Inductively Driven Surface-Plasma Negative Ion Source for N-NBI use

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A stable H- beam with a current ~1A, energy 90 kV, and pulse duration up to 7 s was routinely extracted and accelerated from the long-pulse surface-plasma source prototype, developed at BINP for N-NBI use. The H- ions are produced on the hot surface of a plasma grid, covered by cesium and illuminated by fast plasma particles from the inductively driven radio-frequency discharge. A multiaperture, five-electrode ion optical system is used for beam formation. The essential BINP source features are: 1) an active temperature control of the ion-optical system electrodes by circulation of hot thermal fluid through the channels, drilled in the electrode bodies, and 2) the directed cesium deposition to the plasma grid electrode using a long tube, connected to the plasma grid periphery [1]. The long term effect of cesium was obtained just with the single cesium deposition. The high voltage strength of ion-optical system electrodes was considerably improved with actively heated electrodes. The 90 keV H- beam is transported to the entrance of the high-voltage post-accelerator with the help of the low energy beam transport section.

References