Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Many-body exciton states in self-assembled quantum dots coupled to a Fermi sea P.M. KOENRAAD, N.A.J.M. KLEEMANS, J. VAN BREE, Eindhoven University of Technology, A.O. GOVOROV, University of Ohio , G.J. HAMHUIS, R. NOTZEL, A.YU. SILOV, Eindhoven University of Technology — Using voltage dependent photoluminescence spectroscopy we have studied the coupling between QD states and the continuum of states of a Fermi sea of electrons in the close proximity of a self-assembled InAs quantum dot embedded in GaAs. This coupling gives rise to new optical transitions, manifesting the formation of many-body exciton states. The lines in the photoluminescence spectra can be well explained within the Anderson and Mahan exciton models. The presence of Mahan excitons originates from the Coulomb interaction between electrons in the Fermi sea and the hole(s) in the QD whereas a the second type of many-body exciton is due to a hybridized exciton originating from the tunnel interaction between the continuum of states in the Fermi sea and the localized state in the QD. Our study demonstrates the possibility to investigate a variety of many-body states in QDs coupled to a Fermi sea and opens the way to investigate optically the Kondo effect and related spin phenomena in these systems.

Paul Koenraad
Eindhoven University of Technology

Date submitted: 25 Nov 2009 Electronic form version 1.4