Yet another wrong claim by Ralph Malcolm Rabbidge

Paul B. Andersen

October 12, 2011

1 Introduction

Ralph Malcolm Rabbidge, who is posting in the usenet-group sci.physics.relativity under the pseudonym Henry Wilson, has in this posting: **Ralph Malcolm Rabbidge's original post** made the following claim:

> *"Two synched clocks moved apart at the same speed in opposite directions remain in synch IN SR but NOT IN LET."*

I will show that they according to Lorentz Ether Theory (LET) will stay in sync.

2 Symmetric clock transport according to LET

We will place two clocks C_1 and C_1 at the centre of a rod with length 2L. The clocks move in opposite direction to the ends of the rod with the speed v relative to the rod. This rod is moving at the speed u through an assumed Lorentz type ether.

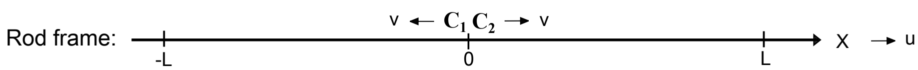

Figure 1: *The frame of reference*

We have the following events of interest:

1. Event E_0: The clocks are adjacent at $x = 0$, both showing zero
2. Event E_1: Clock C_1 is at the left end of the rod showing t'_1 , $x_1 = -L$, $t_1 = \frac{L}{v}$
3. Event E_2: Clock C_2 is at the right end of the rod showing t'_2 , $x_2 = L$, $t_2 = \frac{L}{v}$

Since Lorentz Ether Theory (LET) is defined by the Lorentz transformation, we have:

$$t'_1 = \frac{t_1 + \frac{x_1 v}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{\frac{L}{v} - \frac{Lv}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{L}{v}\sqrt{1 - \frac{v^2}{c^2}}$$

$$t'_2 = \frac{t_2 - \frac{x_2 v}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{\frac{L}{v} - \frac{Lv}{c^2}}{\sqrt{1 - \frac{v^2}{c^2}}} = \frac{L}{v}\sqrt{1 - \frac{v^2}{c^2}}$$

Since the clocks C_1 and C_1 show the same at the time $t_1 = t_2$, they are still in sync with each other, as observed in the rod frame.

The rod's speed through the assumed ether is obviously utterly irrelevant.

3 Calculations in the ether frame

3.1 Symmetric clock transport

In the article: **Ralph Malcolm Rabbidge's article**

Ralph Malcolm Rabbidge makes the following claim:

```
Let light speed = 3E8 m/s

Let absolute speed of clocks = 300 m/s or E-6c

Let clock separation speed, v, be 0.03 m/s for 5000 seconds.

Final separation = 300 m.
**********************************

Calculation of synch error:

Initially, both clocks are running slow by sqrt(1- (u/c)^2)

During movement, C1 runs slow by sqrt(1-((u+v)/c)^2),or

~ 1 - 1/2((u+v)/c)^2)


Similarly, c2 runs slow by ~ (1-1/2((u-v)/c)^2)

Rate difference = (v/c)^2

= 1 part in E20 (clock seconds/absolute second).

In 5000 seconds, the clock readings differ by 5E-15 seconds

***********************************
Measuring travel times using aether light:

Light travel time one way = 300/(1+E-6)c = 299.9997/c secs.

for the other = 300/(1-E-6)c = 300.0003/c

Difference = 18E-12 seconds.
```

Ralph Malcolm Rabbidge quite correctly points out that LET, like SR, predicts that the clocks will be out of sync as observed in the assumed ether frame.

He seems to think that this implies that they according to LET are out of sync in the rod frame as well, which is wrong.

But let's do the math properly.

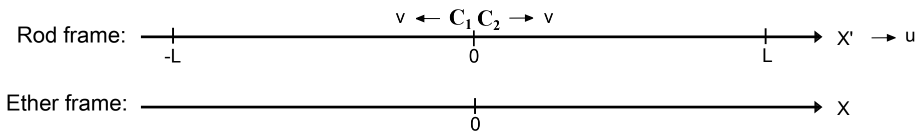

Figure 2: *The frames of reference*

The speed of C_1 in the ether is:

$$v_1 = \frac{u-v}{1-\frac{uv}{c^2}} = \frac{c^2\,(u-v)}{c^2-uv}$$

The length of the left half of the rod as measured in the ether frame is:

$$L_A = L\sqrt{1-\frac{u^2}{c^2}}$$

Observed in the ether frame, the clock will approach the left end of the rod with the closing speed:

$$V_{C1} = u - v_1 = u - \frac{c^2\,(u-v)}{c^2-uv} = \frac{v\left(c^2-u^2\right)}{c^2-uv}$$

The time when C_1 reaches the end of the rod, as measured by stationary clocks in the ether frame, will be:

$$t_1 = \frac{L_A}{V_{C1}} = \frac{L\sqrt{1-\frac{u^2}{c^2}}}{\frac{v(c^2-u^2)}{c^2+uv}} = \frac{L}{v}\frac{\left(c^2-uv\right)}{c\sqrt{c^2-u^2}}$$

Since the clock C_1, as observed in the ether frame, is running slow by by the factor:

$$\sqrt{1-\frac{v_1^2}{c^2}} = \sqrt{1-\frac{\left(\frac{c^2(u-v)}{c^2-uv}\right)^2}{c^2}} = \frac{\sqrt{\left(c^2-u^2\right)\left(c^2-v^2\right)}}{c^2-uv}$$

C_1 will, when it reaches the end of the rod, show:

$$t_1' = t_1\frac{\sqrt{\left(c^2-u^2\right)\left(c^2-v^2\right)}}{c^2-uv} = \frac{L}{v}\frac{\left(c^2-uv\right)}{c\sqrt{c^2-u^2}}\frac{\sqrt{\left(c^2-u^2\right)\left(c^2-v^2\right)}}{c^2-uv} = \frac{L}{v}\sqrt{1-\frac{v^2}{c^2}}$$

The speed of C_2 in the ether is:

$$v_2 = \frac{u+v}{1+\frac{uv}{c^2}} = \frac{c^2\,(u+v)}{c^2+uv}$$

The length of the right half of the rod as measured in the ether frame is:

$$L_A = L\sqrt{1-\frac{u^2}{c^2}}$$

Observed in the ether frame, the clock will approach the right end of the rod with the closing speed:

$$V_{C2} = v_2 - u = \frac{c^2\,(u+v)}{c^2+uv} - u = \frac{v\left(c^2-u^2\right)}{c^2+uv}$$

The time when C_2 reaches the end of the rod, as measured by stationary clocks in the ether frame, will be:

$$t_2 = \frac{L_A}{V_{C2}} = \frac{L\sqrt{1-\frac{u^2}{c^2}}}{\frac{v(c^2-u^2)}{c^2+uv}} = \frac{L}{v}\frac{\left(c^2+uv\right)}{c\sqrt{c^2-u^2}}$$

Since the clock C_2, as observed in the ether frame, is running slow by by the factor:

$$\sqrt{1-\frac{v_2^2}{c^2}}=\sqrt{1-\frac{\left(\frac{c^2(u+v)}{c^2+uv}\right)^2}{c^2}}=\frac{\sqrt{(c^2-u^2)(c^2-v^2)}}{c^2+uv}$$

C_2 will, when it reaches the end of the rod, show:

$$t_2'=t_2\frac{\sqrt{(c^2-u^2)(c^2-v^2)}}{c^2+uv}=\frac{L}{v}\frac{\left(c^2+uv\right)}{c\sqrt{c^2-u^2}}\frac{\sqrt{(c^2-u^2)(c^2-v^2)}}{c^2+uv}=\frac{L}{v}\sqrt{1-\frac{v^2}{c^2}}$$

Note what this means:

- Both clocks are set to zero when adjacent at the middle of the rod.
- The clocks are moving equal distances in opposite directions with the same speed v relative to the rod.
- Both clocks show the same when they reach the ends of the rod.

An observer in the rod frame will thus have to conclude that the clocks still are in sync when they are stationary in the rod frame at the ends of the rod.

An observer stationary in the ether will however be of a different opinion. He will agree that the clocks show the same when they reach the ends of the rod, but according to him, they do not reach the end of the rod simultaneously. C_1 reaches the end of the rod first at the time t_1. So at the time t_2, C_1 will have advanced:

$$\Delta t'=(t_2-t_1)\sqrt{1-\frac{u^2}{c^2}}=\left(\frac{L}{v}\frac{\left(c^2+uv\right)}{c\sqrt{c^2-u^2}}-\frac{L}{v}\frac{\left(c^2-uv\right)}{c\sqrt{c^2-u^2}}\right)\sqrt{1-\frac{u^2}{c^2}}=\frac{2Lu}{c^2}$$

At the time t_2, clock C_1will show $\left(\frac{L}{v}\sqrt{1-\frac{v^2}{c^2}}+\frac{2Lu}{c^2}\right)$ while clock C_2will show $\frac{L}{v}\sqrt{1-\frac{v^2}{c^2}}$. Later than t_2 will C_1 and C_2be out of sync by $\frac{2Lu}{c^2}$ as observed in the ether frame.

3.2 Einstein's synchronization method

Ralph Malcolm Rabbidge has in a posting in sci.physics.relativity made the request:

"Tell us how their synch would appear using light moving at c in the absolute frame."

Let's do that.

We will assume that C_1 and C_2 are stationary at each end of a rod with length $2L$. The rod is moving with the speed u in the ether. Let us select a frame of reference stationary in the ether such that at the time $t = 0$ the centre of the rod is at $x = 0$.

- Event E_0: At the time $t_0 = 0$ a light pulse is emitted from clock C_1 and C_1 is set to zero.
- Event E_1: At the time t_1 the pulse is reflected off C_2 and the reading t'_{21} of C_2 is noted.
- Event E_2: At the time t_2 the pulse is received by C_1 when its reading is t'_{12}.

We then have:

$$t_1 = \frac{2L\sqrt{1-\frac{u^2}{c^2}}}{c-u}$$

$$t_2 = t_1 + \frac{2L\sqrt{1-\frac{u^2}{c^2}}}{c+u} = \frac{4Lc\sqrt{1-\frac{u^2}{c^2}}}{c^2-u^2}$$

The clock C_1will at the event E_2 show:

$$t'_{12} = t_2\sqrt{1-\frac{u^2}{c^2}} = \frac{4L}{c}$$

We will now set C_2 such that it showed $\frac{t'_{12}}{2}$ at the event E_1. So C_2 showed at the time t_1:

$$t'_{21} = \frac{2L}{c}$$

The clock C_1 will at the time t_1 show:

$$t'_{11} = t_1\sqrt{1-\frac{u^2}{c^2}} = \left(\frac{2L\sqrt{1-\frac{u^2}{c^2}}}{c-u}\right)\sqrt{1-\frac{u^2}{c^2}} = \frac{2L\,(c+v)}{c^2}$$

Since C_1 and C_2 not are showing the same at the time t_1, they will, as observed in the ether frame, be out of sync by:

$$\Delta t' = t'_{11} - t'_{21} = \frac{2L\,(c+v)}{c^2} - \frac{2L}{c} = \frac{2Lu}{c^2}$$

So we can conclude that Einstein's synchronization method gives the same result as symmetric clock transport; C_1 and C_2 will be out of sync by $\frac{2Lu}{c^2}$ as observed in the ether frame.

4 Conclusion

We have shown that according to LET will two clocks which are synced with symmetric clock transport stay in sync in the frame of reference where the clocks were initially at rest, but they will not stay in sync in the ether frame.

Synchronization by Einstein's method gives the same result as symmetric clock transport.

SR predicts exactly the same as LET.