

Abstract Submitted
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Electron spin control and spin-libration coupling of a levitated nanodiamond¹ THAI HOANG, Purdue University, YUE MA, Tsinghua University, JONGHOON AHN, JAEHOON BANG, FRANCIS ROBICHEAUX, Purdue University, MING GONG, University of Science and Technology of China, ZHANG-QI YIN, Tsinghua University, TONGCANG LI, Purdue University — Hybrid spin-mechanical systems have great potentials in sensing, macroscopic quantum mechanics, and quantum information science. Recently, we optically levitated a nanodiamond and demonstrated electron spin control of its built-in nitrogen-vacancy (NV) centers in vacuum. We also observed the libration (torsional vibration) of a nanodiamond trapped by a linearly polarized laser beam in vacuum. We propose to achieve strong coupling between the electron spin of a NV center and the libration of a levitated nanodiamond with a uniform magnetic field. With a uniform magnetic field, multiple spins can couple to the torsional vibration at the same time. We propose to use this strong coupling to realize the Lipkin-Meshkov-Glick (LMG) model and generate rotational superposition states.

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