Phys 402: Applications of Quantum Mechanics

Lecture 1

a) Consider an atom laser confined in a one-dimensional box of length L (typically long as 1mm). Sketch the wave functions of the ground state and first two excited states.

b) Consider a small delta-bump or trap in the center of the box. Calculate the 1st order energy correction to all allowed energies. What about the correction to the ground state wave function? And when is the delta-function approximation a good one for a small bump in physical systems?

c) An experimentalist is trying to manipulate the atom using an optical tweezer or a micro-trap. Can you help to design the 1D micro-trap (depth, width etc so that) it can be used to effectively drag the atom along the tube?