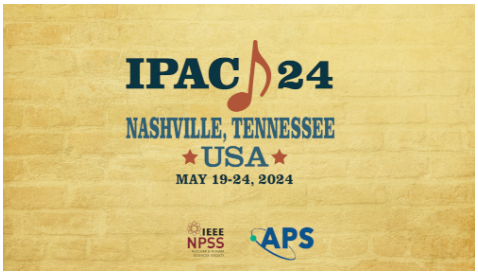

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BAGELS: A General Method for Minimizing the Rate of Radiative Depolarization in Electron Storage Rings

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

We present a novel method for minimizing the effects of radiative depolarization in electron storage rings by use of vertical orbit bumps in the arcs. Electron polarization is directly characterized by the RMS of the so-called spin orbit coupling function in the bends. In the Electron Storage Ring (ESR) of the Electron-Ion Collider (EIC), as was the case in HERA, this function is excited by the spin rotators. Individual vertical corrector coils in the arcs can have varying impacts on this function globally. In this method, we use a singular value decomposition of the response matrix of the spin-orbit coupling function with each coil to define a minimal number of most effective groups of coils, motivating the name "Best Adjustment Groups for ELectron Spin" (BAGELS) method. The BAGELS method can be used to minimize the depolarizing effects in an ideal lattice, and to obtain fine-tuning knobs to restore the minimization in rings with realistic closed orbit distortions. Furthermore, the least effective groups can instead be chosen for other applications where no impact on polarization is desirable, e.g. global coupling compensation or vertical emittance creation. Application of the BAGELS method has significantly increased the polarization in simulations of the 18 GeV ESR, beyond achievable with conventional methods.

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