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Andreev bound states in proximitized InAs nanowires[1]

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We present measurements of individual Andreev bound states (ABS) in semiconducting InAs nanowires contacted by a superconductor. The two ends of a U-shaped Al lead are deposited on the nanowire to form low-resistance contacts, between which a normal lead is then deposited to form a high-resistance tunnel contact to the nanowire. A tunneling current through the nanowire is formed by grounding the Al leads and by applying a voltage bias to the tunnel contact. Measurements of the differential conductance of the device as a function of voltage bias, magnetic field, and backgate show resonances that are associated with the density of states in the proximitized nanowire. This sub-gap structure depends periodically on magnetic flux, with a period of $\phi_0 = h/2e$. At voltages and magnetic fields exceeding the gap and the critical field of the Al leads, this structure disappears completely. Further control is achieved via a global backgate, with the tunneling current completely switched off at sufficiently low gate voltages. We interpret this structure as ABS arising from the normal electronic properties of the nanowires.

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