2A08

Evaluation of Receiving Performance of Modulated Scattering Antenna Array

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1. Introduction

The concept of modulated scattering antenna array (MSAA) has been proposed and its performance in receiving antenna array for the mobile handset has been evaluated [1]. The previous researches have shown that the diversity performance of the MSAA can be improved by decreasing antenna array spacing [2]. However, the effect of the distance between the transmitting and receiving antenna on receiving power of the MSAA has not been investigated. In this report, we studied experimentally the relationship between the receiving performance of MSAA and the distance of antennas

2. Configuration of MSAA

The geometry of a 2-element MSAA is shown in Fig.1. the MSAA is composed of two quarter-wavelength monopole antenna with 0.1 λ array spacing. In Fig.1, one is the receiving antenna connected to receiver circuit, the other is the modulated scattering element (MSE). A schottky diode is mounted between the MSE and the ground plane, and it is used as the nonlinear impedance for modulation.

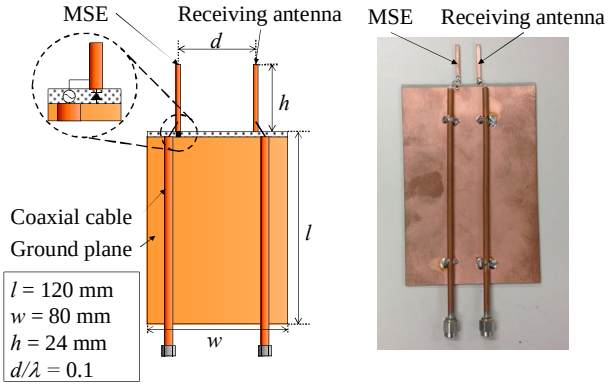
3. Measurement System and Result

Fig. 2 shows measurement system. The measurement was performed in a line-of-sight (LOS) actual indoor environment. In Fig. 2, D indicates the distance between transmitting and receiving antenna array. We changed the distance D every 0.03125 m from 0.3125 to 3.125 m, and measured receiving power at each distance. The transmitting antenna is a log-period dipole array (LPDA), and the receiving antenna is the 2-element MSAA. The RF signal which was applied to the LPDA, is 2.4 GHz CW signal, and 10 MHz LO signal was applied to the MSE, i.e., the signals at f_{RF} = 2.4 GHz and f_{IF} = 2.41 GHz were observed.

The receiving power of RF signal P_{RF} (i) and IF signal P_{IF} (ii) versus D are shown in Fig. 3, and the ratio of P_{IF} to P_{RF} (iii) is also shown in the same figure. From this result, we found that the receiving power of both P_{RF} and P_{IF} is improved as the distance D is shortened. And we also found that the ratio of P_{IF} to P_{RF} is about 30 dB and is almost independent of the distance D.

4. Conclusion

The receiving performance of the MSAA has been evaluated in this report. From experimental result, we found that the ratio of P_{IF} to P_{RF} is almost independent of the distance between the transmitting and receiving antenna.



(a) Geometry of MSAA (b) Prototype of MSAA

Fig. 1. 2-element MSAA.

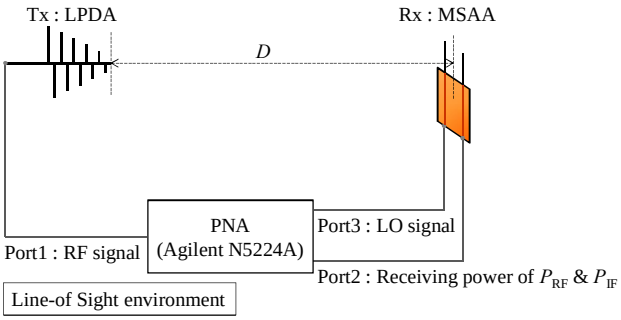


Fig. 2. Measurement condition.

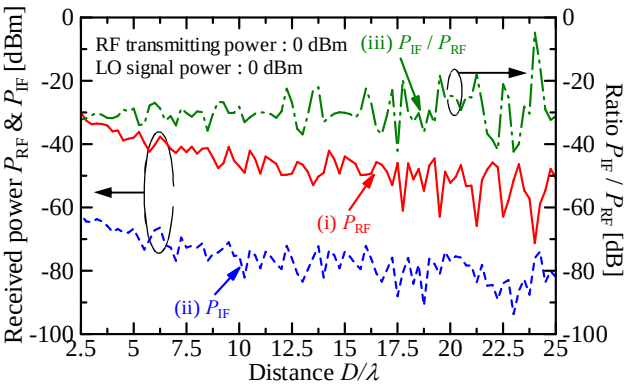


Fig. 3. Result of received power versus antenna distance.

References

[1] Q. Yuan et al., *IEICE Electro. Express*, vol. 2, no. 20, pp. 519-522, October, 2005.
[2] Q. Chen et al., *IEICE Electro. Express*, vol.4, no.7, pp. 216-220, April, 2007.