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Offset-fed Complementary Split Ring Resonators loaded monopole antenna for multiband operations

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Abstract

A miniaturized multiband monopole antenna based on rectangular-shaped Complementary Split Ring Resonators (CSRRs) with offset-fed microstrip line is proposed for Global System for Mobile Communication (GSM) and Wireless Local Area Network (WLAN) applications. The proposed antenna is fabricated on a FR-4 substrate having a dielectric constant (ϵ_r) of 4.4 within a small size of $19.18 \times 22.64 \times 1.6$ mm³. CSRRs in the monopole antenna create a multiband characteristics and bandwidth improvement, which is analyzed by use of the precise quasi-static design equations and electromagnetic simulation software (HFSS version 13). By selecting a proper offset-fed microstrip line, it is capable to achieve 50Ω characteristic impedance and good impedance matching. The parameter extraction procedure of the metamaterial property of the CSRRs is enlightened in detail, by which the negative permittivity existence and the new resonance frequencies are verified. Simulated and measured result coincides with each other. The measured H-Plane (azimuthal plane) exhibits omnidirectional radiation pattern and E-plane (elevation plane) shows a dipole like bidirectional radiation pattern. The proposed antenna has adequate advantages, including simple design, small size, lower return loss and capable of multiband operations.

Key words

CSRRs, GSM, Multiband, Negative Permittivity, Offset-fed, WLAN.

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