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Response of Negative-Ion Beamlet by Insulation Tip in the Vicinity of Plasma Grid

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Negative ion transport from metal surface to meniscus of plasma grid in negative ion source with cesium seeding is useful to design high performance ion sources and has been reported in previous works, most of which are simulation studies. Some of experimental studies estimated the main transport route of negative ion by comparing ion beam currents with the several shapes of negative-ion production surfaces. Experimentally to perform the transport analysis in further detail, we introduced a beamlet monitor in a beam line and insulation tip in the vicinity of the plasma grid to the NIFS-RNIS (Research and development Negative Ion Source of National Institute for Fusion Science) which is a large-scaled multi-apertures negative-hydrogen ion source with cesium seeding. The plasma grid metal surface is the main production area of the negative hydrogen ion forming beam. The beamlet monitor can observe the each beamlet intensity and shape of multi beamlets. The insulation tip can move in three dimensions. The beamlet intensity decreased when the insulation tip was put not only on the plasma grid aperture but also above the plasma grid aperture at least several mm from the plasma grid surface. The beamlet intensity does not much change when the insulation tip was put on the metal surface near the plasma grid aperture. The main transport route can be interpreted as negative-hydrogen-ions once spread to the space in the vicinity of plasma grid and is extracted as beam from the space. In this article, we report the transport of the negative-hydrogen ion through the response of the beamlet by the insulation tip three dimensionally positioned in the vicinity of the plasma grid.

Author: NAKANO, Haruhisa (National Institute for Fusion Science)

Co-authors: KISAKI, Masashi; TSUMORI, Katsuyoshi (National Institute for Fusion Science, The Graduate University for Advanced Studies); IKEDA, Katsunori (National Institute for Fusion Science, The Graduate University for Advanced Studies); Dr NAGAOKA, Ken-ichi (National Institute for Fusion Science, The Graduate University for Advanced Studies); Dr KAMIO, Shuji (National Institute for Fusion Science, The Graduate University for Advanced Studies); Dr FUJIWARA, Yutaka (National Institute for Fusion Science, The Graduate University for Advanced Studies); Dr OSAKABE, Masaki (National Institute for Fusion Science, The Graduate University for Advanced Studies)

Presenter: NAKANO, Haruhisa (National Institute for Fusion Science)

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