Abstract

In this paper, the effect of physical layer limitations on the MAC layer capacity of mobile WiMAX system is analyzed mathematically. The downlink physical layer simulation results show the best burst profiles for a mobile WiMAX system working in a multipath fading channel under the Quality of Service (QoS) requirements for video streaming applications. The capacity mathematical results are obtained based on the physical layer constraints after discarding the MAC layer overheads. Then, a complete simulation model for physical and MAC layers are built to validate the capacity analytical results. The simulation results show a good degree of convergence between the analytical and simulation capacity results. Also, the results show that the maximum number of users that can be served instantaneously by the BS are different depends on the used distributed subcarrier permutation mode.

References

Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1. "New

Local and metropolitan area networks Part 16: Air Interface for Broadband Wireless Access
- V. Bykovnikov, "The Advantages of SOFDMA for WiMAX"; Intel Corporation,
- H. Yaghoobi, "Scalable OFDMA Physical Layer in IEEE 802. 16
- M. A. Mohamed, M. S. Abo-El-Seoud, and H. M. Abd-El-Atty, "Performance
Simulation of IEEE 802. 16e WiMAX Physical Layer"; The 2nd IEEE International
Conference on Information Management and Engineering (ICIME), Chengdu, pp. 661–668,
2010.
- R. Prasad, and F. J. Velez, "WiMAX Networks Techno-Economic Vision and
- S. E. Abdul Fatah, S. A. Mawjoud, "Impact of Downlink Distributed and Adjacent
Subcarrier Permutation Modes on the Performance of Mobile WiMAX System in ITU-R Ped. B
Channel with Obtaining Optimum Cyclic Prefix"; Al-Rafidain Engineering Journal, Vol. 20,
No. 4, 2012, pp. 69–85.
- S. E. Abdul Fatah, S. A. Mawjoud, "Mobile WiMAX: System Performance in
Terms of Distributed and Adjacent Subcarrier Permutation Modes in ITU-R Vehicular A
Channel"; IEEE International Conference on Future Communication Networks (ICFCN),
- B. Kim, J. Yun, Y. Hur, P. America, C. So-In, R. Jain, and A. Al Tamimi,
"Capacity Estimation and TCP Performance Enhancement over Mobile WiMAX
Networks"; IEEE Communications Magazine, June 2009.
- M. Sauter, "Communication Systems for the Mobile Information Society";
- B. G. Lee, S. Choi, "Broadband Wireless Access and Local Networks Mobile
WiMAX and WiFi"; Artech House, USA, 2008.
- K. Balachandran, D. Calin, F. Cheng, N. Joshi, J. H. Kang, ..... , and J. Sun,
"Design and Analysis of an IEEE 802. 16e-Based OFDMA Communication System";
- Y. S. Cho, J. Kim, W. Y. Yang, C. G. Kang, "MIMO-OFDM Wireless
Communications with MATLAB"; John Wiley & Sons, India, 2010.
Evaluation"; August 2006.
- R. Colda, T. Palade, I. Verme?an, A. Moldovan, E. Pu?chi??, "Link Adaptation
in Mobile WiMAX Systems under the ITU-R Mix of Channels"; Proceedings of the 14th
WSEAS International Conference on Communications, Corfu Island, Greece, pp. 242 – 247,
2010.

**Index Terms**

Computer Science  
Wireless

**Keywords**

Mobile WiMAX  physical layer  MAC layer  PUSC  FUSC  ITU-R mixed users  channel model