

Title: Tunable asymmetric square split ring resonator based triple band metamaterial absorber for wireless communication system

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Abstract: This article presents a triple band square split ring with double circular split ring resonator incident angle-insensitive perfect metamaterial absorber. The MMA unit cell was manufactured using a FR4 substrate that had dimensions of 8 mm by 8 mm. With the flexibility of on-design adjusting of the highest absorption frequencies, the suggested MA displays peak absorption of 99.67 %, 99.85 %, and 99.97 % at 2.52 GHz, 6.99 GHz, and 9.28 GHz, correspondingly. The tuning metallic two circular split rings and square split ring resonator provide the possibility of frequency modification throughout three distinct frequency ranges: the first frequency range extends from 2.45 GHz to 2.53 GHz, the second frequency range extends from 6.91 GHz to 7 GHz, and the third frequency range extends from 8.85 GHz to 10.32 GHz. Furthermore, the suggested MA displays near-zero absorption at an oblique incidence angle of up to 45° for both the TE as well as TM modes. The unit cell demonstrates single negative properties, such as an effective medium ratio (EMR) of 14.88 and a quality factor (Q factor) that is more than 30 for both the TM mode as well as the TE mode. An equivalent circuit successfully demonstrated its performance capability, which indicated that it would create an MMA of good quality when using ADS software. A comparison between the measured results of the suggested MMA and the simulated one reveals that there is a significant amount of a similarity between both of them. Because of its easy design within small dimension, wide angular stability, strong absorption, good EMR, and flexibility to frequency tuning is suitable for a wide range of wireless communication system, especially satellite applications like electromagnetic interference reduction, radar systems, imaging, and stealth technology.

Keywords: Metamaterial Absorber (MMA) Triple-Band Absorption Split Ring Resonator (SRR) Frequency Tunability Angle-Insensitive Absorption

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