Experimental demonstration of anyonic statistics with multipho-ton entanglement[1] HARALD WEINFURTER, WITLEF WIECZOREK, CHRISTIAN SCHMID, NIKOLAI KIESEL, REINHOLD POHLNER, University of Munich, Max-Planck-Institute for Quantum Optics, Germany, JIANNIS PACHOS, University of Leeds, UK — Particles in nature are usually distinguished according to their statistics in two categories: bosons and fermions. However, if one considers only two spatial dimensions statistical behaviour ranging from bosonic to fermionic is found. Particles exhibiting such a behaviour are called anyons. Our experimental demonstration of anyonic statistics is based on a particular two-dimensional model: the toric code proposed by Kitaev [1]. There, anyons arise as excitations that are generated by local operations. We show that for this model anyonic behaviour is revealed for as little as four qubits [2]. This enabled us to experimentally demonstrate anyonic statistics in a quantum simulation with four-photon entanglement.
[1] A. Yu. Kitaev, Ann. Phys. **303**, 2 (2003).
[2] J. K. Pachos *et al.*, arXiv:0710.0895v2 [quant-ph] (2007).

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