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Inelastic effects in noise properties of molecular junctions MICHAEL GALPERIN, Northwestern University, U.S.A., ABRAHAM NITZAN, Tel Aviv University, Israel, MARK A. RATNER, Northwestern University, U.S.A. — The effect of electron-phonon coupling on the current noise in a molecular junction is investigated within a simple model. The model comprises a one-level bridge representing a molecular level that connects between two free electron reservoirs and is coupled to a vibrational degree of freedom representing a molecular vibrational mode. The latter in turn is coupled to a phonon bath that represents the thermal environment. We focus on the zero frequency noise spectrum and study the changes in its behavior under weak and strong electron-phonon interactions. In the weak coupling regime we find that the noise amplitude can increase or decrease as a result of opening of an inelastic channel. In particular the relative Fano factor decreases with increasing off resonance distance and junction asymmetry. For resonant inelastic tunneling with strong electron-phonon coupling the differential noise spectrum can show phonon sidebands in addition to a central feature. A striking crossover of the central feature from double to single peak is found for increasing asymmetry in the molecule-leads coupling or increasing electron-phonon interaction. A possible use of noise data from scanning tunneling microscopy experiments for estimating the magnitude of the electron-phonon interaction on the bridge is proposed.

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