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**Design of Dual Band Microstrip Patch Antenna using Metamaterial** (Conference Paper)

Islam, M.R. Adel, A.A.A. Mimi, A.W.N. Yasmin, M.S. Norun, F.A.M.

Department of Electrical and Computer Engineering, Faculty of Engineering International, Islamic University Malaysia, Jalan Gombak, Kuala Lumpur, Malaysia

## Abstract

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Metamaterial has received great attention due to their novel electromagnetic properties. It consists of artificial metallic structures with negative permittivity ( $\epsilon$ ) and permeability ( $\mu$ ). The average cell size of metamaterial must be less than a quarter of wavelength, hence, size reduction for the metamaterial antenna is possible. In addition, metamaterial can be used to enhance the low gain and efficiency in conventional patch antenna, which is important in wireless communication. In this paper, dual band microstrip patch antenna design using metamaterial for mobile GSM and WiMax application is introduced. The antenna structure consists of microstrip feed line connected to a rectangular patch. An array of five split ring resonators (SRRs) unit cells is inserted under the patch. The presented antenna resonates at 1.8 GHz for mobile GSM and 2.4 GHz for WIMAX applications. The return loss in the FR4 antenna at 1.8 GHz is -22.5 dB. Using metamaterial the return loss has improved to -25 dB at 2.4 GHz and -23.5 dB at 1.8 GHz. A conventional microstrip patch antenna using pair of slots is also designed which resonates at 1.8 GHz and 2.4 GHz. The return loss at 1.8 GHz and 2.4 GHz were -12.1 dB and -21.8 dB respectively. The metamaterial antenna achieved results with major size reduction of 45%, better bandwidth and better returns loss if it is compared to the pair of slots antenna. The software used to design, simulate and optimize is CST microwave studio. © Published under licence by IOP

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