



Contribution ID: 512 Contribution code: WEPG32

Type: **Poster Presentation**

Impact of octupoles on the Schottky spectra of bunched beams

Wednesday, 22 May 2024 16:00 (2 hours)

Schottky monitors serve as non-invasive tools for beam diagnostics, providing insights into crucial bunch characteristics such as tune, chromaticity, bunch profile, or synchrotron frequency distribution. However, octupole magnets commonly used in circular storage rings to mitigate instabilities through the Landau damping mechanism, can significantly affect the Schottky spectrum. Due to the amplitude-dependent incoherent tune shift of individual particles, the satellites of the Schottky spectrum are smeared out as the octupolar field increases. This study investigates the impact of octupoles and their incorporation into theory, with the goal of improving beam and machine parameter evaluation from measured spectra. Theoretical findings are validated through macro-particle simulations conducted across a range of octupole strengths, encompassing typical operational conditions at the Large Hadron Collider.

Footnotes

Funding Agency

Paper preparation format

LaTeX

Region represented

Europe

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Session Classification: Wednesday Poster Session

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