

# Ionospheric E-region Plasma Irregularities Measured by Space Plasma Sensor Package Onboard Sounding Rocket IX

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Space Plasma Sensor Package (SPSP) onboard Sounding Rocket IX was successfully launched from the south of Taiwan at 21:34 National Standard Time on 26 March 2014. It consists of a plasma impedance probe to measure electron density, a retarding potential analyzer (RPA) to measure ion temperature, an ion trap/ion drift meter/ion trap (IT/IDM) to measure ion currents and arrival angles, and a planar Langmuir probe to measure electron temperature. The RPA and IT/IDM are fabricated with high optical transparent electro-formed bonded gold meshes (100 LPI mesh density and 0.5 mil mesh thickness) in grid construction to minimize quasi-hysteresis effect. The two ion sensors are used as a pre-flight test of Advanced Ionospheric Probe for FORMOSAT-5 satellite scheduled to launch in 2017Q2. In the laboratory test, the current-voltage (I-V) curves measured by the SPSP indicate that PLP and RPA are almost free from contamination. In the flight test, all the sensors work well and meet design goals. During the up-leg path, nighttime E region is detected around 91-109 km altitude by IT/IDM and confirmed by the other sensors, RPA and PLP. An Es-layer is also found between 100 and 103 km altitude with peak at 101.6 km altitude. During the down-leg path, IT/IDM also detects the E region structure but cannot verify if the Es-layer exists due to weak current readings. It is noted that the preliminary geophysical parameters are derived without attitude calibration. The  $N_i$ ,  $V_i$ ,  $T_i$ , and  $T_e$  will be further calibrated according to attitude information from an onboard 3-axial fiber optical gyroscope and normalization on the I-V curves.

Keywords: Space Plasma Sensor Package, Sounding Rocket IX, Advanced Ionospheric Probe