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Effect of broadening in the weak coupling limit of vibrationally coupled electron transport through molecular junctions and the analogy to quantum dot circuit QED systems RAINER HARTLE, Institut for theoretische Physik, Georg-August-Universitat Gottingen, MANAS KULKARNI, Department of Physics, New York City College of Technology, City University of New York — We [1] investigate the nonequilibrium population of a vibrational mode in the steady state of a biased molecular junction, using a rate equation approach. We focus on the limit of weak electronic-vibrational coupling and show that, in the resonant transport regime and for sufficiently high bias voltages, the level of vibrational excitation increases with decreasing coupling strength, assuming a finite and non-zero value. An analytic behavior with respect to the electronic-vibrational coupling strength is only observed if the influence of environmental degrees of freedom is explicitly taken into account. We consider the influence of three different types of broadening: hybridization with the electrodes, thermal fluctuations and the coupling to a thermal heat bath. Our results apply to vibrationally coupled electron transport through molecular junctions but also to quantum dots coupled to a microwave cavity, where the photon number can be expected to exhibit a similar behavior. [1] Rainer Hartle, Manas Kulkarni, Phys. Rev. B 91, 245429 (2015)

Manas Kulkarni
Department of Physics, New York City College of Technology, City University of New York

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