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P4.1069 Axial electron conductivity in open magnetic trap

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The presented work is part of the fundamental research on the implementation of a controlled thermonuclear reaction in open-type magnetic traps. The interest in such systems is defined by the development of powerful neutron sources, which are necessary, in particular, to control hybrid fusion-fission reactors, and, with further development, the creation of purely fusion reactors for energy production. The main parameter from the applications point of view is the energy efficiency of the system, which rapidly increases with increasing of electron temperature. One of the factors limiting the electron temperature is the high thermal conductivity of the plasma along the magnetic field lines, which is determined by a number of complex kinetic processes in the expanders – regions of the expanding magnetic flux behind the magnetic plugs. The main goal of the work is to study this loss channel in detail and determine conditions under which these losses could be suppressed to levels acceptable for thermonuclear applications of mirror magnetic traps. All the experiments were performed on GDT [1] device in Budker Institute of Nuclear Physics. In previous work [2] experimental results describing the electric potential in the Debye layer near the surface of the plasma absorber and the average electron energy along the longitudinal coordinate were presented. The present work is devoted to measuring of energy carried out from the trap by one ion-electron pair along the length of the expander using a set of probes namely pyroelectric bolometer and ion flux probe. This dependence on the residual gas density in the expander tank has also been investigated. These data will make it possible to complete the theoretical model currently being developed [3], which describes the kinetics of processes in the expander of mirror trap.

1. A. Ivanov and V. Prikhodko, Plasma Phys. Controlled Fusion 55, 063001 (2013). 2. E. Soldatkina, et al. Physics of Plasmas 24, 022505 (2017). 3. D. Skovorodin, Physics of Plasmas 26, 012503 (2019).

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