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### **Experimental progress on Majoranas in semiconductors<sup>1</sup>**

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Majoranas in semiconductor nanowires can be probed via various electrical measurements. Tunnel spectroscopy reveals zero-bias peaks in the differential conductance. These zero-bias peaks have a particular dependence on magnetic field (amplitude and direction) and electron density, which determine the topological phase diagram. This phase diagram allows to falsify alternative theories for our observations. New challenges include quantum superpositions of Majorana states leading, for instance, to a  $4\pi$  current phase relation or a fractional Josephson effect. When the existence of Majoranas is firmly established, the next challenge is to build Majorana qubits. We discuss the different qubit schemes and report on our first building blocks. Recent papers: <https://arxiv.org/pdf/1603.04069.pdf>, <https://arxiv.org/pdf/1609.00333.pdf>

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