

Parabolic Dish Antennas with Waveguide Feeds

General Consideration

WIPL-D Pro is a Method of Moments (MoM) based code which enables very accurate EM simulation of arbitrary 3D structures. Among them are antennas in various technologies: wire antennas, horn and aperture antennas, reflector antennas, microstrip antennas, phased array antennas, helical antennas etc.

For parabolic reflector antennas, a special type of aperture antennas, MoM based simulation gives more accurate results than approximate techniques based on physical optics PO and/or uniform/geometrical theory of diffraction (UTD/GTD) which are widely used for simulation of dishes.

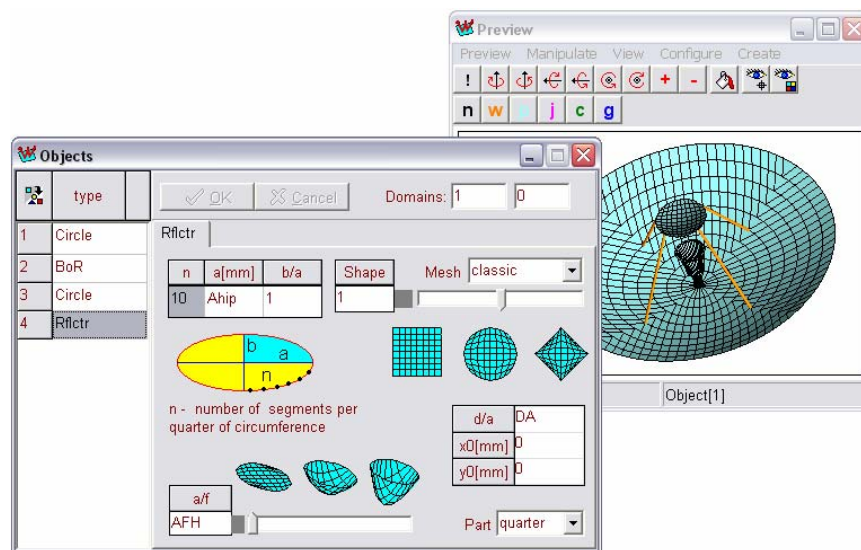
The design process in WIPL-D Pro for parabolic dish antenna is performed in three phases:

1. Preprocessing – (1) definition of the antenna geometry, (2) building a model of the reflector and feeder in simulation tool and (3) specifying output results to be calculated after the simulation. For aperture antennas the results of interest are field distribution over aperture and radiation pattern.
2. Processing – simulation of the structure defined in phase 1.
3. Postprocessing – calculation of output results according to specification in phase 1.

Preprocessing

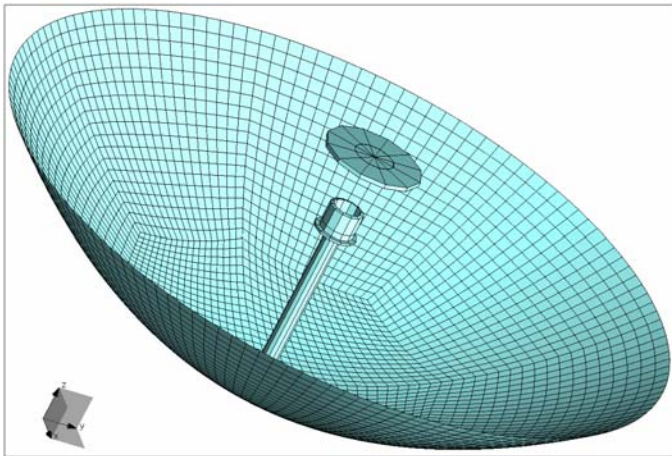
After defining the antenna geometry, a model of the reflector is built in WIPL-D using predefined Reflector object editor, shown below. Automatic geometry and mesh generation enable creation of parabolic reflector of circular, elliptic or rectangular shape (with or without rounded corners), with central or offset feed.

Two types of meshing are available: Classic and Advanced. Advanced meshing is customized for reflectors of circular and elliptical shape and simulation of such reflector requires less unknowns than with classic meshing. This way the simulation time for large reflectors is decreased.

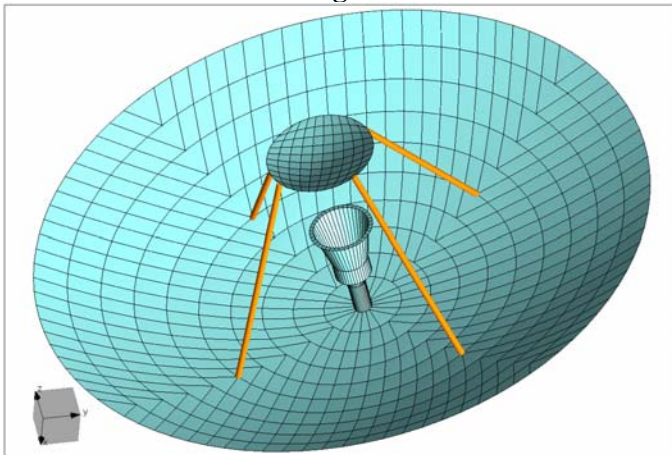
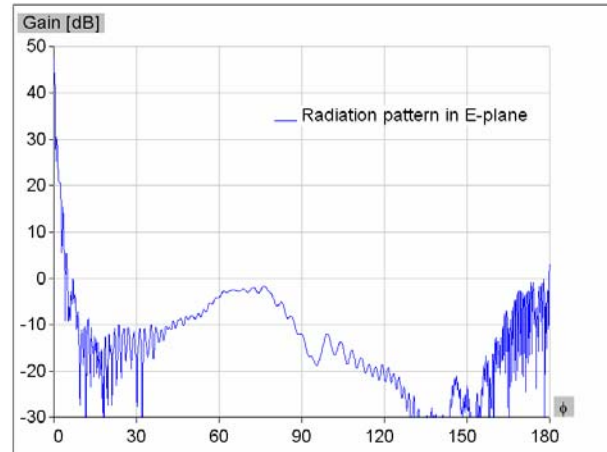


Postprocessing – Radiation Pattern

Cassegrain Reflector Antennas



Cassegrain 1



Cassegrain 2

The property that these antennas have 2 symmetry planes has been used to speed up the analysis.

Antenna	Diameter in λ	No. of Unknowns	Memory Required
Cassegrain 1	105	21980	3.86 GB
Cassegrain 2	25	5638	0.26 GB
Splash	32	6593	0.35 GB

Note: The analysis is done on P4 2.4 GHz with 1GB RAM memory. In Cassegrain 1 case, Outcore solver has been used.

Splash Plate Feed Reflector Antenna

