Capacity Analysis of TDD/CDMA Downlink Systems

徐永昇、李金椿

E-mail: 9511342@mail.dyu.edu.tw

ABSTRACT

The interference time ratio and multiple access interference from both base stations (BSs) and mobile stations (MSs) are analyzed for a cracker-barrel TDD/CDMA downlink system, and guard time is considered to prevent the situation when mobile stations must transmit and receive at the same time. As the MSs tend to distribute randomly over the cell area, their received signal-to-interference ratio (SIR) decreased as the MS further away from the cell site. We consider two particular MS locations in the cell boundary where the interference is higher to analyze the capacity of system according to a required outage probability. Only the path loss and shadowing effect of the mobile radio channel are considered in our investigating, while the effect of multi-path fading is assumed to be compensated by signal processing and channel coding. In regarding to the interference, we find that other MSs in the same cell don ’ t cause interference to the desired MS and only BSs in neighbor cells can create interference when we limit the cell radius to be smaller than 3750 meters. The interference time ratios of BSs in neighbor cells are very small due to the limit of cell radius. System can admit 29、29、29 users per cell when the radius of cell are 500, 1000 and 3000 meters dividedly. We can find that cell radius does not influence the outage probability of the system when we limit the cell radius to be smaller than 3750 meters.

Keywords : TDD/CDMA、interference time ratio、outage probability、capacity、cell radius

Table of Contents

REFERENCES

[1] R. J. Sanchez, “ CDMA digital cellular overview and field trials results, ” Technologies for Wireless Applications Diqest, pp. 37-43, Feb. 1995.

[2] O. Momtahan, H. Hashemi, “ A comparative evaluation of DECT, PACS, and PHS standards for wireless local loop applications, ” Personal Communications, IEEE, Vol. 7, Issue 3, PP.35-41, June 2000.

[3] R. Esmailzadeh, M. Nakagawa, and A. Jones, “ TDD-CDMA for the 4-th generation of wireless communications, ” IEEE Wireless Communications, vol. 10, no. 4, pp. 8-15, Aug. 2003.

[4] A. Samukic, “ UMTS Universal mobile telecommunication system: Development of standards for third generation, ” IEEE Transaction on Vehicular Technology, vol. 47, no. 4, pp. 1976-1983, Nov. 1998.

[5] T. Ojanpera and R. Prasad, “ An overview of air interface multiple access for IMT -2000/UMTS, ” IEEE communication Magazine, vol. 36, no. 9, pp. 82-95, Sep. 1998.

[6] E. Dahlman, B. Gudmundson, M. Nilsson, and J. Skold, “ UMTS/IMT-2000 based on wideband CDMA, ” IEEE communication Magazine,

vol. 36, no. 9, pp. 70-80, Sep. 1998.
[7] E. Dahlman, B. Belling, J. Knutsson, F. Ovesjo, M. Persson, and C. Roobol, “WCDMA-The radio interface for future mobile multimedia communications,” IEEE Transaction on Vehicular Technology, vol. 47, no. 4, pp. 1105-1118, Nov. 1998.
[8] K. Tachikawa, “A perspective on the evolution of mobile communication,” IEEE Communication Magazine, vol. 41, no. 10, pp. 66-73, Oct. 2003.
[9] Y. Kim, B. J. Jeong, J. Chung, C.-S. Hwang, J. S. Ryu, K.-H. Kim and Y. K. Kim, “Beyond 3G: Vision, requirements, and Enabling Technologies,” IEEE Communication Magazine, vol. 41, no. 3, pp. 120-124, Mar. 2003.
[10] Huaming Wu, Weidong Li, Youzheng Wang, and Jing Wang, “WCDMA-TDD for Multimedia Mobile Communication,” State Key Lab. on Microwave & Digital Communications. Department of Electronic Engineering, Tsinghua University.
[11] Xingyao Wu, Lie-Liang Yang and Hanzo, L., “Uplink capacity investigations of TDD/CDMA,” IEEE 55th VTC, vol. 2, pp. 997-1001, 6-9 May 2002.
[12] Miao Qingyu, Wang Wenbo, Yang Dacheng and Wang Daqing, “An analysis of the interference in the TDD/CDMA system,” TENCON 2000. vol. 1, pp. 333-337, 24-27 Sep. 2000.
[13] D. Li, “The perspectives of Large Area Synchronous CDMA Technologies,” IEEE Communication Magazine, vol. 41, no. 3, pp. 114-118, Mar. 2003.
[14] Mugen Peng, Biao Huang and Wenbo Wang , “TDD/CDMA capacity loss due to adjacent channel interference in the macro environment employing smart antenna techniques,” 2004 Asia-Pacific Radio Science Conference, pp. 146-149, 24-27 Aug. 2004.
[15] Jiang Chang, Wenbo Wang and Dacheng Yang, “Investigation of a combined power control scheme for a time-division duplex CDMA system,” The 2000 IEEE Asia-Pacific Conference on Circuits and Systems, pp. 46-49, 4-6 Dec. 2000.
[16] 李金椿, 崔德高, 曾平一, 徐永昇, “TDD/CDMA之上鏈數據流量分析,” Fourth Conference on Communication Applications, CCA Procceding, pp. 208-214, 北台技術學院, March, 2006.
[17] 陳俊男, “Performance analysis for multi-rate transmission in W-CDMA,” Ch2&3,大葉大學, 2002.
[18] J. L. Dornstetter and D. Verhulst, “Cellular efficiency with slow frequency hopping: Analysis of the digital SFH900 mobile system,” IEEE J. Sel. Area Commun., vol. 5, no. 5, pp. 835-848, Jun. 1987.
[19] R. Steele [Ed], “Mobile Radio Communication,” Pentech Press, 2002.
[20] 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 Transactions on Vehicular Technology, vol. 4, pp. 357-364, 1993.
[21] L. A. Gerhardt, “Spread Spectrum Communication,” NATO AGARD Lecture Series, no. 58, Jul. 1973.
[22] D. J. Torrieri, “Performance of direct-sequence system with long pseudo noise sequence,” IEEE J. Sel. Area Commun., vol. 10, no. 4, pp. 770-781, May 1992.
[23] R. Steele, C. C. Lee and P. Gould, “GSM CdmaOne and 3G Systems, ” John Wiley & Sons, 2001.
[24] W.C.Y Lee, “Overview of cellular CDMA,” IEEE Transactions, vol. 40, Issue 2, pp. 291-302, May 1991.
[25] C.-C. Lee, C.-H. Wang and C.-H. Yang, “Performance of the W-CDMA in multi-path fading channels,” 2003 International Conference on Informatics, Cybernetics, and Systems, 14-16 Dec., Kaohsiung, Taiwan, 2003.