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Contents

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On New Space-Time Theory (Part I)

Hutu*

Library, Yongzhou Vocational-technical College, China

***Corresponding author:** Hutu, Library, Yongzhou Vocational-technical College, Hunan Yongzhou 425100, China, Email: llsfwcg@163.com

Thesis

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Abstract

1. Amend the two postulates of the special relativity. 2. Set "the measurement is founded to change the object by destroying the original quantum coherence between the object and its environment" as *the third postulate*. 3. From the third postulate (new added postulate) educe: the concept of the reference system's referenced weight and perhaps the reference system's space is something around the referenced weight; time coordinate should be something as space coordinate there is not the problem to have to synchronize the clocks of the two reference systems before simultaneous time measurement; the essence of Heisenberg Uncertainty Principle; the "actual length" of the same measurement unit in different case is different; it is the reference system's taking measurement instead of the ether or the object's motion that changes the being measured object; two reference systems (e.g. Σ and Σa and their relative motion may be uniform or not) taking simultaneously measure of the same quantity of the same object their measurement will disturb each other and "the numerical values before Σ's unit" ≠ "the numerical values before Σa's unit" (only when the relative motion speed $v \equiv 0$ or uniform relative speed $v=0$ can the sign ≠ just turn into =); even in uniform relative motion Σ and Σa still are different for the relative motion and they may have different referenced weight, in taking simultaneously measure of the same speed of relative motion the speed numerical values of Σa is v while of Σ is va_{11}/a_{44}. 4. From the three postulates express the relation between the numerical values of the two reference systems taking simultaneous measurement of the same speed by matrix and the same small moving particle's mass by the element of the matrix; determine the speed of the photon which come from "in motion" light source by the photon's speed when light source "in stationary" and the reference systems' coordinate relation; determine two reference systems' coordinates relation when reduced the case educe generally there is not the invariant interval, re-reduced the case and re-re-reduced the case then educe the essence of "in motion" time dilate or contract meanwhile space contract or dilate in all directions, moving microparticle's time to dilate and space to contract in all directions, superluminal photonic tunneling experiment, quasar's super-luminal expansion and fine structure constant's lessening, took Michelson-Morley experiment with the light from the sun or quasars or high-speed (close to C) moving micro-particle all obtained zero result, some are for the first time be put forward here never be put forward by any man before.

Keywords: Simultaneous measurements interactional impact; Referenced weight; Go beyond light; Light speed can be changed, "in motion" time dilate or contract space contract or dilate in all directions

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Introduction

From the Special Relativity people hold the opinion "the laws of physics apply in all inertial reference systems, no inertial reference system is special", "no signal can be transmitted by any means whatsoever, in free space or in a material medium, at a speed faster than the speed of light C". However, 1965's discovery 3K background radiation left over from the "big bang" (Nobel prize) [1] and the farther discovery of the blackbody form and anisotropy of the cosmic microwave background radiation (Nobel prize) [2] show us it seems that the reference system of the 3K background radiation left over from the "big bang" should be a special reference system; since 1970 as many as hundred quasars' apparent superluminal expansions observed in astrophysics [3-4]; since 1993 reports on superluminal photonic tunneling experiments [5-8]; they all set the Special Relativity on trial.

In the past years a number of studious persons had made efforts to amend the special relativity more perfect. Among them such as: In 1949 Robertson proposed a more general transformation [9]. In 1963 Edwards replaced "the universal speed of light (one-way speed of light)" with the "two-way average speed of light" found his "generalized Lorentz transformation" [10]. In 1970 Winnie started from his three postulates (the principle of average light speed over a closed path, the principle of the same space interval and the same time interval, the principle of linearity) found his "ε-Lorentz transformation" [11]. In 1977 Mansouri and Sexl proposed another more general transformation [12]. After that time, many papers on this topic, such as Bertotti [13], Tan Shu-Sheng [14,15], MacArthur [16], Haugan and Will [17], Abolghasem, Khajehpour and Mansouri [18], Riis et al. [19,20], Bay and White [21], Gabriel and Haugan [22], Krisher, et al. [23], and Will [24] were published. Also there are other form of space-time theory continue to use the invariant interval [25], still other form of generalized Lorentz transformation not educed from basic postulates [26]. But all of them are far from to harmonize Einstein relativity theory and the recent progress in quantum mechanics. As Nobel prize winner Britain physical scientist P. A. M. Dirac said: (to harmonize relativity theory and quantum mechanics) is the main problem of physics in the recent 40-years. A great deal of efforts had made for it, we still cannot find out a way to solve the problem [27].

However, since 1998 many new physics experiments about quantum theory were performed and analyzed at European laboratory for particle physics (CERN). These new experiments associate with John C. Mather and George F. Smoot's discovery of the blackbody form and anisotropy of the cosmic microwave background radiation have laid the foundation to harmonize Einstein relativity theory and quantum mechanics. This paper (book? not also been composed with paper? so we would say paper, the same below) appears: In the light of John C. Mather and George F. Smoot's discovery of the blackbody form and anisotropy of the cosmic microwave background radiation we amend "the principle of relativity", in the light of the reasonable part in all the studious person's efforts had made to amend the special relativity we amend "the universal speed of light", in the light of the progress in quantum theory since 1998 we set an new added postulate, reasoning from the three postulates (two amended postulates and a new added postulate) with mathematics as Einstein in the special relativity, we can reduce entirely new conclusion.

Next will be expressed by four steps.

The First Step: Set New Principle of Relativity, New Postulate of Light Speed, New Added Postulate

Set New Principle of Relativity

The first postulate of Einstein special relativity i.e. the principle of relativity: "The laws of physics apply in all inertial reference systems" [28,29]. It can be checked even with the event of everyday life. It makes people firmly believe "no inertial reference system is special, any two reference systems in uniform relative motion are identical for the laws of physics". It seems to be absolutely right.

However, John C. Mather and George F. Smoot's discovery of the blackbody form and anisotropy of the cosmic microwave background radiation (2006 Nobel prize) distinctly tell us: "Two reference systems in uniform relative motion are different". Therefore, we have no choice but to amend the principle of relativity to new principle of relativity: "The laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different" (the different is the data of the two reference systems taking simultaneous measurement of the same physical quantity of the same body are different, please see later in 2.2 and 2.4, while the identical is their using his own measurement data of the physical quantities to build laws of physics the two reference systems are identical). Two reference systems in uniform relative motion are different, in different reference system taking measure of the anisotropy of the 3K background radiation's radiation temperature is different, being in accord with John C. Mather and George F. Smoot's discovery. Although as formerly theory when the reference system's speed relative to the 3K background radiation field is v, because of Doppler effect, this reference system's measurement data of the background radiation temperature will be $T = [1-(v/C)^2]^{1/2} / [1-(v/C)cos\theta]$ [30]. Only in the 3K background radiation field reference system v=0, the radiation temperature's anisotropy disappears. However, does this mean that we can take the 3K background radiation field reference system v=0 as an absolute rest system in violation of relativity? Of course not! Because the movement still must be one relative to the other.

Set New Postulate of Light Speed

The second postulate of Einstein special relativity i.e. the universal speed of light: "The speed of light in vacuum is the same for all inertial observers, regardless of the motion of the source, the observer, or any assumed of propagation" [28,29]. The speed is the same regardless of the motion of the source or the observer etc is contrary to the common practice. Many studious persons have proposed many amended means before [9,10]. This paper different from Einstein, also different from any persons had made before, we fix the light source on to a reference system. Because "the average speed measured over a closed path is constant C" is a conclusion on a large numbers of experiments [31], and is the reasonable part in all the studious person's efforts had made to amend the special relativity more perfect, we amend the universal speed of light to new postulate of light speed: "The average speed of any light ray from a stationary light source measured over a closed path in vacuum is always constant C≈3×108 ms-1. Our amendment is either obeying with the result of the experiments or able to give the light speed more freedom: "the average over a closed path is constant C" allows the local speed of light over each short line segment component which built the closed path may not be C. The "light ray from a stationary light source" and cast off "regardless of the motion of the source, the observer, or any assumed of propagation" set our heart at rest. Our light source is fixed in the reference system, "the light ray come from the source" will be more clear, more unassailable.

Here new postulate of light speed's "the average speed over a closed path is constant C" while the local speed of light over each short line segment component which build the closed path may not be C, seems to be similar as new principle of relativity's "using his own measurement data of the physical quantities to build laws of physics the two reference systems in uniform relative motion are identical" while the data of measurement of the two reference systems taking simultaneous measurement of the same physical quantity of the same body may not identical.

Set New Added Postulate

The new physics experiments were performed and analyzed at CERN since 1998 relating this paper are: 1)Direct test of wave-particle duality (complementarity) by a "which-way" experiment in an atom interferometer [32,33]. 2) Einstein-Podolsky-Rosen (EPR) experiments were performed in two-photon entangled state to show the violation of Bell inequality under strict Einstein locality conditions [34] or to show [35,36] the quantum correlation over long distance (>10km). Also an EPR experiment was achieved at CERN to test the non-separability of entangled neutral-kaon wave function [37]. 3) First direct observation of time-reversal non-invariance in the neutral-kaon system [38,39]. The experiments 1) and 2) are directly related to reveals the essence of the measurement which can be summarized as three propositions: a) The measurement is founded to change the state of the object. b) The measurement is also quantum in essence. The quantum correlation (i.e. entanglement) between the measurement apparatus (with its reference system) and the object (with its environment) is founded to destroy the quantum correlation (quantum coherence) originally existing in the object and its environment. c) There is not any information (experimental data) existed before the measurement is taken. Now, the "measurement is founded to change the object by destroying the original quantum coherence between the object and object's environment" is already general knowledge in physics circles [40]. So, this paper set it as one of the basic postulates: the third postulate (new added postulate after the two amended postulates of the Einstein special relativity).

It must be pointed out that: 1) The "measurement is founded to change" in the third postulate is on both sides. Not only the being measured object been changed by the reference system's taking measurement, but the reference system in taking measurement also been changed by the being measured object. Because it is the quantum correlation (i.e. entanglement) between the measurement apparatus (with its reference system) and the object (with its environment) been founded that destroies the quantum correlation (quantum coherence) originally existing between the object and its environment, of course it also destroies the quantum correlation (quantum coherence) originally (before the measurement is taken) existing between the reference system and the reference system's measurement apparatus. 2)If two reference systems (for example Σ and Σa) simultaneously take measure of the same object, because of the third postulate, the simultaneous measurements of Σ and Σa will disturb each other, leading that both the measurement data of Σ and of Σa contain the interactional impact of simultaneous measurement come one from the other (more precisely the interactional impact is among Σ and Σa and the being measured object three sides come one from the other instead of only between Σ and Σa two sides). 3)If many reference systems (for example Σ, Σa, Σb, Σc et al) joining in simultaneously taking measure of the same object, each reference system's measurement data will contain all of the interactional impact come from all of the other reference systems' simultaneous measurement, it is very complex. Of course the first simple case is only one reference system (for example Σ) in measuring, the interactional impact is only between Σ and the being measured object. The second simple case is only two reference systems (for example Σ and Σa) in simultaneously measuring, only two simultaneous measurements of Σ and Σa disturb each other ——or perhaps there are other reference system Σb, Σc et al while Σb, Σc et al do not join to measure with Σ and Σa, or there are Σb, Σc et al joining in simultaneous measurement with Σ and Σa while Σb, Σc et al are far (>>10km) off the place so that the interactional impact of simultaneous measurement from Σb, Σc et al are too weak to be neglected. 4)If two (or more) reference systems are not simultaneously taking measure of, the joining measurement of new reference system (or in simultaneous measurement reference system's stopping measurement) will change the reference system(s) being in taking measurement and the being measured object by destroying the original quantum coherence between the reference system(s) and the being measured object.

To express simply, in the following Σ and Σ_a will be always in this case: Σ is moving along the positive direction of the x-axis of itself relative to the Σa, the Σ's moving speed measured by Σa is constant v (of course the v is not limited i.e. it may be $v \to 0$ or $> C$ or $\gg C$), both the x-axis of Σ and the x_a-axis of Σ_a are on the same horizontal line and the positive directions are from left to right, both the y-axis of Σ and the y_a-axis of Σ_a are horizontal lines and the positive directions are from the book point to the reader, both the z-axis of Σ and the z_a-axis of Σa are vertical line and the positive directions are from below to above.

The Second Step: See New Things Certainly Come

See New Things Certainly Come from New Postulate of Light Speed

Considering Σ and Σ_a are simultaneously measuring the same a horizontal photon from the light source fixed at the Σ's origin, we fix a glass plate on to the Σ's x-axis to reflect the photon come from the Σ's origin back to the Σ's origin. How long time does it take that a photon to make this trip? The light source is in stationary relative to the Σ and the glass plate on to the Σ's x-axis is also in stationary relative to the Σ so the light source's mirror image is also in stationary relative to the Σ. Because the light ray pass to and fro through the same path on the Σ's x-axis is a special case over a closed path, as new postulate of light speed, in Σ the average speed of the light ray should be the constant C. Using the absolute value to list the time equation in Σ is $x/C_{-x}+x/C_x = 2x/C$ (assume the C_x is a constant and the C_{-x} may be another constant), Reduced the x it becomes $1/C_{-x}+1/C_x = 2/C$. While in mathematics it always is $(C_{-x}^{1/2} - C_x^{1/2})^2 \geq 0$ combine it with $1/C_{-x}+1/C_x = 2/C$ we get $(C_{-x}^{1/2} \cdot C_x^{1/2}) \geq C$ bring into $1/C_{-x}+ 1/C_x = 2/C$ we can get $(C_{-x}+C_x) \geq 2C$. It tells us: at least C_{-x} or C_x is higher than C, then we can guess: if nobody nearby Σ and Σ_a, it must be that the C_{-x} and C_x just are $C_{-x} \geq C$ and $C_x \leq C$, in mathematics if and only if $C_{-x}=C_x$ can we get they are $C_{-x}=C_x=C$. Of course when Σ and Σ_a are simultaneously measuring the same a horizontal photon from the light source fixed at the Σa's origin the Σa's measurement data of light speed must be $C_{-ax} \leq C$ and $C_{ax} \geq C$ (just opposite to $C_{-x} \geq C$ and $C_x \leq C$). While the $C_{-x} \geq C$ (or $C_{ax} \geq C$) breaks "C is the maximal and unsurpassable speed".

Of course in $1/C_{-x}+1/C_x=2/C$ the two speed of light C_{-x} and C_x must be: the more the one, the small the other. For example C_{-x} at maximal is $C_{-x}\to\infty$, and then the C_x must be at lowest $C_x\to C/_2$. i.e. when light source is “in stationary” the photon’s speed will always between $(C/2, \infty)$.

See New Things Certainly Come from New Added Postulate

In 2.1 above, in Σ and Σ_a’s measuring the same a horizontal photon from the light source fixed at the Σ’s origin when no other body nearby, the Σ’s measurement data of the horizontal photon’s speed along the positive direction of the x-axis would be $C_x \leq C$ and along the opposite direction be $C_{-x} \geq C$. As new added postulate, besides experienced the Newtonian universal gravitation and other actions it is originally because the measurement data of Σ is disturbed by the simultaneous measurement of Σ_a. It is the reference system’s taking measurement (more precisely the quantum correlation (i.e. entanglement) between the measurement apparatus (with its reference system) and the being measured object been founded) instead of the ether or the being measured object’s motion that changes both the being measured object and the reference systemself. It is evident that different Σa will bring different disturbing then result in different C_{-x} and C_x, only $1/C_{-x}+1/C_x=2/C$ being unchanged in form. It is in accord with the new principle of relativity: “The laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different”.

“Two reference systems in uniform relative motion are different”. Of course the most acceptable difference between two reference systems is the mass rest in the reference systems (more precisely the mass joining in the quantum correlation of taking the measurement). Therefore, we define the mass rest in the reference system (joining in the quantum correlation) as the reference system’s referenced weight, define the center of the mass as the reference system’s origin. Then, as the new added postulate and “the measurement is founded to change” in the new added postulate actually is on both sides, we can consequently get: In taking measure of, the greater the referenced weight a)the stronger the reference system destroies the original (before the measurement is taken) quantum coherence between the being measured object and its environment, b)the less the reference systemself being changed by the being measured object, c)the stronger the reference system disturbs the other reference system’s measurement data of taking simultaneously measure of the same object, d)the less the reference systemself’s measurement data been disturbed by other reference system’s taking simultaneously measure of the same object; on the opposite, the less the referenced weight, it is just the reversed case of a), of b), of c), of d). Then we can guess: It perhaps that space is not empty the reference system’s space is something around the referenced weight, if there is not referenced weight then saying nothing of the space around the referenced weight, so do the reference system’s time.

As above, for example we (on earth) take measure of a micro-particle, Σ_a is our earth’s reference system, while Σ is the particle’s reference system (the particle is “stationary” in it and its moving speed measured by Σ_a is constant v). Compared with our Σ_a earth’s mass the Σ particle’s mass is infinitely small. Therefore, the Σ particle’s taking measure of us disturbs our earth Σ_a infinitely small. However, our earth Σ_a’s taking measure of the particle disturbs the Σ particle infinitely great, almost type of deciding the particle’s there be or there not be. Then we educe: In taking measurement of a micro-particle, because the micro-particle’s mass is too small, the “on” or “off” of the quantum correlations (i.e. entanglements) between the micro-particle and the other objects in the environment make the micro-particle’s behaviour uncertainty. Perhaps it is the essence of the uncertainty in the Heisenberg Uncertainty Principle.

See New Physics Meanings Certainly Come from the New Added Postulate

About the physical meanings of the Lorentz transformation even Einstein and Lorentz himself each stucks to his own opinion until they past away [30]. In fact, off a physical quantity’s measurement process to discuss its physics meanings is a thing cannot exist without its basis. Therefore, as the new added postulate’s suggestion, we establish the coordinates relation of the two inertial reference systems Σ and Σ_a from Σ and Σ_a (there may be other reference systems Σ_b, Σ_c et al and perhaps some of the Σ_b, Σ_c et al are joining in) simultaneously take measure of the same object’s process of a physics event taking place.

First of all, we stipulate “the definition of measurement unit of Σ and of Σ_a is the same”. For example one second is the time in which there occur 9192631770 oscillations of the cesium atom “stationary” in the reference system, one centimeter is 165076373 wavelengths of red light from Kr^{86} “stationary” in the reference system etc. We suppose the mass rest in the Σ is M_0, the center of M_0 is Σ’s origin; the mass rest in the Σ_a is

M_{a0}, the center of M_{a0} is the Σ_a's origin. Here we must remind you: A) The "actual length" of time of the same cesium atom "stationary" in Σ being measured alone by Σ occur 9192631770 oscillations is not equal to "stationary" in Σa being measured alone by Σ_a occur 9192631770 oscillations, because $M_0 \neq M_{a0}$ they are different quantum correlation (i.e. entanglement). As we known, different quantum correlation (i.e. entanglement) is corresponding to different quantum energy level. B)Also because they are different quantum correlation (i.e. entanglement), the "actual length" of time of the same cesium atom "stationary" in Σ being measured alone by Σ occur 9192631770 oscillations is not equal to being simultaneously measured by Σ and Σ_a occur 9192631770 oscillations. So do other unit only the measurement unit's "definition" is unchanged, while the measurement unit's "actual length" can change or be changed in different quantum correlation (i.e. entanglement) is different. C) Although the "actual length" of the same unit in different case (for example as above in A) and in B)) is different, while the reference system himslef is not aware of it using his own unit taking measure of himslef cannot obtain his own change, he thinks the "actual length" of his unit is always the same and being unchanged in different case.

Now, we set Σ and Σ_a "start his own clock" (t =0 and ta=0) at the moment Σ's coordinate axis frames and Σ_a's coordinate axis frames coincide. It must be especially pointed out: Now that the reference systems "start his own clock" and the stipulation "the definition of measurement unit of the two reference systems is the same", time coordinate should be something as space coordinate, each the reference systems is severally using his own clock to determine his own time coordinate in simultaneously measuring the same object's physics process taking place, it must be that there is not the problem to have to synchronize the clocks of the two reference systems before simultaneous time measurement (do you think you need to synchronize the x and x_a to y, or y and y_a to z, or z and z_a to x etc before space coordinate measurement?).

We suppose Σ and Σ_a are in the simultaneous measurement of the same object's process of a physics event taking place, the Σ's measurement data are from (0,0,0,0) to (x, y, z, t) and the Σ_a's are from (0,0,0,0) to (x_a, y_a, z_a, t_a) . Namely, Σ's time t =0 and Σ_a's time t_a=0 are at the same instant of time, while Σ's time t and the Σ_a's time ta are at the another same instant of time. It seems that with unit it must be "Σ's t second (i.e. tΣ's one second)=Σ_a's t_a second (i.e. $t_a\Sigma_a$'s one second)" because Σ and Σ_a are simultaneously measuring the same object's process taking place; while the numerical value before the unit is "$t \neq t_a$" because $M_0 \neq M_{a0}$ and v≠0, from the new added postulate, the disturbing of Σ and of Σ_a in simultaneous measurement are different, leading the "actual length" of time unit to be "Σ's one second ≠Σ_a's one second", though both the definition of "one second" of Σ and of Σ_a is the same. No. That is not the case. In fact, even with unit it still is "Σ's t second (i.e. t Σ's one second) ≠ Σ_a's t_a second (i.e. $t_a\Sigma_a$'s one second)", the "actual length" of the same definition of time's unit in Σ ≠in Σ_a, because $M_0 \neq M_{a0}$ the same definition of time's unit in Σ and in Σ_a are different quantum correlation (i.e. entanglement). Even v =0 it still will be that the "actual length" of the same definition of time's unit in Σ ≠ in Σ_a, because $M_0 \neq M_{a0}$ the same definition of time's unit in Σ and in Σ_a still are different quantum correlation (i.e. entanglement). For example, when v =0, Σ and Σ_a taking simultaneous measurement of the same time of an object's process of a physics event taking place, it must be that both Σ's measurement data and Σa's measurement data are τ second, however, Σ's one second ≠Σ_a's one second (only the numerical value before the Σ's time unit and the numerical value before the Σ_a's time unit are the same τ) because $M_0 \neq M_{a0}$ the same definition of time's unit in Σ and in Σ_a are different quantum correlation (i.e. entanglement). Of course the space length unit is also something as time unit: the "actual length" of space length unit of Σ's one meter ≠ of Σ_a's one meter, so do other physical quantities' unit.

In fact, from the C) of "we must remind you" before, we can see: We need not to pay attention to the "actual length" of the same definition of an unit in Σ ≠ in Σ_a and in Σ's alone measuring ≠ in Σ and Σ_a's simultaneous measuring etc (we have stipulated "the definition of measurement's unit of Σ and of Σ_a is the same" is enough). What we have interest in are: in Σ and Σ_a's simultaneous measuring the same physical quantity of the same object, the numerical value before unit of Σ ≠ of Σ_a, and what the relation between the numerical value before unit of Σ and of Σ_a is? Generally, we suppose the relation about (x, y, z, t) and (x_a, y_a ,z_a, t_a) is linearity as below:

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)a$$

(why it is linearity? Fuke BA [41] though our definiens and postulates are different from them, while the reasons or principles are analogous). The a_{ij}(i, j =1,2,3,4) of (1)a actually is function a_{ij} (M_{a0}, M_0, m_0, m_{10}, m_{20},......, v, u_a, u_{a1}, u_{a2},......, ω,ξ,ψ,......), where m_0 is the rest mass of the being measured object and u_a is its speed measurement data of Σ_a while m_{10}, m_{20},...... are the other objects' rest mass (including the rest mass of referenced weight of other reference systems joining simultaneous measurement with Σ and Σ_a or not joining simultaneous measurement but joining quantum correlation (i.e. entanglement) with Σ and Σ_a), and u_{a1}, u_{a2},...... are the corresponding speed of m_{10}, m_{20},...... ——measurement data of Σ_a, and ω, ξ, ψ, ... are variable representing the simultaneous measurements' disturbance and the other actions, we denote a_{ij}(i, j =1,2,3,4) for shot. Of course different being measured object will result in different a_{ij}(i, j =1,2,3,4), different reference systems joining to measure simultaneously with Σ and Σ_a will also result in different a_{ij}(i, j =1,2,3,4), different (x, y, z, t), different (x_a, y_a, z_a, t_a) for simultaneous measurement's interactional impact.

In taking measure of the same a stationary space-length or a time-length or a mass when v =0: 1) Σ alone (Σa and other reference system do not join) in taking measure of, the Σ's measurement changes Σ self and the being measured object in the same scale (for the being measured object is "stationary" in Σ), Σ's measurement data is l0 or τ0 or m0. 2) Σa alone (Σ and other reference system do not join in) taking measure of, the Σa's measurement changes Σa self and the being measured object in the same another scale (for M0≠Ma0). Because a)the definition of measurement unit in Σ and in Σa is the same, b)the being measured object's atoms number is the same, although "Σa's measurement changes both Σa self and Σa's being measured object" in 2) is different from "Σ's measurement changes both Σ self and the Σ's being measured object" in 1) (for M0≠Ma0) , while the Σa's measurement data is the same l0 or τ0 or m0 as Σ's in 1) (Please note: only the numerical values before Σa's unit in 2)= the numerical values before Σ's unit in 1) while the actual length of Σa's unit in 2) ≠ the actual length of Σ's unit in 1), for M0≠Ma0). 3)Σa joins simultaneous measurement with Σ in Σ's taking measure of, the Σ's measurement data will still be the same l0 or τ0 or m0 as in 1), although here "Σ's measurement changes Σ self and the being measured object in the same scale" is different from in 1) for Σa's measurement disturbing. It is because Σ and the Σ's being measured object are equally changed i.e. are changed in the same scale (because the object being "stationary" in Σ) by the disturbing of Σa's simultaneous measurement and by the Σ self's measurement. Therefore, although here Σ's unit and Σ's being measured object have been changed into not the same as Σ's alone taking measure of in 1), however, the Σ's measurement data is still the same as in 1) (please note: only the numerical values before Σ's unit in 3) = the numerical values before Σ's unit in 1), while the actual length of Σ's unit in 3) ≠ the actual length of Σ's unit in 1), because "Σa joins simultaneous measurement with Σ " changes Σ and Σ's being measured object). 4)In 3) on Σa hand, because of v=0, the being measured object also is "stationary" in Σa as in Σ, "Σa and Σa's being measured object stationary in Σa" are equally changed (i.e. changed in the same scale) by the disturbing from Σ's simultaneous measurement and by the Σa self's measurement, therefore, although both Σa's unit and the Σa's being measured object have been changed into not the same as in 2), however, the Σa's measurement data is still the same l0 or τ0 or m0 as Σa alone taking measure of in 2). Namely, when v =0, whether simultaneous measurement or alone measurement, both Σ and Σa can accurately get that not only origins be coincident but also any other corresponding points on axis frames be coincident as well, although the "actual length" of the reference system's unit and the being measured object have been changed (dilate or contract) by his own measurement or both by his own and by the disturbing from another reference system's simultaneous measurement, the Σ's measurement data of the being measured object is always the same and not different from the Σ_a's. Represented with (1)a (of course (1)a only represents the measurement data of space and time) it will be stipulation: When v=0, the coefficient matrix of (1)a becomes identity matrix (the coefficient matrix's element becomes Kronecker symbol $a_{ij}|_{v=0}=\delta_{ij}$, $\delta_{ij}=0$ *for Inj and* $\delta_{ij}=1$ *for i=j)* i.e.

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)a/_{v=0}$$

The l_0 or τ_0 or m_0 etc above should be something as the so called "proper distance" or "proper time" or "proper mass" in the Special Relativity. We would remind you again: a) Though "both Σ and Σ_a can accurately get that not only origins to be coincident but also any other corresponding points on axis frames to be coincident as well", however, "the actual length" of the same unit of Σ and of Σ_a are not identical (in taking measure of the same object Σ's one second ≠Σ_a's one second, Σ's one meter ≠Σ_a's one meter etc) because of M_0≠M_{a0} . b) The "actual length" of the same unit of the same reference system is different in different case (for example one Σ's second in Σ's alone measurement ≠one Σ's second in Σ and Σ_a's simultaneous measurement, one Σ's second in Σ alone taking measure of m_1 ≠one Σ's second in Σ alone taking measure of m_2 if $m_1 \neq m_2$ etc). Different measurement will result in different change (dilation or contraction) of the reference system and the being measured object, only "the numerical values before Σ's unit" = "the numerical values before Σ_a's unit" when v =0, namely the axis frames of Σ and of Σ_a only are number axis (not with unit). Of course (1)a is only the space-time coordinates numerical values relation not with unit, (only we have stipulated "the definition of measurement unit of Σ and of Σ_a is the same"). Of course so do other physical quantities. However, it just is the true fact what we see in our real-world. Do you understand? If not, you need to re-think the C) of "we must remind you" before, till understand.

In taking measure of the same a stationary space-length or a time-length or a mass when $v \neq 0$: 5) The being measured object is stationary in Σ and Σ alone (Σ_a and other reference system do not join) in taking measure of, the Σ's measurement data also will be the same l_0 or τ_0 or m_0 as in 1) (there $v = 0$). Because Σ_a and other reference system do not join, the quantum correlation (i.e. entanglement) between Σ and the Σ's being measured object is the same as in 1). 6)The being measured object is stationary in Σ_a, and Σ_a alone (Σ and other reference system do not join) taking measure of, the Σ_a's measurement data will be the same l_0 or τ_0 or m_0 as in 2) (there $v = 0$), the same data as the Σ's in 5) and the Σ's in 1), also because Σ and other reference system do not join, the quantum correlation (i.e. entanglement) between Σ_a and the Σ_a's being measured object is the same as in 2). 7) The being measured object is "stationary" in Σ, and Σ_a join simultaneous measurement with Σ in Σ's taking measure of, the Σ's measurement data will still be the same l_0 or τ_0 or m_0, although this time both the Σ's measurement unit and Σ's being measured object have been changed into not as the same as in 3) (the quantum correlation (i.e. entanglement) is not the same as in 3) for there $v = 0$ here $v \neq 0$). It is because the Σ's measurement unit and the Σ's being measured object are equally changed i.e. are changed in the same scale (for the object "stationary" in Σ) by the Σ self's measurement and by the disturbing from Σ_a's (or as well as and other reference system's) simultaneous measurement. However, this time on Σ_a hand, because of $v \neq 0$ the Σ_a's being measured object is "in motion" (with Σ) in Σ_a, therefore, this time the Σ_a's unit and the Σ_a's "in motion" being measured object in Σ_a are not equally changed (i.e. are changed not in the same scale) by the Σ_a self's measurement and by the disturbing from Σ's (or Σ and other reference systems' simultaneous) measurement in Σa's angle of view! Therefore, this time the Σ_a's measurement data will not be the same l_0 or τ_0 or m_0 as Σ_a's in 6)! 8)The object "stationary" in Σ_a, and Σ (or Σ and other reference systems) join(s) simultaneous measurement with Σa in Σ_a's taking measure of, the Σa's measurement data is the same l_0 or τ_0 or m_0 as in 3) on Σ_a hand (there $v = 0$ here $v \neq 0$), although different measurement state result in different change (dilation or contraction) of the reference system and the reference system's being measured object, however, here Σ_a's measurement unit and Σ_a's being measured object are equally changed or changed in the same scale (for the object "stationary" in Σ_a), therefore, Σ_a's measurement data still be the same l_0 or τ_0 or m_0 as in 3), in 2), in 6) on Σ_a hand. However, this time on Σ hand, because Σ's being measured object is "in motion" in Σ, the Σ's measurement unit and the Σ's being measured object are not equally changed (i.e. are changed not in the same scale) by the Σ self's measurement and by the disturbing from Σ_a's (or Σ_a and other reference systems' simultaneous) measurement in Σ's angle of view, therefore, this time the Σ's measurement data will not be the same l_0 or τ_0 or m_0 as Σ's in 3) (there $v = 0$) or in 7). Both 7) and 8) show us: in a reference system the measurement data of the same being measured object's physical quantity, the object "in motion" is different from "in stationary", two reference systems' simultaneous measurement is different from one reference system's alone measurement. Namely when $v \neq 0$ in Σ and Σ_a taking simultaneously measure of the same a physical quantity, the numerical value before Σ's unit ≠ the numerical value before Σ_a's unit, both Σ and Σ_a can accurately get that at the two axis frames coincide moment (t =0 and t_a=0) only Σ's origin and Σ_a's origin coincide while any other corresponding points on axis frames do not coincide (though the two axis frames coincide)! Namely "when $v \neq 0$ the coefficient matrix of (1)a is not identity matrix".

From above we can see: When $v = 0$, the reference system taking measure of a stationary object cannot see that his measurement have changed both himself and the being measured object, cannot see that he and another reference system's simultaneous measurement disturb each other, for the numerical value before Σ's unit = the numerical value before Σ_a's unit (though the measurement data of the same being measured object "in motion" is different from "in stationary"). If and only if $v \neq 0$, can the simultaneous measurement of Σ and Σ_a disturbing each other be seen by Σ and Σ_a themselves —— the Σ's measurement data different from the Σ_a's, the difference on the space-time coordinates between Σ and Σ_a (there may be other reference systems Σ_b, Σ_c et al and perhaps some of the Σ_b, Σ_c et al are joining) in simultaneously taking measure of the same object's process of a physics event taking place as shown in (1)a, the coefficient matrix of (1)a is not identity matrix when $v\neq0$.

Now, we can see: In explaining the Heisenberg Uncertainty Principle in ending of 2.2, the uncertainty must occur and only occurs in taking measure of the "in motion" micro-particle. We also can see: In taking measure of an "in motion" micro-particle, our simultaneous measurement disturb the micro-particle infinitely great is of course measurable phenomenon ourselves, while the micro-particle himself is not aware of it (using his own unit taking measure of itself cannot get his own change). We still can see: When $v\neq0$, only if $v\to0$ is the difference between the simultaneous measurement data (numerical value before unit) of Σ and of Σ_a close to zero (actually only $v=0$ can we get "the measurement data (numerical value before unit) of Σ = of Σ_a").

Of course whether or not $v=0$ and $v\neq0$, one can compare the same physical quantities of his own reference system, for example, compare the speed of a light ray from a stationary source to some direction with to the opposite direction. If the light speed in this direction is greater than in the opposite direction, he can guess: from the stationary light source to some not far away place in this direction there may be a big mass object. Or comparing the speed of a light ray from a stationary source to the same direction in different time, if the speed is increscent (more and more great), he can guess: in this direction from the stationary light source to some not far away place, there may be a big mass object is closing to the stationary light source.

Of course usually (1)a must be

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & a_{14} \\ 0 & a_{22} & 0 & 0 \\ 0 & 0 & a_{33} & 0 \\ a_{41} & 0 & 0 & a_{44} \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} = A \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)a'$$

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & (-v)a_{11} \\ 0 & a_{22} & 0 & 0 \\ 0 & 0 & a_{33} & 0 \\ a_{41} & 0 & 0 & a_{44} \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)b$$

Then $(1)a'^{(-1)}$ goes to (i.e. we solve the equation (1)b)

$$\begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} = \begin{pmatrix} a_{44}/\eta & 0 & 0 & va_{11}/\eta \\ 0 & a_{22}^{-1} & 0 & 0 \\ 0 & 0 & a_{33}^{-1} & 0 \\ (-a_{41})/\eta & 0 & 0 & a_{11}/\eta \end{pmatrix} \begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} \quad (1)b^{(-1)}$$

(where $\eta=a_{11}a_{44}-a_{41}a_{14}=a_{11}(a_{44}+va_{41})$). Of course we also can solve $(1)b^{(-1)}$ back to $(1)^b$, here $(1)^b$ and $(1)b^{(-1)}$ being analogous as $\alpha=\lambda\beta$ and $\beta=(1/\lambda)\alpha$ actually are only one equation's two different forms. Compared the first row of (1)b i.e. $x=a_{11}(x_a-vt_a)$ with the first row of $(1)b^{(-1)}$ i.e. $x_a=(a_{44}/\eta)x+(va_{11}/\eta)t=(a_{44}/\eta)[x-(-va_{11}/a_{44})t]$ we can see: The speed of Σ's moving along xa-axes measured by Σ_a is v while the same speed of Σ_a's moving along x-axes measured by Σ is $(-va_{11}/a_{44})$ instead of $(-v)$, although it is Σ and Σ_a take simultaneous measure of the same speed of relative motion. Actually, it reminds us again: Σ and Σ_a are different (something as va_{11}/a_{44} and v are different) it proofs Σ and Σa are different on the hand of the same speed's measurement data. As light speed's "the average over a closed path is constant C" while the local speed of light over each short line segment component which build the closed path may not equal to C, "the Σ and Σ_a are identical for taking his own measurement data to build laws of physics" while may not identical for each the component physical quantity which build the laws of physics (of course physics law is built by the physical quantities such as distance, time interval, speed etc.) in Σ and Σ_a simultaneously taking measure of the same physical quantity of the same object, the measurement data of Σ and of Σa are different because Σ and Σ_a are different for $M_0\neq M_{a0}$ and $v\neq0$, being in accord with John C. Mather and George F.'s discovery, while in using his own measurement data of the physical quantities to build laws of physics Σ and Σ_a are identical (therefore the laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different).

The Third Step: Get Three Basic Physical Quantities in Mechanics Under (1)b

As known in 1.3 and 2.3, the element of (1)b coefficient matrix also depends on the being measured object's state. If the being measured object is in stationary in Σ we denote the element $a_{ij}(i, j=1,2,3,4)$ of (1)a by o_{ij}, stationary in Σ_a we denote $a_{ij}(i, j=1,2,3,4)$ of (1)a by p_{ij}, in motion in both Σ and Σ_a we denote $a_{ij}(i, j=1,2,3,4)$ of (1)a by q_{ij}, it of course is $o_{ij}\neq p_{ij}\neq q_{ij}$, (because they are different quantum correlation (i.e. entanglement)). As 2.2 only if the mass of the being measured object is small enough, can the reference system (taking measurement) been changed by the being measured object be slight enough, can the reference systems' measurement data been changed by the reference systems themselves simultaneous measurements interactional impact become main part, will it be $o_{ij}\approx p_{ij}\approx q_{ij}$ approximately be $o_{ij}=p_{ij}=q_{ij}$ (of course the more the mass of the being measured object close to zero and two reference systems origins in a more short way off, the more the $o_{ij}= p_{ij}= q_{ij}$ accurate). To reduce the case, in the following we will only consider the mass of the being measured object is sufficiently small and two reference systems origins in a sufficiently short way off, it always approximately is in $o_{ij}=p_{ij}=q_{ij}(=a_{ij})$ except particular explanation. (Special remind: here "the Σ's moving speed measured by Σ_a is constant *v*" the *v* is not limited, it may be $v\to 0$ or $>C$ or $>>C$).

The Numerical Value Relation of Σ And Σ_a's Measurement Data in Simultaneously Measuring the Same "Time-Length" and "Space-Length" Stationary in Σ or Σ_a

In Σ and Σ_a (there may be other reference systems Σ_b Σ_c et al and perhaps some of the Σ_b Σ_c et al joining in) taking simultaneous measurement of a radiate element's half-life, considering "stationary" at Σ's origin and then their measurement numerical value must be $(0,0,0,\tau)$ in Σ and ($x_a\to$, 0,0, $\tau_a\to$) in Σa (in Σ_a the radiate element is "in motion" we sign"→"at the right up corner of its numerical value, the same below). Bring them into (1)b we get "(1)b Σ origin"

$$\begin{pmatrix}0\\0\\0\\\tau\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}x_a^{\to}\\0\\0\\\tau_a^{\to}\end{pmatrix}\quad \text{(1)b } \Sigma \text{ origin}$$

From the 1st row and the 4th row of "(1)b Σ origin" we get $0=a_{11}(x_a\to -v_{\tau a}\to)$ and $\tau= a_{41}\, x_a\to +a_{44}\tau_a\to$, we solve these two simultaneous equations get

$$\tau_a^{\to}=\frac{1}{(a_{44}+va_{41})}\cdot\tau \quad (2)$$

If stationary at Σa's origin and then their measurement numerical value must be (x→, 0, 0, τ→) in Σ (in Σ the radiate element is "in motion") and (0, 0, 0, τa) in Σa. Bring into (1)b we get "(1)b Σa origin"

$$\begin{pmatrix}x^{\to}\\0\\0\\\tau^{\to}\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}0\\0\\0\\\tau_a\end{pmatrix}\quad \text{(1)b } \Sigma_a \text{ origin}$$

From the 4th row of "(1)b Σ_a origin" we get

$$\tau^{\to}=a_{44}\,\tau_a \quad (3)$$

(It must be pointed out: actually the a_{44} in (3) ≠the a_{44} in (2) etc, it only approximately is $o_{ij}=p_{ij}=q_{ij}(=a_{ij})$ for the mass of the being measured object is small enough, as we have expressed at the front and the same below without explanation).

In taking simultaneous measurement of a piece of space-length, if stationary on the Σ's x-axis, their measurement numerical value must be $(l, 0, 0, t)$ in Σ and $(l_{ax}\to,0,0,0)$ in Σ_a (in Σ_a the piece of space-length is "in motion", we must take measure all parts of it at one instant of time of Σ_a). Bring into (1)b we get "(1)b x-axis"

$$\begin{pmatrix}l\\0\\0\\t\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}l_{ax}^{\to}\\0\\0\\0\end{pmatrix}\quad \text{(1)b } x\text{-axis}$$

From the 1st row of "(1)b x-axis" we can get $l = a_{11}l_{ax}\to$ i.e.

$$l_{ax}^{\to}=\frac{1}{a_{11}}\cdot l \quad (4)$$

If stationary on Σ_a's xa-axis their measurement numerical value must be $(l\to, 0, 0, 0)$ in Σ (in Σ the piece of space-length is "in motion" we must take measure all parts of it at one instant of time of Σ) and $(l_a,0,0,t_a)$ in Σ_a. Bring into (1)b we get "(1)b x_a-axis"

$$\begin{pmatrix}l^{\to}\\0\\0\\0\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}l_a\\0\\0\\t_a\end{pmatrix}\quad \text{(1)b } x_a\text{-axis}$$

From the 1st and the 4th row of "(1)b x_a-axis" we get $l\to = a_{11}(l_a-vt_a)$ and $0= a_{11}l_a+ a_{44}t_a$. We solve these two simultaneous equations get

$$l^{\rightarrow} = \frac{a_{11}}{a_{44}}(a_{44}+va_{41})\cdot l_a \quad (5)$$

If stationary on the Σ's y-axis vertical the reference system moves, it must be *(0, l, 0, t)* in Σ and (0, l_{ay}→, 0, 0) in Σ_a (in Σ_a the piece of space-length is in motion, we must take measure all parts of it at one instant of time of Σ_a). Bring into (1)b we get "(1)b y-axis"

$$\begin{pmatrix}0\\ l\\ 0\\ t\end{pmatrix} = \begin{pmatrix}a_{11} & 0 & 0 & (-v)a_{11}\\ 0 & a_{22} & 0 & 0\\ 0 & 0 & a_{33} & 0\\ a_{41} & 0 & 0 & a_{44}\end{pmatrix}\begin{pmatrix}0\\ l_{ay}^{\rightarrow}\\ 0\\ 0\end{pmatrix} \quad \text{(1)b } y\text{-axis}$$

From the 2nd row of "(1)b y-axis" we get l =a_{22} i.e.

$$l_{ay}^{\rightarrow} = \frac{1}{a_{22}}\cdot l \quad (6)$$

If stationary on ya-axis instead of y-axis it must be *(0, l_y→,0,0)* in Σ (in Σ the piece of space-length is in motion, we must take measurement all parts of it at one instant of time of Σ) and *(0, l_a, 0, t_a)* in Σ_a. Bring into (1)b we get "(1)b ya-axis"

$$\begin{pmatrix}0\\ l_y^{\rightarrow}\\ 0\\ 0\end{pmatrix} = \begin{pmatrix}a_{11} & 0 & 0 & (-v)a_{11}\\ 0 & a_{22} & 0 & 0\\ 0 & 0 & a_{33} & 0\\ a_{41} & 0 & 0 & a_{44}\end{pmatrix}\begin{pmatrix}0\\ l_a\\ 0\\ t_a\end{pmatrix} \quad \text{(1)b } y_a\text{-axis}$$

From the 2nd row of "(1)b y_a-axis" we get

$$l_y^{\rightarrow} = a_{22}\cdot l_a \quad (7)$$

Analogous getting (6) and (7) we can get

$$l_{az}^{\rightarrow} = \frac{1}{a_{33}}\cdot l \quad (8)$$

$$l_z^{\rightarrow} = a_{33}\cdot l_a \quad (9)$$

The Numerical Value Relation of Σ And Σ_a's Measurement Data in Simultaneously Measuring the Same A Mass

The equations (1)-(9) have not involved all of the three basic physical quantities in mechanics. All of involved only space-length or time-length, the mass quantity not being involved. Suppose the results of Σ and Σ_a simultaneously measuring the same a mass particle's momentary velocity, measurement data of Σ to be *u=(u_x, u_y, u_z)* and of Σ_a to be *u_a=(u_{ax}, u_{ay}, u_{az})*. For approximately *o_{ij}=p_{ij}=q_{ij}(=a_{ij})* i.e. a_{ij} is constant as *v*, the differentiation of (1)a′ are: the 1st row gives $dx = a_{11}dx_a + a_{14}dt_a$, the 2nd row gives dy = $a_{22}dy_a$, the 3rd row gives $dz = a_{33}dz_a$, the 4th row gives $dt = a_{41}dx_a + a_{44}dt_a$. Then we can from the quotient get

$$u_x = \frac{dx}{dt} = \frac{a_{11}dx_a + a_{14}dt_a}{a_{41}dx_a + a_{44}dt_a} = \frac{a_{11}\frac{dx_a}{dt_a} + a_{14}}{a_{41}\frac{dx_a}{dt_a} + a_{44}} = \frac{a_{11}u_{ax} + a_{14}}{a_{41}u_{ax} + a_{44}}$$

(1st be divided by 4th)

$$u_y = \frac{dy}{dt} = \frac{a_{22}dy_a}{a_{41}dx_a + a_{44}dt_a} = \frac{a_{22}\frac{dy_a}{dt_a}}{a_{41}\frac{dx_a}{dt_a} + a_{44}} = \frac{a_{22}u_{ay}}{a_{41}u_{ax} + a_{44}}$$

(2nd be divided by 4th)

$$u_z = \frac{dz}{dt} = \frac{a_{33}dz_a}{a_{41}dx_a + a_{44}dt_a} = \frac{a_{33}\frac{dz_a}{dt_a}}{a_{41}\frac{dx_a}{dt_a} + a_{44}} = \frac{a_{33}u_{az}}{a_{41}u_{ax} + a_{44}}$$

(3rd be divided by 4th)

Either all of the sages even Einstein or contemporary celebrities (e.g. [30,42,43] etc) are just so above. No body (apart from me) think that in fact we can compose the above with the matrix of (1)a′ as below:

$$\begin{pmatrix}u_x\\ u_y\\ u_z\\ 1\end{pmatrix} = \begin{pmatrix}a_{11} & 0 & 0 & a_{14}\\ 0 & a_{22} & 0 & 0\\ 0 & 0 & a_{33} & 0\\ a_{41} & 0 & 0 & a_{44}\end{pmatrix}\begin{pmatrix}u_{ax}\\ u_{ay}\\ u_{az}\\ 1\end{pmatrix}\frac{1}{(a_{44}+u_{ax}a_{41})} \quad (10)$$

The first row of (10) is the (1st be divided by 4th), the second row of (10) is the (2nd be divided by 4th), the third row of (10) is the (3rd be divided by 4th) and the 4th row of (10) is identity 1=1. However, with the (10) we can make the discovery **of** the results of Σ and Σ_a taking simultaneously measurement of the same a mass: Taking note of that simultaneously measuring the same a mass, as known in *2.3,* no matter *v*=0 or *v*≠0 the mass is stationary in Σ or stationary in Σ_a, the measurement data of the stationary mass is the same m_0. So, we multiply the (10) by m_0 get "m_0(10)"

$$m_0\begin{pmatrix}u_x\\u_y\\u_z\\1\end{pmatrix}=m_0\begin{pmatrix}a_{11}&0&0&a_{14}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}u_{ax}\\u_{ay}\\u_{az}\\1\end{pmatrix}\frac{1}{(a_{44}+u_{ax}a_{41})}$$

$m_0(10)$

Now that the same mass is stationary in Σ or in Σ_a the measurement data is the same m_0, however, when $v\neq0$, being stationary in one reference system and it's measurement data must be m_0 in this reference system, what the other reference system's measurement data is? It of course must be not m_0 because it is "in motion". In simultaneously measuring the same mass particle's momentary velocity, when u=(0,0,0) in Σ it must be u_a=(v,0,0) in Σ_a, and then $m_0(10)$ must go to

$$\begin{pmatrix}0\\0\\0\\m_0\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&a_{14}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}p_v\\0\\0\\m_v\end{pmatrix}\quad m_0(10)/_{u=0}$$

(where $m_v=m_0/(a_{44}+u_{ax}a_{41})$ and $p_v=vm_v=vm_0/(a_{44}+u_{ax}a_{41})$ here $u_{ax}=v$). Compared the $m_0(10)/_{u=0}$ with the (1)b we can see that in taking simultaneously measure of the same a mass particle's mass and momentum, the measurement data of the Σ is m_0 and 0 while of the Σ_a is $m_v= m_0/(a_{44}+va_{41})$ and $p_v=vm_v=vm_0/(a_{44}+u_{ax}a_{41})$ (please note here in Σ_a the moving mass particle's momentary velocity is v). It obviously reminds us that when the moving mass particle's momentary velocity is $u=(u_x, u_y, u_z)$ no matter it is in Σ_a or in Σ, the moving mass particle's mass must be that we only need to replace the variable v by the particle's speed u in the $m_v= m_0/(a_{44}+va_{41})$ then it goes to (no matter it is in Σ_a or in Σ) $m_u=m_0/[(a_{44}(u) + ua_{41}(u)]$ i.e.

$$m_u=\frac{m_0}{a_{44}(u)+ua_{41}(u)}\quad(11)$$

(where $/u/=(u_x^2 + u_y^2 + u_z^2)^{(1/2)}$). As $(1)a/_{v=0}$ in *2.3*, when the particle's velocity is 0, the (11) will go to $m_0/[a_{44}(0)+0a_{41}(0)]$ i.e. $m_0/[\delta_{44}(0)+0\delta_{41}(0)]$ i.e. m_0, it is just the right result. Here (11) is educed from the coordinates relation (1)b instead of from a particular collision [30,42,43,44] as G. N. Lewis and R. C. Tolman etc, and here the (11) is more universal later in the ending of *4.2* we will see: Under (1)c the (11) becomes $m_u=m_0/[a_{44}(u)+ua_{41}(u)]=m_0a_{44}(u)$, just being the same formula as in the special relativity when $C_{-ax}=C_{ax}$ (as known in *2.1* it must be $C_{-ax}=C_{ax}=C$, actually be $v\to0$ in *4.3* the (1)c just becomes Lorentz transformation). It perhaps that G. N. Lewis and R. C. Tolman etc have to from a particular collision [30,42,43,44] get the mass particle's mass is because they all (even Einstein) don't know to compose the differentiation quotient of (1)a′ with the matrix of (1)a′ left over from all of them to let no sagacious no handsome me pick up the bargain to discover (10) and (11).

The Fourth Step: Determine the (1)B Coefficient Matrix's Element

The Numerical Value Relation of Σ And Σ_a's Measurement Data in Simultaneously Taking Measure of the Speed of the Same A Horizontal Photon Coming from the Light Source Stationary in Σ Or Σ_a

In simultaneously taking measure of the speed of the same a horizontal rightward photon coming from the light source being stationary in Σ, the measurement data, of Σ's must be (C_x.0.0) and of Σ_a's must be ($C_{ax}^{\rightarrow}$,0,0) (in Σ_a the light source is "in motion"). Because Σ's speed measured by Σ_a is constant v on x_a-axis, it must be $x=a_{11}(x_a-vt_a)$ and hence $a_{14}=(-v)a_{11}$, bring them into (10) we get (10)Rp1

$$\begin{pmatrix}C_x\\0\\0\\1\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}C_{ax}^{\rightarrow}\\0\\0\\1\end{pmatrix}\frac{1}{(a_{44}+C_{ax}^{\rightarrow}a_{41})}\quad(10)Rp1$$

From the 1st row of the (10)Rp1 we get $C_x=a_{11}[C_{ax}^{\rightarrow}+(-v)]/(a_{44}+C_{ax}^{\rightarrow}a_{41})$ i.e.

$$C_{ax}^{\rightarrow}=\frac{va_{11}+C_xa_{44}}{a_{11}-C_xa_{41}}\quad(12)$$

If the light source being stationary in Σ_a, the measurement data must be ($C_x^{\rightarrow}$,0,0) in Σ (in Σ the light source is "in motion") and (C_{ax}.0.0) in Σ_a. Bring into (10) (please note $a_{14}=(-v)a_{11}$) we get (10)Rp2

$$\begin{pmatrix}C_x^{\rightarrow}\\0\\0\\1\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}C_{ax}\\0\\0\\1\end{pmatrix}\frac{1}{(a_{44}+C_{ax}a_{41})}$$

(10)Rp2

From the 1st row of the (10)Rp2 we get

$$C_{x}^{\to}=\frac{(C_{ax}-v)a_{11}}{(a_{44}+C_{ax}a_{41})} \quad (13)$$

In simultaneously taking measure of the speed of the same a horizontal leftward photon coming from the light source being stationary in Σ, the measurement data must be $(-C_{-x},0,0)$ in Σ and $(-C_{-ax}^{\to},0,0)$ in Σ_a (in Σ_a the light source is "in motion"). Bring them and $a_{14}=(-v)a_{11}$ into (10) we get (10)Lp1

$$\begin{pmatrix}-C_{-x}\\0\\0\\1\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}-C_{-ax}^{\to}\\0\\0\\1\end{pmatrix}\frac{1}{(a_{44}-C_{-ax}^{\to}a_{41})}$$

(10)Lp1

From the 1st row of the (10)Lp1 we get $-C_{-x}=a_{11}(-C_{-ax}^{\to}-v)/(a_{44}-C_{-ax}^{\to}a_{41})$ i.e.

$$C_{-ax}^{\to}=\frac{-va_{11}+C_{-x}a_{44}}{a_{11}+C_{-x}a_{41}} \quad (14)$$

If the light source being stationary in Σ_a, the measurement data must be $(-C_{-x}^{\to},0,0)$ in Σ (in Σ the light source is "in motion") and $(-C_{-ax},0,0)$ in Σ_a. Bring them and $a_{14}=(-v)a_{11}$ into (10) we get (10)Lp2

$$\begin{pmatrix}-C_{-x}^{\to}\\0\\0\\1\end{pmatrix}=\begin{pmatrix}a_{11}&0&0&(-v)a_{11}\\0&a_{22}&0&0\\0&0&a_{33}&0\\a_{41}&0&0&a_{44}\end{pmatrix}\begin{pmatrix}-C_{-ax}\\0\\0\\1\end{pmatrix}\frac{1}{(a_{44}-C_{-ax}a_{41})}$$

(10)Lp2

From the (10)Lp2's 1st row we get $-C_{-x}^{\to}=[a_{11}(-C_{-ax})+(-v)a_{11}]/(a_{44}-C_{-ax}a_{41})$ i.e.

$$C_{-x}^{\to}=\frac{(v+C_{-ax})a_{11}}{a_{44}-C_{-ax}a_{41}} \quad (15)$$

Taking note of that as 2.2, if you ask that how much the "interactional impact of simultaneous measurement" in these two groups data of measurement of photon is? We can only answer that we don't know, but we can confirm: From the new added postulate in 1.3 we can confirm that they should be direct ratio of each other! The horizontal rightward photon the quotient of photon 1's speed $C_x/C_{ax}^{\to}$ (Σ/Σ_a) should be equal to of photon 2's $C_{x}^{\to}/C_{ax}$ (Σ/Σ_a). When (12) and (13) are placed in $C_x/C_{ax}^{\to}=C_{x}^{\to}/C_{ax}$ we get

$$\frac{C_x(a_{11}-C_xa_{41})}{(va_{11}+C_xa_{44})}=\frac{(C_{ax}-v)a_{11}}{(a_{44}+C_{ax}a_{41})C_{ax}} \quad (16)$$

Analogously the horizontal leftward photon the quotient of photon 1's speed $(-C_{-x})/(-C_{-ax}^{\to})$ (Σ/Σ_a) i.e. $C_{-x}/C_{-ax}^{\to}$ should be equal to of photon 2's $(-C_{-x}^{\to})/(-C_{-ax})$ (Σ/Σ_a) i.e. $C_{-x}^{\to}/C_{-ax}$. When (14) and (15) being placed in $C_{-x}/C_{-ax}^{\to}=C_{-x}^{\to}/C_{-ax}$ we get

$$\frac{C_{-x}(a_{11}+C_{-x}a_{41})}{(-va_{11}+C_{-x}a_{44})}=\frac{(v+C_{-ax})a_{11}}{(a_{44}-C_{-ax}a_{41})C_{-ax}} \quad (17)$$

Taking $a=C_{-ax}$, $b=C_{ax}$, $c=C_{-x}$, $d=C_x$ as known quantities, $f=a_{41}/a_{11}$ and $\varphi=a_{44}/a_{11}$ as unknown quantities, we can solve the simultaneous equations (16) and (17) and get the two unknown quantities $f=a_{41}/a_{11}$ and $\varphi=a_{44}/a_{11}$ (please see appendix I):

$$f_1=\frac{v}{ac},\ f_2=\frac{v}{bd},\ f_3=\frac{(bc-ad)-v(c+d)}{cd(a+b)};\ \varphi_1=\frac{abc-v(ac+bd)}{acd},\ \varphi_2=\frac{abd+v(ac+bd)}{bcd}$$

$$\phi_3=\frac{\left[\frac{ab(c+d)(bc-ad)}{cd(a+b)}-\frac{vbd}{c}+\frac{vac}{d}+\frac{vab(c+d)^2}{cd(a+b)}+\frac{v^2bd}{ac}-\frac{v^2ac}{bd}\right]}{\left[bc-ad-v(c+d)-v\left(\frac{ac}{b}+\frac{bd}{a}\right)\right]}$$

(18)

Determine the (1)b Coefficient Matrix's Element when $\Sigma=\Sigma_a$

Please note in (18) $f=a_{41}/a_{11}$ and $\varphi=a_{44}/a_{11}$ are only quotients, a_{22} and a_{33} still are undetermined. If adding M_0 close to M_{a0} i.e. $\Sigma_a=\Sigma$, can we find out the element a_{ij} of (1)b?

In *3.1* Σ and Σ_a take simultaneous measurement of a radiate element's half-life: stationary at Σ's origin obtained (2), at Σ_a's origin obtained (3). As the new added postulate the results of "stationary" in Σ and "stationary" in Σ_a are the same τ_0 i.e. both τ on right side of (2) and τ_a on right side of (3) are equal to τ_0. Still now as $\Sigma_a=\Sigma$, thus $\tau^{\rightarrow}$ on left side of (3) and $\tau_a^{\rightarrow}$ on left side of (2) are equal to each other. We divide (2) by (3) i.e. $\tau_a^{\rightarrow}/\tau^{\rightarrow}=\{1/[a_{44}(a_{44}+va_{41})]\}(\tau/\tau_a)$. Bring $\tau^{\rightarrow}=\tau_a^{\rightarrow}$ and $\tau=\tau_a=\tau_0$ into it we get $1=1/[a_{44}(a_{44}+va_{41})]$.

In *3.1* Σ and Σ_a take simultaneous measurement of the same a piece of space length: "stationary" on Σ's x-axis obtained (4), "stationary" on Σ_a's x_a-axis obtained (5). As the *new added postulate* the results of "stationary" in Σ and "stationary" in Σ_a are the same l_0, i.e. both l on right side of (4) and l_a on right side of (5) are equal to l_0. Still as now $\Sigma_a=\Sigma$, then $l^{\rightarrow}$ on left side of (5) and $l_a^{\rightarrow}$ on left side of (4) are equal to each other. We divide (4) by (5) i.e. $l_a^{\rightarrow}/l^{\rightarrow}=\{a_{44}/[(a_{44}+va_{41})a_{11}^2]\}(l/l_a)$. Bring $l_a^{\rightarrow}=l^{\rightarrow}$ and $l=l_a=l_0$ into it we get $1=a_{44}/[(a_{44}+va_{41})a_{11}^2]$.

In *3.1* Σ and Σ_a take simultaneous measurement of the same a piece of space length: "stationary" on Σ's y-axis obtained (6), "stationary" on Σ_a's y_a-axis obtained (7), both l_y on right side of (6) and l_{ay} on right side of (7) are equal to l_0, $l_{ay}^{\rightarrow}$ on left side of (6) and $l_y^{\rightarrow}$ on left side of (7) are equal to each other. We divide (6) by (7) i.e. $l_{ay}^{\rightarrow}/l_y^{\rightarrow}=(1/a_{22}^2)(l_y/l_{ay})$, for $l_{ay}^{\rightarrow}=l_y^{\rightarrow}$, $l_y=l_{ay}=l_0$, we get $1=(1/a_{22}^2)$; analogously get $1=(1/a_{33}^2)$.

From $1=(1/a_{22}^2)$ and $1=(1/a_{33}^2)$ we can get $a_{22}=1$ and $a_{33}=1$ (abnegate the negative root). From simultaneous equations $1=1/[a_{44}(a_{44}+va_{41})]$. and $1=a_{44}/[(a_{44}+va_{41})a_{11}^2]$ we get $a_{11}=a_{44}$ and $a_{41}=v^{(-1)}(a_{44}^{(-1)}-a_{44})$ (abnegate the negative root). Bring $a_{22}=1$, $a_{33}=1$, $a_{11}=a_{44}$ and $a_{41}=v^{(-1)}(a_{44}^{(-1)}-a_{44})$ into (1)b we get

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix}=\begin{pmatrix} a_{44} & 0 & 0 & (-v)a_{44} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ v^{-1}(a_{44}^{-1}-a_{44}) & 0 & 0 & a_{44} \end{pmatrix}\begin{pmatrix} x_a \\ y_a \\ z_a \\ 1 \end{pmatrix} \quad (1)c'$$

Under (1)c′: ①from $f_1=v^{-1}(a_{44}^{-1}-a_{44})/a_{44}$ abnegating the negative root we can get $a_{44}|_{f=f_1}=[1+v^2/(C_{-ax}C_{-x})]^{(-1/2)}$; ②from $f_2=v^{-1}(a_{44}^{-1}-a_{44})/a_{44}$ abnegating the negative root we can get $a_{44}|_{f=f_2}=[1+v^2/(C_{ax}C_x)]^{(-1/2)}$; ③from $f_3=v^{-1}(a_{44}^{-1}-a_{44})/a_{44}$ we get $a_{44}|_{f=f_3}=\{1+v[C_{ax}C_{-x}-C_{-ax}C_x-v(C_{-x}+C_x)]/[C_{-ax}C_{-x}(C_{-ax}+C_{ax})]\}^{(-1/2)}$ (we abnegate the negative root). As $\Sigma_a=\Sigma$ it must be $C_{-x}=C_{ax}$ and $C_{-ax}=C_x$, then $a_{44}|_{f=f_1}=a_{44}|_{f=f_2}$ and $a_{44}|_{f=f_3}$ is reduced to $a_{44}|_{f=f_3}=[1+v(C_{ax}-C_{-ax}-v)/(C_{-ax}C_{ax})]^{(-1/2)}$. Abnegating $a_{44}|_{f=f_1}$ and $a_{44}|_{f=f_2}$, bring $a_{44}|_{f=f_3}$ into (1)c′ we get the (1)c′ goes to

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix}=\begin{pmatrix} \dfrac{1}{\sqrt{1+\dfrac{v(C_{ax}-C_{-ax}-v)}{C_{ax}C_{-ax}}}} & 0 & 0 & \dfrac{(-v)}{\sqrt{1+\dfrac{v(C_{ax}-C_{-ax}-v)}{C_{ax}C_{-ax}}}} \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ \dfrac{\dfrac{(C_{ax}-C_{-ax}-v)}{C_{ax}C_{-ax}}}{\sqrt{1+\dfrac{v(C_{ax}-C_{-ax}-v)}{C_{ax}C_{-ax}}}} & 0 & 0 & \dfrac{1}{\sqrt{1+\dfrac{v(C_{ax}-C_{-ax}-v)}{C_{ax}C_{-ax}}}} \end{pmatrix}\begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix}$$

(1)c

In (1)c the variables of C_{-ax} and C_{ax} are M_0, m_0, m_{10}, m_{20},……, v, u_a, u_{a1}, u_{a2},……, ω,ξ,ψ,…… actually; m_0 is the rest mass of the being measured object (i.e. the photon coming from the Σ's origin or Σ_a's origin), m_{10}, m_{20},……are the other objects' rest mass (including the rest mass of referenced weight of other reference systems joining simultaneous measurement or not joining simultaneous measurement but joining quantum correlation (i.e. entanglement) with Σ and Σ_a) and u_a, u_{a1}, u_{a2},……are the corresponding speed of m_0, m_{10}, m_{20},……measured by Σ_a, while ω,ξ,ψ,……are variable representing the simultaneous measurements' disturbance and the other action. Here $C_{-ax}\le C$ and $C_{ax}\ge C$ (just opposite to $C_{-x}\ge C$ and $C_x\le C$ please see the ending of *2.1*). Although the numerical value of the determinant of the coefficient matrix of the (1)c is 1, however, the coefficient matrix of (1)c is not orthogonal matrix. Because its' transpose matrix is not its' inverse matrix. When $C_{-ax}=C_{ax}$ (as known in *2.1* it must be $C_{-ax}=C_{ax}=C$, actually be $v\to 0$ please see later in *4.3*) the (1)c just becomes Lorentz transformation.

Here (1)c although the determinant value of the coefficient matrix of (1)c is 1, it is not orthogonal matrix. When for short we denote $(C_{ax}-C_{-ax}-v)/(C_{ax}C_{-ax})$ with ρ we can rewrite (1)c into

$$3=A\begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a\sqrt{\frac{v}{\rho}} \end{pmatrix} \quad (1)c''$$

(we denote the matrix with A). Here any row of (1)c″ is actually (1)c while its coefficient matrix A is orthogonal matrix for $A = A^{(-1)}$, so, we can get scalar product $x^2 + y^2 + z^2 + t^2(v/\rho) = x_a^2 + y_a^2 + z_a^2 + t_a^2\ (v/\rho)$. Although here the equal mark's left equal to the equal mark's right, however, we cannot regard it as the same as Einstein special relativity's invariant interval, for the numerical value of $(v/\rho) = vC_{ax}C_{-ax}/(C_{ax} - C_{-ax} - v)$ is not as the invariant interval's constant $(-C^2)$ i.e. generally there is not the invariant interval.

Determine the (1)b Coefficient Matrix's Element when we Re-Reduce the Case

A little generally it may be $M_0 \neq M_{a0}$: on right side of (2)'s τ and of (3)'s τ_a are the same τ_0 but on left side of (2)'s $\tau_a^{\rightarrow}$ and of (3)'s $\tau^{\rightarrow}$ it may be $\tau_a^{\rightarrow} \neq \tau^{\rightarrow}$ we cannot get $1 = 1/[a_{44}(a_{44} + va_{41})]$; on right side of (4), (6), (8)'s l and (5), (7), (9)'s l_a are the same l_0 but on left side of (4)'s $l_a^{\rightarrow}$ and (5)'s $l^{\rightarrow}$ it may be $l_a^{\rightarrow} \neq l^{\rightarrow}$ we cannot get $1 = a_{44}/[(a_{44} + va_{41})a_{11}^2]$, (6)'s $l_{ay}^{\rightarrow}$ and (7)'s $l_y^{\rightarrow}$ may be $l_{ay}^{\rightarrow} \neq l_y^{\rightarrow}$ we cannot get $1 = 1/a_{22}^2$, (8)'s $l_{az}^{\rightarrow}$ and (9)'s $l_y^{\rightarrow}$ may be $l_{az}^{\rightarrow} \neq l_y^{\rightarrow}$ we cannot get $1 = 1/a_{33}^2$, i.e. a little generally (need not to say generally) we cannot get (1)c.

It must be pointed out that $l^{\rightarrow}$ and $l_a^{\rightarrow}$ is not analogous to Σ and Σ_a's taking simultaneous measurement of the same distance between two reference system's origins i.e. measurement data of $tv(a_{11}/a_{44})$ and $(t_a v)$. Because the rest length of $l^{\rightarrow}$ and $l_a^{\rightarrow}$ are the same "stationary" length l_0 ($l = l_a = l_0$), while $tv(a_{11}/a_{44})$ and $(t_a v)$ are the same "in motion" length ——of course the "in stationary" length of $tv(a_{11}/a_{44})$ and of $(t_a v)$ are impossible the same. Therefore, $l^{\rightarrow}/l_a^{\rightarrow}$ is not equal to $[tv(a_{11}/a_{44})]/(t_a v)$. So, taking $l^{\rightarrow}/l_a^{\rightarrow} = [tv(a_{11}/a_{44})]/(t_a v)$ as an added equation is a wrong idea. So, generally the equations (2)～(9) are useless to determine the element of (1)b's coefficient matrix. Generally determining the element of the (1)b's coefficient matrix is very very difficult or impossible. We have no more better choice but to re-reduce the case (we have reduced the case since **3**): If nobody nearby Σ and Σ_a (i.e. except Σ and Σ_a any other Newtonian universal gravitation and simultaneous measurements' disturbing being neglected), the object being measured only are photon coming from the light source stationary in Σ or Σ_a, both M_0 and M_{a0} close to zero only keeping $\sigma = M_0/M_{a0}$ as an arbitrary constant had been determined like v, i.e. all the Newtonian universal gravitation even from M_0 and M_{a0} would be reduced, it seems that only the interactional impact of simultaneous measurement of the reference systems Σ and Σ_a becomes main part. It must be: at anywhere except the two infinitely small regions (one infinitely small region contains the Σ's origin, the other contains the Σ_a's origin) the C_x is a constant and the C_{-x} is another constant, the C_{ax} is some constant and the C_{-ax} is some another constant; $C_{-y} = C_y = C_{-z} = C_z$ and $C_{-ay} = C_{ay} = C_{-az} = C_{az}$. Therefore, it must be $a_{22} = a_{33} = a$ in this case (whether $C_{-y} = C_y = C_{-z} = C_z$ =or≠ $C_{-ay} = C_{ay} = C_{-az} = C_{az}$ and whether $a_{22} = a_{33} = a$ =1or≠1 we can only answer that we don't know, but we can confirm that when $\sigma = M_0/M_{a0} = 1$ it must be $C_{ax} = C_{-x}$ and $C_{-ax} = C_x$) when $v = 0$ it must be $C_{-ax} = C_{ax} = C_{-x} = C_x = C$ and $C_{-y} = C_y = C_{-z} = C_z = C$ and $C_{-ay} = C_{ay} = C_{-az} = C_{az} = C$ at anywhere except the two infinitely small regions (of course only when M_0 or M_{a0}, or both M_0 and M_{a0} not close to zero and then C_{-ax}, C_{ax}, C_{-x}, C_x are not constants). Can we find out the element of the (1)b's coefficient matrix in this case?

Σ And Σ_a Simultaneously Taking Measure of the Same Wave Front Surface of Light Emitted from Σ's Origin: At first let us take simultaneous measure of the same wave front surface of light emitted from the Σ's origin: In Σ we set some stationary glass plates on to the points at appropriate angle to reflect the light ray come from the Σ's origin back to the Σ's origin, it can change the light ray's direction from Σ's origin into from any other point of Σ's stationary light source (we neglect the two infinitely small regions one contains the Σ's origin and the other contains the Σ_a's origin because in the two infinitely small regions the Newtonian universal gravitation cannot be neglected): From the Σ's origin along the x-axis' positive direction to the stationary point x and then along the opposite direction back to the Σ's origin (as in *2.1* the light source fixed at the Σ's origin), on this a closed path, as *new postulate of light speed*, in Σ the average speed of the light ray should be the constant C. Using the absolute value to list the time equation in Σ we get $x/C_{-x} + x/C_x = 2x/C$, reduced the x it goes to

$$\frac{1}{C_x} + \frac{1}{C_{-x}} = \frac{2}{C} \qquad (19)$$

As known in the ending of *2.1* the two speed of light C_{-x} and C_x in (19) must be: the more the one, the small the other e.g. C_{-x} at maximal is $C_{-x}\to\infty$, and then the C_x must be at lowest $C_x\to C/2$. However, does this mean that the photon's speed will always between $(C/2,\ \infty)$ cannot be zero? Of course not! Here photon's speed is always between $(C/2,\ \infty)$ is because the light source is "in stationary". When the light source is "in motion" it will be not the case. Please see later the discussion after (23) and $(24)|_{\text{under}(25)}$, (27) and $(28)|_{\text{under}(29)}$: Although when $v<<C$ the $1/C_x^{\rightarrow}+1/C_{-x}^{\rightarrow}$ (or $1/C_{ax}^{\rightarrow}+1/C_{-ax}^{\rightarrow}$) always is equal to $2/(C\lambda)\approx 2/C$ almost as $1/C_x+1/C_{-x}=2/C$ (or $1/C_{ax}+1/C_{-ax}=2/C$) because it always is $\lambda\approx 1$, while when v is sufficiently great, in (24) the $C_{-ax}^{\rightarrow}$ may be$\to 0$ or$=0$ or<0 (meanwhile $C_{ax}^{\rightarrow}$ may be$>C$ or$>>C$ when $\sigma=M_0/M_{a0}>>1$ or$\to\infty$ in taking measure of the light come from a quasar please see later in $(34)|_{\sigma\to\infty}$); in (28) the $C_x^{\rightarrow}$ may be$\to 0$ or$=0$ or<0 (meanwhile $C_{-x}^{\rightarrow}$ may be$>C$ or$>>C$ when $\sigma=M_0/M_{a0}<<1$ or$\to 0$ in our (on earth) taking measure of the light come from a small mass particle please see later in $(34)|_{\sigma\to 0}$).

From the Σ's origin along the *r*'s positive direction to the stationary point *p* and then along the opposite direction back to the Σ's origin on this a closed path, as *new postulate of light speed*, in Σ the average speed of the light ray should be the constant *C*. Using the absolute value to list the time equation in Σ we get

$$\frac{r}{C_r}+\frac{r}{C_{-r}}=\frac{2r}{C} \quad (20)$$

From the Σ's origin along the *r*'s positive direction to the stationary point *p* and then along the *z*-axis 'opposite direction, the *y*-axis 'opposite direction, the *x*-axis 'opposite direction back to the Σ's origin. As *new postulate of light speed*, using the absolute value to list the time equation in Σ we get

$$\frac{r}{C_r}+\frac{z}{C_{-z}}+\frac{y}{C_{-y}}+\frac{x}{C_{-x}}=\frac{r+z+y+x}{C} \quad (21)$$

From the Σ's origin along the *x*-axis' positive direction, the *y*-axis' positive direction, the *z*-axis' positive direction to the stationary point *p* and then along the *r*'s opposite direction back to the Σ's origin. As *new postulate of light speed*, using the absolute value to list the time equation in Σ we get

$$\frac{x}{C_x}+\frac{y}{C_y}+\frac{z}{C_z}+\frac{r}{C_{-r}}=\frac{x+y+z+r}{C} \quad (22)$$

Now, from (21) minus (22) plus (20) (please note $C_{-y}=C_y$ and $C_{-z}=C_z$) we get

$$2\frac{r}{C_r}+x\left(\frac{1}{C_{-x}}-\frac{1}{C_x}\right)=\frac{2r}{C} \quad (23)''$$

Although in different octant (21) and (22) will change while (23)″ is always unchanged in form (please see appendix II). Bring (19) into (23)″ (please see appendix III) the (23)″ will go into

$$C_r=\frac{C}{1+\dfrac{(C_{-x}-C_x)}{(C_{-x}+C_x)}\cos\alpha} \quad (23)'$$

Here (23)′ appears: If C_{-x} and C_x have been determined, C_r will have been determined, and on the *x*-*y* plane ($\alpha=\pi/2$) C_r will be $C_r|_{\alpha=\pi/2}=C$.

If we do not only bring (19) as above but bring (19) and $r=(x^2+y^2+z^2)^{1/2}$, $r/C_r=t$ into (23)″, the (23)″ will turn not into (23)′, but into (please see appendix IV) (23):

$$\frac{\left[x-t\dfrac{(C_x-C_{-x})}{2}\right]^2}{\left[t\dfrac{(C_x+C_{-x})}{2}\right]^2}+\frac{y^2+z^2}{t^2C_xC_{-x}}=1 \quad (23)$$

Of course (23)″ and (23)′ and (23) all are Σ's result of taking measure of the same wave front surface of light emitted from the Σ's origin at *t* instant of time of Σ in three different angle of view. The (23) is an ellipsoid and as known in *2.1* here $(C_x-C_{-x})<0$. Analytic geometry tells us: the Σ's origin (light source) is just on the right focus of the ellipsoid (23). While the Σ_a's origin, as *2.2*, ①may on the ellipsoid's two focus join-line (when $M_a^{\rightarrow}>M_0$ (the $M_a^{\rightarrow}$ is "M_{a0} being in motion" in Σ with speed $(-va_{11}/a_{44})$ please see *2.4*), Σ's light be disturbed greater by $M_a^{\rightarrow}$ than by M_0 self so that two focus join-line longer than two origins join-line, great mass object $M_a^{\rightarrow}$ being wrapped in (23)); ②may on the ellipsoid's two focus join-line's leftward extended line out of the two focus join-line but still being wrapped in (23) (when $M_a^{\rightarrow}<M_0$ and $M_a^{\rightarrow}$ is with not great enough speed $(-va_{11}/a_{44})$ Σ's light be disturbed lighter by $M_a^{\rightarrow}$ than by M_0 self so that two focus join-line shorter than two origins join-line i.e. with the speed not

great enough the small mass object at Σ_a's origin is still being wrapped in (23)); ③may on the (23)'s two focus join-line's leftward extended re-extended even out of the ellipsoid (when $M_a^{\rightarrow} << M_0$ and $M_a^{\rightarrow}$'s speed $(-va_{11}/a_{44})$ is great enough i.e. with high speed small mass object Σ_a may not being wrapped in (23)). ——*In Σ we can see: If the speed (or kinetic energy) is great enough, a small mass object can go beyond the light which coming from the light source being stationary in a big referenced weight reference system*.

Since it is Σ and Σ_a take simultaneous measurement of the same wave front surface of light emitted from the Σ's origin, the Σ's measurement result is (23). What result the Σ_a's is? (Note in Σ_a the light source is "in motion"). Bring (1)b and $a_{22}=a_{33}=a$ into (23) we get (please see appendix V and VI)

$$\frac{\left[x_a - t_a\dfrac{(C_{ax}^{\rightarrow}-C_{-ax}^{\rightarrow})}{2}\right]^2}{\left[t_a\dfrac{(C_{ax}^{\rightarrow}+C_{-ax}^{\rightarrow})}{2}\right]^2}+\frac{y_a^2+z_a^2}{t_a^2(C_{ax}^{\rightarrow}-v)(C_{-ax}^{\rightarrow}+v)\dfrac{a_{11}^2}{a^2}}=1 \quad (24)$$

(where $C_{ax}^{\rightarrow}$ is shown in (12) and $C_{-ax}^{\rightarrow}$ is shown in (14)). Since (23) and (24) are Σ and Σ_a take simultaneous measurement of the same wave front surface of light emitted from the Σ's origin, the Σ's measurement result (23) is that the light source is on the right focus of the ellipsoid (23), the principle of relativity pledge: it must be that the Σ_a's measurement result (24) is also that the light source is on the right focus of the ellipsoid (24)! Consequently it must be

$$\frac{a_{11}^2}{a^2}=1 \quad (25)$$

Because only (25) can let the half minor axis' square of (24) become $t_a^2(C_{ax}^{\rightarrow}-v)(C_{-ax}^{\rightarrow}+v)$, let the (24) become

$$\frac{\left[x_a - t_a\dfrac{(C_{ax}^{\rightarrow}-C_{-ax}^{\rightarrow})}{2}\right]^2}{\left[t_a\dfrac{(C_{ax}^{\rightarrow}+C_{-ax}^{\rightarrow})}{2}\right]^2}+\frac{y_a^2+z_a^2}{t_a^2(C_{ax}^{\rightarrow}-v)(C_{-ax}^{\rightarrow}+v)}=1 \quad (24)|_{under(25)}$$

then from the $t_a(C_{ax}^{\rightarrow}+C_{-ax}^{\rightarrow})/2$ = $t_a[(C_{ax}^{\rightarrow}-v)+(C_{-ax}^{\rightarrow}+v)]/2$ can the analytic geometry pledge: The Σ_a's measurement result also is that the Σ's origin (light source) is just on the right focus of the ellipsoid (24) as (23); while the Σ_a's origin, ①may on the (24)'s two focus join-line, ②may on the left drawn-out line out of the two focus join-line but still being wrapped in the wave front surface (24) of the light emitted from the Σ's origin, ③may on the left re-drawn-out line even out of the (24), analogically as the Σ's measurement result (23).

Please note that the $(24)|_{under(25)}$ is still different from (23) for $v \neq 0$, being in accord with the new principle of relativity"*The laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different*". Special remind ——as Einstein special relativity $\Sigma=\Sigma_a$ the $(24)|_{under(25)}$ covariant into (23) i.e. besides $a_{11}^2/a^2=1$ it must be $(C_{ax}^{\rightarrow}-v)=C_{-ax}^{\rightarrow}$ and $C_{ax}^{\rightarrow}=(C_{-ax}^{\rightarrow}+v)$ i.e. Σ's origin and Σ_a's origin just on each one of the same ellipsoid's two focus. It only is in a very special case: not only $M_{a0}/M_0=1$ and nobody nearby Σ and Σ_a, but also the simultaneous measurements of Σ and Σ_a disturb each other just right. Generally we can only conclude: Taking simultaneous measure of the same wave front surface of light emitted from the Σ's origin, both the measurement results of Σ's and of Σ_a's are that the light source (Σ's origin) is just on the right focus of the ellipsoid; while the Σ_a's origin, ①may on the ellipsoid's two focus join-line, ②may on the left drawn-out line out of the two focus join-line, ③may on the left re-drawn-out line even out of the ellipsoid.

From (25) we do get that analytic geometry pledges: both (23) and (24), Σ and Σ_a taking simultaneous measurement of the same wave front surface of light emitted from the Σ's origin, are that the Σ's origin (light source) is on the right focus of the ellipsoid. However, from (25) we also do get $a=a_{11}$ (abnegate the negative root) and hence $a_{11}=a_{22}=a_{33}=a$ and then we know: *If the space length contract it must contract in all directions (instead of Einstein special relativity's only contract in the direction of motion)*! Of course if dilate it will dilate in all directions, as quasars' apparent superluminal expansion observed in astrophysics (Blandford RD [3], Cohen MH [4]).

Σ And Σ_a Simultaneously Taking Measure of the Same Wave Front Surface of Light Emitted From Σ_a's Origin: In taking simultaneous measurement of the same wave front surface of light emitted from the Σ_a's origin, analogically as in *4.3.1* we install some stationary glass plates on to the points at appropriate angle to reflect the light ray come from the Σ's origin back to the Σ_a's origin, with the absolute value we list the time equation in Σ_a we can get:

①Being analogous as"……from $x/C_{-x}+x/C_x=2x/C$ reduced the x we get (19)" in *4.3.1*, in Σ_a we can get

$$\frac{1}{C_{ax}}+\frac{1}{C_{-ax}}=\frac{2}{C} \quad (26)$$

②Being analogous as"……from (21) minus (22) plus (20) we get (23)" in *4.3.1*, in Σ_a we get

$$2\frac{r_a}{C_{ar}}+x_a\left(\frac{1}{C_{-ax}}-\frac{1}{C_{ax}}\right)=\frac{2r_a}{C} \quad (27)''$$

③Being analogous in *4.3.1*, bring (26) into (27)″, the (27)″ can be turned into

$$C_{ar}=\frac{C}{1+\dfrac{(C_{-ax}-C_{ax})}{(C_{-ax}+C_{ax})}\cos\alpha} \quad (27)'$$

(Special remind: as known in *2.1*, here $(C_{ax}-C_{-ax})>0$ is just opposite to $(C_x-C_{-x})<0$ of (23)′). Analogously, here (27)′ appears: If C_{-ax} and C_{ax} have been determined, it must be any C_{ar} will have been determined; and on the y_a-z_a plane ($\alpha=\pi/2$) the C_{ar} will be $C_{ar}|_{\alpha=\pi/2}=C$. Analogously if we do not only bring (26), but bring (26) and $r_a=(x_a^2+y_a^2+z_a^2)^{1/2}$ and $r_a/C_{ar}=t_a$ into (27)″, the (27)″ will not go to (27)′, but go to

$$\frac{\left[x_a-t_a\dfrac{(C_{ax}-C_{-ax})}{2}\right]^2}{\left[t_a\dfrac{(C_{ax}+C_{-ax})}{2}\right]^2}+\frac{y_a^2+z_a^2}{t_a^2C_{ax}C_{-ax}}=1 \quad (27)$$

Of course (27)″ and (27)′ and (27) all are Σ_a's result of taking measure of the same wave front surface of light emitted from the Σ_a's origin at t_a instant of time of Σ_a in three different angle of view. Being analogous (23) in *4.3.1*, here (27) is an ellipsoid and analytic geometry tell us: The Σ_a's origin (light source) is just on the left focus of the ellipsoid (27). While the Σ's origin, ①may on the ellipsoid's two focus join-line (when $M_{a0}<M^{\rightarrow}$ (the $M^{\rightarrow}$ is "M_0 being in motion" in Σ_a with speed v), Σ_a's light be disturbed greatly by $M^{\rightarrow}$ so that two focus join-line longer than two origins join-line), ②may on the rightward extended line out of the two focus join-line (when $M_{a0}>M^{\rightarrow}$ and $M^{\rightarrow}$ is in not great enough speed v, Σ_a's light be disturbed lighter by $M^{\rightarrow}$ than by M_{a0} self so that two focus' join-line is shorter than two origins join-line i.e. with the speed v not great enough the small mass object at Σ's origin is still being wrapped in (27)). ③may on the rightward extended line re-extended even out of the ellipsoid (when $M_{a0}>>M^{\rightarrow}$ and $M^{\rightarrow}$ is in great enough speed v, i.e. with high speed small mass object Σ may not being wrapped in (27)) ——*In Σ_a we also can see: If the speed (or kinetic energy) is great enough, a small mass object can go beyond the light which coming from the light source being stationary in a big referenced weight reference system*, it is as similar as in *4.3.1* in Σ, while it just can explain the reports on superluminal photonic tunneling experiments [5-8] since 1993.

Being analogous in *4.3.1*, since it is Σ and Σ_a taking simultaneous measurement of the same wave front surface of light emitted from the Σ_a's origin, the Σ_a's result is (27). What result the Σ's is? (please note in Σ the light source is "in motion"). Bring (1)$b^{(-1)}$ in *2.4* and $a_{22}=a_{33}=a$ into (27) we get (please see appendix VII and VIII)

$$\frac{\left[x-t\dfrac{(C_x^{\rightarrow}-C_{-x}^{\rightarrow})}{2}\right]^2}{\left[t\dfrac{(C_x^{\rightarrow}+C_{-x}^{\rightarrow})}{2}\right]^2}+\frac{(y^2+z^2)}{t^2\dfrac{(a_{44}+a_{41}C_{ax})(a_{44}-a_{41}C_{-ax})(a_{11}+a_{41}C_{-x}^{\rightarrow})(a_{11}-a_{41}C_x^{\rightarrow})}{a_{44}^{-2}a^{-2}a_{11}^4(a_{44}+va_{41})^4}(C_x^{\rightarrow}+v\dfrac{a_{11}}{a_{44}})(C_{-x}^{\rightarrow}-v\dfrac{a_{11}}{a_{44}})}=1 \quad (28)$$

(where $C_x^{\rightarrow}$ is shown in (13) and $C_{-x}^{\rightarrow}$ is shown in (15)). Analogously as *4.3.1*, since (27) and (28) are Σ and Σ_a taking simultaneous measurement of the same wave front surface of light emitted from the Σ_a's origin, the Σ_a's measurement result (27) is that the light source (Σ_a's origin) is on the left focus of ellipsoid (27), the principle of relativity pledge: It must be that the light source (Σ_a's origin) is also on the left focus of ellipsoid (28). Consequently it must be

$$\frac{(a_{44}+a_{41}C_{ax})(a_{44}-a_{41}C_{-ax})(a_{11}+a_{41}C_{-x}^{\rightarrow})(a_{11}-a_{41}C_x^{\rightarrow})}{a_{44}^{-2}a^{-2}a_{11}^4(a_{44}+va_{41})^4}=1 \quad (29)$$

Because only (29) can let the half minor axis' square of (28) be $t^2(C_x^{\rightarrow}+va_{11}/a_{44})\cdot(C_{-x}^{\rightarrow}-va_{11}/a_{44})$, and then let the (28) become

$$\frac{\left[x - t\frac{(C_x^{\to} - C_{-x}^{\to})}{2}\right]^2}{\left[t\frac{(C_x^{\to} + C_{-x}^{\to})}{2}\right]^2} + \frac{(y^2+z^2)}{t^2(C_x^{\to} + v\frac{a_{11}}{a_{44}})(C_{-x}^{\to} - v\frac{a_{11}}{a_{44}})} = 1$$

$(28)|_{\text{under}(29)}$

then from $t(C_x^{\to} + C_{-x}^{\to})/2$ $= t[(C_x^{\to} + va_{11}/a_{44}) + (C_{-x}^{\to} - va_{11}/a_{44})]/2$, can analytic geometry pledge: The Σ's measurement result also is that the light source (Σ_a's origin) is on the left focus of ellipsoid (28). While the Σ's origin, ①may on the ellipsoid two focus join-line, ②may on the rightward extended line out of the two focus join-line but still being wrapped in the wave front surface (28) of the light emitted from the Σ_a's origin, ③may on the rightward extended line re-extended even out of the ellipsoid (28), analogically as the Σ_a's measurement result (27).

Please not that the $(28)|_{\text{under}(29)}$ is still different from (27) for v≠0, being in accord with the new principle of relativity: "The laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different".

Bring (13), (15) into (29), we solve the equation get $a_{41}=(a_{44}/v)[(a/a_{11})-1]$ (please see appendix IX). As it approximately is $\alpha_{ij}=\beta_{ij}=\gamma_{ij}=a_{ij}$, we can bring $a=a_{11}$ in 4.3.1 to $a_{41}=(a_{44}/v)[(a/a_{11})-1]$ in 4.3.2, leading $a_{41}=0$. Bring $a_{41}=0$ and $a_{11}=a_{22}=a_{33}=a$ into (1)b we get (1)b become

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & (-v)a_{11} \\ 0 & a_{11} & 0 & 0 \\ 0 & 0 & a_{11} & 0 \\ 0 & 0 & 0 & a_{44} \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)\text{d}$$

The Numerical Value Relation Of Σ And Σ_a's Measurement Data of Σ And Σ_a Simultaneously Taking Measure of the Same Focus-Length of the Wave Front Surface of Light Emitted from Σ's Origin and Σ_a's Origin on Σ_a's Position: Considering on Σ_a's position, besides simultaneously measuring the same photon coming from the source stationary at Σ_a's origin we also simultaneously measuring the another same photon coming from the source stationary at Σ's origin: As *the third postulate*, if there is not measurement, both the wave front surface of light emitted from the Σ_a's origin and from the Σ's origin must be radius $r_a=t_aC$ sphere (because not been destroyed by measurement, so, both are radius $r_a=t_aC$ sphere ——otherwise the measurement data of the light source's being "in motion" must be different from "in stationary") merely the centre of the $r_a=t_aC$ sphere from the Σ_a's origin is at the Σ_a's origin while the centre of the $r_a=t_aC$ sphere from the Σ's origin is at the Σ's origin being "in motion" with Σ on Σ_a's position. When there are simultaneous measurement of Σ and Σ_a, the wave front surface of light emitted from the Σ_a's origin being changed by the simultaneous measurement of Σ and Σ_a, the wave front surface radius $r_a=t_aC$ sphere is changed into ellipsoid (27) (the centre of the sphere from the Σ_a's origin is rightward divided another focus of the ellipsoid please note the distance between the two focuses of Σ_a's measurement data is $2c_a$ of the (27) i.e. $2c_a= t_a(C_{ax}- C_{-ax})$); analogously the wave front surface of light emitted from the Σ's origin (the wave front surface radius $r_a=t_aC$ sphere when there is not measurement on Σ_a's position) is changed into ellipsoid $(24)|_{\text{under}(25)}$ (the centre of the sphere from the Σ's origin is leftward divided another focus of the ellipsoid $(24)|_{\text{under}(25)}$ please note the distance between the two focuses of Σ_a's measurement data is $2c_{a^{\to}}$ of the $(24)|_{\text{under}(25)}$ i.e. $2c_{a^{\to}} = t_a[(C_{-ax}^{\to}+v)-(C_{ax}^{\to}-v)]$). On the other hand, on Σ_a's position the mass center of the two referenced weights M_{a0} and $M^{\to}= M_0/(a_{44}+ va_{41})$ is on the length of t_av (the Σ_a's measurement data of the distance between the two origins in Σ and Σ_a simultaneous measurement) and incises the length of t_av to l and $(t_av–l)$, where l is the distance between the M_{a0} (at Σ_a's origin) and the mass center of the M_{a0} and $M^{\to}$. The Σ_a seeing Σ's sphere centre being leftward divided another focus and Σ_a self's sphere centre being rightward divided another focus, are only because the simultaneous measurements of Σ and Σ_a (nobody nearby and both M_0 and M_{a0} close to zero). If you ask that *on Σ_a's position how much the interactional impact of the simultaneous measurements of Σ and Σ_a is*? We can only answer that we don't know, but we can confirm: From the *new added postulate* in *1.3* we can confirm that *Σ_a's measurement data of the two focuses' $2c_a$ and $2c_{a^{\to}}$ show the magnitude of the interactional impact of simultaneous measurement of Σ and Σ_a on Σ_a's position*! Although in *3.2* we have known"we can consequently get"'s a), b), c), d) and the reversed case of a), of b), of c), of d), however, whether it is "*$2c_a$ is in inverse ratio of the Σ_a self's referenced weight M_{a0} and in direct ratio of the Σ's referenced weight $M^{\to}$, $2c_{a^{\to}}$ is in direct ratio of the Σ_a's referenced weight M_{a0} and in inverse ratio of the Σ self's referenced weight $M^{\to}$*" or "*$2c_a$ is in inverse square ratio of the Σ_a self's referenced weight M_{a0} and in direct square ratio of the Σ's referenced weight $M^{\to}$, $2c_{a^{\to}}$ is in direct square ratio of the Σ_a's referenced weight M_{a0} and in inverse square ratio of the Σ self's referenced weight $M^{\to}$*"

we do not know. From the *new added postulate* in *1.3*, and from in *3.2* we have known"we can consequently get"'s a), b), c), d) and the reversed case of a), of b), of c), of d), on Σ_a's position we can only confirm "M_{a0} and $M^{\rightarrow}$ who is bigger, the mass center of the M_{a0} and $M^{\rightarrow}$ will drift off from the middle of the $t_a v$ to whom, whom's measurement data will be disturbed less, whom's ellipsoid two focus length will be less" i.e. on Σ_a's position the simultaneous measurements of Σ and Σ_a disturb shown in $2c_a$ and $2c_a{}^{\rightarrow}$should be in accord with $2c_a/2c_a{}^{\rightarrow}= l/(\ t_a v-l)$. While on Σ_a's position the mass center of M_{a0} and $M^{\rightarrow}$ must be in accord with $l{\cdot}(M_{a0}+ M^{\rightarrow})= (t_a v){\cdot}M^{\rightarrow}$ i.e. $l/(t_a v-l)= M^{\rightarrow}/M_{a0}$, then we get $2c_a/2c_a{}^{\rightarrow}= l/(\ t_a v-l) = M^{\rightarrow}/M_{a0}$. When $2c_a= t_a(C_{ax}-C_{-ax})$, $2c_a{}^{\rightarrow}=t_a[(\overrightarrow{C_{-ax}}+v)-(\overrightarrow{C_{ax}}-v)]$, (12), (14) and $M^{\rightarrow} =M_0/(a_{44}+va_{41})$ being placed in $2c_a/2c_a{}^{\rightarrow}= M^{\rightarrow}/M_{a0}$, under (1)d we get (please see appendix X)

$$\frac{(C_{ax}-C_{-ax})a_{11}}{(C_{-x}-C_x)}=\frac{M_0}{M_{a0}} \qquad (30)'$$

Determine The Element of (1)B Coefficient Matrix when we Re-Re-Reduce The Case

However, taking (30)′ as an added equation to f_3=0, (19), (26) as four simultaneous equations to determine C_{-ax}, C_{ax}, C_{-x}, C_x is not a good idea, for (30)′ contains unknown quantity a_{11} (please note: adding $\varphi_3=a_{44}/a_{11}$ will add more unknown quantities a_{11} and a_{44}). Although having gone through reduce the case since **3**, only when $\Sigma=\Sigma_a$ can we get (1)c. A little generally it may be $M_0 \neq M_{a0}$ we cannot get (1)c, even re-reduce the case since *4.3*, we still cannot find out the element of (1)b coefficient matrix, we can only confirm: 1)The light source is just on one focus of the wave front ellipsoid surface of light. 2)If the speed (or kinetic energy) is great enough, a small mass object can go beyond the light which coming from the light source *being stationary* in a big referenced weight reference system. 3)In this case it must be $a_{33}=a_{22}=a_{11}$ and a_{41}=0 in (1)b i.e. (1)b becomes (1)d and then we know: *If the space length contract it must contract in all directions* (*instead of Einstein special relativity's only contract in the direction of motion* and if dilate it will dilate in all directions as quasars' apparent superluminal expansion observed in astrophysics (Blandford RD [3], Cohen MH [4]).

It must be pointed out that the Lorentz transformation of the special relativity is merely an approximate formula of the (1)c ignore the new added postulate to assume $C_{-a0}=C_{a0}$. Please note although $t=(t_a+x_a\rho)(1+v\rho)^{-(1/2)}$ in (1)c while the factor $\rho(1+v\rho)^{-(1/2)}$ like $-v/C^2$ is infinitely small when $v<<C$. So, the Lorentz transformation of the special relativity is not contrary to (1)c, not contrary to the a_{41}=0 of (1)d.

It also must be pointed out that in general the referenced weight mass may be not a particle the reference system's origin is on the center of the referenced weight mass, there are other objects and other reference systems joining simultaneously to measure with Σ and Σ_a, the speed of a photon from a stationary light source is associated with all of the mass' space distribution and all of the reference systems joining to measure with Σ and Σ_a, leading the a_{ij}(i,j =1,2,3,4) are the function of not only M_{a0}, M_0, m_0, m_{10}, m_{20},…… , the corresponding speeds 0, v, u_a, u_{a1}, u_{a2},……in Σ_a, ω,ξ,ψ,…… variable representing the simultaneous measurements' disturbance, but also x_a, y_a, z_a, t_a and x, y, z, t , there is not "it approximately is $\alpha_{ij}= \beta_{ij}= \gamma_{ij}= a_{ij}$", the a and a_{11} in *4.3.1* ≠the a and a_{11} in *4.3.2*, we cannot "*bring a=a_{11} in 4.3.1 into* $a_{41}= (a_{44}/v)\ [(a/a_{11})-1]$ *in 4.3.2 leading* a_{41}=0", (please see the explanation after (3) in *3.1*).

Therefore the relation about (x, y ,z, t) and (x_a, y_a, z_a, t_a) generally is (1)a, and the a_{41} of (1)a may be analogous the $a_{41}=\rho(1+ v\rho)^{-(1/2)}$ in (1)c, the t in (1)a may be analogous the $t=(t_a+ x_a\,\rho)(1+ v\rho)^{-(1/2)}$ in (1)c might go to time-reversal in some case, as the observation of time-reversal non-invariance in the neutral-kaon system published by CERN in 1998 [38,39]. But we still believe that (1)a will still not disobey the conclusions "*if the speed (or kinetic energy) is great enough, a small mass object can go beyond the light which comes from the light source rest in a big referenced weight reference system*" and "*if the space length contract it must contract in all directions instead of Einstein special relativity's only contract in the direction of motion*" etc educed from *4.3.1* and *4.3.2*, though determining the a_{ij}(i,j =1,2,3,4) of (1)a is very difficult or impossible.

Please note in *4.1* because two reference system's origins are in a short way off then (16) and (17) are in action, there a_{41}=0 (i.e. $f_3=a_{41}/a_{11}=0$), the v is not limited i.e. it may be $v\rightarrow0$ or $>C$ or $>>C$. While usually it may be $v<<C$ or $v\rightarrow0$ but $v\neq0$ leading $f_1\neq0$ and $f_2\neq0$, only f_3 can allow $f_3=a_{41}/a_{11}=0$. Therefore, in the ending of *4.2* abnegating $a_{44}|_{f=f1}$ and $a_{44}|_{f=f2}$, adopt $a_{44}|_{f=f3}$ to get (1)c is right. The physical meanings of $f_3=a_{41}/a_{11}=0$ i.e. $C_{ax}C_{-x}-C_{-ax}C_x=v(C_{-x}+C_x)$ i.e. $C_{ax}/C_x-C_{-ax}/C_{-x}=v2/C$ is clear. However, with f_3=0, (19) and (26) three simultaneous equations we still cannot determine C_{-ax}, C_{ax}, C_{-x}, C_x four unknown quantities (please note: adding $\varphi_3=a_{44}/a_{11}$ will add more unknown quantities a_{11} and a_{44}). Now, the C_{-ax} C_{ax} C_{-x} C_x and a_{11} a_{44} of the (1)d still are unknown quantities. ——If

we re-re-reduce the case: adding $v<<C$, can we find out the C_{-ax} C_{ax} C_{-x} C_x and a_{11} a_{44} of the (1)d?

Taking note of that only both the *time length in motion dilate* and the *space length in motion contract* are in action, can we be able to completely explain the Michelson-Morley experiment [30] and almost all of these experiments are taken under $v<<C$. So, under re-re-reduce the case (i.e. adding $v<<C$), we can from (2) and (4) get

$$a_{11}=\frac{\alpha}{a_{44}+va_{41}} \qquad (31)$$

(or from (3) and (5) it must be $(a_{44}+va_{41})a_{11}/a_{44}=\alpha/a_{44}$ i.e. $(a_{44}+va_{41})a_{11}=\alpha$). Here α is a constant waiting to be determined. From (31) $\varphi_3=a_{44}/a_{11}=a_{44}^2/\alpha$ we get $a_{44}=(\alpha\varphi_3)^{1/2}$, $a_{11}=a_{44}/\varphi_3=(\alpha/\varphi_3)^{1/2}$. Because when v=0 it must be $a_{11}=a_{22}=a_{33}=1$ (please see (1)a$/_{v=0}$ in *2.3*) and $C_{-ax}=C_{ax}=C_{-x}=C_x=C$, then $\varphi_3=a_{44}/a_{11}=[C_{-ax}C_{ax}(C_{-x}+C_x)]/[C_{-x}C_x(C_{-ax}+C_{ax})]=1$, so, it must be $\alpha\equiv1$. Bring $\alpha\equiv1$, $a_{11}=(\alpha/\varphi_3)^{1/2}=(\varphi_3)^{-1/2}$, $a_{44}=(\alpha\varphi_3)^{1/2}=(\varphi_3)^{1/2}$ into (1)d, (1)d goes to

$$\begin{pmatrix} x\\ y\\ z\\ t\end{pmatrix}=\begin{pmatrix} 1/\sqrt{\phi_3} & 0 & 0 & (-v)/\sqrt{\phi_3}\\ 0 & 1/\sqrt{\phi_3} & 0 & 0\\ 0 & 0 & 1/\sqrt{\phi_3} & 0\\ 0 & 0 & 0 & \sqrt{\phi_3}\end{pmatrix}\begin{pmatrix} x_a\\ y_a\\ z_a\\ t_a\end{pmatrix} \qquad (1)e$$

In (1)e the element of the coefficient matrix of (1)e is completely determined by φ_3. Bring $a_{11}=(\varphi_3)^{-1/2}$ into (30)′, then the (30)′ goes to

$$\frac{(C_{-x}-C_x)\sqrt{\phi_3}}{(C_{ax}-C_{-ax})}=\frac{M_{a0}}{M_0} \qquad (30)$$

(where φ_3 is shown in (18)). Please note that with a_{41}=0 i.e. f_3=0 the φ_3 can be reduced (please see appendix XI). Now, in mathematics, with four simultaneous equations f_3=0, (19), (26), (30), we can determine four unknown quantities C_{-ax} , C_{ax} , C_{-x} , C_x , and then from (18) get φ_3 (actually it is with f_3=0 , (19), (26), (30), $\varphi_3=a_{44}/a_{11}$, and (31) i.e. $(a_{44}+va_{41})a_{11}=\alpha\equiv1$ six simultaneous equations we can determine six unknown quantities C_{-ax} , C_{ax} , C_{-x} , C_x , a_{11} , a_{44}).

However, when we stand $C_{-ax}=\gamma$ with f_3=0 , (19), (26) three simultaneous equations, get $C_{ax}=\gamma C/(2\gamma-C)$, $C_{-x}=\gamma^2C/[2\gamma^2-(2\gamma-C)(v+\gamma)]$, $C_x=\gamma^2C/[(2\gamma-C)(v+\gamma)]$ bring into (30), the equation about γ (=C_{-ax}) is higher than 5 degree (so do we stand C_{ax} or C_{-x} or C_x). While as we known, any polynomial equation of degree ≥5 with real or complex coefficients is not solvable by radicals [45]. Therefore, we have no more better choice but to determine the approximate value of C_{-ax}, C_{ax}, C_{-x}, C_x and φ_3 when $v<<C$. When we simultaneous f_3=0 , (19), (26), (30) we can get $C'_{-ax}\big|_{v=0}$, $C'_{ax}\big|_{v=0}$, $C'_{-x}\big|_{v=0}$, $C'_{x}\big|_{v=0}$, $\varphi'_3\big|_{v=0}$, $\varphi''_3\big|_{v=0}$ and $\varphi'''_3\big|_{v=0}$ etc (please see appendix XI). Then, when $v<<C$, approximate formula (neglected more higher order infinitely small) of Taylor series expansion are (where $\sigma=M_0/M_{a0}$)

$$C_{-ax}\approx C+\frac{(-\sigma)}{(1+\sigma)}v\ \ C_{-ax}\approx C+\frac{(-\sigma)}{(1+\sigma)}v\ ,\ C_{ax}\approx C+\frac{\sigma}{(1+\sigma)}v$$

$$,\ C_{-x}\approx C+\frac{1}{(1+\sigma)}v\ ,\ C_x\approx C+\frac{(-1)}{(1+\sigma)}v\ ,$$

$$\varphi_3\approx \phi_3\big|_{v=0}+(\phi'_3\big|_{v=0})v+\frac{1}{2!}(\phi''_3\big|_{v=0})v^2+\frac{1}{3!}(\phi'''_3\big|_{v=0})v^3=$$

$$1+0+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2+0$$

$$a_{11}=a_{22}=a_{33}=\frac{1}{\sqrt{\varphi_3}}\approx\frac{1}{\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2}}\ ,\ a_{44}=\sqrt{\varphi_3}\approx$$

$$\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2} \qquad (32)$$

Of course all v/C^2 above should be replaced by $-(C_{ax}-C_{-ax}-v)/C_{ax}C_{-ax}$ because (1)c is more precise than the Lorentz transformation. After all, as it approximately is $\alpha_{ij}=\beta_{ij}=\gamma_{ij}=a_{ij}$, and then we can bring $a=a_{11}$ in *4.3.1* into $a_{41}=(a_{44}/v)[(a/a_{11})-1]$ in *4.3.2*, then leading a_{41}=0. Precisely it is $\alpha_{ij}\approx\beta_{ij}\approx\gamma_{ij}\approx a_{ij}$, i.e. precisely the a_{11} in *4.3.1* ≠ the a_{11} in *4.3.2*, we cannot bring the $a=a_{11}$ in *4.3.1* into the $a_{41}=(a_{44}/v)[(a/a_{11})-1]$ in *4.3.2* get a_{41}=0 i.e. *precisely* the (1)e's $a_{41}=(a_{44}/v)[(a/a_{11})-1]$ should be infinitely small instead of 0. So, for some reason (please see later) we should approximately take $a\approx1$ and then $a_{41}\approx(a_{44}/v)[(1/a_{11})-1]$ then (1)e goes to

$$\begin{pmatrix} x \\ y \\ z \\ t \end{pmatrix} = \begin{pmatrix} \frac{1}{\sqrt{\phi_3}} & 0 & 0 & \frac{(-v)}{\sqrt{\phi_3}} \\ 0 & \frac{1}{\sqrt{\phi_3}} & 0 & 0 \\ 0 & 0 & \frac{1}{\sqrt{\phi_3}} & 0 \\ \frac{\sqrt{\phi_3}}{(-v)}(1-\sqrt{\phi_3}) & 0 & 0 & \sqrt{\phi_3} \end{pmatrix} \begin{pmatrix} x_a \\ y_a \\ z_a \\ t_a \end{pmatrix} \quad (1)f$$

(where φ_3 is shown in (18) and its' approximate formula (neglected more higher order infinitely small) of Taylor series expansion is shown in (32), more precise please see the ending of appendix XI). Because only so, then can we get $a_{41}=(a_{44}/v)[(a/a_{11})-1] \approx (a_{44}/v)[(1/a_{11})-1]=(a_{44}/v)(a_{44}-1)$ in the (1)f, and then in our (on earth) taking measure of a micro-particle ($\sigma=M_0/M_{a0}\to 0$) will it be $a_{41}=(a_{44}/v)(a_{44}-1)\approx(a_{44}^2-1)/v \approx -v/C^2$ being in accord with the a_{41} of the coefficient matrix of the Lorentz transformation. It is obvious that it is (1)f's $a_{41}=(a_{44}/v)(a_{44}-1)$ being $\to 0$ but $\neq 0$ leading the time might go to time-reversal in some case, as the observation of time-reversal non-invariance in the neutral-kaon system published by CERN in 1998 [38,39].

Discussion and Conclusions

From (32) we can see: when $v << C$ the C_{-ax}, C_{ax}, C_{-x}, C_x are in accord with: greater referenced weight reference system's measurement data be disturbed less (be changed less away from C), less referenced weight reference system's measurement data be disturbed greater (be changed greater away from C) as known in *2.2*. Please note the (1)f and (32) are educed from that nobody nearby Σ and Σ_a, both M_0 and M_{a0} close to zero only keeping $\sigma=M_0/M_{a0}$ as a arbitrary constant had been determined like v and the being measured object only are photon coming from the source stationary in Σ or Σ_a, the more the constant v close to zero and two reference system's origins in a more short way off, the more (1)f and (32) accurate. However, we can roughly take both M_0 and M_{a0} as arbitrary mass or even in space distribution only the center at the Σ and Σ_a's origin, there are other bodies in the world besides Σ and Σ_a, Σ and Σ_a's origin may be in a long way off etc, then educe rough conclusion as follow:

a). Under (1)f, if $M_0 > M_{a0}$, e.g. we (on earth) Σ_a take measure of the light come from any a quasar Σ (Σ's moving speed measured by our Σ_a is the constant v) is just in a small referenced weight reference system take measure of the "in motion" bigger referenced weight reference system's thing (it is said that the mass of any quasar is far more bigger than the sun need not to say our earth), in (32) $M_0 >> M_{a0}$ i.e. $\sigma=M_0/M_{a0}\to\infty$ therefore $\varphi_3 > 1$ and then $a_{44} > 1$, $a_{11} < 1$ in (1)f. Then (2) , (4), (6), (8) in *3.1* become

$$\tau_a^{\to} = \frac{\tau}{(a_{44}+va_{41})} \approx \frac{\tau}{a_{44}} =$$

$$\frac{\tau}{\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2}} = \frac{\tau}{\sqrt{1+(v/C)^2}} < \tau \quad (2)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_{ax}^{\to} = \frac{l}{a_{11}} = l\cdot\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2} = l\cdot\sqrt{1+(v/C)^2} > l$$

$$(4)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_{ay}^{\to} = \frac{l}{a_{22}} = \frac{l}{a_{11}} = \text{x}\, l\cdot\sqrt{1+(v/C)^2} > l \quad (6)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_{az}^{\to} = \frac{l}{a_{33}} = \frac{l}{a_{11}} = l\cdot\sqrt{1+(v/C)^2} > l \quad (8)|_{\text{under(1)f and } \sigma\to\infty}$$

It appears: On earth (small referenced weight reference system Σ_a) take measure of the other "in motion" quasar (bigger referenced weight reference system Σ), will see that the "in motion" quasar's time contract and space dilate in all directions. Perhaps the light speed in the quasar Σ is constant $C\approx 3\times10^8 ms^{-1}$. But $l_0=3\times10^8 m$ is the quasar Σ's measurement data while our (on earth) Σ_a's measurement data is $l_a^{\to} > l_0$, time $t_0=1s$ is the quasar Σ's measurement data while our (on earth) Σ_a's measurement data is $\tau_a^{\to} < t_0$, then it is obvious that the light speed of our's (earth Σ_a's) measurement data is quotient $C_a^{\to}= l_a^{\to}/\tau_a^{\to} > l_0/t_0$ (it's numerator greater than $l_0=3\times10^8 m$ and denominator less than $t_0=1s$) even being more precisely till $(v/C)^5$ (please see appendix XI) we take $\varphi_3=1+0+[(\sigma-1)/(\sigma+1)](v/C)^2+0+[\sigma(1+\sigma-\sigma^2-\sigma^3)/(\sigma+1)^4](v/C)^4+0$. Therefore, our (on earth) astronomical observatory discover the quasars' super-luminal expansion [3,4]). In addition, in 2.4 we have known Σ and Σ_a take measure of the same speed of relative motion, the Σ_a's measurement data is v while the Σ's measurement data is (va_{11}/a_{44}). As above our Σ_a's is v while the quasar's measurement data is $va_{11}/a_{44}=v/[1+(v/C)^2] < v$ —— taking measure of the same speed our earth Σ_a's measurement data is greater than that of the quasar Σ's: Perhaps the light speed in the quasar Σ's is $3\times10^8 ms^{-1}$, however, our Σ_a's measurement data will be greater than $3\times10^8 ms^{-1}$ also can explain our (on earth) astronomical observatory discover the quasar's super-luminal expansion. And our Σ_a's measurement data of the speed of the light from quasars to be greater than $3\times10^8\,ms^{-1}$ will result in our Σ_a's measurement data of the fine structure constant $\alpha=e^2/(2\varepsilon_0 hC)$ of the quasar lessening: Because e and ε_0 as well as h are "stationary" quantities' numerical value before unit (being the same in different reference system), only C express the photon "in motion". Here quasar α's lessening can explain J. K. Webb et al.'s results [46] (they said: "we find no systematic effects which can explain our results"). Here time contract and space dilate in all directions (instead of only in the direction of motion) is just on the contrary to Einstein special relativity. Meanwhile the (3), (5), (7), (9) are:

$$\tau^{\rightarrow} = \tau_a\, a_{44} = \tau_a\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2} = \tau_a\sqrt{1+(v/C)^2} > \tau_a \quad (3)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_x^{\rightarrow} = \frac{a_{11}}{a_{44}}(a_{44}+va_{41})l_0 \approx a_{11}\cdot l_0 \approx \frac{l_0}{\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2}} = \frac{l_0}{\sqrt{1+(v/C)^2}} < l_0 \quad (5)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_y^{\rightarrow} = a_{22}\cdot l_0 = a_{11}\cdot l_0 \approx \frac{l_0}{\sqrt{1+(v/C)^2}} < l_0 \quad (7)|_{\text{under(1)f and } \sigma\to\infty}$$

$$l_z^{\rightarrow} = a_{33}\cdot l_0 = a_{11}\cdot l_0 \approx \frac{l_0}{\sqrt{1+(v/C)^2}} < l_0 \quad (9)|_{\text{under(1)f and } \sigma\to\infty}$$

It appears: *in the bigger referenced weight reference system quasar Σ take measure of the other "in motion" our earth Σ_a (small referenced weight reference system Σ_a), will see that the small referenced weight reference system our earth Σ_a's time length to dilate* (note that the same time "stationary" in Σ and "stationary" in Σ_a, the numerical value before the Σ's time unit and the numerical value before the Σ_a's time unit are the same τ_0 i.e. $\tau=\tau_a=\tau_0$ please see *2.3*) *and the small referenced weight reference system our earth Σ_a's space length contract in all directions* instead of only contract in the direction of motion as Special Relativity! What the see from Σ to Σ_a is just opposite to what the see from Σ_a to Σ.

b). Under (1) f, if $M_0 < M_{a0}$ i.e. $\sigma = M_0/M_{a0} < 1$ therefore $\varphi_3 < 1$ and then $a_{44} < 1$, $a_{11} > 1$ in (1)f. Then (2) , (4), (6), (8) in *3.1* are in bigger referenced weight reference system to take measure of the other "in motion" small referenced weight reference system's things:

$$\tau_a^{\rightarrow} = \frac{\tau}{(a_{44}+va_{41})} \approx \frac{\tau}{a_{44}} > \tau \quad (2)|_{\text{under (1)f and } 0<\sigma<1}$$

$$l_{ax}^{\rightarrow} = \frac{l}{a_{11}} = l\cdot\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2} < l \quad (4)|_{\text{under (1)f and } 0<\sigma<1}$$

$$l_{ay}^{\rightarrow} = \frac{l}{a_{22}} = \frac{l}{a_{11}} < l \quad (6)|_{\text{under (1)f and } 0<\sigma<1}$$

$$l_{az}^{\rightarrow} = \frac{l}{a_{33}} = \frac{l}{a_{11}} < l \quad (8)|_{\text{under (1)f and } 0<\sigma<1}$$

It appears: *in a bigger referenced weight reference system Σ_a take measure of the other "in motion" small referenced weight reference system Σ, will see that the small referenced weight reference system's time length to dilate* (the same time "stationary" in Σ and "stationary" in Σ_a are the same τ_0 i.e. $\tau=\tau_a=\tau_0$); *the small referenced weight reference system's space contract in all directions*, i.e. here b)'s (2) , (4), (6), (8) be similar as the a)'s (3), (5), (7), (9) both are from bigger referenced weight reference system to take measure of the other "in motion" small referenced weight reference system's things. For example, we (on earth) take measure of a particle, Σ_a is our earth's reference system (the earth is "stationary" in Σ_a) and Σ is the particle's reference system (the particle is "stationary" in Σ and the Σ's moving speed measured by Σ_a is constant v) here $M_0 \ll M_{a0}$ i.e. $\sigma = M_0/M_{a0} \to 0$ then (2), (4), (6), (8) will be

$$\tau_a^{\rightarrow} \approx \frac{\tau}{a_{44}} = \frac{\tau}{\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2}} = \frac{\tau}{\sqrt{1-(v/C)^2}} > \tau \quad (2)|_{\text{under (1)f and } \sigma\to0}$$

$$l_{ax}^{\rightarrow} = \frac{l}{a_{11}} = l\cdot\sqrt{1+\frac{(\sigma-1)}{(1+\sigma)}(v/C)^2} = l\cdot\sqrt{1-(v/C)^2} < l \quad (4)|_{\text{under (1)f and } \sigma\to0}$$

$$l_{ay}^{\rightarrow} = \frac{l}{a_{22}} = \frac{l}{a_{11}} = l\cdot\sqrt{1-(v/C)^2} < l \quad (6)|_{\text{under (1)f and } \sigma\to0}$$

$$l_{az}^{\rightarrow} = \frac{l}{a_{33}} = \frac{l}{a_{11}} = l\cdot\sqrt{1-(v/C)^2} < l \quad (8)|_{\text{under (1)f and } \sigma\to0}$$

Even we take $\varphi_3=1+0+[(\sigma-1)/(\sigma+1)](v/C)^2+0+[\sigma(1+\sigma-\sigma^2-\sigma^3)/(\sigma+1)^4](v/C)^4+0$ (more precisely till $(v/C)^5$ please see appendix XI) here $(2)|_{\text{under(1)e and }\sigma\to0}$ —$(8)|_{\text{under(1)e and }\sigma\to0}$ above are still the same. Here $(2)|_{\text{under(1)e and }\sigma\to0}$ —$(8)|_{\text{under(1)e and }\sigma\to0}$ are just the same as Einstein special relativity's formula, while what in distinction from Einstein special relativity is here $(4)|_{\text{under(1)e and }\sigma\to 0}$, $(6)|_{\text{under(1)e and }\sigma\to 0}$, $(8)|_{\text{under(1)e and }\sigma\to 0}$ show the space contract in all directions instead of only in the direction of motion. Meanwhile the (3), (5), (7), (9) are

$$\tau^{\rightarrow} = a_{44}\,\tau_a < \tau_a \quad (3)|_{\text{under (1)f and }0<\sigma<1}$$

$$l_x^{\rightarrow} = \frac{a_{11}}{a_{44}}(a_{44}+va_{41})l_0 \approx a_{11}\cdot l_0 \approx \frac{l_0}{\sqrt{1+\dfrac{(\sigma-1)}{(1+\sigma)}(v/C)^2}} > l$$

$$(5)|_{\text{under (1)f and }0<\sigma<1}$$

$$l_y^{\rightarrow} = a_{22}\cdot l_a = a_{11}\cdot l_a > l \quad (7)|_{\text{under (1)f and }0<\sigma<1}$$

$$l_z^{\rightarrow} = a_{33}\cdot l_a = a_{11}\cdot l_a > l \quad (9)|_{\text{under (1)f and }0<\sigma<1}$$

It appears: *in a small referenced weight reference system Σ take measure of the other "in motion" bigger referenced weight reference system Σ_a, will see that the bigger referenced weight reference system's time length contract and space dilate in all directions*! i.e. here b)'s (3) , (5), (7), (9) be similar as the a)'s (2) , (4), (6), (8) both are from small referenced weight reference system to take measure of the other "in motion" bigger referenced weight reference system's things. Now we know: under (1)f, what the see from Σ to Σ_a is just opposite to what the see from Σ_a to Σ. ——What the see from small referenced weight reference system to "in motion" bigger referenced weight reference system is just opposite to what the see from bigger referenced weight reference system to "in motion" small referenced weight reference system, no matter $M_0 > M_{a0}$ or $M_0 < M_{a0}$ (no matter $\sigma>1$ or $\sigma<1$). The b) ($\sigma<1$) is not in violation of the a) ($\sigma>1$).

c). As the *new postulate of light speed* it is the average speed of "in stationary" light source's light ray over a closed path is constant C while "in motion" light source's light ray should be not? Considering in Σ and Σ_a taking simultaneous measurement of the same wave front surface of light emitted from the Σ's origin, we in Σ_a are making Michelson-Morley experiment with Michelson interferometer at somewhere on Σ_a's (the light ray comes from an "in motion" source) x_a-axis, the glass plate is stationary in the Michelson interferometer with us. We suppose the light ray past from the right end of the line segment Δx_a, to the left end of the Δx_a, will must cost time $\Delta x_a / C_{-ax}^{\rightarrow}$ (the light ray's direction opposite to the light source's speed v). How long time does it take that the reflected light ray past from the left end of the line segment Δx_a to the right end of the Δx_a? Taking note of that the light source's mirror image is "in motion" with speed $(-v)$ on x_a-axis, also is in *the light ray's direction opposite to the light source's speed*, it should be that we replace the variable v of the $\Delta x_a / C_{-ax}^{\rightarrow}$ by $(-v)$ or replace the $(-v)$ in the $\Delta x_a / C_{-ax}^{\rightarrow}$ by v i.e. $\Delta x_a / C_{ax}^{\rightarrow}$. We also can think: as the glass plate is stationary on x_a-axis, the same photon come from "in motion" light source with speed $C_{-ax}^{\rightarrow}$, after being reflected, should with speed $C_{ax}^{\rightarrow}$ (of course when the light source stops, the photon's speed will be C_{-ax} and after being reflected becomes C_{ax}). Then the totalize time cost will be $(\Delta x_a / C_{-ax}^{\rightarrow} + \Delta x_a / C_{ax}^{\rightarrow}) = \Delta x_a (1/C_{-ax}^{\rightarrow} + 1/C_{ax}^{\rightarrow})$. Bring (12) and (14) into it and neglect more higher order infinitely small than $(v/C)^6$ we get

$$\frac{1}{C_{-ax}^{\rightarrow}} + \frac{1}{C_{ax}^{\rightarrow}} = \frac{(a_{11}+C_{-x}a_{41})}{(-va_{11}+C_{-x}a_{44})} + \frac{(a_{11}-C_x a_{41})}{(va_{11}+C_x a_{44})} =$$

$$\frac{1}{\left(-v+C_{-x}\dfrac{a_{44}}{a_{11}}\right)} + \frac{1}{\left(v+C_x\dfrac{a_{44}}{a_{11}}\right)} = \frac{(C_x+C_{-x})\phi_3}{(-v+C_{-x}\phi_3)(v+C_x\phi_3)} =$$

$$\frac{(C_x+C_{-x})}{C_xC_{-x}}\left[\frac{C_xC_{-x}\phi_3}{(-v+C_{-x}\phi_3)(v+C_x\phi_3)}\right] = \frac{(C_x+C_{-x})}{C_xC_{-x}\lambda}$$

$$= \left(\frac{1}{C_{-x}} + \frac{1}{C_x}\right)\frac{1}{\lambda} = \frac{2}{C\lambda}$$

where

$$\lambda = \frac{(-v+C_{-x}\phi_3)(v+C_x\phi_3)}{C_xC_{-x}\phi_3} =$$

$$1+0\left(\frac{v}{C}\right)+0\left(\frac{v}{C}\right)^2+0\left(\frac{v}{C}\right)^3+0\left(\frac{v}{C}\right)^4+0\left(\frac{v}{C}\right)^5+$$

$$\frac{(28+40\sigma-105\sigma^2-54\sigma^3+116\sigma^4+6\sigma^5-39\sigma^6)}{8(1+\sigma)^6}\left(\frac{v}{C}\right)^6+\cdots\cdots$$

$$\approx 1+\frac{(28+40\sigma-105\sigma^2-54\sigma^3+116\sigma^4+6\sigma^5-39\sigma^6)}{8(1+\sigma)^6}\left(\frac{v}{C}\right)^6$$

(to count the λ please see appendix XII). It is obvious that $\lambda\approx 1$ when $v<C$. For example, neglecting other body, taking the sun as Σ and our earth as Σ_a, not only nobody nearby Σ and Σ_a but also $v<<C$ (please note v is Σ's speed measured by Σ_a), bring $M_0=3.29\times10^5 M_{a0}$ (i.e. $\sigma = M_0/M_{a0} = (3.29\times10^5)\to\infty$) into λ we get

$$\lambda \approx 1-\frac{39}{8}(v/C)^6 \quad (34)|_{\sigma\to\infty}$$

Then $C\lambda \approx C$, for neglected more higher order infinitely small than $(v/C)^6$ in (33), then the $(1/C^{\rightarrow}_{-ax} + 1/C^{\rightarrow}_{ax})$ will be $2/(C\lambda) \approx 2/C$ almost as the C_{-ax} and C_{ax} in (26). This is why R. C. Tolman adopted the light from the two ends of the equator diameter of the sun took Michelson-Morley experiment obtained zero result [47]. The sun's rest mass $M_0 = 3.29 \times 10^5 M_{a0}$ is far bigger than our earth's rest mass M_{a0} (please note that R. C. Tolman's experiment precision is only $(v/C)^2$). It obviously is that the $C\lambda$ of a quasar is more close to C because the rest mass of a quasar is far more bigger than of the sun.

d). Why we take Michelson-Morley experiment with the light from high-speed (e.g. $v \rightarrow C$) moving particles but still obtained zero result? Taking Michelson-Morley experiment with Michelson interferometer we have known in c): When we (on earth) take measure of the photons coming from an "in motion" micro-particle i.e. Σ is the particle's reference system (the particle is "stationary" in it and its moving speed measured by Σ_a is constant v). Bring $\sigma = M_0/M_{a0} \rightarrow 0$ into (34) we get

$$\lambda \approx 1 + \frac{28}{8}(v/C)^6 \quad (34)|_{\sigma\rightarrow 0}$$

Compared here $(34)|_{\sigma\rightarrow 0}$'s (28/8) with the before $(34)|_{\sigma\rightarrow\infty}$'s (39/8), we can see the λ here in $(34)|_{\sigma\rightarrow 0}$ is less away from 1, while in $(34)|_{\sigma\rightarrow\infty}$ is a little greater away from 1, i.e. micro-particle's $2/(C\lambda)$ is more close to $2/C$ than the sun's or quasar's $2/(C\lambda)$. This is why T. Alvager et al took Michelson-Morley experiment with the light from high-speed ($v \rightarrow C$) moving particle still obtained zero result [48]. Although the (34) is educed from $v < C$ (instead of $v << C$ because in Appendix XII the x in the $(1 \pm x)^{-\gamma} = 1 \mp x\gamma + x^2\gamma(\gamma+1)/2 \mp \cdots\cdots$ where $\gamma > 0$ and $|x| < 1$ instead of $|x| << 1$=, however, its' precision even until $(v/C)^6$ and $(28/8) < (39/8)$, need not to say the precision of the T. Alväger et al's experiment only is $(v/C)^2$.

As we known above, under (1)f we can either explain our (on earth) astronomical observatory discover the quasars' super-luminal expansion, quasar α's lessening, or explain why we take Michelson-Morley experiment with the light from high-speed (even $v \rightarrow C$) moving particles still obtained zero result, and (1)f be in accord with the new physics experiments were performed and analyzed at CERN since 1998 etc e.g. time-reversal non-invariance in the neutral-kaon system [38,39] (please see the ending of *4.4*).

Now, we sum up the conclusions:

1. We should amend the principle of relativity to new principle of relativity: "*the laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different*" (the *different* is the data of the two reference systems taking simultaneous measurement of the same physical quantity of the same body are different while using his own measurement data of the physical quantities to build laws of physics the two reference systems are identical, it is in accord with John C. Mather and George F. Smoot's discovery of the blackbody form and anisotropy of the cosmic microwave background radiation) (please see *1.1*).
2. We should amend the universal speed of light to new postulate of light speed: "the average speed of a light ray from a stationary light source measured over a closed path in vacuum is always constant $C \approx 3 \times 10^8 ms^{-1}$" (it lets "the light ray come from the source" be more clear, more unassailable and lets we know that the speed of any photon from stationary light source will always between $(C/2, \infty)$ i.e. may be < C or > C) (please see *1.2* & *2.1*).
3. We should set the "measurement is founded to change the object by destroying the original quantum coherence between the object and object's environment" as one of the basic postulate——the third postulate (new added postulate) (in accord with the new physics experiments were performed and analyzed since 1998). Then we can reduce: ①The "measurement is founded to change" in the third postulate is on both sides not only the being measured object been changed by the reference system's taking measurement, but the reference system in taking the measurement also been changed by the being measured object. It is the reference system's taking measurement (more precisely the quantum correlation (i.e. entanglement) between the measurement apparatus (with its reference system) and the being measured object been founded) instead of the ether or the motion of the being measured object that changes the being measured object. Only the measurement unit's "definition" is unchanged while the measurement unit's "actual length" can change or be changed in different quantum correlation (i.e. entanglement) is different (note the reference system himslef is not aware of it using his own unit taking measure of himslef cannot get his own change and he thinks the "actual length" of his unit is always the same and unchanged in different case). The measurement data of the same object's physical quantity in a reference system the object "in motion" is different from "in stationary", while stationary in different reference system, different reference system's measurement data of the same stationary physical quantity are the same,

although the “actual length” of the same unit in different reference system is different. ②The mass stationary in the reference system (more precisely joining in the quantum correlation) is the reference system’s referenced weight; perhaps space is not empty and the reference system’s space is something around the referenced weight, there is not referenced weight saying nothing of the space around the referenced weight. In reference system’s taking measurement, the greater the referenced weight a)the stronger the reference system destroies the original (before the measurement is taken) quantum coherence between the being measured object and its environment, b)the less the reference system-self being changed by the being measured object, c) the stronger the reference system disturbs the other reference system’s measurement data of taking simultaneously measure of the same object, d)the less the reference systemself’s measurement data be disturbed by other reference system’s simultaneously taking measure of the same object; on the opposite, the less the referenced weight, it is just the reversed case in a), in b), in c), in d) (therefore the micro-particle’s uncertainty must be that because the micro-particle’s mass is too small then the “on” or “off” of the quantum correlations (i.e. entanglements) between the micro-particle and the other objects in the environment make the micro-particle behaviour uncertainty) (please see *2.2*). ③ Two reference systems (e.g. Σ and Σ_a and their relative motion may be uniform or not) taking simultaneously measure of the same quantity of the same object their measurement will disturb each other and “the numerical values before Σ’s unit” ≠ “the numerical values before Σ_a’s unit”, if and only if their relative motion speed $v \neq 0$ can the simultaneous measurement of Σ and Σa disturbing each other be seen by Σ and Σ_a themselves the Σ’s measurement data is different from the Σ_a’s (note when $v \equiv 0$ or uniform relative speed $v = 0$ it must be “the numerical values before Σ’s unit” = “the numerical values before Σa’s unit” although they may have different referenced weight, so, the micro-particle’s uncertainty must occur and only occurs in our taking measure of the “in motion” micro-particle). Even in uniform relative motion Σ and Σ_a still are different for a)the relative motion (taking one as in stationary then the other must be in motion), b)they may have different referenced weight; for example taking simultaneously measure of the same speed of relative motion, the speed of Σ moving along x_a-axes measured by Σ_a is v while the same speed of Σ_a moving along x-axes measured by Σ is $(-va_{11}/a_{44})$ instead of $(-v)$ (please see *2.4*), however, in using his own physical quantities’ measurement data to build laws of physics the two reference systems in uniform relative motion are identical (therefore the laws of physics apply in all inertial reference systems, while any two reference systems in uniform relative motion are different) (please see 1.1 & 2.4).

4. From the definition of the unit of time we can reduce: The reference system’s time coordinate should be something as space coordinate, each the reference systems severally using his own clock to determine his own time coordinate in simultaneously measuring the same object’s physics process taking place, it must be that there is not the problem to have to synchronize the clocks of the two reference systems before simultaneous time measurement (please see 2.3).
5. Different quantum correlation (i.e. entanglement) will result in different a_{ij}(i,j =1,2,3,4), generally determining the element of the (1)b coefficient matrix is very difficult or impossible. Only when the mass of the being measured object is sufficiently small and two reference systems origins in a sufficiently short way off, it always approximately is in $o_{ij}=p_{ij}=q_{ij}(=a_{ij})$, and $M_0=M_{a0}$ (i.e. $\Sigma = \Sigma_a$) can we get (1)c. a)In (1)c the $C_{-ax} \leq C$ and $C_{ax} \geq C$ and the v is not limited (i.e. v may be→0 or＞C or＞＞C). b) When $C_{-ax}=C_{ax}$ (it must be $C_{-ax}= C_{ax}=C$ please see *2.1*, actually is $v \to 0$ please see *4.3*), the (1)c just becomes Lorentz transformation i.e. the special relativity’s Lorentz transformation is merely (1)c been reduced when $C_{-ax}=C_{ax}$ (please see the ending of *4.2*). c)A little generally it may be $M_0 \neq M_{a0}$, even nobody nearby Σ and Σ_a, each the M_0 and M_{a0} is mass particle stationary at Σ’s and Σ_a’s origin, both M_0 and M_{a0} close to zero only keeping $\sigma = M_0/M_{a0}$ as an arbitrary constant had been determined like v and the being measured object only are photon coming from the source stationary in Σ’s or Σ_a’s origin, we still cannot find out the element of (1)b coefficient matrix (please see *4.3*), we can only confirm: ①The light speed can change or be changed and be allowable to be exceeded a small mass object can go beyond the light which coming from the light source being stationary in a big referenced weight reference system (i.e. although the speed of a photon from stationary light source will always between $(C/2, \infty)$ while when light source being in motion photon’s speed may be→0 or=0 or＜0 if light source’s speed sufficiently great), however, the average speed of the light ray from an “in motion” source like the sun or a quasar or even a high-speed ($v \to C$) moving particle measured over a closed path in vacuum is $C\lambda$ while usually it always is $\lambda \approx 1$, the light source is just on one focus of the wave front ellipsoid surface of light. ②In this case it must be $a_{33}=a_{22}=a_{11}$ and $a_{41}=0$ in (1)b i.e.

(1)b becomes (1)d, then we know: *If the "in motion" space length contract it must contract in all directions instead of Einstein special relativity's only contract in the direction of motion* (of course *if dilate it will dilate in all directions*) (please see *4.3.1*). ③Under (1)d and from adding $v \ll C$ then we can think the conditions which let us be able to completely explain the Michelson-Morley experiment, then we can find out the a_{11} and a_{44} in (1)d in mathematics theory, actually we only approximately get (1)e. From (1)e and considering the observation of time-reversal non-invariance in the neutral-kaon system [38,39] and given attention to Lorentz transformation we educe (1)f (please see *4.4*). ④From (1)f we can explain that "*moving micro-particle's time to dilate and space to contract, taking superluminal photonic tunneling experiment, quasar's super-luminal expansion and fine structure constant's lessening, took Michelson-Morley experiment with the light from the sun or quasar or high-speed (close to C) moving micro-particle all obtained zero result*" is: Between two reference systems, in the greater referenced weight system taking measure of the other "in motion" less referenced weight system will see that the less referenced weight system's time length dilate and space length contract in all directions, while in the less referenced weight system taking measure of the other "in motion" greater referenced weight system will see the reversed case; in taking simultaneously measure of the same object's speed, the greater referenced weight system's measurement data less while the less referenced weight system's measurement data greater (please see *5*); because the a_{41} of (1)f is →0 but ≠0 so in some case can get time-reversal.

6. Generally from the three postulates (two amended postulates of the special relativity and one *new added postulate (the third postulate)*) by mathematics as Einstein in special relativity because $o_{ij} \neq p_{ij} \neq q_{ij}$ (see 4.), (1)a cannot go to (1)b, (1)c, (1)d, (1)e or (1)f but may go to time-reversal in some case(Long GL [40]), while it still does not disobey the conclusions shown in 1), in 2), in 3), in 4), in 5). Of course generally the "in motion" system's space length may contract or dilate (meanwhile the time length dilate or contract) may not uniformly at anywhere, generally determining the element of the (1)a coefficient matrix is very difficult or impossible (please see *4.4*). Only having gone through many "reduce the case" and then can we reason out the (1)c and (1)f. When $M_0 = M_{a0}$ more precise than the Lorentz transformation is (1)c, when $M_0 \neq M_{a0}$ more precise than Galilean transformation is (1)f.

Some a gentleman thinks: a check on the transformation given in (1)a, (1)b, (1)c, (1)d, (1)e, (1)f shows that the group properties are not satisfied, and he said: "However, to have group property is a strong physical requirement". We answer: Lorentz transformation is accurate formula under Einstein special relativity's two postulates, whether or not there are other reference systems Σ_b, Σ_c, Σ_d et al joining simultaneous measurement with Σ and Σ_a do not disturb the measurement data of Σ and Σ_a. While in our (1)a, (1)b, (1)c, (1)d, (1)e, (1)f not only are between Σ and Σ_a, but also any other reference system (for example Σ_b)'s joining simultaneous measurement with Σ and Σ_a will disturb Σ and Σ_a (of course if the being measured object is "in stationary" in Σ the numerical values before the unit of the measurement data of Σ's will not be changed by any disturb being so called "proper quantity" in the special relativity please see the content after (1)a$/_{v=0}$ in *2.3*, so does "in stationary" in Σ_a or other reference system). So, the group properties are not satisfied with (1)a, (1)b, (1)c, (1)d, (1)e, (1)f.

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