Answer on question # 51437, Physics, Solid State Physics

Question Two spaceships approach each other, each moving with the same speed as measured by a stationary observer on the Earth. Their relative speed is 0.8c. Determine the velocities of each spaceship as measured by the stationary observer on Earth.

Solution In relativity, velocity-adding formula is

$$s = \frac{v + u}{1 + (vu/c^2)}$$

where s is relative velocity of two objects, that have velocities u and v in the laboratory (Earth) frame. We know that $u = v$ and $s = 0.8c$. So we can find $u = v$:

$$0.8c = \frac{2v}{1 + v^2/c^2}$$

$$2v = 0.8c + 0.8v^2/c$$

There is only one solution that is smaller than c, its

$$v = 0.5c$$

So this is velocity measured from Earth.