

Rayleigh衰落信道下相位误差对相干跳频多址接入MRC分集接收系统的影响

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Effect of Carrier Phase Error on Coherent FH/CDMA System with MRC Scheme over Rayleigh Fading Channel

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摘要

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摘要 该文研究一种新型混合通信系统,即基于多载波BPSK调制的相干跳频多址接入(FH/CDMA)系统,接收端采用最大比合并(MRC)分集接收。由于采用相位调制,接收端载波相位恢复的精确度直接影响系统性能。假设载波同步通过一阶锁相环电路(PLL)完成,由于载波恢复环路中存在高斯噪声,当系统达到同步稳态时不可避免地会产生稳态相位误差。该文采用Beaulieu级数方法和特征函数方法,得到理想相干和部分相干(存在稳态相位误差)时FH/CDMA系统误码率性能表达式。仿真结果表明,相对于单用户系统,多用户系统误码率受到相位误差影响较小,误码率性能降低的主要因素是多用户干扰。MRC分集接收能提高系统抵抗相位误差和信道衰落的能力。

关键词: 无线通信 相干检测 最大比合并 多载波调制 跳频多址接入 误比特率

Abstract: A novel hybrid communications system, i.e., coherent Frequency-Hopping CDMA (FH/CDMA) system with Maximum Rate Combining (MRC) diversity reception and multicarrier scheme, is analyzed in Rayleigh fading channel. Due to the introduction of phase modulation, the phase precision in recovering carrier will affect on the system performance. The carrier recovery is implemented with the first-order Phase-Locked Loop (PLL) in the presence of AWGN in carrier recovery the loop, where the resulting steady-state phase error is appeared. The average Bit Error Rate (BER) of the ideal and the partial coherent FH/CDMA system are derived with means of Beaulieu series and characteristic function. Simulation results demonstrate that the BER performance of multi-user system is less susceptible to phase error and the dominating degradation is due to Multiple-Access Interference (MAI), compared to the single-user system. It is also shown that the effect of phase error and fading channel can be reduced by MRC reception more efficiently.

Keywords: Wireless communication Coherent detection Maximum Rate Combining (MRC) Multicarrier modulation FH/CDMA BER

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