Contribution ID: **2429** Contribution code: **SUPS056** Type: **Student Poster Presentation**

Design of a novel high-precision beam diagnostic beamline

Sunday 1 June 2025 14:00 (2 hours)

A novel high-precision beam diagnostic system has been designed for slice emittance and energy spread measurements. The 20-meter diagnostic platform integrates eight quadrupoles, a deflecting cavity, and an energy spectrometer, achieving 100fs temporal resolution in both operational modes through the same beamline layout. The emittance measurement mode provides 50-fold horizontal magnification, while the energy spread measurement mode reaches 1.71 keV theoretical energy resolution through optimized dispersion and screen rotation. Comprehensive error analysis confirms measurement precision of 3.05%±0.69% for relative emittance changes and 4.82±1.35 keV for energy spread variations, demonstrating the effectiveness of this flexible design for high-precision beam diagnostics.

Footnotes

Paper preparation format

Word

Region represented

Asia

Funding Agency

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Session Classification: Student Poster

Track Classification: MC6: Beam Instrumentation and Controls,Feedback and Operational Aspects: MC6.T03 Beam Diagnostics and Instrumentation