ABSTRACT

Currently, researchers have given much importance for designing a compact, multiband, and low cost microstrip antenna to meet the miniaturization requirements of portable/handheld communication equipment. The commonly used antennas are microstrip, slot and coplanar waveguide antennas. Antennas capable of operating at dual band, multiband, cost effective, and good bandwidth are needed for upcoming wireless standards. The physical size, weight and multiband are the major issues in wireless application. This initiated antenna researchers, to develop an assortment of antennas to fulfill the requirements. The inherent feature of patch antenna is to resonate for single narrowband. An antenna competent of screening assortment of frequency bands is desirable for present wireless applications. Fractal geometry is a solution which can solve the needs of wireless applications. Fractal geometry is a concept in mathematics through which miniaturization, multiband characteristics, and bandwidth are achieved to complete a range of wireless applications with improved return loss. Therefore, miniaturization has become the most important objective of a Radio Frequency (RF) designer. It offers mobility and affordability in wireless/mobile devices.

Wireless Local Area Network (WLAN), and Worldwide Interoperability for Microwave Access (WiMAX) are a few mounting

wireless standards in the midst of wireless technologies. The technology supports high speed data rates, wide band applications with wide coverage area, and mobility in cell site. The contact of self-affine fractal antenna is proposed for improving the inherent narrow operating bandwidth of microstrip antenna. To lay bare, a standard for a better coverage area, and mobility, WLAN Multiple –Input-Multiple- Output (MIMO) is chosen. These MIMO technologies can be integrated in WiMAX standard also. Simulation treatment for self-affine fractal geometry for WLAN MIMO antenna is well thought-out. In simulation, it is found that these antennas have dual band of operation, and rejects frequency bands at other spectrums. The contact of self-affine fractal antenna is proposed. While fractal geometry with single layer is presented through coaxial feed technique, cost and complexity involved in fabrication of the primitive antennas are eliminated in the proposed structure.

In open literature, substrate chosen for realizing the structures of antennas is readily available and they are cost effective. The simulated self-affine fractal cantor antenna has been fabricated on a FR4 substrate with thickness of 1.6 mm, relative dielectric constant = 4.4, tan δ = 0.02, and the optimized antenna size is 38.734 mm × 28.757 mm × 1.6 mm . The gain of antenna is 1.97 dBi with directional pattern.

This dissertation addresses a few novel self-similar fractal antennas. These self-similar fractal antennas are compact. The fractal antennas resonate for single, dual, and multiband wireless applications. For future mobile communication systems, these fractal antennas unearth a position as it provides better bandwidth, and return loss. The module slots in iterative function system formulation includes the mode of exclusion of initial geometry, design method and development of fractal cantor antennas. The testing of these antennas for multiband has been reported.

Owing to the purging of metal area, the effect of various feed locations is studied. The purging of metal area depends on iterative coefficient of fractal geometry. Due to the increase in electrical length, the current acquires a longest path to travel on the edges of the geometry. Finally, there is a progress in the performance of return loss. The outcome of these fractals has been studied. At design frequency, these antennas have a return loss of -18.68 dB at high mesh. The VSWR of antenna fractal antenna is 1.263. The VSWR is expressed in ratio as 1.263:1 and the reflection coefficient is 0.116.

The RF performances of proposed fractal antennas are evaluated by fabricating the antennas, testing the archetype and measuring the near field of fractal antennas. Another measurement in fractal antennas involves the measurement of network parameters. These network parameters are achieved through network analyzer. The proposed fractal geometries lead to miniaturization in size with multiband and good return loss. The cantors exhibits a resonance of multiband, and wideband for desired radiation. These antennas are better for WLAN applications when compared to the conventional one.

The demands for multiband antennas covering multistandard wireless systems pave way for a bright future of next generation. In this dissertation, a compact multiband fractal antenna on a lossy substrate has been designed. It aids to improve the performance of wireless systems. When compared with other costlier substrates, the proposed novel concepts are flexible in controlling the multiband operation. This work covers a group of wireless applications such as Wireless Local Area Network (WLAN), WLAN IEEE802.11b, WLAN IEEE802.15, Universal Mobile Telecommunication System (UMTS), Digital Personal Communication System (DCS 1800), International Mobile Telecommunications (IMT2000), and Digital Audio Radio Service (DARS).

The optimized structure measures 40 mm × 30 mm × 1.6 mm in thickness. At design frequency, these antennas have a return loss of -13.92 dB at high mesh. The VSWR of antenna fractal antenna is 1.5. The VSWR is expressed in the ratio of 1.5:1. The novel antenna has a gain of 4.46 dBi with directional radiation pattern. The significance of dielectric substrates is studied to assess the performance of the antenna on dissimilar dielectric materials. Simulation treatment for monopole fractal antenna has also been applied for the novel structure.

Practically, design of antenna is followed by tuning the length and width of the patch to a small change in the original value. The antenna resonates to the near by design frequency with better return loss which is well known to RF designer. The accuracy provided during fabrication of the structure determines the overall accuracy of the return loss exhibited by the antenna. In outline, this thesis presents a range of design, simulation, fabrication and testing of fractal antennas for next generation wireless applications.