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Terahertz Plasmon Oscillations at Room Temperature in Nanotube Transistors DIEGO KIENLE, FRANÇOIS LÉONARD, Sandia National Laboratories, California — We present a theoretical study of the high-frequency properties of carbon nanotube transistors. We employ a new theory for AC quantum transport based on a self-consistent Non-Equilibrium Green Function formalism. The theory is applied to calculate the frequency dependent response of a semi-conducting (17,0) nanotube FET device in the ballistic limit applying a time harmonic signal at the gate terminal. We show that in the ON- state the dynamical conductance exhibits divergent resonant peaks at discrete frequencies in the terahertz regime even at room temperature. These conductance peaks can be associated with the excitation of the charge eigenmodes (plasmons) of the quantum cavity formed by the nanotube channel and its surrounding gate, and shows up as pronounced spatial periodic large amplitudes in the AC charge and potential, respectively. The resonant features vanish when the device is operated in the OFF-state in which case the conductance displays smooth oscillations, a signature of single particle quantum interference. Our results indicate that low dimensional devices with nanometer channel length might show potential as novel detectors and emitters of THz radiation operating at room temperature.

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