Contribution ID: **1653** Contribution code: **WEPL110** Type: **Poster Presentation**

Nonlinear Dynamics of Scaling FFAs

Wednesday, 10 May 2023 16:30 (2 hours)

Fixed Field Alternating Gradient Accelerators (FFAs) that follow the conventional scaling law have –by definition –high order multipole components in their magnetic fields. It is the presence of these nonlinearities that in many cases determines several important properties of the machine, including amplitude-dependent tune shift and dynamic aperture. Consequently, understanding of the nonlinear dynamics in these machines can be critical to design and optimisation processes. Study of these properties is made challenging by the complicated nature of closed orbits in many FFAs and the presence of edge angle effects (which are exploited by design in certain lattice configurations, such as the F-D spiral design chosen as the baseline for the FETS-hFFA prototype ring). This poster presents a novel method of nonlinear analysis based on the combined application of harmonic analysis and truncated power series algebra-derived techniques.

Funding Agency

STFC

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Session Classification: Wednesday Poster Session

Track Classification: MC5: Beam Dynamics and EM Fields: MC5.D02: Non linear Single Particle Dynamics Resonances, Tracking, Higher Order, Dynamic Aperture, Code Deve