Throughput Evaluation of the CDMA 2000 Systems

廖聰隆、李金椿

E-mail: 9303432@mail.dyu.edu.tw

ABSTRACT

The performance and throughput capacity of the third generation mobile radio communication system, cdma 2000, is investigated, where we emphasize the effect of dedicated physical control channels (DCCHs) on the system performance, and the capability of RAKE receivers in combating the multi-path fading. Firstly, the performance of the cdma 2000 system is analyzed in terms of outage probability, and the system capacity and throughput are evaluated according to an outage probability of 2%. Secondly, the capacity degradation due to the introduction of DCCHs is examined. Thirdly, the performance improvement due to the application of RAKE receivers in multi-path fading channels is considered. We found that the throughput without the DCCH loading was approximately the same irrespective of the transmission rates. When the DCCH loading was taken into account, the throughput for different transmission rates became different, where the higher transmission rate produced higher throughput. Under multi-path fading, in addition to the intercellular interference, there is intracellular interference as the multi-path components could not maintain orthogonality with the desire signal. The percentage capacity decrease were 50, 51%, 52%, 57%, 66%, 100% for R0~R6 transmission rate, respectively. With RAKE receivers and Maximum Ratio Combining, the percentage of capacity increase was 47%, 43%, 47%, 38%, 42%, 66%, 100% for R0~R6 transmission rate, respectively.

Keywords : cdma 2000 ; capacity ; multi Carrier ; outage probability ; traffic loading

Table of Contents

REFERENCES

[1] Clint Smith and Daniel Collins, " 3G Wireless Networks ", McGraw-Hill, 2002.

[2] A. J. Viterbi, " CDMA Principles of Spread Spectrum Communication ", 1995.

[3] Ning Yang, " The Third Generation Wireless Network Using CDMA Air Interface ", IEEE Wireless Communication and Networking Conference, vol.2, pp. 649-653, 1999.

[4] H. lervik and A. Perkis, " Increase Capacity in DS-CDMA Systems by Reuse of Spreading Codes ", Proceedings of IEEE ICT 2001, vol.3, pp. 59-62.

[5] 陳俊男, " Performance analysis for multi-rate transmission in W-CDMA ", 大葉大學碩士論文2001.

[6] R. steele, C. C. Lee and P. Gould, " GSM CdmaOne and 3G Systems ", Wiley & Sons, 2001.

[7] Vijay K. Garg , " IS-95 CDMA and cdma 2000 ", Prentice-Hall, 2000.

[8] Qiang Wu and Eduardo Esteves, " The cdma 2000 High data rate Packet Data System ", Qualcomm Technical Report, March 2002.

[9] Eduardo Esteves, " On the Reverse Link Capacity of cdma 2000 High data rate Packet Data System ", Qualcomm Technical Report, 2002.

[10] A. Chheda, " On The Forward Link Capacity of a cdma 2000 1X-System with Transmit Diversity ", IEEE Trans. Veh. Tech., vol.2, pp. 618-623, September 2000.

[11] Sadayuki Abeta, Hiroyuki Atarashi and Mamoru Sawahashi, “ Forward Link Capacity of Coherent DS-CDMA and MC-CDMA Broadband Packet Wireless Access in Multi-cell Environment ” , IEEE Trans. Veh. Tech., vol.5, pp. 2213-2218, September 2000.
[12] S.R. Saunders, “ Antennas and Propagation for Wireless Communication System ” , John Wiley & Sons , 1999.
[13] BERNARD SKLAR, “ Digital Communication Fundamentals and Applications ” , Prentice-Hall, 1996.
[14] P. Jung, P. W. Basier and A.Steil, “ Advantages of CDMA and spread spectrum techniques over FDMA and TDMA in cellular mobile radio applications ” , IEEE Trans. Veh. Tech., vol.4, pp. 357-364, 1993.
[15] 3GPP2, “ Physical Layer Standard for cdma 2000 Spread Spectrum System ” , 1999.
[16] Syed Ali Jafar and Andrea Goldsmith, “ Optimal Rate and Power Adaptation for Multi-rate CDMA ” , IEEE Trans. Veh. Tech., vol.3, pp. 994-1000, September 2000.
[17] T. S. Rappaport, “ Wireless Communication Principles and Practice ” , Prentice Hall PTR, 1996.
[18] Pieter van Rooyen, Michiel Lotter, and Sanie van Wyk, “ Space-Time Processing for CDMA Mobile Communication ” , 2000.