



Contribution ID: 22 Contribution code: THB12

Type: Invited Oral Presentation

Nondestructive beam energy measurement using RF cavity beam arrival time monitor

Thursday, 12 September 2024 11:20 (30 minutes)

Beam energy is one of the key factors for those free electron laser facilities (FEL). There are several methods to detect the beam energy. One of the commonly used nondestructive systems measures the bunch position in a magnetic bunch compressor with a beam position monitor (BPM). A chicane stripline beam position is utilized for this purpose at the Shanghai Soft X-ray FEL facility (SXFEL). However, this method is highly related to the initial bunch position before entering the chicane. A new nondestructive beam energy measurement system is proposed, which uses two cavity-based bunch arrival time monitors to measure the bunch flight time. This paper introduces the development of this system, including the design details, build-up, as well as measurement results. Moreover, it also covers the comparison of the two different bunch energy measurement methods from several aspects: bunch position-based and bunch flight time-based.

Footnotes

Funding Agency

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Yes

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Session Classification: THB: Machine Parameter Measurements

Track Classification: MC8: Machine Parameter Measurements