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Equation Of Relative Velocity And Its Correlations To Equation Of Light Speed, Dynamic Graviton Flux And Equations Of Doppler Shifts

Edward T. H. Wu

Abstract
Equation of Relative Velocity is derived. Dynamic Graviton Flux affected by the relative velocity between target and parent objects is studied. LIGO Experiment, M&M Experiment, Pendulum Swing Time Dilation, Air Bound Time Dilation and Lecher Line Wavelength Anisotropy affected by Dynamic Graviton Flux are explained. In addition, Equation of Light Speed is derived based on Equation of Relative Velocity. Also, a mathematical model Equations of Doppler Shifts incorporated with Equation of Light Speed is developed to calculate Axial Doppler Shift, Acceleration Doppler Shift and Transverse Doppler Shift.
Keywords: *Gravity, Relativity, Graviton Flux, Aether Wind, LIGO, M&M Experiment, Time Dilation, Light Speed, Doppler Shift, Axial Doppler Shift, Acceleration Doppler Shift, Transverse Doppler Shift, Equation of Light Speed, Equation of Relative Velocity, Equations of Doppler Shifts.*

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I. Absolute Space System And Reference System

A reference system is needed for the measurement of object and light speeds, which shall contain a reference point and three perpendicular axes, with the reference point located on a specific point or object. Since in the real universe, everything is moving with each others, there is no such thing as a fixed reference system. However, when a photon is emitted from a light source, it generates a straight optical path from its light origin (not light source) into space. This light origin has a fixed position in the space that doesn't move with the light source, nor the earth or anything else. Therefore, an Absolute Space System can be defined by the light origin and three fixed perpendicular axes, each directs to a far distance star (such as North Star) from the light origin. A reference system on the other hand is defined by a reference point (object) and three fixed perpendicular axes, each directs to a far distance star (such as North Star) from the reference point (object).

II. Equation Of Relative Position

The relative positions of any two points S and P with respect to any reference point O at any fixed time in space obey the following "Equation of Relative Position":

OP = OS + SP

Where **OP** is the vector from point O to point P, **OS** is the vector from point O to point S, and **SP** is the vector from point S to Point P.

III. Equation Of Relative Velocity

As illustrated in Fig. 1, at any instant of time, the relative velocities $_{O}\mathbf{V}_{P}$ and $_{O}\mathbf{V}_{S}$ of any two objects S and P observed at reference object O are correlated to each other by the following equation:

$_{O}\mathbf{V}_{P} = {}_{O}\mathbf{V}_{S} + {}_{S}\mathbf{V}_{P}$

Where $_{O}\mathbf{V}_{P}$ is the velocity of object P observed at reference object O, $_{O}\mathbf{V}_{S}$ is the velocity of object S observed at reference object O, and $_{S}\mathbf{V}_{P}$ is the velocity of object P observed at object S.

In case $_{O}\mathbf{V}_{S}$ and $_{S}\mathbf{V}_{P}$ are constant velocities, then $_{O}\mathbf{V}_{P}$ is also a constant velocity and the above equation is true at all times. This equation is called "Equation of Relative Velocity".

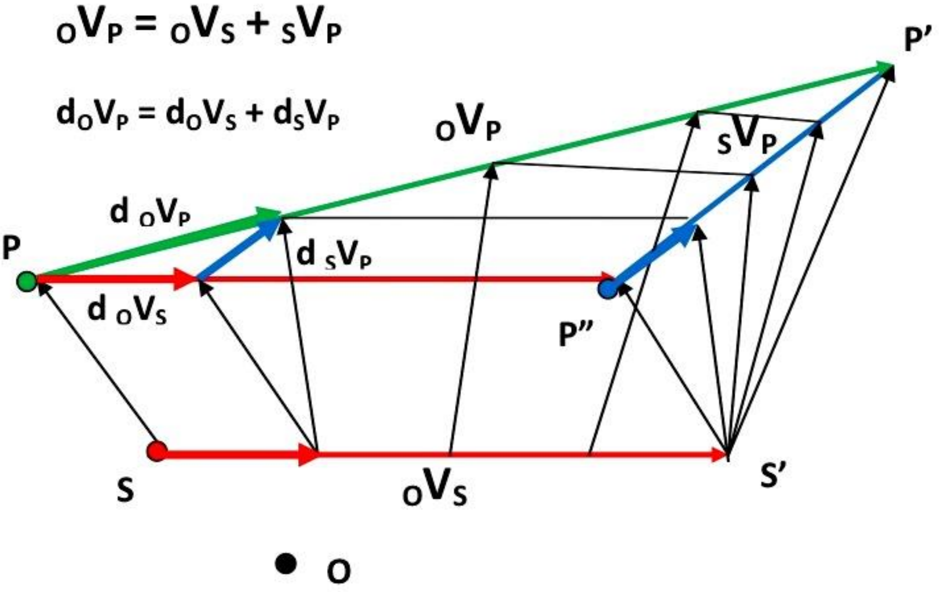

Fig. 1 Equation of Relative Velocities ${}_{O}\mathbf{V}_{P} = {}_{O}\mathbf{V}_{S} + {}_{S}\mathbf{V}_{P}$ at any instant time or for constant velocities at any time. Where O is reference object, S and P are two moving objects, ${}_{O}\mathbf{V}_{P}$ is the velocity of P observed at O, ${}_{O}\mathbf{V}_{S}$ is the velocity of S observed at O and ${}_{S}\mathbf{V}_{P}$ is the velocity of P observed at S.

IV. Equation Of Light Speed

According to Equation of Relative Velocity, light speed **C'** (Normal Light Speed) observed at a reference point is the vector summation of Absolute Light Speed C observed at light source (3 x 10^8 m/s dependent on the local gravitational field and aging of the universe) and the speed of light source **V** observed at the reference point (Inertia Light Speed)**.** This is known as **"**Equation of Light Speed" [1][2].

C' = C + V

Equation of Light Speed holds at the instant of photon emission, no matter the reference points. It also works as the light source travels at constant speed observed at light origin or any stationary point in the inertia system.

V. Applications Of Equation Of Relative Velocity

Constant Light Speed in Inertia System

Equation of Relative Velocity can be applied to two points (or objects) S and R at constant moving velocities observed at reference point (or object) P. Consequently it is also true that Equation of Relative Velocity can be applied to these two points (or objects) S and R with respect to a reference point (or object) Q which is in the inertia system of reference point (or object) R (Q is at a fixed position observed at R or they both move at the same constant velocity observed at any other reference point).

According to Equation of Relative Velocity, ${}_{R}\mathbf{V}_{S}$ and ${}_{S}\mathbf{V}_{P}$ are constant velocities, which ensures that ${}_{R}\mathbf{V}_{P}$ is also a constant velocity observed at reference point (or object) R.

And

${}_{R}\mathbf{V}_{P} = {}_{R}\mathbf{V}_{S} + {}_{S}\mathbf{V}_{P}$

Because R and Q are at rest to each other in the same inertia system, therefore ${}_{Q}\mathbf{V}_{R} = 0$. In addition ${}_{R}\mathbf{V}_{S}$ is a constant velocity, therefore ${}_{Q}\mathbf{V}_{S}$ is also a constant velocity observed at reference point (or object) Q.

And

${}_{Q}\mathbf{V}_{S} = {}_{Q}\mathbf{V}_{R} + {}_{R}\mathbf{V}_{S}$

Similarly, because ${}_{Q}\mathbf{V}_{S} = 0$ and ${}_{S}\mathbf{V}_{P}$ is a constant velocity, therefore ${}_{Q}\mathbf{V}_{P}$ is also a constant velocity observed at reference point (or object) Q.

And

${}_{Q}\mathbf{V}_{P} = {}_{Q}\mathbf{V}_{S} + {}_{S}\mathbf{V}_{P}$

As a consequence, when a photon emitted from a light source and observed at two stationary reference points (or observers), a constant normal light speed can be observed at both reference points (or observers). This can be derived as follows:

In case the velocity of light source $\mathbf{V_1}$ is constant observed at observer 1, then the normal velocity of light $\mathbf{C_1'}$ observed at observer 1 can be represented by Equation of Light Speed as follows:

$\mathbf{C_1' = V_1 + C}$

Because two observers 1 and 2 are stationary in the same inertia system (observer 2 is at a fixed position from observer 1),

$\mathbf{{}_2V_1 = 0}$

$\mathbf{{}_2V_1 + V_1 = V_2}$

Therefore,

$\mathbf{V_2 = V_1}$

$\mathbf{V_2 + C = V_1 + C}$

Because

$\mathbf{C_1' = V_1 + C}$

$\mathbf{C_2' = V_2 + C}$

Therefore,

$\mathbf{C_2' = C_1'}$

As a result, normal light speed C' observed at any stationary point in the inertia system is always constant.

Dynamic Graviton Flux

Like any other flux, graviton flux is also proportional to the speed of graviton flux observed at target object,

$i = kV_g\ (m_1/r^2)$

$\mathbf{i} = k\mathbf{V_g}\ (m_1/r^2)$

Where i is graviton flux, k is graviton flux constant, V_g is the speed of graviton flux observed at target object, **i** is graviton flux vector towards target object, $\mathbf{V_g}$ is graviton flux vector towards target object.

It is obvious that graviton flux speed can change with the relative moving speed between a pair of parent object and target object. Static graviton flux is the graviton flux generated from a parent object to a stationary target object. Dynamic graviton flux on the other hand is the graviton flux produced from a parent object to a moving target object.

Fig. 2 [3](revised from [4][5]) shows a schematic diagram of two relatively moving objects with correlations between the velocity of static graviton flux observed at parent object $\mathbf{V_s}$, the velocity of target object observed at parent object **V** and the velocity of dynamic graviton flux observed at target object $\mathbf{V_d}$.

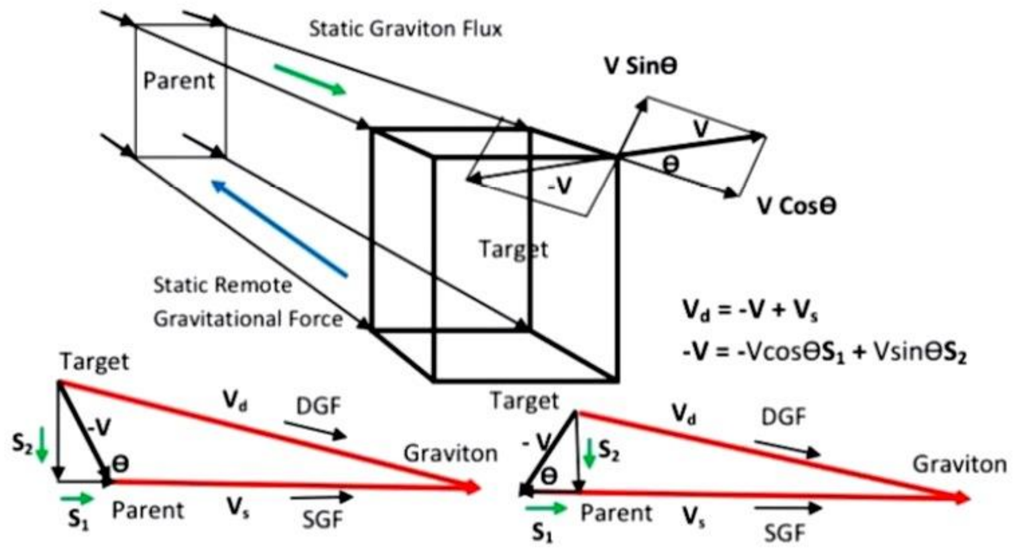

Fig. 2 A schematic diagram of static graviton flux (SGF) observed at parent object and dynamic graviton flux (DGF) observed at target object with Equation of Velocity $\mathbf{V_d = -V + V_s}$ correlating dynamic graviton flux speed observed at target object $\mathbf{V_d}$, parent object moving speed observed at target object **-V** and static graviton flux speed observed at parent object $\mathbf{V_s}$.

According to Equation of Relative Velocity, for constant velocities, the velocity of graviton flux observed at target object $_t\mathbf{V}_g$ (equals to $\mathbf{V_d}$ moves towards target) is the vector summation of the velocity of parent object observed at target object $_t\mathbf{V}_p$ (equals to $-\mathbf{V}$ moves away from target) and the velocity of graviton flux observed at parent object $_p\mathbf{V}_g$ (equals to $\mathbf{V_s}$ moves away from parent object). Therefore,

$_t\mathbf{V}_g = {_t\mathbf{V}_p} + {_p\mathbf{V}_g}$

And

$\mathbf{V_d = -V + V_s}$

As shown in Fig. 2,

$\mathbf{-V} = -V \cos\Theta\, \mathbf{S_1} + V \sin\Theta\, \mathbf{S_2}$

And

$\mathbf{V_S} = C\mathbf{S_1}$

Therefore,

$\mathbf{V_d} = (C - V \cos\Theta)\, \mathbf{S_1} + V \sin\Theta\, \mathbf{S_2}$

$V_d = [(C - V \cos\Theta)^2 + (V \sin\Theta)^2]^{1/2}$

Where V is the speed of target object observed at parent object, Θ is the angle between the velocity of target object $\mathbf{V}$ and static graviton flux $\mathbf{V_s}$ (from parent object to the initial position of target object). Also $\mathbf{S_1}$ is the unit vector along $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to $\mathbf{V_s}$ away from target object. V_d is the velocity of dynamic graviton flux observed at target object and $\mathbf{V_d}$ is the vector of velocity of dynamic graviton flux towards target object and observed at target object.

Because graviton flux is defined as the amount of gravitons pass through a unit area per unit time, therefore graviton flux must be proportional to the speed of graviton as follows:

$i = kV_g (m_1/r^2)$

$\mathbf{i} = k\mathbf{V_g} (m_1/r^2)$

As a consequence, static graviton flux can be represented as follows:

$i_s = kV_s (m_1/r^2)$

$\mathbf{i_s} = k\mathbf{V_s} (m_1/r^2)$

Also static remote gravitational force can be represented as follows:

$F_s = qkV_s (m_1m_2/r^2)$

$\mathbf{F_s} = qk\mathbf{V_s} (m_1m_2/r^2)$

And dynamic graviton flux can be represented as follows:

$\mathbf{i_d} = k\mathbf{V_d} (m_1/r^2)$

Based on Equation of Velocity,

$\mathbf{V_d = -V + V_s}$

Therefore,

$\mathbf{i_d} = k\, (\mathbf{-V + V_s}) (m_1/r^2)$

In addition, $\mathbf{i_d}$ can be calculated by the angle Θ between the velocity of target object $\mathbf{V}$ and static graviton flux $\mathbf{V_s}$ based on $\mathbf{S_1}$ and $\mathbf{S_2}$ a two unit vector Cartesian system as follows:

$\mathbf{i_d} = k\, [(C - V \cos\Theta)\, \mathbf{S_1} + V \sin\Theta\, \mathbf{S_2}] (m_1/r^2)$

$i_d = k[(C - V \cos\Theta)^2 + (V \sin\Theta)^2]^{1/2} (m_1/r^2)$

Where $\mathbf{i_d}$ is the vector of dynamic graviton flux, i_d is dynamic graviton flux, Θ is the angle between the velocity of target object $\mathbf{V}$ and static graviton flux $\mathbf{V_s}$ (from parent object to the initial position of target object). Also $\mathbf{S_1}$ is the unit vector along $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to $\mathbf{V_s}$ away from target object.

Because

$p = kC$

$pq = G$

$qk = G/C$

Where k is graviton flux constant, p is static graviton flux constant, q is graviton contact interaction constant. C is Absolute Light Speed and G is gravitational constant.

Also,

$\mathbf{F_d} = qm_2\, \mathbf{i_d} = qm_2\, k[(C - V \cos\Theta)\, \mathbf{S_1} + V \sin\Theta\, \mathbf{S_2}] (m_1/r^2)$

Therefore, the dynamic remote gravitational force can be represented as follows:

$\mathbf{F_d} = (G/C)[(C - V \cos\Theta)\, \mathbf{S_1} + V \sin\Theta\, \mathbf{S_2}] (m_1m_2/r^2)$

$F_d = (G/C)[(C - V \cos\Theta)^2 + (V \sin\Theta)^2]^{1/2} (m_1m_2/r^2)$

Where $\mathbf{F_d}$ is the vector of dynamic remote gravitational force and F_d is dynamic remote gravitational force. $\mathbf{S_1}$ is the unit vector along $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to $\mathbf{V_s}$ away from target object. Where k is graviton flux constant, p is static graviton flux constant, q is graviton contact interaction constant. C is Absolute Light Speed (static graviton flux speed) and G is gravitational constant.

Furthermore, according to Wu's Spacetime Shrinkage Theory, dynamic gravitational field (graviton bombardment strength) can change Wu's Unit Length and Wu's Unit Time of the subatomic particles in the object, and subsequently change all the properties of the object such as dimension, duration, velocity and acceleration, as well as wavelength, light speed (Normal Light Speed observed at reference point) and time dilation. For examples,

1. Lecher Line Experiment [3][6] – A variety of dynamic graviton fluxes (dynamic gravitational fields) can be generated by EM waves traveling at different angles from static graviton flux of earth which can change the wavelengths of EM waves.
2. LIGO Experiment [7][8]– Interference of different wavelengths can be produced by the dynamic graviton fluxes (dynamic gravitational fields) generated from gravitational waves.
3. M&M Experiment [9][10]– No interference can be produced by equal dynamic graviton fluxes generated by photons traveling at 90^o from static graviton flux of earth.
4. Pendulum Swing Time Dilation [11][12] – Because of the larger projection cross area, the fixed mass pendulums at 90^o to the swing plane interacts with more dynamic graviton flux than those parallel to the swing plane, which can cause larger time dilation.
5. Air Bound Time Dilation [13][14] – East bound air flight has larger relative velocity than that of west bound, which can produce more dynamic graviton fluxes (dynamic gravitational fields) such that larger time dilation is expected.

VI. Application Of Equation Of Light Speed

Equations of Doppler Shifts

To better analyze Doppler Shifts, a general mathematical model named "Equations of Doppler Shifts" [15] as illustrated in Fig. 3 can be applied which includes Equation of Light Speed **C' = V + C**, Equation of Relative Position **P = S + D**, vision of photon **P = C't = Vt + Ct** and vision of light source **S = Vt + ½ at²**, as well as their correlations to the wavelength λ_1 = D/vt, light speed C_1 = P/t and frequency $\nu_1 = C_1/\lambda_1$ of Doppler Shifts observed on earth. This mathematical model Equations of Doppler Shifts can be used for the analyses of various Doppler Shifts such as Axial, Acceleration and Transverse Doppler Shifts.

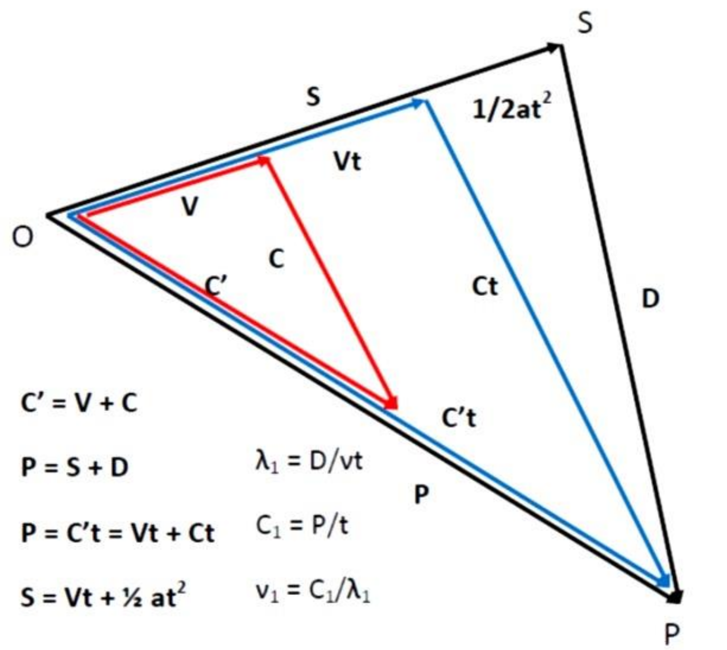

Fig. 3 ' Equation of Light Speed C' = V + C, Equation of position P = S + D, Vision of photon P = C't = Vt + Ct and Vision of light source S = Vt + ½ at^2. Their correlations to the wavelength λ_1 = D/vt, Light Speed C_1 = P/t and Frequency $\nu_1 = C_1/\lambda_1$ of Doppler Shifts.

Fig. 4 is a schematic drawing of linear Doppler Shifts (Axial and Acceleration Doppler Shifts) based on Absolute Space System at light origin (reference point). Because the star is far away from earth, both earth and light origin are nearly stationary to each other, therefore earth can also be considered as a reference point for the same Absolute Space System. As a result, all the measurement observed on earth is the same as that observed at the light origin in the same Absolute Space System.

The light source (star) can either move toward or away from the observer on earth. Assuming it takes time t for a photon traveling from the light origin to earth. S is the distance between the light source and the light origin at time t, V_o is the speed of the light source (star) at the beginning, V_t is the speed of the light source (star) at time t, and a is the constant acceleration of the light source (star) in time t. P is the distance of the photon traveling from the light origin to earth in time t, C' is the light speed observed at the light origin or earth, and D is the distance between the light source (star) and the photon when the photon reaches earth at time t. Also λ_1 is the wavelength, ν_1 is the frequency and C_1 is the light speed of the photon observed on earth. With the above notations, Blueshift and Redshift caused by Doppler Effects can be studied as follows:

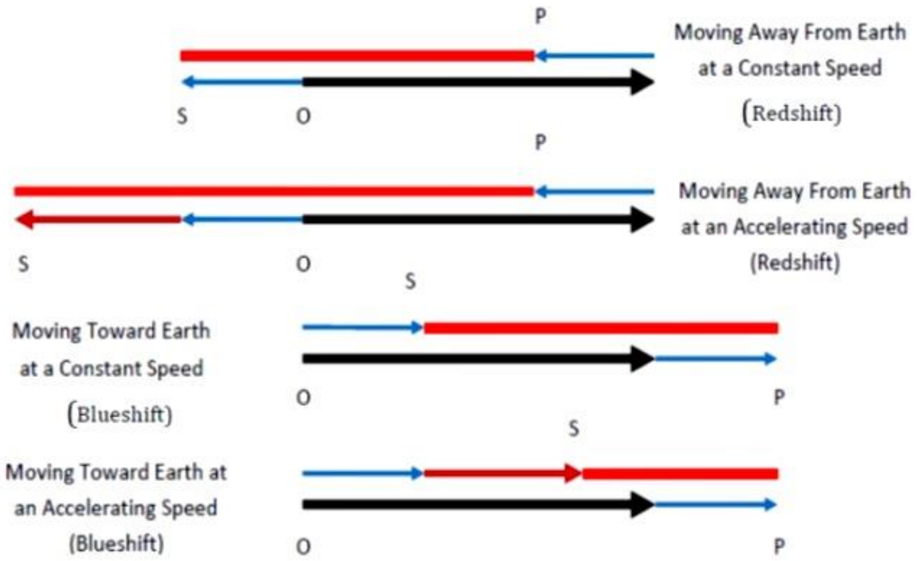

Fig. 4 Redshift and Blueshift caused by Axial Doppler and Acceleration Doppler Effects.

First, the distance vectors between light origin, light source (star) and photon can be correlated to each others as follows (Equation of Relative Position):

OS = **S** = Distance vector from light origin to light source (star) = Movement of light source (star) away from light origin.

SP = **D** = Distance vector from light source (star) to photon = Vision of light observed from light source (star).

OP = **P** = Distance vector from light origin to photon = Vision of light observed from light origin and ground (P_t= Distance vector from light origin to earth).

OP = **OS** + **SP**

Also,

P = **S** + **D**

D = **P** – **S**

In addition, according to Equation of Light Speed [2], when photon separate from the light source (star), the speed of photon observed at the light origin **C'** is equal to the vector summation of light speed observed at the light source (star) **C** (Absolute Light Speed $3x10^8$ m/s) and the speed of the light source (star) observed at the light origin $\mathbf{V_0}$.

$\mathbf{C'} = \mathbf{C} + \mathbf{V_0}$

Therefore,

$\mathbf{OP} = \mathbf{P} = \mathbf{C'}t = \mathbf{C}t + \mathbf{V_0}t = P\mathbf{s}$

$\mathbf{OS} = \mathbf{S} = \mathbf{V_0}t + ½\,\mathbf{a}t^2 = S\mathbf{s}$

Also,

$\mathbf{D} = \mathbf{P} – \mathbf{S} = (P – S)\mathbf{s}$

Where t is the traveling time of photon from light origin to earth, a is the acceleration of light source (star), **s** is the unit vector towards earth, D is the distance between light source and earth (photon position at time t), S is the distance between light origin and light source and P is the distance between light origin and earth (photon position at time t).

Furthermore, the wavelength, light speed and frequency of the photon generated at the light source (star) and observed on earth can be calculated as follows:

$\lambda_1 = D/\nu t$
$C_1 = P/t$
$\nu_1 = C_1/\lambda_1$

Where λ_1, C_1 and ν_1 are the wavelength, light speed and frequency of the photon generated at the light source (star) and observed on earth. λ, C and ν are the wavelength, light speed and frequency of the photon generated and observed at the light source (star), which assuming are the same as that generated and observed on earth.

As a consequence, these models can be used in calculations of Axial Doppler Shift [16], Acceleration Doppler Shift [17] and Transverse Doppler Shift [15][18].

Event Horizon

When a light source accelerating towards the center of a black hole, because of the Photon Inertia Transformation, the photon emitted from the light source bears two competing opposite speeds: (1) outward Absolute Light Speed (**C**) and (2) inward Inertia Light Speed (**V**).

According to Equation of Light Speed,

C' = C + V

At Event Horizon,

|**C**| = |**V**|, therefore **C'** = **0**.

Inside Event Horizon,

|**C**| < |**V**|, therefore **C'** follows **V** and goes inwards.

Outside Event Horizon,

|**C**| > |**V**|, therefore **C'** follows **C** and goes outwards.

Where **C'** is the light speed observed on earth (reference point), **C** is the Absolute Light Speed observed at the light source and **V** is the speed of light source moves away from the light origin (Inertia Light Speed).

As a result, at the Event Horizon [19], the net speed of the photon is zero and the photon is in idle. Outside the Event Horizon (Ergosphere), Absolute Light Speed is bigger than Inertia Light Speed, the photon moves outwards and can escape from the black hole. On the other hand, inside the Event Horizon, Absolute light Speed is smaller than Inertia Light Speed, such that the photon moves inwards and can never escape from the black hole [20]. This is the reason why "Black Hole" is named.

VII. Conclusion

Equation of Relative Velocity is derived. Dynamic Graviton Flux affected by the relative velocity between target and parent objects is studied. LIGO Experiment, M&M Experiment, Pendulum Swing Time Dilation, Air Bound Time Dilation and Lecher Line Wavelength Anisotropy affected by Dynamic Graviton Flux are explained. In addition, Equation of Light Speed is derived based on Equation of Relative Velocity. Also, a mathematical model Equations of Doppler Shifts incorporated with Equation of Light Speed is developed to calculate Axial Doppler Shift, Acceleration Doppler Shift and Transverse Doppler Shift.

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