Quantum Spin Liquids

Neutron scattering has revealed in unprecedented detail new insights into the exotic magnetic behavior of a material that, with a fuller understanding, could pave the way for quantum calculations far beyond the limits of the ones and zeros of a computer's binary code. [10]

An international team of scientists, led by Attila Geresdi at QuTech has now demonstrated a new technology enabling more reliable characterization for future control of Majorana particles. [9]

On a more fundamental level, the GeTe compound used in this study shows that the electric and magnetic polarization are exactly antiparallel, unlike the few other known multiferroic materials. Exactly this property forms the basis for the formation of Majorana particles to be used in quantum computers. [8]

Researchers in the University of Tokyo have demonstrated that it is possible to exchange a quantum bit, the minimum unit of information used by quantum computers, between a superconducting quantum-bit circuit and a quantum in a magnet called a magnon. This result is expected to contribute to the development of quantum interfaces and quantum repeaters. [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.

Neutrons zero in on the elusive magnetic Majorana fermion

Neutron scattering has revealed in unprecedented detail new insights into the exotic magnetic behavior of a material that, with a fuller understanding, could pave the way for quantum calculations far beyond the limits of the ones and zeros of a computer's binary code.

A research team led by the Department of Energy's Oak Ridge National Laboratory has confirmed magnetic signatures likely related to Majorana fermions—elusive particles that could be the basis for a quantum bit, or qubit, in a two-dimensional graphene-like material, alpha-ruthenium trichloride. The results, published in the journal Science, verify and extend a 2016 Nature Materials study in which the team of researchers from ORNL, University of Tennessee, Max Planck Institute and Cambridge University first proposed this unusual behavior in the material.

"This research is a promise delivered," said lead author Arnab Banerjee, a postdoctoral researcher at ORNL. "Before, we suggested that this compound, alpha-ruthenium trichloride, showed the physics of Majorana fermions, but the material we used was a powder and obscured many important details. Now, we're looking at a large single crystal that confirms that the unusual magnetic spectrum is consistent with the idea of magnetic Majorana fermions."

Majorana fermions were theorized in 1937 by physicist Ettore Majorana. They are unique in that, unlike electrons and protons whose antiparticle counterparts are the positron and the antiproton, particles with equal but opposite charges, Majorana fermions are their own antiparticle and have no charge.

In 2006, physicist Alexei Kitaev developed a solvable theoretical model describing how topologically protected quantum computations could be achieved in a material using quantum spin liquids, or QSLs. QSLs are strange states achieved in solid materials where the magnetic moments, or "spins," associated with electrons exhibit a fluidlike behavior.

"Our neutron scattering measurements are showing us clear signatures of magnetic excitations that closely resemble the model of the Kitaev QSL," said corresponding author Steve Nagler, director of the Quantum Condensed Matter Division at ORNL. "The improvements in the new measurements are like looking at Saturn through a telescope and discovering the rings for the first time."

Because neutrons are microscopic magnets that carry no charge, they can be used to interact with and excite other magnetic particles in the system without compromising the integrity of the material's atomic structure. Neutrons can measure the magnetic spectrum of excitations, revealing how particles behave. The team cooled the material to temperatures near absolute zero (about minus 450 degrees Fahrenheit) to allow a direct observation of purely quantum motions.

Using the SEQUOIA instrument at ORNL's Spallation Neutron Source allowed the investigators to map out an image of the crystal's magnetic motions in both space and time.

"We can see the magnetic spectrum manifesting itself in the shape of a six-pointed star and how it reflects the underlying honeycomb lattice of the material," said Banerjee. "If we can understand these magnetic excitations in detail then we will be one step closer to finding a material that would enable us to pursue the ultimate dream of quantum computations."

Banerjee and his colleagues are pursuing additional experiments with applied magnetic fields and varying pressures.

"We've applied a very powerful measurement technique to get these exquisite visualizations that are allowing us to directly see the quantum nature of the material," said coauthor Alan Tennant, chief scientist for ORNL's Neutron Sciences Directorate. "Part of the excitement of the experiments is that they're leading the theory. We're seeing these things, and we know they're real." [10]

Scientists demonstrate microwave spectrometer tailored for the Majorana quest

The quest for Majorana particles as building blocks for a future computer is on since the first observation of these particles in Delft in 2012. Due to their physical properties, a quantum bit based on them is protected from errors. Experimentally, however, the control and realization of Majorana states are very challenging. An international team of scientists, led by Attila Geresdi at QuTech has now demonstrated a new technology enabling more reliable characterization for future control of Majorana particles. They publish their work in Nature Physics.

The Majorana states, exotic quantum particles, only exist under very specific circumstances. While theoretically proposed in 1938, they were observed for the first time in a solid state chip by the group of Leo Kouwenhoven in 2012. 'The key ingredient is a nanowire covered by a superconducting layer', explains Attila Geresdi, leading researcher of the current study. These particles are the building blocks of topological quantum computation, a promising direction in quantum technology that is pursued by several research groups around the globe in collaboration with Microsoft.

'Most current studies of Majorana states rely on measuring the electron flow through the nanowire. This however inevitably destroys the quantum information encoded in these particles,' Geresdi explains. The Delft group collaborated with an international group of researchers. Scientists from Yale University provided theoretical understanding of the very specific devices made from the ultraclean nanowires fabricated in Copenhagen. Researchers in Delft combined the nanowires with an on-chip spectrometer to demonstrate a measurement method not disturbing the Majorana's.

'In the future quantum computer, you want every operation to be correct,' says Geresdi, 'the topological quantum bits are intrinsically protected from errors, which means that if you perform a quantum operation, it always works.' There are still great hurdles on the road towards quantum computing based on Majorana particles, but this work opens doors to a new regime of quantum experiments. Geresdi: 'both fundamental physics and technological challenges towards the control of Majorana states can be explored using our new methods.' [9]

A new class of materials could realize quantum computers

Electron spin generally refers to the rotation of electrons around their axis. In a material electrons also orbit the atom's nucleus. When these two electron motions, spin and orbit interact, they locally produce a very strong magnetic field. As such, spin is used in MRI, NMR spectroscopy, and hard drives. Spintronics, an emerging field of technology, explores spin-orbit interactions to develop a new generation of power-saving electronics and high-capacity memory cells. Publishing in Nature Communications, scientists at EPFL and the Swiss Light Source (PSI) have now identified a new class of materials whose electronic properties can prove ideal for spintronics.

In a classical picture spin exists in either of two directions: "up" or "down", which can be described respectively as the clockwise or counter-clockwise rotation of the electron around its axis. However, the full picture is even more fascinating; the spin is a quantum property of the electron and can thus be in a superposition of up and down. Similar to the picture of Schrödingers cat being alive and dead at the same time. This makes a controllable spin state also a promising aspect for quantum computers.

Hugo Dil at EPFL together with Juraj Krempasky and Vladimir Strocov at the Paul Scherrer Institute led a study on the electronic and spin structure of a material made of Germanium and Tellurium (GeTe) and doped with Manganese (Mn). It belongs to the small class of multiferroic materials where (ferro)magnetic and (ferro)electric properties are directly coupled. In this material the combination of spin-orbit interaction and magnetism produces some exotic properties which were sought for by researchers world wide, but no for the first time are experimentally identified.

For their study, the researchers used thin films of the GeTe material, each about 200 nm thick. The researchers used a technique called photoemission, which uses the photoelectric effect predicted by Einstein and with which Dil's lab has longstanding expertise.

The study revealed the intertwined nature of the electric and magnetic properties of the new class of materials, which are termed "multiferroic Rashba semiconductors" (Rashba refers to the type of spin separation). "In multiferroic materials the electric and magnetic properties are directly linked," explains Hugo Dil.

"So when we switch one the other is affected too, which paves the way to future spintronic devices, since we can switch the magnetic orientation using just a small electrical field."

On a more fundamental level, the GeTe compound used in this study shows that the electric and magnetic polarization are exactly antiparallel, unlike the few other known multiferroic materials.

Furthermore, the properties extend throughout the whole of the material and are not confined to a small region. This has far-reaching implications for the way its electronic states are structured. As Hugo Dil explains: "In this case the electronic structure is similar to that of topological insulators, but then in 3D. Exactly this property forms the basis for the formation of Majorana particles to be used in quantum computers." [8]

Superconducting qubit and magnetic sphere hybrid

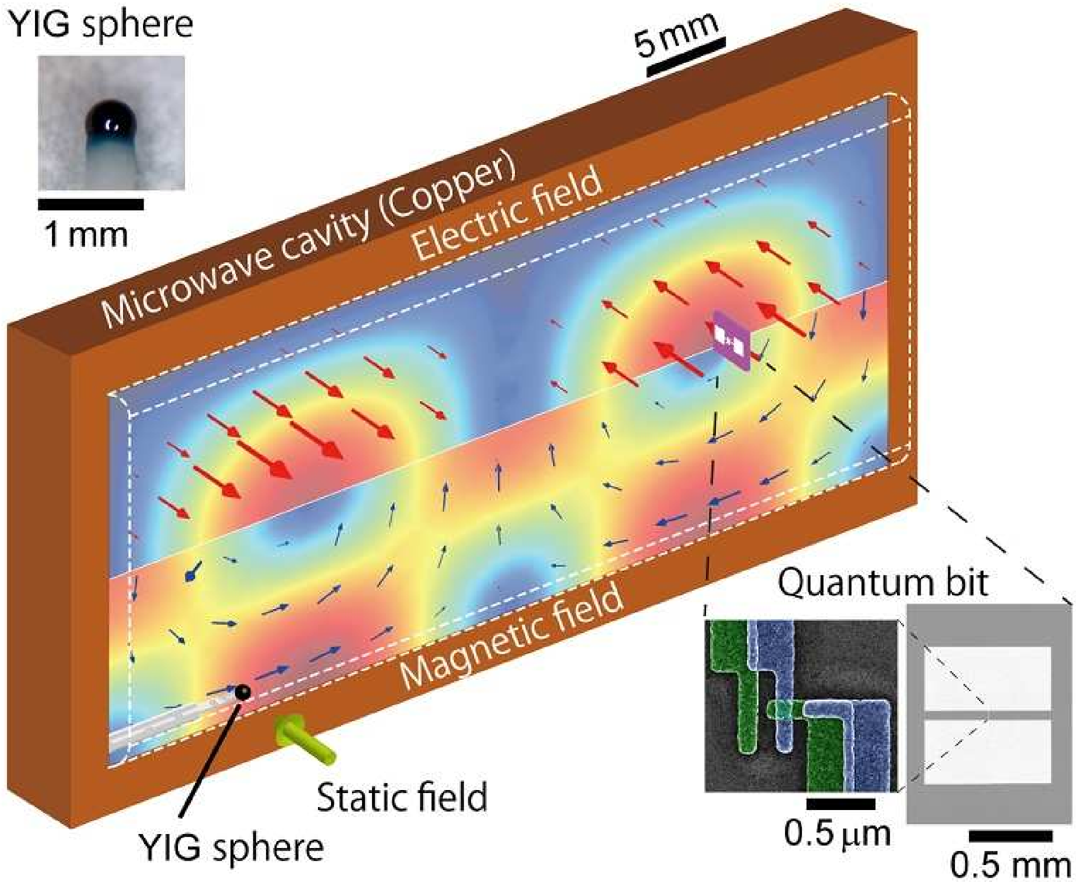

Illustration of magnet-qubit coupled system A magnet (ytterium iron garnet; YIG) and a superconducting qubit are placed with a separation of 4 cm. The electric field in the cavity interacts with the qubit, while the magnetic field interacts with the magnet. At an extremely low temperature of around -273 degrees centigrade, magnons, i.e., quanta of the fluctuations in the magnet, coherently couple with the qubit through the electromagnetic field of the cavity.

Magnets, often used in our daily life, exert a magnetic force produced by a large number of microscopic magnets – the spins of individual electrons – that are aligned in the same orientation. The collective motions of the ensemble of spins are called spin waves. A magnon is a quantum of such excitations, similar to a photon as a quantum of light, i.e., the electromagnetic wave. At room temperature the motions of electron spins can be largely affected by heat. The properties of individual magnons have not been studied at low temperatures corresponding to the “quantum limit” where all thermally-induced spin fluctuations vanish.

The research group of Professor Yasunobu Nakamura at the University of Tokyo Research Center for Advanced Science and Technology has succeeded for the first time to couple a magnon in a magnet to a photon in a microwave cavity at an ultralow temperature near absolute zero (-273.14 degrees centigrade). They observed coherent interaction between a magnon and a microwave photon by placing a millimeter-sized ferromagnetic sphere made of yttrium iron garnet in a centimeter-scale microwave cavity.

The research group furthermore demonstrated coherent coupling of a magnon to a superconducting quantum-bit circuit. The latter is known as a well-controllable quantum system and as one of the most promising building blocks for quantum processors. The group placed the magnet together with the superconducting qubit in a cavity and demonstrated exchange of information between the magnon and superconducting qubit mediated by the microwave cavity.

The results will stimulate research on the quantum behavior of magnons in spintronics devices and open a path toward realization of quantum interfaces and quantum repeaters. [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

The results will stimulate research on the quantum behavior of magnons in spintronics devices and open a path toward realization of quantum interfaces and quantum repeaters. [7]
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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