

On the Fundamental Tests of the Special Theory of Relativity

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Abstract. The article starts with the existing definition of the “scientific method” as a logical and rational order of steps through which scientists reach conclusions about the world around us. The answer to the question “What is truth and evidence in science?” requires attention to be paid to several important key markings indicated in this regard.

The purpose of this article is to reveal the essence of all the “tests of the special theory of relativity” presenting the most common objectionable techniques used in the “fundamental tests” of special relativity, which have been considered within three major types. The first one is based on “logical circular reference”, the second type is based on inadmissible analogy, and the third type are completely contrived (fabricated) tests - here is analyzed as a typical example of the Hafele-Keating experiment. As a conclusion, the reader will uncover that the given explanations by the modern physics of the results of all these tests do not meet the requirement: the science to give a real factual explanation about the world.

KEY WORDS: fundamental tests; special theory of relativity; speed of light postulate; Michelson-Morley experiment; speed of light invariance.

1 On the “Scientific Method”

The physicists create hypotheses to explain the observed behavior of physical reality. If a lot of evidence is collected through experimental testing that supports a hypothesis, then the hypothesis becomes an accepted theory. In science, a scientific theory is an explanation for the events that have been observed.

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Definition of the scientific method:

“A method of procedure that has characterized natural science since the 17th century, consisting in systematic observation, measurement, and experiment, and the formulation, testing, and modification of hypotheses - “the criticism is the backbone of the scientific method””.
[\[1\]](#).

The scientific method is a logical and rational order of steps by which scientists come to conclusions about the world around us. We can distinguish the following main steps of the scientific method.

Step one: Starting the research with observation and description of a phenomenon.

Step two: Formulation of a hypothesis (a possible solution to a problem based on knowledge and research.). In physics, the hypothesis often takes the form of a causal mechanism or a mathematical relation that explains certain phenomena.

Step three: Developing testable predictions based on the formulated hypothesis. The predictions have to demonstrate that the hypothesis is true.

Step four: Designing experiments that must test the predicted results. The purpose of an experiment is to determine whether observations agree with or conflict with the predicted results derived from a hypothesis.

Step five: The final step in the scientific method is the conclusion. This is a summary of the experiment's results, and how those results match up to the hypothesis. There are two options for the conclusions: (1) REJECTION of the hypothesis, or (2) if the hypothesis is true, a theory is developed which has to be consistent with most or with all available data and with other existing theories.

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Key terms when applying the scientific method turn out to be ***“fact”***, ***“experiment”*** and ***“conclusion”***.

“Facts” are related to *the observations*. These are *“observed events”*. The used technical instruments are, therefore, very important for the proper observation and identification of the facts. As a matter of fact, however, the essential problems arise in *the interpretation* of the instrumentation readings as well as the experiment as a whole on which the conclusions depend.

“Experiment” is an operation or procedure carried out under controlled conditions in order to collect facts to discover an unknown effect or law, to test or establish a hypothesis, or to illustrate a known law.

“Conclusion” is the ultimate goal. In the series of steps of the scientific method, however, the importance of [step four](#) stands out at most. This is because the wrongly constructed experiment, the misinterpretation of apparatus readings would lead to incorrect conclusions and, as a consequence – *to erroneous theory...*

At this place, a question should be asked:

“What is truth and proof in science?”

Actually, the proof is the accepted logical conclusion based on the available evidence. In science, empirical data are collected through the process of experimentation.

There are several aspects in relation to the question asked:

Mark 1: Our observations are not perfect, as they are limited by experimental errors – both systematic and random.

Mark 2: Some experiments (because of their bad design) hide the reality, which is actually very important to prove a hypothesis (like Michelson-Morley experiment).

Mark 3: Different persons have different interpretations – they see different “evidence” in the same observed event (depending on the point of view, knowledge, and level of understanding). We all know the anecdote concerning Dr. Ludwik Silberstein and Sir Arthur Eddington about: *“Who are the three men who have actually understood the theory of relativity...”*

Mark 4: We have limitations that are beyond our control which we can hardly be aware of. In this sense, the *“Theorems of Incompleteness”*, published by Kurt Gödel in 1931, actually define the “border of the mathematical and the human logic”. The *“Theorems of Incompleteness”* also refer to physics because they can reveal the shortcomings of some explanations of physical reality through mathematical logic.

Gödel’s second incompleteness theorem states that ***for any consistent system F: the consistency of F cannot be proved in F itself***. The reader can see, that chapter 11 of the same book [2] concerns the “measurement reasons” for the delusion about the constancy of the speed of light in vacuum, and *the paramount importance of our primary physical constants* (the units of measurement) – that this is actually a demonstration of the second incompleteness theorem in the field of physics.

Mark 5: Kurt Gödel demonstrated the “Theorems of Incompleteness” by using the trick called *“liar paradox”*. The essence of the “liar paradox” is that ***the “truth” value of a statement cannot be evaluated by reference to a previously accepted value of the statement itself (self-referring)***. So far, the famous experiments related to the behavior and measurement of the speed of light in our time-spatial domain “near the surface of the Earth” have been explained by modern physics (above all) using this “trick”. In the book, this trick is named *“logical circular reference”*. Using the “logical circular reference” false explanations are named “scientific explanations”. Moreover, fabricated experiments using the “logical circular reference” were designed. Typically, the purpose of such experiments is to check the validity of erroneous hypotheses (such as the special theory of relativity) using the claims of that same hypothesis/theory. Of course, the results of using the “liar paradox” are always with a “true” value. In this way, we can say that an exact mathematical proof cannot always correspond to the physical reality (cannot correspond to the truth about nature).

Actually, the most essential part of the scientific method is that the theory must meet the results of the experiments. However, the results of the experiments must be considered through the prism of the aforementioned marks.

2. About the Tests of the Special Theory of Relativity.

The purpose of this chapter is to reveal the essence of all the “tests of the special theory of relativity”, which have been considered within three major types. The reader will uncover that the given explanations by the modern physics of the results of all these tests do not meet the requirement: the science to give a real factual explanation about the world.

All the “unexpected” and “inexplicable” results of the famous experiments related to the behavior and measurement of the speed of light carried out in the time-spatial region “near the surface of the Earth” have their scientific explanation based on the classical mechanics and Galilean relativity that are proven to be valid in our time-spatial region with a uniform gravitational field

intensity. All the evidence shows the validity of the “*Thesis about the Behavior of the Electromagnetic Radiation in the Gravitational Field of the Universe*” presented in chapter 10 of the book [2]. In turn, the thesis is based on the presented in **part II** “*Model of Uncertainty of the Universe*” presented in chapter 9 of the same book.

There is a range of various experiments, however, which contemporary physics defines as “*tests of the special theory of relativity*”. The aim is to interpret their results as “consistent” with the results of the special theory of relativity and to prove its validity

What is the true essence of the most famous “tests of the special theory of relativity”?

All experiments accepted as tests of the special theory of relativity can be divided into three main types.

2.1. First type tests: Based on “logical circular reference”.

The first type of tests uses the trick “liar paradox”. They interpret the experiments by referring to the false results of the special theory of relativity, but this is, in fact, a “**logical circular reference**” (see [Mark 5](#) above). However, we all know that the “circular reference” is inadmissible – both in mathematics (e.g. in spreadsheets) and in logic.

According to Robertson [3], the following three experiments are the fundamental tests of the special theory of relativity. The first two of the experiments refer to the *first type of tests*:

2.1.1 Michelson-Morley experiment.

Chapter 7 of the book (see Ref. [2]) shows the reason for the inability of the *Michelson interferometer* to ascertain the difference of the speed of light in different directions in the frame of reference related to the Earth’s surface – the so-called “*anisotropy of speed of light*”. As a result, based on the experiment of Michelson-Morley, the claim “*the speed of light is the same in all inertial frames of reference*” was imposed. From the analysis of the article “*On the Electrodynamics of Moving Bodies*” (see Chapter 6 in Ref. [4]), it can be seen that the special theory of relativity has been created on the basis of this erroneous claim. In other words, it turns out that the results of the special relativity are a consequence of the inappropriate conceptual design used in *Michelson’s interferometer*, the advanced version of which is used in the famous *Michelson-Morley experiment*.

But, however, there is no problem to overturn the causal relationship! For modern physics, it turns out that the Michelson-Morley experiment is a fundamental experiment, which proves the results of the special theory of relativity. Even more, the experiment establishes a relationship between the longitudinal and transverse lengths of the moving bodies! This is nothing else than a classic example of “*logical circular reference*”, of a classical use of the trick “*liar paradox*” – that **the “truth” value of a statement cannot be evaluated by reference to a previously accepted value of the statement itself (self-referring)** – see [mark 5](#) above.

2.1.2 Kennedy–Thorndike experiment.

The speed of light in vacuum (in relation to the stationary space) depends on the intensity of the gravitational field. That is why the speed of light in vacuum does not change when the Earth travels in its orbit around the Sun and along with the Solar System in the Galaxy, because, during the motion of the Earth, the intensity of the gravitational field on its surface remains the same – dominated by the mass of the Earth.

The “*speed of light anisotropy*” in the frame of reference related to the Earth’s surface, however, is a fact that cannot be fixed by Michelson’s type interferometers. Kennedy-Thorndike experiment does not principally differ from the Michelson-Morley experiment. The interferometer is actually a modified Michelson interferometer. The modification is that one arm of the interferometer used in the Kennedy-Thorndike experiment is shorter than the other one.

As it was grounded in Ref. [5]:

the interference fringes (the bright or dark bands caused by beams of light that are in phase or out of phase relative to each other) will never be displaced, because the difference in the speeds of each light beam in both directions of each of the arms will be fully compensated – regardless of the length of the arm, regardless of the direction of the arm! [5].

So, the result of the Kennedy-Thorndike experiment cannot be different: no phase displacements are detected as a result of the rotation of the Earth around its axis, which was ascertained in the experiments “One-way measurement of the speed of light” and “Michelson-Gale-Pearson experiment”.

According to modern physics, however, the negative result of the Michelson-Morley experiment is explained by *length contraction* (which is the result of the special theory of relativity). In the same way – the negative result of the Kennedy-Thorndike experiment is explained by *time dilation* (the other result of the special theory of relativity) ... in addition to the length contraction.... From the report of the experiment:

“Using this null result and that of the Michelson-Morley experiment we derive the Lorentz-Einstein transformations, which are tantamount to the relativity principle.” [6].

We see that none of the two experiments can be any proof of the special theory of relativity, because the ***“truth” value of a statement cannot be evaluated by reference to a previously accepted value of the statement itself (self-referring).***

So, the main question that needs to be put on the reliability of any experiment with a claim to prove the validity of a theory is:

“Whether the evaluation of the results of the tests state on the results of the theory the validity of which has to be proven?”

It turns out that most of the tests on the validity of the special theory of relativity use the trick “*logical circular reference*”. Therefore, these “*tests*” cannot serve as proof of the truth of any theory (in this case the special theory of relativity).

2.1.3 Sagnac experiment

The factual analysis of the Sagnac experiment, based on classical mechanics and Galilean relativity, is presented in chapter 5 of the book (see Ref. [2]). The use of a “*logical circular reference*” in modern physics relates not only to the reference [7]. Is it not irresponsible for a scholar to write on the Internet – (for example, retrieved on Apr. 20, 2013, from the site https://en.wikipedia.org/wiki/Tests_of_special_relativity):

“Special relativity also predicts that two light rays traveling in opposite directions around a spinning closed path (e.g. a loop) require different flight times to come back to the moving emitter/receiver (this is a consequence of the independence of the speed of light from the velocity of the source, see above). This effect was actually observed and is called the Sagnac effect.”

This is absurd, even humiliating for modern physics, that the Sagnac effect, which proves the invalidity of the special theory of relativity, is presented as proof of its validity!!! It is interesting in this aspect, the work “*Relativity in Rotating Frames: Relativistic Physics in Rotating Reference Frames*” (Ref.[8]) to be read, too.

2.1.4 Michelson-Gale-Pearson experiment

Concerning the experiment “Michelson-Gale-Pearson” – the factual analysis of the Michelson-Gale-Pearson experiment, based on classical mechanics and Galilean relativity, is presented in chapter 6 of the book (see Ref. [2]).

2.1.5 experiments “One-way Measurement of the Speed of Light”

Concerning the experiments “one-way measurement of the speed of light” – the “*logical circular reference*” is realized by the modern physics – claiming that the “one-way” speed of light from a source to a detector cannot be measured independently of a convention as to how to synchronize the clocks at the source and the detector! Here, it is understood, that if a “**suitable convention**” is chosen to synchronize the clock of the source and the detector’s clock (what, of course, will not correspond to the physical reality), but it can be “*mathematically proven*” that the speed of the light in the direction “east-west” and in the direction “west-east” is the same.

But let us go back to the “fundamental tests” of the special theory of relativity. Apart from the “*logical circular reference*”, that can prove whatever theory (because it is based on a reference to the theory itself), there are other ways of “proving” false theories.

2.2. Second type tests: Based on inadmissible analogy

These are “tests” that use references to unsubstantiated statements that are believed to be correct only by a non-existent analogy with truly proven correct statements. Such is the case with the third, according to Ref. [3], “fundamental test” of the special theory of relativity:

2.2.1 Ives–Stilwell experiment

According to contemporary physics, the Ives-Stilwell experiment (see Ref. [9]), tested the contribution of relativistic time dilation to the Doppler shift of the frequency of electromagnetic radiation (the light).

In the experiment, a tube for “canal (channel) rays” (a mixture of hydrogen ions) is used, which is actually a gas discharge tube in which the cathode is made of perforated plates. An AC rectifier, capable of delivering up to 30,000 volts, has been used to maintain a high negative potential applied to the accelerating electrode, through whose openings (channels) the accelerated ions emitting photons pass. The beam of emitted photons and its reflected image are observed simultaneously with the help of a concave mirror, shifted to 7° from the beam. A measuring microscope is used to fix the displacement of H_β spectral line of the Balmer spectral series of the hydrogen atom emission spectrum. This displacement was claimed to be due to the Doppler effect.

The Ives-Stilwell experiment, performed in 1938 [9], along with their follow-up experiment, performed in 1941 [10], however, have a number of unsatisfactory aspects. Their experimental results are deemed inconclusive not only in the comprehensive review by Wallace Kantor, a seasoned experimenter in this field (see Ref. [11]).

The correct explanation of the results of the experiment is that the frequency (the energy) of the emitted quantum (photon) is always the same, regardless of the direction of movement and the speed of the hydrogen ion that emitted it. In our case, the frequency of the emitted quantum by the hydrogen atom corresponds only and precisely to the difference in energy states of the atom corresponding to the H_β spectral line of the Balmer spectral series – ($E_{\text{photon}} = E_2 - E_1 = \hbar\nu$), where \hbar is the Planck's constant, ν is the frequency, and E is the energy of the quantum (photon). The energy of the emitted quantum (which means its frequency), however, changes at the collision with the moving hydrogen ion that belongs to the moving oncoming beam.

Actually, the Ives-Stilwell experiment obeys Schrodinger's dynamical treatment. According to Schrodinger, the so-called “*Doppler effect for photons*” is nothing but a consequence of the energy exchange in case of collision between an atom (in our case a hydrogen ion) and quantum (photon). This energy exchange depends on the speed (momentum) of the hydrogen ion, and on the angle between the trajectories of the colliding hydrogen ion and the photon. After the collision, the speed of the photon remains the same ($c_0 = \lambda\nu$), however, its energy (frequency) will be changed – ($\Delta E = \hbar \Delta\nu$).

Therefore, the explanation that the observed changing the frequency of electromagnetic radiation is due to the “Doppler effect” – **is not true:**

- *If the “Doppler effect” is valid for electromagnetic waves, then the frequency of the emitted photons in the “East direction” (by a stationary*

source in relation to the moving ground surface), **will be different** from the frequency of the emitted photons in “West direction”!

- If the “Doppler effect” is valid for electromagnetic waves, why the electromagnetic signals from space-probes “Pioneer 10”, “Pioneer 11”, “Galileo”, “Ulysses”, which are moving away from the Sun (and respectively of the Earth), are blue-shifted (instead of to be red-shifted)?

Obviously, the existing misconceptions in contemporary physics must be rejected. *The Doppler effect is an effect of the mechanical waves, which are vibrations of the matter. However, electromagnetic waves have no material character.* This misconception is the reason for another delusion in physics of the 20th century – the „*accelerating expansion of the Universe*”. In the book, “***Accelerating Expansion of the Universe – the Reasonable Alternative***” (see Ref. [12]), the genuine explanation is presented – “the other cause”, as expresses Vesto Melvin Slipher, who is the first to observe the redshift of spectral lines of the electromagnetic radiation (of the light) coming from distant galaxies. This genuine explanation is based on the deduced there “***energy-spatial relationship***”. The Universe does not expand – actually the Universe is in a stage of contraction..., which logically follows by the analyses presented. Modern physics tries to explain the delusion of the „*accelerating expansion of the Universe*” by the inexplicable fiction “*dark energy*” (whose nature is inexplicable even for the modern cosmologists themselves), as well as by the presence of an illogically high percentage of an unknown kind of “*dark matter*” in the Universe.

That is why, to maintain “by analogy” (about the presence of the Doppler effect at electromagnetic waves), **without real arguments, is not admissible in science.**

In the same way, the delusion that the speed of light is the same for all frames of reference, now it’s already funny to maintain! This delusion must be replaced on the basis of the proposed in chapter 10 “*Thesis on the behavior of the electromagnetic radiation in the gravitational field of the Universe*” of the book “***The Special Theory of Relativity – the Biggest Blunder in Physics of the 20th Century***” (see Ref. [2]).

2.2.2 Mössbauer rotor experiments

Concerning the Mössbauer rotor experiments that are also considered as “confirmation of the relativistic Doppler effect”. The experiments are based on the Mössbauer effect. The Mössbauer effect, also called *recoil-free gamma-ray resonance absorption*, is a nuclear process permitting the resonance absorption of gamma rays. The physical phenomenon was discovered by Rudolf Mössbauer in 1958. The absorption occurs at exactly the same energy of the quanta, resulting in a strong resonant absorption of the gamma quanta by the atomic nuclei in the lattice of the solid, so the energy is not lost at the recoil.

The Mössbauer rotor experiments usually use a source of gamma rays located in the center of a rotating disk. The gamma rays are sent to the resonance absorber located on the rim of the rotating disk. A stationary counter, measuring the number of unabsorbed quanta, is placed outside the rotating resonance absorber. When the disk with the absorber rotates, the number of unabsorbed quanta, measured by the stationary counter outside the rotation disk, increases.

According to the explanation, given according to the accepted explanation with “Doppler effect for photons”, the characteristic resonance absorption frequency of the moving absorber at the rim of the rotating disk should decrease due to relativistic time dilation, so the passage of the gamma-rays through the absorber increases, which is subsequently measured by the stationary counter outside the absorber.

In fact, the result of the *Mössbauer rotor-experiments* also obeys Schrödinger’s dynamical treatment. They are also explained as a consequence of the energy exchange (on the collision) between an atom (in that case the atom in the lattice of the solid) and a gamma-quantum. Actually, the process of absorption is a momentary energy process at the impact between the gamma-quanta (with precisely certain energy) and resonant nuclei in the rotating absorber on the rim of the rotating disk. When the absorber rotates, the momentum of atoms of the absorber changes, and the energy of atoms becomes different from the necessary exact “resonance” energy at the absorption of the gamma-quantum.

Therefore, this is the reason why the passage of the gamma-quantum through the absorber increases in the rotation of the disc and subsequently reported by the stationary counter outside the absorber.

2.2.3 Kündig’s experiment

Concerning Kündig’s experiment on the so-called “*transverse Doppler shift*” [13] – there are different doubts about the given explanation of the experiment. For example:

“We are inclined to think that the revealed deviation of $\Delta E/E$ from relativistic prediction cannot be explained by any instrumental error and thus represents a physical effect. In particular, we assume that the energy shift of the absorption resonant line is induced not only by the standard time dilation effect, but also by some additional effect missed at the moment, and related perhaps to the fact that resonant nuclei in the rotating absorber represent a macroscopic quantum system and cannot be considered as freely moving particles.” [see Ref. [14].

Actually, the real explanation of **Kündig’s experiment** is the same as given for the **Mössbauer rotor experiments**.

2.3. Third type tests: Completely contrived (fabricated) tests.

These types of tests are fully fabricated tests. A brilliant example of a fabricated test is the *Hafele-Keating experiment* (supported by mathematical equations based on the “famous” results of the special theory of relativity).

During October 1971, Joseph C. Hafele, a physicist (*Department of Physics, Washington University*), and Richard E. Keating, an astronomer (*Time Service Division, U.S. Naval Observatory*), took cesium-beam atomic clocks aboard commercial airliners. They flew twice around the world in opposite directions near the equator (first eastward, then westward with different sets of clocks), and compared the clocks with reference clocks at the United States Naval

Observatory. The reported result of the experiment was that time dilation was registered as differences between the three sets of clocks – that their differences were consistent with the predictions of special and general relativity.

According to contemporary physics, “the reported results provide an unambiguous empirical resolution of the famous relativistic “clock-paradox” with macroscopic clocks”.

The theoretical staging of the experiment is presented in the paper “*Around-the-World Atomic Clocks: Predicted Relativistic Time Gains*” as follows:

“Special relativity predicts that a moving standard clock will record less time compared with (real or hypothetical) coordinate clocks distributed at rest in an inertial reference space.” [15].

This assertion is an inaccurate interpretation, due to the perhaps inaccurate definition of the frames of reference used in the article “*On the Electrodynamics of Moving Bodies*” [16], where the special theory of relativity was published. In fact, in the section “*Definition of Simultaneity*” of his article, Einstein argued the use of the term “stationary system” in the following way:

“In order to render our presentation more precise and to distinguish this system of co-ordinates verbally from others which will be introduced hereafter, we call it the “stationary system.” [16].

The lack of an exact definition of the frames of reference by Joseph Hafele and Richard Keating also leads to their mixing... and this is very misleading. But let us distinguish the really existing reference systems as they are in this report:

- *Moving frame of reference* – related to the surface of the Earth, which moves in the “*reference space*” with the respective linear velocity of the Earth’s surface in the stationary space at the equator. (*The linear velocity is the speed of motion of a point on the Earth’s surface in the stationary space for the respective latitude*). Actually, the origin of this coordinate system is the starting point of the travel with the airplanes (on the equator), and the x-axis is directed to the east. In this frame of reference (as accepted in this report), the airplane velocity in the east direction is $+v$ (*for an eastward circumnavigation of the Earth ($v>0$)*), and the airplane velocity in the west direction is $-v$ (*for a westward circumnavigation of the Earth ($v<0$)*).
- “*Stationary*” *reference system* – related to the stationary “*non-rotating space*”. Usually, the examination of the experiments is in the “*Earth-centered inertial (ECI) frame of reference*”. **The origin** of this coordinate system is in the center of the Earth, and **its axes** are practically stationary – aimed at very distant astronomical objects. The *ECI frame of reference* can be considered stationary in relation to the surrounding Earth space in specific cases of experiments carried out on the Earth’s surface.

In the given report, the origin of the coordinate system is the North pole:

“For this purpose, consider a view of the (rotating) earth as it would be perceived by an inertial observer looking down on the North Pole from a great distance.” [15].

In this stationary reference system (for the “inertial” observer from the North Pole):

“A clock that is stationary on the surface at the equator has a speed $R\Omega$ relative to nonrotating space, and hence runs slow relative to hypothetical coordinate clocks of this space in the ratio $(1-R^2\Omega^2/2c^2)$, where R is the earth’s radius and Ω its angular speed. On the other hand, a flying clock circumnavigating the earth near the surface in the equatorial plane with a ground speed v has a coordinate speed $R\Omega+v$, and hence runs slow with a corresponding time ratio $1-(R\Omega+v)^2/2c^2$.” [15].

Let us make the following clarifications:

- **first**, that the North Pole observer is actually stationary in the non-rotating space because they are located on the axis of rotation of the Earth; and
- **secondly**, that for them (in this frame of reference related to the stationary space): the ground linear velocity at the equator is $R\Omega$; the velocity of the airplane flying eastward (in the direction of rotation of the Earth) is $(R\Omega + v)$; and the velocity of the airplane flying westward (against the Earth’s rotation) is $(R\Omega - v)$.

It turns out that the authors of this paper make a mistake about the considered frames of reference – which are totally mixed.

That is why and the conclusion, which the authors give, certainly provokes perplexity even for the supporters of the special theory of relativity:

“Consequently, a circumnavigation in the direction of the earth’s rotation (eastward, $v > 0$) should produce a time loss, while one against the earth’s rotation (westward, $v < 0$) should produce a time gain for the flying clock if $|v| \sim R\Omega$.” [15].

According to special relativity, the observer’s clock in the inertial reference system, called a “stationary system” by Einstein “to distinguish this system of co-ordinates verbally from others” [16], should be faster than the clocks that move in relation to it, (**regardless of the direction of moving**). In other words, the clocks on the flying airplanes must be lagging (the time must go slower) in relation to the clocks in the U.S. Naval Observatory – **regardless of the flight direction of the airplanes!** *It turns out that the experimenters are not familiar with the results of the special theory of relativity, i.e. with the results, whose validity they want to prove!*

But not only this inaccuracy makes it clear that the experiment was fabricated. This is also evident from the reported results.

The reported results of the experiment presented in the article “*Around-the-World Atomic Clocks: Observed Relativistic Time Gains*” [17], published in the journal “**Science**” (the peer-reviewed academic journal of the American Association for the Advancement of Science (AAAS), today with a five-year impact-factor equaled to 35.26), are:

1) The clock on the airplane, flying to the East (in the direction of rotation of the Earth), runs slower than the clock located in the U.S. Naval Observatory (Latitude: **38° 55' 16.5403"**, which is far from the North Pole, the point where the experimenters have indicated that is in the “*nonrotating space*”):

- according to the theoretical formulas presented in the article – with (-40 +/- 23 ns), and according to the clock readings – with (-59 +/- 10 ns).

2) The clock in the airplane, flying to the West (contrariwise of the direction of rotation of the Earth), runs faster than the clock located in the U.S. Naval Observatory (Latitude: **38° 55' 16.5403"**, which is not the North Pole, i.e. not in the “*nonrotating space*”):

- according to the theoretical formulas presented in the article – with (+ 275 +/- 21 ns), and according to the clock readings – with (+ 273 +/- 7 ns)

The final reported conclusion of the experimenters (and approved by the journal “Science”) is:

“These results provide an unambiguous empirical resolution of the famous clock “paradox” with macroscopic clocks.” [17].

However, some of the questions that readers of this article may ask are:

First, the *reference clocks*, as indicated, (in relation to which the experimenters measure the differences with the “*flying clocks*”), are located in the US Naval Observatory (latitude **38° 55' 16.5403"**) – which is far from the North or the South Pole where they are initially accepted to be stationary.

Secondly, as already mentioned, in the results of the special theory of relativity **there is no assertion that the time will run slower or faster depending on the direction of the motion of the inertial system!**

Thirdly, according to the special theory of relativity, time runs slower (time slows down) at a higher speed of movement. Consequently (if the special theory of relativity is true), the clock of an observer located on the equator will run permanently slower in regard to the clock of an “inertial” observer located on the North or South Pole (the intersection of the axis of rotation of the Earth with the Earth’s surface), because the linear velocity of the surface in the stationary space at the equator is approximately $R\Omega = 0.46 \text{ km/s}$ (1,656km/h), and the speed of the Earth’s surface on the poles is zero. In other words, an atomic clock in Sweden will be constantly faster than an identical atomic clock located near the Amazon River in Brazil... **and that experiment would not be necessary!**

*So, if the special theory of relativity is true, **why do not we adjust the clocks according to the latitude?** The answer may be only one:*

The “experiment Hafele-Keating” is a brilliant example of a fabricated experiment and the extent to which the “internationally recognized physics journals” are scientific!

(see the subpages of [“THE SCIENTIFIC ARGUMENTS OF THE PHYSICAL SOCIETY”](#)).

The truth is that the atomic clock will run faster in regions with a weaker intensity of the gravitational field. The technology development and the accuracy of measurement make possible tests proving the change of the electromagnetic properties of atoms when changing their location to regions with different intensities of the gravitational field. For example, many experiments confirm this fact – that the atomic clocks run faster at higher altitudes (in the mountain). This is a prediction of the general theory of relativity and, in fact, proves that the characteristics of the electromagnetic radiation emitted by the atoms change depending on the intensity of the gravitational field.

*Increasing the frequency and wavelength of the same electromagnetic radiation emitted by the same atom can be experimented on a space station, such as “the International Space Station (ISS)”. This would also show unambiguously **that the speed of light in vacuum increases in regions with a weaker gravitational field.** This will launch a new realistic concept of the physical reality of the Universe.*

3. Conclusion.

All the “scientific” explanations of the so-called “the fundamental tests of the special theory of relativity”, given by its supporters, do not meet the requirements of the science to give a real explanation about the physical world. All of them support the delusion “special theory of relativity” and are contrived in one or another sense. The presented analyses of the “fundamental tests” in this article reveal their essence.

Important: If the special theory of relativity is valid for the physical reality, the atomic clocks in Sweden, at sea level, will be constantly faster than identical atomic clocks located near the Amazon River in Brazil (near the equator at sea level) ... and all these “the fundamental tests of the special theory of relativity” would not be necessary!

Final question:

If the special theory of relativity is not the biggest blunder in physics of the 20th century – why do not we adjust the clocks according to the latitude?

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