f/d ratio for various horn lengths)



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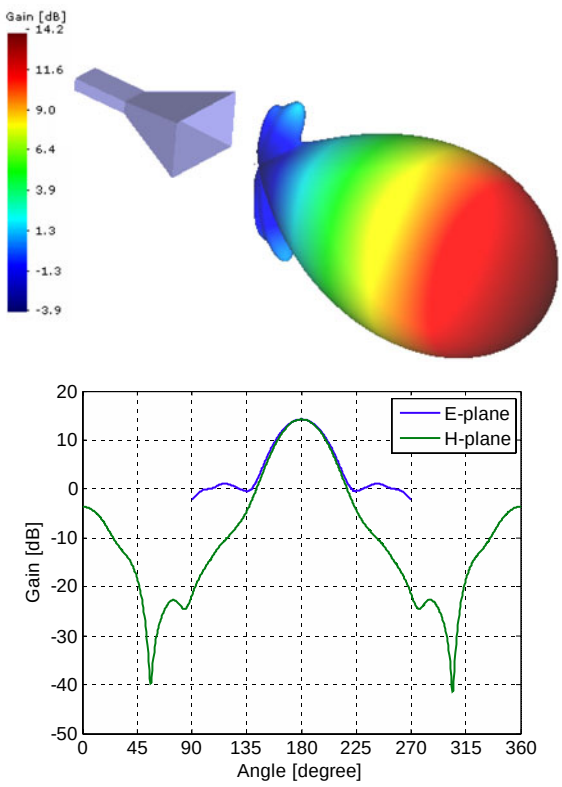
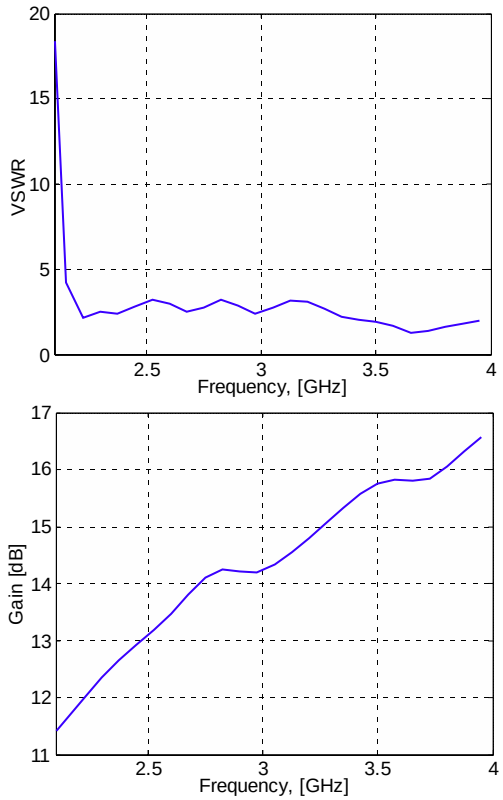
Computational Model of Horn Antenna

Far Field 2D and 3D Patterns (3 GHz)



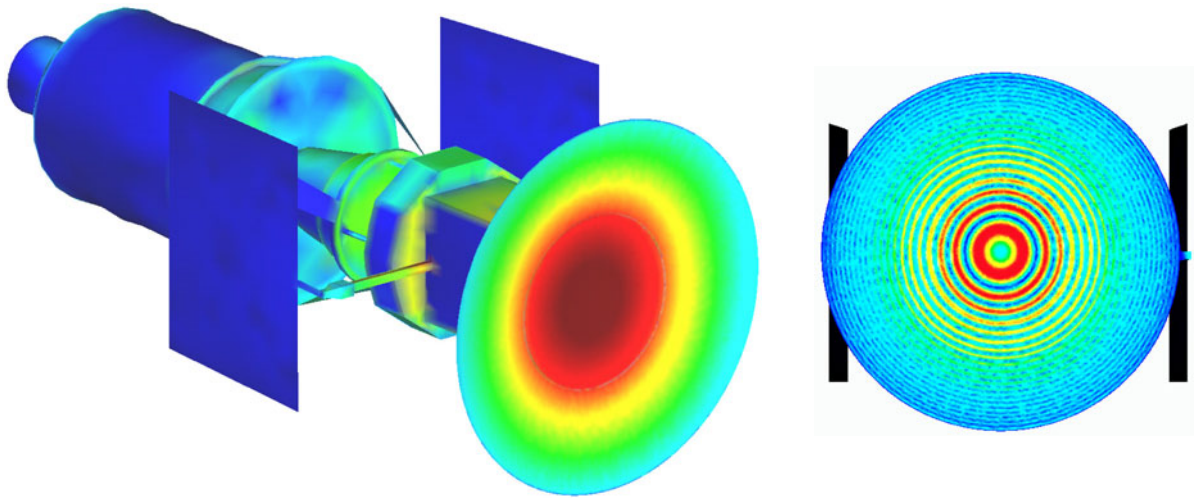
Frequency Characteristics of Horn Antenna



Results

Current distribution on Magellan spacecraft is shown below for 3 GHz frequency:

Current Distribution (3 GHz)



References

- F.G. Bogdanov, R.G. Jobava, D.D. Karkashadze, I.S. Oganezova SATELLITE ANTENNA SIMULATIONS USING COMBINATION OF INTEGRAL EQUATIONS AND PHYSICAL OPTICS APPROACHES (International Scientific Conference "Advanced Lightweight Structures and Reflector Antennas")

EMC Studio/EMCoS Antenna VLab Application Note: #14

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