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Dynamics of Self-consistent Powerful Radio-wave Absorption by Artificial Ionosphere Turbulence

A. V. Kochetov (1), Yu.E. Men'kova (2), S.M. Grach (2)

(1) Institute of Applied Physics, RAS, Nizhny Novgorod, Russia (2) Nizhny Novgorod State University, Nizhny Novgorod, Russia (kochetov@appl.sci-nnov.ru/Fax: +7-831-416-0616)

The numerical simulations of the self-consistent absorption of incident intensive electromagnetic wave due-to plasma turbulence excitation at the vicinity of reflection point in inhomogeneous plasma are fulfilled in the frameworks of driven nonlinear Schroedinger equation with pumping and damping. The dissipative property of turbulent plasma is taken into account by the dielectric constant imaginary part modification with effective collision frequency approach (V. D. Shapiro, V. I. Shevchenko, Handbook of Plasma Physics, Eds. A. A. Galeev, R N. Sudan, Elsevier, 1984, vol.2, p.119). The smooth and hard turbulence excitation regimes with different thresholds, various amplitude dependencies and saturation levels are considered. It is obtained that the transformation of electromagnetic wave into plasma waves leads to the strong electromagnetic wave damping and to the set of quasi-stationary plasma-wave interaction regimes (Kochetov A.V., Bubukina V. Ê, Mironov V. A., Terina G.I., Electromagnetically driven solitons in inhomogeneous overdense plasma, Physica D, Nonlinear phenomena, 2001,vol.152-153, p.723). The calculated reflection index dynamics agrees qualitatively to experimental results (B. Thide, E. N. Sergeev, S. M. Grach,T. B. Leyser, T. D. Carrozi, Competition between Langmuir and upper hybrid turbulence in an HF pumped ionosphere, Phys. Rev. Lett., 2005, vol. 95, no.25, p. 255002). The work is supported in part by Russian Foundation for Basic Research via the grant No. 06-02-17334.