

# PLANETIQ GNSS RO MEASUREMENTS OF THE IONOSPHERE

---

**R. Kursinski** (1), J. Brandmeyer(1), R. Gooch(1), A. Botnick (1), M. Leidner (2), C. Oliveir (2), S. Leroy (2), and Christian Alcala (2)

(1) PlanetIQ, Golden, CO, USA

(2) AER, Lexington, MA, USA

PlanetIQ now has two operational satellites on orbit. The first, GNOMES-2, has been operational since October 1, 2021 in a 525 km, 2 pm sun synchronous polar orbit. The second launched April 1, 2022 into an 11 AM 640 km SSO and has been operational since April 8.

Each satellite carries our new Pyxis GNSS RO receiver which tracks GPS, GLONASS, Galileo and BeiDou satellites, to acquire approximately 2700 daily ionospheric occultations, with pole-to-pole coverage. The number of ionosphere occultations from 2 PlanetIQ satellites is comparable to that from COSMIC-2's 6 satellites.

Total electron content (TEC) is derived from Pyxis dual frequency ranging and carrier phase data, along all available signal paths through the ionosphere for assimilation into space weather specification/forecasting systems. This includes removal of local multipath and phase leveling. We also derive electron density profiles. 50 Hz and higher rate data is available to characterize sporadic E layers with very high vertical resolution. The receiver measures S4 to characterize amplitude scintillations from 50 Hz and higher rate data. Shortly we will also deliver sigma-phi to characterize the phase scintillations as well as downlink the full complex signal for those occultations where S4 exceeds 0.3 to enable location of ionospheric turbulence along the signal paths.

Presently we are using two high latitude ground stations to deliver our data. We will be adding additional ground stations to reduce the latency. We are presently working to maximize the number of ionosphere observations that meet NOAA's 30 minute median latency specification for space weather measurements. Eventually, with additional ground stations, we can reduce median latency to 20 minutes or less.

We plan to deploy 20+ satellites by end of 2025 to acquire 60,000+ daily ionospheric occultations, with full global and diurnal coverage, delivering 1250 occultations every half hour, and an unprecedented, continuous, 4D characterization of the global ionosphere.

We will present a summary of initial measurement, calibration and validation results.