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Longitudinal beam profile monitoring in ILSF based on Smith-Purcell, transition, and diffraction radiation

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Seeking non-invasive beam profile monitoring for the Iranian Light Source Facility (ILSF), we propose a novel approach based on the utilization of Smith-Purcell, transition, and diffraction radiation. The ILSF is a synchrotron radiation facility with a storage ring capable of providing electron bunches up to 3 GeV. The Smith-Purcell radiation is generated when a charged particle passes over a periodic structure, while transition radiation is generated when a charged particle passes through a boundary between two media. Diffraction radiation is generated when a charged particle passes through a slit or grating. To analyze the radiation spectra, we use the Martin-Puplett interferometer, which provides valuable information about the bunch duration. The proposed method is aimed at identifying the key parameters that affect the performance of ILSF. By using this approach, we can monitor the electron bunches and observe any deviation from their trajectory. This can provide a powerful tool for optimizing ILSF performance.

Footnotes

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