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Shortcut toAdiabatic Passage in a NV Center[1] MAYRA AMEZCUA, ABIGAIL PAULS, SPENCER ALEXANDER, HAILIN WANG, Univ of Oregon — Adiabatic population transfer in a three-level lambda system can enable quantum control of the electron spin states of a nitrogen vacancy (NV) center in diamond through optical transitions, facilitating the control of spin as well as mechanical degrees of freedom. However, in practical experiments with desired duration, the adiabaticity is not attainable due to the residual excitation and population of the excited state, which inevitably leads to optically-induced decoherence. Here we apply the technique of shortcut-to-adiabatic-passage to a three-level lambda system in a NV center. Our method uses a microwave pulse to drive the transition between the two lower states of the lambda system. This microwave coupling serves as a counterdiabatic driving, effectively suppressing the excitation of the excited states. For a coupled spin-phonon system with excited-state mediated coupling, this technique can be used to increase the spin-phonon coupling rate, while avoiding optically induced decoherence.

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