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Laser Controlled Rotational Cooling in Na_2 Based on Exceptional Points VIATCHESLAV KOKOOULINE, ADAM WEARNE, Department of Physics, University of Central Florida, ROLAND LEFEBVRE, OSMAN ATABEK, ISMO, University of Paris-Sud (CNRS), Orsay, France — In this study, we describe a computational simulation of the interaction of diatomic molecule with an applied laser field. It is known that for certain laser wavelengths and intensities, the wave functions and eigenenergies of two states become degenerate. Such locations in the laser parameter space are known as "exceptional points." Applying a laser pulse of which encircles one or more exceptional points in the parametric plane of wave length versus intensity, one can bring an ensemble of diatomic molecule into a pre-selected rovibrational state after the laser pulse is over. During this process, a fraction of the molecules dissociate, and those, which remain, are brought to the chosen rovibrational state. Although this scheme can be applied more generally, here we use Na_2 as an illustrative example. We examine the locations in the parametric space of exceptional points, which lead to the exchange of rotational states, and how the shape of laser pulse in the parametric plane affects the "purification" of the chosen rovibrational state and the dissociation of other states. This work is supported by the National Science Foundation, Grant No PHY-10-68785.

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