



Microstrip rectangular patch antenna with comb shape slot

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ABSTRACT

In this paper fractal geometry in comb shape is placed with a rectangular slit and circular slot. A DGS structure is applied on the ground which gives the result as improved performance. The radiating patch is designed on FR-4 substrate for 2.4 GHz frequency which is used for mobile and Wi-Fi application. Simulations are done on HFSS software. Return loss is achieved for comb shape antenna is 21.31 dB at 2.4 GHz frequency and 30.76 dB at 4.4 GHz frequency. After applying DGS technique return loss is achieved as 37.28 dB at 2.4 GHz frequency and 33.87 dB at 4.4 GHz frequency.

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1. Introduction

The enlargement of technology in wireless communication system requires the growth of miniature devices which can easily moveable and handle manually. For any wireless device antenna is main component and these devices used microstrip patch antenna preordained for its many advantages i.e. small size, low weight, low cost and it can easily designed for multiband performance [1–3]. With all these rewards there are some drawbacks also present in patch antenna designs which are the measure issue to overcome for supporting the new technology i.e. narrow bandwidth and less gain. A lot of hard work has been done to attain high performance of antenna to conquer these issues in the form of techniques as PIFA (planner inverted F antenna) structure, DGS (defected ground structure), using a dielectric substrate of high permittivity [1] or DMS (defected microstrip structure) [2]. DGS (defected ground structure) is a structure that is removed from the ground in periodic or non-periodic form. DGS is easy to implement and not require any other large area even it is helpful to reduce the size of microstrip patch antenna. These characteristics allow such structure to obtain high significance in antenna design. DGS is used to design microstrip patch antenna for different application i.e. for instance, cross polarization, mutual coupling

reduction in antenna arrays and harmonic suppression. The work methodology of DGS is when it applies in a microstrip patch antenna's ground it disturbs the effect of current distribution in transmission line characteristics i.e. line inductance and line capacitance. Additionally, introducing DGS technique in microstrip patch can increase the effect of capacitance and inductance which persuade the input impedance and current flow of the antenna and thus reducing its size with respect to a given resonance frequency [4–8].

This paper presents a rectangular microstrip patch with a comb shape slot design and a rectangular slit and circular slot, a DGS structure in form of rectangle is introduced on its ground. Simulation is done with the commercial electromagnetic simulation tool, the FEM based software, HFSS by ANSOFT [9,10]. Section 2 describes the antenna design and analysis for microstrip patch antenna. Simulations and results of antenna are projected in Section 3. Conclusion is followed by the Section 4.

2. Antenna design and analysis

The proposed antenna construction is given away in Fig. 1. The rectangular microstrip patch of measurement $W \times L$ in print on the grounded substrate, which contain a relative permittivity ϵ_r and also consistent by width h , the dielectric material, is theoretically nonmagnetic by means of permeability μ_0 . The measurement of

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