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Narrow peaks in the current power spectra of nanomechanical resonators. DONG LIU, Michigan State University, ADRIAN BACHTOLD, JOEL MOSER, Institut Catala de Nanotecnologia, ALEX LEVCHENKO, MARK I. DYKMAN, Michigan State University — We show that the power spectrum of current through a nanomechanical resonator has narrow peaks at the frequencies of mechanical modes. These peaks can be selectively downshifted to low frequencies by applying almost resonant ac source-drain or gate voltage. Our analysis refers to the Coulomb blockade regime, where the current is limited by tunneling through the contacts. Where the tunneling rate largely exceeds the vibration frequency, the analysis can be done in terms of the conductance that adiabatically depends on the displacement of the nanoresonator. In a more general case the current power spectrum near the narrow vibration-induced peaks is related to the vertex correction for the corresponding Green function. The spectral peak at low frequency can result also from the vibration nonlinearity in the absence of inversion symmetry. We note that measuring the power spectra of the current noise provides an alternative to the often complicated direct measurements of the absorption spectrum of coupled electron-vibrational systems.

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