

Way to Detect Nanoparticles

The team's most recent discovery of the sensing capability of microresonators could have impacts in the creation of biomedical devices, electronics and biohazard detection devices. [11]

Accordingly, techniques such as the one developed in this study will be very valuable in research on new nano-thin films in which the qualitative consistency of the film across a large area needs to be ensured. [10]

As our devices get ever smaller, so do the materials we use to make them. And that means you have to get really close to see them. Really close. A new electron microscope unveiled at the UK's national SuperSTEM facility images objects at an unprecedented resolution, right down to the individual atoms. [9]

New ideas for interactions and particles: This paper examines the possibility to origin the Spontaneously Broken Symmetries from the Planck Distribution Law. This way we get a Unification of the Strong, Electromagnetic, and Weak Interactions from the interference occurrences of oscillators. Understanding that the relativistic mass change is the result of the magnetic induction we arrive to the conclusion that the Gravitational Force is also based on the electromagnetic forces, getting a Unified Relativistic Quantum Theory of all 4 Interactions.

Engineers find better way to detect nanoparticles	2
Development of novel electron microscopy techniques to extract obscured information on material properties	3
This Microscope Can See Down to Individual Atoms	4
The Electromagnetic Interaction	6
Asymmetry in the interference occurrences of oscillators	6
Spontaneously broken symmetry in the Planck distribution law.....	8
The structure of the proton	9
The Strong Interaction	10
Confinement and Asymptotic Freedom	10
The weak interaction	10
The General Weak Interaction	11
Fermions and Bosons.....	12

The fermions' spin	12
The source of the Maxwell equations	12
The Special Relativity	13
The Heisenberg Uncertainty Principle	14
The Gravitational force	14
The Graviton	15
What is the Spin?	15
The Casimir effect	15
The Fine structure constant	16
Path integral formulation of Quantum Mechanics	16
Conclusions	17
References	17

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Engineers find better way to detect nanoparticles

It's long been thought that two's company and three's a crowd. But electrical and systems engineers at Washington University in St. Louis and their collaborators have shown that the addition of a third nanoscatterer, complementing two "tuning" nanoscatterers, to a photonics resonator makes for a fascinating physics party.

Specifically, the two tuning nanoscatterers set the resonator at an "exceptional point," a special state of a system at which unusual phenomena may occur. The third nanoscatterer perturbs the system, and like a nasty playground bully, the smaller it is, the more response it gets.

The Washington University team, led by Lan Yang, the Edwin H. & Florence G. Skinner Professor of Electrical & Systems Engineering, has made major strides recently in the study and manipulation of light. The team's most recent discovery of the sensing capability of microresonators could have impacts in the creation of biomedical devices, electronics and biohazard detection devices.

"It's challenging to detect nanoscale objects, such as nanoparticles," Yang said. "If the object is very small, it introduces little perturbation to a sensing system. We utilize an unusual topological feature associated with exceptional points of a physical system to enhance the response of an optical sensor to very small perturbations, such as those introduced by nanoscale objects. The beauty of the exceptional point sensor is the smaller the perturbation, the larger the enhancement compared to a conventional sensor."

Yang's sensor system belongs to a category called whispering gallery mode (WGM) resonators, which work like the famous whispering gallery in St. Paul's Cathedral in London, where someone on one side of the dome can hear a message spoken to the wall by someone on the other side. Unlike the dome, which has resonances or sweet spots in the audible range, the sensor resonates at light frequencies.

"The so-called 'exceptional point' endows a whispering-gallery sensor with exceptional performance for detecting nanoscale objects, surpassing that of conventional whispering-gallery sensors," said Weijian Chen, an electrical engineering doctoral student in Yang's lab. "Strikingly, the smaller the target object is, the better the performance of our new sensor will be."

Yang's WGM features two companion silica scatterers, or nanotips, which set on the toroid, or donut-shaped wire, the avenue for millions of light packets called photons to traverse. These devices tune various parameters in the system to influence function. Using nanopositioning systems, the researchers can move the scatterers and increase the size and even introduce another medium—a virus particle, for instance—into the field to perturb the field and beckon an exceptional point.

In the team's most recent experiments, the two "tuning" nanoscatterers bring the resonator to exceptional points; the third particle perturbs the system from its exceptional points and leads to a frequency splitting. Because of the very complex-square-root topology near an exceptional point, the frequency-splitting, which is the sensing signal, is represented mathematically as the square root of the perturbation strength. It is significantly larger than what is found in traditional, non-exceptional point-sensing schemes using very small perturbations.

Yang and her group are exploring the use of the exceptional point in photoacoustic imaging studies and other scenarios where they seek development of "unconventional light transport modes," she said. "There should be many applications arising from that." [11]

Development of novel electron microscopy techniques to extract obscured information on material properties

NIMS researchers Bo Da (researcher at the RCAMC and the CMI2, MaDIS) and Hideki Yoshikawa (leader of the Surface Chemical Analysis Group) and a research group led by Shigeo Tanuma (NIMS Special Researcher), Kazuhito Tsukakoshi (MANA Principal Investigator, NIMS), Kazuyuki Watanabe (Professor, Tokyo University of Science) and Zejun Ding (Professor, University of Science and Technology of China) jointly developed versatile spectroscopic microscopy techniques capable of simultaneously measuring a nano-thin film at a wide range of electron energy levels, from almost zero energy to high energy, using a microscope employing electron beams. The group also demonstrated the effectiveness of the technique.

Conventional methods of measuring nano-thin films require great care because they require changing the energy level of a monochromatic incident electron beam and readjusting the electron optical system while measuring the electron microscope image. We addressed this issue using a creative approach. We developed a new measurement technique using secondary electrons - which are generated in a substrate material and have a wide energy distribution - as a virtual white electron probe. To reduce this technique to practice, we needed to completely eliminate background signals from secondary electrons. We adopted the four-point probe method used in astronomy to

accurately detect weak signals captured by telescopes. This method enabled us to simultaneously measure the electron transmittance of graphene at a wide range of energy levels between almost zero and 600 electron volts. We then confirmed that the measured values matched well with theoretical values. This study reports for the first time that information on the properties of a material - specifically, the electron transmittance of nano-thin films - can be extracted from secondary electron signals.

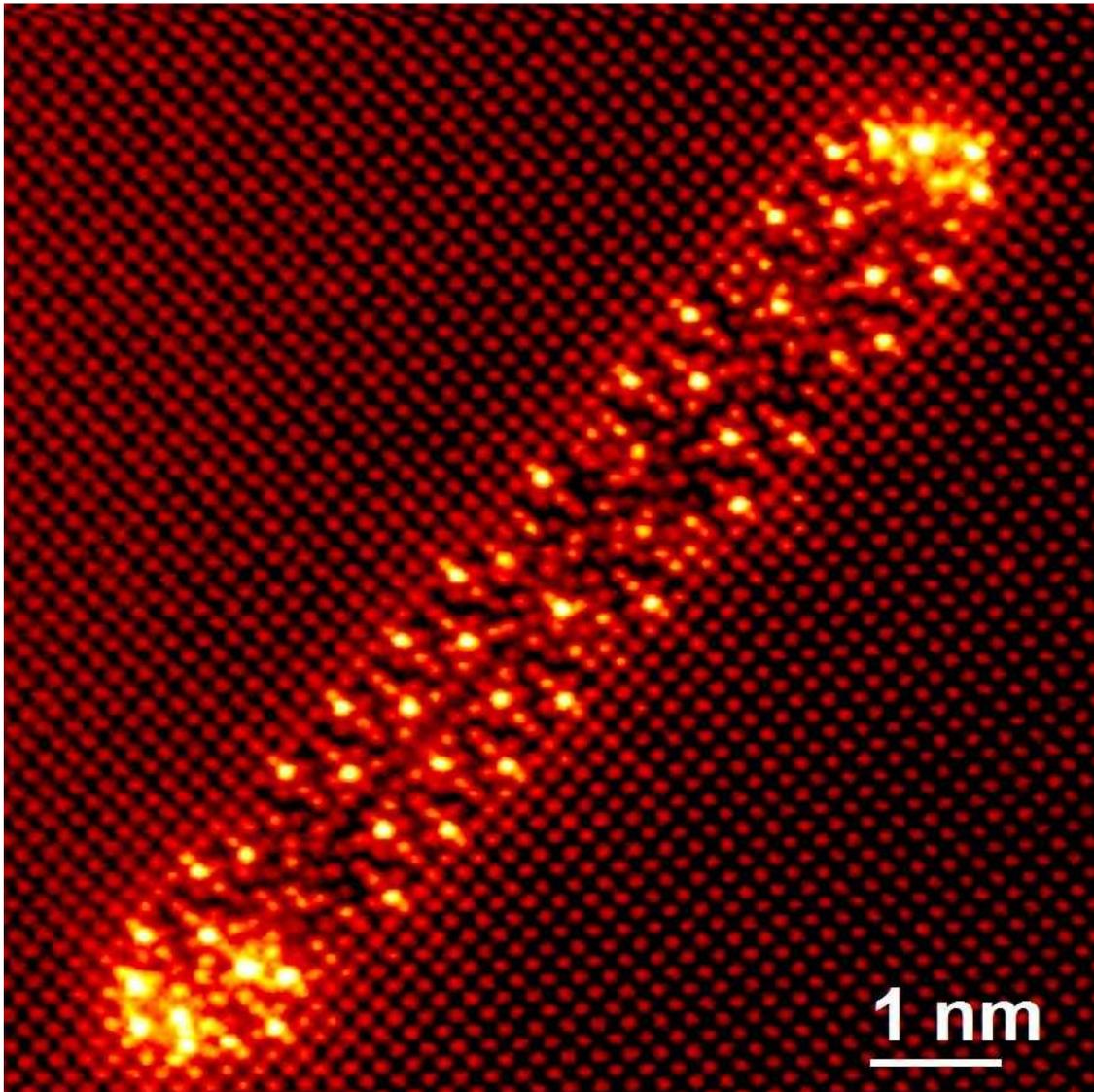
Measurement of the transmittance characteristics of a material using visible light of various energy levels is analogous to identifying the color of the material. Similarly, measurement of the electron transmittance of a nano-thin film using electrons of various energy levels is analogous to identifying the color of a localized area of the film using a more narrowly focused "eye" (electrons). It is difficult to quickly determine the quality (e.g., color) of nano-thin films at specific target sites, as the film itself is normally difficult to locate. Accordingly, techniques such as the one developed in this study will be very valuable in research on new nano-thin films in which the qualitative consistency of the film across a large area needs to be ensured. [10]

This Microscope Can See Down to Individual Atoms

SuperSTEM is funded by the Engineering and Physical Sciences Research Council (EPSRC) and has three electron microscopes that UK scientists can use. The newest was unveiled last month: a £3.7 million (\$5.5 million) Nion Hermes Scanning Transmission Electron Microscope that EPSRC says is one of only three in the world. It can image objects a million times smaller than a human hair.

“Essentially we’re able to look down at materials or most things that we put in the microscope all the way down to the atomic scale,” said Quentin Ramasse, scientific director of the SuperSTEM lab. “So we can regularly see single atoms and atomic columns.”

That’s because electron microscopes use a beam of electrons rather than photons, as you’d find in a regular light microscope. As electrons have a much shorter wavelength than photons, you can get much greater magnification and better resolution.



HAADF micrograph of a copper and silver rich precipitate in an aluminium-based alloy. Image: F S Hage, D M Kepaptsoglou, Q M Ramasse, SuperSTEM Laboratory and S Wenner (Norwegian Technical National University, Trondheim)

Why would you even want to see something in that much detail? The most obvious, Ramasse said, is because we're always trying to miniaturize devices, which means we need to miniaturize parts like transistors and semiconductors—"and that means you need to design materials or materials' components that are really smaller."

It gets to a point where modifying a material even by an atom or two could change its properties. Think about wonder material graphene, for instance: a 2D sheet of carbon atoms. Add another atom here or there and you've changed the material and potentially modified what it can do. Keeping an eye on the exact structure is therefore important.

One project SuperSTEM has been involved with centres on another 2D material, molybdenum disulphide. This can be used as an industrial catalyst, for example to remove sulphur from fossil

fuels. Danish chemical company Haldor Topsoe used the electron microscopes to explore how rearranging its atoms could affect its catalysis properties.

To some extent, it's simply a matter of being able to see what's actually there.

Other applications could include nanomedicine—Ramasse gave the example of needing to check that a drug molecule is sufficiently attached to a nanoparticle acting as a drug delivery vehicle, as “you want to make sure the link is solid so it doesn't disappear in the body.”

And while the most obvious applications are in chemistry, he said the microscopes are also used for some things “a little bit more out there,” like looking at the crystalline structure of dust particles from meteorites. It's a close-up for the far-out. [9]

The Electromagnetic Interaction

This paper explains the magnetic effect of the electric current from the observed effects of the accelerating electrons, causing naturally the experienced changes of the electric field potential along the electric wire. 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. [2]

Asymmetry in the interference occurrences of oscillators

The asymmetrical configurations are stable objects of the real physical world, because they cannot annihilate. One of the most obvious asymmetry is the proton – electron mass rate $M_p = 1840 M_e$ while they have equal charge. We explain this fact by the strong interaction of the proton, but how remember it his strong interaction ability for example in the H – atom where are only electromagnetic interactions among proton and electron.

This gives us the idea to origin the mass of proton from the electromagnetic interactions by the way interference occurrences of oscillators. The uncertainty relation of Heisenberg makes sure that the particles are oscillating.

The resultant intensity due to n equally spaced oscillators, all of equal amplitude but different from one another in phase, either because they are driven differently in phase or because we are looking at them an angle such that there is a difference in time delay:

$$(1) I = I_0 \frac{\sin^2 n \phi/2}{\sin^2 \phi/2}$$

If ϕ is infinitesimal so that $\sin\phi = \phi$, than

$$(2) I = n^2 I_0$$

This gives us the idea of

$$(3) M_p = n^2 M_e$$

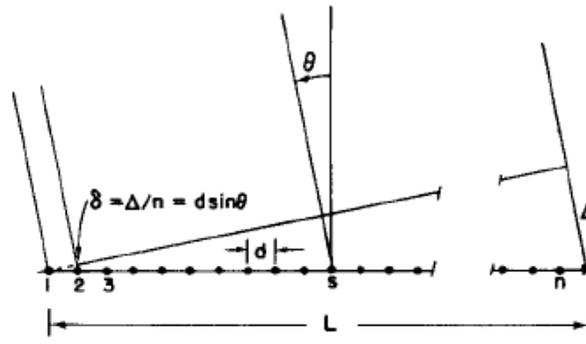


Fig. 30-3. A linear array of n equal oscillators, driven with phases $\alpha_s = s\alpha$.

Figure 1.) A linear array of n equal oscillators

There is an important feature about formula (1) which is that if the angle ϕ is increased by the multiple of 2π , it makes no difference to the formula.

So

$$(4) \quad d \sin \theta = m \lambda$$

and we get m -order beam if λ less than d . [6]

If d less than λ we get only zero-order one centered at $\theta = 0$. Of course, there is also a beam in the opposite direction. The right chooses of d and λ we can ensure the conservation of charge.

For example

$$(5) \quad 2(m+1) = n$$

Where $2(m+1) = N_p$ number of protons and $n = N_e$ number of electrons.

In this way we can see the H_2 molecules so that $2n$ electrons of n radiate to $4(m+1)$ protons, because $d_e > \lambda_e$ for electrons, while the two protons of one H_2 molecule radiate to two electrons of them, because of $d_p < \lambda_e$ for this two protons.

To support this idea we can turn to the Planck distribution law, that is equal with the Bose – Einstein statistics.

Spontaneously broken symmetry in the Planck distribution law

The Planck distribution law is temperature dependent and it should be true locally and globally. I think that Einstein's energy-matter equivalence means some kind of existence of electromagnetic oscillations enabled by the temperature, creating the different matter formulas, atoms molecules, crystals, dark matter and energy.

Max Planck found for the black body radiation

As a function of wavelength (λ), Planck's law is written as:

$$B_{\lambda}(T) = \frac{2hc^2}{\lambda^5} \frac{1}{e^{\frac{hc}{\lambda k_B T}} - 1}.$$

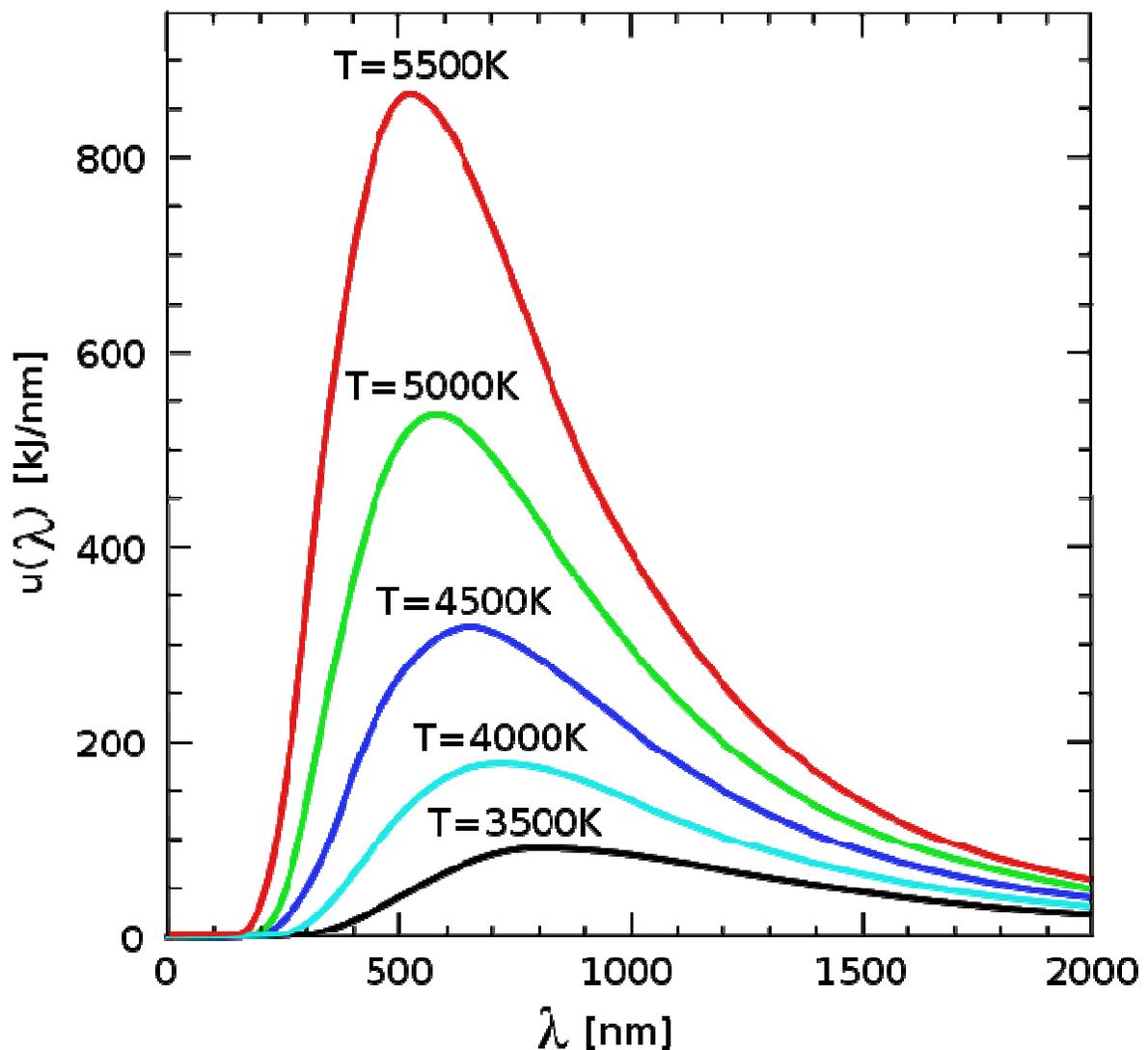


Figure 2. The distribution law for different T temperatures

We see there are two different λ_1 and λ_2 for each T and intensity, so we can find between them a d so that $\lambda_1 < d < \lambda_2$.

We have many possibilities for such asymmetrical reflections, so we have many stable oscillator configurations for any T temperature with equal exchange of intensity by radiation. All of these configurations can exist together. At the λ_{\max} is the annihilation point where the configurations are symmetrical. The λ_{\max} is changing by the Wien's displacement law in many textbooks.

$$(7) \quad \lambda_{\max} = \frac{b}{T}$$

where λ_{\max} is the peak wavelength, T is the absolute temperature of the black body, and b is a constant of proportionality called *Wien's displacement constant*, equal to $2.8977685(51) \times 10^{-3} \text{ m} \cdot \text{K}$ (2002 CODATA recommended value).

By the changing of T the asymmetrical configurations are changing too.

The structure of the proton

We must move to the higher T temperature if we want look into the nucleus or nucleon arrive to $d < 10^{-13} \text{ cm}$. If an electron with $\lambda_e < d$ move across the proton then by (5) $2(m+1) = n$ with $m = 0$ we get $n = 2$ so we need two particles with negative and two particles with positive charges. If the proton can fraction to three parts, two with positive and one with negative charges, then the reflection of oscillators are right. Because this very strange reflection where one part of the proton with the electron together on the same side of the reflection, the all parts of the proton must be quasi lepton so $d > \lambda_q$. One way dividing the proton to three parts is, dividing his oscillation by the three direction of the space. We can order $1/3 e$ charge to each coordinates and $2/3 e$ charge to one plane oscillation, because the charge is scalar. In this way the proton has two $+2/3 e$ plane oscillation and one linear oscillation with $-1/3 e$ charge. The colors of quarks are coming from the three directions of coordinates and the proton is colorless. The flavors of quarks are the possible oscillations differently by energy and if they are plane or linear oscillations. We know there is no possible reflecting two oscillations to each other which are completely orthogonal, so the quarks never can be free, however there is an asymptotic freedom while their energy are increasing to turn them to the orthogonally. If they will be completely orthogonal then they lose this reflection and take new partners from the vacuum. Keeping the symmetry of the vacuum the new oscillations are keeping all the conservation laws, like charge, number of baryons and leptons. The all features of gluons are coming from this model. The mathematics of reflecting oscillators show Fermi statistics.

Important to mention that in the Deuteron there are 3 quarks of $+2/3$ and $-1/3$ charge, that is three u and d quarks making the complete symmetry and because this its high stability.

The Pauli Exclusion Principle says that the diffraction points are exclusive!

The Strong Interaction

Confinement and Asymptotic Freedom

For any theory to provide a successful description of strong interactions it should simultaneously exhibit the phenomena of confinement at large distances and asymptotic freedom at short distances. Lattice calculations support the hypothesis that for non-abelian gauge theories the two domains are analytically connected, and confinement and asymptotic freedom coexist. Similarly, one way to show that QCD is the correct theory of strong interactions is that the coupling extracted at various scales (using experimental data or lattice simulations) is unique in the sense that its variation with scale is given by the renormalization group. [4]
Lattice QCD gives the same results as the diffraction theory of the electromagnetic oscillators, which is the explanation of the strong force and the quark confinement. [1]

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.

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 1/2 spin creator particle to make equal the spins of the weak interaction, for example neutron decay to 2 fermions, every particle is fermions with 1/2 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 $\frac{1}{2}$ 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. [5]

Fermions and Bosons

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

The Higgs boson or Higgs particle is a proposed elementary particle in the Standard Model of particle physics. The Higgs boson's existence would have profound importance in particle physics because it would prove the existence of the hypothetical Higgs field - the simplest of several proposed explanations for the origin of the symmetry-breaking mechanism by which elementary particles gain mass. [3]

The fermions' spin

The moving charges are accelerating, since only this way can self maintain the electric field causing their acceleration. The electric charge is not point like! This constant acceleration possible if there is a rotating movement changing the direction of the velocity. This way it can accelerate forever without increasing the absolute value of the velocity in the dimension of the time and not reaching the velocity of the light.

The Heisenberg uncertainty relation says that the minimum uncertainty is the value of the spin: $1/2 \hbar = \Delta x \Delta p$ or $1/2 \hbar = \Delta t \Delta E$, that is the value of the basic energy status.

What are the consequences of this in the weak interaction and how possible that the neutrinos' velocity greater than the speed of light?

The neutrino is the one and only particle doesn't participate in the electromagnetic interactions so we cannot expect that the velocity of the electromagnetic wave will give it any kind of limit.

The neutrino is a $1/2$ spin creator particle to make equal the spins of the weak interaction, for example neutron decay to 2 fermions, every particle is fermions with $1/2$ 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 source of the Maxwell equations

The electrons are accelerating also in a static electric current because of the electric force, caused by the potential difference. The magnetic field is the result of this acceleration, as you can see in [2].

The mysterious property of the matter that the electric potential difference is self maintained by the accelerating electrons in the electric current gives a clear explanation to the basic sentence of the relativity that is the velocity of the light is the maximum velocity of the matter. If the charge could move faster than the electromagnetic field than this self maintaining electromagnetic property of the electric current would be failed.

Also an interesting question, how the changing magnetic field creates a negative electric field? The answer also the accelerating electrons will give. When the magnetic field is increasing in time by

increasing the electric current, then the acceleration of the electrons will increase, decreasing the charge density and creating a negative electric force. Decreasing the magnetic field by decreasing the electric current will decrease the acceleration of the electrons in the electric current and increases the charge density, creating an electric force also working against the change.

In this way we have explanation to all interactions between the electric and magnetic forces described in the Maxwell equations.

The second mystery of the matter is the mass. We have seen that the acceleration change of the electrons in the flowing current causing a negative electrostatic force. This is the cause of the relativistic effect - built-in in the Maxwell equations - that is the mass of the electron growing with its acceleration and its velocity never can reach the velocity of light, because of this growing negative electrostatic force. The velocity of light is depending only on 2 parameters: the magnetic permeability and the electric permittivity.

There is a possibility of the polarization effect created by electromagnetic forces creates the negative and positive charges. In case of equal mass as in the electron-positron pair it is simply, but on higher energies can be asymmetric as the electron-proton pair of neutron decay by weak interaction and can be understood by the Feynman graphs.

Anyway the mass can be electromagnetic energy exceptionally and since the inertial and gravitational mass are equals, the gravitational force is electromagnetic force and since only the magnetic force is attractive between the same charges, is very important for understanding the gravitational force.

The Uncertainty Relations of Heisenberg gives the answer, since only this way can be sure that the particles are oscillating in some way by the electromagnetic field with constant energies in the atom indefinitely. Also not by chance that the uncertainty measure is equal to the fermions spin, which is one of the most important feature of the particles. There are no singularities, because the moving electron in the atom accelerating in the electric field of the proton, causing a charge distribution on Δx position difference and with a Δp momentum difference such a way that they product is about the half Planck reduced constant. For the proton this Δx much less in the nucleon, than in the orbit of the electron in the atom, the Δp is much higher because of the greatest proton mass.

The Special Relativity

The mysterious property of the matter that the electric potential difference is self maintained by the accelerating electrons in the electric current gives a clear explanation to the basic sentence of the relativity that is the velocity of the light is the maximum velocity of the matter. If the charge could move faster than the electromagnetic field than this self maintaining electromagnetic property of the electric current would be failed. [8]

The Heisenberg Uncertainty Principle

Moving faster needs stronger acceleration reducing the Δx and raising the Δp . It means also mass increasing since the negative effect of the magnetic induction, also a relativistic effect!

The Uncertainty Principle also explains the proton – electron mass ratio since the Δx is much less requiring bigger Δp in the case of the proton, which is partly the result of a bigger mass m_p because of the higher electromagnetic induction of the bigger frequency (impulse).

The Gravitational force

The changing magnetic field of the changing current causes electromagnetic mass change by the negative electric field caused by the changing acceleration of the electric charge.

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 Big 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 ratio $M_p = 1840 M_e$. 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. [1]

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]

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 Casimir effect

The Casimir effect is related to the Zero-point energy, which is fundamentally related to the Heisenberg uncertainty relation. The Heisenberg uncertainty relation says that the minimum uncertainty is the value of the spin: $1/2 \hbar = \Delta x \Delta p$ or $1/2 \hbar = \Delta t \Delta E$, that is the value of the basic energy status.

The moving charges are accelerating, since only this way can self maintain the electric field causing their acceleration. The electric charge is not point like! This constant acceleration possible if there is a rotating movement changing the direction of the velocity. This way it can accelerate forever without increasing the absolute value of the velocity in the dimension of the time and not reaching the velocity of the light. 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 Δx position difference and with a Δp momentum difference such a way that they product is about the half Planck reduced constant. For the proton this Δx much less in the nucleon, than in the orbit of the electron in the atom, the Δp is much higher because of the greater proton mass. This means that the electron is not a point like particle, but has a real charge distribution.

Electric charge and electromagnetic waves are two sides of the same thing; the electric charge is the diffraction center of the electromagnetic waves, quantified by the Planck constant h .

The Fine structure constant

The Planck constant was first described as the proportionality constant between the energy (E) of a photon and the frequency (ν) of its associated electromagnetic wave. This relation between the energy and frequency is called the **Planck relation** or the **Planck–Einstein equation**:

$$E = h\nu .$$

Since the frequency ν , wavelength λ , and speed of light c are related by $\lambda\nu = c$, the Planck relation can also be expressed as

$$E = \frac{hc}{\lambda} .$$

Since this is the source of Planck constant, the e electric charge countable from the Fine structure constant. This also related to the Heisenberg uncertainty relation, saying that the mass of the proton should be bigger than the electron mass because of the difference between their wavelengths.

The expression of the fine-structure constant becomes the abbreviated

$$\alpha = \frac{e^2}{\hbar c}$$

This is a dimensionless constant expression, $1/137$ commonly appearing in physics literature.

This means that the electric charge is a result of the electromagnetic waves diffractions, consequently the proton – electron mass rate is the result of the equal intensity of the corresponding electromagnetic frequencies in the Planck distribution law, described in my diffraction theory.

Path integral formulation of Quantum Mechanics

The path integral formulation of quantum mechanics is a description of quantum theory which generalizes the action principle of classical mechanics. It replaces the classical notion of a single, unique trajectory for a system with a sum, or functional integral, over an infinity of possible trajectories to compute a quantum amplitude. [7]

It shows that the particles are diffraction patterns of the electromagnetic waves.

Conclusions

And while the most obvious applications are in chemistry, he said the microscopes are also used for some things “a little bit more out there,” like looking at the crystalline structure of dust particles from meteorites. It’s a close-up for the far-out. [9]

The magnetic induction creates a negative electric field, causing an electromagnetic inertia responsible for the relativistic mass change; it is the mysterious Higgs Field giving mass to the particles. The Planck Distribution Law of the electromagnetic oscillators explains the electron/proton mass ratio by the diffraction patterns. The accelerating charges 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 Relativistic Quantum Theories. The self maintained electric potential of the accelerating charges equivalent with the General Relativity space-time curvature, and since it is true on the quantum level also, gives the base of the Quantum Gravity. The electric currents causing self maintaining electric potential is the source of the special and general relativistic effects. The Higgs Field is the result of the electromagnetic induction. The Graviton is two photons together.

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