Work Progress on GOL-NB Multiple-Mirror Trap

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The GOL-NB project is a next-step experiment on multiple-mirror plasma confinement in the Budker Institute of Nuclear Physics [1]. Currently, it enters the assembly state with the first plasma in a start configuration scheduled for the first half of 2018. The final configuration of the device will include a 2.5-m-long central gasdynamic trap with two attached multiple-mirror sections of 3 m each, and two end magnetic flux expanders that house a start plasma creation system, plasma receiver endplates and a system of biased electrodes for plasma stabilization. Plasma will be heated by two 0.75 MW, 25 keV neutral beams. The device is the deep reconstruction of the previous GOL-3 multiple-mirror trap; it reuses some part of the magnetic system and infrastructure from the latter. In the final configuration, GOL-NB will be a scaled-down physical model of a future fusion-grade reactor system.

The GOL-NB assembly schedule uses one of the engineering advantages of linear confinement systems. Fast start of commissioning of different subsystems and the first plasma can be achieved before readiness of the each component of magnetic and vacuum systems. Currently, the start configuration includes both expander tanks, a cold start plasma source, a multiple-mirror solenoid with 34 coils (instead of 2×28 coils in the final system), and a short temporary section for the on-site commissioning of NBIs.

Before start of the assembly, experiments with a prototype plasma source in the existing section of magnetic system were done. We demonstrated that a plasma stream from an arc source was successfully compressed by the converging magnetic field and transported through a 3-m-long vacuum system thus imitating the process of start plasma creation in GOL-NB. No significant differences of plasma transport in regimes with the multiple-mirror field from ones in a uniform magnetic field were found.

[1] V.V. Postupaev, et al., Nuclear Fusion, **57**, 036012 (2017).