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Development of a High-Gain Residual Gas Ionization Profile Monitor (HGRGIPM) for the slow extraction proton beamline at the J-PARC Hadron Experimental Facility

Tuesday 9 September 2025 16:00 (2 hours)

We have developed a highly sensitive beam profile monitor, the High-Gain Residual Gas Ionization Profile Monitor (HGRGIPM). The HGRGIPM detects electrons ionized by the proton beam in residual gas, which are guided by electric fields to a phosphor screen. The fluorescence is collected by an optical system. RGIPMs have proven to be powerful diagnostic tools for high-intensity beams because they have non-destructive nature. They have been used as the main profile monitors in the primary beamline, A-line (30 GeV, 83 kW, vacuum ˜0.3 Pa). However, the newly constructed B-line (11 W) presents a significant challenge, as its beam intensity is four orders lower than that of the A-line. To overcome this issue, several improvements were made in the design of the HGRGIPM. These include the use of a thin phosphor screen to enhance the signal-to-noise ratio, optimizing electrode geometry for higher acceleration voltages and improved sensitivity, and incorporating a high-efficiency optical system. These innovations allow profile monitoring even in the low-intensity B line. In this presentation, we report on the HGRGIPM's design and performance, beam response measurements, and future prospects.

Footnotes

Funding Agency

I have read and accept the Conference Policies

Yes

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