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Zero-bias peaks and splitting in an Al–InAs nanowire topological superconductor as signature of Majorana fermions[1]

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Majorana fermions are the only fermionic particles that are expected to be their own antiparticles. While elementary particles of the Majorana type were not identified yet, quasi-particles with Majorana like properties, born from interacting electrons in the solid, were predicted to exist. Here, we present thorough experimental studies, backed by numerical simulations, of a system composed of an aluminum superconductor in proximity to an indium arsenide nanowire, with the latter possessing strong spin-orbit coupling and Zeeman splitting. Induced one-dimensional topological superconductor, supporting Majorana fermions at both ends, is expected to form. We concentrate on the characteristics of a distinct zero bias conductance peak (ZBP) and its splitting in energy - both appearing only with a small magnetic field applied along the wire. The ZBP was found to be robustly tied to the Fermi energy over a wide range of system parameters. While not providing a definite proof of a Majorana state, the presented data and the simulations support its existence.

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