Abstract Submitted
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Demonstration of an on-demand single-photon source based on Rydberg blockade in a thermal vapor cell FABIAN RIPKA, FLORIAN CHRISTALLER, ANNIKA BELZ, HAO ZHANG, HARALD KUEBLER, ROBERT LOEW, TILMAN PFAU, 5th Institute of Physics , University of Stuttgart — Photonic quantum devices based on atomic vapors at room temperature are intrinsically reproducible as well as scalable and integrable. Besides quantum memories for single photons one key device in the field of quantum information processing are on-demand single-photon sources. A promising candidate for realization relies on the combination of four-wave mixing and the Rydberg blockade effect, as was demonstrated for ultracold atoms [1]. Coherent dynamics to Rydberg states [2] have already been demonstrated in thermal vapors, as well as sufficient Rydberg interaction strengths [3] and lifetimes of the collective Rydberg excitations [4]. Here we report on a significant decrease of photon coincidences for photons at 780 nm when the size of the atomic ensemble is reduced to 1 m i.e. below the Rydberg blockade radius. The normalized photon pair correlation shows a clear signature for anti-bunched photon statistics and a strong evidence for the observation of a cooperative quantum effect in a thermal atomic ensemble. Future directions beyond this proof of principle will be discussed. [1] Dudin et al., Science 336, 6083 (2012) [2] Huber et al., PRL 107, 243001 (2011) [3] Baluktsian et al., PRL 110, 123001 (2013) [4] Ripka et al., Phys. Rev. A, 053429 (2016)

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