A Dual-Polarized Triple-Band MIMO Antenna for WLAN/WiMAX Applications

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***Abstract*—A dual-polarized triple-band multiple input multiple output (MIMO) antenna is proposed for WLAN/WiMAX access points. The dual-polarized antenna consists of two identical crossed triple-band dipoles each of which is printed on each side of a square substrate, forming a planar compact dual-polarized configuration. Measured results show that the dual-polarized triple-band antenna covers the WLAN 2.4-GHz band, WiMAX 3.5-GHz band, and WLAN 5-GHz bands with return loss>10 dB and isolation>20 dB. An 8-port MIMO antenna is developed.**

I. INTRODUCTION

As industry and consumers move towards all wireless for high throughput network access, the "Last mile" access points (AP) need high-performance multiple input multiple output (MIMO) antennas. The latest 802.11ac protocol supports up to 8 antenna units for both side of data transmission, and it is a huge challenge to fit all these antennas into a compact space with low correlation. Besides, WiMAX is widely deployed in many countries to provide longer range broadband network access. Several multi-band antennas for APs have been investigated [1]–[3], but both the bandwidth and the number of antenna unis can no longer meet the requirements for the new standards. On the other hand, different dual-polarized antennas have been developed for base stations [4]–[6]. However, these dual-polarized antennas have a single bandwidth.

In this paper, we propose a triple-band dual-polarized MIMO antenna for WLAN/WiMAX applications. It will be demonstrated that the WLAN 2.4-GHz band, WiMAX 3.5-GHz band and WLAN 5-GHz band are well covered with return loss > 10 dB. Low coupling between the antenna elements, high gain and unidirectional radiation patterns are obtained for all the frequency bands.

II. DUAL-POLARIZED TRIPLE-BAND ANTENNA

The configuration of the dual-polarized triple-band antenna is illustrated in Fig. 1. The antenna consists of two identical crossed triple-band dipoles. Each triple-band dipole is composed of a pair of small isosceles trapezoid patches operating for 5-GHz band, a pair of T-shaped branches for 3.5-GHz band, and a pair of arc branches for 2.4-GHz band. Each dipole is printed on one side of a square substrate surface and excited by a T-shaped microstrip stub which is printed on the other side and fed by a coaxial line, leading to a single layer planar antenna with simple feeding network. The dual-polarized triple-band antenna is placed above a circular metal

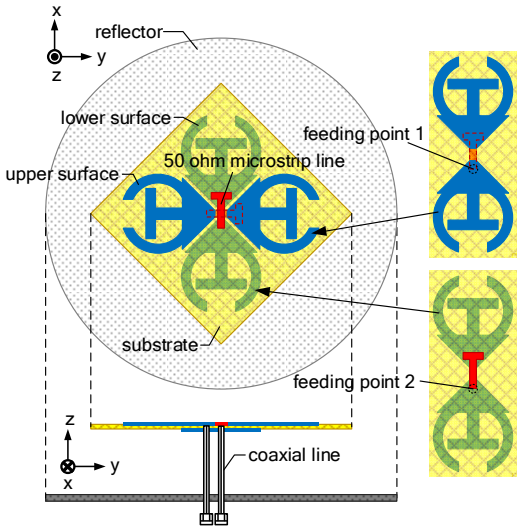

Fig. 1. Configuration of the dual-polarized antenna.

Fig. 2. A prototype of the dual-polarized antenna.

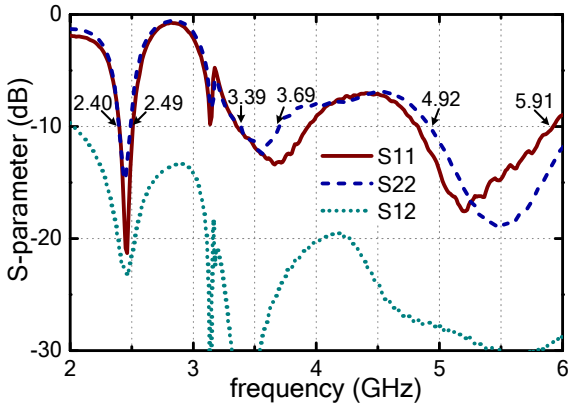

Fig. 3. Measured S-parameters of the dual-polarized antenna.

reflector for a unidirectional radiation pattern. A prototype is demonstrated in Fig. 2. Results show that the 10-dB return loss of the proposed antenna covers the triple bands of 2.4 – 2.49 GHz, 3.4 – 3.7 GHz and 5 – 5.9 GHz. The isolation between the two ports is higher than 20 dB for all bands, as plotted in Fig. 3.

III. Triple-Band MIMO Antenna

A triple-band 8-port MIMO antenna has been developed and fabricated, as shown in Fig. 4. The Antenna consists of 4 dual-polarized antennas which are described in Section II. The measured S-parameters of the MIMO antenna are plotted in Fig. 5. It is observed that the MIMO antenna covers the 2.4-GHz, 3.5-GHz and 5-GHz bands for WLAN/WiMAX applications. The return loss is better than 10 dB and isolation is higher than 15 dB. The radiation patterns of the MIMO antenna are displayed in Fig. 6, which shows unidirectionality in all frequency bands.

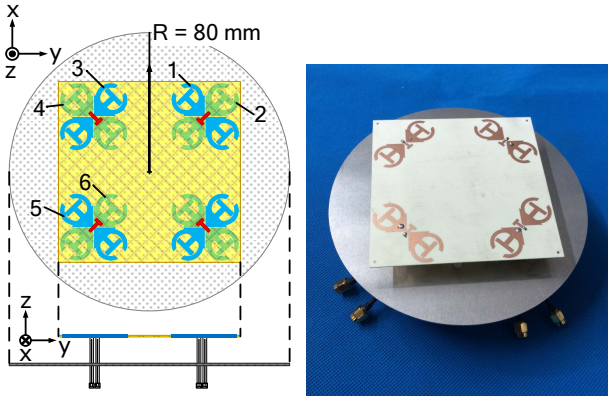

Fig. 4 Configuration and prototype of the 8-port MIMO antenna.

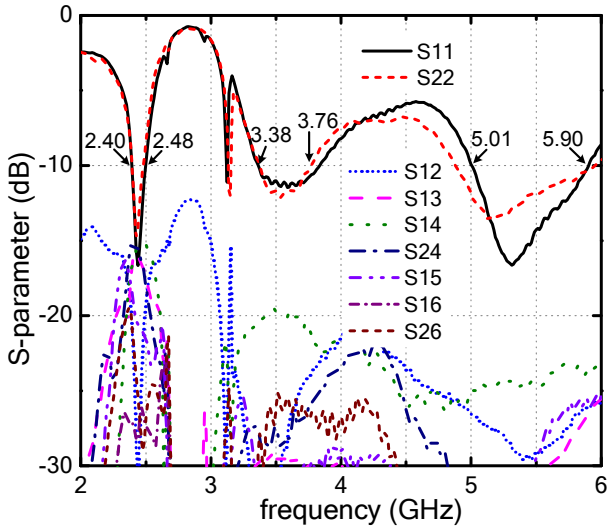

Fig. 5. Measured S-parameters of the 8-port MIMO antenna.

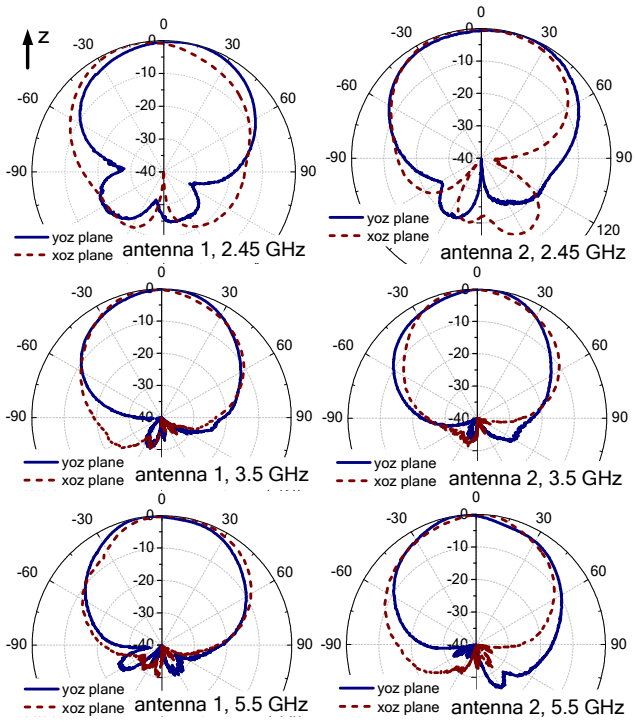

Fig.6. Measured radiation patterns of the 8-port MIMO antenna.

IV. Conclusion

In this paper, a simple planar dual-polarized triple-band antenna is proposed. An 8-port MIMO antenna is developed. The proposed antenna has a unidirectional radiation pattern in 2.4-GHz, 3.5-GHz, and 5-GHz bands, which may find application for high-speed WLAN/WiMAX applications.

Acknowledgement

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