Finite frequency noise in a normal metal - topological superconductor junction

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A topological superconductor nanowire bears a Majorana bound state at each of its ends, leading to unique transport properties. As a way to probe these, we study the finite frequency noise of a biased junction between a normal metal and a topological superconductor nanowire. We use the non-equilibrium Keldysh formalism to compute the finite frequency emission and absorption noise to all order in the tunneling amplitude, for bias voltages below and above the superconducting gap. We observe noticeable structures in the absorption and emission noise, which we can relate to simple transport processes. The presence of the Majorana bound state is directly related to a characteristic behavior of the noise spectrum at low frequency. We further compute the noise measurable with a realistic setup, based on the inductive coupling to a resonant LC circuit, and discuss the impact of the detector temperature. We have also computed the emission noise for a non-topological system with a resonant level, exhibiting a zero-energy Andreev bound state, in order to show the specificities of the topological case. Our results offer an original tool for the further characterization of the presence of Majorana bound states in condensed matter systems.

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