DETERMINATION OF TOTAL ELECTRON CONTENT WITH THE USE OF SELECTED PSEUDO- RANDOM NOISE CODE

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ABSTRACT

Total Electron content (TEC) measurements are made mostly using GPS data because of the good global coverage of the GPS observation network. TEC is an integral of electron density as the signals propagate from the satellites to the Global Positioning System (GPS) receivers and identified as the parameter of the ionosphere that affects most of radio signals. The transmitted GPS signals must propagate through the ionosphere layer at the atmosphere before reaching the surface. The ionosphere layer can cause the effect of the GPS due to the electron density at this layer. It is the main source of error in the GPS positioning. The problem is considered as the ionospheric delay at the ionosphere layer. Ionization process is mainly caused by solar radiation whereas the density of electrons is very much dependant on location (latitude, longitude and height), time of the day, season as well as sunspot cycle. By using data in RINEX format, this project focuses on determination of the total electron content at selected GPS receiver stations since GPS satellites are regularly identified by their pseudorandom-noise (PRN) code number which also acknowledged as the unique identifier for GPS satellites. Besides that, time of the day and analysis using matlab leveling process were considered for calculating mean TEC.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND STUDY

The Global Positioning System (GPS) is a space-based satellite navigation radio system which is used to verify the location and time information in space and on the Earth. GPS provides useful ionospheric information about an electron concentration through the signals travel between satellite and GPS receiver station. The signals of the GPS satellites must travel through the earth's ionosphere on their way to GPS receivers on or near the earth's surface. To achieve the highest possible positioning accuracies from GPS, one must correct for their carrier phase advance and pseudorange group delay imposed on the signals by the ionosphere [1]. The effects of the ionosphere can cause range-rate errors for GPS satellite users who require high accuracy measurements [2]. The parameter of the ionosphere that affects most of the radio signals is identified as total electron content (TEC).

Various methods have been developed for extracting TEC information from the amplitude and phase of GPS signal [3]. From the previous studies, researchers in Malaysia have also embarked in TEC studies around equatorial region. The studied on TEC parameters and comparing the data observed at Fraser Hill and compare the result with one at Parit Raja, Johor [4]. The location chosen were based on fountains effect and magnetic equator to study scintillation effect. Other research on TEC based on geographical location of GPS receiver stations estimated the TEC range errors [5]. This research paper intends to describe the study of the total electron content at selected GPS receiver stations identified by their pseudorandom-noise (PRN) code number and time of the day. TEC processed by using MATLAB software can be estimated.