

Performance Simulation of DS-CDMA and OFDM Combined in Radio Fading Channel

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ABSTRACT

A DS-CDMA-OFDM system, which is a combination of DS-CDMA and OFDM technologies, is proposed to reduce the effect of Inter-symbol interference (ISI) caused by frequency selective fading radio channel and Multi-access interference (MAI). The energy efficiency of proposed system is investigated based on simulation, and the results is compared with a pure DS-CDMA having a RAKE receiver. In the proposed DS-CDMA-OFDM system, the message is spread by a spreading code, and follows by OFDM modulation. To keep the bandwidth of the OFDM sub-carrier smaller than the channel coherence bandwidth in high data transmission rate, the number of the OFDM sub-carriers must be greater than the spreading factor (SF). From the simulation results, for single user situation, we find that the energy efficiency of DS-CDMA-OFDM is approximately the same as the pure DS-CDMA system with RAKE receivers. For the multiple-user situation, the performance of the DS-CDMA-OFDM system is better than the pure DS-CDMA system irrespective of the spread factor. In a BER of 10^{-2} and an SF of 32, the energy efficiency of the DS-CDMA-OFDM system is at least 3 dB better than that of the pure DS-CDMA system, while at least 5.4 dB better for a BER of 10^{-3} and an SF of 64. We find that the MAI rejection capability of the DS-CDMA-OFDM system is proportional to the spread factor. In general, the proposed DS-CDMA-OFDM system is not only able to reduce the effect of ISI ability, but also to reject the MAI.

Keywords : OFDM、DS-CDMA、RAKE receiver、ISI、MAI

Table of Contents

| | | | |
|----------------------------------|-----|---|-----|
| 封面內頁 簽名頁 授權書 | iii | 中文摘要 | iv |
| | iv | 英文摘要 | v |
| | vi | 目錄 | vii |
| | ix | 表目錄 | xii |
| 第一章 緒論 | 1 | 第二章 無線衰變通道 | 4 |
| | 4 | 2.1 無線通道衰減形式 | 5 |
| 遮蔽效應 | 7 | 2.1.1 路徑損失效應 | 6 |
| | 9 | 2.1.2 多重路徑效應 | 6 |
| | 16 | 2.1.3 多路徑通道之數學模型 | 12 |
| | 18 | 2.2 無線通道衰變特性 | 18 |
| | 24 | 3.1 展頻技術原理 | 22 |
| | 41 | 3.1.1 DS-CDMA原理 | 22 |
| 4.1.2 DS-CDMA-OFDM接收模型 | 46 | 3.1.2 耙式接收器 | 28 |
| DS-CDMA-OFDM系統效能模擬 | 51 | 第四章 DS-CDMA-OFDM系統 | 41 |
| DS-CDMA-OFDM系統模擬架構 | 52 | 4.1 DS-CDMA-OFDM系統 | 41 |
| 之效能模擬結果 | 55 | 4.1.1 DS-CDMA-OFDM發射模型 | 42 |
| 目之效能模擬結果 | 59 | 4.1.2 DS-CDMA-OFDM接收模型 | 46 |
| | 61 | 4.2 DS-CDMA-OFDM傳輸頻寬 | 48 |
| | 61 | 第五章 系統效能模擬 | 51 |
| | 61 | 5.1 搭配耙式接收機之CDMA系統模擬架構 | 51 |
| | 61 | 5.2 DS-CDMA-OFDM系統模擬架構 | 52 |
| | 61 | 5.3 系統參數 | 53 |
| | 61 | 5.4 單用戶之效能模擬結果 | 55 |
| | 61 | 5.5 多用戶干擾下之效能模擬結果 | 56 |
| | 61 | 5.6 不同載波數目之效能模擬結果 | 59 |
| | 61 | 第六章 結論 | 60 |
| | 61 | 參考文獻 | 60 |
| | 61 | 圖目錄 | 61 |
| | 61 | 圖 2.1 整體行動通訊簡略架構圖 | 4 |
| | 61 | 圖 2.2 多路徑所造成的ISI現象示意圖 | 5 |
| | 61 | 圖 2.3 路徑損失示意圖 | 6 |
| | 61 | 圖 2.4 遮蔽效應簡易示意圖 | 7 |
| | 61 | 圖 2.5 多重路徑示意圖 | 8 |
| | 61 | 圖 2.6 建設性和破壞性示意圖 | 9 |
| | 61 | 圖 2.7 道衰變特性示意圖 | 10 |
| | 61 | 圖 2.8 頻率選擇性衰落 | 12 |
| | 61 | 圖 2.9 非頻率選擇性衰落 | 12 |
| | 61 | 圖 2.10 簡單電波路徑的行進示意圖 | 14 |
| | 61 | 圖 2.11 多路徑通道模型 | 15 |
| | 61 | 圖 3.1 訊息經展頻技術所得效應：(a)未展頻信號頻譜 (b)展頻後信號頻譜(包含其他用戶) (c)針對原用戶進行解展頻信號頻譜 | 20 |
| | 61 | 圖 3.2 直接序列式展頻技術示意圖：(a)調變 (b)解調變 | 21 |
| | 61 | 圖 3.3 單一載波DS-CDMA發射機結構 | 22 |
| | 61 | 圖 3.4 單一載波DS-CDMA接收機結構 | 23 |
| | 61 | 圖 3.5 衰落呈現頻率選擇性衰落 | 24 |
| | 61 | 圖 3.6 耙式接收器架構 | 24 |

| | | | | | |
|-------|----|--------------------------------|-------|----|------------------------------|
| ..... | 25 | 圖3.7 無重疊(un-overlap spectral)性 | ..... | 29 | 圖3.8 重疊(overlap spectral)性 |
| ..... | 29 | 圖3.9 多載波調變結構 | ..... | 30 | 圖3.10多載波解調變結構 |
| ..... | 31 | 圖3.11傳統FDM傳輸方式 | ..... | 32 | 圖3.12接收方訊息式示意圖 |
| ..... | 32 | 圖3.13 OFDM傳輸頻譜圖 | ..... | 34 | 圖3.14利用IDFT/DFT取代多OFDM調變/解調 |
| ..... | 35 | 圖3.15 OFDM系統發射架構 | ..... | 36 | 圖3.16每一路傳輸頻譜 |
| ..... | 37 | 圖3.17 OFDM信號傳輸頻譜 | ..... | 37 | 圖3.18通道對傳輸信號呈現選擇性頻率衰落示意圖 |
| ..... | 38 | 圖3.19 OFDM系統接收架構 | ..... | 39 | 圖4.1所提DS-CDMA-OFDM系統發射架構 |
| ..... | 43 | 圖4.2展頻後的頻譜 | ..... | 44 | 圖4.3每一個子載波信號所佔用的頻帶 |
| ..... | 45 | 圖4.4 所提DS-CDMA-OFDM系統接收架構 | ..... | 47 | 圖4.5 DS-CDMA-OFDM每一路傳輸頻譜 |
| ..... | 48 | 圖4.6 DS-CDMA-OFDM信號傳輸頻譜 | ..... | 49 | 圖4.7 通道對DS-CDMA-OFDM信號呈現平坦衰落 |
| ..... | 49 | 圖5.1搭配耙式接收機之CDMA系統流程 | ..... | 52 | 圖5.2 所提出的DS-CDMA-OFDM系統流程 |
| ..... | 53 | 圖5.3單一用戶、展頻增益為32 | ..... | 55 | 圖5.4單一用戶、展頻增益為64 |
| ..... | 56 | 圖5.5五個用戶、展頻增益為32 | ..... | 57 | 圖5.6十個用戶、展頻增益為32 |
| ..... | 57 | 圖5.7五個用戶、展頻增益為64 | ..... | 58 | 圖5.8十個用戶、展頻增益為64 |
| | 58 | 圖5.9針對不同展頻增益對應使用不同載波數目時之效能模擬 | | 59 | 表目錄表5.1在DS-CDMA系統下, 多路徑通道參數 |
| | 54 | 表5.2在DS-CDMA-OFDM系統下, 多路徑通道參數 | | 54 | |

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