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Majorana Fermion induced Selective Equal Spin Andreev Reflections[1] KAM TUEN LAW, JAMES HE, TAI KAI NG, Hong Kong University of Science and Technology, PATRICK LEE, Massachusetts Institute of Technology — It is known that a Majorana fermion end state of a topological superconductor can induce resonant Andreev reflections at a normal lead/topological superconductor junction. However, the details of the Andreev reflection processes have not been studied before. Surprisingly, in this work, we show that Majorana fermions induce a special type of Andreev reflections we call *selective equal spin Andreev reflections* (SESARs). In SESAR processes, incoming electrons with certain spin polarization in the normal lead are reflected as counter-propagating holes with the same spin. More importantly, the spin polarization direction of the electrons, which can undergo Andreev reflections, is selected by the Majorana fermion end state. On the contrary, electrons with opposite spin polarization are always reflected as electrons with unchanged spin and they cannot undergo Andreev reflections. Due to SESARs, the current in the normal lead is spin-polarized. Therefore, a topological superconductor, which supports Majorana fermions, can be used as a novel device to create fully spin-polarized currents in paramagnetic leads. We point out that SESARs can also be used to detect Majorana fermions in topological superconductors.

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