On an MC-DS-CDMA System with Rake Receiver with Unequal Fading Figures

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ABSTRACT

The evaluation of system performance of an MC-DS-CDMA (multicarrier direct-sequence coded-division multiple-access) system with dual-dimension (antenna diversity) Rake receiver is proposed in this investigation. The working environment for the scenario is considered as situating in frequency selective fading. Furthermore, some of the system parameters, e.g., the resolvable multipath number, the number of a Rake receiver, the fading parameter the power decay factor MIP (multipath intensity profile), and the correlation characteristic between the antennas, are adopted for analyzing. It is the original proposal of such scenario with dual-dimension Rake receiver for the MC-DS-CDMA system. In order to validate the accuracy of the derivative, a lot of numerical results are conduct in this paper. It is worthwhile claiming that is not only the fading parameter of the correlated-fading model dominates the system performance of the MC-DS-CDMA system, but the number of antennas also definitely affects the system performance.

Keywords : MC-DS-CDMA system ; dual-dimension Rake ; MIP ; antenna diversity

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REFERENCES

[1] J. Proakis, Digital Communications. New York: McGraw-Hill, 1989.

[2] T. Eng and L. B. Milstein,“ Coherent DS-CDMA Performance in Nakagami Multipath Fading, ” IEEE Trans. Commun., vol. 43, pp. 1134-1143, Mar. 1995.

[3] S. Kondo and L. B. Milstein,“ On the Use of Multicarrier Direct Sequence Spread Spectrum Systems, ” in Proc. IEEE MILCOM‘ 93. Boston. MA, pp. 52-56, Oct. 1963.

[4] N. Yee, J. P. Linnartz, and G. Fettweis,“ Multi-carrier CDMA in Indoor Wireless Radio, ” in Proc. PIMRC‘ 93, Yokohama, Japan, pp. D1.3.1-5, Dec. 1993.

[5] L. -L. Yang, and L. Hanzo,“ Multicarrier DS-CDMA: A Multiple Access Scheme for Ubiquitous Broadband Wireless Communications ”, IEEE Commun. Mag., pp. 116-124, Oct. 2003.

[6] Prasad,R. Hara, S,“ An Overview of Multi-carrier CDMA ”, 1996 IEEE 4th International Symposium, vol. 1, pp.107-114, 22-25 Sep. 1996.

[7] Hara, S. Prasad, R.“ Overview of Multicarrier CDMA ”, IEEE on Commun Mag., vol. 35, Issue. 12, pp. 126-133, Dec. 1997.

[8] Hara, s. Prasad, R.“ DS-CDMA, MC-CDMA and MT-CDMA for Mobile Multi-media Communications ”, IEEE 46th Vehicular

Technology Conference, vol. 2, 28, April-1 May 1996.
[9] Xiang Gui, Tung Sang Ng, “ Performance of Asynchronous Orthogonal Multicarrier CDMA System in Frequency Selective Fading Channel ”, IEEE Trans. on Commun. vol. 47, Issue. 7, pp. 1084-1091, July 1999.
[10] Shi, Q. Latva-aho, M., “ Performance Analysis of MC-CDMA in Rayleigh Fading Channels with Correlated Envelopes and Phases ”, IEEE Proc. Commun. vol. 150, Issue. 3, pp. 217-220, June 2003.
[11] Lie-Liang Yang Hanzo, L., “ Serial Acquisition Performance of Single-carrier and Multicarrier DS-DMA over Nakagami-m Fading Channels ”, IEEE Trans. on Wireless Commun., vol. 1, Issue. 4, pp. 692-702, Oct. 2002.
[12] Lie-Liang Yang Hanzo, L., “ Performance of Generalized Mulitcarrier DS-CDMA over Nakagami-m Fading Channels ”, IEEE Trans. on Commun., vol. 50, Issue. 6, pp. 956-966, June 2002.
[13] Lie-Liang Yang Hanzo, L., “ Multicarier DS-CDMA : A Multiple Access Scheme for Ubiquitous Broadband Wireless Communications ”, IEEE Commun. Magazine, vol. 41, Issue. 10, pp. 116-124, Oct. 2003.
[14] Rahman, Q.M., Sesay, A.B., “ Data Sequence Detection for MT-CDMA Signals ”, IEEE CCECE 2002, vol. 3, pp. 12-15, May 2002.
[15] Matthias Patzold, “ Mobile Fading Channel ”, Wiley, pp. 3-7, 2002.
[16] S. Bernard, “ Digital Communications Fundamentals and Applications ”, pp. 962-966, Prentice Hall International, Inc, 2001.
[17] T. S. Rappaport, “ Wireless Communications Principles and Practice ”, T. S. Rappaport, “ Wireless Communications Principles and Practice ”, prentice Hall PTR, New Jersey, 1996.
[18] B. Sklar, “ Rayleigh Fading Channels in Mobile Digital Communication Systems Part 1: Characterization ”, IEEE Commun. Magazine, pp. 90-100, July 1997.
[19] Yacoub, M. D., “ Foundations of Mobile Radio Engineering ”, CRC Press Inc, 1993.
[20] Mondre, E., “ Complex and Envelope Covariance for Rician Fading Communication Channels Communications ”, IEEE Transmission, vol. 19, Issue: 1 , pp. 80-84, Feb. 1971.
[21] D. Middle, “ An Introduction to Statistical Communication Systems and Techniques ”, New York:McGraw-Hill, 1966.
[22] M. Nakagami-m, “ The m-distribution-A General Formula of Intensity Distribution of Rapid Fading in Statistical Methods in Radio Wave Propagation ”, W. G.. Hoffman, Ed. Oxford, U.K.:Pergamon, 1960.
[23] I. S. Gradshteyn and I. M. Ryzhik, “ Table of Integrals, Series, and Products, 5th ed. ” New York:Academic, 1994.
[24] M. K. Simon and M.-S. Alouini, “ Digital Communications over Generalized Fading Channels:A Unified Approach to Performance Analysis, ” Wiley, New York, 2000.
[25] C. C. Tan and N. C. Beaulieu, “ Infinite Series Representation of the Bivariate Rayleigh and Nakagami-m Distributions, ” IEEE Trans. on Commun, vol. 45, pp. 1159-1161, Oct. 1997.
[26] S. Kondo, and L. B. Milstein, “ Performance of Multicarrier DS-CDMA System ”, IEEE Trans. on Commun., vol. 44, pp. 238-246, Feb. 1996.
[27] J. Luo, J. Zeidler, and J. Proakis, “ Error Probability Performance for W-CDMA Systems with Multiple Transmit and Receive Antennas in Correlated Nakagami Fading Channels, ” IEEE Trans. Veh. Technol., vol.51, no.6, pp. 1502-1516, Dec. 2002.
[28] E. K. Al-Hussaini and A. A. Al-Bassiouni, “ Performance of MRC Diversity Systems for the Detection of Signals with Nakagami Fading, ” IEEE Trans. Commun., vol. COM-33, pp. 1315-1319, Dec. 1985.
[29] W. C. Lee, Mobile Communications: Design Fundamentals, 2nd ed. New York: Wiley, pp. 202-211, 1933.
[30] M. Nakagami, The m-distribution- A General Formula of Intensity Distribution of Rapid Fading, in Statistical Methods in Radio Wave Propagation. Oxford, U. K.: Pergamon, pp. 3-36, 1960.
[31] W.C.Y. Lee, A Study of Antenna Array Configuration of an m-branch Diversity Combining Mobile Radio Receiver, IEEE Trans. on Commun. VT-20, pp. 93-104, 1971.
[32] R.K. Mallik and M.Z. Win, “ A New Approach to the Performance Analysis of DS-CDMA over Fading Channels, ” in Proc. IEE Int. Conf Personal Wireless Communications (ICPWC) 2002, pp. 300-304. Dec. 2002, [33] T. Eng and L. Milstein, “ Coherent DS-CDMA Performance in Nakagami Multipath Fading, ” IEEE Trans. Commun., vol. 43, no. 3-4, pp. 1134-1143, Apr. 1995.
[34] M. Pursley, “ Performance Evaluation for Phase Coded Spread Spectrum Multiple Access Communication-Part I: system analysis, ” IEEE Trans. Commun., vol. COM-25, no.8, pp.795-799, Aug. 1977.
[35] G. Efthymoglou and V.A. Aalo, ” Performance of TAKE Receivers in Nakagami Fading Channel with Arbitrary Fading Parameters, ” Electron. Lett., vol. 31 pp. 1610-1612, Aug. 1995.
[36] J. Luo, J. Zeidler, and J. Proakis, ” Error Probability Performance for W-CDMA Systems with Multipoe Transmit and Receive Antennas in Correlated Nakagami Fading Channels, ” IEEE Trans. Veh. Technol., vol. 51, no. 6, pp. 1502-1516, Dec. 2002.
[37] I.S. Gradshteyn and I.M. Ryzhik, Table of Integrals, Series and Products, 5th ed. San Diego, CA: Academic, 1994.
[38] V.A. Aalo, T. Piboongungon, and G.P. Efthymoglou, ” Another Look at the Performance of MRC Schemes in Nakagami-m Fading Channels with Arbitrary Parameters, ” IEEE Trans. Commun., vol. 53, lssue12, pp.2002-2005, Dec. 2005.
[39] H.M. Srivastava and H.L. Manocha, A Treatise on Generating Functions. New York: Wiley, 1984.

[40] H. Exton, Multiple Hypergeometric Functions and Applications. New York: Wiley, 1976.