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Current and shot noise of a QPC coupled to an oscillator NIKHILESH VAIDYA, DEBORAH SANTAMORE, Temple University — We study the dynamics and noise power spectrum of a quantum point contact (QPC), which is coupled to a vibration mode. We obtain the non-Markovian unconditional master equation for the reduced density matrix of the system. Using both the analytical and numerical quasi-Monte Carlo method, we calculate the current through. The modified current due to the QPC-oscillator coupling consists of the terms that depend on the oscillator variables, namely, position, momentum and their moments. We find that one of the current terms, which arise from the symmetrized product of the position and momentum operators of the oscillator, has a substantial contribution to the total current in the non-Markovian case. Both the current and the equations of motion of the oscillator reduce to the Markovian forms under the appropriate limits, namely, the long time limit, which makes the coefficients time independent, and the wide band limit. We also calculate the spectral density of the coupled system. The noise spectra show that the resonant peaks depict the backaction between the QPC and the oscillator. The interplay between the noise and the backaction may have some practical applications such as amplification of the oscillators. Our results agree with the experimental evidence.

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