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# **Study of Ionospheric Scintillation Observed with GPS at Helwan Station Egypt during the Rising Phase of the Current Solar Cycle**

## **THESIS**

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## ABSTRACT

The equatorial ionosphere predominantly shows the appearance of large plasma density fluctuations with a broad range of scale sizes and amplitudes. In the F-region, these night time ionospheric irregularities are usually referred to as Equatorial Spread  $F$  (ESF) or plasma bubbles (EPBs).

Ionospheric scintillation is a rapid change in the phase and/or the amplitude of a radio signal as it passes through these irregularities in the ionosphere. This phenomenon has the ability to affect both the accuracy and reliability of GPS systems. Ionospheric Scintillation varies with the Sunspot Number (SSN), geomagnetic activity, local time and geographical position.

In this study we investigate the ionospheric scintillation variability and its morphology with seasons, local time and geomagnetic activity during the period of 2010-2013. The used data was recorded by dual frequency GPS receiver installed at Helwan station, Egypt (Geographic coordinates:  $29.86^{\circ}$  N,  $31.32^{\circ}$  E).

The results show that the percentage of scintillation events is maximum during equinox months, followed by summer months and minimum during winter months. On the other hand, the maximum occurrence rate of scintillation events (about 50%) is observed during the equinoctial months of the highest solar activity levels of

the year 2013, the percentage is reduced to (about 37%) during the lowest solar activity levels of the year 2010. Also, variation of scintillations amplitude with geomagnetic activities was studied and found that scintillations repress during disturbed days than quite days during two years 2010 and 2012.