Looking at a one-dimensional atomic gas

In this talk recent results from a series of experiments will be discussed, in which we have investigated the one dimensional regime of an ultracold rubidium gas trapped in an optical lattice. In the one-dimensional regime the atomic gas is confined in an array of tube-like potentials. We have characterized the experimental regime by measuring the lowest lying collective oscillations of the trapped 1D gas. When subject to an additional longitudinal periodic potential we observe the transition of the trapped 1D gas from a strongly interacting superfluid to a Mott-insulator state. The excitation spectra and the coherence properties of both phases are quantitatively measured and compared to the three-dimensional situation.