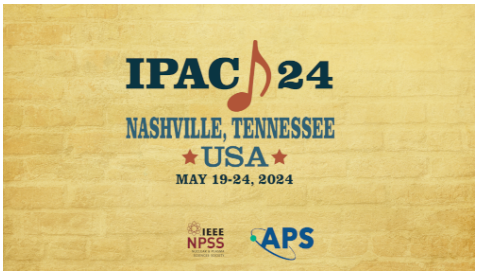

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Dispersion orbit detection by orbit harmonic analysis and potential applications

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

Electron storage rings in synchrotron light sources are typically composed of 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 , while variations affecting energy do generate dispersion orbits with 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 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

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