INTERACTION OF NONLINEAR TRAVELING WAVES IN MHD TAKING INTO ACCOUNT THE HALL EFFECT [[1]](#footnote-1)\*)

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Gavrikov M.B., Taiurskii A.A.

Keldysh Institute of Applied Mathematics RAS, Moscow, Russia, mbgavrikov@yandex.ru, tayurskiy2001@mail.ru.

In the report, nonlinear waves traveling along a constant magnetic field with a constant velocity in a hot plasma were investigated in the approximation of an ideal (dissipative-free) Hall MHD. It is shown that in dimensionless form for a wave traveling along the x axis, the plasma parameters in the wave obey the following system of equations, from which they can be found.

 

where u is the longitudinal plasma velocity in the traveling wave reference frame, ,  is the transverse magnetic field,  is the dimensionless longitudinal magnetic field, *K* is the dimensionless internal energy of an ideal polytropic plasma with the adiabatic exponent ,  is the Budker number, ,  are the integration constants determined by the transverse electric field in reference frame of a moving wave,  is a material constant, where , ,  are the masses and charges of electrons (-) and ions (+),  is the Lagrangian coordinate, ,  is the wave phase, *a* is the wave velocity.

Numerical and analytical study of the presented system of equations made it possible to classify nonlinear traveling waves. It is shown that they are divided into three main types: nonlinear periodic oscillations, solitary waves, and nonlinear wave packets of oscillations. The interaction of solitary waves has been numerically investigated and it has been established that this interaction is similar to the elastic interaction of material particles, which retains its characteristics after interaction. In addition, it is shown that some plasma perturbations localized in space can decay into solitary waves. Finally, in the report, the interaction of wave packets of oscillations is analyzed numerically.

References

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