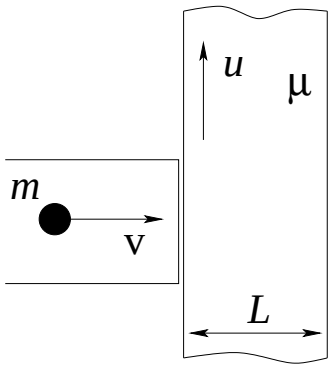
Puck on conveyor

A puck of mass m moves with velocity v, and slides onto a moving conveyor belt. The velocity of the belt is u, the friction coefficient is μ, width L. Describe the trajectory of the puck after it comes in contact with the belt, and find maximal allowed speed of the puck v_{max}, that allows it to stay on the belt, and not to fall off from the opposite edge. Gravity is into the page.



Answer of problem **Puck on conveyor**

In the reference frame moving with the belt, the puck will travel along a straight line at angle $\tan\alpha = u/v$ relative to the line across the belt.

Initial speed of the puck in that reference frame is $\sqrt{u^2+v^2}$.

Puck will not fall off the belt if its speed

$$v^2 < v_{max}^2 = -\frac{1}{2}u^2 + \sqrt{\frac{1}{4}u^4 + (2\mu g L)^2}$$