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Research Article

Coplanar Waveguide Fed Compact Wide Circular-Slotted Antenna for Wi-Fi/WiMAX Applications

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A coplanar waveguide (CPW) fed printing and wide circular slotted, dual band antenna for Wi-Fi/WiMAX applications are presented. The antenna mainly encompasses a ground with a wide circular slot in the centre, a rectangular feeding strip, and two pairs of symmetric planar inverted *L* (SPIL) strips connecting with the slotted ground. The tuning effects of the rectangular patch, ground size, and SPIL strips to the resonance and matching condition are examined by HFSS and the prototype is fabricated and measured. The simulation and experimental results show that the antenna has an impedance bandwidth with −10 dB reflection coefficients 600 MHz (3.26–3.86 GHz, lower band) and 1040 MHz (5.02–6.26 GHz, upper band), which can cover both the Wi-Fi 5.2/5.5/5.8 GHz and WiMAX 3.3/3.5/3.7/5.8 GHz bands. Moreover, a stable omnidirectional radiation pattern and average peak gain for lower band 3.23 dB and upper band 5.93 dB have been achieved, respectively.

1. Introduction

Due to the snowballing demand for high speed internet access in the world where wireless local area networks (WLAN) cannot reach, Wireless Fidelity (Wi-Fi) and the worldwide interoperability for microwave access (WiMAX) technology have therefore been established as a substitute to provide better and long range wireless broadband services. By incorporating both these (Wi-Fi and WiMAX) technology, service providers can provide high speed internet. On the other hand, the present research activity of the multiple or broadband operation and miniaturized size for current antenna has become one of a highly competitive topic and is mounting superbly, because of rapid development of modern wireless communication system technique. Now the microstrip patch antennas have been one of the most popular antennas in modern wireless communication systems as they have several desirable attributes, such as a low-profile planar configuration, a light weight, a simple design principle, and a low fabrication cost [1–4]. Various antennas that integrate both Wi-Fi (2.4/5.2/5.5/5.8) and WiMAX (2.3/2.5/3.3/3.5/3.7/5.8) have been studied. Among them, planar slot antenna [5–15] and monopole antenna [16–21], in which the latter has been subject of many recent studies of wideband and multiband designs.

Microstrip-fed slot antenna [6] with dimension of 30 mm × 35 mm composed of a rectangular and a trapezoid slot was studied. To induce triple-resonant mode operation at 2.4, 3.5, and 5.5 GHz, a pair of symmetrical horizontal stripes was loaded into a rectangular slot antenna; however, this compact design was unable to cover the lower full WiMAX band. Therefore to cover fully the entire WLAN/WiMAX operating bands [7], a slot-ring antenna with a capacitive coupled patch that exhibited quadruple resonant modes was considered. To generate pentaresonant modes, a triangular split-ring resonator slot antenna [5] and a rectangular slot antenna that was loaded with two slits [8] have been developed. Integration of the lowest three resonant modes yields lower operating band, within the bands of interest with a wide 10 dB bandwidth of up to 75%, supporting WiMAX 2.3/2.5/3.5 GHz and WLAN 2.4 GHz operations. In addition to that, the corresponding upper operating band also exhibited a broad 10 dB bandwidth between 18 and 35%, suitable for WiMAX 5.7 GHz and WLAN 5.2/5.8 GHz applications. However, the