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Minimizing dispersion through resonant extraction for BNL's NSRL

Tuesday 3 June 2025 16:00 (2 hours)

Simulations, analysis, and measurements are performed on the BNL Booster's third integer resonance extraction to the NSRL line, which uses a constant optics slow extraction method. In this method, ring dipoles and quadrupoles are changed synchronously for a coasting beam, which aids in maintaining a fixed separatrix orientation through the spill. Simulations show that the outgoing beam has a very small dispersion, independent of the periodic dispersion value at the septum. We show using a first-order normal form approximation that transforms to the Kobayashi Hamiltonian, how the dynamics of such a spill lead to a dispersion-free outgoing beam, which is critical to the uniformity requirements of the NSRL. Finally, we measure the dispersion of the beam by varying the flattop energy of the coasting beam in the booster before engaging the spill and show that the magnitude of dispersion is reduced by over a factor of 5 from the periodic value.

Footnotes

Paper preparation format

LaTeX

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Author: HAMWI, Eiad (Cornell University (CLASSE))

Co-authors: DHITAL, Bhawin (Brookhaven National Laboratory); SAGAN, David (Cornell University (CLASSE)); HOFF-STAETTER, Georg (Cornell University (CLASSE)); BROWN, Kevin (Brookhaven National Laboratory); ADAMS, Petra (Brookhaven National Laboratory); OLSEN, Trevor (Brookhaven National Laboratory)

Presenter: HAMWI, Eiad (Cornell University (CLASSE))

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