

## Beam Extractions of a Prototype Long Pulse Ion Source for the KSTAR NBI System

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### Abstract

Preliminary beam extraction experiments of a prototype long pulse (300 s) ion source were carried out on the NBI Test Stand for the KSTAR. The prototype ion source consists of a magnet bucket plasma generator with multi-pole cusp fields, similar to the US LPIS, and a set of tetrode accelerator with circular apertures. Arc discharges of the plasma generator have been controlled precisely by both a space-charge-limited mode and an emission-limited mode. The emission-limited operation, well controlled by the applied heating voltage of cathode filaments, of plasma generator resulted in more efficient and stable discharges than the space-charge-limited mode. An optimum arc efficiency of 0.33 A/kW and maximum ion density of  $8310^{11} \text{ cm}^{-3}$  were obtained by using a Langmuir probe. Optimum beam perveance of the prototype ion source, which was deduced from the ratio of gradient grid current to the beam current, was 0.52. The preliminary beam extraction results obtained at  $\leq 41 \text{ kV}$  appear less than the expected.

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## Development of High Voltage Power Supply for PEFP Proton Accelerator RF system

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### Abstract

The requirements of the high voltage power supply for PEFP Proton Accelerator RF systems are 100 kV, 20 A with the conditions that both the voltage ripple and regulation are less than 1 %, and energy deposition in the klystron at the tube arc is less than 20 J. The high voltage power supplies for the RFQ and the DTL are designed and fabricated. The high voltage power supply of RFQ consists of IVR, Transformer/Rectifier, and Igintron Crowbar switch. For DTL, it consists of thyristor controller, Trasformer /Rectifier, and IGBT opening switch. The both systems are tested and the results satisfy the all requirements.