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**Experimental realization of robust dynamical decoupling with bounded controls in a solid-state spin system** FEI WANG, Tsinghua Univ, CHONG ZU, University of Califonia, Berkeley, LI HE, WEIBIN WANG, WEN-GANG ZHANG, Tsinghua Univ, LUMING DUAN, Tsinghua Univ and University of Michigan, Ann Arbor — Dynamical decoupling is a powerful method to combat decoherence of quantum systems caused by coupling to slow-varying environment. Here We experimentally demonstrate a robust dynamical decoupling protocol with bounded controls using long soft pulses, eliminating a challenging requirement of strong control pulses in conventional implementations. This protocol is accomplished by designing the decoupling propagators to go through a Eulerian cycle of the coupler group [Phys. Rev. Lett. 90, 037901(2003)]. We use the solid-state spin qubits carried by the Nitrogen-Vacancy (NV) centers in a diamond as a testbed and demonstrate that this Eulerian decoupling scheme increases the coherence time by two orders of magnitude in our experiment under either dephasing or a universal noise environment.

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