IPAC'24 - 15th International Particle Accelerator Conference



Contribution ID: 1972 Contribution code: MOPG07

Type: Poster Presentation

Dispersion orbit detection by orbit harmonic analysis and potential applications

Monday, 20 May 2024 16:00 (2 hours)

Electron storage rings in synchrotron light sources are typically composed of \boxtimes identical sectors that repeat over the ring. Transverse plane betatron frequencies are not an integer harmonic of the beam revolution frequency to avoid that accelerator imperfection effects are turn-by-turn amplified causing beam losses. Consequently, orbit variations induced by ring parameters not affecting beam energy, do not show periodicity equal to \boxtimes , while variations affecting energy do generate dispersion orbits with \boxtimes periodicity. In the relativistic case, the beam energy in a ring is set by its closed orbit length (defined by the RF frequency) jointly with the field in bend magnets. Ring thermal expansion/compression causes energy variations and periodic dispersion orbits. In the frequency domain, the real-time amplitude of these orbits can be determined from their \boxtimes spectral line magnitude and phase. This info can be used in orbit feedbacks to adjust the RF to remove orbit dispersion components avoiding conflict with the corrector magnet action. Initial measurements performed at the Advanced Light Source in Berkeley to validate the technique are presented. Additional application possibilities are also discussed.

Footnotes

Funding Agency

Work supported by the Director of the Office of Science of the US Department of Energy under Contract no. DEAC02-05CH11231.

Paper preparation format

LaTeX

Region represented

North America

Primary author: SANNIBALE, Fernando (Lawrence Berkeley National Laboratory)
Co-author: HELLERT, Thorsten (Lawrence Berkeley National Laboratory)
Presenter: SANNIBALE, Fernando (Lawrence Berkeley National Laboratory)
Session Classification: Monday Poster Session

Track Classification: MC2: Photon Sources and Electron Accelerators: MC2.A04 Circular Accelerators