

Question #80163, Physics / Other

Two events happen simultaneously in the frame S at a distance of 3.0 light years apart. In the frame S', which is moving with a speed v relative to S, the distance between these events is 3.5 light years. Calculate (i) v and (ii) the time interval between these events in the frame S'.

Solution

(i) $l = 3.0$ light years

$l_0 = 3.5$ light years

$$l = l_0 \sqrt{1 - \frac{v^2}{c^2}}$$

$$\sqrt{1 - \frac{v^2}{c^2}} = \frac{l}{l_0} = \frac{3}{3.5}$$

$$1 - \frac{v^2}{c^2} = \left(\frac{3}{3.5}\right)^2$$

$$\frac{v^2}{c^2} = 1 - \left(\frac{3}{3.5}\right)^2$$

$$v = c \sqrt{1 - \left(\frac{3}{3.5}\right)^2} = 0.515c.$$

(ii)

$$t' = \frac{3.5}{0.515} = 6.8 \text{ years.}$$

Answer provided by <https://www.AssignmentExpert.com>