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Topological Phases in gapped edges of fractionalized systems FRANK POLLMANN, JOHANNES MOTRUK, Max Planck Institute for the Physics of Complex Systems, 01187 Dresden, Germany, EREZ BERG, Weizmann Institute of Science, Rehovot 76100, Israel, ARI TURNER, University of Amsterdam, 1090 GL Amsterdam, The Netherlands — We present an extension of the classification scheme for topological phases in interacting one-dimensional fermionic systems to parafermionic chains. We find that the parafermions support both topological as well as symmetry broken phases in which the parafermions condense. In a series of recent works an experimental way of creating parafermions had been proposed: they can arise on the edge of a two-dimensional fractional topological insulator when coupled to superconducting and ferromagnetic domains. The low-energy edge degrees of freedom are described by a chain of coupled parafermions. As a concrete example of our classification we consider the $\nu = 1/3$ fractional topological insulator for which we calculate the phase diagram and study the entanglement spectra. We furthermore discuss a concrete physical realization which allows us to tune between the different topological phases.

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