

Abstract Submitted  
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**Majorana zero modes in a one dimensional Fermi gas with spin orbit coupling and attractive interactions**<sup>1</sup> JONATHAN RUHMAN, EHUD ALTMAN, Weizmann Institute of Science — Majorana zero modes can emerge at the edge of a nano wire subject to Rashba like spin-orbit interaction and a Zeeman field, which is coupled through a proximity effect to an s-wave superconductor. Can the zero modes obtain even if the superconductivity is intrinsic, due to attractive interactions in the single channel wire, with strictly conserved charge? We answer this question in the affirmative and provide an exact low energy description of the Majorana modes at the interface between a low density “trivial” Luttinger liquid on one side and a high density “topological” Luttinger liquid on the other side. The energy splitting of a pair of such modes at the edges of a topological segment of length  $L$  scales as  $1/L^{K/2}$  where  $K > 1$  is the Luttinger parameter. We discuss how to detect these Majorana modes in systems of ultra cold atoms, where an intrinsic attractive interaction is indeed much more natural than proximity induced pairing.

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