

**DEVELOPMENT OF TEC MEASUREMENT AND CALCULATION
MODULE: CONVERSION PROCESS FROM TECs TO TEC_v**

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ABSTRACT

The dual frequency global positioning system (GPS) acts as an effective tool used to investigate the earth's atmospheric layers. Through a linear combination of GPS range and phase measurements observed on two carrier frequencies (L1 and L2) by terrestrial-based GPS receivers, the ionospheric total electron content (TEC) along oblique GPS signal paths may be quantified. This is why it is imperative to calculate the value of TEC_v. The TEC_v are more accurate than TECs due to the fact that the signals travel much lesser thus less propagation error. In this paper efforts are made to examine how the TECs is calculated and its conversion process to TEC_v from the RINEX file containing the GPS data. These values are than analyzed to find the significance of the elevation angle in the difference of the TECs and TEC_v values. The difference of the TEC readings in this paper was also tabulated to see the difference in the TEC values between the day and night time. This paper investigates the TEC covering the period of 10th of July 2006 and 8th of November 2005 in two different periods of time (day and night) in the same time interval of two hours using the data from receiver stations located at Universiti Sains Malaysia, Penang and Wisma Tanah Kuala Lumpur, KTPK respectively. Different satellite PRN tracks are chosen to obtain data with the best elevation angle. This is vital in order for this paper to calculate accurate TEC data.

TABLE OF CONTENTS

CHAPTER	CONTENTS	PAGE
1	INTRODUCTION	
	1.1 Project Overview	1
	1.2 Objectives	2
	1.3 Scope of the Project	3
	1.4 Organization of the Thesis	4
2	LITERATURE REVIEW: IONOSPHERE	
	2.1 Introduction	5
	2.1.1 Geophysics	7
	2.1.2 The Ionospheric Layers	8
	2.2 Ionospheric Variations	12
	2.2.1 Variations Due To The Solar Cycle	13
	2.2.2 Seasonal Variations	13
	2.2.3 Variations With Latitude	14
	2.3 Production and Loss of Electrons	14
3	LITERATURE REVIEW: GLOBAL POSITIONING SYSTEM (GPS)	
	3.1 Introduction	17
	3.1.1 Overview of GPS	17
	3.1.2 GPS System Description	19
	3.2 GPS Satellite Generations	21
	3.3 Satellite Signal	24
	3.4 An Overview Of Navigation Satellite System	26
	3.5 Dual Frequency GPS System	27
	3.6 Sources of GPS Signal Errors	28

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

The dual frequency global positioning system (GPS) acts as an effective tool used to investigate the earth's atmospheric layers. Through a linear combination of GPS range and phase measurements observed on two carrier frequencies (L1 and L2) by terrestrial-based GPS receivers, the ionospheric total electron content (TEC) along oblique GPS signal paths may be quantified.

This project focuses on the calculation and conversion process done in order to obtain slant Total Electron Content (TECs) and vertical Total Electron Content TEC_v from the Receiver Independent Exchange (RINEX) file containing the GPS data. These TEC values are then analyzed to find the significance of the elevation angle in the difference of the TECs and TEC_v values.

The analysis TEC is important to monitor behavior of the ionosphere as well as for practical application like satellite tracking, satellite to satellite communication, satellite to ground communication and all communication system by using satellite like satellite TV and satellite telecommunication.

There are other countries such as the likes of Europe, Japan and China had already have started TEC analysis over their own ionosphere region to improve satellite communication. There are not that many TEC analysis done over ionosphere in the regions above Malaysia. The ionosphere over Malaysia is unique because of it location near the equator line, which means that this region absorbs more solar radiation and ultra violet in comparison to European countries.