

BILLIARD LIKE POTENTIALS. THEORY AND APPLICATIONS

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What kind of solutions do multi-dimensional nonlinear Hamiltonian systems admit? This is a difficult open question, especially when far from integrable systems are considered. We develop a paradigm for studying this question for a class of Hamiltonian systems: smooth mechanical systems with potentials that may be decomposed to a sum of an integrable part and of a steep potential part.

Three applications of this paradigm will be discussed:

- 1) The destruction of ergodicity in some multi-dimensional smooth steep systems that limit to uniformly hyperbolic multi-dimensional dispersing billiards and its relation to the Boltzmann ergodic hypothesis.
- 2) Simple models for tri-atomic co-linear reactions and other scattering systems.
- 3) Robust particles accelerators.