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A DISCUSSION ABOUT SPECIAL RELATIVITY

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Abstract:

This article suggests an experiment to analyze a very long moving object. When one end of it emits a beam of light, we measure the time when the sensors located in different locations receive the light. Based on the theory of relativity (special relativity), when using different inertial frames of reference, the results become different after analysis. This is impossible because there must be a unique result in real physical world. This is also against one of the postulates of special relativity that the laws of physics are the same for all observers in any inertial frame of reference relative to one another. An additional analysis from a different angle also resulted in an impossible contradiction. Thus, the theory of relativity (Special Relativity) should be mistaken.

Key Words: Special Relativity, Theory of Relativity, Albert Einstein, Speed of Light, Frame of Reference, Theoretical Physics

Main Text:

An experiment is designed as follows:

As light travels 299792458 meters per second in vacuum, let's suppose, in the vacuum space, there is a very long and thin and rigid rod X whose length is 299792458 plus 1 meters = 299792459 meters. And there is another short rod Y whose length is 1 meter. Please see Figure 1.

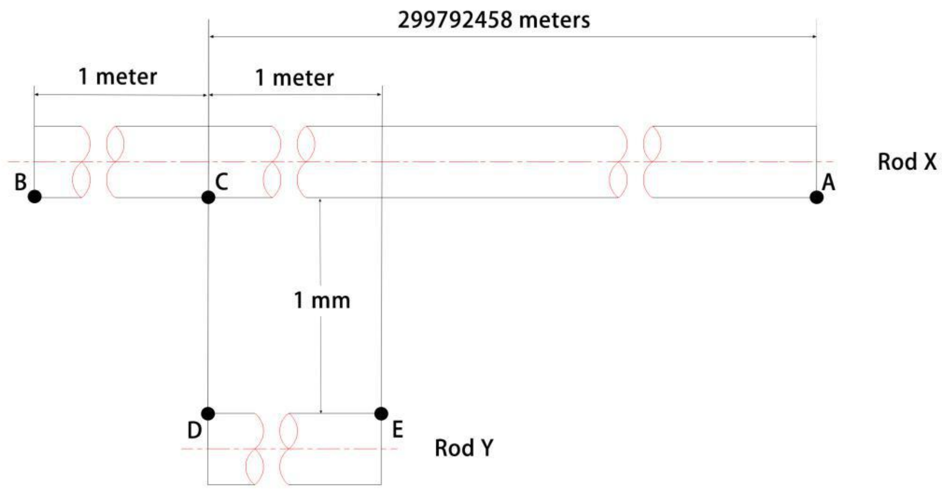

Figure 1 (t_0)

Point A, point B, and point C are all located on the rod X, while point A is located at one end of the rod X, point B is located at another end of the rod X, point C is located one meter away from point B.

Rod X and rod Y are parallel to each other. And they are very near to each other. Their distance is one millimeter, as seen from Figure 1.

Point D and point E are located on the rod Y. Point D is located at one end of the rod Y and point E is located at another end of the rod Y. From point B to point A is the same direction as from point D to point E.

Relative to the rod Y, the rod X travels in vacuum space at the speed of 1 meter per second in the direction from point B to Point A. According to the theory of relativity(special relativity), the laws of physics are the same for all observers in any inertial frame of reference relative to one another (principle of relativity). Thus, we can also say, relative to the rod X, the rod Y travels in vacuum space at the speed of 1 meter per second in the direction from point E to Point D. So, after 1 second, the relative position of the 2 rods will be like Figure 2.

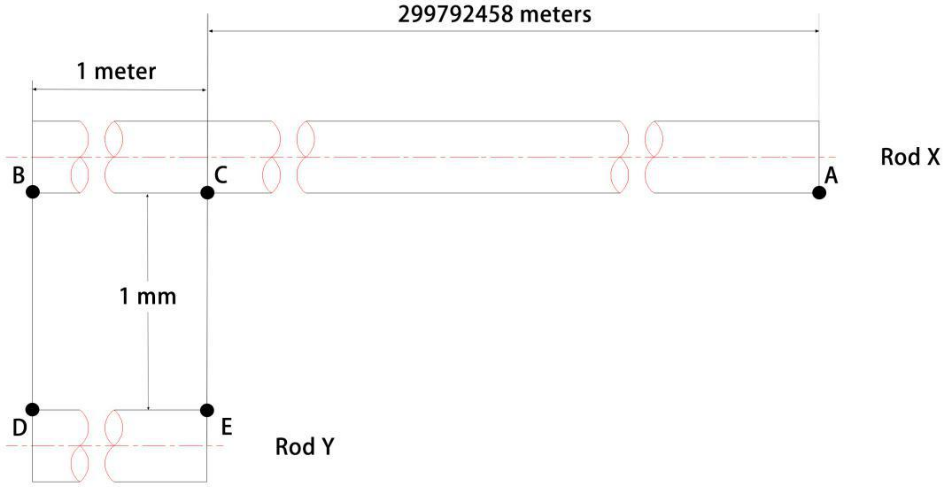

Figure 2 (t_1)

And very accurate atomic clocks are put at each of the 5 points A, B, C, D, and E to measure the time when events happen.

Before we put the 5 clocks at the 5 points, the clocks are well synchronized. And because the rods travel at a very low relative speed, only one meter per second, the theory of relativity says that Time dilation effect can be neglectable, i.e., the 5 clocks will also be well synchronized although the rods are moving relative to each other. Because the rod travelling speed is so low, the theory of relativity also tells us that the effects of Length contraction and Relativity of simultaneity can be neglected during our analysis.

At point A we put a light source. At each point B, C, D, and E, we put a sensor to detect the light emitted by the light source at point A.

When the rod X travels relative to rod Y to the position where point D is side by side with point C, i.e., point D is 1 millimeter away from point C, as shown in Figure 1, the light source at point A emits a beam of light(we call this time as t_0). At this time t_0, the clock at point A has a measurement of time (t_0). Then we will measure the time when this beam of light reach the sensors located at point B, C, D, and E.

According to the theory of relativity (special relativity), the speed of light in a vacuum is the same for all observers, regardless of their relative motion or of the motion of the light source. Then:

- according to the observer on the rod Y, rod X is moving, rod Y is static all the time, so:

when this beam of light is emitted(t_0), the source of light is 299792458 meters away from the sensor at point C. Because the rod travels at the speed of 1 meter per second, 1 second after the beam of light is emitted (we call this time as t_1, whereas t_1-t_0=1second), the sensor at point B will 299792458 meters away from the position where the beam of light is emitted. At this time(t_1), point B travels to the position of point C when at t_0 and point D is side by side with point B, i.e., point D is 1 millimeter away from point B, as shown by Figure 2. Therefore, obviously, when the beam of light reaches the sensor at point B, the time measurement will be exactly 1 second. And apparently, when this beam of light reach the sensor located at point C, the measurements of time will be less than 1 second, i.e., 299792458/299792459= 0.99999999666435905914498002766641 second. This is true because when the beam of light has travelled for 299792458/299792459 second, the distance it has travelled is t*v=299792458/299792459*299792458= 299792458^2/299792459 meters. So the light has travelled to the point 299792458^2/299792459 meters away from the position where the beam of light is emitted. At the same time, after 299792458/299792459 second, the sensor at point C has travelled t*v=299792458/299792459*1= 299792458/299792459 meters. Because 299792458^2/29979245+299792458/299792459=299792458 meters, which is the original distance between point A and point C, so the light meets the sensor at point C when the measurement of the time is 299792458/299792459 second.

At time t_1, when point D is one millimeters away from point B and point C is one millimeters away from point E, we can know by simple calculation that this beam of light reach point D and point B almost at the same time(there is a very tiny difference in time. The exact figure is that the time measurement at point B is exactly 1 second while the time measurement at point D is 1.00000000000000000000000055632503 second, with the calculation process being: according to Pythagorean Theorem, SQRT（$299792458^2+ 0.001^2$）/299792458= 1.00000000000000000000000055632503）. Thus we can see that the time difference is truly very tiny and can be neglected), and that this beam of light reach point C and point E almost at the same time. So we can realistically consider that, when this beam of light reach the sensor located at point D, the measurements of time will also be 1 second. Also, when this beam of light reach the sensor located at point E, the measurements of time will be less than 1 second, i.e., almost 299792458/299792459 second(The exact figure is that the time measurement at point E is SQRT(($299792457^2+0.001^2$) /299792458=0.999999996664359048018485067494453 second).

- according to the observer on the rod X, rod Y is moving, rod X is static all the time, so:

when this beam of light is emitted(t_0), the source of light is 299792458 meters away from the sensor at point C. Because the rod X doesn't move, no matter how long time later, the sensor at point C will still be 299792458 meters away from the position where the beam of light is emitted. So apparently, when this beam of light reaches the sensor located at point C, the measurements of time will be exactly 1 second. Also apparently, when this beam of light reaches the sensor located at point B, the measurements of time will be more than 1 second. i.e., 299792459/299792458=1.00000000333564095198152049575558 second. So, when this beam of light reach the sensor located at point E, the measurements of time will be almost 1 second (the exact figure is 1.0000000000000000000000005563250298825220330531413606 7443 second). And when this beam of light reach the sensor located at point D, the measurements of time will be almost 299792459/299792458 second (the exact figure is 1.00000000333564095198152605900061 second).

In sum:

- according to the observer on the rod Y,
  - this beam of light reaches sensor at point B exactly 1 second after the light is emitted.
  - this beam of light reaches sensor at point C exactly 299792458/299792459 = 0.999999996664359059144980027666641 second after the light is emitted.
  - this beam of light reaches sensor at point D almost 1 second after the light is emitted. (Exact figure being 1.00000000000000000000000055632503 second)
  - this beam of light reaches sensor at point E almost 299792458/299792459 second after the light is emitted. （Exact figure being 0.999999996664359048018485067494 5second)
- according to the observer on the rod X,
  - this beam of light reaches sensor at point B exactly 299792459/299792458= 1.00000000333564095198152049575558 second after the light is emitted.
  - this beam of light reaches sensor at point C exactly 1 second after the light is emitted.
  - this beam of light reaches sensor at point D almost 299792459/299792458 second after the light is emitted （Exact figure being 1.00000000333564095198152605900061 second).
  - this beam of light reaches sensor at point E almost 1 second after the light is emitted （Exact figure being 1.00000000000000000000000055632502988252203305314136067443second)

Thus, there are contradictions.

If the theory of relativity (special relativity) is correct, there should be no contradiction. Because this experiment is not a theoretical hypothesis that can be explained or interpreted using different theories, this is a real physical event that can be tested in real life. When we do the test, there will be an actual result of the experiment. Therefore, the theory of relativity (special relativity) must be mistaken.

Most importantly, and fortunately, because we now have very accurate atomic clocks in the world, we can actually do this experiment on earth. Considering the high accuracy of the atomic clocks available, when we do the experiment, the rod X can probably be much shorter than 299792458 meters. For example, the rod can be as short as multiple km or even multiple meters.

The above analysis is logical but there can be another approach to prove the same result, that is, we now simply select to read the measurements of sensors B, C and D and make comparisons.

So, we do the same experiment:

When the rod X travels at a speed of 1 meter per second relative to rod Y to the position where point D is side by side with point C, i.e., point D is 1 millimeter away from point C, as shown by Figure 1, the light source at point A emits a beam of light (we call this time as t_0). At this time t_0, the clock at point A has a measurement of time (t_0). Then we will measure the time when this beam of light reach the sensors located at point B, C, and D(t_B, t_C, and t_D).

- For the sensor at point B, the measurement will obviously be exactly 299792459/299792458 second after the light is emitted(t_B-t_0=299792459/299792458=1.00000000333564095198152049575558 second)
- For the sensor at point C, the measurement will obviously be exactly 1 second after the light is emitted, i.e., t_C=t_1 . (t_1-t_0=1 second)

- For the sensor at point D, the measurement will be almost 1 second but slightly more than 1 second. Because the distance between the point where the light is emitted and the point 1 millimeter to the side of point D（the point 1 millimeter to the side of point D is actually where point C is located when the light is emitted) is exactly 299792458 meters. So the distance between the point where the light is emitted and the point D is actually 299792458.00000000000000166782048 meters. So the measurement at point D will be t_D-t_0=299792458.00000000000000166782048/299792458= 1.0000000000000000000000055632503 second. Now, t_D-t_0<t_B-t_0. This means, light reach sensor at point D before light reach sensor at point B. However, at time t_1(t_1-t_0=1 second) the point B and point D have moved to the position of being side by side, i.e. one millimeter from each other, and at this time, the light has reached the sensor at point C but has not reached the sensors at point B and point D, even if there is no movement now, t_D-t_0 will be bigger than t_B-t_0. But there still exist relative movement of the rods with a result that point D will be further away from the light source than point B. Thus, the measurement at point D must be bigger than the measurement at point B(t_D-t_0>t_B-t_0), i.e., the light take less time to reach B than to reach D.

Again, there is a contradiction.

Thus, the theory of relativity (special relativity) should be mistaken.

Now that we arrived at the conclusion that the theory of relativity (special relativity) is mistaken, so for the 2 postulates of special relativity:

- The laws of physics are the same for all observers in any inertial frame of reference relative to one another (principle of relativity).
- The speed of light in a vacuum is the same for all observers, regardless of their relative motion or of the motion of the light source.

At least one of them is mistaken. Or both of them are mistaken.

Conclusion:

- The laws of physics are not the same for all observers in any inertial frame of reference relative to one another. Or/and,
- The speed of light in a vacuum is not the same for all observers, when light source or observer is moving. In many cases, light travels faster or slower than currently well accepted speed of light.

References:

1. Einstein A. (1916), Relativity: The Special and General Theory (Translation 1920), New York: H. Holt and Company