

Invitation to a seminar talk

**“Intraband transitions in QD’s : probing the energy levels,  
relaxation and decoherence of polarons”**

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*Abstract*

In strongly confined quantum dots (QD), such as the self organized InAs/GaAs QD’s, the electrons and LO phonons are in the strong coupling regime and form polarons. The polaron energy levels are probed by intraband magneto – transmission experiments while their relaxation is probed by the hole burning of the S –P transition using free electron lasers. The polaron lifetime is limited by the phonon decay triggered by the anharmonicity of the vibrations. We show that it is possible to obtain very long polaron lifetimes (ns or so) by using QD’s with S –P energy distance smaller than the optical phonon energy.

We shall report on the calculation of the polaron decay time and on the temperature dependent lineshape of the four wave mixing profile. When the QD’s are occupied by two electrons, the relaxation towards the ground state displays a two time exponential decay. The slow component involves a spin – flip process. Modeling the spin – flip mechanisms allow a satisfactory description of the experimental data obtained by Zibik et al (University of Sheffield).

The four wave mixing signal evidences the crucial part played by the pure dephasing mechanisms, notably the virtual absorption and re – emission of acoustical phonons.

This work was done in collaboration with Drs R. Ferreira and T. Grange (Paris) and with Drs E. Zibik, T. Luke and Pr. M. Skolnick (Sheffield University).

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