Current noise and power fluctuations in time-dependently driven conductors

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The time-dependent driving of nanoscale conductors allows for the controlled creation of single-electron excitations. This has been demonstrated experimentally both by driving gates coupled to confined systems, such as quantum dots, and by ac-driving of two-dimensional conductors [1,2]. In the latter case, exact single-particle excitations - so-called Levitons - are obtained when the driving potential approaches a Lorentzian shape.

However, in general a large number of electron-hole excitations with some unknown energy distribution goes along with the particle emission. In order to learn something about the precision of the single-particle emission, but also about the character of the emitted signal it is helpful to study the fluctuations in the detected signal.

Here, I will present a theoretical study of transport in coherent conductors driven by a time-periodic bias voltage based on a scattering matrix approach [3,4]. We investigate the role of electron-like and hole-like excitations created by the driving in the energy current noise and we reconcile previous studies on charge current noise in this kind of systems. The energy noise reveals additional features due to electron-hole correlations. These features should be observable in power fluctuations. In particular, we show results for the case of a harmonic and bi-harmonic driving and of Lorentzian pulses applied to a two-terminal conductor, addressing the recent experiments of Refs. [1,2].

The tuneable emission of single particles furthermore allows for the creation of controlled two-particle effects.

If time permits, I will give an outlook of controlled two-particle effects in time-dependently driven conductors and their signatures in the current noise.

Refs.:

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[4] Francesca Battista, Federica Haupt, and Janine Splettstoesser, J. Phys.: Conf. Ser. **568**, 052008 (2014).