Hybrid Methods Simulation for Electrically Large Antenna System in HFSS

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HFSS (High Frequency Structure Simulator) is known to be the industry standard for Electromagnetic simulations for years because of its consistent accuracy when compared to measurements for different application and at different nodes. Although it is very accurate, the simulation time and computer resources needed for electrically large antenna systems are very huge using the traditional methods. The need to model those electrically large antenna systems is increasing significantly in the past decade for many different reasons.

In this paper, we will show the latest technologies ANSYS has been working on to target those two concerns, simulation speed and simulation resources. HFSS-IE (Integral Equation), HFSS-PO (Physical Optics), and Hybrid FEM-IE (Finite Element-Integral Equation) are the three main technologies we will introduce in this paper to solve large problems. We will start by describing the basic technology behind each method, we will also show some design examples for these technologies and compare to known results.

The examples that were solved in this paper are: A 60 wavelength Cassegrain Reflector Antenna, a beam waveguide model with four reflectors each of fifty wavelength, Multiple Antenna placement on an Aircraft model where coupling between antennas were computed, and finally the Radar Cross Section of a two hundred and fifty wavelength missile. When applying the Hybrid Approach, we were able to minimize the simulation time for these examples that used to take days of simulations into hours maintaining the same level of accuracy. For some other examples which were impossible to solve in the past, we were able to solve it on a multi-core computers.