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Computing Rydberg Electron Transport Rates via Classical Periodic Orbits SULIMON SATTARI, KEVIN MITCHELL, Univ of California - Merced — Electron transport properties of chaotic atomic systems are computable from classical periodic orbits. This technique allows for replacing a Monte Carlo simulation launching millions of orbits with a sum over tens or hundreds of properly chosen periodic orbits. Such computations are easiest to realize in sufficiently unstable systems dominated by a few short orbits. However, phase spaces exhibiting a mixture of chaos and regularity present a greater challenge, due to the rich dynamics in the vicinity of stable islands. Homotopic Lobe Dynamics (HLD) uses information encoded in the intersections of stable and unstable manifolds of a few orbits to compute almost all hyperbolic periodic orbits in a system. We compute the ionization rate for a Rydberg atom in parallel electric and magnetic fields. We apply HLD to compute orbits for parameters exhibiting both mixed and fully hyperbolic phase spaces. The ionization rate computed from periodic orbits converges exponentially to the true value as a function of highest period used. We then use periodic orbit continuation to accurately compute the ionization rate when the field strengths are perturbed. The ability to use periodic orbits in a mixed phase space could allow for studying transport in arbitrarily complex physical systems.

Sulimon Sattari
Univ of California - Merced

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