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ACS-Fed Wideband Mirrored Z- and L-Shaped Triple Band Uniplanar Antenna for WLAN Applications

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Abstract—A mirrored Z- and L-shaped printed uniplanar antenna has been proposed and developed in this paper for triple band applications. The developed geometry realizes simple radiating branches with 50 Ω Asymmetric Coplanar Strip (ACS) feedline and rectangular ground plane. It occupies a very compact area of 16×24 mm including the ground plane, the size of which is only 0.18×0.34λ at the frequency of 2.3 GHz in free space. The simulated results obtained in the environment of CST Microwave Studio package have been compared with the measured results of antenna using the PNA N5222A Vector Network Analyzer, and a good agreement of results has been achieved. For –10 dB reflection coefficient the bandwidth is about 230 MHz in the band of 2.27–2.5 GHz, 200 MHz in the band of 3.65–3.85, and 1700 MHz in the band 5.2–6.9 GHz. The proposed uniplanar antenna is not only compact in size, but also has wide bandwidths that cover the Long Term Evolution (LTE), Wireless Broadband (WiBro), Worldwide Interoperability for Microwave Access (WiMAX), Wireless Local Area Network (WLAN) and Industrial Scientific and Medical radio band (ISM) applications.

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1. INTRODUCTION

The present trend in wireless communication technology grabs attention towards utilization of a single system for multiple applications. It is especially relevant in the RF/microwave domain, where the designing and development of antenna that supports multiple frequency operation along with small size, wide bandwidth, high gain and RF energy harvesting features will play an important role in the current and future generation technological advancements.

For providing these specifications, various antenna designs using different feeding methods were reported [1–24]. Out of these, an ACS-fed antenna (Asymmetric Coplanar Strip) is the most attractive, and it provides the best imperative method that is capable to shrink the size of printed uniplanar antenna by approximately 45% [1, 2]. Furthermore, the multiband performance was obtained in the form of triple [3] and quad [4] resonating frequencies with engraving of different cut slots.

Different ACS-fed antenna procedures have been proposed to accomplish the multiband response, such as F-shaped [5], meander line [6], rectangular SRRs [7], open ended slot [8], 7-shaped [9] and rectangular ring shaped [12] designed modules for GPS/WLAN/WiMAX applications. By insertion of C-shaped slot [10], the proposed coplanar antenna is excited at three independent resonances with the coverage of 31×15×1 mm area in all dimensions. The previously mentioned ACS-fed antennas require an extensive space or have complex structures, so F- and C-shaped antennas [11–13] are projected to support ease in structure with the substrate height of 1.6 mm.

Moreover, ACS-fed geometries complement DCS and wideband systems [14, 15] and also contribute to the compactness of novel design with wider impedance bandwidths.

Various CPW-fed antenna designs were also reported [16–24], such as T-shaped slot [16], dipole [17], radiating strips with capacitive coupling [18], T-shaped monopole with a trapeze form ground plane [19], ring monopole antenna with double meander lines [20], Omega microstrip line with a trapezoidal ground plane [21], circular slot [22], Koch snowflake fractal monopole [23], and U-shaped open stub [24] (Table 1).

COMPETING INTERESTS

None of the authors have any competing interests in the manuscript.

ADDITIONAL INFORMATION

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