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It is true that you may fool all the people some of the time; you can even fool some of the people all of the time; but you can't fool all of the people all the time.

Abraham Lincoln (USA, 1809 – 1865)

The Theory of Relativity and Physical Reality

The Theory of Relativity is based on Postulate of Invariability of the speed of light. This postulate says that the speed of light C in any inertial system is 299,792,458 m/s, and this speed depends neither on the movement of source of light nor on the movement of the observer that measures this speed. In this document we would like to show that the Postulate of Invariability of light speed is not true and would like to present totally new experiments, which would prove that this postulate is false.

There were a lot of observations and laboratory experiments that had proved the independence of the speed of light from the movement of the **source**. The observations of double stars are very persuasive. If the speed of light from a star that moves toward the Earth at given time would be greater than the speed of light from a star that moves away from the Earth then the astronomers would have a distorted picture of a double star system. And because of the fact that there are no such distortions we can be sure that the speed of light coming from both stars is the same.

Although there are no experiments that could prove independence of the speed of light from the speed of **observer**, it is assumed based on the Principle of Relativity that the movement of observer is equivalent to the movement of source. And based on this argument it is concluded that the speed of light does not depend on the speed of observer.

The experiments of F.Arago (19th century) are usually presented as a proof of independence of the speed of light from the speed of observer. Using his telescope, Arago observed a star, which the Earth was moving to on its Solar orbit at the moment. After that he would find another star, which the Earth would be headed away from. He was hoping to find the difference in the focal distance in his telescope, because he thought that in the first case the light was headed to his telescope at a greater speed than in the second case. In a similar experiment with a prism he tried to discover the difference on the speed of light

because of the change of refraction angle in the prism. But Arago's experiments had indicated that the speed of light was the same in both cases.

As a result of analysis of these and other well-known optical experiments with the movement of source of light and observer we came to the conclusion that such strange behavior of light cannot be a result of any kind of strange property such as invariability. It can be explained only with the influence that environment has on the speed of light. In absolutely every realistic optical experiment and known phenomena the light coming from a source to an observer is not spreading through the absolute vacuum but is going through a real gas environment. That's why every situation that has to deal with movement of the source of light or the observer himself has to be looked upon only with consideration of the influence that this environment has on the speed of light itself.

It is well known that in every transparent environment the speed of light is determined by the index of refraction of this environment. For example the speed of light in glass is C/n_g , but when the light reaches the air, its speed increases up to C/n_a . According to R. Feynman, as soon as a photon of light reaches the first atoms of any environment, it is being absorbed by an electron of atom and radiated in the same direction after a certain period of time. Radiated photon moves at the speed C relatively to the atom, which it was previously radiated by, until it reaches another atom and re-radiates again. This means that the speed of light in an environment is defined only by the properties of atoms and by density of the environment and does not depend on the speed the light was moving at before entering the environment. In all known situations the light coming from a source towards an observer is not moving in absolute vacuum, but in real gas environment with the index of refraction n , which is less than one.

Knowing the influence that environment has on the speed of light we can give the explanation of all phenomena that have been taking place in experiments with movement of a source of light and an observer himself. Let's take a look at the most principal cases.

The Speed Of Light Coming From Double Stars Is Identical

In 1911-1913 De Sitter showed that speed of light that comes to the Earth from both stars of a double-star system is identical. And it does not depend on the stars' own speed. At that time that fact seemed to be a convincing proof of the

Postulate of invariability because at that time they thought that the light comes to Earth through the absolute vacuum. But nowadays it is well known that the space between stars is not a vacuum but is filled with very dispersed gas, which is an environment with index of refraction n very close to one. The light of the star moving towards the Earth and of the star moving away from the Earth has identical speed relatively to this environment. This speed is determined by the properties of the environment only and does not depend on the speeds of the stars.

C o m m e n t :

The photons of the light of the moving stars enter the environment with the speeds $(C+V)$ and $(C-V)$. Having passed some distance, they meet the atoms of the environment, are re-radiated by these atoms and then they go with identical speed relatively to the environment. The distance that the photons go before re-radiating depends on the density of the environment. This distance can be approximately estimated in the following way.

Emerging from the glass to the air the photons almost immediately change their speed from C/n_g in the glass to C/n_a in the air. Thus they are re-radiated by the very first atoms of the air. If re-radiating takes place on the sufficiently longer distances, noticeable mistakes would appear in the interferometer measurements, which in reality does not take place. Assuming the density of an air 10^{19} atoms / sm^3 we have the photons meeting approximately 10^{12} atoms in 1 sm^2 on the edge of the air. In the interstellar environment (with the density 1 atom/sm^3) in order to meet 10^{12} atoms/ sm^2 the photons have to pass 10^{12} sm. It means, that all photons will be re-radiated in this environment and their speed will be changed from $(C+V)$ or $(C-V)$ to roughly C approximately in 30 seconds. This environment can be described with index of the refraction $n=1$. In reality the re-radiating takes place on less distances, because the density of the environment near the stars is more than 1 atom/sm^3 . In any case the distance, on which the re-radiating of the photons takes place, is negligible when compared with the distance between the stars and the Earth. Therefore on the way from different stars to the Earth the light has the same speed C relatively to the interstellar environment.

So, the phenomenon that the speed of light that comes from double stars is identical can be explained by the influence of environment itself and cannot be considered as the proof of the Postulate of Invariability. As it is known Postulate of Invariability states that the speed of light does not depend on the movement of the source in **vacuum**.

F. Arago's Experiments

In 1813-1815 F.Arago tried to discover influence of the orbital movement of the Earth on the speed of light that his equipment received from the stars during

the experiments. His attempts didn't have any success. The reason why he couldn't discover it is that the atmosphere of the Earth was surrounding him and his equipment. Beyond the atmosphere the speed of light that is coming from the star towards which the Earth is heading is greater relatively the Earth than the speed of light that comes from the star that is on the opposite side of the Earth movement. But when photons meet the atmosphere of the Earth they **change** their speed. In both cases the photons are moving with the same speed C/n_a relative to the atmosphere (we neglect with the Doppler frequency change and with the dispersion in the atmosphere). As you see the light speed, that Arago wanted to measure, has been changed by the atmosphere before he was able to measure it. That means that all equipment on the Earth doesn't measure the true speed of light coming from the stars but the speed that has been changed and is identical relatively to the Earth for any direction. Besides, we arrived at a conclusion that these experiments are wrong in principle, because the refraction angles can depend on the speed in the wave theory only and do not depend on the light speed.

Star Aberration

Star aberration is the displacement of the visible star location that is caused by the Earth's orbital movement. For stars that are located on the perpendicular line to the Earth movement this displacement is 20.5 corner seconds. Astronomers have known the phenomenon of star aberration for the last 270 years but it still cannot be explained by the Theory of Relativity and is contradictory to it. The problem is that the aberration can be observed only with the movement of the one who observes but it fully disappears when there is a movement of the light source. As we know the first person who mentioned it in relation to the double stars was Ph.Lenard. But he didn't explain why aberration disappears when the source is moving.

The absence of aberration with the movement of the source of light is proved by the observations of double-star systems. If there would be some kind of aberration while stars are moving then astronomers would see distorted double-star orbits. Considering that the speed of stars can be much greater than the orbital speed of the Earth it could be a possibility that the visual sizes of orbits could increase hundreds of corner seconds, and that would be noticeable.

The absence of the aberration in double star systems can also be explained by the influence of the gas environment of the interstellar space. This has an influence on the speed of light. If the light would spread in absolute vacuum the W.Rits ballistic hypothesis would be true. And every photon would obtain an

additional speed in the direction of its star movement. As a result the observer would see the star in its position of displacement that means aberration. But what really happens is that the photons are not moving in the absolute vacuum but through the gas environment and that's why do not receive the additional speed in the direction of the star movement. This takes place because relative to this environment they are moving with identical speed in every direction. As the result of this the observer sees the moving star without any displacement of this star that means no aberration. The absence of aberration during the movement of stars or movement of any other source of light (such as **laser**) can be simply explained by the influence of the environment. It also states the mistake of the Postulate of Invariability of the light speed.

Michelson's Experiments

The result of Michelson's experiments can be simply explained by the influence that the environment has on the speed of light. His experiments played a very important role in the creation of the Theory of Relativity. Starting in 1881, Michelson tried to discover the movement of the Earth around the Universe Ether. At that time they thought that the waves of the light were suppose to spread with the constant speed relatively to the Ether. This kind of experiment has proved with great accuracy that the light spreads with the identical speed in every direction relatively to the Earth. And that speed does not depend on the Earth movement. The identical speed of light spreading is explained with the fact that the speed of light in the **atmosphere** is being defined only by the index of the air refraction n_a . As a result of this the light in the atmosphere spreads in every direction with identical speed. That's why the experiment of Michelson does not have any relationship to the Postulate of Invariability of the light speed and cannot proof it because in these experiments the source of light and the observer himself are immovable relatively to the environment through which the light spreads.

The cosmology red shift without the postulate of the light speed invariability

Edwin P.Hubble have discovered in 1929 that the red shifts in galactic spectrums depend on the distances to galaxies. The red shifts were explained by the Doppler's effect. The hypothesis of the expansion of the universe was born as result of that.

All attempts to explain the cosmology red shift with other reasons without the expansion of the universe failed. The most popular hypothesis of "quantum

aging" was rejected because the red shifts were proportional to the wavelengths. They had to be different for the different frequencies according to this hypothesis.

In our opinion, many problems of modern astrophysics are bound up with the Doppler interpretation of the cosmology red shift. Cosmology red shift can be explained with re-radiation of photons in real interstellar space without "the scatter of galaxies", if one will assume variable speed of light.

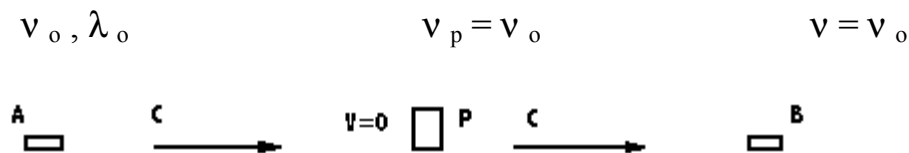
Let us consider the process of the light spreading in the interstellar space. Let's take into account next conditions:

- light is a stream of photons,
- a photon has own frequency ν ,
- atoms of the environment reradiate photons,
- a photon moves up to the next re-radiation with the speed C relatively to the reradiated atom,
- photons repeatedly meet the moving gas accumulations on their way from galaxies to the Earth.

We are going to show that photons change their frequency while reradiated by moving atoms. Let's consider next scheme in order to determine the influence of moving reradiating atoms on the frequency of photons.

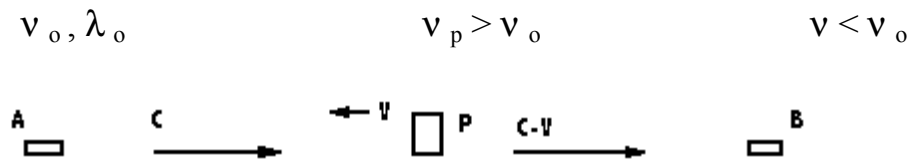
The light source A and detector B are not moving relatively an inertial system. The monochromatic light with frequency ν_0 goes from source A to detector B in the absolute vacuum. On the way from A to B the light passes through the glass plate P (re-radiator). Let us determine the frequency of the light reradiated by moving or not moving re-radiator.

1. Re-radiator is not moving.



The frequency of photons is not changed, obviously. The frequencies of the light ν_p (in the plate) and ν (in the detector) are identical: $\nu_p = \nu = \nu_0$.

2. Re-radiator moves with the speed V towards the source A.



Photons with the frequency ν_o and the wavelength λ_o enter the glass plate with the speed $(C+V)$. The oscillation period T_p becomes less than $T_o = \lambda_o/C$ because of Doppler effect: $T_p = \lambda_o/(C+V)$. Therefore, the light frequency ν_p increases to $\nu_p = 1/T_p = \nu_o (1+V/C)$.

Photons go out of the plate P with the frequency ν_p and move relatively to the plate P with the speed C. Their wavelength is $\lambda_p = C/\nu_p = C/\nu_o (1+V/C)$.

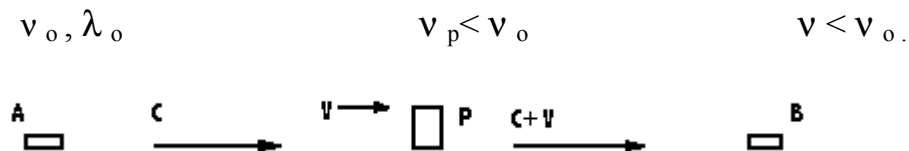
The photons move with the speed $(C-V)$ relatively detector B. So detector receives the frequency $\nu = (C-V)/\lambda_p$:

$$\nu = \nu_o (C-V)(1+V/C)/C = \nu_o (1-V/C)(1+V/C) = \nu_o (1-V^2/C^2).$$

The light frequency becomes equal $\nu = \nu_o (1-V^2/C^2)$.

As a result of the interaction of the light with the re-radiator, moving with the speed V towards the light source, the light receives the **red** shift.

3. Re-radiator moves with the speed V away from the source A.



Photons with the frequency ν_o and the wavelength λ_o enter the glass plate with the speed $(C-V)$. The oscillation period T_p becomes more than $T_o = \lambda_o/C$ because of Doppler effect: $T_p = \lambda_o/(C-V)$. Therefore, the light frequency ν_p decreases to $\nu_p = 1/T_p = \nu_o (1-V/C)$.

The photons go out of the plate P with the frequency ν_p and move relatively the plate P with the speed C. Their wavelength is $\lambda_p = C/\nu_p = C/\nu_o (1-V/C)$.

The photons move with the speed (C+V) relatively detector B. So detector receives the frequency $\nu = (C+V)/\lambda_p$:

$$\nu = \nu_o (C+V)(1-V/C)/C = \nu_o (1+V/C)(1-V/C) = \nu_o (1-V^2/C^2) .$$

The light frequency becomes equal $\nu = \nu_o (1-V^2/C^2)$.

As a result of the interaction of the light with the re-radiator, moving with the speed V away from the light source, the light receives the **red** shift.

Thus, the red shift appears in both cases: the light frequency decreases in $(1-V^2/C^2)$ times when the re-radiator moves with the speed V towards the light source or when it moves away from the source. This red shift appears because of Doppler effect. But this explanation is not bound with moving away of the light source. The red shift effect is explained as a result of photons re-radiation of moving re-radiators.

This result is received for the absolute vacuum. It remains the same for real interstellar environment. In this case, atoms of the environment reradiate photons emitted out of re-radiator P. The photons change their frequency from ν_p to ν and relatively the environment go to detector B with the speed very close to C.

Moving dense accumulations of the gas (interstellar "winds") are the re-radiators in the real interstellar space. The photons meet with such moving accumulations and are reradiated by them receiving some red shift each time.

The cosmology red shifts are proportional to the frequencies. So the formula $\nu = \nu_o (1-V^2/C^2)$ conforms to the observations results.

This formula explains the cosmology red shift in principle only. It does not allow estimate the magnitude of the red shift for each particular case as the number of re-radiations on the way from galaxies can differ significantly from galaxy to galaxy.

The explanation of the cosmology red shift with the re-radiations by the moving gas accumulations will allow repudiate the hypothesis of the expansion of the universe, revise the cosmology scale of the distances, solve the problems of the quasars and so forth. Perhaps, the change of the frequency by re-

radiations may be used to explain effects such as decrease of the frequency when radiation passes the great gravitational mass (Sadch's effect) and the decrease of the frequency on the great distance also.

Doppler effect without postulate of invariability of the light speed

Let's see the situation when the light source moves relatively the environment and the observer is immovable relatively this environment.

Let at the moment the moving light source is in the point O and radiates the photons in all directions (D1, D2 ... on Fig.1). The photons receive additional speed V and move with different speeds in different directions till they will be reradiated.

Their speeds are determined by vector sum $(\bar{c} + \bar{v})$ and described by diagram 2 (if the source were immovable, the speeds of the photons would be identical and describe by diagram 1).

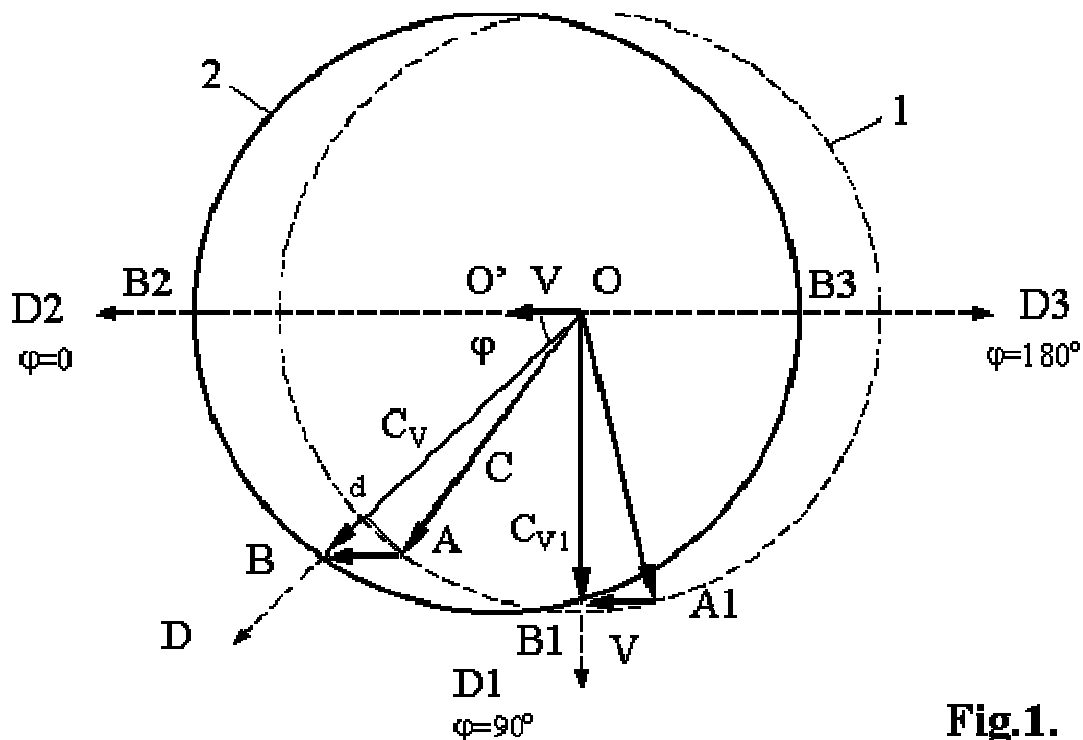


Fig.1.

In some direction D (at an angle φ to direction of the speed V) the speed of the photons C_V is determined by segment OB :

$$C_V = OB = Od + Bd = \sqrt{C^2 - V^2 \sin^2 \varphi} + V \cos \varphi$$

With such initial speed the photons move before re-radiating, then they are reradiated by the atoms of the environment and their frequency changes from

initial value $\frac{C}{\lambda_0} = \nu_0$

to the value $\frac{C_V}{\lambda} = \nu$: $\nu = \nu_0 \sqrt{1 - \beta^2 \sin^2 \varphi} + \beta C \cos \varphi$, where $\beta = V/C$.

This formula allows us determine, in every direction, the frequency of the photons radiated by moving light source from the point O.

So, for $\varphi = 90^\circ$ we get well-known formula for the transversal Doppler effect:

$$\nu = \nu_0 \sqrt{1 - \beta^2}$$

This formula shows that in the direction perpendicular to the direction of the speed V the photons go with the frequency that less than the frequency ν_0 , but this decrease of the frequency is explained only by the cinematic reason, but not by any effects of the special theory of relativity. By the transversal moving of the light source those photons arrive at the observer that were radiated slightly backwards (in direction to point A1), but not those photons that were radiated in direction D1 ($\varphi = 90^\circ$). The speed V is added to speed C and the speed of photons becomes equal C_{V1} . This speed C_{V1} is perpendicular to speed V and it is less than C. As result, the photons that go in direction D1 have the frequency $\nu = \nu_0 \sqrt{1 - \beta^2}$ which is less than the frequency ν_0 .

By $\varphi = 0^\circ$ and $\varphi = 180^\circ$ we receive the formula for longitudinal Doppler effect:

$$\nu = \nu_0 (1 \pm \beta)$$

This formula gives the values that differ in $\sqrt{1 - \beta^2}$ times from values that the formula of the theory of relativity gives.

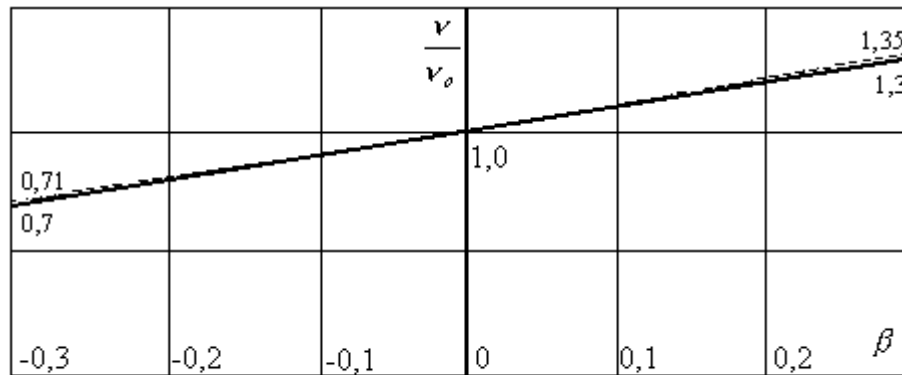


Fig.2.

The diagrams $v(\beta)$ are shown for longitudinal Doppler effect on Fig.2:

the dotted line - formula of the theory of relativity
$$v = v_0 \frac{1 \pm \beta}{\sqrt{1 - \beta^2}}$$

the continuous line - formula
$$v = v_0 (1 \pm \beta)$$

As we see, both formulae give very close values up to the velocities $0,3C$. By velocity of the satellites about 8 km/s both formulae give the same values up to 10^{th} sign. Therefore the experimental verification nowadays, in our opinion, is hardly possible.

How the Postulate of Invariability of Light Speed Can Be Experimentally Disproved

Because of the environmental influence the speed of light does not depend on the movement of source in all real situations. That's why there is no experiment with the movement of the **source** of light that can show the uninvariability of the speed of light. The only experiment that can proof the uninvariability of the speed of light is the experiment with the movement of the **observer**. In order for the moving observer to see the influence of his own movement on the speed that the light reaches his equipment two conditions have to be fulfilled:

- The observer has to move with the maximum speed relatively to the environment in which the light spreads.

- In order to keep its real speed before it reaches the measuring equipment the light should not have any contact with any glass or mirrors, or any other re-radiators.

In the atmosphere of the Earth, where the speed of the light is less than C almost on 90 km/s, the observer cannot move with a speed that will cause the speed of the light to be greater than C in relation to him. Such experiment can only be held on the orbit of the Earth's satellite, where the light relatively to the atmosphere spreads with the speed that is very close to C . In this case the observer may move towards the beam with the speed 8-10 km/s. In the experiment, that will be suggested later, the observer together with the measuring equipment is at the spaceship that is orbiting the Earth.

We suggest a special interferometer that can allow the direct comparison of the speed $(C+V)$ with the speed C during the experiment. This interferometer is shown on Fig.3.

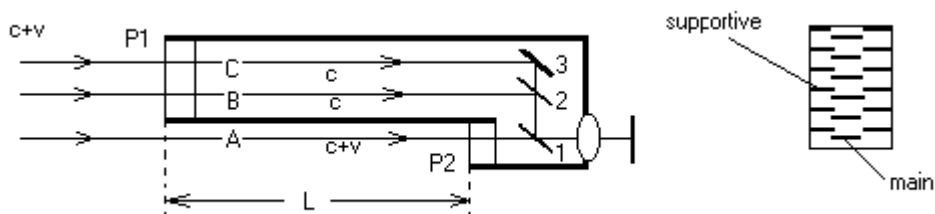


Fig.3

Fig.4

This instrument works with the coherent light of laser. The main interference picture is being created by translucent mirrors 1, 2 and by the beams A, B. The additional interference picture is created by the beams B,C with the help of the same mirrors 1, 2 and the auxiliary mirror 3. This picture is the supportive one. As we can see on the Fig.4 the main and the supportive interference lines are being separated by darkening of the corresponding parts of the mirrors 1, 3. When the interferometer is immovable relatively to the environment of the light spreading all three beams are going through the base distance L with the identical speed C . During this main interference lines are coinciding with supporting lines. When the interferometer is moving towards beam of light with speed V the beam A is going through the base distance with the speed $(C+V)$. But beams B and C are changing their speeds during the entering of the glass plate P1. Relatively to instrument, they start to move with the same speed C they would have if the instrument were immovable. As a result the main interference picture is displacing relatively to the supporting picture. The displacing of lines is proportional to the speed V . With speed 8 km/s the

displacement on one line can be achieved with the interferometer's base distance L close to 0.03 m.

The location of the interferometer should be on the satellite, orbiting the Earth. The laser can be set on the other satellite that has the same orbit with the first one. It should be at some distance in front (or past) the main satellite with the interferometer. The distance between laser and interferometer must be not less than some hundred meters or kilometers. The interferometer should show the constant displacement of the interference lines. The obligatory condition of this experiment is absence of the protection glass in front of the interferometer.

This interferometer may be used with the light of the star. For the use of the interferometer with the light of the star it should be modified with the additional instrument that would be able to fix the interference lines that are being created by the weak light of star. In this case the interferometer should be constantly directed on the bright star. The interference lines should be periodically displaced in both directions, proving the change of the speed of the star's light relatively to the moving equipment.

Conclusion

The keystone of the Theory of Relativity is the invariability of the speed of light, which states that the speed of light in the **vacuum** depends neither on movement of a source of light nor on movement of an observer. The Postulate of Invariability is a result of a wrong explanation of known optical observations and experiments without keeping in mind the influence of **environment** which light is coming through. During the Theory of Relativity analyses of the **real** situations with movement of the source of light and the observer it is assumed that the light spreads in absolute vacuum. But nowadays we know that it is not possible to find a case when the light spreads in the absolute vacuum. Taking into consideration influence that the environment has on the speed of light plus the phenomenon of the star aberration contradicting to the Theory of Relativity gives the opportunity to make the first test to the postulate of the invariability of speed of light. There is a great need of holding these experiments because there is an interest in getting both expected positive result and negative result. Negative result can become in this case the first real proof of independence of speed of light from a movement of an observer.

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