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# Light Velocity is Not the Limit of All Velocities

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Basically, Einstein's special relativity is correct, although it has many contradictions. I think that if these are solved completely, then special relativity will be helpful for scientific development

Firstly, we refer to an experimental apparatus to measure time using light (pages 551 and 552 in the Texbook: "**Physics Principles & Problems**", published by Merrill publishing company-Columbus,Ohio 43216)**.**

"Appendix, A: 4 *the meaning of time.*
Einstein noted that these postulates seemed to contradict each other. Taken together, they did not seem to make sense. The problem, wrote Einstein, was that the measurement of position and time had to be considered very carefully.
Time, said Einstein, is something measured by clock. Consider a special clock installed on a satellite. At one end of a stick of length $L_s$ is flash lamp and detector. At the other end is a mirror. The light flashes and the mirror. The light flashes and the mirror reflect the flash to the detector. The detector triggers the lamp, producing another flash. Each flash is like the tick of a clock. Now, this is not a practical clock, but it is one that illustrates the principle. An astronaut at rest with respect to the clock would find that the time between ticks, $t_s$ , would be equal to the distance traveled, $2L_s$, divided by the speed of light, c . That is, $t_s = 2L_s/c$. In other words, $ct_s = 2L_s$ .
If the satellite is moving with velocity v in a direction perpendicular to the stick, consider what an observer on the earth would see. The lamp would flash, but in the time it takes the flash to reach the mirror, $t_m$ , the mirror would have moved a distance $vt_m$. As shown in Figure A-2, the path taken by the light is the hypotenuse of a right triangle. The altitude is $L_s$ , or $ct_s/2$ and the base is $vt_m$. Because light moves at the same velocity c for all observers, the distance traveled by the light is $ct_m$ . The Pythagorean theorems states

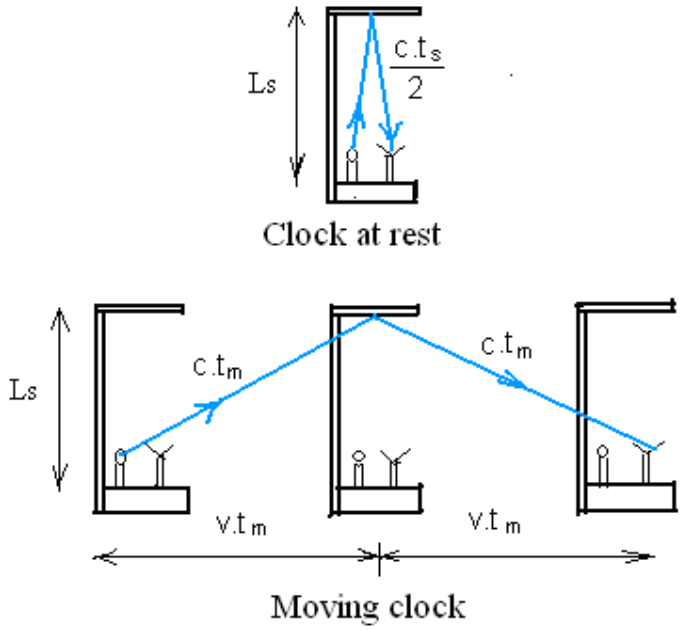
$$\left(\frac{ct_s}{2}\right)^2 + (vt_m)^2 = (ct_m)^2 \qquad t_m = \frac{ct_s}{2\sqrt{c^2 - v^2}}$$

The return trip to the detection takes the same amount of time. Let $t_e$ be the time between "ticks" measured by the observer on the earth. Then $t_e=2t_m$ , which is

$$t_e = \frac{t_s}{\sqrt{1 - \frac{v^2}{c^2}}}$$

The velocity is always smaller than c , so the denominator is always smaller than one. Thus $t_e$ is always larger than $t_s$ . That is, the moving clock on the satellite runs slowly as measured by an observer on the ground. This is called time dilation."

***Figure A-2 .*** *Experimental apparatus to measure time using light*




On the above " Appedix, A: 4 , *the meaning of time*" we realize that $t_s$ is a "tick" of a clock or time passing in the frame at rest, (the frame of "**Clock at rest**"), and $t_e=2t_m$ is a "tick" of clock or time passing in the moving frame, (the frame of "**Moving clock**").

$$t_e = \frac{t_s}{\sqrt{1-\frac{v^2}{c^2}}} \quad , \qquad \text{because } \gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \qquad (1)$$

So, $t_e=t_s.\gamma$ , ($\gamma$ is called dilate coefficient)

If we say that $t_s=s_o$ is a measured unit of time in the frame of "**Clock at rest**", then $t_e=s_r$ is measured unit of time in the frame of the "**Moving clock**". $Km_o$ , $c_o$ are measured units of distance which is denoted by a space and light velocity in the frame of the "**Clock at rest**", then $km_r$ , $c_r$ are measured units of distance which is denoted by a space and light velocity in the frame of the "**Moving clock**".

In **figure A-2**, we find that $l_s=2L_s=c.t_s$ with measured unit: $km_o$ is distance of travel of light in the frame of "**Clock at rest**" and $l_e=c.2t_m=c.t_e$ with measured unit: $km_r$ is distance of travel of light in the frame of the "**Moving clock**".

In Einstein's second postulate, light velocity is a universal constant and equal to c=300,000 km/s in the vacuum. This means that t=s in a measured unit of light velocity:

km/s is either a "tick" of clock: $t_s=s_o$ in the frame of " **Clock at rest**" or a "tick" of clock: $t_e=s_r$ in the frame of "**Moving clock**". If t=s is equal to $t_s=s_o$ ,(t=$t_s$ , s=$s_o$), then t=s won't be equal to $t_e=s_r$ ,(t ≠$t_e$ ,s ≠$s_r$). This is because $t_e=t_s.\gamma$ or $s_r=s_s.\gamma$ .

Since $c=c_o$=300,000 km/s=300,000 $km_o/s_o$ , a distance of the travel of light in the frame of "**Clock at rest**" is
$l_s=2L_s=c.t_s$= 300,000 $km_o/s_o.t_s$= 300,000$km_o/s_o$ . $s_o$= 300,000 $km_o$ .

But a distance of travel of light in the frame of the " **Moving clock**" is

$l_e=c.t_e$=300,000 $km_o/s_o.t_e$=300,000 $km_o/s_o$ . $s_r$

In this case, we can't calculate because a measured unit of time: $s_r$ in the frame of the "**Moving clock**" is different from a measured unit of time: $s_o$ in the frame of the "**Clock at rest**". A distance of travel of light: $l_e$ is only calculated when a measured unit of time in the frame of "**Moving clock**": $s_r$ alters to a measured unit of time in the frame of "**Clock at rest**": $s_o$ , ($s_r=s_o.\gamma$), or a measured unit of light velocity: $km_o/s_o$ alters to $km_r/s_r$. Then, because $t_e=s_r$ ; $t_e=t_s.\gamma$ ; $t_s=s_o$ and $l_e= c_r.t_e$ , so

$l_e=c_r.t_e$=300,000 $km_r/s_r$ . $s_r$=300,000 $km_r$

or $l_e=c_o.t_s.\gamma$=300,000 $km_o/s_o$ . $s_o$ .$\gamma$ =300,000 $km_o$ . $\gamma$ = $l_o.\gamma$

We find that $c_r=\frac{l_e}{t_e}=\frac{l_s.\gamma}{t_s.\gamma}=\frac{300{,}000km_r}{s_r}=\frac{300{,}000km_o.\gamma}{s_o.\gamma}$

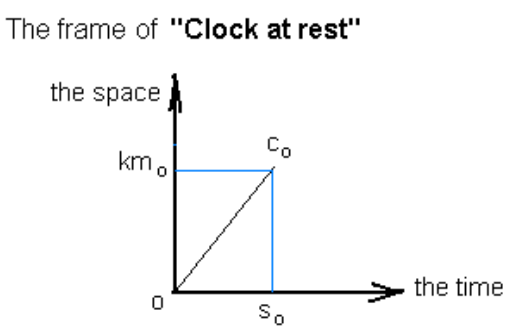
And $c_o=\frac{l_s}{t_s}=\frac{300{,}000km_o}{s_o}$

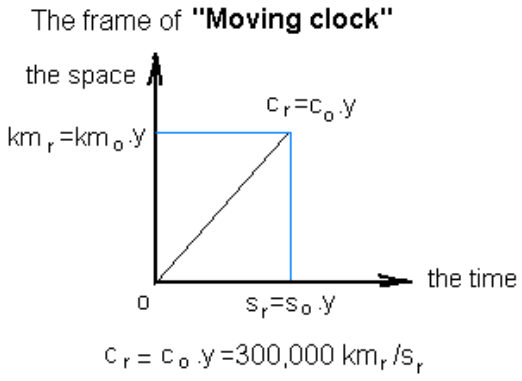
Obviously light velocity is constant for all observers in their measurement of space and time. The observers on the earth or the frame of "**Clock at rest**" see and measure their light velocity which is $c=c_o$=300,000 $km_o/s_o$, and the observers in a Satellite or the frame of " **Moving clock**" also see and measure their light velocity which is $c_r$=300,000 $km_r/s_r$ =300,000 $km_o.\gamma/s_o.\gamma$ .

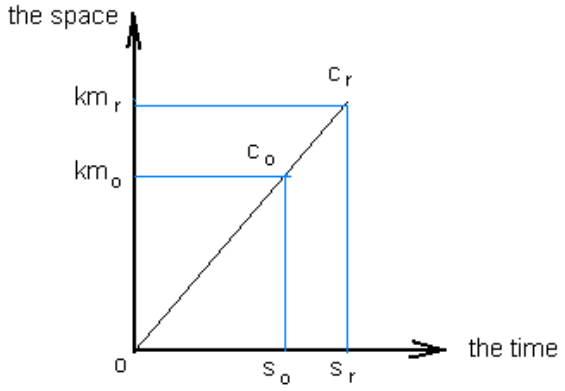
The observers on the earth or the frame of "**Clock at rest**" can see light: $c_r$ in the frame of "**Moving clock**", but can't measure it. On contrary, the observers in the frame of "**Moving clock**" can see light: $c_o$ in the fame of "**Clock at rest**" or on the earth, but also can't measure it. So, the observers on the earth or in the frame of "**Clock at rest**" deem that the light velocity in the frame of "**Moving clock**" is $c=c_o$=300,000 $km_o/s_o$ , in fact, it is $c_r$=300,000 $km_r/s_r$=300,000 $km_o.\gamma$ /$s_o.\gamma$.

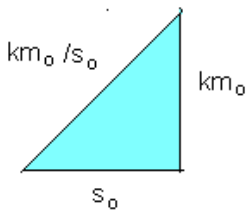
It is true that the light velocity: $c=c_o$ in the frame of the "**Clock at rest**" is similar, but not equal to light velocity: $c_r$ in the frame of "**Moving clock**". At least, we find that a measured unit: $km_o/s_o$ of light velocity: $c_o=c$ is different from a measured unit:

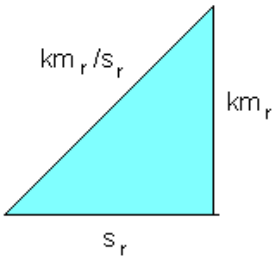
$km_r/s_r = km_o.\gamma / s_o.\gamma$ of light velocity: $c_r$ . This can be illustrated by graphs of the components of space, time and light velocity as follows:



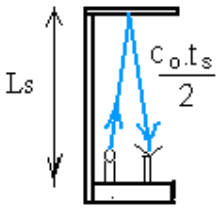




From this graphs, we must confirm that $c_r \neq c_o$

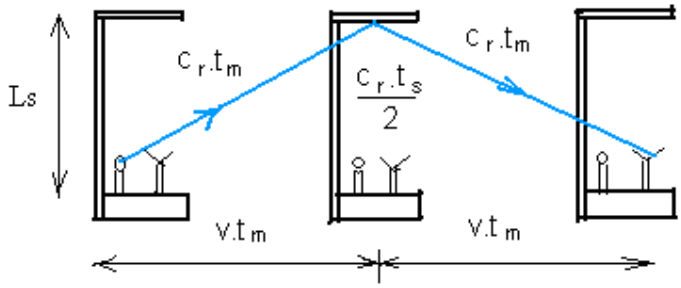
$$c_r = \frac{l_e}{t_e} = \frac{300{,}000km_r}{s_r} = \frac{300{,}000km_o.\gamma}{s_o.\gamma} \neq c_o = \frac{300{,}000km_o}{s_o}$$

$$\rightarrow \quad c_r = \frac{300{,}000km_o.\gamma}{s_o.\gamma} = \frac{300{,}000km_o}{s_o}.\gamma = c_o.\gamma \qquad (2)$$

Thus, the light velocity in the frame of "**Moving clock**" is $c_r$ and "Appedix, A: 4 , *the meaning of time*" in the Texbook: "**Physics principles & problems**" must be revised as follows:




Clock at rest




Moving clock

The Pytagorean theorem states:

$$\left(\frac{c_r.t_s}{2}\right)^2 + (v.t_m)^2 = (c_r.t_m)^2 \qquad t_m = \frac{c_r.t_s}{2.\sqrt{c_r^{\,2} - v^2}}$$

$2.t_m=t_e \rightarrow t_e = \dfrac{t_s}{\sqrt{1-\dfrac{v^2}{c_r^{\,2}}}}$ ; $t_e=t_s.\gamma \rightarrow \gamma = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c_r^{\,2}}}}$ (3)

From (2), $c_r=c_o.\gamma \rightarrow c_r = \dfrac{c_o}{\sqrt{1-\dfrac{v^2}{c_r^{\,2}}}} \rightarrow c_r^{\,2} = \dfrac{c_o^{\,2}}{1-\dfrac{v^2}{c_r^{\,2}}}$

$\rightarrow c_r^{\,2} - v^2 = c_o^{\,2} \rightarrow c_r^{\,2} = c_o^{\,2} + v^2$ (4)

$c_r^{\,2}$ in (3) is replaced by (4):

$$\gamma = \frac{1}{\sqrt{1-\dfrac{v^2}{c_r^{\,2}}}} = \frac{1}{\sqrt{1-\dfrac{v^2}{c_o^{\,2}+v^2}}} \quad (5)$$

Since (1), Einstein's coefficient: $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ with c=constant and when v=c ( v is velocity of the frame of the "**Moving clock**" ), we find that a coefficient: $\gamma = \frac{1}{\sqrt{1-1}} = \frac{1}{0}$ is alogical mathematics and we can't use it to calculate the time dilation exactly. A coefficient: $\gamma = \frac{1}{0}$ also shows that light velocity is the limit of all velocity.

But from (5), coefficient: $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c_o{}^2+v^2}}}$ , Although the velocity: v of a Satellite or the frame of the "**Moving clock**" is v= c=$c_o$ or v › c=$c_o$ , it is logical mathematics and we can calculate the time dilation exactly, because $\gamma \neq \frac{1}{0}$ .

Furthermore, Einstein's coefficient: $\gamma = \frac{1}{0}$ can't explain simultaneity of the observer's position, for example, as follows:

Assume that a Satellite moves with the speed of light: v=c in the vacuum of the universe. There is a lamp which is in middle of the satellite and the beams of light from the lamp shine to the doors of the satellite. At the first and after satellite are installed by two doors, which can open automatically when a beam of light from a lamp meets it. Please see **Figure: 1**.

When the satellite moves with speed: v ‹ c , the observers on the earth or the frame of "**Clock at rest**" see that two doors of the satellite don't open simultaneously. A door: B opens first and a door: A opens after. This is because the traveling beams of light from the lamp and the traveling of the door: B are going in the wrong direction and the traveling of the beams of light from the lamp and the traveling of the door: A in the direction. But the observers in the satellite always see that two doors open simultaneously. This is because regarding the observers in the Satellite, a lamp and two doors don't move and the distance from the lamp to the door: B is equal to the distance from the lamp to door: A and light velocity is constant.

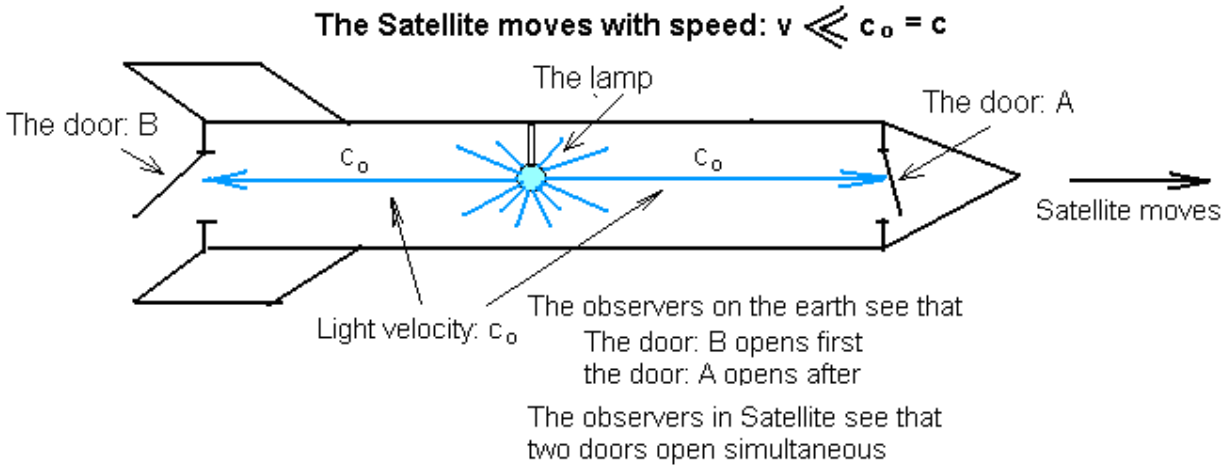
But if the speed of the Satellite is v=c , the observers on the earth will see that there is only door: B opening and a door: A doesn't open. This is because Einstein's coefficient: $\gamma = \frac{1}{0}$ shows that light velocity is the limit for all velocity and the velocity of the lamp as well as the satellite is equal to light velocity: c, so the beams of light from the lamp can't move to door: A.

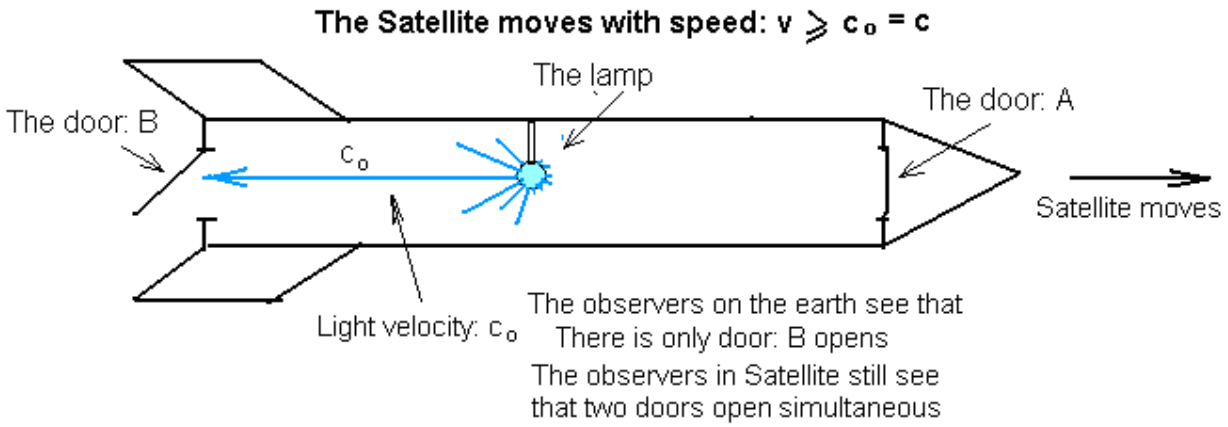
We can accept that the observers on earth see that the two doors of the satellite don't open simultaneously and the observe in the satellite see that two door open simultaneously. But we can't accept that the observers on earth see that there is only one door which opens while the observers in the satellite see that two doors open.

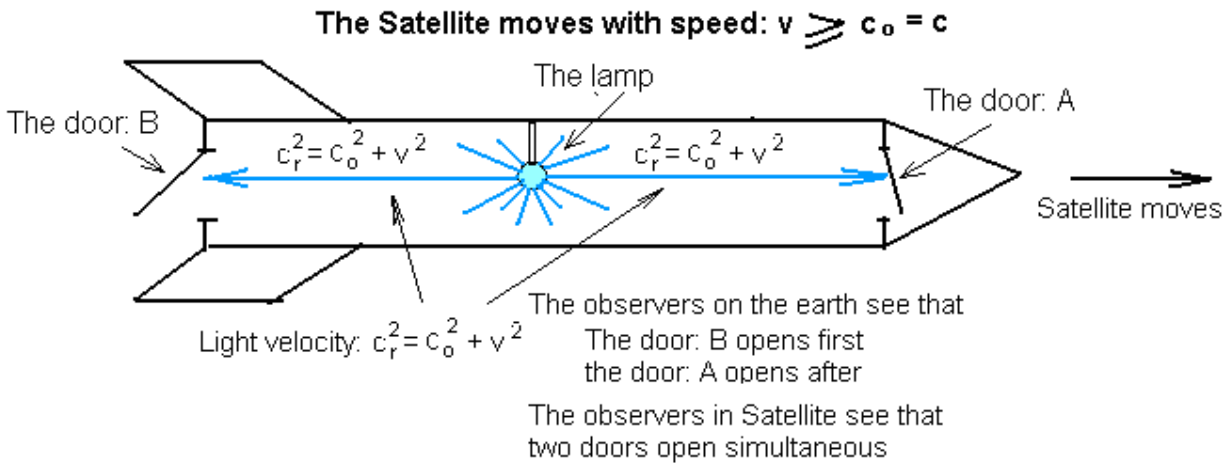
A event of one door which doesn't open is alogical, so Einstein's coefficient: $\gamma = \frac{1}{0}$ must be revised by coefficient: $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c_o{}^2 + v^2}}}$.

Since coefficient: $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c_o{}^2 + v^2}}}$, we find that although speed of Satellite: v can be larger than light velocity: $c=c_o$, it is logical mathematics and the observers on the earth or the frame of "**Clock at rest**" also see that two doors of the satellite open. This is illustrated by **Figure: 1** as follows:

## Figure: 1






**Note**: Because $c_r \neq c_o$ , so it is difficult for the observers on the earth to see light velocity: $c_r$ in the satellite or the frame of the "**Moving clock**" when it moves with changing space and time from $km_o$ , $s_o$ to $km_r$ , $s_r$ . $c_r \neq c_o$ this means that frequency modulation of light: $c_r$ is different from frequency modulation of light: $c_o$ ; $c_o$ is constant in space ($km_o$) and time ($s_o$) and $c_r$ is constant in space ($km_r$) and time ($s_r$). Constancy of $c_o$ is different from constancy of $c_r$ and $c_r^2 = c_o^2 + v^2$ , (of which v=constant is a speed of Satellite which moves in space: $km_o$ and time: $s_o$ ). The observers on the earth in space: $km=km_o$ and time: $s=s_o$ can measure light velocity which is $c=c_o=300{,}000\ km_o/s_o$ , but they can't measure light velocity which is $c_r=300{,}000\ km_r/s_r$ because $c_r$ is in space: $km_r$ and time: $s_r$ . The observers on the earth can't measure $c_r$ which is in the satellite, it doesn't mean that light velocity: $c_r$ does not exist.

## Conclusion:

The demonstration of time dilation in the Texbook: "**Physics principles &problems**" is basically correct although it has contradictions. These must be revised to make it logical. Einstein's dilated coefficient: $\gamma = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c^2}}}$ is alogical mathematics, it must be revised by

$\gamma = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c_r^{\,2}}}} = \dfrac{1}{\sqrt{1-\dfrac{v^2}{c_o^{\,2}+v^2}}}$ (of which $c_o = c$ , $c_r = c_o.\gamma$ is the light velocity in the frame which moves with changing of space and time from $km_o$ , $s_o$ to $km_r$ , $s_r$ and v is a velocity of that frame ).

In Einstein's second postulate, light velocity: c is a universal constant and it is a limit of all velocity in universe. In fact, light velocity: c is not a universal constant or a limit of all velocity. Light velocity is only constant when space and time are not changed. When

space and time are changed from km , s to km', s', then light velocity is also changed from c to c'. The light velocity: c' can be larger than the light velocity: c and in the same direction of travel, light velocity: c' is equal to $c' = \sqrt{c^2 + v^2}$ , (where v is the source of light). But we can't see and measure c' because the frequency modulation of c' is different from the frequency modulation of our c.

We can't confirm and calculate energy of material body when it moves with the speed of light because Einstein's dilated coefficient: $\gamma = \frac{1}{0}$ is alogical mathematics. Now, we can confirm and calculate it easily because that Einstein's dilated coefficient is revised in logical mathematics, ($\gamma \neq \frac{1}{0}$).

A theory oin science is only accepted when it is proven by experiment. The revision about γ and c from $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ to $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c_r{}^2}}} = \frac{1}{\sqrt{1 - \frac{v^2}{c_o{}^2 + v^2}}}$ will be proven by experiment if the scientists on LHC , (they are planning to accelerate speed of protons to speed of light), are concerned with Einstein's relativistic energy formula, which is $E_r = m_r.c_r^2$ , not $E_r = m_r.c^2$ .

Hanoi, December 28, 2008