

3. Title: Polarization insensitive metamaterial enabled multiband absorber over a wide spectrum (X – to – K-bands)

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Key words: Energy absorber, Insensitive Metamaterial, Closed ring resonator, Metamaterial absorber

Domain: Communication

Summary: Microwave absorbers offer a significant role in many applications like Electromagnetic Interference (EMI) suppression, Radar Cross Section (RCS) reduction in stealth technology and antenna applications. A circular-rings based metamaterial enabled electromagnetic absorber is developed, which consists of ten different concentric circular rings along with one circularly slotted square patch printed on a single dielectric substrate, finished with Perfect Electric Conductor (PEC) on the other side.

A simple classic circular ring resonator is used in a particular fashion to achieve controlling over the frequencies as well as absorptivity response. The top circular-rings-based architecture are used and optimized to achieve the desired Undecaband absorptivity response over X, Ku- and Ka-bands of the microwave regime. This design is useful in many applications from X- to K- band where the microwave absorber is needed



Image: (a) Fabricated prototype and (b) Experimental setup

Advantages:

- » It generates perfect metamaterial absorption over eleven consecutive frequencies from 9 to 20 GHz (except 17 GHz).
- » The developed structure is compact with a periodicity $\lambda_0/2.32$ and a thickness of $\lambda_0/16.74$, where λ_0 is the free-space wavelength at the lowest resonant frequency.
- » It shows oblique angle stability up to 45° in TE mode and 60° in TM mode.
- » It also shows nearly a 20 dBsm RCS reduction at normal incidence and 10 dBsm up to 60° oblique incidence.

Applications: RCS reduction of the antennas for Radar stealth applications, RF energy harvesting, Mutual coupling reduction between the antennas, EMI suppression, and sensing applications

Scale of Development: Functional Prototype is fabricated and extensively tested in Laboratory environment

Technology Readiness Level: 4

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