Quantum Dots as Probes of 2DEG-Based Superconductor-Semiconductor Hybrid Wires

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We present experimental results for gate-defined lateral quantum dots coupled to a superconductor-semiconductor nanowire based on InAs/Al two-dimensional electron gas (2DEG). We demonstrate independent voltage control of coupling of multiple quantum dots to a superconducting wire on one side, and to normal semiconducting leads on the other. In the limit of sequential tunnelling, a level of a quantum dot can be used for high-resolution spectroscopy of Andreev bound states [1], with spin resolution in applied magnetic field [2]. With increased coupling, we gain experimental control over hybridization of discrete dot states with subgap Andreev states in the wire [3, 4]. This configuration may also offer the prospect of coupling two dots via an extended wire state. A high degree of experimental control as well as extension to a variety of device geometries is made possible by the hybrid 2DEG platform.

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References

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Figures

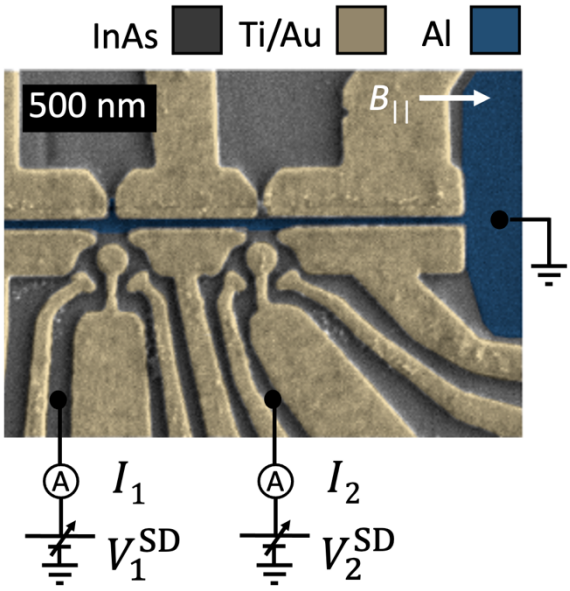

Figure 1: Scanning electron micrograph of a device, consisting of multiple gate-defined quantum dots side-coupled to a superconductor-semiconductor 2DEG nanowire.