Equations of a coherent model of a hot non-homogeneous plasma: Resonant frequencies of a cylindrical plasma column

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A system of eight equations with eight unknowns, describing a coherent model of a hot and non-homogeneous cylindrical plasma is established. The model is characterized by a non-constant electron equilibrium density, the density gradient being balanced by an electrostatic field. The system of equations reduces to a system of six first-order ordinary linear differential equations with variable coefficients. The tensorial generalization of the initial system for a plasma of arbitrary form is derived.

The resonant frequencies of a cylindrical plasma column corresponding to the proposed model is investigated. These proper frequencies are determined by the method of the scattering cross-section of the column relative to a plane homogeneous electromagnetic wave in which the electric field intensity is perpendicular to the cylinder axis and the magnetic induction is parallel to the cylinder axis.