

Abstract Submitted
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Interfacing Conventional and Topological Qubits in Optical Lattices GARRY GOLDSTEIN, Harvard, LIANG JIANG, Caltech, MIKHAIL LUKIN, Harvard, ITAMP — We propose a new interface between conventional and topological qubits. The conventional qubit is encoded in the spin states of two cold atoms of a double well optical trap. The topological qubit resides in the topologically degenerate internal states of four vortices created within p-wave superfluid on a two dimensional optical lattice. The vortices are generated by Laguerre-Gaussian Laser beams propagating transverse to the lattice. We demonstrate that through three controlled tunneling interactions between the conventional and topological qubits it is possible to swap the states of the two qubits. Applications to quantum memory and computing are discussed.

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