Phase Diagram of the Z_3 Parafermionic Chain with Chiral Interactions YE ZHUANG, HITESH CHANGLANI, NORM TUBMAN, TAYLOR HUGHES, Univ of Illinois - Urbana — Majorana fermions and parafermions are exotic quasiparticles with non-Abelian fractional statistics that can be realized and stabilized in one-dimensional models. We study the simplest generalization of the Kitaev p-wave wire, i.e. the Z_3 parafermionic chain [Phys. Rev. B 92, 035154 (2014)]. Using a Jordan-Wigner transform we focus on the equivalent three-state chiral clock model, and study its rich phase diagram using the density matrix renormalization group technique. We perform our analyses using quantum entanglement diagnostics which allow us to determine phase boundaries, and the nature of the phase transitions. In particular, we study the transition between the topological (ordered) and trivial phases (disordered), as well as to an intervening critical (incommensurate) phase which appears in a wide region of the phase diagram. The phase diagram is predicted to contain a Lifshitz type transition which we confirm using entanglement measures. We also attempt to locate and characterize a putative tricritical point in the phase diagram where the three above mentioned phases meet at a single point.

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