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Langmuir-probe measurement in the vicinity of plasma grid aperture of hydrogen negative ion source

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Hydrogen negative-ion source is widely used in the field of high energy particle physics and nuclear fusion science, but the extraction mechanism of hydrogen negative-ion, which is produced at the surface of Plasma Grid (PG) of the source, is not clear. Recent experimental analysis on beam phase-space structure suggests that the non-uniform negative-ion density distribution was formed near the extraction hole and this non-uniformity causes three components of negative-ion beam in the phase-space [1].

In order to evaluate the behavior of negative-ion in the vicinity of the extraction hole at PG, a Langmuir-probe measurement was performed using NIFS Research and development Negative Ion Source (NIFS-RNIS). From the probe measurement scanning the position of the tip along the aperture axis going across source plasma area to beam area, we found a region where I-V curve characteristics significantly changes when the extraction voltage is applied. This suggests the probe passes through the plasma-beam interface (meniscus). The initial experimental results of measuring the meniscus will be introduced in the presentation.

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