

Two spaceships travel at relativistic speeds along the x axis (although not necessarily in the same direction). Spaceship 1 moves at velocity v_0 with respect to an observer. Spaceship 2 moves at velocity v with respect to spaceship 1 in spaceship 1's frame.

An astronaut on spaceship 1 fires a missile of proper length l_0 along the x axis with speed u (which may be positive or negative) in the frame of spaceship 1. The length of the missile in the frame of spaceship 2 is l_2 .

- a) For what value(s) of u would the ratio l_2/l_0 be 0? Is this situation physically realizable?
- b) For what value(s) of u does the ratio l_2/l_0 have its maximum? What is the maximum value of the ratio l_2/l_0 ?
- c) Calculate the length, l_2 , of the missile in the frame of spaceship 2.