Joint DESY and University of Hamburg Accelerator Physics Seminar

Tuesday, October 11-th, 2005

(16:00 in Room 459/30b)

What's So Great About KAM Theory?

H. Scott Dumas

University of Cincinnati

Abstract

The acronym KAM stands for mathematicians A.N. Kolmogorov, V.I. Arnold, and J. Moser. In the context of classical finite–dimensional Hamiltonian systems, KAM theory is a collection of results that guarantee the persistence of integrable–like behavior in nearly integrable systems (i.e., systems whose integrability has been broken by a small perturbation). In particular, the theory guarantees the persistence of "invariant tori" containing "quasiperiodic solutions."

Mention of the KAM theorem is often accompanied by the adjective "celebrated"; back in the 20th century, it was occasionally even called the "theorem of the century." But KAM theory also has detractors who say it is vastly overrated, not nearly as deep or as useful as claimed. Between these two poles of opinion lie many mathematicians and physicists who are simply unfamiliar with the theory or its implications.

In this mostly non–technical talk, I will give a broad overview of KAM theory, its history and its ramifications, and if time permits, I'll present some of the arguments for and against its significance and usefulness in such areas as celestial mechanics, statistical physics, and accelerator beam dynamics.

D.P.Barber (MPY), J.Rossbach (Univ. HH) and M.Vogt (MPY).