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Z-Theory the Ultimate Paradigm Shift

By Allan Zade

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Experience without theory is blind, but theory without experience is mere intellectual play.

- Immanuel Kant

The truth is terrible

- Friedrich Nietzsche

I. The Matter of "Time"

There are two separate ways to describe nature. Those are qualitative and quantitative descriptions. Qualitative decryption shows comprehension of a thinker regarding a subject or something else put under question. In a standard way of comprehension, a thinker gives a qualitative description before quantitative one. That happens because

A qualitative description explains the point of view of a given thinker and application of the measurement device(s) that seems correct for the person. (S1)

That necessity comes from the scientific method developed a few centuries ago and required physical support of any human idea that describes nature. Therefore, every thought that comes from the human mind can be verified against physical experiments to separate correct ideas describing nature from human illusions.

That application of the measurement devices in the form of their readings before, during and after the experiment leads to the physical support of the human idea or destruction of a given concept.

There is one more aspect in the application of any measurement device.

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The way of action of a given measurement device should be clearly understood by the person before the experiment. Otherwise, readings of the device become useless for the person because that person does not comprehend physical interaction between a measurement device and physical attributes of a measuring process coming to measured values during the experiment. (S2)

Statement (S2) seems apparent until the person comes to the categories that cannot be defined.

Definition of a category coming from a thinker is an essential one to the comprehension of his/her point of view on a given category by another thinker. (S3)

As a result, in case of an undefined category, any discussion with a thinker becomes useless because the person ever tries to replace physical attributes of a given physical entity *by an illusion coming from a wrong category that roots deep in his/her mind*.

The worst situation appears when a thinker tries to comprehend interrelation (or mutual interaction) between more than one undefined categories. Such a case looks impossible, but it does exist in some areas of science which touch "dark lands of thoughts." The rest of this section explains the situation in details.

The problem comes from the definition of speed (as motion of something regarding something else) that includes references on two categories which were not correctly defined throughout the history of the humankind. Those are *Space and Time*.

'Motion, in physics, means change with time of the position or orientation of a body…

'All motions are relative to some frame of reference. Saying that a body is at rest, which means that it is not in motion, merely means that it is being described with respect to a frame of reference that is moving together with the body. For example, a body on the surface of the Earth may appear to be at rest, but that is only because the observer is also on the surface of the Earth.' (Motion. (2008). Encyclopedia Britannica)

'Reference frame, also called frame *of reference* in dynamics, means system of graduated lines *symbolically* attached to a body that serve to describe the position of points relative to the body.' (Reference frame. (2008). Encyclopedia Britannica).

Motion was understood for a long time as something that happens in some part of space.

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'Space means a boundless, three-dimensional extent in which objects and events occur and have relative position and direction.' (Space. (2008). Encyclopedia Britannica)

Therefore, all definitions mentioned above have a direct or indirect reference to (or relationship with) something called Space and Time throughout the entire history of humankind.

'Many metaphysicians have argued that neither time nor space can be *ultimately real*. Temporal and spatial predicates apply only to appearances; reality, or what is real, does not endure through time, nor is it subject to the conditions of space. The roots of this view are to be found in Plato and beyond him in the thought of the Eleatic philosophers Parmenides and Zeno, the propounder of several paradoxes about motion…

'Reference has already been made to the way in which Kant argued for an intimate connection between time and space and human sensibility: that human beings experience things as being temporally and spatially situated is to be connected with the nature of their minds, and particularly with their sensory equipment. Kant was entirely correct to describe space and time as "intuitions," by which he meant that they are peculiar sorts of particulars; he was right again to insist on the centrality in sensing of the notions of here and now, which can be indicated but not reduced to conceptual terms.' (Metaphysics. (2008). Encyclopedia Britannica)

More than that, 'Time means a measured or measurable period, a continuum that lacks spatial dimensions…

'Time appears to be more puzzling than space because it seems to flow or pass or else people seem to advance through it. But the passage or advance seems to be unintelligible. The question of how many seconds per second time flows (or one advances through it) is obviously an absurd one, for it suggests that the flow or advance comprises a rate of change with respect to something else—to a sort of hypertime. But if this hypertime itself flows, then a hyper-hypertime is required, and so on, ad infinitum.' (Time. (2008). Encyclopedia Britannica)

There is one more strange observation in "definition" of Time. 'Time means a measured or measurable period…' In other words, they try to define a category (Time) by quantitative-only description. Reference to "a continuum that lacks spatial dimensions" as well as all other physical attributes also seems suspicious. In other words,

Any physical entity that lacks any measurable physical attribute suitable for a definition of that entity supposed to be unreal because a category based on that thing comes only from the human mind instead of nature. (S4)

Statement (S4) leads to the point of view that treats so-called "Time" as a human illusion and nothing more.

What is Time?

Logical Definition: Time is a logical link in the human mind to any physical process that has observable duration.

Physical Definition: Time does not exist (and never existed) as a physical property of the Universe.

Mathematical Definition: Time means a rate of duration between any two different physical processes.

Philosophical Definition: Time is an ancient innate idea of humankind.

Common Definition: Time is a link between an indication of a clock and the duration of its own internal recurrent physical process.

What is "Now"? "Now" is a point in the Universe from where an observer (object, body, etc.) makes interaction with the surrounding Universe. (Zade Allan, 2012)

That illusion becomes heavier during technical progress of the last centuries. The problem comes from "invention" of escapement clock.

'The origin of the all-mechanical escapement clock is unknown; the first such devices may have been invented and used in monasteries to toll a bell that called the monks to prayers…

'Clock is mechanical or electrical device other than a watch for displaying time. A clock is a machine in which a device that performs regular movements in equal intervals of time is linked to a counting mechanism that records the number of movements. All clocks, of whatever form, are made on this principle.' (Clock. (2008). Encyclopedia Britannica)

There is a peculiar aspect in the definition given above. 'A clock is a device for *displaying time*.' In other words, it makes not any measurement of so-called "Time." It only displays something that has some relationship with the category of "Time" that does exist in the human mind.

The problem also comes from the scientific method that requires physical measurements of any category by a physical device instead of human perception. In other words, physical presence (existence) of any physical entity should be confirmed by a given (dedicated) measurement.

There is one more problem here. A scientist should explain step-by-step the principle of operation of any physical device used in the experiment. That is a qualitative requirement for the experiment. That requirement guarantees this. The person who conducts the experiment has a clear understanding of the physical operation of the measurement device. Any experimental result becomes useless without a proper understanding of the physical process of interaction between a physical measuring process and the measurement device. That interaction leads to the indication of the measurement device.

Unfortunately, 20th-century physics does not answer a straightforward question about physical interaction between a clock and so-called "flow of Time." However, they do understand the operation of a given clock by definition given above - "A clock is a machine in which a device that performs regular movements in equal intervals of time is linked to a counting mechanism that records the number of movements."

That definition looks weird for some extent. If that machine has two interacting devices, then *there is nothing related to so-called Time in that process.*

Moreover, "regular movements" mean a particular case of physical implementation of a "clock." In general case, those "regular movements" turns to oscillations of a specific device dedicated to producing those oscillations. That is *an oscillating device or an oscillator.*

Any oscillating device utilizes some physical process that gives pulses with equal duration. That requirement comes from *the human mind* that needs to make any given duration compatible with *a unit* duration of a given oscillating device. Stability of that physical process (of oscillations) gives stability of operation of the oscillating device. Inside or outside environmental influence on that process of oscillations appears as some error or deviation of a stable duration of the process of oscillations (in comparison with other processes). Different physical processes have different sensitivity to such influence. As a result, different physical oscillators show different precision of oscillations (in comparison with other physical processes). That precision comes from the ability of the oscillating device to generate each oscillation with the constant duration regardless of any physical influence.

Therefore, the definition given above can be rephrased the following way by the mentioned explanation of oscillation device operability.

A clock is a machine in which a counting device records the number of oscillations coming from the corresponding (local) oscillating device. (S5)

Therefore, there is not any room for so-called "Time" in the definition given by the statement (S5). As a result, "time measurement" becomes *oscillation counting by a machine* (a clock). Moreover, a process of the counting means an application of the human mind on a given measurement because, at the physical level, a physical process of oscillations has not any relationship with a counting procedure that can be understood only by a human being.

All aspects, mentioned above, push the human mind to become self-trapped by the idea of *"human perception of Time that can be physically supported by a specific measurement device called clock."*

The side-effect of that point of view leads the human mind to the idea of "strong mathematical appearance of so-called Time" because "Time" appears only as "counts and numbers" without any other physical attributes. *That is a great failure of the human mind*.

In other words, so-called "Time" reduces to a physical process with a given duration that a human being uses to make a comparison with the duration of another physical process (and nothing more).

II. The Matter Of Speed

The first section explains the core problem of comprehension of so-called "Time." This section explains some problems in notions of 'space,' 'path,' 'trajectory' and other categories related to comprehension and calculation of "speed."

As mentioned above, 'Motion, in physics, means change with time of the position or orientation of a body… ' In mathematical application, 'the magnitude of the velocity (i.e., the speed) is the time rate at which the point is moving along its path.' (Velocity. (2008). Encyclopedia Britannica)

That definition can be rephrased by the statement (S5) the following way.

The speed is a value of spatial relocation that a point makes by moving along its path in a given number of oscillations coming from a given oscillating device. (S6)

In common sense, '*a given number of oscillations coming from a given oscillating device*' gives a duration of a given physical process.

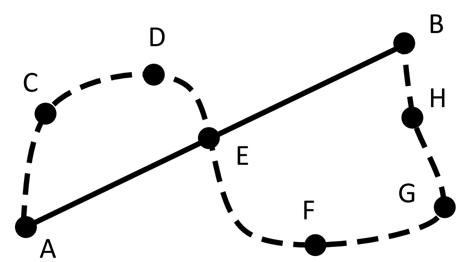

Figure 1: shows the statement (S6) graphically

Suppose an observer observes two physical bodies moving from the point 'A' to the point 'B'. The first body uses the straight path AB. The second body uses the curved path ACDEFGHB.

There are two possible observable situations in that case.

- Each process shows an individual value of a duration

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- Both processes show the same value of the duration

The first situation means this — two physical bodies which start their motion from the point 'A' simultaneously do not meet each other at the point 'B'. As a result, a given oscillating device makes some extra counts "waiting" for the body that comes to the point 'B' later than another one. In that situation, the observer comprehends two values of duration of two processes of relocation by their speeds as $V_1 = S_1/D_1$ and $V_2=S_2/D_2$, where V means value of a speed of a given body; S means spatial relocation of the given body during the experiment; D means the duration of motion of a given body by a given trajectory (path, way, etc.) between points A and B.

The second situation means a particular case when two bodies which left the point 'A' simultaneously meet each other at the point 'B'. In other words, those bodies coexist at both points simultaneously at the beginning and the end of the experiment (measurement).

In a mathematical way of describing it gives the following result.

$$D_1 = D_2 = S_1/V_1 = S_2/V_2 \quad (1)$$

or

$$S_1/S_2 = V_1/V_2 \quad (2)$$

In verbal (qualitative) definition, equation (2) means this.

Anything that has N times greater speed covers N times greater distance than another thing that has N times lesser speed in a given reference frame by a given number of oscillations of a given oscillating device (S7)

Statement (S7) leads the observer to the following idea. If two bodies (things, objects) in the described experiment coexist (to be observed simultaneously at the beginning and the end of the experiment) at the points A and B and the speed of the second body N times greater than the sped of the first body then path ACDEFGHB is N times greater than the path AB.

That idea has a direct link to some optical phenomena.

III. The Matter of Signal Propagation

'In optics, a statement that all points of a wave front of light in a vacuum or transparent medium may be regarded as new sources of wavelets that expand in every direction at a rate depending on their velocities. Proposed by the Dutch mathematician, physicist, and astronomer, Christiaan Huygens, in 1690, it is a powerful method for studying various optical phenomena.

'A surface tangent to the wavelets constitutes the new wave front and is called the envelope of the wavelets. If a medium is homogeneous and has the same properties throughout (i.e., is isotropic), permitting light to travel with the same speed regardless of its direction of propagation, the three-dimensional envelope of a point source will be spherical; otherwise, as is the case with many crystals, the envelope will be ellipsoidal in shape… An extended light source will consist of an infinite number of point sources and may be thought of as generating a plane wave front.' (Huygens' Principle. (2008). Encyclopedia Britannica)

It is apparent that the Huygens' Principle is applicable for *any signal-medium combination without any restriction*. Suppose now this; an observer has a signal transmitter. In case of signal transmission, that signal forms a perfect sphere in an isotropic physical medium by signal propagation (by the principle mentioned above).

Suppose also this. The observer has an oscillating device. Each oscillation of that device has some duration. *The signal, transmitted from the transmitter spends the same duration to cover the same distance.* Therefore, that signal forms concentric spheres at each oscillation coming from the oscillating device. The distance between them becomes equal to the distance covered by the signal in its propagation during each oscillation of the oscillating device.

In that case, the distance between the observer and any other body (object, thing, material point, etc.) can be described in a number of oscillations of the oscillating device. In other words, it forms a perfect *reference frame* that defines a location of a material point (or a physical body) regarding the distance between the point and the observer shown in the number of oscillations that a given signal spends to reach that point coming from the transmitter (the point of origin).

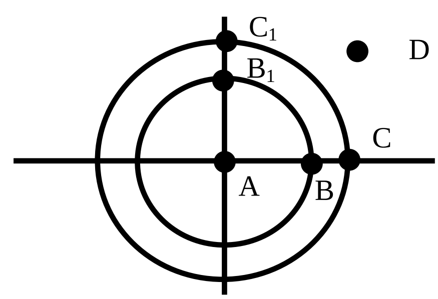

Figure 2: Shows that process schematically. The transmitter and the observer are located at the point 'A'.

The transmitter transmits a signal. The wave front of that signal keeps the form of an exact sphere all the time by Huygens' Principle mentioned above.

It reaches points B and B_1 simultaneously in M oscillations of the oscillating device. As a result of further propagation, the wavefront reaches points of C and C_1 simultaneously in N oscillations of the oscillating device counting from the beginning of the experiment (measurement).

Suppose now this. An observer likes to make a measurement of signal propagation and determine the speed of its propagation. In that case, the observer takes something suitable for such measurement (a rod, for example) puts it in any direction he likes and observes signal propagation regarding that rod. The observer notices this.

Each oscillation of the oscillating device coincides with a new location of the wavefront separated from the previous location with a constant distance. It is also possible for the observer to make a scale on the rod so as each mark of the scale coincides location of the wavefront at each oscillation of the oscillating device.

That way of action coincides with observer's point of view on something that he calls speed. In observer's understanding, any motion has direction and magnitude (speed). In case of a rod, mentioned above, that way of measurement coincides with that point of view. However, the wavefront itself makes propagation in every direction (*unlike a given physical body*).

Therefore, the observer becomes puzzled if he detects the same signal at the point B1. He may think that two bodies located at the points B and B1 have zero distance between them because the signal reaches them simultaneously. Such way of thoughts leads to absurd. The presence of the signal at another point located away from the rod requires another understanding of motion and speed that includes wavefront propagation in every direction instead of linear propagation along the rod. There is one more aspect here.

Propagation of wavefront in any medium depends on relevant physical properties of that medium which affects the speed of that propagation.
Therefore (unlike motion of physical bodies),

Observer-to-medium relative motion makes not any impact on the speed of signal-to-medium relative motion (S8)

In case of body-to-body physical interaction, both bodies do exist before and after the interaction. As a result, after the interaction, both bodies become affected by the speed that they have before interaction. For the same reason, a moving gun gives a higher speed for a shell in the same reference frame if it fires the shell toward the direction of gun's motion.

Unlike such interaction, waves have not any impact from motion of the transmitter. In other words,

There is not any signal source that changes the speed of a created signal in any medium (S9)

IV. The Wave Reference Frame (WRF)

Suppose now this. An observer likes to determine the observer-to-medium speed of relative motion by sending and reserving signals through a given medium. The observer uses an oscillating device with the corresponding counting device, a transceiver, a signal reflector, and a Distance Measurement Device (DMD or a rod in a particular case). The observer put the transceiver and the signal reflector at the opposite ends of the rod. Counting and oscillating devices hold a place at the same end of the rod with the transceiver (point 'A' in Figure 3).

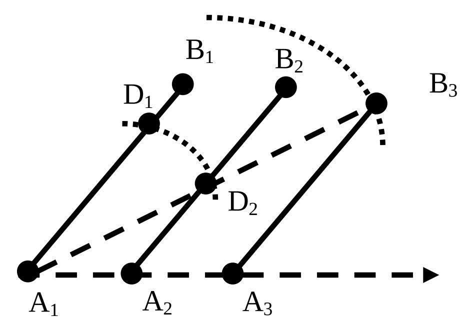

Figure 3

The experiment begins (Figure 3). The transmitter sends a signal in all directions. The counting device starts counting of oscillations coming from the oscillating device simultaneously with signal transmission. That artificial action establishes mutual relationship between duration of signal propagation and number of oscillations (N) coming from the oscillating device by a unit duration of one oscillation.

At the first moment of the experiment, the transmitter and the signal hold the same place that coincides with the point A1 in the reference frame bound to the medium that supports propagation of the signal or in Wave Reference Frame (WRF).

After M oscillations of the oscillation device, the signal reaches the point D2. The rod or the Observer-Bound Reference Frame (ORF) reaches location A_2-B_2. There is a critical aspect here.

A signal and a rod move independently in the Wave Reference Frame. A signal forms sphere as explained above. That sphere makes interaction with the rod in the one point D (at any given moment of the experiment). The observer comprehends that point as the point "of signal location" because he cannot make interaction with the same signal at another point *by definition of the experiment*.

As a result, the observer detects only some *"projection" of signal propagation on the rod*. In other words, the observer determines signal-to-rod relative motion (signal propagation in ORF) instead of signal-to-medium relative motion (signal propagation in WRF). For example, in case of static rod-to-medium location (A_1B_1), the same signal reaches point D_1 with the same number of oscillations of the oscillating device.

Therefore, a moving observer determines a lesser speed of the signal because the same signal covers distance A_2D_2 in ORF and distance $RM = A_1D_1 = A_1D_2$ in WRF. RM is the radius of the sphere formed by the signal in M oscillations of the oscillating device. That exactly matches the Huygens principle mentioned above. As a result, image distance of signal propagation in ORF (A_2D_2) becomes lesser than RM.

Moreover, the signal propagation and motion of the rod described above, happen in the same duration of M oscillations of the oscillating device. Therefore, both processes have the same duration (M oscillations).

Suppose, the speed of the signal in WFR is N times greater than the speed of the observer with his rod in the same reference frame (WRF). In that case, the signal covers N times greater distance in WRF during each oscillation of the oscillating device in comparison with relocation of the observer (and his rod, DMD) in the same reference frame (WRF). That coincides statement (S7) (see above). Therefore, $A_1D_2 = N(A_1A_2)$. In general case, that equation transforms to the following form.

$$R = NS \tag{3}$$

where R is the radius of the sphere formed by the signal wavefront in WRF in a given number of oscillations of a given oscillating device, N is the ratio of signal-to-medium and observer-to-medium speed of motion in WRF, S is spatial relocation of the observer by the same duration. In other words,

A given signal that has N times greater speed of propagation in a given medium forms a sphere with a radius that N times greater than spatial relocation of the body (observer, point, etc.) in the same medium in a given duration. *(S10)*

Statement (S10) remains correct to any duration of the experiment. Therefore, point D "slides" through the rod during the experiment. That is the point of interaction of the signal and the measurement device from the observer's point of view. However, it is only some "projection" of real signal propagation in the medium *accessible to measurement that way*.

Location of that point coincides with the point A at the beginning of the experiment. Later, the wavefront covers N times greater distance in WRF with each oscillation of the oscillating device than the distance covered by the observer in the same reference frame (WRF). From the observer's point of view, the process of wave propagation coincides with relocation (motion) of the point D along the rod. That means *physical interaction* of the wave front and his measurement device (DMD) in his reference frame (ORF).

At any moment of the experiment, the radius of the sphere formed by the wavefront is N times greater than the distance covered by the observer and his measurement device (see statement (S10)).

In other words, the observer cannot cover higher or lesser distance in a given number of oscillations of the oscillating device because he keeps a constant speed in WRF and the signal keeps a constant speed in the same reference frame (WRF) by the definition of the experiment (the observer keeps straight uniform motion).

The experiment ends at the moment when the wavefront reaches the other end of the rod. In that very moment, the rod has location A_3B_3 in WRF. That location has not any unique aspect regarding observer motion and propagation of the signal in WRF. That condition only informs the observer that *one-way signal propagation* comes to an end.

In that case, duration of one-way signal propagation becomes equal to the duration of the one-way experiment. The distance covered by the wavefront of the signal (A_1B_3) becomes N times greater than the distance (A_1A_3) covered by the observer in the same reference frame (WRF).

However, from the observer's point of view, the experiment includes the propagation of the signal along the rod (motion of the point D) that coincides his comprehension of the experiment in his reference frame (ORF).

V. Backward Propagation Of A Signal In Wave Reference Frame

After reflection at the other end of the rod, the signal starts its backward propagation. That process has not any difference in any physical law applicable to the first one-way experiment. Figure 4 shows that process graphically.

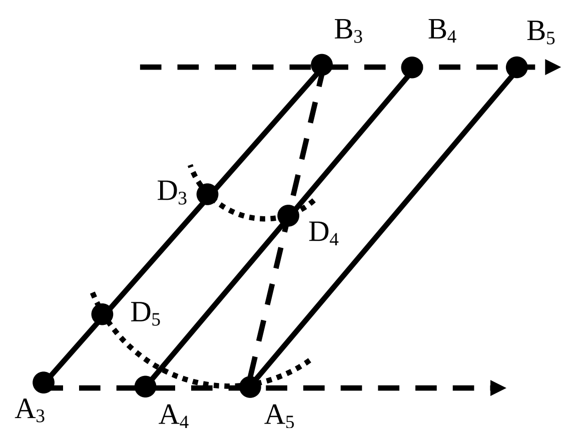

Figure 4

The signal starts propagation in a given medium from the point B_3. After some oscillations of the oscillating device, the wavefront reaches point D_4, and the rod reaches location B_4A_4. Point D again "slides" along the rod making the observer's illusion that he sees the propagation of the signal along the *rod*. However, it is only some "projection" of the physical signal propagation on the rod accessible to the observer's comprehension of the experiment.

At that very moment, the wavefront forms sphere with radius RN = B_3D_3 = B_3D_4. In observer-bound reference frame, it coincides distance B_4D_4 that is greater than the radius RN. Therefore, the observer "determines" a higher speed of signal propagation along the rod in the second one-way experiment because the signal "covers higher distance" by the same number of oscillations of the oscillating device in comparison with the first one-way experiment.

That point of view is wrong regarding the Wave Reference Frame because the signal keeps the same constant speed in that reference frame (or signal-to-medium relative motion) as well as in the first one-way experiment.

That difference comes only from observer-to-medium relative motion and changing the location of the observer regarding the point of origin of the signal (B3, the initial location of the signal transmitter or a signal reflector).

The signal comes back to the other end of the rod where the observer and the transmitter do exist. That is point A_5 (Figure 4). The wavefront forms sphere with the radius B_3A_5 (B_3D_5) at that moment. The experiment finishes because the observer detects the signal reflected from the other end of the rod (by definition of the experiment).

The second one-way experiment follows the same physical law of signal propagation and motion of the rod as mentioned above. Therefore, duration of the second one-way experiment coincides signal propagation from the point B_3 to A_5 and relocation of the rod from location A_3B_3 to A_5B_5. Duration of both processes is the same because the experiment cannot have a different duration. That happens because the observer determines the end of the experiment at the only one moment when he coexists (or detects the signal) with the reflected signal coming from the other end of the rod.

Application of statement (S10) on the second one-way experiment gives the following result.

$$B_3A_5 = N(A_3A_5) \quad (4)$$

In other words, the distance covered by the signal during the second one-way experiment (backward propagation of the signal) is N times greater that relocation of the observer with his rod (DMD) during *the same experiment*. That coincides the law of the first experiment (measurement).

In general case, the oscillating device makes M oscillations during the second one-way experiment and N ≠ M because each one-way experiment has *individual duration.*

VI. A Two-Way (or a Round-Trip) Experiment

A round-trip experiment combines two one-way experiments described above in any case when those one-way experiments conducted one after another. That is a common situation when an observer uses only one oscillating device located at the end of the rod and counts the duration of the entire experiment by that device. Figure 5 shows that case graphically. Letters and subscripts of the figure coincide with their meaning for figures three and four.

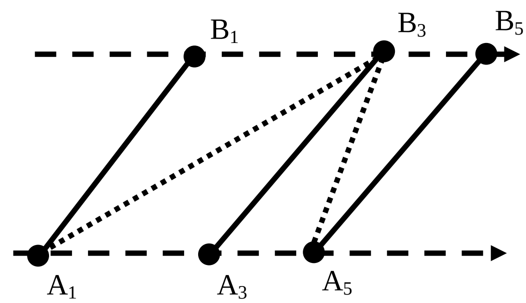

Figure 5

As a result of both experiments conducted one after another, full duration of the experiment becomes equal to the sum of the duration of each one-way experiment. Therefore,

$$D = D_F + D_B \quad (5)$$

where D is the duration of the round-trip experiment, DF is the duration of the first one-way experiment (forward propagation), D_B is the duration of the second one-way experiments (backward propagation). Moreover,

$$A_1B_3 = N(A_1A_3) \quad (6)$$

Sum of both elements of the round trip experiment A_1A_3 (equation (6)) and A_3A_5 (equation (4)) gives the full distance of the rod relocation during the experiment.

Therefore,

$$S = A_1B_3 + B_3A_5 = N(A_1A_3) + N(A_3A_5) = \\ = N(A_1A_3 + A_3A_5) = NL \quad (7)$$

where S is full distance covered by the signal in WRF determined by radiuses of its propagation in both one-way experiments, N is the ratio of signal-to-medium relative motion and observer-to-medium relative motion, L is linear relocation of the observer with all his devices (the rod, the oscillating device, etc.) during the round-trip experiment in the same reference frame (WRF).

Equation (7) shows statement (S10) again in the mathematical form applicable to a round-trip experiment. Figure 6 shows both of them graphically in general case.

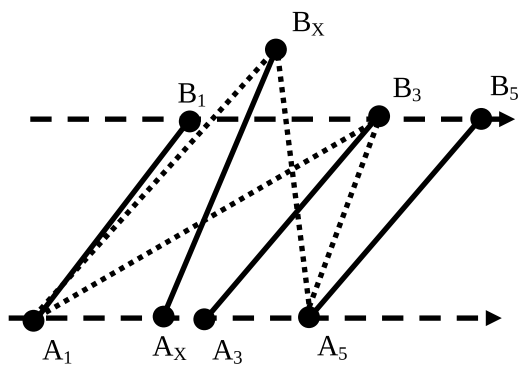

Figure 6

A casual orientation of the rod is shown in the figure by the line A_XB_X. In that casual orientation forward propagation of the signal takes radius A_1B_X. The rod covers distance A_1A_X during the experiment. Moreover, $A_1B_X = N(A_1A_X)$ as explained above.

Backward propagation of the signal takes radius B_XA_5. The rod covers distance A_XA_5 during the experiment. Moreover, $B_XA_5 = N(A_XA_5)$ as explained above. Therefore,

$$S = A_1B_X + B_XA_5 = N(A_1A_X) + N(A_XA_5) + = \\ = N(A_1A_X + A_XA_5) = NL \quad (8)$$

Equation (8) shows this.

In a general case of forward and backward propagation of a signal, that signal keeps specific duration in each one-way experiment. However, full duration of a round-trip experiment that includes both one-way experiments remains constant regardless orientation of the measurement device. (S11)

Figure 6 shows two casual orientations of the measurement device (the rod) according to statement (S11) graphically. Those are AXBX and A3B3. In both cases, each one-way experiment keeps its specific duration because of A1BX ≠ BXA5 ≠ A1B3 ≠ B3A5. However, the full duration of each round-trip experiment remains constant.

That happens because specific duration of each one-way experiment appears as a result of interaction of three aspects. Those are:

1. The speed of signal-to-medium relative motion
2. The speed of observer-to-medium relative motion
3. Orientation of the measurement device

All aspects affect both one-way experiments equally by definition of the experiment. The first and the second aspects are constants during the experiment by definition of the experiments.

The third aspect also affects both one-way experiments but compensates its impact if the observer takes both experiments together. The following figure shows that graphically in the observer-bound reference frame (ORF).

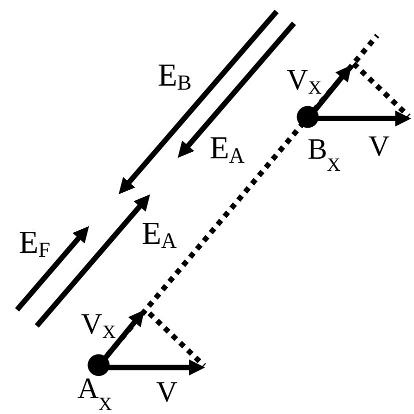

Figure 7

Figure seven shows the observer's measurement device AXBX. The device moves through the medium (observer-to-medium relative motion) by a constants velocity V.

A signal that the observer uses to make measurements has the constant speed E (signal-to-medium relative motion) by definition of the experiment.

In case of static location of the observer in a given medium, V becomes equal to zero. As a result, the signal uses the same speed E in propagation in both directions (both one-way experiments). In that case, the duration of each one-way experiment becomes equal to the duration of any other one-way experiment despite the orientation of the measurement device.

Suppose now this. The observer has some speed V relative to a given medium (or possesses straight uniform observer-to-medium relative motion). In that case, that speed affects the speed of signal propagation in the observer-bound reference frame, and the speed of the signal appears as its "projection" on the measurement device as explained above (motion of the point D in the figures three and four).

That impact has two results. The first result appears as a greater duration of each one-way experiment and a round-trip experiment. Figure 8 shows that result graphically.

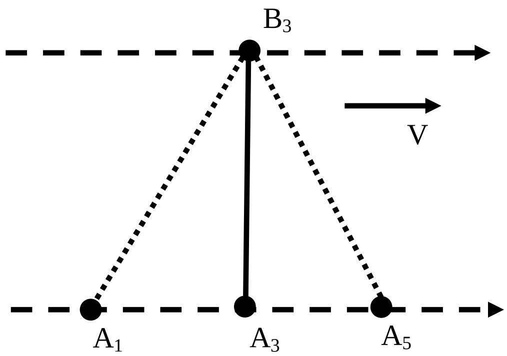

Figure 8

A signal makes interaction with both ends of the measurement device at the points A_1 and B_3 in case of observer-to-medium relative motion with speed V. In case of static location of the observer in a given medium the signal makes interaction at the points A_3 and B_3. As a result, the observer determines a lesser speed of the signal (in case of observer-to-medium relative motion).

In that case of perpendicular motion of the measurement device in a given medium (it is a particular case), duration of both one-way experiments become equal to each other. Therefore, the average speed (EA) determined by the observer that way coincides physical speed that appears as motion of the projection of the signal on the measurement device (point D, figures three and four). That happens because velocity V makes the equal impact on each one-way experiment (and extends the duration of each one-way experiment equally). As a result,

$$D_F = D_B \quad (9)$$

where DF is the duration of a one-way experiment in forward propagation of the signal, DB is the duration of a one-way experiment in backward propagation of the signal.

Suppose now this. The observer changes the orientation of the measurement device (Figure 7).

In that case, the interaction between the measurement device and the direction of its motion in a given medium appears as the projection of the velocity V on the measurement device (on the line that connects two points of measurements AX and BX). That is velocity VX shown in the figure.

Therefore, that projection of velocity affects the average speed EA of the signal the same way in both experiments.

In case of the first one-way experiment, the signal moves (forward) from the point AX to the point BX in the observer-bound reference frame (ORF). As a result, a detectable speed of the signal in the ORF becomes lesser than average (and the one-way experiment has a higher duration)

$$E_F = E_A - V_X \quad (10)$$

In case of the second one-way experiment, the signal moves (backward) from the point BX to the point AX in the observer-bound reference frame (ORF). As a result, a detectable speed of the signal in the ORF becomes higher than average (and the one-way experiment has a lesser duration)

$$E_B = E_A + V_X \quad (11)$$

In case of duration, equations 10 and 11 transform to the following form

$$D_F = D_A + D_X \quad (12)$$

$$D_B = D_A - D_X \quad (13)$$

where D_A is the average duration of the signal propagation determined in case shown in Figure 8, D_F is the duration of forward propagation of a given signal in a given medium at a given orientation of the measurement device, D_B is the duration of backward propagation of a given signal in a given medium at a given orientation of the measurement device, D_X is the duration caused by motion of the measurement device in a given medium at a given orientation of the measurement device.

Therefore, the duration of a round-trip experiment that includes the duration of each one-way experiment becomes

$$D = D_F + D_B = (D_A + D_X) + (D_A - D_X) =$$

$$D_A + D_X + D_A - D_X = 2D_A = \text{constant} \quad (14)$$

VII. A Signal Reflection Ellipsoid

The explanation given above leads to the following result shown in figure nine (see below).

Meaning of points and subscripts in figure nine coincides with their meaning for other figures mentioned above.

Figure nine shows a general case of signal propagation in a round-trip experiment *divided into two one-way experiments.*

Suppose now this. The observer likes to determine elements of signal propagation in a casual orientation of his measurement device. The easiest way to complete that task is this.

In case of orthogonal orientation of the measurement device regarding the direction of its motion in a given medium, the signal covers distance SE in forward and backward propagation ($A_1B_3 = B_3A_5 = S_E$).

In that case, spatial relocation of the observer with his devices regarding a given medium appears as relocation SV = A1A3 during forward propagation of the signal and the equal relocation A3A5 = SV during backward propagation of the signal. As mentioned

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above, a signal covers N times greater distance than the observer in any case ($S_E = NS_V$).

Suppose now this. The observer changed the orientation of the measurement device so as the new orientation coincides with the direction of motion of the observer in a given medium (direction A_1F_9).

In that case, the signal covers some distance during the round trip experiment. It starts propagation from the point A_1 (as usual) covers distance SV twice to reach the point A_5 in the WRF, goes further to the point B5 where it makes reflection from the other end of the measurement device and comes back to the point A_5 where it meets the observer again.

The signal makes interaction with the other end of the measurement device (point B_5 in the WRF) at some moment when the observer keeps some location A_X between points A_3 and A_5. Therefore, the observer covers some distance in WRF (A_XA_5) during the backward propagation of the signal in the given medium (B_5A_5).

In that case, the full path of the signal becomes

$$SR = SF + SB = (SV + SV + SX) + (SX) \quad (15)$$

where S_X is some distance in WRF between points A_5 and B_5.

From the other hand, S_R (or distance covered by the signal in a round-trip experiment) equals to $2S_E$ (as explained above). Therefore,

$$SR = SF + SB = (SV + SV + SX) + (SX) = 2SE \quad (16)$$

$$2SE = (SV + SV + SX) + (SX) = SV + SV + SX + SX = 2SV + 2SX \quad (17)$$

$$2SX = 2SE - 2SV \quad (18)$$

$$SX = SE - SV \quad (19)$$

In other words, distance S_X appears as some deviation from the average distance (S_E) covered by the signal in case of parallel orientation of the measurement device to the observer-to-medium velocity. In that case, deviation (S_X) reaches its maximal value.

That value (S_X) adds some distance to forward propagation of the signal and retracts the equal distance from the average distance (S_E) to backward propagation of the signal.

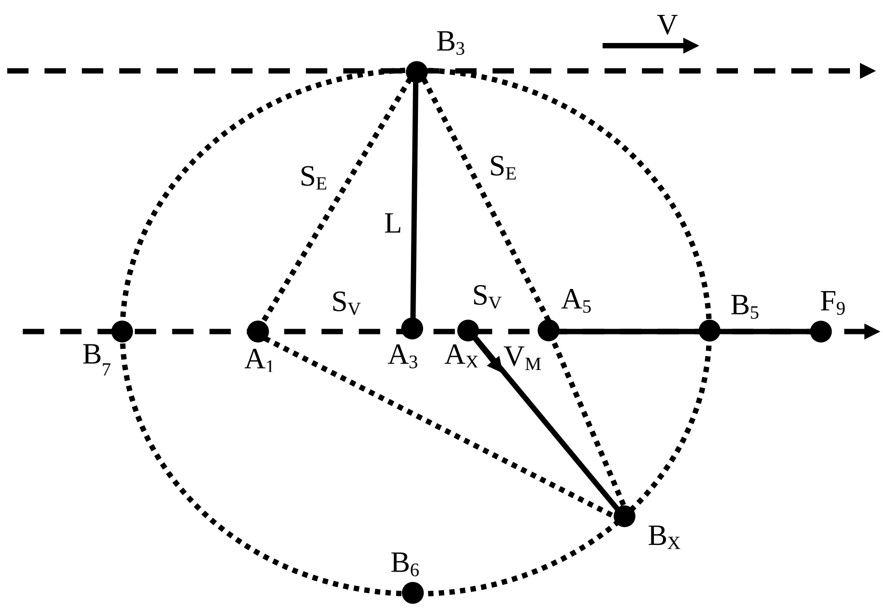

Figure 9

Therefore, as soon as the observer covers constant distance (A_1A_5) in case of straight uniform motion in WRF during a round-trip experiment, rotation of the measurement device any possible way gives an exact ellipsoid (in WRF by the location of the point of reflection of the signal, point B_X) with two focuses which coincide location of the observer at the start and the end of the experiment (points A_1 and A_5). Figure nine shows cross-section of that ellipsoid that transforms into an ellipse that way.

The ellipsoid, made by the point of signal reflection, becomes more elongated if the measurement device increases its speed in WRF and comes back to a sphere as soon as the device-to-medium speed of relative motion drops to zero. In that case, the duration of any one-way experiment in any direction becomes constant. *(S12)*

That is a Signal Reflection Ellipsoid (SRE) that transforms back to a sphere in a particular case when the speed of observer-to-medium relative motion drops to zero.

It is possible for the observer to rotate the measurement device to see the described deviation of distance between the observer's location at the start (or at the end of the measurement) and the point of signal reflection (Bx). In case of V<<E (the speed of observer-to-medium relative motion is many times lesser than the signal-to-medium speed of relative motion) that deviation becomes slightly different from sinusoid if expressed graphically. Figure ten shows a general case of one-way signal propagation in case of rotation.

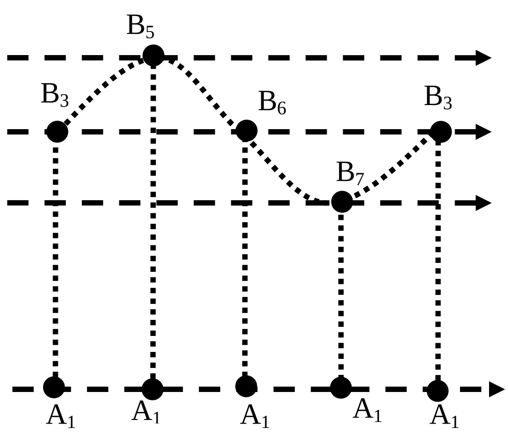

Figure 10

In that case, the observer starts rotation of the measurement device from a casual orientation regarding observer-to-medium relative motion. As soon as the device reaches orthogonal orientation (regarding the direction of device-to-medium relative motion) the wave path (appeared by the signal propagation in a given medium) reaches the distance A_1B_3 in the Wave Reference Frame.

Further rotation of the measurement device causes interaction of the signal and the other side of the measurement device at the point B5. As a result, the signal covers the greatest distance in the experiment.

Further rotation of the measurement device causes interaction of the signal and the other side of the measurement device at the point B_6. That is orthogonal orientation again. As a result, the distance A_1B_3 becomes equal to the distance A_1B_6.

Further rotation of the measurement device causes interaction of the signal and the other side of the measurement device at the point B_7. That is the shortest distance (A_1B_7) covered by the signal during the experiment.

Further rotation of the measurement device causes interaction of the signal and the other side of the measurement device at the point B_3 as soon as the device reaches the orthogonal orientation again. After that, the process starts all over again.

In case of duration measurement of the signal propagation in a one-way experiment, the observer sees the same deviation from the mean value of duration because the signal covers a variable distance in a given medium caused by rotation of the device. (S13)

In case of a two-way experiment (or a round trip experiment), Figure 10 transforms to Figure 11.

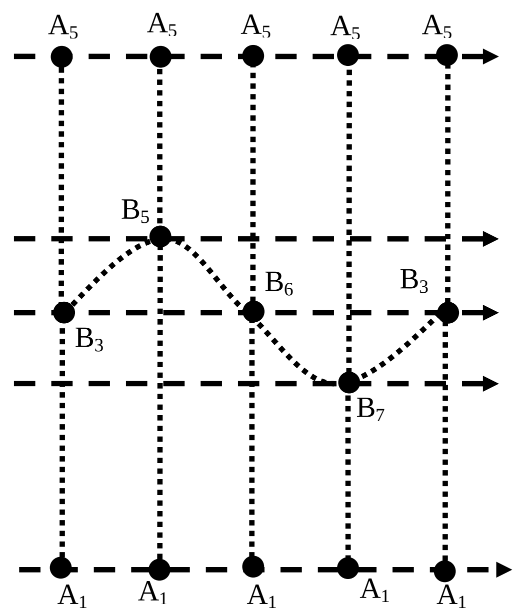

Figure 11

In case of a round-trip experiment, the reflected (or retransmitted) signal comes to the point A_5 where it meets the observer again.

As soon as the signal meets the other side of the measurement device at the point B_3, the signal covers the equal distance in its backward propagation (B_3A_5).

Further rotation of the measurement device causes interaction of the signal and the other end of the measurement device at the point B_5. That coincides with the greatest wave path in forward propagation (A_1B_5) and the shortest wave path in backward propagation (B_5A_5) of the signal in a given medium (or in a Wave Reference Frame).

Full wave path of a round-trip experiment that includes both one-way experiments remains constant as explained above. Therefore distance $A_1B_xA_5$ remains constant (see Figure 11).

VIII. The Doppler Effect

A wave has some extra parameters in comparison with an object (body). Those are frequency, wavelength, and phase. All of them are interconnected by wave propagation through a given medium and the duration of wave creation. The following figure shows those interconnected parameters in key experiments of relative and absolute motion.

Figure twelve represents wave propagation and observer-to-wave interaction in four experiments (A, B, C, and E). Wave propagation happens along the X-axis. Axis D represents oscillations of the oscillating devices used by the observers. It is a relative axis. Therefore, it does not have points but represents pulses of oscillating devices by rectangles.

All experiments involve one observer with an oscillating and a signal transmitting device (the observer A, the active observer) and two observers with oscillating devices and signal receivers (observers B and C, passive observers).

The observers keep motionless locations regarding the medium during the experiment. The experiment 'A' begins. The observer 'A' starts disturbing of the medium at the point WA4 by a disturbing device. The device makes physical interaction with a given medium and transmits disturbance to the medium at the point of the device location. The disturbed medium transmits disturbance to the next point that locates farther from the device location. That process takes some duration. As a result, disturbance generated by the disturbing device moves away from the point of disturbance origin in any direction with some constant speed that depends on the physical properties of a given medium. Axis 'A' (fig. 12) shows that process graphically in one casually taken direction.

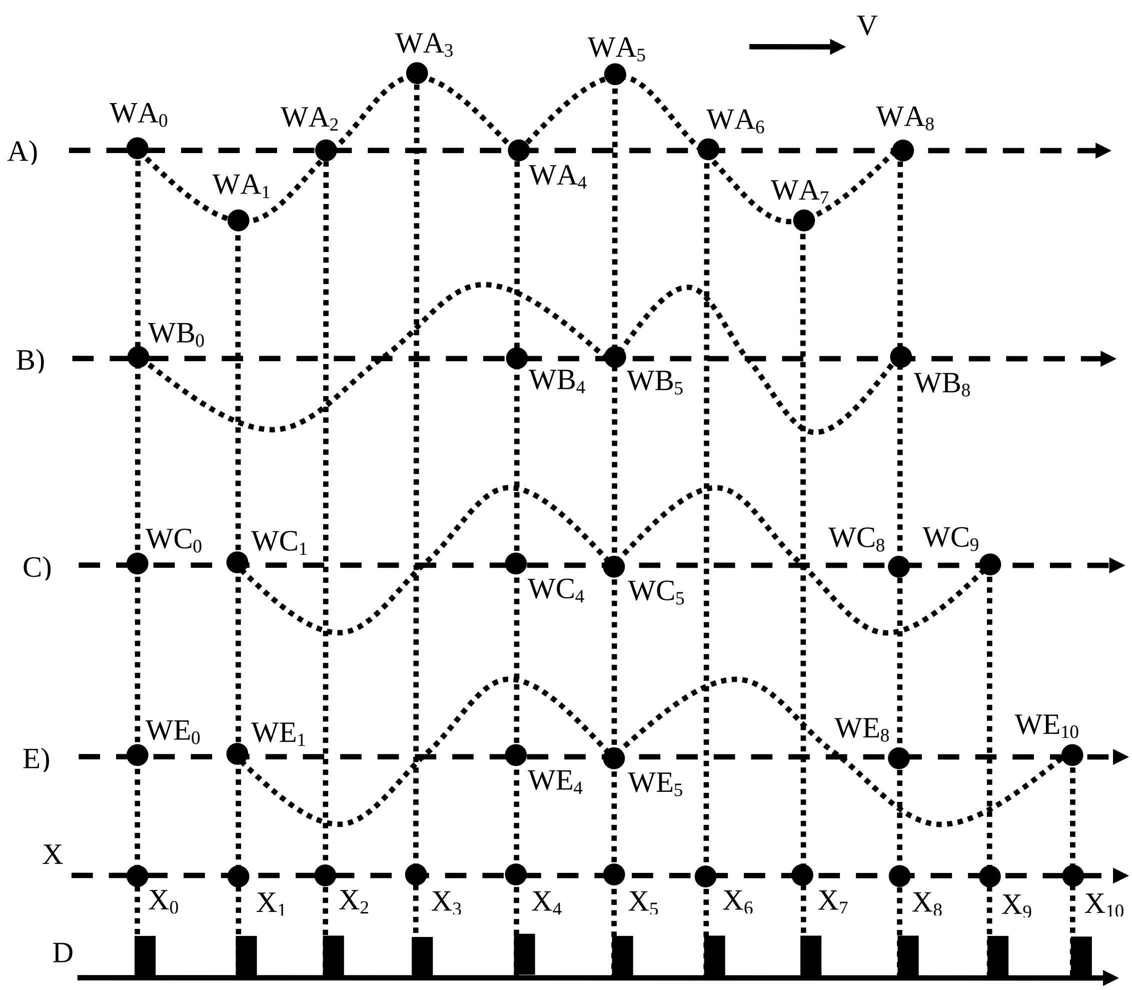

Figure 12

The oscillating device of the observer 'A' makes oscillations during the experiment. The disturbance made by the disturbing device reaches the point WA5 in one direction and the point WA3 in the opposite direction after one oscillation of the oscillating device. That coincides with equal distances ΔX covered by the disturbance in two opposite directions (X5 – X4) and (X4 – X3). In other words, the speed of the signal in a given medium becomes ΔX per an oscillation of the oscillating device.

The disturbing device of the observer 'A' makes a sinusoidal disturbance. As a result of physical interaction between the device and a given medium, the medium follows the same way of disturbance. Therefore, sinusoidal disturbance made by the disturbing device reaches points WA_6 and WA2 in two oscillations of the oscillating device.

In its further propagation, the disturbance reaches points WA0 and WA_8 in four oscillations of the oscillating device. After that, the process of disturbance propagation uses the same way for the next circle of disturbance and so on until the disturbing device keeps the medium disturbed.

According to the figure, the duration of the full circle of disturbance becomes equal to the duration of four oscillations of the oscillating device.

Observer 'B' keeps location at the point WA_8 during the experiment. The observer detects a disturbance and makes some measurements. He detects this.

The disturbance reaches the observer and passes him making physical interaction with the detecting device. The observer confirms that by detection of changing magnitude of disturbance by the same law that was used at the point of disturbance creation.

The observer 'A' makes a comparison of duration of the full circle of the disturbance made by the disturbing device, and the number of oscillations came from the oscillating device (N, four in a given case of Figure 12).

The observer 'B' makes a comparison of duration of the full circle of disturbance detected by the detecting device, and the number of oscillations came from the oscillating device of the observer 'B' (the local oscillating device). The full circle of the disturbance coincides with four oscillations of his oscillating device.

Numerical coincidence coming from both measurements leads the observers to the following conclusion.

The speed of the disturbance in a given medium remains constant during the experiment, and the speed of observer-to-medium relative motion remains constant as well. As a result, the observer-to-disturbance speed of relative motion remains constant. *(S14)*

That happens because any deviation of a given duration shows some deviation in the observer-to-disturbance speed of relative motion. In other words, equal duration of the process of disturbance for both observers coincides their motionless location regarding the medium that supports propagation of the disturbance.

The observer 'C' also agrees observers 'A' and 'B' because he has the same result of the measurement. After the first experiment, the observers conduct the second experiments (B). The observer 'A' starts motion toward the observer 'B' (to the right, see fig. 12) so as he covers the distance ΔX during one oscillation of the local oscillating device.

The disturbing device keeps its operation the same way as in the first experiment, but observers 'B' and 'C' detect something unequal the first experiment.

The disturbing device starts the circle of the disturbance at the point WB_4 and finish that circle at the point WB_5. Therefore, the medium spends some duration to transmit that disturbance from the point of creation to the point of detection as well as in the first experiment. The disturbance propagation from the point WB4 to the observer 'B' located at the point WB_8 takes four oscillations of the oscillating device of each observer.

The disturbance propagation from the point WB_5 to the observer 'B' located at the point WB_8 takes three oscillations of the oscillating device of each observer.

As a result, the beginning of the circle of disturbance reaches the observer 'B' in four oscillations of the local counting device, and the end of the same circle of disturbance reaches the observer 'B' in three oscillations. Therefore, the observer detects some reduction of the full duration of the circle of disturbance equal to the one oscillation (in a given case). As a result, the observer 'B' detects the circle of disturbance equal to three oscillations of the local oscillating device. That is an observable fact for the observer caused by his way of measurement.

However, another way of measurement gives a null result. For example, if the observer measures the speed of disturbance propagation regarding his location, he detects not any deviation from the measurement in the same way for the first experiment. That happens because the speed of disturbance in a given medium remains constant as long as the physical properties of the medium remain constant.

The observer 'C' determines a similar situation in the opposite propagation of the disturbance. In that case, the disturbance propagation from the point WB_4 to the observer 'C' located at the point WB_0 takes four oscillations of the oscillating device of each observer.

The disturbance propagation from the point WB5 to the observer 'C' located at the point WB0 takes five oscillations of the oscillating device of each observer.

As a result, the beginning of the circle of disturbance reaches the observer 'C' in four oscillations of the local counting device, and the end of the same circle of disturbance reaches the observer 'C' in five oscillations. Therefore, the observer detects some increment of the full duration of the circle of disturbance equal to the one oscillation (in a given case). As a result, the observer 'C' detects the circle of disturbance equal to five oscillations of the local oscillating device. That is an observable fact for the observer caused by his way of measurement. In other words, *The duration of signal detection becomes affected by the duration of signal propagation from different points with different distances from the location of the passive observer.* (S15)

Therefore, the detectable duration of the circle of disturbance for both observers (B and C) changes to the same extent but in the opposite way. If those observers put together each duration detected separately, they have precisely the same value (summarized value) of duration that they have in the first experiment.

That happens because the disturbance-to-medium speed of relative motion remains constant in both experiments.

After the second experiment, the observers conduct the third experiments (C). In that case, all observers keep straight uniform motion in the same direction regarding the medium so as each of them covers the distance ΔX in one oscillation of the oscillating devices.

In that experiment, the disturbing device starts the circle of the medium disturbance at the point WC4 and ends it at the point WC5 in the WRF.

The observer 'B' starts detection of the disturbance circle at the point WC_8 and ends it at the point WC_9.

Therefore, the beginning of the circle of disturbance spends four oscillations to reach the observer (in a given case), and the end of the circle of disturbance spends the equal number of oscillations (four) to reach the observer at the point WC_9.

The observer 'C' has a similar situation. The beginning of the circle of disturbance spends four oscillations to reach the observer at the point WC0 (in a given case), and the end of the circle of disturbance spends the equal number of oscillations (four) to reach the observer at the point WC1.

As a result, the duration of the disturbance propagation in a given medium becomes equal by magnitude but opposite by sign impact on the process of detection of the circle of disturbance by its duration. Therefore, the duration of Disturbance Circle Creation (DCC) made by the disturbing device (of the observer 'A') becomes equal to the duration of the Disturbance Circle Detection (DCD) (observers 'B' and 'C').

That *numerical coincidence* leads the observers to the heavy illusion that the experiment C becomes equal to the experiment 'A' because they do not detect any difference of those experiments by their *method of measurement.*

However, at the physical level, those experiments have a significant difference. A full circle of the medium disturbance made by the disturbing device (the experiment 'A') covers some distance L_A (in WRF) equal to $WA_8 – WA_4$. It is also equal to $WA_4 – WA_0$ in the opposite direction of the disturbance propagation. That distance is a physical attribute of disturbance propagation in a medium. In physics, disturbance makes propagation through a medium by waves. Therefore, a full circle of the medium disturbance made by a disturbing device becomes Physical Wave Duration (PWD) and the distance covered by that wave in WRF becomes Physical Wave Length (PWL).

In the second experiment (B), waves coming from the disturbing device have the same Physical Wave Duration (PWD) (by operation of the disturbing device) but a different Physical Wave Length (PWL). That happens because the disturbing device moves regarding the medium during the process of wave creation (points $WB_4 – WB_5$). Therefore, each element of a wave becomes created (by the disturbing device) at a different point of the medium (in the WRF) that coincides with the *physical location* of the disturbing device at a given moment. As a result, Physical Wave Length becomes variable in that experiment and dependent on the direction of motion of the disturbing device.

The disturbing device keeps the same speed in the WRF in the third experiment (C). Therefore, Physical Wave Length and Physical Wave Duration remain equal to the experiment 'B.' However, the observers do not detect that because all devices keep straight uniform motion regarding the medium.

The observer 'B' makes physical interaction with the Physical Wave Length of WB8 – WB5 shorted for ΔX because of disturbance device to medium relative motion in comparison with Physical Wave Length of the first experiment.

As a result of observer 'B' to medium relative motion, the duration of interaction of its detecting device and the Physical Wave Length leads to increasing of the duration of the measurement in comparison with the second experiment (B), and the detected duration of a disturbance circle (that the observer detects) comes back to the value observed during the first experiment (A).

In other words, that coincidence of measured duration caused by the transformation of the Physical Wave Length in a given medium (caused by motion of the disturbing device regarding that medium) and Duration Transformation at the detecting device (caused by the method of measurement).

That numerical coincidence leads to a heavy illusion of the observers that the experiment 'C' has not any difference from the experiment 'A' and the Physical Wave Length is the same in both experiments and any direction *regardless their condition of motion*.

The observers conduct one more experiment 'E' after experiment 'C.' In that experiment, the observer 'B' increases its speed and covers doubled distance in one oscillation of the oscillating devices (2ΔX, $WE10 – WE_8$).

The beginning of the disturbance circle spends four oscillations (in a given case) to reach the observer 'B' (WE_8 - WE_4) and the end the disturbance circle

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spends five oscillations to reach the observer 'B' (WE_{10} – WE_5). Therefore, the observer counts one more oscillation by its local oscillating device during physical interaction of the local detecting device and the physical wave created in the medium by the disturbing device of the observer 'A.' As a result, the observer detects the increased *duration of the observing process*.

That observation leads the observer to a heavy illusion that Physical Wave Length also increased by its relative motion regarding the observer 'A' because the observer 'C' that keeps motionless location regarding the observer 'A' detects no deviation in the duration of the observing process.

An ordinary observer usually uses a notion of frequency instead of duration in experiments with waves because a standard unit of duration is many times greater than the duration of the wave. Frequency is the inversed value of duration. Therefore, all observations and physical processes explained above become applicable to frequency *but still more accessible to explain in a notion of duration*.

The first scientist who explained measurable frequency deviations in wave propagation and moving observers was Christian Doppler.

'Doppler effect is the apparent difference between the frequency at which *sound or light waves* leave a source and that at which they reach an observer, caused by relative motion of the observer and the wave source. This phenomenon is used in astronomical measurements, in Mössbauer effect studies, and in radar and modern navigation. It was first described (1842) by Austrian physicist Christian Doppler.' (Doppler Effect. (2008). Encyclopedia Britannica)

The critical aspect of a definition given above is 'the effect caused by relative motion of the observer and the wave source.' Strictly speaking, that definition applies only to the experiment 'E' (see above) and observers A and B because they have relative motion 'of the observer and the wave source' regardless observer-to-medium, disturbance-to-medium (wave-to-medium) and source-to-medium relative motion.

In general case, the Doppler Effect transforms into a set of effects. Those are:

1. Active Doppler Effect (ADE) that makes the linear deviation of the Physical Wave Length in a given medium by source-to-medium relative motion (see experiment 'B').
2. Passive Doppler Effect (PDE) that makes frequency deviation for the observer (that changes his observer-to-medium speed of relative motion) by increasing or decreasing the duration of the observer to physical wave interaction
3. Double Doppler Effect (DDE) is a combination of Active and Passive Doppler Effects that hides physical wavelength deviation in case of zero speed of observer-to-source relative motion. Otherwise, it appears as the common Doppler Effect (see experiment 'C').

The Double Doppler Effect is responsible for the heavy illusion mentioned above that the experiment 'C' has not any difference from the experiment 'A.' That illusion led to the heavier illusion that in case of straight uniform motion of all observers involved in the experiment the idea of physical medium that supports propagation of the physical waves becomes redundant and can be frown away. In that case propagation of waves becomes explainable as their motion "by themselves" without any physical interaction with a medium.

That idea possessed huge dissemination especially in the area of Electromagnetic Radiation and light propagation through space.

That point of view shows one more big illusion explained in the following section.

IX. Z-Continuum

In physics, the presence of something can be confirmed by its physical, measurable interaction with something else. In case of measurement, something that detects the presence of something else becomes a measurement device. Something that makes physical interaction with a detecting unit of a measurement device becomes a detectable thing. Measurable Physical Interaction of detectable thing and the detecting unit becomes a measuring value.

The easiest way of measurement comprises the utilization of the same attribute in a detecting unit and in a detectable thing.

For example, the temperature of given liquid put in a glass can be measured by a thermometer that makes physical interaction with that liquid (detectable thing) by temperature (the same physical attribute). The result of that physical interaction leads to a value indicated by the thermometer. In other words,

> *Any measurement device measures a given attribute of a detectable thing by its value (S16)*

A thermometer mentioned above, has some mass, but that attribute cannot be used in measurements because it is not an attribute of measurements for a thermometer.

From the age of Newton presence of fields and their physical existence supports by force method that uses force measurement to detect and measure force attribute of a given field.

'Electric field is a region around an electric charge in which an electric force is exerted on another charge. Instead of considering the electric force as a direct interaction of two electric charges at a distance from each other, one charge is considered the source of an electric field that extends outward into the surrounding space, and the force exerted on a second

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charge in this space is considered as a direct interaction between the electric field and the second charge.' (Electric field. (2008). Encyclopedia Britannica)

That definition has reference to an electric charge. 'Electric charge is basic property of matter carried by some elementary particles. Electric charge, which can be positive or negative, occurs in discrete natural units and is neither created nor destroyed.

'Electric charges are of two general types: positive and negative. Two objects that have an excess of one type of charge exert a force of repulsion on each other when relatively close together. Two objects that have excess opposite charges, one positively charged and the other negatively charged, attract each other when relatively near.' (Electric charge. (2008). Encyclopedia Britannica)

The following Figure 13 explains electric attribute of field graphically.

The figure shows schematically two physical particles A and B separated by some distance (seen at the X-axis). Both particles have electric charge shown in the vertical axis. Zero levels (magnitude) of charge coincides with X- axis (points QA0 and QB0). A positive value of charges shown above X-axis and the negative value is shown below X-axis. Under usual circumstances, each particle has some value of charges of both signs. That case is shown in the figure by points $QA^{+}1$, $QA^{-}1$ for the particle A and $QB^{+}1$, $QB^{-}1$ for the particle B.

In Z-Theory something that makes physical interaction with something else by a given way of disturbance and supports propagation of that disturbance calls Z-Field or Z-Continuum. Those categories are interchangeable in Z-Theory.

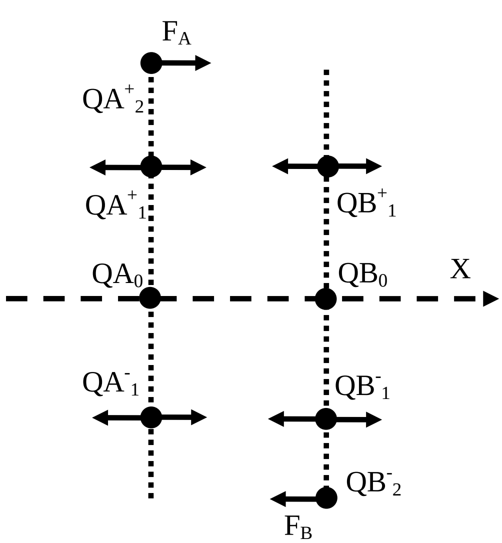

Figure 13

In case of the figure, Z-Continuum accepts disturbance caused *by the presence of the charge* and propagates that disturbance in all directions that appears for the observer as Z-Field detectable by force method of measurement (observation).

As soon as that disturbance reaches another particle, physical interaction between disturbed Z-Continuum and the particle appears as some force applied to the particle.

In case mentioned above, both particles have an equal electric charge. Therefore disturbance of both charges makes equal interaction with Z-Field. Z-Field supports propagation of that disturbance to another particle and makes physical interaction with it.

In a given case, both particles have equal value of positive and negative charges. As a result, the interaction of those charges with Z-Field (at the points of location of the particles) and Z-Field with another particle makes the same value of interaction at both locations, but they have opposite directions.

The result of that interaction appears as compensated forces (net force) applied to each particle at the point of its location.

The observer that uses force method of field detection detects nothing that way because he does not detect anything by using way of measurement. As a result, the observer concludes that both particles have not any interaction. That is incorrect because the particles show not any interaction only by a given method of measurement.

The illusion disappears as soon as both particles possess some level of uncompensated charges. Those are $QA^{+}2$ level and $QB^{-}2$ level (shown in Figure 13).

Those uncompensated charges make a disturbance in Z-Field the same way as other charges. However, they are not compensated by other charges of the particles. As a result, the interaction of Z-Field with those uncompensated charges at the points of particle locations shows some forces applied to both particles (FA and FB) and the observer becomes able to detect that situation by Force Method of Measurement (FMM) (a given method of measurement).

There is one more critical aspect of interaction explained above. That is the distance between particles. Z-Field transmits any disturbance by a given speed because of that process caused by physical interaction between points of the field. Therefore, propagation of any disturbance cannot be faster of slower than changes made by that disturbance in the Z-Field. As a result,

Propagation of any disturbance in Z-Continuum (Z-Field) takes some duration measured in Wave Reference Frame associated with that continuum (the field) (S17)

It is feasible for the observer to change some charges in some object and keep a number of charges variable continuously. In that case, the disturbance caused in Z-Field by the presence of charges also becomes variable continuously. Z-Field transmits that disturbance (as well as any other disturbance) in all directions as mentioned above. That disturbance is well known as Electromagnetic Wave. The following Figure 14 shows that process graphically.

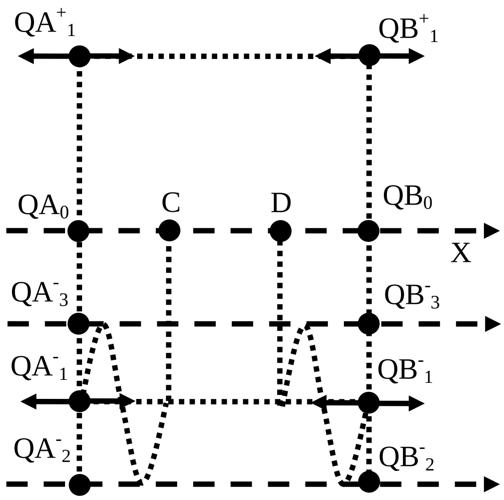

Figure 14

Letters and subscripts of Figures 13 and 14 have the same meaning.

As mentioned above, the observer makes continuous disturbance by continuous variation of a number of negative charges at point A. Therefore, a negative charge of the disturbing device becomes variable from $QA^{-}3$ to $QA^{-}2$.

Z-Field makes propagation of that disturbance as explained above. The observer B located at point B detects that disturbance by Force Method of Measurement. In other words,

> *Electromagnetic Wave appears as disturbance propagation by Z-Field caused by manipulation of negative charges at the point of disturbance origin. That is Negative EM-Wave (NEMW) (S18)*

The observer A cannot manipulate positive charges. Therefore, the creation of EM-Wave by the positive component is not feasible for the observer. That limitation comes from the method of EM wave creation. The observer uses the easiest way to make a disturbance in Z-Field by adding or retracting electrons (negatively charged particles) to the disturbing device at the point of disturbance. Positively charged particles (protons) cannot be used that way because they are trapped in the crystal structure of a disturbing device.

As a result, a constant number of positively charged particles at the point of disturbance origin (A) causes a constant value of interaction of Z-Field and the detecting device at point B. Therefore the observer B does not comprehend that interaction by *his method of measurement*.

Suppose now this. The observer 'A' makes pulses of continuous disturbance separated by some duration of no disturbance.

Figure 14 shows that case as a wave between points A and C and another wave between points D and B.

The observer B detect the first pulse by detection of NEMW at point B. The observer detects nothing after that (until the next pulse) and falls under the illusion that there is not any interaction between points A and B that way. However, that interaction does exist but becomes undetectable for the observer *by his method of measurement*.

That illusion made a massive impact on 20th-century physics by the idea that EM Waves *need not any medium for propagation*.

There is one more question here shown in the following Figure 15. Letters and subscripts of Figures 14 and 15 have the same meaning. Figure 15 shows the propagation of NEMW by interaction with Z-Field (Z-Continuum) as explained above.

However, both observers associate propagation of that wave in something that they call Space because they do not comprehend the presence of Z-Field. That space mention in the figure as Space type (A).

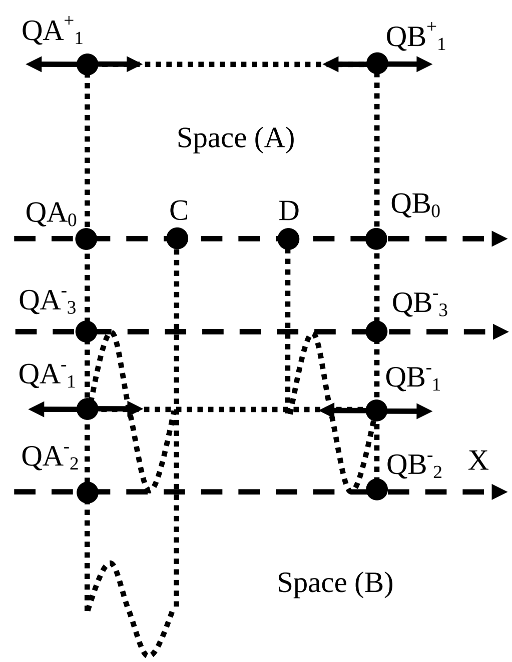

Figure 15

From their point of view, EM-wave makes propagation by itself in pure space. That situation is shown in the figure below the X-axis (Space (B)).

Here appears a question about space. Does it possible to comprehend space as something that lacks all physically measurable and detectable attributes?

That is impossible because there is not any disturbance that can propagate through such space as explained above.

Suppose now this. The observer A uses his disturbance device in the Space B, but the observer B detects nothing because there is not any disturbance (including static disturbance caused by the presence of the observer A and his device) that reaches the observer B. Therefore, the observer B becomes unable to detect anything in such situation. In other words,

"Pure Space" that has not any physical attribute that can be measured does exist only in the human mind as a pure category without any reference to a physical entity that supports propagation of disturbance (Z-Continuum) (S19)

Therefore, the notion of "pure Space" becomes redundant for the description of physical processes. Z-Field (or Z-Continuum) replaces that category in Z-Theory.

Category of Space is still applicable for Z-Theory in the form of Clear-Event Space (CE-Space) that coincides Space type (A) (Figure 15).

As far as humankind concern, the entire Universe appears for observers as CE-Space because earthbound observers can detect remotely located objects in the Universe by interaction explained above. For example, 'quasar is any of a class of rare cosmic objects of high luminosity as well as strong radio emission observed at extremely great distances… The tremendous brilliance of quasars allows them to be observed at distances of more than 10,000,000,000 light-years.' (Quasar. (2008). Encyclopedia Britannica)

X. A Wave Oscillator

Suppose now this. An observer likes to make an oscillator based on wave propagation in a given medium. The following figure shows the principle of operation of that device graphically.

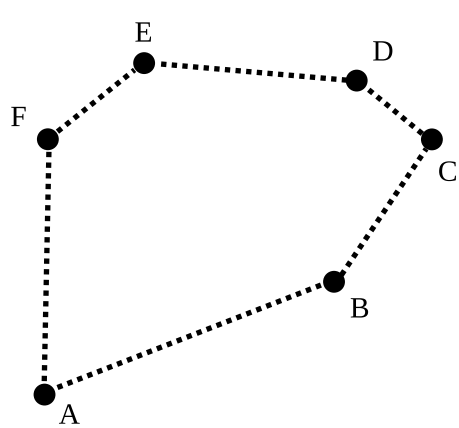

Figure 16

The observer sends a signal through a given medium from point A in a round trip by some number of other points. Each of those points makes reflection of retransmission of the signal as soon as the signal reaches a given point to the next point. As a result, the signal makes propagation in the medium by points ABCDEFA.

That propagation takes some duration, and the signal comes back to the first point (A) later than emitted.

The observer uses that duration of signal propagation to make pulses separated by that duration. The device emits a signal, makes a pulse, waits for the signal (to come back), emits the signal again and makes pulse again. As a result, the device makes pulses based on the duration (separated by the duration) of a round-trip propagation of a given signal (wave) in a given medium and becomes a Wave-Oscillator (WO).

In case of static location of WO in a given medium, the device makes pulses separated by some duration. The device works for a while, and the observer changes its orientation in a given medium. That action makes not any impact on the duration of pulses coming from the device because the distance covered by the signal in the physical medium remains constant.

At the next experiment, the observer puts the device in accelerated motion reading the medium. In that case, the duration of each pulse becomes longer than the duration of the previous pulse because the signal covers a higher distance in each measurement.

At the next experiment the observer drops the acceleration of the device to zero. As a result, the device comes to the straight uniform motion regarding the medium.

In that case, the duration of each oscillation coming from the device remains constant because each signal sent to the medium keeps a constant distance of propagation in that medium.

From the observer's point of view, the signal covers some distance in the observer-bound reference frame (ORF) that is also constant from his point of view. However, the physical wave path of the signal in the medium does not match the length of the signal path in the observer bound reference frame. As explained above, the observer sees only some "projection" of a physical signal that "slides" along each element of the device.

At the next experiment, the observer puts the moving device in a rotation. In that case, the duration of each pulse coming from the device remains constant as explained above.

In the most straightforward case, the observer uses only AB element of the device and comes to the Linear Wave Oscillator (LWO) (a particular case of Wave Oscillator) explained in detail in the section VII 'A Signal Reflection Ellipsoid.'

Those experiments lead the observer to the following conclusion:

Duration of signal propagation in a Wave Oscillator depends on the speed of signal-to-medium relative motion, the size of the oscillator (size of its elements), and the speed of device-to-medium relative motion. That duration is independent of the orientation of the device. (S20)

XI. Physical Experiments

Michelson-Morley experiment is the most famous experiment for 19th-century physics. The impact of the experiment was so huge that all 20th-century physics depends on it. However, Michelson himself made some critical mistakes in his famous article published in 1887. There are two figures and some citations from that work below.

'The transmitted ray goes along ac, is returned along ca1 and is reflected at a1, making ca1e equal 90-α, and therefore still coinciding with the first ray. It may be remarked that the rays ba1 and ca1, do not now meet exactly in the same point a1, though the difference is of the second order; this does not affect the validity of the reasoning. Let it now be required to find the difference in the two paths aba1 and aca1.'

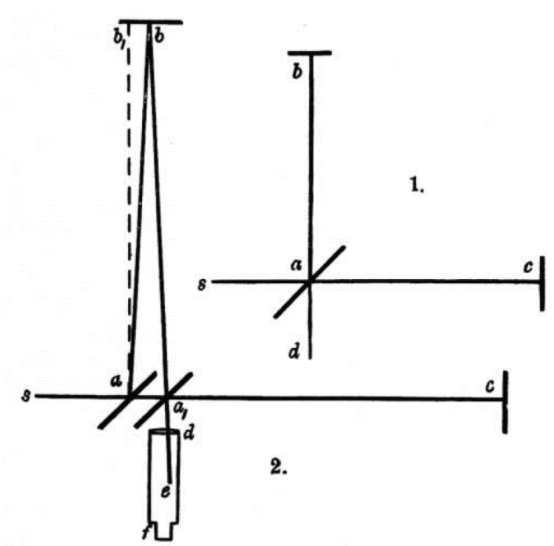

Figure 17: (Figures 1 and 2 from the Michelson article)

'The difference is therefore D(v2/V2)' (p. 336)
Therefore, from Michelson's point of view,

'The reflected rays of the interferometer in their backward propagation do not now meet exactly in the same point (MA)

That is Michelson's postulate made a priori (or before experiment). He used a very simplified way of thoughts and calculations. For example, he made all qualitative and quantitative descriptions of the experiment using one particular case instead of a general case.

Observer-to-medium relative motion is unknown for the observer before the experiment, and the measurement device has a casual orientation at the beginning of any such experiment.

As a result, Michelson's speculations contradict general case of signal propagation explained above. The central contradiction comes from the violation of the statement (S7).

As a result, Michelson's calculations lead to a different ratio (N) of observer-to-medium relative motion (V) and signal-to-medium relative motion (E) *in a different orientation of the measurement device*. That contradicts a priori statement of Michelson that the observer keeps straight uniform motion during the experiment and the signal keeps anisotropic propagation in a given medium (i.e., space, by Huygens Principle).

According to the scientific method, any a-priori statement should be confirmed *by a relevant experiment*. In a given case, the experiment destroyed a-priori point of view claimed by Michelson (with all his speculations).

Despite that fact, Michelson insists that his point of view is correct and the experiment is wrong. According to the scientific method, he should conduct a similar experiment in another signal-medium combination to check his point of view. *He never conducted any such experiment*. That experiment was conducted many decades later by a German researcher Norbert Feist.

Norbert Feist has done something that should be done by Michelson himself. Norbert conducted Michelson-Morley experiment in the acoustic environment using the acoustic signal in air. He had the following result.

'An ultrasonic range finder was mounted on a horizontally rotatable rail at fixed distance, s, to a reflector on the top of a car. The change of the distance reading, s, determined the two-way velocity of sound as a function of the car's velocity and direction. As a result of this experiment, the out and back velocity C_2 was determined to be isotropic – as in the optical case of the Michelson-Morley experiment. Within the experimental error, the velocity was found to vary as $C_2 = (C^2\text{-}V^2)/C$

'The results confirm the hypothesis that the two-way velocity of sound is isotropic in a moving system – as in the case of the optical MME (p.2)'.

According to the experiment he has the following figures for various orientation of the measurement device.

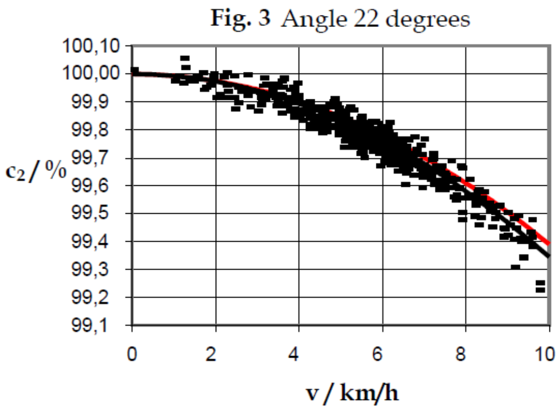

Figure 18: (Figure 3 of the original article)

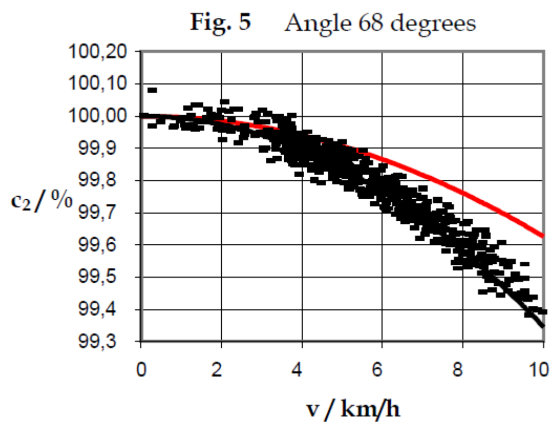

Figure 19: (Figure 5 of the original article)

Those diagrams confirm the result explained above in details that the full duration of a signal round-trip experiment in case of uniform straight motion of the observer in any medium remains constant regardless orientation of the measurement device and signal-medium combination.

Therefore, from the one hand, optical and acoustic tests destroy all speculations of Michelson. From the over hand, they confirm explanations given above by Z-Theory for any signal-medium combination.

Moreover, the explanation given above leads to the conclusion that observer-to-medium relative motion can be determined by analysis of the duration of one-way experiments with signals (see statement (S11)).

Such experiments were not possible in the 19th century and at the beginning of the 20th century for light-space combination until atomic "clocks" were invented. Such devices have enough oscillation frequency of the oscillating device and stability of those oscillations that can be used in the measurement of the duration of one-way experiments in any signal-medium combination including light-space combination.

The first published evidence of such experiments comes from Roland De Witte Experiments.

According to the source, 'In 1991 Roland De Witte carried out an experiment in Brussels in which variations in the one-way speed of RF (Radio Frequency) waves through a coaxial cable were recorded over 178 days. The data from this experiment shows that De Witte had detected absolute motion of the earth through space …'

Figure 20 shows that result graphically.

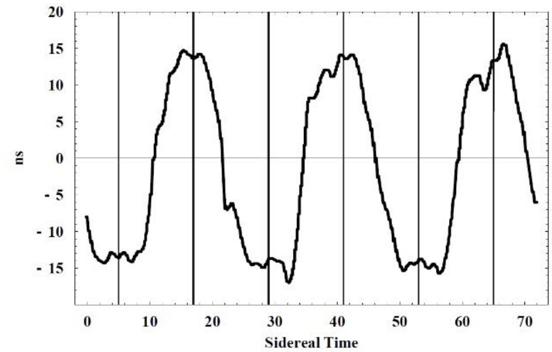

Figure 20: (Figure 6 of the original article): Variations in twice the one-way travel time, in ns, for an RF signal to travel 1.5 km through a coaxial cable between Rue du Marais and Rue de la Paille, Brussels. An offset has been used such that the average is zero. The cable has a North-South orientation, and the data is the difference of the travel times for NS and SN propagation. The sidereal time for maximum effect of _5hr and _17hr (indicated by vertical lines) agrees with the direction found by Miller. Plot shows data over 3 sidereal days and is plotted against sidereal time. De Witte recorded such data from 178 days, and confirmed that the effect tracked sidereal time, and not solar time. Miller also confirmed this sidereal time tracking. The fluctuations are evidence of turbulence in the flow

That experiment shows this. Despite any method of "atomic clock synchronization" one-way experiment of light propagation between those clocks shows constant instability of their indication. That instability shows sinusoidal deviation with a constant duration that coincides with the sidereal rotation of the planet. That is Aurora Effect explained in details by the source 6.

Strictly speaking, that deviation caused by different distance A1BX (figure 9) covered by a signal (light) in a given medium (space) by one-way measurements in a various orientation of the measurement device.

Therefore, it is not a "clock problem." It is a problem of human comprehension of the experiment. Clocks synchronized by any method keep their operation regardless of any illusion of an observer. They only count oscillations coming from the corresponding oscillating device and do nothing more (as explained above).

Deviation found by De Witte comes from various distance of signal propagation in the one-way experiment. Greater distance caused a greater duration of signal propagation that appears for the observer as a higher number of oscillations counted by the counting device of the "clock." That coincides with the law of any other motion. There is not here any room for "mystery."

There is one more experiment in that area that supports all explanations given above. That is Torr-Kolen Experiment.

That experiment was conducted in 1981. They used two "clocks" with rubidium oscillating devices.

Figure 21 (seven) from their paper published in 1984 shows their findings. The figure (see below) shows the same sinusoidal deviation as in case of De Witte Experiment. Rubidium oscillator has lesser precision than cesium one. Therefore, data from De Witte Experiment shows a better picture.

In both cases, one–way experiments show the same way of light propagation. Duration of that propagation depends on the one-way direction of measurement.

The full process of deviation repeats in one sidereal revolution of the planet. That happens because all earth-bound observers and their measurement devices move and rotate with the planet regarding the Z-Continuum (medium, i.e., space) that makes propagation of the signal (NEMW, i.e., light) possible (as explained above).

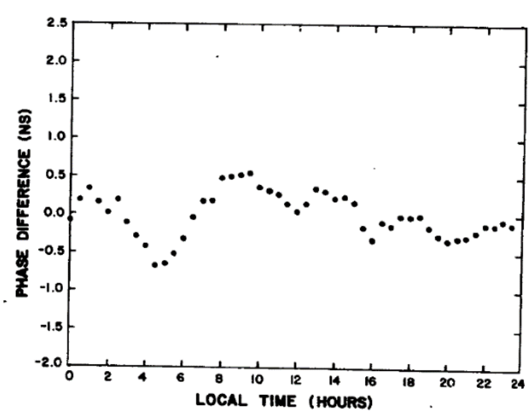

Figure 21: (Figure 7 of the original article)

The coherent sum of 23 days' data for the separated clocks for the period February to June, 1981. Summing was carried out using half hour bins. (Figure 21).

Both experiments give physical support for the Figure 10 that shows a general case of the duration of a one-way experiment in any medium by motion and rotation of the measurement device regarding the medium (that supports propagation of the signal).

XII. Zero Synchronization Remote Operation Method (ZSROM)

Suppose now this. There are two Earth-bound observers A and B who like to detect Aurora Effect in a physical experiment.

Each observer uses a local oscillating device and corresponding counting device. As soon as they turned them on the indication of each counting device becomes casual. Despite that observers start the experiment.

The observer A sends an Electromagnetic Signal (EM-Signal) to the observer B and records the number shown by the local counting device at that moment.

The observer B detects the signal and sends it back immediately. The observer also records the number shown by the local counting device at that moment and sends it to the observer A by a communication channel.

The observer A detects the signal came back from the observer B and records the number shown by the local counting device at that moment.

The following Figure 22 shows that process graphically.

The difference of indications of both counting devices in case of forward propagation of the signal becomes to B1 – A1 = M1. The difference of indications of both counting devices in case of backward propagation of the signal becomes to A2 – B1 = N1. It looks like there is nothing unusual in that experiment.

The observers wait for a while and conduct one more experiment sending and receiving the signal.

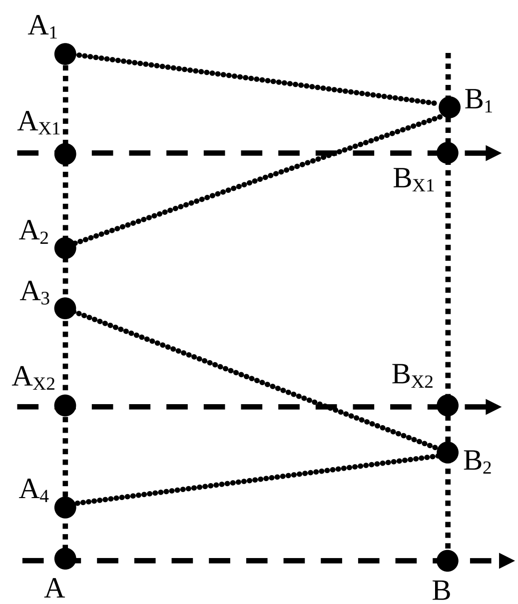

Figure 22

Rotation of the Earth between experiments causes some change in orientation of the measurement device. As a result, the signal covers a different distance (in a given medium) in the second experiment in comparison with the first one (see Figure 9).

Therefore, the second experiment shows indications of B2 – A3 = M2 and A4 – B2 = N2. Moreover, M2 becomes unequal to M1, and N2 becomes unequal to N1. Their difference (M2-M1) and (N2-N1) gives a physical value of duration shown by the

Aurora Effect. That coincides all one-way experiments with EM-Radiation including De Witte and Torr-Kolen Experiments (explained above). In other words,

Any method of counting device synchronization changes only values indicated by local counting devices and change nothing in their comparison. Therefore, Aurora Effect becomes detectable regardless of any way of synchronization including Zero Synchronization (no-synchronization) Method. *(S21)*

Statement (S21) eliminates all speculations based on the idea of "a wrong way of clock synchronization" as a primary cause of Aurora Effect.

XIII. Reference to Relativity

There is another theory born at the same place explained above. Michelson's illusion about his correct point of view and "incorrect experiment" that gives not any physical support for his ideas and calculations led to something proposed by Albert Einstein. Later, that theory became famous as the theory of Relativity. That is a postulate-based theory.

Every such theory has an embedded problem at the basic level of postulates. Postulates as statements of a person taken without proper logical step-by-step (qualitative) explanation, repeatedly lead to illusions of a higher level. In other words, illusions coming from the human mind as postulates make more illusions as a result of "thoughts" based on those postulates.

The scientific method denies such way of thoughts in any branch of science and requires experimental support for any idea in science to separate correct ideas from human illusions.

In case of Michelson's illusions and Relativity, that requirement was replaced by a postulate-based surrogate that uses mathematics as the primary source of "correct ideas." In other words, it was an attempt to replace natural human thoughts based on the scientific method by "calculations" which show some numerical coincidence with experimental results. That way leads to the suppression of qualitative explanation and its replacement by quantitative-only explanation.

As a result, the same way led to the enormous distortion in the human mind because of distortion of some basic categories, making them "applicable" to calculations. Michelson was so brave with his experiment that denied any idea that the experiment disproves his a priori point of view. In other words, the scientific method immediately disproved his point of view by an experiment. Michelson disagrees that because his point of view based on "mathematics and calculations" cannot "be ever wrong." Michelson forgot this.

Mathematics, as a product of the human mind, cannot be used to check the human mind and its thoughts because a product cannot be used to analysis of the product source in the area of philosophy *(S22)*

Einstein shared a similar point of view and got further. His famous "thought method" known as Gedankenexperiment (thought experiment) established the idea of the human mind as the thing of the first order and experiments as things of the second order. That point of view contradicts the scientific method from the beginning.

Einstein started his speculations from "a natural" postulate 'We have not defined a common "time" for A and B, for the latter cannot be defined at all unless we establish by definition that the "time" required by light to travel from A to B equals the "time" it requires to travel from B to A.' (Einstein A., 1905).

This article destroys all and every element of that illusion by the explanation given above including the category of so-called "Time." Moreover, Einstein's statement applies only to the experiment 'A' (see Figure 12). In that case, the duration of the signal propagation in the forward direction between points WA4 and WA8 becomes equal to the duration of backward propagation (in the opposite direction) from the point WA4 to the point WA0 (and from WA8 to WA4). In other words, the fundamental postulate proposed by Einstein describes a motionless location of the observer in a given medium and becomes wrong in case of a moving observer (when the speed of observer-to-medium relative motion exceeds zero in WRF).

However, Einstein insists that the postulate is correct and his mind became immediately trapped behind all limitations of that postulate. That is a common result of all postulate-based speculations (including his famous Gedankenexperiment).

Furthermore, 'Examples of this sort, together with the unsuccessful attempts to discover any motion of the earth relatively to the "light medium," suggest that the phenomena of electrodynamics as well as of mechanics possess no properties corresponding to the idea of absolute rest.' (Einstein A., 1905). Explanations given above destroy that point of view as well. Z-Continuum plays a crucial role in any interaction between any bodies in the Universe. Presence of Z-Continuum explains the full set of phenomena that Relativity refuses to explain.

Moreover, 'They suggest rather that, as has already been shown to the first order of small quantities, the same laws of electrodynamics and optics will be valid for all frames of reference for which the equations of mechanics hold good. We will raise this conjecture (the purport of which will hereafter be called the "Principle of Relativity") to the status of a postulate, and also introduce another postulate, which is only

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apparently irreconcilable with the former, namely, that light is always propagated in empty space with a definite velocity C which is independent of the state of motion of the emitting body. These two postulates suffice for the attainment of a simple and consistent theory of the electrodynamics of moving bodies based on Maxwell's theory for stationary bodies.' (Einstein A., 1905). Ironically, the speed of any disturbance in Z-Continuum remains constant in Wave Reference Frame (as explained above) and becomes E in Z-Theory (the speed of Electromagnetic disturbance propagation in WRF). An interaction of observer-to-medium relative motion in any round-trip experiment with back and forth propagation of that disturbance in WRF appears as some constant value that Einstein claims C in case of straight uniform motion of the observer regarding Z-Continuum with his measurement device.

Einstein's postulate of relativity became a grave problem for the entire theory because that postulate mistakenly takes the experiment C (Figure 12) as the experiment A (the same figure) and tries to use all physical processes equally for all observers regardless they condition of motion in WRF.

Moreover, 'We have to take into account that all our judgments in which time plays a part are always judgments of simultaneous events. If, for instance, I say, "That train arrives here at 7 o'clock," I mean something like this: "The pointing of the small hand of my watch to 7 and the arrival of the train are simultaneous events."' (Einstein A., 1905)

The technological level of 1905 offers not any device that can be used in the measurement of one-way light propagation. Such measurement devices appear later in the form of atomic "clocks." The idea of their "synchronization" immediately destroyed Einstein's illusion mentioned above (about simultaneity, see De Witte Experiment). Einstein's statement about simultaneity transforms to the following one (in case of "atomic clocks").

'The train reaches a given point at the station at some moment. The light coming from the Sun makes interaction with that train at that moment. The reflected light makes propagation by the Hugeness Principle and forms a perfect sphere in WRF. A linear propagation of that light between the train and the observer (that the observer comprehends as a light beam) comes to the observer located at some point of the station. Light uses some duration to cover a given distance between the train and the observer.

'Another ray of sunlight makes interaction with the "clock" located at some other point of the station (above the Einstein's head, at the Station tower or somewhere else). The sunlight makes interaction with the "clock." The result of the interaction is a reflection. The reflected light comes from that "clock". It makes propagation by the Hugeness Principle and forms a perfect sphere in WRF. A liner propagation of that light between the "clock" and the observer (that the observer comprehends as a light beam) comes to the observer located at some point of the station. Light uses some duration to cover a given distance between the "clock" and the observer. The observer detects another ray of light.

'The observer makes a comparison of moments of detection of both rays by his local combination of oscillating and counting devices. The local oscillating device makes some oscillations between those two events. If those number equal to zero, the observer detects "simultaneous" events. Otherwise, he detects two events without simultaneity.'

That is a critical mistake of the observer because he comprehends moments of events happened remotely by comparison with indications of the local counting device. That procedure involves some duration of signal propagation between points where physical events have a place and the point of observer location.

In other words, that is the same problem that appears as an attempt to find a moment of a remotely happened event by a locally located counting device. In that case, the duration of one-way signal propagation between points of events and the observer affects indication of the local counting device, and the device counts more oscillations of the oscillating device for a signal coming from a higher distance that separates a point of the event and the point of observer location.

As mentioned above, "Now" is a point in the Universe from where an observer (object, body) makes interaction with the surrounding Universe. (Zade A., 2012)

As a result, the notion of simultaneity falls into two separated notions of Physical simultaneity and Observable simultaneity.

Physical simultaneity appears as a physical coincidence of two or more events separated by a given distance.

Observable simultaneity of two or more events appears as a coincidence of signals of those events which reach the observer so as the counting device that the observer uses to determine a duration of events counts zero oscillations between those events of observations. (S23)

Therefore, Einstein's speculations mentioned above refers only to Observable Simultaneity. That illusion leaves no room to a category of Physical Simultaneity. That is one more grave illusion of relativity. Figure 9 shows that illusion graphically.

There are some simultaneous events shown in the figure. The first event is the emission of the signal from the point A1. That means Physical Simultaneity of signal emissions from that point and physical location of the observer at the same point of the Wave Reference Frame.

The signal spends some duration to reach the other point of measurements (the point B, as explained above). Location of that point coincides a given ellipse or ellipsoid (in space, Bx). Location of point A at that moment means physical simultaneity of two events. Those are the location of the observer at some point Ax and interaction of the signal with the other end of the measurement device Bx (a rod, in the easiest case). That happens because the rod keeps one and the only one physical location (and orientation) in the WRF at that very moment and that moment does exist physically (as a given location of the device, Ax-Bx in WRF).

Einstein's observer does not comprehend that moment because he is impossible to determine it.

The signal comes back to the observer and makes physical interaction with him at the point A5. Those are two events with Physical Simultaneity because the signal and the observer do exist (coexist) at the same point of WRF at the same moment.

However, Einstein's observer comprehends that situation as *Observable simultaneity* because he detects a signal reflected from the other part of the measurement device. In other words, such observer *does not count* the duration of backward propagation of the signal.

Michelson saw some problem in such an interpretation of the experiment. 'If it were possible to measure with sufficient accuracy the velocity of light without returning the ray to its starting point, the problem of measurement the first power of the relative velocity of the earth with respect to the ether would be solved' (Michelson, 1887). That is a correct point of view, but it refers to one-way experiments which were impossible in 1887.

However, those experiments become feasible as soon as the atomic oscillating device was invented (at the second half of the 20th century). That device has enough stability of oscillations and short duration of oscillations to make measurements of one-way experiments with EM-signals. As a result, all one-way measurements made that way give similar results and detect Aurora Effect as the most noticeable one that disproves relativity (see Figures 10, 18, 20, 21).

Further development of relativity made huge distortion in attributes of basic categories making them "compatible" with basic postulates of relativity (like length contraction and time dilation). As explained above, a physical entity that they call "Time" does not exist. Therefore, it cannot be dilated, expanded, twisted, or distorted any other way. In other words,

Something that does not exist as a physical entity cannot be physically "transformed" (S24)

The best example of that perverted method is this. 'if an observer is moving with velocity **v** relatively to an infinitely distant source of light of frequency v in such a way that the connecting line "source-observer" makes the angle ϕ with the velocity of the observer referred to a system of co-ordinates which is at rest relatively to the source of light, the frequency v' of the light perceived by the observer is given by the equation

$$\nu' = \nu \frac{1 - \cos\phi \cdot v/c}{\sqrt{1 - v^2/c^2}} \tag{20}$$

'This is Doppler's principle for any velocities whatever. When ϕ = 0 the equation assumes the perspicuous form

$$\nu' = \nu \sqrt{\frac{1 - v/c}{1 + v/c}} \tag{21}$$

(Einstein A, 1905)

That is Einstein's explanation of "Relativistic Doppler Effect." However, that explanation has some problem regarding Einstein's postulates claimed for Relativity and basic physical principles.

The first controversy comes from the definition 'with the velocity of the observer referred to a system of co-ordinates which is at rest relatively to the source of light.' In case or Relativity, all reference frames are equal to each other and physical processes should follow the same way (the same law) in any of them. However, Einstein uses a reference frame 'which is at rest relatively to the source of light'. Therefore, that reference frame is not at rest relatively to the observer because it is another reference frame!

In other words, Einstein himself becomes unable to explain the Doppler Effect in the observer-bound reference frame without a reference to another reference frame. That way contradicts postulates of Relativity and makes the theory self-contradictory. That is the worse situation for any theory because "development" of a theory destroys basic assumptions (including postulates) from where the theory starts to rise.

Moreover, as soon as all observers should use the same reference frame "which is at rest relatively to the source of light" that reference frame becomes the Preferred Reference Frame (PRF) and *destroys basic principles of Relativity again.*

That Reference Frame transforms to Wave Reference Frame (WRF) in Z-Theory because it appears as a result of PHYSICAL interaction between the physical wave source and the physical medium that supports physical propagation of disturbance made by the wave source (as explained above).

It is time to look back to Figure 14. Suppose now this. There are two observers A and B separated by some distance AB. The observer B keeps straight uniform motion regarding the observer A. The observer A emits EM-wave that covers distance AC in a given duration in the reference frame bound to the observer A.

According to Einstein's speculations, that EM-wave makes propagation between points C and D by some "magic" without and wave-medium interaction. It "magically" disappears from the first reference frame at some point C and "magically" reappears at the point D in the reference frame bound to the observer B. That wave covers some distance DB in that reference frame and reaches the observer B.

According to Einstein's speculations, that EM-Wave has an equal wave-to-observer speed of relative motion. Because "the speed of light in any reference frame is constant for all observers regardless of their condition of motion."

Therefore, the duration of physical interaction between each wave and the detecting device of the observer B coincides with the duration of each wave created by the disturbing device of observer A.

Equality of that duration for both observers leads to the absence of any physically detectable phenomena based on their relative motion. In other words frequency of created wave and frequency of detected wave should be equal to each other. That happens because duration is the inversed value of frequency and constant duration of a given physical process leads to constant frequency of the same process.

That exactly matches the principle of relativity that claims equality of all physical processes in any reference frames bound to any observer regardless of their condition of motion. However, that principle contradicts observable phenomena as explained above. Despite that contradiction (observable electromagnetic Doppler Effect destroys Einstein's speculations) Einstein incorporates that effect in his theory and claims that effect supports the proposed theory by sophisticated calculations. In other words,

Relativity treats numerical coincidence (quantitative explanation) between calculations and observable facts as unavoidable prove of the theory without proper physical (qualitative) explanation (S25)

Therefore, equations 20 and 21 contradict basic principles of Relativity (as explained above). In other words,

Relativity is not a theory. It is a predatory way of mathematical "transformations" that make some observable facts consistent with the initial set of postulates by numerical coincidence (S26)

XIV. Comparison of Z-Theory and other Theories

The following figure shows a comparison of Z-Theory and other theories graphically.

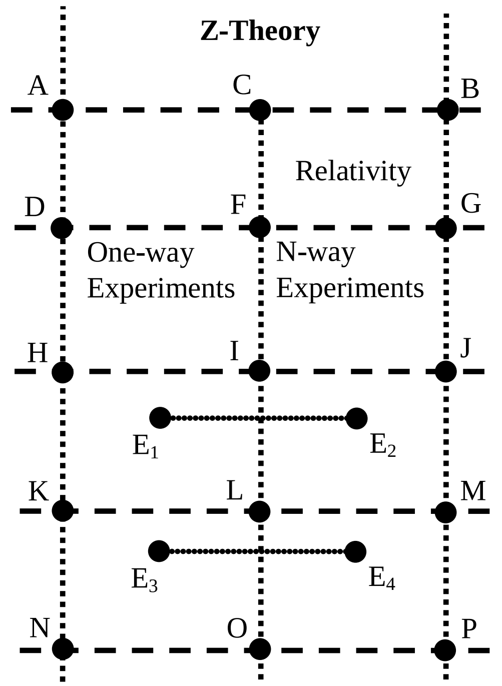

Figure 23

Figure 23 shows that Z-Theory occupied a full set of feasible experiments in any signal-medium combination between lines 'AN' and 'BP.'

That set of experiments can be divided into two groups of experiments. Those are one-way experiments and N-way experiments. A two-way experiment or a round-trip experiment becomes a particular case of N-way experiment. Z-Theory explains each N-way experiments as a proper combination of one-way experiments.

Relativity occupies the area between lines CO and BP. Moreover, it extracts only light-space experiments from their full set and tries to explain all other experiments by that combination. That is IJML area. The famous Michelson-Morley experiment falls in that area (point E2). That area shows limitations of Relativity from other areas.

Line IL shows the limitation of Relativity in one-way experiments. Relativity denies the physical existence of the HILK-area because of its postulate of equality of one-way and round-trip experiments. Therefore, all physical experiments from that area falsify (destroy) Relativity. De Witte experiment is the best example of such experiments (point E1 in the figure).

LM-line shows another limitation of Relativity. It separates experiments with light in space and other experiments with signals in any other signal-medium combination. As a result, Norbert Feist experiment shows a constant duration of a round-trip experiment in sound-air combination at a constant observer-to-medium relative motion *that Relativity cannot explain.* Moreover, Relativity insists on a different result of all such experiments. Therefore, the result of physical measurements in another signal-medium combination contradicts all "predictions" (speculations) of Relativity. That is point E4 in the figure.

There is one more hidden aspect of any theory that appears as a proposed way of creation of new categories of a given theory. That aspect is known as Ockham's razor 'also spelled Occam's razor, also called law of economy, or law of parsimony, principle stated by William of Ockham (1285–1347/49), a scholastic, that *Pluralitas* non *est ponenda* sine necessitate; "Plurality should not be posited without necessity." The principle gives precedence to simplicity; of two competing theories, the simplest explanation of an entity is to be preferred. The principle is also expressed "Entities are not to be multiplied beyond necessity."' (Ockham's razor. (2008). Encyclopedia Britannica.)

The same principle is applicable for all physical entities and all categories in the human mind which explain those entities. In other words,

Any theory tries to establish a relationship between physical entities and corresponding categories of the thinker's mind. (S27)

As a result, categories of pure Space and Time knew throughout human history become redundant in Z-Theory. In other words, Z-Theory shows the best application of Occam's razor to those categories. That way destroys many illusions of the humankind which persist in the human mind for ages.

Unfortunately, the 20th century made many illusions regardless of Ockham's razor. As a result, "new categories" proposed for explanation of physical entities became weirder than ever. For example, 'By the mid-1990s, these and other obstacles were again eroding the ranks of string theorists. But in 1995 another breakthrough reinvigorated the field. *Edward Witten* of the Institute for Advanced Study, building on contributions of many other physicists, proposed a new set of techniques that refined the approximate equations on which all work in *string theory* had so far been based. These techniques helped reveal a number of new features of *string theory*. Most dramatically, these more exact equations showed that string theory has *not six but seven extra spatial dimensions*; the more exact equations also revealed ingredients in string theory besides strings—membrane like objects of various dimensions, collectively called branes. Finally, the new techniques established that various versions of string theory developed over the preceding decades were essentially all the same. Theorists call this unification of formerly distinct string theories by a new name, M-theory, with the meaning of M being deferred until the theory is more fully understood.' (String theory. (2008). Encyclopedia Britannica)

In other words, "further development of String Theory" led to "invention" of seven extra spatial dimensions that raise the number of "dimensions" up to eleven dimensions (four dimensions proposed by Einstein and seven more).

However, proponents of M-Theory never proposed a single physical device that can be used to separate any of those "dimensions" from each other. As a result, M-Theory shows only some numerical coincidences between calculations and experimental results without proper qualitative explanation (as well as Relativity).

Unlike those theories, Z-Theory proposes a universal measurement device that makes physical measurements, supports exaltations of Z-Theory by results of those measurements and subsequently falsifies (destroys) all other theories made by the human mind earlier. That is a Signal Medium Motion Measurement Apparatus (SMA).

XV. A Signal Medium Motion Measurement Apparatus

All aspects of that apparatus at the engineering level were disclosed in the patent application (World Intellectual Property Organization (WIPO) WO 2015/040505; European Patent Office (EPO) 14729725.3; Australia 2014322789). This section explains some physical aspects that the apparatus uses.

Unlike other devices, SMA uses two apparatuses to make measurements. Each apparatus comprises an oscillating device that makes oscillations; a local counting device configured to count oscillations coming from the oscillation device, a transmitting device, and a detecting device. Detecting devices of the apparatuses configured to detect signals coming from transmitting devices of other apparatus(s). Two apparatuses are needed at least to make measurements. In other words, two apparatuses are the minimal number of them that can split a round-trip experiment into two one-way experiments. The following figure shows the operation graphically.

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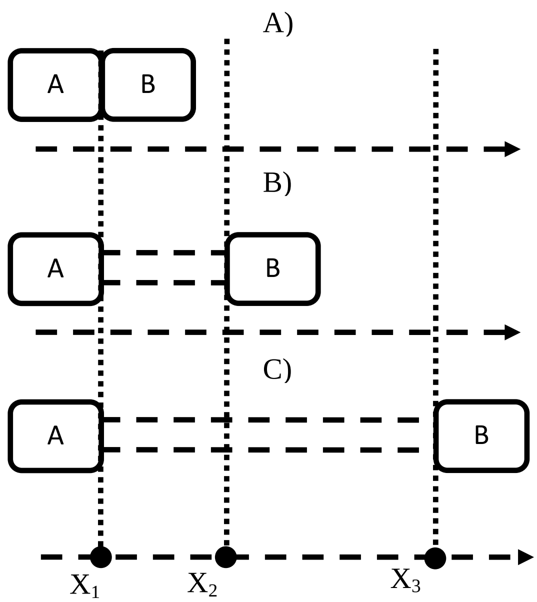

Figure 24

The primary method of SMA operation is Local Synchronization Remote Operation Method (LSROM). The notion of Synchronization applied to the apparatuses means the procedure to set up their local counting devices to a specific number. A given value of that initial number has not any importance for the proposed method of measurement.

To make that synchronization, the apparatus A sends some number to the apparatus B by the communication channel. The apparatus B sets that number on its counting device and waits for the next step of synchronization.

The apparatus A sends a signal to the apparatus B as soon as the counting device of the apparatus A reaches a value that was sent to the apparatus B at the previous step of synchronization.

The apparatus B connects the local oscillating device to the local counting device as soon as it detects the signal sent from the apparatus A. The synchronization sequence is completed now, and the apparatuses are ready to operation (measurements).

The following explanation shows the easiest situation when both oscillating devices have an equal duration of each oscillation and corresponding counting devices change counted number of oscillations on the minimal value suitable for measurements (one).

In that condition, each pulse coming from each local oscillating device to the corresponding (local) counting device increases the number stored in that counting device to a given number (one). That means this. The counting device counts pulses of the corresponding oscillating device. Each pulse means a given duration shown by the oscillating device utilizing its internal recurrent physical process of oscillation. That physical process is self-sufficient and has not any relationship (or dependence) with any category of the human mind (like “flow of Time”). The same physical process has not any relationship with any other physical processes in the Universe. As a result, termination (or creation) of any other physical process in the Universe makes not any impact on a given process of oscillations in a given oscillating device.

That independent operation of both apparatuses means independent counting of pulses by the local device of each apparatus coming from the local oscillating device.

Each pulse coming from the local oscillating device changes the number stored in the local counting device.

Because of synchronization made earlier, each counting device shows a predictable value after each counted oscillation. In other words, the counted values of both counting device remain equal to each other at any given moment. That means Physical Simultaneity (explained above) in an indication of counting devices of the apparatuses.

The apparatuses can prove that condition. To do that, the apparatus A sends a signal to the apparatus B again and waits for the answer from it. The apparatus B detects the signal and sends the number stored at the local counting device at the moment of signal detection to the apparatus A by a communication channel.

The apparatus A makes a comparison of two values. One value comes from the indication of the local counting device of the apparatus A *at the moment of signal emission*. The other value comes from apparatus B by the communication channel. That value shows the indication of the counting device of the apparatus B at the moment of signal detection. The apparatus A determines zero difference in those values because of previous synchronization and location of the apparatus B next to the apparatus A. That means this. The signal spends zero duration to cover zero distance. Another interpretation is also possible that there is not any Space (CE-Space, see above) between apparatuses in that experiment. The apparatus B is also able to emit signal toward the apparatus A at any moment and send an indication of its local counting device at the moment of signal emission to the apparatus A by the communication channel. The apparatus A makes the same comparison of both values and finds zero difference between them again. That is another experiment that uses backward propagation of a given signal. In other words, the signal shows zero duration in forward and backward propagation. That is the first case (A) shown in Figure 24. In that case, both apparatuses share location X1.

After the first experiment, the apparatus B moves slowly away from the apparatus A. Apparatuses continue measurements. Suddenly, apparatuses determine some value of signal propagation. That

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means this. The distance between them reaches enough value to be detected by signal propagation under given circumstances (speed of the signal, duration of oscillations of oscillating devices). Further motion of the apparatus B increases the duration of both measurements or forward and backward propagation of a given signal in a given medium. However, both experiments show equal values. That means zero speed of apparatus-to-medium (observer-to-medium) relative motion or insufficient precision of measurements. In case of SMA, precision becomes higher with a shorter duration of oscillating devices and a higher distance between apparatuses. Therefore, the apparatus B improves the precision of measurement the easiest way by further motion away from the apparatus A.

Suddenly, the apparatuses determine some difference in the duration of forward and backward propagation of a given signal. The minimal detectable difference equals to one oscillation of their oscillating devices. It is also apparent that difference of forward and backward duration of signal propagation rises continuously during motion of the apparatus B and becomes detectable as soon as it rises higher than the duration of one oscillation. That result means detectable motion of both apparatuses regarding the medium that supports propagation of a given signal.

The apparatus B continues its motion away from the apparatus A to improve the precision of measurements and stops at some point X2. The apparatuses keep a constant distance between them for a while making some extra measurements. All of them give X oscillations for forward propagation of the signal and Y oscillations for backward propagation. That means detectable motion of both apparatuses regarding the medium that supports propagation of a given signal. The full duration of all round-trip experiments (D) also keeps a constant value.

$$D = X + Y;\ (X \neq Y) \qquad (22)$$

The apparatus B continues its motion away from the apparatus A to prove measurements. It stops at some point X3 that has N times greater distance from the point X1 than the point X2 (in the observer-bound reference frame, ORF). Apparatuses make measurements again. All measurements increase their values N times and show

$$ND = NX + NY;\ (X \neq Y) \qquad (23)$$

That proves all experiments because a given signal spends N times greater duration to cover N times greater distance in a given medium (WRF). It also proves that the speed of signal-to-medium relative motion and the speed of apparatus-to-medium relative motion keep constant for all experiments.

Suppose now this. The apparatus B comes back to the point X2 and moves around the apparatus 'A' keeping a constant distance between apparatuses. Figure 9 shows that case. As explained above, both apparatuses determine a changing duration of each one-way experiment (X and Y values), but *the full duration (D) of round-trip experiments remains constant*. In that case, apparatuses determine a projection of their speed (a component speed) in a given medium on the line connecting them. Therefore, they detect a maximal speed of apparatus-to-medium relative motion in B5-B7 direction and zero component speed in any orthogonal directions. That is a particular case when both one-way experiments become equal to each other in measured duration (X=Y).

Moreover, each revolution of the apparatus 'B' around apparatus 'A' shows an equal deviation of the duration of each one-way measurement. In other words, the same orientation of the apparatuses (point Bx for example) in each revolution leads to the same ratio of a duration of experiments (X/Y). Therefore, each revolution shows the same curve of duration deviation (see Figure 10) in case of a constant speed of apparatus-to-medium relative motion.

As mentioned above, all explanations given in this article are applicable to any signal-medium combination without any exception.

Suppose now this. An observer uses SMA in light-space combination. The apparatuses give exact values of duration for each one-way experiment and determine the component speed of observer-to-medium relative motion and the speed of signal-to-medium relative motion by the duration of experiments and the distance that separates apparatuses. Information about distance comes from a Distance Measurement Device (DMD) that determines a given distance between apparatuses in the observer-bound reference frame. However, the full duration of both one-way experiments (a round-trip experiment) remains constant. That is an application of SMA to all Michelson-Morley set of experiments.

At the same time, each one-way experiment means the application of SMA to all De Witte set of experiments (including Torr-Kolen experiment).

All of them show deviation in the duration of signal propagation only in one-way experiments and constant duration of round-trip experiments.

In case of sound-medium application, SMA shows the same way of signal propagation. That means the application of SMA to all Norbert Feist set of experiments. They can be conducted in any mechanical signal-medium combination (in gases of liquids). SMA confirms the result shown by Norbert Feist. Moreover, SMA determines a component speed of observer-to-medium relative motion in each measurement (that Norbert's device never does). The apparatuses determine two critical values of apparatus-to-medium relative motion and signal-to-medium relative motion in any signal-medium combination the easiest way:

$$VF = L/DF \quad (24)$$

$$VB = L/DB \quad (25)$$

$$E = (VF + VB)/2 \quad (26)$$

$$V = (VF - VB)/2 \quad (27)$$

Where L is the distance between apparatuses in observer-bound reference frame (ORF); DF is the duration of forward propagation of the signal between apparatuses; DB is the duration of backward propagation of the signal between apparatuses; VF is the speed of forward propagation of the signal in the ORF; VB is the speed of backward propagation of the signal in the ORF; E is the speed of the signal-to-medium relative motion; V is the speed of the apparatus-to-medium relative motion. (Zade Allan, 2016) The explained way of measurement needs not any calibration of the apparatuses before experiments or any information about the physical properties of the medium or a signal.

Strictly speaking, SMA exceeds limitations of all measurement devices invented ever before and becomes a universal measurement device with the highest capability of measurements.

XVI. Discussion and Conclusion

One can ask an easy question now. What is Z-Theory? Strictly speaking, Z-Theory works with and transforms fundamental categories of the human mind applying the scientific method to all possible observations and experiments without any exception or postulate.

Therefore, it is so vast that it is better to understand the theory by application of the theory in a given area.

Other theories have significant limitations at the basic level. Unfortunately, those fundamental limitations lead to the inability of theory to work with new pieces of evidence and experimental results obtained another way that was impossible (or look impossible) at the time of creation of a theory.

Many thinkers comprehend their mental inability to think another way as physical impossibility of physical existence of a physical entity or process. In other words, they deny the fundamental law of the scientific method that requires priority of experiments before thoughts.

Einstein denied that request and used his famous Gedankenexperiment or "thought experiment" as the source of "unavoidable prove" of his speculations. That is the wrong way for science.

The problem of that way is his. A thought experiment includes only known categories of the human mind and their attributes and never gives any category that contradicts basic categories of the thinker's mind.

The most straightforward example of that aspect is this. Einstein used some extra attributes for the category of so-called "Time" without a proper definition of that category. Other thinkers do the same mistake many times trying to comprehend a given category without any definition.

Z-Theory defines that category and destroys it because a pure category without any attribute has not any corresponding physical entity and its physical attributes (as explained above).

Einstein's theory has one more embedded problem. That is a postulate-based theory. As a result, anything that stays beyond postulates of a given theory destroys the theory wholly and immediately.

For example, Michelson-Morley experiment falsified (destroyed) all their a priori speculations. First observable EM-Doppler Effect came from early radars (mid 40's of the 20th century) falsifies Relativity (as explained above).

Torr-Kolen and De Witte experiments falsified Relativity in the second half of the 20th century. Norbert Feist conducted acoustic Michelson-Morley Experiment and falsified relativity in the early years of 21st century. Z-Theory explained illusions of Relativity and proposed a unique measurement device (SMA) with a capability of measurements of one-way and round-trip (two-ways) experiments in the 21st century.

In other words, Relativity cannot be used as a credible scientific theory any longer.

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