Systemic model of charged particles

References

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1 The circular reasoning

In current language, especially in the field of logic [1] there is this notion known as "vicious circle", a term that indicates a reasoning in a closed cycle, from which it is apparently impossible to get out because the premise and the conclusion mutually change their roles, so that no final conclusion can be drawn (the exit from the vicious circle).

A popular example of such reasoning is the well-known question: *Which came first: the chicken or the egg*? If we keep our thinking strictly "in the plan" of qualitative transformations, i.e. without taking into account the fact that real processes take place over time on concrete objects, indeed we cannot give a final answer. If we analyze the transformation process as it takes place in reality, i.e. unfolded (distributed) over time, the ambiguity disappears because we observe that a certain chicken will come out of a certain egg, and this chicken will make another egg. In other words, at each $egg \Rightarrow chicken$ transformation cycle, other objects will be involved (other instances of the *egg* class, and *chicken* class respectively), and common and unchanged will be only the two classes these objects belong to. The question containing the vicious circle refers to classes of objects (notions), while the actual transformation processes apply to instances (concrete objects) of the classes. Finally, if we take into account these clarifications, the correct answer to the question could be: *Another egg and another chicken*.

The same kind of reasoning can be applied to two other classes of material objects that generate each other: photons (PH) and charged particles (CP). Experimentally it is already known that a photon γ with sufficient energy, can generate (under certain conditions) a pair of CPs with opposite charges and equal masses, and these CPs, through annihilation, generate two other photons γ. So if we discuss only the classes of objects, the same question above arises: *What came first: the photons or the particles carrying an electric charge*?

The answer is the same as in the example above, if we realize that the actual transformation processes are applied to class instances and that these processes are distributed both spatially and temporally.

Apparently paradoxical, in certain circumstances the reasoning in a vicious circle is very effective in the cognitive process because it contains the two known states (phases) of a process of qualitative transformation between two classes of objects that generate each other. The one who analyzes this process can only but detail the stages (phases) of that process.

This type of reasoning was the basis for defining the relationship between the CP structure (in the systemic philosophy variant) and the structure of the electric flux produced by the CP. Then, from the resulting configuration for the electric flux, the possible configuration of the photon resulted, which in turn (only under certain conditions) can turn into CP. Obviously, this process of defining the structures requires numerous recursions because every change in the structure of an initial instance causes a change in the structure of

the final instance. In the end, some possible (proposed) structures resulted, but it cannot be said at all (for now, until experimental confirmation) that they are the actual ones.

The very important rule for classes of material systems (MS) that can generate each other is the *basic rule*: **There can be no direct generation processes between instances belonging to the same class**. In other words, if an egg cannot directly produce another egg, or a chicken another chicken, no photon can directly produce another photon, and no CP can directly generate another CP.

2 The systemic model of CP

The systemic model of the CP-type MS results from taking into consideration axiom I from [3] and the existence criteria from the general object model established in chapter 3 of [3], followed by the existence criteria from the general MS model, established in chapter 7 of [3]. We will apply these criteria after laying down some preliminary findings deemed true, resulting from the experimental activity of the world scientific community.

2.1 Systemic arguments regarding the CP structure

1 According to the systemic philosophy, any MS has the model of the triad of fluxes (3**F** see chapter 7 of [3]) as universal model, which implies the existence of an real separation surface (RSS) that contains a stored flux inside it; therefore, inside a CP there must be a movement of some MS also, a movement that will determine the rest energy of the CP (according to the definition of energy from [3]);

2 Under the existing conditions on the Earth's surface, the only known way CP (protons or electrons) are generated, is the generation of paired CPs with opposite charges and equal masses, following the impact of a high-energy γ-photon with a heavy nucleus;

3 Under the same conditions indicated by the statement **2** the only way photons are generated is the movement of CPs, either bound (in atoms or neutrons), or free, however on curved trajectories in a magnetic field (for example, synchrotron radiation). The generated photons always have energies lower than the rest energy of the generating CP, which remains unchanged during the photon generation process;

4 A free neutron (ejected from its nuclear medium) disintegrates after about 10 minutes into two CPs: a proton and an electron [2];

5 Taking into account the statement **2**, it follows that the neutron disintegration process does not contain the generation processes of the two particles, therefore they existed in the neutron before the disintegration;

6 Following the collision of two CPs with opposite charges and equal masses, the annihilation reaction takes place, i.e. the disappearance of the two CPs and the appearance of two γ photons with energies equal to the rest energy of the previously existing CP;

7 Since the annihilation process does not contain the generation processes of the two photons, processes mentioned in statement **3**, it follows that the γ photons existed in the CP before their annihilation (each CP with its photon);

8 For photons the systemic philosophy supports the model of *energy flux with constant effective section* (isotomous EF), a section with order of magnitude equal to or smaller than the section of the generating CP orbital (see the appendix *Thermal photons and thermal energy* from [3]).

Following these statements we can draw the following conclusions:

1. The neutron is a compound particle (a system) consisting of a proton and an electron, each with its structural orbital and the lots of possible energy orbitals;

2. Free electrons or positrons do not exist permanently in nuclei (as permanent components). They appear as a result of pair generation processes. Depending on the

conditions in the nuclear medium, one of the CP thus generated is captured, and the other emerges towards the outside of the atom (producing the corresponding e^- or e^+ radiation);

3. Particles with electric charge contain inside, as an initial flux stored during their formation, a γ photon with energy corresponding to the rest energy of the CP, a photon moving on a closed trajectory in the internal volume of the CP;

Comment 2.1.1: The closure of the photon flux is (possibly) due to the non-uniform radial pressure gradient, which appeared as a result of the entrainment of the near fundamental medium (NFM see [3] and [5]) by the rotary photon. Thus, a stationary vortex appears that maintains itself as long as the pressure gradient exists. The axis of the vortex is the spin axis of the particle, the photon trajectory being included in the equatorial plane (normally on the spin axis of the CP). By collision, two CPs with opposite charges and equal masses cancel each other's self-maintaining baric barriers, the internal photons being thus released, and becoming open isotomous fluxes again.

4. A photon is a T+R flux, T being the translational component with the velocity $\overline{c}$, and R being the rotational component with frequency ν generated by the orbital revolution motion of the generating CP. Relative to the reference direction $\overline{c}$, the component R characterized by the angular velocity vector $\overline{\omega}$ collinear with $\overline{c}$, can have the two possible directions: $\overline{\omega}_d = 2\pi\nu\frac{\overline{c}}{c}$ or $\overline{\omega}_l = -2\pi\nu\frac{\overline{c}}{c}$. At the same energy and propagation direction (as a reference) there will therefore be two classes of photons: dextro- and levorotatory;

5. At the impact of a γ photon with a heavy nucleus, just as in the case of the incidence of any energy flux with an RSS, as we saw in the chapter 7 of [3], the T component of the photon must transform either into a stochastic flux or into two rotational symmetric fluxes (so that the tangential components also have the zero common component)[1]. Thus, two CPs appear with opposite directions of rotation, but with the same R component of the generating photon.

Comment 2.1.2: The above statement must be treated with leniency and suspicion, given the novelty and insufficiency of details regarding the model proposed for CP. It is very unlikely that the γ photon incident on the heavy nucleus split itself into two other photon fluxes with half energies; more likely that photon will simultaneously excite two adjacent CPs from the structure of the activated nucleus, so that these CPs generate in tandem the two photons that will be stored in the structure of the two complementary CPs. It is important to bear in mind that even in the case of the simultaneous excitation of two CPs that will generate the two photons, the R component of the incident photon has the same direction as the R motions of the excited CP, so the two photons produced will also have R components of the same direction (they will be both levo- or dextrorotatory).

6. It thus appears quite clearly what is the differential (specific) attribute of the two CPs generated as pairs, a specific attribute of the two types of electric charge: At the same direction of the photonic component R, the directions of revolution of the two stored photons are opposite.

Comment 2.1.3: The trapped photon model of CP supported by systemic philosophy explains in a coherent manner the cause of CP's own spin motion and the release of stored photons following the annihilation process. The two-particle model of the neutron also has an advantage, namely, the coherent explanation of γ photon generation in the nuclear medium through the presence of neutron orbitals, the excitation and return of which leads to the absorption and generation of photons, similar to the same processes in the hydrogen atom (but on a much higher energy scale). Also, the same orbital-based structure of neutrons allows a more natural understanding of the tendency of neutrons in the nuclear medium to form pairs (similar to hydrogen molecules) and further, to condense these pairs in neutron mediums.

2.2 The structural model of CP

The structural elements of a CP, according to the trapped photon model, are indicated in fig. 2.2.1, in which:

- $\overline{r}_m$ - average radius of CP (relative to the internal reference T of the particle);
- $\overline{\omega}_s$ - spin angular frequency of CP;

[1] See chapter *7.6.5 Composition of energy fluxes* from [3].

– $\overline{c}$ - the speed of translation/propagation of the trapped photon;
– $\overline{\omega}_e$ - the spatial modulation angular frequency of the trapped photon;
– $\overline{v}_{ti}$, $\overline{v}_{te}$ - tangential entrainment speeds, $\overline{v}_{ti}$ within the torus, respectively $\overline{v}_{te}$ exterior, of near fundamental medium (NFM) elements due to the axial rotation of the trapped photon. These velocities are compounded (vectorially added) with the photon translational velocity $\overline{c}$.

In the external spatial domain of the CP, due to the entrainment of the NFM elements with the initial velocity $\overline{c}+\overline{v}_{te}$, radially decreasing, a radially non-uniform static pressure distribution of the NFM appears, with the gradient directed towards the exterior of the CP. As the force exerted on an RSS immersed in a stochastic medium with a pressure gradient has the opposite direction of the gradient, a concentric force will be exerted on the RSS of the trapped photon, a force that will maintain its captivity and thus the existence of CP.

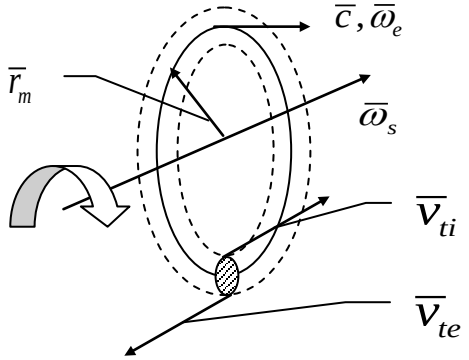

Fig. 2.2.1

In the inner spatial domain of the torus, due to the entrainment motion of the NFM with the peripheral speed $\overline{c}+\overline{v}_{ti}$, another radially non-uniform distribution of the medium pressure appears, similar to that of a vortex, which leads to the decrease of the static pressure towards the center of the torus up to the transition value of the medium from phase L to phase G (see [4]). Thus a cylindrical cavity appears with the axis collinear with $\overline{\omega}_s$, a cavity in which the NFM elements (etherons) have a helical motion, with the same overall speed $\overline{c}+\overline{v}_{ti}$. The systemic philosophy called this cavity containing a helical flux of etherons, a cavity generated in the direction of the spin axis of the CP, *helicon*.

3 The Helicon

3.1 Introduction

The helicon is a helical flux of NFM elements (etherons) enclosed in a filamentary[2] cylindrical cavity, a closure resulting from the phase transition (from phase L to phase G) of NFM. The phase transition is due to the decrease of the static pressure in the NFM in the center of the inner vortex due to the rotational motion of the trapped photon in the CP structure. So we have an RSS (the L/G separation surface of the cylindrical cavity in the NFM) inside which a permanent coherent/stochastic[3] flux of etherons is stored (enclosed).

[2] A concept also found in the writings of Herman von Helmholtz, but for which unfortunately I could not find details in the materials found on the Internet.

[3] We remind the reader that the expression *permanent coherent/stochastic flux* means a coherent flux with a stochastic component, or stochastic flux with a coherent component, both existing permanently and simultaneously, unlike the case of *alternating coherent/stochastic flux* in which the two components do not exist simultaneously but they transform from one to another.

The stochastic component is given by the local conditions of the NFM (external static pressure of the NFM) and the surface tension[4] associated with the radius of curvature of the helical cavity, while the coherent component is provided by the generating CP by concentrating in one direction the travel flux coming from inside it. This coherent component of the flux is given by the helical motion of the NFM elements. The two components of the flux will correspond to the two types of internal pressure in the helical cavity: dynamic pressure and static pressure. The sum of the two types of internal pressure must be in balance with the sum of the two types of external pressure (the static pressure of the NFM and the pressure due to the surface tension from the separation surface, inversely proportional to the radius of the cavity). As we saw in the analysis of cavities in the La mediums (see [4]), the helical cavity propagates (moves) through the La medium depending on the resultant of the existing pressure distribution on its surface.

3.2 The unmodulated helicon

A CP-type MS at rest relative to the NFM (its medium), both translational and rotational rest (rotational rest means exclusively the absence of rotation of the spin axis), will theoretically generate an unmodulated *helicon*.

Being permanently generated (as long as the particle that produces it exists) the helicon is an output flux (a flux offer), a flux that, not being compensated, would lead to the exhaustion of the particle's lifetime (of the internal energy stock). To replenish these losses, the CP must receive energy fluxes from the outside (both T and especially R, to maintain the rotational energy of the CP). However, the only type of flux that transports both types of energy is the helicon (and the systems formed by helicons - photons), therefore a CP needs at least one other complementary CP to ensure its required flux from the outside. The ensemble (system) formed by two such particles mutually supplies each other with the necessary flux (especially the R-type one), resulting in it receiving a much smaller amount of energy from the outside than that required for two unpaired CPs.

This hypothetical type of flux - the helicon - would be the material support of the *electric charge* attribute, its known bipolarity (+ and -) having the two possibilities of association of the two types of internal fluxes T and R as a possible correspondent in the helicon flux, taking into account the fact that the direction of the flux T is unique in both cases (from CP to the outside).

Relative to the reference direction of the flux T, the two types of the fluxes R can be:

- R_l, rotational flux with mean angular velocity $\bar{\omega}_l$ collinear with T, with trigonometric direction of rotation (association according to the left corkscrew rule);
- R_r, rotational flux with average angular velocity $\bar{\omega}_r$, also collinear with T, but with the opposite direction of rotation (association according to the right corkscrew rule).

Worth noting in the case of this theoretical model of the CP is the fact that two complementary CPs, but with the same internal energy (resulting from a pair generation process), differ only in the sense of revolution/propagation of the trapped photon relative to the single reference direction of the generating photon. Therefore, for the unmodulated helicon (generated by a CP at rest relative to the ether) we have two possible types: χ_l and χ_r, generated by two CPs with complementary charges. The helicon generation direction relative to the internal reference system of a certain CP is unique and coincides with the CP spin axis direction. In a medium hypothetically homogeneous and without a pressure gradient this direction is preserved, resulting in a rectilinear helicon, but in a medium with a pressure gradient and in the case of position variation processes (both T and R) of the generating CP,

[4] In La media, due to the force of attraction between the elements, surface tension appears at the medium separation surface, generating a concentric pressure that balances with the pressure inside the cavity.

the helicon no longer has the invariant direction, resulting in a helicon with spatio-temporal shape modulation.

In summary, the unmodulated helicon has as parameters:

– the angular velocity of the helical flux of etherons from the helicon cavity $\bar{\omega}_r$ or $\bar{\omega}_l$ (collinear with the longitudinal velocity $\bar{c}$) $|\bar{\omega}_r| = |\bar{\omega}_l| = \frac{c}{r_m}$ (see fig. 2.2.1);

– longitudinal velocity $\bar{c}$ (for issued emergent flux) or $-\bar{c}$ (for received immergent flux).

Comment 3.2.2: By analogy with the vortices in natural La mediums, for example water, we could estimate the diameter of a helicon starting from a commonplace vortex, that of a bathtub drain. We notice that if the initial diameter (the one at the surface of the water) is about 1...2 cm, at a distance of a few cm in depth it decreases exponentially, reaching a few mm. The same process, in ether however, allows us to estimate that the initial diameter of the vortex is the inner diameter of the CP, a size that, like in water, will decrease exponentially until the diameter dictated by the balance between the dynamic pressure of the internal helical flux and the two cumulative external pressures - the static pressure in the ether and the pressure due to surface tension. In conclusion, the diameter of the helicon will be (much) smaller than the inner diameter of the CP.

3.3 The modulated helicon

We have discussed so far the unmodulated helicon, i.e. the one produced by a CP at rest with respect to the NFM and with the invariant position of the internal reference system. Such a situation is purely hypothetical; in reality, the position of a single CP is variable according to all the elements of an external reference system. In such a case, the generated helicon will no longer be a rectilinear cavity, but also a cylindrical cavity, however with a variable-shaped axis, a shape strictly dependent on the position variation of the generating CP. This variation of the shape of the helicon compared to the unmodulated (rectilinear) shape will be called *spatio-temporal modulation*.

Comment 3.3.1: The spatio-temporal modulation situation of a unidirectional flux is usual if you have ever seen a water jet coming from a garden hose. You have noticed on this occasion that any movement of the hose end translates into a certain spatial configuration of the jet. This is the spatio-temporal modulation of the jet (water flow) depending on the spatio-temporal modulation of the position of the hose end. Unfortunately, due to gravity, the water jet only persists for distances of a few meters, but think that in the absence of gravity, the shape of the modulated jet would be preserved over long distances and **bear in mind that** the spatial modulation of the jet is normal on the direction of the water flow.

The main motions of a CP which is part of a two-particle system are:

1) spin motion (rotational motion around its own axis, a motion due to the motion of the trapped photon and which exists even for a single CP at rest);

2) the orbital motion (due to the coupling with the partner CP).

The requirements of the constructive interaction (see [3]) determine the types of components of the supply fluxes, so that these components are consistent (in phase) with the already existing motions (fluxes). Thus, the spin motion must be maintained by the helical flux of a helicon, a flux generated precisely by this spin motion of another complementary CP that emits the helicon. The orbital motion can be maintained by the R component of the helicon spatial modulation also produced by an orbital motion of the CP that emits the modulated helicon.

An atomic proton (proton belonging to an atomic nucleus) has a spatial modulation of position with respect to the internal reference T of the CP pair[5], due to the interaction with its partner electron (located on an electronic shell) with the angular frequency ω_k ($k \in [s, p, d...]$) and with amplitude $x_k = \frac{m_e}{m_p} f_k(r_k, r_o)$, where r_k is the radius of the electronic shell with the

[5] The internal reference T of CP pairs is the center of mass (CM) of the pair.

number k on which the electronic orbital is located, and r_o is the radius of the respective orbital. The spatial modulation of the protonic position (the motion of the proton on its x_k medium-radius orbital) determines a spatial modulation with the same size and frequency of the helicon flux produced by it. This protonic helicon flux, the material support of the positive electric field generated by the proton, will be captured by the partner electron, and the specific components of the protonic helicon flux will maintain the specific components of the electron fluxes. Since in a pair of CPs in balance the orbital frequencies are equal, it follows that the spatial modulations of the helicons generated by the two CPs will have the same frequency, therefore the energy transfer between the CPs is maximum (phase-level synchronization of the energy flux recirculated), a situation in which the two CPs will be in the ground state. Also, since the helicons produced by each CP are fully captured by the complementary particle in the pair, there will be no helicon outside the pair, so there will be no electric field. The two modulated helicons contain the binding energy of the two CPs, which is why they can also be called *binding energy fluxes* (EF).

The modulated helicon produced by a CP and fully captured by the complementary partner CP of a pair constitutes a *bound photon* and it is the material support of the binding energy between the two CPs. Therefore, the binding energy flux of two CPs that form a pair is made up of two bound photons: the protonic photon emitted by the proton and the electronic one emitted by the partner electron, photons with the same modulation frequency in the case of the ground state of the two CPs. The length of a binding photon is exactly the distance between the orbitals of the two interacting particles. As the distance between these orbitals remains intraatomic even if we are talking metastable orbitals, the length of the emitted photon (see par. 7) when returning to the ground state, will still be intraatomic. These statements are valid for atomic photons, i.e. those produced by the atomic peripheral electrons. For neutron photons both the binding photons and the return (free) photons will have intraneutronic lengths.

Comment 3.3.2: If the Plank relation ($E = hf$ [6]) is also valid for neutron photons, then a gamma photon with the energy of 511 keV, which corresponds to a trapped photon in the structure of an electron, will have the intraneutron length because it can only be produced by neutrons.

Comment 3.3.3: The helicon model for the electric field of a CP proposed by the systemic philosophy allows the coherent explanation of the absence of the external electric field of complementary CP pairs. In the case of ordinary isotropic fluxes, it is impossible for there to be a field between the particles (for an interaction to exist), and to be none outside. In the case of the helicon model, the material support of the electric field (the helicon) is an extremely anisotropic flux (having only one possible direction, that of the spin axis), but for a free (unpaired) CP the direction of this axis is randomly variable, hence an omnidirectional random spatial modulation of the helicon flux, which thus appears uniformly distributed (isotropic). Another interpretation of the helicon model as an isotomous energy flux with an extremely small actual section is that the helicon can be considered as a materialization of an abstract (strictly theoretical) object, the so-called *field line*. Also, the spatio-temporal modulation of the helicons generated by a set of free CPs in coherent motion, located in the conductive medium of a radiator (antenna), allows us to naturally understand the transverse nature of electromagnetic waves, because the spatio-temporal helicon modulation generated by the motion of electric charges is normal (perpendicular) to the direction of propagation (see comment 3.3.1).

In summary, the modulated helicon, produced by the orbital motion of a generating CP, has the following parameters:

- $\overline{\omega}_{op}$ proton orbital angular velocity (for the proton photon);
- $\overline{\omega}_{oe}$ electron orbital angular velocity (for the electron photon), in the ground state of the CP pair $\left|\overline{\omega}_{op}\right| = \left|\overline{\omega}_{oe}\right|$, out of phase by $180°$, and in the electronic excited state $\left|\overline{\omega}_{oe}\right| > \left|\overline{\omega}_{op}\right|$;

[6] In most scientific works, the Plank relation is written $E = h\nu$ where ν is the letter in the Greek alphabet, which stands for frequency. Because of the similarity of this character with the Latin character *v*, symbol for speed, to avoid confusion, I chose the letter *f* as symbol for frequency.

– $\overline{r}_p$ radius of the protonic orbital (relative to the center of mass CM of the pair);

– $\overline{r}_e$ the radius of the electronic orbital;

– $r_p + r_e = d$ the distance between the particles of a pair, equal to the radius of the electronic shell the electron is a part of;

– $\overline{v}_{pp} = \overline{r}_p \cdot \overline{\omega}_{op}$ the tangential (peripheral) velocity of the proton in the protonic orbital;

– $\overline{v}_{pe} = \overline{r}_e \cdot \overline{\omega}_{oe}$ the tangential (peripheral) velocity of the electron in the electronic orbital;

– $\overline{\omega}_{tp}, \overline{\omega}_{te}$ the angular velocities of the transverse modulation of the CP, collinear with the translation velocity of the CP through the ether[7]. The transverse angular velocity has the same direction as the CP velocity.

3.3.1 Transverse modulation

The helical flux of etherons inside the helicon is maintained at the same velocity $c + v_{ti}$ (see par. 2.2 and fig. 2.2.1) along its entire route. In the case of a photon, the helicon is spatio-temporally helically modulated with the angular frequency *f* (according to the Plank relation *E=hf*) $f = \frac{1}{T} = \frac{\omega}{2\pi}$ where ω is the angular velocity of the orbital motion of the CP that generated the photon.

It would result that *h* from the Plank relation is the energy contained in the modulated helicon generated by CP in a period of the orbital motion, more precisely in a winding of the helically modulated helicon generated by CP.

A free photon moves through the ether due to the fact that the flux stored in the cavity of the modulated helicon has velocity $c + v_{ti}$, a flux that is preserved along the photon path, displacing the La medium (ether) considered immobile along the way (the essence of cavitary propagation [4]). If the photon moves (propagates) along a closed path (the CP case), what happens to that photon if its circular trajectory (more precisely the center of mass CM of the CP) has a motion speed $\overline{v}$?

Theoretically, on a diameter of CP perpendicular to the velocity $\overline{v}$, the photon should have two peripheral velocities $c + v$ and $c - v$, however $c + v$ would mean an acceleration of the helicon flux which is an impossible process because the helicon flux is isolated (closed in the helicon cavity), so the CP will rotate around the point $c + v$ in its motion with the velocity $\overline{v}$, a process similar to the rotation of a circle without sliding on a fixed line[8]. If the spin axis of CP is normal (perpendicular) to the velocity $\overline{v}$, then CP will move on a rectilinear trajectory at a distance r_m (see fig. 2.2.1) from line $c + v$ (see footnote 8), and if the spin axis is parallel to $\overline{v}$, the center of mass (CM) of the CP will also move on a rectilinear trajectory.

In all other cases the CP will have a helical motion around the line $c + v$, a spatial modulation motion with amplitude r_m which is called *transverse modulation* because the CM motion of the CP is perpendicular to the motion speed $\overline{v}$. This type of spatial modulation occurs on any type of CP speed, including the peripheral speed of orbital motion.

The transversal modulation of the moving CP position will produce a transversal modulation of the helicon emerging from the CP, a modulation that will accumulate with the modulation produced by the orbital motion.

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[7] The velocity resulting from the vector summation of all translational motions relative to the ether considered immobile.

[8] We can consider the line as the geometric place of the points $c + v$ in the translational motion of the CP.

In summary, the transverse modulation motion of a CP moving at a velocity $\overline{v}$ has an amplitude r_m perpendicular to $\overline{v}$ and an angular velocity $\overline{\omega}_t = g(\theta, \overline{v})$ [9], where θ is the angle between the CP spin axis and the velocity $\overline{v}$ ($\omega_t = 0$ for $\theta = 0$ and $\theta = \pi / 2$).

3.4 The interaction of helicons

If we return to the fluxes in the helicon cavity, we have seen that these are fluxes *stored* as a result of some *input* fluxes (produced either by NFM or the generating CP), but according to the triad model, they must correspond to some *output* fluxes, originating from the fluxes stored inside the cavity. In addition to the particle fluxes, typical of cavities in La mediums, the balance fluxes between the two phases whose imbalance leads to the displacement of the cavity (as a result of the displacement of the balance surface (see [4]), we also have the reflection (collision) fluxes of the internal mediums on the RSS (the internal incident fluxes). We know that any reflection of a flux on an RSS gives rise to numerous normal and tangential components of that flux. As the cavitary RSS is a compact surface for the internal particle fluxes, the output fluxes will be of the impact wave type, made up of compression waves, surface waves and the drive flux (given only by the tangential component).

Like any impact waves, those in the output fluxes will also have a continuous frequency distribution, with a very wide support domain and with the speed of compression waves (the maximum speed of propagation through the NFM). As the tangential drive flux is given by the internal coherent components, it will also be coherent and will have both a T and an R component, with the same directions as the generating fluxes. These drive fluxes from the surface of the cavity will determine in the La medium an uneven distribution of the drive velocities of the adjacent fluid layers (due to the viscosity of the ether). In the hypothesis that the ether would be a Newtonian fluid, this velocity distribution is linear and inversely proportional to the distance to the RSS of the helicon cavity. Anyway, regardless of the law of variation of velocities, linear or non-linear, this uneven distribution of velocities, of the coherent kinetic flux density vector (FDV see [3]) from the NFM will lead to the appearance of an uneven distribution of static pressure (of the kinetic stochastic FDV), with a gradient directed towards the outside of the helicon cavity.

Worth noting is the fact that an element from the external medium of the helicon (an etheron from the La medium) will have an drive velocity with two components: T and R and that these distributed velocities mean fluxes that can be composed in the case of simultaneous existence nearby of two helicons.

The result of this composition can lead to an increase of the stochastic FDV in the space between the two helicons (the appearance of a resultant repulsive force) or it can lead to a decrease of the same attribute, i.e. at the appearance of an attractive force (forces exerted on the helicon RSS).

In the case of the interaction between two helicons emitted by two CPs of opposite signs (the case of the H atom or the neutron), an attractive force appears in the space between them, which makes the helicons come as close as possible. However, the approach is limited by other fluxes emitted by the two helicons, especially by the radial shock wave (RSW)[10] which opposes the approach at too small distances. Between two helicons the RSW flux has the same intensity, but opposite directions (the direction of the helicon radius).

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[9] The function *g* is currently unknown.

[10] The radial component of the closed helical etheronic flux in the helicon cavity, a component that determines a radial shock wave on the RSS of the cavity, a longitudinal wave in the NFM.

3.5 Concatenation of helicons

As we saw in fig. 6.3.2 of [4] in certain circumstances the cavities in the La mediums can combine (concatenate), a process possible only with the fundamental condition that inside the initial cavities (intended for concatenation) there is the same type of stored flux, thus the newly formed cavity will contain over its entire internal domain (over its entire length) the same type of flux. For helicons, these conditions mean that the internal flux of etherons must have the same T component and the same R component.

4 Electric charge

4.1 Introduction

We consider that the analyzed phenomena take place in the NFM (ether), an La-type medium (similar to ordinary fluids), the elements of this medium being *etherons* (similar to the atoms or molecules of ordinary fluids, but with much, much smaller dimensions).

If we established through the systemic model of the CP that two CPs with opposite charges and equal masses differ only in the revolution direction of the trapped photon[11], a logical analysis of the definition and a verification of this statement is needed in the case of the interaction of two CPs with unequal masses. In this type of system, the requirement of constructive interaction forces the flux emitted by a CP to be in phase with the flux requirement of the partner CP.

We have two types of fluxes that correspond to the two types of motions of a CP in the two-particle system:

1) spin flux (the helicon emitted by CP);

2) the orbital flux that produces the spatio-temporal modulation of the helicon emitted by that CP.

Regarding the orbital flux, the situation is clear: In the ground state, the two CPs have the same orbital frequency, which corresponds to the same spatio-temporal modulation frequency of the helicons in the binding fluxes.

For the spin fluxes (etheron fluxes from the helicon cavity) we use the MathType notation:

- $\odot$ immergent flux (towards CP, arrow head) longitudinal velocity -*c*;
- $\oplus$ emergent flux (from CP, arrow tail) longitudinal velocity +*c*.

With these conventions we will have:

1. Right emergent helicon $\chi_d = \uparrow \oplus \downarrow -$ $+c$ (4.1.1)
2. Left emergent helicon $\chi_s = \downarrow \oplus \uparrow +$ $+c$ (4.1.2)
3. Right immergent helicon[12] $\chi_d = \downarrow \odot \uparrow -$ $-c$ (4.1.3)
4. Left immergent helicon $\chi_s = \uparrow \odot \downarrow +$ $-c$ (4.1.4)

Comment 4.1.1: The arrows in the MathType notation indicate both the direction of rotation of the internal flux of the helicon, and the direction of the drive flux of etherons from outside the cavity by the tangential component of the internal flux. The etherons in helical motion will collide on the RSS of the helicon cavity, on which the two components of these collisions will appear - normal and tangential. The tangential component will produce a tangential motion (a drive flux with the same direction) of the etherons from outside the cavity, a drive gradually decreasing with the distance from the helicon cavity. The normal component will produce the radial shock wave (RSW, see par. 3.3). The longitudinal

[11] A fact that determines the direction of rotation of the etheron flux in the helicon cavity.

[12] See comment 4.1.2 for the apparent error of meaning.

component of the helicon flux has the velocity +*c* in the case of emergent flux and -*c* in the case of immergent flux. The attached + or - sign indicates the sign of the electric charge.

Comment 4.1.2: To clarify the MathType notation, we take a pencil or pen with the tip pointing outwards (emergent flux $\oplus$), which we print with our fingers a rotation to the right $\uparrow\oplus\downarrow$ (see relation 4.1.1). Keeping the same rotational motion of the pen, we turn it $180°$ (with its tip toward us; it now represents an immergent flux $\odot$), and the rotational motion becomes $\downarrow\odot\uparrow$ (relation 4.1.3).

We consider that the emergent helicons are those produced by the CP, and the immergent ones are those captured by the CP, or by any other material system the helicon intersects with (the electric field line). We establish that the left helicons are emitted by CPs considered positive (protons and positrons), and the right helicons are those emitted by negative CPs (antiprotons and electrons).

Comment 4.1.3: The electric charge carriers in metals (ordinary conductors) are electrons (CP-), as a result, the direction of rotation of the helicons emitted by the electrons is right, because this is also the direction of the magnetic field observed and established by the right-hand rule.

In the case of emergent helicons emitted by CP of the same sign, between two helicons we will have: $\uparrow\oplus\downarrow\ldots\uparrow\oplus\downarrow$ or $\downarrow\oplus\uparrow\ldots\downarrow\oplus\uparrow$ the drive fluxes of the etherons outside the helicon cavity in the space between the helicons (…) are of opposite directions, i.e. turbulence generators, which leads to the increase of the static pressure in the NFM between the helicons; as a result a repulsive force appears on the helicon RSS. This repulsion causes the helicons emitted by CP of the same type to distance each other as much as possible (see par. 3.4).

4.2 Generation of CP pairs

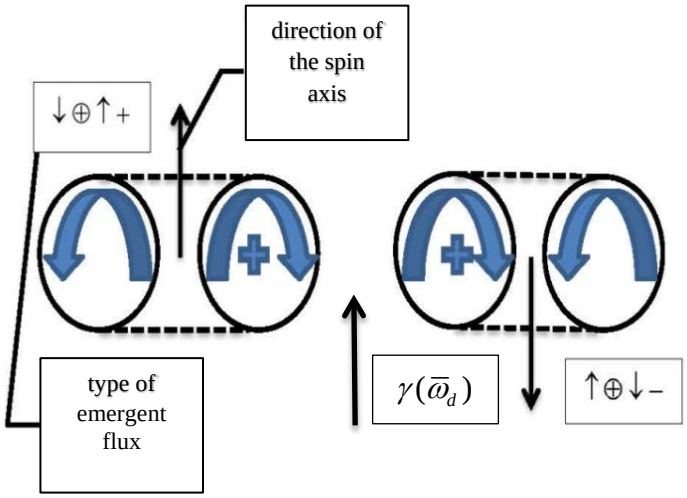

Fig.4.2.1

We reproduce from par. 2.1 statement 2: Under the existing conditions on the Earth's surface, the only known way of generating CP (protons or electrons) is the generation of CP pairs with opposite charges and equal masses, following the impact of a high-energy photon γ with a heavy nucleus. In the middle of figure 4.2.1, the arrow represents the direction of the generating photon γ [13], a dextrorotatory photon (for example) with frequency $\bar{\omega}_d$, which will produce, following its collision with the ASS of a heavy nucleus, the two complementary CPs with antiparallel spin axes. CPs are represented as diametrical sections by two toruses, each torus containing a dextrorotatory photon propagating in a closed circle, with the resting energy of the CP, but in opposite directions. The curved arrows in the circles represent the

[13] Photon with energy $E \geq 2E_r$ where E_r is the rest energy of a CP from the generated pair.

direction of the photonic R component, and the + sign (the arrow tail) in the center of the curved arrows indicates the common direction of both the generating photon and the photons that will form the two CPs). The drive of the NFM elements by the two photons propagating on closed circular trajectories will produce the two helicons with the opposite directions of rotation corresponding to the two types of CP field (positive and negative). The direction of emission of the helicon produced by CP is the direction of its spin axis (the helicon being the supply of electrical flux of CP), but the same direction is also that of the flux requirement to maintain the lifetime of the CP (more precisely, the CP spin motion). It is obvious that the spin flux requirement of a CP will have to have the same direction of rotation (component R) as that of the helicon emitted by the CP.

5 Analysis of the fluxes of a CP pair

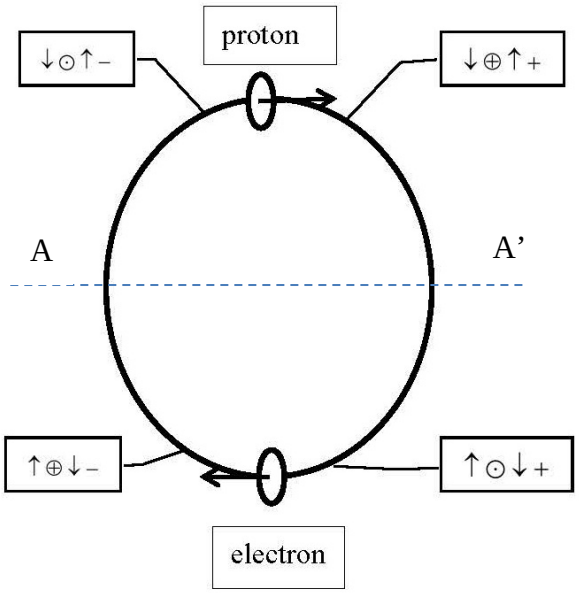

Fig. 5.1

If we analyze the situation of helicon fluxes at the level of a CPs pairs (for example a proton and an electron) we will have the emergent flux of positive CPs $\downarrow\oplus\uparrow+$ [14] in the direction of its spin axis, and on its RSS the received (immergent) flux of a negative CP $\downarrow\odot\uparrow-$ (also with the same direction of rotation, but on the opposite end of the spin axis), a situation in which we observe that one of the conditions of the constructive interaction is verified (the fluxes have the same direction of rotation maintaining the spin motion).

Comment 5.1 In figure 5.1 the dotted line AA' is the intersection of a vertical plane with the plane of the figure, a line that marks the change of the helicons from emergent flux to immergent flux, but with the preservation of the direction of rotation (see comment 4.1.2, with the recommendation for the reader to check himself with a pencil or pen the preservation of the direction of rotation when transitioning from emergent flux to immergent flux). A simpler version of the explanation of fig. 5.1 would be that the proton "sees" the direction of rotation of the emitted (going) flux as left, while the electron "sees" the same flux coming, but turning to the right (also comment 4.1.2). Another remarkable fact in the case of a pair of CPs with opposite charges is that the direction of rotation of the etheron flux from the concatenated helicons (via the two CPs) remains the same, and will be reversed in the case of a pair of antiparticles.

[14] In each location designated by the *CALLOUT* graphic form from fig. 5.1 the type of flux, the direction of rotation and the type of electric charge corresponding to the helicon flux emitted in the direction of the spin axis by each CP is written in MathType symbols.

In the space between the two CPs (…) we have the helicon emerging from the proton and the helicon emerging from the electron $\downarrow\oplus\uparrow\ldots\uparrow\oplus\downarrow$ a situation in which an attractive force[15] appears between the two helicons and, as a result, the two helicons will get as close as possible.

Comment 5.2: Fig. 5.1 in which two toroids with antiparallel spin axes illustrate the two CPs, represents a time-frozen image (without taking into account the orbital motions of the two CPs) of the material system of *CPs pair with opposite charges*. The purpose of this figure is only to illustrate the types of helicon fluxes that appear within this type of material system, but especially the fact that the direction of rotation of the helicon flux is sufficient to define the type of electric charge of the CP. If we draw an imaginary line on fig. 5.1 passing through the two CPs (perpendicular to AA') then that line will divide the space of the figure into two half-spaces with opposite electric fields: positive on the right and negative on the left.

6 Fields generated by CP

6.1 The electrostatic field

An electrostatic field is generated by an object on the surface of which electric charges with the same polarity are dispersed, from which field lines (helicons) emanate. Being helicons of the same type, they will reject each other, and in the space between them a static pressure will appear which is inversely proportional with the distance from the electrified surface; in other words there is a pressure gradient in the NFM (ether), a gradient with the direction towards the electrified surface. This pressure in the ether arising as a result of the presence of electric charges on the surface of the electrified body is called in systemic philosophy the *potential* φ, a scalar the spatial distribution of which is called *electrostatic field*. In this field there is the relation:

$$\overline{E} = -\nabla\varphi \tag{6.1.1}$$

where $\overline{E}$ is the *intensity of the electric field* in newtons per coulomb or in volts per meter, a vector perpendicular to the electrified surface.

Comment 6.1.1: Physicists' obsession with the term *potential* could be used in a systemic manner to express a stochastic energy distribution (with no apparent motion). Obviously, this distribution needs to be allocated to a supporting stochastic material medium, the classic ether. If a material (atomic) object is immersed in this medium, *fair transactions*[16] are expected to exist on its real separation surface (RSS see [3]) between the stochastic external flux from the ether and the RSS of the object's atoms. These transactions integrated on the RSS of the object can have a non-zero result (if the stochastic distribution is uneven), meaning that a non-zero force can appear with the direction opposite to the gradient of the potential distribution.

The ratio between the number of electric charges existing on the surface of the body and the surface of this body gives us the surface charge density σ (the number of helicons per surface unit), a quantity that defines another vector:

$$\overline{D} = \sigma\overline{n} = \varepsilon_0\overline{E} \tag{6.1.2}$$

called the *surface electric field density*, where ε_0 is the electrical permeability[17] of ether, and $\overline{n}$ is the normal to the electrified surface.

Comment 6.1.2: As we have seen in [3] in systemic philosophy, the notion of *field* refers to a spatial distribution of a quantity, either scalar or vectorial. In the current electrical engineering papers, vectorial spatial distributions are also called fluxes, but without observing the systemic definition of the notion of flux in systemic philosophy. We remind the reader that in [3] the flux of a quantity is defined as a collective process of transport of that quantity by a set of objects containing the quantity to be transported. As a result, in systemic philosophy, vector quantities $\overline{E}$ and $\overline{D}$ they also are associated with some

[15] The coherence of the drive fluxes in the space between the helicons leads to a decrease in the static pressure in the NFM and, as a result, to the appearance of an attractive force on the two helicon RSS.

[16] Term defined in [3] meaning exchange of equal and opposite energy fluxes, a process not recognized by official physics, considered as a null process.

[17] Also called *dielectric constant*. From ratio 6.1.3 it follows that it is the capacitance of a cubic meter of dielectric medium located between the two plates of the capacitor.

fluxes, but this time to some real fluxes, carrying energy, and the objects carrying this energy are the material systems in the composition of the ether - the etherons. We must mention that the creators of electrodynamics (Faraday, Gauss, Maxwell, etc.) believed in the existence of the ether and its similarity to fluids, and the laws of hydrodynamics led by analogy to the laws of electrodynamics. The fact that the existence of the ether has been disputed for at least a century has nothing to do with the scientific approach.

$\bar{D}$ is therefore the surface density of the electric charge flux (coulombs per m^2), i.e. the number of helicons per m^2.

A planar condenser (capacitor) consisting of two conducting plates with area *A*, between which there is a dielectric with electrical permeability ε and the thickness *d*, has the capacitance:

$$C = \varepsilon \frac{A}{d} \tag{6.1.3}$$

The W_C energy stored in this capacitor, equal to the mechanical work of charging, is obtained by integration from *q=0* to *Q*, and from *u=0* to *U* respectively and is:

$$W_C = \frac{1}{2}\frac{Q^2}{C} = \frac{QU}{2} = C\frac{U^2}{2} \tag{6.1.4}$$

$$W_C = \frac{1}{2}CU^2 = \frac{1}{2}\varepsilon\frac{A}{d}(Ed)^2 = \frac{1}{2}\varepsilon E^2 Ad = w_e V \tag{6.1.5}$$

where:

$$w_e = \frac{1}{2}\varepsilon E^2 \tag{6.1.6}$$

is the volume density of electrical energy, and *V* is the volume of the dielectric.

The equation 6.1.5 is similar to equation $W_B = pV$ which describes the baric energy in a gas or liquid with pressure *p* and volume *V*, so we can equate electrostatic energy with a form of baric energy in the ether, but not under any conditions, but in the presence of electrical charges (a kind of overpressure caused by the presence of helicons). In the absence of electric charges there is a pressure in the ether (the so-called hydrostatic pressure, as in any fluid medium), but this pressure is currently unknown.

Comment 6.1.3: The hydrostatic pressure in a medium in the composition of an astronomical body (AB) or universe (UN) [5] is given by the gravitational acceleration of the AB and the radial position of the place of pressure evaluation. Being spherical bodies, a pressure gradient is expected to exist, proportional to the mass density of the medium, to the gravitational acceleration and to the thickness of the fluid medium. In the case of ordinary (atomic) fluids, the law $w_p = \rho g h$ applies, where w_p is the volume density of baric potential energy (pressure), ρ is the density of the medium, *g* is the gravitational acceleration of the AB the medium is a part of, and *h* is the radial position of the place of pressure evaluation. The above ratio gives us the static pressure in the medium at position *h* (relative to the AB or UN center the medium is a part of).

6.2 The magnetic field

An electric current through a metallic conductor means a flux of electric charges (free electrons), a flux caused by an electric potential (a voltage) applied to the extremities of the conductor. This potential with a certain gradient determines the movement of charges in the opposite direction to the gradient, but also the alignment in the direction of the electric field of the directions of the helicons emitted by the electrons, which thus become a coherent vector field. Both the coherence, but especially their huge number[18] cause a coherence of the etheron driving flux from the outside of the conductor, a rotational flux that becomes the magnetic field of the current through the conductor.

[18] For example, a current with an intensity of 1 amp means 1 coulomb per second, that is $6.241 \cdot 10^{18}$ electrons and so many helicons moving along the conductor.

Comment 6.2.1: The helicon is at the same time an energy flux and an elementary flux of electric charge, in other words the electric charge can be considered as an energy flux, but with the specification that it is a T+R flux having a rotational component with a direction dependent on the sign of the charge. The T component is the same for both types of charge and has *c* velocity. We can say that the helicon is the indivisible (elementary) carrier of the **electric charge** property. The energy carriers both T and R of the two fluxes (+ and -) are the *etherons*, the elements of the medium La (the ether), the same carriers of both electric energy and magnetic energy, but in the latter case as closed coherent fluxes, without phase change of the medium, drive fluxes produced by the tangential component of the helical flux inside the helicons. We could estimate the angular frequency ω_{el} of the R component in the ratio $T = 2\pi r_e / c$ where r_e is the radius of the electron. If we consider the classical radius of the electron $r_e = 2.81794 * 10^{-15}$ m, the result is:

- period T=5.905965*10^{-23} s ;
- the frequency corresponding to the period $f_{el} = 1.6932 \cdot 10^{22}$ Hz, and
- angular velocity $\omega_{el} = 1.06387 \cdot 10^{23}$ rad/s.

The motion of etherons in the fluid medium La (the ether) takes place (possibly) according to the laws of hydrodynamics, i.e. the drive velocity of the etheron layers will progressively decrease with the distance from the conductor, just like in the case of ordinary fluids, the decrease in velocity being proportional to the viscosity of the fluid.

Between the intensity of the current in the conductor *I* and *the intensity of the magnetic field H* at a distance *r* from the conductor is the ratio:

$$H = \frac{I}{2\pi r} \tag{6.2.1}$$

If we look at ratio 6.2.1, *I* is the intensity of the flux of electric charges, i.e. the number of helicons per time unit (the intensity of the flux of helicons through the conductor), and *r* is the evaluation distance of the velocity of the flux of etherons driven in circular motion by the flux of helicons in the conductor. In the case of the hydrodynamic analogy, the intensity of the magnetic field would correspond to the drive speed of the etherons located at a distance *r* from the conductor.

In a general case, the intensity of the magnetic field *H* can be equated with the intensity of the etheron flux, and the *surface density B* of this flux with the magnetic induction.

In the case of magnetic energy stored in an inductance coil:

$$L = \mu \frac{N^2 A}{l} \tag{6.2.1}$$

where μ is the magnetic permeability of the medium inside the coil, *A* its internal section, *l* the length of the coil, and *N* its number of turns, the current *i* must increase from the value i=0 to the final value *I*. The current *i* must be supplied by an external voltage source *u* to which the self-induction voltage u_i opposes (Lenz's rule):

$$u = -u_i = L \frac{di}{dt} \tag{6.2.2}$$

The mechanical work done for this purpose in the interval dt is:

$$dW = u_i dt = Lidt \tag{6.2.3}$$

Total mechanical work equals energy W_L stored in the magnetic field, according to the principle of energy conservation. Its expression resulting from integration after *i* from *i=0* to *I* is:

$$W_L = \int_0^I Lidi = \frac{1}{2} LI^2 \tag{6.2.4}$$

Also, taking into account that $L = N\Phi / l$, $\Phi = \mu HA$ and $H = NI / l$, the result for the magnetic energy in a coil is:

$$W = \frac{1}{2}LI^2 = \frac{1}{2}N\Phi I = \frac{1}{2}\mu HAN\frac{l}{N}H = \frac{1}{2}\mu H^2 Al = w_m V \quad (6.2.5)$$

where:

$$w_m = \frac{1}{2}\mu H^2 \quad (6.2.6)$$

is the volume density of the magnetic energy, which also has the dimension of a pressure.

Comment 6.2.2: If equations 6.1.6 and 6.2.6 are correct, an explanation must be found for the fact that $\varepsilon E^2 \approx \mu H^2$ (equivalence relation), both having the dimension of a volume density of energy (a scalar or scalarized quantity [3]). For εE^2 the explanation is simple. As no obvious movement exists, the energy is stored in a stochastic medium, the ether in the space between the helicons, the elements of which move chaotically (just like the atoms or molecules of a fluid). For magnetic energy, the carriers of which move coherently (there is a massive flow of etherons), the flux of energy carriers must be a closed flux, the only type of coherent flux that can contain kinetic energy in an immobile volume. Being a closed flux, for the outside of the volume that contains the flux, the energy in that volume is an internal energy, equivalent to any other form of internal energy, i.e. to the baric energy of a stochastic medium. The mandatory condition for a flux to be totally closed is that in the volume that includes the flux, all the flux lines are closed curves, a condition that in the vector calculus translates into zero divergence of the respective flux.

7 The photon

7.1 The classic definition

Photon - The quantum unit of electromagnetic radiation or light that can be thought of as a particle. Photons are emitted when electrons are excited and move from one energy level (orbit) to another[19].

To the classic definition indicated above, the systemic philosophy makes a clarification: Photons are a quantum (a discrete amount of energy T+R) emitted by electrons in the *return* phase, *(relaxation,* the transition from the excited to the stable state of CP on an orbital). A single electron is involved in the process of emitting a photon, a fact that gives the photon its corpuscular character (a finite amount of energy contained in a finite volume).

7.2 The photon from the perspective of systemic philosophy

We have seen in par. 3.3 what is a *bound photon*, in the case of the protonically bound photon it is the carrier of the binding energy between a nuclear proton and its partner electron in the outer shell, and the electronically bound photon is also a modulated helicon emitted by the partner electron and fully captured by the proton. These two photons are linked to the two CPs, so they remain permanently located in the space between the two CPs, their essential property being the spatio-temporal modulation frequency which is the same. We have seen in par. 3.5 that this condition is mandatory for the concatenation of the two helicons (through the two CPs).

In the case of incidence of an external photon with the partner electron of a CP pair in the structure of an atom, the incident photon will transmit its R energy to this electron, which will cause the excitation of the activated electron, which will pass to a higher energy orbital, a state that will last until at the end of the energy stock R of the incident photon. From this moment, the process of restitution of the surplus energy received by the electron from the incident photon will begin, during which the excited electron will return to its previous stable state by decelerating its orbital motion. Throughout these two events (acceleration-deceleration) the orbital frequency of the electron will be different from that of the proton (higher), a fact that prevents the concatenation of the helicons emitted by the two CPs, which is why the modulated helicon emitted by the excited electron during the process of return will

[19] **Robert E. Krebs** - *Encyclopedia of Scientific Principles, Laws, and Theories* Greenwood Press 2008

become a *free photon*, uncoupled with the partner proton, a photon that will propagate in the outer space of the CP pair.

This photon has the same structure as the incident photon, i.e. it is a spatio-temporal helical modulated helicon, the energy contained in the photon being the same as that of the incident photon.

So a free photon is an open flux, formed by a single modulated helicon generated by an electron excited by another photon incident on its orbital. Emission occurs upon return from the excited state to the ground state. Since the internal flux of the helicon has the velocity *c*, this will also be the velocity of the photon that will move through cavitary propagation [4]. In other words, the velocity of the photon's motion through the ether is inherited from the trapped photon that generated the helicon.

Comment 7.2.1: The fact that the systemic philosophy claims that the propagation of photons through the ether is a cavitary propagation, has deep implications regarding the concepts in physics, one of them being the maximum speed allowed for the processes in the ether. In terrestrial La mediums there is also cavitary propagation here, but no photon hydrodynamic modeling has yet been done to verify the speed of this model through water (for example). Anyway, it is important to note that the cavitary propagation through La medium is dependent on its viscosity, but there are propagation processes in this type of medium with higher velocity than the cavitary one (such as that of compressional waves). As a result, there can be propagation processes in the ether also, with a speed higher than that of light.

The energy of a photon can be divided into the two types of motion of the two types of internal references: the T reference and the R reference.

The motion of the T reference (translation of the photon) is done with the velocity *c*, and the energy corresponding to this motion is what determines the light pressure[20].

The energy transmitted by a photon to an atomic peripheral electron, an energy quantitatively defined by the Plank relation ($E = hf$ where f is the spatial modulation frequency of the helicon emitted by the CP that generated the photon) is an R energy contained in the electronic helicon[21] of the photon. At the impact of a photon with an atomic peripheral electron, the helicon of the photon will supply R energy to the driven electron (increasing its speed of revolution), passing it to a higher energy orbital. If the photon energy R exceeds the binding energy between the electron and the partner nuclear proton, the electron will be ejected from the atom.

8 Electromagnetic waves and photons

Systemic philosophy also establishes a demarcation in physics compared to school textbooks, this time regarding the treatment of electromagnetic waves (EMW), considered in the current scientific literature as having the same configuration (structure) over the entire frequency domain, i.e. without any difference between EMW and photons. According to the systemic philosophy, the essential difference between EMW and photons consists in the type of radiator that produces them and, as a result, their spatio-temporal configuration:

– EMW are produced by macroscopic radiators (antennas), formed by electricity conductive mediums, mediums in which electric charges are free and massively move through conductors radiating multitudes of helicons with simultaneous spatio-temporal modulation (EM field), which propagates outside the antenna. The motion of electrical charges is along the conductor (at its surface), and the spatio-temporal modulation of the helicons and the direction of propagation are perpendicular to the conductor. As regards the effective section, EMW are open fluxes (section progressively increasing with the distance from the source, even in the case of parabolic radiators);

[20] The pressure being defined in [3] as the surface density of an energy flux incident on an RSS.

[21] The name electronic helicon comes from the fact that this helicon is generated by an electron, either atomic or neutronic.

– Photons are also generated by electrical charges, but bound in pairs, in atoms or neutrons, and the radiated helicons have a completely different structure from those in EMW, also being open fluxes, but formed by a single helicon per photon, a helical spatially and temporally modulated helicon, therefore with a constant effective section (isotomous flux with an effective section equal to that of the orbital of the generating electron). The helicon modulation frequency is the same as the orbital frequency of the generating electron.

As regards the wavelength (or frequency) photons occupy the range from infrared (thermal radiation) to γ, and EMW the rest of the domain.

9 Conclusions

Systemic philosophy assumes that the CP medium of existence, from which they arise and in which their fields are manifested, is NFM (the ether, see [5]), a medium which is the seat of all electromagnetic phenomena. Contrary to the older hypothesis which considered that this medium is an S (solid) medium, because EMWs are perpendicular to the direction of propagation, the systemic philosophy shows us that the same character of EMWs can be explained starting from the CP model discussed in chapter 2 of this paper and which assumes that the CP medium of existence (NFM) is a La medium (a fluid medium, in which there can be cavities that move in this immobile medium through cavitary propagation [4]).

Starting from a circular reasoning (*What came first, the photons (PH) or the CP?*), based on the experimental fact that the two types of material systems generate each other, we get to the systemic model of CP, the model of the trapped photon emitting in a single direction (the direction of its spin axis) a vortex in NFM, a vortex enclosed in a filamentary cavity called a *helicon*.

This helicon is the material support of the energy flux emitted by the CP, being at the same time the material support of the property *electric charge* of the CP, its bipolarity being given by the direction of rotation of the etheron flux (NFM elements, etherons) inside the helicon.

Although the helicon is emitted in one direction, a free (unpaired) CP has a random spin axis direction, which causes the direction of the emitted helicon to vary randomly, which is why the electric field of the CP appears uniformly distributed. Being a continuously emitted helicon (as long as the CP that emits it exists), any motion of the generating CP is translated into the shape (spatial distribution) of the emitted helicon, a distribution called *spatio-temporal modulation* of the helicon.

If CPs with the same polarity are dispersed on the surface of a body, the emitted helicons will repel each other, the multitude of these helicons (field lines) forming the electric (electrostatic) field of that body. The number of helicons of this field determines the quantity $\overline{E}$ (*electric field intensity*), and their surface density determines the quantity $\overline{D}$ (*electrical induction*), these being the fundamental quantities used in the theory of electrostatics. There is a relation between these two quantities $\overline{D} = \varepsilon \overline{E}$ where ε is a quantity specific to the atomic medium[22] in which the electric field is located.

If the CP of the same type moves en masse through a conductor under the action of an electric potential (an electric voltage) and the helicons emitted by these CPs are of the same type, they will align en masse with the direction of the electric field, and outside them (the same as the outside of the conductor) there will be a tangential drive flux of etherons outside the conductor, a flux with intensity proportional to the flow of charges through the conductor (electric current intensity *I*) and inversely proportional to the distance to the conductor *r*.

[22] The atomic medium is part of the SMAN generation, and the NFM is part of the SMAP generation, see [5].

Quantity $\bar{H} = \frac{\bar{I}}{2\pi r}$ is called *the intensity of the magnetic field*, and its surface density $\bar{B}$ will be the *magnetic induction* of this field. Between these two quantities there is the relation $\bar{B} = \mu \bar{H}$ where μ is a quantity specific to the type of atomic medium in which the magnetic field is located.

CPs bound in pairs with opposite charges, which are part of atoms or neutrons have orbital motions that determine spatio-temporal modulations of the helicons emitted and fully captured by the pair partner. These modulated helicons are called *bound photons*, as they are the material support of the binding energy of the two CPs. The energy flux of this photon is a T+R flux, T being the translation component with velocity c, and R being the spatio-temporal modulation component with angular frequency $\bar{\omega}_e$, the orbital frequency of the emitting CP of the helicon, located on a stable orbital.

In the ground state of the two CPs, the modulations of the two emitted helicons will have equal frequencies, in which case the two helicons will be able to concatenate (through the two CPs), so outside the pair there will be no more helicons and therefore no electric field.

If the electron of a CP pair receives energy R from an external photon, the orbital frequencies of the two CPs in the pair will be different, so the concatenation of the helicons is no longer possible and the modulated helicon emitted by the excited electron will become a *free photon*.

Therefore, a free photon is formed by a helical spatially and temporally modulated helicon which will move through the ether through cavitary propagation, with velocity *c*, the velocity of the etheron flux inside the helicon cavity.