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Hyperentangled Bell-state analysis TZU-CHIEH WEI, JULIO BARREIRO, PAUL G. KWIAT, University of Illinois at Urbana-Champaign — It is known that it is impossible to unambiguously distinguish the four Bell states of two photons using linear optics. However, hyperentanglement, the simultaneous entanglement in more than one degree of freedom, has been shown to assist the complete Bell measurement of the four Bell states (given a fixed state of the other degrees of freedom). Yet introducing other degrees of freedom also enlarges the number of Bell-like states. We investigate the limits for unambiguously distinguishing a subset of all Bell-like states. In particular, we show that the optimal number is 7 out of the 16 Bell-like states, which are composed of polarization and one additional qubit-like degree of freedom. The implications for quantum communication are also discussed.

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