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A New Wideband Planar Antenna with Band-Notch Functionality at GPS, Bluetooth and WiFi Bands for Integration in Portable Wireless Systems

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Abstract — **Empirical results are presented for a novel miniature planar antenna that operates over a wide bandwidth (500 MHz - 3.05 GHz). The antenna consists of dual-square radiating patches separated by two narrow vertical stubs to reject interferences from GPS, Bluetooth and WiFi bands. Radiating patches and stubs are surrounded by a ground-plane conductor, and the antenna is fed through a common coplanar waveguide transmission line (CPW-TL). The two vertical stubs generate pass-band resonances enabling wideband operation across the following communications standards: cellular, APMS, JCDMA, GSM, DCS, PCS, KPCS, IMT-2000, WCDMA, UMTS and WiMAX. Embedded in the ground-plane conductor is an H-shaped dielectric slit, which has been rotated by 90 degrees, whose function is to reject interferences from GPS, Bluetooth and WiFi bands. Measurements results confirm the antenna exhibits notched characteristics at frequency bands of GPS (1574.4 MHz – 1576.4 MHz), Bluetooth (2402 MHz – 2480 MHz) and WiFi (2412 MHz – 2483.5 MHz). The impedance bandwidth of the antenna is 2.55 GHz for VSWR < 2, which corresponds to a fractional bandwidth of 143.66%. Measured results also confirm that the antenna radiates omnidirectionally in the E-plane with appreciable gain performance over its operating frequency range. The antenna has dimensions of 15×15×0.8 mm^3.**

Keywords — **Wideband antenna, notch bands, planar antennas, microstrip technology, GPS, Bluetooth, WiFi, portable wireless systems.**

I. INTRODUCTION

Recently, broadband technology has attracted great attention for wireless applications as it offers advantages of high speed data rate, low power consumption, high capacity, low cost, and low complexity [1]-[3]. Broadband systems necessitate the use of broadband antennas with desirable features including small physical size, ease of manufacture using conventional fabrication technologies, gain and omnidirectional radiation characteristics. Several broadband antenna designs have been recently developed [4]-[16]; such designs include planar monopole antennas that promise wideband performance for wireless communication systems. Wideband systems however will need to operate and coexist with narrowband communication systems such as Global Position System (GPS) (1574.4 MHz – 1576.4 MHz), Bluetooth (2402 MHz – 2480 MHz) and WiFi (2412 MHz – 2483.5 MHz). The abovementioned narrowband systems are a source of severe electromagnetic interference to the operation of wideband systems. It is therefore highly desirable to design the broadband antenna with integral band-notched functionality in order to mitigate any interference. Extensive investigations have been carried out to design wideband antennas with notch bands without using stop band filters [17]-[19]. Various techniques have been adopted to incorporate band-notched functionality