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Non-local order parameters in 1D symmetry protected topological phases FRANK POLLMANN, Max Planck Institute for the Physics of Complex Systems, 01187 Dresden, Germany, ARI TURNER, University of Amsterdam, 1090 GL Amsterdam, The Netherlands, EREZ BERG, Department of Physics, Harvard University, Cambridge, MA 02138, USA — A topological phase is a phase of matter which cannot be characterized by a local order parameter. It has been shown that gapped phases in 1D systems can be completely characterized using tools related to projective representations of the symmetry groups. An example of a symmetry protected topological phase is the Haldane phase of $S = 1$ chains. Here the phase is protected by any of the following symmetries: dihedral group of π -rotations about two orthogonal axes, time-reversal symmetry, or bond centered inversion symmetry. We introduce non-local order parameters for each case which can be simply calculated using numerical methods such as Density-Matrix Renormalization Group (DMRG). These non-local order parameters provide a practical tool for numerically detecting these non-trivial phases.

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