Title: Is production of energy "for free" feasible in a PhR perspective?

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Abstract: *The Physical Reality (PhR) model presented in viXra.org/abs/16040230 (Ref1) is the outcome of an alternative approach to studying cosmic behavior. It implicitly extends the principle of energy conservation to the whole cosmos since its creation out of nihil. This article concludes that under this scenario an attempt to produce energy "for free" would not necessarily be doomed to fail. A global energy conservation rule in PhR does not conflict with a partial and locally valid version as proposed by Physics.*

Comments: *This version contains important modifications and enhancements of previous versions. A list of PhR terms and definitions has been annexed.*

1. Physical Reality (PhR) and energy: a summary .

- In PhR any source or form of energy is either zeron or point driven. A source is a dynamic pattern of points and zerons that are emitting in critical states charge info patterns that are conform the base laws, emitted in all directions at a speed much higher than c. Critical states are special states of particle-like patterns where components of these patterns are emitting (after superposition) charge info packages (axions and polarons) that can be involved in internal binding.
- In emptiness and conform the base law of nature, an antenna point is able, in adequate local raster states, to induce an inverted copy of its format in the CPS-UZS. Charge info is capable to interfere at point level, meaning that in case of destructive interference its impact is nihil. In case of constructive interference it can produce either a short lived hole pattern in the UZS (a polaron) emitted in the I-max return state of a replicating EZK based particle, either it can result by selection, in one or more circular dense sequences or loops of 90° phase shifted copies of a point life cycle, observed by physics as magnetic field curves. As charge info is emitted by at point level in all directions several superposed versions of the same antenna configurations could dynamically emerge and coexist, depending on symmetries of point antenna patterns. These fields do not contain energy in the sense that they cannot change the momentum state (or I-max in replicating particles) but are able to induce a 90° phase shift in the contracted state of certain replicating particle classes.

- Well synchronized charge info patterns , emitted by replicating particle connectors, can induce in the UZS inverted copies of a replicating particle (e.g.) in the contracted state , or in I-max they can emit polaron formatted holes, able to exchange momentum quanta with other compliant connectors of neighbor particles. They can polarize the UZS by selection of well synchronized zerons, leading to Coulomb field lines or to multiple branched contact-EZP's that are able to transfer finally along shortest paths fotino-like components of real photons or momentum quanta (virtual photons).
- All these phenomena take place conform the base laws of PhR.
- If the definition in PhR of a term like energy is very general (the capability of a point or zeron pattern state to change the state of the cosmos) it might be correct, but at the same time it is useless for practical purposes.
- Previous random selection of statements has set the scene for energy issues in a PhR context: in the following paragraphs, we will focus on a class of processes that take place in a UZS spacetime filled with patterns possessing a central *dynamic* multi-zeron-based antenna configuration (EZP, EZK, EZO). *Those processes might* emerge spontaneously (e.g. in a young cosmic shell) or artificially (e.g. in certain scientific experiments). When *antennas duplicate their format by selection of free compliant zeron sets in the UZS, these forthcoming copies are* at least partly reconcilable with particles in physics (*gravitons and photons might be an exception).*
- Finally: any statement made in this document will accept the correctness of the basic cosmic model put forward in Ref1 – a presumption that we will not repeat at every turn throughout the following pages.

2. Large scale particle condensation and global energy conservation scenarios.

- *This chapter repeats to a large extend what has been proposed in another viXra article on cosmology. It is important because a local large scale matter-contra-matter density disequilibrium could be an issue when trying to produce artificially cold fusion energy.*
- The most direct, but also the most unexpected outcome of the Ref1 model was the spontaneous emergence in the UZS of dual matter and contramatter particles, a process with a *fairly* high probability under unbiased *raster* conditions.
- In a young super-symmetric spacetime slice such conditions are indeed omnipresent, due to the fact that primitive zeron collections (UZS N-dim volumes in M-dim point spacetime) are intrinsically, and on average, charge and hole density neutral. Furthermore, point interactions between adjacent zerons in i-max, leading to shrinking of their point-replication pattern, are statistically spread over an N-dim sphere in a perfectly isotropic manner. *About the statistical distribution of the hole tenors of contact-EZP's and their impact on fine structure constants of matter and contramatter, a special article has been issued on viXra.*

- The outcome is such that huge quantities of dual *quasi* identical matter-contramatter *replicating particle* pairs (neutrons and contra-neutrons) emerge spontaneously in an extremely short lapse of time in any young cosmic volume. The *split of EZO's into those pairs* are the result of single heuristic bidirectional axion exchanges under critical conditions between two zerons that are components of two anti-symmetric EZKs of a common EZO complex.
- The two subclasses have "dual" (*in fact contra-symmetric*) sets of properties: opposite mass signs (identified as small positive or negative differences in point-hole density ratios versus a standard *average* CPS density value), opposite zeron and string rotation directions and, finally, when neutrons decay into proton-electron pairs and form atoms, opposite charge signs for each of them. Contramatter charge signs are indeed equal to antiproton-*positron* signs but contrary to these particles, matter-contramatter pairs have opposite mass signs, their replication processes make use of different sets of dimensions, and they do not show a tendency to annihilate as particles and antiparticles do. *Finally the fine structure constants and the values of c and c' (and the maximum speed of particles and contra-particles) are slightly different.*
- When large volumes of matter and contramatter *particles* start to separate (a CPT conservation issue in the EZO or contracted state *and a difference in c-value* under polaron interactions in the return states - the most common scenario (e.g.) in our galaxy) is that they will both condense into two subsets made up of, respectively, stars and contra-stars *or planets and contra-planets*, each behaving according to similar mechanisms. These two sub-collections are characterized by a distribution in spacetime that, at least theoretically and in relative terms, will be geometrically eccentric or centric.
- "Centricity" entails *permanent overlapping or* large scale spherical condensation around a common symmetry center along different dimension sets and a layered structure, separated by a dynamic horizon, i.e. a thin region where electrons and contra-electrons *could* face each other at an extremely short distance, enabling *pseudo* static Coulomb-*like polarization of the UZS* but no virtual photon (=polaron) interactions – as stated before annihilation *of electron-contra-electron pairs* as such cannot take place. These horizons are curved surfaces on a large scale but can be locally flat. The small scale PhR effects due to so called "flat" (see next chapter) states in contact areas will be rather particle related (as carriers of persistent holes and free charges). If this situation would indeed exist (a highly speculative assumption) it could explain e.g. the PhR behind the periodic changes of magnetic field orientations of stars like our sun (or even *in a candidate mixed* planet like ours – *it would indeed imply that the Earth contains permanently or periodically a deep (contramatter condensates faster as c'>c) , spherical contramatter volume, surrounded by a contact zone with matter as potential source of nuclear fusion energy and probably the origin of the earth's magma layer, a phenomenon to be compared with Sun spots). In these calculations one needs to take into account that magnetic effects (like particle spin – in fact CPS patterns) are point charge info based. They can be superposed and interfere for*

matter and contra-matter) are set by taking opposite rotation senses and opposite charge signs into account. It means also that the rotation senses and the impact of two magma layers on the net orientation and sign of our observed net magnetic field would depend on the relative size of both volumes and the impact of two magma layers.

- Eccentric (= *permanently non-concentric)* condensation (an observable and confirmed scenario) entails the emergence of configurations like our galaxy, with huge numbers of stars and contra-stars *and with separate orbits*, surrounding each other. It means that the main discriminating property in a particular horizon area would be exclusively hole density based *whereby* flat curvature *conditions* can be related to *gravity fields, large scale pattern distributions* made of *rotating* EZP *and/*or contra-EZP densities (*in fact PhR of gravitons and contra-gravitons in Physics and PhR)* surrounding central anti-symmetric matter and/or contramatter objects. *Any hole density based* layout of a *net* but dynamic horizon can be rather complex: its *geometry could be* locally flat but large scale *spherical or* hyperbolic in a reference frame with its origin in a virtual contact location.
- *Finally objects like planets could have complex orbits and rotation senses that allow periodic partial or total overlapping states.*
- *In PhR a gravity-like field surrounding a spherical concentration of matter and/or contramatter particles, is mainly materialized by graviton and/or contra-graviton densities (dark matter and (dark) contramatter). Each individual circular two-zeron pattern is induced as a difference particle in the contracted state of transversal branches of a single string and is the outcome of a non-equilibrium of an EZK (or contra-EZK) based replicating particle after an unbalanced polaron interaction in I-max, a mechanism described in detail in other viXra articles. When an object (like e.g. our Earth) moves along a stationary orbital around a symmetry center (our Sun), stationary graviton density distributions will show after a transition period a torus-like format that has been built-up gradually over a huge period of time. (Contra-) Gravitons are charge neutral and are, as multiple rotating 2-zeron patterns, unable to move over the UZS. They are persistent and maintain a virtual rotation axe with a fixed orientation, as long as they are not absorbed by a polaron interaction with a free connector of a particle. After a full replication cycle of this particle, a pair of new versions is released whereby the particle and the graviton interchange their relative positions on the UZS. Their individual symmetry axes, perpendicular to a local circular EZP-like replication format, are oriented on average along historical condensation and acceleration paths of their parent-particle, towards the ad-hoc large scale symmetry center of a matter or contramatter hub (e.g. the center of our planet earth). This condensation process stops when EM based polaron interactions between atoms become more probable than graviton driven interactions. Compared to particle densities, graviton densities along acceleration paths are sets of very small but dense (the size of a few points) patterns, released in subsequent unbalanced contracted states. Other PhR articles referred to the intrinsic 3D symmetry of a replicating EZK as the main explanation for a successful equivalent mathematical*

description of physical processes in just 3 spatial dimensions but that might be not the only factor to explain large scale geometries and symmetries (e.g.GR): the evolution of the density and the spatial distribution and the orientation of stationary gravitons and contra-gravitons along their orbits, is utmost important because their patterns materialize the geometry of any large scale gravity and/or contra-gravity field. The actual spherical particle hole-based mass volume stored (e.g.) in our earth is not the only actual source of a short-range gravity-like field: its growth process (mainly in the past), driven by an increasing acceleration of EZK based particles (today showers of cosmic rays) are the real "historical" basis for graviton and graviton density distributions and their 3D orientation, a process not just valid in case of our planet Earth but for the whole cosmos. Any net spin-2 graviton impact on two branch connectors of a replication string is extremely weak but its, on a large-scale curved density distribution materializes a probability based macro-gauge effect (as proposed in General Relativity). PhR does not need dark matter as another mysterious source of gravity in order to explain the actual and historical dynamics of huge star and planet configurations like our Milky Way. Unobservable dual contra-matter volumes and their contra-graviton distributions will overlap the by cosmologists observable objects, explaining their only partial perception of what could be "the real cosmos". Black holes are not matter-made, they are predominantly huge contramatter concentration volumes. Although on a micro-scale, matter and contramatter particles or patterns (like gravitons) do not interact, they share anyhow the UZS. It means that extremely high local densities of contramatter (e.g. a contra-photon stream in a contra-laser beam or contra-protons in a black hole) "engage" in a shared UZS volume with a fixed contact number density, an excess of contact-EZP's of the short-hole-tenor contra type, leaving a local shortage of "available" matter-like contacts, a phenomenon that has an impact on the dynamics of a set of matter particles like EM photons that (try to) propagate in the neighborhood (explaining why light cannot escape from a black hole volume – think also on Snell's law, applied to path bending in glass).

- *We repeat that in this model, graviton and contra-graviton distributions correspond with matter and contramatter volumes that have distinct (polaron) hole tenors (or mass types) and show a small difference in c and c' values for EM-waves and contra-EM-waves (hole tenors in transversal strings of replicating particles are in fact fundamental discriminating elements). As stated, these differences have been and are responsible for the geometry of the distribution or separation in spacetime of huge particle and contra-particle volumes. For both sets, Einstein's +/-E=+/-mc² is valid, but the c- values in UZS regions dominated either by matter or by contramatter are not the same. Obviously their fine structure constant values are slightly different (in an article on viXra these values have been calculated). It is remarkable that a small scale discriminating property at the elementary level of a graviton is able, in combination with the spherical condensation mechanism of matter and contramatter and the quasi perfect 3D symmetry of an EZK (Higgs) replication mechanism, to sustain the symmetry and*

the large scale properties and dynamics of (e.g.) a gigantic galaxy-like configuration . Such extraordinary performance requires extremely precise and correlated formats and behavior in space and time of elementary building blocks (EZK based replicating particles, gravitons, photons etc….). It also goes together with the superposition of charge info at multiple levels of symmetry, without violating a conservation of energy rule, whereby the propagation speed of charge info over the point-zeron grid takes place at values much higher than c or c' . Finally it requires a hyper-standardized two-level point-zeron raster, capable to deliver <u>everywhere</u> the elementary building blocks needed to construct and maintain dynamically local standard patterns like gravitons, photons, EZK-base particles. Only in extreme circumstances a local very high density of one of them could limit the probability of finding an adequate building block in the UZS for a next pattern version of the complementary type.

- *The main conclusion is that despite a difference in properties, global conservation of energy all over the cosmos can be maintained, although leading to a complex differentiation of matter and contramatter densities, distributed dynamically over a huge spherical UZS volume, a process that on its turn explains to a large extend the behavior of stars and planets.*

3. A definition of the term "flatness" in a PhR context.

- <u>Flat</u> in PhR is synonymous with <u>unbiased</u>, and refers to a stochastic, but on average "*balanced" probability* distribution of the impact of net (= *after superposition)* charge info (see base laws in Ref1) on CPS/UZS states in a representative spacetime volume over an appropriate number of dimensions. In this text and for practical reasons the term <u>flatness</u> will be used for any local and/or global condition in the CPS/UZS grid that would enable, with a probability high enough to be observable :
  - *the spontaneous emergence of eightfold EZO-type zeron patterns,*
  - *one-shot bidirectional axion-type interactions along shortest paths between two anti-symmetric zerons that each belongs to one of the EZK's of an EZO,*
  - *double autonomous contra-symmetric replication processes, driven by each mutated EZK and taking place in proper subsets of UZS dimensions. Hereby contra-symmetric implies that the two EZK's have slightly different hole tenors, enclosed within the contact-EZP's materializing their transversal strings. This will lead to slightly different unit mass values for both replication processes.*
  - *Selection of pattern components in the CPS/UZS, participating in any replication cycle, are dynamic processes.*
- We made a distinction between <u>global</u> flatness in a very young (i.e. mere fractions of a second old) CPS/UZS volume lacking particle patterns (see previous chapter) , and <u>*large scale partial*</u> *or* <u>*small scale*</u> <u>local</u> flatness. The latter springs from the presence of surrounding coherent patterns maintaining, albeit statistically and for a

short term, flat conditions in locations that are impacted by their properly synchronized *charge info* emission and polarization specter, even if this takes place under *large scale* non-flat spacetime conditions. This situation may be either the outcome of a spontaneous cosmic evolution or of an artificial, experimental set-up (if such a distinction needs to be made at all – we are of course part of the cosmos and its evolution, and our behavior must be PhR compliant).

- *It could be useful to compare the present local state of the UZS with the global situation in a cosmic spacetime slice at the time of its origination. Let us assume that an UZS zeron has a maximum size of 2 points that are dynamically selected in the contracted state, meaning that there spatial distribution is statistically spread around a central symmetry location. Each EZK version (a Higgs) contains 4 adjacent zerons and we propose a particle's by replication growing and shrinking zero-momentum strings to fill on average a sphere with a radius of about 10exp(-25) m), a value somewhere in the middle of a length scale delimited by a Planck length (10exp(-35)m) and the experimentally observed size of a hydrogen nucleus or proton (10exp(-15)m) (in fact we package subsequent randomly oriented and selected replicating string versions of observable length into a single spherical volume (an equivalent active zeron volume), transforming in this way time into space). If we compare this equivalent active zeron density in a virtual volume of the UZS that contains 1 mol of hydrogen with the total zeron density, estimated at a specific moment in a local UZS based time frame, we can safely say that the relative and dynamic number of zerons in this volume, potentially involved in the formation of a single version of a proton pattern is, on average, only a tiny fraction of the total number of UZS zerons in the neighborhood. This statement is certainly valid if we limit any comparison to a single replication cycle of (e.g.) a proton.*
- This somewhat simplistic estimation has to be adjusted (*certainly after billions of years)* for all kinds of reasons, e.g. the much more dense presence of EZPs (*static gravitons/contra-gravitons, in fact* dark matter / *contramatter components* materializing *any* gravity-*like* field) or the dense random emission of non-static charge info quanta or polarization effects (e.g. Coulomb fields), all of them having a dynamic and important impact on local spacetime *and contributing to non-flatness*.
- *For gravitons this statement is certainly thru because their size in UZS terms is of the order of an EZK and they are persistent as long as they do not interact with a local particle connector. The same applies to contra-gravitons and contramatter.*
- Nevertheless, our presupposition about particle densities versus zeron densities in the UZS remains important, as it explains (among other things) why certain parameters in physics (like ε and μ and indirectly c) are, on average, not very sensitive to fluctuations in particle densities, at least if they are smaller than those e.g. in certain condensed matter states (*where* they are *nevertheless just* small local perturbations of flatness). In brief, flat curvature conditions in any random location in a stochastically chosen UZS volume and for a short period of time, do not seem to be a priori impossible, not even in our own local, on a large scale

biased (by positive dynamic mass and graviton distributions) spacetime volume *(also in a so called "vacuum").* Even without "artificially" increasing/ decreasing flat curvature probabilities for such volume, an appropriate EZO state will "now and then" appear spontaneously *as random event, that* despite its *special or indirect impact* (e.g. *spontaneous neutron* decay) is hard to be measured.

- *Local f*lat conditions, like anything else in our cosmos, have a stochastic character. They refer to a statistical distribution in space and time and dimensions of coherent zeron subsets (and their corresponding charge info emission pattern) in phase-critical states (i-max) *that are EZO-like*. *The base laws of PhR predict that the charge info pattern emitted in such state, enables the selection of an inverse combination of UZS building blocks (in fact again an EZO), meant to eliminate (without success) the original pattern.* Whenever an accidental EZO combination is *induced* in our local curved spacetime volume *leading to matter-like (and contra-matter) EZK formation,* it must be able to replicate instantly and permanently in order to behave as an observable particle. A successful replication process requires the (dense) presence of enough compliant objects *(building blocks)* with a correct discriminating property in the appropriate subset of dimensions: e.g., if an EZO in a globally flat cosmic volume is able to emerge and to replicate synchronously as a neutron and a contra-neutron pair, this hints at the local presence of enough balanced positive and negative excess charges and holes in the UZS, in fact *candidate-components that* are either *primitive* UZS zerons or free *contact*-EZP patterns (this rule remains generically valid throughout the cosmos, even for something like growing plants because *components of complex patterns are short-lived and need to be rebuilt when the global pattern is moving or rotating over the UZS*).
- In a later phase of evolution a similar *local* charge and/or non-charge based flatness can be *artificially* achieved by the presence in spacetime of <u>appropriate pattern distributions</u> in the UZS/CPS. These are basically EZP and EZK based particles. In a such an approach any "spooky action at a distance" (Einstein) does not exist. Spacetime curvature (charge or hole driven) and the micro-behavior of *interacting* patterns are part of a single, consistent model:
    - Any local equilibrium is intrinsically dynamic: a <u>Coulomb-like charge distribution</u> constituting a field, is *materialized by* quasi-linear chains *or strings* of polarized UZS *contact* zerons "produced" *or "selected"* by a "free" *conserved* unit charge in I-max states of an EZK based particle connector. The source of this effect is itself short-lived, and the next polarization direction of *any* free charge antenna *(the three phase shifted connectors of a replicating particle can act as an external antenna when not involved in internal binding)* may be rotated after *inversion* of the pattern in the contracted state. Each single version of an UZS polarization string will not disappear immediately when the source of polarization (a connector zeron *in an I-max state*) will shift over the UZS as a result of replication. The two zerons at *both* ends of an UZS polarization chain will flip *in I-max* their states coherently (albeit with a very small non-measurable delay) like

any ordinary UZS inter-zeron coupling. In physics, a Coulomb field around a free charge is implicitly treated as an abstract 3D quasi-static radial distribution of virtual field lines, a useful, but nevertheless misleading representation. As it is, a Coulomb field's spatial distribution is not limited to a common 3D space: we only "observe" its 3D distribution because effective interactions between two particles require properly aligned "average" replication directions along a shared 3D set. Between two interacting particles, connecting polarization lines are obviously *for a short time* aligned along the same common directions. Dynamic charge distributions might produce cyclic residual charge info fields at particle level observed as magnetic fields in physics (e.g. magnetic spin). So it would be better to broaden the term Coulomb fields to "electromagnetic fields", as magnetic effects are "curving" spacetime as well. *Magnetic fields are intrinsically charge info fields. Free charge info patterns (emitted by coherent points and coupled zeron pairs involved in replication and not active in binding states at point level) are subject to superposition and interference and forms multiple circular paths, dynamic closed loops of 90° phase shifted copies of time varying and dense point shaped micro-patterns (in fact local time derivatives of sinus-like charge evolution curves at point level) that do not represent net energy but are able to cause synchronized phase shifts at point level between (e.g.) 3 string connectors of a replicating electron. Superposition and symmetries at multiple levels make that a unique source can contribute simultaneously to several fields: at a small dynamic local scale (e.g. particle magnetic spin), at a medium scale (e.g. as driven by a net current in a coil, conform the Faraday or Biot and Savart-laws) and at a very large scale (e.g. the gigantic magnetic field of the Earth), and all that without violating any conservation law. In this context a photon is considered to behave as a set of replicating micro-particles (fotino), producing a cyclic short-lived E and an M field, with a density and periodicity as determined by a high order process at antenna level, changing periodically the I-max values of conduction electrons (see Maxwell). This EM wave transports effectively quantized energy amounts, contrary to the fields we mentioned before as Coulomb and magnetic pre-polarization fields, dynamically "selected" in the UZS.*

- In our cosmic volume, the *global complex* hole (or mass) distribution *has been* "*polarized"* along certain *trajectories and* dimensions, fixed at the time of *acceleration* of huge numbers of particles towards a dynamic, central symmetry center. This *large scale* process created initially a central symmetric *rotating* EZP distribution (a byproduct of any accelerated replication cycle with gradually decreasing I-max values) along 3D dimensions materializing a radial density gradient, thus producing and sustaining an observable gravity field. *A particle condensation process around a symmetry center stops when the probability of repulsive interactions with local particles equals the impact of the historical particle-*

energy and momentum, represented by its small I-max value and all that taking GR macro-gravity effects into account. The outcome was that a fast expanding global sphere (and the cosmic UZS perimeter) was filled with dynamic subsets of smaller and mostly composite spheres like galaxies and stars and planets. Hereby the dynamic spatial distribution of these growing objects was and is conditioned by the properties and the trajectories of small scale accelerated particles, by the difference between c and c' for matter and contramatter, by the local probabilities of spontaneous emergence of new neutron-contra-neutron pairs that depend on the overlap between matter and contramatter volumes etc….

- *It has been put forward that those gravity fields and contra-gravity fields are materialized by gravitons and contra-graviton pattern densities, surrounding huge matter and contramatter volumes (planets, stars, black holes…). Gravitons are small rotating 2-zeron patterns, unable to move over the UZS grid. They originate as a difference particle and are released each time a replicating EZK based nucleus (a process initially driven by a mutated string connector) moves its symmetry center one step over the CPS/UZS grid. So their local densities as compared to particle EZK densities can be extremely high, if observed along virtual gravity field lines whereby they materialize dark matter (or contramatter) in cosmology. They sustain local holes with a tenor that is distinct for matter and for contramatter. Their orientation is on average determined by their trajectories and thus by global and dynamic symmetry properties of a large growing and moving condensation volume (e.g. the center of our earth, rotating on its orbit around the sun, that on its turn rotates around the center of our galaxy etc…). Their contribution to a state of non-flatness of any LENR set-up must not be underestimated. The geometry of the condensation volume itself (a sphere) and its orbit was "historically" conditioned by the propagation path of accelerated particles (e.g. protons) and indirectly by the probability of coupling between the gravity field and each of the 3 orthogonal replication directions of the proton. In this way a torus-like gravity field around a condensation center has been gradually built up when moving along its orbit. To understand why it is a torus and not a flat disk, one needs to understand the probability distribution and replication priority rules when selecting one of the three orthogonal strings of an EZK as the fastest and the most probable to interact, determining in this way a next most probable micro-position shift over the UZS (see other PhR articles).*
- *As a side remark, tt could be interesting to compare at this point PhR with Tesla's ideas (the end of the 19th century) about the existence of an ether (in fact the UZS-CPS) and the capability, showing up in certain of its experiments, to produce energy-for-free. A perfect spherical free charge distribution surrounding a vacuum volume could create (central-)symmetric conditions whereby spontaneous EZO induction-by-selection in a local (flat) UZS would be possible up to a (stochastic) level that would be observable.*

Unfortunately in any set-up a local unknown but significant matter-contramatter (un)balance could lead to negative results (see Pons and Fleishman and cold fusion experiments). Tesla (just like Physics these days when limiting observation to the cosmic part to which we belong) was unable to even imagine the presence and the role of contramatter in its experiments.

- Non-appropriate "*biased"* distributions (*large scale* charge and/*or* hole densities) could prevent local flatness to exist in a number of observable cases. On average *local* "flat or unbiased" charge distributions require grid-like coherent particle patterns (e.g. doped crystals) but even under *such favorable* artificial conditions, *spontaneous "induction by selection" of EZO-copies will not be necessarily observed.*The large scale dynamic hole distribution, intrinsically biased by non-moving EZPs (gravity fields) as well as by moving particles themselves (GR conform spacetime curvature in physics), *can* prevent indeed the spontaneous production of neutron-contra-neutron pairs, although the production of neutrons alone remains at least theoretically feasible if the surrounding particles provide the appropriate amount of energy along the appropriate symmetry lines. *On earth the spontaneous emergence of an EZK would require anyhow the simultaneous induction of a contra-EZK, both part of a single EZO.*
- *The conclusion is that <u>favorable</u> UZS conditions require not just adequate graviton distributions in gravity fields but ideally also equivalent contra-graviton distributions. We cannot directly observe contramatter particles and we certainly do not control their density distributions, so it could be that, despite their weak impact, overlapping (or non-overlapping) matter <u>and</u> contramatter distributions in the cosmos and especially on earth determine implicitly the probability of spontaneous neutron-contra-neutron production (see next chapter). This is not too bad as in the (our) present state of the evolution, a too high spontaneous production rate of free neutrons and a high number of uncontrolled nuclear mutations could be disastrous for human health.*
- All this looks rather obvious, and *contributes to* the classical and <u>*to matter* limited energy conservation rule *in Physics*</u>, although we must not forget that in a PhR context *even* the emerging replication schema of a particle requires some anti-symmetric charge info distributions in the two branches of a string in order to maintain the EZK nucleus *internal* oscillation process. Their *local* short dimensions are different from the 3D *large scale biased* dimensional directions that we observe in physics. In this respect, proper charge info exchange *processes themselves are* crucial, and in combination with the right orientation (the P and T in the CPT conservation rule), complex multi-dimensional patterns (e.g. crystal lattices) are apparently able *to locally and stochastically cause an impact similar to flat charge distributions, be it even in an environment that is not flat on a larger scale.*
- Observable properties of a particle have a marginal character and always refer to connector *components and* properties in I-max *states when (for a while) they are*

not involved in internal interactions at point/zeron level. Hereby an exception has to be made for charge info patterns that are the outcome of dense constructive interference and superposition of charge info at point level along symmetry locations and belonging to multiple superposed layers. In complex solid state crystals, orbital magnetic momentum quanta of unbalanced electrons can be superposed on magnetic particle spin quanta (e.g. Chlebs-Gordon) , leading to (e.g.) large magnetic fields and to permanent magnets. In order to be stationary, these patterns are based on symmetries in pace and time of charge info emitted by "free" antenna points of connector zerons of replicating particles. Any replicating free connector zeron can emit simultaneously charge info in an extremely high number of directions whereby several layers of patterns can coexist in superposition, depending on geometry, symmetry and time-behavior. This does not violate energy conservation rules as magnetic fields in a dense closed loop do not contain energy: e.g. their impact on a propagating replicating particle does not change its I-max values. Modification of relative quantized phase shifts between string connectors can only lead in the contracted state of a replicating particle, to path bending (the first and second-fasted connector property of a string triplet can be interchanged). Another interesting example is the Aharonov-Bohm effect in QM whereby a secondary non-Maxwell conform magnetic field surrounding a current carrying coil can be the cause of a phase jump in the quantum representation of the motion of an electron passing by. An extreme example whereby several superposed layers of charge info fields (magnetic spin, unpaired electron orbits, free moving charged particles in rotating magma layers…) coexist, is the gigantic dynamic magnetic field surrounding the Earth. This field protects us against showers of charged cosmic rays (protons). In this context it is important to stress that those macro-fields for matter and contramatter, "rotating" eventually in opposite sense and with a net impact depending on the relative strength of both fields, have opposite "signs".

- *Magnetic fields are point level phenomena what means that matter and contramatter effects are not transparent to each other and can be superposed taking their different rotation sense, their density in time and their opposite net phase jump at point level into account.*
- *If the Earth would be a double quasi concentric matter-contramatter planet, both opposite magnetic fields add up as a vector sum . The same could be true if the overlap would be cyclic or partial. So the orientation and strength of the magnetic field of the earth could change in the course of its history under the impact of both subfields. If the volume of the Earth would grow faster (or slower) than an hypothetical spherical Contra-Earth beneath our feet, the Nord and South pole could be interchanged (what indeed happened several times in the course of the Earth's history). All this could be related to the distribution, the orientation and the strength of the magnetic field produced by a magma layer, that on its turn could act as an historical fuel for nuclear fusion processes in a flat virtual contact zone between large matter and (invisible) contramatter volumes).*

- *A high probability rate of spontaneous neutron/contra-neutron pair production could increase the probability of mutations of atoms and molecules sets and would give a logical explanation for a lot of phenomena that have been treated by science as unexplainable or as pure nonsense or fiction:*
    - *The existence and presence of contra-life in our neighborhood, most probably more advanced than ours (c' > c) .*
    - *A large variety on earth of particle isotopes, more than on other planets*
    - *The unexpected presence of liquid water at the time the energy emitted as radiation by our Sun was only 75% as of today .*
    - *Possible explanations for many unproven phenomena, often taken serious by astrologists only . Examples would be crop circles (the real ones, made by a contra-laser beam – if such process is active, GSM communication in this circle will not be possible !), spokes, ghosts and flying saucers (we cannot see a contra object but its high local contra-matter density could hide what is behind it, creating a strange contour or phantom-like effect…), the impact on certain properties of humans, of the relative positions versus our earth of large objects like planets and contra-planets…..*
    - *Climate changes and global warming of the oceans, happening too fast in order to be explained only by an increased CO^2 density in the atmosphere.*
    - *Gravitational waves, in fact intense contra-EM waves from outer space…*
- *Many of these phenomena would depend strongly on the degree and periodicity of overlapping matter/contramatter volumes and their orbits. It has to be proven that the main symmetry axes of polarized EZK's and contra-EZK's are parallel. If so, GR-models applied to huge matter en contramatter volumes need to take this into account.*

4. Local *small and large scale* flatness and its outcome in an energy conservation perspective.

- ***Large scale phenomena**:*
- As physics does not allow of any exceptions to its strict energy conservation rules when applied to observable processes (and encompassing all types of energy), there would be no use for this paragraph in a classical context. However, taking encouragement from what happens in a continuous big bang scenario, we have to evaluate the possibility that on a relatively small and local scale, equivalent particle-contra-particle processes have a chance to take place at an observable rate. We will make a distinction between spontaneously and artificially emerging phenomena.
- If we focus on spontaneously emerging flat conditions with a significant impact, *hereby excluding primitive empty (meaning without particles and patterns like gravitons) UZS volumes*, the obvious candidates are spacetime volumes close to gravity horizons, areas where huge volumes of separate EZP densities biased by matter and contra-matter, each with anti-symmetrical charge distributions, face

each other. These dynamic virtual surfaces *enclosing quasi empty UZS volumes,* act as sources of *spontaneous* new particle and contra-particle pair creation processes, *eventually leading to* the "birth" of a galaxy like ours . *Indeed t*he outcome, going hand in hand with a spatially distributed condensation process into stars and contra-stars– each containing numerous matter and contra-matter atoms - and assuming a slight rotation of the core contra-star group in the opposite sense as the peripheral star group (they have anti-symmetric properties), *was or* will be the gradual growth, throughout the Evolution, into the kind of gigantic volume of mega-patterns that is called "(our) galaxy".

- In the course of these processes, the location of the virtual horizon will gradually shift away from the symmetry center of an expanding galaxy volume. This shift must account for the anomaly cosmologists observe between the velocity of peripheral stars on their orbits around the galaxy core and the gravity force produced by a hypothetical black hole at its center and limited to a virtual volume inside the star group. We assume that our galaxy has reached a steady state, although according to cosmologists, new stars are still born each year. On Earth, something we might be able to observe of this ongoing matter- contra-matter creation process would be the arrival of an endless stream of "cosmic rays" – in fact, a shower of new particles caught by our gravity field. As long as these spontaneously emerging and replicating particles are *gradually* accelerated over the UZS grid under quasi-flat conditions at extremely low velocities and high I-max values their photon emission spectrum should match *at least partly,* the cosmic microwave background radiation as observed. *Hereby PhR proposes that if the cosmos has a finite size and because a photon needs an interaction in order to be absorbed, light rays reflected by or bended on the outer shell contribute to what cosmologists observe as the EM spectrum of a huge cosmic cavity.*
- Typical of young(er) stars is that their isotope composition consists almost exclusively of hydrogen and helium. In a globally flat spacetime volume at the time of a large scale, continuous big bang process, emerging neutron / contra-neutron pairs have high I-max values and low mobility. The period of their decay into electron-proton pairs could have been larger than its actual value (+/- 881 sec. *on earth*). So initially the full range of isotopes of chemical elements had a certain probability to appear as the outcome of an initial contraction of multiple neutrons around a common symmetry center *or the stepwise mutation of small elements into more complex atom isotopes by neutron based nuclear reactions*, not as the result of subsequent (step by step) interactions between full nuclei with low(er) atom numbers, *proposed in actual nucleo-synthesis scenario's* . Although the difference in outcome can be rather subtle, it is obviously more straightforward (in PhR terms as well as *in most cases* in physics) to add an extra neutron to an existing isotope nucleus, than to merge two positively charged nuclei. As a consequence, the nucleogenesis cycle in the classical way as proposed by cosmologists has to be critically reviewed at least for "older" stars or for other interstellar objects with a similar matter composition (planets, comets, etc.).

- For horizons between hypothetical centric layered and *overlapping* matter-contramatter distributions the situation could be much more complicated. Although this process could be important to understand (e.g.) the cyclic behavior of our sun, this topic is complex and speculative and is therefore left outside the scope of this document *(PhR-conform proposals for this kind of cosmological events and scenarios have been made in other articles on viXra) …except if such situation would be present permanently or periodically on earth. Indeed, a centric configuration of huge matter and contramatter masses can lead to permanently or periodically fully or partially overlapping volumes of stars or planets, each made of matter or contramatter. The "historical" dynamics hereby will take into account the small difference in maximum speed of elementary particles that belong to both types and obviously on fundamental contra-symmetric differences between matter and contramatter. These effects can lead to a layered spherical structure of matter and contramatter around a shared symmetry center whereby both volumes are transparent to each other (physics does not observe contramatter directly) thanks to non-interchangeable polaron coupling rules.*
- All these large scale phenomena respect implicitly any global energy conservation rule as they originate from the creation of equal amounts of (dark and ordinary) matter and contramatter and *they* are driven by the same laws and rules that dictate the electromechanical (be it anti-symmetric) behavior of both subsets.
- ***Small scale effects*** *in our biased environment are only possible in complex multi-particle conglomerates with connector zeron configurations and states, producing charge info patterns that have a finite chance to show (now and then) an EZO-like format. If we refer to "the fundamental law of nature", this format will induce in the UZS a contra-symmetric zeron set that can survive as an autonomous matter-contramatter particle pair. This concept works because in an attempt to annihilate an EZO , it selects in the huge UZS "component box" an inverted phase shifted copy …..that is in fact again EZO-like !*
- A good example of small scale, but spontaneously and frequently emerging phenomena could be the occasional flat conditions in dynamic and organic 3D structures as created and maintained by linear chemical molecules like enzymes. The earlier discovery (*Prof. Kervran*) of plants and animals containing chemical elements that, apparently, had not been imported from an external source, prompted the theory that, under certain (unexplained) conditions, complex organic 3D structures (eventually sustained by bacteria**)** might be able to induce transmutations of certain nuclei (e.g. K isotopes transformed into Ca). Flying in the face of accepted paradigms, it was, unsurprisingly, rejected by the scientific community; and as in-depth scientific investigations in this domain are lacking, we prefer to leave this group of phenomena out of the scope of this article.
- As for artificial flat conditions, a rapidly growing number of published results of controlled transmutations and cases of energy production in properly conditioned crystal lattices warrants attention. There seems to be a consensus that, by now, those results have become too numerous to be brushed aside as the products of fraud, fiction, or badly prepared tests. In this text, we will call them LENR (Low

Energy Nuclear Reactions) phenomena, as they presuppose non-chemical mutations that take place under standard environmental conditions (i.e. at low temperature , without producing radioactive waste, etc.).

- The first "discovery" of this kind was made in the 1980's by Pons and Fleishman with a test set using a purified palladium cathode saturated with deuterium (after an initial loading phase) and enclosed in an electrolysis cell filled with heavy water. Every now and then, they measured a small temperature increase caused by an unexplained release of energy, and the simultaneous transmutation of palladium nuclei into other metal isotopes. The effect was small and the outcome unpredictable. Despite their efforts to enhance the results, the scientific community has never taken their observations seriously.
- In that respect, the more recent, so-called E-Cat results (Cat is the abbreviation of an electrolysis cell named "Catalyzer") are much more convincing, and despite a lot of skepticism from traditionally minded scientists the existence of these phenomena can no longer be denied. The setup (although reliable details have never been published) involves an electrolysis cell containing small Nickel crystals (*Ni-62 or Ni-64 isotopes*) as one of the electrodes. These Ni crystals are doped in advance for 100% with Hydrogen atoms. The electrodes are suspended in a catalyst liquid containing (among other unknown things) a Lithium complex. LENR reactions take place at not very critical temperatures between 100 and 1000° Celsius.
- Scientific arguments against these results are well known and come down to 4 major types:
    - A nuclear reaction between positively charged atomic nuclei requires a very high temperature in order to have a measurable chance to cross (to tunnel in QM terms) their repulsive Coulomb barrier.
    - A reshuffling or mutation of the QM state of a nucleus will result in the emission of radioactive waves or material (alpha, beta or gamma rays), a phenomenon that in the case of E-Cat is, in fact, present, but the effect is so small that it is hardly measurable.
    - The isotope composition of Copper as the usual outcome of Nickel mutations (*at least for the Ni isotope composition used for the test)* is the same as its statistical distribution observed "in nature" where on a theoretical basis and in accordance with some classical theories about initial nucleogenesis processes, their composition should be different (so the conclusion was that Copper was fraudulently put into the catalyst before or after the test in order to make the results more credible). Also, and inexplicably, small traces of other metals have been found as reaction products in the Ni-raster.
    - As there is no consumption of material and at first sight no overall loss in internal (nuclear *or thermodynamic*) energy in the lattice atoms or in the grid itself this phenomenon violates the never contradicted principle of conservation of energy.

- One of the older theories that addresses some of these "arguments against" we owe to Widom-Larsen. It assumes that a Ni (or Pa) raster intensively "loaded" with H (or D) particles can spontaneously generate slow neutrons with high cross sections in line with to so called "collective weak interactions". If this is true, most objections disappear, except for the energy conservation issue. In order to produce the amounts of energy involved as announced for E-Cat, the gain must stem from transmutations with a substantial difference in energy per particle value between the isotopes involved. A favorite candidate is a conversion of Li-atoms into Helium, a sub-product that will itself escape from the catalyzer. The amount of energy released per successful interaction is in the order of MeV, an enormous figure compared to the amount of just a few eV released in most *exothermal* chemical reactions. The use of Li in E-cat to convert the potential free neutron energy into heat, may explain probably why Pons and Fleishman never succeeded in achieving comparable gains in energy production.
- The main weakness in Widom-Larsen's theory remains the unexplained unbalance in energy. A phenomenon that spontaneously produces slow neutrons in a Ni-lattice would either have to extract energy from the lattice (which, in that case, would cool off or mutate , preventing that the process could go on for 6 months) or be compensated by an equivalent loss in internal energy (at atomic or subatomic level) of the lattice components themselves (*this explanation would probably be in conflict with the "detailed balancing principle" in solid state physics)*. The production of every neutron "out off the blue" requires an amount of energy of at least 940 MeV, which makes that the hypothesis of an energy gain balanced by an opposite and equivalent lattice "mutation *of stored energy"* amount sounds rather implausible.
- A PhR based explanation on the other hand, convincingly answers all the objections against LENR:
    - Slow neutrons are able to tunnel Coulomb barriers.
    - Neutron-contra-neutron pairs emerge directly from an anti-symmetric UZS pattern that in absolute terms stands still on the UZS grid. The neutron's initial I-max value shows an absolute maximum *(supposing that that the induction of an EZO pattern takes place under the impact of a charge info pattern, occasionally emitted in the critical contracted state by a parent particle configuration)*. Its initial momentum is zero, which makes it possible to absorb (but not to emit) photons (gamma rays). The only form of radioactivity would come from the decay or the reshuffling of mutated Ni nuclei, or from other radioactive isotopes emerging accidently.
    - An isotope composition similar to what has been found in nature is not unexpected, at least if the mechanism of nucleogenesis *based on neutron interactions with Ni as* proposed earlier in this text, is applied for natural copper minerals found at the surface of the earth.
    - Finally, according to this PhR model, there is no energy deficiency: the initial internal null-energies of a neutron and a contra-neutron balance against each other, whereby the contra-neutron's (opposite) contribution is

not measured *or taken into account* by science. We assume that (*most of*) these particles escape from the test without being involved in an axion exchange (in PhR terms): a*ny interaction at point level* is theoretically able to exchange energy, but would have an extremely low coupling factor (small probabilities *similar to* neutrino interactions with matter).

- The impact under experimental conditions of slow neutrons on *long lived radioactive* metal isotopes, *put in the neighborhood*, explains equally their transmutations *into particles with a shorter decay time*, a process observed and studied by research centers in Japan.
- Obviously, all this presupposes the existence of locally flat conditions *and properly phase shifted charge info micro-patterns emerging spontaneously* in a crystal lattice. Despite the energy gain per successful transmutation between a slow neutron and a Lithium atom (or 2 neutrons with two Lithium atoms), local flatness remains a statistical phenomenon with a probability that will depend on several parameters and environmental conditions. Some of them will be discussed in the next paragraph but as an example we mention the dependence of the COP (Coefficient of performance) at least in principle, of the momentum state relative to a fixed reference frame (the UZS) of the full equipment used in an experiment. Slow neutrons versus the UZS *do not correspond* necessarily *with "*slow" in a reference frame linked to the catalyzer equipment. This means that (due to the rotation of the earth and the motion on its orbit around the sun – we ignore the rotation of the milky way) depending on the date of the year, the hour and the location where the experiment takes place, the COP figures could be different. In a same context the measurement of a high external neutron flux does not imply that these (versus the UZS very slow) neutrons are as destructive as fast neutrons emitted by a traditional radioactive source (on PhR ground: their I-max values are different). This distinction between absolute and relative "slow" neutrons is worth to be mentioned as a potential research topic: a well prepared experiment would be able to prove the correctness of the PhR model at this point.
- The uncertainty about the energy production rate has probably been the cause of two extreme and conflicting situations: the total failure of a test, and the explosion of closed E-Cat devices. That being said, the nature of an LENR explosion is very different from the kind of uncontrolled chain reaction process that would involve the massive escape of energy from a nuclear reactor. A fission reactor is designed to produce energy as the outcome of a controlled, but vulnerable process that intrinsically relies on the multiplication rate of "slow" neutrons, albeit in a well prepared and secured environment but one that is, nonetheless, filled with radioactive material, *meant to decay* (in theory: a potential atomic bomb). In an LENR experiment, the production of massive amounts of energy and a sudden increase of temperature destroys the state of flatness in the Ni-lattice, which will make the process stop of itself. Obviously, a substantial amount of energy can be released in an extremely short period of time, and the destruction of an experiment

cannot be excluded –but this will never produce consequences even remotely comparable to the explosion or the melting down of a nuclear reactor.

5. "Energy for free" just a dream *and what about actual LENR results* ?

- Any project or solution that aims to use LENR as the ultimate non-exhaustible source of energy, must certainly involve in an earliest stage, experienced solid state (or condensed matter) physicists who are able to cope with some fundamental parameters that could have an impact on the distribution and the probability of flat zones in a doped crystal lattice (e.g. the impact of *up to 100%* interstitial H or D atom *densities* on multiple dynamic Fermi energy levels (or surfaces) for conduction electrons in a Ni/Pa lattice). This issue is certainly important if a potential LENR process would be implemented in a set-up whereby the optimal *UZS* location (in absolute terms) is changing rapidly (e.g. as a real time energy production resource – thus without averaging by intermediary storage - e.g. in a rocket or in a car battery). There is some suspicion that actual solutions produced by researchers, active in the LENR field suffer from varying instantaneous COP values: these figures are often published as average data measured over long periods of time without guarantee that a steady production rate has ever been achieved. That could explain in part why the few investors in this domain are reluctant to transfer their knowhow and equipment to neutral organizations, like universities interested in LENR. Academic researchers would soon enough identify these issues, proposing extra studies that would postpone the implementation of a marketable product for years. Obviously, the main reason could be that there are simply no candidates for active participation in such projects, as LENR altogether lacks a sound theoretical basis in physics: research centers fear for their reputation – nobody wants to be caught up in a second "Pons and Fleishman story".
- As for the fundamental physical parameters that should be taken into account, here are some examples:
    - The crystal lattice structure and composition: the two successful grids used up to now are Ni and Pa crystals, both with an FCC lattice. Not by coincidence, the two are also members of the same metal group in the table of chemical elements. The initial Ni / Pa isotope composition might be important, as well: *as an example, only Ni-62 and Ni-64 isotopes have crystal grids that can be saturated for about 100% with interstitial H atoms.*
    - Saturation of the Ni (or Pa) grid through the absorption of substantial quantities of H (or D) atoms before the energy production can start (a loading ratio close to 100% seems to be needed) . These small nuclei can be stored in the central interstitial holes of the Ni grid and *seem to be* fundamental to create flatness. It explains why spontaneous LENR-like phenomena in pure Ni or Pa crystals do not take place.

- The importance of CPT conservation we mentioned earlier is related to the type of atoms (H or D) used to dope the lattice. This might indicate that the Coulomb (polarization) field by metal protons and by interstitial H or D atoms creates an net excess charge distribution field (and corresponding charge info effects) in virtual contact areas with a curvature flipping between a spherical and hyperbolic geometry. In combination with the free conduction electrons of Ni (or Pa) and H (or D), this dynamic state could produce local flat conditions in interstitial micro-volumes.
- A useful indication of the correctness of this scenario, is that LENR of Pa (an even number of excess electrons on the outer orbit) doped with H, or Ni (1 excess electron if we accept a $[Ar]3d^9\ 4s^1$ electron configuration) doped with D, fails to work. *Also the proton-neutron ratio in a Ni nucleus is important to order to achieve an 100% H doping ratio (saturation works for Ni-62 and Ni-64).* Equal numbers of EZK based spin ½ conduction electrons seem to be required although not as a persistent state :there is only one H per Ni cube and for D we have to accept the dynamic combination of a free and a bound (as part of the neutron state) electron. We assume that these electrons are paired and show opposite spin orientations: so the residual magnetic field in the crystal grid (a *spurious* charge info superposition effect) has to be small. The periodic narrowing of their conduction band (thru Fermi surface curvature cross over) and the use of a pulsed or alternate current in the catalyzer after loading, enables the local compensation, at least stochastically, of the intrinsic crystal grid curvature.
- So the end-to-end conditions of multiple dynamic Coulomb-like zeron polarization strings originating from EZK connectors that belong either to main grid components (Ni or Pa nucleons), or to the interstitial (H or D) grid, and dynamically compensated by slowly oscillating conduction electrons could explain an increased probability for the emergence of EZO-like zeron configurations in virtual symmetry centers in intersection locations between "virtual connectors" of these chains. The role of non charged nucleons (neutrons in the grid metal atoms) and indirectly of the isotope composition has to be further investigated. In the same context, the temperature in the cell *and the absolute (unknown) speed versus the UZS are* important parameters because their impacts the average I-max values (and subsequently the momenta) of all the EZK based components involved.
- This complex situation would need computer simulations designed by experienced research centers in order to be *understand and* confirmed.
- All this assumes in a PhR context that classical or even most of the quantum-mechanical processes are very slow compared to (*e.g.)* an axion based interaction needed to split an EZO in two replicating EZK's. Indeed *and as an example,* a particle at speeds much lower than c *adapt its speed a little bit after an extra polaron interaction (conform* de Broglie *equivalent wavelength). At a speed close to c (conform Einstein's special relativity)*

only the internal replication process within the EZK nucleus is delayed, leading to a mass increase, not to a further increase in speed.

- Other important parameters are:
  - The choice of the size of lattice crystals (and thus the ratio between their irregular surfaces and their volumes), their purity level (including the average percentages of raster defects), and any special treatment of its surfaces in the course of their production phase that might change their porosity. In this context: most of the successful experiments speak about nickel powder.
  - The filling degrees in a *catalysis* cell (degrees of freedom of crystals to move or to rotate).
  - The choice of the catalysis fluid (e.g. the presence of Li containing molecules or other substances and their concentration in the catalyst liquid) or in more general terms: the way Li atoms are integrated in the catalysis process in order to increase their interaction probability with slow neutrons (these neutrons *stand still and* show a natural tendency to escape from the e-cat device due to the motion of the earth relative to the UZS).
  - The physical layout of a catalysis cell (e.g. the simple fact that the apparatus is open or closed).
  - As stated before, the temperature in the cell but from a PhR perspective, in fact any environmental condition that could have an impact on flatness (e.g. the presence of an external magnetic field, if only to compensate for the impact of Earth's magnetic field). It is obvious that when temperatures are too high, they will cause the Ni to melt down.
  - The electric properties of the setup: the present solutions seem to require the presence of an electric current in the cell even after saturation of the Ni crystals with H atoms. The effect of other forms and strengths of artificial or environmental electric fields and currents (continuous, interrupted, pulsed …) needs further enquiry.
  - The already mentioned absolute velocity of a crystal lattice versus a non-visible but fixed UZS grid. Its absolute momentum has an impact on the I-max value of replicating strings, although the effect on the state distribution of lattice knots (oscillating at non-relativistic speeds) and on free electrons in the metal is probably small. *Anyhow, the emission of charge info in I-max by individual particles of a cell must be properly synchronized in order to have statistically a chance to induce an EZO in the UZS.*
  - A similar issue is the overall *set up* of multiple-catalyzer *boxes in a single stack*. Not only can their number (by averaging) improve COP-stability, but escaping neutrons (in fact they stand still but the apparatus is moving) from one catalyzer could effectively impact the COP of one of its neighbors.
  - The way heat is transferred from the E-cat to the external devices that make use of it.

  - Practical issues like maintenance requirements of a setup (how often the *fuel, in fact* Ni crystals and the Li are "consumed" and need to be replaced).
  - Protection, control and security measures with a potential impact on performance.
  - *In line with what has been stated before, even if the E-cat set-up is able to produce charge-info patterns that have the right properties in space and time in order to induce by selection, an EZO copy in a local UZS volume, there still remains an issue if the UZS is strongly biased by either a high local graviton density or more generally, by a strong non-equilibrium between free and available "normal" and "contra" contact-EZP's.*
  - *If the Earth would be periodically an overlapping double planet (see hereafter), it could mean that the probability of successful results of cold fusion experiments would be unpredictable.*

- Most of these parameters are a matter of *further research or* common sense and are not related to a better understanding of PhR. Maybe the impact of many of them has already been investigated by the few research centers trying to understand this group of phenomena.
- Nevertheless, a better insight into PhR can be useful: the simple fact that slow neutrons are at the basis of a successful interaction means that a regular COP depends upon the fact that these neutrons must *be released* at a statistically constant rate from the location in the lattice where they emerged, but in such a way as to guarantee an efficient reaction with the Li catalyst (as stated already, they could indeed escape from the catalyst too without contribution to excess energy production). "Slow" means here: in absolute UZS terms (a PhR compliant rule, but in fact against all principles of Special Relativity). It seems unlikely that considerations like these have hitherto been taken into account.
- However utopian the dream of a clean, non-exhaustible source of energy "for free" may sound, the PhR model does point, encouragingly, to a successful precedent: the emergence of our entire super-symmetric cosmos out of NIHIL.
- Still, nothing is ever really for free: the ultimate cost of an amount of energy produced will always depend on the cost of an E-Cat device, the production of substantial quantities of well prepared fuel: Ni crystals (including eventually a change in their natural isotope composition), the cost of Li (to the extend it is really "consumed"), etc.
- Another issue is the fact that an E-Cat produces energy in the form of heat, stored in and transported by the catalyst liquid. Whenever we want to convert heat into a more useful form of energy (e.g. mechanical energy and indirectly into electricity), we have to keep in mind what thermodynamics has taught us about the limits to the efficiency of any conversion process (Carnot engine, Sterling machine …) – something that is strongly related to, e.g., the temperature of the hot liquid used. Below a COP figure of 3, an E-Cat's overall gain in energy effectively converted into electricity, is too small to justify the total investment (rumors about COP

values of more than 50 in what is called the "hot-cat" have to be confirmed). Obviously, if one were able to produce electricity immediately, i.e. within the catalysis process itself, the situation would be considerably different.

- There is no doubt that the development of a reliable final E-cat product, ready to be certified and sold, will take major efforts and substantial financial investment. But they may well pale in comparison to the kind of resources it would take to make that other old dream come true: the construction of an effective and controllable fusion reactor plant.

6. ***Rules (from a PhR perspective) for building a cold nuclear fusion reactor.***

- *Based on the basic principles of PhR, whatever realistic attempt to successfully build a nuclear cold fusion reactor, has to take a few guidelines into account:*
    - *A reactor will contain in its center a high number of randomly oriented crystals (e.g.in a Ni-62 or Ni-64 solution) at an adequate temperature, each crystal cell properly (=100%) doped with H, hereby increasing by dynamic internal symmetry the probability of producing charge info patterns that are able to induce inverted EZO copies in a locally flat UZS. We call such reactor content its "fuel".*
    - *The size of these crystals must not be too small in order to avoid surface effects but also not too large in order to maximize the chance that several nuclei of each particular raster cell replicate synchronously with a common I-max value. In fact, an adequate raster model is needed to increase the probability of EZP-like charge info emission patterns, able to select in the UZS raster, inverted copies of an EZO.*
    - *The local underlying UZS raster should be as flat as possible, taking hereby the presence of an at first side unbalanced density of gravitons versus contra-gravitons into account (we are not sure about the need for or the success of these efforts as our earth could be part of a double planet/ contra-planet configuration, each with time-varying orbits and with an at least periodically overlap – this could partly explain why in the course of the evolution our planet was several times very hot or why orientation of the magnetic changed or even why there is life on earth and not on other planets or …why cold fusion sometimes works or not).*
    - *The impact of non-synchronized (or non-simultaneous) charge-info emission events by individual atoms in any single crystal cell (their individual I-max values and in fact related to their absolute speed versus the UZS, can be dynamically adapted by a local acceleration/deceleration of the set-up (e.g. by suspending crystals in a turbulent fluid) and will also depend on the chosen size of the individual crystals and on the temperature of the fluid.*
    - *A dynamic set-up capable to inducing EZO's, could be driven by a software driven servo-mechanism in order to counterweight the varying local impact of unbalances in graviton/contra-graviton densities, hereby taking implicitly*

the intrinsic and "historical" dominant 3D symmetry and orientation of graviton- (and hypothetical contra-graviton-) fields around the earth into account. In order to eliminate a graviton-density excess only, a set-up could be inspired by the "Nasa Zero Gravity Facility" but the situation is not the same. A cyclic "zero gravity set-up" eliminates the impact of a gravity field gradient on the speed of an object during part of every cycle but it does not change or eliminate the field itself (the local graviton distribution) permanently: changing the graviton density gradient is not the same as reducing the graviton density as such. The latter could effectively increase the probability of spontaneous EZO induction in the UZS …at least if there is no "accidentally" high contra-graviton density excess due to the local non-measurable presence of a contra-planet.

- *Whatever the set-up would be, it needs to be dynamic because we do not know the local varying contra-graviton density and its impact on the level of unbalance versus graviton densities, taking additionally into account that a reactor will never stand still versus the UZS. The latter is certainly true if (e.g) a small reactor would be installed (e.g.) in a moving vehicle. The steering of the motion of the core by a local servo-system needs to be driven by computer software.*
- *The successful production of neutron/ contra-neutron pairs can be transformed by (cold) nuclear fusion reactions into heath with the help of e.g. Li (a solution ?). Normally such reaction will be electrically balanced (it involves neutrons and non-ionized Li atoms). Anyhow unbalances and reaction products like He should be treated adequately.*
- *As new induced neutrons after an EZO- split stand about still versus the UZS and the earth does not, the set-up should reduce the probability of an unproductive "neutron-escape-without-interaction-with-Li" effect. This suggests a spherical reactor construction, whereby a layer filled with a dense Li-solution will surround completely the central rotating slow-neutron producing unit. When "new" neutron /contra-neutron pairs will emerge, both particles do not contain (a lot of) kinetic energy: they stand about still in absolute terms versus the local UZS. However the reactor itself does not stand still and is involved in the unknown motion of the earth, our solar system and our galaxy versus the cosmic UZS. Anyhow, the probability rate of a Li-atom nucleus hit by a neutron will be small, so a high energy production rate requires a high neutron density.*
- *A third layer enclosing the main reactor, will take care of cooling and should transform heat into more useful forms of energy (comparable to any fission reactor). The possibility to regain part of the Lithium by an adequate nuclear reaction chain, has to be investigated (in that case only He and partially mutated Ni-crystals could finally be the real "waste" of this process).*
- *Even this type of reactor could explode, due to an uncontrolled and excessive amount of heath production in a very short period of time, but*

there is no risk of whatever nuclear chain reaction. Also the radioactive radiation level (gamma rays are quasi absent) will be low.

- *A fourth layer encloses the reactor and protects the environment against any spurious radiation (e.g. due to "escaping" slow neutrons).*
- *The quality of the fuel (e.g. 100% H doped Ni-crystals) will degenerate gradually by mutation of Ni, mainly into Cu-isotopes, what means that it will need to be replaced from time to time.*
- *The real strength of a cold fusion reactor is its capability to produce an excess density of free neutron-contra-neutron pairs that can be used for energy production but also to mutate the nuclei of most other atom types. This could be a way (e.g.) to produce at a reasonable cost, isotopes of "very rare earths" or to reduce the decay period of long-lived radioactive waste, produced by nuclear fission reactors.*

7. Conclusion.

- The main objective of this article is not to give candidate investors some appetite to spend their money on financing these new technologies, although in the long term, these investments could be in mankind's greatest interest.
- The true purpose is to present members of the scientific community with an example of how a better insight into PhR could reward us with some very tangible benefits, unlike what one would expect from a rather abstract theory that starts from nihil, uses un unconventional approach and reaches a number of unusual conclusions. And conversely, if E-cat results were confirmed through sound scientific research, they would lend support to the validity of this model.

Vocabulary of terms frequently used in a PhR context (version 3).

Antenna: *A set of symmetric, coherent, free (or active, e.g. being in special connector states of a replicating particle) point or zeron components can act as the emitter of charge info, capable by superposition and interference to induce a new short-lived or persistent particle-like pattern of CPS/UZS raster components, in fact an inverted copy of the antenna configuration. This induction or selection or ordering process has to respect conservation of energy rules and the FLN principle. In a young (not intensively biased by particle-like patterns) cosmos an antenna can emerge in the CPS and UZS spontaneously, just by coincidence (e.g. an EZO antenna format in the UZS). A successful antenna impact presupposes the ample presence of free building blocks in the CPS-UZS , available for selection. In further steps of the cosmic evolution a similar mechanism can lead to the emergence of more complex patterns of patterns like molecules or even DNA-strings. Charge info is emitted in all directions in M-dim: this means that based on symmetry more than one pattern can be simultaneously the outcome of this process: e.g. the magnetic and orbital spins of a large number of electrons, moving about randomly in an electric wire can have a local impact but their small average density gradient along the wire can also (based on symmetry and superposition of charge info patterns) produce a multi-circular magnetic field that has no net energy impact but is able to bend the path of an external charged particle, moving in this field conform the laws of Electromagnetism in Physics (in PhR terms: by interchanging in the contracted state of an electron the probability distribution of the relative phase shifts of two of its three orthogonal replicating strings without changing the I(max) value as such). This remark about symmetry and conservation in PhR is conform Noethers principles in Physics.*

Axion (interaction): Where a polaron (*charge info emitted by an EZP connector zeron pair of a replicating zeron string in I-max)* has an impact on the momentum property (Physics) of a particle-like pattern (and indirectly on the local point-hole density ratio in the UZS), an axion *(in fact a point level interaction of zerons in an i-max state, between replicating zerons in I-max) has an impact on the charge type property of a particle (Physics) and* changes the local charge density and the net quantized charge info distribution in the UZS. This means that a one-shot charge info pattern emitted by a point (e.g. *as component of a dynamic* zeron *connector or an EZK*) has forced another

compliant point (in an *UZS- or in a particle string-* zeron, being the receiver) *after a shortest or quasi zero time interval* into two subsequent identical charge states *(any CPS interaction conform the base laws between a shrinking points and an empty location is obviously axion-like but the induction of a new point is slightly delayed and takes place in a distinct location: it does not belong to the class of interactions as meant here)*. Such dynamic excess-charge can be (e.g.) stored in the connector of long branch of a particle and will be maintained *during a certain number of replication cycles*. Its impact *in special replication states (I-max or the contraction state)* on the double CPS/UZS raster (a *Gauss or Coulomb* polarization line) is assimilated with an electric field line. If a particle's dynamic excess charge distribution is producing (by *constructive* interference *along a trisectrice of 3 phase shifted branches*) a quantized charge info pattern, it materializes a magnetic field in physics (*e.g. magnetic spin of an electron).* As charge is a conserved quantity on a cosmic scale, an axion-type interaction must create simultaneously two excess charges with opposite charge types in two interacting patterns *with respect of a CPT conservation rule*. In nuclear binding with role interchanges between protons and neutrons, direct short range axion coupling (in combination with polaron coupling) is important and materializes (as a gauge particle) the strong interaction force in Physics. A successful long range axion coupling between uncorrelated particles has an extremely low probability rate, *as it has to take place between short-lived pattern points in appropriate free connector return states . In particle physics, axions may have a disturbing impact: they can lead to a decay of the original patterns due to a mutation of their replication schema after high energy collisions, a process increasing the probability of point level interactions.*

Base Laws: 6 base laws determine cosmic behavior at point level.

- Law 1: Law of inertia. Any quantized change of the cosmic state cannot take place without any delay (or in a zero time lapse). At point level it means that *it takes a* fixed *and* finite time lapse τ *for* any *empty location or an empty* point state *to* change into a charged state q or vice versa. This law creates a local symmetric quantized time dimension *whereby* we neglect the *global* asymmetric impact of charge info on the large scale cosmic growth , *a macro-process with its own time dimension*.
- Law 2: Emission Law. Any change of the charge property of a cosmic state leads to the emission of charge info in all directions by any point that flips its charge state. The sign of this charge info is such that it is meant to

annihilate the change *at the source or at least its external* impact *by compensating w*hat was the cause of its emission. *An empty location cannot emit spontaneously charge info but enables the propagation of charge info according to law 6 or the induction of a new properly signed point according to law 3.*

- Law 3: Induction-reset Law: The impact of a well synchronized charge info quantum *emitted as proposed in law 2,* on the cosmic state is such that if it hits first an empty location (*a new location in a growing cosmic volume or the empty state of a former point),* a new point will be induced with an appropriate charge sign, taking the sign and the state of the one that emitted this info (the source) into account. If it hits first a point in an appropriate regime state (a *compliant* target), it will reset this point into an empty state. *This process has to respect law 4.*
- Law 4: The coupling Law: Any exchange of an *effective* charge info quantum between two points or between a point and an empty location and synchronized as required to reset or create a standard point (a point interaction), has to respect the "overall conservation of charge" principle, counted over source and target. It means that a combined successful induction-reset process (called a coupling) is restricted to both interacting objects. Any point being a source or target, cannot simultaneously be involved in two ongoing coupling processes. The fastest potential exchange along the shortest path will be the most successful. It does not prohibit a point, once its charge content starts to change *due to a successful coupling*, to emit on its turn charge info to be used later in a next coupling process. This new emission should not interfere with charge info exchanged in the course of an ongoing coupling (*see CPT conservation).*
- Law 5: The superposition Law: Charge cannot be superposed (e.g. a point charge q cannot be more charged and grow (e.g.) to a value 2q). Charge info is subject to destructive interference, leading to its partial annihilation in a subset of locations or directions. Quantized phase shifted charge info can lead to constructive interference, meaning that the tenor of an empty (= *point free)* location can be lengthened or that a point's null state can change again without delay. The latter can lead to a compact or dense growing or shrinking (axial) replication process, *protected and conserved against random charge info interactions.*

- Law 6: The constant speed law: Charge info propagates in emptiness at a fixed speed, a value much higher than at least 137 times c, being the speed *in "emptiness"* of ordinary light in physics.
- **Comment: These 6 laws apply simultaneously in any combination. Their ultimate goal is to annihilate the impact of the creation event and to restore the ideal empty state of the cosmos. Such attempt is not immediately successful and leads in a first phase to the creation of a dense, fast growing, dynamic spherical volume around the creation point, filled with short-lived anti-symmetric positive and negative points embedded in empty space (the CPS). We assume that the perturbation principle applies, meaning that there will be more empty space than points in a random cosmic unit volume in its regime state.**

Bifurcation: *an interaction within or between components of a complex pattern that splits its format and main event sequence into two independent sub-patterns (meaning: non- sensitive to new interactions of another type then the one that has led to the original split), each involved in complementary chains of events. An example is a split of an EZO by an internal axion type interaction into two EZK's (a Higgs and a contra-Higgs) whereby both sub-patterns will not be sensitive in the future to polaron-type interactions, proper to each other's class. Conservation rules apply. In case of an EZO split, it means that CPT is conserved between the original EZO and the two sub-patterns together. As a result, the new emerging complementary matter and contramatter particles will have opposite charge types (C conserved) , 2 orthogonal strings that respect opposite relative phase shifts in space versus the 3°, leading to opposite spins (P not conserved) and there will be a 180° phase shift τ at point level between shrink and growth cycles of replicating strings (T not conserved). Classic electricity laws applied on contramatter are different, meaning (e.g.) that the left-hand rule becomes a right hand rule and that the relative phase shift between an E and B field vector in Electromagnetic waves has to be reversed.*

Charge: is the only discriminating signed, *dynamic* and quantized property of a point. Its *fixed regime* amount +/- q for a single point equals one Coulomb unit charge in Physics. *At any moment over a time lapse of order τ, in a representative M-dim cosmic reference frame t*he total net amount of charge is a conserved quantity, equal to the initial quantity q induced in cosmos(0) by the creation event. Charge cannot be described in other more elementary *terms* and

properties *of* our cosmos. *The context has to make clear that the term "charge" refers to the regime state of a point or to such dynamic flow of charge info that it will be able to build up (or reset) a state q (or an empty location) in a fixed time lapse τ.*

Charge info(rmation): an abstract fluid *continuously* emitted (*and propagating* conform the base laws) in an infinite number of directions, as the outcome of a change in the charge state of a point or a set of points (see base laws). Quantized charge info patterns and amounts can be assimilated with magnetic fields in Physics. *Charge info is subject to interference conform the superposition base-law, so symmetry in space and time of emitting point antenna's is crucial to determine their impact on targets* .

Connector(s): The dynamic and composite state of the most external *(or free)* set of points or zerons of (a) replicating string(s). *Hereby "external" refers to a maximum phase (or time, dimension and rotation angle) for point strings in zerons and additionally, to space or length or index-value in case of zeron strings.* Each *short* branch of a string has its *proper* connector *with a complementary state reached after a quantized shift (or delay) of order τ or 2τ versus the "fastest" connector in the longer branch.* All *the dynamic connector versions have* phases *(time shifts)* and/or positions relative to a central nucleus pattern (*for particles the central antenna Higgs)*, that will gradually change or grow and shrink whereby the position index value is increasing or decreasing between 1 and I (or i) -max. *For zeron made patterns this replication process along a fastest path is driven by axion and polaron interactions between pattern components of a branch and/or with well synchronized components of a central EZK pattern.* What is most important is its ultimate return state value (I-max or i-max), where in case of zeron-made patterns, external interactions by exchange of polaron- or axion-like charge info *packages* are enabled: small I-max values imply higher frequencies of full replication growth and shrink cycles and more momentum / energy (Physics) as *stored and maintained (without external interactions) in/by subsequent particle versions*.

Conservation rule: dictates that a specific property or sum of properties of a pattern (or set of *interacting* patterns) will not change under certain *external* interactions or over a certain time lapse and /or space volume *under internal interactions*.

Contact-EZP: *see EZP. It is a short lived or dynamic 2-zeron UZS pattern state between two compliant point connectors of neighbor UZS zerons, both in their i-max states. Several type of interactions are a priori possible and the number (137) of point replication steps, determined by the values τ, M and the CPT conservation rule guarantee a local stationary oscillating state of any free (= not engaged in more complex pattern formation) but dynamic replicating N-dim zeron subset. They can be part of dynamic long pre-polarization strings.*

Contraction state: That particular state of replicating strings where two branches (or a complex phase shifted pattern of 6 branches in case of EZK based zeron replication) shrink their axial strings to standard *phase shifted 2-zeron* antenna length values, whereby *in a next step* the roles and properties of antenna components are inverted versus a virtual central symmetry location. This inversion materialize the (*unsuccessful)* tendency in nature to wipe out any non-empty pattern state, but it just causes the creation *by induction or selection*, of *its inverted* anti (*or contra)*-symmetric copy (*see Base law comment)*. In case of *dynamic* complex pattern like a 4-zeron (or Higgs or EZK) replication cycle, 4 string *growth and* contractions and inversions are needed before a pattern connector set reenters into an identical configuration state (a spin ½ particle in Physics). *In case of anomalies stored in connectors and unbalances between contracting branches, a position shift of a virtual symmetry center over a standard UZS raster length takes place and eventually one or several autonomous difference patterns can be separated from the parent in this contraction process. Both processes respect all conservation rules.*

Contramatter: Any anti-symmetric copy of an ordinary matter-like particle (e.g. a positron with a charge type and some other QM properties opposite to those of an electron) but additionally with an opposite mass or embedded *EZP* hole type property. A difference in hole type of *high (or low)* local contramatter densities has consequences for the UZS and for μ, c (speed of (contra) light) and for the fine structure constant parameter values in its neighborhood. The speed of light is indeed depending on local raster properties and the *local* excessive (or reduced) presence of contramatter versus matter will lead to a *relatively* reduced (or increased) density of raster contact-EZP's available for fast (contra-) light propagation.

Cosmos(0): the initial unbounded empty state of our cosmos.

Cosmos(1): the first non-empty state of our cosmos and the outcome of a single creation event. Its one-point state implements a simplest *short-lived* cosmic set with Shannon entropy zero.

CPS: Complementary Point Space is the *initially* growing spherical collection of points *still* available for pattern formation. The full *M-dim* set of points (including points involved in high order pattern formation) is simply called "Point Space". Without high order patterns, point space is on a relevant scale, homogeneous with a net charge density that is null per unit volume. The point-hole density ratio per reference volume without the presence of patterns, is fixed.

CPT-conservation: a term in particle physics, referring to the fact that certain relevant mathematical descriptions (alias) of (a) particle state(s) or real behavior in case of interactions (alibi), are invariant for specific combinations of inversions of reference frames or relate to real *signed* properties like Charge, Parity and Time in equivalent math-equations. Some violations of the combined CPT conservation rule seem to exist and these anomalies are sometimes hard to explain in physics. In terms of PhR, *differences in results* could be *the outcome of the* absence of contramatter in physical models. *The CPT conservation rule is a direct outcome of the base laws: an example is how a properly phase shifted interaction in I-max of an axial connector of a replicating particle can lead to excess charge conservation (C+) and the shrinking (P-) of a string (T-). The most primitive expression of this law in a primitive CPS refers directly to the base laws. An example on an oriented axe P: a growing (T+) positive point (C+) will emit effective charge info along a "fastest" direction, opposite to the "by coupling" still growing edge (P+), "effective" because destructive interference makes this path non-sensitive to charge info propagating along other symmetric backward paths around the axe P (see Feynman) . This situation enables the* original antenna *point to induce by a new coupling "as soon as possible at its left side (P-)" in an empty location a new growing (T+), (P+) positive point (C+) or to reset an existing negative point (P+,C- and T-), meanwhile resetting (T-) its own positive point state (C+). In both cases CPT is conserved over the two patterns involved in this new interaction.*

Creation event: the first and single event that transformed Cosmos(0) into Cosmos (1) by inducing a single point with a single discriminating property (charge) in an undetermined location at an undetermined time. This concept

replaces a Big-bang event in Physics. Its origin is unknown and beyond the scope of this PhR model.

Dense: *a term used when describing replicating pattern strings. It expresses the fact that subsequent point or zeron knots are added in time and/or space without any delay and/or distance, contributing in this way to the formation of a dynamic shortest and fastest path between dynamic connectors and a central antenna. Such property is in line with the base laws and conservation principles, it imposes strict conditions of symmetry on a central antenna and requires locally a sufficient density of free appropriate raster components*.

Difference Particle: A pattern that emerge as the difference between *the grid components involved in* a parent particle's *replication cycle* and its sub-products in case of *contraction, decay or transformation* (e.g. when a neutron decays into a proton and an electron, a neutrino will emerge as difference particle). It carries *often* a difference in *the* central EZK (*free zeron)* layout and behavior before and after decay. The transformation of a *mutated* particle into a next *more stable* version *in the contracted state is a potential* source of difference pattern production (e.g. an accelerated particle shifts its position *faster* and shrinks its replication length, emitting a photon or, as another example, a contracting neutron moving at constant pace in a gravity field and absorbing a graviton that will be afterwards released in a backward position). A *difference particle (e.g. an electron after neutron decay) integrates in its pattern often one of the time shifted or superposed versions of a parent core (mostly a complex EZK) , enabling autonomous replication according a simpler schema. Its format is often the outcome of symmetry, interference and the FLN rule applied on superposed charge info emitted by embedded connector antenna's in special intermediary particle states before and after a first decay step (e.g. W and Z bosons).*

Dimensionality: A dynamic property of a single pattern of points or, of a pattern of patterns. In physics (and in linear algebra) it refers to the *adequate* number of base vectors (forming a reference frame) needed to describe analytically the behavior *and/or state* of a single particle or a set of particles (e.g. in a crystal lattice) *in space*. If refers also to its capability to maintain (*or change)* its properties before and after a real or virtual symmetry operation in space and/or time. In PhR a generic definition refers to the number of directions (in space and time or phase) along which a central antenna has a priori equal probabilities to couple successful with surrounding compliant patterns or

particles, *although the effective probability remains subject to a "fastest or shortest path in time" rule*. As an example: a *replicating* Higgs-formatted tetrahedron antenna of a proton enables a successful coupling (by *interaction in I-max*) between one of its 6 connector *states* and a *compliant* connector of another particle, *most often (graviton coupling is an exception)* with a similar central Higgs architecture whereby *at least one* of *each pattern's* axial replication *string* directions are coplanar, intersecting each other virtually *and periodically*. This (*in combination with an orthogonal graviton density distribution around a sphere)* explains why Physics "sees" our cosmos in 3D. *It confirms the dependency on the collision angle for elastic collisions in particle physics.* Emptiness in PhR is infinite-dimensional, the CPS is M-dim, the UZS N-dim and their reduction factor is M/N=137 (in phase space, as set by point replication). *M was initially the maximum number of neighbor points able to interact with the creation point without any increase of the cosmic volume. If M would have been infinite, the maximum cosmic size would be equal to two point sizes. The minimum time shift between to neighbor points sets the maximum size of the cosmos.*

Discriminating Property: a property of a point or point pattern that makes the difference, either between an object and emptiness or between two objects of a quasi-identical population in our cosmos. Charge is the only discriminating property that in case of a simple point, makes the difference between something and nothing. This term is also related to the concept and the definition of symmetry *and to the generic definition of the term "energy"*.

Dynamic: *a qualifier of a pattern, expressing the fact that its content can be substituted by other equivalent components (e.g. points or zerons) without changing its fundamental properties*.

Energy: Its most general PhR conform definition is the capacity (*or capability)* of a pattern (or a particle) to change the state of the cosmos. It encompasses internal changes (e.g. by replication) and external modifications of patterns. It is used as a quantity of change, *as well* as a quantity of state. Energy transfer *between patterns* requires necessarily a discriminating property between *both whereby simple but dynamic characteristics like time (phase), charge and symmetry states (or dimensions) could play that role*. Energy transfer needs *a quantized charge info based interaction and has an impact on the pattern lay-out of both interacting objects. This process* cannot be performed in a zero-time lapse *and its probability distribution has a stochastic character*. *Charge info*

*and particle density distributions and symmetries have an impact on the probability density distribution for certain transaction types. We could call them a form of potential energy but this term is not easy to compare with the generic definition of energy in PhR. The combination of energy and time at point level is a quantized property called "action" with value h/2= τ * q (see point). High level transfers need multiples of h/2.*

Event: a *smallest successful* (inter)action *between patterns, between pattern components, between a pattern and one of the two grid elements or between a pattern and an empty location ,* that changes the state of our cosmos. An *action driven* event *presupposes* a convolution of energy and time. *Such action itself it is quantized (a multiple of h/2) and formatted as an axion- or polaron-type charge info exchange process*.

EZK or Higgs: a super-symmetric set of 4 adjacent UZS zerons. In a perfect EZK, they form geometrically a regular tetrahedron, whereby the 4 zerons (or two perpendicular phase shifted EZP's) show 90° phase shifted point replication cycles. Theoretically they are simultaneously in interchangeable DZ,CZ,DH,CH states. Such ideal EZK state is unstable (*as a pattern)* because a shortest or fastest exchange of charge info between zerons *in order to make this state persistent,* would imply annihilation by destructive interference in their central symmetry location. It means that at least one replication cycle need to be slightly phase shifted and this "property" is dynamic (*see also contact-EZP's)* what leads to superposed states *in time* of several pattern versions (by dynamic role interchanges) and *enables* finally zeron replication *whereby the central EZK acts as an antenna for quantized charge info*. The symmetry properties of a *central replicating* Higgs explain why we observe *a* subset of particles and other patterns our cosmos is made-off, successfully in 3 *orthogonal geometrical dimensions. An EZK does not appear solely and spontaneously in our cosmos, as it would create an unbalance in charge and mass-type energy. As long as it is part on an EZO such unbalance does not exist. "Partial" and opposite energy amounts will be the outcome of a stochastic internal axion-type interaction between an EZO's internal over τ phase shifted EZK and contra-EZK sub-pattern states, each owner of an opposite mass type.*

EZO: An *8-zeron* anti-symmetric over order-τ phase shifted EZK pair (*two tetrahedrons with a common symmetry center*, whereby each *EZK shows* an opposite embedded mass type – so in fact a contra-symmetric EZK pair).

EZP: an *at least theoretical* 2-zeron pattern, 180° phase shifted whereby one zeron connector is in the DZ return state when the other is in the CZ state. Such ideal 2 zeron pattern is unstable (see also EZK), *so the definition applies mainly in case of two slightly phase shifted zerons integrated in a more complex pattern (like a Higgs)* . A contact-EZP (see above) is not a particle but a short lived pair of adjacent UZS zerons, interacting *when both parent patterns (zerons) are* in their *compliant* return states. Ordinary phase shifted EZP's *could be treated as "frozen" contact EZP's whereby the tenor of the enclosed time shift remains fixed and the two i-max connectors have opposite charge signs.* The two *possible distinct* interaction *scenario's for EZP's and contra-EZP's* on a stationary *unbiased* UZS raster explain a difference in an *effective* μ *value*, in the local fine structure constant and a difference in c, the speed of light. Depending on the connector combination, they materialize a slightly different *enclosed* mass quantum. Ordinary phase shifted EZP's are integrated as transversal string components in replicating contramatter or matter patterns and particles. Hereby along a growing string, two *orthogonal* phase shifted axial and transversal EZP's form a local EZK *that is a phase shifted interconnected multi-state copy of a central EZK antenna*. *See also: "free zeron" and its matter/contramatter related properties.*

Field: : *A concept used in mathematics and modern quantum physics but in PhR it is a term that refers to large dynamic subsets of raster components with specific properties (most often primitive zeron patterns that share a common anomalous property). They materialize, in classical physics, abstract large scale location sets, enabling distant forces between particles (gravity, gauss, magnetic fields).*

(Inverse) Fine structure constant: See Physics. The dimensionless inverse fine structure constant should be exactly 137, the maximum number of replication steps "in time" of a zeron-like point pattern and the reduction factor between the number of dimensions M and N of the CPS and the UZS. However the interaction in i-max with a neighbor zeron should explain the small discrepancy between the theoretical and the really observed value (*137,036 for matter) . The fraction above the value 137 is* different for a matter- and contramatter-like i-max contacts , *due to* distinct *contact-EZP* hole tenors *and charge types*. The *dynamic* combination of these *two* types at the return states of each single point string should be capable to sustain in the UZS, a stationary

local oscillation process over a marginal time shift of order τ *that is CPT conservation compliant*.

Flatness: the *dynamic* state of a CPS/UZS volume with a local density of free points and holes that guarantees a probability of spontaneous EZO formation up to a level that is comparable to that of an initial particle-free CPS/UZS volume. A natural or artificially flat state in a with patterns filled cosmic volume can produce (with a probability depending on the flatness level) slow neutron-contra-neutron pairs (*neutrons interacting with (e.g.) Li-atom nuclei is a potential source of Cold Fusion energy)*.

FLN-principle: *This Fundamental Law- of- Nature refers to the rule that the base laws and interactions deduced from these laws, try (without success) to re-implement (by the emission of properly signed charge info) the initial ideal empty cosmos(0) state. An inverted charge info pattern emitted by a coherent set of points in order to achieve this goal, could have an impact "by selection of grid or particle components" in a distinct set of locations at a distinct time, producing anti- or contra-symmetric copies of the original antenna pattern. This law relates to the CPT conservation rule and to phenomena like replication or to the formation of new (difference) particles.*

Forces: There are no forces in PhR. Transfer of energy, momentum, mass etc… like in Physics are the result of the *dynamic probability distributions of* basic interactions between patterns whereby Axions and/or Polarons are exchanged between compliant patterns or pattern components in appropriate *point or zeron* connector *return or contraction* states. *These axions or polarons can be embedded in micro-patterns like photons or gravitons.*

Free zeron: In a realistically replicating EZK, stability of the pattern and binding of the 4 zerons requires only *a* dynamic *subset of* three out of four zerons involved in quasi simultaneous interactions in phase shifted time-dimensions. In an extremely short-lived EZK (an Higgs) , a single axion-like charge info quantum is interchanged between 3 local zerons leading to what is called their binding by role interchanges and to the superposition of several quasi-identical "rotating" versions of the same antenna pattern in the UZS. However non-simultaneous replication in 3 orthogonal symmetry *directions is engaging bidirectional axial zeron strings, a process that* requires 3 extra τ shifts. It means that once replication out of *each* central EZK antenna starts off as the outcome of an axion exchange between two zerons of two contra-

symmetric EZK's in an EZO, strings will emerge *dynamically along* 3 superposed orthogonal directions whereby the phase angles of 3 of the 4 central zeron versions are determined and fixed. Nevertheless the phase (*in an 137 dim point replication schema)* of the 4th is still free and dynamic. The effective inverse fine structure constant for these naked zerons *in a superposed multi-state* neutron nucleus is reduced from 137 to 133. Hereby we must understand that role interchanges and superposition implies that at least 6 (one per branch) *phase shifted (in 137 dim)* versions of free zeron states in the EZK co-exist. They act as a memory set (or counter) of the momentum state of the pattern (*determining its I-max value)*. Their *effective state index (expressed in 2τ units) and dynamic behavior* are the outcome of the impact of, by polaron interactions in I-max imported excess holes. Where the symmetry of a replicating string is such that the value of this *state* counter remains fixed for a particle moving at a normal constant speed (*meaning:* with a fixed but reduced I-max value), this is no longer true in a transition state just after a polaron interaction. Restoring an equilibrium needs several replication cycles *and contractions* in order to change the central EZK pattern to a new stable state that *will* lead *finally* to a *new stationary* position shift *frequency* of each next version of the pattern (observed as "motion" in physics), an *appropriate change in I-max value of each string and an updated version of the multiple superposed short-lived versions of free zerons in the central EZK*. At very high speeds where I-max has reached a limit value *slightly above* 1, this complex *process in a particle's contraction phase,* is the cause of an extra delay in the pattern's *position shift. It is due to a chain of complex state interchanges in the EZK itself*, increasing in this way its mass (*see* Special Relativity *in Physics*). *The initial phase shift of a free zeron in a contra-EZK versus its transversal partner is different over a value of order τ versus the corresponding value in a matter like EZK. If this would not be the case, a transversal contramatter string connector could not sustain a different polaron emission pattern, not release in the contracted state a contra-graviton etc….*

Graviton: A flat rotating circular 2-zeron UZS pattern able to sustain a polaron-like hole. A graviton is a pattern equivalent to a unit gravity quantum (Physics). It is unable to move and its large scale density distribution on the CPS/UZS raster materializes a large scale gravity field. Versions exist with two distinct hole formats (gravitons and contra-graviton with a different *sustained* hole tenors) whereby cross-coupling with each other or with particles and contra-particles are impossible. *Like a polaron (a virtual photon in physics) it is charge neutral but it has a spin-2 property meaning that the roles and signs of both*

enclosing zerons are frequently interchanged per tour by an internal axion exchange process, making a graviton persistent: it takes halve a micro life-cycle (one growth +contraction) to reenter into the same effective quantum state. This means that it is able to couple successfully by polaron exchange with spin 1 and spin ½ particle connectors in subsequent I-max states, although with an opposite momentum impact. It is released as a difference particle between contracting transversal EZP strings, by an Higgs based replicating particle at the time of its position shift on the UZS. Gravitons and contra-gravitons are persistent as long as they do not interact *with a particle*: they can sustain the hole in their symmetry center until they couple by polaron exchange with a *zeron* connector of a replicating *particle* in one of its return states. *However this event will release in the adjusted and stable contraction state of the particle, a new similar graviton version in a slightly space shifted position: in fact the relative central positions on the cosmic grid of the particle and the (new) graviton are interchanged.*

Gravity (and contra-Gravity): *The impact of any graviton density distribution in the CPT/UZS on an EZK (Higgs) based replicating and moving particle is perceived by Physics (and described by General Relativity) as a weak (gravity) field. New accelerated particles (and/ or contra-particles) entering such field(s) release a increased-density distribution of gravitons (contra-gravitons) along their paths, increasing in this way the mass of a central object (like a planet, a star or a black hole) and the relative strength (or gradient) of the gravity field. In PhR terms the large scale symmetry properties of graviton based fields in combination with the small scale 3D symmetry character of an EZK based Higgs, explain why Physics can describe successfully large scale properties of macro objects in just 3 spatial dimensions.*

Hole: a hole is a *dynamic* short-lived and free-of-charge location state, carrying nevertheless a *by constructive* interference quantized amount of charge info *(so there exist plenty of empty locations in the CPS that are extremely short lived, non- standard holes)*. This quantization requires a fixed delay between replication cycles of enclosing patterns whereby the fastest path principle and a fixed speed of charge info in emptiness (a base law) apply. When a point is reset into an empty state, its charge info content has *a sign that is different, whether* it is the outcome of the reset of a positive or of a negative point. In this context we use sometimes a notation DH and CH. A contact between a pair of connectors of adjacent point-replicating UZS zerons in their return states are producing short-

lived holes with *alternatively two* slightly different tenors. They materialize positive and negative embedded hole densities (*meaning: above or below UZS average)* that impact several parameter values proper to the UZS raster. Polaron interactions with a connector in I-max of a short branch of a replicating zeron pattern (a particle) change the tenor of an embedded hole *state* in a connector-EZP over a time quantum 2τ, *changing* after a number of *replication cycles*, momentum *state and or particle mass values*.

I-max (or i-max) : the maximum number of steps (or knots) of a replicating zeron (*or point string*) in a particular momentum state (*or growth in time state*) *before it starts shrinking again (in time and/or space)*. These index values (I and i are integers *–counting is the only math operation allowed in PhR*) refer to reaching the *i-max or I-max* return state of a string. Where i-max is *quasi* fixed, this is not the case for I-max for a zeron-replicating particle out of a Higgs-like core antenna. Its value depends on its momentum state *and implicitly on the relevant free zeron phase (or dimension) state in the central EZK of a replicating particle*.

Induction or induced: *a term used to describe the impact of quantized charge info in two distinct cases. In a primitive cosmos it refers to the creation of a new CPS point version in an empty location. In a later cosmic state and frequently used in combination with the term "by selection", it often refers to patterns of primitive UZS zerons or contact-EZP's selected because they are (by coincidence) properly phase shifted in order to producing inversed copies of charge info emission patterns (FLN principle), sustaining in this way dynamic UZS patterns (fields, paths and states) that will support successful axion or polaron transfer and "interactions along shortest paths", based on charge info emitted by one or several correlated particle antenna's in I-max states. Symmetry of the antenna's and charge info interference rules combined with the FLN rule determine the probability of the emergence of new sometimes complex and dynamic patterns. An example is the induction in a flat UZS of EZO's by charge info emitted by Ni-FCC crystals, intensively doped with Hydrogen atoms*.

Interaction: Any exchange of quantized charge info between pattern components *in special states*. Within replicating patterns, interactions are internal between knot-like zeron components and between the central antenna *components* and *axial and transversal* string knot *zerons* according to a strict *fastest* charge info exchange schema. When the longest string of a replicating particle is reaching an i-max or I-max state, external interactions with

appropriate connector states of other compliant patterns or particles are *mandatory (for i-max) or enabled* (*in I-max).* Between zeron-made particle *connectors,* exchanges of normalized *effective* charge info quanta are packaged as axion or polaron-type micro-patterns. *In order to make a comparison with particle Physics more transparent, weak interactions (physics) as a form of polaron interactions are discussed in this vocabulary under weak forces.*

Inversion: When a replicating particle-like pattern is reaching its contraction state, a next anti-symmetric version (versus a virtual symmetry center) is induced in the CPS/UZS that leads again to a new growth cycle of the pattern. This process will at the lowest level respect the base laws of PhR , meaning that this new version tries to restore the empty cosmic state by inverting charge types and certain geometrical properties like string-spin (*FLN principle)* . However perturbations and space and time shifts make it impossible to annihilate the original pattern. Contraction will respect overall conservation laws: if this is impossible by the inversion process as such, one or several difference particles will be stepwise induced and released, eventually after several contractions of a replication process. *Inversion does not change the mass type (a hole property) of a pattern and conserves energy.*

Knot: a successfully selected component of a replicating string (a point or zeron string) indexed by an integer i or I. Selection of candidate components out of a locally available source (like the CPS or the UZS) *imposes* an appropriate distance in space and time, taking the superposition and interference of charge info quanta emitted by a central antenna and *or/*by partial string connectors, into account. This *quasi* deterministic, on the symmetry of the central antenna and on the shortest path principle based process, leads to a perfectly (in terms of geometry and time or phase *or dimensionality*) distributed set of *dynamic interconnected string* components. It explains why normalization and *increasing* complexity of composite patterns in further steps of the evolution of our cosmos, are possible and why (in Physics) equivalent mathematical descriptions of their *real PhR-conform* behavior can be correct and successful.

Location: any abstract position in space and time in cosmos(0). Any event or any object taking place or induced in a location can only be referenced to in relative and/or abstract terms (there are no pre-existing rulers in cosmos(0), able to locate *or to refer* to cosmos(1….X) state(s) or to their content).

***Magnetic field lines*:** *circular charge info patterns at point level, carrying no net energy but able to induce phase shifts of order τ in the contracted state of replicating EZK based particle strings.*

Mass: A measure for (in PhR terms) a net quantized amount of time *(or delay)*, stored as *or sustained by* dynamic and eventually (by *constructive interference)* superposed holes in a set of *(contact-)* EZP-like components of a replicating particle. Unit-mass values are different for matter and contra-matter, as *their built-in hole tenors are different*. In PhR, intrinsic particle mass (like inertial mass in *momentum formalism (Physics) or in* $E=mc^2$ or like a gravity related mass) *all* refer to the same fundamental pattern and/or particle property.

***Neutral-EZP*:** *Often used as synonym of charge-neutral EZP. It refers mostly to by polaron interaction phase shifted and hole type energy carrying EZP's in connectors or in gravitons.*

Particle spin(s): a phenomenon identical with magnetic spin or an internal orbital quantum spin of particles observed in Physics. As an example and for *replicating* electrons, the spin vector in PhR terms is oriented along the trisectrice between the 3 axial phase shifted orthogonal replicating strings. It represents the net (taking interference into account) charge info impact of the dynamic slightly phase shifted free zerons and holes of the connectors of 3 orthogonal, *about synchronously* in length varying strings. For holes such an interference effect is less obvious because a hole as such does not emit charge info but the enclosing zerons do. *The internal* relative phase values of the 3 *over 2τ* shifted connectors of the long branches will change each time a particular string participates in an external polaron interaction that impacts the particle's momentum: it interchanges the "fastest connector or longest string" property within the string triplet. This event will have an impact on the orientation of the spin vector in a virtual fixed 3D reference frame with axes that coincide with the 3 axial particle strings. *In PhR and contrary to Physics, there is no conflict between a description of a magnetic spin phenomenon in terms of a (pseudo or virtual) rotating charge and (e.g.) a maximum speed limit c for a moving particle: in PhR an electron string set does not even rotate when replicating.* For protons and neutrons the spin concept is more complex. The magnetic spin is weaker, taking role and *free charge type (mass types remain the same)* interchanges and symmetry of the central EZK tetrahedron and their impact on the replication process into account.

Particle state: *In PhR the state of a replicating particle with a EZK-like nucleus (protons, electrons …) is determined by its dynamic replication schema, particularly by its connector configuration and its I-max value. In its I-max state a connector is able to polarize "by selection" paths in the UZS, materializing Coulomb and/or magnetic field lines. In QM (Physics) the Schrodinger representation of particle states uses complex numbers: a phase shift between real and imaginary parts refers implicitly (in PhR terms) to a 90° phase shift between changing charge and emitted charge info (on a point scale).*

Pattern: A coherent and dynamic set of points (*and/or zerons*), interconnected by the exchange of appropriate charge info quanta along fastest paths. Large objects are patterns of patterns whereby connections can be broken by external or internal interactions. In this sense very few patterns are persistent as a pattern *(and they are* never as a version: their raster point and zeron content is anyhow changing). Examples of *quasi* persistent patterns of points are zerons, EZK's (Higgs), electrons and protons…. Particles (Physics) are patterns but not all patterns (in PhR) are observed in Physics as particles (e.g. a single UZS zeron).

Periodicity (of a cyclic process): The time it takes (expressed in multiples of a time quantum τ *or in number of contractions*) for a replicating pattern to re-enter into the same connector configuration state, *including relevant i-max / I-max index numbers*.

PhR (Physical Reality): the (proposed) set of unproven most elementary components, processes and laws that constitute our cosmos and dictate its behavior. It is a theory and its correctness cannot be proven but its internal consistency, on top of compliancy with *proven laws and confirmed results of experiments in* Physics can be used to check the validity of whatever proposal.

Point: The single *quantized* most elementary particle-like object in our cosmos and the direct outcome of the Creation event. It owns a fixed signed amount of charge "q" as the sole discriminating property between something and nothing, *be it with two possible but opposite sign states*. A point owns a fixed growth / shrink cycle *time* τ , and $h/2=E(q)*\tau$ is the action needed to set (*or induce)* or reset a point.

Point Replication: two orthogonal anti-symmetric pairs of two appropriately phase shifted points with a shared central symmetry location are able to induce by a single (axion-like) interaction *between* one point of each pair, two successive charge states of the same *charge* type (but opposite in the two pairs,

in order to guarantee overall charge conservation in the cosmos). Each pair is able to maintain this single anomaly several times in a row whereby along fastest paths in time, an anomalous point state is copied, alternatively left-right, be it with a phase shift of order τ. An event sequence that creates and sustains this growing two sided point pattern is called a point replication process. Each 2-point pattern is called a point string or a zeron, an in time (or phase) growing linear composition of two branches whereby their last position and/or time shifted point states are called dynamic connectors. Adding points to a string is a selection exercise of appropriately phase shifted point pairs, being dynamic connectors, out of a set of replicating partial *(or shorter)* point strings, emerging as short-lived versions replicating (*at extremely high but gradually decreasing frequencies)* in multiple superposed (slightly phase shifted) time dimensions around a common central location. All successful selected points (or knots) of a growing branch are connected with each other and with one of the central (antenna) points by well synchronized (or in time equidistant) charge info exchanges (a case of constructive interference). This means that the sequence of successive selected internal *connector* point states of each partial successfully completed string branch, are 2τ phase shifted. Charge info emitted by enclosed "axial" points "set" a connector state, a local and appropriate "transversal" CPS point "resets" it again into an empty state. With respect of the fastest path selection rule, the longest pattern "in time" s*ustaining a fixed charge excess,* is able to persist over 137 successive quantized replication steps. *This in time axial string is dense meaning that successive point shrink and grow cycles take place without delay, protecting the string against random external charge info based interaction attempts from abroad.* When reaching *a critical* limit (i-max), the probability of interaction with a neighbor zeron in a compliant short-state and acting as a short lived transversal string, *becomes* higher than the probability of a delayed successful internal coupling with another appropriate superposed 2-point antenna string of the same (*time)* length *around the shared symmetry center*. This external interaction is the cause of a phase jump τ what leads to a shrinking (in time) under the impact of an ongoing internal axial charge info exchange process, whereby the initial net charge type is maintained until the string re-enters into a contracted 2-point state and the charge type is inverted and (as a new version) an anti-symmetric string restarts its growth. The contact state between two adjacent interacting zerons in i-max, generates or eliminates a hole, in fact a positive or a negative deviation from a standard local charge-hole density ratio, being a form of positive or negative *embedded* "mass" and *as a*

discriminating property, a source of energy: as two *scenario's* of interaction are possible (*the induction of an extra point in a still empty short branch connector location or the reset of a point in a long branch connector)* an excess point *state* is reset *or induced and conform CPT-conservation, the shortest branch becomes the longest* or a hole is filled with an extra induced point a*nd that short branch becomes the longest*) two dynamic zeron-state classes exist *with a slightly distinct replication length in time*, leading to matter and contramatter-like behavior. Each class contains zeron *pair* states (*see contact-EZP)* with a slightly different hole tenor (τ *shift)* as unit mass quantum *(e.g. in E=m'c'²)* and a slightly distinct fine structure constant 1/137, xxxx (physics). The intrinsic, a priori fixed, tenor of 137X2τ (+ fraction) is determined by successive internal interaction shift over small time quanta and the requirement that, despite the distinct impact of an external interaction between zerons in i-max, the original oscillation-like growth-shrink like process must be stationary (otherwise the CPS/UZS raster as a global coupled quantum macro-object could not reach an equilibrium state, *in fact required* to permit any further evolution of the cosmos) could determine the prime number value 137 (why 137 and not another prime number *depends on the values τ, M - a suggestion to be confirmed by computer simulations*). See also viXra article about fine structure constant(s).

Polarization (or pre-polarization): *Free zeron or EZP states emitting quantized charge info, might induce by UZS zeron selection in the UZS, paths of zerons or contact-EZP's that materialize Coulomb or fotino field lines. Hereby the FLN principle applies (inverted copies try to cancel out the impact of an original pattern version in order to (re-)implement an empty cosmos(0)). Pre-polarization lines facilitate the propagation and exchange of standard energy-carrying interaction patterns (polarons, photons…) between candidate particle connectors. The Induction of polarization patterns as a process, makes use of quantized charge info emitted by one or several "antenna points or zerons" not involved in internal binding, whereby symmetry and interference rules, applied to these charge info quanta might select or induce an inverted copy of this antenna, able to behave as a new virtual particle . Overall energy and charge conservation rules apply if these new patterns will behave as quasi persistent particles (e.g. gravitons or particles in high energy collisions in LNC). Successful selection of pre-polarization components requires the local availability of appropriate potential "building blocks" (free UZS-zerons and contact-EZP's of the right type) in order to compose FLN-conform inverted pattern copies.*

Polaron (interaction): One of the two fundamental quantized types of interactions *between patterns on a double raster that are possible (see Axion for the other type). Interactions* permit an exchange of an appropriate charge info package between compatible patterns or pattern components *(e.g. connectors)* with respect of conservation principles, leading to a change of certain properties in both, the emitter and the receiver of the package. In the polaron case it changes the quantized hole content and/or tenor in both interacting objects and because these objects are just raster point compositions, it has a small impact on the local point-hole density ratio in the UZS itself (*a form of energy)*. To change the hole tenor of a particle's short *2-zeron* branch connector, a properly synchronized EZP like charge info pattern has to be exchanged. This elementary pattern is called in PhR a polaron. Emitter and receiver of a polaron have to be *either* two particles (or patterns) of which one has an over 2τ phase shifted zeron composition (e.g. gravitons) *or* both have connectors in I-max states of *long (the emitter) and* short branches (*the receiver)* of Higgs based replicating particles *(a low- energy collision type interaction)*. Polarons exchange momentum between particles. Either the exchange is direct (connector to connector via a virtual photon in Physics) or the polaron is embedded in a photon particle or in a graviton o*r in another gauge boson (Physics)*. The hole tenors *of transversal strings* for matter and contramatter are different, so a normal polaron cannot couple with a connector of a contra-particle (and vice versa). *As long as a polaron stored in a connector has not been integrated in a new particle state by effectively reducing the I-max value of a replicating string and/or adjusting the multiple free zeron configuration of a central EZK, the same connector (the extra phase shift between enclosing zerons makes it non-compliant) is not susceptible to a new polaron coupling. This adjusted phase shift of a free connector zeron is supposed not to perturb the replication growth-shrink process as such (to be proven by computer simulations).*

Process: a *correlated* sequence of events.

Quantized: *The smallest fixed charge amount in the cosmos is q (point charge) built up or reset within a smallest fixed elapsed time amount or quantum τ. A single point-life-cycle takes 2τ and equals a quantized charge info amount.*

Raster(s): A generic name for the CPS or the UZS or for both.

Replication: *see point or zeron replication.*

Return state: A special connector state whereby the growth (*in time or in space/time)* of a replicating point or zeron string stops. In case of point replication, growth (in time or phase) stops when two neighbor zerons interact *directly* what happens under standard conditions in a *particle-less undisturbed stationary* UZS raster (after 137 steps). In case of zeron replication out of an EZK antenna, this process stops when a selected phase shifted transversal string zeron *(synchronized with a free zeron in the central Higgs each time the pattern passes thru a contracted state*) in the connector of the longest branch is reaching an appropriate phase state *versus the phase angle of the zeron in the corresponding axial string . When this happens, the roles of two transversal zerons of the connector are interchanged. The new axial zeron state sensitive for coupling with the enclosed axial branch zerons will be shifted over a* τ *phase quantum whereby CPT conservation leads to an inversion in P and T*. Charge info sent by enclosed zerons in *knots of* the same branch *and used for growth and axial binding along shortest paths,* resets the new *phase shifted axial* connector state and reduces step by step the string length. Former string zerons *are released* again *as* ordinary UZS zerons. The *initial* offset value of the phase angle of a free connector zeron (*determining the actual I-max value*) *just after contraction* depends on the value of *the appropriate free zeron phase state* in the central Higgs. This value determines the maximum string length and the life time of a replicating pattern and indirectly its momentum state, being in fact the pace at which subsequent, in position-shifted new particle versions will emerge. So the free zeron configuration (*per string*) in the central Higgs acts as memory of the momentum property of a particle. *Standard photon and neutrino "difference particles" propagate as modified copies of Higgs patterns in critical contraction states, at maximum speed c and their micro-replication and propagation mechanism must be different (for neutrino's computer simulations are certainly required). They materialize at least partly unbalances in the free zeron configurations of particles before and after collisions or decays.*

Role interchanges. *A term used to express the implicit dynamic character of the role of the 4 zerons of a central EZK in a complex pattern. Their behavior is initially the outcome of an at high frequency rotating phase shift, required to bind and to synchronize internally the 4 zerons of a "stand-alone" EZK. It means that more complex particle states derived from such hypothetical initial Higgs configuration and due to external interactions in connectors and indirectly with the central EZK, might coexist as superposed versions of the same basic pattern. Depending on the kind of extra interactions and the binding*

process with new added components of micro-patterns, this multi-superposition freedom can be limited after a few replication cycles what will explain several distinct decays and replication scenario's and particles with different properties (like mass). Contrary to some theories in physics, PhR rejects a theory that enables identical superposed states of a single pattern, co-existing simultaneously: at least a phase shift (τ or 2τ) between these so called superposed states is required.

String: a linear coherent set of knots, in fact *compliant and* selected raster components (points or zerons) in an out of a central *unbalanced* antenna zigzag-wise growing coherent pattern. *In regime it is* able to grow and to shrink alternatively left and right (the two branches of a string) *as driven by the FLN principle along shortest paths*. In terms of Physics we could call this process simplistically a form of oscillation whereby the string length (*in time and/or space) would show a variable amplitude*. Knots and part of the central antenna components are interconnected by *left-right* charge info exchanges with a central antenna as well as with enclosed knots of the same string branch (*due to the fastest path rule, there are no direct interactions between components of the two branches of the same string or between strings of the same particle, well indirectly via the central EZK).* This process is called "point or zeron replication", as it is able (without external interactions) to maintain in the course of a by physics measurable time lapse, an initially single anomaly in the central antenna pattern, just by distributing *(in time and space)* its impact over one or several (symmetry depending and *dynamic*) successive string connectors. *The symmetry of the central antenna determines the direction along which one or several axial substrings are able to grow in time and/or space, carrying an initial perturbation in its (their) connectors. Growth takes place in line with the fastest path rule whereby other charge info propagation paths cancel out by destructive interference (a base law):this principle explains why axial growth by replication of many particles is able to take place along straight lines.*

String spin (in case of zeron replication): this term refers to the circular distribution of subsequent free transversal zeron states, *selected and added to* knots of linear axial zeron string of a replicating Higgs-based particle. Its virtual rotation sense is opposite for matter and for contramatter particles. It is linked to the *complex* role inversion process in the central Higgs tetrahedron, *already set at the time of the initial EZO split,* and hard to compare with any equivalent particle property in Physics. *The phase shifted distributions of free zeron*

versions of the central EZK (or Higgs) are linked by direct charge info exchanges to the dynamic circular distribution of one of both transversal zeron states in successive string knots. See also "free zerons" to understand the differences between matter and contramatter.

Superposition: Several versions of the same pattern can co-exist as the outcome of the intrinsic symmetry property of a central cyclic charge info emitter (or antenna). As these versions emerge by coupling with multiple central components, internally bound through fixed phase shifted charge info exchanges, these external components are in relative terms also phase (or time) shifted. Where in QM superposition means that (e.g.) a particle can simultaneously be in several superposed states, this statement is not entirely PhR conform. However QM is not able to detect between multiple versions small phase shifts of order τ.

Symmetry: A local or global property of a pattern of points/zerons that refers to its invariance for certain discrete or continuous transformations by virtual or real charge info driven interactions *(see also Noether's theorems)*. Examples of transformation classes are translations in space and/or time (over a raster) and/or between dimensional subset (see zerons), rotations, inversions, *virtual* changes in charge or/and mass types …. Transformations can be real (active) or can refer to changes in reference frames in which the behavior of a patter (e.g. a particle) has been (*often*) mathematically described (passive). *Another example of more complex transformations is the invariance of energy for conserved CPT property transformations of particles (PhR and QM).* If a pattern (or a system) has a local symmetry that is embedded in a global (e.g.) raster with its own distinct large scale symmetry properties, a mathematical description of a local state or process has to add a "gauge" term that is representative for a large scale property and has only a limited impact on local small scale behavior, *transformation capabilities* and symmetry properties. In PhR and at the time the UZS/CPS raster was (still?) growing, the negligible impact on (e.g.) local raster parameter values, of a radial translation in space/time of a local subset of dimensions embedded in the global quasi infinite dimensional spherical CPS, is an example of these principles. In physics (QM) the integration of gravity fields *as historically* produced by large mass objects or *the contribution of large* discrete electric/ magnetic *effects* on their small scale mathematical quantum formalism, are other examples.

UZS: The *name of the* collection of zerons *in the cosmos,* being a dynamic raster of *two-sided in time* replicating 2-point patterns. It *once emerged* spontaneously and dynamically within the CPS by selecting (as a *dynamic and* cyclic process) points in appropriate states *and integrating them in by point-replication selected zeron patterns. Growth of the CPS took place at an incredible speed out of the creation event location in the CPS. Even if the chances of point replication are relatively small on a CPS scale, taking the stringent requirements for two successful orthogonal point pairs into account, the regime zeron density of the UZS will be extremely high because dynamic growth processes of replicating point strings take place in quasi-superposition along an extremely high number of 2-point dimensions embedded in an M-dim set around a very dense set of candidate symmetry centers and taking off in an absolute time frame that is just slightly phase shifted (emptiness is a continuum).* Also in this case the perturbation principle holds, meaning that only a small but variable fraction of points are, at any moment, part of an UZS zeron pattern. In Physics and Cosmology the UZS has to be treated as a gigantic coupled quantum object filled with more complex patterns that constitute matter (Physics or PhR) *and contramatter (PhR). We assume that if the size of the CPS in the cosmos would be finite, the UZS has equally reached its maximum volume. If the dimensionality of the CPS has a fixed value M, the dynamic UZS subset has a dimensionality N after a reduction by 137, being the outcome of point replication. Any dynamic and eventually as a pattern moving UZS point-subset keeps its intrinsic properties, even when its content is made of gradually in M dim phase shifted points and even whenever such pattern would approach the outer shell of a finite CPS, except in an extremely thin outer layer. Other names for the CPS and / or the UZS are "grid" or "raster".*

Weak forces: *Forces do not exist in PhR. Where electromagnetic and strong forces in physics are clearly related to axion and polaron interactions with or between replicating particle connectors in I-max, this is less straightforward for gravity affects and weak interactions. Gravity is driven by probability differences of polaron interactions between successive particle connector states in I-max and a rotating spin-2 graviton EZP. So called weak interactions are intermediated by W-particles, difference patterns of decaying unstable heavy nuclei. Or it refers to an interaction between an EM-type polaron field or a particle connector in I-max, and a high energy replicating baryon-like particle in its quasi contracted state. Such collision impacts directly the connector state of a proton-like replicating particle at speeds close to value c, a state whereby*

its I-max values are close to 1. After such interaction, the contraction and inversion process of the 3 string bundle in a central EZK does not even guarantee CP conservation. However the disturbed replication format of the main particle (or of both), will be reestablished after the release of a difference particle (W or Z boson). The short reach of this class of interactions is of the order of a proton- nucleus size. There is in PhR terms fundamentally no difference between EM-like polaron interactions and weak interactions but their outcome is different. The phenomenon as such confirms the PhR picture of a baryon-like replication schema.

Zeron: *(See: point replication).* An elementary UZS *raster* component and *as a pattern* the smallest persistent *and* cyclic (with periodicity T) point-made object in the cosmos. Zerons *emerge per pair out of* a two-point central antenna, *in regime* a *combination of a* linear (in time) axial point string *with at each side alternatively growing dynamic* connectors of which one maintains an over T/2 (*or about 137 times 2τ)* persistent charge excess, the other being *50% of the time* in a *dynamic* hole state. *The (physical) length of a point string in a zeron is about two points whereby the two antenna points are internally τ-phase shifted, anyhow meaning that the time and space distances between both are fixed and small (Planck units ?).*

Zeron Replication: A cyclic growth and shrink process of a zeron-made pattern, whereby a one-shot anomaly in a central symmetric antenna (in casu an EZK or Higgs *or their contra versions*) is copied along multiple symmetry directions by adding step by step selected UZS zerons in appropriate states to this pattern, along 3 orthogonal zeron strings *and alternatively left-right for each branch*. These so called zeron knots are bound with each other and with the central EZK by appropriate quantized charge info exchanges *along shortest paths as observed along axial strings*. The initial anomaly (mostly a net unit charge quantum excess) is stored in multiple slightly phase shifted string connectors, a dynamic process depending on the symmetry and the internal behavior of the central antenna. *A replication pattern out of a central EZK (a Higgs) shows geometrically a tetrahedron based symmetry. A simple electron replicates along 3 perpendicular directions or strings, whereby each axial string corresponds with a rib of the central tetrahedron. A neutron replicates in superposition along a double anti-symmetric conic bundle of electron-like axial strings whereby the 3 virtual orthogonal symmetry axes of each double cone are perpendicular to opposite ribs of the central EZK antenna. This*

complex pattern determines the ratio between an electron and a neutron mass. It is interesting to notice that fastest zeron replication along a single axial string materializes a straight line as the outcome of the charge info superposition base law (see also Feynman - this statement is not obvious in PhR because particles do not move, only pattern versions seem to do).

Zeron Replication and Collisions. *Except from direct internal interactions with and between central EZK zerons of particles in the contracted state, a r*eplication *process* can lead to a successful external one shot or cyclic coupling between connectors of compliant patterns like particles *or with photons or gravitons (for the latter two cases, a term "connector" makes little sense)* whereby both are in appropriate (I-max) states. Standard charge info packages can be exchanged (axions or polarons) between both whereby one connector is the emitter, the other the receiver. The roles of both are not pre-determined and synchronization is a statistical phenomenon. Hereby the pattern with the shortest string is more frequently in an I-max state and has more chance to be the *successful* emitter. It explains why in case of two colliding particles *and polaron exchanges*, the fastest particle will statistically, in case of a coupling by repetitive interactions, lose momentum. *Axion exchanges between zeron points in connectors of non-coherent particles are extremely short range in space and time and have extremely low probabilities to happen. As the binding by strong interactions (the strong force in Physics is not a different type of interaction in PhR) in the nucleus of an atom is a combination of cyclic axion and polaron exchanges between neutron and proton states it explains confinement (Physics) and why "color force" (point based axion exchange) and zeron-based (in PhR) polaron coupling (EM interaction in physics) have a strength- ratio with value 137 and show different ranges of effectiveness.*