

Study of the ionosphere with GNU Radio Beacon Receiver in Japan and southeast Asia

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We have been successfully conducted observations of total-electron content (TEC) of the ionosphere by the satellite-ground beacon experiment. A unique dual-band (150/400MHz) digital receiver GNU Radio Beacon Receiver (GRBR) were developed based on the recent digital signal processing technologies. The GRBR receivers were deployed first in Japan, and then in southeast Asia, and other areas. Data from the GRBR network were used for the investigations of variety of ionospheric phenomena. We have found mid-latitude summer nighttime anomaly (MSNA) over Japan, which is summer nighttime TEC enhancement at higher latitudes. Longitudinal "large-scale wave structures (LSWS)" in the low latitude were studied in detail as a source of equatorial Spread-F (ESF) events. Also we were successful to measure the equatorial ionospheric anomaly (EIA) in large latitudinal extent of at most +/-20 degrees in Thailand-west Indonesia region. GRBR was also used for rocket-ground experiment. However, many beacon satellites are now aging, and its number is decreasing. We now have a project to start new satellite-ground beacon experiment with new satellite constellations. One of them is TBEx (Tandem Beacon Explorer), a project by SRI International, to fly a constellation of two 3U cubesats with tri-band beacon transmitters. Another one is a project of FORMOSAT-7/COSMIC-2 by Taiwan/USA. Well-known mission of COSMIC-2 is GNSS occultation experiment, but the satellites carry tri-band beacon transmitters. We are now developing the next generation beacon receiver, GRBR2, that should be useful for these new projects. In this presentation we will review achievements with GRBR, and discuss possibility of the new satellite beacon experiment.

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