Contribution ID: **177** Type: **Contributed Oral**

Application of Optical Stochastic Cooling Mechanism to Beam Shaping

Thursday, 10 November 2022 10:50 (20 minutes)

Stochastic Cooling is a feedback system for cooling particle beams in storage rings which uses radiation produced by the beam to correct the average deviation of temporal slices with a duration inversely proportional to the bandwidth. Optical Stochastic Cooling (OSC) uses optical wavelengths which decreases the duration of each slice and, therefore, reduces the incoherent noise each individual particle observes. Particles pass through an undulator (the pickup) where they emit radiation which is amplified and reintroduced downstream in another undulator (the kicker). The optical delay and amplification system, in combination with the relatively short sample slices, provides a potential tool to shape the phase-space of a beam. We outline and simulate two potential methods for shaping the longitudinal phase-space (LPS) of a beam using the OSC mechanism. The first modulates the amplification of the undulator radiation each turn which can be used to focus the cooling into a specific degree of freedom and produce flat beams in LPS. The second non-uniformly amplifies longitudinal sections of the undulator radiation pulse. This may target cooling to specific regions of the beam. Using the two techniques together we demonstrate how the OSC setup can be used to produce micro-bunches with arbitrary separation.

Acknowledgments

This work was supported by U.S. National Science Foundation under award PHY-1549132, the Center for Bright Beams

Primary author: DICK, Austin (Northern Illinois University)

Co-author: PIOT, Philippe

Presenter: DICK, Austin (Northern Illinois University)

Session Classification: WGs 5+7 Joint Session

Track Classification: Working Group Parallel Sessions: WG7 Oral: Radiation Generation and Advanced Concepts