SPECIAL RELATIVITY: PART ONE

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Abstract
The Special Theory of Relativity postulates that the speed of light always remains constant at 186,000 miles per second at all inertial frames. This paper describes an anomaly in the standard computation pertaining to the constancy of the speed of light.
Keywords: time, distance, scale, anomaly

The Special Theory of Relativity posits that a person on a moving vehicle, e.g., a very fast moving train (moving frame), traveling at close to the speed of a beam of light (moving frame) in the same direction would find the speed of the beam of light (moving frame) to be unchanged at 186,000 miles per second, instead of the difference between the speed of the very fast moving train (moving frame) and the speed of the beam of light (moving frame), which would normally be the case. This is because, according to the Special Theory, on the very fast moving train (moving frame) approaching the speed of light the clock therein used to gauge the time traveled by the beam of light (moving frame) has slowed down by the same degree (say X %) as the ruler or measuring device (stated as meter stick or measuring rod in some texts) therein used to gauge the distance traveled by the beam of light (moving frame) has contracted in length in the direction of the very fast moving train's motion (also X %), the greater the very fast moving train's traveling speed the more the clock slows down and the greater the length contraction of the ruler or measuring device. This is expressed in the following equation (the speed of the beam of light (moving frame) being the distance it traveled divided by the time it took to travel this distance), which is in accordance with the Special Theory of Relativity:-

(186,000 miles - X % of 186,000 miles) $\div$ (1 second - X % of 1 second) = 186,000 miles per second

In other words, there has to be a same percentage decrease in the time gauged and the distance gauged due to the respective slowing down of the clock and contracting in length of the ruler or measuring device therein the very fast moving train (moving frame), in order for the speed of the beam of light (moving frame) to remain constant, which is consistent with mathematical logic - this condition must indeed apply in order for the speed of the beam of light (moving frame) to remain constant.

There is however something not quite usual related to the above concept. According to the Special Theory of Relativity, the person on the very fast moving train traveling at close to the speed of light (moving frame) gauging the speed of the beam of light traveling in the same direction (moving frame) would not notice that the clock on his very fast moving train (moving frame) has slowed down and the ruler or measuring device therein has contracted in length in the direction of motion. In other words, everything would appear normal to him, despite the fact that his clock has actually slowed down and his ruler or measuring device has actually contracted in length in the direction of motion, as is postulated by the Special Theory of Relativity. But, according to the Special Theory of Relativity, when he (moving frame) compares himself to a person on the ground who is not moving (stationary frame), he could even consider himself stationary (stationary frame) while thinking that the person on the ground (who is not moving) is actually moving (moving frame), i.e., all movements are relative. He (moving frame) would notice that the clock on the ground (stationary frame) is slower and the ruler or measuring device on the ground (stationary frame) is shorter. The person on the ground who is not moving (stationary frame) would also notice that the clock on the very fast moving train (moving frame) is slower, the ruler or measuring device therein is shorter, and, the length of the very fast moving train (moving frame) is shorter. In other words, both the train-traveler (moving frame) and the person on the ground who is not moving (stationary frame) would notice that the other's clock is slower and the other's ruler or measuring device is shorter, and, according to the Special Theory of Relativity, the slowing down of clocks and the shortening of rulers or measuring devices would appear to be by the same degree (X %) for both.

But, it is actually the clock on the very fast moving train traveling at close to the speed of the beam of light in the same direction (moving frame) which has slowed down and the ruler or measuring device therein which has contracted in length (in the direction of motion) as is postulated by the Special Theory of Relativity, and not those on the ground (stationary frame). To the traveler on the very fast moving train (moving frame) who is gauging the speed of the beam of light traveling in the same direction (moving frame), the beam of light (moving frame) appears to take less time (time dilation) to travel a shorter distance (length contraction), which, according to the Special Theory of Relativity and in accordance with the following equation, explains the constancy of the speed of light at all inertial frames:-

(186,000 miles - X % of 186,000 miles) ÷ (1 second - X % of 1 second) = 186,000 miles per second

The speed of the beam of light (moving frame) is obtained by dividing the distance traveled by the beam of light (as gauged by the ruler or measuring device on the very fast moving train traveling at close to the speed of light - moving frame) by the time it took to travel that distance by the beam of light (as gauged by the clock therein the very fast moving train - moving frame), the gauging being carried out by the traveler on the very fast moving train (moving frame). In the above example, the clock on the very fast moving train traveling at close to the speed of light (moving frame) slows down and gauges a slower time, X % slower. The ruler or measuring device therein also contracts in length in the direction of motion by X %; however because of this it should gauge any object as “longer” due to a change in the scale of the ruler or measuring device on contracting in length in the direction of motion (see Appendix 1), and, this evidently gives rise to an anomaly when computing the speed of the beam of light (moving frame). This anomaly in the computation of the speed of light is described in the example below.

The person on the very fast moving train (moving frame) traveling at close to the speed of the beam of light (moving frame) in the same direction could be considered one inertial frame, and, the ground level (stationary frame) could be considered another inertial frame. If, traveling at close to the speed of light, both his clock has slowed down and his ruler or measuring device has contracted in length in the direction of motion by the same degree or percentage, say 50 %, the beam of light (moving frame) whose speed he is gauging, according to the Special Theory of Relativity, would also appear to him to have traveled a distance (from one designated point to another designated point - reference, stationary frame) which is shortened by 50 %, i.e., the distance between the two designated points (reference, stationary frame) appears to him to have shortened by 50 %.

Let us look at the following self-explanatory diagrammatic example, which contains the above-said anomaly:-

<u>Gauging Of The Speed Of A Beam Of Light At Close To The Speed Of Light When, For Example, The Clock Has Slowed Down By 50 % And The Ruler Has Contracted In Length In The Direction Of Motion By 50 %</u>

How do we gauge the speed of a beam of light (moving frame) while traveling at close to the speed of light on a very fast moving train (moving frame) in the same direction? We do so as follows:-

a) The beam of light (moving frame) travels from one point to another point, say, from Point A to Point B (the distance between Point A and Point B being a reference, stationary frame next to the beam of light, say, on the embankment next to the railway tracks).

b) Let us say that the distance from Point A to Point B (reference, stationary frame) is 1 metre and the beam of light (moving frame) takes x second to travel this 1 metre from Point A to Point B (reference, stationary frame), i.e., the speed of the beam of light (moving frame) is 1 metre per x second. In other words, as gauged from the ground level (stationary frame) the speed of the beam of light (moving frame) traveling from Point A to Point B (reference, stationary frame) is 1 metre per x second, which is depicted as follows:

beam of light travels 1 metre from Point A to Point B (speed is 1 metre
--> per x second)
l--l x second (before clock
<------------------------- 1 metre ----------------------> slows down 50 %)
(length of ruler before 50 % length contraction)

____
l   1-metre ruler   l (ruler before 50 %
l____l length contraction)

c) Next, the beam of light (moving frame) is gauged from a very fast moving train (moving frame) traveling in the same direction as the beam of light (moving frame), at close to the speed of light, when, say, the clock used to time the distance traveled by the beam of light (moving frame) from Point A to Point B (reference, stationary frame) on the embankment besides the railway tracks has slowed down by 50 %, the 1-metre-long ruler used to measure the distance traveled has contracted in length in the direction of motion by 50 %, and the distance traveled by the beam of light (moving frame) from Point A to Point B (reference, stationary frame) has also shortened by the same degree, 50 % (in the eyes of the train-traveler (moving frame) gauging the speed of the beam of light (moving frame), which is in accordance with the Special Theory of Relativity) - i.e., the distance between Point A & Point B (reference, stationary frame) on the embankment besides the railway tracks has shortened from 1 metre by 50 % to 0.5 metre as seen by the train-traveler (moving frame) who is gauging the speed of the beam of light (moving frame), which is in accordance with the Special Theory of Relativity. Note that, in accordance with the Special Theory of Relativity, the train-traveler (moving frame) does not notice that his clock has slowed down by 50 % and his 1-metre-long ruler has contracted in length in the direction of motion by 50 % while his train is moving at close to the speed of light. All this is depicted as follows:

beam of light (contracts in length by 50 % in the eyes of the train-traveler - speed is now 0.5 metre per **1/8** x second, or, 4 metres per x second)
--------------->
l---l ½ x second (after
<----------------------- 1 metre -------------------------> clock slows down
(length of ruler before 50 % length contraction) by 50 %, but train-
traveler does not notice
it, = x second ÷ 2)

 ____
l 1-metre ruler l (ruler after 50 % length contraction
l_________________________l which train-traveler does not notice)

l---------------------------------l ¼ x second (after clock slows down by 50 %,
<----- reads “1 metre” -----> but train-traveler does not notice it, = ½ x
(length of ruler second ÷ 2)
after 50 % length
contraction = 50 %
of original length)

l----------------l **1/8** x second (after clock slows down by 50 %, but train-
<-0.5 metre-> traveler does not notice it, = ¼ x second ÷ 2)

(train-traveler sees this 0.5 metre as the distance from Point A to Point B traveled by the beam of light after the distance has shortened by 50 % in accordance with the Special Theory of Relativity)

The train-traveler (moving frame) obtains the speed of the beam of light (moving frame) by dividing the distance between Point A & Point B (reference, stationary frame), which in his eyes, in accordance with the Special Theory of Relativity, has contracted by 50 % from 1 metre to 0.5 metre, by the time the beam of light (moving frame) takes to travel this distance (0.5 metre).

As is evident from the above diagrams, the train-traveler’s clock, which has slowed down by 50 %, would time the distance (0.5 metre now) traveled by the beam of light (moving frame) 50 % slower of course; it would gauge the time the beam of light (moving frame) takes to travel the distance of 0.5 metre from Point A to Point B (reference, stationary frame) as **1/8** x second. This translates into a speed of 4 metres per x second for the beam of light (moving frame), i.e., 4 times the speed of light, instead of just the speed of light which Special Relativity postulates. (The above description might be difficult to comprehend. For an alternative description, see Appendix 2.)

This is an anomaly and it contradicts an important postulate of the Special Theory of Relativity, namely, the constancy of the speed of light at all inertial frames. All this requires attention and correction.

In order for the speed of the beam of light to remain/appear constant in this instance, i.e., remain at 1 metre per x second, one of the following has to happen:-

1) When the clock slows down by 50 %, the ruler should increase in length by 100 %.
2) When the ruler decreases in length by 50 %, the clock should quicken by 100 %.
3) When the clock slows down by 50 % and the ruler decreases in length by 50 %, the beam of light (moving frame) should slow down by 400 %.

As a matter of fact, depending on how many percent the train-traveler's clock slows down and his ruler decreases in length in the direction of motion, which all depends on how fast the train is traveling, the speed of the beam of light would appear variable, and not constant, to the train-traveler. See the two other examples in Appendix 3.

APPENDIX 1

For example, we have an atlas of size X feet in length by Y feet in breadth with a scale of 1 is to 100,000 (1 inch on the atlas represents 100,000 inches on the actual ground) which shows only a portion of our globe. To have the whole globe represented in this atlas X feet in length by Y feet in breadth, it is evident that we have to change its scale, e.g., change its scale to 1 is to 1,000,000 (1 inch on the atlas represents 1,000,000 inches on the actual ground). The above-mentioned ruler or measuring device which has contracted in length is analogous to an atlas whose scale has been changed to allow it to represent a larger area (i.e., the whole globe), e.g., from 1 is to 100,000 to 1 is to 1,000,000 - with the new scale of 1 is to 1,000,000, 1 inch on the atlas now represents a length of 1,000,000 inches instead of 100,000 inches on the actual ground. If we change the scale of the above-mentioned atlas which shows only a portion of our globe to 1 is to 1,000,000 from 1 is to 100,000, we would have a much smaller atlas showing the same portion of our globe, whose dimensions would be 1/10 X feet in length by 1/10 Y feet in breadth, a contracted atlas which is analogous to the above-mentioned ruler or measuring device which has contracted in length. A 1-metre-long ruler which has contracted in length by 50 %, e.g., would now gauge the length of 1 metre as 2 metres (and not 0.5 metre in accordance with the Special Theory of Relativity), and this is evidently the cause of the above-described anomaly relating to the computation of the speed of light. In fact, for the 1-metre-long ruler to gauge the length of 1 metre as 0.5 metre it would have to increase in length by 100 %. A shortened ruler would gauge an object as "longer" while a lengthened ruler would gauge an object as "shorter".

Let us look at a simple example here. Say, the 1-metre-long ruler used to gauge distance has contracted in length in the direction of motion by 20 %. The clock used to gauge time, which has also slowed down by 20 %, according to the Special Theory of Relativity, would now gauge the time taken, say X, to travel the distance between two designated points (reference, stationary frame), say Y, as having decreased by 20 % to become 0.8 X. Though the 1-metre-long ruler, which has contracted in length by 20 %, still reads "1 metre" in length, it is in effect shorter by 20 % (actually only 0.8 metre in length). Therefore, when it gauges the distance traveled, Y, above, this distance Y would now be gauged as 1.25 Y, and not 0.8 Y in accordance with the Special Theory of Relativity. As stated above, the Special Theory of Relativity theorizes that for a beam of light (moving frame) to remain constant in speed the beam of light (moving frame) has to take less time (time dilation) to travel a shorter distance (length contraction) - in effect, X % less time to travel a distance shorter by X %, in accordance with the following equation, which implies that the speed of the beam of light (moving frame) would remain constant, e.g., 0.8 X (time) to travel 0.8 Y (distance) after "time dilation" and "length contraction":-

(186,000 miles - X % of 186,000 miles) ÷ (1 second - X % of 1 second) = 186,000 miles per second

But, as explained above, this would not be the case; the beam of light (moving frame) would have been gauged as having taken 0.8 X (time) to travel 1.25 Y (distance). This is an anomaly in the Special Theory of Relativity.

APPENDIX 2

Alternative Description - Gauging Of The Speed Of A Beam Of Light At Close To The Speed Of Light When, For Example, The Clock Has Slowed Down By 50 % And The Ruler Has Contracted In Length In The Direction Of Motion By 50 %

The description below is based on the following conditions ((i), (ii), (iii), (iv) & (v)) which are related to the Special Theory of Relativity:-

i) Clocks slow down and rulers contract in length in the direction of motion, at close to the speed of light, but these would not be noticed by the person traveling at close to the speed of light (moving frame) who possess such clocks and rulers. These do not apply to the clock and ruler of the person on the ground who is not moving (stationary frame).

ii) The train-traveler traveling at close to the speed of light (moving frame) and the person on the ground who is not moving (stationary frame) would notice one another's clock and ruler as respectively slower and shorter than his own. Both of them would each notice the other's clock slowing down and ruler length shortening to the same degree (X % for the clock and ruler of the train-traveler traveling at close to the speed of light (moving frame) and also X % for the clock and ruler of the person on the ground who is not moving (stationary frame)). Though the train-traveler's clock has slowed down and his ruler has contracted in length in the direction of motion while he is traveling at close to the speed of light, as is described in (i) above, he would not notice these happenings. All this does not apply to the clock and ruler (which are not affected by (i) above) of the person on the ground who is not moving (stationary frame).

iii) All movements are relative. When the train-traveler traveling at close to the speed of light (moving frame) compares himself to a person on the ground who is not moving (stationary frame), he could consider himself stationary (stationary frame) while thinking that the person on the ground (who is not moving) is actually moving (moving frame) - both parties could each regard themselves as stationary (stationary frame) and consider the other party in motion (moving frame).

iv) The train-traveler traveling at close to the speed of light (moving frame) would see the distance from Point A to Point B at the embankment besides the railway tracks (reference, stationary frame - you might substitute this distance with a ruler) as having shortened. This shortening (by X %) of the distance from Point A to point B (reference, stationary frame) would be by the same degree as his own clock has slowed down (X %) and his own ruler has contracted in length in the direction of motion (X %), both of which he does not notice. This point is the equivalent of Point (ii) above.

v) The speed of the beam of light (moving frame) is obtained by dividing the distance traveled by the beam of light (as gauged by the ruler on the very fast moving train traveling at close to the speed of light - moving frame) by the time it took to travel that distance by the beam of light (as gauged by the clock therein the very fast moving train - moving frame), the gauging being carried out by the traveler on the very fast moving train (moving frame), the greater the very fast moving train's traveling speed the more the clock slows down and the greater the length contraction of the ruler. For the speed of the beam of light (moving frame) to be measured as constant, the clock in the train traveling at close to the speed of light (moving frame) used to gauge the time traveled by the beam of light (moving frame) has to gauge a time which has slowed down by the same degree (X %) as the distance traveled by the beam of light (moving frame) which has shortened (also X %) as is gauged by the ruler therein.

1) Before the distance from Point A to Point B (reference, stationary frame) has shortened by 50 % (as is gauged at the ground level - stationary frame):-

a) Distance from Point A to Point B (reference, stationary frame) = 1 metre
b) Time taken by the beam of light (moving frame) to travel this 1 metre = x second, i.e., speed of the beam of light (moving frame) = 1 metre per x second

The above distance of 1 metre in (a) is gauged at the ground level (stationary frame) with a ruler which has not contracted in length (by 50 %, as yet). The above time of x second in (b) is gauged at the ground level (stationary frame) with a clock which has not slowed down (by 50 %, as yet).

2) a) After the ruler on the moving train (moving frame) has contracted in length in the direction of motion by 50 %, it would gauge the above-mentioned 1 metre (distance from Point A to Point B (reference, stationary frame), before shortening) as 2 metres. (A shortened ruler gauges an object as “longer” while a lengthened ruler gauges an object as "shorter", due to the different scales, as is explained in Appendix 1.)
b) After the clock on the moving train (moving frame) has slowed down by 50 %, at the same time that the ruler has contracted in length by 50 %, it would gauge the above-mentioned x second taken to travel this measured distance of 2 metres as 1/2 x second.
c) That is, the beam of light (moving frame) is now gauged from the moving train (moving frame) as requiring 1/2 x second to travel the distance of 2 metres (before the shortening of the distance between Point A & Point B (we assume here that the distance between Point A & Point B has not shortened) - in accordance with the Special Theory of Relativity this distance would also be shortened (also by 50 %) as seen by the train-traveler, as is described below); this translates into a speed of 4 metres per x second, or, 4 X speed of light.

3) After the distance from Point A to Point B (reference, stationary frame) has shortened by 50 %, as is seen by the train-traveler traveling at close to the speed of light (moving frame), in accordance with the Special Theory of Relativity:-

a) The 1-metre ruler which has contracted in length in the direction of motion by 50 % would gauge the above-mentioned 50 % shortened distance from Point A to Point B (reference, stationary frame) as 50 % shorter than before (i.e., 0.5 metre instead of 1 metre), and would read "0.5 metre" (instead of "1 metre" - full length of the 1-metre ruler) on its 50 % shortened length, which is in accordance with the Special Theory of Relativity. (The ruler now has a different scale as compared to its scale before length contraction. See Appendix 1 for explanation.)

b) When the scale of the ruler has changed due to the ruler's length contraction (by 50 %), and the clock has slowed down (by 50 %), the beam of light (moving frame) being gauged as requiring 1/2 x second to travel the distance of 2 metres, as is described in (2) above, the time taken by the beam of light (moving frame) to travel 0.5 metre now = (0.5 metre ÷ 2 metres) x 1/2 x second = 1/8 x second, i.e., the speed of the beam of light (moving frame) is now 0.5 metre per 1/8 x second, or, 4 metres per x second/4 X speed of light, which is an anomaly (the speed of the beam of light should have remained 1 metre per x second/1 X speed of light, as is postulated by the Special Theory of Relativity).

The above computations have been carried out in accordance with the conditions which are related to the Special Theory of Relativity. The said anomaly is evidently due to the change of the scale of the ruler which has contracted in length in the direction of motion by 50 %.

APPENDIX 3

Two Other Examples - Gauging Of The Speed Of A Beam Of Light At Close To The Speed Of Light When The Clock Has Slowed Down And The Ruler Has Contracted In Length In The Direction Of Motion

The descriptions of the two examples below are based on the following conditions ((i), (ii), (iii), (iv) & (v)) which are related to the Special Theory of Relativity:-

i) Clocks slow down and rulers contract in length in the direction of motion, at close to the speed of light, but these would not be noticed by the person traveling at close to the speed of light (moving frame) who possess such clocks and rulers. These do not apply to the clock and ruler of the person on the ground who is not moving (stationary frame).

ii) The train-traveler traveling at close to the speed of light (moving frame) and the person on the ground who is not moving (stationary frame) would notice one another's clock and ruler as respectively slower and shorter than his own. Both of them would each notice the other’s clock slowing down and ruler length shortening to the same degree (X % for the clock and ruler of the train-traveler traveling at close to the speed of light (moving frame) and also X % for the clock and ruler of the person on the ground who is not moving (stationary frame)). Though the train-traveler’s clock has slowed down and his ruler has contracted in length in the direction of motion while he is traveling at close to the speed of light, as is described in (i) above, he would not notice these happenings. All this does not apply to the clock and ruler (which are not affected by (i) above) of the person on the ground who is not moving (stationary frame).

iii) All movements are relative. When the train-traveler traveling at close to the speed of light (moving frame) compares himself to a person on the ground who is not moving (stationary frame), he could consider himself stationary (stationary frame) while thinking that the person on the ground (who is not moving) is actually moving (moving frame) - both parties could each regard themselves as stationary (stationary frame) and consider the other party in motion (moving frame).

iv) The train-traveler traveling at close to the speed of light (moving frame) would see the distance from Point A to Point B at the embankment besides the railway tracks (reference, stationary frame - you might substitute this distance with a ruler) as having shortened. This shortening (by X %) of the distance from Point A to point B (reference, stationary frame) would be by the same degree as his own clock has slowed down (X %) and his own ruler has contracted in length in the direction of motion (X %), both of which he does not notice. This point is the equivalent of Point (ii) above.

v) The speed of the beam of light (moving frame) is obtained by dividing the distance traveled by the beam of light (as gauged by the ruler on the very fast moving train traveling at close to the speed of light - moving frame) by the time it took to travel that distance by the beam of light (as gauged by the clock therein the very fast moving train - moving frame), the gauging being carried out by the traveler on the very fast moving train (moving frame), the greater the very fast moving train's traveling speed the more the clock slows down and the greater the length contraction of the ruler. For the speed of the beam of light (moving frame) to be measured as constant, the clock in the train traveling at close to the speed of light (moving frame) used to gauge the time traveled by the beam of light (moving frame) has to gauge a time which has slowed down by the same degree (X %) as the distance traveled by the beam of light (moving frame) which has shortened (also X %) as is gauged by the ruler therein.

A) <u>Example 1 - Gauging Of The Speed Of A Beam Of Light At Close To The Speed Of Light When The Clock Has Slowed Down By 25 % And The Ruler Has Contracted In Length In The Direction Of Motion By 25 %</u>

1) Before the distance from Point A to Point B (reference, stationary frame) has shortened by 25 % (as is gauged at the ground level - stationary frame):-

a) Distance from Point A to Point B (reference, stationary frame) = 1 metre
b) Time taken by the beam of light (moving frame) to travel this 1 metre = x second, i.e., speed of the beam of light (moving frame) = <u>1 metre per x second</u>

The above distance of 1 metre in (a) is gauged at the ground level (stationary frame) with a ruler which has not contracted in length (by 25 %, as yet). The above time of x second in (b) is gauged at the ground level (stationary frame) with a clock which has not slowed down (by 25 %, as yet).

2) a) After the ruler on the moving train (moving frame) has contracted in length in the direction of motion by 25 %, it would gauge the above-mentioned 1 metre (distance from Point A to Point B (reference, stationary frame), before shortening) as 1.33 metres. (A shortened ruler gauges an object as "longer" while a lengthened ruler gauges an object as "shorter", due to the different scales, as is explained in Appendix 1.)

b) After the clock on the moving train (moving frame) has slowed down by 25 %, at the same time that the ruler has contracted in length by 25 %, it would gauge the above-mentioned x second taken to travel this measured distance of 1.33 metres as 3/4 x second.

c) That is, the beam of light (moving frame) is now gauged from the moving train (moving frame) as requiring 3/4 x second to travel the distance of 1.33 metres (before the shortening of the distance between Point A & Point B (we assume here that the distance between Point A & Point B has not shortened) - in accordance with the Special Theory of Relativity this distance would also be shortened (also by 25 %) as seen by the train-traveler, as is described below); this translates into a speed of 1.77 metres per x second, or, 1.77 X speed of light.

3) After the distance from Point A to Point B (reference, stationary frame) has shortened by 25 %, as is seen by the train-traveler traveling at close to the speed of light (moving frame), in accordance with the Special Theory of Relativity:-

a) The 1-metre ruler which has contracted in length in the direction of motion by 25 % would gauge the above-mentioned 25 % shortened distance from Point A to Point B (reference, stationary frame) as 25 % shorter than before (i.e., 0.75 metre instead of 1 metre), and would read "0.75 metre" (instead of "1 metre" - full length of the 1-metre ruler) on its 25 % shortened length, which is in accordance with the Special Theory of Relativity. (The ruler now has a different scale as compared to its scale before length contraction. See Appendix 1 for explanation.)

b) When the scale of the ruler has changed due to the ruler's length contraction (by 25 %), and the clock has slowed down (by 25 %), the beam of light (moving frame) being gauged as requiring 3/4 x second to travel the distance of 1.33 metres, as is described in (2) above, the time taken by the beam of light (moving frame) to travel 0.75 metre now = (0.75 metre ÷ 1.33 metres) x 3/4 x second = 0.423 x second, i.e., the speed of the beam of light (moving frame) is now 0.75 metre per 0.423 x second, or, 1.77 metres per x second/1.77 X speed of light, which is an anomaly (the speed of the beam of light should have remained 1 metre per x second/1 X speed of light, as is postulated by the Special Theory of Relativity).

The above computations have been carried out in accordance with the conditions which are related to the Special Theory of Relativity. The said anomaly is evidently due to the change of the scale of the ruler which has contracted in length in the direction of motion by 25 %.

In order for the speed of the beam of light to remain/appear constant in this instance, i.e., remain at 1 metre per x second, one of the following has to happen:-

1) When the clock slows down by 25 %, the ruler should increase in length by 33 %.
2) When the ruler decreases in length by 25 %, the clock should quicken by 33 %.
3) When the clock slows down by 25 % and the ruler decreases in length by 25 %, the beam of light (moving frame) should slow down by 177 %.

B) <u>Example 2 - Gauging Of The Speed Of A Beam Of Light At Close To The Speed Of Light When The Clock Has Slowed Down By 90 % And The Ruler Has Contracted In Length In The Direction Of Motion By 90 %</u>

1) Before the distance from Point A to Point B (reference, stationary frame) has shortened by 90 % (as is gauged at the ground level - stationary frame):-

   a) Distance from Point A to Point B (reference, stationary frame) = 1 metre
   b) Time taken by the beam of light (moving frame) to travel this 1 metre = x second, i.e., speed of the beam of light (moving frame) = <u>1 metre per x second</u>

   The above distance of 1 metre in (a) is gauged at the ground level (stationary frame) with a ruler which has not contracted in length (by 90 %, as yet). The above time of x second in (b) is gauged at the ground level (stationary frame) with a clock which has not slowed down (by 90 %, as yet).

2) a) After the ruler on the moving train (moving frame) has contracted in length in the direction of motion by 90 %, it would gauge the above-mentioned 1 metre (distance from Point A to Point B (reference, stationary frame), before shortening) as <u>10 metres</u>. (A shortened ruler gauges an object as “longer” while a lengthened ruler gauges an object as "shorter", due to the different scales, as is explained in Appendix 1.)
   b) After the clock on the moving train (moving frame) has slowed down by 90 %, at the same time that the ruler has contracted in length by 90 %, it would gauge the above-mentioned x second taken to travel this measured distance of 10 metres as <u>1/10 x second</u>.
   c) That is, the beam of light (moving frame) is now gauged from the moving train (moving frame) as requiring 1/10 x second to travel the distance of 10 metres (before

the shortening of the distance between Point A & Point B (we assume here that the distance between Point A & Point B has not shortened) - in accordance with the Special Theory of Relativity this distance would also be shortened (also by 90 %) as seen by the train-traveler, as is described below); this translates into a speed of 100 metres per x second, or, 100 X speed of light.

3) After the distance from Point A to Point B (reference, stationary frame) has shortened by 90 %, as is seen by the train-traveler traveling at close to the speed of light (moving frame), in accordance with the Special Theory of Relativity:-

a) The 1-metre ruler which has contracted in length in the direction of motion by 90 % would gauge the above-mentioned 90 % shortened distance from Point A to Point B (reference, stationary frame) as 90 % shorter than before (i.e., 0.1 metre instead of 1 metre), and would read "0.1 metre" (instead of "1 metre" - full length of the 1-metre ruler) on its 90 % shortened length, which is in accordance with the Special Theory of Relativity. (The ruler now has a different scale as compared to its scale before length contraction. See Appendix 1 for explanation.)

b) When the scale of the ruler has changed due to the ruler's length contraction (by 90 %), and the clock has slowed down (by 90 %), the beam of light (moving frame) being gauged as requiring 1/10 x second to travel the distance of 10 metres, as is described in (2) above, the time taken by the beam of light (moving frame) to travel 0.1 metre now = (0.1 metre ÷ 10 metres) x 1/10 x second = 0.001 x second, i.e., the speed of the beam of light (moving frame) is now 0.1 metre per 0.001 x second, or, 100 metres per x second/100 X speed of light, which is an anomaly (the speed of the beam of light should have remained 1 metre per x second/1 X speed of light, as is postulated by the Special Theory of Relativity).

The above computations have been carried out in accordance with the conditions which are related to the Special Theory of Relativity. The said anomaly is evidently due to the change of the scale of the ruler which has contracted in length in the direction of motion by 90 %.

In order for the speed of the beam of light to remain/appear constant in this instance, i.e., remain at 1 metre per x second, one of the following has to happen:-

1) When the clock slows down by 90 %, the ruler should increase in length by 900 %.
2) When the ruler decreases in length by 90 %, the clock should quicken by 900 %.
3) When the clock slows down by 90 % and the ruler decreases in length by 90 %, the beam of light (moving frame) should slow down by 10,000 %.

It is therefore evident that the speed of the beam of light could not be constant and is variable, which implies that there is some logical error in the Special Theory of Relativity. For instance, quantum particles are able to teleport or transport themselves to another location instantaneously, which is an example of faster than light travel.

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