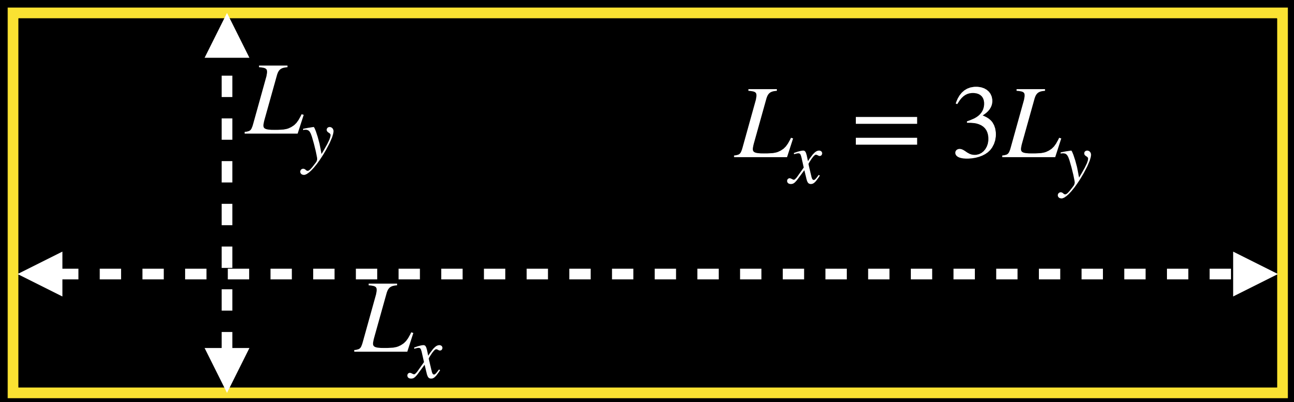
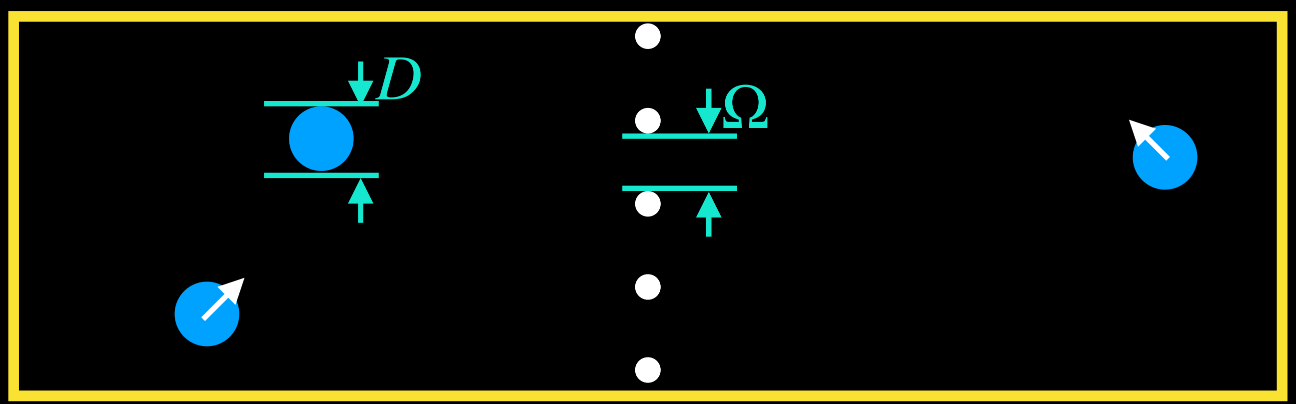
Project 4) Osmotic pressure

Choose an elongated box as shown in the picture below.



Place a vertical chain of infinitely heavy, but small particles inside the box (white particles in the following figure). The gap between those particles Ω should be variable.



We consider that those heavy particles do not move $v_x = v_y = 0$, but they interact with the other particles via elastic collisions.

Task: Chose an initial configuration, where all blue particles are on the right side of the white particle chain. Measure the time to reach the equilibrium steady state (equal density on right and left side) as a function of the particle spacing Ω. What it the minimal Ω to reach equal densities on the right and left? (You know the theoretical value, but does this value exists in practice ?)

Task: Measure the pressure on the right and left wall.

Hint: pressure is force per area and a force is nothing else than momentum transfer.

Check: In above setting the pressure on the right and left wall should be equal if the blue particles can cross the wall of white particles.

Note: It is not necessary, that one and the same code does everything. You can write several codes, which do one specific measurement.

Project 4)

We want to study the osmotic pressure. Consider the white particles as the semi-permeable wall. Your system is composed of two kind of particles.
Blue: the diameter of the blue particles is larger than Ω, hence the blue particles can not cross the semi-permeable wall of white particles.
Orange: the diameter of the orange particles is sufficiently small compared to Ω, hence they can cross the Semin-permeable wall.

We choose an initial state, where blue particles are on the left and orange particles are on the right of the wall. We are interested in the osmotic pressure depending on the initial densities.