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Shaping the Phase of a Single Photon JOERG BOCHMANN, HOLGER SPECHT, MARTIN MUECKE, CHRISTIAN NOELLEKE, STEPHAN RITTER, EDEN FIGUEROA, DAVID MOEHRING, GERHARD REMPE, Max-Planck-Institute for Quantum Optics, Germany — The phase of an individual photon is not defined and is therefore not detectable. However, phase changes of the electromagnetic field within individual photon wave packets can be observed, e.g. in a two-photon interference experiment [1]. We report on arbitrary phase shaping of photons which can result in non-bosonic behavior of photon pairs, even without prior entanglement [2]. We send single photons emitted from an atom-cavity system through a fiber electro-optical modulator which induces controlled phase changes during the passage of individual photons. Using time-resolved two-photon interference measurements we identify subgroups of photon pairs that show coalescence (Hong-Ou-Mandel effect [3]). However, by appropriate photon phase tuning we can even reverse this effect and observe anti-coalescence.

[1] T. Legero et al., Phys. Rev. Lett. **93**, 070503 (2004)
[2] J.-W. Pan et al., Phys. Rev. Lett. **80**, 3891 (1998)
[3] C. K. Hong et al., Phys. Rev. Lett. **59**, 2044 (1987)

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