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Microwave spectra of Andreev levels in nanowire Josephson junctions ATTILA GERESDI, DAVID J. VAN WOERKOM, ALEX PROUTSKI, QuTech and Kavli Institute of Nanoscience Delft, BERNARD VAN HECK, Department of Physics, Yale University, DANIEL BOUMAN, QuTech and Kavli Institute of Nanoscience Delft, JUKKA I. VAYRYNEN, LEONID I. GLAZMAN, Department of Physics, Yale University, PETER KROGSTRUP, JESPER NYGARD, Center of Quantum Devices, Niels Bohr Institute, Copenhagen, LEO P. KOUWENHOVEN, QuTech and Kavli Institute of Nanoscience Delft — Narrow gap semiconductors, such as InAs and InSb have recently become the most studied platform of Majorana zero modes and novel superconducting qubit architectures. The microscopic description of the superconducting proximity effect however requires the understanding of the Andreev bound state spectrum in these systems. Here we present our experimental work addressing the Andreev levels in Josephson junctions of InAs nanowires with aluminum epitaxial shells. In order to directly access the excited Andreev levels up to 90 GHz bounded by the gap of aluminum, we utilize inelastic Cooper-pair tunneling in an on-chip coupled superconducting tunnel junction. With this technique, we show the presence of gate-tunable Andreev levels in a ballistic semiconductor channel for the first time, and demonstrate how an external applied magnetic field influences the spectrum in the presence of strong spin-orbit coupling, relevant for parity-controlled investigations of Majorana bound states. The accompanying theory work is presented by B. van Heck. Reference: D.J van Woerkom et al, arXiv:1609.00333

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