# Seminarankündigung

## Dienstag, 06. November 2012
## 17:15 Uhr

## WSI, Seminarraum S 101

# “Collective spontaneous emission from double quantum dots and QD ensembles”

**Abstract:**
In this presentation, I will discuss the results of the theoretical modeling of luminescence form systems composed of two quantum dots (QDs) and of large ensembles of QDs. The emission of light from such systems is affected by the collective interaction of the QDs with the modes of the electromagnetic field and by the coupling between the dots. It can also be influenced by occupation redistribution between the delocalized single-exciton states due to carrier--phonon coupling, which makes the optical properties of these structures markedly different from the usual exponential decay typical of single dots. I will show that formation of delocalized exciton states, with different strengths of the coupling to the electromagnetic field (that is, "darker" and "brighter" ones) leads to non-exponential decay of the exciton population and of the coherent luminescence signal from double QDs. Collective effects can also lead to population trapping in dark states and to non-monotonic temperature dependence of the exciton life time. In the case of dense ensembles of QDs, the collective character of the spontaneous emission in the presence of inter-dot coupling leads to an enhanced emission rate. Our results indicate, however, that the fundamental long-range (dipole) interactions via the common electromagnetic reservoir are not sufficiently strong to account for the experimentally observed effect. However, additional short-range interactions (which may arise due to a combination of tunnel coupling and Coulomb correlations) can indeed lead to faster radiative decay in agreement with experimental results.

**Prof. Pawel Machnikowski**
**Institute of Physics**
**Wroclaw University of Technology**
**Wroclaw, Poland**