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Odd-frequency Pairing of Majorana Fermions[1] SEVERIN SJOMARK, Nordita, KTH Royal Institute of Technology and Stockholm University, ALEXANDER BALATSKY, Nordita, KTH Royal Institute of Technology, Stockholm University and Los Alamos National Laboratory — Advances in theoretical condensed matter physics in the last two decades has opened up the stage for Majorana fermions in topological systems. The prime example is that of Majorana zero-modes at the ends of 1D wires. Now that there are likely experimental realizations of Majorana modes one can ask questions about the stability of an ensemble of interacting Majorana fermions. We present a study of the effects of both a static and dynamic four-point interaction. In the static case it is found that the interaction opens up a gap in the dispersion, but that their Greens function remain odd-frequency. The dynamic case is investigated in the mean-field regime with a retarded interaction. It is found that an odd-frequency pairing parameter has a non-dispersive effect, and consequently that the Majorana fermions remain as zero-modes. The Greens function of Majorana fermions are odd-frequency as a result of being zero-modes. Since Majorana particles are their own antiparticles the Greens function can be viewed as the Gor'kov anomalous function. We thus conclude that Majorana fermions have a natural propensity to form odd frequency pairing, and that their zero-mode nature is robust against odd-frequency pairing. We also investigate even-frequency pairing, which is found to open a gap.

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Severin Sjomark
Kungliga Tek Hogskolan KTH

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