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DESIGN OF MINIATURIZED ANTENNA FOR IOT APPLICATIONS USING METAMATERIAL

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Abstract

Author keywords

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Abstract

With the accelerated development of wireless technology, miniaturized antennae have become outstandingly favored due to the growing demand of Internet of Things (IoT) devices that are essential to accommodate low power, high data rates, and long-range communication. When an antenna operates at lower frequencies, the size of the antenna becomes bulky, which has raised an issue in the integration of the antennae within IoT devices due to their size constraints. Hence, in this paper, a miniaturized ring-monopole antenna incorporated with Rectangular Complementary Split Ring Resonator (RCSRR) and slotted ground plane, was designed at 2.4 GHz and 5.8 GHz frequency bands.

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The antenna was miniaturized by 46.8 % with overall size of 30 mm x 24.8 mm x 1.6 mm, and it was printed on FR-4 substrate with dielectric constant of 4.3. Design optimization was carried out by modifying the antenna structure, optimizing the dimensions, and using a low loss Rogers RT5880 substrate with a dielectric constant of 2.2, and thickness of 1.575 mm. The width of the antenna was also reduced to 20 mm which furthered the size reduction to 57.8 %. From the simulation results, the antenna was operated at 2.448 GHz, 2.864 GHz, and 5.8 GHz frequency bands with good return loss at -13.872 dB, -33.491 dB, and -19.3 dB respectively. The antenna fabrication and measurement were also implemented to the best simulated design using different substrates to validate its performance by comparing the simulated results with the measured results. © 2023,IIUM Engineering Journal. All Rights Reserved.

Author keywords

complementary split ring resonator (CSSR); IoT application; metamaterial; miniaturized antenna

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