Comparing Charge Offset and Charge Noise for a Single Electron Transistor

A. Pourkabirian[a], M. Gustafsson[a], T. Bauch[a], J. Lublin[a], G. Johansson[a], J. Clarke[b], and P. Delsing[a]

[a]Microtechnology and Nanoscience, Chalmers University of Technology, S-41296, Göteborg, Sweden
[b]Department of Physics, 366 LeConte Hall, University of California, Berkeley, California 94720, USA

We report measurements of the temperature dependence of both offset charge and charge noise measured by Single Electron Transistors.We describe these quantities in terms of a complex susceptibility $\chi = \chi_1 + i\chi_2$, where χ_1 is related to the offset charge Q_{offset}, and χ_2 is related to the charge noise $S_Q(f)$ via the fluctuation-dissipation theorem. Furthermore, χ_1 and χ_2 are Kramers-Kronig related at all temperatures and should therefore have the same temperature dependence. This implies that the ratio of the charge offset and the charge noise should vary as $1/T$. Our preliminary results show a temperature independent offset charge and linearly increasing noise power which agrees with these general arguments.