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Improving the coherence time of a quantum system via a coupling with an unstable system YUICHIRO MATSUZAKI, XIAOBO ZHU, KOSUKE KAKUYANAGI, HIRAKU TOIDA, NTT Basic Research Laboratories, TAKAAKI SHIMO-OKA, NORIKAZU MIZUOCHI, University of Osaka, KAE NEMOTO, National Institute of Informatics, KOUICHI SEMBA, National Institute of Information and Communications Technology, WILLIAM MUNRO, HIROSHI YAMAGUCHI, SHIRO SAITO, NTT Basic Research Laboratories — One of the promising candidates for the realization of quantum information processing is nitrogen-vacancy (NV) center. High controllability of NV centers has been achieved with the current technology, including reliable single qubit operations and quantum non-demolition measurements. However, NV center is affected by dephasing due to magnetic-field environmental noise, which limits the coherence time of the quantum states. In this talk, we propose a counter-intuitive way to improve the coherence time of an NV center where we use a coupling with an unstable system. If we couple a two-level system such as a superconducting qubit with a single NV center, then a dark state of the NV center naturally forms after the hybridization. We show that this dark state becomes robust against environmental fluctuations due to the coupling even when the coherence time of the two-level system is much shorter than that of the NV center.

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