

# H particle-paths hypothesis

## Part 1a2- Introduction

### 1-Introduction

1(1)- Any matter [mass, *Remark 1(1)1*] at rest ( $V = 0$ ) despite of its atomic, molecular, ...etc, structures, *Comment 1(1)1*, its gravitational and electromagnetic fields, is a system or collection of particles, *Remark 1(1)2*, nominated as H particles that are moving in a forward and backward wave-like, *Remark 1(1)3*, (reversible) motion at constant velocity  $c$  (light velocity) in different directions at an indeterministic manner, *Remark 1(1)4*. The reversibility means that a mass body can never reaches the light speed during its motion. Therefore, rest mass is consequence of this reversibility and related to energy by the famous, *Eq. 2(35)1*. Moreover, the system constituted of H particles nominated H system. Please refer also to *Note 1(1)1*, and *Note 1(1)2*.

*Note 1(1)1*- The partial electric charge constituents,  $\varepsilon^-$ , or  $\varepsilon^+$  related formally to each negapa or posipa, is a degree of spin behavior of their as singlet; therefore, these are a portion of electric charge of electron and positron respectively; nominated hereafter *H particle-path spin interacting behavior coefficient*. Supposing an electron is purely constituted of negapas singlet, i.e. not engaged with posipa and vice versa, thus:

$$\varepsilon^- = \frac{e^-}{N_{0e}} = 1.29 \times 10^{-39} \text{ coulombs} \quad (1(3)1)$$

$N_{0e}$ , *Note 2(3)2a1*, is the total initial number H particles (negapas) of an electron; please refer also to *Sec. 7(4)4*. Moreover its negative electric charge,  $e$  is the result of contribution of  $N_{0e}$ , right-handed spin negapas type  $R$  singlet.

According to [294], *part 2*, "Any value of electric charge  $q$  is an integer multiple of a given fraction of the electron charge  $e$ ".

*Note 1(1)2*-

*Remark 1(1)1* – "Ancient Greek philosophers, Aristotle, Parmenides, etc, and recent mathematicians such as Leibniz, Descartes, Spinoza, and Kant asserted, using the logic of philosophy, that all matter and motion, (the entire universe) was derived from ONE substance. "[501] *The new electron in Quantum-electrodynamics*. H particle-paths hypothesis is an attempted to consider the description of matter rather than the particle in terms of a geometrically more complicated object. In H particle-paths models the fundamental constituent of nucleons (quarks, *Sec. 10(2)*, and gluons) as well as the weakly interacting fundamental particles (lepton, photon, weak vector bosons) can be described in terms of left and right-handed spins H particle-paths moving at  $c$  speed according to counter-currency mode of motion, *Sec. 3(1)2*, that can be regarded as stationary wave in case of particle at rest accordingly. Whereas, according to the string theory, *Sec. 8(8)*, (an unproven theory which predicts that extra dimensions exist) their can be considered as vibrational modes of a single kind of string [39]. Moreover, at the case of a moving matter refer to *Sec. 3(1)2*, *Fig. 3(5)*.

*Remark 1(1)2*- "The standard Model is not complete, there are many unanswered questions. Are quarks and leptons actually fundamental, or made up of even more fundamental particles?"[532]. Please refer also to *Sec. 6(2)6c*, and *Sec. 10(2)*. From viewpoint of HPPH, any field (e.g. gravitational, electromagnetical), momentum, energy, *Sec. 2(1)3*, the texture of a medium, *Sec. 5(16)3b*, *Sec. 7(4)3*, are constituted of types  $R$  &  $L$  H particle-paths nominating negapa & posipa respectively of equal energy, but of opposite configurations. Therefore, in this article we encounter merely with integer numbers instead of physical magnitudes. This leading to a binary set of types  $R$  &  $L$  analogous to  $0, 1$  notations, *Sec. 8(7)2*,  $E5$ , as in case of computer processing. "Modern physics implies a calculated world" [583] *Discussion*. "*Quantum minima*: Light is quantized as photons. Matter, energy, time, and space may be the same, i.e. have a minimum amount"[583] *Table 1*. "Planck's discovery that light is quantized (as photons) could then generalize not only to charge, spin and matter, but also to space-time"[583] *A prima facie case*. "Physical existence properties like matter, energy, charge, spin etc are either conserved or equivalently transform"[583] *Table 1*. In other words, the total number of H particle-paths remained unchanged in the worlds.

*Remark 1(1)3*- "Every electron, proton and neutron is structured of quantum waves. Thus, understanding the physical world demands learning new quantum wave rules. They are few and simple, but one has to think a new and discard false rules, such as the material point particle. In their place we must deduce, as did Schrödinger, that location, charge and mass are properties of the wave structure" [503].

*Remark 1(1)4*- The motion of an H particle-path (or a group of that) of path-length value  $\hbar$ , *Sec. 2(4)4*, in a medium, *Sec. 7(4)3*, differs from classical one. In other words, a group of H particle-paths in its type  $R$  (right-handed) configuration expands and contracts in an H hall package unit, *Sec. 5(16)3b*, during stay time interval  $\Delta T$ , *Sec. 7(4)2f*, *part A*. Thus, during such process that is nominating a beat, *Sec. 7(5)3d*, *part D*, it is transferred to an adjacent H hall package unit of reversed handedness of the former, i.e. type  $L$  (left-handed) configuration, at  $c$  speed along with expansion emission in spatial medium, and contraction releasing towards mass medium, *Sec. 7(4)3*, *parts A, D*. Please refer to *Sec. 7(4)4* in this regards. Noteworthy, in case of field propagation in spatial medium, the path-length value of an H particle-path or a group of that is  $2\hbar$ -bar nominating expansion, *Sec. 5(16)1c*, *part A3*. The motion of H particle-paths may be of open-end trajectory (or single, irreversible direction), and closed-end (or reversible) trajectory; please refer to *Simulation 7(4)2e1*, *Fig. 7(4)1*, in case of single direction motion, and *Sec. 9(4)7*, *Fig. 9(3)a*, in case of reversible mode of motion of H particle-paths. Note that, any group of H particle-paths in its expanded mode reveals in form of

type *R* or type *L* configuration related to type *R* or *L* spin (or path-length, *Sec. 5(16)3g*) respectively with slight preference of type *R* over type *L* in our matter Universe. Factually, type *R* or *L* configuration at their expanded mode emits type *WR* or *WL* expandon in spatial medium, *Sec. 7(4)3, part A*, along with releasing of *PL* or *PR* contracton towards the source or related mass medium, *Sec. 7(4)3, part D*, respectively. In fact, based on *Fig. 4(8), parts B&C*, the spin configuration of *WR* or *WL* expandon (or neutropas cell) respect to normal to their propagating plane (reader page) is of type *R* (right-handed) or type *L* (left-handed) respectively. For further information please to *Sec. 7(4)2e1* in this regards.

*Comment 1(1)1*- Supposing a macroscopic mass-body at rest constituted of different atoms and molecules with their related chemical bonding, it can be assumed as a collection of H particles moving at *c* speed in an equilibrium state, i.e. in three spatial directions as stated above. Now, supposing through an external mean, e.g., force, collision, electromagnetical or gravitational interaction, the mass-body is moving at a final rectilinear *v* speed. In other words, during its acceleration all of its H particles in each of its part on the basis of *Sec. 1(3)* assumption acquired a common velocity up to *v* speed in such a way that the total velocity of each H particles is remained constant, i.e. equal to *c*. In fact, we must consider this mass body H system as its H particle constituents of different population densities in each point of its body or constituting parts regardless of the related atomic or molecular structure.

*1(2)* - Each of these H particles (zero rest mass) has a constant energy equal to *H* and proportional to the magnitude of *h* (Planck's constant) with a coefficient (*a*) that depends on the related medium, *Sec. 7(4)3*. Moreover, the *H* has energy and *a* time inverse dimensions.

$$NH = ah \quad \text{or} \quad H = \frac{a}{N}h = a_1h, \text{ Note } 1(2)1 \quad 1(1)$$

Where:

*a* - The media coefficient of time inverse dimension

*a*<sub>1</sub> - The value of media coefficient per an H particle-path of time inverse dimension, or better to say hereafter, the constant of

media coefficient, i.e.  $a_1 = \frac{H}{h}$ , please refer to *Sec. 7(1), Eq. 7(11)* in this regards..

*N* - The population density number of H particle-paths in a medium, *Sec. 7(4)4*.

Please refer to *Comment 5(16)1c, A1* in case of media coefficient *a*<sub>1</sub>, and *Comment 1(2)1*.

*Note 1(2)1*:

A) Referring to *Sec. 2(10)1*:

I) In case of an isolated particle of path-length value *h*, moving through vacuum medium, according to *Eq.1(1)* the population density number *N<sub>d</sub>* of H particle-paths of this media can be obtained as:

$$N = a \frac{h}{H} = a_d \frac{h}{H} \quad 1(1)1$$

$$a_d = N_d a_1 \quad 1(1)2$$

Where:

- *a<sub>d</sub>* is the value of *a* in gravitational free vacuum space, *Sec. 7(4)3 part A*

II) In case of gravitational fields vacuum media:

$$n_G = a \frac{h}{H} = a_G \frac{h}{H} \quad 1(1)3$$

$$a_G = n_G a_1 \quad 1(1)4$$

Where:

- *a<sub>G</sub>*, the value of coefficient *a* in gravitational field media, *Sec. 7(4)3 part B*.

- *n<sub>G</sub>*, the total equivalent number of the H particle-paths (neutropa) related to the interaction of the gravitational field with unit of mass

III) In case of mass medium of a mass-body, the population density number of H particle-paths *N<sub>mass</sub>* of this media can be obtained as:

$$N_{mass} = a \frac{h}{H} = a_{mass} \frac{h}{H} \quad 1(1)5$$

$$a_{mass} = N_{mass} \cdot a_1 \quad 1(1)6$$

Where, *a<sub>mass</sub>* is the value of coefficient media *a* in mass medium, *Sec. 7(4)3 part D*.

Please refer also to *Remark 2(3)1b*.

For reason of simplicity, *a<sub>d</sub>, a<sub>G</sub>, a<sub>mass</sub>* is considered as *a*, i.e. a coefficient that depends on the related medium in some parts of this article.

B) By analogy to case A, a particle irrespective of its total energy, or mass is confined in an H hall package of path-length value  $h$ , Sec. 5(16)3g, and path-limit  $\Gamma$ , Sec. 1(12), according to Sec. 2(10)1, the relationship Eq. 2(117), is holding for its constituting H particle-paths.

As a result, coefficient  $a$  is a function that depends on the media characteristics, e.g. its handedness, Sec. 5(16)9, geometry, Sec. 5(16)1, density..., and is independent of the number of H particle-paths of an H system in the related H hall package, Sec. 5(16)3a, in that medium.

Moreover,  $a = a_s = 1 s^{-1}$ , is regarded as unit of  $a$  based on system of SI units. In this case,  $H$  and  $h$  have the same magnitude. In other words, the magnitude of  $H$  of energy dimension is equal to the numerical magnitude of Planck's constant, thus it must not be confused with the dimension of the latter, e.g.,  $J.s$ , through the full text; please refer to Sec. 2(1)2 in this regards. By analogy to above case, H can be regarded as energy of an H particle-path in an isolated H system (through gravitational field free vacuum medium) consisting of  $N$  H particle-paths. Therefore, the total energy of this H system is as following:

$$E = NH = N a_1 h \tag{1(1)7}$$

I (3) –The H particles system, (nominated H system), have two types of velocity components (or projections):

I) External or common velocity  $V < c$ , of the whole H system related to irreversible single direction of H particles (or, open-end H particles group) motions.

II) Internal or individual velocity of H particles inner the H system related to purely reversible (forward-backward) directions of H particles (or, close-end H particles group) motions, Remark 1(3)1.

The total velocity of each H particle, i.e. the sum of I, II motions is equal to  $c$ . Please refer also to Sec. 7(4)4.

Remark 1(3)1- The reversibility of H particle-paths in an H system in all direction can be viewed as having a hard link with its rest mass.

I (4) - H particles participate in common motion of each other and the velocity components of theirs follow the general law of velocities.

I (5) - H particles are composed of three kinds of particles, Notes 1(1), 1(2); Remarks 1(1), (5).

I) Negapa with right-handed spin related to the negative electrical charge

II) Posipa with left-handed spin related to the positive electric charge, Comment 1(5)1.

III) Neutropa related to neutral charge from combination of a posipa and a negapa:

$$\text{Posipa} + \text{Negapa} \Leftrightarrow \text{neutropa} \quad \text{Note 1(5)1} \tag{1(2)}$$

In case of a mass body with zero charge, the number of posipas and negapas are equal.

Please refer also to Sec. 2(1)1d in this regards

Note 1(5)1- Due to inherent helicity of H particle-paths, the mirror image of a left-handed spinning posipa would look like a right-handed spinning negapa. Thus, posipa and negapa moving along their paths at two intrinsic mode of motions:

I) Left or right-handed spinning, Note 4(3)3a.

II) Translational motion related to their linear momentum.

Comment 1(5)1- The right and left-handedness behavior of H particles abbreviated as "handedness" in the remaining of the text; moreover, the handedness must be viewed respect to translational motion direction, or, in other words, regardless of the latter the handedness is meaningless. As a result, we must consider the rotational motion direction respect to translational one or vice versa.

Remark 1(5)1 - According to [234], discussion held on neutrino handedness "this left-handed vs. right-handed characterization is not meaningful for other particles, like electrons. An electron could have spin to the right and be traveling right and therefore be classified as right-handed. But from the reference frame be to the left, whereas its spin would be unchanged. This would mean that the electron is a left-handed respect to that reference frame. For neutrinos, however, which are traveling at the speed of light or very close to it, you can not accelerate to a greater speed and thereby, change their handedness". We say that the neutrinos have intrinsic parity, all of them being left-handed negative helicity), this cause the weak interactions which emit neutrinos or right-handed (positive helicity) antineutrinos to violate conservation of parity"; please refer to Secs. 5(16)6 to 5(16)9.

Similarly, the above classification can be valid for hypothetical H particles moving at  $c$  speed.

I(6)-All of the particles, e.g. Electron, proton; Atoms, molecules, ions; chemical bonding; Photons; Forces; Electromagnetic waves; Fields, e.g. electric, magnetic and gravitational are composed of collection of wave-like H particles, i.e. an H system, Comment 1(6)1.

Comment 1(6)1- According to Ockham's razor [157] Economy, it is preferable in constructing the interpretation to use a minimum number of independent postulates (i.e. a simpler theory is always preferred). Moreover, H particle-paths profits of all possible configurations, and properties that are permitted by the nature (or physical medium) in the framework of mathematical, and geometrical concepts.

I(7) -The light velocity  $c$ , partial electric charge, i.e. spatial spin behavior, are intrinsic characteristics of H particles and remain unchanged during the time. Moreover, energy and their directions in space, i.e. momentum of an isolated H system is conserved, except the case related to Sec. 5(4), 5(15), of the text.

1(8) - In a system of H particles with external velocity of  $V=C$  (e.g. photon, electromagnetic wave, gravitational field,...) the internal velocity is zero, i.e. in case of zero rest mass  $m_0 = 0$  single direction H particles

1(9) - In the H systems, the momentum and energy change with entrance or exit of H particles and so the energy, momentum, velocity change in the form of non continuous or quantized.

The entering or leaving H particles in an H system may be in the form of collision, fields' interaction, acting force; thus, the total energy of an H system (e.g. rigid body) may be altered due to these interactions.

1(10) - During the entrance of H particles into an H system (e.g. collision, force) H particles in opposite direction leave the system in the form of impulsion (reaction). In contrary if H particles in the form of photon emission, disintegration, fission or collision left the whole system, the remained inner H particles of the system act in opposite direction proportionately.

1(11) - Reflection of a single direction H particle-paths, e.g. photon, by a mass-body surface is interpreted as entrance of H particles of the former and exit H particles of the latter as the reflected photon. Moreover, by entering a negapa (of striking photon), a posipa of the mass-body (reflecting surface) leave the system at opposite direction and vice versa, *Sec. 6(2)3*.

1(12) - H particles principally are not sphere or ball shape but are trajectory like or path like particles (e.g. one dimensional filament, spiral string, *Remark 1(12)1*), and it interact along its path that is extended in a limited invariant path-limit  $\Gamma$  in normal vacuum space, *Sec. 3(1)1, Comment 3(1)1*, of H hall quantized package, *Sec. 5(16)3a*; please refer to *Note 1(12)1*. Moreover,  $\Gamma$ , nominated as path-limit, *Note 1(12)2*:

$$\Gamma = c/a \quad \text{Note 1(12)3} \qquad \qquad \qquad 1(3)$$

Where,  $c$  is the light speed and  $a$  is a coefficient of the medium, *Sec. 1(2), Note 1(2)1*, and *Sec. 7(4)3*. Please refer also to *Sec. 5(16)3b, part D2*.

Moreover, media coefficient  $a$ , *Sec. 7(4)3*, (or path-limit  $\Gamma$  in a medium) can be determined experimentally from energy spectrum of a free moving particle such as electron, *Sec.4(3), paragraph XIII* of explanation of, *Fig. 4(4)*; if the measuring instruments have the desired accuracies; please refer also to *Sec. 7(4)3, part G*.

*Note 1(12)1*- The path-limit  $\Gamma$  may be bounded, contracted, and dilated in gravitational field, or wrapped in some media, e.g., potential well, atom; but in these cases  $\Gamma$  varies as media coefficient  $a$  varies.

*Note 1(12)2* – The path-limit  $\Gamma$  of an H system, e.g., photon [57] has the following characteristics:

A)- According to path constancy, *Eq. 2(26)*, and Mossbauer effect,  $\Gamma$  path-limit remains unchanged, *Sec. ,3(3)*, in a uniform media regardless of the photon frequency change during Doppler effect, or, the speed of the related H system, i.e. emitter or absorber atom. According to *Sec. 7(4)3*, the path-limit  $\Gamma$  in a location of a medium depends on energy density at that location.

B) - H particle-paths can or contract, *Note 9(3)1a*, from  $c/a$ , *Eq. 1(3)*, down to Planck length,  $l_p$  *Eq. 5(33)3, Comment 1(12)1*; thus, the shape of  $\Gamma$ , path can be altered accordingly, *Sec. 5(16)3b, part D*.

C) - According to the counter-currency mode, *Sec. 3(1)2, Figs. 3(4),3(5)*, of posipa and negapa motions, *Sec. 3(1)2*, on the basis of Lorentz contraction ( Delta Effect), *Sec.2(1), Fig. 2(3)*, we have one of the following schema of H particle-paths:

- I) Open and straight configuration (Bosonic type), single direction or non reversible motion of its H particle-paths as in photons, forces,....
  - II) Closed and winded modes, i.e. superimposed H particle-paths, in a back and forth motions (fermionic mode) as in electron, proton,... in their bonded state
  - III) The intermediate state of extremes I and II as in case of free moving particles e.g. electron, *Sec. 4, Fig. 4(4)*.
  - IV) Curved mode as in electromagnetic and gravitational fields, *Sec. 5(10)1, Figs. 5(6), 5(7)*.
- D)- To each path-limit,  $\Gamma$  related an H hall quantized package, *Sec. 5(16)3a*. Please refer also to *Sec. 1(16)*.

*Note 1(12)3*- According to *Sec. 7(4)3*, media coefficient  $a$  depends on the energy (or mass) density of the related medium, e.g. vacuum, mass. Based on *Note 1(2)1*,  $a_1$  is the coefficient  $a$  for an H particle –path through vacuum gravitational field medium, or, better to say constant of media coefficient. Noteworthy, based on H particle-paths hypothesis, the path-limit  $\Gamma$  is regarded as length scale in a medium, e.g. vacuum medium, *Sec. 5(16)3b, part D2*.

*Comment 1(12)1*- "This is not surprising because we have already found that all physical laws are a result of the WSM (wave structure of matter) and its space medium" [501] *How is Principle II obtained mathematically*.

" There is a coherent tradition of philosophical thinking about nature from early ancient times to our days. One indication for this coherence is the fact that some of the most outstanding twentieth century physicists like Schrödinger and Heisenberg put considerable emphasis on the linkage between quantum physics and ancient Greek philosophy. The monographs Schrödinger 1954 and Heisenberg 1958 are just two of their explicitly philosophical works. Atomism can be seen as one form of reductionism with its assertion that everything can be reduced to some basic building blocks. In order to clarify possible ways to understand this assertion and some of its consequences it is helpful to distinguish different notions of reductionism. One reductionist position is that all scientific theories can and should be reduced to a fundamental theory which is generally taken to be found in physics"[598] *Atomism and reductionism*.

*Remark 1(12)1-* “A theory that has emerged in recent decades that claims to bring some relief to physics mysteries like these is called superstring theory, or string theory for short. Previously, scientists believed that the smallest, most indivisible building blocks of our world were particles, but string theory says the world is made of extremely small vibrating loops called strings”[616]. H particles are analogous to some extent to strings in string theory, and loops in loop quantum theory; but differ in many aspects that are coming in this article; please refer also to *Sec. 8(8)*.

*1(13)* - These path-like particles can coincide (or link) with each other (e.g. two or more of these paths can coincide to create a photon or an electromagnetic field) in a path limit or interval  $\Gamma$ , *Sec.5(16)3*. For example, the wave amplitudes are added, when the wave phases coincide the intensity is maximum, or, in other words, posipa (or negapa) coincide with posipa (or negapa) respectively; similarly, when the phases are opposite the intensity is minimum, or, in other words, the posipa eliminates the effect of negapa and vice versa.

The shape of the path may be rectilinear or curvilinear or spiral, in this respect instead of employing the word of H particles we apply H particle-paths nomination in the remaining of the text.

*1(14)* - The tangential speed of H particle-paths at each point along this path is equal to  $c$ , i.e. light speed in the vacuum.

*1(15)* – In case of a mass-body at rest, there is an equilibrium between posipa and negapa, *Sec. 1(5)*, motion at all direction without any preferences. Similar kinds of this equilibrium are extended in all over the physical world, as an example, “In the Stern-Gerlach experiment, it appears that the particles had an absolute angular momentum value  $M^2 = l(l+1)\hbar^2$ ; whereas, the direction of the angular momentum in space was arbitrary (a non-polarized beam)”[36], *section 31, P., 325*.

*1(16)* – An H particle-path, (or, a group of that), is transferred (in, or, out of an H system) through a unit nominated H hall package, *Sec. 5(16)3a*, of path-length value  $h$ , *Sec. 5(16)3g*, regardless of its total number of H particle-paths (or total energy) content, *Sec. 7(4)*. Noteworthy, during an interaction (or measurement, *Sec. 8(7)2*), the energy content of an H hall package will be varied, whereas its path-length value remained unchanged, i.e.  $h$ . Please refer also to *Sec. 6(1)*, *Remark 6(1)2*.