

Performance Enhancement of Communication Antennas using Metamaterials

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OUTLINE

1. Introduction to Metamaterials

- Periodic Structures; Passbands and Stopbands; Negative Index Materials; Realization and Measurements of Metamaterials; Determining effective ϵ and μ from measurements.

2. Directivity Enhancement of A Class of Patch Antennas using Metamaterial Superstrates

2.1 Basic Concepts of Metamaterial Superstrate Design

- Unit Cell Approach to Preliminary Design of Superstrates
- Introducing Defects in Periodic Structures to control Passbands and Stopbands

2.2 Dielectric rod EBG Superstrates

- EBG composite and its unit cell
- Transmission Characteristics of the unit cell as a function of several design parameters
- Defect frequencies of various modes
- Controlling defect modes by changing defect length and dielectric constant
- Applications of Dielectric rod EBG superstrates

2.3 FSS Type Superstrates

- Dielectric rod EBG superstrates vs. FSS superstrates
- FSS superstrate consisting of two-layered FSS screens for dual-band directivity enhancement
- Conventional FSS superstrate vs. thin FSS superstrate
- Applications of FSS superstrates

3. Metamaterials as substrates for Bandwidth Enhancement of Microstrip Antennas

- Realizing high impedance surfaces using Metamaterials
- Synthesis of FSSs for substrates using the Genetic Algorithm (GA)
- Illustrative Examples: Communications, RFID tags and etc.

Proposed Duration: Half-Day