

Study on MIMO operating in Two-tier femtocell

楊國宏、NOTE

E-mail: 344785@mail.dyu.edu.tw

ABSTRACT

The system performance of an MIMO (multiple-input multiple-output) system deployed with femtocell scheme is evaluated and studied in this thesis. The tow-tier femtocell operation environment is applied on this analysis which is majoring in the input and output numbers. It is known that a two-tier femtocell can be distributed around macro-cell network for applying, in indoor, for instance, small office, small enterprises and mobile phone. The results from evaluation of this theirs significantly show that the system performance of an MIMO system definitely is definitely affected by the input and output numbers.

Keywords : MIMO system、 femtocell、 macrocell、 system performance

Table of Contents

封面內頁 簽名頁 中文摘要	iv	英文摘要	iv
. v	誌謝	vi	目錄
. vii	圖目錄	ix	表目錄
. x	第一章 緒論 1.1 研究背景	1	1.2 論文內容摘要
4	第二章 Femtocell技術 2.1毫微微蜂巢(femtocell)技術	6	2.2 Femtocell科技觀點
10	2.3 Femtocell商業觀點	11	2.4容量分析
13	第三章 多載波分碼多重技術 3.1多載波分碼多重訊號	16	3.2調變參數
18	3.3功率頻譜密度	19	3.4接收機模型
21	第四章 跳時數目對傳輸功率於雙層毫微微蜂巢系統之效能分析 4.1毫微微蜂巢之未來	26	4.2系統分析和通道環境
29	4.3空間相關MIMO通道之Ergodic容量	31	第五章 結論
36	參考文獻	37	[1]V. Chandrasekhar and J. G. Andrews, " Uplink Capacity and Interference Avoidance for Two-femtocell Networks, " IEEE Trans. Wireless Commun, Vol. 8, No. 7, pp. 3498-3509, July 2009. [2]S. K. Mem, L. J. Greenstein, H. V. poor, and S. C. Schwartz, " Uplink User Capacity in a Multicell CDMA System with Hotspot Microcells, " IEEE Trans. Wireless Commun, Vol. 5, No. 6, pp. 1333-1341, June 2006. [3]H. -S. Jo, S. Menber, C. Men, Lee, J. Moon, and J. -G Yook, " Interference Mitigation Using Uplink Power Control for Two-Tier Femtocell Network, " IEEE Trans. Wireless Commun., Vol. 8, No. 10, pp. 4906-4910, Oct. 2009. [4]V. Chandrasekhar and J. G. Andrews, " Femtocell Networks : A Survey, " IEEE Commun. Magazine, Vol. 46, No. 9, pp. 59-67, Sep. 2009. [5]N. Yee, Jean-Paul M.G. Linnart and G. Fettweis, " Multi-Carrier CDMA in Indoor Wireless Radio Network, " IEEE Trans. Commun., Vol. E77-B, No. 7, pp. 900-904, July 1994. [6]S. -P. Yeh, S. Taluar, Sa-Co, Lee, and H. Kim, " WiMAX Femtocells : A Perspective on Network. Architecture, Capacity, and Coverage, " IEEE Commun. Magazine, Vol. 46, No. 10, pp. 58-65, Oct. 2008. [7]V. Chandrasekhar and J. G. Andrews, " Spectrum Allocation in Tiered Cellular Network, " IEEE Trans. On Commun., Vol. 57, No. 10, pp. 3059-3068, Oct. 2009. [8]G. L. Stuber " Principles of Mobile Communication, " Kluwer Academic Publishers, Massachusetts, 1996. [9]J. Reig and N. Cardona, " Approximation of outage probability on Nakagami fading channels with multiple interferes, " Electronics Letters, Vol. 36, No. 19, Sep. 2000. [10]Y. D. Yao and Sheikh, A. U. H., " Outage probability analysis for microcellular mobile radio systems with co-channel interferers in Rician/Rayleigh fading environment, " Electronic letters, Vol. 26, No. 13, pp. 864-866, June 1990. [11]Rappaport T. S., " Wireless communication principles & practice, " Prentice Hall PTR Upper Saddle River, New Jersey, 1996. [12]S. Abbas and A. U. Sheikh, " Radio link performance on frequency selective Nakagami fading co-channel interference, " IEEE 49th Vehicular. Tech. Conf., Vol. 3, pp. 1735-1739, Oct. 2001. [13]M.-S. Alouini & M. K. Simon, " Performance of generalized selection combining over Weibull fading channel, " IEEE VTS 54th , Vehicular Technology Conference, Vol. 3, pp. 1735-1739, Oct. 2001. [14]A. D. Adnan and N.c. Beaulieu, " Outage probabilities of cellular radio system with multiple Nakagami interference, " IEEE Trans. on Vehicular Technology Conference., Vol. 4, pp. 757-768, 1991. [15]Nakagami, N.: " The m-distribution: a general formula for intensity distribution of rapid fading, " in HOFFMAN. W.G. (Ed.): ' Statistical methods in radio wave propagation ' (Pergamon, Oxford, UK, 1960), pp. 3-36. [16]Y. D. Yao and Sheikh, A. U. H., " Co-channel interference modeling and performance analysis of microcell system for wireless personal communications, " Canadian Journal of electrical and computer

engineering, Vol. 19, No. 1, pp. 27-35, 1994. [17]T. E. Klein and S. – J Han, “ Assignment Strategies for Mobile Data Users in Hierarchical Overlay Networks: Performance of Optimal and Adaptive Strategies, ” IEEE J. Select. Area Commun., Vol. 22, No. 5, pp. 849-861, June 2004. [18]S. Kishore, L. J. Greenstein, H. V. poor, and S. C. Schwartz, “ Soft Hand Off and Uplink Capacity in a Tow-tier CDMA System, ” IEEE Trans. Wireless Commun., Vol. 4, No. 4, pp.1297-1301, July 2005. [19]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, “ Uplink Capacity and Interference Avoidance for Two-Tier Femtocell Networks, ” IEEE Trans. Wireless Commun., Vol. 8, No. 7, pp.1-12, July 2009. [20]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, “ Coverage in Multi-Antenna Two-tier Networks, ” IEEE Trans. Wireless Commun., Vol. 8, No. 10, pp.5314-5327, Oct. 2009. [21]H. C. Claussen, L. T. W. Ho, L. G. Samual, “ Self-optimization of Coverage for Femtocell Deployments, ” Wireless Telecommunications Symposium., 2008. WTS, pp. 278-285, April 2008. [22]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, “ Power Control in Two-tier Femtocell Network, ” IEEE Trans. Wireless Commun, Vol. 8, issue 8, pp. 4316-4328, Aug. 2009. [23]A. Ghasemi and E. Sousa, “ spectrum Sensing in Cognitive Radio Networks :The Cooperation-Processing Tradeoff, ” Wireless Commun. Mob. Comput., Vol. 7, No. 9, pp. 1049-1060, Nov. 2007. [24]L. Qian, X. Li, J. Attia, and Z. Gajic, “ Power Control for Cognitive Radio Ad hoc Network, ” in Proc. IEEE Workshop on Local & Metro. Area Networks, pp. 7-12, June 2007. [25]A. M. Hunter, J. G. Andrews, and S. Weber, “ Transmission Capacity of Ad hoc Network with Spatial Diversity, ” IEEE Trans. Commun., Vol. 7, No. 12, pp. 5058-5071, Dec. 2008. [26]Joy long-Zong Chen, “ Performance Analysis for an MC-CDMA System over Single-cell and Multiple-cell Environments in Correlated-Nakagami-m Fading, ” IEICE Transaction on Commun., Vol. E90-B, No. 7,pp. 1713-1724, July 2007. [27]M. K. Simon, M. S. Alouini, “ A unified approach to the performance analysis of digital communication over generalized fading channel, ” Proc. of the IEEE, Vol. 86, pp. 1860-1877, 1998.

REFERENCES

- [1]V. Chandrasekhar and J. G. Andrews, “ Uplink Capacity and Interference Avoidance for Two-femtocell Networks, ” IEEE Trans. Wireless Commun, Vol. 8, No. 7, pp. 3498-3509, July 2009.
- [2]S. K. Mem, L. J. Greenstein, H. V. poor, and S. C. Schwartz, “ Uplink User Capacity in a Multicell CDMA System with Hotspot Microcells, ” IEEE Trans. Wireless Commun, Vol. 5, No. 6, pp. 1333-1341, June 2006.
- [3]H. -S. Jo, S. Menber, C. Men, Lee, J. Moon, and J. – G Yook, “ Interference Mitigation Using Uplink Power Control for Two-Tier Femtocell Network, ” IEEE Trans. Wireless Commun., Vol. 8, No. 10, pp. 4906-4910, Oct. 2009.
- [4]V. Chandrasekhar and J. G. Andrews, “ Femtocell Networks:A Survey, ” IEEE Commun. Magazine, Vol. 46, No. 9, pp. 59-67, Sep. 2009.
- [5]N. Yee, Jean-Paul M.G. Linnart and G. Fettweis, “ Multi-Carrier CDMA in Indoor Wireless Radio Network, ” IEEE Trans. Commun., Vol. E77-B, No. 7, pp. 900-904, July 1994.
- [6]S. -P. Yeh, S. Taluar, Sa-Co, Lee, and H. Kim, “ WiMAX Femtocells :A Perspective on Network. Architecture, Capacity, and Coverage, ” IEEE Commun. Magazine, Vol. 46, No. 10, pp. 58-65, Oct. 2008.
- [7]V. Chandrasekhar and J. G. Andrews, “ Spectrum Allocation in Tiered Cellular Network, ” IEEE Trans. On Commun., Vol. 57, No. 10, pp. 3059-3068, Oct. 2009.
- [8]G. L. Stuber “ Principles of Mobile Communication, ” Kluwer Academic Publishers, Massachusetts, 1996.
- [9]J. Reig and N. Cardona, “ Approximation of outage probability on Nakagami fading channels with multiple interferes, ” Electronics Letters, Vol. 36, No. 19, Sep. 2000.
- [10]Y. D. Yao and Sheikh, A. U. H., “ Outage probability analysis for microcellular mobile radio systems with co-channel interferers in Rician/Rayleigh fading environment, ” Electronic letters, Vol. 26, No. 13, pp. 864-866, June 1990.
- [11]Rappaport T. S., “ Wireless communication principles & practice, ” Prentice Hall PTR Upper Saddle River, New Jersey, 1996.
- [12]S. Abbas and A. U. Sheikh, “ Radio link performance on frequency selective Nakagami fading co-channel interference, ” IEEE 49th Vehicular. Tech. Conf., Vol. 3, pp. 1735-1739, Oct. 2001.
- [13]M.-S. Alouini & M. K. Simon, “ Performance of generalized selection combining over Weibull fading channel, ” IEEE VTS 54th , Vehicular Technology Conference, Vol. 3, pp. 1735-1739, Oct. 2001.
- [14]A. D. Adnan and N.c. Beaulieu, “ Outage probabilities of cellular radio system with multiple Nakagami interference, ” IEEE Trans. on Vehicular Technology Conference., Vol. 4, pp. 757-768, 1991.
- [15]Nakagami, N.: “ The m-distribution: a general formula for intensity distribution of rapid fading, ” in HOFFMAN. W.G. (Ed.): ‘ Statistical methods in radio wave propagation ’ (Pergamon, Oxford, UK, 1960), pp. 3-36.
- [16]Y. D. Yao and Sheikh, A. U. H., “ Co-channel interference modeling and performance analysis of microcell system for wireless personal communications, ” Canadian Journal of electrical and computer engineering, Vol. 19, No. 1, pp. 27-35, 1994.
- [17]T. E. Klein and S. – J Han, “ Assignment Strategies for Mobile Data Users in Hierarchical Overlay Networks: Performance of Optimal and Adaptive Strategies, ” IEEE J. Select. Area Commun., Vol. 22, No. 5, pp. 849-861, June 2004.
- [18]S. Kishore, L. J. Greenstein, H. V. poor, and S. C. Schwartz, “ Soft Hand Off and Uplink Capacity in a Tow-tier CDMA System, ” IEEE

Trans. Wireless Commun., Vol. 4, No. 4, pp.1297-1301, July 2005.

[19]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, " Uplink Capacity and Interference Avoidance for Two-Tier Femtocell Networks, " IEEE Trans. Wireless Commun., Vol. 8, No. 7, pp.1-12, July 2009.

[20]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, " Coverage in Multi-Antenna Two-tier Networks, " IEEE Trans. Wireless Commun., Vol. 8, No. 10, pp.5314-5327, Oct. 2009.

[21]H. C. Claussen, L. T. W. Ho, L. G. Samuel, " Self-optimization of Coverage for Femtocell Deployments, " Wireless Telecommunications Symposium., 2008. WTS, pp. 278-285, April 2008.

[22]V. Chandrasekhar, J. G. Andrews, and A. Gatherer, " Power Control in Two-tier Femtocell Network, " IEEE Trans. Wireless Commun, Vol. 8, issue 8, pp. 4316-4328, Aug. 2009.

[23]A. Ghasemi and E. Sousa, " spectrum Sensing in Cognitive Radio Networks :The Cooperation-Processing Tradeoff, " Wireless Commun. Mob. Comput., Vol. 7, No. 9, pp. 1049-1060, Nov. 2007.

[24]L. Qian, X. Li, J. Attia, and Z. Gajic, " Power Control for Cognitive Radio Ad hoc Network, " in Proc. IEEE Workshop on Local & Metro. Area Networks, pp. 7-12, June 2007.

[25]A. M. Hunter, J. G. Andrews, and S. Weber, " Transmission Capacity of Ad hoc Network with Spatial Diversity, " IEEE Trans. Commun., Vol. 7, No. 12, pp. 5058-5071, Dec. 2008.

[26]Joy long-Zong Chen, " Performance Analysis for an MC-CDMA System over Single-cell and Multiple-cell Environments in Correlated-Nakagami-m Fading, " IEICE Transaction on Commun., Vol. E90-B, No. 7,pp. 1713-1724, July 2007.

[27]M. K. Simon, M. S. Alouini, " A unified approach to the performance analysis of digital communication over generalized fading channel, " Proc. of the IEEE, Vol. 86, pp. 1860-1877, 1998.