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ADJOINT OPTIMIZATION OF CIRCULAR LATTICES

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Design of circular lattices involves optimizing figures of merit (FoMs) characterizing the beam properties subject to the constraint that the beam distribution function be approximately periodic in trips around the lattice. We are developing an algorithm that accomplishes this with minimal computational effort. The algorithm takes advantage of recent developments in adjoint techniques that allow the derivatives of the FoM with respect to the many parameters describing the lattice to be evaluated. The present description of the accelerator is based on the 10 second moments of the beam distribution function in the transverse phase space. However, extensions to kinetic descriptions will be discussed. Our algorithm, which we name “Adjoint with a Chaser”, works as three separate minimizations run concurrently. These three working together force the beam into a periodic state, while varying parameters to minimize an FoM. Examples relevant to the Maryland lattice UMER will be presented.

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Primary authors: ANTONSEN, Thomas; Dr DOVLATYAN, Levon (University of Maryland); EINARSSON, Alex (University of Maryland); Dr HABER, Irving (University of Maryland); Prof. O'SHEA, Patrick (University of Maryland)

Presenter: ANTONSEN, Thomas

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