[lex170] Relativistic mass from momentum conservation

Two particles with equal rest masses m are undergoing an inelastic collision as shown in the lab frame S. From the conservation of total momentum in frame S (worked out in [lln16]),

$$\tilde{m}(v)v + \tilde{m}(0)0 = \tilde{M}(\bar{v})\bar{v}, \quad v = \frac{2\bar{v}}{1+\bar{v}^2/c^2},$$

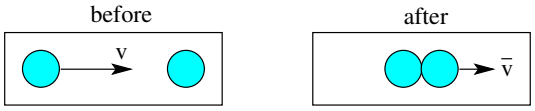
and the second relation (worked out in [lex169]),

$$\tilde{m}(v) + \tilde{m}(0) = \tilde{M}(\bar{v}),$$

between the individual masses before the collision and the compound mass after the collision, derive the expression,

$$\tilde{m}(v) = \frac{m}{\sqrt{1-v^2/c^2}},$$

for the relativistic mass, where $m = \tilde{m}(0)$ is the particle rest mass.



Solution: