

UNIVERSITI TEKNOLOGI MARA

**GMSK MODULATOR IMPLEMENTATION FOR
EARTH EXPLORATIONS SATELLITE SERVICE**

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ABSTRACT

Due to restriction of the spectrum for Earth Exploration Satellite Service (EESS) at 8.5 GHz X-Band allocation, the mission for EESS are looking higher order modulation scheme instead of traditionally phase shift keying (PSK) such as Quadrature Phase Shift Keying (QPSK), Offset Quadrature Phase Shift Keying (OQPSK) and 8-PSK. The main problems with the current modulation are the Bandwidth efficiency and the Inter-symbol Interference Tolerance. The objectives of this research are to analyze Gaussian Minimum Shift Keying (GMSK) perform in EESS, to identify the best BT value for better GMSK performance, to analyze the filtering effect to bandwidth (BW) in GMSK, to simulate GMSK in satellite communication using Matlab and to compare the performance of GMSK with the OQPSK filtering with square root raised cosine (RRC) in satellite communication. The methodology used in this study is identify the current OQPSK with RRC filtering method used such as the roll-off factor best value and its Bit Error Rate performance, designed and simulate the GMSK modulation by using the same method used in OQPSK in Matlab and finally compare the simulation result of GMSK with the OQPSK filtered with RRC. Besides, the BER performance is checked using the BER Tools in Matlab. The result shows that the GMSK performance is almost same as OQPSK in term of bit error rate (BER). However, the GMSK performance in terms of bandwidth efficiency is better compare to the OQPSK. Moreover, spectrum density shows that the GMSK gives constant sidelobe power. In conclusions, the GMSK could be used at lower data rates with a performance almost similar to the OQPSK filtered with RRC.

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CHAPTER I

INTRODUCTION

1.0 Background

Nowadays, Earth Explorations Satellite Service (EESS) is become more important to human. The EESS is giving the lot of information to the living organism on earth such as Atmospheric humidity and temperature, Clouds and precipitation, Sea surface temperature and soil moisture. This information sometimes helps to save human from the natural phenomena disaster.

As we all know EESS is a radio communication service between earth station and the satellite or space station. In which information regarding the earth characteristic and its natural phenomenon is taken by the active and passive sensors on the earth satellites. This similar to the data collected from the airborne or earth-based platform. The capabilities of the EESS sending the collected data or information to earth station is much depend on the transmitted signal purities. To ensure that the transmitted signals are pure, the digital modulation and pulse-shaping technique is played its important part at the transmitter site.

1.1 Contribution of study

Many of the EESS satellite now days are using the Phase Shift Keying (PSK) as its modulator, such as Quadrature Phase Shift Keying (QPSK), Off-set QPSK (OQPSK) or 8-PSK. Then the modulated pulse is shaped by the most effective filter for PSK either raised cosine (RC) or Square-root Raised Cosine (RRC). The OQPSK filtered with RRC has been proving for the very good modulation technique. The OQPSK receiver is typically employing integrate-and-dump type demodulator. Due to