A prototype of high-voltage neutral beam injector, based on acceleration of negative hydrogen ions and their neutralization is under development at the Budker Institute of Nuclear Physics (BINP). The design of BINP high-voltage injector includes several innovative components, important for modern plasma physics research, including the development of negative ion beams. The prototype of plasma neutralizer was constructed and tested. It was founded that a relatively low power of the discharge is required to sustain plasma density \( n \sim 10^{19} \text{cm}^{-3} \) in the plasma volume with the inversed end mirrors.

The full-scale RF H- source with the projected total negative ion beam current of 9 A, energy up to 120 keV and pulse duration up to 1 s was designed at BINP. The cross section of the source is shown in Fig. 7. It includes four RF place drivers, attached to the 600 mm expansion plasma chamber, and the 4-electrode ISS, forming the beam with 242 mm. The emission density of angle beam is 25 m/A. An additional pumping of the ISS area through the peripheral windows in the ISS chamber is projected. ISS electrostatics thermo stabilization by circulating of thermal current through the internal channels will be provided.

**PROTOTYPE OF PLASMA NEUTRALIZER**

The prototype of plasma neutralizer was constructed, and it experiments with neutral beam injection are currently performed. The photo of neutralizer is shown in Fig. 9. The complex magnetic field configuration of the neutralizer is produced by an array of circular permanent magnets. This configuration (multiscale at the wafting longitudinal in the plasma volume with the inverse end mirrors) provides the plasma confinement. Plasma is generated by the arc discharge, the magnetic field, installed at the periphery of the central plane. Working (hydrogen) is injected to the chamber central plane. It was observed, that the considerable negative potential is developed in the plasma, decreasing the ion outflow, and the plasma losses through the ends are suppressed by the inverse magnetic mirrors. It was founded that a relatively low power of the discharge is required to sustain \( n \sim 10^{19} \text{cm}^{-3} \) density plasma in the plasma neutralizer prototype with the inverse end mirrors.

**CONCLUSION**

The first experiments on negative ion beam acceleration and transport through the LEBT and HEBT were carried out at the BINP high voltage injector prototype. The beam was post-accelerated from initial energy 84 keV to 120 keV, and up to 35% of the produced 0.6 A H- beam was transported to the calorimeter mirror. The beam compression by wide-aperture quadrupole magnets was successfully tested. The obtained data on beam angular divergence and transport efficiency is in a good agreement with the COMSOL and IRISIMU calculations. The transport efficiency can be increased up to 90% due to increase of the beam initial energy up to projected 120 keV, and enlarging of the acceleration tube inlet aperture diameter from 26 to 36 cm.

The full-scale RF H- source with the projected total negative ion beam current of 9 A, energy up to 120 keV and pulse duration up to 1 s was designed at BINP. The cross section of the source is shown in Fig. 7. It includes four RF place drivers, attached to the 600 mm expansion plasma chamber, and the 4-electrode ISS, forming the beam with 242 mm. The emission density of angle beam is 25 m/A. An additional pumping of the ISS area through the peripheral windows in the ISS chamber is projected. ISS electrostatics thermo stabilization by circulating of thermal current through the internal channels will be provided.

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[1] Sotnikov, O. I. et al. Development of high-voltage negative ion based neutral beam injector (N-NBI) is under development at the Budker Institute of Nuclear Physics SB RAS. It is intended to test the beam transport efficiency and acceleration to the high negative ion beam current. Data on plasma neutralization target is presented as well. A description of full-scale negative ion source with the beam current up to 9 A will be shown.

[2] Sotnikov, O. I. et al. Introduction. The high-voltage negative ion beam formation, acceleration and transport through the LEBT and HEBT are described in this section. The experimental results on negative ion beam formation, acceleration and transport through the LEBT and HEBT are shown. The schematic of the acceleration tube geometry and the electric connections, used in the experiments are presented.

[3] Sotnikov, O. I. et al. Introduction. The high-voltage negative ion based neutral beam injector (N-NBI) is under development at the Budker Institute of Nuclear Physics SB RAS. It is intended to test the beam transport efficiency and acceleration to the high negative ion beam current. Data on plasma neutralization target is presented as well. A description of full-scale negative ion source with the beam current up to 9 A will be shown.

[4] Sotnikov, O. I. et al. Development of high-voltage negative ion based neutral beam injector (N-NBI) is under development at the Budker Institute of Nuclear Physics SB RAS. It is intended to test the beam transport efficiency and acceleration to the high negative ion beam current. Data on plasma neutralization target is presented as well.

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