We develop a theoretical framework for the description of light emission from plasmonic contacts based on the nonequilibrium Green function formalism. Our theory establishes a fundamental link between the finite-frequency quantum noise and ac conductance of the contact and the light emission. Calculating the quantum noise to higher orders in the electron-plasmon interaction, we identify a plasmon-induced electron-electron interaction as the source of experimentally observed above-threshold light emission from biased STM contacts. Our findings provide important insight into the effect of interactions on the light emission from atomic-scale contacts.
