

**UNIVERSITI TEKNOLOGI MARA**

**DEVELOPMENT OF UITM-SID SYSTEM WITH  
NEAR REAL-TIME FEED FOR VLF  
MONITORING APPLICATION**

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## ABSTRACT

International Heliophysical Year (IHY; 2007-2009) has a remarkable impact on space and earth electromagnetism research and society. For Malaysian perspectives, it acts as a spiral point to the expanding of space weather-related research. The research activities involve installation of real-time Magnetic Data Acquisition System of Circum-pacific Magnetometer Network, i.e. MAGDAS/CPMN for space weather study and application, which was deployed for the IHY; 2007-2009. In addition to the MAGDAS system, a UiTM-Sudden Ionospheric Disturbance (UiTM-SID) system developed to understand the characteristics of the lower ionospheric layer (60-150km) during space weather events. SID is a condition of sudden high ionization occurred at the lower ionospheric D-region caused by solar activity namely solar flare. UiTM-SID system is located at Universiti Pendidikan Sultan Idris, UPSI (3.71°, 101.53°). The low layer ionosphere is important for submarine communication, ionospheric remote sensing, lightning research and some researcher stressed that lower layer ionosphere can be a precursor to earthquake event. Development of the system is to monitor the diurnal variation of the lower ionosphere layer and the activity of Solar flare by using Very Low Frequency (VLF) probing technique. The UiTM-SID system composed of a bidirectional 1-m<sup>2</sup> antenna, a 16 dB-gain pre-amplifier to amplify the signal, ADC converter and data acquisition system. The optimization of 1-m antenna received dual frequencies of 19.2 kHz and 19.8 kHz from South Vijayanarayanam, India (8.28°, 77.45°) and North West Cape, Australia (21.48°, 114.09°) respectively. Due to several issues with manual collection and data archival purposes, this research presents a near real-time data monitoring at an established university's website and data archival for the data monitoring and data backup. Notably, the data is received using File Transfer Protocol (FTP) for every 5 minutes and was stored in Google Drive cloud storage. MATLAB software is used to design and implement UiTM-SID near real-time data plotting. The system can detect solar flare event on 29<sup>th</sup> November 2016 with class C 7.5. After the analysis was made, it is proved that solar flare event gives significant impact with the amplitude increased about 12%. Furthermore, the standard deviation error bar analysis showed that the UiTM-SID data and established VLF receiver system known as UKM-SID data value are less than 10. It proved that the results are low in dispersion and the data are clumped around the mean. Thus, this research introduces a new way to monitor the variation of SID by having a near real-time feed plotting system. Hence, with the new system, researchers can monitor directly the event through the internet without having difficulty to plot the SID raw data manually.

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“Did We not expand for you, (O Muhammad), your chest? And We removed from you your burden. Which had weighed upon your back. And raised high for you your repute. For indeed, with hardship (will be) ease. Indeed, with hardship (will be) ease. So when you have finished (your duties), then stand up (for worship). And to your Lord direct (your) longing.

[Al Inshirah 1-8]

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