DEVELOPMENT OF HIGH-VOLTAGE STAND for HEAVY ION BEAM PROBE DIAGNOSTICs

1,2Vadimov N.A., 1,2Drabinskii M.A., 1Melnikov A.V.

1National Research Center “Kurchatov Institute”, Moscow, Russia
2Moscow Institute of Physics and Technology (State University), Dolgoprudniy, Russia

The heavy ion beam probe is the only method for measuring the potential in the hot plasma region in thermonuclear toroidal devices, such as tokamak and stellarator. In addition to direct and local potential measurements, this method allows simultaneous measurement of local oscillations of the electron density and oscillations of the poloidal magnetic field. HIBP is currently being developed for the T-15MD tokamak, which is being built at the Kurchatov Institute. The aim of the work is to develop a high-voltage high-vacuum experimental stand for adjusting the ion-optical system and calibrating the HIBP energy analyzer before installing the diagnostics on the T-15MD. Also at this stand will be carried out to obtain diagnostic beams of high intensity.

The stand is located on the diagnostic platform of T-10 tokamak. High-voltage elements are located at a distance that excludes electrical breakdowns at a voltage of 300 kV. The resulting model should reflect all the design features of the stand, as it is the basis for the construction of a real device.

The work presents the following stages of creating the stand: the solid model of the device and its environment, calculation of the electric field strength around the high-voltage part of the device, the design of the stand elements (ion injector, beamline, ionization chamber, vacuum pumping system, analyzer, system of fixating the elements to the platform), the location of the elements of the stand on the T-10 diagnostic platform.

References

1. M.A. Drabinskii. Technical aspects of the plasma electrical potential measurement by heavy ion beam probing – Computational nanotechnology, 2018, № 1, 62–70