GENERALIZED WIEDEMANN-FRANZ LAW AND ITS APPLICATION TO A STUDY OF THE SOLAR TRANSITION REGION PHENOMENA

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The generalized Wiedemann-Franz law for the non-isothermal quasi-neutral plasma with developed ion-acoustic turbulence is proved. This law determines the relationship between electrical and thermal conductivities in a plasma with well-developed ion-acoustic turbulence. The anomalously low thermal conductivity, which leads to the formation of high temperature gradients in the region of the temperature jump, is explained. These results are used to explain some properties of the solar chromosphere-corona transition region.

We have shown that the instability of ion-acoustic oscillations can be realized in a plasma without any current and particle fluxes, but with an anisotropic distribution function corresponding to the heat flux. We chose the model distribution function by taking into account the conditions imposed on the mass and heat fluxes. The growth rate of ion-acoustic oscillations was studied as a functional of the parameters of the distribution function. As a result, we determined the threshold condition for the anisotropic part of the distribution function under which ion-acoustic oscillations with wave vectors opposite to the heat flux begin to grow. We determined the local critical heat flux that corresponds to the ion-acoustic instability threshold.

In our opinion, there are good prospects for the studies of the effect of ion-acoustic oscillations on the structure of the transition region. The goal of this research is to develop a self-consistent model of heat transfer through the transition region with ion-acoustic turbulence and to compare theoretical conclusions with currently available experimental data.