

MODELING CASSEGRAIN REFLECTOR SYSTEM USING FINITE
DIFFERENCE TIME DOMAIN METHOD OF BODIES OF REVOLU-
TION

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In this paper we model an entire Cassegrain reflector antenna including the feed, the subreflector and the reflector using the Body of Revolution (BOR) version of the Finite Difference Time Domain (FDTD) Method. The reflector system consists of a corrugated horn as the feed and axially-symmetric shaped subreflector and reflector. The corrugations in the feed (more than 100 corrugations for long horns) must be accurately modeled in order to predict its far-field pattern as well as the return loss. In addition it has been shown that the return loss can also be affected by the presence of the subreflector which rules out the individual modeling of the components.

Typically, due to the large electrical dimensions of reflector antennas, the design and analysis are carried out using approximated techniques such as physical optics and ray tracing. However accurate calculation of the important parameters such as return loss and side lobe level are required for todays modern communication systems which cannot be achieved with these methods. Rigorous volumetric techniques such as FDTD are desired. However the direct simulation of the entire reflector system requires high memory and cpu-time. Therefore to achieve the necessary accuracy and efficiency of simulation the axially-symmetric nature of the system can be used to extract the azimuthal variation and therefore model the antenna in two-dimensional plane using the BOR-FDTD method. This enables one to accurately design the entire system in a timely manner.

We model the entire Cassegrain reflector antenna on SGI Altix 350 PC cluster. The cluster is integrated by two modules each with two nodes of 2 Gbytes. The cluster as a whole unit can carry out the simulations requiring up to 8 Gbytes of shared memory. The numerical results including the far-field pattern and return loss will be presented.

Abstract Submission Form

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