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Analysis of beam properties for laser plasma RF ion source

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The development of high-intensity, high-quality ion sources is essential for advanced applications such as particle beam therapy and nuclear physics experiments. The aim of this study is to integrate the Laser Plasma RF Ion Source (LaPRIS), currently under development, into the cyclotron at the Research Centre for Nuclear Physics (RCNP) in order to accelerate ion bunches with high precision and intensity for advanced applications. LaPRIS can generate laser-plasma in an RF field at the laser focus spot and produce bunches at arbitrary timings. Previous research* has achieved a proton beam with a peak current of 1.2 mA and a bunch width of 5 ns. This allows the charge per bunch to be increased by a factor of 100 compared to conventional systems. This makes it possible to track the beam behavior for each bunch, which has potential applications in high-intensity cyclotron research. The injection into the cyclotron must be matched to the acceptance, so the emittance of the beam bunches is measured under different laser characteristics and target conditions to investigate the beam properties.

Footnotes

*Y. Fuwa, Y. Iwashita, H. Tongu, S. Inoue, M. Hashida, S. Sakabe, M. Okamura, A. Yamazaki, "RF synchronized short pulse laser ion source", Review of Scientific Instruments 87,02A911(2016).

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