Factorial cumulants reveal interactions in counting statistics

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Full counting statistics concerns the stochastic transport of electrons in mesoscopic structures. Recently it has been shown that the charge transport statistics for noninteracting electrons in a two-terminal system is always generalized binomial: it can be decomposed into independent single-particle events, and the zeros of the generating function are real and negative.[1] Here we investigate how the zeros of the generating function move into the complex plane due to interactions and demonstrate that the positions of the zeros can be detected using high-order factorial cumulants.[2] As an illustrative example we consider electron transport through a Coulomb blockade quantum dot for which we show that the interactions on the quantum dot are clearly visible in the high-order factorial cumulants. Our findings are important for understanding the influence of interactions on counting statistics, and the characterization in terms of zeros of the generating function provides us with a simple interpretation of recent experiments, where high-order statistics have been measured.[3]

[1] A. G. Abanov and D. A. Ivanov, Phys. Rev. Lett. **100**, 086602 (2008), Phys. Rev. B **79**, 205315 (2009)
[2] D. Kambly, C. Flindt, M. Büttiker, Phys. Rev. B **83**, 075432 (2011), Editors' Suggestion in PRB
[3] C. Flindt, C. Fricke, F. Hohls, T. Novotný, K. Netočný, T. Brandes, R. J. Haug, Proc. Natl. Acad. Sci. USA **106**, 10116 (2009), C. Fricke, F. Hohls, N. Sethubalasubramanian, L. Fricke, R. J. Haug, Appl. Phys. Lett. **96**, 202103 (2010)