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Explore higher order transverse resonance island buckets at the Cornell electron storage ring

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Transverse resonance island buckets (TRIBs) near a third-order resonance are observed at the Cornell Electron Storage Ring with a newly-designed lattice. Hamiltonian perturbation theory and map-based PTC method have been successfully implemented to design the TRIBs lattice and find the fixed points near the third-order resonance. For higher order resonances (fourth order and higher) which are intrinsically weaker, the effects of radiation damping and excitation may not be negligible in the lepton machine such that the Hamiltonian approach could break down. In this paper, we study TRIBs near the fourth-order and fifth-order resonances with tracking simulations, which predict the existence of islands in both orders. Then experimental observations confirmed the existence of islands near the fourth-order resonance. The positions of the fixed points extracted from experimental results agree reasonably well with those predictions from both tracking and PTC calculations. Experimental exploration of the fifth-order resonance will also be briefly discussed.

Footnotes

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Primary author: WANG, Suntao (Cornell University (CLASSE))

Co-author: KHACHATRYAN, Vardan (Cornell University (CLASSE))

Presenter: KHACHATRYAN, Vardan (Cornell University (CLASSE))

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