

Configuration of Indoor Wireless LAN Base Station Taking Delay Profile into Account for SDMA System

Sokthai Chan, Mitoshi Fujimoto, and Toshikazu Hori
 Department of Engineering, University of Fukui

1. Introduction

The application of the Space Division Multiple Access (SDMA) to indoor wireless LANs has been proposed; however, it is difficult to separate signals correspond to individual mobile terminals using directional beam of Base Station (BS) when the mobile terminals approach each other. This paper proposes a novel configuration for a BS in SDMA system in order to address the above problem. Also the suitable location of BS antennas is considered by evaluating Cumulative Probability (CP) of SINR.

2. Simulation Model

The proposed configuration of BS is illustrated in Fig.1. We suppose that carrier frequency is 5.2 GHz, modulation scheme is QPSK-OFDM, sub-carrier interval is 312.5 kHz, number of sub-carriers is 64 and Guard Interval (GI) is 1/8 of effective symbol. The number of antenna elements is 4 and array layout is square arrangement. GI of OFDM signal is utilized as the reference signal of MMSE adaptive array [1] and Recursive Least Squares (RLS) algorithm is adopted to optimize the weight coefficients. Simulation based on Ray Launching Method (RLM) is carried out as a propagation analysis. Regarding all combinations of the locations of desired terminal and Interference terminal in the room, we calculate their SINR and evaluate the effectiveness of the system by value of 1% of CP[2][3].

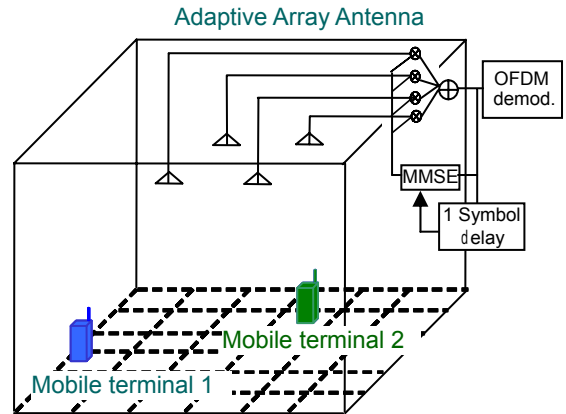


Fig.1 Concept of BS Antennas Configuration.

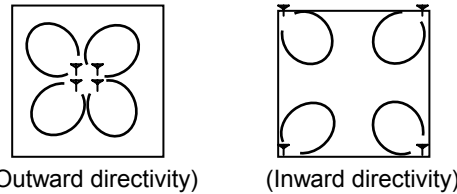


Fig.2 Outward & Inward Element Patterns of BS.

3. Suitable Configuration of BS

Two kinds of element patterns, as shown in Fig. 2, with 2 cases of Half Power Beam Width (HPBW) of 90 and 120 degrees are used in the simulation. In this case, the delay profiles of received signals at BS are considered by their delay time. Figure 3 is the result in case of both outward and inward element pattern. It can be found that the inward element pattern shows excellent SINR value so that it is the suitable arrangement for BS. Furthermore, we evaluate the effect of transmission rate by changing the sub-carrier interval of OFDM signal. Through their results, as illustrated in fig.4, it is clarified that CP 1% of SINR decreases with wider sub-carrier interval that is to say with higher transmission rate. Moreover, it seems to be said that the narrow element spacing is the suitable arrangement of BS in case of higher transmission rate.

4. Conclusion

We had studied the suitable configuration of indoor Wireless LAN base station for SDMA system. As the results, it was clarified that the inward element pattern of BS is the suitable.

References

- [1] S. Hori, et.al., IEICE Trans. Commun., Vol.J85-B, No.9, pp.1608-1615, Sept. 2002.
- [2] S. Chan, et.al., IEICE Tech. Report, AP2004-159, Oct. 2004.
- [3] S. Chan, et.al., IEICE General Conf., B-1-266, March, 2005.

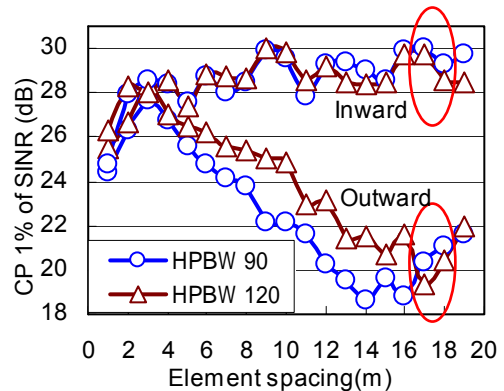


Fig.3 Comparison of Outward & Inward Element Patterns.

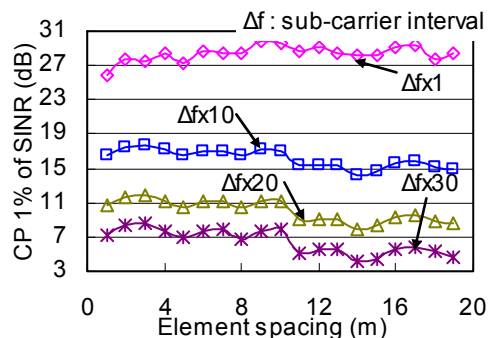


Fig.4 Relation of Element Spacing and CP 1% of SINR.