

Latest activities of i-SPES & Kyutech FM-CW project

*藤本 晶子¹、阿部 修司²、吉川 顕正²、池田 昭大³、廣重 優¹、中村 駿仁¹

*Akiko Fujimoto¹, Shuji Abe², Akimasa Yoshikawa², Akihiro Ikeda³, Yu Hiroshige¹, Hayato Nakamura¹

1. 九州工業大学、2. 九州大学国際宇宙惑星環境センター、3. 鹿児島工業高等専門学校

1. Kyushu Institute of Technology, 2. Kyushu University, i-SPES, 3. National Institute of Technology, Kagoshima College

An FM-CW (Frequency Modulated Continuous Wave) radar is a type of HF (High Frequency) radar. We have installed and operated four FM-CW stations along the Japanese longitude, in Japan, Russia, Philippine, and Peru, to measure the electric fields penetrating the ionosphere. One of the FM-CW project goals is to understand the relationship between Equatorial Electrojet (EEJ) and the generation mechanism of the Equatorial Spread F (ESF) associated with Equatorial Plasma Bubbles (EPBs).

Radio communications and radio navigation (GPS: global positioning system, GNSS: Global Navigation Satellite System) are used in worldwide and widely deployed in a variety of fields, for example, tracking, automated vehicle, clock synchronization or sport analysis. The structure of ionosphere is not stable and variable in the time of day, season, latitude, and solar activity, because of the differences of the energetic photo-ionization process. The irregularities and disturbances in the ionosphere cause various severe problems, for example, lower accuracy of the radio navigation due to GPS/GNSS scintillation, disruption in High Frequency (HF) radio wave bands or interference due to anomalous propagation, etc. Especially, more robust correction models for ionospheric GPS/GNSS delay errors are required to enhance the utility value of GPS/GNSS clock synchronization for the fifth generation (5G) wireless technology. Also, the real-time alert for interference on HF radio waves is necessary for the safety navigation.

We have been developing the SDR (Software-Defined Radio)-based scintillation detector system integrated with FM-CW and MAGDAS (<http://data.icswse.kyushu-u.ac.jp>) projects.

In this paper, we will present the following latest activities of our project: FM-CW observation data archive and QL search system on our website for public access, Proposal of a new detection method of Ionogram echoes, and latest status of development of software radio-GPS scintillation measurements.

キーワード：電離圏観測、FM-CWレーダー、ソフトウェアラジオGPSシンチレーション計測器

Keywords: Ionospheric observation, FM-CW radar, Software-Defined Radio-based GPS scintillation detector