Multiband Antenna Simulation and Design

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ABSTRACT

This thesis presents the design of two printed dipole antennas. These two antennas were developed to produce multiple resonant bands so as to support multi-standard wireless-communication products, such as laptop computers, personal digital assistances (PDAs), and mobile wireless networking devices. These standards include GSM 900 MHz (Global System for Mobile Communications; 870-960 MHz), DCS 1800 MHz (Digital Communication System; 1710-1880 MHz), PHS 1900 MHz (Personal Handy-Phone System; 1890-1915 MHz), WCDMA 2100 MHz (Wideband Code-Division Multiple Access; 2100-2170 MHz), WiFi 2.4 GHz (Wireless Local-Area Network; 2400-2483 MHz; also called WLAN), and WiMAX 2.6 GHz (Worldwide Interoperability for Microwave Access; 2.5-2.7 GHz). Note that the antennas presented here were originally designed for FarEastone telecommunications company (FET), for which the required GSM and DCS bands are in the ranges of 870-890 MHz and 1800-1880 MHz, respectively. For these two standards, the designed antennas must cover these two frequency bands, instead of 870-960 MHz and 1710-1880 MHz. For cost saving, the antennas were printed on FR4 substrates with a thickness of 1 mm. Numerical simulation was carried out using Zeland ’ s IE3D, a full-wave electromagnetic simulator. Before antenna prototypes were constructed and measured, the structural parameters of the designed antennas were varied iteratively until antenna performances are close to the required specifications. The first antenna type is a co-directionally meandered dipole antenna, in which the structures in the two arms of the antenna are almost symmetric with respect to the feeding point. The second antenna type is a bi-directionally meandered dipole antenna, in which the structures in the two arms are nearly anti-symmetric with respect to the feeding point. It is observed that the bi-directionally meandered dipole antenna is slightly more compact than the co-directionally meandered one.

Keywords : printed dipole antenna、multi-standard、wireless networking devices、WiFi、WiMAX、FR-4、Zeeland ’ s IE3D full-wave electro

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