

PERFORMANCE STUDY ON GSM

FAZLINA BINTI ABDUL GANI

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ABSTRACT

The GSM platform is a hugely successful wireless technology and an unprecedented story of global achievement. The GSM platform is living, growing and evolving and already offers an expanded and feature-rich ‘family’ of voice and data enabling services. In this project the GSM system would be studied in detail and later this would be simulated for performance analysis. Matlab, software from Mathworks would be used for the simulation. Both the forward and the reverse links of a GSM system will be simulated. Bit Error Rate (BER) is a parameter that is varied for this simulation. All the building blocks in the GSM transmitter/receiver system such as Encoder, Interleaver, Modulator etc. would be coded in Matlab using a source code. The effect of removing the encoder, decoder, Interleaver and de-interleaver on the performance of the system also will be studied and simulated. Finally the performance of the GSM system in a multipath fading environment will be simulated and analyzed using different type of fading such as Rayleigh Distribution and Ricean Distribution.

ABSTRAK

GSM merupakan satu penemuan yang terbaik bagi teknologi komunikasi tanpa wayar (wireless) serta komunikasi secara global. Perkembangan GSM yang pesat, memberi satu era baru dalam komunikasi khususnya perkhidmatan suara dan data. Projek ini akan mengkaji dengan lebih teliti mengenai sistem GSM secara keseluruhan dan dengan menggunakan Matlab, sebuah perisian daripada Mathworks, satu program akan di reka untuk menganalisa prestasi GSM. Kadar ralat per bit akan digunakan sebagai parameter berkadar bagi projek ini. Kesemua blok- blok yang digunakan dalam sistem pemancar dan penerima GSM akan dikodkan menggunakan perisian Matlab untuk disimulasikan. Kesan pengekod dan penyahkod dalam prestasi sistem GSM juga akan di simulasikan dan dikaji dengan lebih teliti. Akhirnya prestasi sistem GSM dalam persekitaran yang mempunyai kepelbagaian gangguan isyarat seperti Rayleigh dan Rician akan simulasikan menggunakan Matlab dan dianalisa supaya prestasi GSM dapat difahami dengan lebih mendalam.

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CHAPTER I

INTRODUCTION

1.1 Introduction

Global System for Mobile (GSM) is a second generation cellular system standard that was developed to solve the fragmentation problems of the first cellular systems in Europe. GSM was the world's first cellular system to specify digital modulation and network level architecture and services, and the world's most popular 2G technology.

GSM services follow ISDN guidelines and are classified as either teleservices or data services. Teleservices include standard mobile telephony and mobile-originated or base-originated traffic. Data services include computer-to-computer communication and packet-switched traffic.

GSM originally used two 25 MHz cellular bands aside for all member countries, but now it is used globally in many bands. The 890-915 MHz band was for subscriber-to-base transmissions (reverse link), and the 935-960 MHz band was for base-to-subscriber transmissions (forward link). GSM uses FDD and a combination of TDMA and FHMA schemes to provide multiple access to mobile users. The available forward and reverse frequency bands are divided into 200 kHz wide channel called ARFCNs (Absolute Radio Frequency Channel Numbers). The ARFCN denotes a forward and a reverse channel pair which is separated in frequency by 45 MHz and each channel is time shared between as many as eight subscribers using TDMA.

There are two types of GSM logical channels called traffic channels and control channels. The traffic channels carry digitally encoded user speech or user data and have identical functions and formats on both the forward and reverse link. Control channels carry signaling and synchronizing commands between the base station and the mobile station. Certain types of control channels are defined for just the forward or reverse link.

1.2 Objective

To study the performance of GSM in different multipath fading mobile environment.

1.3 Scope Of Work

The scope of work of the project comprises the following aspects:

- i. To study the performance of GSM in mobile radio propagation environment.
 - ii. To study and understand the architecture of GSM.
 - iii. To see the effect on performance if the channel encoder / interleaver in the transmitter and channel decoder /
de – interleaver in the receiver of the GSM system is remove.
 - iv. To evaluate the performance of GSM in various channel condition.
- ❖ Performance of GSM in AWGN (as a reference)
 - ❖ Performance of GSM in multipath fading (Rayleigh and Ricean Distributions)

1.4 Outline Of Thesis

The thesis comprises of six chapters and the overview of all the chapters are given below.

Chapter 1: This chapter gives the introduction to the project, objective and scope of work involved in accomplishing the project.

Chapter 2: The literature review on history of GSM, the architecture of GSM system, the GSM function and the GSM channels are covered in this chapter.

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