

Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Anti-stokes luminescence of the NV-center in diamond from a 785 nm pump beam STEPHEN POTASHNIK, JOHN BARKYOUUMB, Naval Surface Warfare Center, ROSS FONTENOT, BAI, Inc., DANIELLE BRAJE, LINH PHAM, Massachusetts Institute of Technology Lincoln Laboratory — In this work, we report the Stokes and anti-Stokes luminescence from nitrogen-vacancy (NV) diamond samples. Several previous studies have predicted laser-cooling through anti-Stokes emission of the NV- center in diamond [1]. For any possibility of laser cooling, the NV- center must be pumped with laser light of longer wavelength than the peak of the phonon-sideband luminescence from the 637 nm zero-phonon line of the main $3E \rightarrow 3A_2$ emission. In this work we observe and report the spectrum of anti-Stokes emission from a CVD-grown diamond excited with a 785 nm diode laser. The existence of the anti-Stokes emission is necessary but not sufficient to predict laser cooling. We also report on the application to this system of a method developed previously to determine cooling from change (increase) of Stokes luminescence intensity in CdSe/ZnS QDs [2]. This method involves the observation of the conventional luminescence in a thermally isolated sample excited by a 520 nm green diode laser. The 520 nm measurement is alternated with excitation of any potential cooling from the 785 nm anti-Stokes excitation. *BAI, Inc. [1] M. Kern et al., Phys Rev B 95, 235306 (2017). [2] R. Fontenot et al., ECS Trans., 80, 1483 (2017).

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Date submitted: 01 Feb 2019

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