SFB/TRR 21 - Seminar
3. Dezember 2007, Ulm

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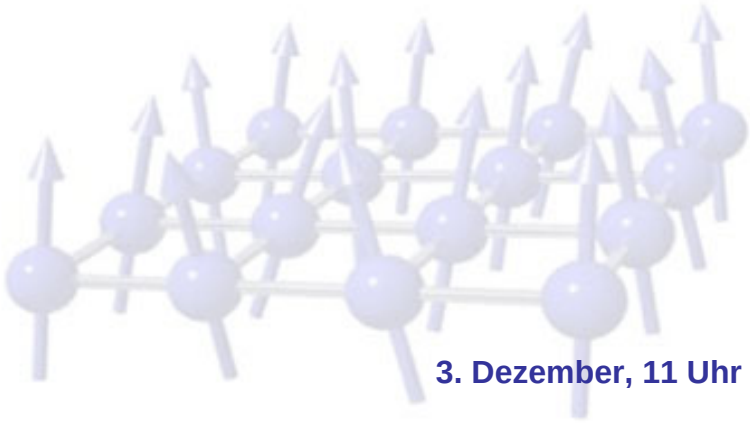
Floating crystals and lattices of polar molecules

Cold atoms and molecules trapped in optical lattices have emerged as primary AMO candidates for realizing quantum simulations of strongly correlated condensed matter lattice models. In this talk, we discuss an alternative scenario of realizing lattice models, where cold atoms or molecules move as extra particles in a self-assembled dipolar crystal of trapped polar molecules. Dipolar crystals are mesoscopic lattice structures with quantum dynamics given by phonons, which we show to be obtainable by inducing a superfluid-crystal quantum phase transition in a gas of trapped polar molecules interacting via electric-field-induced dipole-dipole potentials. Within an experimentally accessible parameter regime extended Hubbard models with tunable long-range phonon-mediated interactions describe the effective dynamics of dressed extra particles.



3. Dezember, 11 Uhr

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