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A Curved Light in a Curved Space

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My paper "**Light velocity changes with the gravitational potential of the reference frame**" shows that when the gravitational potential is changed from G to G.γ , then the measurements of space, time and light velocity are also changed from (km , s and c=300,000 km/s) to (km.γ , s.γ and c'=300,000 km.γ/s.γ). Light velocity is also changed from c=300.000km/s to c'=300,000 km.γ/s.γ , because a velocity is calculated by dividing between space: 300,000km.γ and time: s.γ . Thus, if space and time are changed, then a light velocity also will be changed.

To understand further, we considerate the experiments about "curved" light in the "curved" space or the gravitational potential when it changes as follows:

Assume that in the space of the Universe, there are three planets which are called planet: 1, planet: 2 and planet: 3. The positions of three that planets are on summits of triangle: ABC and the distance between summits of triangle: ABC are equal to each orther. It means that the distance: AB=BC=AC= 600,000 km . Please seeing a **figure: 1** . At planet: 1 we arrange a lamp which can shine a ray of light and a clock and an observer who is in there in order to view and calculate the movement of a ray of light from a lamp at a planet: 1 to planet: 2 , and from planet: 2 to planet: 3 , and from a planet: 3 to return to planet: 1 . At a planet: 2 we put a mirror so that reflecting a ray of light when it shines from a lamp at planet: 1 to planet: 3 . At planet: 3, we also put a mirror in order to reflect a ray of light when it shines from planet: 2 to return to planet: 1. We will considerate the movements of a ray of light in three case of experiment.

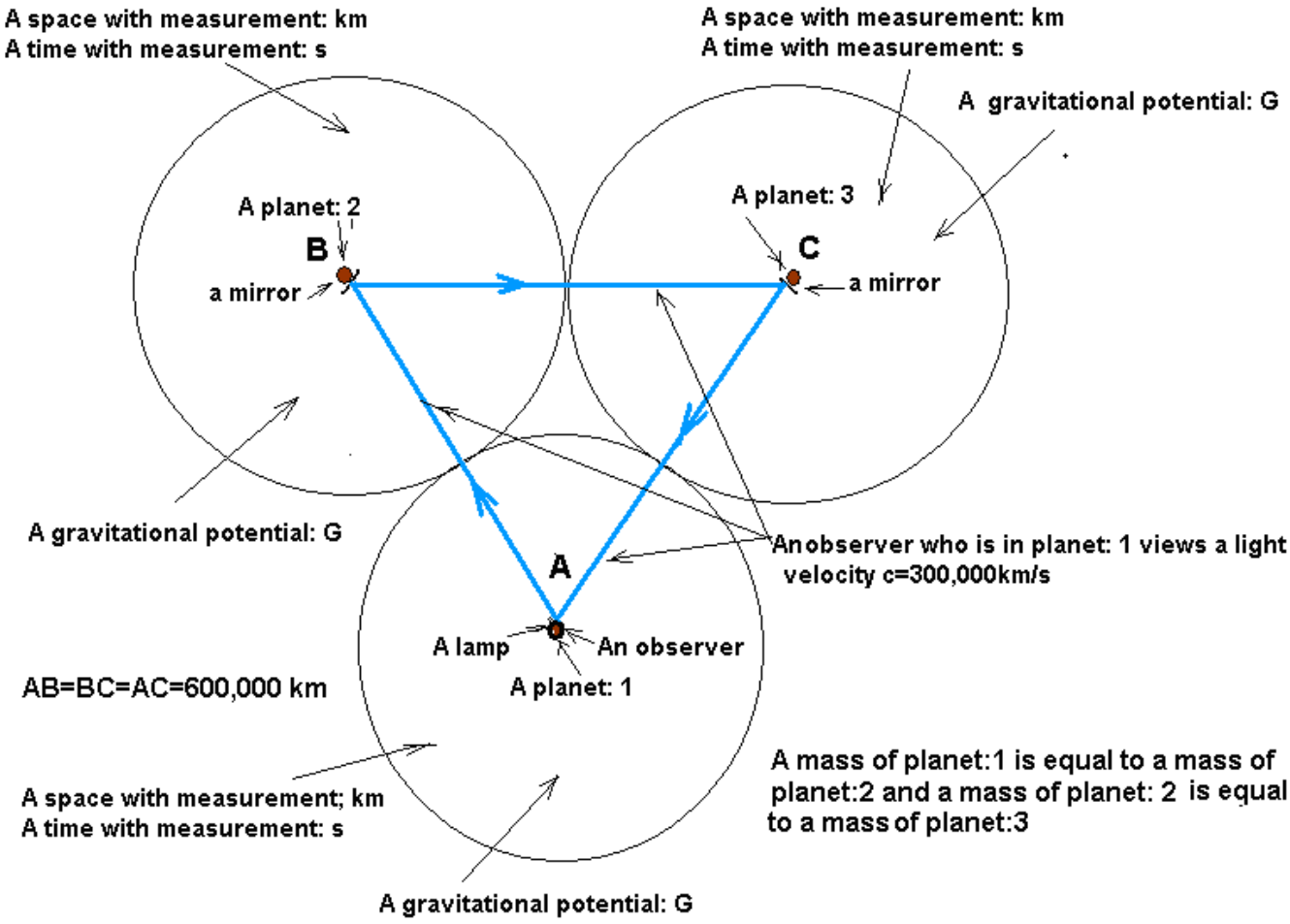
The firth case of experiment :

The mass of planet: 1 is equal to the mass of planet: 2 and the mass of planet: 2 is equal to the mass of planet: 3. This means that the measurements of space and time of all planets (planet: 1, planet: 2 and planet: 3) are the same. The measurements of space and time at planet:1, planet: 2 and planet: 3 are space: km and time: s . An observer who is standing on planet: 1 turns on a lamp and a ray of light starts moving from planet: 1 to planet: 2 . A mirror At planet: 2 reflecting that ray of light to planet: 3 and a mirror at planet: 3 reflecting it to return to planet: 1 . After a ray of light finishes the trip, an observer who is on planet: 1 calculates time passing when a ray of light moves from starting to the end of the trip, he finds that:

$$time = \frac{path}{velocity} = \frac{3 \times 600{,}000km}{300{,}000km/s} = 6.s$$

He concludes that a light velocity is invariable and it is equal to c=300,000 km/s in this case .

Figure: 1



The second case of experiment :

The positions of planet: 1, planet: 2 and planet: 3 in this second case of experiment are same as the first experiment. It means that the distance: AB=BC=AC=600,000 km. The mass of planet: 1 is equal to mass of planet:2 , but mass of planet: 3 is larger than the mass of planet: 1. This means that the measurements of space and time which are around planet: 1 and planet: 2 are different from the measurement of space and time which are around planet: 3. (In Einstein's general relativity, Einstein said that space and time depend on the gravitational potential and the gravitational potential depends on a mass of body). If the units of measurement of space and time on planet: 1 and planet: 2 are space: km and time: s , then the units of measurement of space and time on planet: 3 will be space: km.γ and time: s.γ . (Please read paper: "**light velocity**

changes with the gravitational potential of reference frame" in General Science Journal, http://wbabin.net/science/cuong8.pdf)

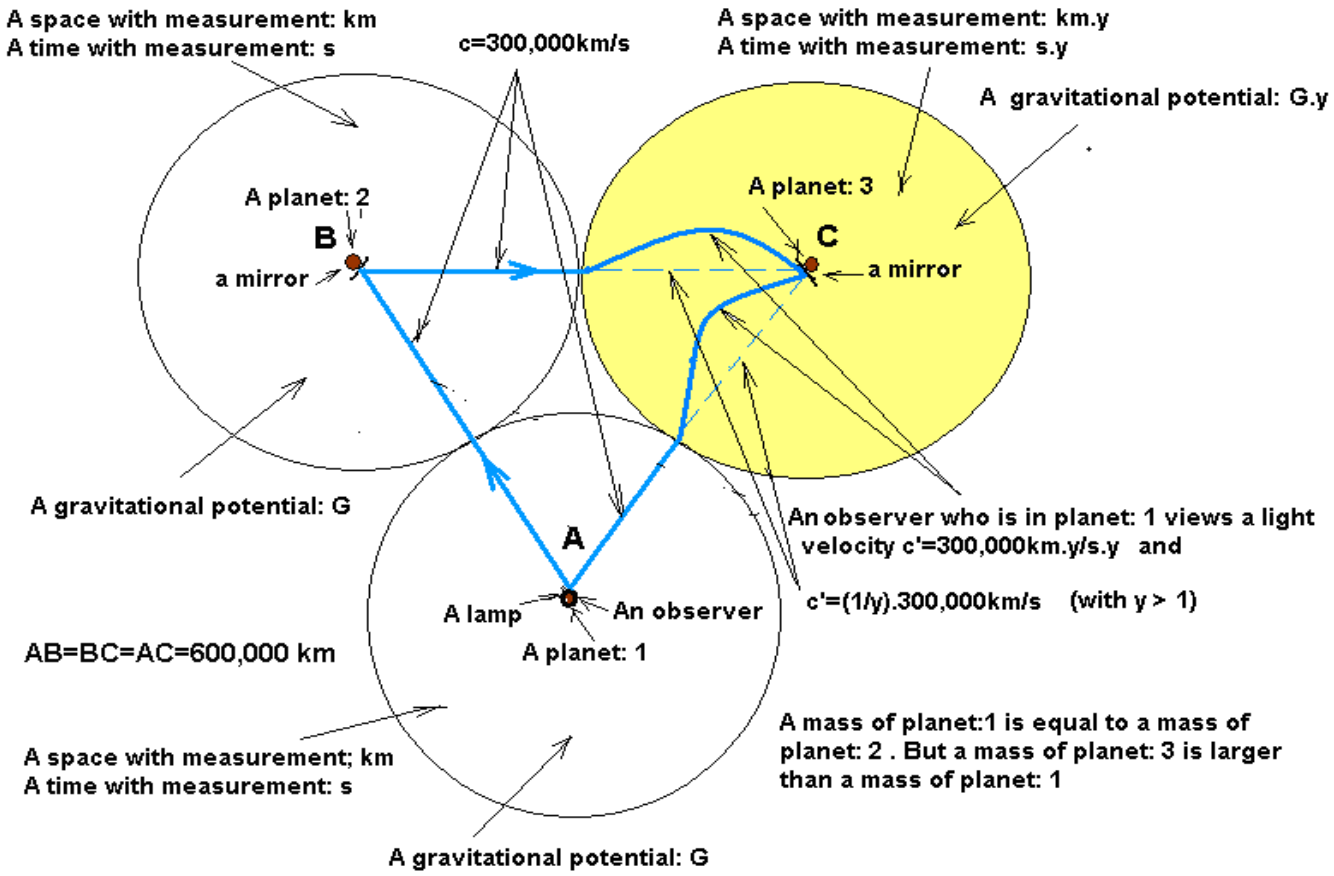
An observer who is on planet: 1, turns on a lamp again, and he views and calculates the time passing when a ray of light moves to planet: 2, and a mirror at planet: 2 reflecting that ray of light to planet: 3 , and a mirror at planet: 3 reflecting it to return to planet: 1 . After a ray of light finishes a trip, an observer on planet: 1 finds that time passes as follows:

$$time = \frac{path}{velocity} = \frac{2 \times 600{,}000km + 600{,}000km.\gamma}{300{,}000km/s} = 4.s + 2.s.\gamma > 6.s$$

(of which γ is delated coefficient and $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} > 1$, so, 4.s +2.s.γ > 6.s)

In this second experiment, ight velocity is slower than light velocity in the first experiment. We find that an observer in planet:1 views a ray of light in ½ BC and ½ AC with velocity: c'=300.000 km/s.γ = (1/γ).300,000km/s in a path: ½ BC= ½ AC= 300,000 km , or with c'=300,000 km.γ/s.γ in "curved" path: 300,000km.γ . Please seeing a **figure: 2** .

Figure: 2



Note: An Observer who is on planet: 1 with measurement of space: km and time: s views that a ray of light moves in the "curved" space and time of planet: 3 with velocity: c'=300,000 km.γ/s.γ in a "curved" path with the distance of 300,000km.γ . And if that observer is on planet: 3, he also views a ray of light moving with velocity: c'=300,000km.γ/s.γ in his measurement of space: km.γ and time: s.γ at planet: 3. Thus, we can't make the calculation:

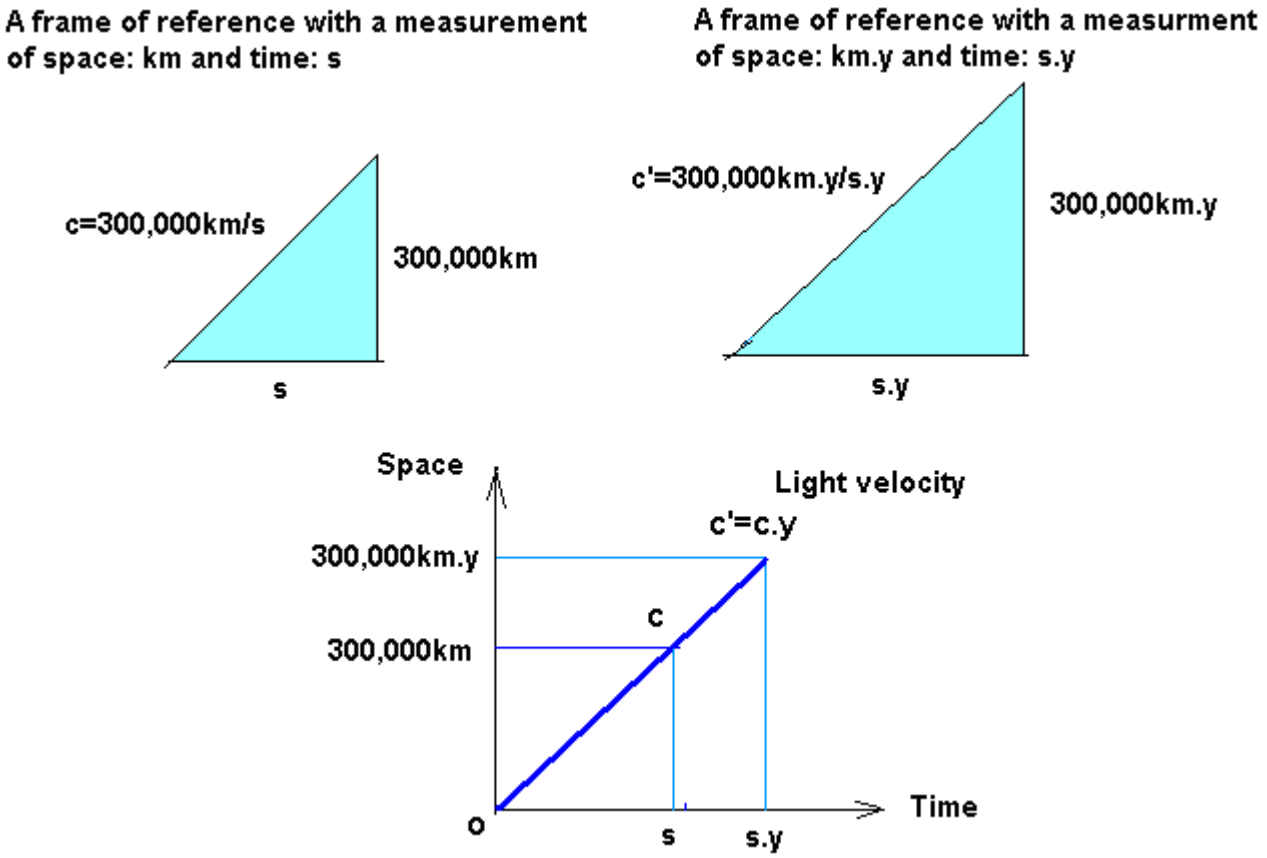
$$c'=300{,}000\ km.\gamma/s.\gamma=c=300{,}000km/s\ .$$

If we the make calculation as such, it means that the space and time of planet: 3 won't be changed and Einstein's Special Relativity won't be valid. So

$$c'=300{,}000\ km.\gamma/s.\gamma \neq c=300{,}000\ km/s$$

Please read a paper: "**Mathematical postulate 1:2≠2:4**" in GSJ, (http://wbabin.net/science/cuong14.pdf). Light velocity in a frame of reference with measurement of space: km and time: s is only similar, but not equal to a light velocity in the frame of reference with measurement of space: km.γ and time: s.γ. It can be illustrated in **figure: 3** as follows:

Figure: 3



The third experiment :

The positions of planet: 1, planet: 2 and planet: 3 in the third experiment are the same as in the first experiment. It means that the distance: AB=BC=AC=600,000 km . The mass of planet: 1 is equal to mass of planet: 2 , but the mass of planet: 3 is smaller than the mass of planet: 1 . So, the measurement of space and time at planet: 1 and planet: 2 are different from the measurement of space and time at planet: 3 . If the units of measurement of space and time at planet: 3 in the second experiment are space: km.γ and time: s.γ , then the units of measurement of space and time at planet: 3 in the third experiment will be contradicted. It means that the units of measurement of space and time at planet: 3 in this third experiment are space: km/γ and time: s/γ . All case of experiment, the units of measurement of space and time at planet: 1 and planet: 2 are not changed. Their units of measurement of space and time are space: km and time: s .

An observer who is on planet: 1 turns on a lamp again, and he views the movement of a ray of light starting from planet: 1 to a planet: 2 , and from planet: 2 reflecting to planet: 3, and from a planet: 3 reflecting to return a planet: 1. Afer a ray of light finished a trip, an observer calculates time passing of a ray of light, he calculates that:

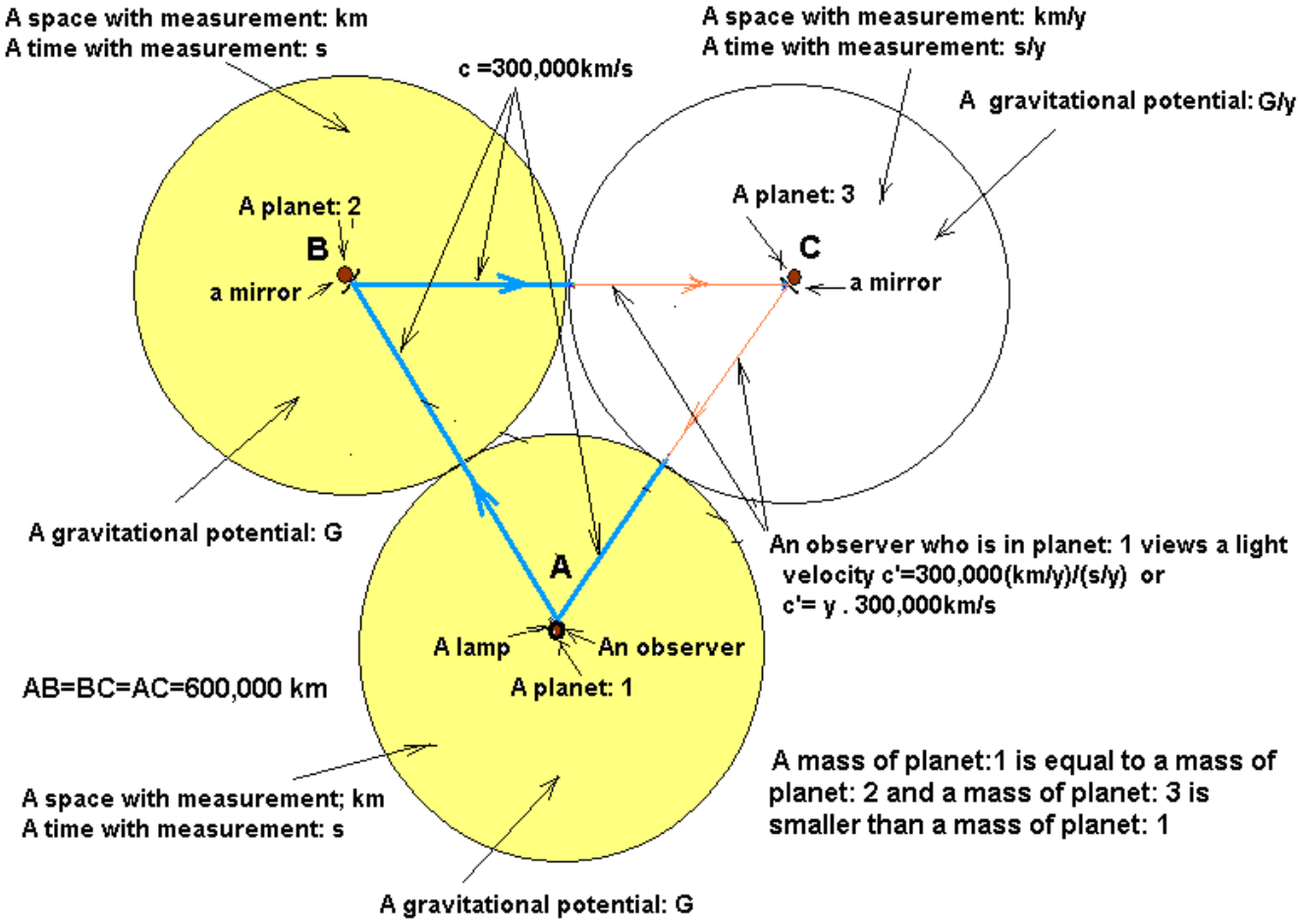
$$time = \frac{path}{velocity} = \frac{2 \times 600{,}00km + 600{,}000km/\gamma}{300{,}000km/s} = 4.s + \frac{2.s}{\gamma} < 6.s \qquad (\text{with } \gamma > 1)$$

In this third case of experiment, an observer who is on planet: 1 finds that the movement of a ray of light in space and time at planet: 3 with velocity: c'=300,000 (km/γ)/(s/γ) in a "curved" path: is 300,000km.(1/γ) , or with velocity:

$$c' = 300{,}000km/(s/\gamma) = \gamma \times 300{,}000km/s.$$

Obviously, light velocity: c' in this third experiment is faster than light velocity: c in the first experiment. Please see **figure: 4** .

Figure: 4



Conclusion :

From three case of experiment as above, we find that the space and time depend on the gravitational potential, so there is no "**empty space**" so that light velocity is constant as Einstein's second postulate in his paper: "**On the Electrodynamics of moving Bodies**".

In the universe a light velocity is not constant and it depends on the space which is contained by the gravitational potential of a heavenly body's mass. In the other words, when the space and time of a frame of reference are changed, then light velocity is also changed.

In the third experiment, we find that where there is a weak gravitational potential, light velocity: c' is faster than a light velocity: c . So, light velocity: c is not the limit of all velocities as per Einstein's annoucement and the fomula: coefficient $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ is not correct. (From this formula: coefficient γ , Einstein has predicated that light velocity is the limit of all velocities).

Because light velocity: c is not the limit of all velocitiies and Einstein's formula: coefficient γ is not correct, we must revise the fomula: coefficient γ from $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$ to $\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2 + v^2}}}$.

Please read papers: "**Light velocity is not the limited of all velocities**" , (http://wbabin.net/science/cuong15.pdf) and "**On the Electrodynamics of Moving Bodies, Revised**" (http://wbabin.net/science/cuong19.pdf), to understand that.

Hanoi, June 28, 2010