

P2.3006 Influence of charged particles on a strong shock wave of a neutral component in a weakly ionized gas

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See the full abstract here

<http://ocs.ciemat.es/EPS2019ABS/pdf/P2.3006.pdf>

The interaction of neutral and charged gas components is in a high interest of modern physics. This attention is caused mostly by the aerospace applications as well as for exploring the nonlinear wave processes in the near-Earth space (ionosphere). In this work, the interaction of strong shock waves (supersonic bodies) with low-ionized plasma is discussed.

The basic principles of nonlinear ion-acoustic waves formation in a weakly ionized nonisothermal gas ($T_e \neq T_n$) subjected to a strong stationary shock wave of the neutral component is studied on the base of computer-aided calculations and analytical methods. The ionacoustic approximation is employed to describe the plasma component of charged gas. Within a such approach the ion-acoustic waves arise via the collisions of charges with the neutral particles.

Recently, the ion-acoustic wave formation in a weakly ionized non-isothermal gas was considered in [1, 2], where the charged particles influence on neutral one was not taken into account. In this work, this problem was solved numerically with the use of scientific packages Comsol and Matlab.

Found in such analysis patterns reveal the additional mechanism for the reduction of the strong shock wave intensity of the neutral component without heating energy release in the region ahead of the front. The reciprocal action of the charged components on the neutral particles lead to significant modification of the structure and reduction of the intensity of the shock wave.

It is found that the low-ionized plasma (the nonperturbed state) effects strongly on the neutral component and reduces the shock wave intensity. The same physical picture was observed in the experiment [3].

References

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