TITLE: Elementary Particles as Standing Gravity Waves or Energy Density Waves

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Abstract:

Quantum Mechanics and General Relativity are the two primary theories of modern physics and they are both very accurate in their realms of use. However, physicists have been unable to unify them. I show that the two theories can be unified by considering elementary particles to be standing gravitational waves. Further, the gravitational waves are representations of more fundamental energy density waves. The energy density wave include P and S type waves, analogous to seismic waves. The P waves and S Waves are waves that travel through a 4D shell volume, which is similar to a balloon, where the thickness of the elastic shell is determined by the total energy density at that point in space. It is shown that standing waves made of such P

and S type traveling waves can reproduce the observable characteristics of elementary particles. It is also predicted that neutrinos can have velocities greater than C, since neutrinos are standing P type waves and P type waves typically travel faster than S waves. Indeed, traveling P waves should have a velocity of approximately 1.7C and neutrino velocities can approach 1.7C.

MAIN TEXT:

General Relativity and Quantum Mechanics are the two primary theories of modern physics, but they are not considered to be consistent with each other. Most physicists trying to solve this dilemma have assumed that Quantum Mechanics is more fundamental than General Relativity and many have been trying to show that General Relativity can be deduced from Quantum Mechanics. However, if we consider GR more fundamental than Quantum Mechanics, we can resolve the apparent inconsistencies.

Elementary particles are shown to be standing gravitational waves. Gravitational waves are further shown to be representations of more fundamental energy density waves. The energy density waves are presumed to have P and S type waves, similar to sound waves because the 4D shell of energy density has elastic properties. The P waves and S Waves being waves that travel through the 4D shell like volume, where P waves are compression waves and S waves are shear waves. It is shown that standing waves made of such P and S type traveling waves can reproduce the observable characteristics' of elementary particles. It is also predicted that neutrinos can have velocities greater than C, since neutrinos are standing P type waves and P type waves typically travel faster than S waves in elastic media. Anti-matter is described as matter having a traveling wave component 180 degree out of phase with a traveling wave component of the corresponding matter wave, such that the combination of the two waves would release a traveling wave from each particle when the first two traveling waves interfered and cancelled each other out.

The equations of General Relativity comprise a set of partial differential equations. [1] The solutions to those differential equations have been shown to include Wave function solutions, in the same way that photons are the solution to the differential equations of electromagnetism. [1] The wave function solutions of General Relativity are known as gravitational waves. Gravitational waves are waves of curvature propagating through curvature. [2] All gravity waves must be linear combinations of the wave functions that satisfy the differential equations, since these waves comprise the eigenstates of the system.

However, all massive particles have an energy density in all space and thereby curve space according to that energy density. Indeed, if a particle was observed to be traveling at a speed close enough to C, it would curve the Universe more than all other energy in the Universe. The curvature caused by such a particle would be required to satisfy the partial differential equations for curvature and thus would be comprised of a linear combination of the wave function solutions to those partial differential equations.

Accordingly, the curvature caused by all particles must be a linear combination of the wave functions that satisfy the General Relativity partial differential equations, since those wave functions are the only allowed states of curvature. Since all particles that have rest energy can be considered to be at rest in some reference frame, they must be standing wave solutions to the differential equations. Photons are a type of traveling wave solution. However, standing waves are just combinations (wave packets) of traveling waves. Further, those same particles/standing

waves will have velocity when observed from other reference frames, so that the particle's wave packet will also have a group velocity.

Although Gravitational waves are waves of curvature traveling through a medium of curvature, they can be thought of as a representation of a more fundamental energy density wave. Oscillations of energy density would necessarily cause oscillations in curvature, since the curvature in the neighborhood of a point in space is dependent upon the distribution of mass density near that point in space. Also, energy density extends through the entire Universe in the same way that matter extends through the entire earth. However, energy density provides us with a 4D shell, much like it is the rubber of a 4D balloon. Accordingly, we should expect to have S and P type energy density waves, since they are the predominate types of waves in elastic media. A photon is an S type traveling energy density wave. Electrons and Quarks comprise S standing waves.

Neutrinos are standing P type waves and thus travel faster than C, since compression waves always travel faster than shear waves. In the 3D elastic medium of the of the Earth, the travelling P waves travel about 1.7 times faster than the travelling S waves, which would allow neutrinos to exceed C without very significant relativistic effects because the gamma factor of Neutrino will be based upon the travelling speed of P waves. This knowledge should allow for more accurate determination of neutrino masses.

Anti-matter is matter having a traveling wave component 180 degree out of phase with a traveling wave component of the corresponding matter particle, such that the combination of the

two waves out of phase waves would free a traveling wave from each particle after the other two traveling waves cancelled each other out.

The energy density waves will have a set of second order partial differential equations that describe them, since all physically existing waves are solutions to differential equations. Also, there should be a transform to shift from the gravity wave representations to the energy wave representations, where an uncertainty relation will likely hold regarding measurements of the two representations. Accordingly, you can only know the curvature and energy density together within a certain level of error.

The true nature of elementary is as wave function solutions to a set of second or energy density partial differential equations for a 4D elastic shell, where standing wave solution represent massive particles. More complex objects are made of wave packet comprising linear combinations of the Eigen-waves. Qualities such as charge or spin are provided by the wave characteristics (phase, polarization, etc.) of the S and P type waves and of surface waves. [3]

The standing waves provide the particles with a rest energy that corresponds to all of the energy of the particle (standing wave) when it is at rest. Kinetic energy (momentum energy) causes the standing wave to move with respect to the observer's standing wave and will correspond to the group velocity of the particle. The standing waves, as well as the traveling waves that comprise them, extend through the universe and provide the particle with an energy density value at all points of the Universe, where the energy density of a particle reduces according to its wave

function (approximately by the inverse of the radius squared) the farther from the particle you get.

The thickness of the 4D elastic energy density shell at a point in space is determined by sum of the energy densities for all objects at that point. Changes to a standing wave travel through space at the appropriate P wave and S wave traveling wave rates. However, all gauge bosons would be traveling wave solutions and thus have momentum but not mass.

As observed from a particular observation frame, the energies of all particles in the universe combine to give an energy density value at each point in space-time. A gravity well is a volume of space where the energy density increases as you approach the center of the volume. When a particle goes deeper into a gravity well (an area of high energy density), the particle's rest energy decreases, which means that the particle needs less energy to exist as a standing wave when it is in the gravity well. [2,3] Accordingly, the kinetic energy (momentum energy) of the particle increases as the particle goes deeper into the gravity well because of conservation of energy as viewed from any specific reference frame.

This change in the particle's standing energy density wave and its increase in group velocity can be seen as analogous to what happens to a seismic wave when it goes from a less dense medium to a more dense medium, where the wave velocity, amplitude, and direction all change when the wave transmits into and through a higher density medium. [10] Accordingly, gravity can be seen as a diffraction of the standing or traveling waves.

Accordingly, all massive objects in the Universe can be represented as standing gravitational waves or as standing energy density waves. The behavior of particles as standing energy density waves is given by the differential equations for energy density in an elastic 4D shell, which is analogous to the behavior of seismic waves travelling through the volume of the earth. The 4D elastic shell is the sum of the energy densities of all particles at that point and at that time and it is similar to the rubber of a balloon. However, it does not have a reference frame, since it comprises energy density from everything.

The observed characteristics of elementary particles can all be represented by the characteristics of standing wave packets. Indeed, we know that photon waves can have spin and that the degrees of freedom provided to S and P type wave packets could represent all known elementary particle characteristics, where some of the more exotic particles could correspond to surface waves and their linear combination with S or P waves. Energy between S and PO waves and Surface wave can couple amongst them, but the combinations are not always stable. Further, we can expect energy density waves to have quantum behavior because they exist as eigenvectors (eigen wave functions) of the system and thus only have specific quantums of value.

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[4] L. B. Okun, K. G. Selivanov, V L. Telegdi, Gravitation, photons, clocks. Physics- Uspekhi 42 (10) 1045 -1050 (1999).