CHAPTER: 3

BRIEF OVERVIEW OF METAMATERIAL WITH ANTENNA

[1]JAIMINI SHAH
[1]School of engineering and technology
Apeejay stya university Sohna-Palwal road, Gurugram

[2]Dr. PARIKSHIT VASISHT
[2]School of engineering and technology
Apeejay stya university Sohna-Palwal road, Gurugram

[3]Dr. SUDHAKAR RANJAN
[3]School of engineering and technology
Apeejay stya university Sohna-Palwal road, Gurugram

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Metamaterials" because of its electromagnetic properties have attracted an excellent amount of attention within the recent years. Electrically thin material layer, designed layer, designed and optimized to function as a tool to manage and transform electromagnetic waves. it's possible to get a desired structure metamaterial by combining with a microstrip antenna periodically

A compact complimentary split ring resonator (CSRR) fused with slotted microstrip patch antenna with inset feeding for better transmission efficiency .We experimentally confirmed that composite metamaterial can improve the performance of the microstrip patch antenna at the frequencies where electromagnetic band gap transmission takes place.The use of metamaterials in antenna design not only reduces the scale of the antenna but can even improve other antenna parameters like enhancing bandwidth, increasing gain, or generating multiband frequencies of antennas operations. To improve the radiation properties of the antenna by using metamaterials surface, antennas are often placed above the reflector so as to radiate in a very specific direction only, while reducing the back-radiation .The distance between the antenna and also the metal surface should be chosen minimum $\lambda/4$, where the metamaterial acts as a reflective plane to reinforce the graphical record and radiation efficiency.

The complimentary split ring resonator antennas (CSRR) have received growing attention because of its numerous remarkable characteristics like low-profile, high radiation efficiency, broadband characteristics, light weight and stable for prime frequency applications. additionally, the belief of split ring resonator(SSR) in various geometrical shapes together with the easy feeding mechanism like inset ,offset, coaxial probe, aperture coupling, coplanar feed, slot line etc. Typically, CSRRs are similar temperament for low loss wireless applications on the account of infinitesimal conductor losses and high impedance.

METAMATERIAL-OVERVIEW

In early decades SRR were recognized as radiating element beginning with the analysis of basic shapes like rectangular, circular and cylindrical . Fundamentally, a typically existed structures like CRLH based antenna provides gain of three.16 dbi with antenna efficiency 76.5% and with FBW 1.52% at very high resonate frequency. circularly polarized patch antenna (CRLH based) has gain of three dbi with 70% efficiency .Metamaterial shell based antenna with electric coupling and magnetic coupling has 92% and 82% of antenna efficiency with 4.1 FBW. Microstrip DBE based antenna has gain of 4.5 dbi with 95% efficiency at 1.48 GHz frequency. MPC based antenna has 6.2dbi gain with 675 antenna efficiency at 2.35 Ghz frequency with high 8.85

FBW.mu-zero resonance antenna has 2.9 dbi gain with 86% efficiency with operating frequency at 7.3 Ghz .SRR spherical wire antenna has 73% efficiency at 403 Mhz. Inductively fed vertical SRR antenna has 2.05 dbi and 68.1 % efficiency at 2.85 GHz with FBW 20.1%.CSRR resonator antenna has 2.13-5.04 dbi with 74.5% at 2.82-3.82GHz with 1.76 FBW. Triple band antenna (CSRR) has 4.45dbi and 75.5% efficiency .

RIS meta-surface loaded antenna has 4.5 dbi gain and 90 efficiently with 6.7 FBW. Meta-surface loaded AMC ground plain antenna has 19 dbi +with 80% efficiency at very high frequency .In this proposed design CSRR with rectangular patch antenna with inset feed provide gain and antenna efficiency with better performance with better lobe result and cross polarization. The SRRs manifest capacitive effect at higher frequencies. For feeding the microstrip patch antenna, novel inset feeding method is employed. The simulation is dispensed in HFSS Microwave Studio.
The left-handed metamaterial used could be a three-dimensional periodic structure which consists of circular split ring resonators and thin wires. A completely unique concept of using slotted ground structure and one circular split ring resonator (SRR) to realize multiband operation from a miniaturized UWB antenna is wideband integrated photovoltaic (PV) cell patch antenna the look consists of a slot loaded Patch Antenna with an array of complimentary split ring resonators (CSRR) etched within the ground plane.

CONCLUSION

In this chapter, there exist different type of metamaterial design which works efficiently in the better utilization of antenna .Split ring resonator used split rings to create capacitance highly used in previous papers but now days many design with different structure gives better performance with antenna and sensors.