Abstract Submitted
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On the emergence of quantum chaos from anisotropic interactions between ultracold Lanthanide atoms[1] CONSTANTINOS MAKRIDES, ALEXANDER PETROV, Department of Physics, Temple University, Philadelphia, Pennsylvania 19122, USA, EITE TIESINGA, JQI and QuICS, National Institute of Standards and Technology, Gaithersburg, MD 20899 USA, SVETLANA KOTOCHIGOVA, Department of Physics, Temple University, Philadelphia, Pennsylvania 19122, USA — Ongoing experiments in the trapping and cooling of magnetic Lanthanide atoms have enabled investigations into the effects of their complex internal electronic structure on collision dynamics. Conceptually, complex-structure atoms are a middle ground between simple atomic system, such as alkali metals, and molecules. Gaining an understanding into the nature of the interactions between these atoms will in the future aid in modeling of the even-more complex molecular collision physics. Recently, we found that the collision between two Erbium atoms contains a dense set of Feshbach resonances over a modest magnetic field range. Furthermore, we found that the distribution of spacings between the resonances resembles a Wigner-Dyson distribution indicating the existence of quantum chaotic behavior. What was not understood, however, is to what degree the long-range atom-atom interactions play a role in the emergence of chaos. We show in this presentation that as a result of the complex internal structure of these atoms it is the anisotropic component of the interactions that leads to the emergence of quantum chaos. We base this observation on the exact calculations of the near-threshold bound-states of both Erbium and Dysprosium.

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