

Dual-Band Microwave Metamaterial Absorber Using Modified Circular Ring Resonator for Sensor Applications

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Abstract : This study presents a dual-band metamaterial microwave absorber that functions at frequencies of 3.5 GHz and 5.7 GHz. The design comprises modified ring and rectangular patch resonators fabricated on an FR4 dielectric substrate with a ground layer beneath it, emphasizing simplicity. Each absorption frequency is independent and can be individually adjusted by altering the dimensions of the respective resonator structures. The unit cell of the absorber is simulated and optimized parametrically using high-frequency structure simulator (HFSS) software. The mechanism behind the absorption is examined through surface current analysis as well as the symmetric model method. The absorber demonstrates over 97% absorption at both resonant frequencies and is shown to be suitable for sensing applications related to dielectric constant measurement. With its straightforward design, wide-angle acceptance, and polarization-insensitive characteristics, the proposed absorber is likely to be beneficial for both absorption and sensing purposes.

Keywords : absorption, dielectric permittivity, metamaterials, meta surfaces, resonant structures, sensor devices

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