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Service de Physique de l'Etat Condensé
SÉMINAIRE

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Dynamics and Third Cumulant of Quantum Noise

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The existence of the third cumulant S_3 of voltage fluctuations has demonstrated the non-Gaussian aspect of shot noise in electronic transport. Until now, measurements have been performed at low frequency, *i.e.* in the classical regime $\hbar\omega < eV$, k_BT where voltage fluctuations arise from charge transfer process. We report here the first measurement of S_3 at high frequency, in the quantum regime $\hbar\omega > eV$, k_BT. In this regime, experiment cannot be seen as a charge counting statistics problem anymore. It raises central questions of the statistics of quantum noise, in particular:

1. The electromagnetic environment of the sample has been proven to strongly influence the measurement, through the possible modulation of the noise of the sample. What happens to this mechanism in the quantum regime?

2. For $eV < \hbar\omega$, the noise is due to zero point fluctuations and keeps its equilibrium value: $S_2 = G\hbar\omega$ with G the conductance of the sample. Therefore, S_2 is independent of the bias voltage and no photon is emitted by the conductor. It is possible, as suggested by some theories [**?**, **?**], that $S_3 \neq 0$ in this regime?

With regard to these questions, we give theoretical and experimental answers to the environmental effects showing they involve dynamics of the quantum noise. Using these results, we investigate the question of the third cumulant of quantum noise in the a tunnel junction.

References

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[2] J. Salo, F. W. J. Hekking, and J. P. Pekola , Frequency-dependent current correlation functions from scattering theory, *Phys. Rev. B* **74** pp. 125427 (2006)

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