Energy fluctuations in electron quantum optics

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Abstract

In classical electricity, Joule's law gives the heat generated by the flow of an electrical current in a conductor. Very recently, on demand single electron sources have been demonstrated in ballistic quantum conductors. This device has enabled the demonstration of quantum optics with electrons propagating along quantum Hall edge channels. At very low temperatures, due to Coulomb interactions, a single electronic excitation will lose its energy in the electromagnetic environment of the conductor thus providing a toy quantum version of the Joule effect. We will thus study the probability distribution of the energy change of this environment during the propagation of a single electronic excitation in a quantum Hall edge channel.

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