Using a Software Defined Radio to Receive the FORMOSAT-7 RF Beacon and Derive the Total Electron Content

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FORMOSAT-7/COSMIC-2 is a joint US-Taiwan six satellite constellation launched in 2019 focused on atmospheric and space weather. One of the payloads is a radio frequency (RF) beacon that transmits at 400 MHz, 965 MHz and 2200 MHz. By receiving two of these frequencies and calculating the phase difference, the ionospheric total electron content (TEC) can be derived. For this purpose, a simple RF beacon receiver was set up using the GNU Radio, a free and open-source signal processing software, and a Universal Software Radio Peripheral (USRP) software defined radio (SDR). We compare the results with the data obtained by existing ground based GNSS receivers to determine if the results are consistent.

Keywords: GNU Radio, FORMOSAT-7, USRP, beacon, total electron content (TEC)

