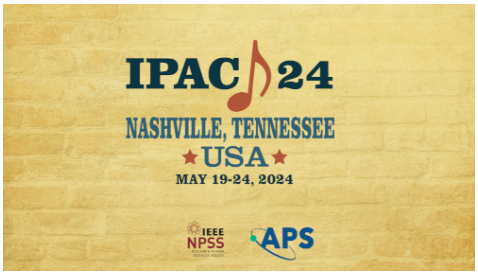

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Longitudinal Phase space density tomography constrained by the Vlasov-Fokker-Planck equation

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

Understanding the evolution of complex systems with numerous interacting particles requires advanced analytical tools capable of capturing the intricate dynamics of the phase space. This study introduces a novel approach to longitudinal phase space density tomography in an electron storage ring, leveraging constraints imposed by the Vlasov-Fokker-Planck equation. The Vlasov-Fokker-Planck equation provides a comprehensive description of the evolution of density functions in phase space, accounting for both deterministic and stochastic processes. Measurements of the turn-by-turn bunch profile offer a time-dependent projection of the phase space. Observing the bunch profile evolution of charged particles in regimes characterized by a rich phase space dynamics presents a challenging inverse problem for reconstructing the phase space densities.
In this work, we present a tomographic framework for reconstructing the longitudinal phase space density of an electron bunch at the Karlsruhe Research Accelerator (KARA). This framework utilizes simulated data and applies the Vlasov-Fokker-Planck equation to drive the reconstruction process.

Footnotes

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