Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Self-consistent effects and breather mode in semiconductor quantum wells[1] PADMA KANT SHUKLA, FERNANDO HAAS, Ruhr University Bochum, Bochum, Germany, GIOVANNI MANFREDI, PAUL-ANTOINE HERVIEUX, Louis Pasteur University, Strasbourg, France — A novel breather mode in the self-consistent electron dynamics in semiconductor quantum wells is identified and characterized. The breather solution corresponds to coherent oscillations of the size of the electron gas around a self-consistent equilibrium. A non-perturbative time-dependent variational formalism is used to describe the relevant properties of the breather mode, both in the linear and nonlinear regimes, in the context of a quantum hydrodynamic model. The time-dependent Wigner-Poisson or Hartree equations are shown to be in excellent agreement with our analytical results. For asymmetric quantum wells, a signature of the breather mode is observed in the dipole response, which can be detected by standard optical means. The present approach should equally apply to metal nanoparticles and carbon-based systems such as fullerenes.

[1]This work was partially supported by the Alexander von Humboldt Foundation and by the Agence Nationale de la Recherche.

Bengt Eliasson
Ruhr University Bochum

Date submitted: 14 Jul 2009 Electronic form version 1.4