

Abstract Submitted
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Certified quantum non-demolition measurement of atomic spins

ROBERT SEWELL, MARIO NAPOLITANO, NAEIMEH BEHBOOD, GIORGIO COLANGELO, FERRAN MARTIN CIURANA, MORGAN MITCHELL, ICFO - Institute of Photonic Sciences — We report certified quantum non-demolition (QND) measurement of atomic spins via paramagnetic Faraday rotation, recently used to demonstrate spin squeezing in an optical magnetometer [Phys. Rev. Lett. 109, 253605 (2012)]. We apply rigorous criteria, originally developed for continuous variable experiments in optics [Nature 396 537 (1998)] and which we have extended to describe measurements of material systems [New J. Phys. 14, 085021 (2012)], to distinguish QND from similar non-classical measurements. We observe quantum state preparation (QSP) and information-damage trade-off (IDT) beyond their classical limits by seven and twelve standard deviations, respectively [Nat. Phot. 7, 517 (2013)].

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