

Majorana bound states in artificial Kitaev chains

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In the past decade superconductor-semiconductor hybrids have been studied intensively, with significant efforts towards studying Majorana bound states (MBSs). However, uncontrolled microscopic variations in hybrid devices have complicated the study of MBSs. A potential way to mitigate the effects of disorder, is to create a Kitaev chain using an array of quantum dots (QDs) with controllable couplings. In this talk I will focus on the realization of Kitaev chains in a two-dimensional electron gas. I will first discuss different ways to control the inter-dot coupling in a 2-site Kitaev chain [1,2], and to identify the appearance MBSs. Then I will show some recent results on a 3-site chain, where we simultaneously probe all three QDs to demonstrate localized MBSs at the ends of the chain and an excitation gap in the middle.

[1] Triplet correlations in Cooper pair splitters realized in a two-dimensional electron gas; <https://www.nature.com/articles/s41467-023-40551-z>

[2] Engineering Majorana bound states in coupled quantum dots in a two-dimensional electron gas; <https://arxiv.org/abs/2311.03208>