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Signature of Majorana Fermions in Charge Transport in Semiconductor Nanowires[1] CHUNLEI QU, YONGPING ZHANG, LI MAO, CHUANWEI ZHANG, Department of Physics and Astronomy, Washington State University, Pullman, WA 99164 — We investigate the charge transport in a semiconductor nanowire that is subject to a perpendicular magnetic field and in partial contact with an s-wave superconductor. We find that Majorana fermions, existing at the interface between superconducting and normal sections of the nanowire within certain parameter region, can induce resonant Andreev reflection of electrons at the interface, which yields a zero energy peak in the electrical conductance of the nanowire. The width of the zero energy conductance peak for different experimental parameters is characterized. While the zero energy peak provides a signature for Majorana fermions in one dimensional nanowires, it disappears in a two-dimensional semiconductor thin film with the same experimental setup because of the existence of other edge states in two dimensions. The proposed charge transport experiment may provide a simple and experimentally feasible method for the detection of Majorana fermions in semiconductor nanowires.

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