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COMMISSIONING OF THE DINA-KI60 DIAGNOSTIC NEUTRAL BEAM ON THE T-15MD TOKAMAK ^{*)}

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Budker Institute developed and manufactured DINA-KI60 diagnostic neutral beam injector for the Kurchatov Institute Research Center [1]. The injector forms a beam of 60 keV atoms, an equivalent atomic current of about 2 A. The total active duration of the beam is 1 sec. in mode with 1:1 beam modulation. The full design pulse duration with beam modulation is up to 10 sec. The injector is developed based on a plasma source with an arc discharge generator. Fraction of atoms with full energy (by equivalent current) is more than 80%. The injector was successfully tested in April 2016 at the Budker Institute and during the experiments the main design parameters were demonstrated. Since 2016, the injector has been stored at the Kurchatov Institute Research Center.

In 2023, before the injector commissioning, the injector power system was modernized. The voltage on the second focusing electrode in a four-electrode IOS was formed using a resistive divider. During the modernization, an active voltage generation circuit was used on the second electrode, which ensures high stability of the focusing voltage regardless of the current to this electrode. Such modernization radically improved the reliability of diagnostic neutral beam at the ST-40 tokamak (TE, UK) in 2020 and at the reversed field configuration C-2W (TAE, USA) in 2021.

In September-October 2023, the mechanical assembly of the injector power system was completed on the lowest level of the T-15MD tokamak hall. The control system cabinet is located in the area where according to calculations, the residual field of the T-15MD magnetic system is about 20 Gauss. The injector vacuum tank was placed not far from the tokamak in temporary location. The injector worked on its own beam receiver.

During the tests, the main and auxiliary injector systems were checked separately and then together. The high voltage electrode system was preconditioned. Tests were carried out at a voltage of 56-59 kV. The current in the IOS pulling system was up to 4.6A. The injector operated in the beam modulation mode of 17x7ms. The total pulse duration was up to 0.3 sec.

In the next step, vacuum tank of the neutral beam will be installed on a special support (to be manufactured) and connect to the tokamak. The atomic beam will be used to determine the ion temperature and density of impurities in the plasma of the T-15MD tokamak using CXRS diagnostics [2].

References

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^{*)} [abstracts of this report in Russian](#)