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Conductance spectroscopy of topological superconductor wire junctions¹ F. SETIAWAN, Condensed Matter Theory Center and Joint Quantum Institute, University of Maryland, College Park, PHILIP BRYDON, University of Maryland College Park and University of Otago, JAY SAU, Condensed Matter Theory Center and Joint Quantum Institute, University of Maryland, College Park — We study the zero-temperature transport properties of one-dimensional normal metal-superconductor (NS) junctions with topological superconductors across their topological transitions. Working within the Blonder-Tinkham-Klapwijk (BTK) formalism generalized for topological NS junctions, we analytically calculate the differential conductance for tunneling into two models of a topological superconductor: a spinless intrinsic p-wave superconductor and a spin-orbit-coupled s-wave superconductor in a Zeeman field. The zero-bias conductance takes nonuniversal values in the nontopological phase while it is robustly quantized at $2e^2/h$ in the topological regime. Despite this quantization at zero voltage, the zero-bias conductance only develops a peak (or a local maximum) as a function of voltage for sufficiently large interfacial barrier strength, or certain parameter regimes of spin-orbit coupling strength. Our calculated BTK conductance also shows that the conductance is finite inside the superconducting gap region because of the finite barrier transparency, providing a possible mechanism for the observed soft gap feature in the experimental studies.

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