

Abstract Submitted
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Majorana fermions in nanowires without gating superconductors¹

CHIEN-HUNG LIN, HOI YIN HUI, JAY SAU, SANKAR DAS SARMA, Condensed Matter Theory Center and Joint Quantum Institute, Department of Physics, University of Maryland, College Park, Maryland 20742-4111, USA — Majorana fermions have been proposed to be realizable at the end of the semiconductor nanowire on top of an s-wave superconductor [1,2]. These proposals require gating the nanowire directly in contact with a superconductor which may be difficult in experiments. We analyze [1,2] in configurations where the wire is only gated away from the superconductor. We show that some signatures of the Majorana mode remain but the Majorana mode is not localized and hence not suitable for quantum computation. Therefore we propose an 1D periodic heterostructure which can support localized Majorana modes at the end of the wire without gating on the superconductor.

[1] Jay D. Sau et al., arXiv:1006.2829, Phys Rev B (in press)

[2] Roman M. Lutchyn et al., Phys. Rev. Lett. 105, 077001 (2010)

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