

# **ACCELERATOR SEMINAR**

## **“An Accelerator Lattice with Non-Linear Transverse Motion Integrable in Polar Coordinates”**

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Several families of nonlinear accelerator lattices with integrable transverse motion were suggested recently [1]. One of the requirements for the existence of two analytic invariants is a special longitudinal coordinate dependence of fields. This research presents the particle motion analysis when a problem becomes integrable in the normalized polar coordinates. This case is distinguished from the others: it yields an exact analytical solution and has a uniform longitudinal coordinate dependence of the fields (since the corresponding nonlinear potential is invariant under the transformation from the Cartesian to the normalized phase-space coordinates). A number of interesting features are revealed: while the frequency of radial oscillations is independent of the amplitude, the spread of angular frequencies in a beam is absolute. A corresponding spread of frequencies of oscillations in the Cartesian coordinates is evaluated via the simulation of the transverse Schottky noise and Frequency Map Analysis technique (FMA). A monochromatic beam motion was examined under different perturbations such a linear optics perturbation or nonlinear lens misalignment.

[1] V. Danilov and S. Nagaitsev, *Phys. Rev. ST Accel. Beams* 13 084002 (2010).

**Coffee before seminar at 10:45 a.m.**

**Thursday, December 13, 2012**

**11:00 a.m.**

**CEBAF Center, Room F113**