



## Prof. Dr. Hanns-Christoph Nägerl

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### Matter-wave interference with interactions

We observe matter wave interference in the form of quantum carpets for a Bose-Einstein condensate (BEC) in the presence of interactions. Bloch oscillations lead to a fully coherent evolution for the macroscopic interacting wave function as manifested by a regular time-varying pattern in the first Brillouin zone. Coherence is demonstrated by reversing the evolution upon switching the strength of the interaction to zero and applying a harmonic force in a matter wave spin echo type experiment. As an application, we perform matter wave interferometry with interacting trapped BEC when the effect of interactions is balanced by the harmonic trapping potential. If time permits, we will discuss our progress towards the production of a BEC of ro-vibrational molecules. Starting from Feshbach molecules produced out of a BEC we produce a molecular quantum gas of molecules bound by more than 1000 1/cm via coherent STIRAP transfer. The next step will be to add a second STIRAP transfer step into the ro-vibrational ground state.



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