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Chaos-induced pulse trains of cold atoms in a double Gaussian trap KEVIN MITCHELL, University of California, Merced — In previous work, we predicted that a hydrogen atom, placed in parallel electric and magnetic fields, would ionize by emitting a train of electron pulses after an initial laser excitation. This pulse train results from chaos in the electron dynamics. Here we predict that an analogous pulse train can be measured using cold atoms in an optical dipole trap. We consider a trap potential realized by two overlapping Gaussian beams, forming a two-dimensional double well. The escape of atoms from the first well into the second is predicted to occur in pulses. The structure of these pulses bears the imprint of fractal structure that arises in the nonlinear dynamics of the trap. The underlying dynamics in this system is mathematically analogous to the dynamics of chaotic escape in many other physical systems, such as the ionization problem mentioned above. Thus, the double Gaussian trap could serve as a convenient experimental model for chaotic escape.

Kevin Mitchell
University of California, Merced

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