# Long-Pulsed Negative Ion Beam Production and Transport

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An experimental long-pulsed negative-ion-based neutral beam injector for plasma heating and current drive in magnetic fusion device is under construction at Budker Institute of Nuclear Physics (Novosibirsk). The injector scheme comprises separate 120 keV H- ion source, the Low Energy Beam Transport (LEBT) section and 1 MeV accelerator. The LEBT section is the innovative element of the project and it is necessary to prevent the harmful secondary particles from entering into the accelerator. The report presents the first results on negative ion production in the RF multiaperture surface-plasma source and beam transport through the LEBT section.

The original BINP ion source uses a 40kW RF driver to produce plasma, the magnet system to confine plasma in the source expansion chamber, to filter plasma electrons near the plasma grid and to deflect the co-extracted electrons from the beam. To enhance surface-plasma negative ion production the deposition of cesium is applied. A four-electrode ion-optical system is used for beam extraction and acceleration. The electrode cooling system provides heat removal during the beam pulse by the circulation of heat transfer fluid, while plasma and extraction grids were kept at high temperature between pulses to prevent the cesium accumulation.

The generated negative ion beam current profile was directly measured by Faraday cup in the LEBT and by calorimeter after the LEBT at distance ~ 4 m from the source. The beam production with intensity above 0.6 A, energy 86 kV and the pulse duration up to 25s is described.