**Chromaticity Considerations for Nonlinear Integrable Lattices**

**Abstract:**

The nonlinear integrable lattices of the proposed IOTA ring are susceptible to chromaticity-induced tune spread. In conventional accelerator rings, sextupoles are used to correct the linear chromaticity. We present preliminary studies of how sextupole correction can affect integrable dynamics in IOTA.

**Summary:**

Nonlinear integrable optics [1] is a promising route to large tune spreads to suppress parametric resonances such as beam halo [2]. The Integrable Optics Test Accelerator (IOTA) has been proposed to study the practical implementation and beam dynamics of integrable lattices [3]. The ring [4] and its special purpose nonlinear magnets [5] are currently under construction.

A critical effect to be studied is chromaticity, the energy-dependent focusing that can lead to broken invariants. We present here preliminary studies of how linear chromaticity effects beam dynamics in a simplified model of the IOTA lattice. Also, we examine how the use of sextupoles for chromaticity correction affects the dynamic aperture and integrability particle trajectories.

[1] V. Danilov and S. Nagaitsev, Phys. Rev. ST-AB 13, 84002 (2010).

[2] S. Webb et al., “Effects of Nonlinear Decoherence on Halo Formation,” (2013), submitted to PRSTAB; http://arxiv.org/abs/1205.7083

[3] A. Valishev et al., “Beam Physics of Integrable Optics Test Accelerator at Fermilab,” Proc. IPAC, TUPPC090 (2012).

[4] E. Prebys, "Protons in IOTA Ring," presented at 2nd ASTA Users Meeting (Fermilab, June 2014).

[5] F. O‘Shea, "Non-linear IOTA inserts," presented at 2nd ASTA Users Meeting (Fermilab, June 2014).