

Experimental Investigation of MIMO Performance Using Dual-antenna System in Multipath Environment

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1 Introduction

It was demonstrated that a reflectarray is capable of improving the propagation channel in urban area [1], but it is difficult to design a reflectarray for broad angle scattering. A dual-antenna system (DAS) was designed for broad angle scattering [2]. In this research, we fabricated a quasi-planar DAS which consists of a patch array and a planar Yagi-Uda antenna and investigated experimentally the MIMO performance in a multipath environment.

2 Geometry of the quasi-planar DAS

Fig. 1 shows the geometry of the quasi-planar DAS consisting of a 4-element folded-patch antenna (FPA), a planar Yagi-Uda antenna and a power combiner. Two features of the quasi-planar DAS as a passive RF booster are polarization transition and broad-angle scattering.

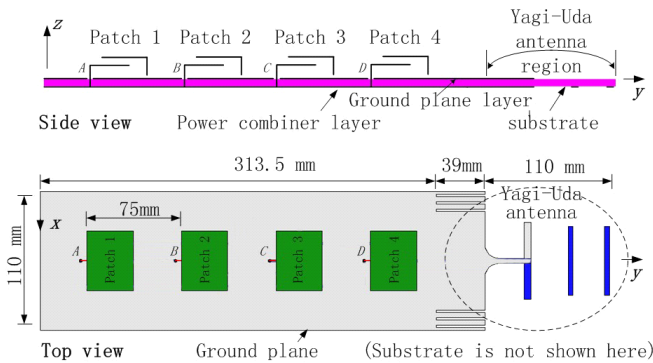


Fig. 1 Geometry of quasi-planar DAS.

3 Experimental results

In the experiment, an indoor 2×2 MIMO system shown in Fig. 2 was used to demonstrate the effectiveness of the 4-unit quasi-planar DAS for improving the propagation channel for MIMO communications where half-wavelength dipole antennas are used for transmitting and receiving antennas. The cumulative distribution function (CDF) of the received power and the

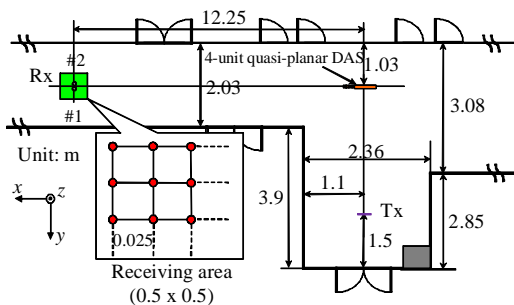


Fig. 2 Geometry of MIMO measurement system.

MIMO channel capacity with or without 4-unit quasi-planar DAS is shown in Fig. 3 and 4, respectively. It is found that the received power and the MIMO channel capacity are improved clearly by using 4-unit quasi-planar DAS.

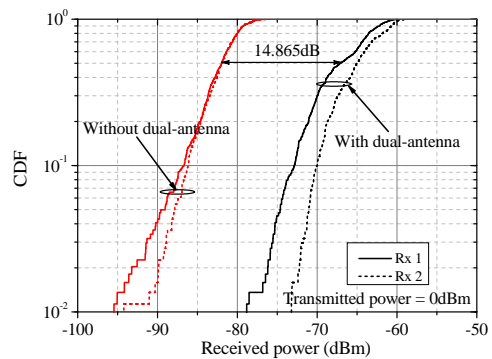


Fig. 3 The CDF of the received power with 4-unit quasi-planar DAS and without 4-unit quasi-planar DAS.

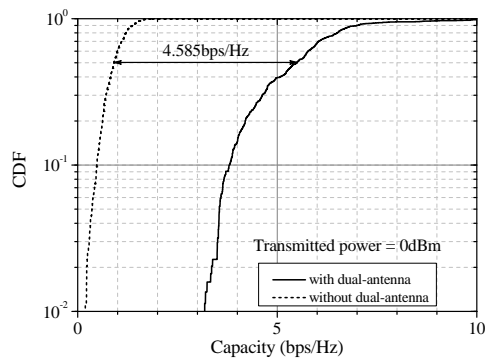


Fig. 4 The CDF of MIMO channel capacity with 4-unit quasi-planar DAS and without 4-unit quasi-planar DAS.

4 Conclusions

The 4-unit quasi-planar DAS was investigated experimentally in this report. It has been found that the received power and the MIMO channel capacity can be improved clearly by using 4-unit quasi-planar DAS.

Acknowledgment

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References

- [1] L. Li et al., *IEEE Antennas Wireless Propagat. Lett.*, pp. 881-885, Aug. 2009.
- [2] Q. Chen et al., *IEICE Electro. Express*, vol. 7, no. 9, pp. 647-651, May 2010.