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Classical dynamics of the 2D hydrogen atom driven by elliptically polarized microwave field ELENA SHCHEKINOVA, TURGAY UZER, Center for Nonlinear Science, Georgia Institute of Technology — The behavior of the highly excited hydrogen atoms driven by the electromagnetic fields is observed to be very sensitive to the parameters of the field such as amplitude and polarization. We study classical dynamics of hydrogen atoms with quantum numbers n_0 in the range $31 - 45$ subject to 9.904 GHz electric field. As the polarization of the field is varied from circular to linear limits the ionization yield curves show a very different behavior. This sensitive dependence can be explained by analyzing various phase space transitions that occur for different parameters of the driving field. For the elliptically polarized microwave field the Hamiltonian is time dependent and the phase space is three dimensional. There are no integrals of motion. Therefore Poincare surface of section can not be of any use. The novel technique based on the short time Lyapunov exponents computation renders us geometrical insight into the phase space structure of this high dimensional system. We show that the method gives an accurate prediction of the stability properties and ionization of trajectory for each initial condition in the phase space after an interval of time much shorter then the time necessary for the corresponding trajectory to ionize.

Elena Shchekinova
Center for Nonlinear Science, Georgia Institute of Technology

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