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Incoherent dynamics of intense proton beams under electron cooling

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The minimum emittance of ion beams achieved using electron cooling is limited by the heating processes of Intra Beam Scattering and diffusion driven by resonance crossing of particles due to space-charge. We describe a new experiment to explore the intense space-charge regime with a transverse tune shift approaching -0.5 using 2.5 MeV protons at the Integrable Optics Test Accelerator (IOTA) at Fermilab. We also report on the results from PyORBIT simulations incorporating transverse space-charge and electron cooling with emphasis on the incoherent dynamics of the particles.

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