



Studying anisotropy of ionospheric irregularities with LOFAR instrument

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An electromagnetic (EM) wave which propagates through a medium with spatially variable refraction index is scattered on irregularities and superposition of contributions from each structure forms a complex diffraction pattern. Such fluctuations of EM wave, called scintillation, affect performance of many technologies that use EM signals: radio communication, satellite positioning, low frequency radioastronomy etc. Scintillating signals bear many characteristics of scattering medium and can provide information on the medium itself.

Currently, astronomy makes use of multi-point radio measurements for interferometric high-resolution celestial imaging, on a large scale. The scattering of distant radio sources emissions by an interstellar medium decreases the accuracy of the interferometry, but, gives, in turn, some information on the medium between source and receiver. Essentially, the multi-point interferometric measurement and LOFAR receiving frequency band make it a very good tool for studying ionospheric irregularities.

Taking into account fundamentals of radioastronomic interferometry and radiowave propagation in the ionosphere, we try to assess the ionospheric scintillation content in the LOFAR data. Using well known mathematical methods, basing on the correlation analysis, it is possible to determine geometry and sizes of the medium structures. We present the simple simulation studies as well as the LOFAR data analysis.