Dynamical stabilization of the kicked hydrogen atom

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Abstract

We analyze the quantum dynamics of the one-dimensional periodically kicked Rydberg atom. The time-dependent Schrodinger equation is solved by employing a non-unitary representation of the period-one evolution operator in a finite basis set which accounts for the outbound probability flux. We find a direct correspondence between stable classical islands in phase space and the quantum Husimi distributions of stable Floquet states. More surprisingly, we find quantum localization for very high- frequency perturbation. In this case, stable Floquet states are localized in the region of phase space where the corresponding classical Poincare map displays a chaotic sea. The relation between quantum localization and the unstable periodic points will be discussed.