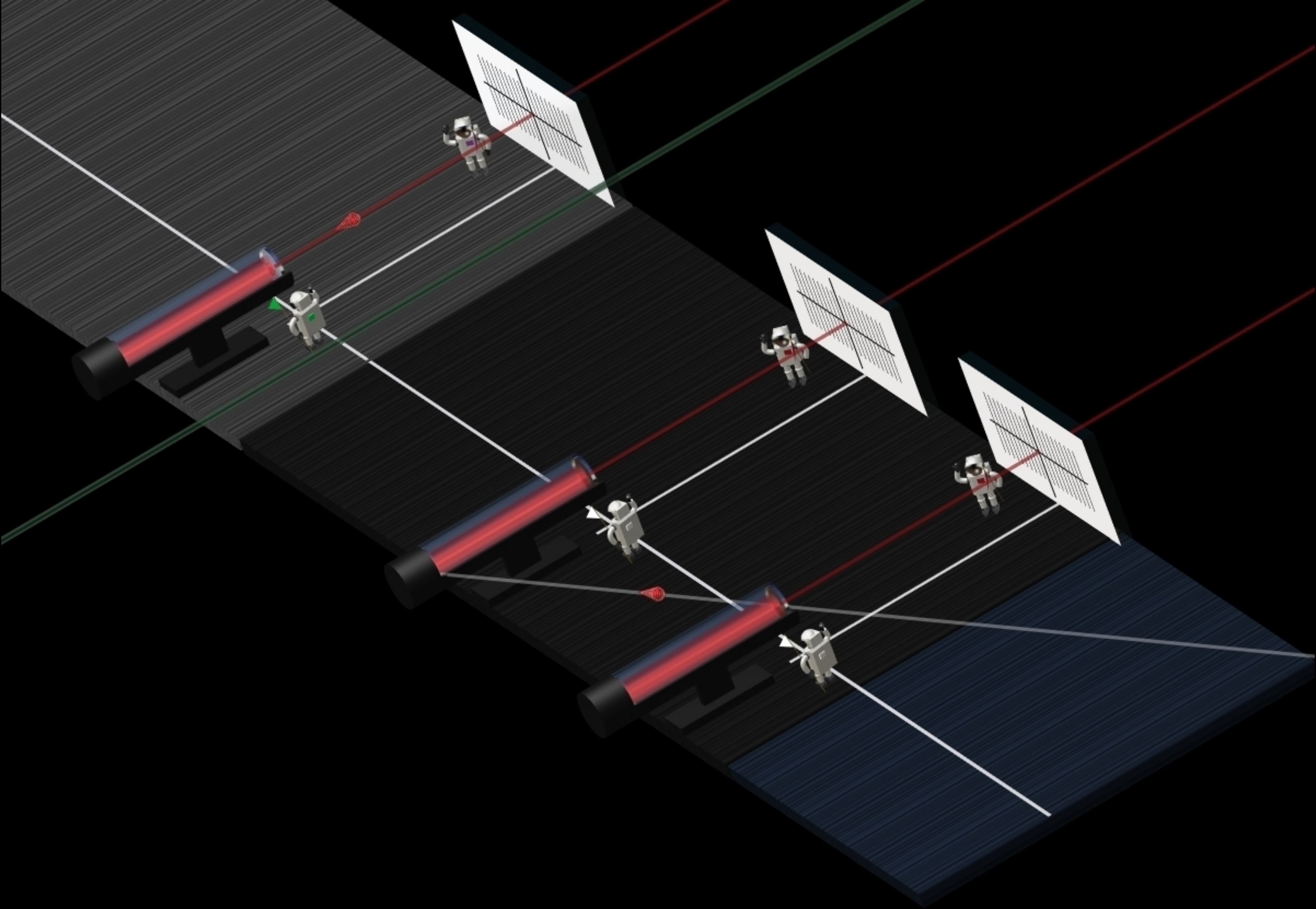

EXPERIMENT-L

This book describes the spatio-optical phenomenon in motion. Independent methods that allow to discover and precisely define absolute vehicle velocity have been presented. The „true” nature of time was discovered and described.

"Experiment-L" is a second part of book "Experiment-C" !!!

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ISBN 978-83-939097-6-6

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Author’s note.

If an error is detected in any well-established theory, such error should be corrected. If several errors are detected, they should be corrected all the more. But what happens if the entire well-established theory is erroneous? Should it be replaced by a new corrected theory? The answer to this question seems to be obvious. Yes, it should be. It should be done as soon as possible. The choice appears to be straightforward.

Let’s make the problem as difficult as possible, up to the limits of absurd. What should be done if the considered theory is one of the most important theories in the entire Physics? It is regarded as true by all scientists, well, almost all of them. It’s confirmed experimentally and by plenty of publications of various authors. Even authors of SF (Science Fiction) books write about it. I am talking about the Special Theory of Relativity by Albert Einstein. What should be done in such case? If errors are discovered in such theory, should one expose oneself to criticism and try to explain them? Is it necessary to act contrary to the view held by the most eminent scientists? Are these the limits of absurd or pure stupidity? Is it an impossible, unfeasible task? What should be done in such situation?

Answer 1.

No, such significant and well-known theory should not be changed because all people are well accustomed to it. Why should I cause their brains to reel? Let them live and duplicate the errors.

Answer 2.

Yes, the erroneous theory should be corrected. The occurring errors should be exposed even if one exposes himself to any trouble. Development of science requires that discoverer should share their knowledge with others. If the new theory will be accepted by others, fine, if not – it can’t be helped. Everyone has their own mind and opinions. Everyone can make their choice between the new and current theories. Learning something new will not cause any harm. The new theory can always be considered as an alternative to the currently established one.

I, Grzegorz Ileczko, have selected answer 2. The consequence of my choice is precisely this book.

Introduction.

This book is composed of two parts:

– Part 1 **Experiment – C** **(Absolute velocity of vehicle)**
– Part 2 **Experiment – L** **(Absolute Time)**

This book deals with some Theory of Relativity issues in a non-standard generally accepted way. In principle it is a concept of physics without relativism. Generally speaking both parts of the book are based on no assumptions whatsoever. The entire book is based on a well known and founded laws of physics, in particular on the ***„free space loss"*** law. A detailed analysis of optical phenomena that occur in space for high vehicle velocities forms the basis for better understanding of the time and space real nature. One can say briefly that the material compiled and described in this publication pertains to several problems:

– Clarification of deficiencies of the Special Theory of Relativity,

– The phenomenon of ***„free space loss"*** for very fast vehicles,

– Geometry of optical beams on-board a very fast vehicle,

– Two independent equations determining vehicle's absolute velocity,

– Modernisation of a theoretical experiment with a light clock (this is a clock composed of two mirrors and a photon),

– The real nature of time. A mathematical proof that time has absolute nature – it is invariable.

All the experiments shown in this book refer, more or less, to the postulates comprised in the Albert Einstein's Theory of Relativity.

The main postulates of the Theory of Relativity have been presented here below in an abbreviated form:

1.) The central paradox is that the speed of light must be the same for all observers irrespectively of their velocity and the source of light velocity. Light speed is always constant and it is $c = 2{,}998 \cdot 10^8 \frac{m}{s}$.

2.) Space shrinks, in the direction of movement, by $\sqrt{1-\frac{v^2}{c^2}}$ factor, whereas time slows down by $\gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}}$ factor.

3.) There is no method for determination of vehicle's absolute velocity. There are no physical experiments that could be performed inside the vehicle to determine it's speed assuming total absence of vehicle's interior contact with the external world.

Experiment – L Pertains mainly to the first and second postulate.

Experiment – C Pertains mainly to the first and third postulate.

Experiment – C (Part 1)

In the first part of the book two experiments allowing to find and precisely define vehicle's absolute velocity have been described. The assumption of total lack of contact between the vehicle interior and the external world has been complied with in both cases. According to the Theory of Relativity such experiment does not exist and vehicle's absolute velocity cannot be determined.

Division of experiment – C into two parts facilitates its easier presentation and understanding. The first part has the same name. The second part illustrates Experiment – cosine C. Both parts are strongly bound.

Both experiments resulted in provision of new knowledge on deficiency of the postulates contained in the Theory of Relativity. Explanations of this "error" was a serious challenge for me because it has appeared that this could be accomplished. The explanation should be clear and precise.

Transparency of the proposed idea could have been achieved by application of proper computer animations, drawings and relevant verbal descriptions.

Precision of argumentation could have been assured only by application of mathematical (physical) equations and their numerical analysis.

Experiment – L (Part 2)

In the second part of the book Experiment – L has been described. It makes a modified version of a well known experiment with the light clock. This experiment has been improved compared with the original one. The optical clock was substituted by a laser. Laser beam can leave laser's interior, therefore, it becomes observable (not only in theory). Experiment – L has been designed as a "broad" angular analysis. Various laser positions onboard the vehicle were accurately studied. One can literally say that laser beam has been analysed at every angle. This resulted in new knowledge on deficiency of the gamma factor (Theory of Relativity).

Whether the presented results of all experiments are correct or not, this is for the reader to assess. I cannot, and even don't want, to decide it single-handed. However, I can present my own ideas and my own point of view. Let it be a theory that is alternative to the ruling Theory of Relativity.

N.B. Numbering of all drawing, computer animation, mathematical equation and characteristic markings has been introduced at this point from the very beginning. This is so because Experiment–L can be analysed and presented independently from the other experiments.

Technical information:

This book contains a high number of drawings and animations. The animations facilitate greatly understanding of the presented problems. They were compressed with a strong H.264 video codec. Proper video codecs should be installed in your computer's operating system so that the animations can properly operate. One of several exemplary video codec packs should suffice to properly play the animations:

FFDShow,

K-Lite Codec Pack,

Win7codecs

I use the last one. You should have also correct PDF file reader. Any alternative PDF file readers do not cope properly with animation playing. You should install a free Adobe software in your operating system. The Adobe Reader XI ensures faultless operation of the presented document. All the above-named applications can be downloaded free from the Web and installed in your computer's operating system.

Animations are also available on the website: www.gibook.eu

Experiment – L

Part 2

3. Experiment – L.

Experiment – L is a modification of Albert Einstein's experiment with the light clock. The light clock experiment is special. In fact, it is doubly special. Why?

- The light clock has been set at the right angle with relation to vehicle's direction of motion. The angle (α=90deg) is a specific setting. The conclusions drawn from the experiment have been generalised to all other values of the angle setting of a light clock. Generalisation of the experimental results performed for the angle (α=90deg) to the other angle values, which were not checked, can be a source of problems. It turns out that it really is.
- The conclusions of the experiment have been generalised to all material things. They do not pertain only to optical phenomena but to all physical phenomena. Such generalisation may appear to be too broad. Therefore, it is special.
- The conclusions of the experiment have been generalised to space and time. They do not pertain only to optical phenomena or material things. The conclusions pertain to the space–time. Such generalisation certainly is too broad – special.

Experiment – L has been designed to eliminate many deficiencies that occur in the light clock experiment. The most important ones have been listed below:

- Ideal mirrors in the light clock were replaced by a gas laser. It allows for easy observation of the light beam. Such a device was unavailable until the time of Albert Einstein's creation of the Theory of Relativity. Currently it is available.
- Experiment – L has been performed for various laser angle settings. The angle (α=90deg) is only one of possible settings. Setting the laser at the angle (α=90deg) with relation to vehicle's direction of motion has turned out to be very special. Conclusions should not be generalised to other angles. In fact it is the other way round. The (α=90deg) angle is only a special case of all other laser setting angles. Other angles make a general case.
- The conclusions of the experiment have not been generalised. They are rather raw and pertain only to the essence of the problem. They pertain to spatial and optical phenomena. There is no modification of the time or structure of time and space whatsoever. Such modifications will turn out to be unnecessary and even misleading.

"If the facts don't fit the theory, change the facts." **Albert Einstein**

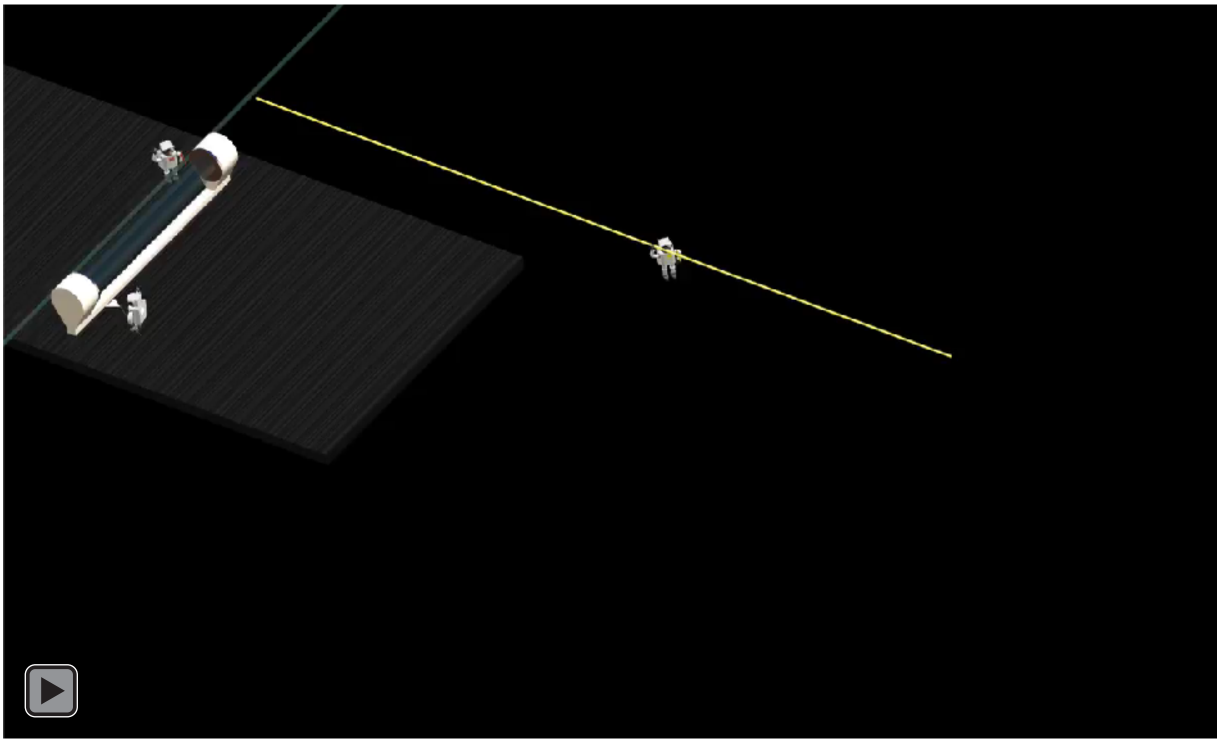
"Physics is facts. If the facts don't fit the theory, change the theory. It's a right way."

(author)

Visualisation of Albert Einstein's experiment with the light clock.

Real animations are available on the website: www.gibook.eu

N.B. Numbering of all drawing, computer animation, mathematical equation and characteristic markings has been introduced at this point from the very beginning. This is so because Experiment –L can be analysed and presented independently from the other experiments.



Anim.L-1. Light clock in motion.

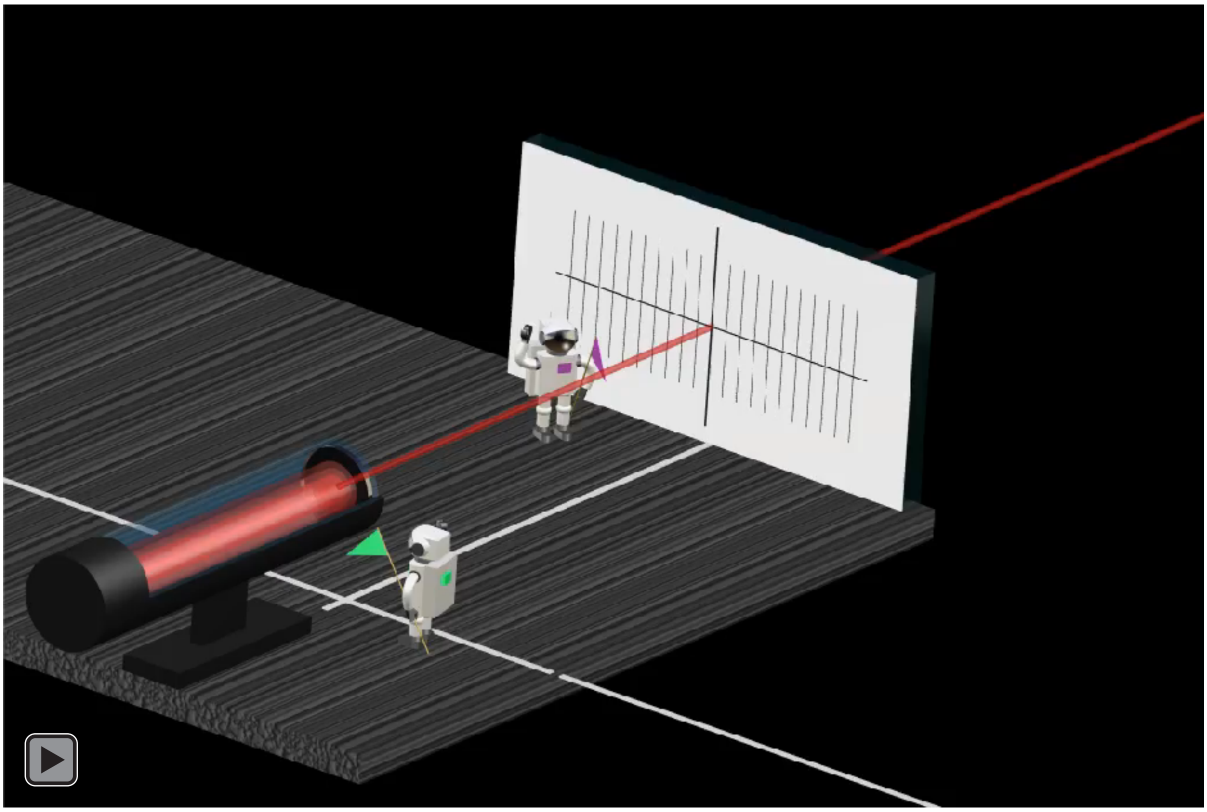
The vehicle has a light clock and some astronauts on-board. The photon and the vehicle move independently of each other. The voyagers, who observe the photon (theoretically, of course), arrive at the conclusion that time has slowed down. They have this impression because the observed photon flies with velocity below C. Reflecting off the clock's mirrors, the photon moves in a zigzag pattern. It has two velocity components. They are in conformity with the symbolically adopted (x, y) axes:

x – axis (velocity component) is parallel to the yellow measuring bar held by an astronaut,

y – axis (velocity component) is parallel to the green laser beam emitted from the planet.

The astronauts/voyagers do not see the photon velocity component (x) because it is identical with the vehicle's velocity. They only see the velocity component (y). The photon observed by the voyagers moves between the mirrors at a velocity below C. The voyagers have an impression that the time has slowed down, but this is not true. Time retardation is illusory.

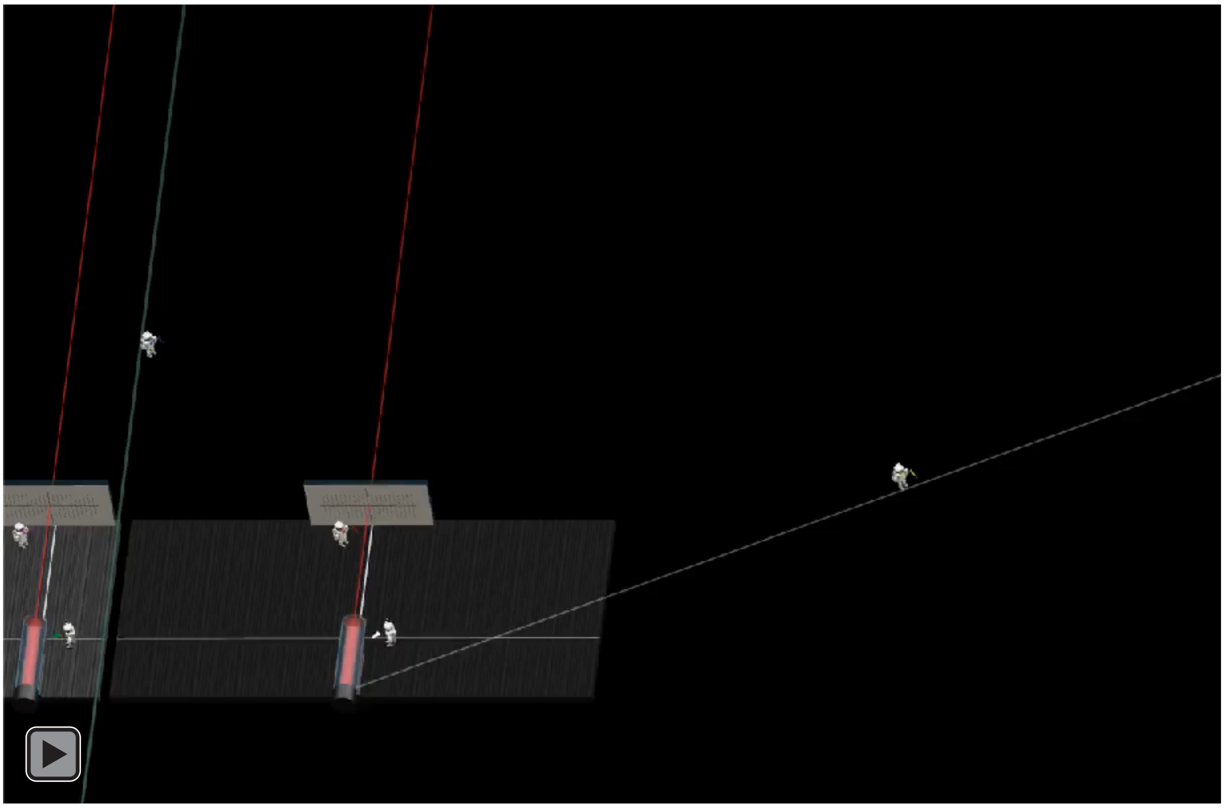
To explain the photon retardation phenomenon Albert Einstein modified time and space. He came to a conclusion that time on-board the vehicle slowed down. I will try to show that such an approach is wrong. For this purpose, I have modified the light clock experiment. The clock was replaced by a gas laser. The animation shown below forms the basis for Experiment – L. It is the simplest version of the entire series of animations.



Anim.L-2. Experiment – L. Light clock was substituted by a gas laser.

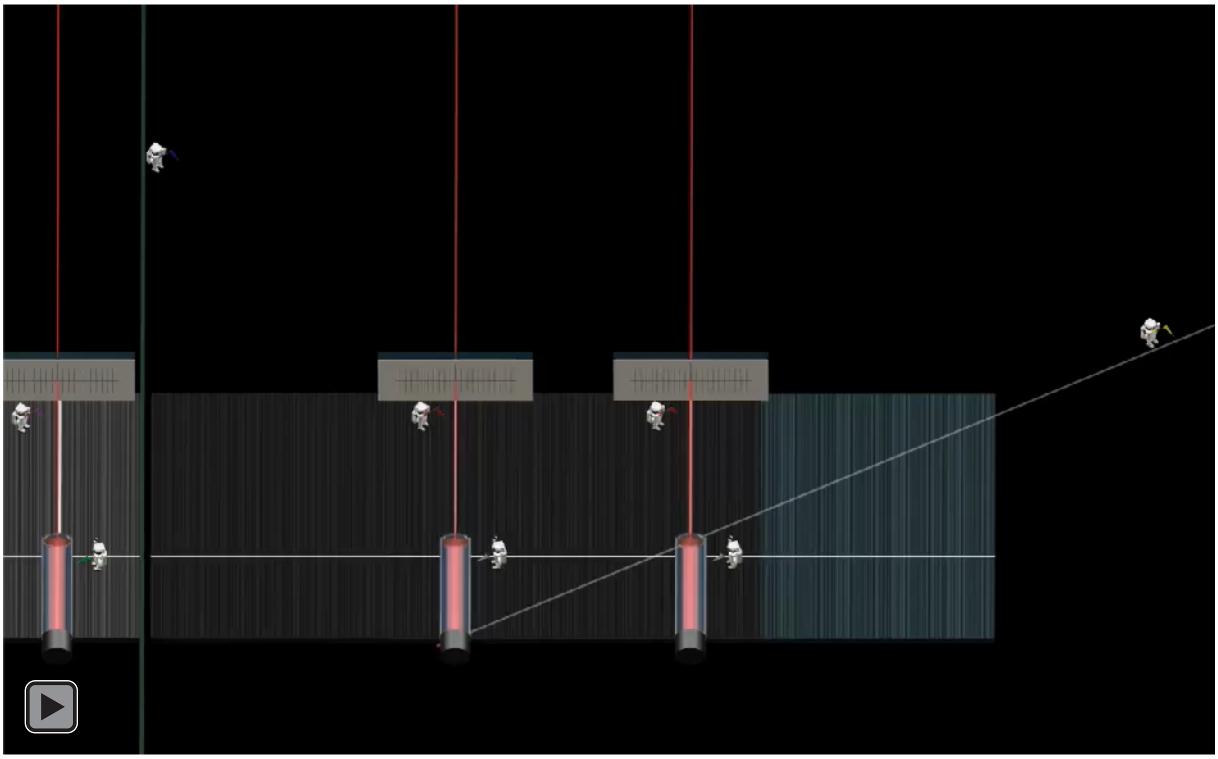
3.1 Visual analysis for a laser beam on-board a very fast vehicle.

Laser setting angle (α=90deg).



Anim.L-3. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=90deg).

Both photons move with identical velocity. They differ only in the direction of motion. The moving vehicle has an imposed velocity factor of (0.9) with relation to photon velocity. It is purely by chance that it appears that the photon from the stationary laser arrives at the measuring target at the same time as the second photon just leaves the moving laser. The animation can be stopped or replayed several times. The astronauts/voyagers have the impression that time moves slower on-board their vehicle. They cannot see that the photon moves at an angle with relation to the moving vehicle. The semi-transparent fixed white line represents the real path along which the photon flies. The angle of inclination of the line with relation to the axis of the vehicle flight path has been strictly defined, and it is exactly (α=25.85deg) for vehicle velocity of (v=0.9C). The method of determination of this angle's value has been described in the next section pertaining to the mathematical analysis. At this moment it is important to say that value of this angle is strictly defined and depends on the vehicle velocity.

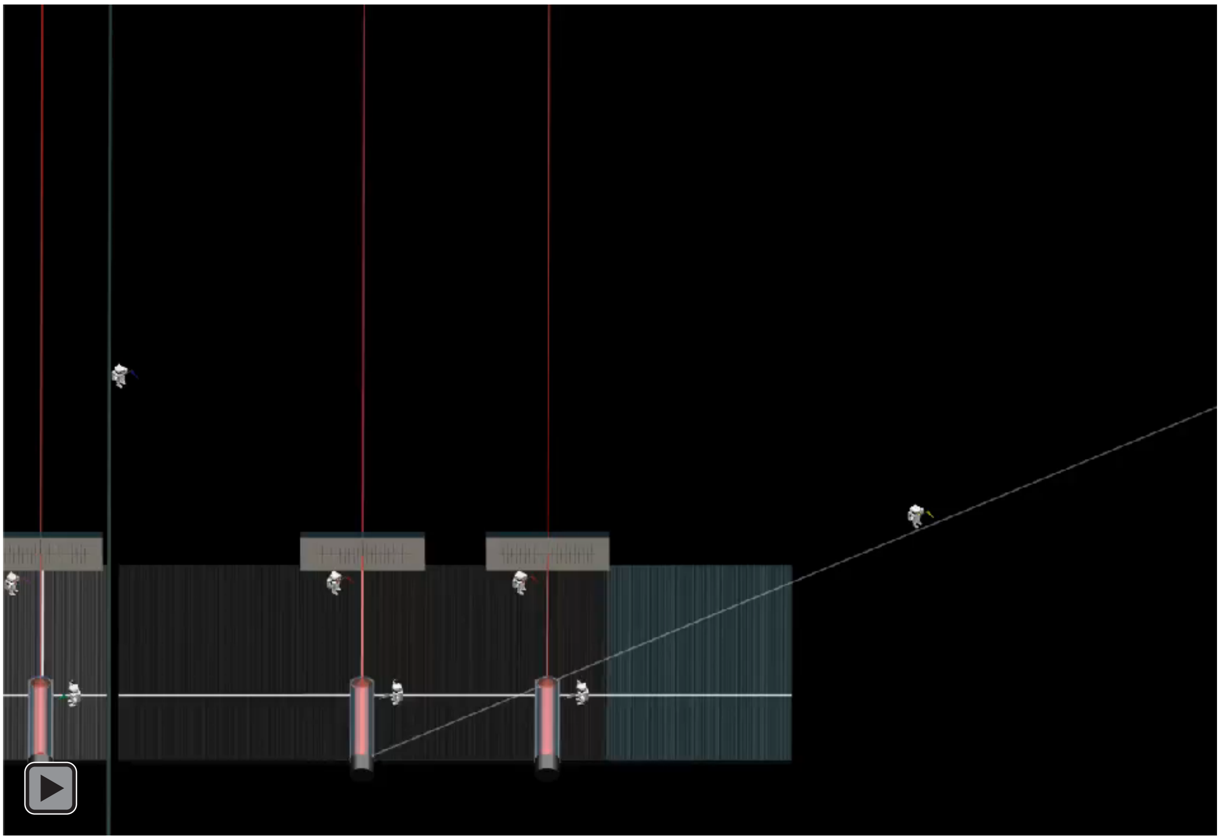


Anim.L-4A. Stationary vehicle in combination with moving vehicle. The photos are animated in the last sequence. Laser setting angle (α=90deg).

Animation L-4.A is a slightly modified version of animation L-3. The moving vehicle's "ghost" has been added. It's located exactly at that place, from which the photon departs from the moving laser. The photons have been animated in the last sequence. These are the only differences with relation to animation L-3. One can vividly say that the moving laser's photon has two velocity components, (x) and (y). The stationary laser's photon has only one velocity component. The component that is perpendicular to the vehicle's direction of motion is observable. The velocity component that is parallel to the vehicle's direction of motion cannot be observed by the astronauts/voyagers. This is easier to see in animation L-4.B. We should observe the photon in terms of what is seen by the voyagers.

x – axis (velocity component) parallel to the vehicle's direction of motion,

y – axis (velocity component) perpendicular to vehicle's direction of motion. It is, at the same time, parallel to the red laser beam ray emitted by the laser located on-board the stationary vehicle.



Anim.L-4B. Stationary vehicle in combination with moving vehicle. Ghost of the moving vehicle has been placed at the point from which the photon exists the laser. Laser setting angle (α=90deg).

The photons and the vehicle are animated simultaneously. The astronauts/voyagers have the impression that time on-board the vehicle has slowed down, but this is only an illusion. The voyagers cannot see the photon's parallel velocity component (x). This value of this velocity component is identical with vehicle's velocity, and for this reason it cannot be observed. The voyagers may observe only the photon's perpendicular velocity component (y). It is smaller than the speed of light, which is always the same (C). As the photon's perpendicular velocity component has its value lower than C, it takes longer for it to travel the distance between the laser and the measuring target. This distance remains unchanged, and can easily be measured. The photon's perpendicular velocity component will somehow be observed longer. The voyagers have the impression that time has slowed down but is only an illusion.

It has happened so that full explanation of this phenomenon is impossible by application of the above described case i.e. the laser angle setting of (α=90deg). Analysis of all possible laser positions, in conjunction with mathematical and numerical analyses, is barely sufficient to gain an understanding of the presented problems. They are very illusive and hardly intuitive. So, I ask for your patience and understanding. All the problems have been presented in strict sequence and only combining them into a whole provides the complete image of the situation.

x – axis (velocity component) parallel to vehicle's direction of motion,

y – axis (velocity component) perpendicular to vehicle's direction of motion. It is, at the same time, parallel to the red laser beam emitted by the laser located on-board of the stationary vehicle.

3.2 Mathematical analysis. Laser setting angle (α=90deg).

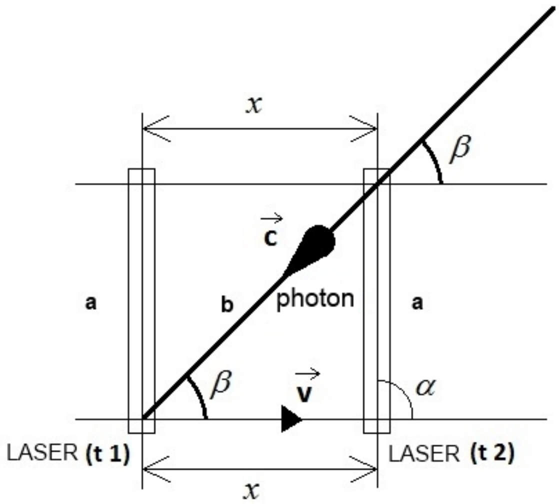
The main objective of the analysis is to determine the vehicle velocity (v) as a function of the actual laser beam angle (β).

Another objective of the analysis is the comparison of the results of Experiment – L with the Theory of Relativity. For this purpose the omega factor was defined and compared with the gamma factor. Omega is a ratio of two values of photon flight duration for a defined measurement distance i.e. the photon flight time measured for the moving vehicle compared with the photon flight time for the stationary vehicle (t/ t_0).

t – time of photon flight over a deck of a very fast vehicle

t_0 – time of photon flight over a stationary vehicle's deck

3.2.1 Determination of vehicle's velocity as a function of laser beam deflection angle (β). Laser setting angle (α=90deg).



$$\alpha = 90\,\text{deg}$$

$$\alpha \geq \beta \geq 0\,\text{deg}$$

Fig. L-1. Laser on-board moving vehicle. From moment (t1) to (t2) the laser will cover distance (x). The photon reflected from the lower mirror travels to the upper mirror at angle (β).

The laser has been located on-board the vehicle at angle (α=90deg) to the direction of motion. (Fig.L-1) schematically presents this situation. The laser shall cover distance (x) from moment (t2) to (t2). The velocity of the laser, and the entire vehicle, is defined and it is (v). Photons inside the gas laser cruise between the lower and upper mirrors. Some photons depart the laser through the semi-transparent upper mirror. One of the photons reflected off from the lower mirror at exactly moment (t1). It will arrive at the upper mirror at moment (t2). The distance (b), which the photon will travel, is longer than distance (x), which will be travelled by the laser at the same time. The laser beam angle (β) can be determined by application of the cosine trigonometric function.

$$\cos(\beta) = \frac{x}{b} \qquad (1)$$

Time analysis:

The photon will travel distance (b) with speed C during t_1 time. During time t_2 the laser will travel distance (x) with velocity (v) that is specific for the vehicle. This can be written as equations (2) and (3).

$$c = \frac{b}{t_1} \rightarrow t_1 = \frac{b}{c} \qquad (2) \qquad\qquad v = \frac{x}{t_2} \rightarrow t_2 = \frac{x}{v} \qquad (3)$$

Time values t_1 and t_2 are identical. They can be equated. This is because the photons inside the laser always search for the shortest route between the upper and lower mirrors. The laser action occurs at that time. For the stationary vehicle, the length of the route is (a). For the moving vehicle this route increases and it is (b > a). Distance between the laser mirrors is always constant and it is (a). The laser setting angle (α) also remains unchanged. The vehicle moves in space covering the distance (x). The value of distance (x) depends on vehicle's velocity (v) and on the time of its measurement t_2. This time, in the described above case, is equivalent to time t_1 of photon flight at distance (b).

$$t_1 = t_2$$

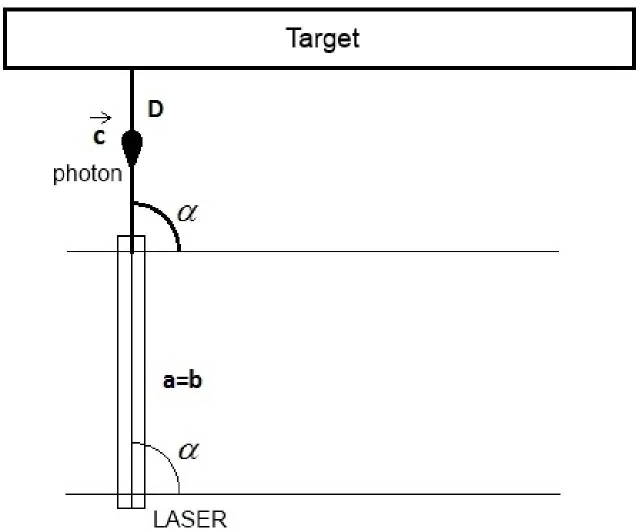
$\frac{b}{c} = \frac{x}{v}$ let velocity (v) occur on the left-hand side of the equation, distance (b) on the right-hand

$\frac{v}{c} = \frac{x}{b}$ right-hand side of the equation can be substituted by equation (1)

$$\frac{v}{c} = \cos(\beta)$$

$v = c \cdot \cos(\beta)$ (4) vehicle velocity as a function of laser beam angle (β)

3.2.2 Determination of omega factor. Laser setting angle (α=90deg).

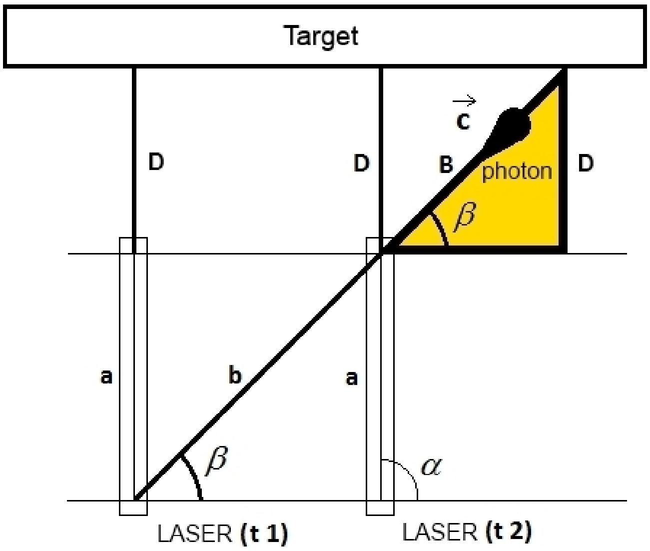


$$\alpha = 90\,\text{deg}$$

Fig. L-2. Laser illuminates the target. Stationary vehicle.

Distance (D) between the laser and the measuring target is known. The photon will travel distance (D) in time t_0.

$$C = \frac{D}{t_0} \rightarrow t_0 = \frac{D}{C} \qquad (5)$$



$\alpha = 90\,\mathrm{deg}$

$\alpha \geq \beta \geq 0\,\mathrm{deg}$

Fig. L-3. Laser illuminates the target. Vehicle in motion. Distance (B) that photon has to cover is longer then distance (D).

The angle (β) depends on vehicle velocity (4). We can make an assumption that it is known as the vehicle velocity (v). So, the angle (β) can be determined from formula (4). Equations determining absolute vehicle velocity were derived and presented previously (Experiment – C). The distance (D) is known. The distance (B) can be calculated using a trigonometric function.

$$\sin(\beta) = \frac{D}{B} \rightarrow B = \frac{D}{\sin(\beta)} \qquad (6)$$

The photon will cover distance (B) in time t.

$$C = \frac{B}{t} \rightarrow t = \frac{B}{C} = \frac{D}{C \cdot \sin(\beta)}$$

$$t = \frac{D}{C \cdot \sin(\beta)} \qquad (7)$$

The omega factor is a ratio of both photon flight time values ($t/\ t_0$).

$$\Omega = \frac{t}{t_0} = \frac{\frac{D}{C \cdot \sin(\beta)}}{\frac{D}{C}} = \left(\frac{D}{C \cdot \sin(\beta)}\right)\left(\frac{C}{D}\right) = \frac{1}{\sin(\beta)}$$

$$\Omega = \frac{1}{\sin(\beta)} \qquad (8)$$ omega factor for laser setting angle (α=90deg)

3.3 Numerical analysis. Laser setting angle (α=90deg).

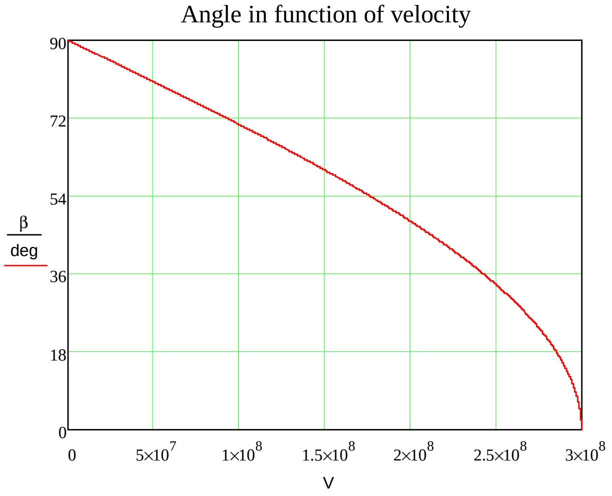
Equations (4) and (8) were calculated numerically. Based on the obtained numerical values relevant graphs have been plotted.

3.3.1 Vehicle velocity as a function of angle (β).

Numerical analysis of equation (4). Laser beam angle (β) varies within the interval

(α ≥ β ≥0deg). The value of the iteration step assumed for the angle beta is ($\beta_{\_STEP}$ = 0.01deg).

$$v = c \cdot \cos(\beta) \quad (4)$$



V = (m/s)

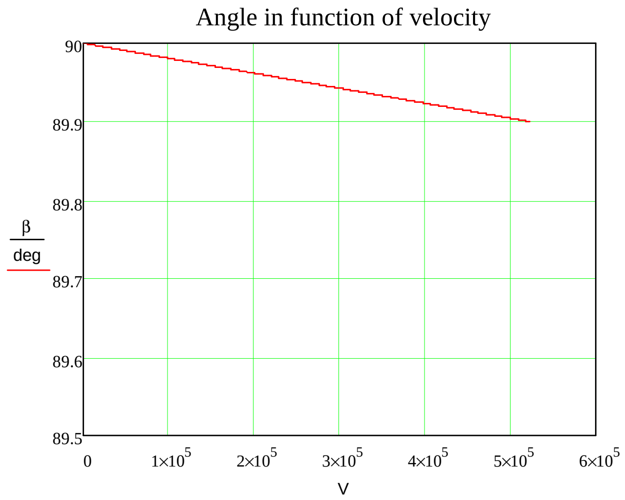
	0
0	$1.84 \cdot 10^{-8}$
1	$5.23 \cdot 10^{4}$
2	$1.05 \cdot 10^{5}$
3	$1.57 \cdot 10^{5}$
4	$2.09 \cdot 10^{5}$
5	$2.62 \cdot 10^{5}$
6	$3.14 \cdot 10^{5}$
7	$3.66 \cdot 10^{5}$
8	$4.19 \cdot 10^{5}$
9	$4.71 \cdot 10^{5}$
10	$5.23 \cdot 10^{5}$
11	$5.76 \cdot 10^{5}$
12	$6.28 \cdot 10^{5}$
13	$6.8 \cdot 10^{5}$
14	$7.33 \cdot 10^{5}$
15	...

β = (deg)

	0
0	90
1	89.99
2	89.98
3	89.97
4	89.96
5	89.95
6	89.94
7	89.93
8	89.92
9	89.91
10	89.9
11	89.89
12	89.88
13	89.87
14	89.86
15	...

Graph L-1. Laser beam deflection angle (β) as a function of vehicle velocity.

Graph L-1. was produced for the full scale of vehicle's velocity. Several initial numerical values of the analysis were placed next to the graph. Velocities attained by spacecraft in the real world are considerably lower than the velocity obtained from the first iteration step. It is worth finding the laser beam deflection angle for small vehicle velocities. For this reason the analysis step has been reduced. The numerical analysis of equation (4) was repeated for the iteration step value of ($\beta_{\_STEP}$=0.00001deg).



V = (m/s)

	0
0	$1.84 \cdot 10^{-8}$
1	52.32
2	104.65
3	156.97
4	209.29
5	261.62
6	313.94
7	366.27
8	418.59
9	470.91
10	523.24
11	575.56
12	627.88
13	680.21
14	732.53
15	...

β = (deg)

	0
0	90
1	89.99999
2	89.99998
3	89.99997
4	89.99996
5	89.99995
6	89.99994
7	89.99993
8	89.99992
9	89.99991
10	89.9999
11	89.99989
12	89.99988
13	89.99987
14	89.99986
15	...

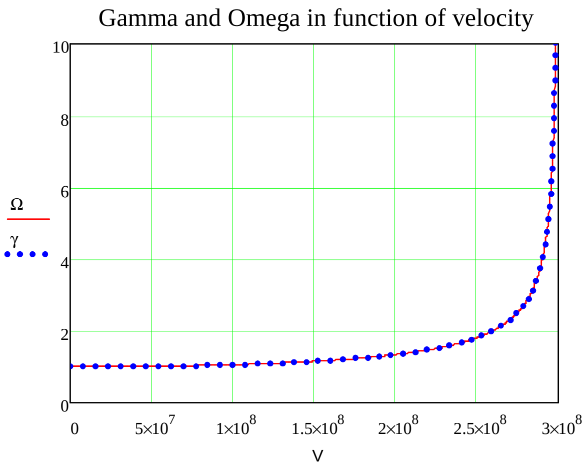
Graph L-2. Laser beam deflection angle (β) as a function of vehicle velocity.

The vertical axis of graph L-2 was considerably enlarged. Without this operation it would appear to be a straight line. It is worth turning your attention to numerical analysis values placed next to the graph. A minute change of angle (β) value (the fifth decimal place) causes considerable increase of velocity, but in reality it is, of course, the other way round. Change of vehicle's velocity affects the value of beta angle. It is more convenient to do it the other way round in the computer analysis. The beta angle should be steered and vehicle's velocity calculated.

3.3.2 Omega factor.

Numerical analysis of equation (8). Laser beam angle (β) varies within the range (α ≥ β ≥0deg). The value of the iteration step assumed for the angle beta is ($\beta_{\_STEP}$ = 0.01deg). To compare the obtained results with the Theory of Relativity, gamma factor has been calculated. Values of both calculated factors (gamma and omega) have been presented in a common graph.

$$\Omega = \frac{1}{\sin(\beta)} \quad (8) \text{ omega} \qquad \gamma = \frac{1}{\sqrt{1-\frac{v^2}{c^2}}} \quad \text{gamma} \qquad v = c \cdot \cos(\beta) \quad (4)$$



Ω =

	0
0	1
1	1.0000015
2	1.0000061
3	1.0000137
4	1.0000244
5	1.0000381
6	1.0000548
7	1.0000746
8	1.0000975
9	1.0001234
10	1.0001523
11	1.0001843
12	1.0002194
13	1.0002575
14	1.0002986
15	...

γ =

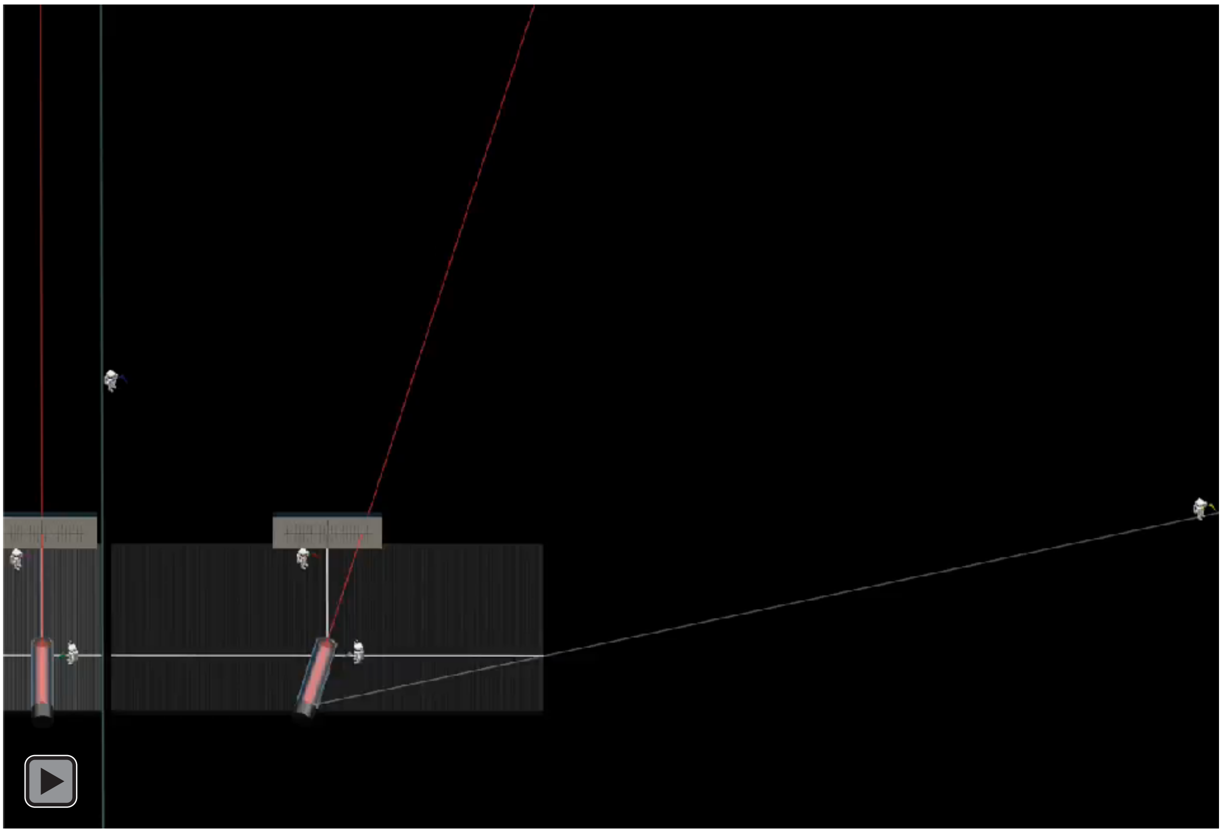
	0
0	1
1	1.0000015
2	1.0000061
3	1.0000137
4	1.0000244
5	1.0000381
6	1.0000548
7	1.0000746
8	1.0000975
9	1.0001234
10	1.0001523
11	1.0001843
12	1.0002194
13	1.0002575
14	1.0002986
15	...

Graph L-3. Gamma and omega factors as a function of vehicle velocity.

The analysis numerical values placed next to graph L-3 leave no doubts whatsoever. The gamma and omega factors are equal. It seems that correctness of the Theory of Relativity has been thus confirmed. A different method of analysis provided the same numerical results as the method used by Albert Einstein. I intend to explain that. The gamma and omega factors are equal only for a specific case when **the laser is set at the right angle (α=90deg)**. Analyses performed for other alpha angle values, presented in the subsequent sections, will reveal a difference. It will turn out that both gamma and omega factors behave divergently. The factors are not equal. **The only exception is the above described case!**

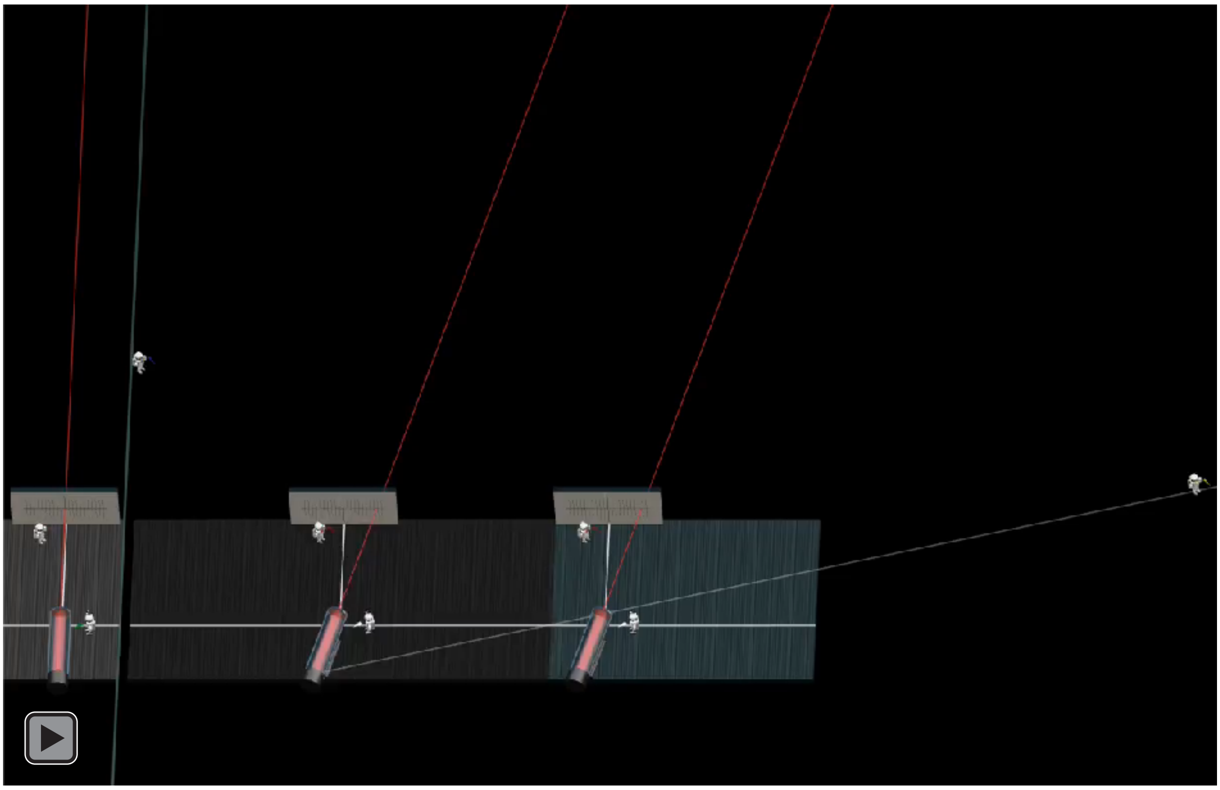
4.1 Visual analysis for a laser beam on-board a very fast vehicle.

Laser setting angle (90deg>α>0deg).



Anim.L-5. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=75deg).

Both photons travel with the same velocity. They differ only in the direction of flight. The moving vehicle features the imposed velocity factor of (0.9) in relation to photons velocity. Laser setting angle was adopted as (α=75deg) with relation to vehicle's direction of motion. The astronauts/ voyagers have the impression that time moves slower on-board their vehicle. They can't see that the photon moves at a different angle than the laser setting angle. The semi-transparent fixed white line represents the real path of the photon's movement. The line inclination angle with relation to vehicle's flight path axis has been strictly defined. It is exactly (β=14.62deg). The method to be applied for determination of that angle has been described in the next section pertaining to mathematical analysis. At this moment it is important to say that angle (β=14.62deg) of the real photon's inclination departs considerably from (β=25.85deg). The latter value is correct for the laser setting angle (α=90deg) presented in the previous section. Any change of the laser setting angle alpha value on-board the moving vehicle will cause a change of the actual laser beam's angle beta. The actual laser beam (white line) differs from the beam observed on-board of the moving vehicle (red line).



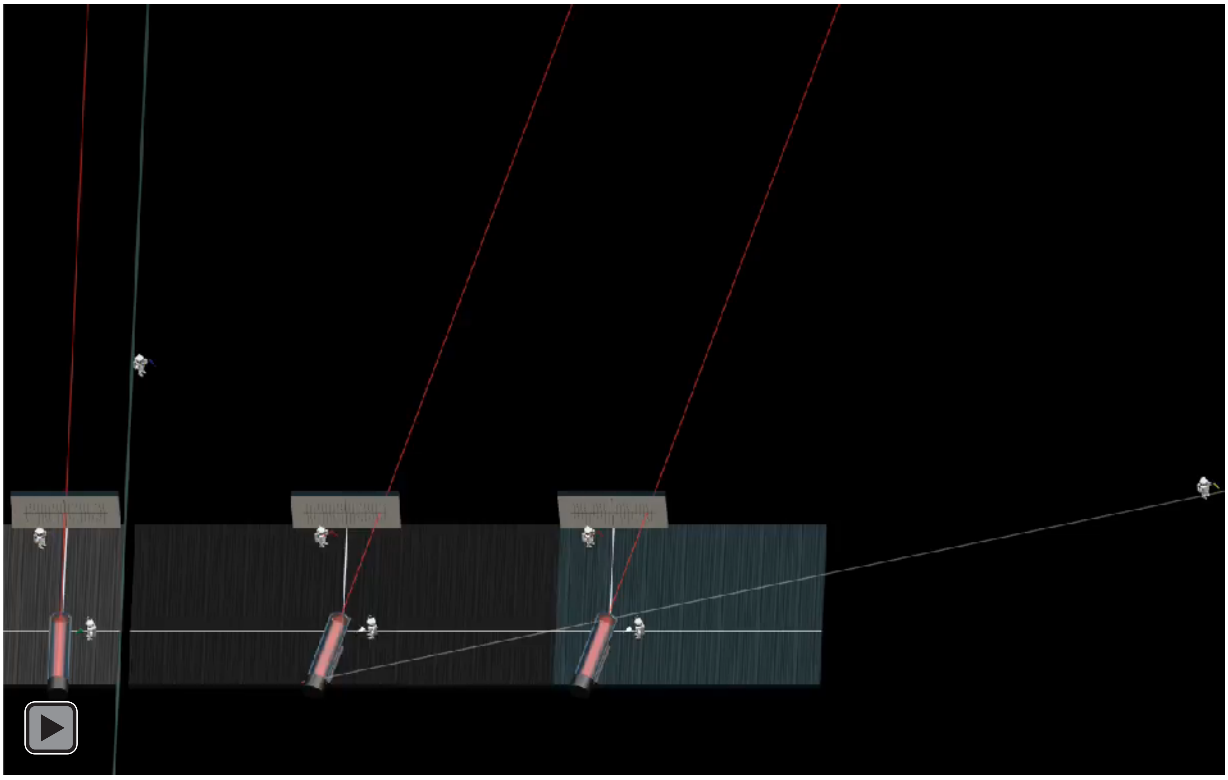
Anim.L-6A. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=75deg).

A “ghost” of the moving vehicle was added to animation L-5. It’s been located exactly at that place, from which the photon departs from the laser. One can vividly say that the moving laser’s photon has two velocity components. The component perpendicular to vehicle’s direction of motion is observable (y). The component parallel to vehicle’s direction of motion (x) is observable only to certain extent, to a small degree.

x – axis (velocity component) parallel to vehicle’s direction of motion,

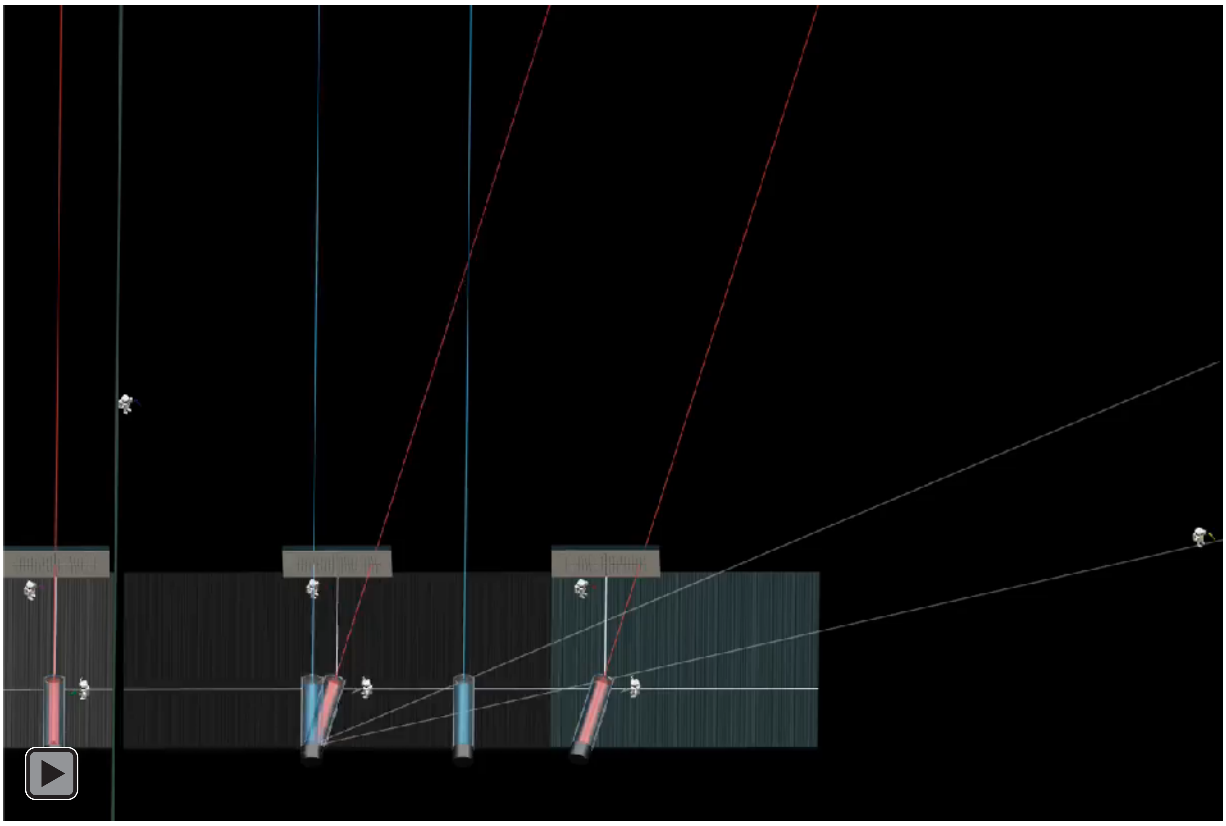
y – axis (velocity component) perpendicular to vehicle’s direction of motion. It is, at the same time, parallel to the red laser beam emitted by the laser located on-board of the stationary vehicle.

The voyagers see only a part of photon’s parallel velocity component (x). This part is a difference between the photon’s parallel velocity component and vehicle’s velocity. The difference of both velocities is observable and the remaining part is not. Only the difference of velocities can be observed. The upper laser’s mirror has been positioned exactly in the middle of the measuring target. The photon departing the laser travels to meet the target at an angle. When it will arrive at the target, it will hit its surface at the distance of approx. 9 scale marks from the centre of the target. The distance of nine scale marks is observable for the astronauts/voyagers. The moving vehicle with the laser covers at the same time the distance that is many times longer than length of the measuring target. The voyagers cannot see that “excess” distance. They have the impression that it is the time that has slowed down.



Anim.L-6B. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=75deg).

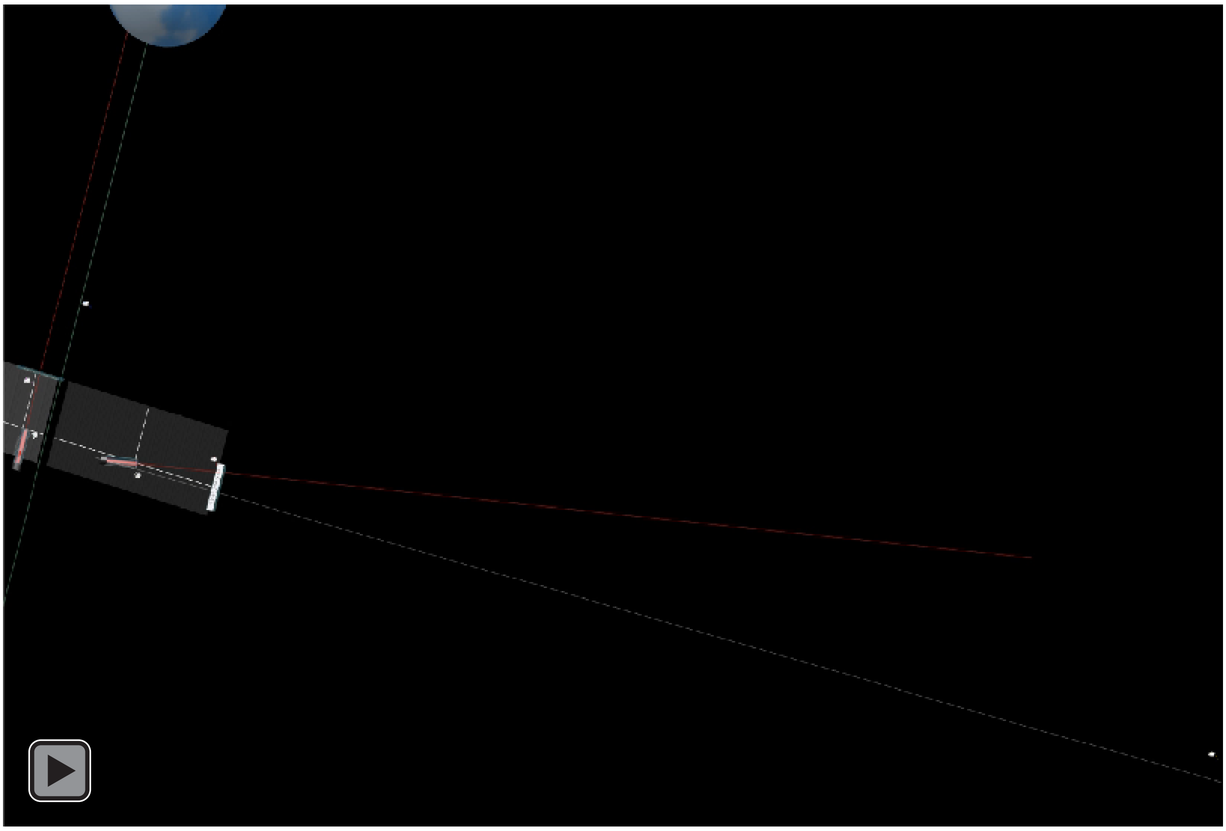
Animation L-6.A was slightly modified. The photons are being animated in the last sequence. This operation has a cognitive character. It's easier imagine what is happening. All the animation parameters, apart from the sequence, are identical with the former one.



Anim.L-7. Stationary vehicle in combination with moving vehicle. The animation contains a deliberately introduced additional blue laser and photon. Red laser setting angle (α=75deg). Blue laser setting angle (α=90deg).

Vehicle's velocity is the same as before (v=0.9C). Red laser's angle of setting is (α=75deg). The angle of inclination of the laser's actual beam (white line) is (β=14.62deg) with relation to vehicle's flight path axis. This pertains to the correct red photon. An extra laser and photon were introduced deliberately to the animation. The photon was marked as blue. The angle of inclination of the laser's actual beam (white line) for the blue photon is (β=25.85deg). So, this value is perfectly compatible with the previous section i.e. setting the laser on-board the vehicle at the right angle (α=90deg). Thus, two photons and their actual paths of flight were shown in the common animation. The blue photon must travel along a different path than the red photon. A small difference in a single variable (β=14.62deg–25.85deg=–11.23deg) causes a considerable difference in photon's flight path and in time of its observation above the vehicle's deck. In the actual world, the value of the laser generated beam angle beta will always be correct. The angle beta changes automatically depending on vehicle's velocity and depending on the laser setting alpha angle on-board the vehicle. There are three variables that are related with one another by one equation, and they are respectively:

– vehicle's (laser's) velocity: v=0.9C,
– angle α; laser's location on-board the vehicle: α=75deg,
– angle β of the actual laser beam (white line): β=14.62deg (correct value)



Anim.L-8. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=10deg).

The laser setting angle (α=10deg) makes an interesting case. The moving vehicle will travel a considerable distance before the photon arrives at the measuring target. This is because the laser angle setting is small (acute). For invariable vehicle's velocity (v=0.9C) the actual laser beam angle is (β=1.01deg). The angle beta is approx. 1/10 of the value of alpha angle.

"Information is not knowledge." **Albert Einstein**

"Information is illusive knowledge. Knowledge is composition of information." **(author)**

4.2 Mathematical analysis. Laser setting angle (90deg>α>0deg).

Just like in section (3.2), the main objective of the analysis is to determine vehicle's velocity (v) as a function of angle (β) of the actual laser beam.

Another objective of the analysis is the comparison of the results of Experiment – L with the Theory of Relativity. For this purpose the omega factor was defined and compared with the gamma factor. Omega is a ratio of two time values of photon flight duration for a defined measurement distance i.e. the photon flight time measured for the moving vehicle compared with the photon flight time for the stationary vehicle (t/t_0).

t – time of photon flight over a deck of a very fast vehicle

t_0 – time of photon flight over a stationary vehicle's deck

4.2.1 Determination of vehicle velocity as a function of angles (α) and (β).

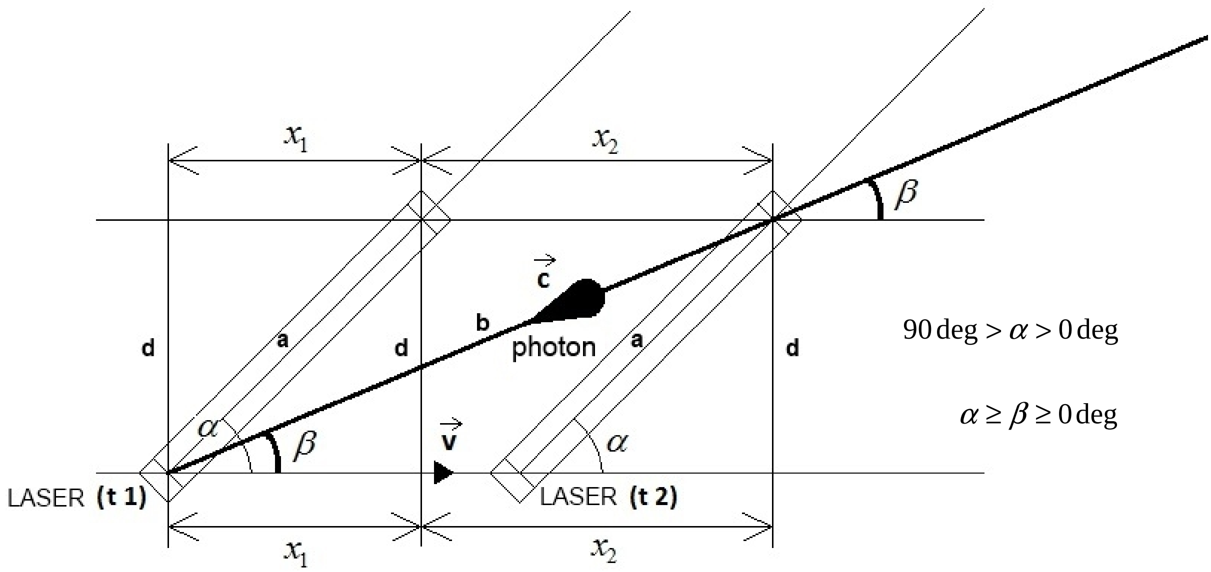


Fig. L-4. Laser on-board moving vehicle. From moment (t1) to (t2) the laser will travel distance (x_2). The photon reflected from the lower mirror travels to the upper mirror at angle (β). Angle (α) is known, as is the laser's length (a).

The laser has been located on-board the vehicle at an angle (90deg>α>0deg) with relation to the direction of motion. (Fig.L-4) is a schematic presentation of such situation. The laser shall travel distance (x_2) from moment (t2) to (t2). Laser's, and the entire vehicle's velocity is defined and it is (v). Photons inside the gas laser cruise between the lower and upper mirrors. Some photons depart the laser through the semi-transparent upper mirror. One of the photons reflected off the lower mirror exactly at moment (t1). It will arrive at the upper mirror at moment (t2). The distance (b), which the photon will travel, is longer than distance (x_2), which will be travelled by the laser at the same time. Initially distance (x_2) should be presented as a function of angles alpha and beta. This can be done based on (Fig.L-4). The angle (α) is known just like laser's length marked (a).

$$\sin(\alpha) = \frac{d}{a} \rightarrow d = a \cdot \sin(\alpha)$$ (9)

$$\cos(\alpha) = \frac{x_1}{a} \rightarrow x_1 = a \cdot \cos(\alpha)$$ (10)

$$\sin(\beta) = \frac{d}{b} \rightarrow b = \frac{d}{\sin(\beta)} = \frac{a \cdot \sin(\alpha)}{\sin(\beta)}$$ (11) variable (d) has been described by equation (9)

$$x = x_1 + x_2$$ (12)

$$\cos(\beta) = \frac{x}{b} \rightarrow x = b \cdot \cos(\beta) = \frac{a \cdot \sin(\alpha)\cos(\beta)}{\sin(\beta)}$$ (13) variable (b) has been described by equation (11)

The distance values (x) and (x_1) were determined. The distance (x_2) assumes the form of equation (14).

$$x_2 = x - x_1$$

$$x_2 = \frac{a \cdot \sin(\alpha)\cos(\beta)}{\sin(\beta)} - a \cdot \cos(\alpha)$$ (14) distance (x_2) as a function of angles (α) and (β)

Based on (Fig.L-4) time analysis can be performed. During time t_1 the photon will travel the distance (b) with speed C. During time t_2 the laser will travel distance (x_2) with velocity (v) that is specific for the vehicle. Equations (15) and (16) show these relations.

$$c = \frac{b}{t_1} \rightarrow t_1 = \frac{b}{c}$$ (15)

$$v = \frac{x_2}{t_2} \rightarrow t_2 = \frac{x_2}{v}$$ (16)

Times t_1 and t_2 are identical. They can be compared.

$$t_1 = t_2$$

$$\frac{b}{c} = \frac{x_2}{v}$$ let velocity (v) occur on the left-hand side of the equation

$$\left(\frac{v}{c}\right)b = x_2$$ variable (x_2) has been described by equation (14)

$$\left(\frac{v}{c}\right)b = \frac{a \cdot \sin(\alpha)\cos(\beta)}{\sin(\beta)} - a \cdot \cos(\alpha)$$ variable (b) has been described by equation (11)

$$\frac{v}{c} = \frac{a\left(\frac{\sin(\alpha)\cos(\beta)}{\sin(\beta)} - \cos(\alpha)\right)}{\frac{a \cdot \sin(\alpha)}{\sin(\beta)}} = \left(\frac{\sin(\alpha)\cos(\beta)}{\sin(\beta)} - \cos(\alpha)\right)\left(\frac{\sin(\beta)}{\sin(\alpha)}\right) = \left(\cos(\beta) - \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}\right)$$

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}$$ (17) vehicle velocity as a function of angles (α) and (β)

A specific case for laser setting angle (α=90deg) is shown below. It was presented in a previous section (3.2.1).

$\alpha = 90\text{deg}$

$\sin(\alpha) = 1$

$\cos(\alpha) = 0$

0

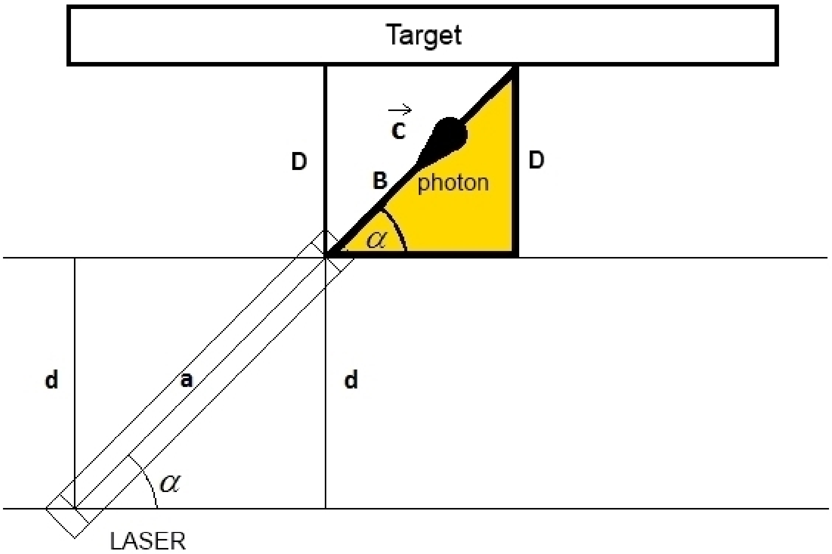
$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)} \qquad (17)=(4) \qquad \text{equations are equal}$$

1

$$v = c \cdot \cos(\beta) \qquad (4)$$

For angle (α=90deg) equation (17) is reduced to formula (4). A conclusion follows that setting the laser at right angle to the vehicle's direction of movement makes a particular, special case. The results derived from this case must not be generalised for other laser setting angles. The Theory of Relativity contains this type of subtle error.

4.2.2 Determination of omega factor. Laser setting angle (90deg>α>0deg).



$$90\,\text{deg} > \alpha > 0\,\text{deg}$$

Fig. L-5. Laser illuminates the target. Stationary vehicle.

The distance (D) between the laser and the measuring target is known. Distances (B) and (D) are related by the dependence (18).

$$\sin(\alpha) = \frac{D}{B} \rightarrow B = \frac{D}{\sin(\alpha)} \qquad (18)$$

The photon will cover distance (B) in time t_0.

$$C = \frac{B}{t_0} \rightarrow t_0 = \frac{B}{C}$$ variable (B) has been described by equation (18)

$$t_0 = \frac{D}{C \cdot \sin(\alpha)} \qquad (19)$$

"Look deep into nature, and then you will understand everything better."

Albert Einstein

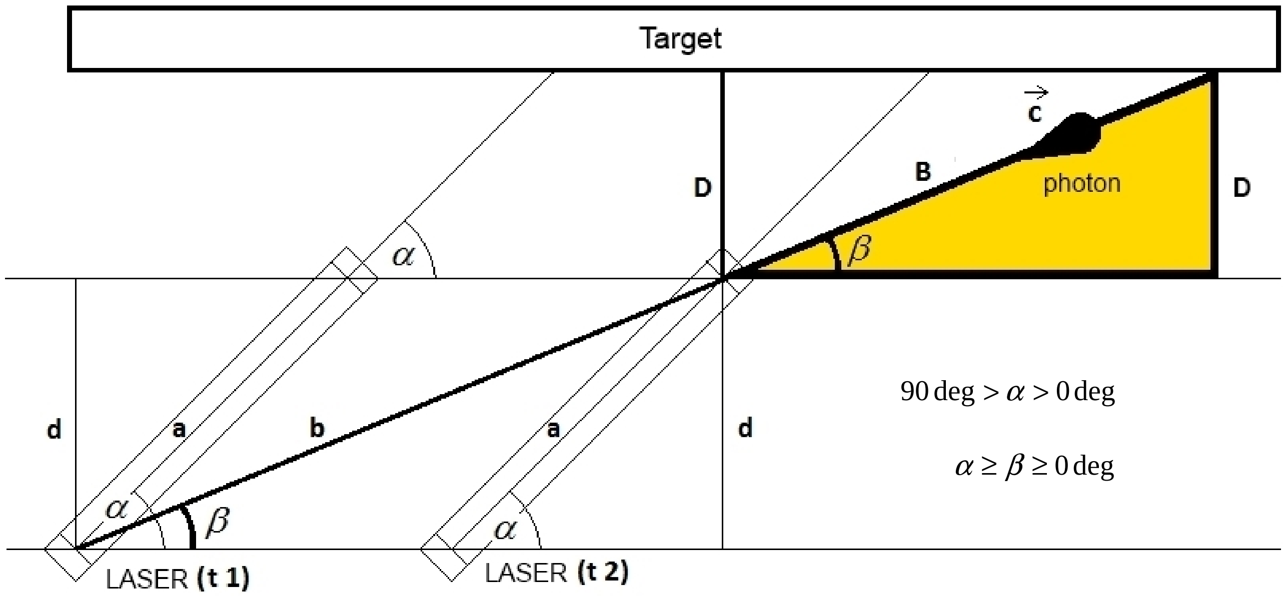


Fig. L-6. Laser illuminates the target. Vehicle in motion.

The distance (B) can be calculated using a trigonometric function.

$$\sin(\beta) = \frac{D}{B} \rightarrow B = \frac{D}{\sin(\beta)} \qquad (20)$$

The photon will travel distance (B) in time t.

$$C = \frac{B}{t} \rightarrow t = \frac{B}{C} = \frac{D}{C \cdot \sin(\beta)}$$

$$t = \frac{D}{C \cdot \sin(\beta)} \qquad (21)$$

The omega factor has been determined based of both photon flight times ratio (t/ t_0).

$$\Omega = \frac{t}{t_0} = \frac{\frac{D}{C \cdot \sin(\beta)}}{\frac{D}{C \cdot \sin(\alpha)}} = \left(\frac{D}{C \cdot \sin(\beta)}\right)\left(\frac{C \cdot \sin(\alpha)}{D}\right) = \frac{\sin(\alpha)}{\sin(\beta)}$$

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)}$$ **(22)=(8) omega factor for the laser setting angle (90deg>α>0deg)**

A specific case for the laser setting angle (α=90deg) has been presented below. It was already presented in a previous section (3.2.2).

$\alpha = 90\text{deg} \rightarrow \sin(\alpha) = 1$

$$\Omega = \frac{1}{\sin(\beta)}$$ (8)

For angle (α=90deg) equation (22) is reduced to formula (8). A conclusion follows that setting the laser at the right angle to the vehicle's direction of motion makes a particular, specific case. This case must not be generalised for other laser setting angles.

4.3 Numerical analysis. Laser setting angle (90deg>α>0deg).

Equations (17) and (22) were numerically calculated. The results were plotted in form of graphs. There are many possibilities for laser setting on-board the vehicle. The analysis was divided into two cases. The pattern of action is in both cases similar.

In the first case, the analysis was performed for the laser set at the angle (α=75deg). This is the laser setting angle that has been applied in the computer animations presented in section (4.1). The results of the analysis were presented in graphical form.

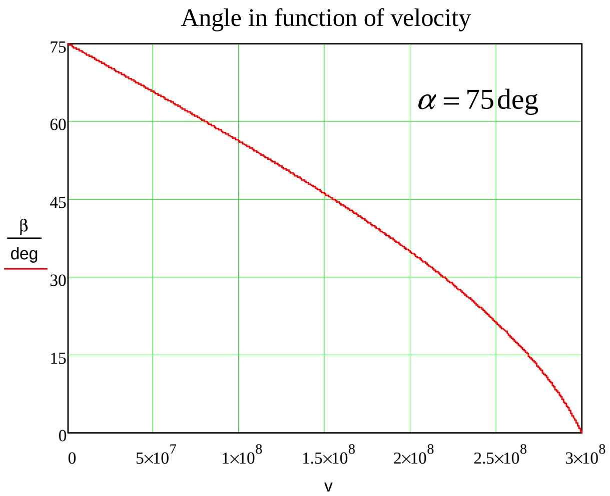
In the second case, the analysis comprises several different laser settings. The results have been shown in a common plot, which allows for their comparison. The laser setting angle alpha is changed in 10 degree steps. The values applied in the analysis are, respectively, as follows:

$\alpha = 90\deg$
$\alpha = 80\deg$
$\alpha = 70\deg$
$\alpha = 60\deg$
$\alpha = 50\deg$
$\alpha = 40\deg$
$\alpha = 30\deg$
$\alpha = 20\deg$
$\alpha = 10\deg$

The (β) angle of the laser beam changes within the (α ≥ β ≥0deg) interval respectively. The iteration step value adopted for the beta angle is ($\beta_{\_STEP}$ = 0.01deg). This value is identical for all cases.

4.3.1 Vehicle velocity as a function of angles (α) and (β).

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)} \quad (17)$$



v =

	0
0	0
1	$5.42 \cdot 10^{4}$
2	$1.08 \cdot 10^{5}$
3	$1.63 \cdot 10^{5}$
4	$2.17 \cdot 10^{5}$
5	$2.71 \cdot 10^{5}$
6	$3.25 \cdot 10^{5}$
7	$3.79 \cdot 10^{5}$
8	$4.33 \cdot 10^{5}$
9	$4.88 \cdot 10^{5}$
10	$5.42 \cdot 10^{5}$
11	$5.96 \cdot 10^{5}$
12	$6.5 \cdot 10^{5}$
13	$7.04 \cdot 10^{5}$
14	$7.58 \cdot 10^{5}$
15	...

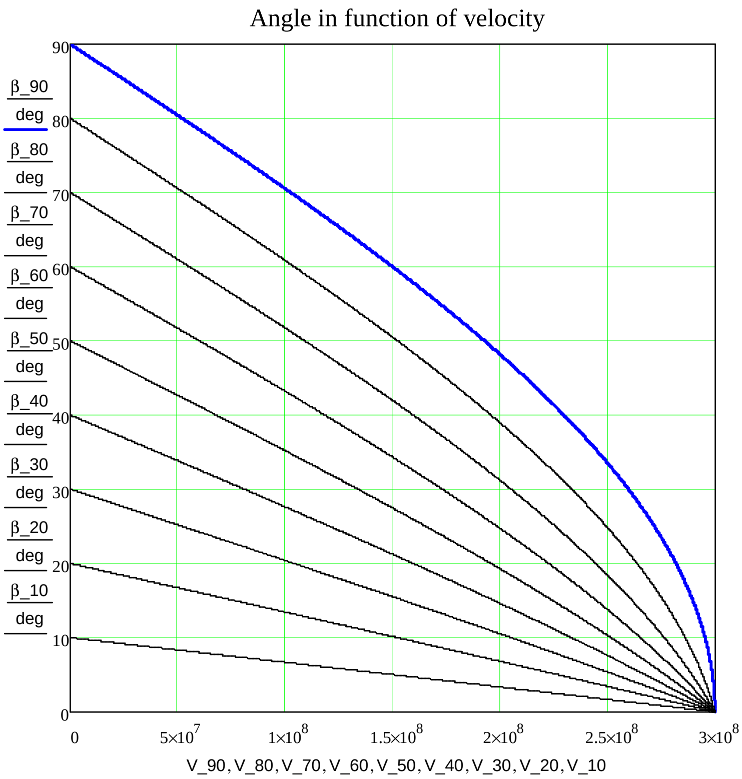
$\frac{m}{s}$

β =

	0
0	75
1	74.99
2	74.98
3	74.97
4	74.96
5	74.95
6	74.94
7	74.93
8	74.92
9	74.91
10	74.9
11	74.89
12	74.88
13	74.87
14	74.86
15	...

·deg

Graph L-4. Laser beam deflection angle (β) as a function of vehicle velocity. Laser setting angle (α=75deg).



$\beta\_90 \rightarrow \alpha = 90\,\text{deg}$

$\beta\_80 \rightarrow \alpha = 80\,\text{deg}$

$\beta\_70 \rightarrow \alpha = 70\,\text{deg}$

$\beta\_60 \rightarrow \alpha = 60\,\text{deg}$

$\beta\_50 \rightarrow \alpha = 50\,\text{deg}$

$\beta\_40 \rightarrow \alpha = 40\,\text{deg}$

$\beta\_30 \rightarrow \alpha = 30\,\text{deg}$

$\beta\_20 \rightarrow \alpha = 20\,\text{deg}$

$\beta\_10 \rightarrow \alpha = 10\,\text{deg}$

Graph L-5. Laser beam deflection angle (β) as a function of vehicle velocity. Analysis was performed for several values of laser setting angle (α).

4.3.2 Omega factor.

The omega and gamma factors were calculated numerically. The calculation results were presented in a common plot for easier comparison.

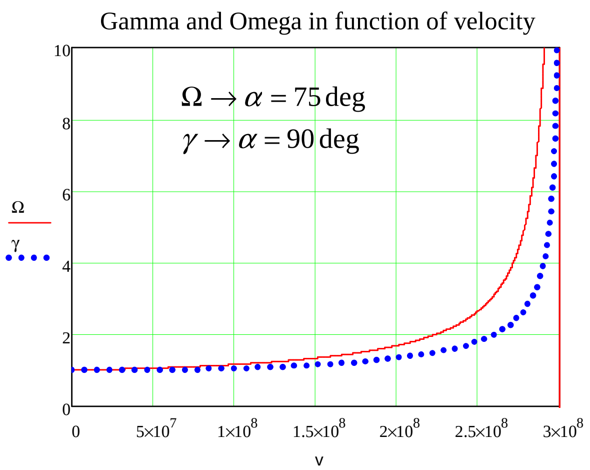
"You can never solve a problem on the level on which it was created."

Albert Einstein

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)} \quad (22) \text{ omega}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{gamma}$$

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)} \quad (17)$$



Ω =

	0
0	1
1	1.0000468
2	1.0000936
3	1.0001405
4	1.0001873
5	1.0002343
6	1.0002812
7	1.0003282
8	1.0003752
9	1.0004223
10	1.0004694
11	1.0005165
12	1.0005637
13	1.0006109
14	1.0006581
15	...

γ =

	0
0	1
1	1
2	1.0000001
3	1.0000001
4	1.0000003
5	1.0000004
6	1.0000006
7	1.0000008
8	1.000001
9	1.0000013
10	1.0000016
11	1.000002
12	1.0000024
13	1.0000028
14	1.0000032
15	...

Graph L-6. Gamma and omega factors as a function of vehicle velocity. Laser setting angle (α=75deg).

For the laser set at the angle of (α=75deg) the omega factor must differ from the gamma factor. Omega depends on the laser setting α angle (formula 22). Albert Einstein derived the gamma factor using the right-angled triangle formula ($c^2 = a^2 + b^2$). Then he generalised the derived factor to the other cases. One can vividly say that he comprised all the alpha angles by the gamma factor. Such action is incorrect from the mathematical point of view. The equation describing the right-angled triangle applies only to such triangle. It is correct, when the right angle (α=90deg) is considered. The case of the laser setting at the angle (α=75deg) pertains to an obtuse-angled triangle. Violet triangles shown in (Fig.L-7) and (Fig.L-8) schematically illustrate this situation.

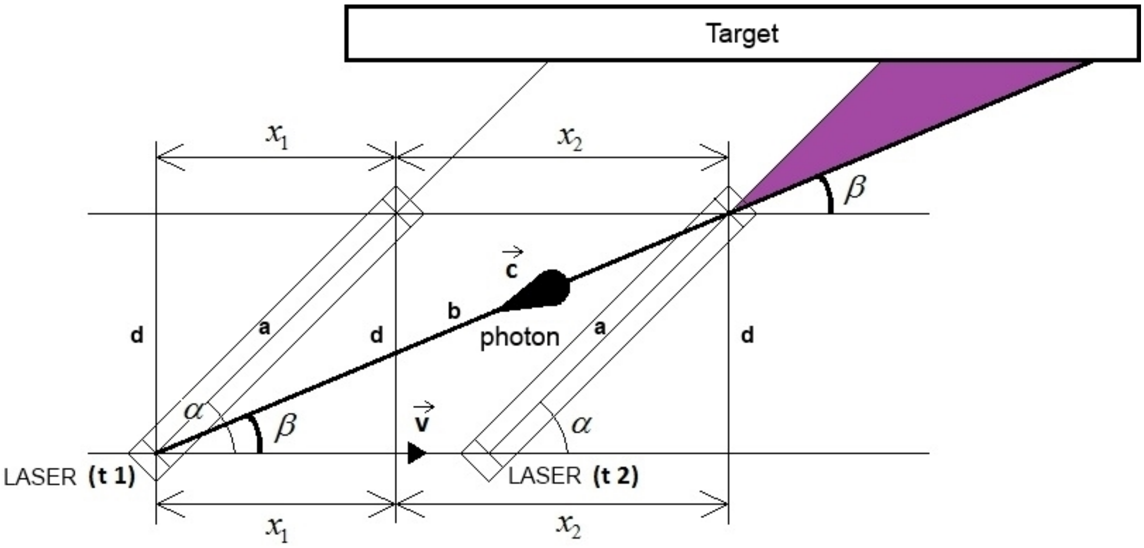


Fig. L-7. Laser on-board moving vehicle. Laser setting angle (90deg>α>0deg).

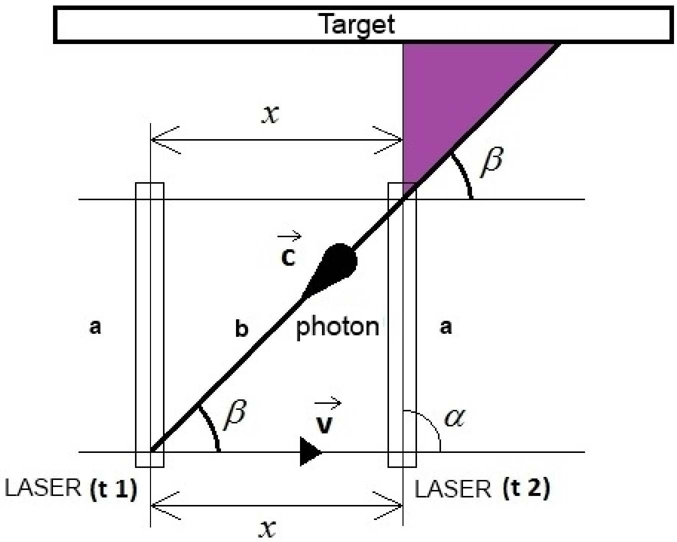


Fig. L-8. Laser on-board moving vehicle. Laser setting angle (α=90deg).

The right-angled triangle equation must not be used for acute-angled or obtuse-angled triangles!
A more thorough analysis, just like that for the omega factor (section 4.2.2), should be performed. This is one of those subtle errors in the Theory of Relativity.

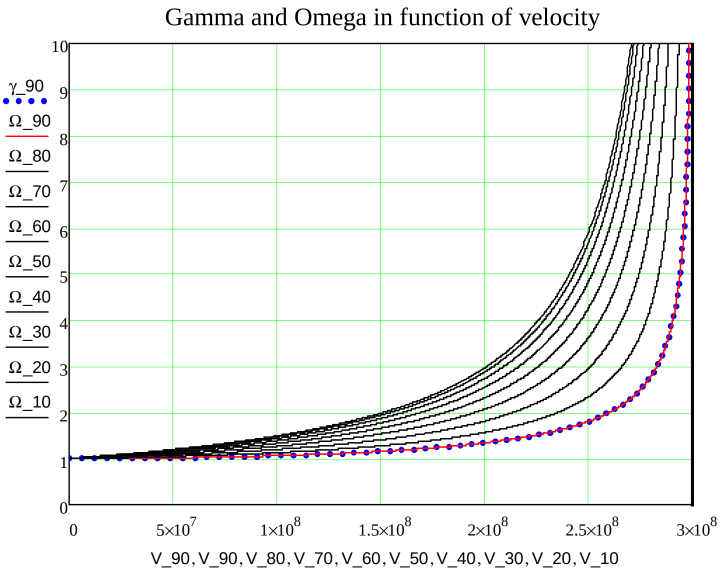
"If you haven't found something strange during the day, it hasn't been much of a day."

John Wheeler

Several different omega factor values have been shown in the plot below. Also the gamma factor has been plotted on the graph. The gamma and omega factors for a specific laser setting angle (α=90deg), have identical values.

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)}$$ (22) omega

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



$gamma \rightarrow \alpha = 90\,deg$
$\Omega\_90 \rightarrow \alpha = 90\,deg$
$\Omega\_80 \rightarrow \alpha = 80\,deg$
$\Omega\_70 \rightarrow \alpha = 70\,deg$
$\Omega\_60 \rightarrow \alpha = 60\,deg$
$\Omega\_50 \rightarrow \alpha = 50\,deg$
$\Omega\_40 \rightarrow \alpha = 40\,deg$
$\Omega\_30 \rightarrow \alpha = 30\,deg$
$\Omega\_20 \rightarrow \alpha = 20\,deg$
$\Omega\_10 \rightarrow \alpha = 10\,deg$

Graph L-7. Gamma and omega factors as a function of vehicle velocity. Analysis was performed for several values of laser setting angle (α).

Incorrect conclusions can be drawn from the analysis of graph L-7. It seems that time slows down as vehicle velocity increases. Even more surprising is the fact that the time retardation rate depends on the laser setting angle on-board the vehicle. I mean, of course, the alpha angle. Is it possible that a change of laser setting angle may influence flow of time? Of course, this is impossible. Both casually drawn conclusions are incorrect. Those conclusions contribute to another subtle error, which persists in the Theory of Relativity. Subtlety of this error is truly very big, just like its destructive character.

The correct interpretation of graph L-7 becomes possible when our way of thinking about time changes. The gamma and omega factors seen in (GraphL-7) do not pertain to any retardation of time passing on-board the stationary vehicle. Time is absolute. It passes at the same rate on-board the moving and stationary vehicles. Gamma and omega factors pertain to the time of observations performed by the astronauts on-board the vehicle. The observed time (of photons) changes depending on vehicle's velocity and the laser setting angle (α). In order to provide the best possible explanation of this phenomenon an illustrative example should be used.

The astronauts on-board the moving vehicle do not perceive all physical phenomena. Certain part of the reality escapes them. From this originates the erroneous belief about time retardation. (Fig.L-8) shows the laser on-board the moving vehicle. The laser setting angle is (α=90deg). When the vehicle gains speed, the beta angle becomes more and more acute. The real laser beam "leans" on its side. The photons search for the shortest route between the laser's mirrors to support the laser action. The astronauts/voyagers observe only a single component of photons' velocity. This is the component that is perpendicular to vehicle's direction of motion. It is the distance between the laser and the measuring target. The voyagers do not see the photons' parallel velocity component. It is exactly the same as vehicle's velocity. The parallel component "corrects itself" automatically, in a way perfectly synchronised with the vehicle's velocity. Therefore, it is unobservable by the voyagers.

When the vehicle continuously accelerates, the photons' perpendicular velocity component constantly decreases. The parallel component increases at its expense. The photons' actual velocity is always constant and it is C. The observers on-board the vehicle are convinced that time slows down. In reality, the time of observation of the photons' perpendicular velocity component continuously increases. The parallel velocity component becomes lost; it is not subject to observation. The observation comprises, therefore, somehow only a part of the physical phenomenon. The real time flows with fixed and constant rhythm. It comprises, with its action, both photons' velocity components. It behaves identically always and everywhere. The difference in the perception of time by the astronauts comes down to the psychological (not physical) nature issues. We simply expect a different time value than that, which we see. Some information, that can be observed, is being lost.

The case for the laser setting angle of (90deg>α>0deg) is similar to the above described one. The small difference lies in the fact, that in this case a part of the photons' parallel velocity component is observable (Fig.L-7). The photons' parallel velocity component is, in this case, greater than vehicle's velocity. The difference of those velocities is observable. The parallel velocity component is observable, of course, in full. This "small" difference explains the graphs included in graph L-7. For various laser setting angles (α) the value of the observable part of the photons' velocity parallel component is different.

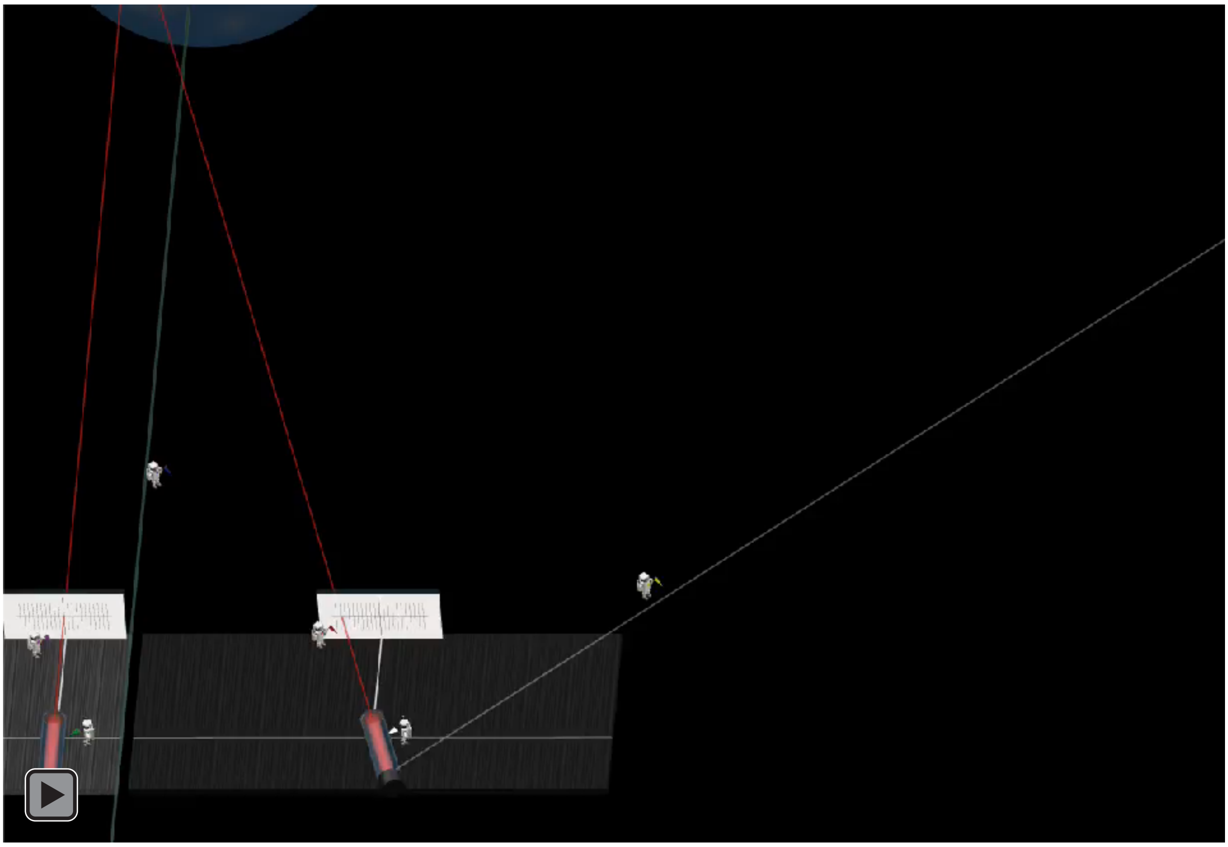
The conclusions that can be drawn from the above analysis expand or change the postulates contained in the Theory of Relativity. The gamma factor gives correct results only for angle (α=90deg). For other cases gamma was artificially generalised and consequently provides erroneous results. Therefore, in the general case, the gamma is erroneous.

The omega factor takes into account all the cases of laser settings within the interval (90deg>α>0deg). In the general case, the omega factor appears to be a correct, providing correct results. This conclusion can be "extended" to even greater number of cases. The mathematical and numerical analyses for the laser setting angle within the interval (180deg>α>90deg) explain this case.

Actual time appears to be absolute. It flows identically everywhere, for all systems and all vehicle velocities. Time retardation, that is being noted by the observers on-board the moving vehicle is illusory. Time retardation is simultaneously real and illusory. Observation of the photons on-board the moving vehicle really lasts longer. Time does not slow down. The occurring illusion is caused by the impossibility of observation of all velocity components of the photons. This is a spatio - optical phenomenon. The physical phenomena somehow slow down their "normal" pace. Time has nothing to do with such situation; it always flows at the same pace. This conclusion is in clear contradiction with the postulates of the Theory of Relativity in which time is being presented as relative.

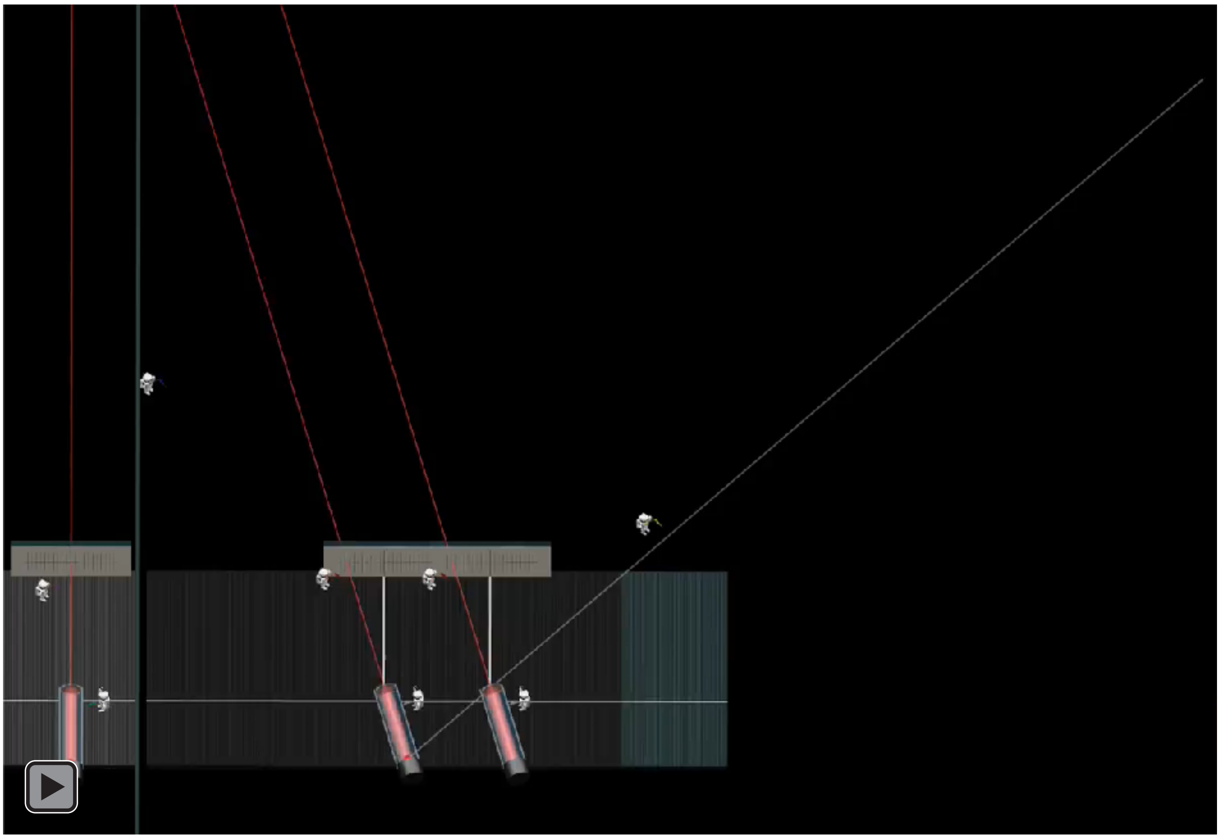
5.1 Visual analysis for a laser beam on-board a very fast vehicle.

Laser setting angle (180deg>α>90deg).



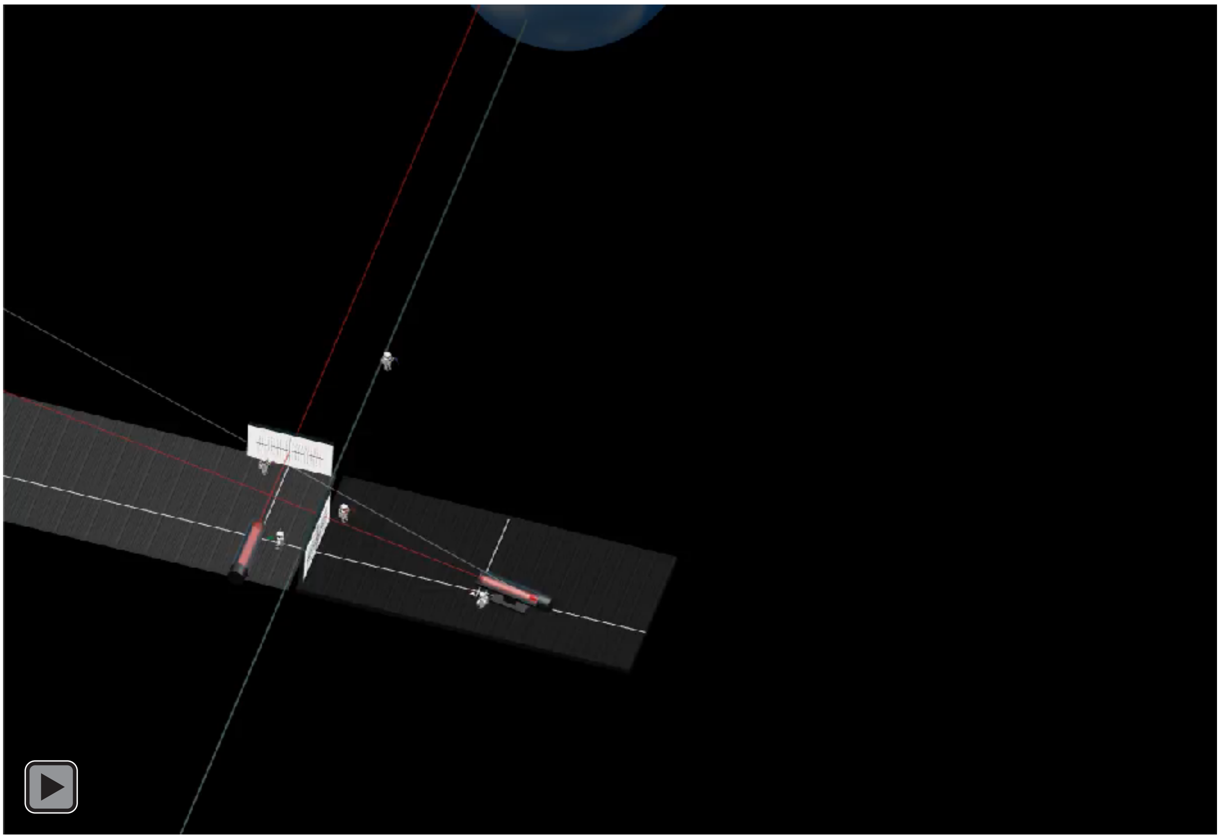
Anim.L-9. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=105deg).

Both photons move with the same speed. They only differ in their direction of flight. The moving vehicle has a velocity coefficient (0.9) imposed on it in relation to photons' velocity. The laser setting angle has been assumed as (α=105deg) in relation to the vehicle's direction of flight. The semi–transparent fixed white line represents the path along which the photon travels. The angle of inclination of this line with relation to the vehicle's flight path axis has been strictly defined. It is precisely (β=44.62deg). The method to determine this angle's value has been described in the next section pertaining to the mathematical analysis. The actual laser beam (white line) differs from the ray observed on-board the moving vehicle (red line).



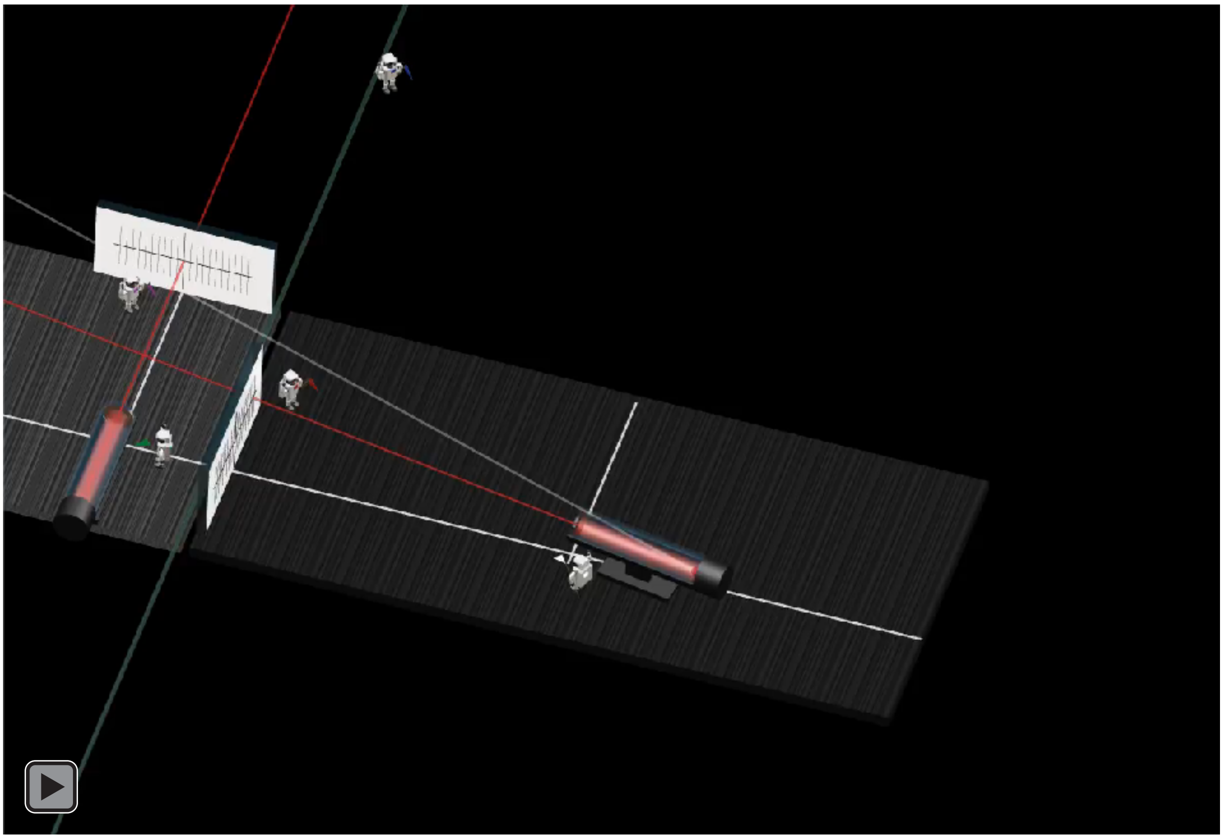
Anim.L-10. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=105deg).

The animation is similar to the previous one. The difference is the introduction of the moving vehicle's "ghost". It is placed exactly at the point from where the photon exits the moving laser. The white transparent line that has been led from the lower mirror, cuts through the upper mirror of the "laser – ghost".



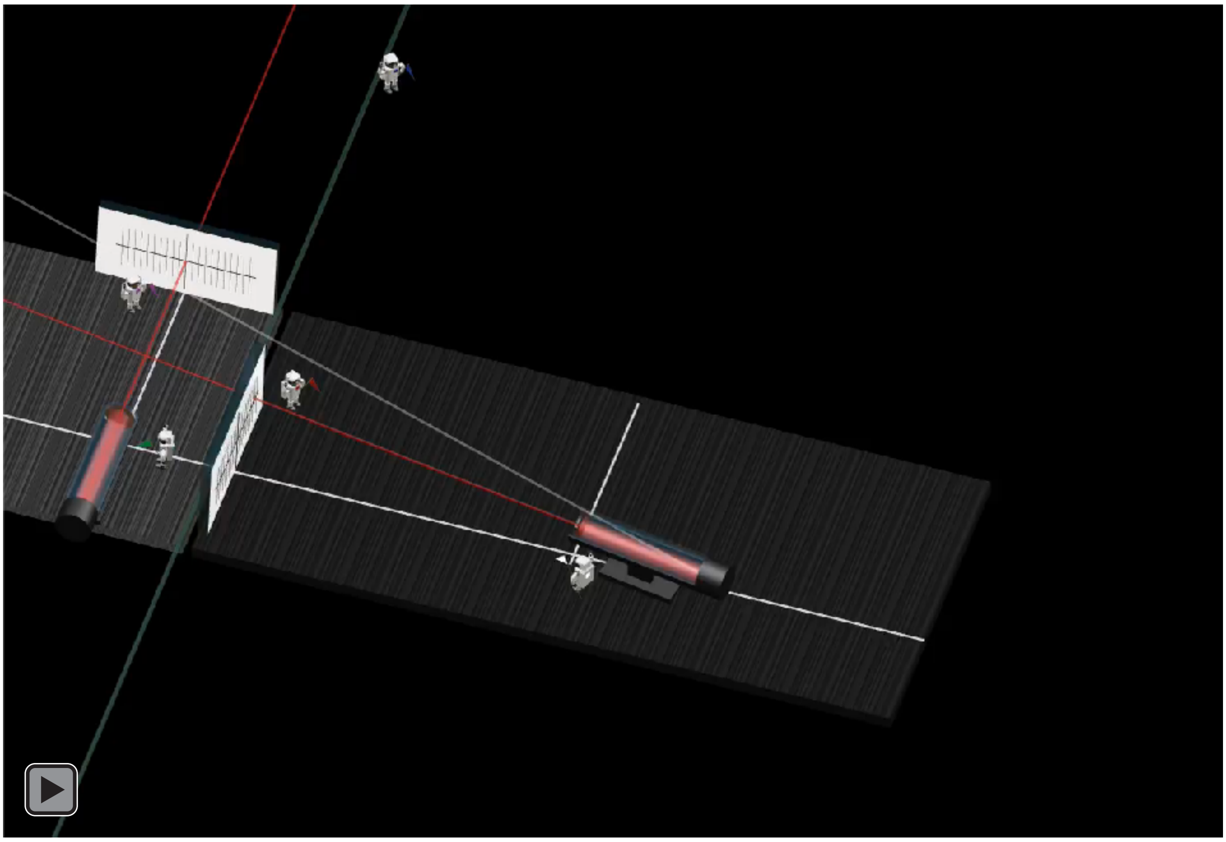
Anim.L-11A. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=170deg).

The laser setting angle of (α=170deg) makes an interesting case. The actual laser beam (white line) and the photon move in a direction that is opposite to that of the vehicle. The actual laser beam's angle is (β=161.01deg). The astronauts/voyagers have an impression that time on-board the moving vehicle accelerated! The animation can be played several times or stopped at the moment when the photon hits the target. Has the change of the laser setting angle on-board the vehicle any influence on the flow of time? Apparently, it seems that it has, but a precise analysis yields a negative result. This is simply an illusion being experienced by the voyagers.



Anim.L-11.B. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=170deg).

This is a version of the animation L-11.A. The difference consist in magnifying and simultaneously slowing down the process. The whole thing is clearly visible. The photon from the moving laser is generated faster (it exits laser faster) and reaches the measuring target sooner. It seems that time on–board the vehicle has accelerated in relation to the stationary vehicle.



Anim.L-11.C. Stationary vehicle in combination with moving vehicle. Laser setting angle (α=170deg).

This is a version of animation L-11.B. The difference consists in deliberate introduction a different order of animated elements. The moving vehicle is animated first. Then, photons are animated. This is the only difference in relation to animation L-11.B.

5.2 Mathematical analysis. Laser setting angle (180deg>α>90deg).

Just like in sections (3.2) and (4.2) the main objective of the analysis is to determine the vehicle's velocity (v) as a function of angle (β) featured by the actual laser beam.

The second objective of the analysis is the comparison of Experiment – L with the Theory of Relativity. For this purpose the omega factor has been defined and compared with the gamma factor. The omega factor is a ratio of two photon flight times for a defined measurement distance. The photon flight time measured for the moving vehicle to the photon flight time for the stationary vehicle (t/ t_0).

t – photon flight time over the deck of a very fast vehicle,

t_0 – photon flight time over the stationary vehicle's deck.

As the degree of complexity has increased in this particular case, the mathematical analysis has been divided into 6 subsections. The first three subsections facilitate derivation of an equation describing the vehicle velocity (v). The next three subsections describe derivation of the omega factor equation. In this way all the instances of angle (β) have been subjected to analysis. The first three subsections provide a single result. The difference lies in a different starting point. This is similar for the next three subsections. Analysis of all possible cases provides relative certainty as to the correctness of the final calculations. It eliminates any uncertainties associated with an unexamined area of the studied phenomenon. Generalisation of the obtained solutions to other cases becomes unnecessary because every case is being analysed separately.

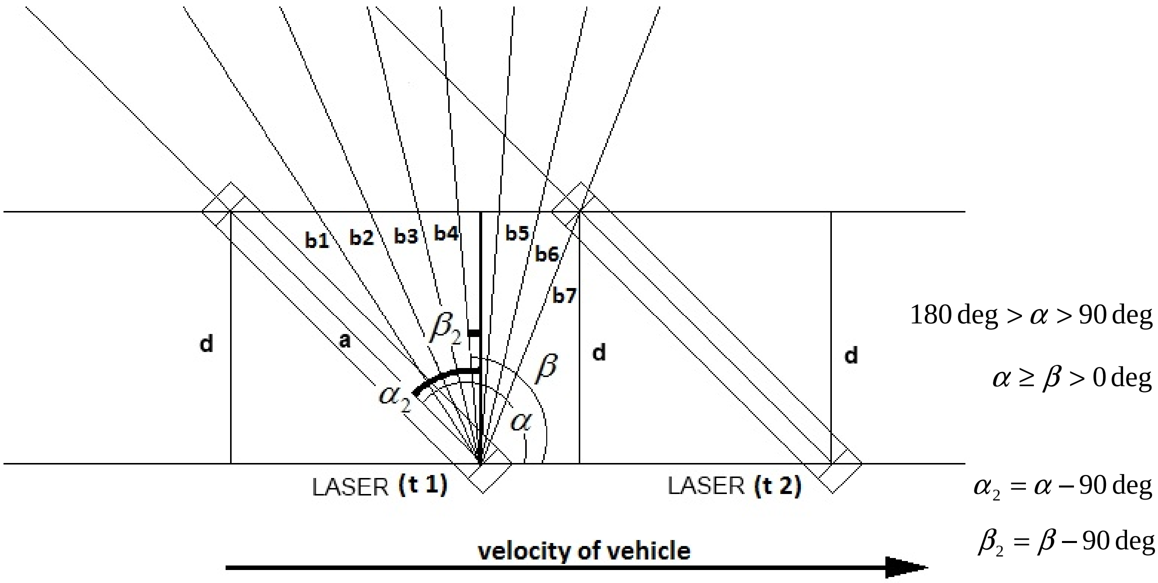
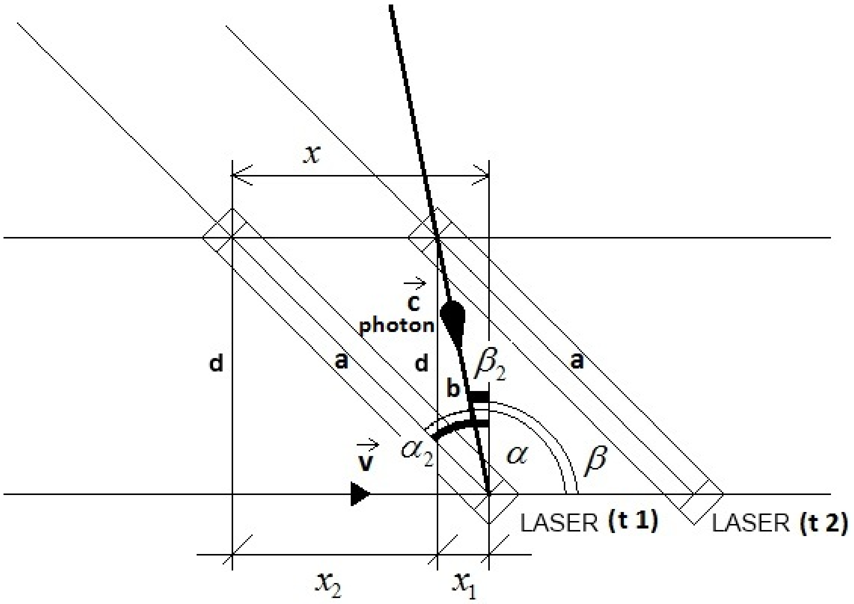


Fig. L-9. Laser on-board moving vehicle. The photon reflected from the lower mirror travels to the upper mirror at angle (β). A few examples of the laser beam angles dependent on vehicle velocity (b1,b2,…,b7) are shown.

5.2.1 Determination of vehicle velocity as a function of angles (α) and (β). Radius angle (β>90deg).



$180\deg > \alpha > 90\deg$

$\alpha \geq \beta > 90\deg$

Fig. L-10. Laser on-board moving vehicle. The photon reflected from the lower mirror travels to the upper mirror at angle (β>90deg).

The laser is located on-board the vehicle at an angle of (180deg>α>90deg) in relation to the direction of motion. During the period from (t1) to (t2) the laser will travel the distance (x_2). Velocity of the laser and of the entire vehicle has been fixed and it is (v). Photons inside the gas laser cruise between the lower and the upper mirror. Some photons exit the laser via the semi-transparent upper mirror. One of the photons was reflected from the lower mirror exactly at the moment (t1). It will arrive at the upper mirror at the moment (t2). In the first instance the distance (x_2) should be presented as a function of angles (α_2) and (β_2). Relevant calculations can be performed based on (Fig.L-10). The angle (α) is known, just like laser's length (a). The angles (α_2) and (β_2) (bold curves) were introduced to facilitate use of trigonometric functions.

$\alpha_2 = \alpha - 90\deg$

$\beta_2 = \beta - 90\deg$

$$\cos(\alpha_2) = \frac{d}{a} \rightarrow d = a \cdot \cos(\alpha_2) \quad (23)$$

$$\cos(\beta_2) = \frac{d}{b} \rightarrow b = \frac{d}{\cos(\beta_2)} = \frac{a \cdot \cos(\alpha_2)}{\cos(\beta_2)} \quad (24)$$ variable (d) has been described by equation (23)

$$\sin(\alpha_2) = \frac{x}{a} \rightarrow x = a \cdot \sin(\alpha_2) \quad (25)$$

$$\sin(\beta_2) = \frac{x_1}{b} \rightarrow x_1 = b \cdot \sin(\beta_2) = \frac{a \cdot \cos(\alpha_2)\sin(\beta_2)}{\cos(\beta_2)} \quad (26)$$ variable (b) has been described by equation (24)

$$x = x_1 + x_2 \quad (27)$$

The distances (x) and (x_1) have been determined. Distance (x_2) takes on the form of equation (28).

$$x_2 = x - x_1$$

$$x_2 = a \cdot \sin(\alpha_2) - \frac{a \cdot \cos(\alpha_2)\sin(\beta_2)}{\cos(\beta_2)} \qquad (28)$$

distance (x_2) as a function of angles (α_2) and (β_2)

Based on (Fig.L-10) time analysis can be performed. The photon will travel in time t_1 the distance of (b) with velocity C. The laser shall travel in time t_2 the distance (x_2) with velocity (v) that is specific for the vehicle. Equations (29) and (30) represent those relations.

$$c = \frac{b}{t_1} \rightarrow t_1 = \frac{b}{c} \qquad (29) \qquad\qquad v = \frac{x_2}{t_2} \rightarrow t_2 = \frac{x_2}{v} \qquad (30)$$

Times t_1 and t_2 are identical. They can be compared.

$$t_1 = t_2$$

$$\frac{b}{c} = \frac{x_2}{v}$$ let velocity (v) occur on the left-hand side of the equation

$$\frac{v}{c} = \frac{x_2}{b}$$

variable (x_2) has been described by equation (28), variable (b) has been described by equation (24)

$$\frac{v}{c} = \frac{\left(a \cdot \sin(\alpha_2) - \frac{a \cdot \cos(\alpha_2)\sin(\beta_2)}{\cos(\beta_2)}\right)}{\left(\frac{a \cdot \cos(\alpha_2)}{\cos(\beta_2)}\right)} = a\left(\sin(\alpha_2) - \frac{\cos(\alpha_2)\sin(\beta_2)}{\cos(\beta_2)}\right)\left(\frac{\cos(\beta_2)}{a \cdot \cos(\alpha_2)}\right)$$

$$\frac{v}{c} = \left(\frac{\sin(\alpha_2)\cos(\beta_2)}{\cos(\alpha_2)} - \sin(\beta_2)\right)$$

$$v = c\left(\frac{\sin(\alpha_2)\cos(\beta_2)}{\cos(\alpha_2)} - \sin(\beta_2)\right)$$

$$v = c \cdot \frac{\sin(\alpha_2)\cos(\beta_2)}{\cos(\alpha_2)} - c \cdot \sin(\beta_2) \qquad (31)$$

vehicle velocity as a function of angles (α_2) and (β_2)

The above relation can be simplified to the form that is dependent on the angles (α) and (β).

$$\alpha_2 = \alpha - 90\,\mathrm{deg}$$

$$\beta_2 = \beta - 90\,\mathrm{deg}$$

$$v = c \cdot \frac{\sin(\alpha - 90\,\mathrm{deg})\cos(\beta - 90\,\mathrm{deg})}{\cos(\alpha - 90\,\mathrm{deg})} - c \cdot \sin(\beta - 90\,\mathrm{deg})$$

Trigonometric formulas should be used to substitute relevant components of the above equation.

$\sin(\alpha) = \cos(\alpha - 90 \text{ deg}) \ \ \cos(\alpha) = -\sin(\alpha - 90 \text{ deg})$

$\sin(\beta) = \cos(\beta - 90 \text{ deg}) \ \ \cos(\beta) = -\sin(\beta - 90 \text{ deg})$

The final form of equation (31) is the equation (32).

$$v = c \cdot \frac{-\cos(\alpha)\sin(\beta)}{\sin(\alpha)} + c \cdot \cos(\beta)$$

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}$$ (32) vehicle velocity as a function of angles (α) and (β)

Equation (32) is identical with equation (17) derived in section (4.2.1). I marked it with a different number because there is a difference in derivation of both formulas. The content of formulas (17), (32) and (4) is identical and finally takes one designation. Regardless of which designation we select, it is common for all laser setting angles alpha.

angle (α)	**equation**
α<90deg	(17) = (32),
α=90deg	(4) = (32),
α>90deg	(32)

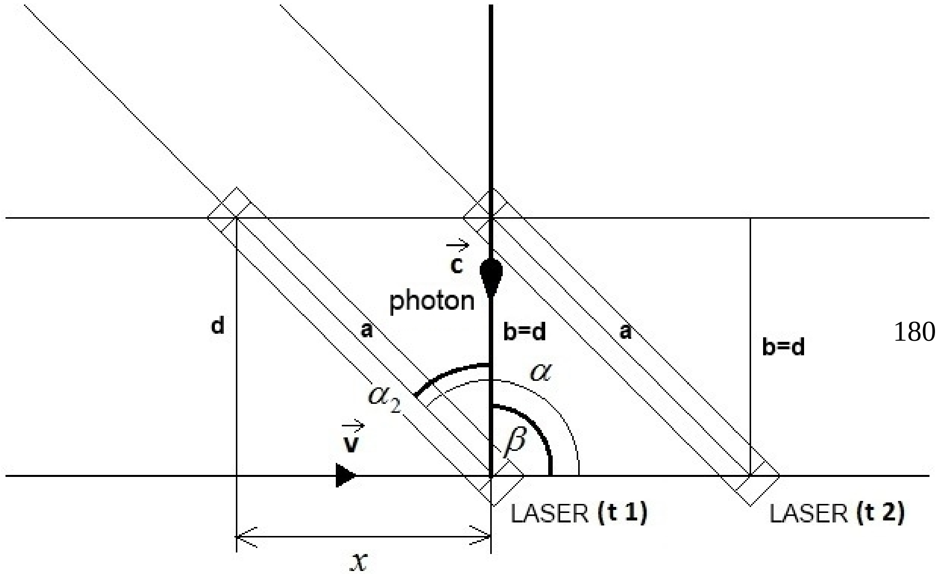
Two cases differing in their angle (β), still remain to be solved.

"Do not worry about your difficulties in Mathematics. I can assure you mine are still greater."

Albert Einstein

5.2.2 Determination of vehicle velocity as a function of angles (α) and (β).

Radius angle (β=90deg).



$180\deg > \alpha > 90\deg$

$\beta = 90\deg$

Fig. L-11. Laser on-board moving vehicle. The photon reflected from the lower mirror travels to the upper mirror at angle (β=90deg).

Firstly, the distance (x) should be presented as a function of angle (α_2). Distance (b) is identical with distance (d).

$$b = d$$

$$\cos(\alpha_2) = \frac{d}{a} \rightarrow d = a \cdot \cos(\alpha_2) \quad (33)$$

$$\sin(\alpha_2) = \frac{x}{a} \rightarrow x = a \cdot \sin(\alpha_2) \quad (34)$$

Based on (Fig.L-11) time analysis can be performed. The photon will travel in time t_1 the distance of (b=d) with velocity C. The laser shall cover in t_2 time distance (x) with velocity (v) that is specific for the vehicle. Equations (35) and (36) represent these relations.

$$c = \frac{d}{t_1} \rightarrow t_1 = \frac{d}{c} \quad (35) \qquad v = \frac{x}{t_2} \rightarrow t_2 = \frac{x}{v} \quad (36)$$

Times t_1 and t_2 are identical. They can be compared.

$$t_1 = t_2$$

$$\frac{d}{c} = \frac{x}{v}$$ let velocity (v) occur on the left-hand side of the equation

$$\frac{v}{c} = \frac{x}{d}$$

variable (x) has been described by equation (34), variable (d) has been described by equation (33)

$$\frac{v}{c} = \frac{a \cdot \sin(\alpha_2)}{a \cdot \cos(\alpha_2)} = \frac{\sin(\alpha_2)}{\cos(\alpha_2)}$$

$$v = c \cdot \frac{\sin(\alpha_2)}{\cos(\alpha_2)}$$

The above relation can be simplified to the form that is dependent on the angle (α).

$$\alpha_2 = \alpha - 90\,\text{deg}$$

$$v = c \cdot \frac{\sin(\alpha - 90\,\text{deg})}{\cos(\alpha - 90\,\text{deg})}$$

Trigonometric formulas should be used to substitute relevant components of the above equation.

$$\sin(\alpha) = \cos(\alpha - 90\text{ deg})$$

$$\cos(\alpha) = -\sin(\alpha - 90\text{ deg})$$

The final form of equation (37) is the equation (38).

$$v = -c \cdot \frac{\cos(\alpha)}{\sin(\alpha)}$$ (38) vehicle velocity as a function of angle (α)

Equation (38) makes a particular case of equation (32) – (angle β=90deg). Both equations can be compared.

$$\beta = \beta_2 = 90\,\text{deg}$$

$$\sin(\beta) = 1$$

$$\cos(\beta) = 0$$

1

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}$$ **(32)=(38) vehicle velocity as a function of angles (α)**

0

$$v = -c \cdot \frac{\cos(\alpha)}{\sin(\alpha)}$$ (38)

5.2.3 Determination of vehicle velocity as a function of angles (α) and (β). Radius angle (β<90deg).

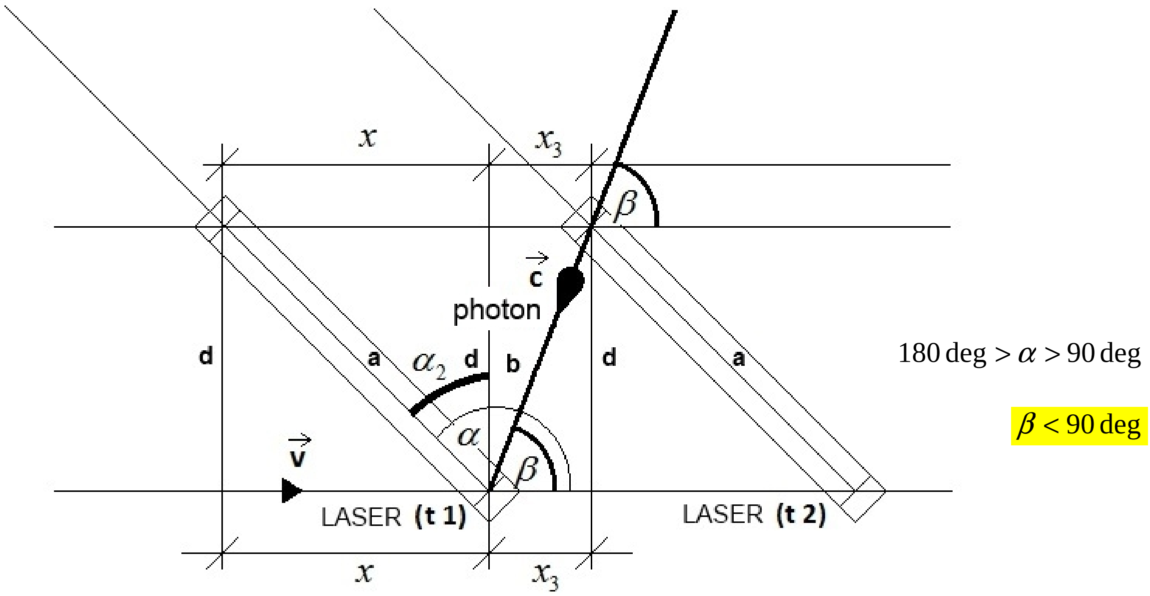


Fig.L-12. Laser on-board moving vehicle. The photon reflected from the lower mirror travels to the upper mirror at angle (β<90deg).

Firstly, distance (x_3) should be presented as a function of angles (α_2) and (β).

$$\sin(\alpha_2) = \frac{x}{a} \rightarrow x = a \cdot \sin(\alpha_2) \quad (39)$$

$$\cos(\alpha_2) = \frac{d}{a} \rightarrow d = a \cdot \cos(\alpha_2) \quad (40)$$

$$\cos(\beta) = \frac{x_3}{b} \rightarrow x_3 = b \cdot \cos(\beta) \quad (41)$$

$$\sin(\beta) = \frac{d}{b} \rightarrow b = \frac{d}{\sin(\beta)} = \frac{a \cdot \cos(\alpha_2)}{\sin(\beta)} \quad (42)$$

variable (d) has been described by equation (40)

$$x_3 = b \cdot \cos(\beta) = \frac{a \cdot \cos(\alpha_2)\cos(\beta)}{\sin(\beta)}$$

$$x_3 = \frac{a \cdot \cos(\alpha_2)\cos(\beta)}{\sin(\beta)} \quad (43)$$

distance (x_3) as a function of angles (α_2) and (β)

Based on (Fig.L-12) time analysis can be performed. The photon will travel in time t_1 the distance of (b) with velocity C. The laser shall travel in time t_2 the distance of ($x + x_3$) with velocity (v) that is specific for the vehicle. Equations (44) and (45) represent these relations.

$$c = \frac{b}{t_1} \rightarrow t_1 = \frac{b}{c} \quad (44) \qquad v = \frac{x + x_3}{t_2} \rightarrow t_2 = \frac{x + x_3}{v} \quad (45)$$

Times t_1 and t_2 are identical. They can be compared.

$t_1 = t_2$

$\frac{b}{c} = \frac{x + x_3}{v}$ let velocity (v) occur on the left-hand side of the equation

$\left(\frac{v}{c}\right)b = x + x_3$

variable (x) has been described by equation (39), variable (x_3) has been described by equation (43)

$\left(\frac{v}{c}\right)b = a \cdot \sin(\alpha_2) + \frac{a \cdot \cos(\alpha_2)\cos(\beta)}{\sin(\beta)}$ variable (b) has been described by equation (42)

$$\frac{v}{c} = a\left(\sin(\alpha_2) + \frac{\cos(\alpha_2)\cos(\beta)}{\sin(\beta)}\right)\left(\frac{\sin(\beta)}{a \cdot \cos(\alpha_2)}\right) = \left(\frac{\sin(\alpha_2)\sin(\beta)}{\cos(\alpha_2)} + \cos(\beta)\right)$$

$$v = c\left(\frac{\sin(\alpha_2)\sin(\beta)}{\cos(\alpha_2)} + \cos(\beta)\right)$$

$v = c \cdot \frac{\sin(\alpha_2)\sin(\beta)}{\cos(\alpha_2)} + c \cdot \cos(\beta)$ (46) vehicle velocity as a function of angles (α_2) and (β)

The above relation can be simplified to the form that is dependent on the angles (α) and (β).

$\alpha_2 = \alpha - 90\deg$

$$v = c \cdot \frac{\sin(\alpha - 90\deg)\sin(\beta)}{\cos(\alpha - 90\deg)} + c \cdot \cos(\beta)$$

Trigonometric formulas should be used to substitute relevant components of the above equation.

$\sin(\alpha) = \cos(\alpha - 90 \text{ deg})$

$\cos(\alpha) = -\sin(\alpha - 90 \text{ deg})$

$$v = c \cdot \frac{-\cos(\alpha)\sin(\beta)}{\sin(\alpha)} + c \cdot \cos(\beta)$$

$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}$ **(47)=(32) vehicle velocity as a function of angles (α) and (β)**

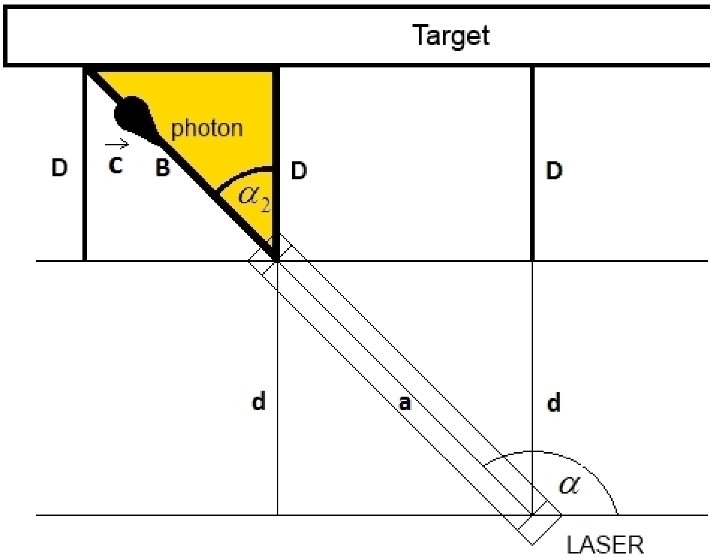
All the equations describing vehicle's velocity (v) as a function of angles (α) and (β) are equivalent.

(47)=(38)=(32)=(17)=(4)

"An expert is one who knows more and more about less and less."

Nicolas Murray Butler

5.2.4 Determination of omega factor. Laser setting angle (β>90deg).



$$180\,deg > \alpha > 90\,deg$$

$$\beta = \alpha$$

Fig. L-13. Laser illuminates the target. Stationary vehicle.

Distance (D) between the laser and the measuring target is known. Distances (B) and (D) are associated with relation (48).

$$\cos(\alpha_2) = \frac{D}{B} \rightarrow B = \frac{D}{\cos(\alpha_2)} = \frac{D}{\cos(\alpha - 90deg)} \qquad \Leftarrow \qquad \alpha_2 = \alpha - 90\ deg$$

$$B = \frac{D}{\cos(\alpha - 90deg)} = \frac{D}{\sin(\alpha)} \qquad \Leftarrow \qquad \sin(\alpha) = \cos(\alpha - 90\ deg)$$

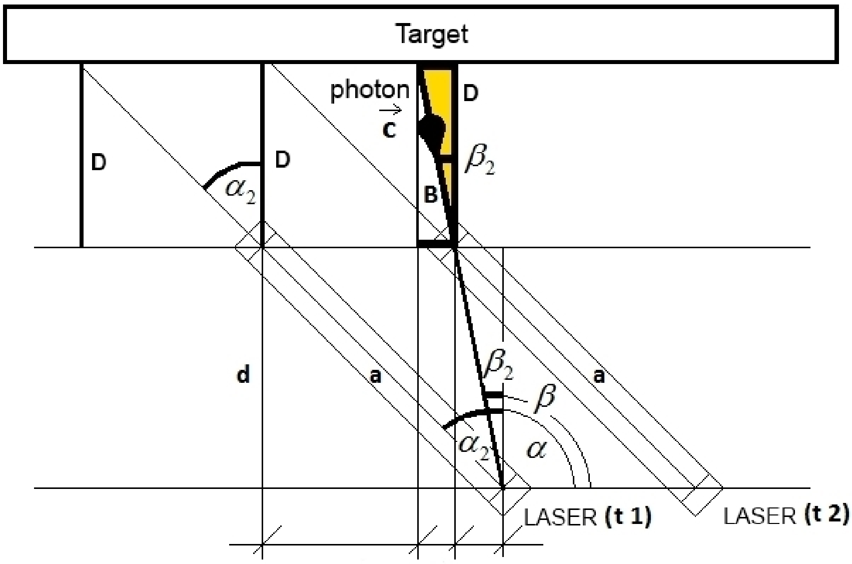
$$B = \frac{D}{\sin(\alpha)} \qquad (48)$$

The photon will cover distance (B) in time t_0.

$$C = \frac{B}{t_0} \rightarrow t_0 = \frac{B}{C}$$

variable (B) has been described by equation (48)

$$t_0 = \frac{D}{C \cdot \sin(\alpha)} \qquad (49)$$



$180\,\text{deg} > \alpha > 90\,\text{deg}$

$\beta > 90\,\text{deg}$

Fig. L-14. Laser illuminates the target. Vehicle in motion.

Distance (B) can be calculated using trigonometric function.

$$\cos(\beta_2) = \frac{D}{B} \rightarrow B = \frac{D}{\cos(\beta_2)} = \frac{D}{\cos(\beta - 90\text{deg})}$$

$\beta_2 = \beta - 90$ deg

$$B = \frac{D}{\cos(\beta - 90\text{deg})} = \frac{D}{\sin(\beta)}$$

$\sin(\beta) = \cos(\beta - 90$ deg)

$$B = \frac{D}{\sin(\beta)} \qquad (50)$$

The photon will cover distance (B) in time t.

$$C = \frac{B}{t} \rightarrow t = \frac{B}{C} = \frac{D}{C \cdot \sin(\beta)}$$

$$t = \frac{D}{C \cdot \sin(\beta)} \qquad (51)$$

The omega factor has been determined based on both photon flight times ratio (t/ t_0).

$$\Omega = \frac{t}{t_0} = \frac{\dfrac{D}{C \cdot \sin(\beta)}}{\dfrac{D}{C \cdot \sin(\alpha)}} = \left(\frac{D}{C \cdot \sin(\beta)}\right)\left(\frac{C \cdot \sin(\alpha)}{D}\right) = \frac{\sin(\alpha)}{\sin(\beta)}$$

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)} \qquad (52) \quad \text{omega}$$

5.2.5 Determination of omega factor. Laser setting angle (β=90deg).

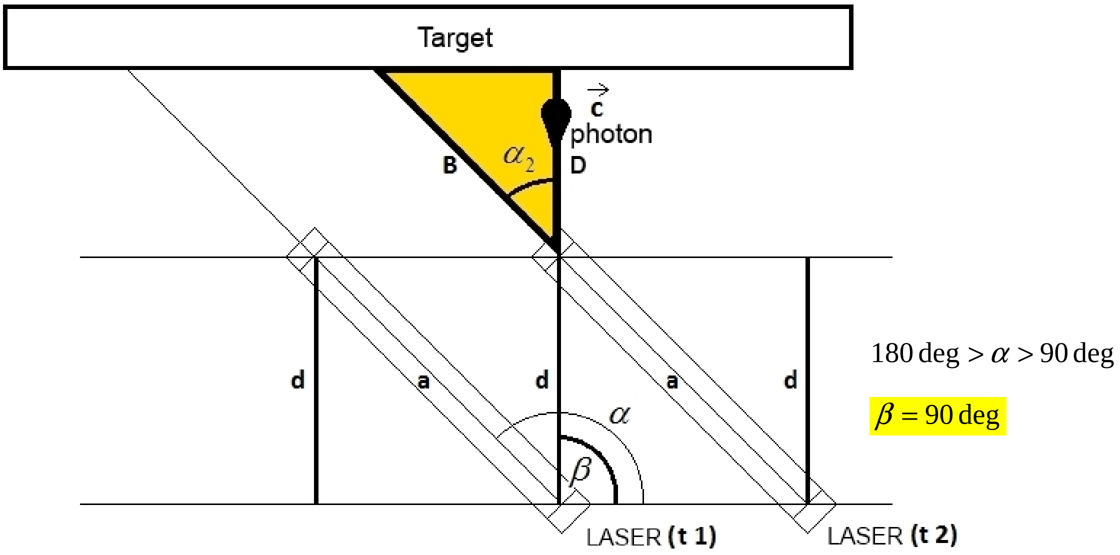


Fig. L-15. Laser illuminates the target. Vehicle in motion.

The photon will travel distance (D) in time t. Time t_0 has been determined previously (49).

$$C = \frac{D}{t} \rightarrow t = \frac{D}{C} \qquad (53)$$

The omega factor has been determined based on both photon flight times ratio (t/t_0).

The derivation of time t_0 equation (49) was presented in the previous section (5.2.4).

$$\Omega = \frac{t}{t_0} = \frac{\frac{D}{C}}{\frac{D}{C \cdot \sin(\alpha)}} = \left(\frac{D}{C}\right)\left(\frac{C \cdot \sin(\alpha)}{D}\right) = \frac{\sin(\alpha)}{1}$$

$\beta = 90 \text{ deg} \rightarrow \sin(\beta) = 1$

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)} = \frac{\sin(\alpha)}{1} \qquad (54) \quad \text{omega}$$

5.2.6 Determination of omega factor. Laser setting angle (β<90deg).

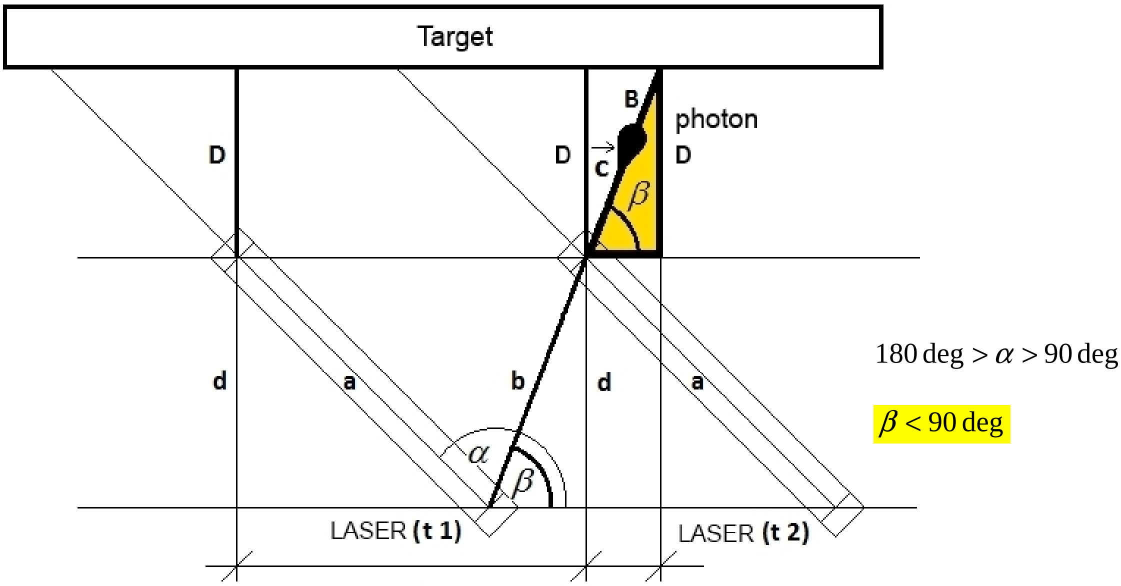


Fig. L-16. Laser illuminates the target. Vehicle in motion.

Distance (B) can be calculated using trigonometric function.

$$\sin(\beta) = \frac{D}{B} \rightarrow B = \frac{D}{\sin(\beta)} \quad (55)$$

The photon will cover distance (B) in time t. Time t_0 is described by equation (49).

$$C = \frac{B}{t} \rightarrow t = \frac{B}{C} = \frac{D}{C \cdot \sin(\beta)}$$

$$t = \frac{D}{C \cdot \sin(\beta)} \quad (56)$$

The omega factor has been determined based on both photon flight times ratio (t/t_0).

The derivation of time t_0 equation (49) was presented in the previous section (5.2.4).

$$\Omega = \frac{t}{t_0} = \frac{\frac{D}{C \cdot \sin(\beta)}}{\frac{D}{C \cdot \sin(\alpha)}} = \left(\frac{D}{C \cdot \sin(\beta)}\right)\left(\frac{C \cdot \sin(\alpha)}{D}\right) = \frac{\sin(\alpha)}{\sin(\beta)}$$

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)} \quad (57) \quad \text{omega}$$

All the equations describing the omega factor are equivalent.

(57)=(54)=(52)=(22)=(8)

5.3 Numerical analysis. Laser setting angle (180deg>α>90deg).

Velocity equation (47) and equation describing the omega factor (57) were calculated numerically. The results were presented in relevant graphs. There are many possibilities for setting the laser on-board the vehicle. The analysis has been divided into two cases. In both cases the operation pattern is similar.

In the first case the analysis was performed for the laser set at the angle (α=105deg). This is the laser setting angle that has been adopted for the computer animations presented in section (5.1). The results of the analysis are presented in the graph.

In the second case the analysis comprises several different laser settings. The results have been shown in a common graph so that their comparison can be made. The laser setting alpha angle has been changed in 10 deg steps. The assumed values are respectively:

$\alpha = 90\,\mathrm{deg}$

$\alpha = 100\,\mathrm{deg}$

$\alpha = 110\,\mathrm{deg}$

$\alpha = 120\,\mathrm{deg}$

$\alpha = 130\,\mathrm{deg}$

$\alpha = 140\,\mathrm{deg}$

$\alpha = 150\,\mathrm{deg}$

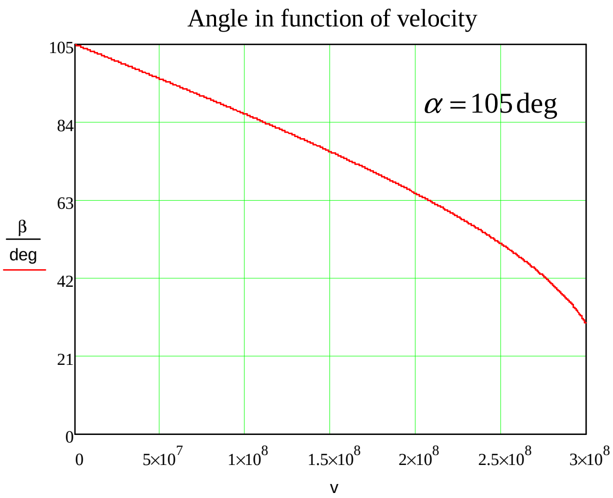
$\alpha = 160\,\mathrm{deg}$

$\alpha = 170\,\mathrm{deg}$

The laser beam angle (β) changes respectively within the (α ≥ β ≥0deg) interval. The iteration step value assumed for the beta angle is ($\beta_{\_STEP}$ = 0.01deg). This value is identical for all the cases.

5.3.1 Vehicle velocity (v) as a function of angles (α) and (β).

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)} \qquad (47)$$



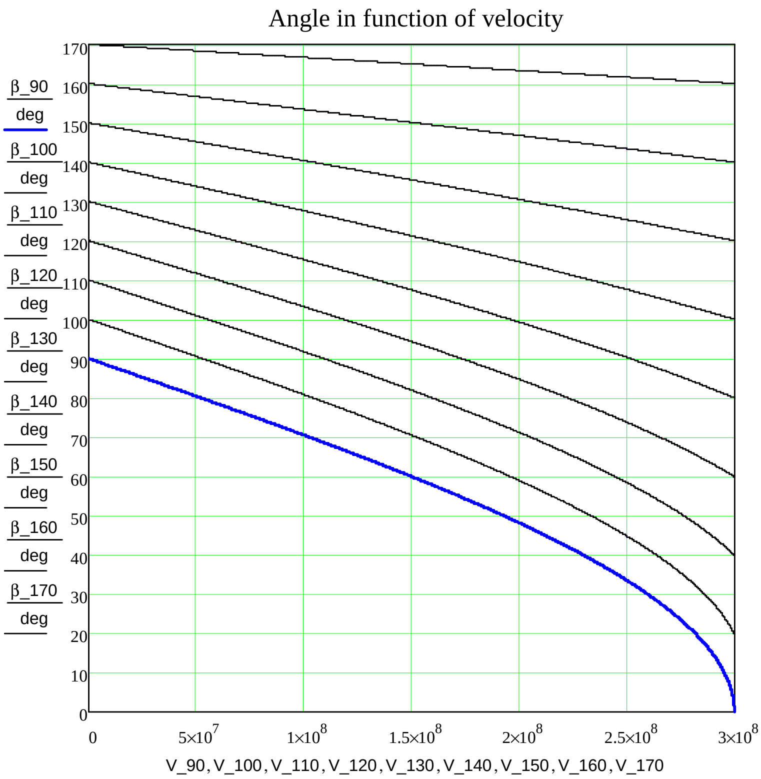
v = (m/s)

	0
0	0
1	$5.42\cdot10^4$
2	$1.08\cdot10^5$
3	$1.63\cdot10^5$
4	$2.17\cdot10^5$
5	$2.71\cdot10^5$
6	$3.25\cdot10^5$
7	$3.79\cdot10^5$
8	$4.33\cdot10^5$
9	$4.88\cdot10^5$
10	$5.42\cdot10^5$
11	$5.96\cdot10^5$
12	$6.5\cdot10^5$
13	$7.04\cdot10^5$
14	$7.58\cdot10^5$
15	...

β = (·deg)

	0
0	105
1	104.99
2	104.98
3	104.97
4	104.96
5	104.95
6	104.94
7	104.93
8	104.92
9	104.91
10	104.9
11	104.89
12	104.88
13	104.87
14	104.86
15	...

Graph L-8. Laser beam deflection angle (β) as a function of vehicle velocity. Laser setting angle (α=105deg).



$\beta\_90 \rightarrow \alpha = 90\,\text{deg}$

$\beta\_100 \rightarrow \alpha = 100\,\text{deg}$

$\beta\_110 \rightarrow \alpha = 110\,\text{deg}$

$\beta\_120 \rightarrow \alpha = 120\,\text{deg}$

$\beta\_130 \rightarrow \alpha = 130\,\text{deg}$

$\beta\_140 \rightarrow \alpha = 140\,\text{deg}$

$\beta\_150 \rightarrow \alpha = 150\,\text{deg}$

$\beta\_160 \rightarrow \alpha = 160\,\text{deg}$

$\beta\_170 \rightarrow \alpha = 170\,\text{deg}$

Graph L-9. Laser beam deflection angle (β) as a function of vehicle velocity. Analysis was performed for several values of laser setting angle (α).

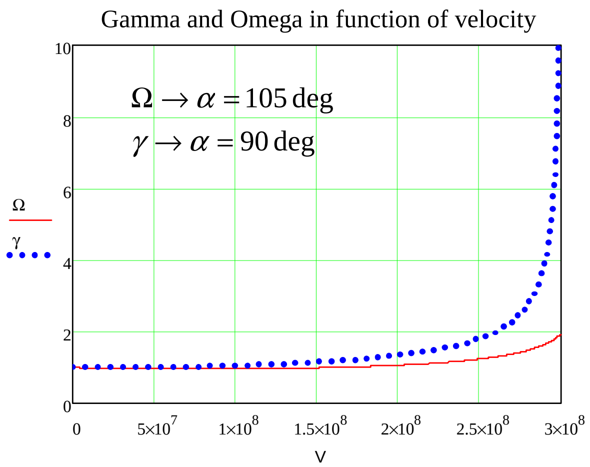
5.3.2 Omega factor.

The omega and gamma factors were calculated numerically. The results have been shown in a common graph so that both factors can be compared.

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)}$$ (57) omega

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

$$v = c\cdot\cos(\beta) - c\cdot\frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)}$$ (47)



Ω =

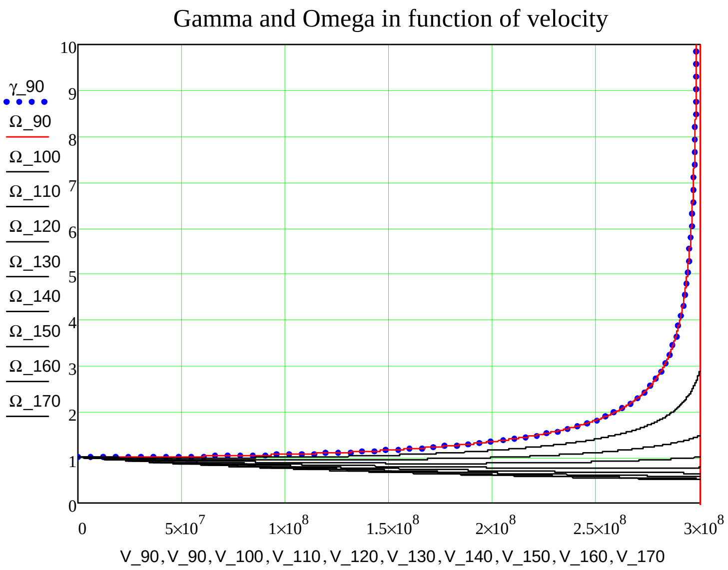
	0
0	1
1	0.9999533
2	0.9999065
3	0.9998599
4	0.9998132
5	0.9997666
6	0.99972
7	0.9996735
8	0.999627
9	0.9995805
10	0.9995341
11	0.9994877
12	0.9994413
13	0.999395
14	0.9993487
15	...

γ =

	0
0	1
1	1
2	1.0000001
3	1.0000001
4	1.0000003
5	1.0000004
6	1.0000006
7	1.0000008
8	1.000001
9	1.0000013
10	1.0000016
11	1.000002
12	1.0000024
13	1.0000028
14	1.0000032
15	...

Graph L-10. Gamma and omega factors as a function of vehicle velocity. Laser setting angle (α=105deg).

The omega factor determined for the angle (α=105deg) differs significantly from the gamma factor. One can say vividly that the photons in the laser beam move slightly „against the current". They move to a small degree, in the direction opposite to that of the vehicle. Increasing the laser setting angle alpha up to approx. (α=120deg, α=130deg) gives rise to a strange phenomenon. It is can be seen in graph L-11. Instead of the expected time retardation, its acceleration occurs. Due to increasing the laser setting angle, the photons in the actual laser beam move more and more "against the current". They fly at an angle in the direction opposite to that of the vehicle motion. The limiting case has been set by the angle (α=180deg). It is absent from graph L-11 but it was described in detail in the first part (Experiment – C).



$gamma \rightarrow \alpha = 90\,deg$

$\Omega\_90 \rightarrow \alpha = 90\,deg$

$\Omega\_100 \rightarrow \alpha = 100\,deg$

$\Omega\_110 \rightarrow \alpha = 110\,deg$

$\Omega\_120 \rightarrow \alpha = 120\,deg$

$\Omega\_130 \rightarrow \alpha = 130\,deg$

$\Omega\_140 \rightarrow \alpha = 140\,deg$

$\Omega\_150 \rightarrow \alpha = 150\,deg$

$\Omega\_160 \rightarrow \alpha = 160\,deg$

$\Omega\_170 \rightarrow \alpha = 170\,deg$

Graph L-11. Gamma and omega factors as a function of vehicle velocity. Analysis was performed for several values of laser setting angle (α). Photons observation time acceleration is noticeable as of a certain value of angle (α).

For the laser set at an angle exceeding (α=90deg), the omega factor must differ from the gamma factor. The omega factor depends on the laser setting angle (α) (formula 57). Albert Einstein derived the gamma factor using the right-angled triangle formula ($c^2 = a^2 + b^2$). Then he generalised the derived factor to the other cases. Violet triangles shown in (Fig.L-17), (Fig.L-18) and (Fig.L-20) schematically illustrate this situation. Please note their shapes.

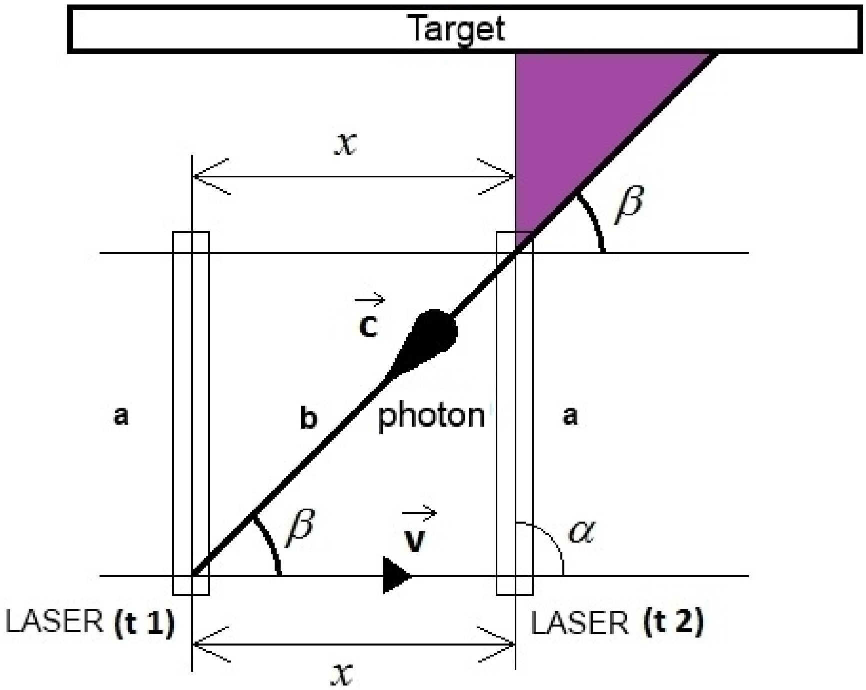


Fig. L-17. Laser on-board moving vehicle. Laser setting angle (α=90deg).

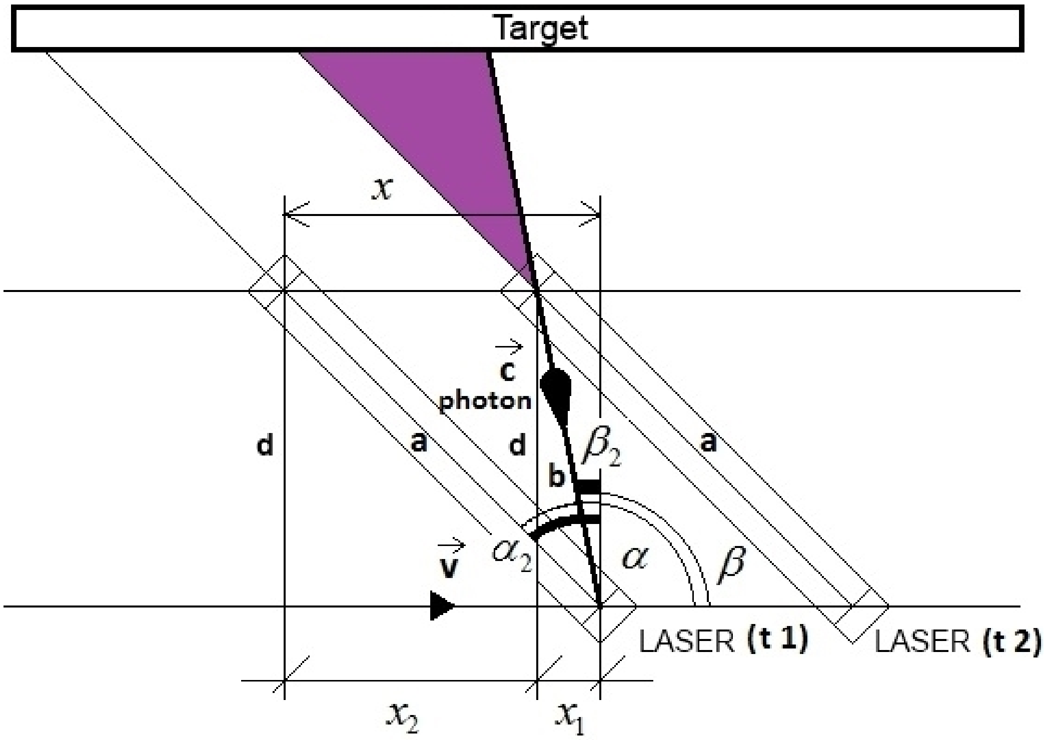


Fig. L-18. Laser on-board moving vehicle. Laser setting angle (180deg>α>90deg). Angle beta is narrower than alpha angle, (α>β>90deg).

"The only source of knowledge is experience." **Albert Einstein**

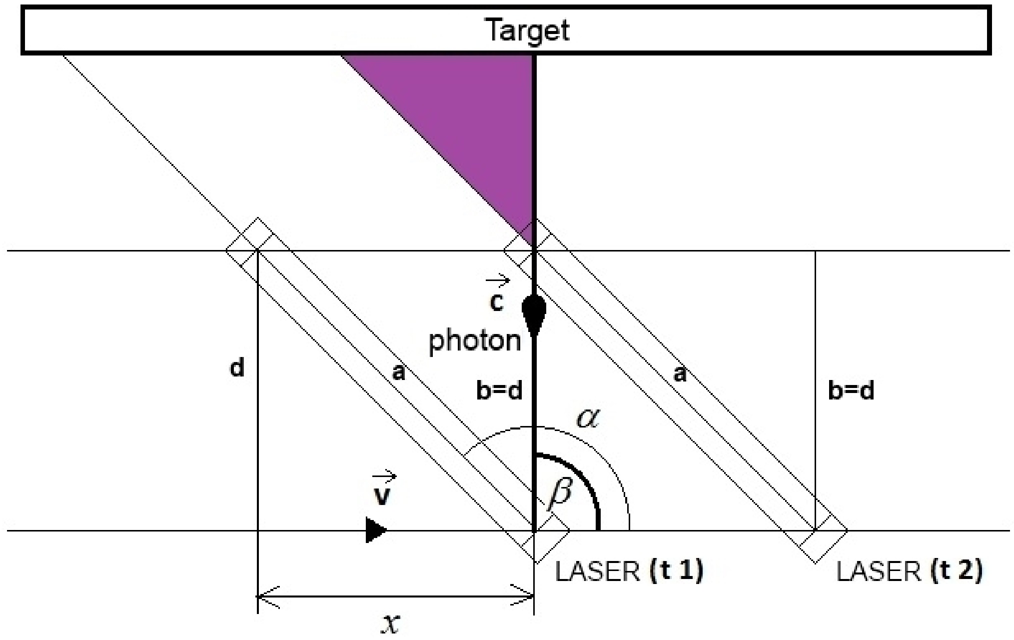


Fig. L-19. Laser on-board moving vehicle. Laser setting angle (180deg>α>90deg). Angle beta is narrower than alpha angle and (β=90deg).

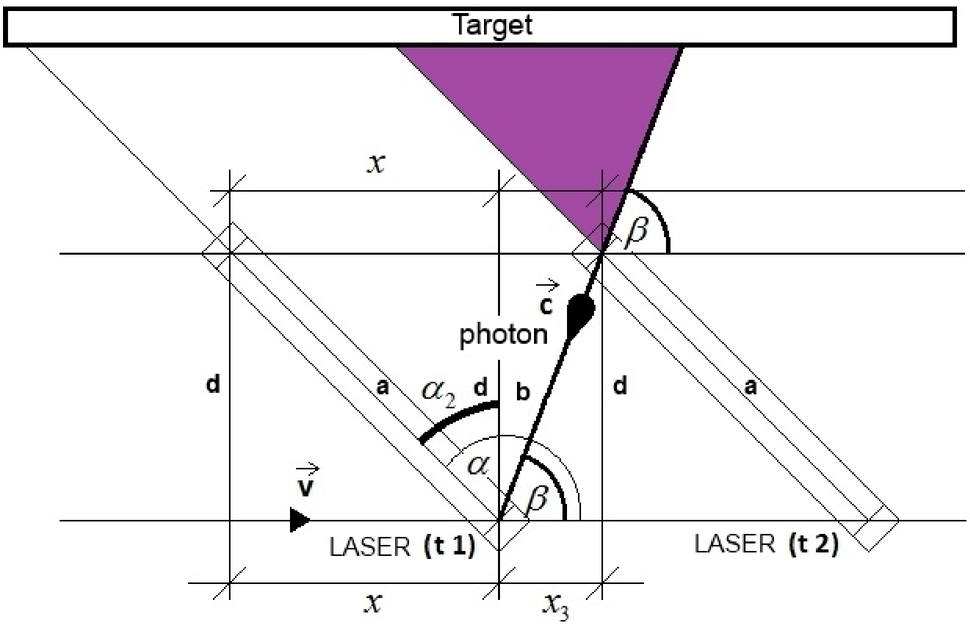


Fig. L-20. Laser on-board moving vehicle. Laser setting angle (180deg>α>90deg). Angle beta is narrower than alpha angle and (β<90deg).

The right-angled triangle equation must not be used for acute-angled or obtuse-angled triangles! A more insightful geometrical analysis should be performed just like in the case of omega factor. The difference between the omega factor graphs, and the gamma factors graph (Graph L-11) should be explained in this way.

"The best way to predict the future is to invent it." **Alan Kay**

6. Partial conclusions.

- Analysis of all possible cases provides relative certainty as to the correctness of the calculations. It eliminates the uncertainty instances associated with the unexamined area of the studied phenomenon. Generalisation of the obtained solutions with relation to other cases becomes unnecessary. Each of the cases is analysed separately.

- There is only one equation describing the vehicle's velocity as a function of angles (α) and (β). It was derived for several various starting points. The formula's final form is identical for all the possible cases.

$$v = c \cdot \cos(\beta) - c \cdot \frac{\cos(\alpha)\sin(\beta)}{\sin(\alpha)} \qquad (47)=(38)=(32)=(17)=(4)$$

- There is only one equation describing omega factor as a function of angles (α) and (β). It was derived for several various starting points. The formula's final form is identical for all the possible cases.

$$\Omega = \frac{\sin(\alpha)}{\sin(\beta)} \qquad (57)=(54)=(52)=(22)=(8)$$

- The gamma factor known from the Theory of Relativity provides correct results only in the case of angle (α=90deg). For all other cases gamma factor was artificially generalised providing consequently erroneous results. Therefore, in the general case, the gamma factor is erroneous.

- The omega factor comprises all laser setting cases within the alpha angle interval (180deg>α>0deg). In the general case the omega factor appears to be correct providing correct result.

- Actual time appears to be absolute. It flows identically everywhere, for all systems and for all vehicle velocities. Time retardation noted by the observers on-board the moving vehicle is illusory. The occurring illusion is caused by impossibility of observation of all velocity components of the photons. This is a spatio-optical phenomenon. The actual laser beam differs from the observed beam. This conclusion clearly contradicts the postulates of the Theory of Relativity in which time has been described as relative.

- We should change our way of thinking about time. It is not easy to change any established views. Time flows in a constant stream.

- If the omega factor has been derived correctly than there is definitely an error in the Theory of Relativity, but other scientists should confirm this (or not).

"Make everything as simple as possible, but not simpler."

Albert Einstein

7. Conclusion.

Clearly, this book is not easy to read. It takes a lot of effort to go through many physical equations, graphs, drawings and animations. However, if the reader has already done it, he/she now possesses new knowledge about the problems as old as the Universe. What is time? What is its nature? These are the questions that have been bothering scientists, philosophers, logicians and normal people for scores of centuries, in fact, from the very beginning of the civilisation. During the past century an opinion was established that **time has relative nature**. This means that its passage (flow) **depends on the velocity of a moving object**. Hundreds of books were written about Albert Einstein's Special Theory of Relativity announced in 1905. It seems that nothing more can be done in the matter of the nature of time. That's all very well, but in this book I prove mathematically and logically something completely different. All the experiments shown in this book prove that **time is absolute**. It's passage (flow) **does not depend on the velocity of a moving object.** Time flows with a fixed rhythm that is identical for all the objects of the Universe. One can vividly say that time is like water in a river. Although the landscape changes, and the river itself changes, yet the water flows always in the same way.

Experiment is the foundation of physics. Each physical theory without any exception must be experimentally confirmed to gain the status of true theory. It wasn't otherwise in the case of Albert Einstein's Special Theory of Relativity. It was confirmed experimentally many times, therefore, it should be true, shouldn't it? Actually, it does not need to be true!

How is this possible? It sounds almost absurd. I therefore explain this apparent contradiction:

1. The reply to this was already presented in section (3.3.2) for Experiment – L. It's about the numerical analysis of the omega factor equation for laser setting on-board vehicle at an angle of (α=90deg). This case is, in principle, identical with that presented by Albert Einstein in his Theory of Relativity (light clock). The gamma and omega factors were calculated numerically. A different method of analysis, that I have applied, provided the same numerical results as the method used by Albert Einstein. However, it should be remembered that the gamma and omega factors are equal only in a specific case, when **the laser has been set on-board the vehicle at the right angle (α=90deg)**. The analyses performed for other values of the alpha angle, presented in other sections, reveal the difference between the gamma and omega factors. It has turned out that the gamma and omega factors behave, generally, divergently. These factors are not equivalent. **The only exception is the above case of (α=90deg)!**

2. The Theory of Relativity states the fact that physical phenomena must occur alike on-board the stationary and moving vehicles. This applies even if the moving vehicle travels with velocity close to C. Therefore, the astronauts/voyagers locked inside the moving vehicle cannot determine if they move fast or not at all. All the optical experiments such as Experiment – C, Experiment – cosine C and Experiment – L prove otherwise. Physical phenomena do not occur identically for moving and stationary vehicles at all. An extra example of a spatio-optical phenomenon has been described in attachment - A. This has been aimed at alerting the reader's attention and imagination to this very important fact.

3. There is one very important problem that has not been considered so far in this book. Physical experiments show that clocks on-board rapidly moving vehicles slow down and are delayed relatively to the stationary clocks. Experience does not lie but interpretation of its

results can be misleading. And so it is. The moving clock may be late relatively to the stationary clock but time flows, in both cases, with the identical, “normal” pace. Impossible? But yes, it is possible! This issue has been described in attachment - B. I have placed the explanation deliberately in the attachment and not as another chapter of the book. This is because the physical phenomenon responsible for retardation of moving clocks is not a spatio-optical phenomenon. It is simply a different type of physical phenomenon. Only the spatial and optical phenomenon was described in the book as exhaustively as possible. I didn’t want to touch upon other physical phenomena. The issue of the clock is, however, very important when we consider any time-related problems. If the reader wants to know how it happens that moving clocks slow their pace, he/she may do so by reading the contents of attachment - B.

Could the conclusions originating from physical experiments performed with relation to the Theory of Relativity appear erroneous or insufficient? Could Physics be completely different to what we have thought so far? Do the clocks “cheat” the voyagers?

Those who seek the truth, have been told that *„Those who seek, will find”*.

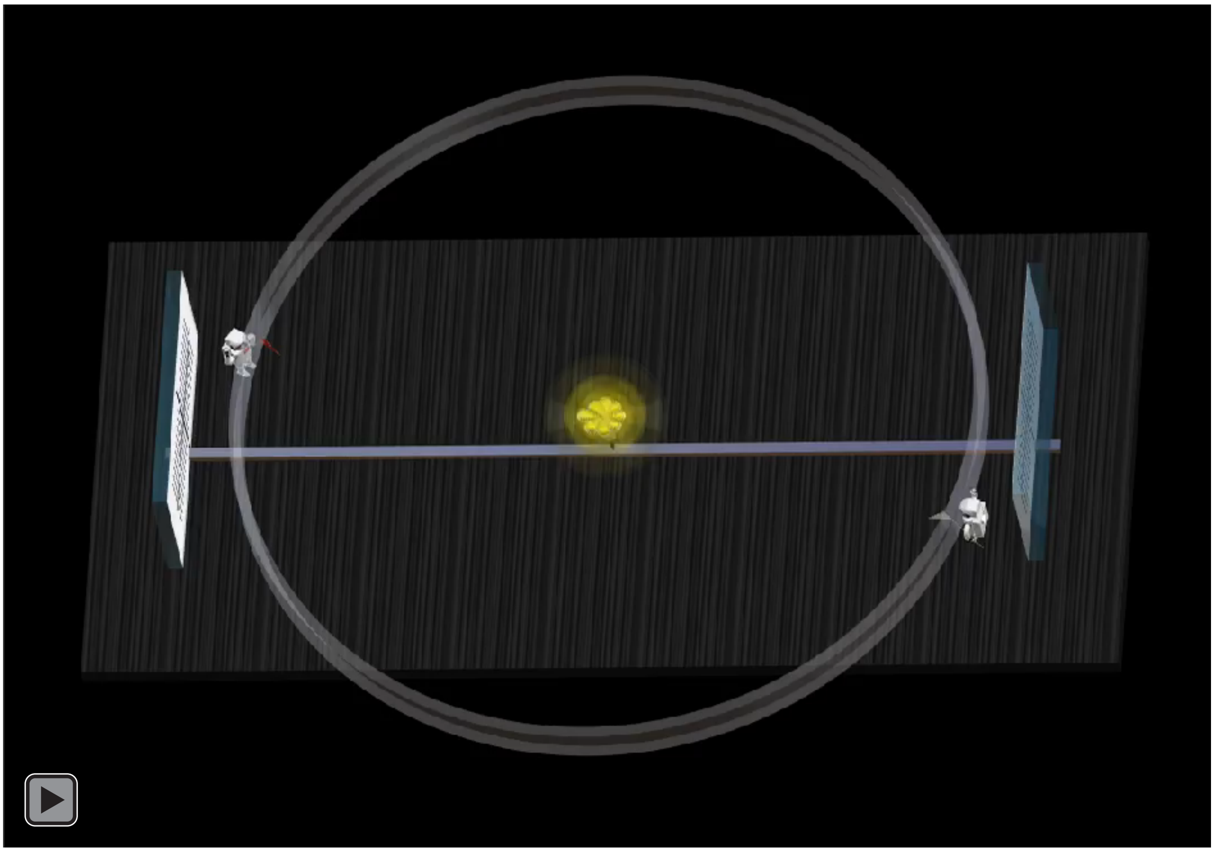
8. Attachment – A.

The spatio-optical phenomenon on-board moving vehicle proceeds in different way than on-board stationary vehicle. All the experiments presented in this book confirm this thesis. Below, I present an additional example to confirm this thesis. This example has a very strong impact on the imagination, and helps to improve the understanding of the fact that the spatio-optical phenomenon depends on the velocity of the vehicle in which the experiments are performed. Thus, the divergence of the results of experiments shown in the book with the postulates of the Theory of Relativity has been highlighted. This pertains to the postulate of indistinguishability of physical phenomena occurring on-board a very fast vehicle, from similar phenomena occurring on-board a stationary vehicle.

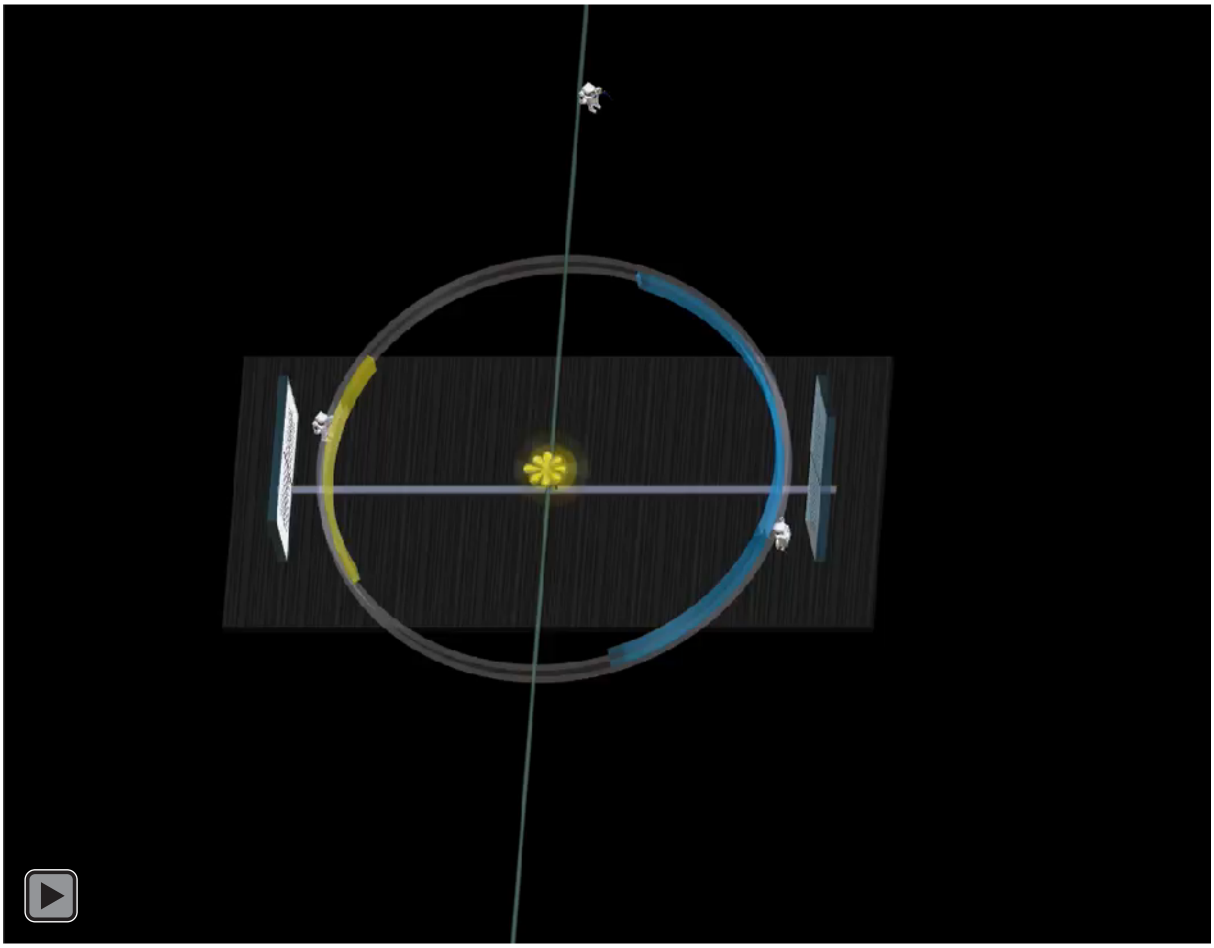
Non-symmetrical illumination of a moving vehicle's interior.

The illumination of a moving vehicle's interior is non-uniform. The front part of the vehicle will be illuminated to a minimum degree, whilst the rear part of the vehicle will be illuminated to the highest degree, much higher than the front part. It is assumed, of course, that a point light source has been located centrally on-board the vehicle. The rear part of moving vehicle somehow "scoops" the photons rushing in the opposite direction. The photons will not have enough time to "disperse" too much away from each other. The first part of the moving vehicle somehow "flees" from the photons, which increasingly "disperse" from the light source. This phenomenon has been shown in two animations below. In the case of the second animation, the same amount of light will fall on the yellow area as on the blue one, but the blue area is much greater than the yellow one. So, the blue area is illuminated to a lesser extent compared with the yellow area. It should be noted that both areas are illuminated unevenly. The entire circle seen in the second animation is illuminated unevenly; in vehicle's direction of motion – to the minimum extent, whereas in the direction opposite to the direction of motion – to the maximum extent. Illumination of stationary vehicle's interior is, of course, uniform.

Both cases result directly from the fact of existence of the *"free space loss"* law.



Anim.D-1. Expansion of illumination. The stationary vehicle.



Anim.D-2. Expansion of illumination. The moving vehicle (v=0,9C).

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9. Attachment – B. Delayed clocks.

Experiments show that fast moving clocks run slower than the stationary ones, or those that move slowly. Why is this? This is caused by the existence of a physical phenomenon that is different from the spatio-optical phenomenon. An answer to this question goes beyond the scope of this book, in which only spatio-optical phenomena are presented. Yet I thought that at least a brief explanation of this issue is necessary. For this reason, it was presented as an attachment to the book and not as another of its chapters.

In real physical experiments pertaining to the Theory of Relativity various types of very precise clocks are used. These are laser, maser or atomic clocks. All those clocks are electronically controlled. They contain controllers, connecting paths, printed circuit boards, electronic detectors, converters and electric cables. Generally speaking, clocks contain, among other things, electronic devices. For the fact that clocks slow down on-board a very fast vehicle, an electro-optical phenomenon is responsible. This phenomenon has a lot in common with the spatio-optical phenomenon presented in Experiment – L yet, it is not identical but only very similar.

Between various electronic circuit components (generally speaking, electric circuit) flow currents composed of electrons. Electric charges flow in the circuit with a certain velocity. In the case of stationary or slow objects the electrical charges flow in the circuit very quickly, yet slower then C. This velocity amounts to approx. (1/3C) for the electric signal i.e. voltage. The electrons themselves move considerably slower. If a vehicle with a clock on-board moves very fast, the actual route that must be travelled by an electric charge (voltage signal/also electrons) in the electric circuit increases. The size of the circuit itself, or of an integrated circuit, does not change, of course. The real distance that electrons have to travel inside the circuit changes in proportion to the vehicle's velocity. Just like in Experiment – L, the photons that move at freely selected angle travel the distance to the measuring target faster or slower in dependence on the vehicle's velocity. The same is true in the case of electrons in the electronic circuit. Simply, the actual electron route on-board a fast vehicle is different to that of an electron on-board a stationary vehicle. The actual route of an electron is inclined at some angle with relation to the circuit's electrical path. This angle depends on vehicle's velocity and is equivalent to angle (β) from Experiment – L. Location of the electrical path with relation to vehicle's direction of flight is equivalent to angle (α). The faster the vehicle moves, the longer actual distance the electrons in the circuit have to travel. The entire electronic controller of the on-board clock operates slower. Laser (or other) pulses are more slowly. They are read more slowly by the detector and more slowly processed by the micro-controller. The computer operates more slowly.

Does it mean that time on-board the fast vehicle slows down? No, time does not slow down its flow, of course! The electrical processes slow down their "normal" pace. This is the electro-spatial phenomenon. Certainly it has not been fully explained by me; I rather generally indicated its existence since this book describes only the spatio-optical phenomenon. It is impossible to describe all the existing physical phenomena in one book.

At the end I would like to use a certain analogy taken from everyday life. The analogy of a frog, who has been frozen in a lump of ice somewhere in a pond, is relevant. Biological processes in such a frog have slowed down considerably. Does this mean that time has slowed down? No, it is quite clear that time flows at its normal pace and only the frog has an impression that everything proceeds at a slower rate. This is the frog's life process that slowed down due to the ambient temperature. In fact due to lower energy. It is likewise in the case of fast moving clocks. Only physical processes retard their "normal" pace due to high vehicle velocity. This is associated with the energy of molecules and space. Each molecule must travel "excess distance" in space. It is not time that slows down its flow, only physical processes retard their "normal" pace. The difference is really significant. All three spatial and optical experiments presented in this book seem to confirm this thesis.

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