

Ionospheric scintillation diagnostics using LOFAR interferometer

The Low Frequency Array (LOFAR) is an excellent astronomical instrument as well as the very useful tool for studying irregularities in the ionosphere. Due to its operational frequency range (10-270 MHz), LOFAR is very sensitive even to very small changes in ionospheric electron density. The interferometric nature of the instrument allows for the multi-point observations, and, thus gives the possibility for ionospheric scintillation measurements over distances ranging from tens of meters to hundreds of kilometers.

Although scintillations itself are problematic in radioastronomy, because they decrease the accuracy of the measurements, they are excellent phenomena to study ionosphere, since they bear its characteristics as the scattering medium.

We are interested in both the morphology of ionospheric scintillation as well as in developing methods to measure the drift of irregularities. We work on the data delivered from single station/network of stations observations.

We have analysed the seasonal and daily dependence of the scintillation intensity in mid-latitude region, using observations taken by PL610 in single station mode. We have also investigated what impact the magnetic storm has on the ionospheric scintillation properties and behavior.

In order to describe the drift we have used data from whole network collected within the frame of the program dedicated to the scintillation monitoring over LOFAR. Spatial distribution of LOFAR station allowed to measure drift and to determine the anisotropy of the irregularities. We have performed theoretical studies on the simulated data, and applied the same method, that is based on the correlation analysis, to the real data measurements.