

The features of small-scale artificial field-aligned irregularities, induced by the O- and X-mode HF pumping by the EISCAT/Heating facility

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We present the results of investigations of small-scale artificial field-aligned irregularities (AFAIs) induced by an ordinary (O-mode) and extraordinary (X-mode) polarized HF pump waves [1],[2].

The research was made in operating hours of the EISCAT/Heating facility in Tromso via the multi-channel HF Doppler radio scatter receiver at the Gorkovskaya station, near Saint-Petersburg; via chirp ionospheric oblique sounders[3] on the Lovozero station - Gorkovskaya station radio path, on the Amderma - The Gorkovskaya station radio path, on the Sweden - The Gorkovskaya station radio path, on the Irkutsk - The Gorkovskaya station radio path and the Sodankylä - The Gorkovskaya station radio path; via the *CUTLASS radar in special mode of operation*[4].

It was shown that both, the O- and X-mode HF pumping, are led to the small-scale artificial field-aligned irregularities generation.

The comparative characteristics of AFAIs were made, based on diagnostic data such as the oblique sounding ionograms, spectral analysis of scattered HF signals and the CUTLASS radar data. Some special features were highlighted.

A possible mechanisms for the AFAIs generation induced by an X-mode HF pump waves are discussed.

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[1] Gurevich A.V. "Nonlinear effects in the ionosphere". Physics-Uspekhi. 2007. T. 50. № 11. pp. 1091-1121.

[2] Blagoveshchenskaya N.F. "Geophysical aspects of active impacts in near-Earth space" (in Russian) Saint-Petersburg, Gidrometeoizdat, 2001

[3] Иванов В.А., Куркин В.И., Носов В.Е., Урядов В.П., Шумаев В.В. ЛЧМ ионозонд и его применение в ионосферных исследованиях//Изв. Вузов Радиофизика. 2003. т.46, №11.с. 919-952.

[4] Lester M., Chapman P. J., Cowley S. W. H et al. Stereo CUTLASS: A new capability for the SuperDARN radars // Ann. Geophys. V. 22. P. 459 -473. 2004