Weyl Particles Dance

Researchers at MIPT have examined the behavior of Weyl particles trapped on the surface of Weyl semimetals. [10]

Researchers at the U.S. Department of Energy's Ames Laboratory have discovered a new type of Weyl semimetal, a material that opens the way for further study of Weyl fermions, a type of massless elementary particle hypothesized by high-energy particle theory and potentially useful for creating high-speed electronic circuits and quantum computers. [9]

An international team of researchers has predicted the existence of several previously unknown types of quantum particles in materials. The particles—which belong to the class of particles known as fermions—can be distinguished by several intrinsic properties, such as their responses to applied magnetic and electric fields. In several cases, fermions in the interior of the material show their presence on the surface via the appearance of electron states called Fermi arcs, which link the different types of fermion states in the material's bulk. [8]

An international team led by Princeton University scientists has discovered an elusive massless particle theorized 85 years ago. The particle could give rise to faster and more efficient electronics because of its unusual ability to behave as matter and antimatter inside a crystal, according to new research.

The researchers report in the journal Science July 16 the first observation of Weyl fermions, which, if applied to next-generation electronics, could allow for a nearly free and efficient flow of electricity in electronics, and thus greater power, especially for computers, the researchers suggest. [7]

While physicists are continually looking for ways to unify the theory of relativity, which describes large-scale phenomena, with quantum theory, which describes small-scale phenomena, computer scientists are searching for technologies to build the quantum computer.

The accelerating electrons explain not only the Maxwell Equations and the Special Relativity, but the Heisenberg Uncertainty Relation, the Wave-Particle Duality and the electron's spin also, building the Bridge between the Classical and Quantum Theories.

The Planck Distribution Law of the electromagnetic oscillators explains the electron/proton mass rate and the Weak and Strong Interactions by the diffraction patterns. The Weak Interaction changes the diffraction patterns by moving the electric charge from one side to the other side of the diffraction pattern, which violates the CP and Time reversal symmetry.

The diffraction patterns and the locality of the self-maintaining electromagnetic potential explains also the Quantum Entanglement, giving it as a natural part of the Relativistic Quantum Theory and making possible to build the Quantum Computer.

Contents

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Preface

While physicists are continually looking for ways to unify the theory of relativity, which describes large-scale phenomena, with quantum theory, which describes small-scale phenomena, computer scientists are searching for technologies to build the quantum computer.

Australian engineers detect in real-time the quantum spin properties of a pair of atoms inside a silicon chip, and disclose new method to perform quantum logic operations between two atoms. [5]

Quantum entanglement is a physical phenomenon that occurs when pairs or groups of particles are generated or interact in ways such that the quantum state of each particle cannot be described independently – instead, a quantum state may be given for the system as a whole. [4]

I think that we have a simple bridge between the classical and quantum mechanics by understanding the Heisenberg Uncertainty Relations. It makes clear that the particles are not point like but have a dx and dp uncertainty.

Scientists explain the way Weyl particles 'dance' on crystal surface

Researchers at MIPT have examined the behavior of Weyl particles trapped on the surface of Weyl semimetals. Their study was published in the prestigious Rapid Communications section of Physical Review B.

The Weyl particle—or the Weyl fermion, to use a more precise term—was predicted in the early 20th century by Hermann Weyl, a German physicist. Despite his early prediction and tremendous efforts directed toward the search for the illusive Weyl particle, it was only experimentally discovered in 2015. Contrary to expectations, the Weyl was not observed in a giant collider, but in tiny crystals, which came to be known as Weyl semimetals. These materials have since attracted a lot of attention, making this research area one of the hottest in modern physics.

Weyl semimetals can be considered a 3-D equivalent of graphene, the 2-D crystal with unique properties discovered by MIPT graduates Andre Geim and Konstantin Novoselov, who were awarded the Nobel Prize in physics in 2010. Electrons in graphene and Weyl semimetals behave as massless particles akin to photons. However, unlike photons, these particles have an electric charge, making them promising for applications in electronics. As it turns out, the bizarre properties of electrons in these kinds of materials can be described in terms of topological field theory. The 2016 Nobel Prize in physics was awarded to scientists that introduced topological concepts into condensed state physics.

In a theoretical study supervised by MIPT's Prof. Vladimir Volkov, Zhanna Devizorova, a Ph.D. student at MIPT, looked into surface states of Weyl fermions, i.e., how electrons behave near the surface of a Weyl semimetal crystal. The special states of electrons near the surface of a crystal, known as electronic surface states, were predicted in the 1930s by future Nobel Prize winners Igor Tamm (USSR) and William Shockley (USA), who proposed and studied the first theoretical models of these states. However, it was not until recently that surface states gained the attention of researchers. The practical significance of this field of research is evidenced by the fact that modern microelectronics using silicon are universally based on near-surface conducting channels. However, silicon itself is not a topological material.

The behavior of any particle under an external field is determined by the dispersion law that relates the particle's energy to its momentum. According to the dispersion law, the energy spectrum of electrons in a crystal defines such electronic properties as conductivity. The bulk energy spectrum of electrons in a Weyl semimetal is described by a set consisting of an even number of Weyl cones, or valleys, centered at special points in the momentum space.

The surface of such a crystal has remarkable properties. Weyl semimetals are distinguished by the trademark energy spectrum of particles populating their surface states. In these exotic spectra, the curves that represent states with equal energy are non-closed and appear as arcs on two-dimensional momentum space. These so-called Fermi arcs connect points of the electron spectrum that belong to different Weyl cones. Unlike Weyl fermions, ordinary electrons are characterized by closed Fermi curves in the form of a circle. Until now, all theoretical descriptions of Fermi arcs have relied on complicated and obscure computer calculations based on first principles.

The MIPT-based scientists took advantage of the fact that Weyl fermions located away from the surface of the crystal obey Weyl's differential equations to derive the boundary conditions that successfully account for intervalley interactions on semimetal surface. They solved the system of Weyl's equations for two valleys "by hand," taking into account the derived boundary conditions, thus analytically finding the shape of Fermi arcs. In effect, they offered a quantitative as well as qualitative description of experimental data, and proved that Fermi arc formation is mainly driven by strong intervalley interaction under Weyl fermion scattering on crystal surface.

It is conceivable that Weyl semimetals could enable ultrafast electronics. Theoretical researchers are currently looking into principles that lay the foundation for next-generation electronic devices based on Weyl semimetals. This analytical approach is a relatively easy way of accounting for the influence of electric and magnetic fields on Weyl fermions. The heuristic potential of this approach could greatly facilitate progress toward faster and more efficient electronics. [10]

New material discovery allows study of elusive Weyl fermion

Researchers at the U.S. Department of Energy's Ames Laboratory have discovered a new type of Weyl semimetal, a material that opens the way for further study of Weyl fermions, a type of massless elementary particle hypothesized by high-energy particle theory and potentially useful for creating high-speed electronic circuits and quantum computers.

Researchers created a crystal of molybdenum and tellurium, one of only a few compounds that had been predicted to host a new and recently postulated type of Weyl state, where the hole and electron bands normally separated by an indirect gap touch at a few Weyl points. Those points are equivalent to magnetic monopoles in the momentum space and are connected by Fermi arcs.

A combination of angle resolved photoemission spectroscopy (ARPES), modelling, density functional theory and careful calculations were used to confirm the existence of this new type of Weyl semimetal.

This material provides an exciting new platform to study the properties of Weyl fermions, and may lead the way to more new materials with unusual transport properties.

"This an important, interdisciplinary discovery because it allows us to study many aspects of these exotic particles predicted by high energy physics theory in solid state, without need for extremely expensive particle accelerators," said Adam Kaminsky, Ames Laboratory scientist and professor in the Department of Physics and Astronomy at Iowa State University. "From my perspective as solid state physicist it is absolutely extraordinary to observe two bands touching each other at certain points and being connected by Fermi arcs – objects that are prohibited to exist in "ordinary" materials." [9]

Unconventional quasiparticles predicted in conventional crystals

An international team of researchers has predicted the existence of several previously unknown types of quantum particles in materials. The particles—which belong to the class of particles known as fermions—can be distinguished by several intrinsic properties, such as their responses to applied magnetic and electric fields. In several cases, fermions in the interior of the material show their presence on the surface via the appearance of electron states called Fermi arcs, which link the different types of fermion states in the material's bulk.

The research, published online this week in the journal Science, was conducted by a team at Princeton University in collaboration with researchers at the Donostia International Physics Center (DIPC) in Spain and the Max Planck Institute for Chemical Physics of Solids in Germany. The investigators propose that many of the materials hosting the new types of fermions are "protected metals," which are metals that do not allow, in most circumstances, an insulating state to develop. This research represents the newest avenue in the physics of "topological materials," an area of science that has already fundamentally changed the way researchers see and interpret states of matter.

The team at Princeton included Barry Bradlyn and Jennifer Cano, both associate research scholars at the Princeton Center for Theoretical Science; Zhijun Wang, a postdoctoral research associate in the Department of Physics, Robert Cava, the Russell Wellman Moore Professor of Chemistry; and B. Andrei Bernevig, associate professor of physics. The research team also included Maia Vergniory, a postdoctoral research fellow at DIPC, and Claudia Felser, a professor of physics and chemistry and director of the Max Planck Institute for Chemical Physics of Solids.

For the past century, gapless fermions, which are quantum particles with no energy gap between their highest filled and lowest unfilled states, were thought to come in three varieties: Dirac, Majorana and Weyl. Condensed matter physics, which pioneers the study of quantum phases of matter, has become fertile ground for the discovery of these fermions in different materials through experiments conducted in crystals. These experiments enable researchers to explore exotic particles using relatively inexpensive laboratory equipment rather than large particle accelerators.

In the past four years, all three varieties of gapless fermions have been theoretically predicted and experimentally observed in different types of crystalline materials grown in laboratories around the world. The Weyl fermion was thought to be last of the group of predicted quasiparticles in nature. Research published earlier this year in the journal Nature (Wang et al., DOI: 10.1038/nature17410) has shown, however, that this is not the case, with the discovery of a bulk insulator which hosts an exotic surface fermion.

In the current paper, the team predicted and classified the possible exotic fermions that can appear in the bulk of materials. The energy of these fermions can be characterized as a function of their momentum into so-called energy bands, or branches. Unlike the Weyl and Dirac fermions, which, roughly speaking, exhibit an energy spectrum with 2- and 4-fold branches of allowed energy states, the new fermions can exhibit 3-, 6- and 8-fold branches. The 3-, 6-, or 8-fold branches meet up at points - called degeneracy points - in the Brillouin zone, which is the parameter space where the fermion momentum takes its values.

"Symmetries are essential to keep the fermions well-defined, as well as to uncover their physical properties," Bradlyn said. "Locally, by inspecting the physics close to the degeneracy points, one can think of them as new particles, but this is only part of the story," he said.

Cano added, "The new fermions know about the global topology of the material. Crucially, they connect to other points in the Brillouin zone in nontrivial ways."

During the search for materials exhibiting the new fermions, the team uncovered a fundamentally new and systematic way of finding metals in nature. Until now, searching for metals involved performing detailed calculations of the electronic states of matter.

"The presence of the new fermions allows for a much easier way to determine whether a given system is a protected metal or not, in some cases without the need to do a detailed calculation," Wang said.

Verginory added, "One can just count the number of electrons of a crystal, and figure out, based on symmetry, if a new fermion exists within observable range."

The researchers suggest that this is because the new fermions require multiple electronic states to meet in energy: The 8-branch fermion requires the presence of 8 electronic states. As such, a system with only 4 electrons can only occupy half of those states and cannot be insulating, thereby creating a protected metal.

"The interplay between symmetry, topology and material science hinted by the presence of the new fermions is likely to play a more fundamental role in our future understanding of topological materials - both semimetals and insulators," Cava said.

Felser added, "We all envision a future for quantum physical chemistry where one can write down the formula of a material, look at both the symmetries of the crystal lattice and at the valence orbitals of each element, and, without a calculation, be able to tell whether the material is a topological insulator or a protected metal." [8]

After 85-year search, massless particle with promise for next-generation electronics discovered

Proposed by the mathematician and physicist Hermann Weyl in 1929, Weyl fermions have been long sought by scientists because they have been regarded as possible building blocks of other subatomic particles, and are even more basic than the ubiquitous, negative-charge carrying electron (when electrons are moving inside a crystal). Their basic nature means that Weyl fermions could provide a much more stable and efficient transport of particles than electrons, which are the principle particle behind modern electronics. Unlike electrons, Weyl fermions are massless and possess a high degree of mobility; the particle's spin is both in the same direction as its motion — which is known as being right-handed — and in the opposite direction in which it moves, or left-handed.

"The physics of the Weyl fermion are so strange, there could be many things that arise from this particle that we're just not capable of imagining now," said corresponding author M. Zahid Hasan, a Princeton professor of physics who led the research team.

The Weyl fermion possesses two characteristics that could make its discovery a boon for future electronics, including the development of the highly prized field of efficient quantum computing, Hasan explained.

For a physicist, the Weyl fermions are most notable for behaving like a composite of monopole- and antimonopole-like particles when inside a crystal, Hasan said.
This means that Weyl particles that have opposite magnetic-like charges can nonetheless move independently of one another with a high degree of mobility.

Weyl, who worked at the Institute for Advanced Study, suggested his fermion as an alternative to the theory of relativity proposed by his colleague Albert Einstein.
Although that application never panned out, the characteristics of his theoretical particle intrigued physicists for nearly a century, Hasan said. Actually observing the particle was a trying process — one ambitious experiment proposed colliding high-energy neutrinos to test if the Weyl fermion was produced in the aftermath, he said. [7]

Quantum Computing

A team of electrical engineers at UNSW Australia has observed the unique quantum behavior of a pair of spins in silicon and designed a new method to use them for "2-bit" quantum logic operations.

These milestones bring researchers a step closer to building a quantum computer, which promises dramatic data processing improvements.

Quantum bits, or qubits, are the building blocks of quantum computers. While many ways to create a qubits exist, the Australian team has focused on the use of single atoms of phosphorus, embedded inside a silicon chip similar to those used in normal computers.

The first author on the experimental work, PhD student Juan Pablo Dehollain, recalls the first time he realized what he was looking at.

"We clearly saw these two distinct quantum states, but they behaved very differently from what we were used to with a single atom. We had a real 'Eureka!' moment when we realized what was happening – we were seeing in real time the `entangled' quantum states of a pair of atoms." [5]

Researchers have developed the first silicon quantum computer building blocks that can process data with more than 99 percent accuracy, overcoming a major hurdle in the race to develop reliable quantum computers.

Researchers from the University of New South Wales (UNSW) in Australia have achieved a huge breakthrough in quantum computing - they've created two kinds of silicon quantum bit, or qubits, the building blocks that make up any quantum computer, that are more than 99 percent accurate.

The postdoctoral researcher who was lead author on Morello's paper explained in the press release: "The phosphorus atom contains in fact two qubits: the electron, and the nucleus. With the nucleus in particular, we have achieved accuracy close to 99.99 percent. That means only one error for every 10,000 quantum operations."

Both the breakthroughs were achieved by embedding the atoms in a thin layer of specially purified silicon, which contains only the silicon-28 isotope. Naturally occurring silicon is magnetic and therefore disturbs the quantum bit, messing with the accuracy of its data processing, but silicon-28 is perfectly non-magnetic. [6]

Quantum Entanglement

Measurements of physical properties such as position, momentum, spin, polarization, etc. performed on entangled particles are found to be appropriately correlated. For example, if a pair of particles is generated in such a way that their total spin is known to be zero, and one particle is found to have clockwise spin on a certain axis, then the spin of the other particle, measured on the same axis, will be found to be counterclockwise. Because of the nature of quantum measurement, however, this behavior gives rise to effects that can appear paradoxical: any measurement of a property of a particle can be seen as acting on that particle (e.g. by collapsing a number of superimposed states); and in the case of entangled particles, such action must be on the entangled system as a whole. It thus appears that one particle of an entangled pair "knows" what measurement has been performed on the other, and with what outcome, even though there is no known means for such information to be communicated between the particles, which at the time of measurement may be separated by arbitrarily large distances. [4]

The Bridge

The accelerating electrons explain not only the Maxwell Equations and the Special Relativity, but the Heisenberg Uncertainty Relation, the wave particle duality and the electron's spin also, building the bridge between the Classical and Quantum Theories. [1]

Accelerating charges

The moving charges are self maintain the electromagnetic field locally, causing their movement and this is the result of their acceleration under the force of this field. In the classical physics the charges will distributed along the electric current so that the electric potential lowering along the current, by linearly increasing the way they take every next time period because this accelerated motion.
The same thing happens on the atomic scale giving a dp impulse difference and a dx way difference between the different part of the not point like particles.

Relativistic effect

Another bridge between the classical and quantum mechanics in the realm of relativity is that the charge distribution is lowering in the reference frame of the accelerating charges linearly: ds/dt = at (time coordinate), but in the reference frame of the current it is parabolic: $s = a/2\ t^2$ (geometric coordinate).

Heisenberg Uncertainty Relation

In the atomic scale the Heisenberg uncertainty relation gives the same result, since the moving electron in the atom accelerating in the electric field of the proton, causing a charge distribution on delta x position difference and with a delta p momentum difference such a way that they product is about the half Planck reduced constant. For the proton this delta x much less in the nucleon, than in the orbit of the electron in the atom, the delta p is much higher because of the greater proton mass.

This means that the electron and proton are not point like particles, but has a real charge distribution.

Wave – Particle Duality

The accelerating electrons explains the wave – particle duality of the electrons and photons, since the elementary charges are distributed on delta x position with delta p impulse and creating a wave packet of the electron. The photon gives the electromagnetic particle of the mediating force of the electrons electromagnetic field with the same distribution of wavelengths.

Atomic model

The constantly accelerating electron in the Hydrogen atom is moving on the equipotential line of the proton and it's kinetic and potential energy will be constant. Its energy will change only when it is changing its way to another equipotential line with another value of potential energy or getting free with enough kinetic energy. This means that the Rutherford-Bohr atomic model is right and only that changing acceleration of the electric charge causes radiation, not the steady acceleration. The steady acceleration of the charges only creates a centric parabolic steady electric field around the charge, the magnetic field. This gives the magnetic moment of the atoms, summing up the proton and electron magnetic moments caused by their circular motions and spins.

The Relativistic Bridge

Commonly accepted idea that the relativistic effect on the particle physics it is the fermions' spin - another unresolved problem in the classical concepts. If the electric charges can move only with accelerated motions in the self maintaining electromagnetic field, once upon a time they would reach the velocity of the electromagnetic field. The resolution of this problem is the spinning particle, constantly accelerating and not reaching the velocity of light because the acceleration is radial. One origin of the Quantum Physics is the Planck Distribution Law of the electromagnetic oscillators, giving equal intensity for 2 different wavelengths on any temperature. Any of these two wavelengths will give equal intensity diffraction patterns, building different asymmetric constructions, for example proton - electron structures (atoms), molecules, etc. Since the particles are centers of diffraction patterns they also have particle – wave duality as the electromagnetic waves have. [2]

The weak interaction

The weak interaction transforms an electric charge in the diffraction pattern from one side to the other side, causing an electric dipole momentum change, which violates the CP and time reversal symmetry. The Electroweak Interaction shows that the Weak Interaction is basically electromagnetic in nature. The arrow of time shows the entropy grows by changing the temperature dependent diffraction patterns of the electromagnetic oscillators.

Another important issue of the quark model is when one quark changes its flavor such that a linear oscillation transforms into plane oscillation or vice versa, changing the charge value with 1 or -1. This kind of change in the oscillation mode requires not only parity change, but also charge and time changes (CPT symmetry) resulting a right handed anti-neutrino or a left handed neutrino.

The right handed anti-neutrino and the left handed neutrino exist only because changing back the quark flavor could happen only in reverse, because they are different geometrical constructions, the u is 2 dimensional and positively charged and the d is 1 dimensional and negatively charged. It needs also a time reversal, because anti particle (anti neutrino) is involved.

The neutrino is a 1/2spin creator particle to make equal the spins of the weak interaction, for example neutron decay to 2 fermions, every particle is fermions with ½ spin. The weak interaction changes the entropy since more or less particles will give more or less freedom of movement. The entropy change is a result of temperature change and breaks the equality of oscillator diffraction intensity of the Maxwell–Boltzmann statistics. This way it changes the time coordinate measure and makes possible a different time dilation as of the special relativity.

The limit of the velocity of particles as the speed of light appropriate only for electrical charged particles, since the accelerated charges are self maintaining locally the accelerating electric force. The neutrinos are CP symmetry breaking particles compensated by time in the CPT symmetry, that is the time coordinate not works as in the electromagnetic interactions, consequently the speed of neutrinos is not limited by the speed of light.

The weak interaction T-asymmetry is in conjunction with the T-asymmetry of the second law of thermodynamics, meaning that locally lowering entropy (on extremely high temperature) causes the weak interaction, for example the Hydrogen fusion.

Probably because it is a spin creating movement changing linear oscillation to 2 dimensional oscillation by changing d to u quark and creating anti neutrino going back in time relative to the proton and electron created from the neutron, it seems that the anti neutrino fastest then the velocity of the photons created also in this weak interaction?

A quark flavor changing shows that it is a reflection changes movement and the CP- and T- symmetry breaking!!! This flavor changing oscillation could prove that it could be also on higher level such as atoms, molecules, probably big biological significant molecules and responsible on the aging of the life.

Important to mention that the weak interaction is always contains particles and antiparticles, where the neutrinos (antineutrinos) present the opposite side. It means by Feynman's interpretation that these particles present the backward time and probably because this they seem to move faster than the speed of light in the reference frame of the other side.

Finally since the weak interaction is an electric dipole change with ½ spin creating; it is limited by the velocity of the electromagnetic wave, so the neutrino's velocity cannot exceed the velocity of light.

The General Weak Interaction

The Weak Interactions T-asymmetry is in conjunction with the T-asymmetry of the Second Law of Thermodynamics, meaning that locally lowering entropy (on extremely high temperature) causes for example the Hydrogen fusion. The arrow of time by the Second Law of Thermodynamics shows the increasing entropy and decreasing information by the Weak Interaction, changing the temperature dependent diffraction patterns. A good example of this is the neutron decay, creating more particles with less known information about them.
The neutrino oscillation of the Weak Interaction shows that it is a general electric dipole change and it is possible to any other temperature dependent entropy and information changing diffraction pattern of atoms, molecules and even complicated biological living structures.
We can generalize the weak interaction on all of the decaying matter constructions, even on the biological too. This gives the limited lifetime for the biological constructions also by the arrow of time. There should be a new research space of the Quantum Information Science the 'general neutrino oscillation' for the greater then subatomic matter structures as an electric dipole change.
There is also connection between statistical physics and evolutionary biology, since the arrow of time is working in the biological evolution also.
The Fluctuation Theorem says that there is a probability that entropy will flow in a direction opposite to that dictated by the Second Law of Thermodynamics. In this case the Information is growing that is the matter formulas are emerging from the chaos. So the Weak Interaction has two directions, samples for one direction is the Neutron decay, and Hydrogen fusion is the opposite direction.

Fermions and Bosons

The fermions are the diffraction patterns of the bosons such a way that they are both sides of the same thing.

Van Der Waals force

Named after the Dutch scientist Johannes Diderik van der Waals – who first proposed it in 1873 to explain the behaviour of gases – it is a very weak force that only becomes relevant when atoms and molecules are very close together. Fluctuations in the electronic cloud of an atom mean that it will have an instantaneous dipole moment. This can induce a dipole moment in a nearby atom, the result being an attractive dipole–dipole interaction.

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.

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]

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.

Gravity from the point of view of quantum physics

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 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.

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 and Quantum Gravity

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.

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]

Conclusions

One of the most important conclusions is that the electric charges are moving in an accelerated way and even if their velocity is constant, they have an intrinsic acceleration anyway, the so called spin, since they need at least an intrinsic acceleration to make possible they movement .
The accelerated charges self-maintaining potential shows the locality of the relativity, working on the quantum level also. [1]
The bridge between the classical and quantum theory is based on this intrinsic acceleration of the spin, explaining also the Heisenberg Uncertainty Principle. The particle – wave duality of the electric charges and the photon makes certain that they are both sides of the same thing.
The Secret of Quantum Entanglement that the particles are diffraction patterns of the electromagnetic waves and this way their quantum states every time is the result of the quantum state of the intermediate electromagnetic waves. [2]
The key breakthrough to arrive at this new idea to build qubits was to exploit the ability to control the nuclear spin of each atom. With that insight, the team has now conceived a unique way to use the nuclei as facilitators for the quantum logic operation between the electrons. [5]
Basing the gravitational force on the accelerating Universe caused magnetic force and the Planck Distribution Law of the electromagnetic waves caused diffraction gives us the basis to build a Unified Theory of the physical interactions also.

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