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PLASMA POTENTIONAL'S RADIAL DISTRIBUTION CONTROL FOR RESEARCH OF ITS ROTATION AND CAPTURE IN THE OPEN MAGNETIC TRAP WITH A HELICAL MAGNETIC FIELD SMOLA^{*)}

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Effective suppression longitude losses of the particles and energy from an open magnetic trap is staying unsolved issue in open magnetic systems. Experimental verification of the plasma helical confinement concept is carried out at the SMOLA device at BINP SB RAS [1, 2, 3]. In this concept plasma's longitude losses are regulated by forced plasma rotation due to E×B drift using magnetic field with helical symmetry [4]. Plasma deceleration or acceleration is predicted depending on the helical magnetic field direction relative to the plasma flow. The obtained results at the experimental device correlate [1, 2] with theoretical estimations.

The SMOLA device consists of 3 parts: a plasma source with an entrance expander, a transport (helical) section with necessary helical magnetic field configuration and an output expander where plasma exits to the radially segmented endplate. The efficiency of plasma confinement in this configuration is determined by the speed of its rotation in crossed radial electric and helical magnetic fields. Necessary radial distribution of electrical potentials in the plasma for its rotation is determined by the device's subsystems: the plasma gun, the input and output limiters of the transport section and endplate.

Electric potentials (fields) dynamic in the plasma is studied by a distributed complex of probe and optical diagnostics. Direct fields and potentials measurements are carried out by double emission probes. Doppler spectrometers with high spatial resolution allow to estimate the plasma rotation velocity's radial distribution and as a consequence the value of the plasma potential in assume of axial symmetry.

The results of a study of plasma electric potential's profile controlling using distributed potential biasing to the plasma gun, limiters in the helical section and sectioned endplate in the exit expander will be presented in the report.

References

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