ACCELERATOR SEMINAR

"Methods for Computing the Stability and Chaotic Regions of Non-Linear Differential Equations with Periodic Coefficients"

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Proposed presentation will be devoted to the investigation of some type of nonlinear differential equations. Motivated by a number of particle and plasma physics problems (Fermi, Pasta and Ulam: Zabusky: Ermakov, Courant and Snyder).

We propose methods and investigate the parametric resonance, stability and chaotic regions of some non-linear differential equations arising in particle and plasma physics. Numerical scheme is presented for computing the boundaries between the stable and unstable regions of Hill type of equations. The approach based on formulating an integral representation of equation. Thus, the problem of finding the boundary between the stable and unstable regions in parameter space is then a spectral problem of an integral operator. The numerical scheme has a number of advantages of the classical methods for locating the stability boundary. Several examples will be presented.

For investigation of chaotic and pre-chaotic regions in parameter space for some type of nonlinear ordinary differential equations, we propose an approach based on Method of Multiple Scales (MMS). As a demonstration we investigate lateral vibrations of a moving current-carrying a conductive string in a homogeneous magnetic field. We assume direction sof the magnetic field and the motion of the string coincide. Non-linear resonance vibrations of a moving string are investigated when a periodic non-stationary current flows through the string. Domains of parameters are defined when the string falls into pre-chaotic state (i.e. the frequency of vibrations is doubled). At the end of the presentation we are planning discuss the group properties and the associated Lie algebra for complete integration of ordinary or partial differential equations.

Coffee before seminar at 10:45 a.m.

Tuesday, March 21, 2013
11:00 a.m.
CEBAF Center, Room F113

Jefferson Lab

For further info, please contact Alex Bogacz at x5784 or Anne-Marie Valente at x6073