Title:	Tunneling characteristics of weakly coupled Majorana wire arrays
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Abstract:	The Majorana modes in solid-state systems have the potential to be applied in fault tolerant quantum computing. It is well known that a semiconducting nanowire with strong Rashba coupling and in the proximity of a superconductor hosts Majorana edge modes. An array of such nanowires with inter-wire coupling gives an approximate description of a two-dimensional topological superconductor, where depending on the strength of the magnetic field and the chemical potential, a rich phase diagram hosting trivial and different types of non-trivial phases can be achieved. In this work, we theoretically consider such a two-dimensional assembly of spin–orbit coupled superconducting nanowires and calculate the collective tunneling conductance between normal electrodes and the wires in the topological regime. When the number of wires in the assembly is N , as a consequence of the way the Majorana bonding and anti-bonding states form, we find that N conductance peaks symmetric about the bias V=0 appear for even N . When N is odd, a zero-bias conductance peak (ZBCP) also appears. We have identified the region in the parameter space where this odd–even rule applies. The effects of finite temperature, finite dissipation, and the barrier potential on the conductance profiles have also been discussed in detail. A device comprising of an array of weakly coupled Majorana wires can be realized by standard nano-fabrication techniques where individual nanowires can be turned ON or OFF by using a mechanical switch (or local top gating) to make N either even or odd—thereby switching the ZBCP OFF or ON , respectively, modulo the control parameter being in the desired range. Hence, in principle, our results can be used to realize and detect topological superconductivity efficiently and in a controlled manner.
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