



Patch Antenna Array Design

Faraday Dynamics EDA Solutions



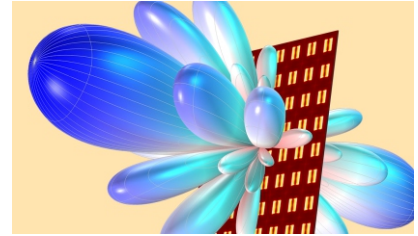
Faraday Dynamics

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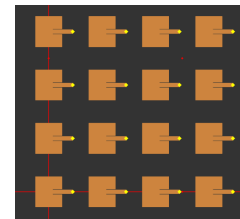
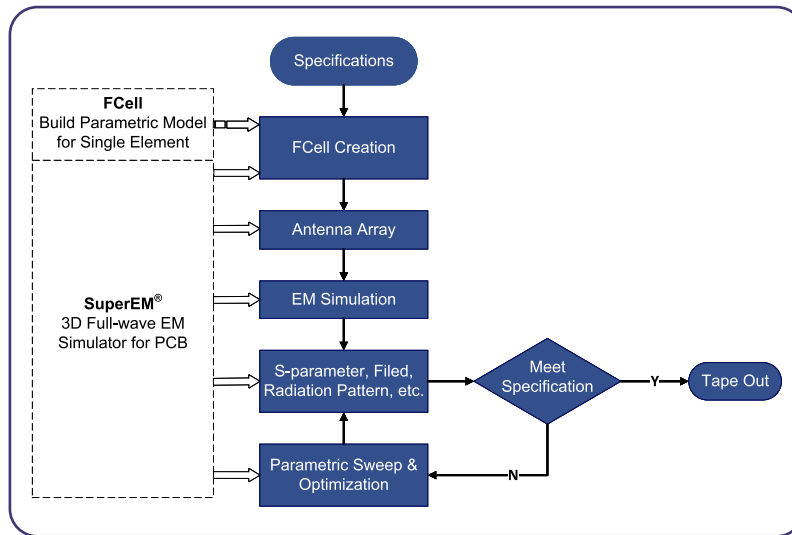


Introduction

Patch antennas possess merits such as miniaturization, low profile, high gain, easy installation, and low cost. Large-scale arrays composed of patch antennas find extensive applications in wireless communication systems, including millimeter-wave base stations, satellite communications, automotive radar, and industrial IoT. SuperEM[®] is applicable to the comprehensive design process of any type of patch antenna arrays, covering various stages from simulation to optimization. It accurately simulates data such as S-parameters, near field, and radiation patterns. This case study presents a 4x4 patch antenna array with a unit spacing of half wavelength, operating at 3.5GHz, and the simulation results are exported from SuperEM[®].



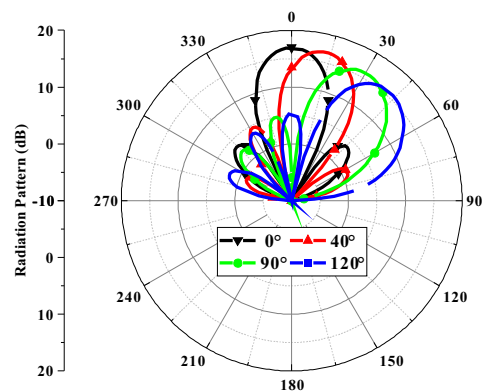
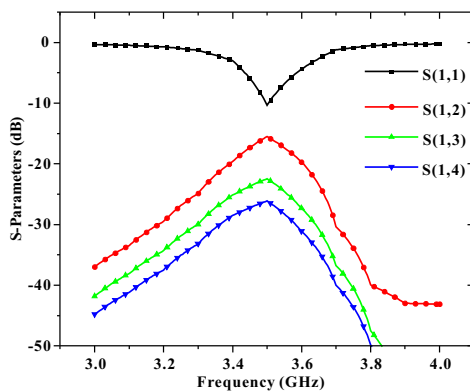
Design Flow



SuperEM[®] Model

A 4x4 Patch Antenna Array, constructed on an FR4 substrate with a dielectric constant of 4.3, loss tangent of 0.02, and a profile height of 1.6mm. The operational frequency is 3.50GHz, and the distance between antenna elements is half wavelength, with feed provided through microstrip lines.

Simulation Results



Utilizing the FCell model from one time design, SuperEM[®] facilitates antenna unit construction, applicable to various materials and dimensions. The simulations demonstrate that the antenna array exhibits a return loss of less than 10dB in the 3.5GHz frequency range, coupling between ports is below 15dB, and the scanning gain within 60-degree ranges from 14-15dBi. The performance is exceptional, making it suitable for large-scale beam-scanning arrays.