Nonsymmetrized Correlations in Mesoscopic Current Measurements

WOLFGANG BELZIG, University of Konstanz, ADAM BEDNORZ, University of Warsaw, CHRISTOPH BRUDER, University of Basel, BERTRAND REULET, University of Sherbrooke — A long-standing problem in quantum mesoscopic physics is which operator order corresponds to noise expressions like $\langle I(\omega)I(-\omega) \rangle$, where $I(\omega)$ is the measured current at frequency $\omega$. Symmetrized order describes a classical measurement while nonsymmetrized order corresponds to a quantum detector, e.g., one sensitive to either emission or absorption of photons. We show that both order schemes can be embedded in quantum weak-measurement theory taking into account measurements with memory, characterized by a memory function which is independent of a particular experimental detection scheme [A. Bednorz, C. Bruder, B. Reulet, and W. Belzig, Phys. Rev. Lett. 110, 250404 (2013)]. We discuss the resulting quasiprobabilities for different detector temperatures and how their negativity can be tested on the level of second-order correlation functions already. Experimentally, this negativity can be related to the squeezing of the many-body state of the transported electrons in an ac-driven tunnel junction.

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