# MP 7: Quantum Mechanics

Zeit: Dienstag 16:30–18:05 Raum: SFG 2010

**Hauptvortrag** MP 7.1 Di 16:30 SFG 2010

**The Adiabatic Theorem for Many-Body Quantum Systems** — Sven Bachmann[2], Wojciech De Roeck[1], and •Martin Fraas[1] — [1]KU Leuven, Leuven, Belgium — [2]LMU, Munich, Germany

The first proof of the quantum adiabatic theorem was given as early as 1928. Today, this theorem is increasingly applied in a many-body context, e.g. in quantum computing, linear response theory for QHE, and in control protocols for artificial states of matter. In this setup, the rate of variation of local terms is indeed small compared to the gap, but the rate of variation of the total, extensive Hamiltonian, is not. Therefore, applications to many-body systems are not covered by the proofs and arguments in the literature. We prove a version of the adiabatic theorem for gapped ground states of quantum spin systems, under assumptions that remain valid in the thermodynamic limit. A direct consequence is a mathematical proof of the Kubo linear response formula for a broad class of interacting systems.

**10 min. break**

MP 7.2 Di 17:25 SFG 2010

**Lossless quantum compression of quantum measurements** — •Andreas Bluhm and Michael M. Wolf — Technische Universität München

In this work, we investigate the task of compressing quantum measurements in the Heisenberg picture with respect to their Hilbert space dimension. This serves to minimize data storage requirements. In our analysis, we allow for an arbitrary classical side channel and give a concrete procedure to determine the minimal dimension that we can compress to. Furthermore, we show that for two generic binary measurements compression is impossible, whereas for two von Neumann measurements we can reduce to dimension 2. For the latter case, we give a quantum channel with classical side information which achieves this compression.

MP 7.3 Di 17:45 SFG 2010

**On the Measurement Problem and the EPR Paradox** — •Eugen Muchowski — Vaterstetten

After a polarization measurement with photons in singlet state we know for certain the photons were in the measured state prior to measurement. Photons in singlet state do therefore not exhibit action at a distance. The EPR paradox with entangled photons has been challenged. It was also shown why quantum mechanics infringes Bells inequality.