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Topological Entanglement Entropy with a Twist[1] BENJAMIN BROWN, Controlled Quantum Dynamics Theory Group, Level 12, EEE, Imperial College London, London, SW7 2AZ, United Kingdom, STEPHEN BARTLETT, ANDREW DOHERTY, Centre for Engineered Quantum Systems, School of Physics, The University of Sydney, Sydney, NSW 2006, Australia, SEAN BARRETT, Controlled Quantum Dynamics Theory Group, Level 12, EEE, Imperial College London, London, SW7 2AZ, United Kingdom — Topologically ordered phases of matter offer an attractive approach to fault tolerant quantum computation. They give rise to exotic quasi-particle excitations known as anyons. Anyons have a degenerate Hilbert space associated to them, which can be used to encode quantum information over non-local degrees of freedom. Recently, it has been shown that twists, the end points of dislocations in the toric code model, and the quasi-particles available on the toric code have some features analogous to a different anyon model; the Ising anyon model. Characteristics of topologically ordered phases can be assessed by calculating the topological entanglement entropy of regions of the ground state of its Hamiltonian. Further to this, the data of its anyonic excitations can be calculated using the von Neumann entropy. We present analytic results showing that twists have the same topological data as Ising anyons using extensions of known topological entanglement entropy formulas. This extends further the analogy between twists and Ising anyons.

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