An Improved Design to Enhance Isolation and VSWR in 3*3 MIMO Antenna

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The isolation between antennas is a critical parameter in many practical applications such as antenna arrays, diversity antennas and also MIMO communication systems. Of these applications, MIMO systems have attracted significant attention as they have the potential to achieve significant increase in wireless channel capacity without the need for additional transmit power or spectrum. In addition, for application in portable devices very small form factors are an important requirement and therefore good isolation between antennas with closely packed antenna elements is necessary.

The purpose of this work is to develop design to enhance the isolation and VSWR between two closely packed antennas operating at two different frequency bands: (2.4 GHz- 2.5 GHz) and (5.725 GHz - 5.85 GHz). The idea is to use field cancellation to enhance isolation by putting a coupling element which artificially creates an additional coupling patch between the antenna elements. The complexity for RF circuits to feed the antenna elements when solid ground plane PCB is modified or removed limits their functionality, thus showing the demand for improving their characteristics. Specific characteristics that have been focused in this study are the suppression of harmonics, cross-polarization and excellent gain, isolation and VSWR over desired frequency bands of 3*3 MIMO due to asymmetrical DGS configuration with minimum aberration or distortion and maximum efficiency. The asymmetrical DGS is introduced to provide a band-stop effect by suppressing the ground current flowing between antenna elements.

This work presents a design of dual band 3*3 MIMO using asymmetrical DGS configuration to improve isolation and VSWR as shown in Fig. 1 for 2.4 GHz and 5.8 GHz respectively. The antenna elements are etched on a compact low-cost FR4 (ε_r =4.4, tan δ=0.02) PCB board. The VSWR characteristics for both the frequency band is < 2 throughout the range. Similarly, the isolation for both the frequency bands isolation is greater than 20dB. The dielectric constants, loss tangents, and thicknesses of the various materials to be used in the configuration construction of the work are designed to provide excellent transmission and reception efficiency over the frequency ranges desired. It produces an optimized performance design for WLAN application range with high gain and isolation and low VSWR. Such results can be proved by HFSS simulations.

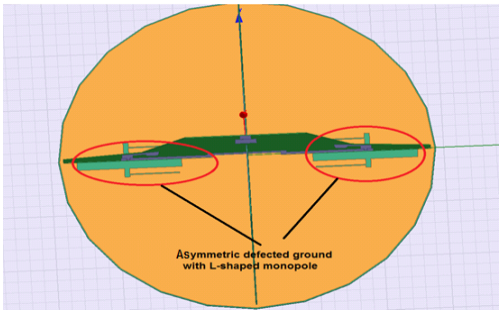

Figure 1. DGS introduced to improve isolation.