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Non-local topological rejection of noise

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Topological properties of physical systems have been studied for many years for their robustness against environmental disturbances which leave these properties unchanged. In the context of magnetic systems, a topology that has been extensively investigated is that of the skyrmion where it has been shown to provide some utility for use in low-power, information storage and computing. More recently, the optical analogy to these systems has been studied in classical beams with inhomogeneous polarization structures. Here we show the first non-local realization of the skyrmionic topology manifesting as a shared property between two entangled photons. Furthermore, we explore the topological robustness of these entangled states to channels which decay its degree of entanglement as well as those which add in isotropic noise into the system. We then present simple arguments to explain how the topological noise rejection works in each case. We believe this work reveals a deeper connection between topology and entanglement and offers a new mechanism for constructing more robust quantum states.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

MSc

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