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Effect of RF Electric Field on Beam Focusing in Negative Ion Source Plasma

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Optimization for beam focusing of negative ions is one of the important issues for developing neutral beam injector (NBI) for ITER. Low beam divergence less than 5 mrad has been realized with Filament-Arc (FA) type negative ion sources. On the other hand, the divergence with Radiofrequency (RF) type sources is over 2 times larger than that obtained with FA sources, and the ITER requirement on the divergence less than 7 mrad has not been achieved so far.

In this study, the beam focusing is investigated when the RF electric field is externally applied in the beam extraction region of the FA source (NIFS-RNIS). A RF antenna is installed in the beam extraction region, and the RF electric field with a frequency range of 4-8 MHz is applied. A beamlet shape is measured, and the responses of beamlet width and beamlet axis position to the RF field are experimentally observed. It is found that the beam focus of negative ions is deteriorated with the RF electric field.

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