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Gravitational Waves Detected By LIGO Interferometer Based On Anisotropic Light Speed Caused By Dynamic Graviton Flux

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Abstract
According to Einstein's Spacetime Theory, Gravitational Waves are "Spacetime Ripples". These ripples are distorted space which can cause oscillation to LIGO interferometer and such that interference signals can be detected. However, what exactly the spacetime is, how these ripples propagate and oscillate with LIGO interferometer remain unknown. In this paper, instead of "Spacetime Ripples", gravitational waves as the "Graviton Surges" in a combined graviton flux composed of two alternately blocking graviton fluxes emitted from a pair of rotating black holes (or mega stars) are proposed based on Graviton Radiation and Contact Interaction Theory. As a graviton flux meets a moving target object, dynamic graviton flux can be generated dependent on the speed of the target object and the relative direction between the moving target object and the static graviton flux observed at the parent object. Furthermore, according to Gravity Affected Wu's Spacetime Shrinkage Theory and Principle of Parallelism, Wu Unit Length (diameter) and Wu Unit Time (period) of Wu's Pairs (building blocks of the universe) in an object or event are dependent on the local gravitational field generated by either static graviton flux or dynamic graviton flux, as is the dimension, duration, velocity and acceleration of the object or event, as well as the wavelength and light speed of a photon. As a result, when Graviton Surges and Graviton Valleys in the gravitational waves hit LIGO Interferometer, different anisotropic light speeds can be produced in the two arms of LIGO interferometer subject to the dynamic gravitational field dependent on the effective mass of either one of the two black holes or two black holes caused by blocking in the rotation process between two black holes, and the direction between laser beams and gravitational waves (static graviton flux), such that interference can be generated and thus Graviton Surges and gravitational waves can be detected.
Keywords: *Gravitational Waves, Spacetime, General Relativity, LIGO, Interferometer, Yangton and Yington Theory, Wu's Spacetime Shrinkage Theory, Principle of Parallelism, Graviton Flux, Static Graviton Flux, Dynamic Graviton Flux, Graviton Radiation, Anisotropic Light Speed.*

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I. Gravitational Waves As Spacetime Ripples

Gravitational waves [1]are proposed as "ripples" in space-time that propagate like waves, traveling outward from the source caused by some of the most violent and energetic processes in the universe. Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity [2]. Einstein's mathematics show that massive accelerating objects would disrupt space-time in such a way that "waves" of distorted space would radiate from the source. Furthermore, these "ripples" would travel at the speed of light through the universe, carrying with them information about their cataclysmic origins, as well as invaluable clues to the nature of gravity itself. By contrast, gravitational waves cannot exist in Newton's theory of gravitation, since Newton's theory postulates that physical interactions propagate at infinite speed. Potential sources of detectable gravitational waves include binary star systems composed of white dwarfs, neutron stars, stellar cores (supernovae) or Black Holes. On February 11, 2016, the LIGO Scientific Collaboration and Virgo Collaboration teams announced that they had made the first observation of gravitational waves, originating from a pair of merging black holes using the Advanced LIGO detectors [3].

Although this "Spacetime Ripples" model seems pretty neat, but many questions have been raised, such as "What is the sapcetime? How can space or spacetime be distorted? What exactly LIGO is measuring? Is it the change of length, wavelength, light speed or something else?".

II. Gravitational Waves As Graviton Surges In Graviton Flux

Recently, a new model of gravitational waves was proposed [4] based on Graviton Radiation and Contact Interaction Theory [4] and Yangton and Yington Theory [5]. In which gravitational waves are considered as the "Graviton Surges" in a fluctuating graviton flux combining of two alternately blocked graviton fluxes emitted from a pair of rotating black holes (or mega stars). It is similar to that in a fluctuating light beam combining of two alternately blocked light beams emitted from a pair of rotating stars (Fig. 1). In addition, gravitational force is conducted through graviton flux by graviton radiation and contact interaction, which opposes to Newton's theory of gravitation that physical interactions propagate at infinite speed. Furthermore, because graviton is a very tiny particle which can penetrate most objects except those massive objects such as black holes and mega stars. This is the reason why Graviton Surges can only be found in a pair of merging black holes or mega stars.

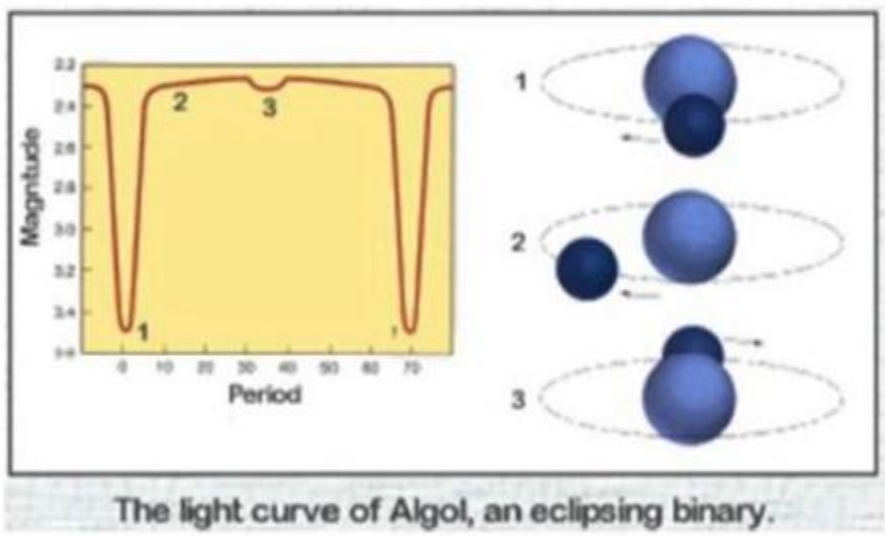

Fig. 1 The brightness of the eclipsing "Algol" binary system.

With this new "Graviton Surges" model based on Graviton Radiation and Contact Interaction Theory, the challenges are how we can detect the gravitational waves that are composed of Graviton Surges in graviton flux, and if LIGO can still be applied in detection of Graviton Surges and gravitational waves.

III. Yangton And Yington Theory

Yangton and Yington Theory [5] is a hypothetical theory based on a pair of superfine Yangton and Yington antimatter particles with built-in inter-attractive Force of Creation circulating against each other on an orbit. These pairs of Yangton and Yington circulating particles are named "Wu's Pairs" which is considered as the building blocks of the universe.

Yangton and Yington Theory can successfully explain that subatomic particles are composed of string structures which are built upon Wu's Pairs and String Force in compliance with String Theory [6], also String force and Four Basic Forces are induced from Force of Creation in accordance to Unified Field Theory [7].

Furthermore, Yangton and Yington Theory can very well bridge Quantum Theory with Relativity, also interprets and correlates space, time, energy and matter in the universe. Therefore, it is believed that Yangton and Yington Theory is a theory of everything.

IV. Graviton And Gravitational Force

Based on Yangton and Yington Theory, Wu's Pairs are the Building Blocks of the universe. When two Wu's Pairs come together with the same circulation direction (either spin up or spin down), they can stack up on each other at a locked-in position, where Yangton of the first Wu's Pair lines up to the Yington of the second one due to the attractive force between Yangton and Yington particles from each Wu's Pairs. This attractive force is called "String Force". By repeating this stacking process, various linear structures can be formed such as single string, multiple strings and ball type strings, which complies with String Theory. The single string structure is named "Graviton" [8].

When two gravitons in the same object come together side by side, no matter the circulation directions, they can adjust themselves so as to attract each other at the contact points by a group of string forces generated between the Yangtons of one graviton and the Yingtons of the other graviton in each cycle of circulations. This process is called "Contact Interaction" and the group of attraction only string forces generated between the two adjacent gravitons in the same object is named "Gravitational Force". Other elementary subatomic particles having basic string structures such as quarks, leptons and bosons can also have gravitational forces between them, except photon and gluons which have neither string structures nor adjustable circulations.

V. Graviton Radiation And Contact Interaction

Like photon, graviton can also be radiated from a parent object by absorbing thermal or kinetic energy. This process is called "Graviton Radiation". As a graviton emitted from the parent object reaches the target object, it makes a contact side by side with the graviton on the target object where the two gravitons can adjust themselves so as to attract each other at the contact points by a group of string forces generated between the Yangtons of one graviton and the Yingtons of the other graviton in each cycle of circulations. This interaction is called "Contact Interaction" and this group of string forces generated between two gravitons from different objects is called "Remote Gravitational Force". Also, the entire process is called "Graviton Radiation and Contact Interaction Theory" [4]. In general, Remote Gravitational Force contains "a group of gravitational forces" generated by the contact interactions between two groups of gravitons, one group from target object and the other group through graviton flux from parent object. It is different from the ordinary gravitational force which is "a single gravitational force" generated by the contact interaction between two adjacent gravitons on the same object. In addition, Remote Gravitational Force applied on target object is always towards to the opposite direction of the graviton flux from parent object.

As a result, instead of being produced by the propagation of gravitational force generated from parent object, Universal Gravitation as the remote gravitational force is generated by Graviton Radiation and Contact Interaction process between two objects. In fact, gravitational force cannot propagate by itself, only gravitons can move as part of graviton flux through graviton radiation process from parent object to target object and such that Remote Gravitational Force can be produced.

VI. Graviton Fluxes

Graviton flux is generated by graviton radiation, it is the graviton streams emitted from parent object to target object. There are two types of graviton fluxes: static graviton flux and dynamic graviton flux [9].

Static graviton flux (also known as Aether Inflow) is the graviton flux emitted from a parent object to a stationary target object. The intensity of static graviton flux observed at the stationary target object is dependent on the speed of static graviton flux, mass of parent object and the distance between the parent object and the stationary target object.

Dynamic graviton flux (also known as Aether Wind) on the other hand is the graviton flux emitted from parent object to moving target object observed at moving target object, which is dependent on the speed of dynamic graviton flux observed at moving target object, mass of parent object and the distance between the parent object and the moving target object (It is different from the distance between parent object and the stationary target object. However, the difference is negligible because the speed of moving target object is much smaller than the speed of graviton flux assuming equal to the light speed). In addition, based on Equation of Relative Velocity, the velocity of dynamic graviton flux observed at target object is the vector summation of the velocity of parent object observed at target object and the velocity of static graviton flux observed as parent object.

According to Wu's Spacetime Shrinkage Theory, Wu Unit Length and Wu Unit Time of the subatomic particles in an object or event are dependent on the local gravitational field (graviton bombardment strength). Furthermore, based on Principle of Parallelism, all the properties of an object or event are dependent on the Wu Unit Length and Wu Unit Time of the subatomic particles in the object or event, therefore they are also dependent on the local gravitational field (graviton bombardment strength) and thus the total intensities of graviton fluxes.

Since the intensity of dynamic graviton flux can vary with the relative motion between target object and parent object, therefore, the dimension, duration, velocity and acceleration of an object or event, as well as wavelength [10], light speed [11] and time dilation [12][13] as a function of the local gravitational field (graviton bombardment strength) can all be affected by the relative velocities between parent object and target object.

VII. Static Graviton Flux And Newton's Law Of Universal Gravitation

According to Particle Radiation and Contact Interaction Theory, Newton's Law of Universal Gravitation [14] can be derived and used to calculate the Static Remote Gravitational Force (Universal Gravitation) caused by static graviton flux between two stationary objects.

Like photon emitted from a heat source by absorbing thermal energy to overcome the string force, graviton can also be emitted from an object by absorbing thermal energy to overcome the gravitational force. In case that both parent object and target object are stationary, it is obvious that Static Graviton Flux (i_s), the gravitons emitted from parent object to stationary target object per unit area per unit time, should be proportional to the mass of the parent object (m_1), and also inversely proportional to the square of the distance (r) between parent object and stationary target object (Fig. 2). Therefore,

$i_s = p\ m_1/r^2$

$\mathbf{i_s} = p\ m_1/r^2\ \mathbf{r}$

Where $\mathbf{i_s}$ is the static graviton flux vector and i_s is the static graviton flux emitted from parent object to stationary target object observed at stationary target object, p is static graviton flux constant, m_1 is the mass of parent object, r is the distance from m_1 and $\mathbf{r}$ is the unit vector with direction from parent object m_1 to stationary target object m_2.

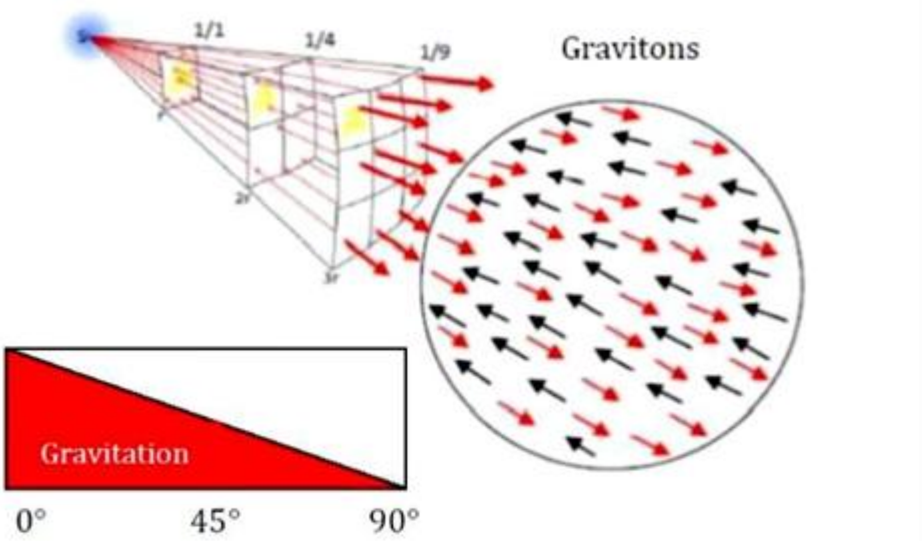

Fig. 2 Gravitational force caused by Graviton Radiation and Contact Interaction.

As a consequence, the static remote gravitational force (F_s) generated by contact interaction between the gravitons emitted from the parent object and the gravitons on the stationary target object should be proportional to the static graviton flux (i_s) arriving at the stationary target object and the total quantity of the gravitons on the stationary target object which is proportional to the mass of the stationary target object (m_2) (Fig. 2). Therefore,

$F_s = q(pm_1/r^2)\ m_2$

$\mathbf{F_s} = q(pm_1/r^2)\ m_2\ \mathbf{S}$

Where F_s is the static remote gravitational force and $\mathbf{F_s}$ is the static remote gravitational force vector applied on stationary target object by parent object observed at stationary target object, q is graviton contact interaction constant, p is static graviton flux constant, m_1 is the mass of parent object and m_2 is the mass of stationary target object, r is the distance between parent object m_1 and stationary target object m_2 and $\mathbf{S}$ is the unit vector with direction from stationary target object m_2 to parent object m_1.

In addition, because of the random angels from 0° to 90° between the emitted gravitons from the parent object and the gravitons on the target (Fig. 2), an average 50% of the full contact interactions should be expected.

Furthermore, given G = pq, then Newton's Universal Gravitation (Fig. 3) which is the same as static remote gravitational force can be represented as follows:

$\mathbf{F} = G\ (m_1m_2/r^2)\ \mathbf{S}$

Where $\mathbf{F}$ is universal gravitation vector (static remote gravitational force vector)applied on stationary target object by parent object observed at stationary target object, G is gravitational constant, also known as static remote gravitational force constant (G is a constant quantity, $G= 6.674 \times 10^{-11}\ m^3kg^{-1}s^{-2}$ measured on earth with earth units), m_1 is the mass of parent object and m_2 is the mass of stationary target object, r is the distance between parent object m_1 and stationary target object m_2 and **S** is the unit vector with direction from stationary target object m_2 to parent object m_1.

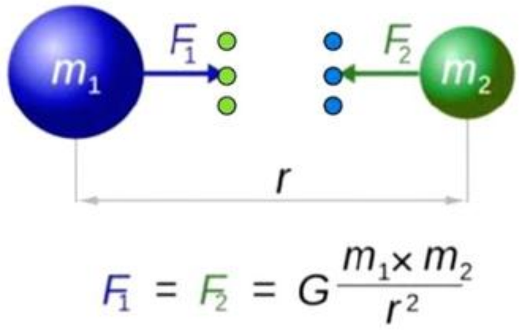

Fig. 3 Remote gravitational force between two objects.

Also vise versa, the same Newton's Universal Gravitational force except in the opposite direction can be applied to the parent object by stationary target object.

$\mathbf{F'} = G\,(m_1 m_2/r^2)\,\mathbf{S'}$

Where **F'** is universal gravitation vector (static remote gravitational force vector)applied on parent object by stationary target object observed at parent object, G is gravitational constant, also known as static remote gravitational force constant (G is a constant quantity, G= $6.674\text{x}10^{-11}$ $m^3kg^{-1}s^{-2}$ measured on earth with earth units), m_1 is the mass of parent object and m_2 is the mass of stationary target object, r is the distance between parent object m_1 and stationary target object m_2 and **S'** is the unit vector with direction from parent object m_1 to stationary target object m_2.

VIII. Dynamic Graviton Flux And Dynamic Remote Gravitational Force

Like any other flux, in addition to the concentration of graviton, graviton flux is also proportional to graviton speed. Therefore, dynamic graviton flux and vector can be represented as follows:

$i_d = kV_d\,(m_1/r^2)$

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

Where i_d is dynamic graviton flux observed at moving target object, k is graviton flux constant, V_d is the speed of dynamic graviton flux observed at moving target object, $\mathbf{i_d}$ is dynamic graviton flux vector observed at moving target object, $\mathbf{V_d}$ is dynamic graviton flux speed vector observed at moving target object ($_t\mathbf{V_g}$). m_1 is the mass of parent object and r is the distance between parent object and moving target object.

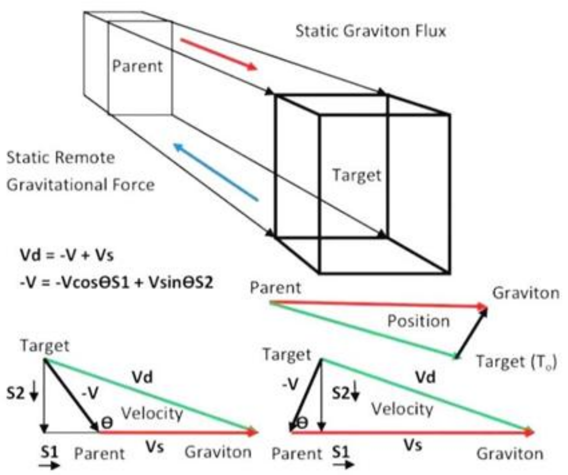

Fig. 4 A schematic diagram of dynamic graviton flux observed at target object interpreted by Equation of Relative Velocity $\mathbf{V_d} = -\mathbf{V} + \mathbf{V_s}$. Where $\mathbf{V_d}$ is the speed of dynamic graviton flux observed at target object, **V** is the speed of target object observed at parent object and $\mathbf{V_s}$ is the speed of graviton observed at parent object.

Fig. 4 [15] (revised from [9][16]) shows a schematic diagram of the relative positions and velocities between three objects: graviton, parent object and target object.

Take the stationary parent object 'p' (or position P) as reference point. In the beginning at time $t_o = 0$, graviton 'g' is emitted from the stationary parent object 'p' at position P. Meantime, target object 't' is moving out from its original position T_o. Finally at time $t_f = t$ both of the graviton 'g' and target object 't' meet at position G. Therefore,

$\mathbf{T_oG = T_oP + PG}$

Also, according to Equation of Relative Velocity, for constant velocities, the velocity of graviton observed at target object $_t\mathbf{V_g}$ (equal to $\mathbf{V_d}$ moves towards target) is the vector summation of the velocity of parent object observed at target object $_t\mathbf{V_p}$ (equal to $-\mathbf{V}$ and $\mathbf{V} = {}_p\mathbf{V_t}$, the velocity of target object observed at parent object) and the velocity of graviton observed at parent object $_p\mathbf{V_g}$ (equal to $\mathbf{V_s}$ the velocity of static graviton flux observed at either parent object or target object). Therefore,

$_t\mathbf{V_g} = {}_t\mathbf{V_p} + {}_p\mathbf{V_g}$

And

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

Also,

$\mathbf{T_oG = T_oP + PG}$

And

$\mathbf{T_oG}/t = {}_p\mathbf{V_t} = -{}_t\mathbf{V_p} = \mathbf{V}$

$\mathbf{PT_o}/t = {}_t\mathbf{V_g} = \mathbf{V_d}$

$\mathbf{PG}/t = {}_p\mathbf{V_g} = \mathbf{V_s}$

As shown in Fig. 4, because the triangle of Equation of Position composed of $\mathbf{PT_o}$, $\mathbf{T_oG}$ and $\mathbf{PG}$ is proportional to the triangle of Equation of Relative Velocity composed of $\mathbf{V_d}$, $\mathbf{V}$ and $\mathbf{V_s}$, therefore the angle between $\mathbf{T_oG}$ and $\mathbf{PG}$ is equal to that between $-\mathbf{V}$ and $\mathbf{V_s}$, also as is the angle Θ between the velocity of target object $\mathbf{V}$ and the velocity of static graviton flux $\mathbf{V_s}$ observed at parent object (Fig Z13 shows that in both $\Theta < 90^o$ and $\Theta > 90^o$ cases). As a result, $\mathbf{V_d}$ is parallel to $\mathbf{PT_o}$ and can be calculated as follows:

Because

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

And

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

Assuming graviton speed is equal to light speed C, then

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

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_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 observed at target object. C is light speed, V is the speed of target object observed at parent object, Θ is the angle between the velocity of target object $\mathbf{V}$ and the velocity of static graviton flux $\mathbf{V_s}$ observed at parent object. Also $\mathbf{S_1}$ is the unit vector along static graviton flux $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to static graviton flux $\mathbf{V_s}$ towards target object.

Because dynamic graviton flux and dynamic graviton flux vector can be represented as follows:

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

$i_d = kV_d\,(m_1/r^2)$

Therefore,

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

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

Where $\mathbf{i_d}$ is the vector of dynamic graviton flux, i_d is dynamic graviton flux, k is graviton flux constant, C is light speed, V is the velocity of target object and Θ is the angle between the velocity of target object $\mathbf{V}$ and the velocity of static graviton flux $\mathbf{V_s}$ observed at parent object. Also $\mathbf{S_1}$ is the unit vector along static graviton flux $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to static graviton flux $\mathbf{V_s}$ towards target object. m_1 is the mass of parent object, r is the distance between two objects.

Furthermore,

$p = kC$

$pq = G$

$qk = G/C$

Where k is graviton flux constant, p is static graviton flux constant, q is graviton contact interaction constant. C is light speed (static graviton flux speed) and G is gravitational constant.

Because

$\mathbf{F_d} = -\,qm_2\, \mathbf{i_d}$

$F_d = - q m_2 i_d$
Therefore, the dynamic remote gravitational force can be represented as follows:
$\mathbf{F_d} = - (G/C)[(C - V \cos\Theta) \mathbf{S_1} + V \sin\Theta \mathbf{S_2}] (m_1 m_2/r^2)$
$F_d = (G/C)[(C - V \cos\Theta)^2 + (V \sin\Theta)^2]^{1/2} (m_1 m_2/r^2)$

Where $\mathbf{F_d}$ is the vector of dynamic remote gravitational force and F_d is dynamic remote gravitational force, G is gravitational constant, C is light speed, V is the speed of target object observed at parent object, Θ is the angle between the velocity of target object **V** and the velocity of static graviton flux $\mathbf{V_s}$ observed at parent object, $\mathbf{S_1}$ is the unit vector along static graviton flux $\mathbf{V_s}$ and $\mathbf{S_2}$ is the unit vector perpendicular to static graviton flux $\mathbf{V_s}$ towards target object, m_1 is the mass of parent object, m_2 is the mass of target object, r is the distance between two objects,

Dynamic remote gravitational force is dependent on the speed of dynamic graviton flux observed at target object, which is further dependent on the speed of target object and the angle between the velocity of target object and the velocity of static graviton flux observed at parent object. Also, according to Wu's Spacetime Shrinkage Theory, all the properties of a moving target object are dependent on the dynamic remote gravitational force. As a result, all the properties of a moving target object are dependent on the speed and direct of the moving target object with respect to the parent object. Therefore, when a photon passes through a massive object, anisotropic light speeds can be produced at different directions.

IX. Wu's Spacetime Shrinkage Theory

According to Yangton and Yington Theory [5], Wu's Pairs are the building blocks of the universe. Therefore, Wu Unit Length (dimension) and Wu Unit Time (duration) of Wu's Pairs are the dominate factors of all the properties of an object or event.

Under massive graviton bombardment (or at a large gravitational field in a stationary single parent object system), based on Graviton Radiation and Contact Interaction Theory, the speed of Yangton and Yington circulation is slower which can make Wu Unit Length and Wu Unit Time bigger (Wu's Spacetime Equation $t_{yy} = \gamma\ l_{yy}^{3/2}$) [17]. This phenomenon is named "Gravity Affected Wu's Spacetime Shrinkage Theory". Furthermore, in compliance with Principle of Parallelism, the dimension and duration of an object or event should be bigger while velocity and acceleration should be smaller, also wavelength should be bigger and light speed should be slower.

In case of static graviton flux, the dimension, duration, velocity and acceleration of an object or event, as well as wavelength and light speed are all dependent on the static gravitational field generated by the static graviton flux between two stationary objects. For examples, Gravitational Redshift, Altitude Time Dilation, Deflection of Light and Perihelion Precession of Mercury. On the other hand, in case of dynamic graviton flux, all these properties are dependent on the dynamic gravitational field generated by the dynamic graviton flux dependent on the relative velocity and direction between the moving object and stationary parent object. For examples, Air Bound flight, Pendulum Swing Time Dilation and Anisotropic Light Speed.

On the other hand, when the universe becomes older, due to the attraction between Yangton and Yington particles caused by Force of Creation in Wu's Pairs, the speed of Yangton and Yington circulation becomes faster while the circulation orbit becomes smaller. In other words, both Wu Unit Length and Wu Unit Time become smaller. This phenomenon is named "Aging Affected Wu's Spacetime Shrinkage Theory" [17]. Furthermore, according to Principle of Parallelism, as Wu Unit Length and Wu Unit Time become smaller, the dimension and duration of the object or event become smaller while velocity and acceleration get larger, also wavelength becomes smaller and light speed becomes faster. As a result, the shrinkage of wavelength due to aging of the universe is the main reason to cause Cosmological Redshift, Hubble's Law, Intrinsic Expansion and Universe Expansion.

X. Wu's Spacetime Shrinkage Theory Versus General Relativity

Space and Time are the elements of the universe. Space contains the total volume of room in the universe. Time contains the entire sequence of distribution in the universe. Both of them are absolute quantities. They don't change with anything at all. However, the Dimension and Duration of a corresponding identical object or event are the properties of an object or event with associated quantities. They can change with local gravitational field and aging of the universe.

According to Wu's Spacetime Shrinkage Theory, Wu Unit Length and Wu Unit Time of Wu's Pairs (the building blocks of matters) in the subatomic particles of a corresponding identical object or event are bigger at large gravitational field because of the expansion of Wu's Pairs caused by the massive bombardment of gravitons from graviton flux. They are also bigger in early stage of the universe due to the less attraction of Force of Creation in Wu's Pairs.

Furthermore, based on Principle of Parallelism, Wu's Spacetime Transformation and Wu's Spacetime Equation, the dimension and duration of a corresponding identical object or event become bigger, while velocity and acceleration become smaller at large gravitational field and early aging of the universe. These are the reasons causing Gravitational Time Dilation, Expansion of the Universe and Perihelion Precession of Mercury. Also, photon as a corresponding identical object or event, its wavelength ($\lambda \propto l_{yy}$) is bigger and Absolute Light Speed ($C \propto l_{yy}^{-1/2}$) is smaller at large gravitational field and early aging of the universe. These are the reasons causing Gravitational Redshift, Cosmological Redshift and Deflection of Light.

Einstein's Spacetime is nothing but the potential energy of an object or event, which likes dimension and duration, is also dependent on the local gravitational field and aging of the universe (Spacetime is a fancy name which has confused people in decades). In fact, it is the image of the local gravitational field and aging of the universe [18][19]. However, Einstein believed that Space (dimension) and Time (duration), as well as Spacetime (potential energy) of an object or event were naturally generated. Also, the curvature of spacetime (acceleration) reflects the distribution of matter and energy in the universe. Even more, Einstein derived his theories including Special Relativity, General Relativity, Spacetime, Field Equations and Mass and Energy Conservation, all based on two wrong assumptions: (a) Light speed is always constant no matter the light sources and observers (or in other words, velocity is the principle factor of special relativity), and (b) Acceleration is the principle factor of general relativity and Spacetime.

In contrast, according to Yangton and Yington Theory, it is believed that (a) Light speed is not constant, instead it is the vector summation of Absolute Light Speed C and Inertia Light Speed, and (b) Acceleration is not a principle factor, instead gravitational field and aging of the universe are the principle factors in the universe. According to Wu's Spacetime Shrinkage Theory, Wu Unit Time (t_{yy}) and Wu Unit Length (l_{yy}) are dependent on the local gravitational field and aging of the universe. Furthermore, based on Principle of Parallelism, Wu's Spacetime Transformation and Wu's Spacetime Equation, all the properties of a corresponding identical object or event including dimension, duration, velocity, acceleration and potential energy (Einstein's Spacetime), as well as wavelength and light speed are also dependent on the local gravitational field and aging of the universe, no matter of the velocity and acceleration of the object or event (except those of corresponding identical object or event [20][21]).

Velocity is relative. According to Einstein's Special Relativity, the speed of the spaceship observed by the brother on earth is identical to the speed of earth observed by his twin brother in the spaceship, except in opposite directions. Therefore, same time dilation should be found by both brothers. This conflict is named Twin Paradox. Because acceleration is also relative, Twin Paradox can also happen to Einstein's General Relativity. However, it is not the case by Wu's Spacetime shrinkage Theory. The brother at larger gravitational field will always have slower time (Gravitational Time Dilation) than that of his twin brother at smaller gravitational field.

Although both Einstein's General Relativity and Gravity Affected Wu's Spacetime Shrinkage Theory [20] agree that under a massive gravitational field (or large acceleration), the dimension and duration of an object or event are bigger, while velocity and acceleration are smaller, also wavelength is bigger and light speed is slower, it is more reasonable that Gravitational Redshift and Deflection of Light are produced by massive gravitational force instead of that by the acceleration or the curvature of Einstein's Spacetime.

Furthermore, Wu's Spacetime Field Equation can be derived from the correlations between acceleration and gravitational field on earth with Wu's Spacetime Transformation. In comparison, Einstein's Field Equation is derived from the correlations between potential energy (Einstein's spacetime) and acceleration on earth with the transformation of potential energy from a nonlinear geometry system (geodesics) to a Normal Spacetime System (Cartesian coordinate system).

Because Wu's Spacetime Field Equations observed on earth based on t_{yy0} and l_{yy0} of a reference subatomic particle have G and C_0^{-4} on the matter and energy side (right hand side) and the amount of normal unit acceleration a_0 on the acceleration side (left hand side) of the equations, which is similar to Einstein's Field Equation. Therefore, the curvature of Einstein's Spacetime in a Normal Spacetime System on earth is in compliance with the amount of normal unit acceleration in Wu's Spacetime System on earth. In other words, Einstein's Field Equation is true and also it is equivalent to Wu's Spacetime Field Equation only if acceleration is generated by gravitational field.

XI. Anisotropy Of Light Speed And Dynamic Graviton Flux

Recently Rene Steinhauer did an experiment [11] on the wavelength of standing waves of the same stationary radio frequency by Lecher Line, and has found out anisotropic difference on wavelength and light speed in various directions. In Rene Steinhauer's experiments, with the use of a Lecher line and a standing electromagnetic wave, the experimenter can measure changes in wavelength by measuring electrical output at an assigned position on a Lecher line. Results of this experiment demonstrated an obvious and experimentally repeatable phase change associated with direction of the Lecher line. This phase change was demonstrated by a change in electrical output measured at the assigned location on the Lecher line. This experiment was repeated using various frequencies and voltage inputs into the Lecher line with obvious results that demonstrated an anisotropic difference. Further experiments were completed attempting to find an alternative hypothesis for the phase change noted in the original experiment, but these experiments were unable to identify an alternative cause of the phase change and consequently support the hypothesis that the phase change was directly related to anisotropy secondary to a change in the measured wavelength of the electromagnetic wave. Based upon the logical conclusions associated with this experiment and the results obtained, this experiment appears to demonstrate variable speed light. Furthermore, this discovery brings into question the theory that electromagnetic propagation though space is at the constant speed of c.

As illustrated in Fig. 4 [15], as an object passes through a gravitational field that is vertical to the surface of earth, it can generate various amounts of dynamic graviton fluxes subject to the direction and speed of the object. The dynamic remote gravitational force can be represented by the dynamic gravitational field as follows:

$F_{gd} = 1\text{kg}\ (G/C)[(C - V\ \text{Cos}\Theta)^2 + (V\ \text{Sin}\Theta)^2]^{1/2}\ (m_1/r^2)$

Where F_{gd} is dynamic gravitational field, G is gravitational constant, C is Absolute Light Speed (static Graviton flux speed), V is the speed of the target object and Θ is the angle between the velocity of target object **V** and the velocity of static graviton flux $\mathbf{V_s}$ observed at parent object (earth), m_1 is the mass of parent object (earth), r is the distance between two objects (radius of earth).

In a dynamic gravitational system containing a parent object and a moving target object, the dynamic gravitonal field F_{gd} generated on the moving target object is dependent on the speed of moving target object V and the angle Θ between the directions of moving target object and the static graviton flux observed at parent object. In other words, for a target object moving at a constant speed, its moving direction with respect to the parent object (more preciously, the static graviton flux emitted from parent object) observed at parent object can affect the intensity of dynamic remote gravitational force generated on the moving target object.

Furthermore, according to Gravity Affected Wu's Spacetime Shrinkage Theory, gravitational fields including static gravitational field and dynamic gravitational field can change Wu Unit Length and Wu Unit Time of the subatomic particles in the object or event, which based on Principle of Parallelism can subsequently change all the properties of the object or event such as dimension, duration, velocity and acceleration, as well as wavelength, light speed and time dilation.

As a result, all the properties of a moving target object are functions of dynamic gravitational field which are dependent on the speed and direction of the moving target object with respect to the parent object (more preciously static graviton flux emitted from the parent object) observed at parent object. Consequently, different light speeds can be found at different directions from the static graviton flux emitted from the parent object, this phenomenon is named "Anisotropy of Light Speed".

Because of these reasons, the standing radio electromagnetic wave in Rene Steinhauer experiment working as the target object traveling in different directions from the static graviton flux emitted vertically from the surface of earth (parent object), can generate different wavelengthes and light speeds [15]. This experiment gives a direct proof to not only that "light speed is anisotropic", but also that "light speed is not constant". It also provides an indirect proof to the existence of static and dynamic graviton fluxes based on Yangton and Yington Theory.

In comparison to Michelson and Morley Experiment which was conducted on a horizontal plane on earth. Because the dynamic gravitational fields generated by a photon moving in different directions on a horizontal plane on earth are constant due to the same angle 90^o between static graviton flux and photon moving directions, therefore, light speed remains unchanged and no interference caused by dynamic graviton flux can be detected in Michelson and Morley Experiment.

Furthermore, when gravitational waves reach LIGO detector, anisotropic light speeds can be produced in the two arms due to the different dynamic graviton fluxes generated at different angles between the light beam and the static graviton flux carried by gravitational waves emitted from parent object (black holes), such that two light beams are out of phase and no longer totally destructively interfere, and thus gravitational waves can be detected.

XII. Gravitational Wave

Gravitational waves [1] are proposed as "ripples" in space-time that propagate like waves, traveling outward from the source caused by some of the most violent and energetic processes in the universe. Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity [2]. Einstein's mathematics show that massive accelerating objects would disrupt space-time in such a way that "waves" of distorted space would radiate from the source. Furthermore, these "ripples" would travel at the speed of light through the universe, carrying with them information about their cataclysmic origins, as well as invaluable clues to the nature of gravity itself. By contrast, gravitational waves cannot exist in Newton's theory of gravitation, since Newton's theory postulates that physical interactions propagate at infinite speed. Potential sources of detectable gravitational waves include binary star systems composed of white dwarfs, neutron stars, stellar cores (supernovae) or Black Holes. On February 11, 2016, the LIGO Scientific Collaboration and Virgo Collaboration teams announced that they had made the first observation of gravitational waves, originating from a pair of merging black holes using the Advanced LIGO detectors [3].

Recently, a new model of gravitational waves was proposed [4] based on Graviton Radiation and Contact Interaction Theory and Yangton and Yington Theory. In which gravitational waves are considered as the "Graviton Surges" in a fluctuating graviton flux combining of two alternately blocked graviton fluxes emitted from a pair of rotating black holes (or mega stars). These Graviton Surges can generate anisotropic light speed, which gives a better interpretation to gravitational waves than Einstein's spacetime theory and meantime can still be detected by LIGO detector.

XIII. LIGO's Interferometer

U.S. National Science Foundation Laser Interferometer Gravitational-wave Observatory detectors (Fig. 5)[22] are Michelson interferometers, fundamentally similar to the sort of device that was invented in the 1880's. They are similar in that:

- They are L-shaped with two equal-length arms
- A mirror at the vertex of the arms splits a single light beam into two, directing each beam down an arm of the instrument
- Mirrors at the ends of the arms reflect the beams back to their origin point where they are recombined to create an interference pattern called 'fringes'

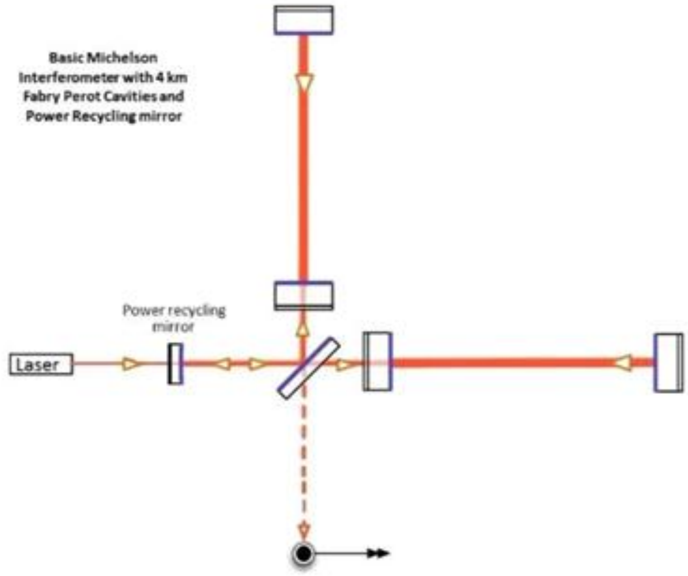

Fig.5 Basic Michelson with Fabry Perot cavities and Power Recycling mirror. LIGO's interferometers use multiple power recycling mirrors but for simplicity only one is shown. Click to enlarge. (Credit: Caltech/MIT/LIGO Lab)

But this is where the similarities end. NSF LIGO's interferometers are far larger and more complex than the builders of the world's first interferometers could have imagined. For one thing, a big difference between the original Michelson interferometer and LIGO is that LIGO uses a laser beam as its light source, whereas the first Michelson interferometer used a plain white light. And of course the most obvious difference between the original Michelson interferometer and LIGO's is sheer scale. With arms 4km (2.5 mi.) long, LIGO's interferometers are by far the largest ever built. (By contrast, the interferometer Michelson and Morley used in their famous experiment to study the "aether" had arms about 1.3m long). The scale of LIGO's instruments is crucial to the search for gravitational waves. The longer the arms of an interferometer, the smaller the measurements they can make. And having to measure a change in distance 1,000 times smaller than a proton means that LIGO has to be larger and more sensitive than any interferometer ever before constructed. While 4-km-long arms already seems enormous, if LIGO's interferometers were simple Michelson interferometers, they would still be too short to enable the detection of gravitational waves. But there are practical limitations to building a precision instrument much larger than 4km. So how can LIGO possibly make the measurements it makes?

The paradox was solved by altering the design of the Michelson interferometer to include something called "Fabry Perot cavities". The figure at left shows this modification to the basic design illustrated above. An additional mirror is placed in each arm near the beam splitter and 4km from the mirror at the end of that arm. This 4-km-long space constitutes the Fabry Perot cavity. After entering the instrument via the beam splitter, the laser in each arm bounces between these two mirrors about 300 times before being merged with the beam from the other arm. These reflections serve two functions:

1. It builds up the laser light within the interferometer, which increases LIGO's sensitivity (more photons keeping track of the lengths of the arms makes LIGO more sensitive)
2. It increases the effective distance traveled by each laser from 4km to about 1200km. (The light in Michelson's original interferometer only traveled 11 meters!) This is important because the longer the interferometer's arms, the bigger the absolute changes that gravitational waves make to total arm length (i.e., total distance traveled by the lasers). Consequently, the longer the arms and the farther the lasers travel, the bigger the effect even small gravitational waves have on the whole interferometer, making them more readily detectable.

Even with the Fabry Perot cavities, LIGO still must push the limits of what is literally physically possible in its quest to detect passing gravitational waves. Length isn't the only limiting factor in LIGO's sensitivity. Laser power is also a consideration. Just as increasing length increases the interferometer's sensitivity to more distant gravitational waves, increasing laser power also enhances its performance. In this case, the more laser photons that merge from each arm (most photons = more power) the sharper the fringes that are measured by the photodetector.

But there's a problem here too. LIGO's laser first enters the interferometer with a power of about 40 Watts, but it needs to operate closer to 750kW if it has any hope of detecting gravitational waves. Here we have another paradox. Just as it would be impossible to build a 1200km-long interferometer, building a laser with this initial power is a practical impossibility.

Once again, LIGO uses mirrors to solve this dilemma. They are called Power Recycling Mirrors. Inside the interferometer, light from the laser passes through the transparent side of a power recycling mirror to the beam splitter where it is directed down the arms of the interferometer. The instrument's alignment and mirror coatings, and even quantum mechanics, ensure that nearly the entire laser light entering the arms follows a path back to the reflective side of the power recycling mirror before it exits to the photodetector. As laser power is constantly entering the interferometer from the laser itself, the power recycling mirror continually reflects the laser light that has already traveled through the instrument back into the interferometer (hence 'recycling'). This process greatly boosts the power of the laser light 'stored' inside the Fabry Perot cavities without the need to generate such a powerful laser beam at the outset. The boost in power generated by power recycling results in a sharpening of the interference fringes that appear when the two beams are superimposed--fringes which will tell scientists if a gravitational wave has passed. The sharper the fringes, the easier it becomes to identify the tell-tale signs of gravitational waves.

Two other modifications make LIGO's interferometers unique and able to make the world's smallest measurements. First, they also possess signal recycling mirrors, which further enhance the signal that is received by the photodetector. And second, LIGO's interferometers were constructed with extraordinary mechanisms to damp out unwanted vibrations (noise) making it easier for the instruments to sense just the vibrations caused by gravitational waves. LIGO's seismic isolation system is discussed in much greater detail in LIGO Technology.

With these modifications, LIGO's interferometers are more precisely known as a dual recycled, Fabry-Perot, Michelson interferometers (Fig. 5).

XIV. Spacetime Oscillation Detected By LIGO

LIGO was deliberately designed in the way that when two beams recombine, they totally destructively interfere and no light comes out of the instrument. But if they travel different distances, then when the beams recombine, their light waves are no longer perfectly aligned, and some light leaks out. This is the mechanism how LIGO detector works [22]. According to Einstein's Spacetime Theory, Gravitational waves cause spacetime itself to oscillate, alternately stretching in one direction while compressing in a perpendicular direction. As a consequence, LIGO's arms also oscillate in length, thus causing the lasers within them to travel different distances before recombining. Now, as the beams recombine, they are out of phase, and no longer totally destructively interfere. Instead, the merging beams shift in and out of phase, and a flicker of light emerges from the interferometer. However, what exactly spacetime is and how the LIGO's arms oscillate with spacetime remain unexplained.

XV. Anisotropic Light Speed Detected By LIGO

Instead of "Spacetime Ripples" based on Einstein's Spacetime Theory, gravitational waves as the "Graviton Surges" in a combined graviton flux composed of two alternately blocking graviton fluxes emitted from a pair of rotating black holes (or mega stars) are proposed based on Graviton Radiation and Contact Interaction Theory.

As a graviton flux such as gravitational waves meets a moving target object, dynamic graviton flux and dynamic gravitational field can be generated dependent on the speed of the target object and the relative direction between the moving target object and the static graviton flux observed at the parent object. The dynamic gravitational field can be represented as follows:

$F_{gd} = 1kg\ (G/C)[(C - V\ Cos\Theta)^2 + (V\ Sin\Theta)^2]^{1/2}\ (m_1/r^2)$

Consequently, as a photon travels through the static graviton flux (such as gravitational waves) generated by a parent object (such as black hole), a dynamic gravitational field can be produced on the photon as follows:

$F_{gd} = 1kg\ G\ 2^{1/2}\ (1 - Cos\Theta)^{1/2}\ (m/r^2)$

Where F_{gd} is dynamic gravitational field on the photon, G is gravitational constant, C is light speed, Θ is the angle between the direction of photon and the direction of static graviton flux observed at parent object, m is the mass of parent object, r is the distance between the photon and parent object.

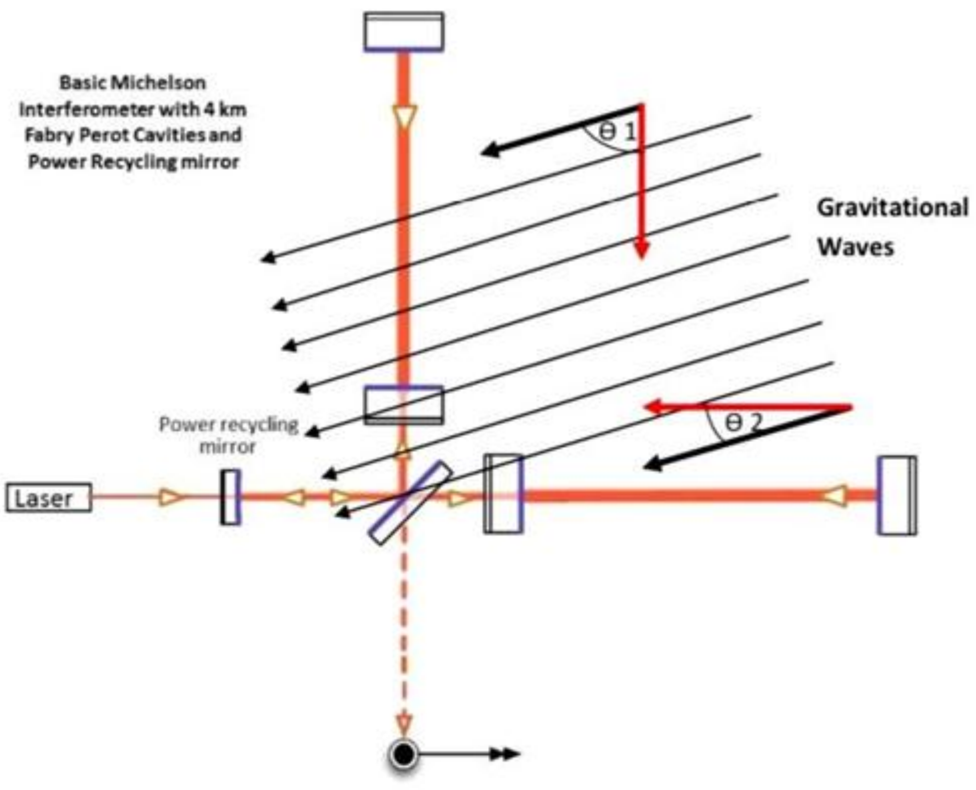

Fig.6 Anisotropic light speed produced by dynamic graviton flux generated by gravitational waves and LIGO detector (Credit: Caltech/MIT/LIGO Lab).

In case of LIGO detector, as illustrated in Fig. 6, any parent object in the universe can generate dynamic gravitational field on the two arms of LIGO detector respectively as follows:

$F_{gd1} = 1kg\ G\ 2^{1/2}\ (1 – Cos\Theta_1)^{1/2}\ (m/r^2)$

$F_{gd2} = 1kg\ G\ 2^{1/2}\ (1 – Cos\Theta_2)^{1/2}\ (m/r^2)$

Where Θ_1 is the angle between the direction of photon in one arm of LIGO detector and the direction of static graviton flux generated and observed at parent object (or observed on earth stationary to parent object), Θ_2 is the angle between the direction of photon in the other arm of LIGO detector and the direction of static graviton flux generated and observed at parent object (or observed on earth stationary to parent object), m is the mass of the parent object, and r is the distance between the parent object and LIGO detector on earth.

Since $\Theta_1$is different from Θ_2, therefore F_{gd1} is different from F_{dg2}. As a result, according to Wu's Spacetime Shrinkage Theory and Principle of Parallelism, the corresponding light speeds in the two arms are also different from each other. However, all the differences caused by the planets in the entire universe can be offset simply by tuning the combined laser beams from two arms to totally destructive such that no leaking light can be detected before gravitational waves come to hit LIGO detector.

Once the two black holes came closer and started to rotate against each other, gravitational waves are generated. Subsequently as the gravitational waves come down to earth and hit the LIGO detector, various dynamic gravitational fields can be generated on the two arms of LIGO detector because of the Graviton Surges in the gravitational waves. As is the anisotropic light speeds on the two arms of LIGO detector according to Wu's Spacetime Shrinkage Theory and Principle of Parallelism. Such that the recombined beams are out of phase and the total destructive interference is interrupted, and thus some leaked light can be detected by LIGO detector.

The dynamic gravitational fields produced by the concurrent two-way laser beams on the two arms of LIGO detector can be calculated before and after the impact by the gravitational waves, also that by the Graviton Surges and Graviton Valleys as follows:

A. Before the rotation starts between two black holes, there are no gravitational waves, such that two independent graviton fluxes from a pair of approaching black holes (mass M_1 and mass M_2) can be generated and emitted to the two arms of LIGO detector on earth. Thus the dynamic gravitational fields on both arms of LIGO detector can be calculated as follows:
   Arm 1: $F_{gd1} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_1)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_1)]^{1/2}\}\ (M_1+M_2)/r^2$
   Arm 2: $F_{gd2} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_2)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_2)]^{1/2}\}\ (M_1+M_2)/r^2$
B. When Graviton Surges of the gravitational waves, which are the peak intensity of the fluctuated graviton flux generated during the rotation without blocking between the two black holes, hit LIGO detector. The combined graviton fluxes from the two black holes are the summation of the two graviton fluxes. Thus the dynamic gravitational fields can be calculated as follows:
   Arm 1: $F_{gd1} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_1)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_1)]^{1/2}\}\ (M_1+M_2)/r^2$
   Arm 2: $F_{gd2} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_2)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_2)]^{1/2}\}\ (M_1+M_2)/r^2$
C. When Graviton Valleys of the gravitational waves, which are the valley intensity of the fluctuated graviton flux generated during the rotation with blocking between two black holes, hit LIGO detector. Because one black hole is blocked by the other one, therefore only one graviton flux of the two black holes is exposed to LIGO detector on earth. Thus the dynamic gravitational fields can be calculated as follows:
   Arm 1: $F_{gd1} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_1)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_1)]^{1/2}\}\ (M_1)/r^2$
   Arm 2: $F_{gd2} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_2)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_2)]^{1/2}\}\ (M_1)/r^2$
   or
   Arm 1: $F_{gd1} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_1)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_1)]^{1/2}\}\ (M_2)/r^2$
   Arm 2: $F_{gd2} = 1\text{kg}\ G\ 2^{1/2}\ \{(1 - \text{Cos}\Theta_2)^{1/2} + [1 - \text{Cos}\ (180^o - \Theta_2)]^{1/2}\}\ (M_2)/r^2$

As a result, because of the blocking in each cycle of the rotation between two black holes, the total dynamic gravitational fields produced on each arm of LIGO detector are different dependent on the actual dynamic graviton fluxes generated by the total effective mass of either one of the two black holes or two black holes, such that the recombined beams are out of phase and the total destructive interference is interrupted. Instead, the merging beams shift in and out of phase, and a flicker of light emerges from the interferometer. In other words, Graviton Surges and gravitational waves are detected.

XVI. Conclusion

Instead of "Spacetime Ripples" based on Einstein's Spacetime Theory, gravitational waves as the "Graviton Surges" in a combined graviton flux composed of two alternately blocking graviton fluxes emitted from a pair of rotating black holes (or mega stars) are proposed based on Graviton Radiation and Contact Interaction Theory. As a graviton flux meets a moving target object, dynamic graviton flux can be generated dependent on the speed of the target object and the relative direction between the moving target object and the static graviton flux observed at the parent object. Furthermore, according to Gravity Affected Wu's Spacetime Shrinkage Theory and Principle of Parallelism, Wu Unit Length (diameter) and Wu Unit Time (period) of Wu's Pairs (building blocks of the universe) in an object or event are dependent on the local gravitational field generated by either static graviton flux or dynamic graviton flux, as is the dimension, duration, velocity and acceleration of the object or event, as well as the wavelength and light speed of a photon. As a result, when Graviton Surges and Graviton Valleys in the gravitational waves hit LIGO Interferometer, different anisotropic light speeds can be produced in the two arms of LIGO interferometer subject to the dynamic gravitational field dependent on the effective mass of either one of the two black holes or two black holes caused by blocking in the rotation process between two black holes, and the direction between laser beams and gravitational waves (static graviton flux), such that interference can be generated and thus Graviton Surges and gravitational waves can be detected.

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