Title: **Particle and gravity mass in a Physical Reality (PhR) concept.**

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Abstract: Particles and gravitons in Physics are conform this PhR model, coherent patterns of standard but dynamic space-time raster points. This proposition allows the calculation of a simple but quantitative relationship between mass-values of a neutron and an electron.

1. A PhR model as proposed in a recent version (3) of viXra.org/abs/1604.0230.

- This version of a candidate PhR model starts from an empty cosmos(0), a (perfect) symmetry state that has been broken by a single creation event, inducing one charged point in an undetermined location (a cosmos(1) state with Sharon entropy zero). Charge is the only elementary binary (and quantized) property in the cosmos that makes the difference between something and nothing. Six simple base laws applied to this state and in a recursive manner to all successive states, leads to the creation and the evolution of a growing spacetime volume (called CPS), filled with points and quasi immediately thereafter, with more complex dynamic patterns of points and point-sets. Components (points and coherent subsets of points) of these patterns are internally and externally connected by the exchange of interfering quantized charge info packages. Charge info is emitted by points whenever their charge states are changing. After superposition, charge info can selectively interact with points or point sets, being in compliant states: successful coupling events take place along shortest paths and respect conservation rules. Net quantized charge info patterns materialize magnetic fields in physics. Charge is a conserved quantity over the whole CPS and the net sum of all signed and over several dimensions and locations distributed point charges in the cosmos equals at any moment of its evolution the initial creation amount. If the smallest phase shift between any two points life cycles has a lower limit (so the CPS has a finite number M of dimensions) , any limited time resolution implies that the CPS, being a huge unique collective quantum "object", must lead to a cosmos(x) with a maximum size. As charge info can propagate in the full set of dimensions, the coherence of a cosmos(x) can be assured.
- All dynamic points are identical and exact copies of the creation point, be it in distinct locations and endowed with an opposite charge sign. Charged point states are reset or new versions of points are induced in empty locations by charge info quanta emitted by other points whereby the point state transition time τ is a constant. Although all single point states are dynamic and short lived, the hazardous appearance of more complex combinations (e.g. particles in physics) will lead to an increase of the life time of their patterns and of some of their properties, be it that their point contents are permanently refreshed by new versions: a pattern can be persistent, a version is not. The process of increasing complexity of the cosmic point raster's pattern content never stops. All these assumptions imply that any advanced

PhR conform model can only be successful if it takes the presence of an underlying non-abstract spacetime grid (CPS) filled with quantized short lived points (as dynamic elementary building blocks of Planck size) into account.

- In a young CPS volume, a lowest level subset and dense collection (the UZS) of point patterns called zerons , originated spontaneously while the CPS-volume was still growing. Zerons are patterns of 2 anti-symmetric point strings that are alternatively growing (and shrinking) in time along two over τ phase shifted "directions", whereby they are able to maintain an anomaly over longer time period than a single point could do. The import of such anomaly is the outcome of a single hazardous interaction: an appropriate charge info quantum emitted by an appropriately phase shifted point pair, is exchanged with another orthogonal, properly synchronized and positioned pair: one point (version) of each pair will show twice in a row the same (with opposite sign in each pair) charge state. The appearance of such special "embryonic" pair of 2-point cores is in fact an heuristic event in the CPS and the two forthcoming cyclic processes are called "point replication" whereby the initial anomalies, once stored in each core, are in an anti-symmetrical way and alternatively left-right copied: despite an attempt to respect overall conservation rules, this process is creating temporarily local unbalanced space and time quanta. The initial interaction has injected phase shifted anomalies at both ends of a so called "point string" : at one end a so called "connector" is carrying in the course of one life cycle of the zeron pattern, a persistent but dynamic unit point charge type excess, at the other end a hole (a dynamic, over half a point life cycle τ, phase shifted quantized pointless or empty location state). Both "orthogonal" replication processes do not interact with each other.
- Each growth process is the outcome of constructive interference between charge info quanta, emitted by compliant superposed and time shifted versions, replicating in distinct dimensions, out of a common high-dimensional anti-symmetric core antenna. Any point replication process reduces locally the CPS dimensionality M by a factor 137, meaning that a charged excess point state with the same sign is maintained in the same location by successive identical and phase or time (2τ) shifted growth cycles (indexed by an integer i and materializing, in a local subset of dimensions, a fastest and normalized path in time). The remaining number of dimensions N of UZS space-time is assumed to be still a very large number.
- Growth of a replication process comes to an end after 137 steps by an interaction with a point/hole connector of a neighbor zeron, both in compliant states, a process that leads after proper phase shifts, to imbedded signed and quantized delays of both patterns and to the shrinking of their replication sequences (synchronization of dimensions gets gradually lost). The value 137 has to be a prime number and is a constant over the CPS (no discriminating property in the CPS could make them different). It guarantees energy and charge conservation for interaction scenario's per zeron pair. This limit reflects the fact that the probability of a next growth cycle,

based on “constructive” interference between dimensional subsets of point string versions, replicating in superposition around a shared central point pair, becomes smaller than the probability of a “destructive” interaction with a compliant neighbor connector. After a phase jump in de contact state (i-max), point strings start to shrink until reduction to a quasi empty (except from charge info) contracted state. After inversion of a string (including its sign), a new anti-symmetric growth process begins.

- The charge conservation rule can be respected in the contact location, either by the injection of an extra point with opposite sign, or by the elimination of an existing point with the same sign. Both interaction scenario's, depending on the connector combinations (point or hole states) materialize in PhR the discriminating property between positive (matter-like) or negative (contramatter-like) mass quanta and correspond with opposite deviations from a local standard point/hole density ratio. It explains a small difference between an exact number 137 in the by physics observed inverse fine structure constant for matter (in a contra world contra-scientists would observe values slightly less than 137). Apart from this contact property, one that is in fact owned by a zeron pair (EZP) in a particular state, all replicating zerons shrink and growth cycles are identical. The reason hereto is that all the subsequent charged point states are separated by a fixed 2τ phase lapse (a standard point version's life time), implementing a shortest and dense path in time that is temporarily immune for external interactions. The two types of mass related anomalies in a homogeneous double raster, are primitive forms of energy and are maintained when zeron pairs will be integrated in more complex zeron patterns. It will lead to a cosmos made of overlapping or separated two point and zeron pattern subsets, apart from their initial creation totally transparent to each other for most basic interaction processes (e.g. no EM coupling between both is possible). Energy conservation rules take the presence of these two types of contact states into account (e.g. +/- E = +/-mc² (m and c can be slightly different for EM waves and contra-EM-waves whereby the μ values of the two CPS/UZS subspaces are the discriminating (= what “makes the difference”) property for both types of magnetic field parameters).
- After a phase jump in de contact state (or i-max), point strings start to shrink until a reduction to an about empty (except from residual charge info) contracted state, where after inversion of a string pattern a new anti-symmetric growth cycle begins.
- Particles (as in Physics and excluding gravitons) are more complex zeron patterns replicating out of a 4-zeron Higgs core (an EZK) and composed of 90° phase shifted by charge info interconnected zeron states (again initially an heuristic phenomenon taking place in a high-dimensional CPS/UZS). They grow and shrink (a zeron replication process along fastest multidimensional paths or strings in time and space, protecting the pattern against outside impact, except when connectors are in special states – e.g. in I-max). The symmetry of an EZK (or Higgs) – 4 zerons form geometrically a regular tetrahedron and their states that are in zeron-space, 90°

phase shifted - implies that replication takes place (stepwise 2-sided and phase shifted) along 3 perpendicular symmetry directions. They have in general (as a version) a short 4-cycle life span (spin ½ patterns, meaning that 4 successive growth and shrink cycles are needed to transform, by 4 inversion processes in the contracted state, a pattern again into the same state). Growth of a zeron string stops by a subtle and complex internal mechanism driven by phase shifted string zerons, not by interaction with a neighbor particle (as a single UZS zeron in i-max does).

- In what follows, geometric concepts like tetrahedron- symmetries in an EZK need to be treated with care: contrary to (static and abstract) mathematical properties and definitions, this PhR concept is dynamic. It means that (e.g.) even a virtual rotation of 2-zeron tetrahedron rib over 180° around a virtual parallel axe thru the center of an EZK needs a finite quantized amount of time: as a consequence, a non-symmetry in math could be a symmetry in a dynamic EZK concept, if (e.g.) during the time laps required to rotate, the (virtual) rib in its new position changed its content / orientation. Multidimensionality makes things even more complex, although those dimensions are mostly limited to critical (90° or multiples) time or phase related symmetries in zeron-space or in point-space.
- The maximum length of a particle string (expressed as a version-dependent index I-max) is a measure for the amount of momentum and energy stored in a particular version state, but additional (symmetry) properties at core level are needed to understand the full mechanism of particle motion (see the general PhR article on viXra) . A single particle version is unable to move over the double grid: what science perceives as “a moving particle” is a correlated set of subsequent versions with their central positions shifted on the double grid over quantized interzeron distances. Such shift can only take place when a mutated replicating version is periodically inverted in a central contracted state. The distribution in space and time of subsequent versions forms a virtual propagation path (to be compared with a moving picture on a computer screen whereby individual active pixel components stand still). “Moving” patterns that did not import external perturbations, maintain their collective format and properties thanks to internal exchanges of quantized interfering charge info packages at point and zeron level (“raw” info is emitted in all directions and dimensions) propagating <u>at a much higher speed than c</u>. One of the smallest particle-like patterns able to “move” are <u>fotino</u>’s: what Physics observes as photons are correlated sequences of, in multiple dimensions superposed, fotino versions emitted in a contracted state by an accelerated (charged) particle , acting as an antenna that did not yet enter into a new internal equilibrium state after its connector was “hit” by an external interaction. Successful photon coupling between source and target takes place along a fastest path (Fermat/Feynman/RQFT/PhR compliant).
- Those changes in momentum are induced by properly synchronized interactions between a particle’s hole connector in the I-max state and another particle in a compliant state (the term “particle” encompasses photons and gravitons although

the compliancy rules for both are slightly different). Each one-shot coupling is intermediated by a 2τ lengthened quantized charge info pattern as emitted by two coupled phase shifted zerons. This micro-pattern reflects the small fixed (although slightly different for matter and contramatter zeron pairs) phase shift between two shrinking transversal EZP zerons in their contracted states.

- Elementary particle-like (but zeron made) patterns originate from hazardous combinations of point-zeron raster elements or are induced by colliding particle connectors or, sometimes, are standard "difference" patterns in case of pattern decay. Their components are connected along shortest paths by one shot hazardous interactions or cyclic charge info exchanges. An axion interaction between two zerons is leading to a change of the net local point charge density, often by switching a point (in the contracted state or in an I-max connector zeron) twice into the same charge state. In complex particles this unusual state might become a quasi persistent but dynamic Coulomb-unit charge excess, a source of an UZS polarization string and assimilated with an electric field line. Interactions between two patterns have to respect overall charge conservation rules. A polaron, in fact a charge info pattern emitted by two contracting but phase-shifted zerons (often a virtual photon coupling in physics), is exchanging between patterns a fixed time quantum or hole. Multiples of these time shifts stored in complex patterns and observed over a standard replication cycle, materialize a particles' mass property (null- mass as well as momentum related free mass per time frame). It creates and maintains in fact a local non-standard hole-point density ratio and is a second indirect form of energy (a single hole, as an object on its own, does not carry energy). Both types (axions and polarons) are a convolution of energy and time, implementing a standard action amount (in physics: h for polarons or h/2 for axions) equal to $\delta E * \delta t$. Abstract short or long range forces, as defined in physics, are not PhR compliant.

2. Gravitons.

- Contrary to ordinary particles, gravitons are not EZK (4-zeron) based growing and shrinking zeron sets but persistent EZP (2-zeron) patterns. In PhR terms a graviton is a simple quantized persistent 2D or planar or "flat" point/zeron pattern, rotating around a central symmetry location (attention: the same rule applies as in case of ordinary 3D particles – a particular graviton version does not rotate, its subsequent versions show a circular planar pattern distribution around a central symmetry or contraction location). It is a spin 2 pattern, to be compared with a 3D - 4 growth-shrink –cycles EZK pattern: spin ½ particles need 4 growth-shrink cycles to reenter into the same state, gravitons just one.
- A graviton is stepwise induced (or copied) in the UZS and released (or absorbed) per single growth-shrink cycle as an autonomous pattern in spacetime whenever an unbalanced elementary contracting (or growing) particle string (in a particular

momentum state) has been accelerated before (or decelerated) by a one-sided interaction with either another particle (e.g. a photon) or with an existing graviton. All matter-like gravitons (except from the orientation of the virtual symmetry axe perpendicular to their plane) are the same and cannot be directly observed by physics (contra-gravitons maintain in their centers a slightly different mass or time quantum) . As a pattern they do not store directly the energy part of an action quantum, but they "freeze" a quantized time delay in a fixed location of the CPS. This explains partly why physical experiments will never be successful when trying to observe gravitons directly: gravitons change the potential energy of other objects in the neighborhood "by maintaining quantum holes in an a priori homogeneous spacetime raster". This principle is important whenever one applies a global energy conservation check on a multi-particle interaction process. An interaction between two particle connectors in their I-max states will shift, over a fixed amount, the relative phase angles of both point replication schema's of two connector zerons (an abstract perturbation in Physics). Obviously this has an impact on the local point-hole density ratio in the CPS/UZS and as explained before, a quantized hole is a time component of an "action" amount exchanged under a polaron type format.

- A stand-alone rotating graviton pattern is unable to shift its average position over the double CPS/UZS grid. When absorbed and subsequently again released by a moving and/or accelerated particle, its new central position has changed only slightly over a quantized unit distance corresponding with the opposite position shift of the particle (GR conform). Gravitons, as spin 2 patterns, couple with connectors in I-max states of subsequent replication cycles of a spin1/2 particle and they have an opposite impact on its momentum state. So there will only be a net impact if a local, on large scale and in geometrical terms curved, graviton density will be the cause (and the outcome) of an unequal coupling probability of a graviton with I-max connectors of subsequent replication cycles of a "moving" spin 1 or spin ½ particle. Large scale curved graviton density fields materialize dark matter (or dark contra-matter). A gravity field in Physics is the PhR representation of the geometrical non-flat form of a graviton density distribution in the cosmos, mostly around a growing central symmetric spherical condensation point of particles or contra-particles.

3. Some of the consequences of this PhR approach.

- Some important consequences of previous propositions are :
    - All causally linked processes taking place after the initial creation event, as well as all spontaneously emerging raster patterns (both the outcome of what has been called a cosmic evolution driven by the base laws) are at least temporarily cyclic, whereby subsequent versions are often anti-symmetric versus the previous ones. In fact they are unsuccessful attempts to restore the perfect empty cosmos(0) state. "Unsuccessful" as their outcome is just a

growth of a space-time (or CPS/UZS raster) volume and/or an increase in complexity (and in entropy) of the cosmic content.

- All phenomena observed by physical experiments are materialized by correlated point and/or zeron sets replicating and propagating as pattern versions on a double CPS/UZS grid.
- When particle versions are "moving" at constant speed in flat spacetime, the average local graviton density remains the same but subsequent graviton versions along the propagation path will change their position over a distance of the size of an Higgs. However any displacement of a spin ½ pattern <u>at a constant velocity rate</u> (Newton) can be treated as the impact of a single acceleration-deceleration (or vice-versa) sequence, being the outcome of subsequent spin-2 interactions. So when particles are moving over the double space-time raster in a flat quantum gravity field at constant speed, they restore "backwards" the previous "gravity or graviton density state" after each position change of their symmetry center (and their EZK nuclei).
- A concentration of accelerated particles (or contra-particles) due to a radial graviton density gradient will lead to the formation of galaxies, stars and planets. Gravity is not a force but is based on unequal coupling probabilities between gravitons and anti-symmetric particle connectors of subsequent replication states (an extremely weak effect over a single replication length).
- There exists in the cosmos a Preferred Reference Frame, namely the CPS/UZS grid. Einstein's principle of relativity as proposed in SR is at least partly wrong although PhR conform Lorentz transformation laws remain valid, be it that these laws reflect a real change in a patterns life cycle at high velocities. Patterns propagating at different speeds versus this frame (e.g. electrons with different momentum values) have different I-max values (consistent with "de Broglie's law". They seem to behave as waves because their replication cycles and their coupling probabilities depend on I-max values , perceived as a wave-length). The famous "slowing down of local time in a high-velocity muon" is a misleading way to describe the fact that the decay time of the muon has been effectively lengthened. Michelson and Morley's experiments are irrelevant: the value "c" (for matter) is fixed on a "normal" spacetime grid and all the emitters of fotino's stand still (in absolute terms) versus the CPS/UZS grid. There is no dragging effect (not to be mixed up with Doppler shifts) and the speed of light cannot depend on what physics erroneously observes as the speed of an emitter.
- C is a maximum propagation speed of particles, meaning : it's the maximum speed at which successive versions of a matter-like pattern can form a correlated and by physics observable path in spacetime (in PhR terms: on the double grid). However this value is small as compared to the speed of charge info, propagating between pattern components (>= 137*c). So principles in

physics like “locality and realism” have to be reconsidered in a PhR perspective.

- Acceleration (deceleration) of particles (a change in the pace at which new particle versions are released, a situation at least partly conditioned by a change in I-max value) is equivalent to and determined by net graviton emission or absorption processes (conform Einstein’s equivalence principle) although acceleration and deceleration can also be driven by other sources of (polaron) interactions, not just by the impact of varying, small or large scale, graviton densities.
- At a smallest scale (e.g. when neutron/contra-neutron pairs emerge out of a broken EZO) short range matter and contramatter particle interactions can be locally repulsive (too complex to explain in this resume – it is a source of dark energy in a young cosmos slice and an alternative for a Big-bang scenario). This spontaneous emergence of an anti-symmetric neutron-contra-neutron pair does not violate energy conservation principles (it explains why LENR reactions are possible). This PhR model is proposing a single point as cosmic(1) state and without new creation events, all what comes later must charge and energy-wise cancel out except from an increased spacetime volume filled with balanced charge and hole densities and an increase of complexity.
- The cosmos is intrinsically high dimensional but Physics is observing only subsets of patterns that are temporarily in a common 3D (or 3 + 1 D) state: these dimensions correspond with an intrinsic Higgs symmetry (4 phase shifted, adjacent zerons geometrically in a tetrahedron format with in space and time interchanged zeron states), whereby successful particle interactions (thus also direct observations) require at least coplanar axial replication directions and net charge info propagation paths. The multidimensional nature of superposed versions of replicating particles does not disturb these geometrical restrictions if subsequent versions are mainly time shifted. All instruments used in physical experiments belong to this dimensional subset and will always be unable to observe directly the rest of the cosmos.
- Although polaron coupling between two particle strings prefers co-linearity of replication axes, there is a collision angle dependent probability that coplanar connectors of two orthogonal strings of a replicating particle interact periodically with each other, materializing a process of rotation or bending with a redistribution of string-momenta, eventually without an increase of energy (the I-max value of the longest replication string). This mechanism presupposes that a string after its successful interaction is subject to a phase jump that makes him temporarily no longer the longest and fastest of the 3 phase shifted string connectors. <u>The ultimate criterion for successful coupling is that charge info emitted by two phase shifted contracting zerons of a</u>

connector, will reach two zerons of a target connector synchronously or "at the right moment" in order to impact in a quantized manner and by constructive interference, the duration of their embedded empty state .

4. Elementary particles and their mass property.

- We focus here on implicit relationships (conform PhR principles) between mass values of spin ½ particles like neutrons, electrons and protons. These three particle-like patterns are quasi-persistent (a free neutron decays very slowly) and they are representative for two major replication schema's in PhR, as well as for their corresponding particle families in physics: the lepton (electron) and baryon (neutron and proton particle) classes.
- In this PhR concept members of both classes are replicating around a central EZK, a regular tetrahedron pattern with four 90° phase shifted zerons. Baryon like replication processes originate from an internal axion-type interaction between two zerons that belong to two anti-symmetric EZK's with a shared central symmetry location, both subsets of an 8-zeron EZO pattern. This zeron combination has a non-negligible chance to emerge spontaneously in a local "flat" UZS subspace (one with a balanced point-hole density ratio).
- In the beginning only neutron / contra-neutron pairs did emerge in a growing "young" cosmic UZS volume. Without a momentum increase by polaron import, their masses correspond with approximately 1/133 of an Higgs mass (an EZK in PhR - see viXra.org/abs/1706.0099). The reduction of the I-max value from 137 to 133 is the result of 4X2τ internal phase shifts, leading to the emergence of a neutron-like zeron replication process: one 2τ quantity initiates the decay of an EZO into two anti-symmetric replicating EZK's, the 3 other quanta implement relative phase shifts in point space along 3 orthogonal symmetry directions, typical for any replicating EZK in the null-state and the outcome of dynamic role interchanges between its 4 zerons. Even in a primitive and highly symmetric pattern like an EZK, perfect synchronous (= without any phase shift) orthogonal superposed processes are excluded because destructive interference of charge info would make it impossible to sustain a pattern format and to respect an overall charge conservation rules.
- An electron (or positron)-like replication schema takes place along 3 orthogonal dense and growing or shrinking (in zeron space) axial strings, each string surrounded by a narrow helical (in point or phase space) transversal 2-zeron string. Together and per string they form a dense dynamic growing sequence of identical but anti-symmetric EZK copies, sharing per growth step an axial zeron. Hereby an initial net excess charge is maintained as the state of the non-free transversal zeron in the "long connector" of each growing string. At the opposite end of each string, excess holes are maintained by 3 phase shifted "short" connectors, materializing the pattern's mass property (in PhR terms a change in the local point/hole density ratio).

The terms “long” and “short” refer to alternatively growing, over τ phase shifted processes at both ends. Holes (for each matter/contramatter subclass) are unsigned quantities and maintained by phase shifted transversal zeron pairs (contact EZP types) whereby the “duration” of a contact in i-max (equivalent to the lifetime of the hole and the phase shift between a pair of contracting zerons) is slightly different for matter and contra-matter (positive or negative deviations from a standard density value as based on perfect 2τ time shifts in point replicating zerons). Whenever the phase of the free zeron (the zeron that does not carry the persistent charge excess) state of the long connector reaches a value 137, growth of the strings turns into shrinking due to a role interchange between 2 transversal zerons in the long string connector in its I-max state and a subsequent phase shift in the axial zeron. Charge info coupling with the central EZK guarantees that the 2 other strings start shrinking as well. This simple schema explains the fixed and small null-mass of an electron and its persistent unit charge amount. Taking superposition into account, the residual charge info pattern emitted by the 3 orthogonal replicating free charge connectors materialize an electron’s magnetic momentum (and phase shifted hole- “masses” the mechanical spin). Both spins are oriented along a virtual trisectrice between and versus the three orthogonal replication directions. The magnetic spin value, as a by constructive interference dense pattern, takes the 2τ phase shifts of the connector zerons and the phase jumps in the contracted states of the 4 growth-shrink cycles of a spin ½ pattern into account.

- A more complex baryon-like replication schema (the neutron case) leading to an estimation of the Higgs mass, has been described in a PhR article mentioned above. Permanent role interchanges of the 4 phase shifted EZK components at point and zeron level generate a complex rotating replication process , in fact 3 in point space superposed <u>multidimensional</u> bi-conical distributions along 3 fixed orthogonal symmetry axes, each conical line showing the simple lay-out of a replicating electron or positron (axial + transversal zeron pairs). Hereby we stress that binding of 4 zerons in an EZK can be done by three interactions, implying that one zeron of a quartet has some flexibility as far as its standard 90° phase shift (in point replication terms) versus the other is concerned (called a dynamic <u>free zeron of an EZK</u> – “dynamic” meaning that in a cyclic process, a copy of each EZK zeron is a free version, taking superposition and role interchanges into account. The 3 symmetry axes of a tetrahedron, perpendicular to the centers of opposite virtual ribs, do not coincide with potential axial two-sided replication strings along an EZK’ s 180° phase shifted orthogonal zeron pairs.
- Superposed (phase shifted in point space) electron-like replicating strings distributed over 3 bi-conical line bundles originate from role interchanges in an EZK nucleus and are only periodically able to increase their I counter value, each time their dynamic zeron connectors coincide in phase and space with an axial replication direction (4 “times” conform the rotation-of-roles frequency of the EZK zerons). The I-max

return value counted in a fixed central reference frame of a tetrahedron cannot exceed 133. Because these processes take simultaneously place along 3 orthogonal 2 τ phase shifted directions, their coupled “return” events show a relative small but flexible priority schema .

- An important difference with a single electron replication process is that two adjacent partial strings are able to interact in critical phase states by axion interactions between adjacent zerons in i-max states. The outcome is that contrary to a simple electron replication schema where contacts between connectors of orthogonal strings are excluded, the adjacent “long” connector free charges interchange periodically their signs and connector types. So the total charge of a neutron for an observer remains the same (null) although the magnetic spin momentum is not null, be it much smaller than in case of an electron. The phase shifted free charge connector states along growth directions, temporarily with opposite signs in distinct connectors, are interconnected by polarized zeron strings in the UZS, prohibiting the presence of any measurable external Coulomb field. The mass quanta of baryons on the contrary simply add up: the impact of phase shifted connector holes on the free zeron states of an EZK, typical for low velocity electrons, does not cancel out for electron-like partial strings in a baryon schema. This explains (e.g.) why the gyro-magnetic ratio’s of a proton and an electron are inverse proportional to their null-masses. This also means that a same amount of action leading to a baryon- or electron-like replication process, does not store the same amount of null-energy $E = mc^2$(or mass or life time) in both particles. This effect is compensated by a difference in replication (null) tenor T for the two schema’s, taking $h/2 = \delta E.T$ into account. This difference in tenor is important to understand in PhR terms, nucleus/multi-electron coupling schema’s in atoms.
- If the number of electron (or positron)-like point level replication schema’s is even, the net charge of a baryon is null (a neutron), if it is odd (a proton) the net charge is by convention positive. The spin-off pattern charge (a 3-string electron) in case of neutron decay is negative. The difference in energy and momentum between a neutron and a (proton + electron with momentum) combination is released as a (anti)neutrino pattern. Neutrino’s are difference particles, taking into account the distinct point replication schema’s of free zeron’s in role interchanging EZK’s of protons or neutrons, and not fully “absorbed” by the emitted electron. They emerge when a pattern is in the contracted state as the outcome of a reshuffling of the central EZK in a Higgs at the time decay takes effectively place. All e-neutrino’s and anti / contra-types interact with zerons in patterns by axion exchange but both have opposite helicities. Contra-neutrino’s would have $m' < m$ en $c' > c$ values and more experiments are needed to find out that some antineutrino’s could be in fact contra-neutrino’s.
- If we neglect any small neutrino impact, we can deduct approximately the mass of a neutron (and obviously indirectly of a proton) from its virtual electron mass content.

Hereby we summarize following assumptions, consistent with what has been described before:

- In a baryon replication schema, electron-like masses of partial replication strings add up , but impact of charges taking axion exchanges into account, cancels out per pair. A particle carries mostly only a net single charge excess of a particular type, distributed in space and time over its dynamic connector components.
- In a baryon schema, replicating over a double cone with electron-like distributions of axial replicating zeron strings, properties in physics are measured along symmetry directions perpendicular to and in the center of opposite virtual 2-zeron ribs of an EZK tetrahedron (how an experimenter "sees" a free proton or neutron quark set).
- Dynamic bi-conical (with a circular directrix) string distributions, each around **3 orthogonal symmetry directions** are made of **133 point replicating pattern versions**. This process takes place as driven by a central EZK tetrahedron, endowed with dynamic role interchanges in point space of the 4 central phase shifted zerons.
- This dynamic multiple version set with multidimensional orthogonal conical distributions, contributes to growth and to an increase in I-index value each time a replication coincides with a string direction of a properly phase shifted 2D zeron pair in the central EZK (**4 times per virtual tour in a role-interchanging concept**).
- The space-time angle between any measurement, made along a 2D axial string (a tetrahedron rib and the electron case) and a virtual orthogonal symmetry axe (the baryon case) is **about 30°**. So the observed mass of a neutron (as a total time or phase quantity) has to be multiplied by cos30° in order to compare it with a number derived from an electron mass measured directly along an EZK 2-zeron direction. This proposal to attribute to mass a vector character, is consistent with the PhR definition of energy, being the pattern's capability to change the state of the cosmos per unit time interval (a probability of interacting successfully). See also "Koide's rule(s)".

- **These assumptions lead to following approximate equations with mass values expressed in MeV/c² units: 0.511 (electron mass observed in physics) x 3 x 4 x 133 = 815.56 = 939,6 (neutron mass in physics) x cos (29.77°). A similar equation exists for protons: 0.511 (electron mass as observed in physics) x 3 x (4 x 133 – 1) = 814,023 = 938,27 (proton mass) x cos(29.821°).** The discrepancies versus a theoretical 30° angle are relatively small.
- It is also worth to notice that the difference between a neutron and a proton mass does not exactly equal the, in a PhR concept at first sight expected value. The difference in case of neutron decay, could be related to the momentum energy of the electron and to the emission of an anti (or contra)neutrino with mass and

momentum, in fact a difference pattern representing the impact of a reshuffling process in the central EZK of the free zeron distributions. The number of “circular” (and phase shifted) distributed axial strings in neutron cones and their impact on the role interchanges in the central EZK before and after elimination of 3 electron-like point strings sets, does not match the sum of these states in separate proton and electron replication schema’s . In a proton a configuration with 4 equal 133 point subsets per circular cone (the neutron case) is excluded because an even number of electron-like strings would make a dynamic 3D pattern with properly phase shifted and alternatively positive charged connectors (a PhR equivalent of “quark” charges in particle physics) impossible. The in PhR terms accepted approximation takes extra dynamic phase shifted axion like couplings between the multiple versions in the Higgs nucleus into account, making a proton persistent as a pattern and explaining its net +q charge value. The number of superposed electron-like patterns is reduced by 1 versus its value in a replicating neutron.

- The decay of a neutron leads after the reshuffling of its core to two difference particles: a neutrino with a negligible mass and an electron with an Higgs core that does not necessarily match that of an electron “at rest”, meaning that the phase angle of its free zeron can have a value smaller than 133. If this is the case, it has an I-max value smaller than 133 and it owns kinetic energy on top of its rest energy (Physics measured a value of 0,782 MeV). Computer simulations are required to deduct the composition of the electron energy (rest + kinetic) from the transformation of a neutron replication schema into a proton schema.
- An indirectly related issue has to do with the dynamic strong binding of protons and neutrons in the nucleus of an atom. In case of stable nuclei and taking PhR into account, the transitions between replication formats of proton and neutron states under the impact of a combination of polaron and axion exchanges (PhR of gluons and the strong interaction force in Physics), must allow a stable but oscillating format for the whole nucleus. Stable implies that at least charge, mass and energy conservation rules have to be respected. Hereby the symmetry of the spin ½ patterns, the limited range of an axion exchange process (a matter of probability of successful coupling between two zerons at short distances, a much smaller value than the polaron coupling case between EZP’s and PhR in physics of “asymptotic freedom”), the momentum variations (in sign and in direction, observed in a fixed reference frame) between interacting nucleons under the impact of polaron exchanges, superposed and spatially overlapping states, all these are issues to be taken into account when trying to reconcile observations in physics with PhR. As an electron in most cases has left the nucleus, charge conservation applied on the nucleus alone in combination with periodic role interchanges between protons and neutrons requires extra axion-type interactions between both. As the number of holes in the two patterns is slightly different, the binding energy (in fact adequate variations in I-max values of the interacting nucleons) has to compensate, in order to

respect overall energy conservation, the small binding energy of an electron on its orbit. This process must remain stable in case of ionization of the atom. Finally the model should be able to calculate the probabilities of different types of decay for unstable nucleon configurations (radioactive isotopes). This model is flexible enough to solve these puzzles but this complex exercise needs to be done with the help of computer simulations.

5. Conclusion.

- These results of PhR-conform but approximate calculations confirm our statement that a correct insight in the internal dynamic structure and processes of elementary particles, expressed as coherent sets of points and zerons involved in properly designed replication schema's on a double cosmic grid, could contribute to the understanding of their behavior and to the correct calculation of their properties as observed in physics. And vice versa, properties observed in physics and in line with PhR predictions would confirm the validity of this model.
- On the other hand we must be careful when making a comparison between Physical quantities and numbers, and "equivalent" pattern properties in a PhR concept. There is a serious risk of oversimplification in PhR. In this TOE an abstract definition of the term "energy" says that it is the capacity of a pattern to change the state of the cosmos. To do so one needs a discriminating property in order to make the pattern different from its environment. Hereby we identified two major sources of energy for simple patterns: either a charge excess or a non-standard hole density ratio. For more complex particles other discriminating properties are linked to combinations of elementary properties of a pattern or to its relationship and interaction with its environment.
- When a (naked) particle is mentioned in Physics, individual properties are measured and listed: its free charge content, its null-mass, its spin. The question is: how and to what extend do these properties contribute to the energy of a pattern in a PhR perspective ? If a clear answer to this question is not given, it is risky to use simple PhR lay-outs and compositions in order to calculate properties like null-mass and compare these results with Physical models where concepts like "on mass shell value" and "self energy" exist. The decay of a charge neutral neutron into a charged proton-electron pair with a relative non-zero speed versus each other converts a pattern without net potential electric energy and with a small net magnetic potential, into a pattern whereby null-energy depends on its definition and its relationship between decay products and between these products and their environment. Even in Physics alone this is a complex topic and several domains of interest apply hereby different criteria to distinct situations: examples are the definition of mass in particle physics, effective mass in solid state physics and self-energy in field theories whereby

a potential impact on the environment is taken into consideration (an approach the best comparable with PhR).

- In PhR the property “mass” corresponds with hole based energy, leading to physical properties like null-mass ($E=mc^2$), kinetic energy and momentum, or gravity based potential energy. Exchange of energy by interactions between patterns is polaron based. Charge, as a discriminating property, is a conserved quantity of a replicating pattern that has no direct impact on mass related energy but its indirect impact is dominant and crucial – idem for what its interaction capability is concerned:
    - If a complex replication pattern contains a net amount of charge, conservation of this amount must be guaranteed in time at point level in the course of a full replication cycle.
    - If due to the geometrical symmetry properties of the pattern, free charge is distributed over several components (like strings in PhR or quarks in Physics) a simple sum of charges can only make sense if the previous rule is respected (so their local phase shifts have to be taken into account).
    - The combination of previous rules lead to properties like magnetic spin.
    - Free connector charge is not a source of energy in a sense like $E=mc^2$. If two particles interact via an electromagnetic coupling, charge properties are polarizing the UZS in such a way that Coulomb field lines determine along which paths and in which sense momentum impact takes place. The latter depend on the replication formats and states of both interacting patterns.
    - Previous statement is valid over long distances: in a nucleus of an atom direct polaron coupling without Coulomb polarization between nucleons is possible but also in that case the role of free charge types has an impact on the probability and the direction of energy and momentum exchange processes (leading to what Physics calls strong interactions by gluon coupling and eventually to decay by weak interactions). Hereby axion type interactions between connector zerons make the behavior of nucleons more complex and explain why successful processes are mostly “short range”.
    - There is no separate strong gluon exchange based interaction type in PhR, just a combination of axion and polaron driven interactions between connectors of replicating particles in a nucleus.