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The Theory of "Gravilon or Spacetime Particles" as an Explanation for Gravity and Light using The Same Particles and Light Speed Limit. The Explanation for Dark Matter, Dark Energy and Mass. The Explanation for Why Small Particles Follow Quantum Mechanics but Larger Particles Follow the Einstein Relativity with Resolution of Black Holes Singularity

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Abstract

There has always been a question about what transmits electromagnetic waves and/or gravitational forces. Furthermore, the nature of dark matter and dark energy remains elusive. This paper is introducing a new simple theory that may explain many unexplained phenomena in physics. This theory should stimulate many physicists and mathematicians for a new way of thinking about our universe and unsolved mysteries in physics. In this theory, the presence of new particles in the universe called "Spacetime or Gravilon (Gravi for gravity and L for light and on for transmission)", are proposed as the replacement for the space time fabric / field described by Einstein. The fact that gravity and light have the same speed for their propagation can be explained by the presence of Spacetime particles as they utilize the same vehicle (Spacetime particles) for their effect. The presence of Spacetime particles in the universe may explain the unknown phenomena called dark matter. The maximal possible contraction of time particles between space particles can explain why light or any matter cannot surpass the maximal speed of light and why time nearly stops with the light speed. These particles are simplified in this paper but are most likely complicated structures that could have more dimensions than the known four dimensional space time and could be very diverse in nature with multiple subunits than simple illustration in this paper. However, in the core, these particles are made from two fundamental parts. One part contains space particles connected to each other via other part time particles. Time particles could have particle quality but could also be pure energy. Basically, these Gravilon particles introduced in this paper have two major components. One is space and the other one is time. Space particles connected to the time particles could explain Spacetime effect known in the relativity theory. The main difference between this theory and the Einstein relativity, is the fact that this theory is introducing Spacetime particles instead of Space-time fabric. Connection of space with time particles can also explain relativity. Furthermore, interaction of these particles with matter can give matters their masses as an explanation for why matter has mass. Higgs bosons and fields could be also a part of Spacetime particles. This simple theory could also explain limitations of light speed and why light and gravity have the same speed for their effect. Furthermore, probably the distance between Spacetime particles can be stretched or contracted to fit small propagating particles in between based on their sizes. However, these stretching, and contraction properties should have limits. Those particles that can fit between the Spacetime particles before reaching the maximal stretching capability of Spacetime particles will behave mostly as quanta following quantum mechanics rules. Once propagating particles are too

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large to fit between Spacetime particles, then the quanta's behavior will weaken or disappear making them follow the Einstein relativity theory. This mechanism can clearly explain why the size of particles are important in order to determine their behaviors. Spacetime particles have most likely their own gravitational forces like any particles in the universe. With their gravitational forces, many fundamental particles are attached to or are in between Spacetime particles including photons, electrons and more. These particles are most likely the vehicle of propagating photons and small particles explaining why small particles are propagating as a wave using Spacetime particles but losing wave character once interacting with matter as it will lead to the loss of Spacetime wave collapse. Another theory would be the theory that space particles can change to photons or other small particles under specific circumstances explaining wave and particle duality. Loss of gravity due to disintegration of Spacetime particles in the center of a black hole secondary to extreme forces can resolve the problem with singularity in the black holes. Gravitational forces of Spacetime particles can make Spacetime particles to be the same as dark matter. In galaxies, these particles are squeezed together due to high gravitational forces of stars and black holes leading to higher gravitational forces of Spacetime particles itself per unit space acting as dark matter in galaxies. Dark energy also can be explained by the gravitational forces of the multiverse around our universe pulling our galaxies apart using Spacetime particles between the universes as space can never be empty anywhere. The entire world is most likely packed with basic Spacetime particles but each universe after each own big bang should have individual modified surrounding Spacetime particles. Spacetime particles between universes could transmit gravitational forces of each universe to others leading to expansion of the neighboring universes including ours.

Keywords: ***The Einstein relativity; Quantum mechanics; Dark matter; Dark energy; Higgs boson; Space time; Light speed; Graviton; Quantum mechanics; Particles Mass; Photons; Electrons; Quanta; Quantum theory; light speed; Space-time; Astronomy; Galaxies; Gravity; Elementary particles; Black hole singularity***

Introduction

This theory attempts to explain why light and gravity have the same speed for their effect using Spacetime particles. These particles bind the entire universe like a glue together, thus responsible for light and gravity being able to propagate with the same speed. This is the replacement of Space-time fabric described by Einstein [1]. These particles are most likely the smallest particles in nature and are probably Planck or near Planck length size and may be very complex in character. However, they are made of two connected but distinct types of particles, one space and the other time. The Einstein Space-time fabric is neither a fabric of nothing nor inert space, but active particles with their own gravitational forces. They are responsible for gravity and light to exert their effects with the same speed. These particles have highest conductivities in empty space explaining fastest speed of light in an empty space. Whereas, in non-empty space other particles will interfere with Spacetime particles reducing the light speed as Spacetime particles have their own gravitational forces thus slowing down the speed of light entering different mediums. These gravitational forces can also explain dark matter. Dark energy can be explained by the gravitational forces of the multiverse around our universe pulling our galaxies apart using Spacetime particles between the universes. These Spacetime particles are not the so-called ether that was described as a medium without connections and without any gravitational forces in the past. In the following paragraphs, the unsolved mysteries of physics will be discussed in detail based on the new theory of Spacetime particles (Gravilon) proposed in this paper that may provide some answers to these mysteries.

Dark matter explanation

What holds galaxies together? Spacetime particles could be the answer for the presence of dark matter [2]. Spacetime particles are filling the entire cosmos. This can explain why these particles must have the highest gravitational force in our universe explaining

dark matter. As heavy objects with strong gravitational forces like stars and black holes will contract Spacetime particles to a smaller space per unit, it will lead to higher gravitational forces per unit of space explaining these mysterious extra gravitational forces that keeps stars in galaxies together as an explanation for the so-called dark matter. The gravitational forces of these particles can probably be calculated by taking the entire cosmos size and dividing it to the assumed missing gravitational forces in the cosmos that is called dark matter:

Gravilon gravitational force = Entire cosmos space size/Dark matter gravitational forces in the cosmos.

FIG. 1 and **FIG. 2** are showing the new way to look at Space-time. Instead of the Einstein's proposed Space-time fabric, this fabric is replaced with the presence of tightly connected Gravilon particles (Spacetime particles with space particles connected with each other through time particles). **FIG. 3** illustrates how at different speeds, time will slow down or stop at the speed of light with maximal squeeze of time particles between the space particles with shortening of this space at higher speed (blue circles only seen on the space axis). This explains the Einstein relativity theory by using the theory of Gravilon or Spacetime particles.

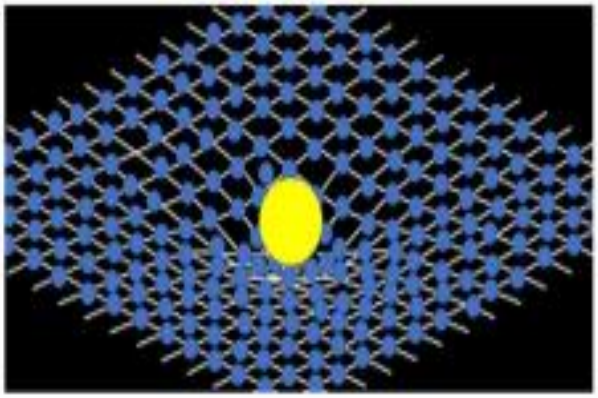

FIG. 1. **The new way to look at space-time. Instead the Einstein's Space-time fabric, this fabric is replaced with the presence of tightly connected Gravilon (Spacetime) particles contracted through the sun's gravity in space in this illustration. (Spacetime particles, Blue, Space particles connected with each other through white, time particles, adopted from 100 Years of General Relativity | NASA asd.gsfc.nasa.gov).**

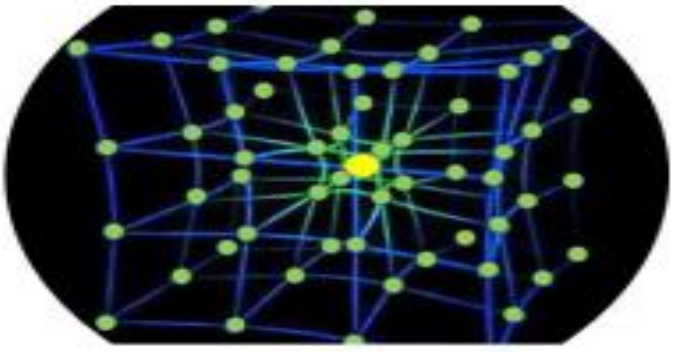

FIG. 2. **The new way to look at space time in a 3-dimensional illustration. Instead of the Einstein's Space-time fabric, this fabric is replaced with the presence of tightly connected Gravilon (Spacetime) particles contracted through the sun's gravity in space. (Spacetime particles, Green, Space particles connected with each other through blue, time particles). Higher concentration of Spacetime particles with own gravitational forces near the star in this illustration can explain higher gravitational energy seen near dense matters explaining the so-called dark matter.**

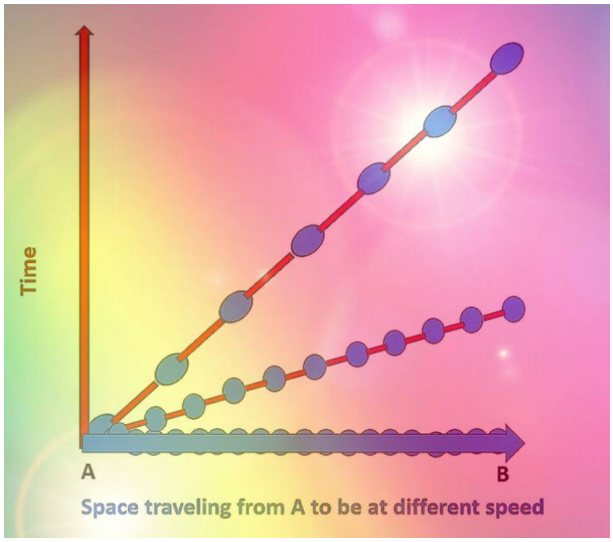

FIG. 3. **Blue represents space and red time particles. This figure illustrates how at different speeds, time will slow down or stop at the speed of light with maximal squeeze of the time particles between the space particles (blue circles only seen on the space axis traveling at speed of light) consistent with the Einstein relativity theory by using Gravilon or Spacetime particles. This also clearly illustrates the occurrence of space contraction described in the Einstein relativity theory that occurs at a higher speed near the speed of light.**

FIG. 4 is a simulation of a higher gravity in galaxies due to the squeezed Spacetime particles explaining dark matter. Recent publication using quantum gravity as an explanation of dark matter is perfectly in concordance with the Spacetime particles theory [3].

Spacetime particle theory described above can also explain why some dwarf galaxies were found to have hardly any dark matter as opposed to other common galaxies. These are illustrated in **FIG. 4** and **FIG. 5.** Dwarf galaxies are notorious for evenly distributed matter [4]. As illustrated in the figure, these evenly distributed matters will lead to evenly distributed Spacetime particles contraction in these galaxies neutralizing and balancing the gravitational forces across the galaxy, thus simulating a lack of dark matter [5]. The Andromeda galaxy, for example, is an unevenly distributed galaxy. As it can be seen in the **FIG. 6**, unevenly distributed matter will lead to imbalanced contractions of Spacetime leading to the detected extra gravitational forces in those areas called dark matter.

How can we explain the creation of stars if Spacetime particles are the same as dark matter?

The answer is simple. Like the dark matter theory, Spacetime particles can trigger star formation. In areas of higher mass after the big bang, Spacetime began to contract due to higher gravitational forces of Spacetime particles finally leading to the collapse of matter into Stars.

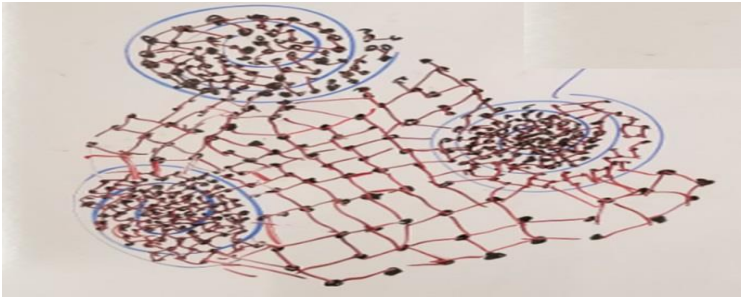

FIG.4. **Squeezed and contracted Spacetime particles in dense galaxies due to the high gravitational forces of stars and black holes will lead to a higher density of Spacetime particles which have their own gravitational forces. This will cause the**

presence of higher gravitational forces in galaxies as an explanation of the detected extra gravitational forces in these galaxies leading to the theory of dark matter.

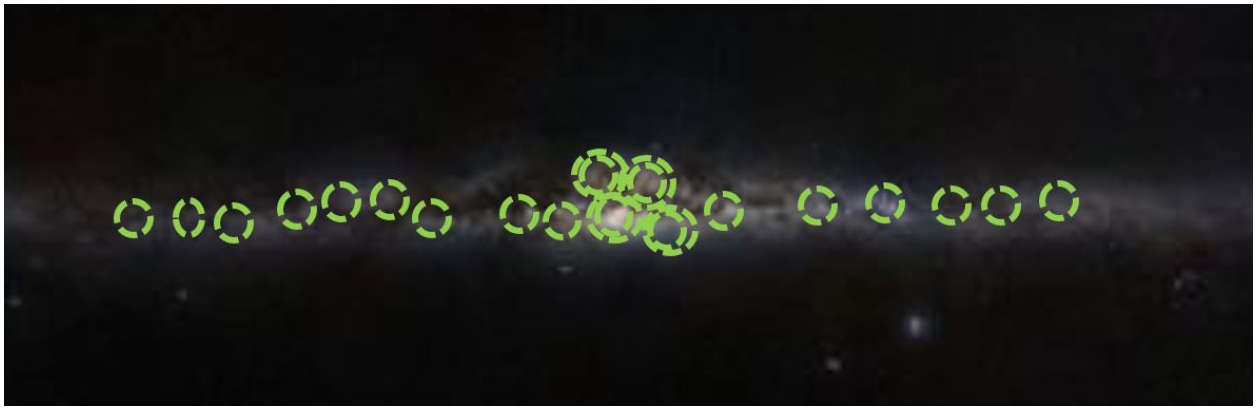

FIG. 5. **Why in a dwarf galaxy like above no dark matter has been detected? It can be explained by Spacetime particle gravitational forces theory. In contrast to other galaxies like Andromeda galaxy, dwarf galaxies have evenly distributed matter. This will lead to evenly contracted Spacetime particles with evenly increased gravitational forces of these particles throughout the galaxy. This causes evenly higher gravitational forces (dark matter) throughout the galaxy leading to neutralization of forces across the galaxy simulating a condition of lack of extra gravitational pulls or simulating lack of dark matter. Green circles simulated contracted Spacetime particles with higher contraction with larger mass.**

As can be seen above, due to evenly distributed matter in this dwarf galaxy, Spacetime particles are evenly contracted in a balanced way explaining why mistakenly no dark matter forces can be detected.

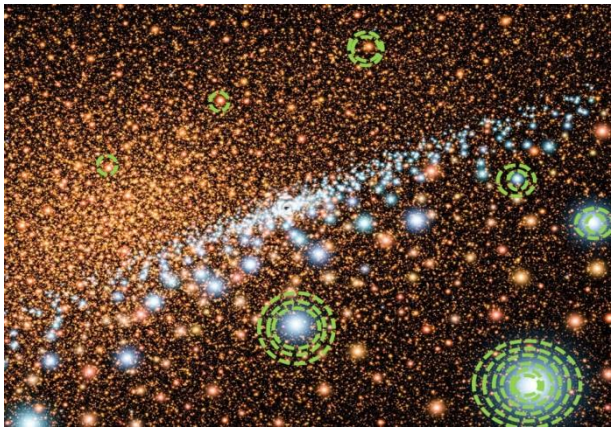

FIG. 6. **The Andromeda galaxy in contrast to dwarf galaxies has unevenly distributed matter. This will lead to unevenly contracted Spacetime particles with unevenly increased gravitational forces of these particles throughout the galaxy leading to clearly higher unexpected gravitational forces that is known as dark matter. Green circles simulated contracted Spacetime particles with higher contractions in the area of larger matter accumulation. As can be seen above, due to unevenly distributed matter in the Andromeda galaxy, strong dark matter forces are detected. (Adopted from Andromeda galaxy (Artist's Impression ca.lumas.com).**

Explanation of why light and gravity have the same speed for their effect and why matter cannot move faster than the speed of light

Nothing can go faster than the speed of light [6]. When light particles (forces, or gravitational forces) have to travel across the space, they must use Spacetime particles. So Spacetime particles or Gravilon are the medium for gravity and light to exert their effect. As opposed to ether that was thought to be like a fluid medium similar to an ocean, Spacetime particles are tightly connected particles explaining why experiments that attempted to detect ether all failed. These particles are simplified in this manuscript but are likely more complicated particles with many dimensional structures. They could be more diverse in their existence than the simple illustration in this paper. However, in the core, these particles are made from two fundamental parts, first type are space particles that are connected to each other via the second type time particles. Basically, these Gravilon particles introduced in this paper have two major components. One is space and the other one is time. Space particles connected to time particles explain the Spacetime effect known in the relativity theory. The main difference to the Einstein relativity theory describing space fabric is that this theory instead of having Spacetime fabric introduces Spacetime particles. These Spacetime particles are connected in a way that they cannot be stretched beyond a certain length explaining why light can never travel faster than the maximal speed of light. This length is probably the known Planck length which is 1.616255(18)×10-35 m. Furthermore, increasing gravitational forces can tighten the space between these connected particles until the limit of Planck length is reached preventing further tightening of time space between space particles. When the limit is reached, then time will stop as it will happen in the event horizon of a black hole or at the speed of light. At the maximal light speed, these particles are at the maximal possible contraction, squeezing the time particles to a maximal possible contraction state when the time will stop **FIG. 7**. This can explain why nothing can move faster than the speed of light as any motion will interact with these particles. Same particles transmit the propagation of gravitational forces and this is the reason why the effect of gravity has the same speed as the speed of light. The main difference is that light uses photons that set Gravilon or Spacetime particles in a wave motion for transfer of photons, but gravity has no particles to transfer and just uses Spacetime particles to exert its gravitational propagation in a wave form and function. **FIG. 8** explains why the maximal speed of light cannot be surpassed due to maximal contraction of time particles between the space particles. **FIG. 7** illustrates the contraction of time particles during light wave propagation leading to the time particle contraction to a maximal of Planck length and thus limiting the maximal speed of light and causing the time to stop at the light speed.

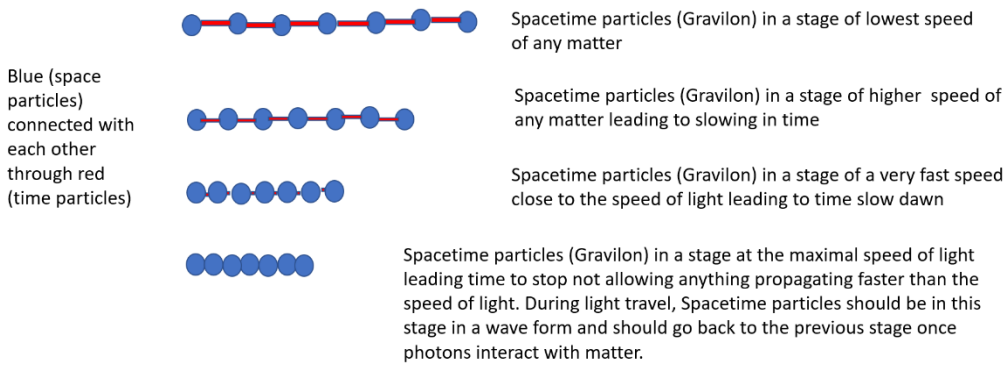

FIG. 7. **A very simplify theoretical description of Spacetime particles in the different stage depend on the speed. At the speed of light, time particles are contracted to a maximal possible contraction of probably Planck length leading to time stop at the speed of light.**

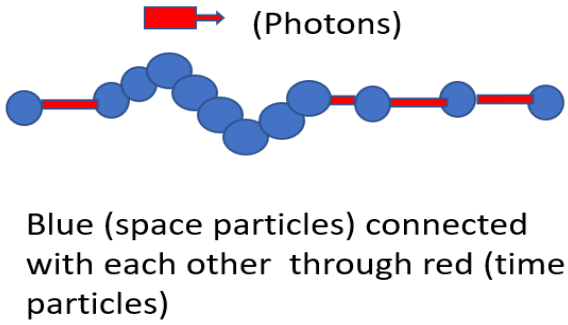

FIG. 8. **Light wave propagating is shown in a very simplified illustration using Spacetime particles (these particles are most likely very complex with probably multi-dimensional structures) squeezing time particles to a maximal contraction. This will limit the light speed to a maximal speed during maximal time contraction during the light propagation as an explanation why light cannot propagate faster that the maximal speed of light and why time will stop at the speed of light.**

Explanation of why light and small particles propagate as waves but also have particle quality and follow the quantum mechanics rules versus larger particles that follow the Einstein relativity theory with very little wave quality. It can also explain quantum fluctuation

The main explanation of this behavior is illustrated in **FIG. 9**. Photons or small particles that fit (probably only photons completely fit) or partially fit between Spacetime particles traveling in a three dimensional space time (here simplified as two dimensional) have to utilize Spacetime particles to propagate in between in a wave form. However, at the end of the propagation when interacting with matter illustrated in **FIG. 10**, they will set free as particles. Most likely Spacetime particles prevent photons or small particles from disintegration during traveling. Furthermore, it is likely that gravitational forces of Spacetime particles alone or with the help of additional glue type particles in between will keep photons or small particles close (or attached) to the Spacetime particles. It is also possible that due to weak gravitational forces of Spacetime particles, small particles will travel as quanta in a cloud type character in between explaining why small particles speed and location in space cannot be determined simultaneously as propagation occurs like a cloud type quanta.

How can we explain differences between the Einstein relativity and the quantum mechanics? The distance between Spacetime particles in a three dimensional space most likely can be stretched to fit small travelling particles based on their size but this stretching behavior has limits. Those particles that can fit between the Spacetime particles before reaching maximal stretching capability of Spacetime particles will behave as quanta following quantum mechanics rules. Once particles are too large to fit between the Spacetime particles, then the quanta's behavior will markedly be limited making them follow increasingly the Einstein relativity theory and hardly any quantum mechanics. This mechanism can clearly explain why the size of particles is important to determine their behavior and why every mass has both wave and particle type behaviors even in the case of large masses.

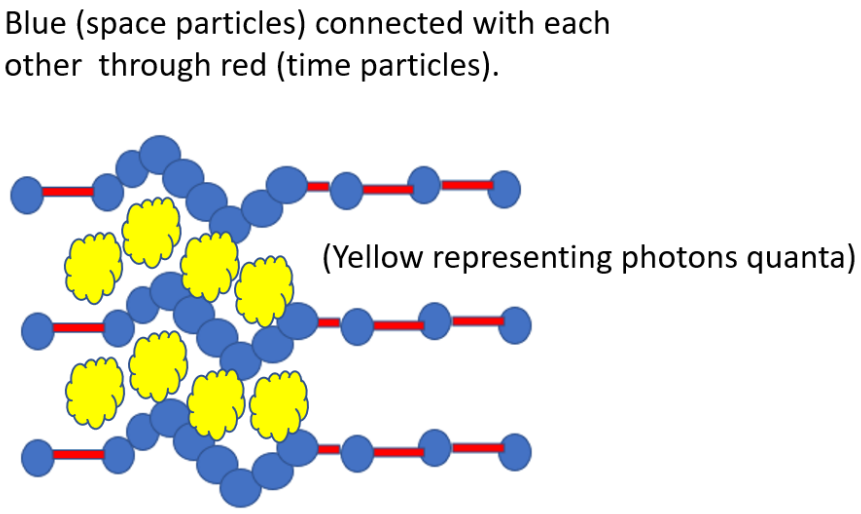

FIG. 9. **Photons traveling in a three dimensional space have to use Spacetime particles to propagate in between in a wave form and at the end of propagation, photons will be set free as particles. Most likely Spacetime particles prevent photons or small particles from disintegrating during traveling. Furthermore, gravitational forces of Spacetime particles or other weak gluon type particles keep photon particles close to Spacetime particles. However, due to weak gravitational forces, small particles will propagate as quanta in a cloud type character explaining why small particles' speed and location in space cannot be determined simultaneously.**

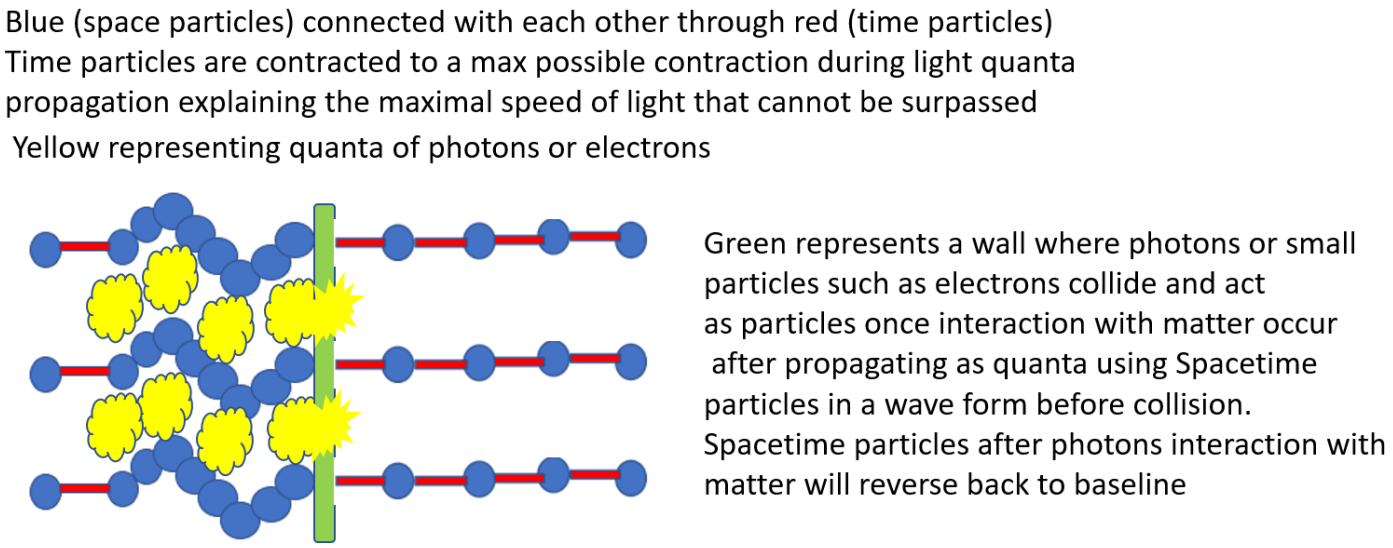

FIG. 10. **Photons or small particles that fit between Spacetime particles propagating in a three dimensional space time (here simplified as two dimensional) have to use Spacetime particles to travel in between in a wave form and at the end of propagation when interacting with matter, they will be released as particles.**

How to explain that photons always travel at the speed of light and other particles cannot? Why other particles may induce virtual waves during propagation?

Photons most likely fit perfectly between Spacetime particles with minimal or no interaction with it except gravitational forces of Spacetime particles holding photons between them and making photons using Spacetime as a carrier (**FIG. 11**). Other particles use

similar ways to propagate, like electrons, but as they are larger than photons or have larger mass or charges, they have more interaction with Spacetime particles, giving them the mass and preventing them from reaching the speed of light. This can theoretically trigger virtual waves due to interaction of Spacetime particles with each other in all directions during light propagation. Yellow showing photons propagation at the speed of light with time particle contraction probably to the size of Planck Time and Planck length. However, electrons seen in red are larger and therefore they will have more interaction with Spacetime particles and are never able to squeeze time particles to a Planck time or length and therefore will never reach the speed of light in vacuum as it will make their mass infinite.

In other words, gravitational forces of Spacetime particles make many fundamental particles to be attached to them or stay in between the Spacetime particles including photons, electrons, and other elementary particles. These particles can be set free during photon or small particle transmission when propagating in a wave form leading to occasional photon particles release explaining why small particles can act as waves and as particles simultaneously.

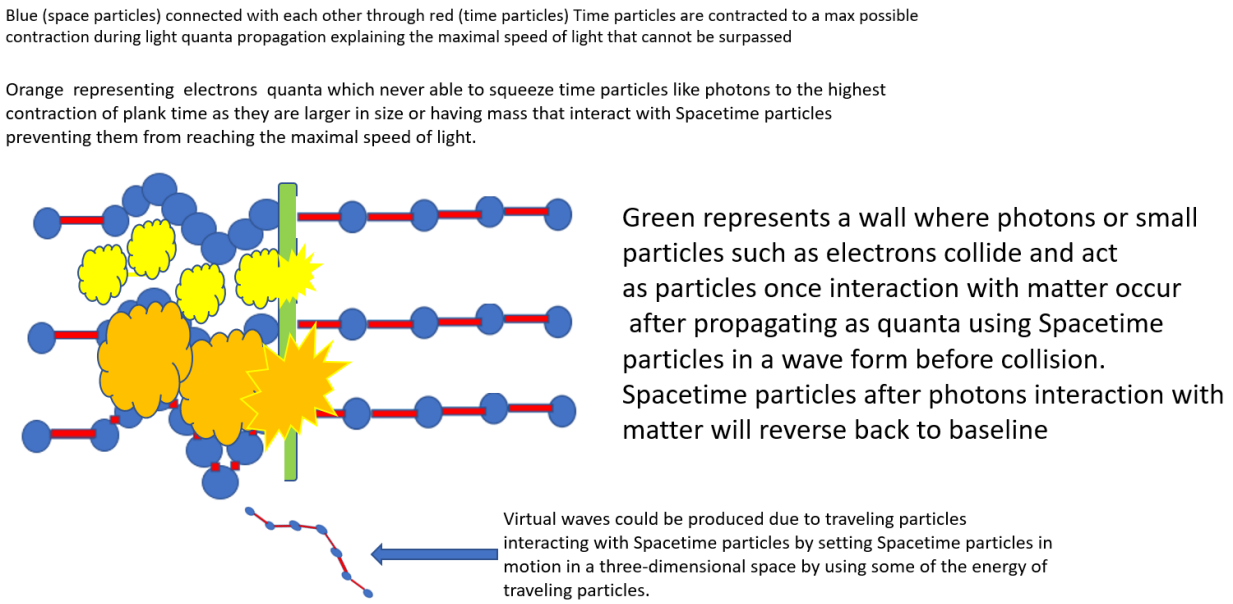

FIG. 11. **Why photons always travel at the speed of light but other particles can never reach that speed in vacuum? Why other particles can induce virtual waves during propagation in space time using Spacetime particles? Photons most likely are perfectly fit between Spacetime particles with minimal or no interaction with them and using Spacetime particles as carrier. Other particles use similar way to propagate like electrons but as they are larger than photons or have larger mass or charges, they will have more interaction with Spacetime particles giving them mass and making them unable to reach the speed of light. This may also trigger virtual waves as interactions will set Spacetime in motion in all directions. Yellow showing photons propagation at the speed of light with time particles pressed to the size of Planck time. However, electrons seen in red are larger and they will interact more with Spacetime particles and are unable to squeeze time particle to a Planck length and therefore will never reach the speed of light as it will make their mass infinite.**

Another theory would be the theory that Spacetime particles can change to photons or other small particles under specific circumstances during or at the end of propagation (**FIG. 12)**. Blue (space particles) connected with each other through red (time particles). This theory is based on the assumption that photons or any other small particles quanta set Spacetime particles in wave state for its propagation and at the end when interaction with matter occurs, space particles turn into the original photons or small particles explaining dual wave and particles behavior at the same time. The fact that background radiation is present in the entire

universe all the time making Spacetime particles always in motion that could possibly explain the quantum jittering fluctuation that is observed in vacuum. Another explanation of jittering behavior in vacuum could be the fact that Spacetime particles always have a baseline motion due to transmission of all matters gravitational forces to each other all the time without any particles traveling between them causing the known jittering observation in a vacuum.

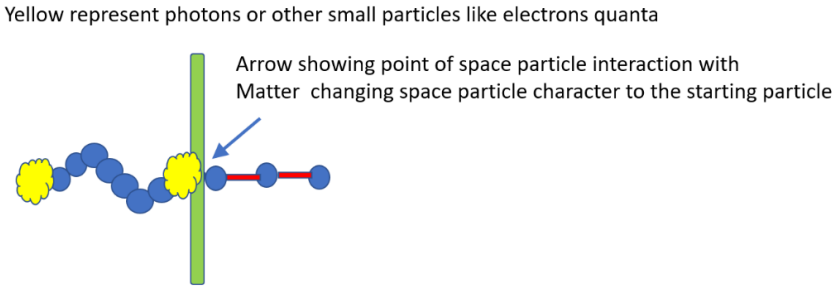

FIG. 12. **Another possible explanation for photon particles and waves duality. Blue (space particle) connected with each other through red (time particles). This theory is based on assumption that photons or any other small particle quanta trigger Spacetime particles in a wave like motion for its propagation and at the end when interaction with matter occurs, space particles turn to the original photons or small particles.**

Black holes interaction with Spacetime particles with the theoretical solution to singularity problem

In the event horizon of a black hole, Spacetime particles will have their maximal contraction or tightening to a Planck length when time stops [7]. The question remains if these Spacetime particles will finally disintegrate in the center of a black hole or always remain in the tightest stage. If they remain in the tightest stage, even the center of a black hole will continue to exert gravitational forces using these particles to the outside world. However, it is most likely that due to extreme gravitational forces of a black hole center, these particles will disintegrate when they are at the center of a black hole. In this case, the center of a black hole should lose all the gravitational force transmissions in the center to the upper layers of the black hole (**FIG. 13**). This would lead to a condition similar to the primordial soup shortly after the big bang. This soup probably contains a mixture of elementary particles such as quarks, electrons, neutrinos, Higgs bosons, etc. It can also be even more disintegration of these particles leading to a condition similar to the beginning of the big bang. In this soup, temperature must also be very high similar to the temperature at the beginning of the big bang. This should lead to the immediate expansion of a black hole center due to the lack of gravitational forces. However, Spacetime particles from upper layer of a black hole will reactivate gravitational forces again near the center of a black hole. This cycle would occur repeatably as a wave form. This may produce high energy waves that could be another explanation for the detected strong high energetic Gamma rays that are produced by black holes escaping black holes from its poles. In very large black holes, it can lead to large explosion that can release matter and energy into the space escaping the gravitational pull of a black hole momentarily.

How this can resolve singularity problem in black holes?

The singularity at the center of a black hole is the ultimate place where matter is compressed down to an infinitely small point where all conceptions of time and space completely break down. Physicists are aware that something must replace the singularity theory as it is not compatible with reality**.** As explained above, the loss of gravitational forces in the center of a black hole should cause expansion of a black hole in the center and prevent singularity as r in Schwarzschild equation will never reach a zero value **(FIG. 13).** In a location at and near the center of a black hole where space and time particles disintegrate due to extreme gravitational pull, gravity will be lost at the center of a black hole. This should prevent the singularity problem and lead to the expansion and outward motion of the elementary particles in a cycle where gravitational pull start again causing cyclic high energetic waves production inside a black hole. This may be in part explaining high energetic gamma waves seen at the poles of

black holes. In very large black holes, this center with loss of gravitational forces containing extreme density, energy and temperature could lead to an explosion that could be strong enough to release mass and energy back into the space escaping black holes gravity. This will most likely occur in black holes that are not spheric. This non-spherical condition occurs when two black holes that are orbiting each other close enough to lose energy and merge together. In that instant, the merging black holes are a single object. Then, newly formed larger black hole will only be reasonably round, but it has to go through a reasonably long process called “ringdown” to settle back down into a perfectly spherical object. **FIG. 14**, is showing such a black hole that is asymmetric which is more prone to explosion due to above explanation with loss of gravity at the center of the black hole. **FIG. 14** is showing the mechanism of such an explosion through weaker area of an asymmetric black hole in details. The above theory and illustration can perfectly explain the Chandra observation that reported in 2016 of a giant explosion in the Ophiuchus galaxy cluster that was confirmed later by Giacintucci [8]. They considered it as a part of the wall of a cavity in the hot gas created by jets from a supermassive black hole. They found emissions from electrons accelerated to nearly the speed of light. They compared it to the effect of the blast that ripped off the top of the mountain St Helens in the eruption that occurred in 1980. This comparison would perfectly fit the Gravilon theory mentioned above and with the fact that the loss of gravitational forces in a center of a black hole can be strong enough to act like a volcanic eruption spilling matter and energy out of a black hole into space. The theory that with extreme gravitational forces at the center of a black hole, Spacetime particles will disintegrate also suggests that the light speed limit will disappear in such a condition. In the last chapter of this paper, this interesting fact is discussed regarding possibilities that the maximal speed of light can be surpassed under similar circumstances.

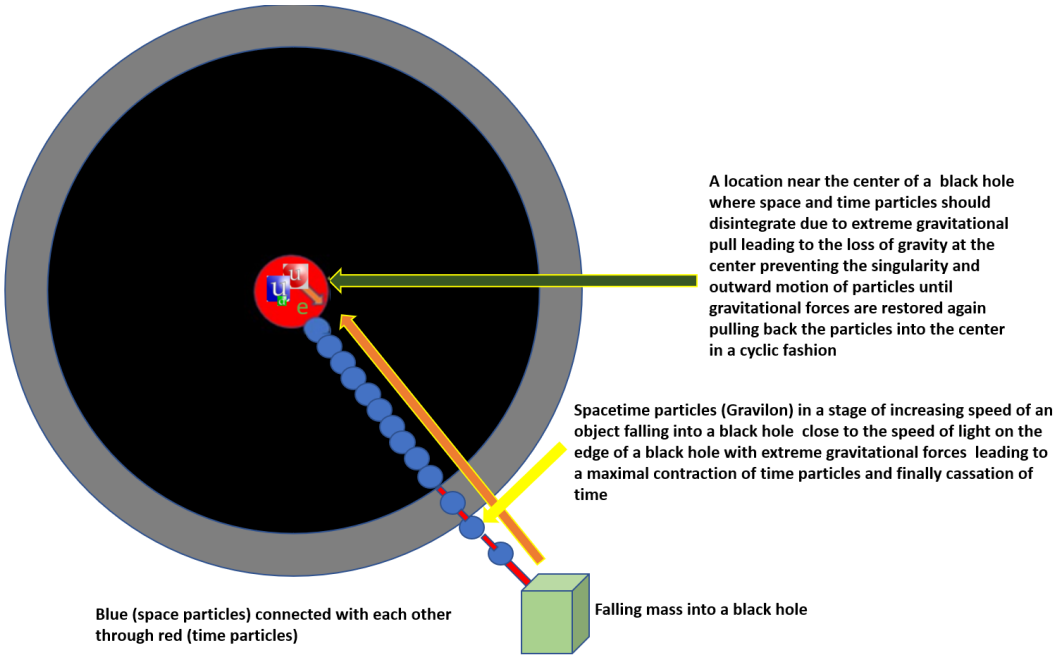

FIG. 13. **A location near the center of a black hole where space and time particles disintegrate due to extreme gravitational pull leading to the loss of gravity at the center that should prevent the singularity. It will trigger outwards motion of particles in a cycle where gravitational pull start again causing cyclic high energetic wave like motions inside a black hole. In a very large black hole, this center without gravitational forces with extreme density, energy and temperature can lead to explosion that could be strong enough to release mass and energy back into the space escaping black hole’s strong gravity. In the red zone, very high pressure and temperature together with the presence of elementary particles should resemble primordial soup similar to the conditions that were present at the beginning of the big bang.**

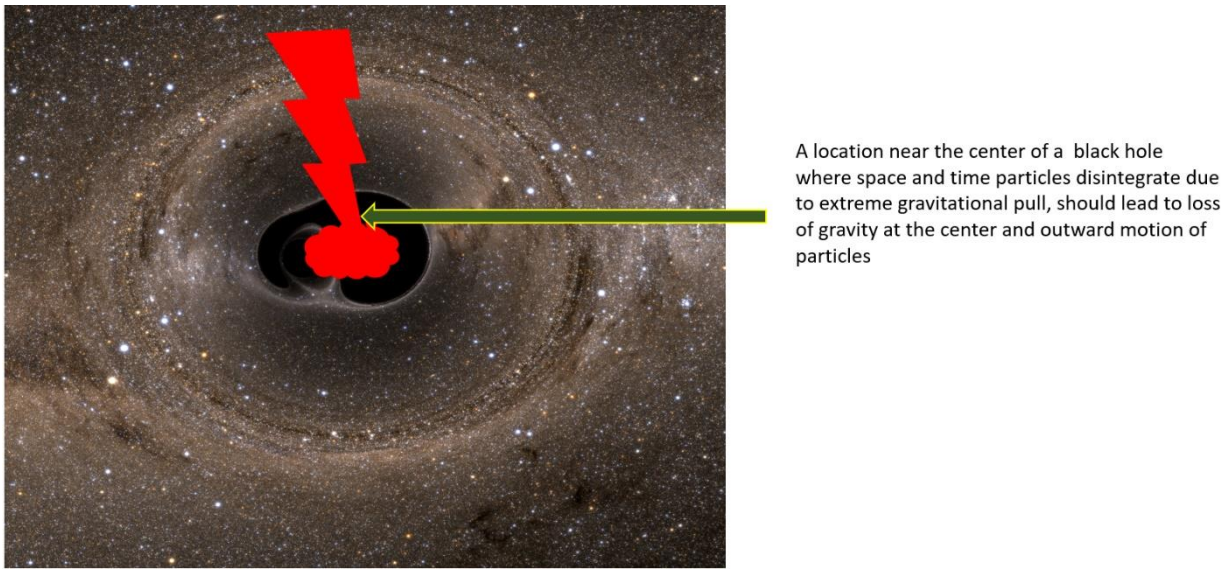

FIG. 14. **Two merging black holes leading to an asymmetric black hole before undergoing the ring dawn process. A location near the center of a black hole will be created where space and time particles disintegrate due to extreme gravitational pull. This will lead to the loss of gravity at the center of a black hole and outward motion of elementary particles until gravitational forces are restored again in the upper layers of the black hole pulling back these particles into the center in a cyclic fashion. Particularly in asymmetric blackholes, this can lead to expulsion of very large amount of matter through the weakest diameter of the black hole into the space similar to a volcanic eruption (Credit: Bohn et al 2015, SXS team).**

How can this explain quantum entanglement?

Quantum entanglement remains a major mystery. The easiest explanation is that Spacetime particles may be folded in another 5th dimension that is very small, making it only meaningful for very small particles. These small subatomic particles that propagating in the opposite directions using Spacetime particles can remain in contact with each other during the entire journey using the fifth dimension. This can explain quantum entanglement that is not based on the Einstein locality explanation [9]. As this dimension is very small, only extremely small particles can have this ability explaining the differences between the Einstein relativity theory and quantum mechanics. This extra dimension can also explain why very small particles can be present in different parts of the space at the same time. Another non-locality theory could be explained as permanent interaction of Spacetime particles with traveling quanta at all time.

However, based on the unproven Einstein locality theory, Spacetime particles can perfectly explain quantum entanglement. **FIG. 15** is a simple illustration of this theory. Yellow and green representing photons or electrons quanta produced in an event as a pair traveling in the opposite directions in an entangled condition. Due to the fixed Spacetime particles geometry, the spin of pair particles must always be in the opposite directions, explaining the Einstein locality theory for the behavior of the entangled particles.

Another way to explain quantum entanglement based on the non-locality theory that appears to be the real basic for entanglement phenomena (based on experiments done on the Bells calculations) could be as following: Due to fixed Spacetime particles geometry, the spin of pair particles must be always in the opposite directions explaining the opposite spin of the entangled particles. A quantum of a particle can spin in all directions before detection but only commit to one spin once it interacts with matter or is measured. This will lead to the opposite spin direction in the entangled particle due to the Spacetime geometry and the loss of wave

function as Spacetime particles changing back to the baseline and making quanta to be detected as particles. The reason why spin of a particle is not set from the beginning is based on the fact that all small particles near the speed of light are most likely ghost like particles until they interact. Therefore, a detailed character of a particle will only be set after it is measured. This explains why light quanta from the time they are produced have zero time for propagation for many years as the propagation only occurs as ghost particles and their journey into the true particles occur when they interact with something. This interaction will change instantly a ghost like particle into a real particle explaining why light traveling in zero-time until it interacts with something. True photons are initially frozen in time after production and propagating only as ghost like photons until interaction with matter occurs.

Interaction with matter leads to instant transfer of the ghost like particles into true particles. (**FIG. 16).** This theory assumes that every small particle near the speed of light is traveling mostly or in the case of photons exclusively as ghost particles until interaction with matter occurs. Every matter has ghost like and real particle characters combined. Expression of any of those characters depends on the speed of the matter. So, in our daily movements on earth, due to a very slow speed, the ghost part of slow-moving matters are very small and negligible. Ghostliness is inversely related to the speed of light and should be independent of mass. If we can travel in a ship near the speed of light, our matter in our body will mostly be in a ghost like condition until the speed slows down or we interact with other matters. So changing any speed will change the Ghostliness index. This above theory is based on the Ghostliness index that is directly related to the speed of matter or particles. Higher speed means more ghostlike character. Ghostliness index can be calculated as:

Particles speed/C (speed of light) x 100.

It means that photons have a Ghostliness index of 100%. It is important to mention that Ghostliness is not equal to virtually. These are true particles that have diffuse quality hiding many original characters of the initial particles until interactions occur.

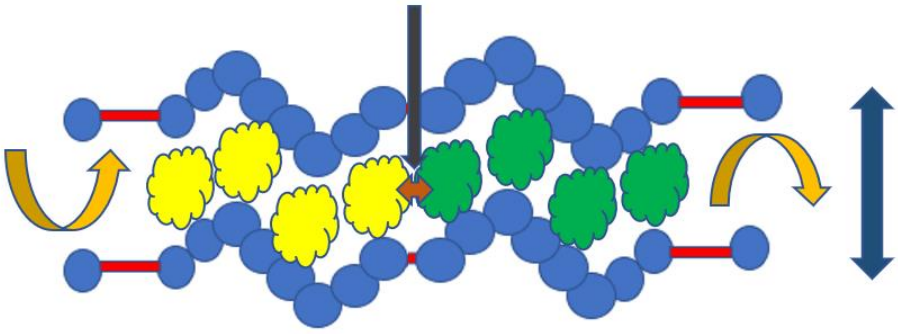

FIG. 15. **Yellow and green representing photons or electrons quanta produced in an event (arrow) as a pair traveling in the opposite directions in an entangled condition. Due to the fixed Spacetime particles geometry, the spin of pair particles must be always in the opposite directions explaining the Einstein locality theory for the behavior of entangled particles. Non-locality theory can be explained as a permanent interaction of Spacetime particles with traveling quanta at all time. Furthermore, the space between Spacetime particles that allow small particles to travel can be stretched to a limit. Once this limit is reached, larger particle will lose the ability to behave as quanta and lose the ability to follow quantum mechanics.**

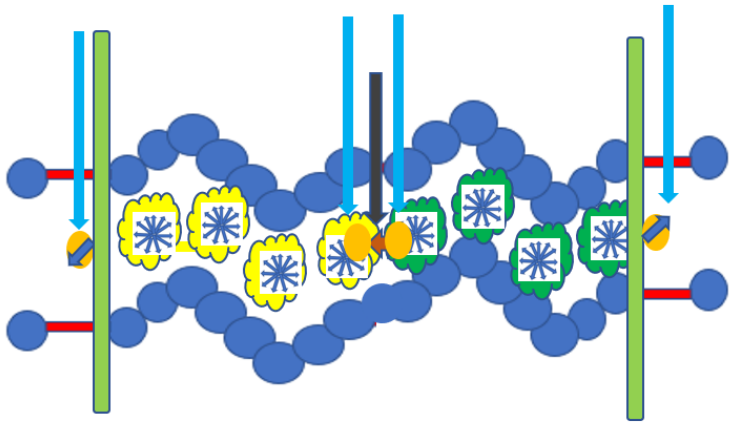

FIG. 16. **The non-locality explanation for the entanglement: Yellow and green representing photons or electrons quanta produced in an event (arrow) as a pair traveling in the opposite directions in an entangled condition. Because of the fixed Spacetime particles geometry, the spin of pair particles has to be always in the opposite directions explaining the opposite spin of entangled particles. Quanta of particles can spin in all directions before detection, but only commit to one spin once interaction with matter occurs. This will lead to an opposite spin direction in the entangled particles due to Spacetime geometry and the loss of wave function as Spacetime particles change back to the baseline geometry and quanta will be detected as particles. The reason why spin of a particle is not set from the beginning, is based on the theory that all small particles traveling near the speed of light are mostly ghost like particles until they interact. Therefore, detail characters of a particle will only be set or known after it is measured.**

How can Spacetime particles explain the occurrence of virtual particles in vacuum and how can we explain that photons can also propagate as particles?

Spacetime particles are present even in vacuum. Most likely other very small particles such as neutrino and photons are also present and cannot be removed from a vacuum. Probably, vacuum reduces suppression of small particle interactions with Spacetime particles. Once a vacuum is produced, small and Spacetime particles may have increased interactions with each other without any large matter interference. These interactions could lead to the release of electrons and positrons by splitting photons traveling as a wave using Spacetime particles. Another theory for this phenomenon can be explained by the presence of Spacetime gravitational force as described earlier. This force can hold many fundamental particles in between including photons, electrons and more. These particles can be set free in vacuum as matter interaction with Spacetime particles will be the lowest leading to particles release that were attached to the Spacetime particles. Another theory could be the theory that space particles can change to photons or other small particles under specific circumstances and change back to Spacetime particles explaining the intermittent appearance of the so-called virtual particles in a vacuum.

How can this theory explain that matter has mass?

Every matter has mass and gravitational attraction. At rest, basic interaction of matter based on their density with Spacetime particles gives any matter their resting mass. Motion increases interaction of matter with Spacetime particles. Matter with higher density will have higher interaction with Spacetime particles, leading to a higher mass near the speed of light. We know that Higgs Boson explains masses in small particles. So Spacetime particles could explain larger matter mass and Higgs Boson may or may not be a part of Spacetime particles as an explanation for why matter has mass. This also explains why mass of matter increases as

speed of matter increases. (**FIG. 17)** The recent discovery of Higgs Boson in the collider experience may be a part of the Spacetime particles. Another way to describe the mass of matter is "matter resistant" to the wave function of Spacetime particles. Photons traveling in a three-dimensional space using Spacetime particles should propagate in between in a waveform. Therefore, photons will have no mass due to the lowest resistant to the Spacetime particles waves function. Larger masses have increasing particle type behavior with increasing interaction with Spacetime particles leading to infinite mass at the speed of light due to infinite resistance to the Spacetime particles wave function. Based on de Broglie formula, every mass has also a wave function which is related to Spacetime particles as every motion will interact with Spacetime particles, setting a waveform in addition to particle type behavior. So mass of a matter is directly correlating with resistant to the wave function at rest and with increasing speed near or close to the speed of light, but inversely related to the Ghostliness index described above:

Mass=Resistant to the wave function x speed of light/Ghostliness index:

m=RWF x c/GI. For example Photon mass= light resistant to wave function =0 x C speed of light /100 (Ghostliness index of light) =0

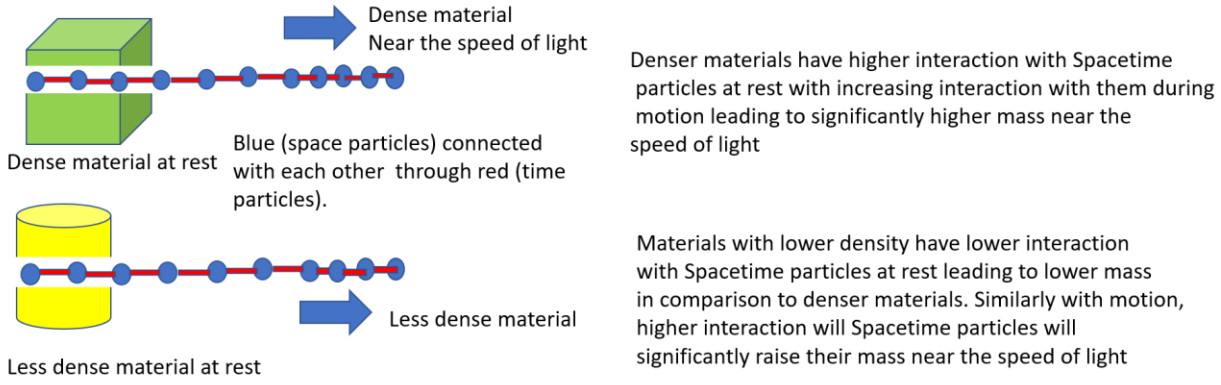

FIG. 17. **Spacetime particles (Gravilon) explaining mass as denser material have higher interaction with Spacetime particles explaining why denser material have higher mass. Therefore, Spacetime particles could be the missing Higgs boson. Resting mass occurs with resting matter interaction with Spacetime particles depend on the matter density with masses significantly increases when reaching near the speed of light due to higher interaction with Spacetime particles at a very high speed.**

The presence of multiverse can explain dark energy

What is pulling our galaxies apart? Dark energy is proposed [10]. One way to explain this phenomenon could be the theory that describes the presence of multiverse [11]. In order for this theory to explain dark matter, it should be fundamental that space can never be empty anywhere. The entire world is most likely packed with basic Spacetime particles, but each universe after its own big bang will modify surrounding Spacetime particles to its physical property of each uniquely created universe. Spacetime particles between universes should transmit gravitational forces of each universe to others. All other universes that surround our universe should have some gravitational forces using their masses and their Spacetime particles that stretches all the way to the outer layer of any universe. These multiversal gravitational forces should pull our and other neighboring universes outward leading to neighboring universes to expand, if the gravitational pull is stronger than gravitational forces inside a neighboring universe. The

best way to prove this theory is the ability to see if the expansion of our universe has some irregularities. As each universe around our universe has different gravitational forces in comparison to others, it should lead to some differences in the speed of expansion in different parts of our universe. If we can prove it, this theory would be clearly substantiated. The question remains about what is filling the space between all multiverses that can be used to conduct gravitational forces? The answer might be the theoretical fact that there will never be an empty space anywhere. So between the universes, connected particles similar to particles of Spacetime in our universe must exist with similar properties. These particles are then the medium that multiverses use in order to exert their gravitational pull toward the neighboring universes. **FIG. 18** is demonstrating in a simple way the theory behind gravitational pulls of multiverse that can explain dark energy.

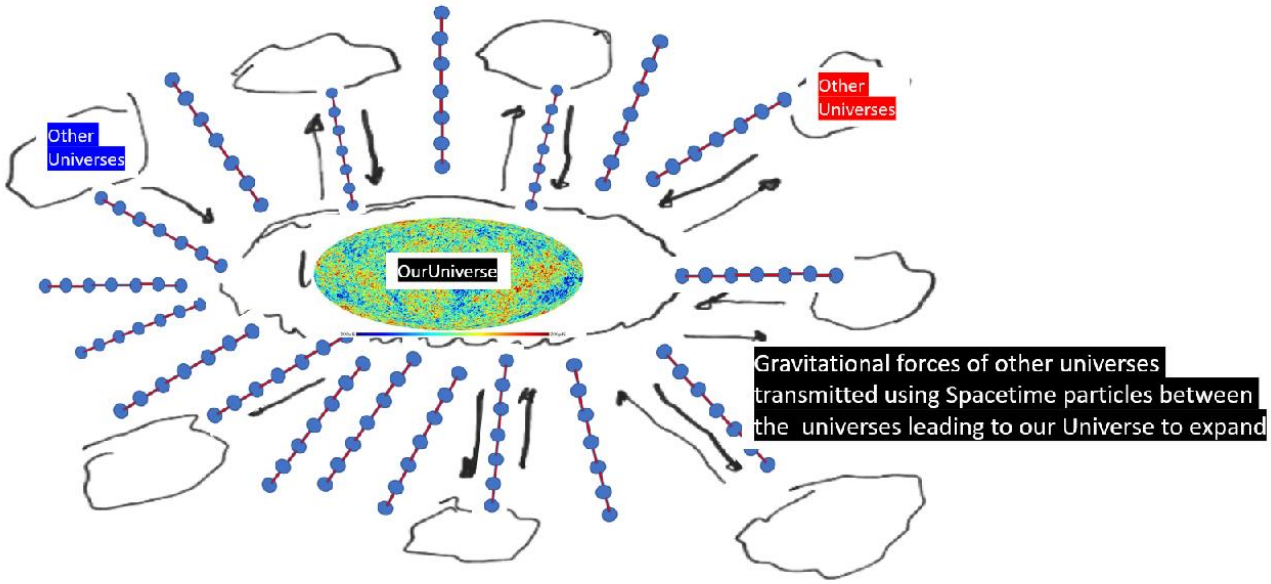

FIG. 18. **Gravitational forces of other universes transmitted using Spacetime particles between the universes leading to our universe to expand. The variation seen in the temperature of the cosmic microwave background radiation could be an explanation for differences between the different gravitational forces of multiverse. This will be in contrast to the theory that less damping of the acoustic collision in the early universe caused this variation.**

How gravitational forces are transmitted using Spacetime particles?

FIG. 19 illustrates this process. As all matters have gravitational forces exerted upon each other all the time, Spacetime particles are needed to transmit these forces in a wave form. This means that our entire Spacetime particles in the universe are always in a wave form state, transmitting at least gravitational forces of matter to each other. This could be like a persistent wave form of electrons surrounding a nucleus. However, in the case of gravity, time particles are in a more contracted state near an object with higher mass than an object with lower mass. This explains why time slows down with higher gravitational forces near larger objects.

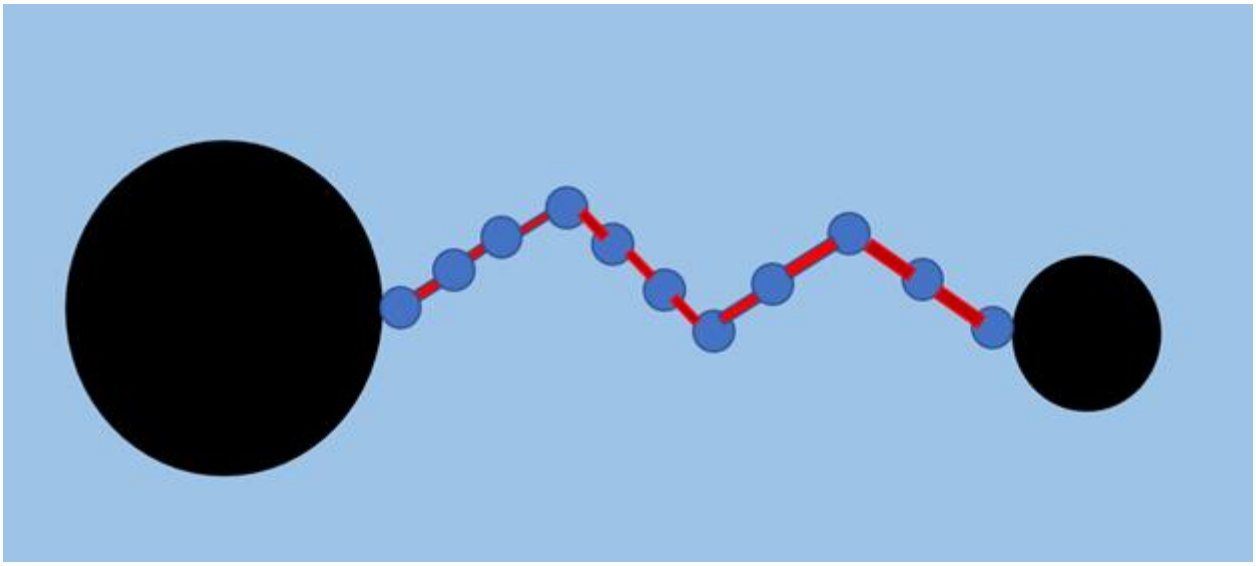

FIG. 19**. Gravitational forces are transmitted constantly between objects using Spacetime particles all the time in a wave form. Blue, space particle connected with red, time particles. Near larger mass, time particles are more contracted than near smaller mass. This explains why time slows down with higher gravitational forces near larger objects.**

What are other evidences that can substantiate the existence of Spacetime particles?

In addition to the above-mentioned explanations for the existence of Spacetime particles, there are many other findings in physics that may strengthen the theory of Spacetime particles. Professor Hawkins mentioned that black holes can be created from totally empty space. This would perfectly make sense if space is made of particles with own gravitational forces that when is squeezed together can create black holes. Another interesting study [12] revealed that quantum communication can be achieved in a particle free space. Presence of Spacetime particles may explain this finding as Spacetime would be the vehicle for this communication. A new discovery of a subatomic particle named dubbed X17 [13] as an explanation of dark matter could be a part of Spacetime particles. A recently published paper describing a gravitational molecule that orbit black holes like electrons swirling around atoms as another explanation of dark matter could be a part of Spacetime particles [14].

How about the possibility of having matter traveling above the speed of light?

Spacetime particles (Gravilon) theory is consistent with Einstein calculations that no information or matter can travel faster than the speed of light as long as nothing can destroy Spacetime particles. However, as explained earlier, most likely in the center of black holes due to extreme gravitational forces, Spacetime particles will disintegrate suggesting that the speed limit of light will disappear in such a condition. In theory, if a device can be built that can destroy Spacetime particles in front of a moving objects momentarily, at that moment before Spacetime particles regenerate, speed of light as maximal possible speed will disappear and doors can be opened to travel much faster than the speed of light. However, A travelling Spaceship cannot enter a space without Spacetime particles as it will lead to complete disintegration of a spaceship due to the loss of gravitational forces in the matter that build the spaceship. So, in such a theoretical scenario, destruction of Spacetime particles in front of a spaceship should follow by the immediate recovery of Spacetime particles before the Spaceship enters this Spacetime particles free zone. This possibility is illustrated in **FIG. 20.**

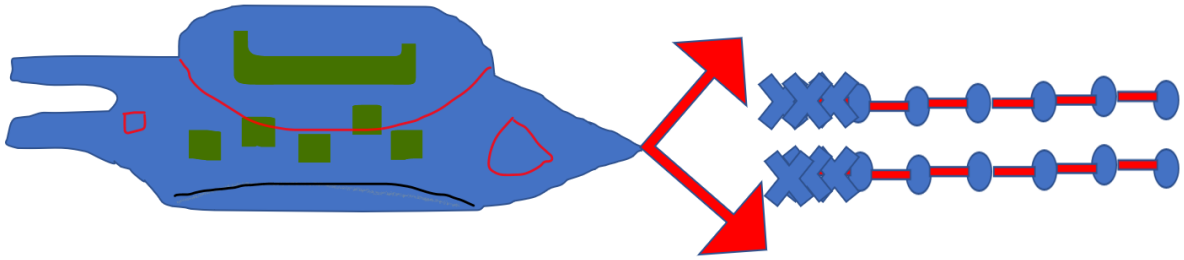

FIG. 20. **Destruction of Spacetime particles in front of a traveling Spaceship should enable the ship travel faster than the speed of light.**

What would be the physical characteristic of Spacetime particles?

Until they are discovered or calculated in detail, we cannot be sure about Spacetime particles fine characteristics but I have the following suggestions about their physical characteristics:

1. Probably very small and may be near or at Planck length.

2. May have masses with gravitational forces.

3. Most likely are not simple particles and most likely are made from different particle subtypes woven together.

4. Most likely space particles are connected with time particles and time particles are probably boson type particles with no masses with extreme forces that might be stronger than strong nuclear forces holding space particles together.

5. May have or may not have spin with tight connection to the time particles.

6. Probably are electrically neutral but may hold electrically charged particles intermittently.

7. Should be the most abundant particles in the universe, many trillion times more than neutrinos.

8. They are everywhere in the entire universe.

9. Probably without these particles, no matter, protons or electron ever remain stable. Deep inside a black hole where Spacetime particles are disintegrated, then only elementary particles in a very unstable condition will be present like the conditions in the primordial soup at the beginning of the big bang.

10. Most likely have characteristics similar to Higgs boson. Higgs bosons are most likely a part of Spacetime particles.

Summary of their effect

1. Have gravitational forces and so can explain dark matter and dark energy.

2. Vehicles for transferring any small particles including photons and electrons in a wave form, but releasing them as particles after interacting with matter, explaining wave and particle duality character of small particles.

3. Limiting maximal speed of particles and gravitational forces by preventing time contraction beyond certain point of Planck length

4. As a vehicle for particles and light transfer and at the same time as a vehicle for transferring gravitational forces of matter. This

explains why gravitational force transmission and light propagation have the same maximal speed. Photons use Spacetime particles to propagate as wave until interacting with matter when they set free as particles by breaking up the wave function of the Spacetime particles. However, gravity uses Spacetime particles for simple transmission of gravitational forces across matters in a waveform.

5. Responsible for matters having mass similar to the effect of Higgs boson. Higgs boson is most likely a part of Spacetime particles. Resistant to the wave function of Spacetime particles could be partially responsible for the mass of matter.

6. Protecting small particles from disintegration during motion acting like a protecting shields and cover in a 3-dimensional space surrounding particles during transmission in a wave like motion.

7. In a center of black holes due to extreme gravitational forces of compact mass, Spacetime particles will disintegrate leading to expansion in the center of blackholes thus resolving the singularity problem.

REFERENCES

1. Amelino G. Astrophysics: Shedding light on the fabric of space-time. Nature. 2011;7370:466-467.
2. Bertone G, Tait TMP. A new era in the search for dark matter. Nature. 2018;7725:51-6.
3. Calmet X, Latosh B. Dark matter in quantum gravity. Eur Phys J C Part Fields. 2018;6:520.
4. Kyle A. Oman, Julio F. Navarro, et al. Missing dark matter in dwarf galaxies?. Monthly Notices of the Royal Astronomical Society. 2016;4:3610–23.
5. Guhathakurta P, Chemin L, Dorman C, et al. Asymmetric Drift in the Andromeda Galaxy (M31) as a Function of Stellar Age. Astrophys. J. 2019;11:20.
6. Abdo A, Ackermann M, Ajello M et al. A limit on the variation of the speed of light arising from quantum gravity effects . Nature. 2009;462:331-4.
7. Giddings SB. Black holes in the quantum universe. Philos Trans A Math Phys Eng Sci. 2019;2161:10-1.
8. Lee Mohon. Chandra observation. 2020;2.
9. Horodecki R, Horodecki P, Horodecki M, et al. Quantum entanglement. Mod. Phys. 2009;81:865.
10. Edmund J, Sami CM, Tsujikawa S. Dynamics of dark energy. Int Jour of Modern Physic. 2006;11:1753-1935.
11. Carr B, Ellis G. Universe or multiverse?. Astro & Geophysic. 2008;2:29-33.
12. Cartlidge E. Particle-free quantum communication is achieved in the lab. PhysicsWorld. 2017;8.
13. A Krasznahorkay, M Csatlos, L Csige. New evidence supporting the existence of the hypothetic X17 particle. Nuclear Experiment. 2019;10:02-08.
14. Ikeda T, Bernard L, Cardoso V et al. Black hole binaries and light fields: gravitational-Molecules. Phys Rev D. 2020;103:16-7.