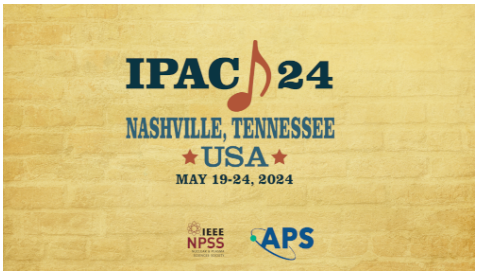

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A new beam-based method to calibrate the relative gains of the beam position monitor pick-up electrodes at the Cornell Electron Storage Ring

Wednesday, 22 May 2024 16:00 (2 hours)

The Cornell Electron Storage Ring (CESR) beam position monitors (BPM) consists of four button-shaped pick-up electrodes, each individually instrumented with readout electronics that allow acquisition of turn-by-turn data. The beam position is reconstructed using the measured signal amplitude from the four electrodes. Systematic effects such as physical differences between the electrodes (displacement, tilt) and gain differences between the readout electronics bias the measured amplitudes, thus the measured beam position. A novel beam-based method to measure the relative gains has been developed and validated using Monte Carlo simulations, and has been successfully deployed at CESR. It relies on solving a system of equations for different beam positions and simultaneously for the relative gains, knowing the response map of the pick-up electrodes as a function of beam position. The typical implementation uses 9 beam positions at one BPM with horizontal and vertical spatial separation greater than 500 microns. The main limitation of the method is time; it takes about 15 minutes to collect data for a single/few BPMs, making it impractical to calibrate all the 100 BPMs. We are planning on using a transverse resonance island buckets (TRIBs) lattice demonstrated at CESR to allow collecting 9 beam positions at all BPMs at once in a matter of minutes. This paper will present the new method, its use, and how its performance compares to the previous technique developed in 2010.

Footnotes

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