

Abstract Submitted
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Optical Pi Phase Shift Created with a Single-Photon Pulse STEFFEN SCHMIDT, DANIEL TIARKS, STEPHAN DÜRR, GERHARD REMPE, Max-Planck-Institute of Quantum Optics — A deterministic photon-photon quantum-logic gate is a long-standing goal. Building such a gate becomes possible if a light pulse containing only one photon imprints a phase shift of π onto another light field. Here we experimentally demonstrate the generation of such a π phase shift with a single-photon pulse [1]. A first light pulse containing less than one photon on average is stored in an atomic gas. Rydberg blockade combined with electromagnetically induced transparency creates a π phase shift for a second light pulse which propagates through the medium. This demonstrates the crucial step towards a photon-photon gate and offers a variety of applications in the field of quantum information processing.

[1] D. Tiarks et al. arXiv:1512.05740

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