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Protecting OAM states of light from the decoherence effects of a turbuent atmosphere JOSE RAUL GONZALEZ ALONSO, TODD BRUN, University of Southern California — While there are many advantages to using the polarization of photons to encode quantum information, a major disadvantage is that the limited dimension of the Hilbert space that describes the polarization state allows only the encoding of one qubit per photon. However, if one uses the the orbital angular momentum (OAM) of photons then the Hilbert space that describes the OAM state of a photon is infinite dimensional. Thus, it is possible to encode more than one qubit per photon. This advantage can be exploited in quantum key distribution (QKD) and in quantum secure direct communications. However, unlike the polarization of a photon, the OAM is prone to the decoherence effects produced by interactions with a turbulent atmosphere. In this work, we derive an expression for these decohering effects, and numerically simulate them to find a Kraus error map. We then theoretically demonstrate encoding and information recovery methods that could mitigate such unwanted effects.

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