Consider the two dimensional system below. There is an $L \times L$ square fixed in position with hard walls. There is also a fixed hard disk in the middle of the square and another hard disk that moves on a frictionless surface according to Newton's laws with an initial speed of V in the direction indicated. Its subsequent position and velocity are $\mathbf{r}(t)$ and $\mathbf{v}(t)$ respectively.

Calculate

$$P(u_x) \equiv \lim_{T \to \infty} \int_0^T \delta(u_x - v_x(t))dt$$

that is, the time averaged distribution for the x-component of the velocity.