

In this talk, a current carrying single or double-orbital quantum dot (QD) with electron-phonon interaction and its exposure to an incoming electromagnetic field is considered. In the Polaron regime and static limit, by approximating the electron-phonon interaction with an attractive Hubbard interaction, using the self-consistent Hartree-Fock (HF) approximation, we show that depending on the parameters, the system could be bi-stable. Also, using current conserving second order approximation for the single orbital QD, in addition to bi-stability, negative differential conductance (NDR) is predicted. This NDR is explained by the emergence of a Polaron level near the Fermi energy of the drain. Moreover, in the two orbital QD we predict that if both the interaction and level spacing are strong enough, the system could have strong optical absorption in a special range of applied bias voltage, and outside that range the light absorption is weak.