

# Measurement of Electron and Ion Dynamics in a Cesium Seeded Negative Ion Source for Neutral Beam Injector

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Understanding of the particle dynamics in the arc plasma is an important issue to enhance the hydrogen-negative-ion ( $H^-$ ) current in the large-scaled negative ion source for neutral beam injectors, to extract stably the  $H^-$  beam current and the beam divergence. The accumulation of the experimental database is also important to the numerical modeling of the arc plasmas and process on  $H^-$  production. The fundamental plasma parameters, which are the electron density, its temperature, cesium (Cs) vapor pressure, the photo-work function on the plasma-grid (PG) surface, in a large-scaled negative ion source are measured. The parameters are measured using Langmuir probe, Cs ionization gauge [1], and an optical fibre inserted in the arc chamber.

Usual probe tip made of tungsten melts near the hot filament due to the high electron current to the tip. To avoid the problem, carbon probe tip is applied. The distributions of the floating potential and plasma potential are shown in Fig. 1. The discharge voltage and the input arc power are 72 V and 50 kW, respectively. The Langmuir probe is scanned at the same depth-position of the filaments installed at the sidewalls of the arc chamber, and the minimum distance between the probe tip and filament is about 2 mm.

The plasma parameters and heat flux in the vicinity of PG and local work function on the surface of PG are measured. Those parameters are affected by the field structure mainly induced by the electron deflection magnets inside the extraction grid.

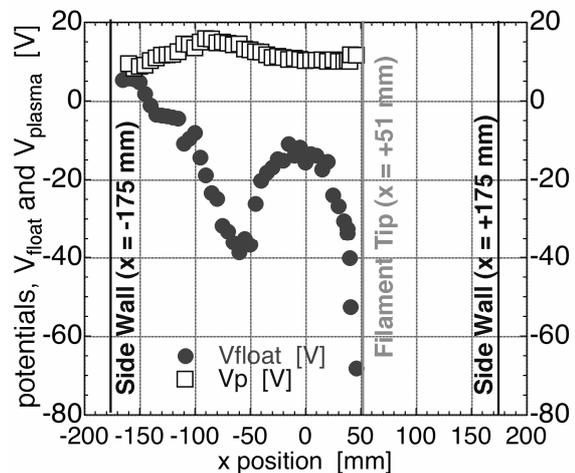


Figure 1. Distribution of floating and plasma potentials at the same depth-position of filament at the sidewall.

## References

[1] M. Bacal (private communication)

**Topic:** 2.  $H^-$  and  $D^-$  Sources for Fusion, accelerators and other applications

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