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Demonstrating beam splitting through stable islands formed by the third-order resonance at the CERN Super Proton Synchrotron

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In recent years, several new beam manipulation techniques have been proposed that exploit the crossing of nonlinear resonances and the use of stable islands of the transverse phase space. One such manipulation is a novel approach to slow extraction, which combines particle trapping in stable islands with the use of bent crystals to reduce losses on the extraction septum. As a first step towards testing this approach, measurements were performed at the CERN Super Proton Synchrotron (SPS) to demonstrate beam splitting using stable islands of the third-order resonance generated and controlled by sextupole and octupole magnets. The phase-space topology was reconstructed by displacing the beam and observing the turn-by-turn evolution of the signal of the beam position monitors. The beam splitting was achieved by varying both the machine tune and the radial steering of the beam. The measurement results were found to be in excellent agreement with the tracking simulations.

Footnotes

Paper preparation format

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Region represented

Europe

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