



The Single Field Theory (SFT)

Introduction

"The development during the present century is characterized by two theoretical systems essentially independent of each other: the theory of relativity and the quantum theory. The two systems do not directly contradict each other; but they seem little adapted to fusion into one unified theory. For the time being we have to admit that we do not possess any general theoretical basis for physics which can be regarded as its logical foundation."

Albert Einstein, 1940

A Basic theory:

We do not possess, still today, any general theoretical basis for physics which can be regarded as its logical foundation!

In **the standard model** particles are considered points which move through space. To take into account the different particles interactions **we have to provide not only position and velocity, but also things such as mass, electric charge, colour or spin.** The wave equations give us answers that are in good agreement with observation once they have been properly manipulated. An equation that gives a correct answer may be useful, but unless it also answers many of **the deepest how and why questions**, it's inadequate.

The gravitational field at a fixed time could be described by the geometry of the three spatial dimensions at that time. The history of the gravitational field is described by the four dimensional space-time that these three spatial dimensions sweep out in time. **Space-time is a dynamical field.** To describe a dynamical field (space-time) it's required a theory of **quantum gravity**, an appropriate **description of physical processes that occur at very small length scales** and short times. The standard model does not seem to fit into this scheme. **The Single Field Theory (SFT)** physically outlines intuitive concepts using a novel theoretical framework into the local electromagnetic interaction in the nanometric subsystem composed of electrons and photons. The SFT formulate a new conceptual idea about light-matter interaction.

The particle is replaced by a single fundamental building block, a resonant electromagnetic wave. Different resonant electromagnetic waves represent the different particle types, since different modes are seen as different masses or spins. We can make sense of **the interaction phenomenon in the SFT** in a way we could not in the standard model. The SFT gives a consistent theory of quantum gravity, which possesses the necessary freedom degrees to describe all the particle interactions. Gravity is not a thing we put in the theory, it must be there. A great achievement of the SFT is to give a consistent theory of quantum gravity, which resembles Relativity, Special and General ones.

Abstract

The SFT uses **4 dimensions** as we know and perceive: three spatial dimension and one temporal dimension.

The SFT is based on a **single postulate, the electromagnetic field, and a single law, the resonance**. The law of resonance **represents the dynamic of the postulate**. This postulate and this law involve **four fundamental principles: quantum, symmetry, synergy, and the scale factor**. These are the main properties from which the theory was born.

Every item of physical reality must have a counterpart in physical theory. The SFT works in a "quantum world" today inaccessible to experiments. The new theory could solve this problem because one of its main property is the scale-factor: if the SFT has verified in the quantum world, it must be true also in a big world like that of nanotechnology. The nano-applications could be a macro-check system helpful to the theory as experimental verification.

"...The physical reality of space is represented by a field whose components are continuous functions of four independent variables - the co-ordinates of space and time. Since the theory of general relativity implies the representation of physical reality by a continuous field, the concept of particles or material points cannot play a fundamental part, nor can the concept of motion."

Einstein

Issued questions: How does the mechanism behind the fundamental constants " α " and " c ", gravity, relativity and quantum electrodynamics work? One fundamental complaint is that the standard theory fails to explain how force is conducted among objects. We can speak of quarks, gravitons, muons, mesons, kaons, pions and so on, but the geometry of nature remains unknown.

We speak of a field, but what is the field and how could it work? What physical reality does the wave function represent? The Photon is a particle and a wave, but how exactly does it accomplish this feat?

The photon is in nature the favourite way to dispense packets of energy and as consequence it's critical to the overall dynamic of the universe, but in reality we know frighteningly little about what a photon really is, and how it behaves, the way it does. **Einstein, Podolsky and Rosen believed** that the quantum theory was incomplete and that every photon held a **"secret property"** that, if known, could explain - in **deterministic mode** - the meaning of the measurement of **polarization**.

The innovation: The "secret property" means the interception of the photon polarization, according to the SFT, which is a **description of the physical system in a deterministic mode**. The photon polarization defines instantly (on the Planck axis) the **reflection point between the photon/antiphoton entangled**, i.e. the reflection point between two opposed standing waves. The

reflection point is essential to the corresponding resonance. **The reflection point is realised by two counter-rotating standing waves (photon/antiphoton), and we define it as *quantum entanglement*. It's the fundamental behaviour of every interaction. It's the electric field aspect.** Fig.1 The electron-positron pair consists of counter-rotating standing waves, with a separation distance of half the photon wavelength. This is the magnetic field aspect. Electric and magnetic fields are two aspects of the same thing. The electric and magnetic fields together constitute the electromagnetic wave function. The standing electromagnetic wave incorporates photon/antiphoton and electron/positron. Fig.2 Thus during any interaction a photon appears to be the centre of an electron-positron pair with a separation distance of half the photon wavelength. This explains supersymmetry: the conversion between lepton and boson, i.e. the unification of particles with integer spin (1) and semi-integer spin (1/2). **Photon/antiphoton and electron/positron together are definable as neutrino/antineutrino.** Fig.6 The magnetic spin gives it the possibility to interact electromagnetically with electrons. The direction (the point) of observation on Planck's axis defines the neutrino or antineutrino aspect. It's the pixel of the *image* space-time. It makes up dark matter.

Assumptions of the theory: The SFT should be a compelling hypothesis that addresses the deepest how and why questions in a simple way; simple enough to be fundamental and therefore unique. An intimate **connection between Einstein's theory of relativity (general and special) and quantum physics.** According to general relativity, **space and time are dynamic entities** linked to matter and energy. By contrast, quantum physics tells us about matter and energy behaviour, but can only be formulated in a frozen space-time. The SFT impinges directly on the world we live in, helping to redefine physics as discovering reality. **Entanglement and propagation/conduction** are two different physical phenomena, **a double physical reality:** non-locality (space without time) and locality (space with time) respectively. Thus, **general relativity and quantum-field theory seem to be embedded deeply inside the same structure.**

The SFT, also, defines a **connection between general relativity and special relativity, because in the SFT the constant speed of light "c" represents the dynamic process of space-time in GR.** The description of a physical process that configures the geometry of general relativity.

resolving problems: The polarization of the photon and the spin of the electron shape the entanglement phenomenon (non-locality coherency action) -- each on the corresponding Planck axis (orthogonal axis). Fig.3a

What we call propagation mode (locality action) with constant speed is the reflection crash point between the photon/antiphoton and electron/positron entangled (wave function collapse) and their rebuilding (recreation), which changes Planck's axis (the third, or propagation, axis). Fig.3b. **The speed of light, "c", in the isotropic neutrinos space-time, dark matter, is therefore**

free of any frame of reference. **Propagation is a process.** Locality is standing wave exchange (electromagnetic chain) from knot to knot.

The time related to the propagation process is firmly associated with space and represents **the dynamics of space -- the quantum-clock** of space.

The photon propagation agrees with the electric field aspect, and the electron conduction agrees with the magnetic field aspect. Both propagation and conduction belong to the same physical process: propagation/conduction. Therefore they have the same speed "c."

A correspondence to **the geometry of a black hole**: The electrons manage to organize themselves in a quantum critical state, meaning that their **collective quantum physics becomes scale invariant** (it looks the same, regardless of the time) and length-scale over which one observes the system. The SFT looks at **the black hole as a laser**, on a gamma wave length, it's a **macroscopic phenomenon of quantum coherence**. [Fig.7](#)

Every item of physical reality must have a counterpart in physical theory. **The SFT has to be verified by experimental measurements. The nano-technological applications could be a macro check system helpful to the experimental verification of the theory.** The nature is inclined to management by large with the help of small. **The scale factor.**

"If an experiment agrees with theory it means "perhaps" for the latter. If it does not agree it means "no"."

"Theoretical remark on the superconductivity of metals"

A. Einstein

Epistemology of the SFT

A physics problem first should be thought in terms of images, only later you can turn those pictures into a mathematical formalism. A new mathematical theory (formalism) could describe the SFT as analytical geometry.

Physics is based on the concept of measure and the causality depends on the measurement of distance. The distances are measurable only by energy exchange: The interaction. The electric interaction is the paradigm of any phenomenon caused by interaction. **The observer can exchange energy only by electric interaction.**

The *maximal causal speed* is defined as the speed of electric radiation without matter, but only in presence of electric and gravitational fields; but the *maximal causal speed* is a physical entity that can't ignore the space-time structure, because is an interaction process.

In accord to General Relativity (GR) space-time can't exist without a field and be disconnected from what contains it. The empty space doesn't exist! It doesn't exist space that is empty of interaction field. Any interaction defines, locally, its space-time structure. Space-time is solidly connected to the interactions and therefore the respective property influences each other (GR, the gravitational interaction).

The SFT defines any possible interaction (the interaction concept) possible only between e.m. standing waves i.e. by angular momentum exchange. Any physical causal event is connected each other only by means of interaction. Also the measurement is an interaction.

The SFT doesn't admit the Born's causality definition in which the event can be built on the probability of more elementary elements and not by the elements themselves. The term " Ψ " function in Schrodinger's equation was interpreted as the wave front of the probability waves. The intensity of the wave front at a specific point represents the probability of the described particle at that point. This abstractive interpretation was advanced by Max Born and Niels Bohr and it's known as the Copenhagen Interpretation.

The SFT doesn't need of " Ψ " to justify the meaning of duality, because the "particle" is simply an electromagnetic standing wave.

All real events must be based on real processes that preceded them. All the real processes in the universe must be traceable back to the basic process. Causality and determination are fundamental expressions of SFT. The observation and the measurement are **interaction which can't affect the reality.**

"One can make a safe guess that uncertainty relations in their present form will not survive in the physics of the future".

"The evolution of the physicist's picture of nature".

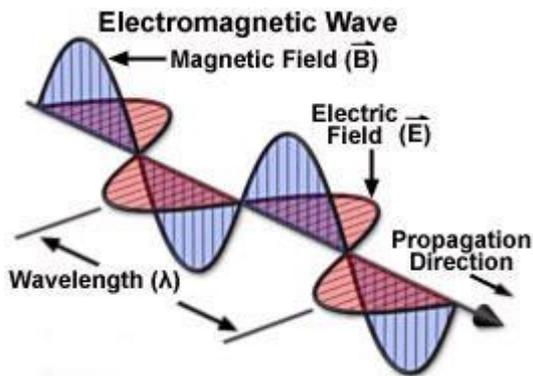
Dirac, 1963

The SFT key element is the quantum entanglement between the system and its environment.

The Single Field Theory

The SFT is based on a single postulate, the electromagnetic field, and a single law, the resonance. The law of resonance represents the dynamic of the postulate. This postulate and this law involve four fundamental principles: quantum, symmetry, synergy, and the scale factor.

A single postulate: the electromagnetic field.



Electric and magnetic fields are two aspects of the same thing. The electric and magnetic field together constitute the electromagnetic (e.m.) wave function.

The model: The Single Field Theory (SFT) is based on a new theoretical model in which **the space** is infinite and all pervading of e.m. waves with energy $E=hf$. The maximum frequency of the e.m. waves is the Planck frequency (f_p), about 10^{43}

Hertz, the Planck oscillator. These e.m. waves compose a 3D network oriented in all direction. **The space is a dynamic definition** because the e.m. waves are a sequence of electric fields and magnetic fields. **To describe a dynamics** one requires **appropriate description of physical processes** that occur at very small length scales and short times, one **requires a law** for the e.m. wave. The law of its dynamics is **resonance**.

A single law: resonance

The law of resonance represents the dynamic of the postulate.

Every physical process that occurs in nature is related to the law of resonance.

What resonance is: Each body has one or a set of frequencies where it naturally oscillates, these are the natural frequencies. To each natural frequency it is related a **standing wave**, a pattern that builds up a **discrete symmetric structure** of the body **when the incoming waves from the source interfere with the reflected waves from the end of the body**. Fix points appear on the body: **the nodes**, the destructive interference between the incoming and reflected waves.

These structures are possible only inside a body with specific vibrations, they are the **harmonic waves**, where the first is related to the fundamental one.

A source and a reflection point are essential to the corresponding resonance.

For leptons the fundamental harmonic wave is related to the Planck dimension. A well known harmonic is the electron, a special lepton.

The resonance structure is a vibration mode that has **the maximal amplitude and the minimal input source of energy**. The body prefers this frequency that has the minimal energy: this is the **synergy of the resonance law**.

For 2 dimensions (2D) one speech of **standing wave configuration**. For 3 dimensions (3D) one speech of **standing wave structure**.

This postulate and this law involve four fundamental principles: *quantum, symmetry, synergy, and the scale factor*. These are the main properties from which the theory was born.

How the standing wave packet is, geometrically, relatable to the postulate and the law:

The SFT uses **4 dimensions** as we know and perceive: three spatial dimensions and one temporal dimension.

Both the geometry of space-time, and the geometry of General Relativity (GR), are highly related to standing wave packet. Because:

According to GR, **space and time are dynamic entities. Space-time is a dynamical field**. To describe a dynamical field (space-time) it's required a theory of **quantum gravity**, an appropriate **description of physical processes that occur at very small length scales** and short times.

The SFT makes an appropriate **description of physical processes by means of the interaction of standing waves** in the following way:

The space is infinite and all pervading of e.m. waves with energy $E=hf_p$. The maximum assumed frequency is the Planck frequency (f_p), the fundamental frequency. It's the discrete **quantum** minimal entity. The ensemble of e.m. wave oriented in all directions makes the Planck's space. To simplify the theory explanation we consider only one direction along which the standing wave can resonate. We call this direction ***Planck axis*** composed of the e.m. wave of Planck frequency (f_p). The Planck's axis defines 1 dimension (1D) and is a real axis composed of Planck's wave where each period represents a minimal physical entity (quantum), not the abstract 1D ideal line composed of dimensionless points.

Fig.1 The SFT uses a new theoretical model based on a photon-antiphoton concept. On the Planck frequency **two harmonic standing waves** are built up: one with right-hand circular polarisation and a second one with left-hand circular polarisation. When two counter-rotating standing waves mirror each other a reflection point is generated. It's an imaginary point and it represents the fundamental behaviour of every interaction. The two harmonic waves, with the **reflection point** between them, enable the up building of standing waves (resonance). The two counter-rotating standing waves are the photon/antiphoton. **The symmetry principle. The frequency of this harmonics is the Compton's frequency.** There are physical reasons for applying a cut-off frequency to the orbital angular momentum, for the electron, a cut-off in the vicinity of the Compton frequency.

The polarization of the photon shapes the entanglement phenomenon. It's **the photon entanglement on the Planck axis**, it's **the most elementary interaction wave function**: We define it as "quantum entanglement". The polarisation is the angular momentum definition, it's the means of interaction. **The photon angular momentum can't be created, but only interacted**. Any physical causal event, a process, is connected to each other only by means of interaction. Also the measurement is an interaction.

The SFT is an explanation for the origin of gauge symmetry. **Symmetry dictates interactions**. The most advanced form of symmetries are local symmetries and gauge symmetry. **Gauge symmetry is never broken, it's only hidden by the asymmetric macroscopic state we live in**.

The SFT search for a synthesis of these two forms of symmetry, as a consequence of a **greater and deeper symmetry**: it's **the symmetry that contains both photon/antiphoton and electron/positron in an unique 4-tails symmetric particle**. It's **the neutrino/antineutrino symmetry**.

The invariance of natural laws for different observers is a symmetry of space-time: **It's the Lorentz's symmetry**, which defines the isotropic space-time i.e. **all directions and all uniform motions are the same, no one is special**. The relativity associated to quantum mechanics forms, the relativistic quantum theory of fields with the Lorentz symmetry of the particle, and / or the force are described by a field of space-time.

The SFT describes the electromagnetic quantum field including gravity, unifying gravity and electromagnetism, finding **a geometrical origin for electrodynamics**.

Photon-Antiphoton model on Planck's space

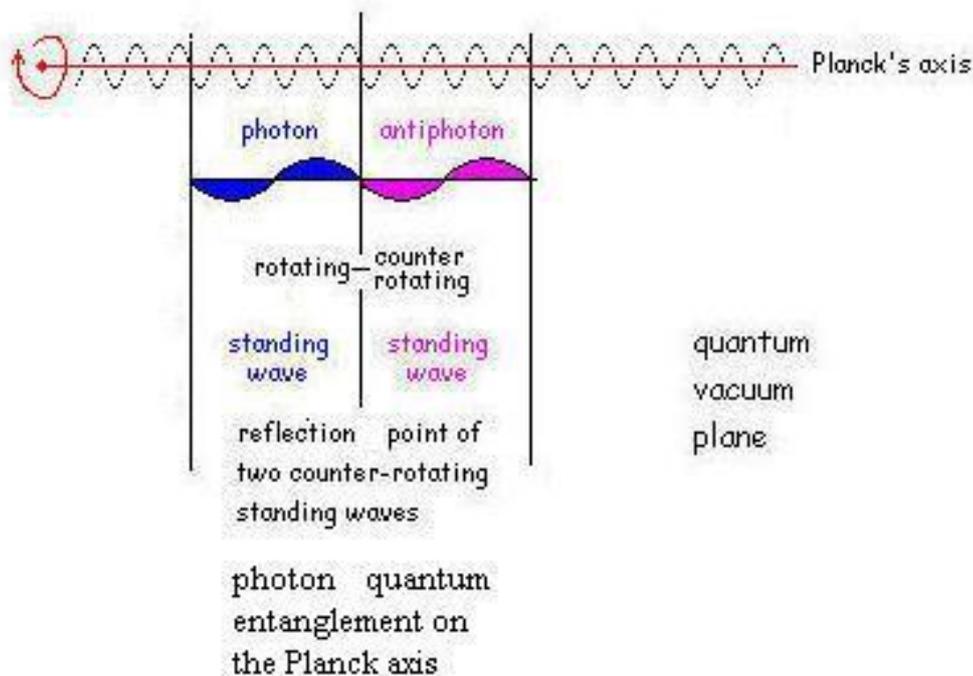


fig.1

Fig.2 The electric and magnetic field together constitute the two sides of the same aspect: the electromagnetic wave. The **standing electromagnetic wave**, therefore, incorporates the **photon/antiphoton** (the electric field aspect) and **the electron/positron** (the magnetic field aspect) as a **single entity**. Each couple is orthogonal to each other. Thus during any interaction a photon appears to be the center of an electron-positron pair with a separation distance of half the photon wavelength. The interception of the polarization or spin (the electric or magnetic aspect) is **the collapse of the resonance** (of the standing wave). It's **the collapse of the wave function**, the angular momentum collapse. **A step of the entanglement interaction.**

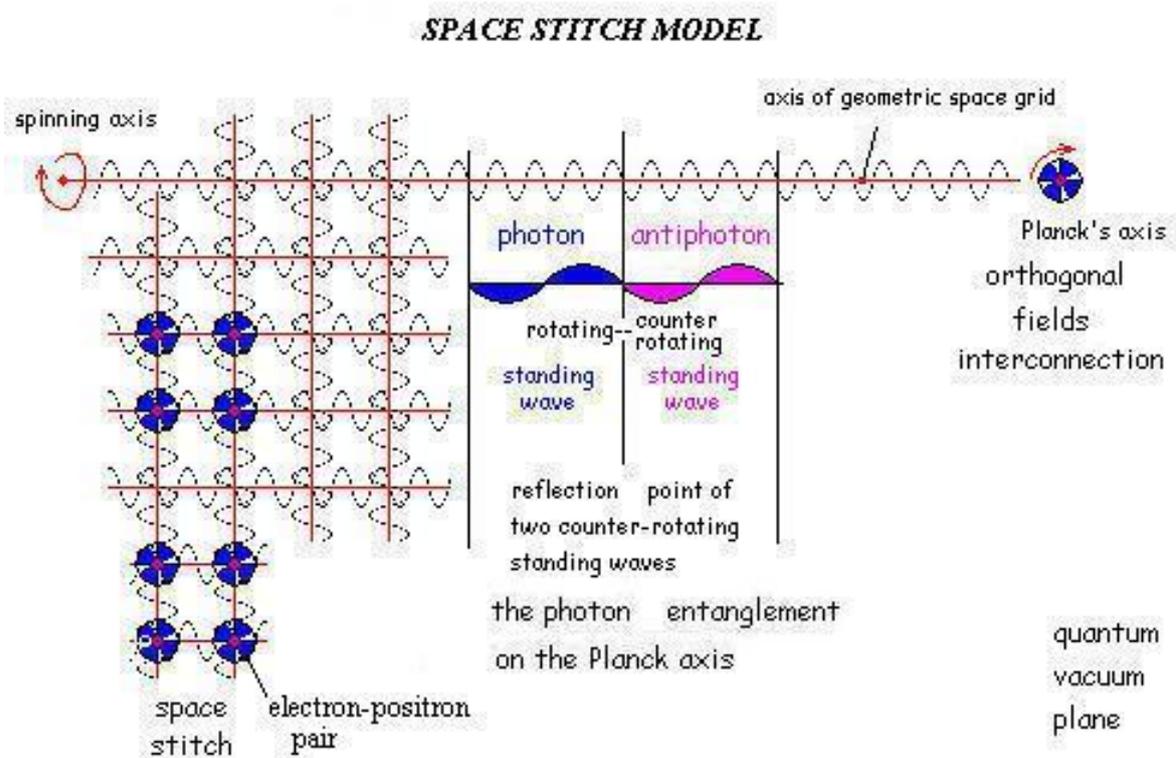


Fig.2

The Photon-antiphoton couple represents the electric field aspect in the SFT. To complete the e.m. field we need the complementary magnetic field aspect. It's represented by an electron-positron pair. This pair consists of two counter-rotating standing waves like the photon-antiphoton one, but the separation distance of electron-positron counter-rotating standing waves is a half photon wavelength.

Fig.3a Photon/electron model.

Photon/antiphoton and electron/positron together are definable as neutrino/antineutrino. The direction (the point) of observation on Planck's axis defines the neutrino or antineutrino aspect. This explains super-symmetry: the conversion between lepton and boson, i.e. the unification of particles with integer spin (1) and semi-integer spin (1/2). The magnetic spin gives the neutrino the possibility to interact electromagnetically with electrons. It's the *pixel* of the *image space-time*. Einstein, Podolsky and Rosen believed that quantum theory was incomplete and that every photon held a "secret property" that, if known, could explain - in deterministic mode - the meaning of the measurement of polarization. The "secret property" means the interception of the photons/antiphotons polarization, or the interception of the electrons/positrons spin which are the interaction description of the entangled photon/antiphoton-electron/positron with a second photon/antiphoton-electron/positron. The interaction between neutrinos. It's the pixel of the image space-time.

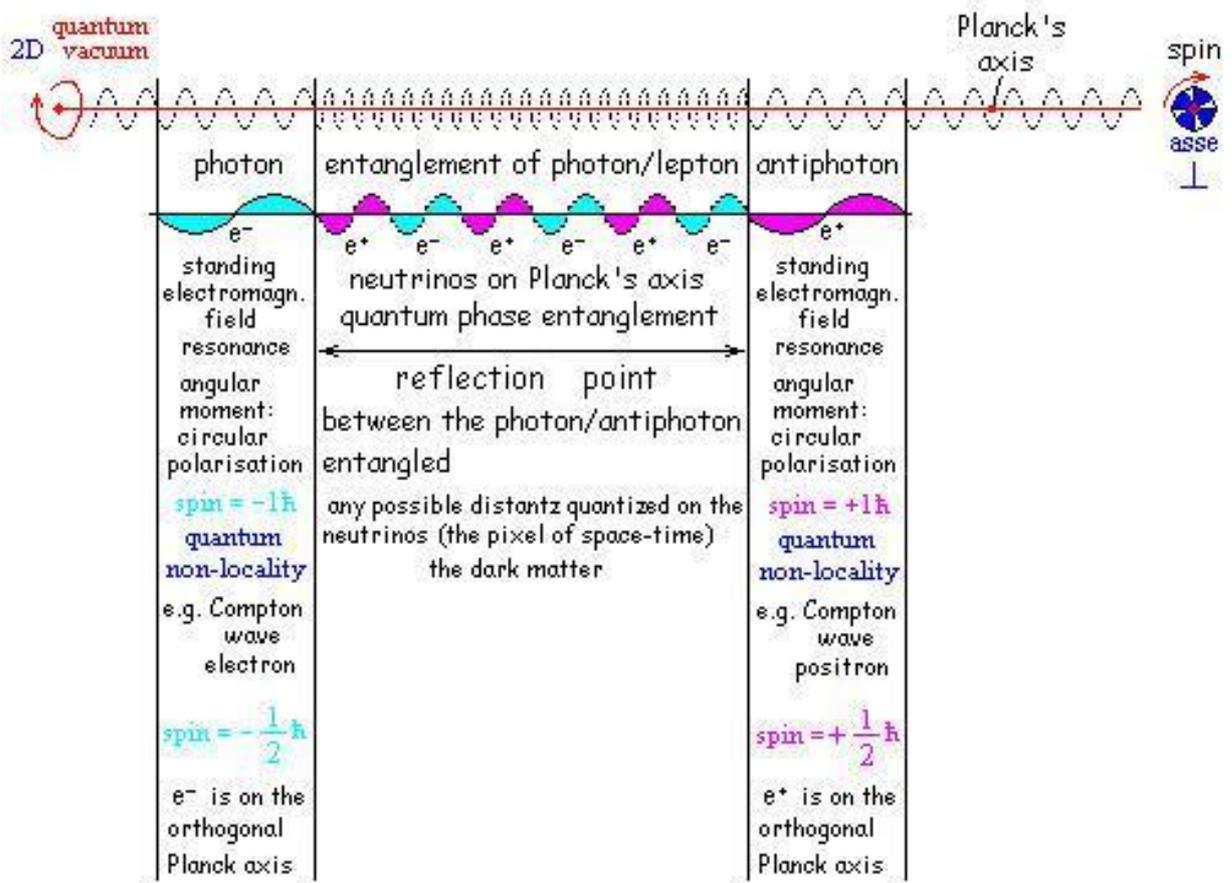
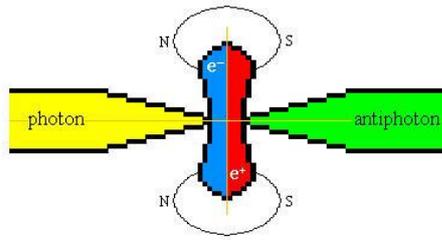


fig.3a Photon/electron model



"The finite size of the electron now reappears in a new sense, the interior of the electron being a region of failure, not of the field equations of electromagnetic theory, but of some of the elementary properties of space-time."

Dirac

Fig.3b 3axis model. X: the photon/antiphoton axis; Y: the electron/positron axis; Z: the propagation axis.

- **X**: the photon/antiphoton axis in counter-rotating polarization $\pm 1\hbar$. The photon entanglement. (non-locality, no time)

- **Y**: the electron/positron axis in counter-rotating spin $\pm \frac{1}{2}\hbar$. The electron entanglement. (non-locality, no time)

The entanglement, non-locality, isn't propagation phenomenon, it doesn't change the Planck's axis.

- **(X,Y) plane**: It's the electromagnetic plane where are the electric and magnetic fields, two aspects of the same thing; they represent the neutrino symmetry.

- **Z: the propagation axis**, accordingly with quantum electrodynamics, is an exchange among standing waves ($\gamma^+ - e^- / \gamma^- - e^+$). **Annihilation/recreation pair process through more X, Y planes**. It's the space quantum step among neutrinos. **A quantum step of the space-time net**, the way to cross the space-time net. A propagation/conduction process, the process speed explains the **light speed meaning**. An electromagnetic chain in the space-time that represents **the locality**. The propagation time is **the 4^o space dimension**, it's the meaning of time.

Everything interacting into the space-time must produce a propagation/conduction process. Interaction means: **The collapse of the wave function**, the interception of the photon polarization, the interception of the electron spin, the interception of the angular momentum. **The angular momentum interaction represents the interaction fundamental principia**. Any process is a sequence of interactions i.e. a sequence of angular momentum exchange. The propagation/conduction process of photons/electrons is the fundamental principia process of light speed, the constant "c".

The segment length of the space-time stitch (the stitch dimension) is the **neutrino/antineutrino contiguity** (the neutrino dimension), **the standing wave length of the photon/lepton**.

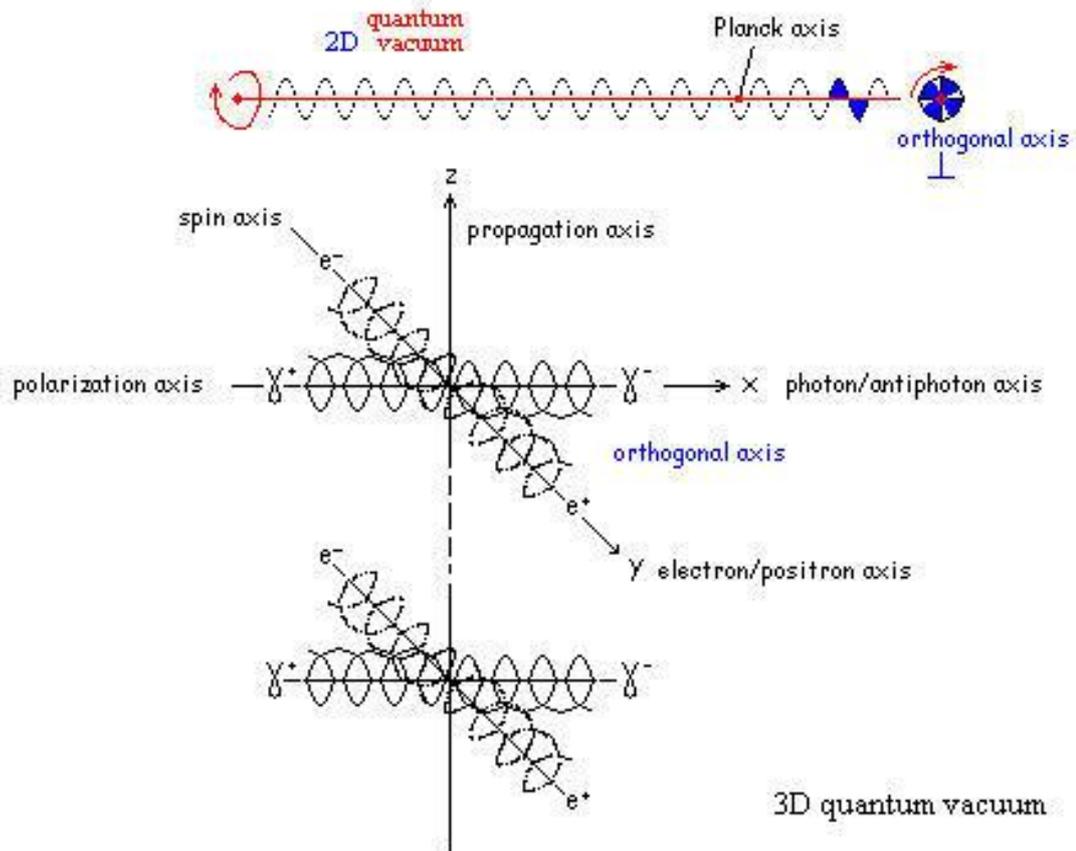


fig.3b 3 axis model

X: the photon/antiphoton axis; Y: the electron/positron axis; Z: the propagation axis.

Another view of the EPR concept is to conceive two opposite standing waves (particles), as the **Pauli Exclusion Principle** to have opposite spins. The Pauli Exclusion Principle may be considered to be absolutely essential to any viable theory of quantum mechanics. When the spin of one particle is unilaterally changed, an experimental result is that the second particle spin "immediately" flips of its own accord and thus maintains the validity of the Pauli Exclusion Principle. The EPR Experiment has become the most supporting milestone for the Quantum Physics. There are no isolated systems. One of the assumptions of **Heisenberg Uncertainty Principle**, which is seldom quoted, is that it assumes an isolated system. This assumption is not stated explicitly (it's an implied assumption). Within very small time increments (again on the neutrino scale), these same elementary particles are sharing their energy with the rest of the universe.

SFT and Heisenberg Uncertainty Principle.

The transmission of information doesn't necessarily require the transmission of energy if the energy of a photon doesn't change as a result of a change in its direction of polarization. That is possible only if the balance of energy between the photon angular momentum and the related entangled system is respected, in

other words, because of the untouched entanglement phenomenon. How is it possible in the presence of the interference of the measure that implies a breaking point for the energy balance?

Because interaction means angular momentum exchange, transmission of information by exchange of polarization appears impossible: therefore **the formulation of the Heisenberg uncertainty principle**. The SFT view point considers the breaking point, related to the balance of energy, as the wave function collapse of the quantum phase entanglement (fig.3a). **The problem is not relatable to an indefinable uncertainty principle, on the contrary, it's simply definable as a technological limited resolution of our experimental instrumentation** i.e. its impedance is of the same magnitude order of the object we are checking. Therefore the SFT doesn't consider valid the Heisenberg uncertainty principle, but the prior and well definable **quantum resolution principle**. In fact it's possible to realize a high resolution and a bigger impedance watching the "*birth, life and death*" of a photon:

"The quantum state of the atoms according to the presence of a single photon."

"Detecting a photon usually... destroy it in a photodetector."

"... "quantum non-demolition" (QND) measurements on single photons, whereby the presence of a photon is determined without destroying it."

"A microwave cavity cooled to 0.8K. contain one photon, spontaneously appeared from the vacuum, live a life of less than one second, and then vanishes."

"A stream of rubidium atoms (Rydberg atoms) through the cavity."

*"The atoms are flipped between **g** and **e** (status) by a non-resonant interaction with the cavity field."*

*"If the atoms cross an empty cavity, they will emerge in state **g**, if they encounter a photon they will emerge in state **e** (the position of the atomic energy levels)."*

"A spectroscopy determine the state of the atoms. (able to make hundreds of measurements on a single photon without destroying it)"

"... demonstrating the fundamentals of quantum mechanics."

*"Physicists watch the "birth, life and death of a photon"
Michel Brune and colleagues at the Ecole Normal Supérieure in Paris*

On the other hand a trick can demonstrate well how we could change the impedance of an entangled system, giving it a harder impedance, so that the impedance of the angular momentum of a photon, the measurement expression, doesn't affect the transmission of information significantly. We can realize that with the atom entanglement according to the scale factor principle. The atom entanglement implies a more energetic angular momentum i.e. lower impedance.

"Neutral atoms are ideal objects for the deterministic processing of quantum information".

"Entanglement operations have been carried out by photon exchange or controlled collisions, and atom-photon interfaces have been realized with single atoms in free space or strongly coupled to an optical cavity".

"... a single-photon source with one, and only one, atom quasi-permanently coupled to a high-finesse cavity".

"This is achieved by a unique combination of single-photon generation and atom cooling".

"... deterministic protocols of quantum information science with light and matter closer to realization".

Nature Physics

"A single-photon server with just one atom"

*Markus Hiljkema, Bernhard Weber, Holger P. Specht,
Simon C. Webster, Axel Kuhn and Gerhard Rempe*

These experiments demonstrate the interactive border line between the quantum world and the semi-classic world, but these are just usual etiquettes, because it doesn't exist- any classic/quantum world, it exists only a quantum phenomenon where the complexity and the corresponding resolution grade relates our etiquettes. When complex standing waves aren't in Bose-Einstein status, i.e. in a decoherence status, the still existing interaction isn't observable because it is very short transition time in which the transition of the entanglements status evolves. The thermodynamics, using a classic expression, doesn't enable the actual instrumentation (its resolution grade) to look at so fast transitions. The new attoseconds Laser pulses could be the right way in the future. The Gauge symmetry is never broken, it's only hidden.

A key-stone because reality exists independently of observation is the double reality of locality and non-locality, i.e. of the two coexisting phenomena of propagation/conduction and entanglement.

Locality and non-locality

The concept of time is strongly connected to our living biological process that implies dynamical interactions. Therefore in our unique "living reality", only the 4D space-time reference (the locality) is conceivable, but both locality and non-locality are existing reality.

*"... **manifestations of material which would normally be mutually exclusive - e.g., local and not local, coherent and not coherent - are indeed measurable and make themselves evident, in a particular "transition area". One can speak of partial localisation and partial coherence, or partial visibility and partial differentiability**".*

"In this transition area the Complementarity Principle, and the complementary dualism of nature, can be extended to be a co-existence principle, a parallel dualism. Nature has thus an ambivalent character previously unassumed. Atomic interferometry provides us with examples of this ambivalence".

Nature 437, 711-715, September 29, 2005

Source: Max Planck Society

Locality / non-locality i.e. propagation-conduction process / entanglement i.e. decoherence / coherence i.e. 4D space-time / 3D space are coexisting reality in a universal open system.

A system coexists as "superposition" in a "pure state" which is said to be coherent. The process which converts a pure into a mixed state is known as "decoherence".

Our, conceivable, relationships leave in the locality, but we must also observe the "tunnel effect" as a transition effect between coherence and decoherence. The nature is made of these mixed states. Our experimental view can refer on one of the two aspects showing the other. The minimal conceivable aspect must be referred to the space-time stitch.

Fig.4 Neutrino model and space-time stitch.

A geometric interpretation of electromagnetism: Localization of the particle in the theoretical model of the SFT.

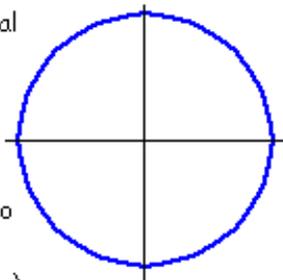
The harmonic motion electric field and the harmonic motion magnetic field, orthogonal to each other and with a phase difference of 90° , build up a circumference (Lissajous picture). The two orthogonal axes of the circumference are the two axes of Planck related to the two fields (electric and magnetic).

The spinning of the electromagnetic standing wave, the circumference, builds up the electromagnetic sphere (photon/electron) forming a three-dimensional picture. The second counter-rotating harmonic motion electric field and the second harmonic motion magnetic field, build up the second sphere, the antisphere. **The sphere together with the antisphere (antiphoton/positron) build up the neutrino.**

The harmonic motion electric field and the harmonic motion magnetic field, orthogonal to each other and with a phase difference of 90° , build up a circumference

(Lissajous picture)

The two orthogonal axis of the circumference are the two axis of Planck related to the two fields (electric/magnetic).



The spinning of the electromagnetic standing wave (the circumference) builds up the electromagnetic sphere on the third axis.

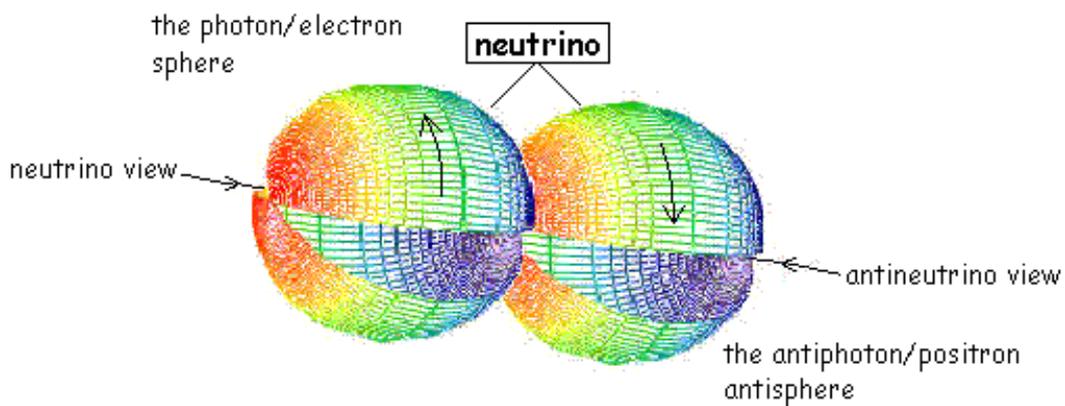
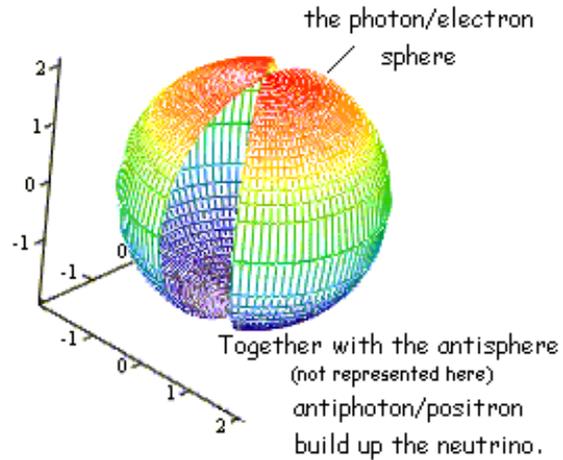


Fig.4 Neutrino model

The space-time stitch model, the dark matter.

One sphere is the photon/electron, The counter-rotating sphere is the antiphoton/positron. **Both are the neutrino. The side of the spheres that is seen defines the neutrino/antineutrino aspect.**

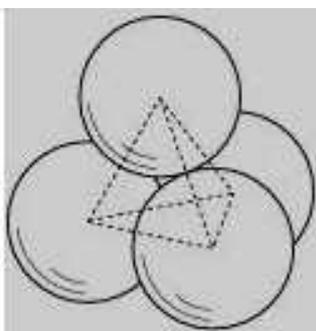


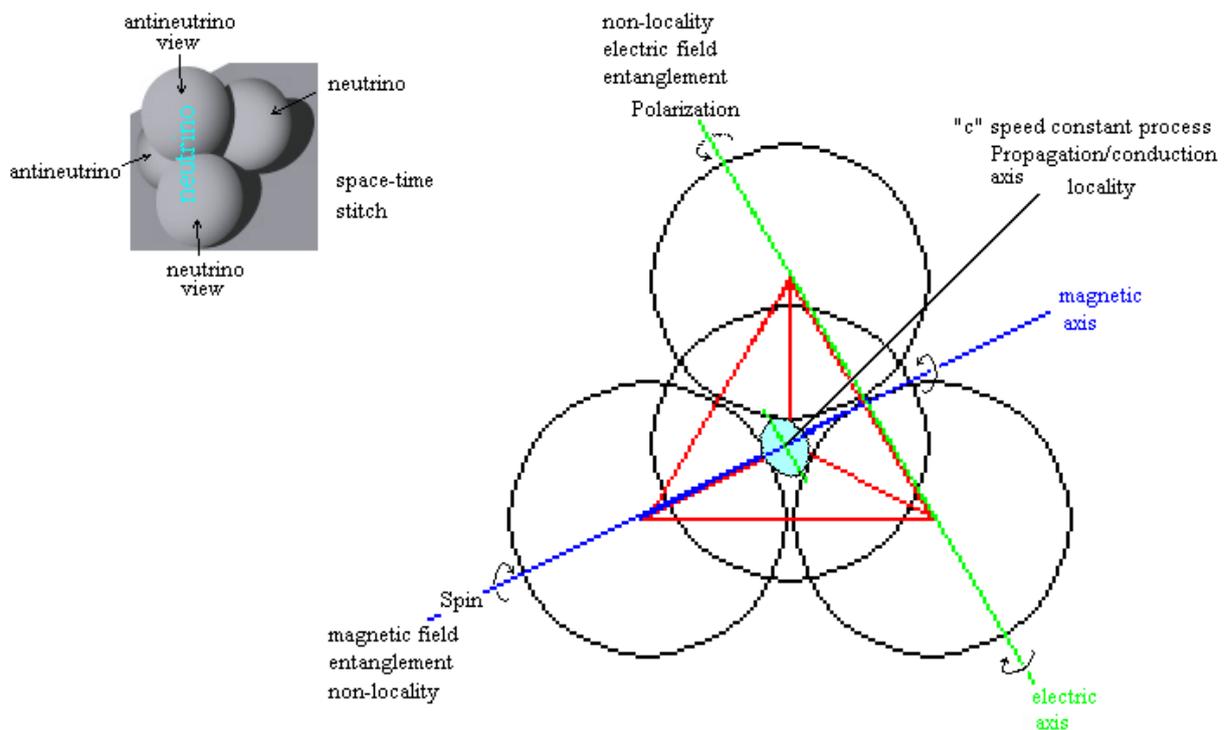
Fig.5 3D vision of two neutrinos: the pixel of the image space-time.

The **space-time stitch is composed of two neutrinos** geometrically organized not to lose any space among the spheres. The space is fully quantized. A fully quantized space that, paradoxically, we call quantum vacuum.

The lines **connecting the Centrum of the 4 spheres** (the two neutrinos, 2 pairs of $(\gamma^+ - e^- / \gamma^- - e^+)$ design the geometric picture of a **tetrahedron**. Similarly to the exceptionally stable carbon molecule: fullerene, the Fuller's geometry: an interconnected structure of triangular elements. A scale factor geometry.

The sides of tetrahedron are also the Planck's axes (through the spheres Centrum).

A. Poincare's opinion: *"physics and geometry are completing each other"*.



The perpendicular axes, **electric** and **magnetic** field, are not on the same plane:

The quantum jump of the annihilation/recreation process, the propagation/conduction process

The neutrino can't move itself , because it's the element of space-time stitch (the fine structure). **It can only propagate as annihilation/recreation process**, the propagation/conduction process, the light speed process. Therefore we say that its speed is "c", the speed of light. The neutrino **replaces itself with the orthogonal adjacent neutrino and so on i.e. realizing a neutrinos squish**. Each squishing neutrino, at the speed of light, **entangles the corresponding orthogonal axes (the electric and magnetic one)**, connecting, instantly, any system on the respective axes. Electrically or magnetically, as phenomenon of photon-polarization or electron-spin. This explains as the nature is interconnected in holistic way.

NEUTRINO system:

The collective behaviour of a system of particles can be so fundamentally different from that of the constituent individuals.

Fig.6 Isotropic dark matter model.

In accord to Clifford, Einstein and Schrödinger the mistake of material is solvable analysing the space structure, its geometry and not in the bits of the material.

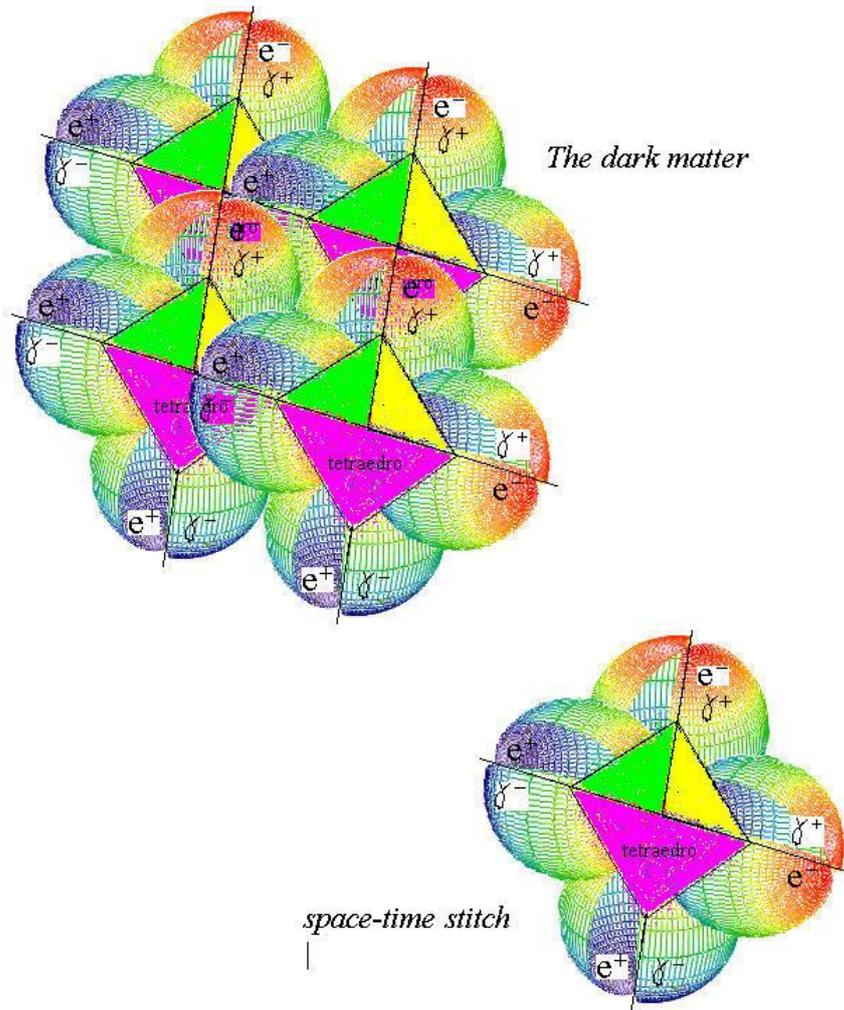


Fig.6 Isotropic dark matter model

Dynamics of the isotropic neutrinos space-time.

The dynamics of the isotropic neutrinos space-time, geometrically, is a continuously random reorientation of the tetrahedral picture that connects the neutrinos centres everywhere in the space-time. It doesn't exist any initial preferential condition or orientation, it doesn't exist any static condition. It's a **continuum random variation in the orientation of the entanglement status that relates to a global dynamic connection in every direction of space-time.**

The tetrahedral neutrinos structure has only 6 sides and therefore it can have only 6 preferential directions of propagation/conduction in an imaginary static space picture vision. But the **Universe, an infinite space-time, a quantized plenum of neutrinos is, holistically, interconnected by means of entanglement, a dynamic entanglement.** A static entanglement, in a general contest, couldn't have any sense just like for the basic concept of static space or time unrelated to space. The dynamic is an integral part of the postulate and **the strong Universal spatial entanglement must evolve continuously. It's a**

process of space-time. Zitterbewegung ("jitter") is the source needed from resonance law, the law that represents the dynamic of postulate. Zitterbewegung is an oscillation term with an amplitude equal to the Compton wavelength, is a circular motion of electrons, which is responsible for producing their spin and magnetic moment. The existence of such motion was first proposed by Erwin Schrödinger in 1930 as a result of his analysis of the wave packet solutions of the Dirac equation for relativistic electrons in free space, in which an interference between positive and negative energy states produces what appears to be a fluctuation at the speed of light.

E. Schrödinger, *Über die kräftefreie Bewegung in der relativistischen Quantenmechanik* ("On the free movement in relativistic quantum mechanics"), Berliner Ber., pp. 418-428 (1930); *Zur Quantendynamik des Elektrons*, Berliner Ber, pp. 63-72 (1931)

The zitterbewegung supplies the annihilation/recreation pair process. The zitterbewegung motion is the basis of particle spin. The spin is undetermined until it will be applied a field that aligns the zitterbewegung into a specific (determined) helical motion, either with positive or negative helicity, i.e. with spin up or spin down.

The entanglement dynamic evolution works by means of the propagation/conduction process, an interaction process, i.e. it depends on the angular momentum (from circular polarization and from spin).

The photon angular momentum preservation is the direct reason of the isotropic neutrinos space-time. **This is, also, the energy preservation principia related to the light speed process. It's also the narrowest connection between dynamic entanglement and propagation/conduction process. The two basic elements of space-time, the two basic elements to explain the non-locality/locality interconnection.**

In the isotropic space-time the two aspects, entanglement and propagation/conduction process (non-locality and locality), are the dynamic random process in space-time, the zitterbewegung: The most elementary source of quantum de-coherence. A relationship between entanglement and propagation/conduction must exist also for complex systems. The study of this relationship can be initiated by special material with anisotropic structure (non-linear crystal, nanocarbon atomic monolayer, etc.) that should show, in the confining atomic monolayer structure, the double future of entanglement (tunnel effect), non-locality and the superconductivity at high temperature (like Bose-Einstein status).

A 2D (bidimensional plane) material shows easier superconductive features at high temperature because the directional dependence that occurs in 2D material (electron-conduction). High temperature superconductivity is highly related to understand scientific issues in condensed matter physics.

" What do we wish to express when we say that our space is infinite?

Nothing more than that we might lay any number whatever of bodies of equal sizes side by side without ever filling space".

"... space is infinite in relation to practically-rigid bodies, assuming that the laws of disposition for these bodies are given by Euclidean geometry".

Einstein, 1921 Geometry and Experience

The space of the SFT is infinite in relation to standing waves, assuming that the laws of disposition for these standing waves are given by Euclidean geometry i.e. the geometry of neutrinos in the space. The dynamic of neutrinos in the space: the zitterbewegung is the dynamic Euclidean geometry representing the space-time.

The physical meaning of **the SFT** model must integrate and perfectly correspond in an univocal explanation: **a geometrical theory**. The SFT is a simple theory that would fit all known empirical information, where any physical product can be created from only a piece of geometrical information!

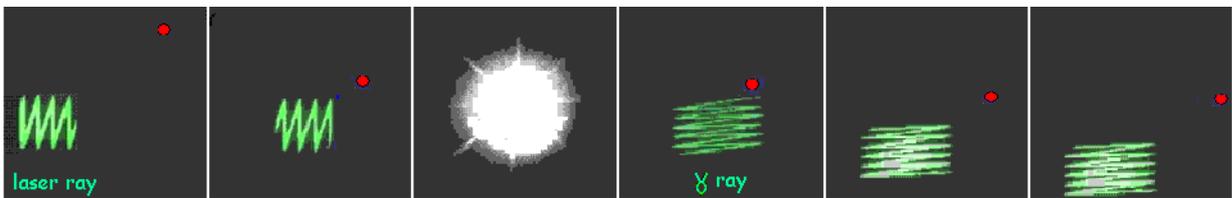
The fine structure constant α is the amplitude for a real electron to emit or absorb a real photon.

" α ... a magic number that comes to us with no understanding by man. You might say the "hand of God" wrote that number, and "we don't know how He pushed his pencil."

Feynman

The fine structure constant α is the measurement of the e.m. force that controls how the photon interacts with the electron. It's the exchange between standing waves, between ($\gamma^+ - e^- / \gamma^- - e^+$).

An electron, which interacts with a laser ray orthogonally, converts itself in a γ ray (annihilation) that recreates a new electron (recreation) in an orthogonal direction to the first one.



↓ First **electron** direction ↓ γ ray → New recreated **electron** direction →
interacting with a **laser** ray (annihilation) ↓ γ ray orthogonal direction ↓

The γ photon and the electron e have orthogonal resonance cushions. It's important to note the new orthogonal direction of the recreated electron referred to the previous direction of the first electron.

The laser ray interaction produces the annihilation/recreation pair process in an "artificial mode" so as the zitterbewegung makes it in the constant natural dynamic of space-time. The electron has a resonance peak very sharp, the Compton frequency, with an energy $hf_c = 512 \text{ KeV}$. The most precise value known in nature.

The SFT is a geometrical theory constructed on the basis of the number π and the fine structure constant α . **The fine structure constants α and π are ontological super-constants, from which all dimensionless physical constants come from.** The fine structure constant α is dimensionless because is relatable at other two fundamental constants: h and c .

$$\alpha = e^2 / \hbar c$$

$$\hbar = h / 2\pi$$

$$e = \text{electron charge}$$

$$c = \text{light speed}$$

The force of the e.m. field, defined by α (how the photon interacts with the electron) is the force required to spring knot to knot in the space-time chain, it's the quantum force of energy α **among** neutrinos. It is the same force that is present in the propagation/conduction process. **The segment among neutrinos is the quantum distance (unity distance) at which the quantum craft of the e.m. field (α) works.** The segment **among** neutrinos is equal to the tetrahedron side and equal to the diameter of neutrino sphere.

Quantum distance means to consider the diameter $d = 1$

quantum distance = $d = 1$ = neutrino distance = distance at which α works

Therefore: $\pi = \text{circumference/diameter}$

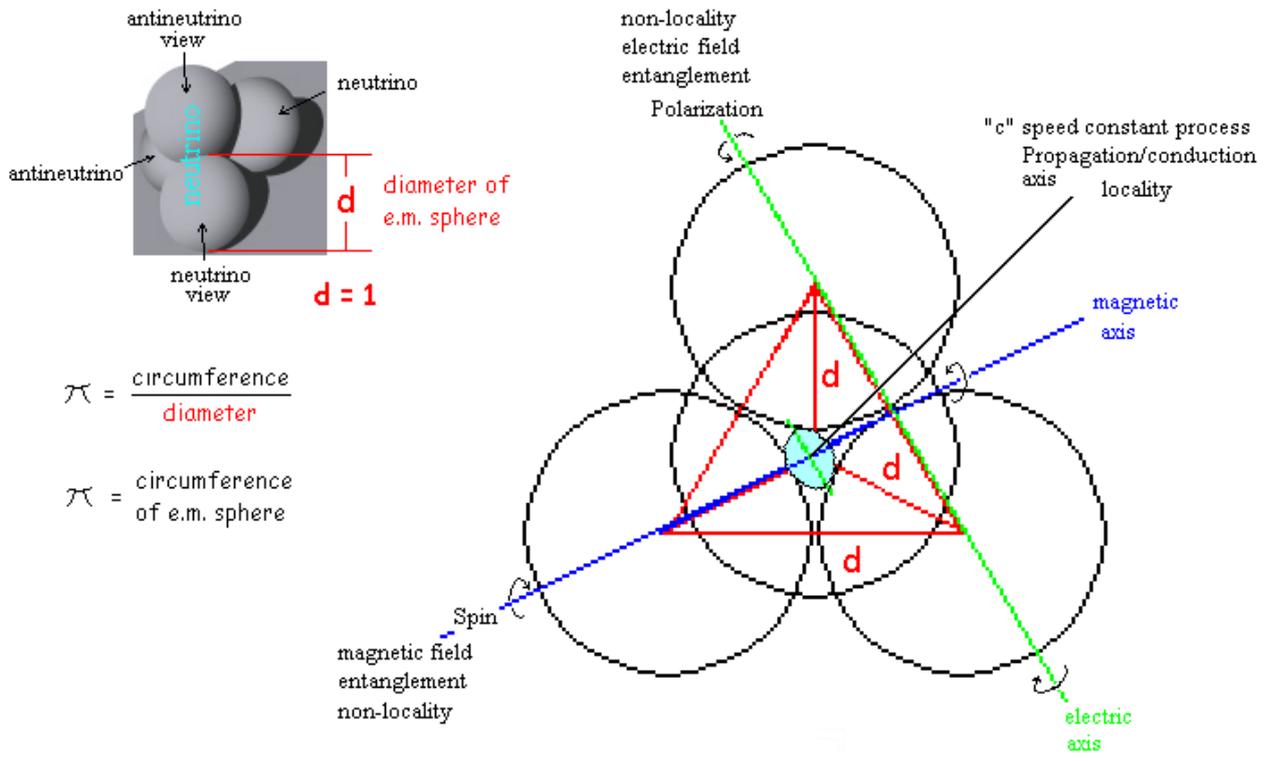
$\pi = 2\pi r/1$; $\pi = \text{the e.m. circumference of neutrino sphere}$

Neutrino geometry and space-time stitch of SFT is perfectly compatible to π , that represents the circumference value of neutrino.

$\alpha h c = 2 \pi e^2$ the three constants that define the dynamic geometry of e .

$\alpha h c = 2 (\pi e^2)$; $(\pi r^2) = \text{circle area}$

$\alpha h c = 2 \text{ e.m. standing circles. (Fig.4 Neutrino model)}$



d = tetrahedron side = diameter of e.m. sphere = distance at which α works = 1

the fine structure constant α = the quantum jump

What causes the motion of the electrons is that motion is constrained by certain geometrical laws.

The Compton wavelength of an electron: $\lambda_c = 2.42631021^{-12}$ m.

Propagation/conduction process viewed as photoemission/photoelectric effect

The photon propagation agrees with the electric field aspect, while the electron conduction agrees with the magnetic field aspect. Both **propagation and conduction belong to the same physical process: propagation/conduction. Therefore they have the same speed "c".**

The **photoelectric effect** relates to the **recreation pair process** and the **photoemission** relates to **annihilation**. The difference is only a scale factor. The photoelectric effect works near our- wave length perception and is used for the atomic spectrometry.

In a **medium** the repeated process of **photoemission/photoelectric effect** interchanges angular momentum (spin) among electrons-ions: the atoms of the medium. The different relative structures (electrons-ions) spin at different velocity, with different electrodynamics, "spin velocity" reaction, and therefore the light speed and the conduction speed in a medium are always minor than the light speed "c". The speed depends on the electrons-ions structure: the medium atomic composition. The kinetic momentum is linked to the "spin velocity" of the particle.

"... negative electricity is caused by sub-atomic carriers of particular mass and charge (electrons), there were good reasons to believe that metallic conductivity rests on the motion of electrons."

"hypotheses: the number n of free electrons is independent of temperature; the free path length of the electrons is inversely proportional to the root of the energy content of the metal."

"...one could imagine that the electron in an agitation-free metal moves as if in empty space, but inhomogeneities due to thermal excitations provide electric fields which deflect the electrons."

"The curvature of the resistance curve at low temperatures is thereby indirectly related to quantum theory."

"...the resistance of the pure homogeneous metal could have zero resistance as the limit."

"Electric conductivity at ordinary temperature may be based on ongoing thermal creation and annihilation of conduction chains."

Theoretical remark on the superconductivity of metals (1922) A. Einstein

SFT relation to special relativity

The **special relativity** is particularly related to the **light speed c** that is also represented by the **propagation/conduction process** of the SFT.

$$\Delta E = \Delta mc^2$$

momentum = $\mathbf{p} = (E / c^2)(\mathbf{v})$

but $\mathbf{v} = \mathbf{c}$, therefore: $\mathbf{p} = \mathbf{E} / \mathbf{c}$

because $E = hf = h(c / \lambda)$;

$\mathbf{p} = (hc / \lambda) / c$

$\mathbf{p} = h / \lambda$

($\lambda_{\text{de Broglie}} = h / m\mathbf{v}$)

$E = \mathbf{p} \mathbf{c}$

the energy = angular momentum (SPIN) for a constant speed free from any frame of reference.

$$E \Rightarrow \text{SPIN} \Rightarrow mc^2$$

Compton discovered that **x-ray photons** when collided with **electrons** in a graphite crystal displayed particle properties of momentum.

The **energy can transfer itself only by means of spin and at the constant light speed c** that is the constant of the unique possible dynamic process: the **propagation/conduction process**. SPIN: an energy for an inertial mass.

SFT relations between fine structure α and propagation/conduction process.

The **acceleration of the electron, Compton's standing wave in space-time**, produces a **quantum Doppler effect**, a step equals to α that, at the considered unity distance, begins a cascade process of reconfiguration of the leptons couple, a reconfiguration between ($\gamma^+ - e^- / \gamma^- - e^+$). **Annihilation/recreation pair process looks like the propagation/conduction process, the light speed process.** The Doppler effect produces a $\Delta\lambda$ Compton, when the $\Delta\lambda$ is bigger than the unity basic quantum a new reconfiguration of the standing wave neutrino takes place. The reconfiguration between ($\gamma^+ - e^- / \gamma^- - e^+$) begins as a cascade process through space-time. To cross the space-time stitches means to jump in

quantum steps knot to knot in the space-time, in α fine structure steps. That is the locality, the concept of motion i.e. the concept of a moving "mass".

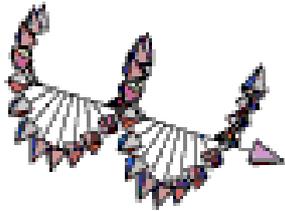
"moving matter generates two kinds of gravitational fields: gravito-magnetic and gravito-electric"

Einstein

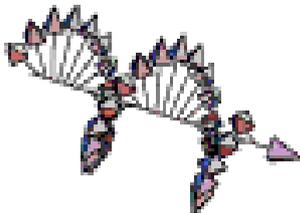
Inertia and gravity in respect to general and special relativity.

The light has angular momentum related to its polarization.

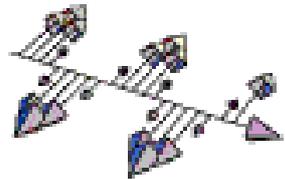
The quantum state of spin rotates. The polarization vector of ray rotates in the transversal plane, the ray has angular momentum so as a rotating mass.



spin = $-1 \hbar$ per photon (right-hand circular polarisation)



spin = $+1 \hbar$ per photon (left-hand circular polarisation)

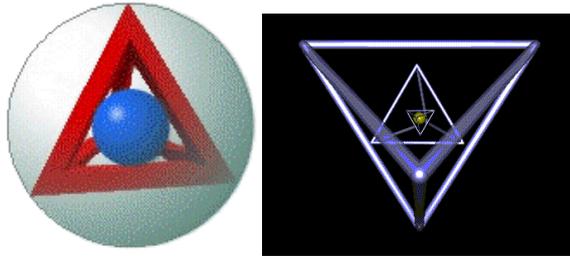


spin = 0 (linear polarisation)

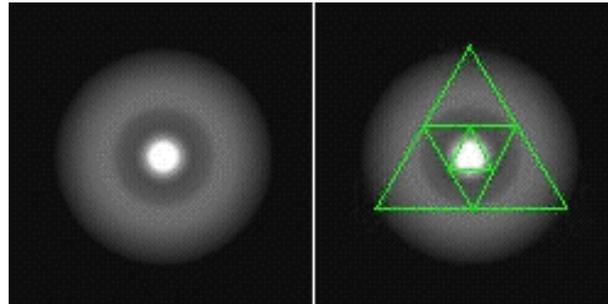
There isn't a proper state for spin = 0, the two overlapped spins ($-1 \hbar$, $+1 \hbar$) produce the status of spin = 0. It's an equilibrium state between the other two dynamic states, there isn't rotating state, but only an oscillation in a plane.

The spin is the angular momentum of the e.m. wave in space-time, it's the concept of phase space-time and is a non-local phenomenon.

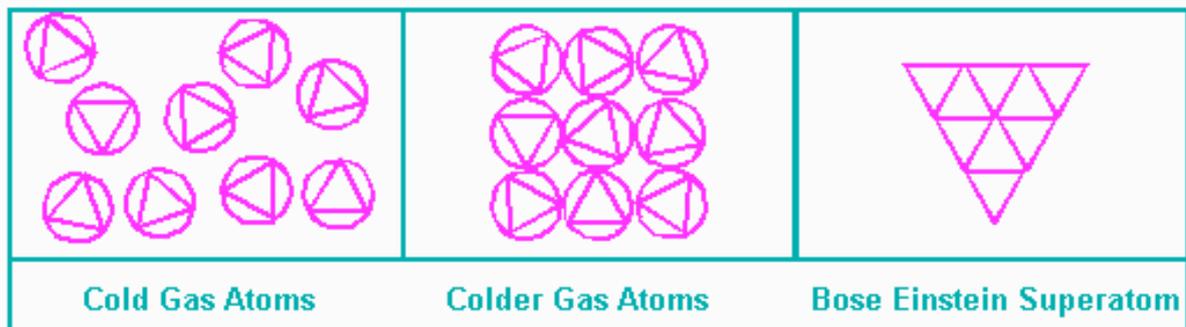
Angular momentum (spin) among electrons-ions, the atoms, has different velocity, different "spin velocity" reaction (different electrodynamics). Hydrogen atom is the most elementary one. The electrons are confined in a geometrical space in the same manner of rotating standing wave. The dynamics of the isotropic neutrino space-time, geometrically, is a continuously random reorientation of the tetrahedral picture that connects the neutrinos central points everywhere in the space-time. **A rotating tetrahedron in every direction respect to its Centrum builds up 2 spheres.** One inscribes its face and the other circumscribes its vertices.



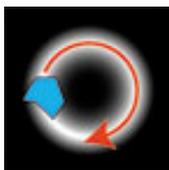
The big sphere can represent the next small one and so on ... **are geometrical forms, variations in space-time structure.** The physical complexity is a special geometry: **Spherical harmonics.**



Elementary spherical distribution of an hydrogen atom, in the first excitation status. Electromagnetic wave on a standing wave structure interacts interchanging angular momentum (spin). That is the thermal effect. The impact of the thermal energy on the rotating tetrahedrons:



A screened atom at absolute zero doesn't rotate and the structure remains a 2D standing wave, a Bose-Einstein condensation. In the same way the photonic ray when has the two spins ($-1 \hbar$, $+1 \hbar$) overlapped, produces an angular momentum = 0, spin = 0 loses one dimension vibrating in a plane.



Experimentally it is demonstrated that the quantum state of spin, the mechanical nature of the light (the angular momentum), rotate because the spin produces a rotation of a particle around its axis.

Summarizing:

A single fundamental building block exists: the resonant electromagnetic scalable wave (scale factor), where different resonant electromagnetic waves represent the different particle types, since different resonant modes (complex nodes structure) are seen as different spinning masses. **A complex structure**

defines spherical harmonics, what is called "mass". The matter is made of more complex standing wave, with different angular momenta, where the spin velocity is inverse proportional to their complexity.

On the rigid Planck's net it was born the isotropic 3D matrix made of space-time pixel, the knots on the Plank's net: The neutrinos. The different resonant modes, in that space-time made of neutrinos pixel, represent space-time deformations. **A dynamic deformation of the space-time net is the gravitational wave.** The quantum space-time elasticity. The regularity of the isotropic space-time net is defined by the local gravity value.

Quantum gravity:

"gravity pixel" and electromagnetism can be unified in the geometrical model of neutrino, where the two neutrinos space-stitch represent the cell for the "unity mass" configurable and definable like an electrodynamic's "gravity pixel".

Space-time and gravity: *The explanation of General Relativity in the structural logic of quantum electrodynamics.*

On the rigid Planck's net it was born the isotropic 3D matrix made of space-time pixel, the knots on the Plank's net: the neutrinos. The quantum space-time elasticity is quantized per jump of λ_c (Compton wave length), the complex standing wave is built with harmonics of λ_c (bigger wave length and minor energy) and therefore enlarges the local space-time stitches. So a local gravitational field surrounds the complex standing wave, the gravitational gradient related to matter in space-time.

A single fundamental building block exists: the resonant electromagnetic scalable wave (scale factor), where different resonant electromagnetic waves represent the different particle types, since different resonant modes (complex nodes structure) are seen as different spinning masses. **A complex structure defines what it is called "mass". The matter is made of complex standing waves entangled with different angular momenta, where the spin velocity is inverse proportional to their complexity.**

In the isotropic space-time net they are built up **different resonant modes**, it's what we call matter, whose presence in the space-time neutrinos pixel, **produces a space-time deformation: A gravity gradient. A dynamic deformation of the space-time net is a dynamic gravity gradient: it's a gravitational wave.** The regularity of the space-time net is defined by the local gravity value.

Viewing the matter as a local enlarged network of space-time:

A space-time made of matter. The explanation of Special Relativity in the structural logic of quantum electrodynamics.

"Matter" is a space-time gradient! The light speed, in fact, changes its speed in the corresponding gradient space-time i.e. to the corresponding space-time net with the enlarged dimensions (x, y, z). The process of light speed in the "matter" (the process of propagation/conduction) remains constant, but its speed is slower than "c" because the step process of "annihilation/recreation" follows a space-time/matter, which has a larger mesh respect to space-time, made of

neutrinos. The value of the light speed depends on the coordinates of space, depends on the local gravitational field, on the "matter" in which the process of propagation/conduction occurs.

Space-time and length contraction.

"The wave character of the phenomena of motion" (Einstein)

A space-time elasticity, quantized per jump of λ_c , can be produced by the presence of complex standing wave (gravity), but also by Doppler effect. A complex standing wave (matter), moving along a Planck axis, modifies its structure in the specific direction: reduces its length (length contraction effect). The contraction of the "matter" is related to the waves length contractions introduced by the Doppler effect. The quantum electrodynamics between the complex standing wave and the neutrinos (the space-time pixel, the knots on the Plank's net). Increasing the speed (acceleration) it increases the Doppler frequency that reduces the waves lengths of the complex standing wave quantizing per jump of λ_c . The Lorentz contraction reduces the waves length of the complex standing wave (object) because the Doppler-shift is increasing its frequency. A still more energetic "mass" modifies the space-time, travelling in it. **Accelerating the object, increasing the speed as far as the speed of light, the Doppler frequency increases until the complex standing wave, which composes the object, will be reduced to the γ wave length. So the object (the complex standing wave), per jump of λ_c , collapses, forming only a multitude of fundamental waves λ_c .** So that it looks as the gravitational collapse near the black hole: The gravitational singularity. (Fig.7) It's the extreme limit of the Principle of equivalence between gravity and acceleration (Einstein). The complex standing wave loses its structure and retransforms itself in the fundamental energy, returning in the primary form of γ photon/antiphoton and electrons/positrons. Partial structural modifications (less Doppler effect, less acceleration) produce only light emission.

The contraction of the length is the same regardless our approaching to an object or receding from it, because the only "frame of reference" is the neutrinos space-time. The contraction of the length is, in fact, caused by interactions among standing waves (the object) with the neutrinos compounding space-time. (Fig.4 Neutrino model). The e.m. standing wave spheres, the spinning e.m. circumferences, compounding the object reduce their diameters because of the Doppler effect and consequently we have the phenomenon of object length contraction. The length contraction occurs, of course, into the specific speed direction (the Planck's axis where both the angular momentum and the spin-spin interaction - take place (polarization/spin coherence). The length contraction is quantized per jump of λ_c , the Compton's frequency, the basic standing wave (quantum wave) on the fundamental Planck's frequency (f_p). **When The Compton's standing wave (electron at rest) moves into the space-time it passes through the neutrinos (made also of electrons) and interferes with itself.**

The electron is the unique e.m. wave that interferes with itself, producing the Doppler effect.

Because the e.m. standing wave compounding the object is (must be) an harmonic of λ_c , the spherical harmonics, the standing wave spheres, the spinning e.m. circumferences, must jump down per quantum step of λ_c .

The speeded object is contracted, but its energy is higher because of the shorter wavelength of the e.m. spherical standing wave, the spinning e.m. circumferences compounding the object.

A progressive increase of speed reduces the length of the object, jumping down per step λ_c , increasing in speed (until light speed), reduces the object in all coherent λ_c particles i.e. coherent neutrinos with the highest related energy: all coherent micro-black holes. The object can reduce its length also in a strong gravitational field, in presence of another big object, because the space-time deformation. If the very strong gravitational field is caused by a black hole, then the object reduces itself in coherent neutrinos like the space-time stitch near the black hole (gravitational collapse), just like for the very high speed (light speed). The two phenomena explain the Principle of Equivalence between acceleration and gravity until the singularity limit. Jumping down per step λ_c means the operating process propagation/conduction seen for the light speed "c".

The gravitational collapse of an object in a black hole reduces it in all coherent λ_c particles i.e. in all coherent neutrinos. Vice versa the recreation of material reapers on the cone of the black hole as a decoherence process in a zitterbewegung (dynamic) space-time i.e. the birth of matter: The black hole evaporation model of Stephen Hawking.

The one-dimensional resolution, related to the length contraction, is definable as the "relativistic point" that composing the length dimension and is represented by neutrino (quantum geometry).

Space-time and inertia.

The matter is made of complex standing wave with different angular momentum and the related different spin velocity are inversely proportional to their complexity. Because any interaction is possible only by means of angular momentum, the speed of light must correspond in space-time (in vacuum, neutrinos dark matter) to the primary form of photon/antiphoton, to its basic angular momentum (maximum speed). Vice versa the interaction between the angular momentum of the complex standing waves (matter) and neutrinos (the space-time pixel) angular momentum must have spin velocity inversely proportional to their complexity.

Increasing or decreasing the speed (acceleration or deceleration) changes the interaction between the respective speed angular momentum complex standing wave (matter) and neutrinos. These quantum electrodynamics interactions, an e.m. friction effect, is what we call "inertia" effect: **A variation of a relative**

quantum spin speed. The absolute motion, referred to neutrinos space-time, is proved by inertia. The "mass effect", inertia, is a scrolling on the fine structure caused by the Doppler effect.

Fundamental source for electromagnetism and gravitation.

According to SFT, which relates Special and General Relativity, defining gravity as geometry, the SFT lends information to the understanding of its cause, because an enlarged mesh of neutrinos space-time (geometry) means presence of complex e.m. standing waves i.e. presence of matter, so as accelerating matter it is achieved its contraction i.e. geometry contraction.

Summarizing:

A variation in space-time net is an anisotropy that manifests itself by:

- **Gravity**, a static deformation of space-time for the presence of a complex standing wave (matter).
- **Inertia**, a linear acceleration of standing waves (matter). The variation of quantum spin speed between standing waves (matter) and neutrinos of space-time.
- **Gyroscopic precession**, whose effect is produced by a constant angular speed of standing waves (matter), because of the continuum variation of direction, There is the continuum exchange of Planck's axis. When a complex standing wave (object) changes direction (changes Planck's axes), then the **gyroscopic precession effect** intervenes because of the angular speed: a collapsing and reproducing effect of neutrinos on the different axes due to interference with the speed components producing the matching Doppler effect).

A dynamic deformation of the space-time net, by means of one or more of the described effects, means a dynamic gravity gradient: it produces gravitational waves, that, for the explained intrinsic relativistic nature, must have the same propagation speed of light "c".

Quantum gravity is a quantum geometry: Any object, independently from its structure (mass), in the same gravitational field, falls down at the same speed. Two different objects, with different structure (mass), have different complex standing waves composition, but it doesn't change the speed of fall. The dynamic falling process (energy) links only "c" and "α". The dynamic falling process relates the light speed process.

$$E = m c^2$$

m = the mass whenever it doesn't change the speed of fall.

c² = acceleration is as constant as the gravitational acceleration.

E = the kinetic energy is related to the falling mass, moving in the space-time net, in its local mesh dimension. Any energy exchange interacts only by means of angular momentum (spin), i.e. it interacts by means of neutrinos propagation/conduction process. Therefore any type of "mass", any type of complex standing wave composition, in order to change its kinetic energy, must follow the **constant neutrinos propagation/conduction process** (like the "c"

process). This fundamental, prior process, is independent from the complex standing wave composition (mass). Therefore any object, independently of its structure (mass), in the same local gravitational field, falls at the same speed. **In the falling down direction the decomposition/recomposition of the standing waves, composing the mass, must follow the neutrinos step process, independently of the type of complexity of the standing wave (mass).**

The object in the gravitational acceleration reduces its length, following step by step the meshes of neutrinos that define the drop speed. The related gravitational wave has as source the neutrinos interaction which interacts at the speed of light. The neutrinos interaction, following the propagation/conduction process (the same light speed process), produces a gravitational wave at the same speed, at the speed of light.

"...the fundamental constant c entering the geometric and matter sectors of general theory of relativity has different conceptual meanings".

"the universal character of the propagation speed of light and the consequent dependence of space, time and other mechanical measurements on the motion..."

(Einstein).

The gravitational wave, a rippling in space-time, is detectable by means of the tides phenomenon. The gravitational strength of the moon and of the sun produces the effect of the tide on the earth. The maximum tide effect for the sun is delayed of 8 minutes: the same delay time of the light.

Gravity and light have the same speed, because they are referred to the same propagation/conduction process.

It is the only process capable to produce local interactions.

Two types of action at distance exists in the Universe:

Entanglement (non-locality) and gravitational wave (locality at speed " c ").

The first is related to the phase of space, the second one is related to the dynamic of space, the clock of space, the space-time.

Both of them exchange interactions. The biggest entanglement interaction is the entanglement among black holes. The biggest gravitational wave is the gravitational one generated by binary black holes. It is always a macro ensemble of neutrinos, the basic element of space-time.

Quantum entanglement, quantum electrodynamics, quantum gravity, SR (" c "), GR (space-time geometry), altogether, have the same common matrix in the SFT.

What we call "quantum vacuum" is a **quantum plenum of isotropic neutrinos, the dark matter** of space-time. The complex standing wave of the wave length that is bigger than λ_c (the matter) can be born inside the dark matter. Both, dark matter and matter all together build up the space-time. The gravity field effect is defined by the matter distribution in space-time: a local geometry, an anisotropy in the dark matter. At bigger standing wave (bigger matter) corresponds bigger geometric deformation of space-time and as consequence local bigger gravitational field effect (bigger gradient).

The interaction, the angular momentum or spin, binds photons/antiphotons-electrons/positrons (the neutrinos) with complex standing wave (matter).

The matter is made of more complex standing waves, with different angular momenta, where the spin velocities are inverse proportional to their complexity.

The energy equilibrium between particle and antiparticle (the reflection point for resonance) can be realized also between leptons and atomic nucleus, but with different angular momentum speed. This is the basic principle of connection among neutrinos, dark matter and matter.

The neutrinos that form the dark matter is the frame of reference for the accelerated object. When an object, made of complex standing waves, accelerates in space-time, it must interact via angular momentum, by means of spin/antispin reaction **between** neutrino spin of **dark matter and atomic** (ion-electron) **resonant antispinning** constituting the structure of the object. This interaction process is the same one that occurs between neutrinos, the process of light speed "c", the propagation/conduction process. The speed process for accelerated objects is slower because the spin/antispin interaction has different spin speed reaction, it doesn't have the same smallest angular momentum that occurs between neutrinos.

The **extreme deformation of dark matter**, the **maximum of gravity field**, is realized when in a **maxi-coherence**, an ensemble of **all neutrinos**, are all parallel oriented forming what we call **black hole**.

An extreme deformation of dark matter is a "**singularity**" in **space-time**, because in this space (of extreme deformation of dark matter) no propagation/conduction process (the speed of light "c") is possible (all neutrinos don't have more the tetragonal geometry), and then it doesn't exist time.

Just only space exists, the singularity is a non-locality phenomenon. Therefore the opposite phenomenon, the formation of matter in space-time, we can define it as **decoherence** phenomenon. The beginning of the decoherence phenomenon corresponds to the birth of matter: The black hole evaporation model of Stephen Hawking.

According to Einstein: Particles are not objects that reside in space-time, but parts of the space-time; not attached furs at the textile, but knots in the same textile.

Matter lives in space-time and is a complex structure with less energy than a black hole. **The energy is in inverse relation to complexity. Matter can't be arbitrarily compressed.**

A meaning to define the rest mass.

The relationship between the "quantum vacuum" (neutrinos space-time, a Minkowski space-time) and matter explains how we measure the motion without reference points and therefore what it is (represents) the rest mass of particle, considering the effect of the "quantum vacuum" as well as the matter and energy inside the "quantum vacuum".

Summarizing:

GRAVITY is a local space-time net with a spin angle coherence (anisotropy) referred to the dynamic isotropic neutrinos space-time net (dark matter) that, normally, lives without preferential orientation in a zitterbewegung status.

MAX GRAVITY means max spin angle orientation = singularity = black hole. All the neutrinos are oriented in the same direction. All neutrinos orient themselves summing the electric and magnetic field, orthogonally each other.

GRAVITY implies the presence of a complex standing wave (object) that orients the local isotropic neutrinos around itself. The spin angle gradient (gravity gradient) decays with the square of distance, as the electric/magnetic field composing the neutrinos (primary element). Therefore we can speak of gravito-electric and gravito-magnetic field (Einstein).

A complex standing wave (object) orients itself with the local spin direction i.e. the gravitational line field produced from another object in space-time. The object following the line field (a curved Planck axis) follows the coherence of its spin component, also contracting itself (because the Doppler effect by acceleration). This defines the moving object in space-time (also a curved space-time) or its dynamic equilibrium. A relationship between two gravito-electric and gravito-magnetic field means an electrodynamics spin interaction. The space-time (neutrinos) between and around the two objects remains spin oriented, proportionally to the square of distance.

Gravitational wave:

If two (or more) objects move reciprocally then a dynamic spin oscillation occurs producing a perturbation of the neutrinos space-time that we call gravitational wave. **This gravitational wave propagates itself** (because of the oscillating spin) **orienting the neutrinos space-time net** (the dark matter that, normally, lives without any preferential orientation in zitterbewegung status), and **coherently putting them in the same oscillation**.

The speed of neutrinos spin-spin angle interaction (the speed of the gravitational wave) is the same of the electromagnetic propagation/conduction process interaction (annihilation/recreation of photon/electron - antiphoton/positron) i.e. the light speed "c". The neutrino spin oscillation implies the oscillation of its components i.e. its electric/magnetic field. Electromagnetic field and gravitational field (gravito-electric and gravito-magnetic) are two aspects of the same postulate.

The neutrino spin oscillation is a partial angular phenomenon of the electromagnetic propagation/conduction process interaction (annihilation/recreation of photon/electron-antiphoton/positron), it means the basic interaction. Today it is possible to produce, experimentally, by means of off-resonant picosecond-scale optical pulses, a coherent rotation of a single electron spin through arbitrary angles up to π radians.

Each single neutrino is the fundamental wave composing the complex standing wave (the object). When the object moves with constant speed (respect) to the neutrinos net (space-time), in the line of Planck axis following the spin angles, a neutrinos exchange between space-time and object (a scrolling in/out in the complex standing wave) takes place. A real object is definable as a complex standing wave, as mass at rest, minus a fixed length contraction proportional to its constant speed. The energy of the complex standing wave plus the kinetic energy, for the reduced wave length by Doppler effect, defines the real energy i.e. the complete future of the object.

How it works and what defines a moving object.

Mains reference points are these:

- it must underline a RESONANCE process. The universal law of every dynamic.
- it works by means of SPIN-process (angular momentum) because it's the only way of every possible interaction.
- the object is made of complex standing waves.
- at a single spin interaction relates a step of light speed process.
- the moving object direction follows the Planck axis of neutrinos space-time, the axis can be also a curved axis because of the local spin orientation of neutrinos (the gravity line gradient).
- The spin angle sequence on the Planck axis (curved line) defines the gravity gradient.
- The moving object on neutrinos space-time, produces Doppler effect i.e. length contraction.
- The light speed doesn't depend on its wave length.
- The light speed in an object is lower than "c" and depends on its wave length (prism effect).

The light speed "c" in an object at rest (the object doesn't change its complex standing wave, no recomposing process takes place) depends on the type of standing wave composition (its angular momentum for the spin exchange) and on the wave length of the propagating light, it depends on its interacting angular momentum value.

Every standing wave moves itself in neutrinos space-time by means of a spin resonance process on the Planck axis (direction) and contracts itself on the relating segment of the specific Planck axis.

The quantum resolution relates itself to the neutrino (the quantum space-time).

The quantum process time relates itself to the single spin-spin electrodynamics reaction that happens at the light speed. At the maximal possible acceleration of the object, at the speed of light, the length contraction phenomenon reduces the object in a whole of fundamental waves (the Compton wave) i.e. in the formation of a Black hole.

The speed of the object relates itself to the scrolling time of many spin-spin reactions, each linked to the fundamental wave λ_c , recomposing the object in its length relating to the local gravitational field gradient.

The quantum length (λ_c), as well as the quantum speed ("c"), are independent from the type of standing wave composition (type of object).

The moving object operates a process of length contraction for the correlated Doppler effect. The moving complex standing wave jumps down per spin-spin interaction between the neutrinos space-time and reforms the object, it also reforms the new complex standing wave, step by step. The reconstruction step relates itself to the spin collapse, to the constant speed of light.

In the scrolling steps the moving object rebuilds up itself. Each quantum step is referred to quantum light and works as well as the propagation/conduction process.

The electrodynamics interference (inertia) depends on the spin orientation that in a normal object (a complex e.m. wave) has an isotropic distribution. In anisotropic condition, for an object with coherent spin (a "coherent object", a special case) changes the fall speed. It's the case of superconductivity, the Bose-Einstein matter, etc.

Special materials, like the non-linear crystals, nanomaterials or materials at Bose-Einstein status, could realize partial coherence of some bordering areas where new FEATURES and phenomena just like superconductivity, the tunnel effect and entanglement could be shown, i.e. the non-locality can emerge and can be explained.

Fig.7 The black hole: a quantum coherence.

With the same structure as a laser, but on a gamma wave length, it's a macroscopic phenomenon of quantum coherence: when large numbers of particles can collectively cooperate in a single quantum state.

This is closely related to what is called "Bose-Einstein condensation": A matter coherent status.

Space-time anisotropy in dark matter: coherent status of all neutrinos

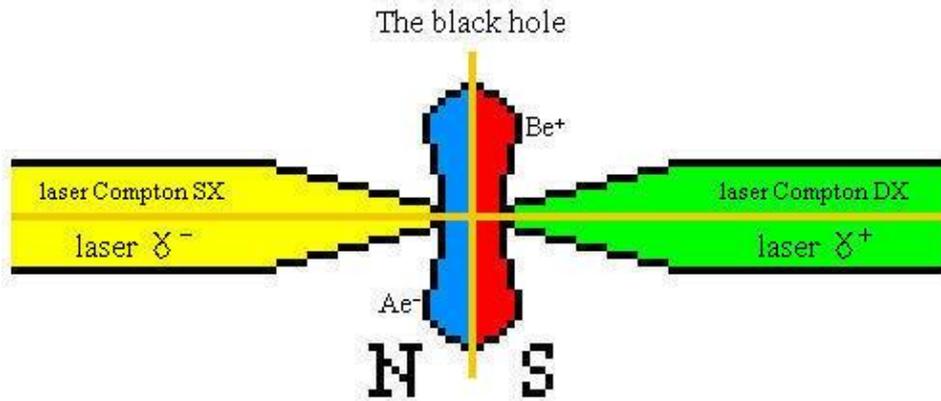
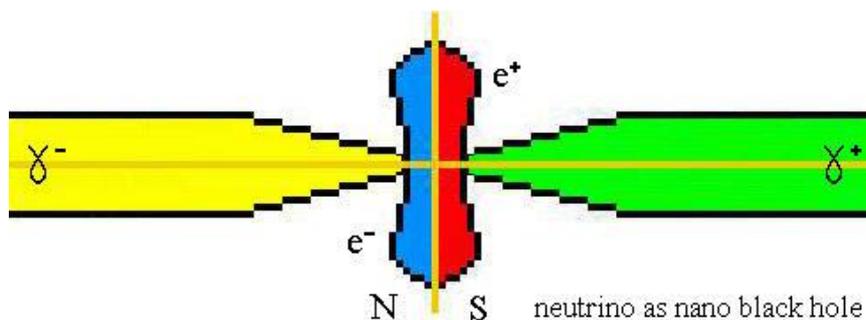


Fig.7 The black hole

Quantum coherence: "This refers to circumstances when large numbers of particles can collectively cooperate in a single quantum state..."

Roger Penrose

A coherent large number of neutrinos can collectively cooperate in a single black hole.



A neutrino seen as a nano-black hole, a single element of the black hole.

A nanostructure can be an anisotropic source localizing, with an ad hoc geometry, one of the two (possible) aspects: the entanglement or the propagation/conduction, the non-locality or locality prevailing.

Specific nanostructure can combine the tunnel effect and/or the superconduction effect. More elements (particles) of quantum systems, in decoherence status, take the shape of a classic system. It's not significant and/or perceptible respect to the global function. It's just like looking at an image made of pixels, but you can see it as a whole without analyzing individual pixels. Nature is arranged to the macro management on the basis of the micro things, according to the principle of the scale factor.

Superfluidity, superconductivity and the laser are macroscopic systems of quantum coherence.

Synthesis of theory: The hypothesis should complete the theory of relativity, according to quantum mechanics, and replace the uncertainty principle with the principle of quantum resolution.

The SFT begins with a single postulate, the electromagnetic field, and a single law, resonance and it involves four properties: the *quantum*, *symmetry*, *synergy*, and the *scale factor*. It redefines the concept of "interaction" and "process", fundamental principia for energy exchange, by means of the only interaction of the angular momentum.

The reflection point is essential to resonance. It's realised by two counter-rotating standing waves (photon/antiphoton). It's the electric field aspect. The electron-positron are two counter-rotating standing waves, with a separation distance of half of the photon wavelength. This is the magnetic field aspect. The electric field and the magnetic field, together, constitute the electromagnetic wave function, definable as neutrino/antineutrino. It's the pixel of the *image* space-time. **The SFT may provide reasonable explanations, using Special Relativity, for the fundamental assumptions of gravitation theory as represented in General Relativity.** The effects of inertia are equally well explained on particle travelling in geodesic motion defining the curvature of the particle in space-time.

The **black hole** as a laser, of wave length gamma λ_γ , is a macroscopic phenomenon of quantum coherence. An object, near a high energy line is dismantled in its harmonics and feeds the black hole. This is the **gravitational collapse**.

As a pure quantum system interacts with a quasi-complex system, which brings us to the borderline of knowledge between the quantum world and the classic world.

Where the SFT aims: When a "frame of reference" (a complex standing wave) accelerates among the knots of isotropic neutrinos (space-time) then a Doppler effect engages a $\Delta\lambda$ emerging from the relative electrodynamics interference and manifests the effects of **inertia**. A reconfiguration of the standing wave, through quantum jump, occurs when the Doppler effect produces a $\Delta\lambda$ bigger than a Compton wave (electron acceleration), building up new pairs of photons/antiphotons as a "visible" **inertia effect**.

A static deformation of space-time is formed by the presence of a complex standing wave group because of the different wavelengths (different harmonic composition).

The presence of a set of anisotropic standing waves (matter) into an isotropic plenum of neutrinos (ironically, called quantum vacuum) is a **gravitational field**.

The effect of inertia, acceleration in a straight line of an object, is due to the Doppler effect on a specific axis of Planck.

If a complex of standing waves (object) changes direction, doesn't follow a straight line, i.e. it changes the Planck's axis, intervenes the gyroscope precession effect because of the angular acceleration: changing axis means to interfere with the geometrical components of different directions that cause the Doppler

effects, i.e. the effect of collapsing and reproducing on the different Planck's axis. That is the explanation of **the directionality of the inertia**.

Different wave lengths as deformations of space-time (gravity) or as acceleration, Doppler effect (inertia), produce the same result and effect. This is Einstein's **principle of equivalence**. The general theory of relativity and its geometrical representation are perfectly applicable to the SFT.

"The solution to this apparent paradox is to simply explain how the discrete "particle" properties of matter and light (quanta) are in fact caused by standing wave interactions"

Einstein

The neutrinos build up the pixel composing the space-time and fine structure. The neutrino is the primary cause of mass and inertia, but it can't have in itself the future of mass: The inertia because its speed is "c" (light speed).

The neutrinos build the space-time neutrinos-net, are they the medium in which the propagation/conduction process works, i.e. the annihilation/recreation process of neutrinos/antineutrinos, the light speed process (locality).

The neutrino is also the space middle connection between distant photon/electron and atoms (matter) at Bose-Einstein status (entanglement, non-locality). The two conditions should explain the two neutrinos models: The neutrino of Dirac and the neutrino of Majorana, **massless and massive neutrinos**. At the two models correspond experiments in monolayer and bilayer graphene.

"The unique electronic behavior of monolayer and bilayer graphene is a result of the unusual quantum-relativistic characteristics of the so-called 'Dirac fermions'..."

"...in monolayer graphene move as if they were massless, and in bilayer graphene they do so with non-zero mass..."

"Unexpectedly, we find evidence for the coexistence of both massless and massive DFs in graphite".

"Observation of Landau levels of Dirac fermions in graphite"
Nature Physics 8 July 2007 Guohong Li & Eva Y. Andrei
Department of Physics and Astronomy, Rutgers University,
Piscataway, New Jersey 08854, USA

SFT and Dirac's symmetry

The Dirac equation is a relativistic equation, derived from the Schrodinger equation, which physically describes the evolution of an electron, or generically the evolution of a particle with spin 1/2. The equation solutions have positive and negative status and therefore Dirac inferred that the "vacuum" was made of electrons. An electron, a negative energy status, can absorb e.m. radiation and generate a positive energy status i.e. a positron (or a hole in the "vacuum"). The

inverse phenomenon also occurs with generation of e.m. radiation. Therefore were introduced the symmetry operators:

C = the charge operator,
P = the parity operator,
T = the temporal inversion operator

The SFT, according to Dirac, considers the Dirac's "vacuum" as the neutrinos space-time (dark matter), where the **C**, **P**, **T** operators relate to the resonance law where the source is the zitterbewegung and the reflection point is the spin/antispin symmetry.

Future developments: The SFT could explain nanotechnology features. It's possible to apply entanglement, in scale, to complex systems.

It is a new tool to define and quantify entanglement beyond the original microscopic framework. The **main task** is to develop **quantum coherent states isolated from the environmental interactions, which cause decoherence.**

New physical phenomena come into play at the nano-scale, where quantum mechanical principles begin to dominate the material properties. Examples of these new phenomena are the **Coulomb blockade** and the related **single-electron transistor** device, the **spin-valve**, and **macroscopic quantum states such as the recently demonstrated Bose condensates.** A wealth of new physics is currently appearing in experiments, where Carbon Nano Tube CNT-hybrid devices, nanocrystal of semiconductor are the main examples.

Applications: New opportunities can be achieved following the SFT, characterizing quantum coherence and entanglement:

- The distribution of entanglement, through the network of quantum states between nodes, can be analyzed. It's possible to apply entanglement, in scale-factor, to complex systems. It's possible to realize a coherence status, i.e. a Bose-Einstein status, with specific nano-technological conditions at room temperature.

- It is to reach the control of semiconductor quantum dot spin by means single spin optical control. The degree of freedom of electron, the spin, its internal angular momentum, can be localized in semiconductor quantum dots.

The interaction of electrons and photons in semiconductor quantum dots is a direct link between electron spins and photon polarizations. Spin polarization can be converted into photon polarization and vice versa.

Polariton states are linked to propagation/conduction process of SFT

In semiconductors the strong confinement of a microcavity builds up a quasiparticle called "polariton". Polariton is an atom-photon system.

"Particles that are 'half-matter and half-light'".

"... how light interacts with semiconductors and other materials. It's an amalgam of two different ingredients: an electron-hole pair (or "exciton") and a photon, which is emitted when the electron and hole recombine."

"When a photon is emitted, it remains trapped in the material and creates another exciton, so the cycle is repeated. This continuous exchange of energy between photons and excitons can be described in terms of polariton states."

"...coherent monochromatic light is produced by the single lowest state of the system at the bottom of the polariton trap."

"... a Bose-Einstein condensate of polaritons is formed that requires no "population inversion", as in a conventional solid-state laser, so the lasing threshold is reduced by several orders of magnitude."

Ref. "Polaritons promise more efficient LEDs"

May 19, 2008 ([Nature 453 372](#)).

Pavlos Savvidis of the University of Crete

POLARITON, a scale factor of the neutrino model, in the SFT:

A polariton is an electron-hole (electron-positron) "exciton" and a photon, which is emitted when the electron and the hole recombine. Excitons are trapped in quantum wells formed at the two ends of a microcavity.

"When a photon is emitted, it remains trapped in the material and creates another exciton, so the cycle is repeated. This continuous exchange of energy between photons and excitons can be described in terms of "polariton states".

In the neutrino model of the SFT the continuous exchange of energy (by zitterbewegung or any other interacting anisotropic process) between photons-antiphotons and electron-positron (neutrinos), is the propagation/conduction process, the corresponding "*polariton states*" per scale factor. The difference is the wave length of the photon.

A Bose-Einstein condensate of **polaritons makes low-power lasers** sources, by the single lowest state of the polariton trap. (synergy).

Many quantum wells forming an ensemble of **polaritons making nano-lasers** sources could build up an anisotropic system in a solid-state nanotechnological

structure that is linked to a coherent matter like Bose-Einstein status at high temperature, performing features like superconductivity and gravito-electric/gravito-magnetic effects.

The experiment that stops the light is made by means of atoms-photons (polariton) spin interaction by the American Institute of Physics.

A solid-state EPR experiment.

Nanoscale crystal of semiconductor known as a "quantum dot" will be devices emitting entangled light as laser diode or light emitting diode (LED). **Entangled photon LEDs** will be commonly used. **The polarizations of the two emitted photons are governed by the spins of the electron and hole (positron) residing in the dot cavity.** Only symmetric shape dot produces entangled photons. A source that generates pair of entangled photons in response to an external trigger.

Ref. *"Towards Entangled photon LEDs" Mar 6, 2006*
Andrew Shields at Toshiba and colleagues at the University of Cambridge

Manipulation of entanglement in a quantum dot.

Off-resonant picosecond-scale optical pulses produce a **coherent rotation of a single electron spin through arbitrary angles up to π radians**, on time scales much faster than the spin coherence time.

Ref. *Science 18 April 2008*
"Picosecond Coherent Optical Manipulation of a Single Electron Spin in a Quantum Dot."
J. Berezovsky, M.H. Mikkelsen, N.G. Stoltz, L.A. Coldren, D.D. Awschalom

Coherent manipulation of single spins in semiconductors.

Investigations of fundamental quantum-mechanical processes.

Single spins can be isolated, initialized, coherently manipulated and read out using both electrical and optical techniques.

Progress has been made towards the whole control of the quantum states of single and coupled spins in nanostructures, understanding the mechanisms through which spins lose coherence in the systems.

Nature 453, 1043-1049 (19 June 2008)

Ronald Hanson. Kavli Institute of Nanoscience Delft, Delft University of Technology, P.O. Box 5046, 2600 GA Delft, The Netherlands.

David D. Awschalom. California Nanosystems Institute, University of California, Santa Barbara, California 93106, USA.

The motion of an electron in a laser field.

The movement of electrons is responsible for chemical reactions and the transmission of biological information. What happens when an inner electron is ionized, whenever the other electrons fill in the gap that has been created?

Ultrafast laser pulses can observe the interaction between light and matter. The time for a "single revolution" (*spherical harmonics distribution*) of an electron in the hydrogen atom is **152 as** (1 attoseconds = 10^{-18} sec.) and in order to monitor electrons in real time we need a speed of the same timescale. Today the shortest laser pulse is **80 as**. (www.atto.fysik.lth.se)

An attosecond laser stroboscope films an electron that rides on a lightwave soon- after having been pulled out from an atom and the motion of the electron colliding with its parent ion again, the re-collision dynamics of an electron into an atom. An attosecond spectroscopy can observe the electron motion in condensed matter systems and on surfaces in real time.

Attosecond technology in quantum dots enables a direct link between electron spins and photon polarizations:

It is the interaction, on the role of angular-momentum conservation, and also could be the control of the electronic motion.

In semiconductors spin polarization can be converted into photon polarization and vice versa, a link between spintronics and photonics.

Entanglement can be turned from electron spin qubits into qubits defined by the photon polarization, enabling the measurement of entangled spin states via photons. **The photon source is deterministic,** (recombination of biexcitons in a single quantum dot) providing entangled photons on demand. Moreover, magneto-optical effects (Faraday rotation) provide mechanisms for spin detection: Quantum non-demolition measurements of single spin.

All that means the measurement of polarization, an item of physical reality that needs a counterpart in physical theory. **The angular momentum interaction represents the interaction fundamental principia.** Any process is a sequence of interactions, i.e. a sequence of angular momentum exchange.

Einstein, Podolsky and Rosen believed that quantum theory was incomplete and that every photon held a **"secret property"** that, if it was known, could explain - **in deterministic mode - the meaning of the measurement of polarization.**

Physical reality can't be related to **the Heisenberg uncertainty principle,** but it must be explained by means of a technological experimental instrumentation corresponding to a physical theory (it is conceived on a physical theory). Any technological experimental instrumentation is, of course, always limited in its resolution. **Its resolution is our limit to know the reality.**

Looking at the new nanotechnology and the SFT new features should be achieved.

According to the SFT and today's quantum dot experiments, off-resonant laser pulses, with a specific duty-cycle, applied to entangled electrons, should enable the realization of a **"Spin frequency modulation"**.

It is possible because the interaction of electrons and photons in semiconductor quantum dots is a direct link between electron spins and photon polarizations, in addition the electron "spin angle modulation" (electrical modulation of spin angle) can be converted into photon "polarization angle modulation" (optical modulation of polarization angle).

The "spin angle modulation" (electrical modulation) with a quantized angle should transmit information - instantaneously, at any distant, via spatial, quantized photon "polarization angle modulation" (optical modulation) and then reconverted, by means of a quantum dot semiconductor receiver, in an electron "spin angle modulation", reproducing a spin modulated current (spintronics technology), i.e. receiving the information transmitted instantaneously.