10th Australian Symposium on Antennas, Sydney, Australia, 14-15 Feb. 2007

CORRELATION ANALYSIS ON MIMO-OFDM CHANNELS IN POPULATED TIME VARYING INDOOR ENVIRONMENT

Jishu DasGupta[1], Karla Ziri Castro[1], and Hajime Suzuki[2]
[1]University of Southern Queensland, WEST Street, Toowoomba, QLD-4350 Australia
[2]CSIRO ICT Centre, PO Box 76, Epping NSW 1710 Australia

The use of multiple-input multiple-output orthogonal frequency division multiplexing (MIMO-OFDM) has been considered for the physical layer transmission scheme of the next generation wireless communication systems (e.g. [1]). Accurate analysis and modelling of practical MIMO-OFDM channels are important in designing and optimising this transmission scheme.

In indoor environment, pedestrian movement is known to cause significant effects on MIMO channels [2]. However, only a few measurement results concerning these effects have been reported in the literature. In this paper, time variation characteristics due to pedestrian movement are reported based on measured MIMO-OFDM channels at 5.2 GHz band with 40 MHz bandwidth. In particular, correlation of MIMO sub-channels (for example between the channels from transmitter (Tx) 1 to receiver (Rx) 1 and from Tx 1 to Rx 2, and so on) are analysed.

The measurements were performed in an office environment by MIMO-OFDM channel sounder developed by CSIRO ICT Centre equipped with four transmitters and four receivers [3]. Two types of pedestrian configuration were considered: pedestrians standing in the middle between Tx and Rx and pedestrians walking and crossing the direct path between Tx and Rx. Both line-of-sight (LoS) and non LoS (NLoS) paths were analysed. The number of pedestrians ranges from zero to three. In order to observe the variability of the correlation results by different positions, measurements were performed for two Rx antenna array locations within a local area for each scenario. In every case, 100 time samples were collected. With 114 OFDM sub-carriers and 16 MIMO sub-channels, a total of approximately 6 million MIMO channels were obtained.

Preliminary analysis shows decrease in correlation amplitude (average over frequency and MIMO sub-channels) from 0.99 to 0.93 and from 0.94 to 0.90 by the presence of standing pedestrian in LoS and NLoS cases respectively. With walking pedestrians, average correlation amplitude decreases from 0.99 to 0.76 and from 0.94 to 0.74 in LoS and NLoS cases respectively. The presentation features full analysis of the results.

References

[1] S. Coffey, A. Kasher, and A. Stephens, “Joint Proposal: High throughput extension to the 802.11 Standard: PHY,” IEEE 802.11-05/1102r4, January 2006.

[2] K. I. Ziri-Castro, W. G. Scanlon, and N. E. Evans, “Prediction of variation in MIMO channel capacity for the populated indoor environment using a radar cross-section-based pedestrian model,” *IEEE Transactions on Wireless Communications*, vol. 4, no. 3, pp. 1186-1194, May 2005.

[3] Hajime Suzuki, T. V. A. Tran, and I. B. Collings, “Characteristics of MIMO-OFDM Channels in Indoor Environments,” EURASIP Journal on Wireless Communications and Networking, vol. 2007, Article ID 19728, 9 pages, 2007.