

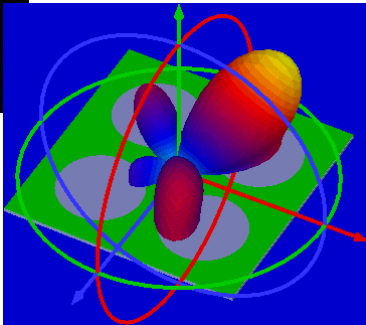
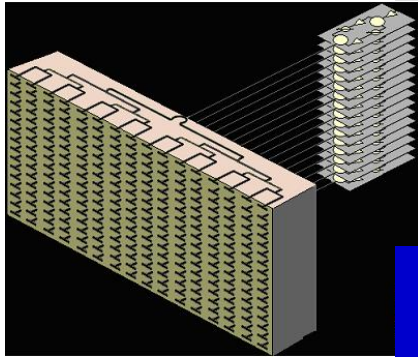
Subject: Model Order Reduction for Antenna and Antenna Array Farfield Simulations

Key Research Area: Multi-Scale; Model Order Reduction

Conventional radar system
based on a mechanically
rotating antenna



Array of 16x16 antennas
together with the corresponding
feeding network



Example of an array of four antennas
with an electronically steerable
antenna beam by means of phase
adjustments of the individual antenna
elements

Description:

In modern communication systems and many other applications such as radar utilization large arrays of antennas are used to form an electronically steerable antenna beam while completely avoiding mechanically moving parts. In order to adjust such a beam to the given dynamically changing needs, a large amount of consecutive fully three dimensional field analysis runs would be necessary for the processing of each and every emerging parameter set. Due to the enormous computational effort that would have to be employed for such an analysis it is highly desirable to extract a subset of information from those fully three dimensional results which enables the fast tuning on a somewhat reduced accuracy level. In mathematical terms, the challenge is to reduce a very large linear system of equations with typically millions of unknowns to a comparatively small one with only thousands of unknowns while keeping the relevant information in the system. This kind of approach belongs to the group of Model-Order-Reduction algorithms which are nowadays employed in many areas, in particular in electronic design processes.

Requirements:

Supervisors: T. Weiland, Computational Electromagnetics Laboratory
J. Lang, Numerics of PDEs