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# Realization of a Complementary Split-Ring Resonator (SRR) Based Metamaterial Antenna

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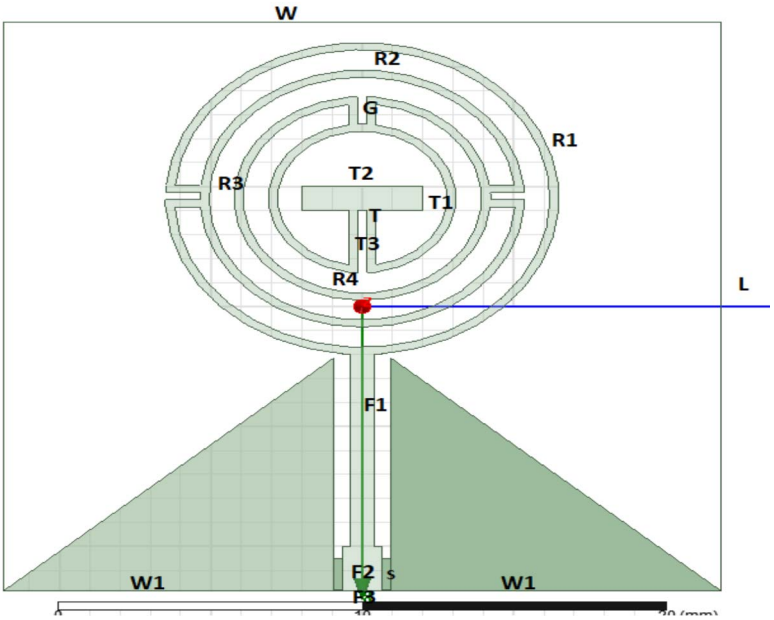
***Abstract—***

Metamaterials are artificial materials that are known to produce extraordinary electromagnetic responses, due to their constituent artificially-engineered micro- or nanostructures with dimensions smaller than that of the wavelength of light. The Split Ring Resonator (SRR) is one such nanostructure that forms the basic unit of a metamaterial. Since the dimensions of the SRRs are required to be smaller than the resonance wavelength, they become critical when a response is required at near infrared and optical wavelengths. In this the various properties of nano-scale SRRs was studied that resonate in the infrared and visible spectrum. The SRRs are made of both aluminium (Al) and gold (Au) and have been fabricated on silicon and silica substrates using Electron Beam Lithography (EBL) techniques.

In this paper, a novel SRR based metamaterial antenna was proposed for various applications. The proposed structure will consists of a main SRR, directly fed by the microstrip line and a parasitic patch which is coplanar with the ground plane and indirectly fed by two via holes connected with two split rings. A "COMPLEMENTARY SPLIT RINGS" double negative inspired metamaterial structure was introduced as a cover to the circular microstrip patch antenna at a height of 1.6 mm from the triangular ground plane, operating at 3.05 GHz. The results showed that the proposed metamaterial cover, effectively improves the patch antenna's gain and bandwidth. The complex permittivity and permeability of the proposed structure has been extracted by Nicolson-Ross-Weir (NRW) approach. The outcomes of this work open the possibility to use the proposed structure as a miniaturized and flexible antenna for wireless communication applications.




Proposed Antenna Design

***Keywords -*** ***Electron Beam Lithography; Coplanar Waveguide; Metamaterial Antenna; SRR Structure; Complementary Split Ring; Nicolson-Ross-Weir (NRW); Negative Permittivity and Permeability.***

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