Detection of Noise in the Mesoscopic Quantum Realm

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The detection of quantum fluctuations is discussed in light of the van Hove-type relationship between time-dependent correlators and measurable physical properties. Considering the interaction between the fluctuating electron system and a resonant circuit or a photon mode, we discuss the detectability of zero point fluctuations (ZPF) and show how that is related to the absorption spectrum of the system. Shot noise, which has recently been used to measure the effective nonintegral charge of quasiparticles in special situations will be discussed next. Related results on Hanbury-Brown Twiss (HBT) correlations for fermions will be briefly discussed. A theoretical treatrment of the full measurement chain for excess noise will be presented, in agreement with the discussion above.