Experimentally, K is understood to be constant at low reduced field strengths. This post examines why this parameter is useful with simulations where reduced field strength (E/N) is altered.

1 Key IMS Scaling Factor (E/N

E/N is known as the reduced field strength.

1.1 No Electric Field ($E/N = 0$)

First, we can consider the effect when ions are confined in a box in the presence of neutrals without the presence of an electric field. The red squares represent the ions and the blue dots correspond to the neutrals present. Without the presence of an electric field, the ions travel in a pattern of motion known as Brownian motion. The ions behave similarly to that of the neutral gasses.

1.2 Applied Constant Electric Field

Now the motion of the ions change when a constant electric field is applied. The voltage decreases linearly in the direction from left to right.

1.3 Double Electric Field

The ions travel with a higher terminal velocity (v_d) when the electric field is doubled proportional to the defined mobility (K) of the ion population.

1.4 Double Electric Field and Number Density

The reduced field strength remains constant when the number density and electric field are doubled. The animation on the right highlights that the terminal velocity (v_d) of the ion population is similar to the animation in the left.