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Majorana fermions in hybrid superconductor-semiconductor nanowire devices V. MOURIK, K. ZUO, D.J. VAN WOERKOM, F.R. DE VRIES, O. GUL, H. ZHANG, M.A.W. DE MOOR, Delft University of Technology, D. CAR, Eindhoven University of Technology, E.P.A.M. BAKKERS, Eindhoven University of Technology, Delft University of Technology, L.P. KOUWENHOVEN, Delft University of Technology — Our experiment carried out in hybrid superconductor-semiconductor nanowire devices gave the first experimental indications for the existence of Majorana fermions [1], but many open questions need to be answered. Majorana fermions have to come in pairs, before we were only capable of probing one Majorana fermion. Majorana fermions should be fully gate controllable, which could not be demonstrated convincingly. Upon bringing Majorana fermions closer together, an energy splitting between the two is expected, giving rise to a pair of split peaks instead of a single zero bias peak (ZBP). We are performing new experiments in similar but improved three terminal normal-superconductor-normal InSb nanowire devices. This enables the possibility to probe Majorana fermions occurring at the ends of the superconducting contact by using tunneling spectroscopy. Furthermore, the devices have an improved gate design enabling more efficient gating under the superconducting contact and they have improved contact interfaces resulting in less undesired resonant states. We have observed ZBP's in a large magnetic field range, an oscillatory behavior from ZBP to split peak and back, and tunability of ZBP's by gates underneath the superconducting contact. [1] V. Mourik, K. Zuo et al., Science 2012

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