

研究论文

毫米波段地-空链路MIMO通信系统的误码率研究

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摘要:

给出了确定晴空和降雨环境中信道矩阵元素的方法. 基于一种中轨卫星地-空链路多输入多输出通信系统, 以西安地区实测降雨数据为依据, 模拟、计算了传输分集多输入多输出通信系统、空分复用多输入多输出通信系统及单输入单输出通信系统在晴空和降雨环境中的误码率特性, 分析了传输分集多输入多输出通信系统和空分复用多输入多输出通信系统在不同天气传输环境下的误码率性能, 讨论了传输环境对毫米波段地-空链路多输入多输出通信系统误码率性能的影响, 分析了多输入多输出通信技术对开发应用毫米波技术的重要意义.

关键词: 降雨环境 地-空链路 毫米波段 多输入多输出通信系统

Study of the BER performance of the earth-space MIMO communication system at the millimeter wave band

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Abstract:

The methods to decide the elements of a channel matrix in clear and rain environments are given. The BER performances of transmitting diversity and spatial multiplexing modes are calculated and simulated based on a supposed earth-space MIMO communication system and the measured rain rate data. The BER performances of transmitting diversity and spatial multiplexing modes in different propagation environments are analyzed according to the simulated results. And the effects deduced by different propagation environments on earth-space MIMO communication are discussed. It can be concluded that MIMO technology is significant for developing earth-space communication systems at the millimeter wave band. The results given in this paper are important and valuable for exploiting the earth-space MIMO communication system at the millimeter wave band.

Keywords: rain earth-space link millimeter wave multiple-input multiple-output communication system

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参考文献:

- [1] 弓树宏. 电磁波在对流层中传输与散射若干问题研究 [D]. 西安: 西安电子科技大学, 2008.
- [2] Flament M, Svensson A, Cioffi J M. Performance of 60 GHz Virtual Cellular Networks Using Multiple Receiving Antennas [J]. Wireless Personal Communications, 2002, 23(1): 15-29.
- [3] 李建东, 陈睿, 李长乐, 等. MIMO 空间相关信道下规格约辅助的信号检测 [J]. 西安电子科技大学学报, 2012, 39(1): 12-22.
- Li Jiangdong, Chen Rui, Li Changle, et al. Lattice-reduction-aided Detection in Spatial Correlated MIMO Channels [J]. Journal of Xidian University, 2012, 39(1): 12-22.
- [4] Sheldon C, Torkildson E, Munkyo S, et al. A 60GHz Line-of-Sight 2x2 MIMO Link Operating at 1.2Gbps [C] //2008 IEEE International Symposium on Antennas and Propagation. Piscataway: IEEE,

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[5] Madhow U. Multi Gigabit Millimeter Wave Communication-System Concepts and Challenges [C] //2008 Information Theory and Applications Workshop-Conference Proceedings. Piscataway: IEEE, 2008: 193-196.

[6] Liolis K P, Rao B D. Application of MIMO Theory to the Analysis of Broadband Fixed Wireless Access Diversity Systems above 10GHz [C] //IEEE Antennas and Propagation Society International Symposium. Piscataway: IEEE, 2006: 145-148.

[7] Ishimaru A, Jaruwatanadilok S, Ritcey J A, et al. A MIMO Propagation Channel Model in a Random Medium [J] . IEEE Transactions on Antennas And Propagation, 2010, 58(1): 178-186.

[8] Oh C I, Choit S H, Chang D I, et al. Analysis of the Rain Fading Channel and the System Applying MIMO [C] //2006 International Symposium on Communications and Information Technologies. Piscataway: IEEE, 2006: 507-510.

[9] Ranvier S, Icheln C, Vainikainen P. Measurement-Based Mutual Information Analysis of MIMO Antenna Selection in the 60-GHz Band [J] . IEEE Antennas and Wireless Propagation Letters, 2009, 8: 686-689.

[10] Kivinen J. 60-GHz Wideband Radio Channel Sounder [J] . IEEE Transactions On Instrumentation and Measurement, 2007, 56(5): 1831-1838.

[11] Ei Z G. Propagation Channel Modeling for Emerging Wireless Communication Systems [C] //2009 International Conference on Advances in Computational Tools for Engineering Applications. Piscataway: IEEE, 2009: 457-462.

[12] Xia Pengfei, Niu Huaning, Oh J S, et al. Practical Antenna Training for Millimeter Wave MIMO Communication [C] //IEEE 68th Vehicular Technology Conference. Piscataway: IEEE, 2008: 1-5.

[13] Toda A P, de Flaviis F, Castaneda J. 60GHz Waveguide Array Design for MIMO Channel Characterization [C] //Proceedings of 2009 IEEE International Conference on Ultra-Wideband. Piscataway: IEEE, 2009: 12-16.

[14] Suzuki S, Nakagawa T, Furuta H, et al. Evaluation of Millimeter-wave MIMO-OFDM Transmission Performance in a TV Studio [C] //Proceedings of Asia-Pacific Microwave Conference: 2. Piscataway: IEEE, 2006: 843-846.

[15] Moraitis N, Constantinou P. Indoor Channel Capacity Evaluation Utilizing ULA and URA Antennas in the Millimeter Wave Band [C] //The 18th Annual IEEE International Symposium on Personal. Piscataway: IEEE, 2007: 1-5.

[16] Liolis K P, Panagopoulos A D. On the Applicability of MIMO Principle to 10-66GHz BFWA Networks: Capacity Enhancement through Spatial Multiplexing and Interference Reduction through Selection Diversity [J] . IEEE Transactions on Communications, 2009, 57(2): 530-541.

[17] Sheldon C, Torkildson E, Seo M, et al. Spatial Multiplexing over a Line-of-Sight Millimeter-Wave MIMO Link: a Two-Channel Hardware Demonstration at 1.2Gbps over 41m Range [C] //Proceedings of the 1st European Wireless Technology Conference. Piscataway: IEEE, 2008: 198-201.

[18] Nsenga J, Van Thillo W, Horlin F, et al. Joint Transmit and Receive Analog Beamforming in 60GHz MIMO Multipath Channels [C] //The IEEE ICC Proceedings. Piscataway: IEEE, 2009: 1-5.

[19] Horvath P, Frigyes I. Application of the MIMO Concept in Millimeter Wave Broadband Wireless Access Networks [J] . International Journal of Wireless Information Networks, 2005, 11(4): 217-225.

[20] Ishimaru A, Jaruwatanadilok S, Ritcey J A, et al. A MIMO Propagation Channel Model in a Random Medium [J] . IEEE Transactions on Antennas and Propagation, 2010, 58(1): 178-187.

[21] 张琦, 葛建华, 李靖. 一种低复杂度MIMO逐级检测算法 [J] . 西安电子科技大学学报, 2011, 38(4): 56-60.

Zhang Qi, Ge Jianhua, Li Jing. Multi-stage MIMO Detection Algorithm with Low Complexity [J] . Journal of Xidian University, 2011, 38(4): 56-60.

[22] 谢显中, 雷维嘉. 移动通信中的空时信号处理 [M] . 北京: 电子工业出版社, 2008.

[23] Chiani M, Zanella A. Spatial and Temporal Equalization for Broadband Wireless Indoor Networks at Millimeter Waves [J] . IEEE Journal on Selected Areas in Communications, 1999, 17(10): 1725-1734.

[24] Liolis K P, Panagopoulos A D, Cottis P G. Multi-Satellite MIMO Communications at Ku-Band and Above: Investigations on Spatial Multiplexing for Capacity Improvement and Selection Diversity for Interference Mitigation [J] . Eurasip Journal on Wireless Communications and Networking, 2007(2): 30-41.

[25] 王爱华, 罗伟雄. Ka频段卫星通信信道建模及系统性能仿真 [J] . 通信学报, 2001, 22(9): 61-69.

Wang Aihua, Luo Weixiong. Modeling of Ka-band Satellite Communication Channel and System Performance Simulation [J] . Journal on Communications, 2001, 22(9): 61-69.

[26] 梅妍玘. 卫星链路Ka频段雨衰研究 [D] . 南京: 南京邮电大学, 2009.

[27] Ishimaru A. Wave Propagation and Scattering in Random Medium [M] . New York: Academic Press, 1978.

[28] Louis I Jr. Attenuation by Atmospheric Gases [M] . Netherlands: Springer, 1986: 25-37.

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