An Optimized Antenna Array Beam Pattern for CDMA System

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ABSTRACT

The optimal radiation patterns of linear array antenna employed in CDMA system are investigated, where two weighting schemes from the windowing method, namely Hamming and Blackman weighting schemes, are considered to improve the CDMA system performance. Their improvements are compared with the basic phase weighting schemes. The improvement is terms of gain in bit-energy-to-interferences Ratio( ), is used as the criterion for performance assessment. We find that when the number of antenna elements increase, the intra-cellular interference reduction factor decreases for both the phase and Blackman weighting schemes, while for the Hamming weighting scheme, the reduction becomes saturate when the number of antenna elements is greater than 17. In phase weighting scheme, the inter-cellular interference increase factor increases as the number of antenna elements increases, while remain constant for both the Hamming and Blackman weighting schemes. In the over all performance enhancement, both Hamming and Blackman weighting schemes provide better improvement than that of phase weighting scheme. However, the performace enhancement of the Hamming weighting scheme is better than that of the Blackman weighting scheme.

Keywords : Blackman window weight ; phase weight ; Hamming window weight

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REFERENCES

[1] Oseph C., J. R. Liberti, Theodor S. Rappaport, “ Smart antennas for wireless communicationa:IS-95 and third generation CDMA applications, ” Ch. 3, Prentice Hall PTR, 1999.

[2] R. steele, C. C. Lee, P. Gould, “ GSM, CdmaOne and 3G Systems, ” Ch5, John Wiley & Sons, 2001.

[3] Jianri Horng Chen, Kuen Tsair Lay, “ Finite field wavelet spread signature CDMA with hybrid successive and intracode interference cancellation, ” IEEE Semiannual, vol.4, pp. 2793-2797, Apr. 2003 [4] Xiao Heng Tan, “ A hybrid multi-user detector for CDMA, ” IEEE Proceedings, vol. 1, pp. 994-997, Sept. 2003 [5] P. Cardieri, T. S. Rappaport, “ Application of narrow-beam antennas and fractional loading factor in cellular communication systems, ” IEEE Trans., vol. 50, Mar. 2001.

[6] S. Bellofiore, C. A. Balanis, J. Foutz, A. S. Spanias,“ Smart-antenna systems for mobile communication networks. Part 1. Overview and antenna design,” Antennas and Propagation Magazine, IEEE Trans., vol. 44, Jun. 2002.
[7] Bing Wang, H. M. Kwon,“ PN code acquisition using smart antenna for spread-spectrum wireless communications,” IEEE Trans., vol. 52, Jan. 2003.
[8] C. C. Lee, Hsin-Hsyong Richard Yang,“ Performance evaluation of employing smart antennae in CDMA systems,” 1999兩岸無線電通訊研討會, 南京郵電學院, Oct. 1999.
[9] B. P. Ng, M. H. Er, C. Kot,“ A flexible array synthesis method using quadratic programming,” IEEE Trans., vol. 41, pp. 1541-1550, 1993.
[10] 謝昔恩,“ Performance Analysis of Employing Array Antennae in CDMA Systems,” Ch. 5, 大葉大學, 2005.
[11] 陳俊男,“ Performance analysis for multi-rate transmission in W-CDMA,” Ch. 2, Ch. 3, 大葉大學, 2002.
[12] W. C. Y. LEE,“ Overview of cellular CDMA,” IEEE Trans., vol. 40, no. 2, pp. 291-302, May. 1991.
[13] R. Cameron, B. D. Woerner,“ An analysis of CDMA with imperfect power control,” IEEE 41st VTS conf., pp. 47-49, 1992.
[14] 許震堂,“ The Study Of Smart Antenna System To Simplify Hierarchical Structure Of GSM System,” Ch. 1, Ch. 3, 大葉大學, 2003.
[15] Constantine A. Balanis,“ Antenna Theory Analysis and Design,” pp. 3-7, pp. 39-52, John Wiley & Sons Inc., 1997.
[16] J. S. Blogh, L. Hanzo,“ Third-Generation System and Intelligent Wireless Networking: Smart Antennas and Adaptive Modulation”, pp. 123-146, John Wiley, 2002.
[17] 王元鈞,“ A Study on Beam Pattern Generation Method for Antenna System,” Ch. 2, 大葉大學, 2004.
[18] M. Chryssomallis,“ Smart antennas,” Antennas and Propagation Magazine, IEEE Trans., vol. 42, pp. 129-136, Jun. 2000.
[19] R. J. NOLL, S. H. Macomber,“ Analysis of Grating surface Emitting Laser,” IEEE journal, vol. 26, no. 3, Mar. 1990.
[20] C. Y. Rew, S. B. Park, J. B. Ra,“ Elimination of all grating lobes in ultrasonic synthetic focusing using a linear array,” IEEE ELECTRONICS LETTERS , vol. 29, no. 19, Sep. 1993.
[21] J. Warner,“ Array symmetry, beam patterns, and grating lobes,” Electronically Scanned Antennas, IEEE Colloquium, pp. 2/1-2/3, Jan. 1988.
[22] J. G. McWhirter, T. J. Shepherd,“ Systolic array processor for MVDR beamforming,” IEEE Proceedings, vol. 136, pp. 75-80, Apr. 1989
[23] S. Haykin,“ Adaptive Filter Theory,” pp. 94-107, Prentice Hall. Upper saddle River.
[24] Lonnie C. Ludeman,“ Fundamentals of Digital Signal Processing,” pp. 263-264, Wiley, New Mexico State University, 1986.
[25] C. C. Lee,“ CDMA for Cellular Mobile Radio Systems,” Ph. D. thesis, University of Southampton UK, Nov. 1994.
[26] J. S. Lee and L. E. Miller,“ CDMA Systems Engineering Handbook,” Artech House, 1998.