Proposal to Detect Graviton

A recent article in Physical Review Letters proposed a new way to detect gravitons. The setup could be done in a lab, which is in stark contrast to the usual view that you'd need a Jupiter-mass detector orbiting a neutron star to detect gravitons. It's one of those "if we pull this off we'll eat like kings" experiments…so naturally we should be a little skeptical. [6]

Unambiguous detection of individual gravitons, though not prohibited by any fundamental law, is impossible with any physically reasonable detector. The reason is the extremely low cross section for the interaction of gravitons with matter. [5]

The changing acceleration of the electrons explains the created negative electric field of the magnetic induction, the electromagnetic inertia, the changing relativistic mass and the Gravitational Force, giving a Unified Theory of the physical forces. Taking into account the Planck Distribution Law of the electromagnetic oscillators also, we can explain the electron/proton mass rate and the Weak and Strong Interactions. Since the gravitational force is basically a magnetic force the matter-antimatter gravitational repulsion makes sense.

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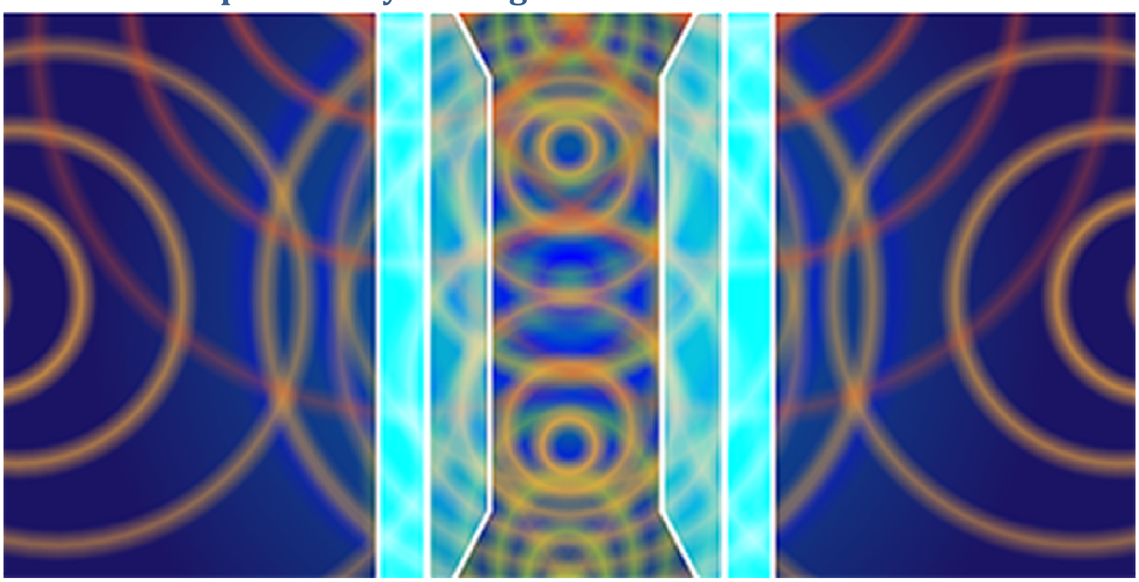
Author: George Rajna

Preface

Today the most popular enigma is the gravitational force after founding the Higgs boson experimentally. Although the graviton until now is a theoretical particle, its existence is a necessary basis of the Quantum Gravitation and the Theory of Everything.

The electromagnetic origin of mass gives an explanation of the inertia, the relativistic change of mass and also the gravitational force.

Scientists Propose a Way We Might be Able to Detect the Graviton



You might remember that gravitons are the hypothetical quanta for the gravitational field, just as photons are the quanta of electromagnetism, and gluons that of the strong force. While we don't have a complete quantum theory of gravity, it's generally thought that gravitons likely exist, so it's worth trying to look for them.

In this particular paper, the author proposes using the Casimir effect, which is where two metallic plates are placed very close to each other (fractions of a millimeter apart). According to quantum theory, there are less fluctuations between the plates than outside the plates. As a result, the plates have a net attractive force between them. In practice, this is due to electromagnetic quanta, but in principle, it should work for gravitons as well.

The gravitational Casimir effect would just be much smaller; however, the author claims that, for superconducting materials, the gravitational effect should be much stronger, and therefore it would be detectable. This claim is based on an earlier paper on gravitational waves and superconductors, and there are questions as to whether the earlier work is really valid. [6]

Electromagnetic inertia and mass

Electromagnetic Induction

Since the magnetic induction creates a negative electric field as a result of the changing acceleration, it works as an electromagnetic inertia, causing an electromagnetic mass. [1]

Relativistic change of mass

The increasing mass of the electric charges the result of the increasing inductive electric force acting against the accelerating force. The decreasing mass of the decreasing acceleration is the result of the inductive electric force acting against the decreasing force. This is the relativistic mass change explanation, especially importantly explaining the mass reduction in case of velocity decrease.

The frequency dependence of mass

Since $E = hv$ and $E = mc^2$, $m = hv /c^2$ that is the m depends only on the v frequency. It means that the mass of the proton and electron are electromagnetic and the result of the electromagnetic induction, caused by the changing acceleration of the spinning and moving charge! It could be that the m_o inertial mass is the result of the spin, since this is the only accelerating motion of the electric charge. Since the accelerating motion has different frequency for the electron in the atom and the proton, they masses are different, also as the wavelengths on both sides of the diffraction pattern, giving equal intensity of radiation.

If the mass is electromagnetic, then the gravitation is also electromagnetic effect caused by the accelerating Universe! The same charges would attract each other if they are moving parallel by the magnetic effect.

Electron – Proton mass rate

The Planck distribution law explains the different frequencies of the proton and electron, giving equal intensity to different lambda wavelengths! Also since the particles are diffraction patterns they have some closeness to each other – can be seen as a gravitational force. [2]

The Gravitational force

The gravitational attractive force is basically a magnetic force.

The same electric charges can attract one another by the magnetic force if they are moving parallel in the same direction. Since the electrically neutral matter is composed of negative and positive charges they need 2 photons to mediate this attractive force, one per charges. The Bing Bang caused parallel moving of the matter gives this magnetic force, experienced as gravitational force.

Since graviton is a tensor field, it has spin = 2, could be 2 photons with spin = 1 together.

You can think about photons as virtual electron – positron pairs, obtaining the necessary virtual mass for gravity.

The mass as seen before a result of the diffraction, for example the proton – electron mass rate Mp=1840 Me. In order to move one of these diffraction maximum (electron or proton) we need to intervene into the diffraction pattern with a force appropriate to the intensity of this diffraction maximum, means its intensity or mass.

The Big Bang caused acceleration created radial currents of the matter, and since the matter is composed of negative and positive charges, these currents are creating magnetic field and attracting forces between the parallel moving electric currents. This is the gravitational force experienced by the matter, and also the mass is result of the electromagnetic forces between the charged particles. The positive and negative charged currents attracts each other or by the magnetic forces or by the much stronger electrostatic forces!?

The gravitational force attracting the matter, causing concentration of the matter in a small space and leaving much space with low matter concentration: dark matter and energy.
There is an asymmetry between the mass of the electric charges, for example proton and electron, can understood by the asymmetrical Planck Distribution Law. This temperature dependent energy distribution is asymmetric around the maximum intensity, where the annihilation of matter and antimatter is a high probability event. The asymmetric sides are creating different frequencies of electromagnetic radiations being in the same intensity level and compensating each other. One of these compensating ratios is the electron – proton mass ratio. The lower energy side has no compensating intensity level, it is the dark energy and the corresponding matter is the dark matter.

The Graviton

In physics, the graviton is a hypothetical elementary particle that mediates the force of gravitation in the framework of quantum field theory. If it exists, the graviton is expected to be massless (because the gravitational force appears to have unlimited range) and must be a spin-2 boson. The spin follows from the fact that the source of gravitation is the stress-energy tensor, a second-rank tensor (compared to electromagnetism's spin-1 photon, the source of which is the four-current, a first-rank tensor). Additionally, it can be shown that any massless spin-2 field would give rise to a force indistinguishable from gravitation, because a massless spin-2 field must couple to (interact with) the stress-energy tensor in the same way that the gravitational field does. This result suggests that, if a massless spin-2 particle is discovered, it must be the graviton, so that the only experimental verification needed for the graviton may simply be the discovery of a massless spin-2 particle. [3]

Although the electron-positron pair annihilating to 2 photons, they can be considered as a graviton, because the magnetic force between the electron and positron moving toward each other is an attractive force.

Experimental observation

Unambiguous detection of individual gravitons, though not prohibited by any fundamental law, is impossible with any physically reasonable detector. The reason is the extremely low cross section for the interaction of gravitons with matter. For example, a detector with the mass of Jupiter and 100%

efficiency, placed in close orbit around a neutron star, would only be expected to observe one graviton every 10 years, even under the most favorable conditions. It would be impossible to discriminate these events from the background of neutrinos, since the dimensions of the required neutrino shield would ensure collapse into a black hole.

However, experiments to detect gravitational waves, which may be viewed as coherent states of many gravitons, are underway (e.g., LIGO and VIRGO). Although these experiments cannot detect individual gravitons, they might provide information about certain properties of the graviton. For example, if gravitational waves were observed to propagate slower than c (the speed of light in a vacuum), that would imply that the graviton has mass (however, gravitational waves must propagate slower than "c" in a region with non-zero mass density if they are to be detectable). Astronomical observations of the kinematics of galaxies, especially the galaxy rotation problem and modified Newtonian dynamics, might point toward gravitons having non-zero mass. [5]

The Higgs boson

By March 2013, the particle had been proven to behave, interact and decay in many of the expected ways predicted by the Standard Model, and was also tentatively confirmed to have + parity and zero spin, two fundamental criteria of a Higgs boson, making it also the first known scalar particle to be discovered in nature, although a number of other properties were not fully proven and some partial results do not yet precisely match those expected; in some cases data is also still awaited or being analyzed.

In my opinion, the best explanation of the Higgs mechanism for a lay audience is the one invented by David Miller. You can find it here: http://www.strings.ph.qmul.ac.uk/~jmc/epp/higgs3.html .
The field must come first. The boson is an excitation of the field. So no field, no excitation. On the other hand in quantum field theory it is difficult to separate the field and the excitations.
The Higgs field is what gives particles their mass.
There is a video that gives an idea as to the Higgs field and the boson. It is here: http://www.youtube.com/watch?v=RIg1Vh7uPyw . Note that this analogy isn't as good as the Miller one, but as is usually the case, if you look at all the analogies you'll get the best understanding of the situation.

Since the Higgs boson is necessary to the W and Z bosons, the dipole change of the Weak interaction and the change in the magnetic effect caused gravitation must be conducted. The Wien law is also important to explain the Weak interaction, since it describes the T_{max} change and the diffraction patterns change. [2]

Higgs mechanism

The magnetic induction creates a negative electric field, causing an electromagnetic inertia. Probably it is the mysterious Higgs field giving mass to the charged particles? We can think about the photon as an electron-positron pair, they have mass. The neutral particles are built from negative and positive charges, for example the neutron, decaying to proton and electron. The wave – particle duality makes sure that the particles are oscillating and creating magnetic induction as an inertial mass, explaining also the relativistic mass change. Higher frequency creates stronger magnetic induction, smaller frequency results lesser magnetic induction. It seems to me that the magnetic induction is the secret of the Higgs field.

In particle physics, the Higgs mechanism is a kind of mass generation mechanism, a process that gives mass to elementary particles. According to this theory, particles gain mass by interacting with the Higgs field that permeates all space. More precisely, the Higgs mechanism endows gauge bosons in a gauge theory with mass through absorption of Nambu–Goldstone bosons arising in spontaneous symmetry breaking.

The simplest implementation of the mechanism adds an extra Higgs field to the gauge theory. The spontaneous symmetry breaking of the underlying local symmetry triggers conversion of components of this Higgs field to Goldstone bosons which interact with (at least some of) the other fields in the theory, so as to produce mass terms for (at least some of) the gauge bosons. This mechanism may also leave behind elementary scalar (spin-0) particles, known as Higgs bosons.

In the Standard Model, the phrase "Higgs mechanism" refers specifically to the generation of masses for the $W^{\pm}$, and Z weak gauge bosons through electroweak symmetry breaking. The Large Hadron Collider at CERN announced results consistent with the Higgs particle on July 4, 2012 but stressed that further testing is needed to confirm the Standard Model.

What is the Spin?

So we know already that the new particle has spin zero or spin two and we could tell which one if we could detect the polarizations of the photons produced. Unfortunately this is difficult and neither ATLAS nor CMS are able to measure polarizations. The only direct and sure way to confirm that the particle is indeed a scalar is to plot the angular distribution of the photons in the rest frame of the centre of mass. A spin zero particles like the Higgs carries no directional information away from the original collision so the distribution will be even in all directions. This test will be possible when a much larger number of events have been observed. In the mean time we can settle for less certain indirect indicators.

Gravitational interaction of antimatter

It is difficult to directly observe gravitational forces at the particle level. For charged particles, the electromagnetic force overwhelms the much weaker gravitational interaction. Even antiparticles in neutral antimatter, such as antihydrogen, must be kept separate from their counterparts in the matter that forms the experimental equipment, which requires strong electromagnetic fields. These fields, e.g. in the form of atomic traps, exert forces on these antiparticles which easily overwhelm the gravitational force of Earth and nearby test masses. Since all production methods for antiparticles result in high-energy antimatter particles, the necessary cooling for observation of gravitational effects in a laboratory environment requires very elaborate experimental techniques and very careful control of the trapping fields.

The gravitational interaction of antimatter with matter or antimatter has not been conclusively observed by physicists. While the overwhelming consensus among physicists is that antimatter will attract both matter and antimatter at the same rate that matter attracts matter, there is a strong desire to confirm this experimentally.

Antimatter's rarity and tendency to annihilate when brought into contact with matter makes its study a technically demanding task.
Most methods for the creation of antimatter (specifically antihydrogen) result in high-energy particles and atoms of high kinetic energy, which are unsuitable for gravity-related study. In recent years, first ALPHA [1][2] and then ATRAP [3] have trapped antihydrogen atoms at CERN; in 2013 ALPHA used such atoms to set the first free-fall loose bounds on the gravitational interaction of antimatter with matter, with a relative precision of the measurement of ±100%, not enough for a clear scientific statement about the sign of gravity acting on antimatter. Future experiments need to be performed with higher precision, either with beams of antihydrogen (AEGIS or GBAR) or with trapped antihydrogen (ALPHA).

Theories of gravitational repulsion

The first non-classical physical principles underlying a matter-antimatter gravitational repulsion have been published by Cabbolet. He introduces the Elementary Process Theory, which uses a new language for physics, i.e. a new mathematical formalism and new physical concepts, and which is incompatible with both quantum mechanics and general relativity. The core idea is that nonzero rest mass particles such as electrons, protons, neutrons and their antimatter counterparts exhibit stepwise motion as they alternate between a particle-like state of rest and a wavelike state of motion. Gravitation then takes place in a wavelike state, and the theory allows, for example, that the wavelike states of protons and antiprotons interact differently with the earth’s gravitational field.

In addition, Villata argued that antigravity of antimatter becomes a prediction of General Relativity when the latter is extended with the CPT theorem. The core of Villata’s theory is that the C, P, and T-operators can be applied to the equation of motion of general relativity for particle in a gravitational field, to yield a new equation for the behavior of antimatter in the gravitational field of ordinary matter. This latter equation then predicts a repulsion of matter and antimatter. However, it has been argued on methodological and ontological grounds that the area of application of Villata’s theory cannot be extended to include the microcosmos.

These objections were subsequently dismissed by Villata.

Further authors have used a matter-antimatter gravitational repulsion to explain cosmological observations, but these publications do not address the physical principles of gravitational repulsion. [4]

Conclusions

Overall it’s an interesting idea, and the author is careful not to overstate the conclusions of the work. It might be an experiment worth trying, but I wouldn’t plan a banquet in celebration of the elusive graviton just yet. [6]

A theory of quantum gravity is needed in order to reconcile these differences. Whether this theory should be background independent is an open question. The answer to this question will determine our understanding of what specific role gravitation plays in the fate of the universe. [5]

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Since the gravitational force is basically a magnetic force the matter-antimatter gravitational repulsion makes sense. The parallel moving different charges would repel each other by the magnetic force.

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