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OPTIMIZATION OF TARGET PLASMA PARAMETERS AT THE CAT INSTALLATION

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A new CAT (Compact Axisymmetric Toroid) installation is an axially symmetric mirror with a powerful atomic injection. The purpose of the planned experiment is to create and study the confinement of a hot ions population with an extremely high $\beta \sim 1$. The possibility of switching to a field-reversed configuration (FRC) is also considered. It is assumed that two 2 MW, 15 keV hydrogen neutral beams will be injected into the target plasma. According to the results of earlier calculations [1], for the hot ions effective accumulation formed as a result of the neutral beams capture, it is necessary that the target plasma electron temperature is in the range of several tens eV, and the linear density is sufficient for the effective neutral beams capture. To generate a target plasma with the required parameters, a technique developed earlier for plasma injection into an ambipolar trap is used [2]. The essence of the technique is to use an arc-type plasma source, which has a discharge channel with an annular configuration and operates in a magnetic field. The plasma differential rotation resulting from the E×B drift leads to the Kelvin-Helmholtz instability development, which in turn causes plasma jet ions heating. Due to Coulomb collisions, ions transfer energy to plasma electrons. A thermal barrier is formed using a special magnetic coil to suppress the electronic thermal conductivity between the central cell and the plasma source.

The purpose of this research is to obtain the target plasma using this technique and optimize its parameters. Detailed studies of the target plasma parameters have been carried out. The results of the search for the optimal ratio between plasma linear density and its electron temperature for the capture and hot ions confinement have been described.

REFERENCES

[1] Tsidulko Yu. A., Chernoshtanov I. S. Particle-in-cell simulation of field reversal in mirror trap with neutral beam injection // AIP Conference Proceedings / AIP Publishing LLC. — Vol. 1771. — 2016. — P. 040005

[2] Akhmetov T. D. et al. Production and study of a high-temperature plasma in the central solenoid of the AMBAL-M device //Plasma physics reports. – 2002. – Vol. 28. – p. 750-755.