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Demonstration of Flat/Round Transformations of Angular Momentum and Space Charge Dominated Electron Beams

Wednesday, 10 May 2023 16:30 (2 hours)

We describe an experiment to demonstrate Derbenev's flat-to-round (FTR) and round-to-flat (RTF) optical transformations, *designed to match electron beams from a high-energy storage ring into and out of a solenoidal cooling channel. We are using a linear transport system with a design optimized by a computationally-efficient adjoint moment equation technique developed by our group for general application to beam optical systems**. We will explore cases on FTR/RTF, first with low space charge, followed by further examples with significant space charge, comparing simulations to beam measurements and reoptimizing the design as needed to test alternative experimental configurations. Our goal is to experimentally and computationally test the Derbenev scheme, which has not been done in its entirety, and to carry out a rigorous, experimental validation of the adjoint moment equation techniques.

Funding Agency

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Footnotes

- Ya.S. Derbenev, "Advanced optical concepts for electron cooling;" Nuclear Instruments and Methods in Physics Research A 441 (2000) 223-233
- ** L. Dovlatyan, et al., "Optimization of flat to round transformers with self-fields using adjoint techniques," PHYSICAL REVIEW ACCELERATORS AND BEAMS 25, 044002 (2022)

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Yes

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