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Optically detected transient nutation relaxation spectroscopy of electron spins in nanodiamonds[1] JUN-HUO HSIEH, HSUAN-KAI HUANG, JESON CHEN, HSAO-CHIH HUANG, OLIVER Y. CHEN, HUAN-CHENG CHANG, MING-SHIEN CHANG, Institute of Atomic and Molecular Sciences, Academia Sinica — Nanoscale magnetic sensing has found important applications from material studies to life science, and a nitrogen vacancy center (NVC) in diamond has been demonstrated as a superb magnetic nanoprobe, given the stability of the diamond material and high sensitivity of electron spin resonance (ESR). Conventional magnetic sensing with NVC is achieved via optically detected magnetic resonance (ODMR), in which ESR is detected optically. However, the requirement of relatively high microwave power and low ESR constract limits its sensitivity. Here, we demonstrate a new method to measure ESR using optically detected transient-nutation relaxation of ESR. Compared to the ODMR with a typical contrast of 10% in nanodiamonds, the signal spectrum, which is the transient nutation decay time constant under same microwave power, has a contrast of up to 93%. The method gives 100 times sensitivity on the microwave power and potentially provides a new way for AC magnetic sensing in the nanometer scale.

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