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Majorana Zero Modes in 1D Quantum Wires Without Long-Ranged Superconducting Order LUKASZ FIDKOWSKI, ROMAN LUTCHYN, CHETAN NAYAK, Microsoft Station Q, MATTHEW FISHER, University of California, Santa Barbara — We show that long-ranged superconducting order is not necessary to guarantee the existence of Majorana fermion zero modes at the ends of a quantum wire. We formulate a concrete model which applies, for instance, to a semiconducting quantum wire with strong spin-orbit coupling and Zeeman splitting coupled to a wire with algebraically-decaying superconducting fluctuations. We solve this model by bosonization and show that it supports Majorana fermion zero modes. We argue that a large class of models will also show the same phenomenon. We discuss the implications for experiments on spin-orbit coupled nanowires coated with superconducting film and for LaAlO3/SrTiO3 interfaces.

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