A Novel Dual-Polarised Microstrip Patches Antenna for Ultra-Wideband MIMO Application

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Summary: A closely-packed ultra-wideband (UWB) multiple input multiple-output (MIMO) antenna is proposed. The dimension is only 30 mm square (0.0476λ × 0.0476λ), which is suitable for size limited applications. The -10dB matching bandwidth reaches 3.5 GHz (4.62 GHz - 8.12GHz) at a center frequency of 6.3GHz. The mutual coupling between the adjacent elements throughout the band is lower than -18dB. The diversity Gain is above 8 dB and the Envelope correlation coefficient (ECC) is almost zero.

Introduction: UWB systems have been taking significant interests because of their very high data rates and low operating power level. The low power feature enables frequency reuse, since it does not cause significant interference in nearby devices. In fact, many papers have been published on designing high performance and cost effective UWB antennas. However, in order to further increase data throughput and exploits multipath fading, MIMO has been considered for UWB systems. Currently use portable devices require small weight, low volume antennas to suite the design, such as Microstrip patch antennas which are widely used because of these several attractive features as well as ease of fabrication, and comfortable to planar and non-planar surfaces [1]. The proposed design consists of 4 patches placed on back to back configuration, on multilayer configuration to improve the bandwidth and gain of the antenna, feeding through a proximity coupling with a feeding patch placed inside the substrate [1-3].

Antenna Design and Simulation Results: The proposed antenna is shown in Fig. 1. The four rectangular patches antenna placed into back to back structure with a proximity feeding, consists of a patch with feeding strips placed in the substrate. The dimensions of the antenna and the feeding structures are also shown in the Fig. 1. The return loss of the proposed antenna is shown in Fig. 2. It achieves 3.5GHz bandwidth at -10dB From 4.62 GHz to 8.12GHz at the center frequency 6.3 GHz. The mutual coupling, which is crucial in MIMO structures, is kept below -18 dB as shown in Fig. 3.

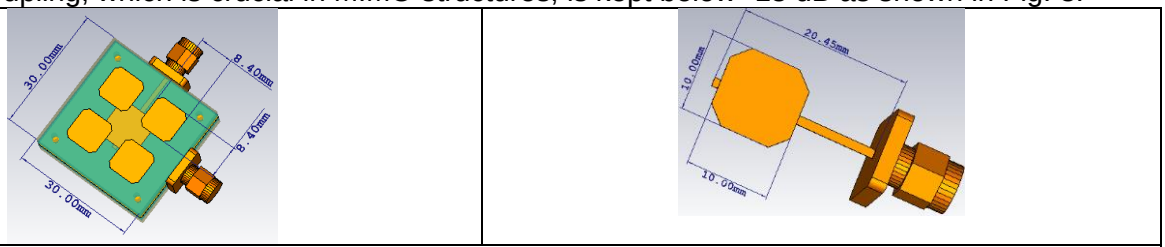

Figure 1. Antenna & the Feeding structures; Antenna patches (left), antenna feeding network (right)

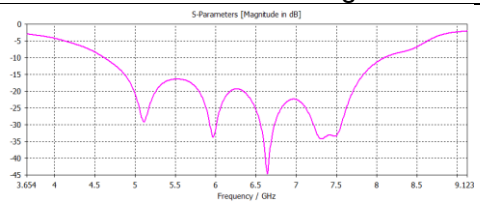

Figure 2. Return loss (S11)

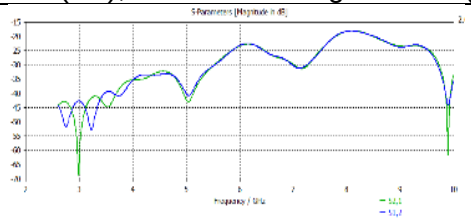

Figure 3. Mutual coupling

[1] Omer M. Arabi; Nazar Ali; Peter S. Excell; Abdul Muhsin AlTimimi; Raed A. Abd-Alhameed. "Multipolarized/Multi-Band orthogonal MIMO antenna for WiFi and WiMax applications", *2015 IEEE International Symposium on Antennas and Propagation & USNC/URSI National Radio Science Meeting*

[2] Chan H. See; N. T. Ali;Abd-Alhameed; Omer.M. Arabi, McEwan. "Compact MIMO/diversity antenna for portable and mobile UWB terminals", *2014 Asia-Pacific Microwave Conference*

[3] Le Kang, Hui Li, Xinhuai Wang, and Xiaowei Shi, "Compact Offset Microstrip-Fed MIMO Antenna for Band-Notched UWB Applications". *IEEE ANTENNAS AND WIRELESS PROPAGATION LETTERS, VOL. 14, 2015*