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Hexagonal ring fractal antenna with dumb bell shaped defected ground structure for multiband wireless applications

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ABSTRACT

A compact hexagonal nested loop antenna with hexagon dumb bell shaped defected ground structure is proposed for quad band wireless application. Effects of fractal iterations and position of dumbbell defect on ground plane are optimized for wideband characteristics and better performance of the antenna. An equivalent circuit of the proposed antenna and defected ground structure (DGS) is modeled and the same is verified using ADS. Reflection coefficient and radiation properties further confirm the performance of the proposed design for wireless applications. The proposed design is fabricated on FR4 substrate with an overall dimension of $40 \times 32 \times 1.6 \text{mm}^3$. Simulated results are validated by proper measurement and are in good agreement with experimental results.

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1. Introduction

Recent advancement in wireless applications demand antenna to integrate multiple wireless standards in compact design space with wideband characteristics to support recent deployment of high data rate Long-Term Evolution (LTE) applications for next generation smart phones [1]. Numerous compact and multiband techniques have been proposed for WLAN/WiMAX application using CPW feed monopole [2-3], self similar ring radiators [4], and monopole with defected ground plane [5-7]. To further reduce the volume devoted to antenna element various ground plane radiation modes are excited for multiband applications [8]. However, fractals with self similarity and self affinity in their structure can offer size miniaturization with multiband characteristics [9] and proves to be a better candidate for compact multiband antenna. Various planar curve fractals for multiband using Koch,

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