Performance Analysis of the TD-WCDMA Wireless System

崔德高、李金椿

E-mail: 9607588@mail.dyu.edu.tw

ABSTRACT

This thesis investigates the multiple access interference (MAI) and the interference time ratio. Moreover, we introduce a guard time to prevent the situation that the mobile station (MS) simultaneously transmits and receives data, where a TDMA frame is composed of only one transmission and one receiving time slots. Since the MSs are uniformly distributed within a cell, in the downlink side, the degree of interference is according to thesis respective position. We take two points at the cell boundary that are severely interfered to analyze the interference. We analyze system capacity based on the outage probability. Only the path loss and shadowing effect are considered in channel modeling, the effect of multipath funding is assumed to be equalized by signal processing or compensated by channel coding. We find that as cell radius is limited within 3750m, the other users will not interfere to the desired MS except that the neighboring base stations (BSs). Due to the constraint of cell radius, we found that the interference time ratio arises from neighboring BSs is quite small. However, when the cell radius exceeds the constraint, the MSs from neighboring cells will severely interference the desired user. We observe that when the radius is 500, 5000, 10000m the capacity is 29, 26, 20 users, respectively. We conclude that the outage probability is highly correlated with cell radius when it exceeds 3750m.

Keywords : TD-WCDMA ; proportion of interfering time ; cutting off rate of communication, ; capacity ; cell's radius ; efficiency

Table of Contents

封面內頁 簽名頁 授權書.....................iii 中文摘要....................iv 英文摘要....................v 誌謝....................vii 目錄......................vii 圖目錄.....................x 表目錄.....................xii 第一章 緒論..................1 第二章 行動無線通訊簡介............4 2.1 行動無線通訊的演進.............4 2.2 行動無線通道................5 2.2.1 路徑損失.................6 2.2.2 遮蔽效應.........8 2.2.3 多重路徑衰變...............9 2.2.3.1 瑞雷分佈.............10 2.2.3.2 萊斯分佈................10 2.3 蜂巢網行動通訊系統...........11 2.4 蜂巢網組織與架構..............14 第三章 TDD和WCDMA基本理論..........15 3.1 雙工系統..................15 3.2 多重存取系統................17 3.2.1 劃頻多重存取的技術............17 3.2.2 劃時多重存取的技術............18 3.3 展頻技術..................21 3.3.1 虛擬雜訊序列...............22 3.3.2 處理增益................24 3.4 CDMA系統..................26 3.5 WCDMA系統............... 26 3.5.1 WCDMA的特性與重要參數.......... 27 3.6 TD-WCDMA系統...............28 3.6.1 通道結構.................29 3.6.2 展頻...........31 第四章 TDD-CDMA無線電系統下鏈容量分析.....32 4.1 護衛時間與細胞半徑.............32 4.2同細胞的用戶干擾.............. 34 4.3緊鄰基地台干擾...... 35 4.3.1 干擾時間比例...............36 4.3.2 干擾強度............... 37 4.3.2.1 行動台位於A點............. 38 4.3.2.2 行動台位於B點............. 43 4.4 緊鄰細胞行動台干擾......... 46 4.4.1 干擾時間比例...............46 4.4.2 干擾強度.......... 47 4.5細胞外總干擾量............... 50 4.6 TD-WCDMA的通訊效能Eb/I0.......... 51 4.7通訊容量分析................ 54 4.7.1 參考行動台位於A點............ 55 4.7.2 參考行動台位於B點............ 56 4.7.3 超過限定半徑於A、B點探討.........57 第五章 結論..................60 參考文獻............... 62

REFERENCES
