Space-Fed Antenna Array Design and Analysis Software Package

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Modern society is heavily reliant on the applications of electromagnetic wave propagation. This leads to rapid advancements in antennas, such as the popular space-fed arrays, which integrate the best traits of reflector, lens, and printed antenna arrays. Such rapid development has allowed for great improvements over previous antenna designs. However, there is a downside to this rapid development. For those just entering into the field of electromagnetics, it can not only be daunting to initially understand electromagnetic theory, but it can be also overwhelming to have to go through all the recent developments of space-fed arrays in order to apply electromagnetic theory.

To make the process of taking theory into practical applications simpler, a package that allows the user to focus on applying and learning theory while still producing an antenna array that has practical use has been developed. This was done by providing a software package that embodies modern and relevant design/analysis theory so that users can more easily familiarize themselves with practical applications of electromagnetic theory. Such simulators are becoming more and more readily available, however, they are not always easy to use and often assume the user has moderate theoretical background. A more user experience-agnostic package for the design of practical antennas greatly aids those who wish to become more familiar with electromagnetic engineering.

The space-fed antenna array family was chosen as the focus for this software package because its members typically combine the numerous advantages of printed antenna arrays and reflector/lens antennas and create a hybrid high-gain antenna with a low-profile, low-mass and diversified radiation performance. These antennas are now emerging as the new generation of high-gain antennas for long-distance communications, with a recent interest in space applications. Since the common considerations for space antennas are size, weight, and power, the space-fed array family also show significant advantages over the traditional high-gain space antennas, which are typically reflectors/lenses and arrays (P. Nayeri, Ph.D. Dissertation, University of Mississippi, July 2012).

The developed package serves as an educational tool which presents the users with a systematic and user friendly interface for design and analysis of space-fed antenna arrays. This software package embodies modern and relevant design/analysis theory of space-fed arrays in an intuitive way that allows the user to more easily familiarize themselves with learning and applying electromagnetic theory. The package can also be used by anyone regardless of background in electromagnetics and antenna theory and provides a step-by-step walkthrough with documented parameters for the user to design and analyze a space-fed array. As a result, it also serves as an intermediary between student engineers and full-bodied commercial electromagnetics solvers, who often assume that the user is experienced in electromagnetic theory and design.