DOI: 10.34854/ICPAF.51.2024.1.1.063

LINEAR PLASMA DENCITY MEASUREMENTS ON THE GOL-NB BY ATTENUATION OF THE BEAM OF FAST NEUTRAL ATOMS [*)]

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The GOL-NB facility is a linear axisymmetric open trap with corrugated magnetic mirrors. The starting plasma in the installation is created using an arc plasma gun, further heating is carried out using two injectors of fast neutral atoms with a total power of up to 1 MW [1]. Projected plasma parameters: ion temperature $T_i \sim 20$ eV, density in the central section with a reduced field $n = 3\times10^{19}$ m^{-3}.

To study the physics of plasma flow through a multiple-mirror system, the facility uses a number of diagnostic systems, one of which is based on measuring the linear plasma density by attenuation of a beam of fast neutral atoms. It is located in the middle of a long magnetic mirror on the opposite side of the starting plasma creation system. The diagnostic system is based on a wide-aperture ion source “Start”, which creates a beam of atoms with an energy of 8 keV and an aperture of 100 mm, covering the entire cross section of the plasma flowing through the magnetic mirror. The beam energy is adjusted to optimally measure its loss as it moves through the plasma. The transverse profile of the beam current is recorded using two sets of 15 secondary emission sensors located at the points? Where beam enters and exits the facility vacuum chamber. Control of the beam current at the entrance to the facility vacuum chamber allows one to significantly reduce the influence of beam current instability on the measurement result. Both sets of sensors have identical geometry and are located at a distance of 130 mm from the center of the plasma cord at the local zero point of the facility’s magnetic field. As a result, taking into account the beam divergence, the diagnostics has a transverse spatial resolution of 5.3 mm. The design of the diagnostic system is described in more detail in [2].

This report presents the results of measuring the linear plasma density profile in the output section of a corrugated magnetic field.

References

[1]. Postupaev V.V., Batkin V.I., Beklemishev A.D., Burdakov A.V., Burmasov V.S., Chernoshtanov I.S., Gorbovsky A.I., Ivanov I.A., Kuklin K.N., Mekler K.I., Rovenskikh A.F., Sidorov E.N., Yurov D.V.// Nuclear Fusion. 2017. V. 57. doi:10.1088/1741-4326/57/3/036012.

[2]. Никишин А.В., Иванов И.А., Баткин В.И., Бурдаков А.В., Куклин К.Н, Меклер К.И., Поступаев В.В., Ровенских А.Ф.// ФИЗИКА ПЛАЗМЫ, 2022, том 48, № 3, с. 213–222. doi: 10.31857/S036729212203012X

[*)] abstracts of this report in Russian