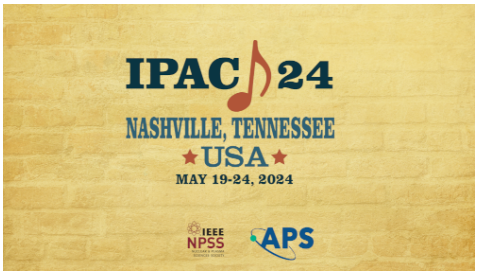

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Interplay of space charge, emittance, and angular momentum in a flat-to-round transformer

Thursday, 23 May 2024 16:00 (2 hours)

We present simulations compared to an experiment based on Derbenev's flat-to-round (FTR) transformation designed to match an electron beam from a high energy storage ring into a solenoidal cooling channel. Our experiment transports a large-aspect-ratio electron beam through a skew quadrupole system and a long solenoid. We focus on examining the complex dynamics of FTR systems in low-energy electron beams where space charge is a major factor. We explore the interplay of angular momentum imparted by the skew quadruples with emittance and space charge in the transport system. We have found that while the envelope equations accurately predict averaged beam parameters, beam evolution details depend on the initial beam distribution. We present simulation results that illuminate the complex interplay of emittance, space charge, and angular momentum in non-ideal beam distributions, and we test our understanding against experimental results described elsewhere in these proceedings.

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