**Construction of analytical many body wave functions for correlated bosons in a harmonic trap** PETER SCHMELCHER, YIANNIS BROUZOS, University of Hamburg, CENTER FOR OPTICAL QUANTUM TECHNOLOGIES TEAM — We develop an analytical many-body wave function to accurately describe the crossover of a one-dimensional bosonic system from weak to strong interactions in a harmonic trap. The explicit wave function, which is based on the exact two-body states, consists of symmetric multiple products of the corresponding parabolic cylinder functions, and respects the analytically known limits of zero and infinite repulsion for arbitrary number of particles. For intermediate interaction strengths we demonstrate, that the energies, as well as the reduced densities of first and second order, are in excellent agreement with large scale numerical calculations.

Peter Schmelcher
University of Hamburg