Abstract Submitted
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Entanglement of Ince-Gauss Modes of Photons[1] MARIO KRENN, ROBERT FICKLER, WILLIAM PLICK, RADEK LAPKIEWICZ, SVEN RAMELOW, ANTON ZEILINGER, University of Vienna, Faculty of Physics, IQOQI Vienna, Austrian Academy of Sciences, Austria — Ince-Gauss modes are solutions of the paraxial wave equation in elliptical coordinates [1]. They are natural generalizations both of Laguerre-Gauss and of Hermite-Gauss modes, which have been used extensively in quantum optics and quantum information processing over the last decade [2]. Ince-Gauss modes are described by one additional real parameter – ellipticity. For each value of ellipticity, a discrete infinite-dimensional Hilbert space exists. This conceptually new degree of freedom could open up exciting possibilities for higher-dimensional quantum optical experiments. We present the first entanglement of non-trivial Ince-Gauss Modes. In our setup, we take advantage of a spontaneous parametric down-conversion process in a non-linear crystal to create entangled photon pairs. Spatial light modulators (SLMs) are used as analyzers. [1] Miguel A. Bandres and Julio C. Gutiérrez-Vega "Ince Gaussian beams", Optics Letters, Vol. 29, Issue 2, 144-146 (2004) [2] Adetunmise C. Dada, Jonathan Leach, Gerald S. Buller, Miles J. Padgett, and Erika Andersson, "Experimental high-dimensional two-photon entanglement and violations of generalized Bell inequalities", Nature Physics 7, 677-680 (2011)

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