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P4.1088 New neutral beam injector for Globus-M2 spherical tokamak

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See the full abstract here:
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The choice of available auxiliary heating and current drive schemes is limited in spherical tokamaks (STs) due to tight aspect ratio, low toroidal magnetic field, and high plasma density approaching the Greenwald limit. The most successful heating and current drive method used to date in STs is Neutral Beam Injection (NBI). Toroidal magnetic field and plasma current will more than double in Globus-M2 ST [1], which could cause a significant increase in plasma density. Therefore, in order to ensure the optimal depth of atomic beam penetration into plasma before beam ionization, it is necessary to increase the energy of injected atoms. In order to enhance the power and duration of auxiliary plasma heating, NBI upgrade program for Globus-M2 stipulates the installation of a new neutral beam (NB) injector in addition to existent heating injector [2]. The main characteristics of new NB injector are as follows:
- maximum atomic beam power 1MW;
- maximum accelerating voltage 50kV;
- maximum ion beam current 40A;
- maximum beam pulse duration 1sec;
- beam divergence 1.2°;
- focal length 3.5±0.5m.

The paper (1) details NB injector structure, process of atomic beam formation, and the choice of optimal experiment layout, (2) discusses experimental results on discharge characteristics of high frequency plasma source, as well as its emissivity, (3) describes the dependence of beam divergence on its current and acceleration voltage, emission spectrum of the atomic beam, and power distribution across the NB, and (4) demonstrates that NB injector is capable of changing the NB power incrementally and modulating the injection power. With the installation of the new injector, Globus-M2 has greatly extended the range of accessible plasma parameters that are highly relevant to tokamak fundamental physics and machine operation studies and will strongly contribute to fusion neutron source projects. References: [1]. Minaev V.B., Gusev V.K., Sakharov N.V., et al., Nuclear Fusion, 57 (2017) 066047 [2]. Gusev V.K., Dech A.V., Esipov L.A., et al., Technical Physics, 52 (2007) No. 9, 1127-1143

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