



Contribution ID: 56

Type: Poster

Empirical Study of Multidimensional Child-Langmuir Law with Plasma Ion Source Extraction Using Round Apertures

One dimensional Child-Langmuir (C-L) law is commonly used in ion source physics to describe space charge limited ion extraction from the plasma. However, C-L law is not strictly valid for plasma ion sources as the emission surface is dynamically changing plasma meniscus, not a fixed planar electrode. The applicability of the recently developed 3D C-L law to positive ion extraction from filament-driven ion source was studied experimentally. Extracted Ar⁺ currents were measured as a function of extraction voltage in space charge and plasma limited regions comparing different aperture sizes. Effects of the meniscus on the emission were studied using ion beam simulations with IBSimu. Results indicate agreement with the theory in the space charge limited region, as larger apertures lead to smaller current densities. However, saturation current densities and the voltage required to reach the saturation depend on the aperture size as well, which is due to the dynamic nature of meniscus.

E-mail for contact person

satakoso@jyu.fi

Funding Information

Primary author: KOSONEN, Sami (University of Jyväskylä)

Co-authors: Dr KALVAS, Taneli (University of Jyväskylä); Dr TARVAINEN, Olli (UKRI-STFC); Dr TOIVANEN, Ville (University of Jyväskylä)

Presenter: KOSONEN, Sami (University of Jyväskylä)

Session Classification: Poster Session 1

Track Classification: Beam extraction, transport, and diagnostics