Title: **About Physical Reality.**

Subtitle: **A methodology to discover the fundamental behavior of our cosmos.**

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Abstract: *This article presents a methodology to express the Physical Reality (PhR) of our cosmos, its content and its evolution, as the outcome of a deductive axiomatic process starting from nihil and taking into consideration a limited set of presuppositions, a single elementary creation event and 6 simple base laws. The recurrent application of these laws on the subsequent states of the cosmos must lead to a version with a content and a behavior which is, at least at detailed level and in qualitative terms, reconcilable with any observation or confirmed law of physics: no additional measurements or tests are required except to confirm or to falsify new deduced laws as proposed by this exercise. Any contradiction between this specific PhR model, its direct consequences and physics might lead to an adjustment of this version, although without rejecting the methodology as such.*

Comments:

Version 4 of this text contains several enhancements (printed in italic) and corrections. Chapter 4 about zeron pattern formation has been partly rewritten.

1. The challenge.

- The empiric and inductive approach as practiced by science (physics) starts from observation and measurement of phenomena appearing in a cosmos to which we (apparently) belong. In practice this means: "searching for generic properties of states, generated by repetitive or at least reproductive processes that occur spontaneously or artificially in our direct or distant environment".
- Relevant information about experimental results is usually expressed in statements called laws, which can be logically deduced from or are at least consistent with new or existing theories. Theories and laws have to be reduced to minimum sets with as few presuppositions as possible and are preferably consistent over several separate domains of scientific observation and investigation. They are often expressed in a mathematical format, i.e. an equivalent representation of what is thought to be real cosmic behavior. *Hereby uncertainty about certain processes in case of very small objects or high numbers of interacting objects leads to multiple*

solutions expressed in terms of probabilities. This approach, which lends physics considerable constructive and predictive powers, has proven invaluable in science as well as engineering.

- Many scientists, however, go one step further and claim that Physics can grasp Physical Reality (PhR – a metaphysical concept and in fact a branch of philosophy) just by observing cosmic behavior, a statement that remains unproven and might be overly optimistic. Indeed, while physicists may well be able to describe certain observable properties of nature's behavior and their relations under certain specific and controllable conditions (up to an impressive level of precision, and answering questions like "how?"), this does not entail that they know or even understand the "what" and "why" of such behavior.
- Things might go wrong in a number of cases: when conditions are less well controlled, when properties are hidden, when numbers are too big or objects too small, when events are not repeatable or the cost of investigations and experiments is too high, and so on. In order to escape these restrictions, there might be a tendency to extrapolate phenomena observed under standard conditions as described by confirmed physical laws beyond the limits of their guaranteed validity or applicability. Doubt is clearly justified if we accept that our cosmos has shown a tendency to dramatically increase its level of complexity over the course of its evolution: would any of the laws of thermodynamics, none of which has ever been contradicted in today's cosmos, still be valid for a primitive version of the cosmos, containing just a few short-lived objects of a magnitude of a few Planck units ?
- Mathematical equivalent descriptions of PhR might help to disclose the base laws that dictate cosmic behavior, nevertheless they cannot be the driving forces themselves behind these processes. Nature does not have to solve at each step of its evolution, a quasi infinite set of coupled differential equations to find out how to proceed. So one could argue that the Physical Reality of our cosmos needs to be described by a set of properties and governed by rules of conduct that are independent from their mathematical equivalent representations.

2. **Presuppositions.**

- Certain assumptions are made in this manuscript about the initial state of our cosmos and about its main behavioral process called "evolution":
    - The cosmos to which we belong does exist and is not a fiction. If it would be part of a more global all-encompassing Universe, its components other than "our cosmos" are outside the scope of this text.
    - The actual version of the cosmos did not always exist and emerged out of a single creation event in emptiness (NIHIL or cosmos(0)). The origin of the creation event is outside of the scope of this text.
    - The empty state (cosmos(0)) is homogeneous and unbounded.
    - A creation event in cosmos(0) gave rise to a single object (cosmos(1)) with a single discriminating property, constituting the sole difference between

something and nothing. Being in a single state, it shows Shannon entropy zero.

- If there would exist simultaneously (whatever this term means) another cosmos in the Universe, it needs to own, as a minimum requirement, a different discriminating property, one that is transparent to ours.
- The initial event which created cosmos(1) occurred in an undetermined location at a non-defined moment (given the absence of any frame of reference or location) but depending on its outcome the creation event itself could be used as reference in space and time for the versions deduced from cosmos(1).
- Successive versions will be the result of a logical and deductive process, based on the recurrent application of a minimum set of base laws on previous states of the cosmos. These laws are axioms: they are best guesses and they cannot be proven. They apply both to the initially created object and to the full content of all subsequent versions of the cosmos.
- The distinction between two successive states of the cosmos is made on the basis of their respective contents, or the non-transient state of objects that belong to their content. Successive versions of the cosmos are never identical and their sequence is established through an absolute time counter, i.e. a numerical index that is increased by 1 with each version. The set of natural numbers is held to be available for this purpose, as it can be defined in an empty set (see math). In this concept absolute time flows in a single direction.
- The sequence of subsequent versions (or states) of the cosmos provides the elements of the absolute time dependent set called evolution.
- Over the course of evolution no new assumptions like creation events, base laws or fundamental discriminating properties are to be introduced to justify a next cosmic step, unless they are already meaningful and applicable to this cosmic state as such and have been logically directly or indirectly deduced from the initial set.

- Obviously, the initial assumptions mentioned above might give rise to all kinds of unrealistic, even fantastical version of the cosmos, depending on the choice of the base laws and on the definition of the initially created object and of its chosen discriminating properties. Therefore, the first deduced cosmic version to reach a state that seems to match any proven law or property or object successfully described by physics must be submitted to a 'quality check' between both approaches. In this respect, the remarks made in chapter one about the equivalence of physics and PhR are to be taken into consideration.
- The initial set can be an educated guess that has to be improved subsequently, based on the outcome of a matching process with physics. This type of feedback mechanism is itself in line with the evolutionary process that it claims to describe.
- Over the course of evolution this method needs generic definitions for its own properties and objects and behavior, in order to guarantee their internal

consistency and validity and reconciliation with overall cosmic behavior throughout all the steps in the evolution, not just with modern physics.

- If it turns out to be impossible to match the results obtained through the implementation of this model with scientific observation, one of them must be wrong. Indeed, as a methodology, this approach can only be rejected if one of its presuppositions is not accepted. Its validity, however, does not depend upon the correctness of any particular implementation of its principles and concepts.
- This text aims to describe the cosmos and its evolution qualitatively at its most detailed level. Meanwhile, quantification of properties or phenomena remains an issue, because of the absence, in perfect emptiness, of any standard that could be used to this purpose. As physics itself makes use of conventional and relative standards to compare results of observations or measurements, reconciliation of the outcome of both methodologies will depend on a non-obvious and unproven match between two standards for common properties, objects and/or processes.

3. An example of a successful implementation of this methodology.

- After several trials and adjustments, the following initial set has proven to be successful in passing an impressive number of quality checks against physics:
    - Creation object: one physical point with a single discriminating property called (electric) charge. Charge cannot be expressed in another more fundamental property of cosmos(0). All points appearing afterwards have a finite (infinitesimal) size *and tenor* and will be identical members of the same class or versions of the same object (any difference would require an a posteriori adjustment of the outcome of the creation event which is in conflict with the presuppositions), having the same steady-state charge content q. q is a signed scalar and the creation point has been allocated (by convention) a positive sign qualifier. Different versions of a point might have opposite sign qualifiers. (Physical) points are the smallest standard quantified objects in the cosmos and any observable change in a cosmic state involves at least one physical point. The presence of an object class that contains the most elementary and unique building blocks of our cosmos, is a presupposition that would explain why in a later stage of its evolution, any successful (physical or mathematical) description of the cosmic content and of its behavior in spacetime, has to be quantized, whereby quantities can be expressed as multiples (using the natural number class) of elementary quantum properties of these base objects. The only mathematical or logical operations needed to express cosmic behavior are "bidirectional counting: +1/-1" and the comparison of a number counter with a natural and fixed limit value, its outcome leading to distinct event sequences (a bifurcation).
    - The initial set assumes 6 base laws supplemented by a seventh that requires that the recurrent application of the 6 base laws on successive

cosmic states will of itself generate all the successive versions of the object "cosmos", up to its current state.

- *As no new creation events are part of this cosmic model, application of the base laws on subsequent cosmic states must lead to objects that have to be dynamic compositions of just points, there is nothing else. They are either short-lived uncorrelated points or complex coherent point sets called (point) patterns. Standard short lived (or dynamic)"empty or non-point" locations between points have to be treated too as pattern components.*

- Law1 (the law of inertia): A change in the state of the cosmos (an event – a causal or correlated sequence of events will be called a process) cannot take place instantaneously or simply stated: "in 0 absolute time units". Because any such change must involve at least one point, a finite transition delay (called τ in this text) occurs between the empty state of any abstract cosmic location and its potential steady (point) state. This law thus creates time and justifies implicitly the use of absolute time as cosmic state counter (one of the presuppositions). This law is valid for the creation event itself. It does not require a specific resolution as being a lower limit for a point's change of state: a point state transition can be perceived as a continuous process, ordered in local time by a phase angle. Neither does it necessitate a fixed delay between successive steady states, although the internal average steady state charge density of a representative point set is initially and statistically constant (see chapter 4 – the CPS*)*. In this concept the term point state refers to a special or regime state being a binary property with charge value either +/- q or nihil. A state transition process and format is called growing when starting from the empty state, otherwise it is shrinking.

- Law2 (the emission law): Any change in the (micro- or macro-) state of the cosmos will be emitted as a charge information quantum- in an a priori isotropic manner, from any point involved in the change event. *Although charge info is intrinsically continuous, it will only have some impact if it is quantized and formatted as a point.* Any emitter of charge info will be called an antenna. The smallest antenna is a single point, acting as an elementary emitter of point state transition info. Other more complex patterns behave as correlated sets of elementary antenna's. As we cannot express charge in terms of any other property of cosmos(0), the same necessarily holds true for charge info. Charge info propagates and impacts emptiness in a manner as described by other base laws. An info propagation path sets a direction and a sign. This sign confers upon any info originating in a change in an antenna state an inherent tendency to neutralize (according to the base laws below) the impact of such change on the cosmos. This tendency could be described as an unsuccessful attempt to restore the empty cosmos(0). This simple generic rule is extremely important to understand cosmic behavior throughout its evolution. We will use in this text often the expression "copying a pattern (defined as a coherent set of points)" where a term "making an inverted copy" would be more appropriate. This is again an unsuccessful attempt

to cancel at point level the impact of any previous version and to restore an ideal empty cosmic state. *In this text we will use often terms like "inversion" or "inverted copies": as we cannot refer to mathematical definitions of these terms, their pseudo-definitions expresses the tendency of the cosmos to wipe out what exists, an attempt that will fail, taking into account that charge info emitted in order to perform such act of annihilation will only be effective at a certain distance from the emitting point or antenna and arrives at a later moment of time (see other base laws).*

- **L**aw3 (the induction-reset law): Whenever a single point charge info package hits an empty cosmic location it will gradually (respecting law1) induce a new point whose sign derives from the sign and the format of the transmitted info and from the inversion principle: info emitted by a growing positive point can induce a negative point, and vice versa for a (growing) negative point. Info emitted by a shrinking positive point can induce a positive point and vice versa. This induction mechanism requires a unique but temporary coupling (see law4) between the antenna and the empty target location along a unique ad-hoc (or communication channel), hereby excluding multiple simultaneous induction processes in several locations along a common dimension, originating from of a single emission event. It guarantees that all new points are identical, apart from their charge type (inversion principle). If they are induced out of a single point along distinct dimensions, they cannot emerge at exactly the same moment in distinct locations, violating in such case (through an extra creation of charged point) a cosmic charge conservation rule. H*ereafter in the text we will compare the term "dimension" in PhR with its definition and properties in Physics.*
- If, on the other hand, properly synchronized charge info hits first a point with a commensurate sign in a steady *or special* +/- q state, it will reset this point to the empty state. In both cases the principles set forth in law4 (below) apply.
- So a point in the +q state can be reset when hit by charge info emitted by a growing positive point or by a shrinking negative point. An analogous rule applies for a point in the –q state. This process takes place without loss of information or alteration of the "amount of charge q". Points can only be reset by other points' emitted and properly synchronized charge info.
- In a virtual local reference frame linked to a standard point life cycle there is a minimum delay between both micro processes: the charge info emitter and the (successful) receiver cannot coincide because the charge info propagation speed is finite (see law 5). If they would have been able to coincide, nothing should exist.
- The probability distribution of a successful impact of randomly (along several local dimensions) emitted info has to respect all the base laws but as a general rule, determining the precise order of events, it means: "the impact of a micro info package that is first able to take place effectively or successfully , will happen first (an events priority or local time ordering rule), be it either an induction or a reset process" . The term "effectiveness of an info package" means the same as "properly synchronized" when a potential target along a shared communication

channel is hit. This synchronization requirement is different for induction (law 3) and coupling with an existing point (law 4). For both it means also: "not already involved in another induction of reset process". For the latter it additionally means that charge info that hits a point in the course of its transition phase has no impact. The same is thru for positive (or negative) charge info that hits a positive (or negative) point in a regime state (a positive point cannot become more positive).

- Law4 (the coupling-conservation law): whenever charge info resets an existing well synchronized point, the antenna and the target point are temporarily coupled (a unidirectional coupling) along a shared communication channel or dimension. In case of an interaction between two points, net charge exchange is a continuous micro-process *whereby in the course of each* elementary time lapse charge is conserved *over* antenna and target *together*. This implies that two distinct target points can never be simultaneously coupled with a single antenna point (i.e. with a zero relative phase shift between them). Similar conservation rules apply to an antenna and points involved in an induction process in empty locations (see law3*)*, considering that any location (in empty or point state) that has been hit first under the proper conditions (e.g. phase and sign) by emitted charge info and changes its state, will itself start to function instantaneously as an antenna and induce new points along distinct dimensions (if there are still free dimensions available). It could start to reset an existing point (an hypothetical effect called secondary emission) along a by both points shared dimension but overall charge conservation applies at any moment to this collective induction-reset-coupling process. As a consequence, any final point format and the absolute regime quantum q are standard properties (PhR behind QM). These rules allow for a form of parallelism (or superposition) throughout evolution, at least if empty locations are available, encompassing the creation point without any need for additional creation events or adjustments. The charge conservation rule implies that a quasi continuous superposition mechanism is anyhow conditioned by the respect of a minimum time resolution (or phase shift) between correlated point transition processes along multiple dimensions (or communication channels) in order to be effective. This means e.g. that the primitive set of versions of *quasi* superposed points~~,~~ (successfully but) gradually induced by the creation point antenna through a process that would have to comply in its entirety with the C(harge)S(pace)T(ime) conservation rule (see hereafter), might show a spiraling multidimensional path of effective couplings, properly phase shifted in space-time, "surrounding" the central antenna, a process that takes secondary emission effects and *charge info speed and* superposition rules (see laws 5 and 6) into account. The total average net charge and effective charge info (filling spacetime) amounts in the cosmos (after the creation event) are and remain null. Parallelism comes to an end whenever a maximum cosmic size would be reached (see hereafter).

- Law5 (the fixed and limited propagation speed rule): Charge info propagates in emptiness at a constant, *extremely high but* non-infinite velocity (consistent with

law1). The outcome of this info distribution process (i.e., what will happen successfully to pieces of charge info) will implicitly depend on laws 3, 4, and 6 and on the local point state density. Together the base laws will result in the creation of space in emptiness; and as the ratio of space and time growth *on a local scale* is constant, one can say that the combined operation of the base laws in case of induction creates an expanding phase shifted, dense and by charge info connected space-time volume. Each temporary compensation for the inapplicability of a perfect and timeless charge conservation rule means the creation or maintenance of spacetime volume filled with points and connected by properly synchronized charge info packages.

- As a consequence, a charge conservation rule has to be broadened into a (or CST) conservation rule (not to be confused with, but nevertheless the PhR behind a similar CPT rule in QM – in this PhR model the same rule applies to interactions within or between complex point patterns). Where this rule in Physics has an impact on the symmetry properties in space and time of transformations of equivalent mathematical descriptions of single or multiple particles and particle states, in PhR it dictates real behavior of (and between) point sets - see also hereafter). In case of successful point interactions, in which (e.g.) a positive point is reset by either a growing positive point (C + and T -) or a shrinking negative point (C – and T +) , adequate synchronization of info arriving at the receiver's end is required during transition. So info packages in both never mixed cases should come from distinct relative directions (*and/or dimensions* - the importance of P-), in order to bridge the appropriate distance in a way that accurately maintains the point's growth or shrinking format and optimizes the symmetric distribution in spacetime of simultaneously ongoing phase-shifted parallel exchanges with other points or locations with respect of the overall charge conservation rule. This implies also that successful elementary charge info exchanges (law4) take place along shortest paths between antenna and receiver with respect of the priority rule for events as expressed before. So CPT conservation combines a charge conservation rule with the fastest (or shortest) path connection rule: e.g. in an hypothetical case of a single point growth and shrink cycle, this rule permits, as the only and fastest way, that two successive transitions between point states (a growth and a shrink cycle – the T dimension in the CPT rule) are involved in two successful interactions with neighbor points (left-right - P in the CPT rule *whereby in this manner, destructive interference of charge info propagating along shortest paths can be avoided – see law 6*), with respect of all the base laws (*including charge conservation – C in the CPT rule).*
- For reasons to be explained further on, the maximum cosmic info propagation speed v_e must be well above the speed of light. *Charge info propagation does not make use of a medium but if a sequence of points or other simple patterns of points involved in a subsequent or stepwise propagation of standardized charge info quanta, the properties of the point sets involved as "antenna's" determine the average or effective speed of this chain of micro propagation steps (e.g. the speed of a "pre-polarization by selection" process mentioned in chapter 6).*

- Law6 (the superposition law): Point charge quanta cannot be superposed in a single location at exactly the same time. They exchange standard but signed charge info quanta, inducing or resetting other point objects. Charge info is part of (or materializes) and propagates within space-time and is directly and at least theoretically observable, charge is not.
- This explains why successful emission and induction between antenna and target respect CPT conservation as a realistic form of delayed charge conservation: otherwise the whole cosmos could remain concentrated in a single quasi-empty location. It suggests the usefulness, in case of a point based location set chosen as space-time manifold, of a dynamic discrete but dense topology, eventually with a metric (math). A CPT conservation rule applies to local point interactions. As stated before, the sign of a local time quantum in this concept refers to the sense of change of the phase angle of a point life cycle. A similar definition could hold for other cyclic *patterns-of-points* but it makes no sense to generalize local negative time to the definition of absolute time, proposed in law1….except if one could prove that our cosmos (*as a gigantic coupled quantum object, made of points or point patterns– see hereafter)* will sooner or later (or did already) reach a maximum size after which it would shrinks again (an oscillating cosmic model ?*).*
- *Quantized charge info packages* propagating in space-time may be subject to destructive interference being cases of superposition where charge info micro-packages with opposite signs, emitted by several *correlated and/or in a symmetric configuration positioned* antennas hit a location or a point quasi simultaneously. As an effectively exchanged charge info quantum is an overall conserved quantity, destructive interference does not violate this rule and just means that other potential propagation paths (starting from an a priori isotropic emission pattern) could become more appropriate or eligible to take care of an effective coupling in the sense of laws 3 (priority rule) and 4. This rule relates to collective properties like symmetry and dimensionality.
- Constructive interference, on the other hand, entails an *effective* impact on a location *immediately after the reset of its previous point state, a process* due to the superposition of *phase shifted* charge info quanta (multiples of τ*)* emitted by several *correlated and* synchronized antennas, *at proper distances and often in a symmetric configuration , implementing in this way a shortest quantized path in time (a communication channel). Multiples of 2τ are able to sustain the empty state of a location (see hereafter). So constructive interference does not mean that an abstract location, hit simultaneously by two charge info quanta would show a state with a double charged content: it is excluded that this would happen because it would imply that in the cosmos a net double charge quantum of the same type could exist in a single location what violates the conservation of charge principle. If an empty location is hit by two charge info packages of the same type at quasi the same time, only one was first and the other will be neglected.*

- *If destructive interference will lead to non-quantized charge info densities (meaning that they have no (semi-) point-like format), they have no impact on a point or on an empty location state (it is just noise).*
- These terms are important in physics as well, considering that any direct physical observation relates to "(charge) info": only *quantized* charge info is able to change the state of an observer's instrument. It is equally PhR behind Feynman's path integrals concept. Constructive interference does not prohibit the quantized *(be it delayed)* impact of charge info packages on properly synchronized point objects. On the contrary, both forms of interference have to be interpreted in a context of effectiveness of a net charge info quantum to hit and couple a target point in one of its two special states. *When linked to the concept of "a fastest path in time rule", constructive interference means that multiple successful interactions between patterns can take place in such a way that the target pattern is changing states repeatedly at a fixed fastest rate (see hereafter magnetic fields), whereby geometry and space-time symmetry of point-like antenna patterns are important . When it has been stated before that (dynamic) empty locations are intrinsic properties of point made patterns, these locations (in space and/or time) are often induced by interfering charge info quanta exchanged by and between pattern components.*
- In a context of parallelism and superposition, the concept of dimensionality (*in space)* refers to the number of orthogonal (or independent) directions and target locations surrounding a central antenna that have an a priori equal probability to be hit successfully by the isotropic emitted charge info package along a dedicated communication path, keeping in mind all the base laws. The same definition remains valid for the reduced number of directions in a local steady state volume, taking into account other local or global contributors of charge info, their complex antenna symmetry and the superposition law. In terms of superposition and interference, and by definition, orthogonal processes do not influence each other. At point level the term "orthogonal" encompasses the phase shift property between processes (*thus shifting a local time reference frame)* which makes sense in a CPT conservation concept. In a primitive cosmos filled with points flipping between steady states the reduced but unknown number of dimensions is assumed to be still extremely high but not infinite (an in PhR terms extremely precise steady state value M). The generic definition of a direction (or charge info communication channel *)* set, materializing a particular number (X) of dimensions, that we propose is the dynamic angle distribution in X-dim of the shortest orthogonal non-zero paths in space-time between an antenna and adjacent successfully interacting (empty or point) target locations. CPT conservation, superposition, averaging and the "shortest path rule", make that the composition of these paths gradually migrate from random micro-segments at point level up to coherent macro-trajectories between large objects in a later evolutionary stage.
- *The definition of the term "superposed states" in a PhR context implies that two versions of a single pattern cannot be simultaneously in the same state (to be compared with similar rules and restrictions in QM (Physics)): the states of those versions are either different and/or they need to be time (or phase or*

communication channel) shifted. In most cases these differences are hard to be observed by measurement techniques as practiced by physicists.

4. About the selected initial set and some of this choice's direct consequences.

- **A " Fundamental Law of Nature (FLN)":**
- There is no (diachronic or other) hierarchy among the base laws: they all simultaneously apply since the creation event. Their impact on the cosmos and its evolution represents what we could call a "Fundamental law of Nature".
- They express indeed the fact that, once the perfect symmetry of emptiness has been punctured by the creation event, any attempt to restore this "ideal" state (by offsetting charge, in the same location, with an equal amount of charge with an opposite sign) is bound to fail. Instead, any such attempt will only contribute in a first phase to the creation of a growing, dense, chaotic space-time volume consisting of short-lived +q/-q point versions, all of them quantized objects and equal or inverted clones of the creation point. So this law is driving the origination of space and time but it also leads, as the outcome of a stochastic process, to an increase of complexity by combining points in more or less stable patterns.
- If the cosmos would ever reach a maximum size, it could finally restore emptiness (cosmos(0)) by an inverted shrinking process. Certainly on a local scale the application of FLN will force all processes in nature to be quasi cyclic. "Quasi" otherwise the cosmos would be unable to evolve.
- If this set of laws would be expressed in other terms their outcome must be equivalent to the one used in this text. One could also say that there are some similarities between *the implications of* these laws and Maxwell's laws (electromagnetism), whereby net quantized *and by interference superposed and formatted (see law 6)* charge info patterns, as *(e.g.)* produced by coherent phase shifted point pairs, *would* correspond with magnetic fields (see further).
- *Proposing a set of base laws as the outcome of a single creation event that leads to a step-by-step emergence of our cosmos in its present complex state, implies that this approach accepts and implements a principle of causality whereby its application should not be in conflict with the impact of probability on certain events and processes. Causality is a rather philosophic term and the link with science (e.g. physics) remains ambiguous. In this text it means that the cause of an event is preceding the event itself, a statement that holds if one accepts that the (cosmic) evolution is linked to the existence and the role of (absolute) time. It goes together with the principle that any change in the state of the cosmos (except the creation of cosmos(1) out of cosmos(0) ??) needs charge info, emitted by a point and capable to changing the state of another point or an empty location, whereby charge info propagates in emptiness at a very high but non-infinite speed.*

- **The Cosmic Point Set (or CPS):**
- In any spherical shell of locations centered around the creation location, the maximum local point density is reached when the probability of charge info

inducing an additional point equals the probability of its resetting an existing point. The implicitly postulated extremely narrow point density spread is strictly related to the unknown M-dim value of any point surrounded by neighbor points or locations, each with an equally high coupling probability. The filling process of a dense multidimensional point shell around a central symmetric pattern as proposed by this PhR-model, is the outcome of a (left or right turning) spiral-wise coupling process that combines a highest local point density with the fastest charge-info exchanges between adjacent points, with respect of all base laws and synchronization principles. This filling mechanism is generic, meaning that in a later stage of the evolution of the cosmos, similar processes take place with respect of the same kind of rule, be it in less dimensions and dictating the more complex behavior of different classes of objects.

- We call a non-border M-dim volume in a local steady state and still devoid of complex point patterns , a (perfect) CPS (Complementary Point Set). CPS points have standard properties (their regime +/- q value and τ, the shortest possible time lapse to induce or reset a point), but it can be that, under certain conditions as suggested by law6, the lifetime of an empty *location in a* reset state can be lengthened by the impact of properly synchronized and constructively interfering charge info, leading to distinct and time-varying local point and charge densities. *It must be clear that such lengthening process has to be the outcome of the collective behavior and impact of more complex point patterns, not just of a pair of isolated random CPS points (an hypothetical phenomenon with a too small probability).*
- *An important aspect related to variable point densities as induced by patterns, will be discussed when we will mention gravitons as particle-like patterns that are able to maintain persistent holes at the scale of a local CPS volume.*
- The still available excess number of spatial dimensions (between M and infinite) outside a central reference volume could explain why a locally quasi steady state space-time CPS volume as occupied by our cosmos today *could* continue to grow at its border… at least if emptiness is unbounded (one of the presuppositions). It could explain the recently observed accelerated Hubble expansion of a super-distant cosmic shell. Similar primitive steps in the evolution that took place billion years ago in point volumes close to the creation location, could have been still ongoing in an outer shell at the time needed for light to reach us today.
- It remains indeed unproven that a finite maximum point density could ever be reached within a fixed volume around the initial creation location but if we assume that a single point occupies a certain volume in infinite dimensional emptiness and if we extend the concept of dimensionality to time whereby the fixed value of τ (the transition time between two successive point states) is taken into account, such maximum local point density could be reached when it would be faster (thus more probable) for charge info to interact successfully with a location outside a local virtual M-dim reference volume, than with a point or an empty location inside. In that state, average point density becomes a (locally) conserved quantity per unit volume , a state that will gradually be reached over

the full cosmos (see hereafter: "is the cosmic size finite?") … as long as no large, correlated point sets or patterns will appear.

- But if we reject the assumption about the ability of cosmos(0) to house in whatever cosmos(0) location, an infinite number of spatial dimensions, hereby taking the uniqueness of the creation event and the fixed net charge content q of any subsequent cosmic version into account (permitting that by law 4 interconnected charged points cancel out per pair), its maximum size expressed as the total number of locations that are not simultaneously in the same dynamic point state must have a limit, a state that could have been reached already for some time … but we just do not know (see the concept of local and global negative time – law6). *In a PhR context a reason to reject an infinite value M is that under this assumption the size of the cosmos could be limited to the creation point itself, plus its infinite number of adjacent points, a state that would never be able to explain the presence of cosmic patterns and their behavior, as observed by physics.*
- An in number of points maximum cosmic volume could implicitly mean that we could treat the global point set as a single dynamic coupled quantum-object, whereby each point is indexed by a finite set of indices, including local time (shells of local subsets M' have at least one distinct "discriminating" dimension) whereby two points simultaneously in the same state could never have an identical quantum number set. Points in the superset need to be able to exchange charge info in the vacuum at speeds v_e (speed in emptiness) higher than c and at least equal to c_p (effective speed in point space) although the probability that distant interactions could take place would be low. The dynamic nature of points does not impact substantially the average point density in a local CPS volume, at least if no composite patterns (meaning: sets of coherent points) belong to this volume.
- If the maximum size of the cosmic point set would be limited, a limit that has already been reached (a statement with a tremendous impact on observations made by cosmologists - the cosmos should be treated as a gigantic cavity, with walls reflecting or bending EM waves – see also Microwave Background Radiation in Physics) and taking into account that we just need one dimensionless parameter (137 – see further) to describe cosmic behavior, it would support the correctness of this PhR model if we could find a logical relationship between this constant figure and an estimated radius of about 13,7 billion light-years (an estimate made by cosmologists) in any 3D direction and supposing that the earth is, at least periodically, not too far away from the location of the creation event. Observations of certain asymmetries in the cosmic microwave radiation map (see e.g. the "axis of evil" in cosmology) seem to confirm this statement, although it would be in conflict with the Copernican principle. It may be indeed hard to believe that the figure 13,7 is just a matter of a coincidence. A low "absolute" speed of the earth could also explain why the application of Special relativity, contradicting in fact the existence of a fixed and privileged reference frame as proposed by this PhR model (the CPS/UZS double raster- see further), shows nevertheless correct results when using (locally) Lorentz transformation formula in its search for invariant properties (see also "some thoughts" in chapter 7 about the Big-bang).

- Our conclusion: a "perfect *or most dense*" local CPS reference volume in a non-border shell has initially and on average (in space and time), a homogeneous point and empty location density and a zero net charge density (indeed, it could not be otherwise, as we start from a homogeneous cosmos(0) without emergence in an early phase of any new large scale discriminating properties). *Later we will see how patterns of points succeed in creating and maintaining empty locations (or holes) in the CPS, a process that would make the CPS locally less dense and potentially contributing to the shrinking of its maximum size. In law 5 a fixed limited propagation speed of charge info in emptiness has been proposed but in a gradually more complex cosmic volume filled with point patterns its impact does not guarantee forever (e.g.) neither a fixed growth rate of the CPS volume, nor an extremely high and persistent point density. Any discussion about the dynamic size and the content of the cosmos should handle at the same time a topic that bothers cosmologists: why most fundamental parameter values in physics seem to be the same all over the global cosmic volume ?*

- **Patterns and pattern interactions:**
- The generic definition of a pattern is: a dynamic set of standard objects (points or high order objects, i.e. patterns of patterns) displaying a cyclic collective and coherent behavior in local space-time, caused by the efficient (the fastest possible couplings) internal exchange of standard charge info quanta (a process in accordance with the base laws, including law6 that enables a built-in quantized delay of successful internal interaction steps between pattern components, a selection process that eliminates certain charge info packages along propagation paths based on symmetry and destructive interference). Those standard objects originate stochastically and belong to a common class , so the smallest pattern-like objects in our cosmos are members of the point class. *Ultimately all more complex patterns (including you and me) emerging in the course of the cosmic evolution, will be dynamic point compositions.*
- The term dynamic is used in this text to express the fact that at all levels components of patterns have a finite life time and are as such periodically substituted in the parent set by other objects that belong to the same class, however without abandoning some fundamental properties of the parent, be it totally or partially in an inverted version *and time (or phase) shifted in distinct locations. In terms of physics any presupposition about the impact and the outcome of those so called "dynamic conditions and states" implies the calculation of probabilities. Hereby uncertainty, even at a most elementary level, seems to be in conflict with a PhR model that is in search for causality and fixed rules, applicable permanently in the course of the cosmic evolution. However, although rules might be strict, their outcome in particular states for certain event types will remain uncertain.*
- In an attempt to say meaningful things about the PhR *content* of our cosmos this text describes a totally different deductive and axiomatic approach, one not only applicable to its present state but throughout the earliest stage of its evolution since its hypothetical creation out of "NIHIL".

- In special states pattern components emit single or multiple charge info quanta at point level that enable an external coupling with other patterns. In law4 we described an unidirectional coupling. In case of a coupling between anti-symmetric components of two complex patterns, both of them composite antennas (made of several emitting points with a coherent behavior), charge info emitted by each pattern might reach a component of the other one, so that two unidirectional couplings have each a successful impact (a matter of a coincidence – to be confirmed by computer simulations). In keeping with the base laws (destructive interference), this type of hypothetical bidirectional exchange requires that the two partial and potential emission patterns are properly positioned (at short distances) and phase shifted over at least a value of magnitude τ. Moreover, their individual and collective antenna patterns are subject to strict correlation rules that guarantee CPT conservation over the global exchange process. Contrary to an a priori strictly causal or linear evolutionary process, bidirectional coupling implicitly presumes a form of "chance or coincidence between events" and adequate environmental conditions. Often, such couplings are isolated events; they are, in fact, the PhR behind so-called local or global bifurcations (see chaos theory), emerging spontaneously or artificially (e.g. in scientific experiments) in the course of our cosmic evolution.
- *The term "bidirectional" in this context could be misleading: conservation rules and laws 2 and 4 make every successful charge info exchange process between coupled points strictly spoken, bidirectional, but previous paragraph want to stress the fact that there is a chance that two properly correlated complex patterns can be involved in a double interaction, whereby in one coupling event, a component of A is the antenna and in a second properly synchronized coupling, a different component of B (at a slightly different time) will play this role. These correlated interactions have to respect all conservation rules, globally and per interaction. This important class of processes will reappear hereafter (see EZO split in chptr 6) . Each successful individual interaction at point level is never bidirectional (meaning that both interacting points would behave successfully and simultaneously as an antenna): either destructive interference will wipe out the net impact of emitted and superposed charge info, or the principle of causality would need to be abandoned. In a cosmos with an incredibly high point density and taking the base laws into account there is a chance that many odd short-lived patterns emerge that will never be directly or indirectly "observed" by physics or cosmology. In order to be persistent their format must be quasi symmetric so that charge info emitted by its components and after superposition is able to be copied into a next inverted (see FLN) version of the parent pattern. Hereby the built-in time or phase properties of a pattern should be persistent (e.g. a point that is twice in the same charge state must flip its sign in the contracted state after a zero delay. If this requirement is not fulfilled , a pattern will be short lived and decays into primitive point patterns or into more straightforward but persistent patterns.*
- Patterns of patterns materialize the concept of complexity. Their layered states, in order to be stable, require high level patterns to interact with lower levels by cycle

steeling (in fact, relatively small numbers of interactions in special states, periodically reached by low level internal processes, and without disturbing its underlying cyclic behavior). In many cases several combinations seem to have equal probabilities in order to take place (a source of degeneracy in physics) although we have to be careful when making this statement. The slightest difference in dimension, phase or distance between two events, sometimes transparent to physics and in combination with *symmetry and* the "along the fastest path interaction rule", can turn hazard into determinism.

- Hereafter in this text the sometimes subtle distinction in PhR terms between a *single* (pattern) interaction and a (particle) collision will be explained.

- **Zerons and the Unstructured cosmic Zeron Set (or UZS): the transition state.**
- In this context a next non-obvious evolutionary step following from this postulated early PhR version, is the *simultaneous* appearance in point space (CPS) of anti-symmetric *orthogonal* pairs of a smallest composite pattern, each called in this text a zeron.
- *A point pair eligible for zeron-like behavior implies a central nucleus of two in space and time adjacent CPS points that belong to a shared communication channel in the sense that the exchange of an effective charge info quantum is possible, conform the base laws. Although such channel might be successful in coupling two points just once, it does not mean than repetitive coupling is guaranteed, taking indeed the fastest path rule and the presence of other neighbor points into account.*
- Zerons are dynamic and cyclic patterns (singletons) capable of maintaining locally a +/-q net charge excess for half of their *life-time* period ($T/2 >> \tau$). A full period is defined as a sequence of two successive growth and shrink cycles *of a zeron*. Over a corresponding anti-symmetric multidimensional CPS volume, *each* zeron maintains a single quantized phase shifted point *charge* density excess *whereby* (at the other end of the growing 2-point pattern) the complementary local empty location (called a hole in this text) can materialize (in relative terms *and short lived*) a local point-*hole ratio* deviation from the standard average CPS value (PhR behind the non-exhaustive physical term. *Deviations in average point-hole density ratio's do not imply that more points are simultaneously compressed in a standard volume but that more locations are either in the point or in the empty state than in any hypothetical standard CPS volume without zerons.*
- Each single zeron pattern emerged "historically" and in an "ideal" CPS as a growth process that was the outcome of a single initial bidirectional charge info exchange between *two points, one of each* orthogonal , properly phase-shifted and adjacent (*implementing a shortest path),* 2-point pairs (*showing geometrically and by coincidence a* short lived tetrahedron *format, enabling two one-shot communication channels between two compliant points, one of each pair – we will not repeat these presuppositions each time*). *They behave together as a complex bi-directional double antenna in an anti-symmetric (phase shifted and orthogonal) configuration. Their initial one-shot charge info exchange is so synchronized* that,

conform the fastest path rule, each of the coupled points show two succeeding *(without any delay)* states with identical -but opposite between pairs- charge signs (creating dual local anomalies , implementing a local spontaneous or *heuristic* symmetry break). So where any two *random* properly synchronized and adjacent points with opposite signs have a tendency to switch these signs about simultaneously in their contracted states (conform the FLN principle), the appropriate phase shift and distance of charge info packages exchanged by both orthogonal pairs can be able to force by a successful bidirectional coupling, one of both points of each pair twice into the same charge state whereby nevertheless overall charge is conserved. This process will also guarantee energy (materialized by a local point *charge* density ratio) conservation (see hereafter: *a contra-symmetric anomaly as a source of energy*). *The criteria imposed on such spontaneous emergence of anti-symmetric zeron pairs in the CPS are very strict what means that only a relatively small, be it dynamic, number of points participate in this kind of elementary 2X 2-point patterns. The transition to the same charge state of the point hit by the appropriate charge info package in its empty reset state takes place without delay, meaning that charge info exchange takes place along an absolutely shortest path in time. The other points of the original pairs receive no usable charge info from their "partner" and keep temporarily (of order τ) an empty state (a dynamic short lived hole state).*

- *Further g*rowth *of each zeron* means that coherent CPS points are selected and added step by step, phase shifted and alternatively to each side of both once mutated 2-point antennas , implementing two chains of points , each called an axial *point* string. This selection process takes the high underlying multidimensional character of point space into account – so axial just refers to the *fixed* local linear geometry (in a shared dimension) of a central 2-point pattern *version,* not to a *further* linearly growing *geometric* path within an (e.g.) 3D-subspace. Selected CPS points are interconnected by a properly synchronized and quantized charge info exchanges with the central antenna pair (*see hereafter)* and the previous enclosed points, added alternately at each end of the anti-symmetric point string: *a growth in time process materializes the most elementary application of the shortest path and the CPT conservation rules. Added points to this subset form* a *dense*, in time *over 2τ* equidistant pattern, implementing ultimately a set of quantized and properly synchronized phase shifts between the last added dynamic point states called (temporary) connector states (implementing in fact the fastest end-to-end path amongst multiple higher-dimensional candidate paths and the *initial* antenna points). *An in time* two-sided growth process takes place, alternatively at each end of the two-point string. *It means also that the point life-cycles of the two connector points are phase shifted over a fixed amount τ: at one end the type of charge of a point is maintained, at the other end the induction or selection of a next point version is slightly postponed, sustaining in this way a periodic short-lived hole connector state. In PhR terms we call a zeron a two-point pattern but taking into account that both antenna locations are never simultaneously in a point state, this expression can be misleading. We could call it*

also a 2-point antenna oscillator but eventually with a fixed period if there is a specific reason why this process should come to an end (see hereafter).

- *Anyhow this growth process is not unique in a young M-dim CPS (what would indeed be the discriminating property to make it unique ?) and presupposes the presence of other similar patterns in compliant states, even around a shared symmetry center so that charge info exchange between their connectors can take place along in-phase-compliant communication channels.*
- Such so called "point replication by selection and dimensional reduction" process is leading to a multiple sequence of additional strictly periodic constructive couplings (knots) with superposed neighbor pattern versions involved in a similar process over a distinct but compliant and nearby dimension set, around a shared central location (a symmetry center) and through properly synchronized fastest charge info exchanges (two coupled (M-x) dimensional sets will behave as a more complex (in M-x-1 dim) pattern). Additionally and by periodic properly synchronized feedback couplings, they made what was initially an isolated central anomaly in each orthogonal core antenna, a cyclic or long-lived property. The layout of the central 2-point antenna and the "fastest connection rule" applied to the replication process of zerons guarantee that their point strings are made of point-knots, separated by quantized phase shifts, expressed as exact multiples of point cycle time units 2τ. *These multiples are indexed by a counter i*.
- As a remark: such "standard or quantized phase shift rule" valid for points that are components of zeron *versions*, is not a priori valid for the life cycle of any randomly chosen CPS point subset. Even the initial creation process of the cosmic point space (*the CPS)* in M-dim as was described before, did not require that minimum phase shifts between two randomly chosen point patterns had to be exact multiple of τ, at least if they belonged to distinct dimensions. Such constraint would have seriously limited the growth speed of the CPS volume and its rejection is not in conflict with the base laws, as long as the simultaneous emergence of charged points does not violate the charge conservation rule on an overall (cosmic) dimensional scale.
- *Each of the two primitive orthogonal anti-symmetric 2-point zerons that initially emerged simultaneously are orthogonal: they do not impact each other and further in this text we will treat most of the time just one of them.*
- *We called a two-sided clustering processes axial point replication (two charge-hole density distributions in spacetime, taking previous remarks about fastest replication paths into account). This process requires per knot extra "ad hoc" short lived CPS points (sometimes in this text called transversal or free charge points) in order to reset each single point growth cycle contributing to a knot period.* The *total* number of short lived "transversal" *(or auxiliary)* points *involved* in subsequent knots with higher i-values is increasing and their spatial statistical distribution is assumed to be circular *versus the geometrical orientation of an initial "linear" 2- point string. Reset of point connectors by random auxiliary transversal CPS points is one possibility. However it could be that an interaction between two connectors of the active string version takes care of this*

reset because a zeron is geometrically just a two-point pattern with a fixed length. The outcome of the two possibilities in a young emerging UZS should be the same: in this text (except otherwise stated) we presuppose a reset by auxiliary "transversal" points, at least at the time the UZS originated, but this choice has to be confirmed by computer simulations..

- *We stress and repeat that growth of a* knot does not refer to a lengthening of a point string in space but to *an, in relative terms decreasing number of successful quantized time strings with an increasing time length index, each starting from superposed versions around the same central location of the initial mutated 2-point string. Each knot (i) represent a set of strings with an identical number i of* 2τ time intervals *whereby each last* point state is able to maintain *the initial 2-point* charge *excess*. *So knot(2) was initially the collection (M/2) of strings, each able to maintain their charge anomaly over a* $2*2\tau$ *time length etc….* Growth in time of a point string without geometrical increase in length of a single zeron pattern is only possible if selected contributing points and partial strings have *either* a circular (or even spherical) phase shifted distribution around a virtual shared central symmetry location *or belong to different superposed dimensions in time and space (the solution proposed, but to be confirmed by computer simulations).* So one could argue that from a geometrical point of view, speaking from an axial point string is misleading. This remark is correct but the term refers as stated to a linear growth in time and to the fact that two dynamic phase shifted connector points (a point and a hole) could be connected by a virtual shortest straight line thru the symmetry center of a *point* pair with a, for each zeron version, varying orientation *and/or dimensional subset* (*see remark above – we propose a varying dimensional subset).* Partial superposed growth states are indexed by a parameter i and connect a hole- and point-state connector version. We also assume that the outcome of this "*in time lengthening by* selection" process will be a zeron *version* with a two point size *length* and a fixed geometrical orientation *over a* half a zeron period (a single growth *plus(to be proven)* shrink cycle).
- *This at first sight unproven growth process in time of a zeron point string is based on the assumption that the one shot injection of a charge excess in a 2-point string is an anomaly and as such a potential form of energy that in its final format will be conserved. The way to reach this state, is to lengthen step by step the duration that this excess will be maintained over a decreasing number of successful knots in a total fixed time interval i(max)*2τ. In the beginning and on average X(M)/2 strings around a common symmetry center succeeded to maintain their charge excess twice in a row, in a next step X(M)/4 maintained three times their excess etc… .As we assume that the speed of charge info exchanged between the initial 2-point set with and between all subsequent new point states remains constant, all the knots contributing to these states must by distributed phase-wise over two high time-like dimensional subsets at both ends of the initial point pair(see remark above). The net charge excess at any point in time must remain the initial excess amount (conservation of charge and energy). This step-by-step "normalization by*

selection" implies that relative time shifts between random point-pair life cycles of M-dim in a infinite-dim cosmos(0) are much smaller than τ.

- *Although zerons are dynamic point patterns, their transition and growth from an unordered collection of short lived M –X dim double point sets into a standard N-dim UZS is considered to be an initial one-shot process in a young cosmos CPS volume. What comes after in other chapters of this text refers (except otherwise stated) to a local UZS volume in its regime state with standard-property-zerons.*
- *Another way to express this process is to say that point string growth takes alternatively place at each end of the string (we call each partial time string of the 2-point string a branch) by selection of properly synchronized CPS points, being connectors of other similar point strings around a common central symmetry location, be it in distinct dimensional subsets. Without the "help" of these other strings, "random" growth life time of a single 2-point string could not be a fixed dense multiple of 2τ.*
- *The transition phase whereby an (M-x) dim collection of primitive zerons, each able to sustain temporarily a fixed charge excess, guaranties that the reset of a connector state could be gradually the outcome of a well synchronized charge info exchange between the two ordered points of an non-complete string.*
- *When and how comes an initial time-ordering- of- "point pairs"- process to an end ? As a similar phenomenon takes place in several locations of the CPS, there is a chance that the probability of internal coupling between a decreasing number of subsequent synchronized point pair versions of zerons growing around a common symmetry center and leading to further growth in time of the pattern, is smaller than an the external coupling probability between compliant connector point states of geometrically distinct zerons. The outcome is (CPT conservation-wise) a phase jump and an instantaneously or slightly delayed shrinking in lifetime of both zerons involved in this non-local coupling interaction. This statement presupposes that synchronization between selected, in time shorter point strings gets stepwise less probable in the course of the shrinking process, an assumption that remains to be proven. If this presupposition would be wrong, the time length of a once grown zeron should remain about constant forever, only the roles of both connectors would be interchanged after contact with a compliant neighbor zeron. In this text we opt for a dynamic growth-shrink life cycle of a zeron as described.*
- *Although the idea of zerons being persistent time ordered replicating patterns would be attractive and will be proposed, it seems to be impossible to explain at first sight how and why a previous string of time-ordered points could maintain its privileged properties even after shrinking. However, taking the criteria of a successful resonant framework of zerons in a regime state into account (see hereafter), we opt for a varying point composition of zerons but leading to a fixed replication format with a limited set of i-max connector properties.*
- *Interactions in i-max between two neighbor zerons require the presence of a common communication channel between connector points and/or holes of both quasi-identical and properly synchronized patterns. Additionally both interacting 2-point strings need to be quasi collinear, in order to guarantee the exchange of a*

standard point-type charge info format (remains to be proven). In practice the phase and distance in space and time have to be such that (scenario 1) charge info emitted by the reset of the long connector point of string A resets the point state of string B or (scenario 2) charge info emitted by string A induces a point in the short-lived hole connector location of string B. The roles of A and B are obviously interchangeable. Additionally the charge of A en B can be of type D or C. Finally, the reset of a string connector point by an neighbor connector leads to the quasi immediate inversion of the "longest branch" property: indeed the other connector in the hole state will still become a point after τ….but to make it even more complex: this depends on the presence and state of another contact zeron at that side. These interactions initiate both the shrinking of the two point strings, be it that the implications are different. These interactions between two neighbor zerons imply that such zeron pair could be treated as a short-lived micro-pattern called a <u>contact-EZP</u> (see hereafter).

- *In this text the term "longest" branch is often synonym of "<u>active</u> connector" of a replicating pattern, meaning that a point in this connector and <u>in a specific state</u> is free (not involved in an interaction with other points within the replicating more complex pattern). The charge info emitted (or broadcasted) by such short lived "antenna" point makes it possible (with a certain probability) to interact successfully with other compliant pattern connectors.*
- As a summary:
    - *The proposal of a point string to be the fastest path in time capable to maintain a fixed charge type for a point state is very strict what means that the relative chances for any spontaneous zeron creation event are small: so the relative number of points in any standard CPS volume that at any moment of the evolution, are part of a zeron pattern, is extremely small (and dynamic: meaning that after contraction, a zerons point content will change).*
    - When the zeron growth process initially proceeded, the number of successful "longer lived" strings (or time dimensions) *around a shared symmetry center* will decrease. This means that the probability of the successful "increase by selection" of the string length *(in time)* will decrease but growth continues as long as the "time *to select"* remains short as compared to 2τ.
    - The term "connector" refers to the last added *and for a while "active" and "passive or phase shifted (see hereafter)"* set of components at both ends *(or branch)* of each substring. Each connector point of a knot with index i maintains the same charge quantum type i-times during each local growth cycle and contains a combination of axial and auxiliary transversal points. This effect takes into account the phase shifted impact of properly synchronized (τ of a point is a constant universal time unit) charge info emissions of the cascade of all the previous knot points for each substring. All these paths and their sequence of internal charge info couplings guarantee the fastest q*uantized* growth *in time* of each substring connector.

- The alternative phase-shifted growth at both ends of a string is in line with FLN principle forcing the pattern to restore anti-symmetry: this happens indeed for the enclosed knots (a hole connector is just a temporary state *of* a point) but the balance is not *perfect* for the *two* dynamic connectors together: perfect compensation of the initial anomaly (at the origin of replication) is impossible because charge info to adjust the difference propagate at finite speed what result in a permanent small phase shift between both connector point states. *The fastest connector point of a pair is sometimes called in this text "active", the other (temporarily in the hole state) "passive".*
- Two similar replication processes took place simultaneously out of two orthogonal point pairs that initially interacted only once with respect of conservation laws and we implicitly accept that these processes do not disturb each other (or remain "orthogonal"). *The initial signs of their conserved point charge states are opposite. An open question is to what extend these two initial versions of replication processes will continue to have an impact on the properties of a future zeron raster, in particular: "will they be the basis for two UZS subsets with distinct properties ?". Without prove of the contrary, we reject the idea of "different properties" but not the concept of subsets in M dim. So after the initial hazardous creation of two zeron-like point pairs and after their growth cycle they will be both part of zeron space. Their opposite charge types will be no longer a discriminating property because every point-replicating zeron will switch its charge type in the contracted state (the auxiliary transversal points doing the same).*

  Nevertheless we assume that the total cosmic charge will be conserved whereby it has to be mentioned that the hole connector of a zeron will turn after a time lapse τ into a point with charge type opposite to the other point connector.
- A "point replication path in time" is hard to visualize by a simple drawing (pictures of this process simulated on computers could use colors to distinguish connector states in different dimensions).
- A process like point replication does not originate as the outcome of a mysterious external "force". It is just the result of pure hazard referring to the fact that *initially* 4 adjacent points in the CPS where in such relative space, *charge* and time states that a double persistent replication process could start off *with respect of conservation rules and basic laws*. The probability that such phenomenon takes place is small but on the other hand, the point density in the CPS is so incredibly high that it *has real chances to* happen. It is crucial to understand this concept because the whole evolution of our cosmos (including the simple fact that a person X married wife A and not B) is driven by similar kind of hazardous selection processes, *be it later in a reduced number of dimensions*.

The UZS in a regime state.

- *The initial g*rowth *(and shrinking)* by (point) replication continues in accordance with the reduction of the remaining number of available M-x dimensions, representing *stepwise* (or in M dim phase shifted) growth around a common core location, until a critical value N (3<<N<<M-x < M) – see also chapter 6 and 7 where R=137 has been put forward as the as the number of reduction steps in dimensionality between point space (M) and zeron space (N) and a corresponding string index i-max was reached - , a limit set by the unavoidable phase shifted interaction between connectors of other adjacent zeron strings in an appropriate state (no free "in M-x-dim orthogonal" dimensions around a common antenna are left between growing neighbor zerons that would enable further superposed fastest "constructive" internal couplings with a probability higher than that of any occasional and base-law compliant external coupling).
- This at first sight obvious statement is hiding a very subtle mechanism. As long as I < 137 we assumed before that shorter strings were "oscillating" what implied that they also were interacting with shorter compliant strings of unfinished neighbor zerons *whereby non-selected candidates started to shrink* ! So why did this selection and growth/shrink process did not stop *systematically* at (e.g.) *prime* values smaller than 137 ? The answer is that this process only stops *(and enters into a stationary cyclic state)* when the phase shift between two *potentially (= charge type dependent)* interacting growing "unfinished" neighbor zerons was *exactly* equal to (or a multiple of) τ (*reset of a point in the appropriately signed state) or zero (insertion of a point in a hole type location), depending on the interaction scenario*. *Once that happened the properties of a dynamic zeron subset became persistent (or resonant) and its critical i-max value (137) never changes in the course of the evolution. The UZS at a cosmic scale became a dynamic stationary and locally coupled quantum raster with quasi fixed properties.*
- The *presupposed* CPT-wise distinct charge info exchange scenario's between adjacent zerons (here called a contact or return state) are the beginning of a cascade of internal over τ phase shifted "destructive" charge info exchanges *either* with *other* lower indexed *substrings* of the same string whereby, as the outcome, a cycle of shrinking for both zeron patterns initially involved in the external interaction *, or (as an alternative scenario) the shrinking in time of a string is the outcome of internal interactions between the two connectors of the string*. *In the contracted state the roles and phases of the two points will be interchanged so that time growth is again enabled.*
- *In case of a scenario based on the presence of multiple well synchronized lower length substrings around a common symmetry center, the* remaining dimensionality N means that N+2 single dimensional time strings succeeded in attaining about the same maximum string length i-max in superposition but we assume that one of them is the fastest (perfect simultaneity is rejected) and makes contact with a neighbor zeron. *The outcome is reflected by a phase jump that is distributed by the central 2-point antenna over all the less successful superposed strings with quantum-states (i-max -1, 2 ….), so the shrinking process of all those*

substrings will start about simultaneously per index level. After contraction of the full pattern the next "winner" of the ultimate N-candidate successful growing strings (embedded in M-dim point space) that could interact with a neighbor zeron will be different: the distribution of contact locations will be spherically distributed in M-dim around a virtual central empty location between the two central antenna points (this statement is speculative – the alternative scenario could be that the growth of a zeron subset would be a one-shot process – after reaching a stationary state at an i-max value 137 , the "historical" role and contribution of shorter partial point strings would become irrelevant : if this could mean that the geometric orientation of a successful point pair (a zeron) would be fixed forever, we reject this proposal unless prove of the contrary).

- *The application of the CPT conservation rule on two interaction scenario's in i-max connector states, for each individual zeron as well as over the combination of both*, should explain the behavior and properties of each. *If (e.g.) a connector point is reset by a neighbor zeron (C has to be taken into account), T would switch its sign but the hole in the opposite connector of the zeron completes its growth and becomes a point with an opposite charge type. So the corresponding branch is now the longer and the P and C properties of the string switch their signs simultaneously. If an extra connector point is inserted in the empty short branch connector location of a neighbor zeron C, P and T are maintained for one extra cycle but the P and T properties are switched in that other zeron.*
- *If in one zeron CP would be switched whereby the short branch becomes the longest and so the excess charge type of this zeron changes, the other zeron has to guarantee overall conservation of charge by the reset of its appropriate signed point connector state … otherwise the interaction cannot take place. The critical differences in phase gaps between two interacting zerons for the two interaction scenario's should be of order τ. These rules guarantee hole (or mass – see hereafter)-type energy conservation over a zeron volume, deployed of zeron patterns like particles (including gravitons – see hereafter). They are not just abstract laws: they guarantee an overall stationary zeron volume and they must be the outcome of the base laws applied to what happens in a contact locations between compliant zerons of the same time length: hereby not all combinations and interactions are possible (e.g. charge info emitted by a shrinking positive point cannot reset another positive point).*
- *As this double interaction mechanism must be confirmed by computer simulations, the outcome of these tests must also explain the values of the small discrepancies between the inverse fine structure constants and 137, for more complex matter as well as for contramatter patterns and particles (see hereafter).*
- The combined space-time behavior *of interacting neighbor zerons* (in CPT terms, as observed in a common reference frame in a virtual contact location between both zerons) leads to opposite phase jumps and implies an anti-symmetric change over the two replication directions *(CPT is conserved per pattern and over both connectors involved in the interaction for both scenario's) of hole densities, consistent with what happened with the maintained charge amounts. Anti-*

symmetric phase jumps imply that the total amount of hole-type energy (see hereafter the definition of "energy") over both zerons is conserved.

- The assimilation of an energy quantum with a single phase jump τ makes sense because in a simple single point's life cycle, it implies a switch of states between something and nothing or vice-versa *and this has an impact on the local point-hole density ratio. It is PhR behind the constancy of a unit action quantum h/2=δE*δT.*
- The "conservation of charge" assumption means that two compliant interacting i-max states could be a combination of opposite zeron states, one with a persistent point charge and the other with a hole state connector : hereby it makes sense to accept that the states of the "axial" and *the selected* "transversal" connector points of each zeron involved in the interaction, are interchanged . Hereby we repeat that point and hole states are dynamic: e.g. a hole connector becomes a point …after a standard quantized phase shift τ. *However the charged point connector after reset becomes in the course of a replication cycle again a point with a fixed charge type and reset either by a distinct transversal point, either by interaction with a neighbor zeron.* This makes things clear as far as the role of which one of both interacting zerons was the antenna and which was the receiver of a charge info packet.
- It is important to repeat (*once more…)*, as far as this PhR concept of mass (*or hole)* type or sign is concerned, that any net +charge excess in a contact location can be the outcome of either a local –point reset or a +point induction, each with a distinct impact on the local point-hole ratio density. Although point replication processes (growth and shrinking) themselves are strictly standardized, as imposed by the "shortest path rule", the small uncertainty of the exact timing of a successful contact process between two zerons relates to the distance that charge info emitted by the fastest antenna point has to bridge before either a point is reset or a empty location is filled. Computer simulations are absolutely needed in order to confirm the presupposed interaction processes between two UZS zerons in i-max, each in either the DZ/CZ (= charged) or in a Dh/Ch (= hole) connector state *and with respect of per zeron and global CPT conservation rules*.
- As a side remark, notations like Dh/Ch are ambiguous. If we would accept that a zeron in the contraction state changes its *hole or* mass type (like it does with charge *if we neglect the impact of the last transversal point*) this notation could refer to such double change. If we reject this idea (*what we propose to do)* it just refers to a flipping charge sign (D-C) *of points involved* in a contracted state. The context should make things clear. Without more details this text is assuming that mass type of a single zeron can only be changed due to interaction with another *neighbor* zeron *whereby it refers to the tenor of the hole in the contact location*. *So mass (in physics) is rather a property of a hole enclosed by a zeron pair (e.g.: a contact-EZP), not of a short-lived hole connector state of a single UZS zeron in the course of its growth cycle. As we will see its type remains fixed for an EZP component of a more complex particle-like pattern, but it is variable (or dynamic) as a "free" short lived contact- EZP in the UZS. In a standard UZS volume the numbers of both contact types are statistically about balanced, but this is no*

longer the case if a volume is heavily "polarized or biased" by a local density excess of a particular type of particles (see hereafter as an example –graviton and contra-graviton densities and viXra article about fine structure constant values).

- *If the shrinking process of a zeron requires the contribution of other shorter (in time) strings in (M-x) dim along their original growth path, it causes implicitly the local increase of dimensionality whereby no selection procedure is needed. Points that belonged to other auxiliary patterns are just released as unconnected CPS points.* The preposition that shrinking (without selection) and growing (with selection) of a replicating zeron point pattern take place at the same effective speed implies that we assume implicitly that the selection process in high-dimensional spacetime is extremely fast. It means also that only one final fastest path between synchronized knots can exist, materializing a single *geometric* dimension.
- S*hrinking a zeron-type point string, after reaching an i-max regime state, in a quasi fixed period of time is a non-obvious presupposition: it requires several conditions to be fulfilled :*
    - *a zeron is geometrically a 2-point pattern*
    - *each knot needs to have a standard time length 2τ*
    - *between knots in a non-special state the time interval is zero*
    - *the contact with a neighbor zeron in i-max is the source of a charge info quantum that triggers a two-sided shrinking process whatever the contact scenario is,*
    - *the initial phase shift implies that the two initially phase shifted "time-branches" start to shrink alternatively due to synchronized internal charge info exchanges between their geometrically adjacent connectors and/or taking the impact of auxiliary transversal points into account,*
    - *the two branches ware initially τ phase shifted, a condition that needs to be maintained in the contracted state of the pattern, so growth will restart under the same time or phase conditions.*
    - *circular (in space-time) distributed auxiliary or random CPS points complete the point life cycle of a knot.*
    - *CPT conservation rules need to be respected in special states for each interacting zeron and for the combination as such.*
- The step by step release of *a cascade of* all previously connected axial points back into the CPS set will come to an end with the appearance of a contracted "empty or pure charge info" state between both original antenna points. It is followed (through an inversion process) by the emergence of a new version (or anti-symmetric state or next generation) of a zeron's mutated central point pair, with opposite charge connector properties. The latter means at least that the roles of both connectors are interchanged: in a fixed central reference frame the fastest growing branch of an inverted axial string still contains the charge connector. This requires a phase jump in the inversion process. The "mass" type (*as represented by the new hole connector)* remains the same (*as stated before, it would be better not to use the term mass for a dynamic short-lived "hole" connector in a non-i-max state)* . This inversion process is CPT conservation compliant, but this time over

two successive zeron versions conserving P but not T and (C or) Q individually - the latter is base laws 2 and 3 compliant), *so in an abstract reference frame the inversion process has a tendency to restore the perfect empty state by annihilating a charge amount q but this attempt fails because time and space do not match between successive versions states*. Each single growth-plus-shrinking sequence is called a single (point) replication cycle or zeron version. An overall shrink and growth sequence of a pseudo zeron cycle (in fact two subsequent versions) is mass (energy) and charge neutral whereby the charge type changes in the contracted state, *the mass type eventually in the return state: as mass is a measure for time delay (or phase shift) in PhR but for energy in physics, the respect of the energy conservation rules has to be checked over the two interacting zerons for any two contact scenario's .* It could also imply that a zeron pattern, a composition of a shrink and growth cycle oscillates around a virtual symmetry location over a small time quantum (*to be checked).*

- *In the empty contracted state location the zeron pattern is subject to the impact of random, non-previous state related charge info quanta but emitted by other faster phase shifted 2-point pairs around a common symmetry center . This means that the orientation of the virtual connection line between the two points of a next inverted zeron state, can and will be statistically different from the former direction 2- point replication direction whereby the same density in time remains guaranteed. Observed over a large period of time, subsequent versions of a replicating zeron will form a set of 2-point lines, randomly distributed over a high-dimensional spherical volume around a central symmetry location. This assumption is proposed for a "free" UZS zeron, but is no longer valid when it is a dynamic but bound component of a more complex multi-zeron pattern. All these virtual ball-form distributions of free zerons will make periodically contact with similar neighbor balls, distributed over dynamic N-dim subsets in an M-dim CPS.*
- *The two scenario's proposed for an inter-zeron contact in i-max will have a different impact in each point string on the opposite connectors, themselves not directly involved in the local contact: charge info normally arriving to induce the point state in such connector can have been "used" to induce a local point in the contact process so that its hole state is lengthened. In the second scenario the point state of the connector involved in the contact process has been reset so that the "longest or active branch property" of the pattern has been interchanged. So it means that in a large UZS volume short lived contact- EZP's (Elementary Zeron Pairs) are present that enclose holes with a different tenor. In this context an abstract mass property being a measure for non-charge related energy (in fact a different local point-hole density ratio) becomes a more specific quantized and dynamic property, sustained by a pair of zerons. This is extremely important because this intrinsic but dynamic raster duality explains also why propagation of two classes of patterns over the UZS grid can take place at distinct velocities (see hereafter). As the average density of EZP's (in the UZS and/or as components of patterns – see hereafter) of both types are balanced, their presence do not violate an overall (meaning: at a cosmic scale) energy conservation rule.*

- So once emerged in an empty CPS state, zerons are persistent as a pattern (not as version) and subsequent versions belong to identical N-values that remain dynamic (meaning: with varying point compositions) but standard (meaning: their number) subsets of the M dim CPS. A full zeron period T (in global time units), i.e. the time needed to return to its original state, contains at least two replication cycles or two successive versions and could be used as a standard time unit set by local zeron clocks *although the average tenor of this clock is sensitive to differences in contact scenario's*. *A single zeron version* could be seen as an oscillator with four at the end of each quarter of a period changing states (mass DH/CH and/or charge DZ/CZ properties), only in those phase states potentially capable to interact with other patterns or with a previous version (inversion *in the contracted state*). Flipping properties only periodically in special states means that their intense internal charge info exchange activity during transition (a point string is indeed a fastest quantized and connected path, to be expressed in *exact* multiples of τ) protects them against external perturbations over a much longer period than what is the case for just a random single CPS point life cycle. This is good news for the future emergence of more complex patterns, as it makes of zerons the useful elementary building blocks for any further evolution of the cosmos.
- *In the course of a full period a zeron's dynamic fixed charge connector behaves subsequently as a magnetic north or a south monopole* (the other connector being *in* a hole state, a term used in this text to name an empty location with a (at least for connectors) standard life time that is the outcome of phase shifted and properly interfering charge info packages). The term "magnetic pole" in this context refers rather to the net charge info pattern emitted, *in its phase shifted subsequent states, by transversal auxiliary points of a charged connector*, taking their assumed helical distribution path and the charge info superposition law into account (to be proven by computer simulations).
- The zeron raster, a steady state dense collection of single zerons that are not yet part of more complex composite patterns, is called a local UZS (or Uncoupled Zeron Set). It owns everywhere the same intrinsic be it dynamic properties – how could they be different, at least in any non-border cosmic shell. *If we take into consideration that M>>N, the answer could be obviously "an M-dim subset number" but this subset would be dynamic and such numbering needs a discriminating property and cannot be persistent. This makes an at first sight simple concept of "zeron formation" complex: so if an zeron subset forms an interconnected network, the selected contributors to this network form themselves a (dynamic) subset in M-dim. This at first sign "academic discussion" becomes relevant if in next chapters we come to the formation of complex zeron patterns, whereby contributing zerons are supposed to have appropriate relative phase shifted point replication schema's. In a same context the term "UZS" refers to a dynamic superset of subsets, not to a single fixed zeron subset. All these subsets have the same i-max values (and obviously common fine structure constant values) but in M-dim a small phase shift in function of the distance to the creation event is implicitly present in more distant local point replication process when observed on*

the scale of an abstract cosmic reference frame. This will not be an issue because in PhR no long-range interaction processes take place and even the speed of charge info in vacuum is supposed to be finite. Another approach could be based on subsets of random symmetry locations for each zeron subset: there is obviously a relationship between the geometric size and dimensionality of the CPS, its time (or phase) resolution and the speed of charge info in emptiness .

- The average net charge and mass densities of a representative UZS space-time volume are null (in fact, a super-symmetric dynamic multi-state set in space-time). *The latter presupposes that different tenors of holes in contact EZP's are considered to be properties determined by varying phase shifted states of zeron pairs, not by single zerons although the hole connector of a zeron point pair keeps its hole tenor amount in the course of a shrink-growth cycle, be it in line with the CPT conservation rule (see above) and due to the fact that a zeron point string is a sequence of point states that are exact multiples of 2τ. In a hypothetical empty UZS volume (meaning: diploid of particles or contra-particles) the average numbers of each of both hole types are equal.*
- *If we accept the existence of a cosmic CPS with a limited size, it is hard to estimate the time lag between the moment the CPS reaching this size and the time that was needed for the UZS sub-raster to grow and to attain a stationary state. We assume that the delay between both was extremely short. If the CPS volume would ever start to shrink and as the UZS is just a dynamic subspace of the CPS, we presume that both will shrink and that the stationary state set of the remaining UZS volume would not be disturbed.*
- This second superposed raster materializes PhR behind the non directly observable vacuum in physics. If we estimate the typical τ value for point life cycles to be of the order of Planck units, the value of T could a priori and theoretically lay somewhere between the non precise limits 10exp(-43) and 10exp(-24) sec, fixing nevertheless a standard i-max value with flipping properties precluding, of course, any experimental observation of a single zeron oscillator. On the other hand and as a zeron pattern grows out of a point pair by reduction in dimensionality, the size (or its multidimensional enclosed volume) of an UZS zeron should be rather of the same order of magnitude as *two* points. If we propose 10exp(-43) as the order of magnitude of τ, the point density is conditioned by the unknown value of c_v which is at least 137 times higher than c. For zeron space the effective propagation speed c_p of charge info between effectively coupled UZS zerons taking reduction of dimensionality into account is even more difficult to estimate: this process is mainly based on a time reduction having little impact on average distances between zerons.
- We need anyhow an adequate definition of a metric applicable to CPS-UZS spaces before trying to make estimates of point and zeron densities expressed in absolute figures. Even than making these estimates without adequate computer simulations does not make much sense.
- Single unbound UZS zerons on one hand and phase shifted short-lived zeron pair densities (*contact-EZP's* in point replication return states) on the other hand, set

together with the CPS the ε and μ parameters of the "vacuum" in Physics. The μ value will vary between two slightly different values, depending on the interaction process and hole types between two adjacent zerons. These differences are PhR behind the small discrepancies between 137 and the observed inverse fine structure constant for matter-like *(or contramatter- like – see hereafter)* patterns: *these particle class patterns have fixed built-in hole types and their behavior depends on the availability of local contact-EZP's of the appropriate type*. As will be seen in next chapters, their at first sight statistically 50-50% distribution can be locally disturbed and biased by the presence of more complex *dense* multi-zeron pattern distributions *but also slightly by unequal probabilities of reset and induction of a point for any interaction process that takes CPT conservation rules into account: of the theoretical 8 combinations, 5 refer to insertion of an extra point in a neighbor hole connector and only 3 to the reset of a point (see special viXra article about fine structure constant).*

- Computer simulations are needed to find out if zerons acquired and maintain their mass (*or hole)* types since their origination or are able to switch their types in their special states (*as proposed here in i-max and per zeron pair, not in the contracted state of a single zeron).* In any case we assume that overall symmetry of the cosmos as far as the average point-hole density ratio is guaranteed and conserved. If mass type c*ould be* a conserved property of any zeron there *would* exist two subclasses of patterns in the UZS: zerons and contra-zerons. In this text we do not make explicitly this distinction (there are just two possible zeron i-max states *conditioned by the way they interact in their point replication return states*) but we assume anyhow that stable composite patterns of zerons (like protons or contra-protons- see further) *are able to conserve* their mass types. *If we treat the UZS as a superset of coupled quantum (sub-) grids, the value 137 in combination with the value τ has to be considered as the smallest prime factor that guarantees a zeron replication patterns that is stationary when oscillating around a dynamic symmetry center taking two different contact tenors into account. So there is no need for reshuffling permanently on a global scale a whole UZS sub-raster (see above – the preference for 137 as* ***the*** *i-max value) except for what the local point composition of the dynamic superset in M-dim is concerned . Hereby each subset is assumed to own the same main properties (e.g. the 137 parameter value).*
- Zerons are the standard building blocks of composite patterns (sets of coherent zerons) that in turn determine the behavior and properties (charge, mass, spin …) in space-time of a whole range of particles as "observable" by physics, even if only partially and without insight in their internal structure in terms of PhR.
- The presence of a cosmic framework, made of two layers of superposed, standardized and dynamic quantum grids with clearly distinct but correlated clocks and dimensions, makes it hard for physicists to include gravity (a weak point/hole-density related phenomenon sustained by a most simple but unobservable 2-zeron combination - see further neutral-EZP's) in their Standard Model. It implies also the existence in our cosmos of a preferred, be it dynamic and flexible reference

frame, a statement that is formally in contradiction with the principle of relativity (SR).

5. Examples of generic definitions equally valid in a PhR and in a Physics context.

- **Dimensionality:**
- The generic definition of dimensionality (see above) applies to simple and to more complex patterns. The context has to make clear whether this term refers to an exclusively geometrical property of a pattern or that quantized time or phase shifts (*exact* multiples of single point life cycles (2)τ) are part of its definition and its metric. *When making a comparison with the definition of vector spaces in (e.g.) linear algebra whereby a random point could be proposed as an "ad hoc" origin for a fixed and minimal basis of vectors that permit a correct description of what will happen under the impact of the base laws in any location in whatever state surrounding this origin, several complicating issues show up: the basis must be dynamic (time or phase dependent) and quantized but its phase (or time) component is continuous, a correct prediction of a next event requires base-vectors that end up in points but also in empty locations (base laws conform) etc…If in this model a dim value M for point space in a stationary state is proposed, any comparison with an equivalent mathematical definition and model is not obvious and the choice of whatever particular basis will necessarily have a stochastic character.*
- As complex behavior is determined by the coexistence of processes that make at least use of the two superposed grid layers, dimensionality will be different at each level. Multilevel processes will be determined by the layout and symmetry in space-time of a central core antenna (made of points and/or zerons) that was initially mutated (breaking the theoretical lowest energy state of a quasi perfect (*anti- or contra-)*symmetry configuration). When applying the laws of interaction and superposition to excess (i.e. not already used for internal binding of components) charge info emitted by versions of patterns in the course of replication, their impact appears to be effective only along a limited set of directions, a reduction that takes into account each antenna's dimensionality and symmetries and the relevant connector processes and properties at group and component level.
- Their "number of dimensions" might be further reduced in case of even more complex patterns with gradually more restricted symmetry properties. Hereby the strict definition of dimensionality as limited to their point or zeron levels no longer holds: the number of dimensions still refers to states that could have under free conditions a priori equal probabilities to exist *as potential communication channels between points and zerons*, but the observed probability distribution takes implicitly (several) collective parameters, *charge info superpositions (a base law)* and external interactions of the pattern into account.
- One has to understand that all underlying dynamic processes, at point as well as at zeron level, maintain locally their high intrinsic numbers of dimensions at least in

the contracted state, even in our present cosmos (e.g. at its most basic level, the content of our body is continuously being rebuilt in terms of the M dim, proper to its dynamic CPS components). The three spatial dimensions we are used to, are merely an effect of averaging and superposition *of charge info*, what reduces dimensionality to a stochastic phenomenon by selective, ad hoc couplings (cycle steeling) between compatible objects over all the intermediary layers, starting from mutated central particle antennas with an intrinsic topological 3D symmetry, but still embedded in a double M/N dim raster (see further - PhR in accordance with the concepts of superposition and quantum state reduction in QM). Without extra external coupling with compliant patterns successive 3D pattern versions show rotational and/or by phase shifting degrees of freedom in a N dim raster in the contracted state (an a priori stochastic distribution of orientations but biased by the fact that the probability distribution of a sequence of rotations or phase shifts over a certain number of unit angle versus the previous state is Gaussian (in high dim) and an important net rotation due to several subsequent interactions in the same sense has a very low probability of appearance). Frequent successful interactions between distinct patterns along particular and compliant 3D + properly phase shifted subsets, will lead to a local or global reuse of dimensions in a raster (PhR behind quantum state reduction in QM whereby the term interaction between 3D patterns in PhR equals observation between compliant particle states in physics). This phenomenon is perceived as a kind of polarization in N- or M-dim of a large number of auxiliary (or primitive) components in a pattern. The a priori isotropic distribution of interactions around a nucleus will be biased by the inertia of such huge numbers that their collective behavior can no longer be treated as a simple perturbation. Finally we like to remind once more that, although dimensionality numbers like M and N are fixed, any particular materialization (as a persistent pattern) of a base set is dynamic, so its point and zeron content will change over time.

- Previously we mentioned that enough dimensions are available between M and infinity in order to permit the cosmos to grow (at least if this does not lead to the appearance somewhere in the cosmos of two points in exactly the same state at exactly the same moment, violating hereby the uniqueness of the creation event and probably the rule that the algebraic sum of all charges in the cosmos at any absolute time moment must be smaller or equal to q (PhR) (see the rule in QM that two quantum objects cannot be simultaneously in exactly the same quantum state (Physics)). However it means that, at any distance from the initial creation location, the content of the set of dimensions “used” by local patterns could gradually change. This is not a real problem as long as interactions between point and zeron patterns are “local”. If they would be exceptionally under artificial conditions distant (see a viXra article about EPR effects), the direct charge info coupling between two coherent particles will take place at a high but finite propagation speed (>= 137*c) , permitting a phase angle shift between both dimensional reference frames in point space and materializing in fact the flow of absolute time in a cosmic perspective. Even in that case their local successful

interactions at both ends have to remain quantized and should not violate the charge conservation rule on a cosmic scale.

- *In this text we use the term "symmetry" as equivalent of the expression "a symmetry". The exact meaning of this subtlety depends on the context: in some cases properties like charge and mass type are important to compare probabilities of hypothetical equivalent pattern creation and interaction processes. A prefix like anti (opposite charge types) or contra (opposite charge and mass types) has been added to specify the relevant (symmetry group) property. Once more we repeat that at an elementary level (points and zerons) the members of each class forms a dynamic (meaning: non-persistent) and stochastic set what makes it less obvious to describe their properties and behavior by a mathematical representation.*
- *Symmetry (in space and time or phase)is a concept in PhR that is fundamental in order to understand the behavior and the evolution of our cosmos. Every raster pattern contains dynamic point and zeron sets that that are involved in internal binding or, in some particular states, are a source of net charge info emission (active connector points), itself subject to superposition (a base law). Symmetry of the original pattern configuration leads to inverted symmetry properties of by interference of quantized charge info (a base law and the expression of the FLN principle) selected (or induced) raster point configurations with on their turn an impact (be it in terms of probabilities) on new pattern versions or on other patterns (a good example is the magnetic spin property of electrons – see hereafter) . For mixed symmetric / contra-symmetric configurations this requires that raw building blocks of both contact-EZP types are present in ample numbers in a local UZS volume. So the UZS behaves as the sensitive plate of a gigantic photocopy machine for not-internally-balanced quantized matter as well as contramatter patterns whereby the process of creating inverted copies of such complex antenna pattern needs to respect conservation laws (charge, energy ..).*

- **Superposition:**
- This PhR model starts from an infinite dimensional empty cosmos(0). Point and zeron subspaces are M and N dimensional. The cosmos described by *standard relativistic* Physics is 4 dimensional. The term superposition (or superposed states) refers to the fact that multiple pattern versions in (e.g. zerons) in a higher dim-state are able to co-exist whereby these versions replicate quasi simultaneously out of overlapping antenna states around a common symmetry center. A pattern version in a particular low-dim subset is not aware of what is going on in the higher dim enclosing subset. This will be equally true (as will be mentioned hereafter) in our by interactions to 4-dim reduced pattern subset, as described by physics. We will see how (frequent) interactions in more complex patterns between low-dimensional components will reduce their capability to co-exist in multiple superposed states.
- When QM refers to superposition and to superposed quantum states they sometimes use the term "simultaneous" which is not correct: e.g. if a particle is said to be simultaneously in two superposed states, either these states are quantum

phase shifted in a common dimensional point subspace or they are in fact two distinct patterns that belong to different dimensional subsets. A single point pattern version cannot be simultaneously in two distinct states in a unique dimensional subset.

- **Energy:**
- Another example is the definition of the term energy (or energy density) as the capability of a pattern or a set of patterns to change the state of a relevant sample of the cosmos (encompassing its own internal energy state or content) through a combination of internal and external *quantized* charge info exchanges. It includes effects like pattern creation and annihilation. Energy reflects the capability of a particular (point) pattern to achieve, within a certain amount of time, the goal expressed by the FLN…..although and again without an overall and persistent success. This definition works on any level, from the primitive creation event itself up to the highly complex impact of the publication of stock exchange information on financial markets.
- The idea is that a single object is unable to change the state of another object if both are fully identical (*taking* (*anti or contra) symmetry into account*) at the moment they *would* effectively exchange charge info. Hereby one has to take hidden properties of objects (e.g. *connector* type in a zeron state) into account. Anti-symmetric states can be broken *(e.g. electron-positron annihilation).*
- As any change of a cosmic state is ultimately driven by the FLN principle, it requires at least the exchange of a fixed or quantized amount of charge info between well positioned and synchronized points (see base laws). It might be not correct to allocate to charge or to charge info an intrinsic and abstract property "energy": a point acquires this property only as a micro-pattern, a format inherited from the creation event. Nevertheless this statement remains at least theoretically an item of discussion even in Physics, as the definition of energy and the concept of effectiveness of interactions in PhR terms, have been mixed up. In that context it makes sense to use the term "action" (physics) as a measure for the capability of a pattern to convert by interaction(s) (part of) its energy content into an effective change of its format over a fixed amount of time, reflected by an expression like $h/2 = \delta E * \delta T$. h is a constant (Planck) and h/2 expresses the quantum of change q exchanged in the course of a dynamic single point growth or shrink cycle τ. It uses one (X)Z to (X)H (X is D or C) transition charge info package to modify (or to be modified by) another point or a (hole) state of a one of its components and/or of another external pattern (*including raster points).* Action is quantized, consuming thereto an energy amount δE and it says that its impact will take a fixed amount of time δT to be completed. Hereby "Time" does not include the delay required for charge info to bridge the distance between antenna and target. So the convolution between energy and time determines what can realistically be changed over a certain period of time *but does not say anything about when and where this will happen*.

- For the cosmos as a whole this means that ……the whole cosmos has been and will be created by the single action amount, injected historically in the cosmos by the creation event. What happened between then and now has to cancel out as far as net energy is concerned, only time (and space up to a maximum size) can be cumulated and is driving the large scale evolution of the cosmos *whereby the probability of particular interactions based on local circumstances play an important role* !! *If we accept that energy is a conserved quantity and that the creation event induced a single point in emptiness whereby h/2 = δE * τ, we need to accept that the total net energy content of the cosmos was and is equal to δE. If we compare this principle with a Big-bang (Bb) scenario in cosmology, a few remarks can be useful. Also in a Bb concept all the future energy quantities stored in our cosmos had to cancel out along the course of its evolution (e.g. mechanical potential and kinetic energy amounts) … except from the net null-masses of all the initial and future particles, to be delivered by the initial Bb itself. Conform a definition like h/2 = E(Bb)*T ,a huge amount of energy would be needed if one accepts an extremely short creation period of order T. That amount had to be redistributed over a growing cosmic volume. If we add to these elements the fact that there exists only one type of mass-like energy in Physics and the mysteriously accelerated growth (Hubble expansion) of the size of the cosmos, a Big-bang scenario seems to be a unrealistic, at least in a cosmological model based on Einstein's GR (subtleties in QM proposed by Hawking and inspired by black hole models cannot be compared with a PhR model that has different ideas about what a black hole really is). In PhR these issues and arguments are not real obstacles. The net capability of the creation event "to change the cosmic state" (the PhR definition of energy) never changed. A theoretical amount of (potential) energy of the creation point itself in an empty space-time, in order to change the state of any next point or empty location, even at the border of our present cosmic volume and taking the local character of interactions by charge-info exchange into account, has never be an issue, at least if we take the life time of the cosmos and the perfect conservation and cancellation of all types of energy into account. If the propagation speed of charge info would be high enough, the creation point could even have induced its first new point in a border location of our present cosmos, the only objection against such scenario is not an energy issue but an extremely low probability if we apply the fastest path rule on charge info emitted by an initially "isolated" creation point surrounded by perfect emptiness.*
- A double h/2 or h quantum sustains a time effect by constructive interference of charge info emitted by two coupled phase shifted zerons, materializing hereby a polaron-like charge info pattern (see hereafter, *including the difference between matter and contramatter patterns*). The energy contribution of this 2-zeron pattern can be linked to the maintenance of a persistent hole, changing locally the point-hole ratio in the CPS. This pattern can be successfully exchanged between particle connectors (see hereafter- a virtual photon in physics).
- It is clear that this capability to effectively change the cosmic state , even at a scale as treated by this document, will depend on several parameters:

  - On the kind and value of the relevant discriminating property applied to such patterns (or sets, owners of an amount of energy) and compared to relevant properties of its local or global space-time environment.
  - On the internal structure (or complexity) of a pattern and on which component(s) has been modified or induced.
  - On the capability to convert the modifications into significant information.
  - On the effective velocity of coded information (think on EM waves).
  - On limits imposed by conservation rules etc….

- A fundamental overall restriction (e.g. C and CPT conservation) says that the total average energy density in an appropriate closed (and stationary) cosmic volume has to be zero (for stock exchange transactions– the sum of gains and losses in a perfect *(without fees and taxes)* global market). A pattern contains an initial amount of energy due to a one-shot interaction between low level objects or patterns, mutating both items involved, eventually in a persistent but cyclic manner and in such a way that the partial energies at each appropriate level can compensate each other except for a small residual amount with potential external impact.
- This means also that the term "appropriate volume" needs to be a dynamic and relative concept, equally in cases where partners are involved in a series of local interactions but where end-to-end conservation rules apply over a long distance in space-time. An example is the long distance coupling with another compliant pattern, by a photon (at its lowest or "fine structure" level: a fotino sequence, that couples locally UZS zerons and zeron pairs along multiple *potential* equivalent and superposed paths) with the appropriate wavelength, emitted by a decelerated particle. *Another example is related to graviton (a dynamic pattern enclosing a persistent hole) density distributions with an impact on the large scale zeron-hole density distribution in the cosmos. In that case the term "appropriate volume" encompasses a full galaxy or even the whole cosmos.*
- *It is also useful to repeat that charge info seems not to contain net energy on its own. Otherwise (e.g.) a base law like "the charge info destructive interference capability" would violate an energy conservation principle. Nevertheless this assumption seems to be in conflict with the definition of energy itself: a compromise could be that charge info can transport energy but is unable to store it. When PhR proposes (see hereafter or eventually in other articles about PhR) a pre-polarization capability of charge info whereby multiple raster component paths are selected as candidates for effective coupling between particle-like patterns, such ordering process does not consume or store energy. Finally the emission law says that a point in the course of its life cycle is emitting charge info in an infinite number of directions in emptiness and at an extremely high speed compared to c, whereby summation of this info does not imply an infinite amount of energy. One can justify this statement by allocating an amount of energy to a point's charged state only, whereby the growth phase of its life cycle is due to the local impact of a <u>previous</u> external charge info quantum and the shrinking cycle produces on its turn an outgoing charge info distribution that will <u>later</u>*

successfully impact just a single point or location , a process respecting the principle of causality whereby the reset charge info comes necessarily from another antenna point than the initial point that emitted the growth cycle charge info quantum (think on the role of auxiliary transversal points in a point replication process) . Any successful impact does not produce energy for free as the coupling law and the FLN principle both guarantee that the net effect in terms of amounts of charge and charge info involved in each coupling event cancels out, be it over distinct locations in space and time.

- In a primitive cosmic state where point and zeron grids are still growing their sizes, the concept of "appropriate volume" is hard to determine: even the principle of locality cannot exclude statistically exceptional long distance effects, capable to guarantee the application of conservation rules (EPR effects). *Hereby the just mentioned pre-polarization effects are important. Pre-polarization does not change directly an energy balance but has (often temporarily) an impact on the local probability distribution of certain interactions, each of them with a real energy impact.*
- In the next chapters the term "energy" will be more specifically and more practically explained in a context of particle-like multi-zeron patterns.

- **Elementary point and zeron level interactions:**
- The definition and the use of the term "interaction" is another relevant example of generic definitions. In PhR terms it relates to structured quantized charge info exchanges between point patterns. The same definition applies in case of single zeron point replication where it refers to interactions in i-max and to the induction by inversion (*FLN and base-law compliant)* in the contracted state of a next zeron version. The i-max interaction between two neighbor zerons in the UZS is a process that has already been discussed in previous chapter. Other elementary interactions (and although they take place at point level) take place when zerons are integrated in multiple zeron-made patterns, meaning that the impact of the interaction is spread over a longer time period . Hereby terms like "connector" apply in case of point replication processes in a single zeron, as well as to double zeron replication in more complex patterns: the context should make this distinction clear.
- There exist only two primitive point pattern based types of interaction capable of mutating in a quantized manner, multi-zeron pattern connectors . The first simple case (what we call an axion exchange process) entails the single reversal of a DH-CH transition in the contracted states of two interacting zerons into a DH-CH-DH (or CH-DH-CH) sequence, which means that each mutated zeron carries locally a net persistent charge excess (+/-q), often observed over a significant part of the life cycle of a more complex replicating pattern (thus e.g. a DZ-DH-CH-DH-DZ … instead of a more probable zeron regime state sequence DZ-DH-CH-CZ…). *This reversal takes place without delay, meaning that it does not enclose a hole (this makes a notation like DH or CH not very appropriate).* As such interactions in case of complex patterns often encompass just a small number of component

states, symmetry can get lost leading to instability and decay of the pattern after one or several life cycles. This type of interaction demands at point level an h/2 action amount. *Being a direct point-level interaction, its probability is declining quickly at larger distances between random potentially interacting patterns . In Physics it corresponds with the (very short range) strong color force and it explains the low probability of uncorrelated neutrino interactions with matter. As a point level interaction it will implement a dense sequence of subsequent states, protecting more complex patterns against external perturbations in the course of their (growth or shrink) life cycles (see e.g. zeron replication in particle-like patterns).*

- The second interaction is the polaron exchange between two distinct compliant and coherent zeron pairs (see next chapter). This type of interaction, requiring the exchange of an action amount h, will increase or shorten the DH-CH (or CH-DH) transition process in the contracted state of one of both zerons relative to the other zeron's moment of contraction. To fully understand the implications of this relative phase shift, one needs to understand the role of these mutated zeron pairs in multiple-zeron patterns. *This interaction is similar to what happens in i-max as one of the potential interaction scenarios in a contact-EZP between neighbor zerons in the UZS itself (see also hereafter).*
- The axion kind of interaction induces, in each pattern involved in the interaction, an opposite energy quantum at zeron level by changing the charge type property of each patterns connector *zeron (in fact an at point replication level determined event)*; the second, a polaron type (a term in physics to name a quasi-particle *or virtual photon* – in this case it refers to the quantized hole state maintained by two phase shifted zerons – capable to change the local point-hole ratio density), stores initially in the contracted state of a central antenna (a case of constructive interference – law 6) a standard time quantum, expressed in point level τ units. In complex patterns it implements a phase shift between two coupled point-replicating zerons, an amount that will be often gradually "cumulated" and stored by an encompassing cyclic replication process at zeron level, a process that was itself the outcome of the initial single polaron interaction (see chapter 6). Fundamentally, both interaction types impact point level processes, but the terms axion- and polaron-type are applicable only when integrated in zeron level patterns, either in the contracted or in the return state. Both types can be combined for more complex patterns where multiple point level external couplings can take place. In equivalent terms in Physics, interactions are linked to elementary forces or combinations of those forces: an axion *(*plus *one or several* short range polaron *interactions in case of the nuclear force - the relative strength ratio of both components is 137- in QM differences in relative probabilities of quantum states correspond in PhR with probabilities and relative impact of either point or zeron based interaction types, being the discriminating factor of a particular multiple state spectrum*) could correspond with a *the color property of a gluon in case of a* strong force, a polaron with the electromagnetic force or with the gravity force, but the link between definitions depends often on the *lay-out and the* exact states and

distances of the interacting patterns. Further computer simulations have to confirm these relationships but PhR does not need forces: changes of cosmic states are driven by local *density* distributions in space and time of pattern states and by *probabilities of* interactions between those states leading to a *direct and/or delayed* changes in the pattern's configurations and properties. Pattern state distributions and interactions are base laws compliant and probability driven, not the result of the impact of any *abstract* force(s) . *Relative strengths of forces in Physics are related to probabilities of successful interactions in PhR (e.g. the factor 137 when comparing axion and polaron coupling probabilities with the relationship between the strength of the color force (axion) and the EM force (polaron)in Physics.* This does not exclude that pattern distributions show a large scale format *and corresponding properties* (e.g. gravity fields – see hereafter).

- As mentioned before an interaction between two standard UZS zerons in their i-max states (a hole connector with a charge connector *or two phase shifted charge connectors* -see point replication in chapter 4) has to be seen as an overall charge conserving but time (or phase) modifying interaction *whereby (in the latter case) the state of the opposite connectors of each point string have to be taken into account. It also means that a check of the CPT-conservation rule has to take the potential inversion of a pattern (the P-term) into account, meaning that the shorter branch becomes the longest.* It is not an ordinary polaron exchange *and we call an interacting dynamic UZS zeron pair a short-lived or contact-EZP*. The base laws, the rules of probability and the nature of the quasi homogeneous CPS / UZS raster exclude any other kind of breaches of the symmetry of space-time. It means that a consistent scenario for the evolution of our cosmos is strictly conditioned by just these two basic interactions, excluding other theories or hypothesis … at least if we accept the presuppositions and the base laws proper to this model.
- Once more we stress that, unless under artificial conditions (e.g. EPR), single particle interactions (see next chapter) take place at point level by short range charge info exchanges as described in this chapter, a statement that is PhR-conform and physically in line with a locality principle ("spooky actions at a distance" are excluded except under exceptional artificial conditions – see also viXra article about EPR phenomena).

6. Examples of zeron patterns and their link with elementary particles in physics.

- Zeron patterns and their life cycle are initially the outcome of the net internal charge info exchange by a pattern's quasi-ideal core antenna with another compliant "candidate" antenna in the neighborhood. Each antenna is a small subset of correlated zerons with particular properties, a configuration that has a certain finite chance to emerge spontaneously in a standard (or flat) UZS environment. The more complex the combination, the lower the probability of its spontaneous appearance in a UZS. An antenna's behavior is persistent or cyclic if its intrinsic symmetry in space-time assures that periodic internal and "fastest" successful

interactions between components (points and zerons) implement a pattern as the outcome of continuous, layered, consistent and interchangeable process, one that is resistant to the random, disruptive impact of external sources of charge info, at least if not in special or "vulnerable" states. Real processes might take place in slightly distinct formats, based on secondary discriminating property values (e.g. the earlier mentioned distinction in point density between paths in a point pattern's single zeron life cycle - a primitive form of pattern state degeneration and the outcome of the presence of a secondary discriminating property – in fact the contact scenario in i-max).

- The impact of a successful external (inter)action on such a zeron pattern's content or behavior, what we called a mutation or perturbation , might lead to a direct or a delayed change in its antenna format or behavior or to a secondary change in its point or zeron replication format in space-time. Successful external interactions take place exclusively in states qualified as "special" ("contracted I-null -" or "return states I-max" , universal terms already used for similar states at elementary point/zeron level).
- In our cosmos, we assume the presence at zeron level of only 3 distinct symmetry-wise perfect *(be it for a short time)* antenna patterns, i.e. zeron compositions with a decreasing probability of *spontaneous* appearance in a flat (meaning: unbiased by other patterns, already present) UZS. More complex formats than those 3 are for statistical reasons unrealistic (although not totally impossible, be it that they would be extremely short-lived for a lack of symmetry – see in this context observations reported by ANITA):
    - EZP: a dense (or compact or adjacent) zeron pair, each zeron in a relative 180° phase shifted interchangeable state (DZ & CZ - in fact an elementary electromagnetic dipole). *We could call this a selected contact-EZP between zerons in opposite point-charge states, enclosing a fixed hole tenor. An EZP as autonomous and persistent pattern is not proposed in this PhR model.*
    - EZK: a dense (or compact or adjacent) zeron-hole quartet, meaning a synchronous DZ-DH-CZ-CH state combination or two 90° phase shifted EZPs showing together a local regular tetrahedron 3D geometry and an equidistant and *persistent* time symmetry (PhR of the so called *Higgs or* "God's particle").
    - EZO: a dense zeron octet made of two anti-symmetric, in M-dim space overlapping EZK tetrahedrons with a common central symmetry location).
- For an EZO these rules imply additionally that the two composing EZK patterns show an opposite net point/ hole density sign (so each of them contains in any state a net positive or negative mass quantum). *We repeat that the term "positive or negative mass" refers to a different tenors of the hole states of contact-EZP in both EZK's . This extra discriminating property between EZK's is why we propose to replace the term anti-symmetric by contra-symmetric.* In chapter 4 we mentioned for the first time the idea of a *simultaneous* bidirectional charge info exchange. It might seem that there is no need for this assumption if the two EZK

replication processes contain anomalies that at point level are shifted over a phase angle τ (see earlier comments about the term "bidirectional") *whereby these fixed phase shift amounts apply for persistent opposite hole types in EZP's*.

- *In previous chapters there has been referred to the presence of numerous dynamic N-dim subsets of coupled zerons in an M-dim CPS, each with similar properties, a topology that permits the hazardous formation of phase shifted compact multi-zeron patterns like EZO's. In a single cosmic interconnected zeron network scenario, local dense 90° phase shifted zerons (as in an EZK) would have statistically no chance to emerge. The possibility of cross-coupling between phase shifted zerons that belong to different UZS subsets means that PhR rejects the idea of multiple parallel worlds in the cosmos, perfectly transparent to each other. The only exception to be made is for matter and contramatter patterns: after an EZO split, only axion-type interactions at point level between EZK and contra-EZK based patterns remain possible in special states, be it with an extremely low probability .*
- *In an attempt to increase artificially the probability of spontaneous EZO formation and the subsequent split in an EZK and contra-EZK in our present environment, (e.g. for making cold fusion possible) one needs to start from a dense complex and symmetric particle configuration (e.g. a Ni-crystal heavily doped with H), a raster emitting stochastically inverted charge info patterns that are EZO-like. But even in that case, an emission pattern will only be able to induce effectively "by selection " an EZO in a local free UZS volume, if the local UZS has a fairly balanced free zeron/contra-zeron pair density distribution (on earth this condition is not necessarily fulfilled - hereby we refer to the high local graviton versus contra-graviton density ratio as a main source of such disequilibrium).*
- Persistency of these ideal core patterns requires at point level small internal dynamic charge info exchanges, distributed and acting as the outcome of a stochastic process, that will generate small, interchangeable deviations from the hypothetical super-symmetric lowest energy state (otherwise, as stated before, bidirectional charge info exchanged between two zerons would annihilate (base law 6)- we refer also to the equivalent "Mexican hat" picture *for null-energy states* in particle physics and QM).
- A single axion-like charge info exchange would trigger in the two patterns involved (in, as far as dimensionality (geometry and phase) and mass type is concerned, distinct *dynamic* UZS subspaces !) two anti-symmetric replication processes that respect conservation rules *per EZK –based pattern*. The issue of coincidence remains relevant as this situation requires equally in order to be successful, an appropriate synchronization at point level of the two EZK processes and the *appropriate* distance between both zerons involved in the one-shot charge info coupling. This stringent assumption explains, once two EZK replication processes *out of* an EZO take off, why they are and remain "orthogonal" (*meaning: behave as autonomous patterns)*: a second interaction that could disturb both patterns life cycles, has no *or at least, little* chances to take place. Computer simulations to confirm this scenario are absolutely needed.

- *Once these two quasi-ideal EZK-like pattern states interacted successfully exchanging just once an axion info package with respect of all conservation rules, several types of directly or indirectly observable primary or secondary processes may emerge*.
- We remind once more that the capability of a simple point pattern to further increase its life time, its size and/or its format solely by reducing its dimensionality in point space, has already been exhausted by creating the primitive UZS superset. Zerons keep approximately geometrical diameters that are limited to an order of magnitude of *a double point with an orientation of subsequent versions distributed over a small high-dimensional sphere*, leading after reduction in dimensionality from M to N, to a number 137 as the amount of in phase (or time) shifted point *states* in a zeron string. It means that all elementary zerons are, except from mass (*which is a contact-EZP or double-zeron property)* about identical, be it because the lack of whatever other discriminative property in a "primitive state" of the cosmos.
- *We assume that isolated <u>persistent</u> EZP and EZK patterns (without local contra partners) do not emerge <u>spontaneously</u> in the UZS. Such appearance would imply a local unbalance in energy to be either delivered by another local process (like high energy collisions or unbalanced interactions between replicating subsets in more complex patterns – see hereafter) or to be compensated by an opposite unbalance of the same type like, it is the case in an EZO pattern.*
- Any further more complex pattern growth will be the outcome of *additional external* point level standard interactions with and between UZS zeron *components of other patterns or raster components* in special states. These selected zerons are dynamically added and bound along shortest charge info exchange paths, properly synchronized in space and time, with a core pattern and between each other, creating in this way growing spatially linear and/or circular or helical zeron sets, a process that takes *into account* the (*broken)* symmetry of core antenna's and the superposition law applied to the internal charge info exchanges *that will combine and release dynamically pattern components and extra UZS components*.
- **Examples are**:
    - **Zeron replication out of a mutated EZK nucleus**: e.g., a local bidirectional (or single – see earlier) axion exchange between two zerons of two coherent EZKs belonging to a common EZO, will trigger two anti-symmetric zeron replication processes, one in each EZK, along *phase shifted* path segments with geometrically orthogonal dimensions (a case of symmetry break between matter and contramatter). *Once more:* both EZK's replicate in superposition and are orthogonal, meaning *that they* behave as autonomous point and zeron cycle driven phase shifted processes, due to the small difference of order τ between phase angles of zerons in a matter or contramatter (DH or CH) point replication state. *The term "replication" refers to a process whereby superposed quantized charge info packages emitted by an EZK antenna with broken symmetry is copying its "inversed" content in the CPS-UZS along several symmetry*

based directions, (in space and time or phase – so alternatively left-right and charge-type inversed and FLN compliant). Hereby extra selected zerons are integrated into (or released from) the highly symmetric central parent or the previous pattern configuration. A growth process changes or stops when an internal symmetry based multistate combinatory process has been exhausted or when a "one shot" external interaction forces the replication process into a new slightly adjusted version or when the pattern in the contracted state "decays" into several autonomous patterns. In all these cases conservation rules will be respected.

Replication evolves along 3 dynamic perpendicular symmetry axes of each central dense 4-zeron tetrahedron, alternatively in opposite directions per axis. Further in this text the prefix "anti" refers to pattern types with an inverse geometry and usually with opposite net charge types. The prefix "contra" implies additionally opposite mass types. The symmetry of the antenna, driving this dynamic process explains indirectly our spatial 3D view of the cosmos, as polaron based effective interactions between connectors of two patterns with an EZK nucleus, PhR of what physics calls "observation", necessarily take place along (dynamic in N-dim) collinear (or in a plane orthogonal to) versions of one of their 3 orthogonal replication axes (*or even more general:" in such a way that charge info emitted by a properly phase shifted zeron pair reaches a candidate receiver along paths that maintain the initial critical polaron-like phase shift between the antenna zeron pair"*. Zeron replication is a process similar to point replication in a CPS *but the symmetry properties of the central antenna are more complex.* Replication patterns behave initially as local in amplitude growing oscillators around the core antenna's symmetry center. Each single growth (by selecting compliant UZS zerons in the "neighborhood in N-dim") and shrink (along the same axial string) process happens step by step and zigzag-wise according to its specific layout but *this intermediate pattern* is anyhow unable to move over the cosmic grids in the course of a time lapse between two successive contracted states. Indeed the central core antenna stands still versus the double CPS-UZS raster at least over a full growth and shrink cycle. For a central EZK antenna, only 3 local quasi-simultaneous (by charge info exchange driven interactions at a zeron's point scale) connections are needed to bind 4 zerons. The fourth zeron remains adjacent in space but not necessarily in local time and/or dimension, meaning that the phase angle of the 4^{th} zeron's internal point replication cycle might be, in distinct point dimensions, phase shifted relative to the other three zerons. Phase shifts are quantized and expressed in τ units. The role of this 4^{th} "***free zeron***" is dynamic (it means that a priori each *of the 4* EZK zerons could play this role whereby in the course of a complex replication process, multiple compliant UZS zerons in superposed dimensions become phase shifted copies of the initial zeron version in the central EZK). This fact and the

high intrinsic number of dimensions of the UZS raster, imply that multiple phase-shifted versions of a pattern can be present in quasi superposition within a small N-dim volume, without destroying some fundamental properties of the EZK core antenna (e.g. its "partial" geometrical symmetry). In the same context, processes being the basis for rotating or interchanged discriminating properties in the pattern (originated as a result of point and/or axion perturbation) over interacting components in special states , will be called "dynamic role interchanges". In an EZK these interchanges are driven by point level charge info exchanges between each other or with external zerons added to a in complexity growing pattern. This leads to stepwise variations in phase angles of subsequent (free) zerons involved in the superposed (meaning: in separate dimensional sets) versions of the initial EZK pattern. To be more specific: the intrinsic 3D symmetry of an ideal EZK will lead to 3 orthogonal, about simultaneously growing subsets of zerons. The role of free zerons in an EZK core antenna of a replicating zeron pattern, is crucial to understand physical reality in relationship to many results of observations in physics. Dynamic role interchanges and symmetry *based conservation* rules *at the time of an EZO split,* imply that two opposite senses of rotation exist for matter- and for contramatter- like EZK patterns.
What the terminology is concerned: the 3 dynamic virtual perpendicular directions along which an EZK nucleus is replicating are called phase shifted (zeron) strings (equivalent *of non-PhR conform* quarks in Physics). Connected EZK copies spiraling in superposition along multiple dimensions (due to at point level interchanges within the central EZK and charge info exchanges between growing string connectors and the central EZK) take place along 3 main EZK symmetry directions. They grow alternatively at both ends of each phase shifted string. Each zeron chain forms one (or several in case of multiple, in subsequent versions distinct linear replication schema's) *dense* axial string pattern. Due to role interchanges in the central EZK, it must be clear that, observed in an abstract fixed central reference frame with origin in the symmetry center of a central EZK, the 3 multiple subsequent perpendicular axial strings have a dynamic orientation that does not coincide with 3 (virtual or abstract) fixed symmetry directions of this reference frame but, have zeron pairs as their antenna, regularly distributed along 3 *virtual* double conic surfaces around each central virtual symmetry direction). E.g. in case of a **baryon-like** replication schema, each line thru the apex of the *virtual* cone *in space and time (or phase)* in the center of the EZK, corresponds in fact, **in superposition along multiple symmetry directions,** with simple single **electron-like** axial replication schema's. *The symmetry properties (like the virtual top angle) of this virtual cone depend on what happens in space and time in the central EZK whereby one has to be very careful when speaking in terms like "rotation": subsequent orientations and geometric states of*

axial strings should be maintained in the course of a single growth and shrink replication cycle (computer simulations are once more needed). In a single electron-like schema every dynamic connector or knot with index I adds 3 new zerons to the patter and shares one zeron with the previous knot with index (I-1). The shared zerons form a collinear by charge info exchanges connected chain, in fact a growing and fastest (*or dense)* axial replication string, the two other zerons a local transversal string. One of them is tightly coupled (with a fixed unit phase shift) with the local axial zeron, the others show a circular distribution and are phase shifted. The axial zeron of a connector with index I maintains its charge type I times by well synchronized charge info exchanges with all enclosed knots and does not change its position. The free transversal zeron versions change their positions and phase angles and are *regularly* distributed along circular paths around the axial string. Each time the *local* value I is reached, the axial zeron flips its sign *(the net charge content of a replicating EZK is a conserved quantity)*, the tightly coupled zeron does the same, whereby it interchanges its role (phase) as fastest connector zeron with the previous axial zeron, and the string is lengthened (new index I+1). The phase angle of the free transversal zeron is increased by a factor 2τ. This schema can be described as an *FLN-conform* process of making *multiple (inversed)* copies (+/ -) of a central EZK antenna and of all previously enclosed knots with each other and with a central EZK that is rotating thru internal role interchanges. The growth *rate* of a string decreases in speed with increasing I value because a higher number (I-1) of enclosed knots is involved in the replication cycle *and the next growth step*. The whole process takes place with respect for conservation rules and the base laws. The *phase shifted* replication cycles at both ends of a string are isolated and independent from each other (two branches), except indirectly by their interactions with the central EZK (this is important – see later in this text). They are τ phase shifted versus each other, materializing an unsuccessful attempt to compensate each other's impact on the cosmos (FLN principle). The application of the superposition law and the fastest connection rule on the charge info exchanged between all zerons of an axial string and the central EZK guarantee the co-linearity, *the density (axial zerons flip their excess charge without delay)* and the orthogonal orientation of each single axial string version. *Density means that linear axial substrings are made of zerons that keep an excess point with a fixed charge type over a number of life cycles, increasing linearly with the value of the I-counter. This is the outcome of internal charge info exchanges and it means that for a particular pattern class the internal lay-out is fixed and not sensitive for external charge info-like perturbations ….except in the I(max) or return state.* Replication as a dynamic process (we must never forget that all point *and zerons* involved in replication maintain their proper *internal* growth-shrink cycle – in the contracted state they can well or no flip their charge

type) is respecting the conservation of the net excess charges but not necessarily of the net hole excesses in the connectors *(in fact they never do in an hypothetical isolated pattern, but any interaction with another compliant connector can slightly change the hole tenor of a transversal zeron pair)* . They are the outcome of the initial symmetry break in the EZO but depend also on the complexity and the duration of the replication schema. This aspect determines the relationship via $h/2 = \delta E^{*}T$ between internal energy (and mass) and the replication period and obviously the differences between (e.g.) the electron- and proton-*type* mass *(and implicitly: between their replication schema's)*. *The link between internal energy, particle mass and the complexity and the tenor of a replication process must take into account that such schema might contain two types and sources of energy and time: charge- (info) and mass- or hole- like. For charge-excess based energy in complex schema's, (proton-like) T will be lengthened without increase in charge excess if the sign of a partial (electron-like) axial string version flips periodically in the contracted state. Hereby the embedded hole-type remains the same and contribute to the total mass of a complex replication schema.*

In the contracted state of a single axial string, the inversion process of the pattern versus a central symmetry location implies that left-right copying takes place in space and in time, thus including a *by a* phase jump τ *quantized anomaly*, so that in the new emerging long branch of the string, the connector zeron's I-max state is still the "fastest", ahead of its contraction state. *The format of a connector- set when passing thru the contracted state will change because charge types and roles of each zeron pair will be reversed: it takes four CPT-compliant contractions before a baryon like (and an electron-like spin ½) particle shows the same I-max connector configuration state.*

For **baryon-like** replication schema's multiple superposed connector states carry phase-shifted copies of the initial anomalies, observed by physics as fractional charges. The initial asymmetry in the central EZK does not disappear globally at connector level but the rest of the zeron content of both branches is step by step adjusted: this means that except from both connectors, a string has a balanced effect on spacetime (the CPS/UZS). So in fact, the impact of the initial symmetry breach *in the central EZK* is spread over a growing spacetime volume. The index-length of this subschema expressed in number of phase shifts in free transversal zerons of a chain before it starts shrinking, is also determined by the potential initial offset value of the corresponding free zeron phase in the central EZK, as well as by periodic resets thru internal axion exchanges, responsible for role interchanges in the central EZK and ultimately in the zeron configuration of the 6 dynamic connectors. A correct description of this process must allow a correct computation of the mass of stable baryons (*at least in relative terms)*. Hereby the cyclic nature of a point and zeron life

cycle has to be taken into account. Idem as far as phase shifts between the branches of a replicating string is concerned. Computer simulations are absolutely needed to describe correctly the sequence all the changing quantized states of the components of a baryon pattern. *Also the difference between a neutron- and an anti-neutron schema has to be explained.*
In case of single **electron** replication processes along narrow strings with a fixed orientation, no axion exchanges between connector zerons of neighbor string *versions* can take place in the central EZK: role interchanges do not impact the axial zeron pair of a string), what makes this schema more straightforward and explains why the electron mass is much smaller (see next paragraphs about energy and null-mass of particles) and why its magnetic spin type is persistent (axion exchanges in the EZK or between connector versions of baryons flip the sign of the free charge) and much larger (*a factor* as determined by the ratio between a proton and an electron mass). For each schema and each axial string version, the gradually *selected and* added (two sided and in 3D) zeron pairs (or knots or dynamic connectors) are (for baryons over a full tour) indexed by a main natural number I. The absolute I maximum value (or return state where the full growing pattern starts to shrink again) is called I-max: the virtually rotating connector zeron (or hole) set in their I-max state determine the external interaction capabilities of a particle pattern. A process of alternative and anti-symmetric growth at opposite ends of a string and although slightly phase shifted, has a compensating effect for what the net impact of the coupling charge info of both substrings or branches on the central antenna pattern is concerned. As mentioned hereafter, a full replication process of a stationary complex pattern might require several contractions before it shows again an identical format, in fact the outcome of the 3D symmetry of the central antenna, the bidirectional dynamic replication cycle in three orthogonal directions and the complex 3D inversion process of the nucleus in the contracted state. All these processes are ultimately driven by the base laws, each time when charge info emitted by the 4 EZK zerons couples with their next versions in the contracted states. Another already mentioned but important property of an EZK-driven replication process is that knots are coupled by interactions along fastest paths, leading to *dense* axial string zerons being tightly interconnected. This means that a string growth rate (the time needed to reach I-max) can be expressed as an exact multiple of τ. Consequences of this statement are that all (e.g.) protons (*and electrons)* have the same null-mass and that accelerated particles with lower I-max values and moving over the double grid, store multiples of quantized amounts of energy *and that there is a fixed ratio between null masses of protons and electrons*. This form of quantization explains why physics is able to use equivalent mathematical models and laws to describe successfully nature's behavior, *even for particles that are just dynamic compositions of points* .

To fully understand the multidimensional replication schema in case of baryons, computer simulations are needed. One of the crucial questions is the way elementary *(or partial)* electron-like growth and contraction processes are distributed in space and time over the 2X3 virtual cones. These cones are the outcome of the fact that in a central EZK tetrahedron the symmetry directions *perpendicular to its ribs* do not coincide with the 3 orthogonal *crossing* axial 2-zeron replication directions. So either the partial electron-like replication cycles all take place in superposition at point level in combination with a dynamic, multidimensional and at point level phase shifted and rotating EZK nucleus (the role inversion process), or each partial growth and shrink replication cycle is fully completed at zeron level versus a fixed EZK orientation. In the latter case the conic format is just the statistical distribution of subsequent (*electron- or positron-like)* particle versions that are observed by physics as a single pattern with a fixed global mass. This hypothetical process would only be acceptable if the "subsequent- version- distribution over a virtual conic surface" set is owner of an additional property (an extra quantum number) to identify the subgroup. It should determine the begin and the end of this multi-level replication process. Although in this text we opted for the "at point level" multidimensional superposition solution, this choice remains to be proven: in an N-dim UZS it is not excluded that around a common symmetry center in an EZK several superposed versions coexist. The issue is: it seems to be impossible that multiple axion exchanges in superposed EZK's in a EZO could initiate simultaneous replication processes in distinct dimensional subsets around a common symmetry center. *On top of this, at any time the net charge excess of a replicating pattern must be limited to a single point charge. In next paragraphs where by physics observed baryon sizes are discussed we come back on this issue.* In fact and more generally: we accept that interactions are reducing dimensionality. Anyhow baryon-like replication must induce observable properties compliant with baryon properties in QCD (physics). For more details about the rather complex process of zeron replication out of an EZK, see also appendix A.

It is useful to mention the fact that pattern growth by replication requires a very fast and efficient selection process of appropriate elementary building blocks in the UZS. In this context a few comments can be useful:

- *Pattern growth is a perturbation- like process, as observed on the scale of the UZS raster: the density of "free" zeron states (in space and time or phase) is high enough to permit a fast, efficient and cyclic growth and shrink processes of replicating pattern strings. This statement is based on the fact that the by science estimated size of a proton is of the order of 10.exp(-15)m and that the in PhR proposed 2-point size of a zeron is of the order of 10.exp(-35)m.*

- *If that would not be the case, the time to shrink a pattern into a contracted state could be much shorter than its time to grow what we reject. Without computer simulations or extremely exceptional situations (e.g. (contra-)graviton densities in black holes) in conflict with this assumption, the perturbation principle is maintained.*
- *Computer simulations of simplified replication processes whereby 3D pictures of reduced numbers of zerons and internal zeron replication states are shown need to use colors to identify phase shifted zeron versions.*

- **(EZK based) Particle formation:** *In a PhR context any more or less stationary pattern of raster points and zerons could be called a particle (or contra-particle). As this model will refer to Physics in order to check its validity, names and types of "particles" treated by this article are limited to a subset of patterns as defined in particle and quantum physics.* In a young cosmos and/or in flat environmental conditions, the emergence of chiral (in CPT terms – *so the differences in PhR go further than just left-right turning transversal strings*) particle pairs is another example. Indeed, one of the previous replication patterns (a baryon with an even number of electron-like substrings) matches (in physics and PhR) a neutron, while the partner is, at least in PhR terms, a dual contra-neutron. The latter is almost impossible to be directly observed by "matter-made" observers (connectors of matter and contramatter patterns do not interact by polaron coupling (EM coupling in Physics)- their embedded holes have slightly different life times and the charge info patterns emitted by both zerons do not fit those of a particle connector *of the other type*) and they show by convention negative internal energy and mass ($-E=-mc^2$). In order to take sufficiently often place and as proposed before in this text, such spontaneous process requires global (in a young cosmic slice) or at least local flat conditions (i.e. zeron- state- related balanced hole *type* densities, extremely rare in our present local cosmic region, except under special or artificial conditions). Hereby we mention, as a special source of local *short-lived* flat conditions, the "polarization by selection" of a small enclosed double raster volume by compliant anti-symmetric connector configurations of two "head-to-head" colliding particles with extremely reduced string lengths (a standard procedure in particle accelerators). This situation can lead (being a stochastic process that must respect all conservation rules in order to take place) to the emergence in this central volume of short-lived complex combinations of anti-symmetric or even *(invisible)* contra-symmetric pattern pairs. They oscillate around a geometrically common symmetry location as a phase –shifted combination of an EZK and an anti- or contra-EZK state. They are often observed by physics as single complex spin-1 particles (meson like - see also unstable particles hereafter). It is important to accept that, even under non- artificial

conditions (like those in *colliding* accelerator *beams*) and *even* in a large non-flat spacetime *(or UZS)* volume, there will always exist a small probability that for a very short period of time, local conditions are such that EZO's emerge and split spontaneously into replicating matter and contramatter

EZK pairs (they could be a potential source for cosmic (particle) rays, *in particular when they come from distant UZS volumes with low particle and contra-particle densities at the border of a galaxy*). *In the UZS two contra-symmetric subclasses of replicating patterns will emerge and take place in parallel. For tightest (without embedded holes) single zeron couplings along axial strings there is no difference between both pattern subclasses but transversal EZP pairs make use of short-lived contact EZP's with a different fixed- tenor- value for particle class members, of order 2τ. This is important when it comes to polaron interactions between 2-zeron connectors of neighbor particles in I-max. It also supports the assumption that replication processes that belong to both subclasses do not interfere with each other by hazardous polaron-like charge info exchanges. In order to justify a similar assumption for the extremely low probability of spontaneous axion based interactions between patterns of both classes, low densities in the CPS need to be presupposed for particles and/or contra-particles in general. This makes sense if we compare estimated point-units (e.g. τ – in fact Planck order of magnitude in space and time) with (e.g.) an "observed" proton size in physics (order of 10exp(-15)m whereby its 4-zeron central Higgs (each zeron is a 2-point pattern) can be estimated to be of order 10exp(-35)m. The latter is hard to prove and should be the order of magnitude of the (un-measurable) size of small particles like photons, gravitons and e-neutrino's. It also means that effective I-max numbers can be high what is anyhow required if one takes into account that the swing in velocity of (e.g.) a proton can vary between null and about 300.000 km/sec whereby the stepwise increment in momentum values is small (see hereafter). "Effective " means that in a life-cycle of a baryon like pattern several electron-like sub-cycles with each time a reset take place. For a sub-cycle the index-limit for a slow-moving pattern is anyhow 137.*

We also have to take into account that in physics, estimations of the size of elementary replicating particles (baryons and electrons) are based on their capability to interact "at a certain distance" with (e.g) photons or other particles. Hereby pre-polarization effects (certainly for electrons that maintain their charge excess in a string connector in the course of a replication cycle) can be misleading. In the literature the size of the connector quarks of an electron is estimated to be smaller than of that a proton, although the particle length based on its ability to interacted is larger !

The time lapse required for a replicating electron axial string in regime, to grow from I=1 to its I-max value, is an exact multiple of 2τ what means that the details of this dense ongoing process will never be observable (observation means interactions with connectors in I-max), but equally that all items (e.g. electrons) of the same class have similar internal formats and properties. What is not fixed is the time to inverse a pattern in a quasi contracted state. This has to do with the variable tenor of the complex internal replication process within a central EZK under the impact of, and the interaction with transversal zerons and connector pairs of the two branches of three strings. Hereby the EZK's "free zeron" configuration (see hereafter and see appendix A) is sensitive to the impact of former external interactions and depends on the I-max value . The delay is also slightly different for matter and contra-matter (different hole tenor) EZK's and particles (see hereafter).
It is important to stress that the orientation of a replicating axial string of an electron remains fixed along each rib of an EZK tetrahedron in the course of a growth-shrink cycle, where in case of (e.g.) proton replication, only the (observed average) orientation of such direction is perpendicular to initial opposite EZK ribs. Hereby virtual properties like cones and ribs need to be "treated with care" at the scale of a central EZK whereby terms like "superposed states" have a geometric and phase (or time) connotation. This is important when calculating interaction probabilities (coupling factors) in colliders for both particle types.
When a replicating EZK based pattern acquires momentum (see hereafter "particle motion"), its I-max value will change, a phenomenon that has an impact on the subsequent superposed free-zeron states of the central EZK, in particular relevant when the pattern is contracting . This impact is significant for short strings with small I-max values (speed values close to c), leading to a non-linear increase of mass-values (see Lorentz formulas).

- **Circular or rotating zeron-level replication of a persistent EZP pattern (PhR of gravitons and dark matter / dark contra-matter):** *In order to be persistent, an EZP needs to behave as a "particle-like" autonomous pattern, able to sustain an embedded local-time quantum (or a hole or a relative phase shift amount of charge info) in the contracted states of an enclosing zeron pair. However without an extra (cyclic) coupling process it would be hard to explain why a single EZP could be persistent and why it would maintain the same type of embedded hole (or phase shift) over subsequent versions.*
As a comparison, a next (in phase and space distinct) version of a primitive short-lived EZP (a contact-EZP in the UZS) changes its external contact type in i-max each time randomly and might switch as a result, the mass type of the enclosed hole in that state, depending on the fact that an interaction between neighbor zerons implies a conservation of charge by

reset of a point or by induction of a point (in fact CPT conservation rules need to be respected in i-max per zeron and per contact-EZP pair). Such process can change the tenor of the hole states of a two-zeron contact whereby overall density (and energy) conservation remains guaranteed. The stochastic nature of inter-zeron contact in the UZS is even more stressed when taking into account that a zerons 2-point orientation in the contracted state is not fixed but has a spherical distribution. However if an EZP is part of a stationary replicating EZK, <u>its hole type or tenor remains fixed</u> for any matter (or contra-matter) pattern.

Hereafter we will also see that the total impact of an initially by a polaron interaction accelerated (or decelerated) EZK pattern, is complex: a unitary (*or quantum-)* increase (or decrease) of its momentum, a reduction (or increase) of its I-max value, a position shift on the UZS grid, the emission (or absorption *as polaron source*) of a photon quantum, the increase (or decrease) of the offset value *and dimension* of a *superposed* central free zeron and the release of a rotating dynamic charge neutral-EZP that stores persistently a unit time shift of a specific sign (left or right turning) and type (positive or negative mass, reflecting in fact *a* slightly different hole tenor – *in fact a graviton*). The total impact of all these phenomena must respect global conservation rules. In this context it is important to stress that the exchange of action quanta that are "polaron like (including neutral-EZP's)" are *in fact* exchanging a time quantum: an action amount is a convolution of time and energy but a hole as such does not contain energy. Its energy impact *on the cosmos* is only indirect by changing the local point-hole density ratio and this can lead to a change in what is called *in physics* "potential energy" of position shifted objects *in a curved field*. One could say that direct observation of *persistent (charge)* neutral-EZP's *(in fact gravitons or contra-gravitons in Physics)* will always remain a problem because their energy impact *on a particle-like pattern just* leads to a change *in coupling probabilities in large graviton density fields which is not observable as a property of the pattern itself: it refers to its position within a large scale geometry (like a galaxy) in the UZS* . In physical *or engineering* terms *and as a quote, circular neutral-EZP patterns* are just punching (or inducing) *quasi-persistent* holes in spacetime! *Their presence is a cause of non-flatness of the local UZS on earth, what could determine the probability of the emergence of energy-for-free based "spontaneous" EZO's in the UZS.*

Anti-symmetric sequences of processes and properties take place in case of acceleration and deceleration. In case of a position shift without acceleration/deceleration (*in a flat UZS)* there is no net change in I-max and no photon emission /absorption *but the relative position of a local graviton and a particles central location are interchanged*. The local neutral -EZP density before and after a "move" must be *quasi* maintained,

neglecting *hereby* the *impact of the relative* small position shifts of the particles EZP holes.

- **Momentum and particle motion:** Momentum as a pattern state property and momentum conservation as a rule governing particle interactions are complex topics with an impact on many domains in physics. What the latter is concerned we treat in this paragraph the simple case of particle-to-particle collisions between two EZK based replicating patterns (in physics: elastic collisions in a closed system). On top of these artificial collisions, the impact on average I-max values of gravity-like phenomena (or more generally: any position related terms in a Lagrangian formalism) will be mentioned. The cases of motion at constant velocity as well as acceleration of a particle are treated but deceleration is a similar process, taking place under anti-symmetric connector state conditions and interactions. The emission of photons as the outcome of interactions with an abstract "EM field" (Physics), able to change the net energy content of an individual pattern, is analyzed in a PhR context. Finally we refer to relativistic effects, appearing at a speed close to c (or: for small I-max values, the equivalent in PhR terms). What we intend to prove is that the proposed combination of pattern replication processes and interactions in PhR terms, offers the flexibility to explain whatever physical statement or observation of momentum-related effects, be it in classical physics, relativistic or ordinary electro-mechanics, QM, gravity etc **…**
  Polaron-type charge info exchanges, as the *base* of an interaction between connectors (a long and a short branch connector) of two compliant patterns in a strings I-max state will export or import a point level unit phase shift, producing in a replicating particle a change in momentum (and most often in energy). This import takes place asymmetrically at one end (most probably in the short branch connector – to be confirmed by computer simulations) of a string. The replication process will carry this perturbation, in fact a unit (2τ) phase shift quantum at point level and stored it in the transversal connector, repetitively and zigzag wise and with inversion *of the enclosing zeron states (the hole tenor remains the same)* when transiting the contracted state(s). As a result and after a number of contraction cycles *resulting in a position shift* (a number decreasing for smaller values of I-max) an increased phase shift amount will be stored in the free EZK zeron(s) *set* of the appropriate string: its cumulative net phase shift at point replication level is added eventually to an existing offset value, acting as a cumulative memory of previous perturbations for small I values – see hereafter). The outcome of an initially once mutated replication cycle will be that the central antenna pattern will be able to shift periodically over one axial zeron position quantum over the UZS raster *along the same virtual direction*.

Without a new external perturbation this process will repeat itself at a constant pace because a position shift after acceleration will decrease the I-max value (and the string length) of the pattern with one unit, dropping a net *charge- neutral-* EZP pattern in the UZS (*a graviton)* with a position and a polaron content that is adequate to be absorbed by the short branch connector in the I-max state of the next anti-symmetric replication cycle (see also hereafter *in a chapter about gravity – in an existing non-curved neutral-EZP density raster volume, there seems to be no need for a re-absorption of the EZP, just released by the particle itself after acceleration, in order to explain momentum conservation. However we propose to maintain this fundamental principle at the time of the very first acceleration of a new particle/ contra-particle pair when both patterns have zero momentum on a local grid without any pre-existing contact-EZP density gradient (an "empty" UZS state, in fact the null limit of a flat gravity field), in order to gain and sustain momentum but also to release and build up gradually a graviton field in the cosmos. Computer simulations are (once more) required. Hereby we should take into account that local flat conditions require that the UZS itself is everywhere locally and on average, contact type neutral in i-max states, a statement that can never be confirmed in 100% of the statistically spread inter-zeron contact scenario's, and certainly not if we take large scale superposed distributions of matter / contramatter volumes in our cosmos into account.* EZPs involved initially in an effective external exchange either belong to two properly aligned, oriented (dimension wise) and time compliant particle *connectors,* situated at small relative distances, or to one particle and one field pattern. In the first case the charge info carrier is called a virtual photon in physics and the polaron (*as a pattern*) transport is facilitated by a zeron (*pre)*polarization string (see further also – Coulomb *or Gauss* field lines) between particle connectors in compliant states. In the second case (a field *particle* interaction) coupling might be either EM field (or photon) based or gravity field *(or graviton density distribution)* driven. A successful EM coupling is facilitated by an excess charge connector of a fotino particle (in PhR terms a real short living elementary component of a photon, a pattern with a double superposed *and inverted* EZK core and a *unit charge* density *with varying charge type* observed in physics as the *instantaneous* E component of an EM wave) but the EZP charge info *density* pattern itself corresponds physically with the B field component of a fotino. *Photons in this concept are in time varying densities of fotino-like micro-patterns with an autonomy and net action impact only after a full wavelength, synchronously with the replication process in an accelerated particle antenna string . Each effective coupling requires that an EM wave exchange process is properly synchronized and transfers multiples of full h action quanta from sender to receiver. In this concept a single photon can behave as an autonomous particle, able to propagate as a pattern over*

long distances. The net energy quantum of a photon is transported and finally exchanged between sender and receiver as polaron type energy: a photon does not carry net charge. The E-field property is the outcome of a phase shift between transversal EZP zerons in the antenna string. Propagating as a micro-pattern, it makes use of the UZS in order to replicate and to induce subsequent versions. Hereby the local availability (or density) of "free = not engaged in other patterns" raster elements (that will depend on the local density of other matter and contramatter particles and patterns) will have an impact on the effective velocity (as a vector) and the polarization state of "propagating" EM waves (or photons). This statement is in conflict with physics when it says that light (or EM waves) is able to propagate in <u>empty</u> space-time. If a photon is behaves as a particle (in both, physics and PhR, whereby it has the size of a few Planck-unit lengths – (10exp(-36)m) it would be unrealistic to suppose that (e.g.) light bending could be determined by interactions with raster elements that are themselves (e.g.) 10exp((10m) apart. In PhR the local impact of these raster elements on the free zeron state distribution in the UZS and on the path selection by a propagating particle is the answer to this issue. A similar statement might be repeated a few times in this text for other pattern types.

Coupling with a gravity field particle (see hereafter gravity - gravitons and neutral-EZP's) is the second possibility, assuming that this field is a distribution of neutral- EZP densities that have been dropped "recently or historically" by moving or accelerated or replicating EZK based particles.

If a direct polaron exchange takes place between two particles with the same mass type (either matter or contramatter) the I-max values of both will be adjusted after some internal shrinking and growing replication cycles (in QM: an exchange of virtual photons with respect of global energy conservation but with different momentum impact on each pattern). Computer simulations are needed to confirm the stepwise transformation of the global replication schema's into new stationary pattern versions around an over a quantized distance on the double grid shifted symmetry centers (eventually with the release of (a) difference pattern(s) like photons, gravitons, neutrino's - see hereafter).

In case of an interaction of a charged particle with an EM field (particle-EM-wave collisions in Physics with overall conservation of energy and momentum), an external photon will be absorbed and disappears as a pattern but after a certain delay it will be replaced by a new free propagating photon with updated properties (a modified wavelength and orientation, a process taking energy conservation rules into account).

In case of an interaction by absorption of a graviton , its original micro-pattern will decay into standard UZS components but a new version will reappear in a position shifted location (see hereafter) .

Effective coupling between emitters and observers of polaron-like charge info, taking the multitude of quasi-simultaneous parallel charge info emission patterns by different connectors in an high dimensional CPS-UZS raster and taking the superposition law into account, is a matter of a coincidence and unavoidably subject to statistical rules. In case of a direct coupling between two particles, we do not even know in advance *and with certainty* for a single coupling which of both will be the emitter or the receiver. The ultimate target that will couple successful with the emitter is hard to predict but has to respect an adequate statistical distribution and must respect end-to-end compliancy and conservation rules. If polaron-like charge info is carried by a multitude of short living and locally coupled fotino particles along superposed *potential* trajectories, the *selected* path(s) in the appropriate dimensions and the end-to-end partners that will couple successfully when a photon emission cycle is complete, can only be predicted in statistical terms and taking charge info superposition rules into account (e.g. double slit experiment in QM – *see hereafter pre-polarization effects and the unfortunate use of the term fotino in this context*). This statement is not valid for a *single* ordinary *photon itself*: this micro-pattern cannot be the receiver of an extra energy quantum The unit "UZS raster distance per displacement" for EZK based particles is the same for every successful contraction event set, by which we mean that its by observation perceived velocity is determined by the frequency of these effective contractions (PhR of e.g. a "de Broglie" wavelength, the particle-wave duality and the quantum nature of momentum). This frequency depends on its turn on a pattern's layout (complexity and its internal symmetry – they determine the duration of a full replication cycle – *to be assimilated with a particle mass*) and obviously on the I-max value (in fact a unique quantum number of a particular replication cycle). This PhR compliant process justifies the use of a second order differential equation to describe a particle's motion according to Newton's law in Physics, at least for speeds well below c. I-max has the value "1" as its lower limit, so a particle's maximum velocity must be limited to some fixed absolute value on an homogeneous non-biased UZS grid (this PhR based deduction is in accordance with Einstein's fixed c value in SR). We also stress that the I-max value in an EZK pattern is the same for the three orthogonal strings but as their individual replication schema's *at connector level* are 240° phase shifted (in a spin ½ 720° replication schema, *determined by the subsequent states of the EZK core – see hereafter*) and because the next *most* successful external polaron coupling will be driven by the "fastest growing" connector, the relative phase shift between connectors (that is changed by external interactions) determines (*in terms of probabilities)* the *most probable* direction of a *next* successful displacement quantum exchange.

Successful polaron exchanges between two EZK based field particles *(a very rare phenomenon ??), a particle and a field particle* or *two* ordinary particles require local and instantaneous collinear or at least coplanar axial strings (the angle between both is a measure for the success rate of the coupling – *the" fastest growing connector" rule does not exclude for 100% a successful external coupling with an I-max connector of a 240° phase shifted transversal and coplanar string leading to bending of a particle propagation path – see hereafter*). Notwithstanding rotational freedom in the contracted state of multiple subsequent particle versions (in QM implicitly considered to be superposed states instead of subsequent multidimensional phase shifted states in PhR) frequent long-range polaron based interactions with other particles *(mostly graviton distributions)* will "force" complex patterns into an interconnected network with seemingly global 3D dimensionality and properties (as accepted in physics). Ultimately, the distance expressed in raster units (space and phase and taking distinct DH and CH (or zeron / contra-zeron raster densities into account) and the symmetry properties of two interacting connectors determine what the effective impact of a particular polaron exchange will be, not just on how their absolute velocities will change but also in which direction the patterns can or will move. Hereby the two particles in their connector I-max states need to be compliant, taking (e.g.) their spin-1/2 replication schema's into account: not every distinct zeron pair state combination of connectors involved in the 4 successive replication cycles, will be compliant. The inversion processes of connector properties in the contracted state of a replicating pattern guarantees that viable combinations allow quatized motion in the left or right direction in a fixed reference frame and acceleration as well as deceleration of a particle (increasing or decreasing I-max values) with respect of overall conservation rules. The fact that two particles, owners of "free" charges of the D or C type, attract or repulse each other (Coulomb' law) is just a logical consequence of this subtle selection mechanism (see hereafter also *the important role of* "Coulomb *(pre-)*polarization").When a non-accelerated particle moves (*in a "flat" gravity field)* one position over the grid, it restores the neutral-EZP density in previous location of the hole connector in I-max but it absorbs an identical EZP in its new position, taking the symmetries of a typical space ½ into account. In a flat (EZP density) environment this process does not lead to any change of velocity, it does modify eventually slightly the local average neutral-EZP density distribution in spacetime (GR - Einstein tensor equation compliant) and it is in line with Newton's law on particle motion and momentum conservation. On the other hand, in a "large" realistic central symmetric Riemannian spacetime volume, curved geometrically along radial directions, the probabilities of absorbing and releasing a neutral-EZP in critical states of successive replication cycles, are not equal towards and away from the central condensation volume, what leads to

radial acceleration and displacement of a particle, the further increase of a spherical neutral-EZP density distribution, but equally (be it with a lower probability) to a small tangent planar motional component).
So a contra-intuitive but PhR compliant statement says that a single version of a particle never moves over the grids. Physics observes in fact the path in spacetime (or on the UZS grid in PhR terms) that is followed by subsequent position shifted and short-lived versions of a particle pattern, connected by appropriate charge info exchanges in their contracted states. *This makes it clear why the speed of propagation of a particle-like pattern (a stochastic process) depends on the availability of free UZS building blocks, enabling successful copying at a constant pace of new versions on the grid of patterns, owners of an appropriate asymmetry in their replication schema's: e.g. the speed of a light particle in glass is not the same as in vacuum because the dense solid state presence of glass particles is disturbing the normal availability of free zeron contact-pairs in the UZS.*
It is important to notice that the dynamic connector *states* of a particle in transition mode show temporarily an internal charge info exchange pattern along fastest paths that protects them against an additional external polaron coupling: only just after an effective position shift *of the central EZK* over the grids, internal particle symmetry has been restored, enabling a new polaron interaction. This is apparently not in conflict with a particle moving at constant speed over the grid (Newton's law): this process is driven by the flexibility of the free zeron *states* in the central EZK pattern and/or by picking up a polaron in the opposite branch of the string in I-max of a next replication step: in fact by coupling with an EZP, released *once* as the excess connector at the opposite side of the polaron carrying string *(it will be released as a new position-shifted graviton in the contracted state- see hereafter)*, when the pattern was moving one step over the grids. This proposal works because the I-max value and subsequently the branch lengths of particles moving at constant speed, have values that oscillate between two successive constant values (like a *virtual* combination of an acceleration step, followed by a deceleration or vice versa) and as a consequence of the connector properties of the 4 spin ½ states of a replicating particle. Previous assumption that a pattern moving at constant speed carries an asymmetry that is repetitively released and imported as a *virtual* polaron in the free zerons of the transversal string connectors of *the* string along which the next position shift will take place, is not proven. It should be in line with the proposition made in chapter 7 about gravity and the impact of a gravity field on the I-max value of a replicating pattern. An asymmetry is obviously needed but this effect could be provided by the difference in offset value stored in the free zeron versions of the central EZK. Computer aided simulations are needed: any solution should enable a next external polaron import or export leading to further acceleration or deceleration**.**

Near to *a* speed *value* c, a further EZP import has only an *incremental* impact on the internal behavior *and lay-out* of the EZK nucleus' (the incremental change rate of the phase counting mechanism at point level in a free zeron *pattern* , leading *usually* to a particle's capability to "move faster" on the grid, is reduced by an increased non-compensated effect in the contracted state, of the impact of phase shifted quanta stored in free zerons of two successive opposite branches of an extremely short string). Non-compensation means that the imported polaron time quantum can be stored back and forth as an, over a unit phase amount shifted and in a different dimension rotated, extra copy of the free zeron in the transversal zeron pair in a new version of the EZK nucleus. This "oscillation at point level" effect increases the contraction transit time in the EZK and increases its observed mass (Lorentz and Special Relativity compliant) but does not improve substantially its ability to "move *faster"*. Role interchanges and the flexibility of adapting the phase angle (in τ units) of the free zeron in an EZK, will lead to multiple superposed versions of the particle's nucleus and explains also why and how momentum in case of the split of (less symmetric) unstable particles (see hereafter) can be distributed over several decay products. In case of extremely high velocities, even Lorentz transformation laws do no longer apply - hereby we remind that the classic mathematical format of the Lorentz transformation laws, are not PhR compliant. "Nature" does not know what a square root means. What would be mathematically acceptable and PhR compliant, is an equivalent finite series of terms (representing in fact a counting process of signed 2τ units *up to a maximum of about 137*), equal to the cumulative charge info impact of contracting *quasi* balanced connectors on the *EZK free zerons relative phase angle values*. *This mechanism only works because an axial string of a replicating EZK based particle is "dense in space and time over multiples of equal 2τ values ".*

In this context we repeat that a central EZK contains several versions of free zerons, hereby taking into account the kind of replication schema of a particle, the fact that each string can store its own left and right direction history and that unbound particle can exist in several superposed versions: it is (e.g.) indeed not enough for a particle to "remember" how fast and in which direction to move but also in what sense (left-right). *It explains why in a transversal connector of a growing string with index value I , the net offset value of one of the two transversal zerons, conditioned by coupling with a free zeron in the central EZK, determines when the phase angle of a growing axial string zeron shifts its phase over value τ, leading to a transition from growth to shrink thru the impact of the existing cyclic stream of axion exchanges with the coupled enclosed axial string knots* .

For a spin ½ or for partially a spin 1 particle this should not be an issue.

Conservation of rotational momentum in case of particle motion (physics) implies in terms of PhR some flexibility when it comes to selecting a path for a next version of such particle.
"Bending of its path" without any change in absolute momentum amount (= with a conserved I-max value) seems, at first sight and theoretically, to be possible in several ways:
** direct internal p*olaron exchanges between connectors of orthogonal strings of the same particle .
**external exchanges (e.g.) with a curved graviton density field (see hereafter) by polaron exchanges with an equal but opposite impact on coplanar connectors of two successive I-max states in a spin ½ or 1 replication schema;*
**in case of elastic scattering between two particles: a statistical unbalance between the two orthogonal string external coupling probabilities when after a polaron interaction with the connector of the longest axial string along the particle's propagation path, it is losing temporarily its "fastest path" property. Such unbalance in the left-right choice of the next "longest" string can be a stochastic phenomenon or the systematic outcome of an asymmetry in the charge info distribution at the time and location of contraction of a particle)like pattern. These differences in coupling probability between rotating connectors of two potentially interacting connectors are easy to understand based on simple 3D geometry whereby two connector zerons are treated as small rotating vectors in a local plane, perpendicular to their axial strings directions: polaron exchange is only possible between a pair of rotating 2-zeron connector antenna's that are 2-by-2 equidistant at the time they emit and capture charge info. So if two compliant single axial particle strings are close to each other and collinear (see the role of pre-polarization of the UZS hereafter) the coupling probability rate is 100% , otherwise their replication axes need preferably to be coplanar whereby the coupling probability depends on the crossing angle value. This statement is also true for coupling with a string connector of replication direction that is perpendicular to the main propagation direction, leading to particle path "bending" (elastic particle collision). High energy non-elastic collision models apply when two EZK's interact (e.g. and additionally) by axion exchange. We also stress the impact of any change of the "longest- or active-branch" property of a string triplet on the orientation of the spin-vector of an EZK based replicating particle (see QM – in PhR a straightforward trigonometric calculation).*
** No attempt has been made to link these simple rules to the outcome of proven statistical methods and observed results in QM (least action principle, path integrals ….). PhR can be useful (see pre-polarization effects hereafter) to demystify certain aspects of QM (cfr double slit*

experiments). Several momentum and rotational momentum conservation rules in QM should be matched with a replication process in PhR.
**A very important case is the presence of a local magnetic field (see physics and see hereafter) that transforms the a priori linear path of a non-accelerated charged particle (e.g.an electron) into a curved path according to the rotation sense and orientation of the field versus an hypothetical straight particle propagation path. This mechanism has to be compliant with a F=B x v. q rule in electromagnetism whereby the orientation of the B field is related to a systematic rotation asymmetry (at central EZK level) when fixing the next longest transversal phase shifted string connector, perpendicular to the previous absolute I-max string after successful coupling. This selection mechanism does not change the internal energy content (and the I-max value) of the pattern.*
** finally a curving effect when a <u>contracting</u> particle selects a next dynamic EZP in the UZS when shifting effectively its position over the UZS grid. The latter process looks very similar to normal interference effects of light waves, taking into account in PhR terms that these waves are in fact (in both cases) fotino sequences allowing some <u>pivoting</u> when selecting next contact EZP's at the time of a position shift (this would explain light wave polarization effects in optics) . In QM this phenomenon has led to the matter - wave duality hypothesis. Dual slit experiments with electrons and photons confirm the similarity of both "next step" selection procedures in case of "monochromatic" particle waves (e.g. electrons with the same I-max value). What is really "interfering" are the charge info patterns emitted by, in parallel pre-polarized (contact) EZP's (see hereafter). Computer simulations are required to find out which of those phenomena explains path curving in case of magnetic spin driven interactions in the course of particle propagation, whereby the relationship between the orientation of the magnetic spin vector and the values of the relative phase shifts between the 3 axial string connectors have to be taken into consideration.*

- **Energy :** A generic (PhR) definition of the term "energy" *(see above)* needs to remain valid in the course of the evolution of the cosmos at any level or in any state, from the primitive creation event itself up to the highly complex impact of the publication of stock exchange information on financial markets. However it remains hard to find in physics alone, a good definition of "energy", encompassing all of its possible forms. It is clear that "the capability to effectively change the cosmic state" (a PhR conform definition), even at scales typically treated by this document, will depend on several parameters: once an amount of action (an h polaron or an h/2 axion interaction) has been imported in a pattern as an anomaly (or extracted and stored in another pattern), the outcome will be a shorter (or longer) lifetime of the new emerging multi-zeron pattern (e.g. a new or a

change in replication- cycle). This implies for a specific replication schema, a change of the potential energy impact (and corresponding equivalent mass) on the environment. Indeed any effective external interaction is only possible in layout dependent I-null or I-max sensitive states: in the second case longer periods T mean less frequent potential interactions with other patterns by standard axion or polaron interactions at point *or zeron* level. This rule, applied to zeron made complex patterns, explains indirectly the intrinsic relationship in physics (the inverse fine-structure constant, being *in PhR* a measure for the *ratio* in dimensionality between zeron and point spacetime) between at first sight unrelated constants c, h & q (and eventually μ).

The same kind of one-shot initial interaction or bifurcation (compliant with CPT conservation rules) that once took place on a large scale in a young cosmic volume, lies at the roots of the separation in phase (or time) and often in space of large volumes, each filled with chiral patterns, according to a particular discriminating factor (the type or sign of their internal mass property, something not directly observable by physics and reflecting the difference between local point-hole density ratio's versus a theoretical average UZS value in perfect vacuum – such hypothetic vacuum is very hard to achieve because of the presence everywhere of gravitons and contra-gravitons). A central contramatter volume in our galaxy is transparent to physics as contramatter and matter do not interact by local or distant polaron coupling (in physical terms: by real or virtual photon exchange).

Those chiral pattern pairs store equal but opposite (with charge and mass type , string spin and momentum as discriminating factors) energy amounts – PhR behind the distinction between a non-exhaustive and misleading partial (in physics) versus global (in PhR terms) energy conservation rule. Misleading, because all local patterns and particles in our biased – (in the sense of "dimensional, unit time and spatial") - environment, have intrinsic net mass values with an identical – by convention positive – sign. A stationary pattern in this environment is capable to internally store a net amount of this local type of energy which implies that it *needs to* contain one or several other discriminating properties or multiple quantities of such properties *in order to be capable to change the state of* other patterns in its dynamic, local and relevant UZS-CPS volume. If this net amount remains fixed in the course of a pattern's life cycle, the pattern is capable to maintain its actual state over successive versions, even when it is shifting its position over the spacetime grid, although degeneration of a symmetric pattern implies that internal property-equivalent transformations of its pattern state remain possible (e.g. in the contracted state, leading to curved trajectories, conserving energy amounts, except from potential energy in a large scale gravity field). The opposite is not necessarily true at sub-particle level: a stable replicating pattern can vary its internal amount of

energy in such a way that these changes annihilate each other in subsequent anti-symmetric states, in fact cycles of a full replication schema over a fixed period. Due to its 4-components *per string* involved in a inversion process in the contracted state, a spin ½ particle needs 4 subsequent growth and shrink cycles in order to return into an identical connector configuration. So even without external interactions its internal energy state is only on average constant. As overall energy is conserved at any moment, cyclic fluctuations in internal energy must be compensated by equivalent amounts of energy stored in or extracted from the double grid. At a cosmic scale a representative closed volume in a steady state and with a net zero energy content needs to have at least the size of a galaxy with a central black hole, dominated by contramatter (or a "white hole" made of matter in case of a contra-galaxy – see further).
A generic definition of the term "energy" is useful at elementary level. In a more complex environment, definitions and properties as proposed by physics (*often in statistical terms)* are much more adequate. Anyhow they have to be fully compliant with the generic definition. An example of the compatibility between both is the famous $E=mc^2$ equation imposed by Special relativity. At PhR level, rest-mass is mainly determined by the number of net excess holes of one or two types, as sustained by a replicating pattern with an fixed I-max value (in fact oscillating around a virtual center and not moving over the double grid), per full replication cycle set. Th**is** statement assumes that the minimum value and the prolongation of the life time of a hole is quantized (multiples of τ) and that the counting of a pattern's hole *states* takes the $h = \delta E*T$ rule into account. T is a measure for the pattern's cyclic behavior in a fixed local spacetime (or CPS-UZS) reference frame. Under these conditions, net hole excess is a conserved quantity whereby mass and null-energy calculations have to take positive and as well as negative *number and type of* hole *changes* (or phase shifts with the same mass type) into account. We refer to a statement made earlier: any contact in i-max between adjacent zerons is able to maintain (e.g.) a negative charge excess by reducing locally the number of positive points or inducing an extra negative point. Both processes impact locally the hole-point ratio in the opposite sense and are producing opposite and equal quantized energy (and mass) amounts (*see another viXra article about relative probabilities of these scenarios and their impact on the fine-structure constant for matter and contramatter).* A computer should be able to calculate exact null-masses of particles, once their replication schema's are fully understood and physicists agree on the value of a (free hole) unit mass standard(s). E.g. once a particle has been accelerated by an adequate synchronized polaron import, a new calculation of its net energy content needs to take its increased replication frequency and its modified string length into account. The neutral and signed EZP's, released by an acceleration process as EM wave patterns (as fotino sequences) and/or as

gravitons, are capable to store or to carry a quantity of elementary positive and negative holes (neutral-EZP's or contra-EZP's), so their internal energy has to be taken into account when calculating a global energy balance as the outcome of interaction processes. The same rule is valid for the net hole quantum, ultimately exchanged between antenna and target by photon transport, a process completed at the end of a full wavelength. Even in case of a sustained equilibrium state, several parameters contribute to what effectively will happen in PhR terms. A few examples:

- The energy content of a replicating pattern depends on its I-max value but for small I values internal oscillations take place whereby the EZK nucleus is involved in a local cyclic process (between multiple states, "discriminated" by *over* multiple *time* dimensions *distributed* free zeron versions) that delay the effective phase jump needed to move its symmetry center over the UZS. Physics observes this as a mass increase (SR) or as an off-shell or/and even as a non-Lorentz transition process (with mass and eventually contra-mass contributions).
- The selection of the string and the branch along which a next displacement will finally take place, even in a constant energy-momentum state, is another complex but critical mechanism. It is driven by historically or hazardous "(charge) information" outside the pattern but equally and even in case of a "flat" external raster density, on information stored inside the EZK nucleus. Hereby we must take its multi-dimensional content at point level (several combinations of phase shifted "free zeron" versions co-exist) into account.
- As a general rule, each position shift relates to the string that is temporarily owner of the "fastest" connector being the one with a free transversal zeron with an internal phase count the nearest to 137 (meaning: to its I-max return state). Implicitly the counting mechanism is based on a virtual clock whereby the "minutes" digit relates to the replication index I in a UZS spacetime reference frame and the "seconds" digit to a phase angle, expressed in τ units in high-dimensional point space, counted up to a limit value 137 in a free zeron . This should not be a surprise: it reflects the two major steps in the evolution of the cosmos starting from point-space: in the first step CPS points were selected based on *critical* phase synchronization, leading to point replication and a first reduction of dimensionality and the emergence of the UZS, in the second step zerons were selected based on space and phase synchronization, leading to zeron replication and a further reduction of dimensionality and the emergence of 2D neutral-EZP's and 3D particles.

- *In previous chapters it has been mentioned that forces in PhR are not required to describe the behavior of particles. This means that differences in the energy state of a pattern need to be represented by a distinct layout, corresponding with a different impact on the double UZS/CPS grid. For kinetic energy and momentum (Physics) this issue is properly addressed by changing I-max of a properly aligned particle-like pattern after a polaron interaction with a connector in an appropriate I-max configuration state. It implies that a Lagrange approach in QM is more in line with PhR that a Hamiltonian based description of motion. In this concept at very high speed numbers near to c the free zeron configuration of the central EZK will change, increasing in this way the number of hole states (and the mass value) per replication cycle) of a, conform the Lorentz mass transformation formula in Special relativity. The question has not been answered for increases in non-charge based potential energy. For gravity related phenomena, a distinct position of an object with mass in a central symmetric gravity field, eventually combined with a change of tangent momentum and rotational energy, addresses properly this issue. Remains at least theoretically an increased/decreased amount of potential energy to be stored/released in a charged particle when it stands still relative to a stationary field or has been slowly moved in a modified electric field without any significant change in speed and I-max value. The way to include charge and position related potential energy in this state, is to take the probability density distribution for successful coupling between a particle and a modified local charge info density field into account. If the environmental conditions of such particle prohibit a change in momentum, other patterns or particles will contribute to a new large-scale energy- balance state.*

- **Unstable *(or short-lived)* particles:** After the one-shot action(s) *in an EZO* leading to the creation of a particle – contra-particle pair, occasional secondary axion exchanges between connectors of two adjacent and properly synchronized particles (or an ordinary particle and a field pattern) might lead to binding between and/or to a mutation of their replication processes. In chapter 5, we mentioned the impact of a symmetry reduction on the stability of replicating patterns. In that context the impact of axion-type interactions will often lead to fast or strong decay, where on the other hand, polaron-like interactions more often will be the cause of a slow or weak decay. Strong forces (in Physics) may combine both interaction types: multiple internal short range (or locally in the EZK nucleus) polaron-like exchanges between branches of a string can have a direct impact on the phase state of free zerons in a central EZK, whereby the combination with axion-like exchanges between connectors of string

versions in a baryon-like replication schema (having an impact on the connector charge type distribution and PhR of exchange particles like gluons in physics) can lead to the split of a pattern. The need for confinement (referring to a short distance force, not sensitive to a classical Coulomb force), and the fact that the strength of strong interaction *(the color force)* is 137 times the strength of the electromagnetic force, could mean that both show some similarities but that strong interaction is a direct, at point level cyclic, coupling or exchange process between zerons that belong to distinct EZK nuclei or versions of nuclei in multi-string patterns with an extremely small I-max value. Further investigation and computer simulation are absolutely needed in order to find the point/zeron pattern lay-out of gluons (axion-polaron compositions) that intermediate the strong force. Head-to-head high energy collisions of two particles with well aligned strings and synchronized connectors and small I-max values, can induce *by selection,* in a temporarily enclosed pseudo-flat UZS raster volume, artificial zeron patterns (PhR behind new particle jets in Physics), conform the impact of their connector "free" *but interfering* charge info emission patterns. Both processes have to respect conservation rules and can lead to unstable or short-living complex patterns with a single (e.g. baryons like Ω or Σ particles) or "double" (or mixed) properly synchronized EZK nuclei (e.g. mesons like K – their nucleus might behave as a superposition (physics) or subsequent versions (PhR) of a particle and a contra-particle). Instability here means that, after a number of replication cycles, destructive superposition of internal charge info packages in the contracted state will transform the replication layout and the particle's connector properties. The CPT conservation rule applied to the contracted state will lead to a pattern's decay product combination and/or its transformation. The way external interaction(s) initially contribute to a change in the particle's lay-out and behavior, will determine (eventually in combination with local grid parameters) when and how, after a certain number of replication cycles, a particle will decay (e.g. weak and strong decay in physics). Sometimes several decay modes (branch ratio's) are possible. The subject is complex because the zeron configurations of the 6 connectors of a baryon (including their relative phase angles) in an I-max state are different and dynamic, so the numbers of potential successful combinations in case of two interacting connectors for short replication paths (very small I-max values) are high. This means that the outcome of these complex interaction processes can vary, leading to multiple branch ratio's and to the induction *by selection* of what certain physicists call, "an (unstable-) particle zoo". Many of these experiments and their results are (*academically*) interesting but do not contribute to a better understanding of the fundamental properties and processes of our cosmos.

- **Field particles:** In terms of PhR, all abstract fields (physics) including spacetime itself have a specific content represented by one or several elementary grid pattern types and density distributions. The impact of a field on particles comes down to a probability calculation for basic interactions between these particles in their special states and the field particles. In this model several ways of producing field particles have been or will be described. The net (meaning: "not used for internal pattern binding") result of superposition of charge info emitted by mutated components of particles (connectors) in special states, might induce or release *or delete* such patterns in the CPS/UZS. Other, although in PhR terms very similar processes are the source of patterns called difference patterns, often restoring equilibrium in by an external interaction mutated replication processes. They are frequently treated by physics as ordinary particles. The distinction is subtle and often based on the simple fact that physics is – yes or no- able to observe them directly, or (for field particles) that mathematical equivalent models need them to maintain their validity over a broader range of phenomena. In a PhR perspective, criteria to treat patterns either as field or as ordinary particles could be their ability to replicate and/or to move over the double cosmic grid or that (what comes often down to the same) their core is EZK based or a neutral-EZP or none of them (e.g. a single zeron in a Coulomb *or Gauss* field). *Field particles at UZS level are further discussed hereafter (see polarization effects).*

- **Examples of special particle classes**:
  - A simple direct exchange of a polaron between compliant connectors of two particles could be called a virtual photon driven interaction (physics) materializing (or intermediating) locally the electromagnetic force in physics. In combination with a *very* short range axion interaction *in the nucleus of an atom*, it intermediates the strong force. A successful exchange assumes in case of *medium* range interactions the presence of a dynamic zeron polarization string, connecting periodically two compliant and available connector zerons in both particles (see hereafter – *pre polarization*). Momentum and energy conservation rules (physics) have to be respected what in terms of PhR at low velocities means that an increase in I-max of one particle leads to an equivalent decrease in the other *and vice versa*. An internal polaron coupling between strings *or the less probable polaron coupling with a particle string that is not the longest*, can lead to changes in velocity (the direction of the next position shift) without change of energy or speed. *In this context it has to be stressed that the three string connectors of a replicating particle, able to enter into an active polaron coupling are phase shifted whereby after successful coupling the "fastest connector or longest string" will lose* in the

contracted state after a phase jump in the central EZK rotation schema, this status or property in favor of one of both orthogonal string connectors". As energy must be conserved , it has to be investigated that a direct polaron exchange is in all circumstances the adequate mechanism to change the particle replication schemas involved. Hereby quantized pre-polarization fields in the UZS have to be taken into consideration as interaction enabling or coupling probability determining effects (see hereafter). At very a very high speed (*I-max is about1) the incremental* polaron impact on EZK free zeron states will be non-linear leading to relativistic effects (in physics, as well as in PhR terms – see above or hereafter) .

- Two branches of a replicating particle string of which one connector has been mutated asymmetrically by a polaron-type interaction will induce in the double point-zeron raster, each time they contract and geometrically in a plane through the central antenna's symmetry location, orthogonal to the axial string direction, a simple (*difference)* pattern called (PhR) a fotino, to be treated as the elementary component of a photon. Fotino's are difference patterns that, in order to respect conservation rules, behave as the superposition of double phase shifted EZK copy's or versions (in fact string knots of two opposite contracting branches) with critical free zeron phase state values, a pattern with a behavior similar but not identical to that of a simple electron propagating at a marginal speed of about c. This means: a micro replicating process with successive growth, shrink and position shifts over the UZS-grid over a marginal replication length. Even in this extreme state it remains a pattern that shifts over the UZS grid and not some imaginary moving fixed point or zeron set. Each version of a fotino is a micro-pattern replicating along a marginal string length (just one step in a free zeron's point replication phase counter ?) that stands still versus the CPS in the absolute sense this term, behaving hereby on its turn as a short lived local antenna oscillator and a potential source of multiple (in several dimensions) superposed copies of its very simple pattern layout. Indeed, being difference patterns fotino's copy, by ordering grid components, the layout of two contracting branches, whereby the superposition law has to be applied on the two-sided emitted charge info patterns. The outcome is a micro-pattern with a marginal but standard axial string (one signed excess zeron) and a transversal two-zeron pattern storing a by one-point phase shifted time quantum (a mutated EZP or magnetic dipole in terms of physics). The difference process is producing this simple regular format, thanks to the symmetry and the standard quantized phase properties of the original antenna EZK tetrahedron, copied on the UZS grid in the course of its replication

and contraction process along two opposite branches of a string. *Hereby energy conservation rules have to be taken into account (the total net energy amount, stored in a difference pattern sequence should correspond with the small change in momentum and energy stored in the antenna particle). A fotino as a micro-particle component of a photon carries energy but the net energy quantum for each pair of contractions states flips its sign whereby the net charge type contribution is eliminated and only a net hole-type impact remains (even spin combination). That is also why the net energy quantum stored in a photon is only released and the photon becomes an uncharged autonomous micro-particle, when the emitting antenna particle enters into a new regime state with an adjusted I-max value.*

*Charge info fotino-like copies (being branches of contact-EZP's) of standard I-max connectors of replicating particles in a regime state will lead to (pre)polarization by selection of potential or candidate propagation paths. Both patterns are called fotino's in this text what can be misleading. One obvious distinction between both is that the pre-polarization process of a branched contact-EZP string set proceeds at a speed of at least 137*c and does not carry energy, where a photon, as a micro-replicating subset of fotino's, is a real autonomous particle "propagating" in vacuum at speed c and carrying energy.*

A photon generates along any propagation direction in the transversal plane, alternatively an *in type* varying charge density (a transversal E field), followed by a pattern of quantized phase shifted zeron-pairs of the original double transversal branches, emitting circularly a net (due to superposition) charge info density quantum (see hereafter: magnetic fields), in fact observed as a to the E field orthogonal B- field. The variation in E and B densities and their virtual vector orientation, is sensitive to the pace and the orientation of the transversal zerons in the parent pattern when contraction takes place (also indirectly depending on the time behavior of the I-index of the contraction process). So each contraction of an asymmetric or loaded string antenna is emitting a fotino: a fotino sequence corresponds with a complete photon *(in physics)* at the moment an antenna pattern will effectively shift its position over the point-zeron grid (*see above for a zero-momentum or null state) and enters into a new equilibrium state*. Both orthogonal E and B *vector* fields are perpendicular to the propagation direction but their orientation depends on the *transversal string* orientation of the *axial* antenna string that emitted them. Each emission will reflect weakly the state of change of the parent antenna by varying the fotino emission rate and/or its

orientation. If the frequency of several subsequent cyclic polaron exchanges between a parent connector and its environment is conditioned by an external modulator, the photon E/B field layout (amplitude, wavelength …) will *correctly* represent this situation. A single fotino pattern *(a photon)* is bosonic (a spin 1 particle in physics): its pattern returns into its initial state after 2 contractions, not 4 (PhR). *It means that the contraction process implies a double inversion of the mutated connector zeron configuration of the original antenna pattern.* As a combination of two asymmetric contracting components, it is propagating by micro-replication at speed c over the double grid and although the process is similar to an electron-like difference pattern with a minimum I-max value and a maximum free EZK zeron offset amount, it is fundamentally different. An electron (a fermion in physics) originates as a difference patterns between a neutron and a proton state but it replicates around a single EZK nucleus *state*. *It is charged and lepton-like, meaning in PhR that it replicates along three orthogonal directions, each aligned along two adjacent zeron combinations of the EZK tetrahedron nucleus. A baryon replicates as a complex superposed multi-electron (and -positron) like pattern along symmetry directions thru the virtual EZK center, on average, perpendicular to the 3 orthogonal and opposite 2-zeron rib combinations of a central EZK tetrahedron). A single version* stands still *vis-à-vis* the grids and it behaves as a short lived ordinary spin ½ particle when it comes to acquiring momentum. It is important to notice that each contraction of an antenna string with a built-in polaron-type asymmetry produces a *real* fotino, a *pattern* capable to propagate at its turn by copying its simple pattern on the double grid by info emissions propagating at speed c. In fact the only thing that happens in this process is that charge info emitted by a *connector in I-max* is ordering by selection and along multiple directions, standard single zeron and *contact*-EZP sets. So subsequent *pre-polarization* versions of each individual fotino are copied many times along, in point space and phase superposed *and branched* paths whereby each segment has some rotational degrees of freedom: this multiplication process takes place at a speed *of at least* 137*c: 137 is the maximum number of superposed copies in point-space of a single fotino. As a single version of a fotino (*as a micro-particle)* antenna stands still, it means that all its next short lived copies exist in superposition along multiple trajectories "perpendicular in local time-dimensional terms" to its micro-EZP-dipole which makes their statistical distribution a *branched* cascade of charge info patterns around each subsequent individual copy . The full pattern is the outcome of a complex double

superposition exercise, in fact a cascade of multiple *polarization* copies in multiple dimensions of multiple subsequently emitted fotino's (see also Feynman's propagators model in the context of a double slit experiment). This charge info driven superposition process in multiple dimensions, takes all *quantized charge info emitting* objects (*like dynamic slit edges in a double slit experiment in QM)* along its potential path segments into account when constructing its final successful fastest connection path between compliant source and targets. A *real* fotino as a *pattern component (see hereafter once more the unfortunate double use of the term fotino in this text)* is transparent to physics and a photon (a *quantized* sequence of *real* fotino's, coupling along a fastest path) is treated as an elementary full wavelength pattern with spin 1 symmetry. This wave length reflects the outcome of the superposition of all these charge info packages in a fastest final target location whereby a successful net action quantum of a polaron type is exchanged between the effectively mutated and position shifted parent and the target, a process that guarantees the respect of all conservation rules. "Observation" of a single photon is always the outcome an exchange of a *charge info type* action quantum along a fastest path (*this is* not necessarily the shortest in a geometric perspective – see *Snellius' law or* Fermat's principle in physics or the Lagrangiaan-functional reduction in time in QFT) between source and target, taking superposition (interference) and local spacetime (CPS-UZS) properties along potential paths into account (including their impact on the value c and on the polarization direction of the fotino zeron pair). So even if several propagation paths coexist in multiple dimensions, the ultimate path that connects source and target whereby a single action quantum is exchanged, is the fastest in a single dimension set to which source and target belong, and the observed speed c in vacuum applies to this path. After this exchange the photon pattern collapses (coherence get lost and all components become again ordinary CPS-UZS points and zerons). As an example: $E = 2$ f. $h/2$ is the energy quantum exchanged between source and target by a full wave transport. This energy quantum is hole- or phase-shifted or mass-like, all terms to say that, like any polaron interaction, the action impact is quantized and time driven ($E = \delta E * \delta T$). In view of Einstein's $E=mc^2$ and although an unfinished photon is mass-less in the course of its propagation, the net action amount ultimately transferred between source and target is mass-like. Successful hole-driven energy transport takes place along a fastest axial propagation direction (Pointing vector – the E and the B field quanta carry equal energy amounts, also in PhR terms) at the moment the antenna and

a first successful candidate target are compliant with all the base laws (an "end-to-end target selection process", conform (e.g.) a double slit experiment in QM). Some of the by physics observed properties (amplitudes and wavelengths) of a photon are determined by the production rate of fotino's in the antenna, not by the rate at which single (standard) fotino versions are copied in superposition over the UZS grid. *In the same context Maxwell's differential equations for (e.g.) EM-wave propagation in an "empty" spacetime volume (without free charges or currents) have to be reconciled with equivalent quantized fotino propagation processes on a double CPS/UZS grid (a long debate in the course of previous century between physicists-experts in quantum particle models and believers in a Maxwell conform EM wave theory (e.g. BKS) whereby energy was supposed to be based on intensity of EM waves, not on frequency). Additionally in PhR abstract phenomena in Physics like displacement currents are easier to understand on an UZS grid.* Further investigations are needed in order to determine the impact of the layout of a replicating pattern and its state (in the context of a spin ½ symmetry there are 4 subsequent I-max states as potential antenna configurations) on the symmetry of the photon that will be finally emitted as the outcome of this interaction. *PhR-conform models make it easier to combine a particle / EM-wave approach on a UZS grid whereby <u>contra-EM waves</u> are a new class of (for our instruments invisible) patterns that must be taken into consideration (see "gravity" waves, propagating at a slightly higher speed than c).*

- <u>neutrinos</u> (*matter,* mixed matter-antimatter (or contramatter ??): difference patterns, induced in the UZS and the outcome of contracting and eventually mutated and/*or* unstable string combinations. These combinations *are the cause of* one-shot mutations in their central EZK's free zeron pattern, changing hereby the configuration proper to their normal replication schema. In case of decay the free zeron configurations in the contracted state (in number and spacetime distribution) of all patterns involved do not add up correctly to the amounts of the original configurations. So neutrino's being single EZK spin1/2 3D micro-patterns, balance (conform all conservation principles) the free-zeron multistate <u>in the central EZK of the old and the new version of the parent particle,</u> taking hereby the properties of other decay products and conservation rules into account. Because the 3D lay-out of all these patterns depends on the complexity of the original unstable parent pattern, several neutrino types exist, eventually able to replicate in different modes and (eventually) to "oscillate" (a physical term) between these modes. Neutrino's compensate only unbalances in

the central EZK of complex contracting baryon replication schema's. A well known example is the very slow decay of a *free* neutron in a proton, an electron and a neutrino. In this case the *driving* unbalance does not seem to be the result of an interaction (to be further investigated – *e.g. quid the role of the local graviton density ?*). Either their size (of the order of an EZK pattern), their particular replication schema and/or the fact that they show partly contra-matter properties (??) would explain their low coupling rate (only through weak interactions in physics or axion coupling in PhR) with other particles. They are, as difference patterns, charge-neutral leptons with an extremely small mass property, moving over the grid at speeds close to c (physics) meaning that their replication schema is simple and at least not baryon-like. Their very high propagation speed means that their short contracting string(s) reach quickly the critical zeron phase limit in their central EZK in order to shift over the grid and substitute *their pattern* by a next version. The low mass value and their low coupling rate could mean that their hole state could be *mixed (or contains a contact-EZP that is* contramatter like - this statement is unproven). As they originate from EZK configurations, showing a behavior that was described as driven by "dynamic role interchange processes with opposite rotational senses for matter and (unobservable) contramatter-like patterns", it is not a surprise to observe in physics exceptions of the symmetry properties of certain processes in which neutrino's are involved (e.g. some radioactive decay processes).

- electrons are treated as ordinary particles by physics although they are the outcome of a decay process of a neutron into a proton (the even multiple conic distribution of electron like replication processes in a neutron is reduced by one unit whereby the balance between positive and negative charged connectors gets lost). They balance the replication patterns of an old and a new baryon particle state in a conservation law perspective, complementary to what *additionally emitted* neutrino's do for the EZK nucleus.
- As stated and in PhR terms, most *items* of this *list of* special patterns and phenomena are examples of difference particles needed to satisfy conservation requirements *up to a lowest level of zeron grid components*. They emerge in the contracted state *as an induction pattern in the UZS* due to a *charge info* unbalance between the replication patterns before and after the standard inversion process of an EZK nucleus. This unbalance is initially often the (delayed) outcome of an asymmetric polaron interaction (fotino's or gravitons) or axion interaction (neutrino's *even* in case of neutron decay *if we treat the electron emission as the result of a change in the internal axion interaction schema of a replicating*

neutron, taking free EZK zerons into account) with a single particle's connector zeron (axion) or zeron pair (polaron) *(or even with more than one connector in case of very high energy collisions).* Properties and the distribution of the effective emission paths of difference particles are sensitive to the actual or "historical" layout and symmetry of the mutated parent components. Their split products probability distributions (branch ratio's), their replication and motional abilities as well as their layout in space-time, will determine properties like charge, mass (or the equivalent amount of internal energy), equivalent wavelength (de Broglie), spin(s), velocity etc… All these decay and transformation processes strictly obey global and locally relevant conservation rules (net charge, energy, CPT …).

- *Fermions and Bosons: Difference particles as described in previous paragraph are compact patterns, emitted or induced by residual or free charge info packages. These are the outcome of a residual disequilibrium in the contracted state of branch connectors of a replicating particle that had been hit by standard polaron/axion type perturbations in their I-max state. They are compact but have in some cases the capability to replicate and to propagate (gravitons rotate locally and are an exception). In general their replication schema's are such that either 4 (spin ½ - electrons, neutrino's) or 2 (spin 1 - fotino's) contractions are needed to reenter into the same connector configuration state. There are cases whereby high energy collisions between spin ½ particles in a quasi-contracted state (with extremely small I-max values) will induce on the UZS raster an unstable pattern with a replication schema that reflects the impact of a combination of charge info emitted by the two original colliding particles. Hereby the central EZK's are oriented, charged and phase shifted in such a manner that a net double contraction impact will twice invert the connector configuration. We could call this mechanism a difference pattern effect that produces a spin 1 particle, meaning that only two contractions of this pattern are needed to reenter into the same I-max connector configuration. In statistical mechanics the terms fermion (odd states like spin ½ particles) and boson (even states like spin 1 particles) refers to multi-particle states where patterns have a tendency to be in the same or in distinct quantum states. This different collective behavior is the outcome of a distinct impact in case of a polaron interaction between any pair of particles: a successful interaction forces fermion particles into non-equal states and this is not the case between patterns of a boson-like pattern set. In Physics direct observation of connector configurations is impossible but there is an obvious relationship*

between a particles connector configuration in case of inversion in the contracted state (PhR) and spin directions and orientations (PhR and Physics): after a polaron interaction in I-max, a string is losing its "longest branch in time or active state" property and the relative phase shifts between charge info emitted by the three axial connector zerons (and thus the spin orientation" will change.
Except from their role in the classification of difference particles (PhR), the distinction between fermions and bosons is broadened to ordinary particles in QM (Physics): if a pair of identical particles in a collection are interchanged, their two-particle state function is either symmetric (bosons) or anti-symmetric (fermions). For large sets of identical particles this leads to the Pauli exclusion principle, saying that two fermions of a set can never be in the same (1-particle momentum + spin) quantum state. In a PhR context it just says that if two identical and nearby replicating particles can interact by virtual photon emission and absorption and taking pre-polarization effects and conservation rules into account, the two patterns will change their replication schema's in the opposite sense. For bosons the opposite is rather true because their connector configuration schema remains CPT-wise the same after polaron interaction . As an example: a set of monochrome and by induced emission well synchronized and polarized photons (bosons) can be concentrated into a thin ray. In this state (PhR) such photon bundle (e.g. a laser beam) can engage a very dense local contact-EZP collection along parallel propagation paths in such an intensive way that it prohibits magnetic fields (or quantized charge info fields in general) to make use of their virtual UZS subspace (in fact: they repulse such field along their propagation path by "engaging" in the UZS, part of a contact-EZP cascade-like volume, similar to a state typically induced by an high density magnetic field source). On a scale of atoms, internal binding between nucleons determine the number of "free (this property is dynamic)" spin ½ particles that remain available for external coupling what sets the fermion- or bosonic character of the nucleus: He-4 is a boson, He-3 is a fermion. In PhR terms all this has to do with symmetry in space and time of connector configurations, superposition and interference of quantized charge info emitted in I-max and coupling probabilities between replicating patterns: how many replication cycles are needed before the free connector (meaning not used for internal binding) configuration is the same ? Also in this case there is a relationship with the orientation of the, by superposition and interference collective spin property. It is clear that the consequences of a valid PhR model must give answers to fundamental questions in QM: the internal structure and

symmetries of replicating raster patterns (particles) in combination with charge info emissions and the base laws (e.g. superposition) make phenomena like double slit experiment results more easy to understand. Other examples are related to particle replication principles: it is obvious that the simultaneous measurement of momentum of a single particle along different symmetry axes (QM) would imply the perfect coincidence of two polaron coupling events between the measurement tool and two phase shifted string connectors, what is excluded in PhR. Except from these rather general comments, no attempts have been made to reconcile this PhR model with theories about multi-particle structures like atoms, molecules, condensed matter, crystal lattices etc…. In these domains mathematical and statistical descriptions of cosmic behavior are very successful, so PhR would limit its contribution to a better understanding of some underlying mechanisms.

- In an UZS raster based concept all elementary or micro-particles behave as autonomous patterns (sometimes short-lived and either able to propagate as a pattern over the UZS grid or persistent and *standing still* as local oscillators in the UZS): field theory calls some of them particles (physics) or virtual field particles: virtual photons, gravitons (dark matter), W and Z patterns are some examples. In physical models they intermediate the main interaction forces.
- *Gauge particles (Physics) emerge as short-lived perturbations in mathematical representations of small scale processes superposed on large scale curved phenomena : hereby the local symmetry on a quantum scale (e.g. of a replication pattern like a neutron) is confronted with a distinct global or large scale symmetry. This situation in PhR has to be often and, at least locally, solved either by the periodic reshuffling of the replication schema of a pattern and/or the production of a difference particle (e.g. an electron, a neutrino, a graviton …). The reshuffling takes time what means that the transition state could lead to a short-lived or even persistent "gauge" pattern (a difference pattern between the old and the new replication state). If these patterns are quasi-persistent between interactions (like gravitons or photons) they can materialize a large scale field (a gravity field or an EM field). Some of the particles mentioned before (like W and Z bosons) are short-lived gauge particles. Examples of symmetry mismatches at elementary particle level are the internal binding processes and properties of a 4-zeron Higgs nucleus (with a triple orthogonal geometry, a 4-fold role interchange between zerons, (at point level) τ phase shifted free zeron states and finally, with EZP-type contacts between adjacent zerons of a tetrahedron) on one hand, and the "ideal" 3D*

replication schema and inter-particle polaron coupling of protons on the other. Another case at a very large macro-level is the mismatch between the local 3D particle symmetry and the spherical symmetric distribution of matter around a condensation center (e.g. our sun or the earth). This gravity-field related case is more subtle and is discussed hereafter. Mismatches emerge frequently as the outcome of an interaction with other compliant particles: they change the stationary replication process and destabilize the internal state transition process of the central EZK (Higgs). Hereby the reshuffling takes several replication steps and the outcome is a new stable state with a different Higgs free zeron state, a new I-max value, a different central symmetry location and the release of a difference particle (a photon) and finally the adjustment of the local graviton density distribution.

- **(*Pre-*)Polarization (as a property of elementary CPS/UZS components (PhR) or simple field patterns (physics)):** in accordance with this model most replicating particles are able to create and sustain (as dynamic N-dimensional subsets) field *patterns* that are materialized by chains of elementary but correlated *raster components*: *either axial strings of coupled* UZS zeron-pairs *or* short-lived *transversal* zeron-pairs (EZP's) *(in fact contact*-EZP's or *contact*-contra- EZP's)... These dynamic over a long range linear and/or *branched and* circular pattern versions with a coherent layout and behavior in space and time are called "polarization field lines (not directly visible but indirectly by their impact on *the formation and propagation of* other patterns and *the probability distribution of certain macro- or long-range processes*, observable in physics)". *The very fast growth by selection in the UZS of such multiple communication channels is purely quantized interfered charge info driven and does not consume energy.*
  The definition and the properties of field lines can be a source of misinterpretations in what follows. In physics those terms appear in classic large scale laws and models, including Maxwell's equations and EM-wave theories. They reappear in QM as extra energy terms in Hamiltonians or as gauge terms in field theories. In a PhR context they are treated at an even lower level whereby the properties of the underlying CPS-UZS framework are key to understand their contribution and integration in high level phenomena (contrary to physics where they are often treated as abstract parameters like μ and ε).
  Some examples:
  - **Electric field lines**: successive versions of uncoupled, replicating particles with a quasi-isotropic distribution of their 3D-symmetry orientations (the result of their multidimensional character and rotating degrees of freedom in N-dim *of their central EZK*) have *a*

dynamic connector *set* with at least one zeron *per string that maintains periodically a net charge quantum state in the course of a sometimes complex particle replication cycle* (see also a baryon replication schema). When not involved in strong – EZK-nucleus binding, these zerons *(in a free I-max state)* will induce and align *by selection in the UZS, long but* short lived *or dynamic* coherent and by charge info exchange connected *linear* chains of UZS zerons, materializing a centrally symmetric Coulomb *or Gauss* field (Physics). This effect is fundamental to understanding in PhR terms, *probabilities of* non-local interactions and momentum transfers (through polaron transport along those field lines) between charged particles (e.g. a dynamic electron-proton coupling in any atom). The four subsequent "special" *i-max* states of any single at point level replicating *free* UZS zeron make it possible to match (taking the small quantized phase shifts of order τ between these special states into account) the compliance rules imposed by any combination of dynamic free charge states at both ends of a replicating particle connector (e.g: formation of dynamic UZS polarization chains, connecting both shoes of a U-form electromagnet in vacuum, driven by an alternate current, is PhR of what is called a charge displacement current – see also Maxwell's laws - in Physics). In this perspective and in combination with the PhR concept of momentum and its dependence (the left-right orientation of a change in momentum due to a polaron exchange) on a connectors particle state properties and replication symmetries, it is simple to logically deduct the outcome (*there are no forces in PhR*) *of potential* Coulomb-like interactions *(the four successive connectors states in I-max of both particle strings connected by a linear polarization chain, create the conditions for an effective polaron coupling that will lead to the appropriate changes in momentum of the two interacting particles). In this perspective it is interesting to notice that a positive and a negative charged connector zeron in I-max states do not attract each other if they belong to a matter and a contramatter particle. In such hypothetical case an appropriate polarization line is not enough to enable effective polaron exchanges between two non-compliant connectors. If this statement would not be correct, a matter based experiment would be able to observe charged contra-particles in the neighborhood (this whole PhR model would be wrong). It proves that attraction or repulsion between particles are polaron driven interactions, whereby free connector zeron charge types are just enabling or facilitating certain combinations of connector states to effectively interact in a certain sense and/or direction. If polarization effects take place in a space volume that is not empty,*

the impact on the particle population filling this medium has to be taken into account. We stress that polarization lines are dynamic (or short-lived) because the connector states involved are conditioned by the "in se" dynamic replication processes of particles at both ends. This remark is crucial to understand (e.g.) the nature of binding by periodic polaron exchange in an atom between an in-se dynamic nucleon (protons and neutrons charge sign based on axion-type interactions) and an electron along its orbit. Particles (e.g. neutrons) with dynamic connector configurations that have *internally* mixed signs (these are slightly phase shifted and compensate each other "on average") could have internal polarization chains interconnecting these charged zeron states (to be investigated – the even number of electron-like replicating substrings equally distributed over 2X3 cones around the nucleus guarantees anyhow a net charge neutral pattern). These short dynamic local or internal *Coulomb* field lines remain even indirectly transparent to observers, *except from the fact that their corresponding superposed charge info emission pattern explains why the magnetic spin of a neutron is not zero*.

- **Magnetic field lines** are, *at a deepest level, quantized charge info patterns, induced* by *free point connectors* (dipoles) *of two* phase shifted *zerons,* emitting *interfering signed and* quantized circular charge info patterns in surrounding symmetric spacetime locations . These pairs are part of *numerous* more complex patterns, so their individual complex charge info distributions have to be *combined or superposed* conform the superposition law. *Hereby geometry and dynamic phase shifts between combinations of coherent charge info antenna's are important. It is crucial to treat any point made pattern as a complex a-priori multi-directional antenna in those "free" states where one or more components are not involved in internal binding, hereby taking coherence, symmetry (in space and time) of the pattern and superposition of interfering charge info emitted by each component into account.* A fundamental difference between *quantized* charge- and charge-info-patterns is that charge quanta are confined to specific locations *and cannot be individually superposed*, where *emitted* charge info is *a priori* omnipresent and propagates at a very high speed (>c): its local density distribution takes the, *by any antenna symmetry driven,* emission format and the superposition (or *constructive and destructive* interference *of quantized charge info packages – other non-well-synchronized charge info superposition effects have no impact and are just noise – it is crucial to understand that a point-like charge info quantum does not carry net energy – so in case of complex antenna symmetries, several superposed charge info interference patterns,*

emitted by the same short lived antenna pattern, can coexist without violating an energy conservation rule) laws into account. *Conform the FLN principle (and the time varying Maxwell equations) the potential impact of charge info over a time lapse τ is opposed to the initially time varying charge distribution.*
Propagating at a speed by far exceeding c, net quantized charge info packages facilitate coupling between intrinsically quantized compliant point states *with* respect of the base laws. In the former chapter about point replication in single zerons, we mentioned that a replicating point string behaves like a magnetic monopole: so *at least* two *properly* phase shifted zerons are needed to emit a dipole pattern as described in physics. *Multiple successive dipole patterns in the UZS* originate by point-zeron selection, as subsets of coherent grid components being copies (*by selection of contact-EZP's in the UZS)* of free (*in I-max) transversal* connector *zeron* pairs, and induced by particles *when replicating and "moving"* over the grid. Their net average charge content is zero but they carry a small *quantized* phase shift at point level. Where the selection process for electric field lines *along a single axial or longitudinal path* make use of the abundance of free zerons *and contact-EZP's* in the UZS, magnetic field lines are doing the same with primitive short lived *transversal free* zeron pairs in the *I-max* contact state (*multiple branched copies , each circularly distributed and transversal to their propagation direction).* They form a *complex* pattern (in fact each *compliant contact-EZP* acts *on its turn in i-max* as an antenna, capable to order *spiral-wise* by selection other short lived *contact*-EZP pairs in their contact state) that can be indirectly observed when zeron pairs are integrated in a more complex *energy-carrying* pattern, able to *shift* over the grid by replication or propagation: an example is the B-field in a fotino sequence *oriented along a perpendicular bisector on a virtual connection line between a phase shifted rotating transversal zeron pair. A similar constructive interference and superposition effect (like the one at single zeron level - the just mentioned case of point replication in UZS zerons that behave as magnetic monopoles) exists internally at particle level (e.g. the magnetic spin property of a replicating* electron *along the trisectrice of 3 strings*, as observed in physics, *a process that does not prohibit the same electron to contribute to contact-EZP pre-polarization impact in the UZS*) or *even*, on a macro scale, *to contribute*, whenever (e.g.) an electric current is inducing a net circular magnetic field around its wire. *But* even when a charged particle is (theoretically) standing still versus the double spacetime grid, its replication process is producing a net magnetic spin effect *as just mentioned above*, being the

superposition of residual charge info along a virtual trisectrice, of the orthogonal replicating strings and emitted by 3 orthogonal phase shifted free EZP connector zerons in phase shifted branch connectors (in fact the transversal string components of each long branch, not to be confused with the impact of the connector hole along the short axial branch which is producing the "normal or *mass-like or hole related* " spin, being a pure dynamic point-hole ratio density effect). The same residual magnetic spin effect (physics) is weak in case of baryon-type particles like protons (see baryon replication *schema*): a (e.g.) proton flips periodically *for each internal replication string version* its local charge types due to axion exchanges between adjacent connectors of electron-type replication *string versions,* distributed over a *virtual* cone. *On the other hand, the impact and "sign" of the hole type connector state remains the same for all the superposed electron-like replication sub-patterns.* The latter explains *(in PhR terms)* why the order of magnitude of the ratio of electron and baryon magnetic spin values (the Landé g-factor in physics) is related to their inverse mass ratio's: an electron replication cycle maintains its connector free charge type during the full life cycle between two contractions. *As a side remark: an equivalent proton/neutron replication cycle should at first sight be shorter in time than a free electron cycle (as* $h/2 = T * \Sigma.\delta E$ *) but the number of hole locations, all of the same type and maintained over a full cycle is larger (the total net mass value is high, consistent with* $E=mc^2$ *). This seeming conflict is properly addressed by the term "equivalent" and relates to the fact that internal axion interactions flip the charge (and charge based energy) type of each partial superposed electron- (or positron-) like replication schema in a baryon: so the Σ-symbol refers to a kind of algebraic sum whereby free-charge-related (axion-type) energy cancels out over a full baryon cycle where on the contrary, hole related energy adds up. So a single action quantum can induce a simple or a composite process, depending on the complexity and the symmetry of the internal replication schemas of both patterns.* Any external magnetic field has an impact on the path over the grid, as followed by a moving pattern. *Hereby there are two possibilities.* This effect could be either *systematic and* the outcome of the impact of a magnetic field on the inversion process of the EZK in the contracted state (in fact it *determines* the orientation of the next position shift) or it is *stochastic and related to an increased probability* of polaron exchanges in *I-max states with* connectors of *a particular transversal string (so not oriented along the preferred propagation direction)* of a moving and replicating particle, *effects that both enables at least theoretically, the* curving

of the particle's propagation path. Such a change in velocity (not in speed) does not modify the net energy content (and the I-max value) of a free pattern *but it interchanges the "fastest branch connector property" between two strings of a replicating particle and modifies the orientation of the particle spin vector*.
All this makes sense: changing the cosmic state *at point level* by an action quantum h needs convolution of both, an energy quantum (thanks to available (free) charge) and a time quantum (thanks to phase shifted points with opposite types). The high density of available unbiased primitive dynamic uncoupled zerons and of zeron pairs in i-max return states in the UZS grid *(contact-EZP's)*, enables patterns (or particles in physics) to induce by selection and ordering of grid components, electric and magnetic polarization lines. *The distribution of* these primitive grid components are PhR behind the ε and μ parameters of spacetime in physics. Their density (*and geometric format and "availability", meaning: not involved in other pattern bindings*) has an impact on the speed and velocity of an EM wave (physics), meaning on the speed of appearance of subsequent selected fotino versions *along a photon propagation path* but also on the even higher propagation speed of multidimensional charge info copies of fotino's, explaining their net interference pattern and the outcome of the *fastest pre*-selection process itself (PhR behind "double slit" experiments in QM).
The duality of Coulomb (*or Gauss)* and magnetic field lines is PhR behind Maxwell's equations (preferably expressed in relativistic differential tensor format). *However Maxwell's static and dynamic laws are unable to describe physical behavior adequately at a most detailed level. In this context, relativistic models of Maxwell's laws need to take into account that their intrinsic behavior, in order to be PhR, should be independent from an observers state. However in QM and in PhR terms, observations imply interactions…..*
Finally we want to stress (once more) that a magnetic field (*in PhR and in Physics)* is a *time* quantized charge info *(magneton)* field: *a* superposition *by constructive interference* of field quanta is PhR conform *(base law 6). In order to be quasi-persistent on a macro scale, given a stationary but cyclic antenna source, a magnetic field pattern needs to show a circular (geometric) and/or cyclic (time or phase) format and has to maintain an anomaly as part of a more complex energy carrying pattern (e.g. an electron spin vector or a photon B field). The reason is that its charge info pattern needs to be maintained by a sequence of contact-EZP micro-processes of the same type (matter- or contramatter-like) that guarantees nevertheless a quasi exact multiple of τ (see "fine structure constant article" on viXra) in order to be a local stationary pattern in the*

UZS. This condition can be geometrically satisfied (e.g.) along a polygon embedded in a circle with the appropriate radius value. It could explain (in PhR terms) why a factor π shows up in fine structure related formula's in QM.
In this perspective, it has to be investigated how magnetic field line patterns in a by contra-matter dominated UZS volume would relate to magnetic field lines in our environment: contact-EZP scenario's are different, particle free charges are distinct (e.g. a contra-electron has a net positive charge), rotation senses are opposite (e.g. an electron spin) etc….If our planet is a double planet (contains permanently or periodically a contra planet), what would be the impact on the orientation of the magnetic north-south pole axe of the earth versus its rotation axe?
An interesting case in QM (Aharonov-Bohm effect in Physics) describes a macro state whereby superposition and constructive interference of magnetic field quanta lead to macroscopic "topological or geometric" symmetry patterns. This means that (quantum) magnetic effects (in QM and in PhR terms) can be measured outside or at the border of domains where classic electromagnetism (Maxwell – the dynamic laws apply when both, polaron exchanges and pre-polarization effects, are involved leading effectively to energy transfer and momentum changes in interacting particles by photon-coupling) would predict and limit their presence: in PhR terms it means that it is not because there is no free charge to be impacted, that well formatted superposed charge info cannot be present. Earlier in this text was stated that these dynamic states are similar to, on symmetry in space and phase based patterns of charge info emitted by free connector zerons in electrons and periodically in protons, leading to sustained particle magnetic spin configurations (see also a paragraph in chapter 5 about the role of symmetry in case of pattern formation and behavior). Their presence is determined by properties in phase and space in locations outside the active connector trajectories and they are emitting (as correlated "free" zeron pairs not engaged in string component binding) the original charge info quanta to be superposed. One of both transversal zerons in a "long" connector of a replicating pattern is coupled and synchronized with a central EZK "free zeron" but is locally reset what means that it has anyhow a net local properly synchronized charge info impact. This impact is determined by the space-time format and the tenor of a magneton: computer simulations are (once more) needed to confirm its lay-out.
In PhR terms we called some of these primitive effects in vacuum a form of <u>pre-polarization</u> by selection of UZS components that does

not require energy and their dynamic distributions are implemented at a speed much higher than c. Coulomb field polarization lines are linear. Magnetic contact-contact-EZP polarization effects show often a multiple branched distribution. In order to produce a stable and measurable impact they need to be dense and quantized and form closed loops (see above- see also QM and Aharonov-Bohm effects). These dynamic effects should explain formulas in particle Physics like F (transversal force on propagating charged particle) = B (magnetic field strength) x V (charged particle velocity) whereby x is a vector product. "By elastic scattering" particle path bending seems to be effective only in the contracted state whereby a local B field quantum will determine the preference of the choice of a next "longest string" without changing the regime I-max value of the replicating pattern. The impact of a B field can lead to a relative phase jump between the 3 orthogonal strings of a particle so that the longest string, available for polaron coupling, lays no longer in the actual propagation direction of a particle. Obviously the relative frequency of successful transversal bending steps will increase when I-max is smaller (higher velocity values) and when the local B-field strength is greater (electromagnetic theory in Physics – an increased probability in PhR). We refer to other very interesting phenomena in particle physics whereby very precise equivalent mathematical models of external magnetic field coupling with an (e.g.)electron particle spin result in precession of the particle. The measurements in this domain are extremely important to prove the correctness of this PhR model. The capability of charge info to be superposed based on large scale symmetries leads to gauge terms in mathematical formula's of QM (this could be seen as a potential source of conflict with the locality principle).
It is also obvious that in a contra-world where transversal strings (and magnetic fields) rotate in the opposite sense, the left-right handed rules in "applied electromagnetism" will be inverted.
Some magnetic field related phenomena are conditioned by the fine structure constant value (hole tenor of a contact-EZP has an impact on unit mass), so results will be slightly different in a contra-matter environment.
In an EZK based replication schema we could say that a free zeron connector charge in I-max is the source of an electric field whereby its "extension by selection" is materialized by dynamic chains of properly polarized free contact-coupled UZS zerons (Gauss field lines and conditioned by the value of the ε parameter), while extensions of magnetic fields have a tendency to form closed loops of symmetry centers of circular charge info (magneton) patterns (see above) or are dynamic narrow circular patterns along

geometrical symmetry directions like magnetic spin patterns of electrons along the trisectrice of the 3 replication axes of the particle. Propagation of these patterns are materialized by "selection" of appropriate contact-EZP's in the UZS, perpendicular to the propagation direction (on its turn locally linked to the μ parameter value).
We refer to another article on viXra about EPR-like (de)coherence effects, that are equally based on a shared two-sided anti-symmetric pre-polarization strings, enabling propagation in opposite directions of two photons with a coherent anti-symmetric format. Measurement of the state of one of them in combination with conservation rules has an impact on the state of its partner even if this would seem to require classical charge-info transport at speeds >> c where in fact the two-sided pre-polarized contact-EZP made string flips its states quasi synchronously after to a one-sided measurement event .
Another interesting case relates to the quantization of the orbital momentum states of an electron "moving" around *and periodically coupled with a dynamic proton state in a central* atom nucleus (physics). A particular global atomic state is stationary when the quantized charge info patterns emitted by the subsequent electron states are stable after superposition of charge info along an orbit: the outcome itself is quantized. Spin - orbit coupling is taken into account when calculating potential stationary states and combinations of states, in case of multiple orbits occupied eventually by unpaired electrons. Both, orbital momentum and the combination of spin and momentum, need to be quantized (see also Chlebsch-Gordan coefficients in Physics). A QM description of this global process is only PhR compliant if magnetic fields involved are net quantized interfering charge info patterns, as based on the superposition law whereby charge info propagation speed is much higher than c! This extremely important but complex mechanism needs further investigation (e.a. by computer simulations).
No attempt has been made to check in a PhR context magnetic field contributions and properties to the collective behavior of large numbers of "free" ionized particles in plasma states. The combination of electric and magnetic field lines, as emitted in special states by connectors of spin ½ and spin 1 particles is important to understand the distinct behavior and impact of fermions and bosons in QM, in solid state physics and magnetism, in statistical mechanics etc… An interesting case is the formation of Cooper pairs in superconductors whereby paired electrons (fermions) behave like bosons. This "pairing" seems, in PhR terms, to be related to a cyclic binding by direct polaron exchange

between transversal string connectors (perpendicular to the direction of motion), a state that requires (in order to be persistent) low temperature and an adequate magnetic field coupling, parallel with the third free string connectors of both electrons. Here again Coulomb repulsion is not a valid argument to reject these models. In previous paragraphs an overview has been made of several effects based on charge info emission and superposition whereby only part of them are related to magnetic fields as described in standard electromagnetic theories. At a lowest level charge info is emitted by changing point states and propagates at speeds at least as high as 137c , in fact a much more detailed level than phenomena related to particle driven charge info emissions whereby high-level symmetry and superposition are conditioned by those particles replication cycles and free zeron components. The fact that the term "magnetic field" has been used at distinct levels could be a source of misinterpretation. Computer simulations are (once more) needed to fully understand those mechanisms in a PhR context.

- ***Graviton* field lines *(see also next chapter)***: after the creation event, on emerging new UZS grid shells and referring to the earlier described process of pattern creation and motion in those shells, an increasing number of charge-neutral particles (e.g. neutrons or non-ionized atoms) are shifting step by step in their contracted states, their average position towards the center of any spherical-symmetric volume, *leading to increasing radial pattern density distributions around* central symmetry locations. *The spontaneous emergence of these large scale non-homogeneous particle density states* is hard to avoid, *be it* because the probability of any pattern *of particles* moving over a long time at *fixed* speed is statistically about impossible. Any initially *random small-scale condensation* process will create *(or at least maintain)* a fast growing gravity field materialized by a radial density gradient of unconnected but "historically" correlated charge neutral-EZP *patterns* (see *hereafter a* special chapter on gravity related topics like *gravitons, contra-*gravity, Big-bang energy considerations, LIGO …). Any reduction of a particle's I-max value thru at first sight randomly oriented polaron import will release, *in combination with an acceleration (and as difference patterns for transversal string zerons in the contracted state*) excess pseudo-static (meaning: a pattern unable to move over the UZS) patterns with *a rotating persistent charge-neutral EZP format, sustaining a net local hole density* (in N-dim UZS- space) that is on a *large* global scale, spherical symmetric with a gradient that increases towards a volume's symmetry center *(a non-linear effect due to the geometry of a sphere but additionally*

step by step increased by gradually smaller I-max values and an increasing number of contractions). Charge neutral-EZP's *for matter* (gravitons with spin 2 in physics) have identical properties as they *are induced on the UZS, as difference patterns between transversal strings of two branches at the time of a position shift in the contracted state of a particle, accelerated (or even by any position shift: see hereafter – a position shift in a particular direction always implies at the origin, an unbalance between two branches of a string)* by any *single extra* asymmetric *standard* polaron import *or by a gravity field pattern itself. Their net charge impact is on average nihil because contraction of a charged transversal pattern leads to inversion of the net charge type property.*

A similar process could turn up in case of deceleration whereby polaron import would take place in another *connector* state of a 4-state spin ½ particle, *but* such situation is artificial *and non-gravity related, meaning that polaron coupling with another particle and the appropriate connector states are needed in order to accelerate a particle in a direction, opposite to the local gravity field gradient.*

Why this difference in impact *of a polaron and graviton coupling* ? *In case of gravitons n*et acceleration or deceleration is driven by a *similar* impact of (neutral) EZP densities (materializing a gravity field, a process taking place in superposition with any other source or target of polaron exchange), on the subsequent *distinct* replicating particle's I-max connector(s) states. *On the other hand t*he connector properties of a replicating spin ½ pattern are *each time* interchanged in the contracted state and so will be the *impact* of polaron-like *interactions with photons, emitted by other particles,* in connectors of subsequent *I-max* branch states ….*but gravitons (due to their internal lay-out - see hereafter) are spin 2 patterns.*

That means that they couple with each subsequent I-max connector state format of a spin ½ (or spin-1) particle and their net *momentum* impact would cancel out over the *full 4-step* life cycle of *such* particle. So the only remaining discriminating property is the distinct probability of successful coupling, which is slightly different for two subsequent interaction events, an effect due to the gradually changing curvature *(or density gradient) towards or away from the center in* an existing *large scale* radial neutral-EZP density distribution volume.

Over a particle's small and gradually decreasing string length (due to a by acceleration increased velocity *in terms of Physics*) this extremely weak *probability* gradient explains *finally* the small coupling constant of the gravity force in physics. In this way radial

neutral-EZP fields around and inside young stars, planets etc…have been built up as observed these days by cosmologists. They call them radial 3D gravity fields materialized by unobservable "gravitons" (*see next chapter* - neutral-EZP *patterns* and their density distributions are PhR behind dark matter (a topic in large scale cosmology) and behind gravitons (particle physics)). The weak impact of those fields on local matter particles (and vice versa – e.g. their huge spherical volumes are able to copy or to drag over small distances gravity field densities filled with excess EZPs along their orbits) can be approximately and mathematically described in accordance with Newton's gravity law and/or Einstein's GR-theory. Hereby one has to take the contribution of hole densities (their static and dynamic mass content) maintained by these particles themselves, into account. However, these theories are valid for describing *in most cases and* on average the macro-behavior of charge-neutral particle sets, whereby this PhR model shows that to understand their underlying local micro-behavior, one needs to know the lay-outs of a replicating particle and a graviton, in order to calculate the probability of successful interactions between both. In the same context one understands why Newton's F = m*dv/dt law applies locally whereby F can be expressed on a microscopic scale as a covariant vector representing the gravity field force : at sub-relativistic speeds and in PhR terms and for patterns with a constant mass, there is indeed a quasi linear inverse relationship between I-max and a patterns speed v: the higher the speed, the smaller I-max and the higher the gravity field gradient (and the *equivalent* $F= G*Mm/r^2$ value, observed in a fixed large scale reference frame as practiced in Newtonian physics).
We mention that in PhR terms a similar process takes place in black hole volumes. M*ainly* contramatter particles also condense as contra-stars whereby their contra-graviton fields are in fact radial density gradients of *contra neutral*-EZP's (materialize dark contramatter).
The examples above explain why in physics and as observed on a macro-scale, classical pseudo-static gravity (hole based) and *Gauss* (charge driven) fields show a similar symmetry and mathematical format. Without the presence of an external time-varying field *with an impact on these phenomena*, both fields are conservative and non-rotational and the relationship between hole or charge *density* distribution on one hand and the corresponding potential energy field on the other, obey similar "laws-of-physics formats". They reflect an analogue spherical probability distribution for successful interactions by polaron exchange between properly aligned and synchronized pattern connectors. The difference in coupling factor

and sign (or direction) between the two is well understood in PhR terms by combining both field properties with the symmetry properties of a particle's replication pattern.
As mentioned before, our on a macro scale 3D perception of the cosmos is a form of polarization induced by frequent interactions between *on a large scale* properly aligned and synchronized matter particles, *each intrinsically and originally with an a priori randomly oriented internal 3D* (or regular tetrahedron format) symmetry.
Two particles that couple successfully through a polaron exchange *between axial string connectors* (*enabling a successful* EM coupling in physics) must be properly phase shifted and should belong to an –at least temporarily- common 3D subspace (*one of* their quasi linear replication axes should be at least coplanar *in order to interact successfully although this is not enough to belong quasi permanently to a large scale common 3D subspace*).
A graviton with a circular – at point level phase shifted – pattern should preferably rotate *around a virtual axe, coplanar with a patterns* fastest axial replication direction (high success rate) or at least perpendicular to the *virtual* plane formed by two *non-slowest* symmetry axes (lower probability) in order to couple successfully *(the chances that even the third replication direction of a particle, perpendicular to the plane would be temporarily the longest, is so small that it can be neglected – see also small torsion assumptions in differential geometry).*
These rules (*in combination with the fact that any string connector involved in a successful interaction is not the longest anymore what* could explain why radial acceleration towards and, leading to *a spherical* concentration of all the matter particles *around* neighborhood in a central symmetry center, will not take place in 100% of the cases. It could explain how and why (e.g.) planets *are rotating spheres and why their orbits* around the sun acquired and conserved historically their *planar form and their* rotational energy.
Successive versions of co-rotating particles (e.g. on a macro-scale, components of a large object rotating around the sun) lay in a common plane and each of them is able to change slightly its direction in a curved gravity field by exchanging polarons (see earlier – we neglect relativistic effects at very high velocities) between coplanar strings of a common EZK pattern, without a need for external polaron input and incremental energy: an I-max decrease in one string is compensated by an increase in its neighbor's string length, just leading to a new relative phase shift configuration, *a different spin vector orientation and distinct relative interaction probabilities for* the three orthogonal strings

…but all this without loss of the large scale 3D character of our solar system. This mechanism is PhR behind the principle of conservation of rotational impulse (physics).
The average radial orientation of the graviton rotation axes distribution in large scale gravity fields around (e.g.) our planets and stars, act as a memory of what, on the lowest scale, is the historical outcome of the intrinsic 3D symmetry of an Higgs based accelerated particle combined with the on average "fixed" orientation of its radial propagation path. It contributes, together with a fixed orientation of the most probable coupling axe between subsequent versions of such propagating Higgs based replicating particle, to our perception (on a large scale and on a particle scale) of a cosmos with just 3 spatial orthogonal dimensions.

- **Miscellaneous:** As a general remark, interactions (including most measurements in physical experiments) *are a form of short-lived or dynamic binding that* puts quantum objects temporarily into *single* non-superposed states. The same is true for random collisions with particles in the neighborhood (the reason why quantum computers prefer a low temperature). The statistical distribution of possible results of any observed quantum object property can be calculated in QM but each individual "measurement's" outcome is hard to predict in advance. One thing is for sure: any measurement requires point level interactions between properly aligned and synchronized EZK based pattern string connectors. The more frequently these interactions take place (e.g. cyclic coupling between atoms in a molecule), the smaller the *average* spread in the observed results (PhR conform- any change in relative shifts takes place in EZK's in the contracted state). This explains why macro-objects (like in Schrodinger's cat experiment) show a more predictable behavior. The Copenhagen interpretation of an "observation" as a phenomenon taking place in a high-dimensional world with superposed and statistically distributed potential states (or local dimensions) and external communication channels, but reduced by complex binding (or by observations themselves), is consistent with this PhR model. Nevertheless a model describing nature at an underlying sub-particle level like the one proposed in this text, would make the situation more transparent and easier to understand. Superposition of several versions in spacetime of point / zeron patterns, induced by one or several coherent antenna's, leads to a complex state that can be the outcome of sophisticated experiments in physics. They prove in PhR terms that particles are *not persistent objects but* just sets of coherent and interacting raster points and zerons, in fact patterns with a dynamic behavior that take the symmetry properties of the core configuration and the

multidimensional character of superposed charge info propagation paths *(and interference)* into account. Hereby they must respect, consistent with this PhR model, all conservation rules. This interpretation implies that a statement in QM saying that "a small object like a proton can be in two places at the same time" must be adjusted for the fact that two distinct "quantum states (physics)" of a pattern, are dynamic and cannot be coupled at exactly the same time with a single central antenna set (PhR). So two observations coming to the conclusion that both versions seem to coexist simultaneously, should rather conclude that these two versions are either slightly phase (and/or dimension-) shifted and/or coupled with two distinct but coherent central antenna versions in order to be PhR-conform.

Two simultaneously emitted coherent and anti-symmetric particles like *photons (or fotino subsets)* or electron pairs, *with respect of conservation rules and* propagating in two opposite collinear or coplanar directions and replicating as subsequent versions of the initially emitted patterns, are able (under critical environmental conditions and step-by-step or version by version) to align by induction and selection of raster components, coherent sets of local *contact*-EZPs, each zeron pair orthogonal to the propagation path. Their centers form a quasi-linear "persistent" (*but in practice short-lived)* hole-filled *pre*-polarization (field) line. According to the base laws, charge info exchanged end-to-end between both original correlated particles is able to propagate along an existing coherent connection path at velocities c_p , much greater than c (at least 137 times the speed of light). Abandoning the universal principle of locality, widely accepted in physics (and by this PhR model, although limited to typical phenomena taking place at UZS level) would explain (non-local) EPR effects (whereby *non*-locality is *due to charge-info exchange at very high speed using* fast causal sequences of *raster* component *pre*-selection processes at CPS *or UZS* level) without involvement of "real" particles *and without the exchange of energy and/or momentum*. This info propagation process is similar to what happens in a (UZS) zeron *(pre-)*polarization string (a dynamic Coulomb *or Gauss* field line) but in this case the string is hole- (*charge info or magnetic-field like)* based and maintained by a coherent *linear transversal contact*-EZP *set*. There is no doubt that such hole- *(or contact-EZP-)* based polarization path is extremely sensitive to external interactions, leading to a de-coherence of the original particle pair.

Direct collisions between particles as defined in physics (QM) are not necessarily equivalent to single interactions in terms of PhR. It is indeed impossible to switch the sense of the *linear* motion of a

particle over the grid, just by a single elementary interaction. When connectors of both particles did reach about simultaneously their I-max return states at distances where compliancy rules permit with a high probability, that they can share a zeron polarization line of a particular type, a *direct* polaron type interaction has a chance to take place. The conditions for a successful connection depend indeed on the connector states involved (taking 4 distinct connector configurations of a spin ½ particle into account) what on its turn determines the potential format of zeron state sequence of connecting polarization lines (e.g. this determines Coulomb attraction or repulsion by enabling compliancy and interactions only between connectors in the appropriate state). Hereby one of both patterns plays the role of antenna, the other of receiver of a (polaron)momentum quantum. Hereby it helps that the emitter is (most probably – it remains to be proven) a long branch connector with a free zeron, and the receiver a connector of a shorter branch, carrying a hole (to be proven by computer simulations). Per successful interaction conservation rules will apply over both interacting components : an increase of momentum of one particle implies a decrease in momentum of the other, at least in a common by matter or contra-matter dominated cosmic subspace . One has to realize that, when such event takes place, both patterns stand still versus the double spacetime grid. *Direct polaron coupling between particles without involvement of photon exchange, has only a chance to take place over short distances. An example is what happens between nucleons or the coupling between protons and electrons in an atom. For a successful point-to-point axion coupling distances must be even shorter (see point-to-point strong interactions or color forces in a nucleus).*

What physics in this situation observes as a collision is in fact the outcome of a sequence of subsequent elementary interactions whereby the probability distribution of successful cases in one or in the other sense, depend on average on their I-max values: the shorter the replication length of a particle, the more frequently it will act as the potential successful emitter of a polaron that will lead *"on average"* to a loss in momentum in favor of the receiver . So *even the outcome of* a *single* "collision" (= interaction) *between particles in an unequal momentum state remains* a statistical phenomenon *, in line with the principles of quantum mechanics.* This scenario encompasses the more probable case when the two interacting particles do not replicate along a *theoretically* collinear axe but *more realistically between* just coplanar interacting string axes what implies that both trajectories will (*on average)* bend, relative to each other. As stated, the elementary phase angles of the

two end points in the zeron life cycles at both ends of a successful polarization line (a measure for the hole/charge state and for the sign of these charges), and subsequently of the two connector zerons involved in the polaron exchange interaction, determine the repulsive or attractive nature of their impact. Reconcilement of these rules in Physics and in PhR is not obvious: in Physics and based on energy and momentum conservation laws, it is accepted that in a fixed common reference frame, a positive charged particle moving to the right towards another positive charged particle of the same type moving in the opposite direction (a head-to-head collision), will lead to an *initial* loss of momentum for both *and an decrease in I-max values and replication length* (and *in practice* a bending of their paths *and a temporarily increase of potential energy in Physics*, due to a *stronger* repulsive Coulomb force). If the same positive particle is "hit" by another positive particle (with a higher speed and moving *along* the same direction but approaching from the opposite side), it will gain momentum. In terms of PhR (*and in QM)* both situations need to be explained by probabilities of successful coupling as based on I-max values and replication types (electron or baryon like), *by impact of polarons on each of the 4 connector configuration of (e.g.) a spin 1/2 particle and* by compliancy rules of connectors for the two particle *I-max* replication states *and* by a *proper* common schema of *UZS* zerons at both ends of a *(Gauss or even gravity) pre-* polarization line, leading in *all* cases and particle- *types* to an *on average* correct and consistent increase or decrease of I-max values (see "momentum" as explained before): to prove the internal consistency of this model, it is not permitted to use a priori any confirmed law of physics !

Ultimately relativistic effects have to be included in these scenario's whereby non-linear behavior of replicating particles with small I-max values will lead to a sequence of interactions between superposed EZK configurations and eventually (in case of non-elastic very high energy collisions) to interactions at the level of the EZK cores themselves (e.g. induction of new short lived particles like mesons). Other interesting topics (e.g. quantum tunneling and the violation of the maximum speed of light rule) could be discussed in a PhR context but this exceeds the scope of this document. We also draw the attention on the role of a filling substance, itself made of particles, in case of experiments in non-vacuum: in most cases a change in background properties (e.g. propagation speed of light in a transparent glass plate is most probably not due to direct interactions between photons and glass

particles but to a difference in availability of appropriate free contact-EZP densities in the UZS, leading to another μ value).

7. **Gravity-related topics.**

- **Gravitons and "(non) repulsive ??" gravity forces:** "*dynamic but persistent* charge neutral-EZP patterns " (gravitons in physics) materialize dark matter (like contra-gravitons do for dark contramatter). In previous paragraphs it has been shown how a fixed type mass- (or hole or time-) quantum can become persistent and maintained by a *rotating* 2D neutral-EZP pattern. The circular distribution of successive versions of this simple replication pattern is the outcome of the way subsequent versions of transversal zerons of two unbalanced contracting EZK branch connectors interfere at the time the "neutral-EZP" is induced and finally released as an autonomous pattern in the CPS/UZS. Although such circular replication process has to be confirmed by computer simulations, we presume that both signs of the two zerons that belong to a next version of an EZP change their charge type in their i-max states in such a way that overall charge and charge info conservation in the full pattern is guaranteed (*so no electric or magnetic pre-polarization field is produced, neither is a graviton sensitive to these type of fields).* The two original, along a helical path distributed, transversal EZP substrings, *in fact connector copies* of the contracting branches of an accelerated (by a one-sided imported polaron) string, are phase shifted and a difference pattern (the neutral-EZP being in fact a *inverse* copy of the unbalance on the UZS grid) is gradually built up at each contraction. This pattern is complete and will be released *as an autonomous persistent difference particle,* when a position shift *of the original particle* takes effectively place, whereby successive copies form a dynamic but persistent loop that needs to have the properties mentioned before (single or double rings – to be investigated – we propose a single and closed ring: although two successive transversal connector copies in each branch, at the time of contraction and observed versus a central symmetry location, are shifted over an, at point-scale, small distance but its net impact is limited by the final "closure" of the pattern). Free neutral-EZP's are spin-2 patterns (so they are in the same pattern state twice per reference period, as compared to a spin ½ EZK replication period, but they own as a pattern no net magnetic spin impact). They are able to interact successfully by polaron exchange in both inverse I-max hole connector states of two successive and compliant replication states of a spin 1/2 EZK particle (*a replication schema* whereby 4 contractions and inversions are needed before an identical particle pattern *connector configuration* reappears – *the same statement is valid for the two contractions required in case of a spin 1 pattern).* A spin 2 property does not imply that the reappearance of the same pattern state happens *just* once or twice per rotation cycle of the neutral-EZP: *it rather comes from its highly probable capability to couple successful with each of the 4 potential connector I-max states of a replicating spin ½ particle string (in such connector zeron combination, CPT-wise four left-right and charge-type*

combinations are possible). Further investigations are needed *but here has been assumed that an axion exchange between successive neutral-EZP's states is neutralizing the impact of the sign inversion in the contracted state what implies that every "in a plane rotating around a properly oriented spin axe" phase shifted EZP state fits the requirements for successful polaron coupling what makes a successful interaction between a neutral-EZP and a particle connector state a very versatile and effective process.* These polaron-like interactions are anyhow leading to either a momentum increase- or decrease of the spin ½ particle *depending on the connector I-max state configuration involved in the interaction, and to the absorption and the re-induction of a graviton pattern in a slightly position shifted location, parallel with the previous version and perpendicular to the axial string along which the momentum change took place*. This means that statistically and on average, the net impact of a high local *and properly oriented* density of neutral-EZP's on a particle's momentum is nihil. In a *virtual* fixed UZS reference frame the *relative* positions of the particle nucleus and the neutral-EZP are eventually just interchanged but the *net* energy *and momentum* of the particle do not change. This conclusion is consistent with the fact that the difference in the (as a change in momentum expressed) energy state of the particle after deceleration (acceleration) *just* corresponds with the released (or absorbed) photon energy. But if this statement is correct, how could a neutral-EZP, released in the UZS and standing still *versus the UZS* without possessing *itself* any residual quantum of momentum, impact on its turn the momentum state of another interacting particle in the future? *If a graviton density distribution of a particular type (be it matter- or contramatter-like) over a large-scale central symmetric pattern volume (like our planet Earth), is showing a radial gradient, the coupling probabilities and the net impact of the successful interactions with successive opposite connector-states of an (along a radial direction) moving, charge neutral particle, will be no longer nihil, although this net impact is still extremely small* (related to twice the *difference of the* EZP density gradient over a small distance of the order of a string length). *The graviton density gradient along radial paths, distributed around a spherical symmetric volume is conditioned by two effects: the large scale geometric and symmetry properties of a 3D sphere and a gradual and non-linear increase in velocity of an accelerated replicating particle.* This is a valid explanation for the extremely small coupling constant of the "gravity force", as compared to other forces in the standard model (physics) and one of the many unanswered questions in physics. The same gravity field will exert on a particle moving into the direction of a negative EZP density gradient a decelerating impact because the relative phase shifts between transversal connectors of successive spin ½ states depend on the direction of a momentum vector. So if one throws a ball upwards in a gravity field like ours, it decreases gradually and slightly the local neutral-EZP density *gradient* along its path due to *selective* polaron absorption and by an increase of I-max *values* of the ball's *elementary* particle content, *a process that slows down its speed* (which seems to be consistent with a classical physical approach), because a quantity of matter (the ball) just left a virtual enclosed

spherical volume filled with matter-like mass and *its previous local volume is replaced by* "empty *or less particle dense*" space). An equivalent (be it along a distinct path) neutral-EZP density *distribution* is rebuilt when the ball falls down again. In PhR terms all this is obvious, but in terms of Physics it answers a question often raised : how can a large central-symmetric "curved" field around (*e.g.)* the earth, superposed on an even larger field around the sun, take a distant *small scale* phenomenon on earth into account ….in real time (so without delay- even the speed of light is not fast enough) in order to adjust instantaneously the strength of a local gravity field, not just along the path of the ball but theoretically "everywhere", be it because the ball itself has mass. So there seems to be a problem in GR, at least if the *causality and* locality principles (QM) for graviton interactions are accepted. In PhR on the contrary, an a priori local *anti*-symmetric process can be successfully transformed into an extremely small but large scale asymmetric density impact on spacetime curvature, *conform* GR. One could say that a graviton clearly act as a gauge particle between a local *micro-symmetry* and a global *large scale 3D-symmetric field whereby the discriminating factor in PhR terms is just the varying coupling probability, over a particle replication length along the radius of a spherical matter (or contramatter) density distribution, between gravitons and incoming particles*.

- In PhR and as stated before, the change in the radial position of a particle in a gravity field, changing its momentum state and releasing a neutral EZP, will have on one hand a small impact on the local gravity field distribution, and on the other hand and energy-wise, a *non-linear* change in potential energy, compensated by an adjusted I-max value and a consistent change in kinetic energy.
- In very strong gravity fields and for small I-max values, effects like mass increases (see before for high speed impact) appear in PhR, as well as in physics (relativity). If potential energy and momentum related kinetic energy make both use of the same I-max parameter to represent two types of macro-energy, it implies that in an on average fixed position in a non-flat gravity field, a pattern (in a particular initial momentum state) is indeed able to oscillate at an appropriate frequency between two I-max values in two opposite connector states in a spin ½ replication schema, accelerating and decelerating a particle along a redial polarization line (think on a classic experiment whereby a mass hanging on a spring is pulled and released). As earlier proposed, even a particle moving at constant velocity *along a large-scale tangent path in a locally flat gravity field* would be importing and exporting subsequently (*a process with a much lower probability rate)* a polaron, maintaining *hereby and on average,* its I-max parameter value. This mechanism has to be confirmed by computer simulation but is proposed in this text, be it because it allows a smooth transition between a decelerated and an accelerated particle replication state, just based on relative successful interaction probabilities. *These simulations should also prove that the combination of the arrival of new particles along a tangent path will lead to elliptic orbits of planets, including the precession of this orbit, and obviously to*

the spherical volume and geometry of planets and stars and to the conservation of rotational momentum, all this conform GR (physics).

- *Another issue is the contribution of the huge graviton density distribution to our 3D perception of spacetime on earth. Gravitons have a major symmetry or rotation axe dominantly oriented parallel to the shortest (and fastest) axial replication direction of the original protons (and neutrons) when they were moving towards the surface of our planet along radial paths. In this manner they contribute implicitly to a dominance of a particular large scale orientation of an a priori randomly oriented Higgs based longest replication string of a free particle. This conclusion could also be important in geology and crystallography in order to fully understand certain matter conglomerate formation processes in the course of the cosmic evolution.*
  The same PhR mechanism under similar conditions explains how the original graviton density in any abstract elementary volume along a large scale propagation path with zero radial gravity-force gradient (physics), will be restored just after the passage of a particle along a tangent path. This also means that the Sun (if we neglect further increases of mass due to arrival of new particles, observed by cosmologists as cosmic rays emitted by unbalanced graviton/contra-graviton densities somewhere in the cosmos) has no impact on the strength of gravity-like "forces (physics)" that the earth "feels" actually along its orbit. Its propagation path is solely determined by the presence of an "historical" graviton density distribution. If our Sun could suddenly just disappear (impossible and against all conservation principles and rules), life on Earth would be impossible but the Earth's elliptic orbit would not change. If Einstein would have disagreed with this statement, it would mean that after all, he still accepted despite his brilliant GR theory, in "an, although delayed, action at a distance". Most theories (to solve this conflict) propose that we would feel this disappearance after about 8 minutes, the time needed for gravity waves (physics) to reach the earth, but this solution is not PhR conform.
- *In a former version of this text an explanation for the large scale distribution of matter and contramatter was proposed to be at least partly based on the presence of a short range repulsive interaction between matter and contramatter particles when they emerged just after an EZO split. This idea has been dropped for several reasons:*
  - *Where theoretically axion interactions between matter and contramatter patterns could be possible, their probability seems to be small and they have no direct impact on momentum.*
  - *Polaron interactions between both are anyhow excluded.*
  - *A large scale separation between matter and contramatter seems to be the outcome of differences in the inverse fine structure constant and the maximum speed c of both, particle and contra-particle types.*
  - *Not all the large quantities of matter and contramatter separated completely from each other: there could be mixed stars and planets and even mixed type black (and white) holes. Hereby it has to be investigated*

(depending on the sense of rotation of e.g. two planets with distinct types on a shared orbit) that the overlap is periodic or permanent.

- *It is about certain that the global momentum energy of planets, stars etc… should equal the total potential energy (physics) amounts for each matter/contramatter type sub-volume, observed in a large "fixed" symmetry frame (e.g. a galaxy) and for a fixed mass-amount of matter-contramatter. So the only net amount of energy calculated over both types in a huge cosmic volume, has to be based on their intrinsic different unit-mass types and values. Both these masses are indeed different, depending on unequal hole tenors of embedded EZP's in particles and contra-particles. On a large scale their energy amount distributions should be balanced by opposite free raster contact-EZP density distributions. Hereby we must take the spontaneous emergence of new matter/contramatter pairs (out of stochastic EZO formation processes in the UZS) into account (PhR of dark matter/contramatter) in the course of the cosmic evolution.*

- In this text we mentioned the case of an internal *dynamic* neutron (or contra-neutron) *connection* state for which external Coulomb forces were not observed, in fact the outcome of internal Coulomb polarization field lines connecting zerons in opposite charge states within the pattern itself. In a similar situation but on an atomic scale (e.g. in hydrogen), *weak* gravity forces could become relevant if Coulomb *or Gauss* field line(s) between proton and electron connectors, prohibit all external large scale charge based field impact. In that case the coupling between a local gravity field and a balanced *stationary* proton-electron combination is strong enough to enable (e.g.) the clustering of huge quantities of matter into stars and planets. Such a large scale matter condensation process takes implicitly the replication properties and the pattern layouts of the individual particles into account. They determine the probability of successful interactions between connectors in I-max states and local graviton densities. Although the proposed mechanisms of acceleration /deceleration of particles by gravity or by electromagnetic "forces" are both I-max related (*see remark about storing potential electric energy in a particle without significant I-max impact)* , a fast variation of I-max values due to EM effects can be superposed on a slow or weak variation due to gravity based "forces".
- The conclusion is that distant antigravity forces seem not to exist, but local antigravity at the time matter and contramatter simultaneously emerged in a format that was not subject to net Coulomb-like forces (in neutrons or in charge balanced atoms) could have been present. Nevertheless this could hardly be called a "gravity force": a "positive hole" as such does not repulse a negative "hole", both stored in two distinct contra-symmetric EZP patterns. The main reason why holes in neutral contra-EZP's do not interact with particle connectors, has to do with distinct phase shifts *in contact-EZP's and therefore* between subsequent versions (observed in a matter base reference frame) in the contracted state *at the time gravitons or contra-gravitons are released* (in Physical terms: their inverse fine

structure constants are different – see point replication) . The different hole life times *in a graviton and a contra-graviton* imply non-properly synchronized charge info packages emitted by enclosing zerons, unable to impact connectors belonging to patterns *with opposite mass types*. The only indirect and extremely weak impact in a cosmic CPS/UZS volume *with an unbalanced mass-type density* could be an abnormal probability of successful interactions of particles (or contra-particles) with other patterns of the same type, due to the changed properties of the local double-grid (e.g. as a consequence of the impact of the mutated μ parameter on the value c, the speed of light). *Although s*uch phenomenon would require important unbalances taking the high dimensionality *and the perturbation principle (very high relative contact-EZP densities versus local particle densities in the UZS) into account, these effects are important in black-holes. Even at the scale of the Earth, unbalances could prohibit any successful spontaneous induction of matter/contramatter particle pairs (EZO's) in nature or even in LENR (Low Energy Nuclear Reactions) experiments.*

- *Other challenging issues need further attention: if graviton production is related to what happens at the level of the central EZK when an unbalanced replicating proton or neutron pattern is finally in a new contracted state, will a graviton then also be released by a single accelerated and contracting electron with its much more straightforward replication schema ? Quid the impact of non-linear mass increases (Lorentz) of very high-speed particles on the number and the properties of released gravitons ? Is the slow decay process of a free neutron into a proton and an electron (plus neutrino) conditioned by the small difference in number of EZP states in both patterns ? And/or on the average relative density of two types of gravitons in a local gravity field whereby the proton-layout materializes the lowest local energy density ? Has the probability of neutrino oscillations to do with the graviton/contra-graviton density ratio in a local UZS volume along their journey and/or with the their original state (the outcome of an EZK unbalance in a particle or in a contra-particle) or even with a different layout depending on the origin of a graviton ?*
- **Big-bang, energy-momentum considerations and LENR:**
  In the same context and in order to fully understand the origin of the enormous amount of (mass and kinetic) energy stored in our present cosmos, a brief aside concerning the consequences of one-shot EZO-splits (in physics: a chiral symmetry break , in PhR + an opposite mass type) can be useful. Although remote photon coupling between distant matter and contramatter particles is excluded, local interactions (axion- like) between spatially overlapping matter and contramatter connectors seem to remain possible. This *could* only happen spontaneously in a young and locally flat cosmic volume *(e.g. at the border of a galaxy)* when both EZKs of a decaying EZO still belong to a very small *shared* cosmic volume and if both particles are not subject to other short and long range attractive forces like Coulomb forces (which *cannot be* the case *between* neutrons and contra-neutrons): *the probability of this type of interactions between uncorrelated particle patterns with different mass types is supposed to be*

extremely small (see above: polaron based interactions are excluded, so the only theoretical possibility could be based on huge unbalances in local positive and negative point density states in the CPS). However, if we accept that certain large objects like planets and even "black holes" could be dense and mixed (e.g. our sun can have a small invisible contramatter nucleus, embedded in a larger matter-like volume), axion-type interactions are theoretically possible.

- In our present *presupposed* local mainly matter-dominated and -curved environment an interaction between two compliant matter particles (or between two contramatter particles within a "black hole") by polaron exchange will increase momentum *(including rotational momentum)* of one of them while decreasing the other's (the shortest string is more frequently in an I-max state and thus more likely to be an "emitter" in a successful interaction process, so on average losing momentum to the other i.e. the receiver with its larger I-max property). This mechanism guarantees also conservation of energy, observed over the two interacting patterns. As small differences in fine structure constant numbers go together with differences in c-values and in mass *unit*-values for equivalent matter and contra-matter particles (see before) it would explain why *contramatter condensates faster and why* most of the galaxies seem to have a central *by* contra-matter *dominated* black-hole and seldom a white hole, *contrary to an a priori expected ratio of* 50% . It remains hard to explain why and how matter and contramatter, *standing still at the time of an EZO split in a local spacetime slice*, started to separate after their simultaneous emergence, a process that stored *finally* massive partial energy quantities in huge cosmic volumes, filled with matter and/or contramatter, but nevertheless *a process* enabling afterwards the use of classical conservation rules for momentum and potential energy in each partial volume. Immediately after an initial EZO split, locally *and separately per type* interacting matter as well as contramatter particles seemed to acquire *independently from each other*, momentum without the need for e.g. any mysterious anti-gravity force in our cosmic subspace. *In each matter-contramatter class the even smallest unequal graviton (or contra-graviton) densities seem to be the only driving "forces" behind this phenomenon. The acceptation of different but related quantized hole tenors (globally compensated by different point-hole densities, materialized by unequal numbers of remaining unbound UZS zeron states and contact-EZP's) and non-equal velocities can justify a global energy conservation rule on a cosmic scale combined with partial momentum conservation per matter/ contramatter subclass, without the need of an overall momentum conservation rule. Nevertheless it could be that momentum (a combination of mass or hole-tenor and velocity) remains quasi conserved.*
- **Gravity waves and LIGO:** Being elementary two-zeron patterns, gravitons are not capable of shifting their positions over the UZS raster. Their behavior is different from photon patterns: those are fotino sequences *emitted with a varying charge and hole density* and *released as a photon:* each photon is locally replicating, being a micro-particle capable of propagating at speed c *over the UZS, hereby observed as a source of oscillating as varying E and B fields* in virtual

transversal planes through the symmetry center of the *dynamic* string involved in a quantum change of momentum. Each fotino *(see earlier the ambiguous use of the term fotino)* was induced in the UZS/CPS raster by net charge info emission in the contracted state of two *anti*-symmetric EZK replication based components *whereby* the free connector zeron of one branch is phase shifted by a one-sided polaron import. *Photons are autonomous difference patterns capable to move over the grid, built up and released gradually, balancing the energy impact of a momentum change, while gravitons are patterns induced in the UZS between two contracting unbalanced transversal strings, without direct net impact on the overall energy content of that parent particle. They stand still versus the UZS and their energy impact on a cosmic scale is based on their capability to sustain unbalanced hole densities in the UZS, in fact in physics a source of potential energy linked to the geometric distribution of large mass quantities.*

- These fundamental differences in PhR terms between gravitons and photons (*although both phenomena are driven by a disequilibrium in the EZK core at the time of contraction of a replicating particle carrying a one-sided polaron-driven perturbation))* imply that gravity waves propagating on the UZS grid the same way as replicating photons do, seem to be impossible and should never be observed. However recent results of sophisticated experiments (e.g. LIGO) seem to prove the contrary. So from a conceptual point of view these results are not just important in physics but equally in the context of this model where (contrary to what physics is assuming) black holes are *mainly* condensed contramatter particle volumes and potential emitters of contra-photons.
- In a PhR perspective the by LIGO observed and *as such* valid results would not necessarily prove the existence of gravity waves: they could as well represent the (negative) mass impact on LIGO's measurement equipment of intense contra- EM ray bundles emitted by interacting collections of *stars and* contra-stars. Although contra-photons do not couple electromagnetically with ordinary matter – the *tenor of their* embedded hole quantum is different and their B-field vector is at point or fotino level 90° phase-shifted, ahead of the E-field (*as compared with* particles, a 180° shifted B-field is emitted by accelerated contramatter particles – "left and right hand symmetry rules" for *E- and B-type* forces as in basic EM theories *for each subclass* have to be interchanged). Both types of EM waves are able to propagate in a mass-type-neutral UZS as there exist no persistent zerons and contra-zerons but just two distinct *short lived* zeron *contact-EZP* states: the UZS contains a priori both *types of* states everywhere in the cosmos. *The maximum speed of EM- and contra-EM waves is slightly different: the value c' on a double UZS/CPS raster will be higher than c (see before: consistent with smaller values of μ') whereby dynamic raster parameter values are determined by those free raster zerons densities that are not involved in particle/contra-particle replication processes (e.g. in vacuum)).*
- *So very intense contra-photon densities could have a small impact on local spacetime curvature (dense bundles of contra-photons change the local <u>free</u> contact-EZP- types ratio in the UZS) although this remains an extremely small*

effect superposed on the direct impact of large unbalanced concentrations of ordinary persistent particle, including gravitons.

- In a similar context "curving space time (GR)" just means in PhR terms that the standard point-hole ratio in the CPS/UZS has been temporarily and locally disturbed by an unbalanced mass density distribution. *Acceleration of large quantities of particles towards a major spherical symmetric condensation object (like our sun or a black hole) induced in the past large volumes of gravitons (and/or contra-gravitons if the central objects are mixed). Their distributions curve space-time but we assume that today these massive historical distributions are rather stable (this presupposition is only justified if the volume of a young empty UZS no longer increases significantly) . Changes (even collisions between black holes and galaxies) are unable to produce propagating short-wavelength effects due to local quickly varying graviton densities. So on a macro scale, an hypothetical sudden change in position or the destruction or transformation of extremely heavy objects in the cosmos would be reflected by and limited to a very <u>local</u> change in the spatial distribution of neutral- EZP's in a surrounding spacetime volume, not because these massive objects did really move but just because their local environment is hit by an unbalanced stream of patterns (ordinary particles or photons).*
- *Most cosmological models* address these issues by p*roposing* a rather abstract GR model that does not take quantization into account, proposing that large mass quantities curve spacetime, even over large distances. Gravity waves as a result of local collisions and explosions could be in line with this approach. But this situation seems to be a potential source of conflict with the locality principle, as proposed by this model when assuming non-mobile large scale graviton density distributions.
- In PhR one could argue that an extremely large scale *impact of dynamic* massive and contra-massive collections *of patterns* could modify the point-hole density *and the contact-EZP* ratio in a local CPS volume *…. what on its turn could explain why a very intense contra-EM wave would have an observable impact on LIGO detectors. A same argument is true for ordinary matter-based EM waves but their impact has been separately detected and eliminated software-wise by LIGO's measurement equipment.*
- *As a conclusion: the UZS itself as an oscillating double grid is unable to transfer local variation in free contact-EZP densities over non-local distances, so* the net *impact of hypothetical large scale phenomena (neglecting bursts of photon and contra-photon rays)* over long distances will be *nihil and non-observable ….if gravitons, conform this PhR model, are not capable to move over the UZS.*

8. <u>Conclusion.</u>

- We would like to point out once more that the (unproven) processes described briefly in this document, take place on a double point-zeron raster and obey only the postulated standard base law set. This simple PhR driven scenario of nature's

behavior is meant as an eye-opener but demonstrates how coherent sets of zerons show properties that correspond remarkably well with equivalent properties of particles as observed in physics: this is exactly the kind of quality check required in order to validate any PhR based theory.

- It confirms our statement that PhR insight will enable us to explain at least qualitatively, all phenomena, up to the microscopic level of an atom or even related to properties of macroscopic cosmological models. Complex phenomena and patterns are grounded in the same laws and mechanisms, but complexity (i.e. the number of potential distinct combinations of objects and patterns) and the subsequent macro-behavior *and symmetries* of those composite patterns (molecules, crystal lattices…and galaxies) increases dramatically due to high numbers of persistent components and their combinations, even if on the other hand, that number is reduced by averaging, by particular symmetries, by reduction of dimensionality through selection, superposition and polarization etc.
- In our opinion, this conceptually simple PhR model consistently and persuasively answers a lot of the questions and mysteries physics is struggling with today or has tried to explain by way of "best guesses" or bold extrapolations of laws that are, admittedly, true … under standard conditions.
- Unfortunately an elaborate description of this model, detailing step by step all its aspects, its powerful internal logic and its consequences, would far exceed the size of this manuscript. However after rescaling, an equivalent version should be able to approximately simulate cosmic behavior on a computer, a very useful approach (e.g.) for hard-to-visualize processes like baryon replication.
- As a more general statement: any alternative model that pretends to successfully describe our cosmos and its evolution in a bottom-up approach (in fact an example of extreme reductionism) has to be based on generic properties of objects and processes valid throughout the cosmic evolution, a principle like what has been proposed and maintained in this model. It should be on one hand able to combine a fixed set of rules, dictating the behavior of patterns in a determinist way, a requirement that guarantees normalization at multiple superposed levels (*a Lego-type approach)* and persistency at any particular moment of the evolution of our cosmos. But on the other hand, it enables a strong dependency on chance and coincidence, leading to more complexity and to new less numerous but more sophisticated versions of patterns. In order to combine these at first sight contradictory requirements, the number of distinct object classes, proposed as elementary building blocks and the basis for more complex objects, must be small. Elementary classes have to be superposed (higher classes are compositions of objects belonging to lower classes) what requires normalization *and symmetry* in order to make superposition possible. Their pattern composition and their behavior in spacetime will show only a relatively small number of deviations from a cyclic, ideal and predictable schema. These deviations, called perturbations are the outcome of external interactions with other patterns and such events must have a rather stochastic character.

- It is encouraging to see that these opposite types of requirements are in line with this PhR model. When (e.g.) a zeron-made pattern grows and shrinks, its dynamic zeron composition implements a cyclic non-flexible replication schema. Nevertheless a small percentage of these components, the connector zerons and holes in I-max states, are capable to interact with compliant patterns in their neighborhood. (*Pre)p*olarization of the UZS, the local density *and symmetry* of particular compliant patterns, the frequency of being in an active I-max state, the shortest time selection process, superposition charge info in multi-dimensional pattern versions and of course simple coincidence will finally determine between which of the candidates and at what rate coupling events will take place.
- Is this PhR model the ultimate Theory of Everything? We do not know and we cannot even prove that indeed it is. When we apply Occam's razor as a criterion for success, a solution as shown in this text will be hard to be further simplified. This model is proposing a single elementary object type (a point) with just one fundamental discriminating property (charge) with two potential signs, a single creation event, 6 simple laws dictating cosmic behavior at all levels, 2 fundamental interaction types between patterns (axions and polarons), and just one dimensionless (coupling) parameter (137,…*with two possible fractions for matter and for contra-matter*) *and 3 fundamental constants (q,ε and τ),* two quantized and related energy sources *linked to simple discriminating properties* (a *short-range* excess charge impact and a non-standard hole/point ratio density, the latter leading to *distinct (for matter and contramatter) inertial* mass *and* quantized *standard* time delays). *Mass appears as an elementary property of a smallest semi-persistent 2-zeron contact-EZP pattern.* Finally at each level, all these properties sustain processes that guarantee increased complexity. Part of the behavior of compositions is rule based and requires normalization, while other processes are based on coincidence, driving the further evolution of the cosmos, *conform probability distributions as described in QM. Charge info emission, symmetry (in space and time) of complex point antenna patterns and the superposition law are the agents to implement the Fundamental Law of Nature. The "induction by selection" in the UZS of inverted copies of special symmetric patterns are the basic instruments to give even the most complex steps in the course of the evolution of our cosmos, a chance to "happen" spontaneously. Taking the PhR definition of energy and action into account, this PhR model confirms that an action amount inducing a single point with just one quantized discriminating property "charge" in an infinite and empty cosmos(0) has been capable to generate a cosmos(X) in its actual state whereby contra-symmetry of all patterns involved, guarantees a net overall energy content that is relatively small and conserved in the course of the evolution, be it that the single initial creation-action amount h/2 needed an evolution of billions of years in order to implement the present cosmic state X.*
- The ultimate validation of this model, requiring computer simulations, has to focus on proving its internal consistency and on its capability to match its presupposed processes with every confirmed physical law and observation. It would be even

more convincing if this model would make predictions about objects and processes that could be proven by experiments, producing results that physics is either not capable to observe directly, or to explain (e.g. contramatter and the implications of its existence). *In this context a few experiments, able to confirm at least some key aspects and implications of this PhR model, have been conceived but are complex and expensive and their success is not guaranteed. In all cases, the presence of a huge quantity of contramatter in our cosmos (an essential conclusion of this model) and materialized by contra-particles not directly interacting with our instruments, remains an issue.*

APPENDIX A: The Higgs boson.

- *To understand what follows, it is crucial to have a clear insight in the concept and the basic properties of point patterns. A zeron (as an example) is just a 2-point pattern with a few simple discriminating properties: it maintains in the course of 137 point life cycles a charge quantum q with a sign that can change in special states, it makes contact in i-max with a compliant neighbor zeron according to 2 distinct scenarios etc…So in a gigantic disorderly collection of point and point patterns, zerons are a dynamic privileged 2-point subset that are persistent as a pattern with a dynamic geometric orientation of replication axes and distribution of versions, each filling a high dimensional stationary sphere. These properties make the UZS network a collection of standard patterns that are candidate-building blocks for high-order point compositions like EZP's, EZK's and in a further evolutionary stage, electrons, neutrons etc….It is important to realize that a single 2-point sphere has the size of a few Planck lengths, compared to (e.g.) a proton with a size of about 10exp(-15)m !!*
- Since the end of the 1960s, mathematical models in physics that describe the behavior of elementary particles, including their interactions with a rather abstract vacuum field, have integrated an at that time undetected Higgs boson in their architecture. In field theories the Higgs scalar field was thought to give all matter particles their "mass" property; therefore, a not directly observable short- lived, charge-less gauge boson with non-zero mass and spin 0 had to exist.
- When we compare the properties of this hypothetical particle with the pattern layout proposed in our PhR model, the most likely equivalent of an Higgs boson would be either the EZK or the EZO. PhR-consistent objects like points, zerons, and EZP, EZK and EZO patterns can implicitly be assimilated with real-vacuum (in fact "emptiness" in PhR) field particles as defined in physics. Thus a "matter particle" as a field excitation in quantum field theory (physics) corresponds, in PhR, to each particle state of a pair of EZK's that starts to replicate in a local matter *(or contramatter)* subspace of the cosmic spacetime grids. As physics has no clear picture of what really exists in terms of PhR, the connection between field particles, gauge particles and ordinary particles is rather subtle and a comparison with equivalent PhR terms and concepts is not always straightforward.
- In this model a pair of coherent EZKs is the outcome of a bifurcation (a bidirectional axion exchange between two zerons, one of each EZK) within a *dynamic short lived* EZO (an 8-zeron pattern). Geometrically both EZK's are regular tetrahedron patterns combining 4 adjacent (in N-dim) zerons in dynamically interchanged states (CZ,DZ,CH,DH). As discussed before, this ideal *lowest energy state* configuration *has a dynamic point and zeron content and* can only be persistent *as a pattern* if small discrepancies with a magnitude of unit phase shifts (on a point scale τ) are part of their spacetime behavior (in accordance with the base laws and analogue to the "Mexican hat" model for real sustainable processes in physics). *This requirement is not an issue if both virtual EZK quartets in an EZO have hole states with a slightly different tenor, the outcome of distinct*

contact- EZP scenarios and point-replication return mechanisms in i-max states. The hole tenor as a discriminating property between the hole states of two EZK's of a broken EZO remains a persistent property in the course of a replication process, typical for matter and for contramatter patterns and particles. It means that they need distinct free UZS subsets in order to "behave".

- *Replication out of an EZK for matter as well as for contramatter patterns* requires that the theoretical a*nd approximate* value of 137 i.e. the hypothetical standard maximum number (i-max) of point-like components that belong to a single dimension in time in each point-string of a point-replicating zeron , will slightly and randomly change as the outcome of marginal cyclic charge info exchanges between the 4 zerons (meaning: EZK versions, internally interacting at two levels) while in their special states. This process is called a dynamic role interchange.
- That does not mean that the number of *subsequent* point *states* in a zeron point string has changed but that at least in an EZK quartet, the phase angle *of free zeron versions can be* time shifted versus the phases of the other zerons. *The combination of both requirements implies that free zerons in a quartet can be substituted by other UZS zerons in appropriate phase states or that several versions of an EZK in a replicating particle can coexist in superposition* .
- The impact on i-max *phases* of small perturbations of quantized phase state sequences needed to hold pattern zerons together, comes on top of the small standard discrepancy vis-à-vis a theoretical prime number 137 value, an effect of periodic point interaction related phase shifts between any pair of adjacent UZS zerons in their i-max return points (in this specific case these adjacent zerons belong to a dynamic common EZK set). As explained earlier, this - on an UZS-scale - standard phenomenon is, on a local EZO scale and "observed" over the two interacting patterns together, anti-symmetric in any contact point *and remains a fixed property for each (replicating) EZK after an EZO split*.
- In the same context, we want to repeat (see chapter 4) that a positive local charge density excess in the UZS-CPS can be the outcome of the induction of an extra CP (a C state point) in emptiness but also of the elimination of an existing DP (a point in the D state) in the CPS (or vice versa). This subtle "discriminating property" (in fact like any discrepancy, a potential source of energy) is relevant in any zeron contact point (i-max) where the point replication growth process turns into shrinking. *To understand the possible scenarios for inter-zeron contact that lead to differences in fine structure constant values for matter and contramatter, we refer to a separate article on viXra.*
- It is also PhR behind the occurrence of two distinct, what we called zeron spin orientations (e.g. a DZ-CH or DZ-DH spiral-wise transversal point sequence). The ratio between a local (i.e., in an i-max contact volume) point-versus-hole density is *related to* this phenomenon and it is a conserved property during a zeron *patterns* shrinking and growing replication cycle. It is the underlying property of what has been called in this text, positive or negative particle mass (or null-energy if we respect the equivalence $+/-E=+/-mc^2$ in physics), i.e. the most fundamental difference between matter and contramatter

(indeed: an opposite charge *and spin* type *but* a positive mass are also present in antimatter). At CPS level a reset of a charged point state or the induction of a new point in a contact location, are phase shifted processes on a common virtual time scale (a phase shift of 90° or τ, a quarter of a point's period), a subtlety that explains conservation mechanisms *under axion-type interactions at point level* but also certain incompatibilities between *by polaron exchange* interacting matter and contramatter patterns (e.g. no EM (physics) or no fotino *or graviton* (PhR) coupling between both is possible).

- Previous statement has to be correctly understood. The *intrinsic* duration of a zeron replication growth or shrink cycle expressed in 2τ units last always the same. When we say that the mass property is persistent during a zeron life cycle we refer to the fact that the local point-hole density ratio (and the point replication string length *in time*) are maintained. This ratio will only change when the string is in the i-max contact state with a neighbor zeron, being the outcome of a *distinct* phase shift τ in combination with small increase or reduction of the point-hole ratio. It explains why the inverse coupling factor in physics is not exactly 137 and (in PhR terms) different for matter and contramatter patterns, leading to positive and negative masses. Intrinsically there are no matter or contramatter zerons but *just* distinct 2-zeron coupled states. The difference between both states appears in the contact or interaction state between two zerons, a state conserved during a shrink and growth cycle, and it also leads to an anti-symmetric circular transversal point selection *(a point spin). But even in case of elimination of a contact point in the longest branch of a particular point string, the CPT conservation rule is maintained because the shrinking of its opposite branch is postponed and it will become the longest (a PhR effect that materializes the P term in CPT). In the UZS t*hese properties can change in subsequent contacts with neighbor zerons, whereby we reject the possibility that this could ever lead to *a* cumulative or double charge-hole density anomaly. When more complex multi-zeron patterns emerge, *mass-type* will become a persistent property *in a* zeron-replication *process*, be it because *the* maximum replication length *of a zeron string* is no longer determined by a *direct* contact with a neighbor particle's ***ze****ron*. In that case matter and contramatter particles become permanently incompatible, *except for very rare axion-type interactions*. The inverse fine structure constants *for matter and contramatter zeron replication based processes* are *slightly* different .
- As long as EZKs are *still* part of EZOs and zeron replication does not take off (*an hypothetical and extremely short-lived state)*, the value 137 fluctuates slightly but on average remains constant per EZO and over the UZS: *after the split* each EZK is a closed pattern that "behaves" within its own subset of dimensions, *although* the sum of certain properties over the two EZKs on average cancels out. *If this is locally not the case, the difference has to be stored in the UZS contact-EZP type distribution.*
- As a more general remark it is useful to mention once more the link between dimensionality in PhR terms and (local rotational) degrees of freedom in physics. When subsets of points in a primitive CPS emerge and form a class of quasi

identical zeron patterns, the number of dimensions is locally reduced from an unknown value M (the CPS) by an a priori unknown but assumed number R = 137, down to a number N (the UZS). The unknown number N, in this case, is *related to* the (dynamic in M-dim) ultimate number of *(around a shared mutated two-point pair)* superposed growth-shrink (2τ) point strings per zeron replication cycle before one version *(the fastest)* makes contact with a neighbor zeron. It also relates to the number of potential compliant neighbor zerons that are a priori eligible for an efficient interaction in i-max between their properly aligned and synchronized replicating point string connectors and is ultimately depending (be it indirectly) on the reduction R in dimensionality that takes place in the course of a complex point replication growth cycle. In the end, only one string (the "fastest" or the first to start replication) will successfully make contact with another zeron (via charge info exchange with the nucleus, all other N+x partial strings start shrinking). The "winner" will never be the same twice in a row because of a τ phase shift at the moment of contact between "neighbors" in i-max. *So where reduction in dimensionality per point string is a time-ordering process, similar quasi simultaneous processes take place along other geometrically distributed directions in the CPS. If we reject perfect simultaneity at point level in the CPS (leading to violation of the charge conservation rule and to an infinite value M) the UZS subset could be treated as a dynamic gigantic coupled quantum raster whereby individual zeron states could be identified by a unique set of quantum numbers- (Physics)).*

- The value R = 137 depends originally and indirectly on M and on c_v and determines the value i-max (the number of coupled knots in a point string with maximum time length) and is necessarily an integer . This figure must be a prime number, identical for all UZS zerons (there exists no property at CPS level to make them different except from the zeron-spin effect in a contact point but that is an effect per pair of points and zerons). The dimensionless figure 137 is also the rounded value of the reciprocal fine structure constant in physics and it has to be investigated to what extend this value relates to N, the remaining number of dimensions in M after reduction by 137. Our model assumes that zeron growth stops when the number of available superposed dimensions of a replicating central point pair set after reduction per replication step, becomes so small that the probability of a successful point interaction with a neighbor zeron exceeds the probability of an extra constructive interference by selection with another partial and phase-shifted string version, replicating around the same common nucleus. This reasoning reflects the rule that string growth evolves dynamically towards the construction of the fastest and "superposition law" compliant internal connection path until an internal or external interaction (a discontinuity or perturbation) stops the growth. A more in-depth reason why growth stops for some *smallest but* fixed number (in casu 137) could be that the difference in time *(or phase)* between the two contact scenario's correspond with an *exact* multiple of the value τ. In such case the whole (finite ?) UZS (without the presence of complex patterns) forms a global interconnected system in a resonant state whereby the two connectors of a

shrink-growth cycle have opposite mass properties *and the "longest branch property" of a successful point string version can be interchanged depending on the contact scenario. In this way a point replication cycle becomes a stable and local process that does not require a full reshuffling of the UZS raster, depending on the type of successful contact.* The term "shortest" combines a stable spatial *orientation and* distribution of a string version with a dynamic time (or phase angle) per version, so it is more complex than just a classical geometric metric in 3D. Until a value R of well synchronized knots is reached, growth of a point pattern is dominated by small not necessarily but most probably quantized relative phase shifts (or a growth in "units of time") between partial non-persistent point strings around a shared central antenna. Further growth in a later phase of the evolution will require coupling between persistent, coherent standard zerons, leading to an observable lengthening of a pattern in space. The generic "shortest-*in -time* or fastest path" rule is ultimately PhR behind many organic growth process in nature and it confirms the universal character of the base laws (*ref: the successful use of functional- like Lagrangians in Field theories)*. UZS zerons identical properties and the unique symmetry of an EZK nucleus explain the limited number of observed classes of persistent matter particles and the strictly identical properties of each of them (e.g. the replication schema's and the level of compactness of all uncoupled members of the electron class are physically the same).

- An ideal EZO is just theoretically a perfect anti-symmetric pattern and this configuration is highly unstable as the base laws indicate that no feedback mechanism forces the 2 EZK components to persistently occupy the lowest energy-states within an EZO configuration. Both tetrahedrons made up of 4 zerons indeed show *some* limited global rotational degree of freedom in N-dim and subsequent versions of both patterns are able to rotate randomly around their common (though slightly phase shifted) central symmetry location.
- When *global* symmetry in an EZO is accidently broken by a single bidirectional axion exchange between zerons that belong to two each anti-symmetric EZK, conservation rules require that the two EZKs behave as a chiral pair (positive and negative *free or* excess charge, opposite mass *or hole tenor* ….). The impact of an extra-axion *type of interaction,* leading to a zeron *in each EZK* that keeps in the contracted state the same previous charge state, and the application of the fastest interaction rule, imply that replication will start off instantaneously in each EZK. The small differences in *relative* point string phase *gaps of dynamic contact-EZP pairs* and in transversal point string rotation sense (meaning distribution of subsequent selected auxiliary points) as mentioned before (materializing mass and contra-mass properties in two-zeron interaction processes) and that applies to both zerons involved in the axion exchange, are conserved in *each of* the two EZKs. These rules and the *intrinsic* anti-symmetry of the two EZKs in an EZO, also entail that growing transversal zeron strings in each EZK "rotate" (*or spin)* in opposite sense not to be confused with ordinary and magnetic spins *in PhR (in Physics t*he virtual rotation of a *charged* particle as observed *in magnetism or in QM is equally*

called a particle spin). *Also the term "rotate" in PhR refers to the geometric distribution of successive local points or zerons involved in a replication process, not to a real rotation of a single point or zeron !*

- Zeron replication in a particle is a mechanism that conserves *dynamically* the initial net imported charge and hole excess properties over a long period of time by copying and spreading them along multiple replication directions, taking into account the symmetry properties of the central zeron antenna and the base laws. Specific replication schemas exist for distinct particle classes and in this chapter the term "particle" without qualifier refers to an element of the neutron class. The overall net charge excess of a particle (in PhR terms *it refers to dynamic uncoupled* phase shifted unit charges distributed over several connectors), remains conserved, at least without external (or internal in case of decay) action-type interactions. But this same statement is not valid for what the total net free hole density is concerned, a dynamic property that is particle-layout and replication schema dependent. Its value determines the total mass (and the internal null energy content) of a particle replication schema (to be calculated by computer simulations). I-max is reached when the marginal dimensional coupling between the nucleus (*the free zeron in* the central EZK) and the *phase shifted* free zeron of the connector of the of the longest branch *are reaching both* the value R=137, flipping the roles of the transversal connector zerons, whereby the application of the fastest interaction rule and application of CPT conservation on the new phase shifted axial connector zeron, will lead to the shrinking of the string. This connector effect is thus related through successive internal couplings, to the structure of an EZK nucleus: one of its four zerons is temporarily in a free state (or not involved in the 4 zeron coupling of a central EZK version – this zeron's free state is dynamic and spread over three strings, due to cyclic internal EZK role interchanges) which means that (as the result of the imported axion perturbation and of any future external interactions) its relative phase angle shift in subsequent superposed versions and expressed in point (time scale) units, systematically adds up in the same sense per string branch and per axial zeron replication step, although each branch rotates in the opposite sense as observed in a nucleus reference frame. They both depend on the rotation sense of the string spin. The sign (addition or subtraction) of this counting mechanism takes the transition and the subsequent phase shift between the growing and shrinking state of a string into account. Each nucleus version is copied, step by step at point and at zeron level, into the dynamic connector zerons. We refer to previous chapters to make the difference between baryon and electron replication schema's clear.
- Each external polaron import in an I-max connector of a replicating EZK based zeron pattern has an net impact on the relative point replication phase of *a new version of* the free zeron *state* in the EZK nucleus. So as a side- remark, the presence of multiple phase shifted and, delay-contributing free zeron versions in an EZK, taking also its role interchanges into account, is a presupposition that is fundamental to understand why the contribution of this point level phase counting mechanism, to particle mass continues to increase (see special relativity in

physics) in case of an extremely high one-sided import of polarons. In fact the nucleus gets involved at point level in a local replication-like zigzag (alternatively with the two branches) process that increases just slowly the net absolute number of stored, over τ phase shifted, free zeron versions per unit time. So the mass (expressed as a time delay) continues to increase without leading to a further acceleration of the pattern over the UZS. The simple fact that this model is perfectly able to explain this subtle mechanism, supports our proposal to assimilate a Higgs with an EZK and it justifies the statement in physics, saying that "a Higgs gives a particle its mass property": *so any one-sided external perturbation of a particle-like replication process that does not absorbed by a reduction of I-max and an increase in speed, will lead to a secondary internal (at EZK or Higgs level) phase shift and role interchange process between EZK zerons that will delay the main zeron replication process, an effect observed by Physics as an increase of mass (Lorentz compliant). In case of split of a complex particle through the radioactive emission of an α-particle, the phase shifted free zeron combination is spread over two particles whereby overall momentum is conserved. If that would not be the case, an extra difference particle (e.g. a neutrino) will emerge. So this PhR model is able to explain this kind of processes and conservation rules in a consistent manner.*

- Without additional external perturbations (by polaron impact leading to an increased momentum) of an EZK based replication pattern and stated in equivalent but more quantitative terms: an absolute and critical replication limit (I-max) is reached when the number 133 + 4 equals the number of points between two special states of a free zeron in the connector of the fastest (or longest, expressed in phase angles) string branch. Thus what this model in fact proposes, is a two-level (but related) quantization of the local phase angle shift in free connector zerons of growing EZK strings, each ultimately expressed and counted in an UZS reference frame, *in the same way as elementary point periods are counted as phase shifts in a single zeron's internal time frame.*
- For the standard case of particles with momentum, the offset number 4 has to be replaced by X being the net algebraic sum of all phase shifts resulting from multiple polaron impacts that are permanently stored as an offset value in each free zeron of the nucleus that corresponds with a version proper to each string (so a free (but dynamic) EZK zeron acts as a <u>memory or storage</u> of all +/- point-phase quanta resulting from polaron- import (export) along any string direction) and as a property materializing the particles momentum state. As a consequence, particles that acquired "kinetic energy" through polaron impact will reach their I-max return point faster than an initial null-mass pattern or put more simply, their string lengths will be shorter. Particles that lose kinetic energy will increase their string lengths. In both cases their nucleus contains a free zeron version with a relevant phase angle offset value *at point-level time scale, synchronized with free zerons in the UZS set and integrated as connectors of transversal strings*. Conclusion: an initially only once mutated and replicating EZK shows a fixed and absolute I-max

value, representative for each particular class (i.e. electrons, baryons …in physics) of replicating particles without momentum.

- Taking the rule +/- h/2 = δE*δT (an action quantum h/2 representing the initial axion impact) into account, the EZO symmetry-breaking mechanism creates a net or unit positive and negative (or contra) mass (+/-m_0 = +/- E_0/c^2) per pair of emerging particles. These null-mass amounts are related to the duration of a full replication cycle (or a particle's life-time or its half-period T/2) induced by the single h/2-action amount but not in a unique way. Indeed and as stated before, the link between T and the maximum length of a particle's growth cycle expressed in zeron periods (I-max) and the number of effective zeron-connector phase shifts expressed in point cycles or UZS zeron periods (i-max), depends on the lay-out of each growing replication mechanism which in its turn depends on the symmetry properties of the core antenna, and on the number of periodic internal axion exchanges *in the contracted state* between rotating connectors of temporarily adjacent electron-like string versions along symmetry directions (e.g. the latter explains the difference between baryon and lepton patterns or even between (e.g.) a neutron and a proton growth process and why an electron can emerge in the contracted state of a neutron as a spin-off or difference particle). So the total duration and the net energy *(expressed as number of hole based mass states in $E=mc^2$)* impact of replication cycles of two different particle types, that is the outcome of the same initial action amount can be different if the increase in replication time is due to internal opposite axion exchanges that have no cumulative impact on the net charge content of the pattern.
- Electron replication string patterns show narrow virtual top angles (its knots are in fact , at point level phase shifted and geometrically co-linear *axial strings along three dynamic orthogonal pairs of phase shifted zerons of a central EZK – <u>in fact replicating along its tetrahedron ribs</u>*) and an internal axion-like contact between adjacent strings around a shared EZK nucleus is excluded (a fixed particle spin orientation and persistent *net charge type,* magnetic and mechanical spin strength values at both ends in the course of a single growth and shrink cycle of a replicating electron are the consequences). The spin directions make equal angles with the 3 orthogonal electron axial strings *and the superposition of charge info emitted by free connector zerons show how a magnetic field (Physics) can be the outcome of base law 5, proposing interference and superposition rules of quantized charge info patterns at point level. Obviously a change in momentum by external interaction and polaron coupling will interchange the fastest string connector property and the relative phase shifts between the three strings. The spin orientation will change (conform QM).*
- On the contrary, a baryon replication process produces a pattern with a superposed cone-like multi-string distributions around *three* virtual central symmetry axis *in the middle of and perpendicular to opposite zeron pairs of* the central EZK tetrahedron. It has to be seen as a collection of phase-shifted anti-symmetric string-like patterns, just like generatrices of a cone distributed along a virtual circular directrix (see geometry), each string similar to an individual replicating electron

pattern. The net charge info patterns emitted by connectors of the three perpendicular rotating cones intersect geometrically and phase shifted and destructive interference taken into account, along a virtual trisectrice between their geometric symmetry axes (in fact a particle spin axis direction). Their set of spiral-wise distributed growth processes along 3 dynamic symmetry directions can be seen as an in dimensionality reduced version of the generic growth schema proposed in chapter 4. Zigzag wise growth of the multi-string length parameter means that the context has to make clear what I-max means: in this text it refers to the absolute maximum, when the global pattern is complete and starts shrinking. The way the more complex baryon replication takes place is the outcome of the fact that in an EZK tetrahedron, the symmetry directions are virtual, perpendicular to the opposite pairs of ribs, whereby 3 axial strings *of a virtual electron (or positron)* are oriented along 2-zeron ribs themselves. However role inversion *and superposition "in time" of several versions of* the central EZK makes a stable baryon replication schema possible. Hereby the index I increases by 1 each time the rotating electron or positron-like generatrices (in fact axial zeron strings) of neighbor cones interact along the 3 symmetry directions of the central tetrahedron. In the growth or shrink state, the axial strings coincide with the spin directions of a baryon. This rule is confirmed when we deduct the proton *(or neutron)* mass from the *sum of the* individual masses of the lepton-like strings, contributing to replication (an exercise too *specific* to *be* explained in this text *but proposed in another article of the same author on vixra*). *The net charge type of individual axial lepton-like generatrices are interchanged by axion-type interactions so that the total charge amount of a baryon-like replication cycle is null (neutron) or one (q) (proton, anti-proton or contra-proton, contra-anti-proton).*

- The repartition of the action amount over the values E (energy) and T (local time) in a particle's replication process are subject to an overall *charge and mass* conservation rule, requiring that synchronous positive and negative *charge* contributions of two branches of a string should be netted - i*n the case of mass, we refer to free zerons in the EZK nucleus*). *Remaining unbalances in mass-type energy have to be compensated by small mass-like amounts exchanged with or stored in external (difference) patterns. Extra* netting does not seem to be observed whenever physics measures the null-masses of particles, even when taking place in distinct dimensional subsets which means that at least in a proton or a neutron, all excess holes have the same types. This is apparently not *necessarily* the case for other unstable baryons with sometimes small mass differences relative to neutrons. However they emerge as the outcome of *polaron-type* interactions between baryon-connector zerons of two *colliding-at-high-energy* particles, leading to distinct masses just as we have seen in case of returns states between *point replicating* UZS zerons.
- The conversion factor c^2 between E and m at particle level (physics) relates to the double layered counting mechanism in replicating particles, converting the by an initial axion quantum induced energy amount δE at point level (PhR) into connector energy in I-max whereby we assume that $c_p >= 137 \times c$.

- One EZK of a broken EZO, showing a string spin opposite of what we observe in case of a neutron, is a contra-neutron that remains unobservable for physics through EM-coupling with matter (real or virtual photon *or polaron* exchange). Coulomb *(or Gauss)* and magnetic field polarization by all particles with excess connector charges still permits indirect observation, although it might also lead to confusion: a contra-particle might erroneously be taken for an anti-particle. In some cases, this would explain the off-shell nature of "(virtual) particles" in physics. Indeed their masses are not directly observed and their momenta only indirectly inferred from decay products produced by high-energy head-to-head collisions. The polarization of micro-volumes of UZS – spacetime, concentrated between compliant connectors of *high-energy* head-to-head colliding particles, leads to the local induction in vacuum (*in PhR: the UZS)* of a series of decaying EZO-like patterns in subsequent locations along a path that takes even the smallest difference of velocities of two interacting particles into account. This would explain their eventual breach of Einstein's $E^2 = m^2 c^4 + p^2c^2$ equation (p is the 4-momentum of a relativistic particle). Examples of patterns induced in the UZS by *very* high-energy collisions *between protons* with small I-max values are short-lived patterns like W and Z bosons *(free zeron driven EZK patterns)* and (their contra-versions).

- **A realistic highest I-max value.**
- Bearing all this in mind, it makes indeed sense (as proposed before) to assimilate an EZK with a Higgs in physics. The ideal or theoretical 137 point string *unit time* length figure (*2 τ)* in *non-accelerated* UZS-zerons has to be adjusted for 4 equivalent point *periods* per EZK, due to the *one shot* internal binding *and phase shift* of a not yet replicating EZK within an EZO plus the impact of an extra axion-exchange in the EZO, leading to replication along 3 orthogonal phase shifted symmetry and spin directions. So an hypothetically isolated neutron nucleus without momentum has, compared to the i-max value of a free zeron, 133 remaining internal *(time or phase)* degrees of freedom: the initial 137 value minus its own 3 internal degrees (set by internal dynamic couplings in/with the nucleus *between versions*) and one internal time degree of freedom (the *minimum* relative phase angle of a free zeron acting as a double layered local clock). An hypothetical single isolated pattern version without momentum reflect those adjustments as directly for Physics observable properties in a local 3D frame: the particle spin plus its 3 spatial directions (strings in ¨PhR terms – *quarks in Physics*) as based on their connector properties (charge, mass), but also indirectly by their external impact (observed as mini-jets or Coulomb polarization lines *or symmetry properties in QM*). So the constraint that any successful replicating EZK has to behave as a 3D spin ½ particle, embedded in an N dim UZS, will reduce its *hypothetical dimensionality in time from* 137 to 133. Hereby we ignore the number of superposed pattern versions coexisting around the same symmetry center and using separate EZK subsets in an N dim UZS (the free set) but we assume that it will be high : each observation or external coupling will select a

limited number of 3D versions out of this free set (in accordance to superposition of states in Physics- QM).

- The remaining (or effective – a term used in physics when measuring unusual values for the inverse fine-structure constant of particular high energy field particles) dimensions of the free set guarantee the rotational freedom over superposed states of subsequent versions of any free particle in the UZS. For a single version there is a causal link between 133 and *the largest* I-max *value* whereby I-max is a measure for the frequency of potential external interactions per standard unit of time (only in I-max or in contracted states external interactions are possible). We could say that the theoretical *(reciprocal)* fine structure constant becomes for some classes of interaction, an "effective external coupling parameter" although after deduction of the impact of the minimum number of interactions needed for the particle's internal binding.
- When (e.g.) a neutron starts to replicate, net charge added over 12 dynamic phase-shifted special connector states is on average still null, but 4 subsequent versions with frequently interchanged states are needed in order to maintain approximately the compact symmetry properties of an initially nearly perfectly balanced central EZK antenna. Replication growth and contraction explains the spin ½ state of a neutron as observed in physics: in PhR terms, it takes 4 life cycles (T/2 *each* or one growth plus one shrink cycle)) of a neutron pattern before the same connector layout turns up again (*net charge type and transversal left-right connector lay-out are inverted versus contraction location)*. Finally we want to stress once more that the dimensionality of the EZK as given above is a relative figure versus the (unknown) CPS-UZS *absolute* number of dimensions. So when an EZK based pattern is passing thru in its contracted state, it is still weakly sensitive to fluctuations in average local point densities and properties but this effect is extremely small. It must be repeated that per major step in the cosmic evolution and as an example, only a very small percentage of CPS points are involved in the higher level process of zeron formation, just like relatively few UZS zerons will be part of replicating patterns, observable as particles in "our" cosmos and finally, binding with *other* neighbor *2D (gravitons) or* 3D patterns will reduce the local free set to an even smaller number. So most of the general properties and parameters of the CPS and the UZS are not very sensitive to what happens in a by science observable subspace. This remark explains the successful use of perturbation theory in physics (QM). Exceptions on this general rule are (e.g.) dense regular highly symmetric patterns (like atoms in a solid state lattice at extremely low temperature *or dense bosonic laser beams or black holes*) *or (to be verified) very high graviton densities around large massive matter or contramatter objects*.
- Extra perturbation-like interactions in I-max between neutrons (or neutrons and other particles or EZP fields) could further reduce the initially high number of degrees of freedom. A reduction of I-max gives their connectors the capability to exchange more frequently and successfully momentum quanta (packaged as EZP's or polarons) with other particles or fields, explaining why in physics a

second order differential equation is needed to describe *successfully* a particle's motion under the impact of an external "force".

- **The Higgs mass :** In light of the above paragraphs, detecting a relationship between the observed neutron null-mass in physics (939,5MeV/c²) and the unknown (i.e. not calculable within the Standard model in physics) Higgs mass turns out to be a rather straightforward affair. For the sake of clarity, however, let us recall the following assumptions, which are vital here:
    - A Higgs in physics is identical with an EZK in this PhR model.
    - A replicating EZK after an EZO split is identical with a neutron in physics.
    - *I*-max relates to the reciprocal fine structure constant 137 (integer value).
    - In case of neutron replication the highest I-max value reflects an adjusted *I*-max value 133 in free zerons of a string.
    - A neutron with its fixed lay-out and without momentum has an amount of null- energy that depends initially on the energy content of an EZK nucleus with its broken symmetry and subsequently on its I-max value.
    - $E=mc^2 = m * (c_p / 137)^2$ in accordance with the double phase counting cycle at point and zeron level in a replicating neutron string *without momentum* .
- As we start from the actual mass of a replicating particle observed in our 3D subspace we have to multiply the neutron mass with 133 (i.e. the adjusted value of the reciprocal fine structure constant (137)) which gives us a Higgs mass of 125 GeV/c². This corresponds fairly well with what has been observed, calculated and published by CERN.
- It is also in line with what the electroweak theory predicts to be the symmetry breaking energy level (250 GeV) that leads to the emergence of Z and virtual Z' boson pairs: indeed, these particles too, have to find their origin in a by head-to-head collision in the CPS-UZS induced anti-symmetric EZK pair , to be treated approximately as a stochastically (meaning: depending on the *actual* replication states of colliding, *mostly baryon type* particles) broken EZO. If we combine the masses of both EZK's of such *short-lived* EZO, the absolute value of the null-energies is 250 GeV. In cases where some of the directly or indirectly observed particles (e.g. an off-shell Z') could be decay products of contramatter particles, the "real" Higgs boson would rather be the short-lived EZO with its broken symmetry, so in fact a *kind of* meson with an absolute *but partly non-observable* energy content of 250 GeV.
- Another quality check of these figures relates to the null-energy of an electron (physics). Its (PhR conform) replication schema is a difference pattern, driven by two subsequent EZK nucleus versions, replicating each in quasi- orthogonal states (with rotating connectors that belong to two adjacent phase shifted branches of a replicating neutron, exchanging periodically axions – see *another article on this topic, published on vixra*).
- As a more general remark: once we have a correct insight in other particle's replication schema's, quasi exact calculation of their masses should be possible.

The replication schema's of a central EZK with a persistent mass type (as is the case for ordinary spin ½ lepton and baryon patterns) depend strongly on the counting mechanism of the point phase shifts in free zeron versions of the central *multi-state* EZK. If (e.g.) this zeron "stores" already *in one of its versions* a special offset phase shift close to 133 (*along* one or several orthogonal *string* directions), it is obvious that I-max in a replicating string *connector* will be *more* quickly reached leading ultimately to a speed close to the speed of light c. *Idem for "difference" sub-particles in case high energy collisions* (*some of them reflect a remaining unbalance between free zerons linked to the 3 replication directions within the central EZK itself* - e.g. neutrino's are probably in that situation). The by physicists observed properties of replicating patterns are determined by their connector configurations in the special states but their internal behavior is often transparent to physicists . E.g.in case of over a virtual cone distributed replication lines of three orthogonal strings (baryon- like schema's are in fact compositions of electron-like replicating generatrices), neighbor connector zerons interact periodically and additionally thru axion exchanges, a process having a one shot impact on the connector zeron states involved. If this kind of interactions take place in tangent locations between "virtually (in fact superposed versions of the local free set, with a particular spatial distribution satisfying the right conditions to interact by axion exchange) rotating" cone-like distributed string patterns (in the contracted state), it makes sense to assume a difference in number of generatrices per tour for distinct baryon types: that number would be even in a neutron as compared to an odd figure in a proton, generating in case of neutron decay two extra types of difference patterns – an electron and a neutrino – both released in the contracted state.

- In case of polaron-driven changes in particle momentum and if the spin axis (as the outcome of interference between charge info emitted by three free zeron connectors) coincides with a trisectrice, its orientation will change whenever the relative phase angles of the 3 string connector patterns are interchanged, due to an external interaction. This is consistent with observations of electron *spins* in QM.
- Frequent axion-like interactions between connectors of electron-like generatrices of conic baryon strings (*leading to flipping charge types)* explain why their magnetic spin are much smaller (*a reduction factor related the number of charge type inversions, on its turn related to the mass ratio between baryons and electrons)* than for an electron that maintains its *charge type* sign during the full replication process, producing spins reflecting *persistent* charge info and hole density patterns.
- Computer simulations are absolutely required to confirm the actual layout of replicating baryons.
- At this moment we prefer to stress that some open issues (e.g. the precise list and properties of observed decay products) make it difficult to determine to what extent the results measured at CERN and the standard model in physics and this PhR model simply converge towards a common understanding of cosmic behavior at sub-particle level. What this chapter does demonstrate however, is that our

model's description of a vacuum content (CPS and UZS) on one hand and the hypothetical layout and behavior of EZK-based replicating particles on the other hand, can complement the proven mathematical formulas and experiments of physics in trying to describe physical reality.

- The fact that this PhR model is capable to consistently deduce the Higgs mass from the neutron mass value seems to confirm its validity: results like this are unlikely to be a matter of mere coincidence.

Appendix B: Vocabulary of terms frequently used in a PhR context (version 2).

Antenna: *A set of symmetric, coherent and free or active (e.g. being special connector states of a 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 raster components. This induction or selection or ordering process has to respect conservation of energy rules and the FLN principle. In a young 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 building blocks, available for selection. In further steps of the cosmic evolution a similar mechanism can lead to the emergence of more complex patterns like molecules and even DNA-strings.*

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 pattern points in appropriate free connector return states . In particle physics, axions may have a disturbing impact and lead often to a decay of the original pattern after mutation by high energy collisions, increasing hereby the probability of successful short range axion coupling.*

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. A*ll 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 2-zeron UZS pattern 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 guarantees a local stationary oscillating state of any free (= not engaged in more complex pattern formation) dynamic replicating N-dim zeron set.*

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*. *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 (*interacting with (e.g.) Li-atom nuclei, 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 4^{th} 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.*

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.

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).

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.

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)*τ 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 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*).

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 gauss or fotino (or magnetic) or graviton 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. 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). 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".*

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.*