# DS-CDMA系統在無線衰變通道的通道均衡研究


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**摘 要**

在本論文中針對直接序列劃碼多存取系統(DS-CDMA)系統，以系統模擬方式，探討其使用前置循環碼(Cyclic Prefix)，並配合通道均衡器與本文所提出的耙式均衡器(RAKE Equalizer)後之系統效能，並與單純使用耙式接收機(RAKE receiver)的效能相比較。考慮兩種通道，有多路徑無衰變通道、雷利衰落(Rayleigh fading)多重路徑通道。 由模擬結果，我們發現在未加入前置循環碼而只使用均衡器來消除切片(chip)與字符(code sequence)間的干擾的情況下，因字符間之干擾嚴重，使得均衡器的效果有限。當加入前置循環碼後，字符間的干擾被移除了，使得均衡器的效能大幅提升。在Rayleigh衰落通道下，雖然字符間的干擾可以有效移除，但是依然無法彌補通道衰落問題，使得其效果比單純的RAKE接收機差。為了要消除切片與字符間的干擾又可提供分集(diversity)的效果，我們提出了耙式均衡器，比單純的RAKE接收機以及均衡器系統效能，我們發現耙式均衡器有更好的效能，在處理增益分別為16和8時，效能分別改善了2.3dB及1.7dB。



關鍵詞 : 直接序列劃碼多存取 ; 耙式接收機 ; 均衡器 ; 前置循環碼 ; 耙式均衡器


**目錄**



**參考文獻**


[1]T. S. Rappaport,“ Wireless Communication. ” Prentice-Hall, 2nd, ch4、5、7, 2002.

[2]B. Sklar,“ Digital Communications. ” Prentice-Hall, 2nd, ch3、12 2001.

[3]S. Haykin,“ Communication System. ” WILEY, 4th, 2000.

[4]D. Smalley,“ Equalization Concepts: A Tutorial. ” Atlanta Regional Technology Center, 1994.

[5]B. Sklar,“ Rayleigh Fading Channels in Mobile Digital Communication Systems. ” IEEE Communications Magazine, 1997.

[6]Baum, K.L., Thomas, T.A., Vook, F.W. and Nangia, V.,“ Cyclic-prefix CDMA: an improved transmission method for broadband DS-CDMA cellular systems. ” WCNC2002, Pages:183 - 188 vol.1, March 2002.

[7]Taewon H. and Ye L.,“ Iterative Cyclic Prefix Reconstruction for Coded Single-Carrier System with Frequency-Domain Equalizaton. ” VTC 2003-Spring, Pages:1841 — 1845 Vol.3, April 2003.

[8]Naofal Al-Dhahir, ” Single-carrier frequency-domain equalization for space-time block-coded transmissions over frequency-selective fading channels. ” IEEE Communications Letters, Pages:304 — 306 Vol.5, July 2001.

[9]Vook, F.W., Thomas, T.A. and Baum, K.L.,“ Cyclic-prefix CDMA with antenna diversity. ” VTC Spring 2002, Pages:1002 - 1006 vol.2, May 2002.

[10]F.J. Gonzalez-Serrano, V. Abreu-Sernandez and J.J. Murillo-Fuentes,“ Adaptive nonlinear equalization for CDMA communication systems. ” ICC 2001, Page:1969 - 1973 vol.6, June 2001 [11]T. Shimamura,“ Performance of order statistic LMS equalisers on stationary channels. ” Signals, Systems & Computers, 1998, Pages:673 — 677 vol.1, Nov. 1998.

[12]Martin V. Clark,“ Adaptive frequency-domain equalization and diversity combining for broadband wireless communications. ” Selected

Areas in Communications, Pages:1385 — 1395 vol.16, Oct. 1998.
[13]Ya-Ju Yu. ” Equalizer design for wireless communication. ” [14]S. Haykin, “ Adaptive Filter Theory. ” Prentice-Hall, 4th, ch4、5、7, 2002.
[15]G. W. Rice, D. Garcia-Alis, I. G. Stirling, S. Weiss and R. W. Stewart, ” An Adaptive MMSE Rake Receiver. ” Signals, Systems and Computers 2000, Pages:808 - 812 vol.1, Nov 2000.
[16]D.Garcia-Alis and R. W. Stewart, ” MMSE Adaptive Receiver For UTRA TDD. ” EUSIPCO 2000.
[17]R. Steele, C.C. Lee and P. Gould, “ GSM, cdmaOne and 3G Systems. ” WILEY, ch5, 2001.
[18]D. Falconer, S.L. Ariyavisitakul, A. Benyamin-Seeyar and B. Eidson, “ White Paper: Frequency Domain Equalization for Single-Carrier Broadband Wireless Systems. ” [19]Naofal Al-Dhahir and Suhas N. Diggavi, “ Guard sequence optimization for block transmission over linear dispersive channels. ” Global Telecommunications Conference, 2000, Page:970-974 vol.2, Dec 2000.
[20]H. Boujemaa, R. Visoz and A. Berthet, “ A RAKE-DFSE Equalizer for the UMTS Downlink. ” VTC Spring 2002, Page:1626-1630 vol.4, May 2002.
[21]P. P. Vaidyanathan and B. Vrceli, “ Theory of Fractionally Spaced Cyclic-Prefix Equalizers. ” ICASSP 2002, Page:1277-1280 vol.2, May 2002.
[22]P. Boyer, “ Performance based on selective multipath reception. ”, Communications, IEEE Transactions on, Page:280-288 vol.52, Feb 2004.