

Simulation of Antenna Arrays: Part 1

Background

For some applications single element antennas are unable to meet the required gain or radiation pattern, this limitation can be overcome by combining several antenna elements in an array, for example Figure 1. Antennas exhibit a specific radiation pattern, the overall radiation pattern changes when several antenna elements are combined in an array. The *array factor* quantifies the effect of combining radiating elements in an array without taking the specific radiation pattern of the individual element into account. The overall radiation pattern of an array is determined by the *array factor* combined with the radiation pattern of the individual antenna element.

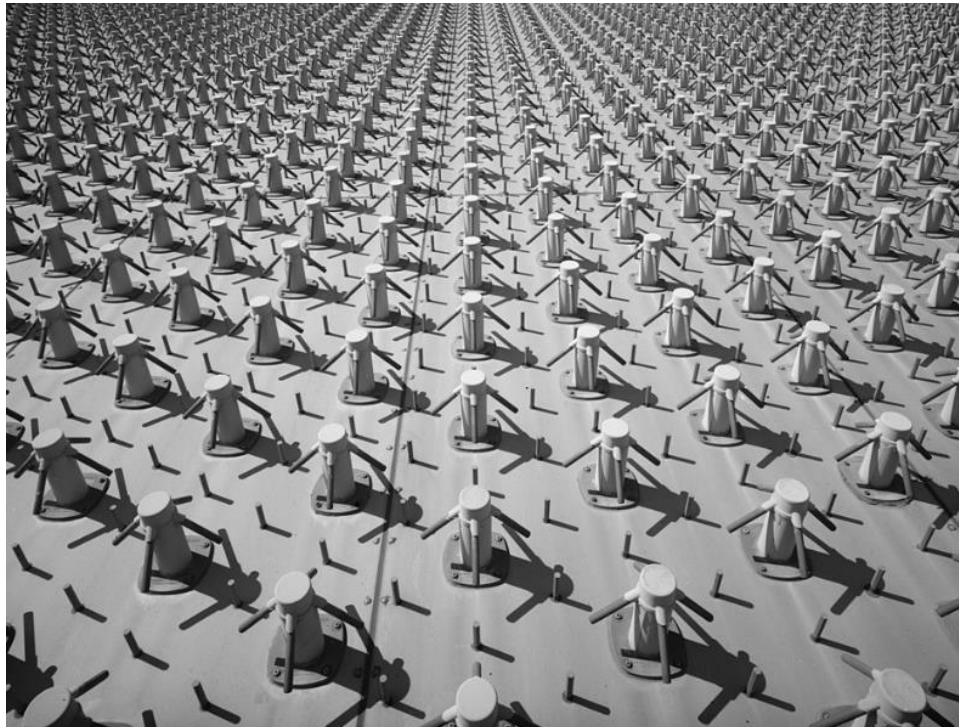


Figure 1: Planar array of 2677 dipole antenna producing a narrow beam only 2.2° wide. Image from Wikipedia: https://en.wikipedia.org/wiki/Phased_array

In this series of five blogs we will examine the theory of evaluating the output of multiple antenna based on the performance characteristics of a single antenna in the array. With an understanding of the theory, an example of implementation for a half-wavelength dipole antenna in COMSOL Multiphysics will be provided; the approach to analyze a single antenna will be extended to cover multiple antennas through the use of array factors before demonstrating an example application for an antennas array.