# Q 69: Photonik III

Zeit: Freitag 10:30–11:30 Raum: 5J

Q 69.1 Fr 10:30 5J

**Asymmetrically pumped optical lattices: collective excitations and instability** — •Janos Asboth[1,2], Helmut Ritsch[1], and Peter Domokos[2] — [1]Institut für Theoretische Physik, Univ. Innsbruck, Innsbruck, Österreich — [2]Institute for Solid State Physics and Optics, Budapest, Hungary

We solve the self-consistent, coupled equations of motion for trapped atoms and the field of a one-dimensional optical lattice in the large detuning limit. In steady state the refractive index of the particles reduces the lattice constant, an effect, which is greatly enhanced if the lattice is formed by unbalanced pump beams. For pump asymmetry above a finite value, independent of the lattice size, no equilibrium configuration exists. Below this limit, the optomechanical coupling mediates collective oscillations of the particles around their steady state positions, which for asymmetric pumping take the form of traveling density waves. Above an asymmetry threshold, which decreases with the lattice size, these waves are amplified and the equilibrium becomes unstable, even in the presence of arbitrarily large viscous damping.

Q 69.2 Fr 10:45 5J

**Evanescent mides are virtual photons** — •Günter Nimtz[1] und Alfons Stahlhofen[2] — [1]Uni Köln, II. Physikal. Inst., Zülpicher Str. 77, 50937 Köln — [2]Uni Koblenz, Physik, Universitätsstr. 1, 56070 Koblenz

Former QED-based studies of evanescent modes indentified these with virtual photons. Recent experimental studies confirmed the resulting predictions about non-locality, non-observability, violation of the Einstein relation and the existence of a commutator of field operators between two space-like separated points. Relativistic causality thus is violated by the near-field phenomenon evanescent modes while primitive causality is untouched.

Q 69.3 Fr 11:00 5J

**Propagation of Electromagnetic Fields in Inhomogeneous Dielectric Media** — •Igor Drozdov[1] und Alfons Stahlhofen[2] — [1]Uni Koblenz, Physik, Universitätsstr. 1, 56070 Koblenz — [2]Uni Koblenz, Physik, Universitätsstr. 1, 56070 Koblenz

The second order differential equation for classical electromagnetic field in a dielectric medium with a space-dependent dielectric permittivity (wave-equation) is derived in a rigorous way from the Maxwell equations. The resulting equation exhibits some differences to the commonly used generalization of the ordinary wave equation for this case. The latter is shown to be inconsistent with classical electrodynamics. Some optical features of inhomogeneous media resulting from this approach are elucidated.

Q 69.4 Fr 11:15 5J

**On a local concept of wave velocities** — •Igor Drozdov[1] und Alfons Stahlhofen[2] — [1]Uni Koblenz, Physik, Universitätsstr. 1, 56070 Koblenz — [2]Uni Koblenz, Physik, Universitätsstr. 1, 56070 Koblenz

The classical far field concept of wave velocities has its merits while exhibiting intrinsic difficulties. A general local approach for the definition of velocities and especially phase velocities for waves avoiding these difficulties is proposed. It includes the classical definitions as particular cases and can be applied to waves of an arbitrary structure, and to arbitrary propagation media as well. Applications of the formalism are elucidated and some basic properties of the local concept defined here are discussed.