Combining tunnelling and Coulomb blockade spectroscopy on hybrid Al/InAs nanowire devices

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Hybrid semiconductor–superconductor devices hold great promise for realizing Majorana zero modes [1-3]. However, multiple claims of Majorana detection, based on either tunnelling or Coulomb blockade (CB) spectroscopy, remain disputed. In this talk I will introduce an experimental protocol that allows to perform both types of measurement on the same hybrid island by adjusting its charging energy via tunable junctions to the normal leads [4,5]. This method reduces ambiguities of Majorana detections by checking the consistency between CB spectroscopy and zero-bias peaks in non-blockaded transport. I will discuss the theoretical interpretation of the experimental observations in terms of low-energy, longitudinally confined island states rather than overlapping Majorana modes. The results highlight the importance of combined measurements on the same device for the identification of topological Majorana zero modes.

References

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Figures

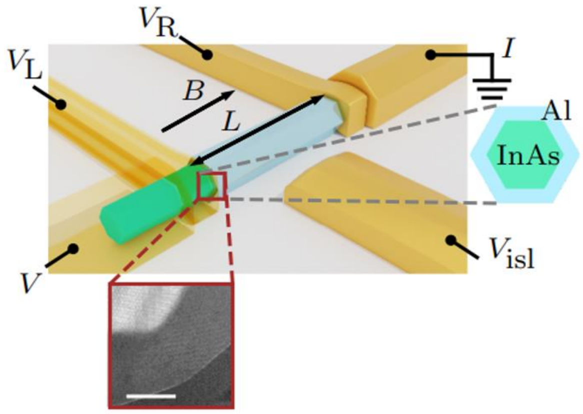

Figure 1: Schematics of a full-shell NW device. Turquoise represents the hexagonal InAs core, light blue the Al full-shell and gold the Ti/Au leads and gates. The insets show the NW cross-section schematic (right) and an atomic-resolution, high-angle annular dark-field scanning transmission electron microscopy image (left). Scale bar, 20 nm.