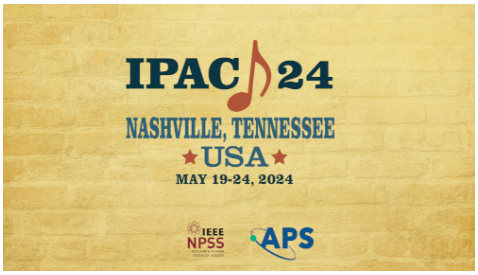

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Luminosity effects due to dependent heavy-tailed beams

Monday, 20 May 2024 16:00 (2 hours)

The luminosity of particle colliders depends, among other parameters, on the transverse profiles of the colliding beams. At the LHC at CERN, heavy-tailed transverse beam distributions are typically observed in routine operation. The luminosity is usually modelled with the assumption that the □-□ planes are independent (i.e. statistically uncorrelated particle distributions between the planes) in each beam. Analytical calculations show that the solution of inverting 1D heavy-tailed beam profiles to transverse 4D phase-space distributions is not unique. For a given transverse beam profile, the distributions can be dependent (i.e. statistically correlated) or independent in the transverse planes, even in the absence of machine coupling. In this work, the effect of transverse □-□ dependence of the 4D phase space distribution on the luminosity of a particle collider is evaluated for heavy-tailed beams.

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