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Observation of beam emittance reduction due to gas sheet injection for beam profile measurement

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To realize more stable operation of a high-intensity ion beam accelerator with a minimum beam loss, we have developed a non-destructive beam profile monitor detecting photons produced by interaction between the beam and a gas sheet injected into the beam line. The gas-injection-type profile monitor should induce scattering of the beam particles, and the beam emittance is considered to become larger. On the other hand, the beam-gas interaction may also induce space-charge neutralization of the beam. The plasma produced by the beam-gas interaction cancels the electric potential of the beam, and emittance growth due to the beam space-charge force is inhibited; the emittance relatively becomes small. To evaluate the effect of gas sheet injection on the beam, we have measured the phase space distribution of the 3 MeV, 60 mA H⁻ ion beam with/without the gas sheet injection. As the result, the root mean square value of the beam emittance was constant or decreased against the increase in the amount of the injected gas-sheet flux.

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Footnotes

I have read and accept the Privacy Policy Statement

Yes

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