UNIVERSITÄT DUISBURG ESSEN

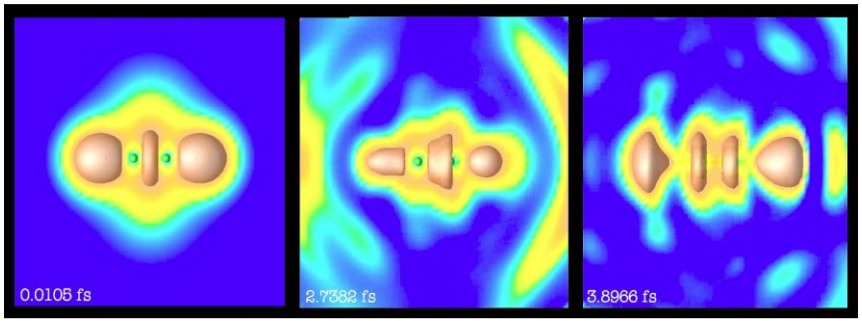
PHYSIK E=

Physikalisches Kolloquium

Mittwoch, 08.07.2015
17:15 Uhr
Hörsaal MC 122

Ultrafast processes in many-electron systems: A density-functional perspective to the atto- and femto-second timescale”

Prof. Dr. Eberhard Groß
MPI für Mikrostrukturphysik Halle/Saale



The time-dependent generalization of density functional theory (TDDFT) will be employed to visualize, analyse and, ultimately, control electronic motion on the femto-second time scale. Several recent developments beyond the linear-response regime will be presented.

The first topic is the time-dependent electron localization function. This quantity allows one to visualize the formation and breaking of chemical bonds in a laser field in real time. Questions like: How much time needs an electron to complete a transition from one state to another? can be addressed in this way. The second topic will be quantum transport. Time-dependent features of the electronic current through nano-scale junctions will be studied such as electron pumps and molecular optical switches. A combination of quantum optimal control theory with TDDFT will be presented as a method to compute laser pulses that are optimized to achieve a given goal. As an example we will calculate the laser pulse needed to switch the chirality of the electronic current in a quantum ring.

Finally we will study the ultrafast laser-induced demagnetisation of ferromagnetic solids.