

Quantum Physics

Laser control of complete vibrational transfer in Na₂ using resonance coalescence

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With a specific choice of laser parameters resulting into a so-called exceptional point in the wavelength-intensity plane, it is possible to produce the coalescence of two Floquet resonances describing the photodissociation of the molecule Na₂, which is one of the candidates for molecular cooling. Appropriately tuning laser parameters, following a contour around the exceptional point, the resonances exchange their labels. This represents a laser control of the vibrational transfer from one field-free state to another, through an adiabatic transport involving these resonances. The proportion of undissociated molecules at the end of the pulse is checked through Floquet adiabatic theory. A vibrational cooling scenario can be proposed based on a complete vibrational transfer which is predicted, with only 20 percent of molecules undergoing dissociation.

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