

Abstract Submitted
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Exploring a high-dimensional Hilbert space using hyperentangled photons ADITYA SHARMA, University of Illinois at Urbana-Champaign, KEVIN MCCUSKER, Northwestern University, JULIO BARREIRO, University of California at San Diego, PAUL KWIAT, University of Illinois at Urbana-Champaign — Quantum entanglement exhibits many interesting features that emerge only in high-dimensional systems. One of the most fascinating is bound entanglement, entanglement that cannot be extracted using only local operations and classical communication: a famous example is the four-qubit Smolin state. Because of its relatively high dimensionality, the Smolin state had not been experimentally observed until recently, and all previous photonic realizations relied on randomly selected unitary operations to introduce decoherence. Here we present an experiment in which we use hyperentangled photons to prepare the Smolin state. Since it does not use random unitaries, our source can be used to prepare a variety of other high-dimensional states as well.

Aditya Sharma
University of Illinois at Urbana-Champaign

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