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Disorder-induced phase transitions in a quasi 1-D Majorana wire MARIA-THERESA RIEDER, PIET W. BROUWER, Freie Universität Berlin, INANC ADAGIDELI, Sabanci University, Istanbul — In a strictly 1D spinless pwave superconductor, disorder is known to induce a phase transition between a topologically nontrivial phase and a trivial insulating phase when the mean free path lbecomes of the order of the superconducting coherence length  $\xi$ . We show that, in constrast, a multichannel spinless p-wave superconductor goes through a series of phase transitions alternating between topologically trivial and nontrivial phases upon increasing the disorder strength. The number of phase transitions equals the channel number N and each phase transition is accompanied by a Dyson singularity in the density of states  $\nu(\varepsilon) \propto \varepsilon^{-1} |\ln \varepsilon|^{-3}$ . The observed behavior is the result of an effective chiral symmetry allowing us to analytically investigate the phase boundaries and the density of states. The latter displays a power-law singularity  $\nu(\varepsilon) \propto \varepsilon^{|\alpha|-1}$ for small energies  $\varepsilon$  away from the critical points. Using the concept of "superuniversality," we relate the exponent  $\alpha$  to the wire's transport properties at zero energy and, hence, to the mean free path and the superconducting coherence length.

> Maria-Theresa Rieder Freie Universität Berlin

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