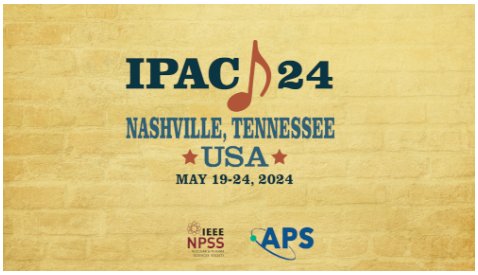

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Predicting the multi-turn channelling efficiency of a 7 mrad-bending silicon crystal in the Large Hadron Collider for TeV-range proton energies

Tuesday, 21 May 2024 16:00 (2 hours)

A double-crystal fixed-target experiment is planned for installation in CERN's Large Hadron Collider (LHC). This experiment features a 7 cm-long bent silicon crystal, with 7 mrad bend-angle to deflect particles produced by proton interactions with a target. As this crystal is more than an order of magnitude longer than any other installed in the LHC, it requires specific characterization, alignment, and testing. Testing will begin using the LHC's proton beam at different beam energies, before considering studies of interactions with particles out scattered from a target. Using a particle tracking program, we simulate the expected signals from the angular alignment of this unique crystal with multi-turn halo particles of the circulating LHC proton beam. A range of beam energies is considered to evaluate the performance, as particles with a spread of energies are anticipated downstream of the target following the interactions of the 7 TeV proton beams in the final experiment. The simulation results predict the crystal's multi-turn efficiency as a function of energy and serve as a benchmark for the commissioning process to integrate this long crystal into the LHC.

Footnotes

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