

Accelerator Physics and Technology Seminar

Isochronous and Period-Doubling Stability Diagrams

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Date: Tuesday, January 14

When: 4:00 pm CST

Where: One West (WH1W) and Zoom

Abstract: Symplectic mappings are fundamental models for understanding complex behavior in accelerator physics. Central to this exploration is the effective visualization of stability regimes, which facilitates interpreting how systems evolve under varying conditions. In this presentation, we introduce the use of two complementary diagrams: the isochronous and period-doubling. These tools provide a comprehensive framework for representing system bifurcations and identifying groups of symmetric periodic orbits that emerge during typical bifurcations of equilibrium orbits. We present both qualitative and quantitative explanations of the key features within regions of bounded motion. Additionally, we extend the application of these techniques to systems with multiple reversibilities, such as octupole magnets and longitudinal dynamics in thin RF stations. Finally, we explore a novel mechanism for regularizing and stabilizing motion through the use of the twistless orbit — a trajectory characterized by vanishing nonlinear detuning.