Abstract Submitted
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Resolution effects on the current measurement in a resonant level model YASUHIRO YAMADA, MASATOSHI IMADA, Department of Applied Physics, University of Tokyo — Current measurements have attracted much attention in studies on understanding the intrinsic information of nanoscale systems. Here, we theoretically study the influence of the smallest detectable change in the measurement, i.e. resolution, on the outcomes of the measurements, using an extension of the full counting statistics for a resonant level model. It is shown that the limited resolution of current measurement gives rise to a positive excess noise, which leads to a violation of the Johnson-Nyquist relation naively expected between the measured conductance and the measured current noise. The deviation from the Johnson-Nyquist relation exhibits universal single-parameter scaling with the nondimensional scaling variable S_0/S_M where S_0 is the intrinsic noise and S_M represents the characteristic noise determined from the measurement process. In addition, our findings offer an explanation for anomalous enhancement of noise temperature observed in Johnson noise thermometry. [1] Y. Yamada and M. Imada, arXiv:1307.7535.

Yasuhiro Yamada
Department of Applied Physics, University of Tokyo

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