

3. Rocket (5 points) — Jaan Kalda.

A photon rocket is accelerated by a laser beam sent from the ground: the rocket's mirror reflects the photons in the exact opposite direction. The rocket's rest mass M_0 did not change during the ride. The total energy of the photons emitted by the laser (and later reflected by the rocket) is $\alpha M_0 c^2$. The laser power is constant over time.

- i) (1 point) What speed v does the rocket reach if $\alpha = 1 \times 10^{-6}$?
- ii) (2 points) What speed v does the rocket reach if $\alpha = 1$?
- iii) (2 points) How many times does the rocket's acceleration, as perceived by passengers (i.e. the inertial force acting on them) differ at the beginning and at the end of the acceleration if $\alpha = 1$? Express the answer in terms of the rocket's final speed v .