Title: **<u>About Physical Reality.</u>**

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 3 contains several enhancements (printed in italic) and corrections of (sometimes major) errors in the previous versions. "Point replication" a process leading to the emergence of "zeron" patterns, is important and has been partly rewritten (chapter 4). Actual issues in cosmology (e.g. gravitons and gravity waves (LIGO)" are treated in chapter 7. "The Higgs particle in a PhR context" is a subject already treated in a separate viXra text and has be joined as an appendix A. In appendix B, a selection of topics has been added that refer either to phenomena observed and confirmed by experiments, or to underlying theories proposed by physicists. Many of these topics have been reconciled and eventually explained, confirmed or rejected by this PhR model.

1. <u>The challenge.</u>

- 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. 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 at its deepest level, 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.*
- In an attempt to say meaningful things about the PhR 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".

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 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. T*he 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.

- 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. 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.*

- **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 dimension (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.*
- If, on the other hand, properly synchronized charge info hits *first* a point with a commensurate sign in a steady +/- 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 the case of single points net charge exchange is a continuous process and at any elementary time lapse charge is a conserved quantity between antenna and target. 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 (s*ee 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 immediately 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 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 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, 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 laws3, 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 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 (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), with respect of all the base laws.*
- For reasons to be explained further on, the maximum cosmic info *propagation speed* v_e must be well above the speed of light.

- Law6 (the superposition law): *Point c*harge *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 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 will sooner or later (or did already) reach a maximum size after which it would shrinks again (in case of an oscillating cosmic model).

- Charge info 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 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) will 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 a delayed net impact on an empty location due to the superposition of charge info quanta (*multiples of τ)* emitted by several synchronized , meaning properly phase shifted and correlated antennas. *Application of this rule has to respect the fastest path selection principle.*
- *These terms* are important in physics as well, considering that any direct physical observation relates to "(charge) info": only 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 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.*
- In a context of parallelism and superposition, the concept of dimensionality 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 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.

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 is the basis of 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 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. Most of these statements become clear in the course of this manuscript.*
- 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 these laws and Maxwell's laws (electromagnetism), whereby net quantized charge info patterns, as produced by coherent phase shifted point pairs, correspond with magnetic fields (see further).*

- **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* 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.
- 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 volume as occupied by our cosmos today continues 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*.
- *Nevertheless it remains unproven that a finite maximum point density could ever be reached within a fixed volume around the initial creation location. 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, a 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.*
- *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).*
- *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 (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" *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).

- **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.

- 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.*
- 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 process between points to be bidirectional but here it stresses the fact that both interacting correlated patterns are complex and at equal foot, that the exchange is direct and that in one coupling process pattern a component of A is the antenna and in the second coupling, a different component of B would play this role.*
- *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 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 (pattern) interaction and a (particle) collision will be explained.*

- **Zerons and the Unstructured cosmic Zeron Set (or UZS):**
- In this context a next non-obvious evolutionary step following from this postulated early PhR version, is the appearance in *point space (* CPS) of anti-symmetric pairs of the smallest composite patterns, each *of them called in this text a* zeron.
- The *fast growing* collection of zerons implement a dense dynamic subset of *correlated* point patterns. *Dense* as the two sided growth of each zeron pattern comes to an end by a point charge info exchange based interaction with one of the properly synchronized neighbor zerons, being *simultaneously* in a *compliant* growth state.
- Zerons are dynamic and cyclic patterns (singletons) capable of maintaining locally a +/-q net charge excess for half of their period ($T/2 >> \tau$). *A period is defined as a sequence of two successive growth and shrink cycles.* Over a corresponding *anti-symmetric multidimensional CPS* volume, *a zeron* maintains (*at the other end of the growing charge excess pattern)* a single *quantized phase shifted* point density excess or shortage, *whereby* the complementary local empty location (*called a* hole *in this text*) can materialize (in relative terms) a *local* positive or negative point density *deviation from* the standard average CPS value (PhR behind the non-exhaustive physical term "(positive *or negative*) null- mass quantum of any particle").
- Each single zeron pattern emerged "historically" and in an "ideal" CPS with a growth cycle that was the outcome of a single initial bidirectional charge info exchange between orthogonal , *properly* phase-shifted and *adjacent,* 2-point pairs *(geometrically a short lived virtual tetrahedron position).* They behave *together* as a potential *(or an ad hoc) bi-directional* complex antenna with an *anti-symmetric (or orthogonal, whereby both patterns impact each other only once) position* and their initial info exchange is so synchronized that each of the coupled points show two succeeding states with identical -but opposite between pairs- charge signs (creating dual local anomalies , implementing a spontaneous *local* symmetry breaking). *So where two 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 local point density ratio) conservation (see hereafter).*
- Growth 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 string. Th*is selection process takes the high underlying multidimensional character of point space into account – so axial just refers to the local linear geometry(in a shared dimension) of a central 2-point antenna, not to a linearly growing single dimensional path within a 3D-subspace (as practiced in Physics). Selected CPS points are*

interconnected by a properly synchronized and quantized charge info exchanges with the central antenna pair and the enclosed points, added alternately at each end of the anti-symmetric point string. They form an, in time 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 antenna points. This two-sided growth process takes place, alternatively at each end of a point string).

- This *so called "point replication by selection and dimensional reduction"* process is leading to a multiple sequence of additional *strictly* periodic *(as exact multiples of τ)* 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 hole 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 multiples of point cycle time units 2τ, times the string index i* .
- *As a remark: such "standard or quantized phase shift rule" valid for points that are components of zerons, 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 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 a overall (cosmic) dimensional scale.*
- Each *of both* (*of the two orthogonal anti-symmetric zerons that emerged simultaneously –as they are orthogonal they do not impact each other and further in this text we just treat one of them)* two sided *clustering* processes called *axial* point replication *(two charge-hole density distributions in spacetime, taking previous remarks about fastest replication paths into account*) requires per knot *extra "ad hoc" short lived* CPS points (*sometimes in this text called transversal or free charge points)* in order to complete a single *point growth* cycle *per knot period. The number of short lived transversal points in subsequent knots with higher i-values is increasing and their spatial distribution is assumed to be circular. One has to understand the term knot correctly: it does not refer to a lengthening of a point string in space but to an increment of the length of the time interval that a point state is able to maintain its charge sign. It also refers to a collection of compliant shorter strings, contributing to a next growth step.*

- One branch connector of a growing string carries the initial excess charge (C) property, the other (*temporarily and periodically*) an excess (or shortage) hole (H or h) density. *We will refer to the dynamic free hole connector in the opposite branch of a string as Dh or Ch, not to be confused with the notation DH/CH of a special "empty" contracted state DH /CH of a replicating zeron. A short living Dh/Ch hole is the outcome of destructive interference of charge info emitted by enclosed points that on their turn take into account that the one shot coupling between two point pairs that initiated a one sided selection of a point with twice in a row the same charge type, had a phase impact on the state of other point of a pair. After a small delay τ the hole state becomes a synchronized point connector that after its reset will implement again the small initial hole-like connector state.*
- *As a side remark, the notation DH/CH is ambiguous. If we accept that a zeron when contracting , changes its mass type (like it does with charge) this notation refers to that double change. If we reject this idea it just refers to a flipping charge sign (D-C) in a contracted (H) 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 in a return state due to interaction with another zeron.*
- As a summary:
    - each step *(or knot- see remark before)* of a point string is numbered by a *point* string quantum number 1 up to i-max. *The multidimensional selection and reduction process means that a knot (state) encompasses several subsequent point states that belonged to many higher dimensional substrings (in superposition in QM terms – a kind of pyramid of constructively interfering string pairs with growing length). Identical substrings with smaller but equal i-values are "oscillating" at high frequency around a common symmetry center in distinct dimensions (we call this later "in superposition"): two substrings are selected if they have properly synchronized connectors in order to enable them to form gradually a longer lived and fastest path string. In total a successful zeron point pyramid contains so many interconnected and supporting axial points that the outcome of this selection process will generate a very stable zeron pattern (all zerons are quasi identical).*
    - *The multiple short lived auxiliary "transversal" points needed for a knot, originate step by step and have geometrically a circular distribution. They "reset" the subsequent point states, set by properly phase shifted charge info packages received subsequently from all enclosed knots.*
    - *Each ordered and internally connected string represent temporarily a single dimension in point space. When the growth process proceeds, the number of successful longer lived strings (or dimensions) will decrease. This means that the probability of the successful "increase by selection" of the string length will decrease but growth continues as long as the selection time remains short as compared to 2τ.*
    - *The term "connector" refers to the last added set of components at both ends 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 synchronous coherent growth of each substring connector. Per knot i auxiliary short-lived "local or transversal" points are required to complete its growth cycle and we assume without prove their (kind of) "helical" distribution in a higher multi-dimensional CPS subset. Where an axial connector point with index value i maintains the sign of its initial charge state by interactions with selected connector states of higher dimensional neighbors around a common central symmetry center, auxiliary local points reset these states.

- *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 and becomes a point) but the balance is not permanent for the dynamic connectors: 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 creates a permanent small phase shift between both connector point states.*
- *We assume that point replication implies growth in time around an initially once mutated point pair, this process will not increase significantly the radius of a virtual geometrical volume (see earlier remark about computer simulations), occupied by subsequent successful connector states of a growing zeron pattern: it just reduces step by step the dimensionality of this CPS subset or pattern.*
- *Two similar replication processes take place simultaneously out of two orthogonal point pairs that initially interacted only once with respect of conservation laws, we implicitly accept that these processes do not disturb each other but remain "orthogonal".*
- *A point replication path is hard to visualize by a simple drawing (pictures of this process simulated on a computer could use several colors to make a distinction between subsequent connector states that belong to different dimension sets).*
- ***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 4 adjacent points in the CPS where in such relative space and time states that a double persistent replication process could start off. 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 will 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 this kind of hazardous selection processes.

- Growth by (*point)* replication continues in accordance with the reduction of the remaining number of available M-x dimensions, *representing parallel (or in M dim phase shifted) growth* around a common core location, until a critical value N (3<<N<<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* 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 and started to shrink! So why did this selection and growth/shrink process did not stop at values smaller than 137 ? The answer is that this process only stopped when the phase shift between two interacting growing "unfinished" zerons was quasi equal to τ . Once that happened a local zeron subset became persistent (or resonant) whereby their critical i-max value 137 would never change anymore in the course of the evolution.*
- *This CPT-wise distinct charge info exchange situation between adjacent zerons (here called a return state – DZ/ CZ) is the beginning of a cascade of internal over τ phase shifted "destructive" charge info exchanges with lower indexed knots of the same string whereby, as the outcome, a cycle of shrinking for both zeron patterns initially involved in the external interaction.*
- *The remaining dimensionality N means that N 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 superposed strings with quantum-states (i-max -1), so the shrinking process of all the substrings will start about simultaneously. 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 .*
- *In fact, the application of the CPT conservation rule on interacting i-max connector states, in each individual zeron as well as over the combination of both, should explain the behavior and properties of each. Per zeron, the charge excess type is conserved, but there is a switch in mass type (mass being a hole density excess or shortage leading to corresponding phase jumps in each replication*

process and shrinking of both patterns: so P and T have to switch their signs). Their combined space-time behavior (in PT 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 (P in CPT terms is conserved versus the virtual common reference frame), consistent with what happened with the maintained C type and the mass properties (the anti-symmetric phase jumps mean that also T and the total energy (see hereafter the definition of "energy") over both zerons are 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.*
- *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 transversal connector points of each zeron involved in the interaction, are interchanged . Hereby we stress once more that point and hole states are dynamic: a hole connector becomes a point …after a standard quantized phase shift τ. 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, as* far as the PhR *concept* of mass 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.*
- Shrinking processes along the original growth path cause implicitly the local increase of dimensionality *whereby no selection procedure is needed. Points that belonged to a zeron pattern 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 dimension.*
- The *step by step* release 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" *DH/CH* 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 remains the same. This inversion process is CPT conservation compliant, but this time over two successive zeron versions conserving P but not T and (C or) Q - the latter is base laws 2 and 3 compliant). 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 in the return state. It could also imply that a virtual zeron pattern, a composition of a shrink and growth cycle oscillates around a virtual symmetry location over a small time quantum. All this has to be confirmed by computer simulations.*

- 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. A zeron 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). 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 connected path, *to be expressed in multiples of* τ) protects them against external perturbations over a much longer period than what is the case for just a single CPS point life cycle. *This is good news for the future emergence of more complex patterns, as it turns zerons into useful building blocks for any further evolution of the cosmos.*
- In the course of a full period a zeron's *dynamic free charge connector induces subsequently* a magnetic north or *a* south monopole (the other connector being a hole, 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 by a transversal point of a charged connector, taking its 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 ? 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). *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 reached this size and the time that was needed for UZS growth to come to an end. We assume that this delay was extremely short.

- 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 a few 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 (in point replication return states) on the other hand, set the ε and μ parameters of the "vacuum" in Physics. Certainly the μ value could 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 patterns. As will be seen in next chapters, this at first sight statistically 50-50% distribution can be locally disturbed and biased by the presence of more complex multi-zeron pattern distributions.*
- *Computer simulations are needed to find out if zerons acquired and maintain their mass types since their origination or are able to switch their types in one of their special states. 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 is a conserved property of any zeron there 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 states) but we assume anyhow that stable composite patterns of zerons (like protons or contra-protons- see further) maintain their mass types. We also assume that the densities of zerons and zeron states in the cosmos are extremely high compared to these of complex zeron combinations. Finally we presume that if the size of the CPS is finite and has already been reached, the same is true for the UZS.*
- 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).
- ***As a summary****: A cyclic point replication process as described in this chapter is the (only) way to construct dynamic patterns (zerons) of selected raster objects (points), time-ordered along shortest paths, able to transport and maintain charge and hole antenna anomalies (perturbations in their one shot creation state).*
- *More generically (hereafter more complex forms of replication processes are described), these growing and shrinking paths (or strings) are single or multi-level point and/or zeron compositions interconnected by synchronized charge info exchanges between dynamic components, each component switching its state at perfect multiples of τ. Replicating strings take the symmetry of the central antenna and the impact of the single or multiple perturbations on the antenna state into account. Although the final outcome of a single replication process in its return point is single dimensional, the global processes are intrinsically multidimensional in their contracted states, just like a point and zeron raster is on its own. It means that in the central (contracted) symmetry state of a pattern subsequent pattern versions, (and if not integrated in and as such biased by internal or external high level interactions leading eventually to more complex patterns but with a reduced dimensionality) are able to exist in superposition . Replication processes are PhR behind nearly all standard and at least temporarily stable patterns (or particles as observed and called in physics).*

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 (multiples of single point life cycles τ) are part of its definition and its metric.*
- *A*s 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 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, but the observed probability distribution takes implicitly (several) collective parameters 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, which 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) (or the rule in QM that two quantum objects cannot be simultaneously in 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.*

- ***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 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:***

- A second 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 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 (and symmetric) at the moment they effectively exchange charge info. Hereby one has to take hidden properties of objects (e.g. mass type in a zeron state) into account. If they are anti-symmetric this state can be broken.*
- *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 = δE*δT. h is a constant (Planck) and h/2 expresses the quantum of change exchanged in the course of a dynamic single point growth or shrink cycle. 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. 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. "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. 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 !!*
- *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). 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 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 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 equivalent and superposed paths) with the appropriate wavelength, emitted by a decelerated particle.*
- *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 interactions, capable to guarantee the application of conservation rules (EPR effects).*
- *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 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…). As such interactions in case of complex patterns often encompasses just a small number of components, 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.*
- 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.*
- 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 a pattern connector; the second, *a* polaron type *(a term in physics to name a quasi-particle – 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 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 are taking place. *In equivalent terms in Physics, interactions are linked to elementary forces or combinations of those forces: an axion plus a short range polaron (sequence) could correspond with a strong force, a polaron with the electromagnetic force or with the gravity force, but the link between definitions depends often on 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 distributions in space and time of pattern states and by interactions between those states leading to a change 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 mysterious force(s) .This does not exclude that pattern distributions show a large scale format (e.g. gravity fields – see hereafter).

- *As mentioned before an interaction between two standard UZS zerons in their i-max states (most probably a hole connector with a charge connector-see point replication in chapter 4) has to be seen as a charge conserving but time (or phase) modifying interaction. It is not an ordinary polaron exchange. 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 pseudo-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* DH or *a* CH state in a *point* pattern's *single* zeron life cycle - a *primitive* form of pattern state degeneration, *but in fact the outcome of the presence of a secondary discriminating property*).
- 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 antenna patterns, i.e. zeron compositions with a decreasing probability of 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).
    - 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 time symmetry (PhR of the so called "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..
- 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 "Mexican hat" picture in Physics). 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). In chapter 4 we mentioned for the first time the idea of a bidirectional charge info exchange. It might be 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") . A single axion-like charge info exchange would trigger in the two patterns (in, as far as dimensionality (geometry and phase) and mass type is concerned, distinct UZS subspaces !) two anti-symmetric replication processes that respect conservation rules when applied initially just once on this axion interaction event between two zerons. 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 correct distance between both zerons involved in the one-shot charge info coupling. This stringent assumption explains, once two EZK replication processes within an EZO take off, why they are and remain orthogonal: a second interaction that could disturb both patterns life cycles, has no chance to take place. Computer simulations to confirm this scenario are absolutely needed..*
- *So when two of these quasi-ideal EZK-like pattern states are properly synchronized and capable to interact by successfully exchanging an axion info*

package with respect of all conservation rules, gradually several types of 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 set. Zerons keep approximately geometrical diameters that are limited to an order of magnitude of twice a double point size, leading after reduction in dimensionality from M to N, to a number 137 as the amount of in phase (or time) shifted points in a zeron string. It means that all elementary zerons are, except from mass, about identical, be it because the lack of whatever other discriminative property in a primitive state of the cosmos.*
- *Any further more complex pattern growth will be the outcome of extra point level standard interactions with and between UZS zerons 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 the symmetry of core antenna's and the superposition law applied to the internal charge info exchanges, into account.*

- **Examples are**:
    - ***Zeron re*plication *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 path segments with *geometrically* orthogonal dimensions (a case of symmetry breaking *between matter and contramatter: both* EZK's replicate in superposition *and are orthogonal, meaning: 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. 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 t*his 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. Zeron replication is a process similar to point replication in a CPS. 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 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 4th 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 4th "free" zeron is dynamic (it means that a priori each EZK zeron 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, p*rocesses 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 "<u>dynamic role interchanges</u>". 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. <u>Dynamic role interchanges and symmetry-rules imply that two opposite senses of rotation exist for matter- and for contramatter- like EZK patterns</u>.*

<u>What the terminology is concerned</u>: the 3 dynamic virtual perpendicular directions along which an EZK nucleus is replicating are called phase shifted (zeron) <u>strings</u> (equivalent of 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 <u>connectors</u> and the central EZK) take place along the 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) axial string pattern. Due to role interchanges in the central EZK, it must be clear that 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 double conic surfaces around the central virtual symmetry direction). E.g. in case of a ***baryon-like*** *replication schema, each line thru the apex of the cone in the center of the EZK, corresponds in fact* ***in superposition*** *with a simple single* ***electron-like*** *axial replication schema. 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 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 distributed along circular paths around the axial string. When the value I is reached, the axial zeron flips its sign, 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 τ. This schema can be described as a process of making copies (+/ -) of a central EZK antenna and of all previous enclosed knots with each other and with a central EZK that is rotating thru internal role interchanges. The growth 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. The whole process takes place with respect for conservation rules and the base laws. The 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 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 and the orthogonal orientation of each single axial string version. Replication as a dynamic process (we must never forget that all points involved in replication maintain their typical 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. They are the outcome of the initial symmetry breaking in the EZO but depend also on the complexity and the duration of the replication schema. This aspect determines the relationship via h/2= δE*T between internal energy (and mass) and the replication period and obviously the differences between (e.g.) the electron and proton mass.*
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 phase jump τ, 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.
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 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. 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 needed to describe correctly the sequence all the changing quantized states of the components of a baryon pattern.
In case of single ***electron*** *replication processes along narrow strings with a fixed orientation, no axion exchanges between connector zerons of neighbor strings can take place (neither 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 larger as determined by the ratio between a proton and an electron mass. For each schema and each axial string version, the gradually 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 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 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. This form of quantization explains why physics is able to use equivalent mathematical models and laws to describe successfully nature's behavior.
To fully understand the multidimensional replication schema in case of baryons, computer simulations are needed. One of the crucial questions is the way elementary 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 an EZK tetrahedron the symmetry directions do not coincide with the 3 orthogonal 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 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 group. It should determine the begin and the end of this multi-level replication process. In this text we opt 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. So in fact and more generally: we accept that interactions are reducing dimensionality. Anyhow baryon 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.

- ***Circular or rotating zeron-level replication of a persistent EZP pattern (PhR of dark matter and dark contra-matter):*** *in previous chapters a contact between two adjacent, by point replication growing UZS zerons (successfully interacting in their quasi synchronous i-max states DZ/ CZ and/or Dh/Ch) has been called a (short-lived) EZP. The density of these EZP's is extremely high in the CPS/UZS and is, at least without the presence of other local more complex pattern densities, quasi constant per virtual CPS unit volume. As single UZS zeron densities materialize the ε parameter of an empty (meaning: without particles) spacetime volume, short-lived contact EZP's and their emitted net charge info pattern densities, do the same for the μ parameter (see before).*
  In order to be persistent, a <u>neutral-EZP</u> 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) in the contracted states of an enclosing zeron pair. However without an extra (cyclic) coupling process in the i-max states of these zerons, it would be hard to explain why a single neutral-EZP could be persistent and why it would maintain the same type of embedded hole (or phase shift) over subsequent versions.
  Indeed, a standard short-lived EZP changes its external contact in i-max randomly and might switch 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. This changes the duration of the hole states of both zerons whereby overall density (and energy) conservation is guaranteed.
  Nevertheless an extra axion coupling in the i-max states of successive versions could take care of this requirement . This axion could be initially the outcome of a process that created these neutral-EZP's (as sub-product of a replicating EZK pattern in the contracted state), storing a net hole-like action amount in a stationary rotating (charge and charge info -) neutral-EZP. Contrary to a replicating EZK, a neutral-EZP is unable to move its symmetry center over the UZS grid but it has (in the lengthened contracted state) a rotational degree of freedom in a plane, perpendicular to a vertical symmetry axis through its central symmetry or contraction point. This axis is "historically" related to a symmetry direction of a replicating EZK string that dropped these EZP's in the UZS. Phase shifted EZP versions, in fact transversal zeron pairs and string connectors

in replicating multidimensional patterns, out of a mutated EZK core (in fact: particles), might build up incremental phase shifts in a free EZK zeron until the nucleus shift its position (see a next paragraph on particle motion). Once released in the UZS, subsequent circularly rotating, (neutral) EZP versions are persistent as the outcome of the search for fastest charge info exchanges per version and between versions (base law conform). Contramatter particles (see further) contain and release neutral "contra" EZP patterns, rotating in the opposite sense (contra-gravitons) with an opposite excess hole density sign (see earlier the distinct states DZ-DH-(CH-DH)-CH-CZ and a DZ-CH-(DH-CH)-DH-CZ (or CZ-DH-(CH-DH)-CH-DZ and CZ-CH-(DH-CH)-DH-DZ) combination). When a neutral-EZP version is contracting (in point space), the signs of the charge connectors are interchanged but the central hole mass type has been changed twice and maintains its "type". Depending on the sign of the phase shift of a (in fact a unit mass quantum), the CPT conservation conform charge info exchange and the original rotation sense of the parent particle string will force the pattern to rotate to the left or to the right. Hereafter we will see that the total impact of an initially by a long-range polaron interaction accelerated (or decelerated) EZK pattern, is complex: a unit 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) of a photon quantum, the increase (or decrease) of the offset value of a central free zeron and the release of a rotating dynamic neutral-EZP that stores persistently a unit time shift of a specific sign (left or right turning) and type (positive or negative mass, in fact a slightly different hole duration). 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 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 is only indirect by changing the local point-hole density ratio and this can lead to a change in what is called "potential energy" of position shifted objects. One could say that direct observation of neutral-EZP's will always remain a problem because their energy impact only leads to a change in potential energy (see Physics) of other objects in the neighborhood. In physical terms: they are just punching (or displacing) holes in spacetime! Anti-symmetric sequences of processes and properties take place in case of acceleration and deceleration. In case of a position shift without acceleration/deceleration there is no net change in I-max and no photon emission /absorption. The local neutral-EZP density before and after the motion must be maintained, neglecting the small position shift of the neutral-EZP hole.

- **(EZK based) Particle formation:** In a young cosmos and/or in flat environmental conditions, the emergence of chiral (in CPT terms) 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) and it shows by convention negative internal energy and mass (-E=-mc²).* In order to take place *sufficiently often and as proposed before*, this process requires global (in a young cosmic slice) or at least local flat conditions (i.e. zeron state related balanced hole densities, extremely rare in our present local cosmic region except under *special or* artificial conditions). *Hereby we mention, as a special source of locally 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 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 accelerators) and in a large non-flat spacetime volume, there will always exist a small probability that for a very short period of time, local conditions are such that EZO's exist and split spontaneously into replicating matter and contramatter EZK pairs (they could be a potential source for cosmic (particle) rays).*

- **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 result 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 phase shift quantum at point level and stored in the free zeron of a transversal connector, repetitively and zigzag wise and with inversion when transiting the contracted state(s). As a result and* after a number of contraction cycles *(a number decreasing for smaller values of I-max) an increased phase shift amount will be stored in the free EZK zeron(s) 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.

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 EZP pattern in the UZS 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 hereafter). An in fact stochastic effect becomes cyclic what makes momentum a conserved quantity.

EZPs involved *initially* in an effective external exchange either belong to two properly aligned, oriented (dimension wise) and time compliant particles situated at small relative distances, or to one particle and one properly signed and neutral-EZP or photon field pattern. *In the first case the charge info carrier is called a virtual photon in physics and the polaron transport is facilitated by a zeron polarization string (see further – Coulomb field lines) between particle connectors in compliant states. In the second case (a field interaction) coupling* might be *either* EM field (or

photon) *based or gravity field 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 EZK core and a density observed in physics as* the varying E component of *an* EM wave) *but the* EZP *charge info* pattern *itself* corresponds physically with the B field component of *a fotino*. 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 an exchange takes place between two particles of the same mass type (either matter or contramatter) the I-max values of both will be adjusted (an exchange of virtual photons with respect of global energy conservation but with a distinct energy impact on each pattern), where in case of an interaction of a particle with an EM field (an external photon emission) or a graviton, the latter will disappear, either as free propagating (the photon case) or as stationary pattern, linked to a fixed location in spacetime (the graviton case). 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 direct coupling between two particles, we do not even know in advance 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 trajectories, the specific 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). This statement is not valid for ordinary photon interactions: 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). A frequency that depends on its turn on a pattern's layout (*complexity and its* internal symmetry – *they determine the duration of a full replication cycle)* and obviously on the I-max value (in fact a unique quantum number of a *particular* replication cycle). *This PhR 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 (t*his* 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 are 240° phase shifted (in a spin ½ 720° replication schema) and because the next 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 the direction of a successful displacement quantum exchange.*
Successful polaron exchanges between two EZK based field or 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). 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 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: <u>not every distinct zeron pair state combination of connectors involved in the 4 successive replication cycles, will be compliant. The inversion process 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.</u> 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 "Coulomb polarization").When a non-accelerated particle moves 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. It is important to notice that the dynamic connectors 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 extra position shift 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 zerons 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 as the former excess connector at the opposite side of the shifting string, when the pattern was moving one step over the grids. This 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 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 polaron in the free zerons of the transversal string connectors of a string along which the next position shift will take place, is not proven. It is 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 the speed c, a f*urther EZP import has only an impact on the internal behavior of the EZK nucleus' (the *incremental change* rate of the

phase counting mechanism at point level *in a free zeron* , leading to a particle's capability to "move faster" on the grid, is reduced by an increased non-*compensation 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-c*ompensation 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. *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 τ units), equal to the cumulative charge info impact of contracting unbalanced connectors on the free EZK zeron's relative phase angle value.*
In this context we stress 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 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). For a spin ½ or for partially a spin 1 particle this is not an issue.
Polaron exchanges between connectors of orthogonal strings of the same particle permit the storage and conservation of rotational momentum (see hereafter).

- ***Energy :*** *A generic (PhR)* definition *of the term "energy" 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" (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 level.* This rule, applied to zeron made *complex* patterns, explains indirectly the intrinsic relationship in physics (the *reverse* fine-structure constant, *being a measure for the reduction in dimensionality between zeron and point spacetime*) between the *at first sight* unrelated constants c, h & q (*and eventually μ)*.

The same kind of one-shot initial interactions or *double* bifurcations (both compliant with CPT conservation rules) that once took place *on a large scale* in a young cosmic volume, lie at the root of the separation 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 an average UZS value*). The central volume of contramatter in our galaxy or the peripheral pattern volumes in other dual contra-galaxies are transparent to physics as contramatter and matter do not interact by *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 local momentum* as criterions for discrimination) 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 contains one or several other discriminating properties or multiple quantities of such properties, compared to other patterns in its dynamic environment, encompassing a 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 involved in a inversion process in the contracted state, a spin ½ particle needs 4 subsequent growth and shrink cycles to return into an identical pattern state. 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 are 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 absolute I-max value (in fact oscillating around a virtual center and does not move 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 excesses 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 holes (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. 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 type 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 multi-dimensional 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 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.*
- ***Computer simulations should confirm these ideas about energy, as proposed in a PhR perspective , just like any other proposal***

about a particle's motion**. **A key issue remains how the combinations of subsequent cumulative imported time quanta along distinct strings and connectors are ultimately converted into a sequence of subsequent position shifts over the grid in a contracted state. This mechanism should be compliant with the equivalence in physics between a matter-like and a wave formatted descriptions of elementary particles and their behavior (Physics QM - de Broglie).

- **Unstable particles:** *After the one-shot action(s) 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 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 this strong force. Head-to-head high energy collisions of two particles with well aligned and synchronized connectors and small I-max values, induce in a temporarily enclosed pseudo-flat UZS raster volume, artificial zeron patterns (PhR behind new particle jets in Physics), due to the impact of their connectors "free" charge info emissions. 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* contract*ed 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 of what certain physicists call, "an (unstable) particle zoo". Many of these experiments and their results are interesting but do not contribute to the understanding of fundamental properties and processes of the 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* 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 field).*

- ***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 short range axion interaction, it intermediates the strong force. A successful exchange assumes in case of long range interactions the presence of a dynamic zeron polarization string, connecting periodically two compliant and available connector zerons in both particles (see hereafter). 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. An internal polaron coupling between strings can lead to changes in velocity (the direction of the next position shift) without change of energy or speed.. At very high speeds net polaron impact (on EZK free zeron phase) will be non-linear leading to relativistic effects (in physics, as well as in PhR terms – see further) .*
- *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 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 process along two opposite branches of each string. This mechanism has to be confirmed by computer simulations. Its outcome generates along any propagation direction in the transversal plane, alternatively a 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 (see hereafter: magnetic fields), in fact observed as an on 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 at the moment an antenna pattern will effectively shift its position over the point-zeron grid. Both orthogonal E and B fields are perpendicular to the propagation direction but their orientation depends on the orientation of the 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 represent this situation. A single fotino pattern is bosonic(a spin 1 particle in physics): its pattern returns into its initial state after two contractions, not 4 (PhR). 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. It stands still versus the grids and it behaves as an 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 asymmetry produces a fotino, capable to propagate at its

*turn by copying its simple pattern on the double grid by info emissions propagating itself at speeds higher than c. In fact the only thing that happens in this process is that charge info emitted by a single fotino is ordering by selection and along multiple directions, standard single zeron and EZP sets. So subsequent versions of each individual fotino are copied many times along, in point space and phase superposed, paths whereby each segment has some rotational degrees of freedom: this multiplication process takes place at a speed 137*c: 137 is the maximum number of superposed copies in point-space of a single fotino. As a single version of a fotino 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 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 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 objects along its potential path segments into account when constructing its final successful fastest connection path between compliant source and targets. A fotino as a pattern is transparent to physics and a photon (a sequence of fotino's 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 an action quantum along a fastest path (not necessarily the shortest in a geometric perspective – see 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 = δE*δT). In view of Einstein's E=mc² 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. 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.*

- *neutrinos (mixed matter-antimatter (or contramatter ??): difference patterns, induced in the UZS and the outcome of contracting and eventually mutated and unstable string combinations. The branches of those string combinations are storing one-shot asymmetries in their central EZK's free zerons, changing the standard configurations proper to their replication schema's. At 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 in the central EZK of the old and the new version of the parent particle, taking hereby other decay product patterns 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 to oscillate (a physical term) between these modes. Neutrino's only compensate unbalances in the central EZK of complex contracting baryon replication schema's. A well known example is the very slow decay of a neutron in a proton, an electron*

and a neutrino. In this case the unbalance does not seem to be the result of an interaction (to be further investigated). 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 high speed means that their contracting string(s)reach quickly the critical zeron phase limit in their central EZK in order to shift over the grid and substitute it by a next version. The low mass value and their low coupling rate could mean that their hole state could be partly 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 detect in physics exceptions on the symmetry properties of certain processes in which neutrino's are involved (e.g. some radioactive decay processes).

- *<u>electrons</u> 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 neutrino's do for the EZK nucleus.*
- *As stated and in PhR terms, most of these special patterns and phenomena are examples of <u>difference particles</u> needed to satisfy conservation requirements. They emerge in the contracted state due to an 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 except in case of neutron decay) with a single particle's connector zeron (axion) or zeron pair (polaron). 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 …).

- *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 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.*

- **Polarization (as a property of elementary CPS/UZS components (PhR) or simple field patterns (physics)):** in accordance with this model most replicating patterns are able to create and maintain (by dynamic N-dimensional subsets) sub-particle fields that are materialized by chains of *elementary but correlated patterns: single UZS* zeron *strings, short-lived* zeron-pairs (EZP's), *neutral-EZP's or contra- EZP's...* These dynamic *over a long range linear and/or 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 other patterns and, processes,* observable in physics)". 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) *have* dynamic connectors *with at least one free zeron. Periodically , when not involved in string – nucleus binding, these zerons will induce and align in their I-max return states (see also baryon replication schema hereafter), short lived coherent and by charge info exchange connected chains of UZS zerons, materializing a centrally symmetric Coulomb field (Physics) which is fundamental to the understanding in PhR terms, of non-local interactions and momentum transfers (through polaron transport along those field lines) between charged particles (e.g. dynamic electron-proton coupling in an atom).* The properties of the four subsequent "special" charge/hole states of any *single at point level replicating* UZS zeron make it possible to fit (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 *and hole states* at both ends of a connecting chain (it is also PhR of a charge displacement current in vacuum – see Maxwell's laws). *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 sign (repulsive or attractive) of Coulomb-like interactions. Particles (e.g. neutrons) with dynamic connector configurations that have 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 replication strings equally distributed over 2X3 cones around the nucleus guarantees anyhow a net charge neutral pattern).* These local or internal *electric* field lines remain even indirectly transparent to observers.

- ***Magnetic field lines*** *are materialized by zeron pairs (dipoles) that are phase shifted, emitting net quantized circular charge info patterns in their spacetime symmetry locations . These pairs are mostly part of more complex patterns, so their individual charge info distributions have to be added conform the superposition law. A fundamental difference between charge based patterns and charge info patterns is that charge quanta are confined to specific locations, where charge info is omnipresent and propagates at a high speed (>c): its local density distribution take the emission format and the superposition (or interference) laws into account. Charge info packages facilitate coupling between intrinsically quantized compliant point states respecting the base laws. In the former chapter about point replication in single zerons, we mentioned that replicating point strings behave like a magnetic monopole: two phase shifted zerons are needed to emit a dipole pattern as described in physics. They originate by point-zeron selection, as sets of coherent grid components being copies of free connector charge pairs, and induced by particles, moving over the grid. Their net average charge content is zero but they carry a small phase shift at point level. Where the selection process for electric field lines make use of the abundance of free zerons in the UZS , magnetic field lines are doing the same with primitive short lived zeron pairs in the contact state. They form a pattern (in fact each EZP act as an antenna, capable to order by selection other short living EZP pairs in their contact state) that can be observed if zeron pairs are integrated in a more complex pattern that is able to move over the grid by replication or propagation: an example is the B-field in a fotino sequence. A similar constructive interference and superposition effect as 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, as observed in physics) or on a*

macro scale when (e.g.) an electric current is inducing a net circular magnetic field around its wire. This current is in fact and on average, a parallel multi-electron propagation set. So even when a charged particle (theoretically) is standing still versus the double spacetime grid, its replication process is producing a net magnetic spin effect, being the superposition of residual charge info quanta emitted by free 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 hole along the short axial branch which is producing the normal spin, being a pure dynamic point-hole ratio density effect). In case of electrons (physics), the magnetic spin represents the net impact, after constructive interference of phase shifted charge info quanta emitted by 3 orthogonal phase shifted EZP connector zerons along a virtual trisectrice of the orthogonal replicating strings. The same residual magnetic spin effect (physics) is weak in case of baryon-type particles like protons (see baryon replication) . A (e.g.) proton flips periodically its local charge types due to axion exchanges between adjacent connectors of electron like replication states distributed over a cone. The latter explains 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 on the contrary maintains its connector free charge type during the full life cycle between two contractions. A proton replication cycle is shorter in time than a free electron cycle (as $h/2 = T * \delta E$, this is leading to higher E values) and the number of hole locations of the same type, maintained per cycle is higher (so the total net mass value is higher, consistent with $E=mc^2$). Any external magnetic field has an impact on the path on the grid, as followed by a moving pattern. This effect is <u>either</u> the outcome of the impact of the magnetic field on the inversion process of the EZK in the contracted state (in fact it curves of the orientation of the next position shift) <u>or</u> it is due to an increase in probability of internal polaron exchanges between connectors of subsequent versions of two adjacent strings of a moving and replicating particle, an effect that is also curving the particle's propagation path (we assume that the latter hypothesis is correct but this remains to be proven). Such change in velocity (not in speed) does not modify the net energy content (and the I-max value) of a free pattern. All this makes sense: changing the cosmic state 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, enables patterns (or particles in physics) to induce by selection and ordering of grid components, electric and magnetic polarization lines. Primitive grid components are PhR behind the ε and μ parameters of spacetime in physics. Their density (and "availability")has an impact on the speed and velocity of an EM wave (physics), meaning on the speed of appearance of subsequent selected fotino versions 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 selection process itself (PhR of double slit experiment in QM).
The duality of Coulomb and magnetic field lines is PhR behind Maxwell's equations (preferably expressed in relativistic differential tensor format). Finally we want to stress (once more) that a magnetic field is a quantized charge info field, meaning that superposition of field quanta is PhR conform.
Another interesting case relates to the quantization of the orbital momentum states of a electron "moving" around an atom nucleus (physics). A particular global atomic state is stationary when the quantized charge info patterns emitted by the subsequent electron states is stable after superposition: 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). This global process is only PhR compliant if magnetic fields are net quantized 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).

- ***Gravity field lines**: after the creation event, in emerging new UZS grid shells and referring to the earlier described process of pattern creation and motion in those shells, a growing number of charge-neutral particles (e.g. neutrons or non-ionized atoms) are shifting step by step and in their contracted states, their central symmetry positions towards the middle of a spherical- symmetric volume, whenever such central location contained initially even the smallest particle-density excess and hole density gradient. This asymmetric situation is hard to avoid because the probability of a pattern moving over a long time at constant speed is statistically about impossible. This initially local process will create a fast growing gravity field materialized by a radial density gradient of*

unconnected but "historically" correlated neutral-EZP's (see special chapter hereafter on gravity related topics like anti-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 excess pseudo-static (meaning: a pattern unable to move over the UZS) connector patterns with a neutral-EZP format, ….showing nevertheless a net local density (in N-dim UZS- space) that is globally spherical symmetric but with a gradient that increases towards such volume's symmetry center. These neutral-EZP's (gravitons with spin 2 in physics) all have identical properties as they are the outcome of any by an asymmetric polaron import induced acceleration process in the same direction. This import is leading after a number of contractions to a position shift, a decreasing I-max value and the release of a new neutral-EZP. The same process turns up in case of deceleration whereby polaron import takes place in another state or in the opposite connector of a 4-state spin ½ particle although such situation is either artificial or has locally and statistically a much lower probability to happen in an existing gravity field. Why this asymmetry in the production and absorption of elementary patterns, materializing a net radial asymmetric density distribution? Net acceleration or deceleration is driven by an opposite 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 replicating particle's connector(s) states . The connector properties of a replicating spin ½ pattern are interchanged in the contracted state and so will be the outcome of neutral-EZP based polaron import in connectors of subsequent branch states. This means that due to their signs the impact would cancel out …nevertheless the probability of successful coupling is slightly different for these two subsequent states, due to the changing curvature of an existing radial neutral-EZP density distribution....even over a particle's small and gradually decreasing string length (due to a by acceleration increased velocity). This extremely weak gradient impact explains 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" (so neutral-EZP's and their density distributions are PhR behind dark matter (a topic in large scale cosmology) and behind gravitons (particle physics)). The (very 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 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-out of a replicating particle and of a neutral-EZP, 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 gradient: 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 F= G*Mm/r² 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 where contramatter particles condense as contra-stars and whereby their contra-graviton fields are in fact radial density gradients of neutral contra-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 Coulomb (charg*e driven*) fields show a similar *symmetry and mathematical format. Without the presence of an external time-varying magnetic field, both fields are conservative and non-rotational and the relationship between hole or charge 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 between the two is well understood *in PhR terms* by combining both field properties with the symmetry properties of a particle's replication pattern. *It is also useful to repeat the PhR definition of the term "action", being a convolution of a charge driven energy quantum and a quantized hole driven delay in a zeron replication cycle (or time or phase shift): a single empty location (a hole) is strictly spoken not an energy agent and cannot change on itself a cosmic state.* As mentioned before, our 3D perception of the

cosmos is a form of polarization induced by frequent interactions between properly aligned and synchronized matter particles with an internal 3*D (or regular tetrahedron format)* symmetry. *Two particles that couple successfully through a polaron exchange along collinear strings (an EM coupling in physics) must be properly phase shifted and should belong to an –at least temporarily- common 3D subspace (their quasi linear replication axes should be at least coplanar). A graviton with a circular – at point level phase shifted – pattern must preferably rotate in a virtual plane, perpendicular to the patterns axial replication direction (high success rate) or <u>at least perpendicular to the plane formed by two symmetry axes</u> (lower probability) in order to couple successfully. The latter could explain why 100% radial acceleration <u>towards</u> and, leading to concentration of all the matter particles in the neighborhood <u>in</u> a central symmetry center, did often not take place. It could explain how and why (e.g.) planets around the sun acquired and conserved historically their rotational energy. Successive versions of 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 their direction in a curved gravity field by exchanging polarons (see earlier – we neglect relativistic effects at 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 between the three orthogonal strings. This mechanism is PhR behind the principle of conservation of rotational impulse (physics).*

- *As a general remark, interactions (including many measurements in physical experiments) put quantum objects temporarily into non-superposed states. The same is true for random collisions with particles in the neighborhood (the reason why quantum computers need low temperatures). The statistical distribution of possible results of an observed quantum object property can be calculated in QM but each individual "measurement's" outcome is hard to know in advance. One thing is for sure: any measurement requires point level interactions between properly aligned and synchronized EZK based pattern strings. The more frequently these interactions take place (e.g. cyclic coupling between atoms in a molecule), the smaller the 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 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 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 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 fotino or electron pairs, 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 EZPs, each zeron pair orthogonal to the propagation path. Their centers form a quasi-linear persistent hole-filled 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 locality is extended to fast causal sequences of component selection processes at CPS level) without involvement of "real" particles. This info propagation process is similar to what*

happens in a (UZS) zeron polarization string (a dynamic Coulomb field line) but in this case the string is hole based and maintained by a coherent EZP collection. There is no doubt that such hole 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 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 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 longer 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. 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 to a loss in momentum in favor of the receiver . So a particle collision is a statistical phenomenon. This scenario encompasses the more probable case when the two interacting particles do not posses collinear but just coplanar interacting string axes what implies that both trajectories will 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 obvious 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 a loss of momentum for both (and obviously a bending of their paths), due to a repulsive Coulomb force. If the same positive particle is "hit" by another positive particle (with a higher speed and moving in the same direction but approaching from the opposite side), it will gain momentum. In terms of PhR 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 a common schema of zerons at both ends of a polarization line, by compliancy rules of connectors for the two particle replication states, leading in both cases and particles to a 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 !

7. **Gravity and gravity-related topics.**

- ***Gravitons and repulsive gravity forces:*** *"neutral-EZP's " (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 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. The two original, along a helical path distributed, transversal EZP substrings 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 copy of the unbalance on the UZS grid) is gradually built up at each contraction. This pattern is complete and will be released when a position shift takes 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 to 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), so they are able to interact successfully by polaron exchange in both inversed I-max hole connector states of two successive and compliant replication states of a spin1/2 EZK particle (whereby 4 contractions and inversions are needed before an identical particle pattern state reappears). A spin 2 property does not imply that the reappearance of the same pattern state happens once or twice per rotation cycle of the neutral-EZP. It could be that one is not related to the other what would make a successful coupling of a neutral-EZP with a particle connector, to be a very versatile process. Further investigations are needed. These polaron-like interactions are anyhow leading to either a momentum increase- or decrease of the spin ½ particle. This means that statistically and on average, the net impact of a high local density of neutral-EZP's on a particle's momentum is nihil. In a fixed UZS reference frame the positions of the particles nucleus and the neutral-EZP are eventually just interchanged but the energy of the particle also does 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) corresponds with the released (absorbed) photon energy. But if this statement is correct, how could a neutral-EZP, released in the UZS and standing still without possessing 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, is showing a radial gradient, the probability of a successful coupling between successive connector-states of an (along a radial direction) accelerated, charge neutral particle, is no longer nihil, although still extremely weak (based on twice the EZP density gradient over a small distance of the order of a string length). 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 along its path due to polaron absorption and by an increase of I-max of the ball's particle content (which seems to be consistent with a classical physical approach, because a quantity of matter just left a virtual enclosed spherical volume filled with matter-like mass and "empty" space). An equivalent (be it along a distinct path) neutral-

EZP density 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 the earth, superposed on an even larger field around the sun, take a distant local 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 locality principle (QM) for graviton interactions is accepted. In PhR on the contrary, an a priori local symmetric process can be successfully transformed into an extremely small but large scale asymmetric density impact on spacetime curvature in the sense of GR. One could say that a graviton clearly act as a gauge particle between a local and a global symmetry.

- *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 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 (with a particular initial momentum)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 radial 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 would be importing and exporting subsequently a polaron, maintaining in this way 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.*
- *All this also means that, although repulsive gravity is not observed, a pair of overlapping anti-symmetric patterns (see formation of a neutron - contra-neutron pair) emerging simultaneously out of a successful EZO split in locally flat spacetime, contains at that time, two superposed anti-symmetric (in terms of their mass types and sense of rotation) double EZP rings before closing, that might have an accelerating impact on both EZK based patterns, relative to each other. This extremely subtle effect in the null- energy state (assuming the application of CPT conservation rules in a common neutron / contra-neutron reference frame) might trigger a separation process of matter and contramatter particles in opposite directions, just by storing (about) equal but anti-symmetric polaron quanta in both particles. This topic is not just an insignificant detail. It is extremely important in*

this PhR model, be it because a split EZO, standing still in absolute terms versus the double UZS-CPS raster, is supposed to produce two EZK patterns, both replicating until they reach absolute I-max states over maximum replication lengths. If there would exist no mechanism to reduce initially and simultaneously these maxima to smaller values (or in other terms: "to give them both some quantum of momentum"), partial cosmic volumes like ours could never acquire their kinetic energies or behave (with respect of momentum conservation) the way physics is observing. A particle that stands still in a fixed reference frame in a double grid cannot transfer momentum to another particle with the same mass type being in a similar momentum null state. So …this PhR model would be incomplete or not correct. If the orientation and the collective distribution in spacetime of these 4, two by two contracting rings just before reaching the neutral-EZP closing state, would be a stochastic process, it could be that two main scenario's remain possible: or matter and contramatter further condense, oscillating around a common symmetry center in separate dimension sets and with opposite mass signs (this might be (e.g.) the case in our sun) or are split over and around two distinct and gradually separating symmetry centers (e.g. our galaxy),leading to a large scale configuration with a central contramatter black hole surrounded by rotating matter stars and planets. In the UZS superposed and over distinct dimension sets distributed, gravitons and contra-gravitons coexist. Their complex but on a largest scale central symmetric gravity fields are both present and should explain the anomaly of a too high velocity of most of the stars on their elliptic paths within our milky way (a similar situation in other galaxies is less obvious and can be mixed – this PhR model can explain this difference, even the link with the value of the cosmological constant) . Hereby we stress once more that gravity is extremely weak compared to other forces, so repulsive interactions must be initially local, or eventually, compensate or superpose their impact (on CPS point densities) before an hypothetical repulsive gravity force could become relevant.

- *In this text we mentioned the case of an internal neutron (or contra- neutron) connector state whereby 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), gravity forces could become relevant if Coulomb 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 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. Because the proposed mechanisms of acceleration /deceleration of particles by gravity or by electromagnetic forces are both I-max*

related, 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 anti-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 between subsequent versions (observed in a matter base reference frame) in the contracted state (in Physical terms: their inverse fine structure constants 137 +/- 0,0xx are different – see point replication) . These different hole life times imply not properly synchronized charge info packages emitted by enclosing zerons, unable to impact connectors belonging to matter (or in the opposite case) contramatter -made patterns. The only indirect and extremely weak impact in a unbalanced mass-type cosmic CPS/UZS volume 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). But such phenomenon would require gigantic unbalances taking the high dimensionality and the relative density of a local neutral particle-less UZS volume into account.*
- *All these ideas need further investigation: e.g. if matter does not couple with contra-matter due to small discrepancies in polaron hole properties, how could the initial separation process of neutrons and contra-neutrons be globally energy neutral ? Obviously, if cosmic energy is anyhow conserved and $E=mc^2$, small differences in c (μ_0 would be different) will just lead to small differences in unit mass values and in the G- coupling factors (physics) for matter and contramatter, something that does not seem to be a real issue.*

- ***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 breaking) can be useful. Although remote photon coupling between distant matter and contramatter particles is excluded, local *interactions* (*axion- or polaron-like)* between *spatially overlapping* matter and contramatter connectors *seem to* remain possible, *whereby in case of polaron coupling* I-max values of replicating EZKs *are* simultaneously reduced (*see previous paragraphs).* This only happens spontaneously in a young and locally flat cosmic volume when both EZKs of a decaying EZO still belong to a very small common cosmic volume *and if both particles are not subject to other short and long range attractive forces like Coulomb forces (which is the case for neutrons and contra-neutrons).* In our present *local* mainly matter-dominated and -curved environment this situation no

longer exists: an interaction between two *compliant* matter particles (or between two contramatter particles within a "black hole") by polaron exchange will increase the 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 the conservation of energy, observed over the two interacting patterns. *If small differences in fine structure constant numbers go together with differences in c-values and in mass units for equivalent matter and contra-matter particles (see before) it could explain why most of the galaxies seem to have a central contra-matter black-hole and not a white hole, not just in 50% of the cases.* Without all these subtleties, it would be hard (*as already stated)* to explain why and how matter and *contra*matter started to separate after their simultaneous emergence in a new spacetime slice, a process that stored massive partial energy quantities in huge cosmic volumes of matter and contramatter, but nevertheless, also justifying afterwards the use of classical conservation rules for momentum and potential energy in each partial volume. So immediately after an initial EZO split, *locally interacting* matter as well as contramatter particles were both able to acquire momentum without the need for e.g. a mysterious anti-gravity force *in our cosmic subspace*.

- *The definition of terms like energy and action in previous chapter(s) started from the capability of a single point's state transition to induce in an empty location a new point object or to change within a standard amount of time, the state of another point object. As a consequence the creation event was able to fill a specific cosmic volume gradually with points along multiple dimensions….at least if such process does not need an extra creation event (and an extra charged point, violating hereby the "conservation of charge" rule) and if the huge effort needed had enough time at its disposal to be achieved. Although the growth rate of the CPS expressed as a number of extra points per unit time τ could be higher than the growth rate of the UZS subspace, we assume that this is not relevant for estimating the (hypothetically finite) geometrical size of the cosmos, as the presence of zerons will just lead to a reduction in dimensionality and to the renormalization of the properties of zerons. Models of the cosmos as proposed by cosmologists depend mostly on the observation of light, itself (according to PhR) a pattern that requires an UZS in order to propagate or to even exist. As already stated, the age of the cosmos has been estimated to be about 13,8 billion years (corresponding with a size of 13,7 light-years ?). There are reasons to assume that a theoretical maximum cosmic size has already been reached. This scenario supports the idea (proposed by some cosmologists) that the full cosmos has to be seen as a single integrated quantum object. The implications of this proposal would be important, at least if …*
    - *the whole CPS has been already filled with zerons (UZS) which means that visual observations at the speed of light of objects or events within a total cosmic volume is limited by its border surface.*

- *the earth passes at least once a year through a location near to the creation location, a proposal needed to explain the stability and the symmetry of our central perception of the cosmos. The orbit of the earth with a periodicity of one year, observed in an absolute reference frame linked to the creation location would be stationary (an idea consistent with the axis of evil observation)*

- *…it could be that:*
  - *the number of stars cosmologists observe would be overestimated: their sophisticated equipment picks up the outcome of reflections and superposition of star light on a quasi stationary (or shrinking ??) UZS border shell. Due to a presupposed earth's central position, our perception in 3D of starlight emitted by a star and eventually reflected once or several times by a virtual dome-like shell, could look to be persistent.*
  - *the Hubble expansion rate has to be reexamined because the impact of the slightest expansion of the border shell in the past is multiplied by the number of reflections before light will finally reach a central observer on earth. Distance calculations in astronomy that make use of the brightness of reference candles must verify that these markers are really distinct objects or just reflected versions of the same limited number of star(s). Ancient dome- or cupola-like models of a sky filled with stars may be not so ridiculous – they could be PhR compliant!*
  - *the earth on its orbit would be object capable to house patterns that periodically stand still versus the CPS/UZS grid (a Goldilock state). In this state the string lengths (I-max) of primitive patterns could reach an absolute maximum, enabling superposition of many layers of gradually more complex patterns, needed to permit the emergence of complex macro-objects (like e.g. cells and intelligent life). It is probably not a coincidence that the first humanoids appeared only recently in the history of the earth (since the time the maximum cosmic size was reached ??).*
  - *<u>Previous remark however is not correct or at least not complete</u>. Once the CPS/UZS grids are in place, the initial creation location has lost its privileged <u>local</u> status (although not its "historical" status as global symmetry center of the cosmos). This means that local curvature conditions in such location are not necessarily "flat". On the contrary and because we have no idea about the contramatter density distribution in the cosmos, the Goldilock (flat) conditions on earth, required to permit large I-max values, are not necessarily unique neither persistent (e.g. they could be periodic).*
  - *Even if the maximum cosmic size has already been reached, all the galaxies, stars and (exo)planets could be involved in a collective rotation around a virtual cosmic symmetry axis. The impact of this assumption would be hard to estimate but should be taken into account when investigating an earth's hypothetical "natural" Goldilock state.*

- *The net total energy amount stored in a stationary cosmic volume with respect of all the conservation laws proposed in this PhR model would still equal …..the initial energy of a single point induced once in an infinite cosmos(0). All what happened after reaching a stationary cosmic CPS/UZS state and all what will happen in the future has to globally remain energy-neutral !*
- *LENR could become a main source of energy in the future. As a consequence of the hypothesis of the earth's (quasi) central position in the cosmos or more correct, of its periodic transition thru a large approximately flat curvature area, and taking the complexity of its orbit into account, one or several location per day or per year on its surface could be temporarily in a really flat (space-time) state. Such state could also be flat in the sense that it contains equal local densities of matter and contramatter EZK's, because such conditions are required for successful EZO formation. This seems actually not be the case on earth. Other short lived flat condition states could locally exist: e.g. some symmetric and highly doped crystal lattices seem to be able to sustain sets of dynamic interstitial micro-holes that are temporarily flat. In these cases it just means that the probability and the rate of a local spontaneous neutron-contra-neutron pair production would raise above the extremely low standard frequency, as typical for on earth local average curvature conditions.*
- *If EZO's split in slow neutron's and contra-neutrons, overall energy amounts are conserved and the neutron energy can be transformed into a useful form of energy by a nuclear fusion reaction at low temperature (e.g. with Lithium) - the unobservable contra-neutron will just escape as "waste". Although LENR – experimenters (without being aware of this model and without a valid theory to explain their by chance driven results) are in search for experiments that prove the capability of their equipment to produce cheap energy, high spontaneous neutron production is not necessarily a useful thing in all circumstances. Hazardous nuclear fusion reactions between slow neutrons and (e.g.) Lithium in an electric battery could have disastrous consequences: a single successful nuclear reaction between Li and slow neutrons will release >20MeV of free energy (compared to <20 eV as released by an ordinary combustion reaction).*

- ***Gravity waves and LIGO:*** Being elementary two-zeron patterns, *neutral*-EZPs are not capable of shifting *their positions* over the UZS raster. Their behavior is different from photon patterns: those are *fotino sequences and each fotino is replicating, being a micro-particle capable of propagating at speed c in a virtual transversal plane through the symmetry center of the string involved in a quantum change of momentum, leading to photon emission. Each fotino was induced in the UZS/CPS raster by* net charge info emission in the contracted state of two *asymmetric EZK replication based components (the free connector zeron of one*

branch is phase shifted by a one-sided *polaron import). The fundamental differences in PhR terms between gravitons and photons imply that gravity waves propagating on the UZS grid the same way as replicating photons do, seem to be impossible and could 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 condensed contramatter particles and potential emitters of contra-photons. In a PhR perspective the by LIGO observed and valid results would not necessarily prove the existence of gravity waves: they could as well reflect the (negative) mass impact on LIGO's measurement equipment of intense contra- EM ray bundles emitted by interacting collections of contra-stars. Although contra-photons do not couple electromagnetically with ordinary matter – their embedded hole quantum is different and their B-field vector is <u>at</u> <u>point or fotino level</u> 90° phase-shifted, ahead of the E-field (versus particles a 180° shifted B-field is emitted by accelerated contramatter particles – "left and right hand symmetry rules" for forces as in basic EM theories have to be interchanged), an extremely small effect, about transparent to physics. 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 zeron states: the UZS contains a priori both states everywhere in the cosmos. Contra-photon densities themselves could nevertheless have a very small impact on local spacetime curvature (the point-hole density ratio). This is an extremely small effect as compared to the impact of most persistent particles. Indeed their EZP-like connector patterns have a cyclic impact on spacetime hole densities (see also GR in physics) even in the course of intermediary replication processes between two particle shifts over the raster. In this context "curving space time" just means in PhR terms that the standard point-hole ratio in the CPS/UZS has been temporarily and locally disturbed by a replication process (in physical terms: by their mass density distribution). So on a macro scale, an hypothetical sudden change in position or the destruction or transformation of extremely heavy objects in the cosmos should be reflected by a change in the spatial distribution of neutral- EZP's in a surrounding spacetime volume even if these colliding massive objects do not really move, but just because their surroundings are hit by a stream of micro-patterns (ordinary particles or photons) capable themselves to propagate. Physics addresses these issues by using a rather abstract GR model that does not take quantization into account, proposing that large mass quantities curve spacetime even over large distances. So 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 implicitly proposed by this model that assumes non-mobile large scale graviton density distributions. Finally one could argue that extremely large scale interactions between massive and contra-massive collections could modify the point-hole density ratio in a local CPS volume. However taking the multidimensional character of point space into account, as compared to a*

subspace filled with particles or contra-particles, the net effect over a long distance would be negligible. And even if a reshuffling of this ratio would take place, it can only take place by short distance point interactions, unobservable for physics, and certainly not propagating at a "slow" speed equal to c.

8. Conclusion.

- 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 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 of those sophisticated 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 s*imple* 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 the 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 as 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 and persistency at any particular moment of the evolution of our cosmos. But on the other hand, it enables a certain 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 limited. Elementary classes have to be superposed (higher classes are compositions of objects belonging to lower classes) what requires normalization in order to make this 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. Polarization of the UZS, the local density 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 will effectively 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 reduced. 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), two quantized and related energy sources (a local excess charge impact and a non-standard hole/point ratio density, the latter leading to mass and to quantized time delays). 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 a coincidence, driving the further evolution of the cosmos.*
- *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 <u>confirmed</u> physical law and observation. It would even more convincing if it could 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).*

APPENDIX A:

The Higgs boson.

- **The context (part of it has been treated in previous chapters).**

- 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 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 an EZO (an 8-zeron pattern). Geometrically each EZK is a *regular* tetrahedron pattern combining 4 adjacent (in N-dim) zerons in dynamically interchanged states (CZ,DZ,CH,DH). As discussed before, this ideal configuration can only be persistent 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*). The pattern requires that the theoretical 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 processes is called a dynamic role interchange.*
- *That does not mean that the number of points in a zeron point string has changed but that at least in free zeron versions of an EZK quartet, the phase angle is time shifted versus the phases of the other zerons.*
- The impact on i-max 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 .

- 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. It is the 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 *based on* this phenomenon and it is a conserved property during a zeron's 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 type and 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 but also* certain incompatibilities between interacting matter and contramatter patterns (e.g. no EM (physics) or no fotino (PhR) coupling *between both is possible*).
- <u>*Previous statement has to be correctly understood*</u*. The 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) 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 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 distinct zeron 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. These properties can change in subsequent contacts with neighbor zerons, whereby we reject the possibility that this could ever lead to cumulative or double charge-hole density anomaly. When more complex multi-zeron patterns emerge, mass will become a persistent property of zeron replication, be it because the maximum replication length is no longer determined by a contact with a neighbor particle .*

In that case matter and contramatter particles become permanently incompatible. Their inverse fine structure constants are different (above or below 137 ?).

- As long as EZKs are part of EZOs and zeron replication does not take off, the value 137 fluctuates slightly but on average remains *constant per EZO* and over the UZS: each EZK is a closed pattern that "behaves" within its own subset of dimensions even while the sum *of certain properties* over the two EZKs on average cancels out.
- 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 *to N* (the UZS). *The unknown number* N, in this case, is the (dynamic in M-dim) ultimate number of *superposed growth-shrink (2τ) point strings* per zeron replication cycle *before one version 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.
- 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 chance 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 fixed number (in casu 137) could be that the difference in time between the two contact scenario's correspond with a multiple of the value τ. In such case the hole (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. The term "shortest" combines a stable spatial distribution of a string versions 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 or fastest path"* rule is ultimately PhR behind any organic growth process in nature and it confirms the universal character of the base laws. 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 limited global rotational degrees 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 (*anti*)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 excess charge, opposite mass ….). The import of an extra-axion, *leading to a zeron 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 immediately in each EZK. The small difference in point string *phase and in transversal point string rotation (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, is conserved in the two EZKs. These rules *and the anti-symmetry of the two EZKs in an EZO,* also entail that *growing transversal* zeron strings in each EZK rotate in opposite sense not to be confused with *ordinary and magnetic* particle spins – *the virtual rotation of a particle as observed by physics and called a particle spin.*
- *Zeron replication in a particle* is a mechanism that conserves the initially 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 these are phase shifted unit charges dynamically 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 central EZK) and the free zeron of the connector of the of the longest branch reaches 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 nevertheless 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. T*he 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 the free zeron 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".*

- *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, *similar to* elementary point periods counted in a single zeron's internal 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 memory or storage 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. 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 +/- $h/2 = \delta E * \delta T$ (an action quantum h/2 representing the initial axion impact) into account, th*e* 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 a*s 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 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 pattern). So the total duration and the net energy 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 axion exchanges that have no cumulative impact on the 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 zerons) and an internal axion-like contact between adjacent strings around a shared EZK nucleus is excluded (a fixed particle spin orientation and persistent 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 orthogonal electron axial strings.*
- *On the contrary, a baryon replication process produces a pattern with a superposed cone-like multi-string distribution around a virtual central symmetry axis, set by 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 virtual 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 are oriented along 2-zeron ribs themselves. However role inversion in the central EZK makes a stable baryon replication schema possible. Hereby the index I increases by 1 each time the rotating electron-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 mass from the individual masses of the electron-like strings, contributing to replication (an exercise, too difficult to explain in this text).*
- *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 energy conservation rules, requiring that synchronous positive and negative mass contributions of two branches of a string should be netted (just like it happens for charges). But 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 the case for other unstable baryons with sometimes small mass differences relative to neutrons. However they emerge as the outcome of*

interactions between baryon connector zerons of two particles, leading to distinct masses just as we have seen in case of returns states between 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 exchange). Coulomb 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 head-to-head colliding particles,* lead to the local induction in vacuum 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 high-energy collision with small I-max values are short-lived patterns like W and Z bosons 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 *length* figure in uncoupled UZS-zerons has to be adjusted for 4 equivalent points per EZK, due to the internal binding 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 degrees of freedom: the initial 137 value minus its own 3 internal degrees (set by internal dynamic couplings in/with the nucleus) and one *internal* time degree of freedom (the *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 quark (strings in ¨PhR terms) directions as based on their connector properties (charge, mass), but also indirectly by their external impact (observed as mini-jets or Coulomb polarization lines). 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 the EZK's natural local dimensionality in time from 137 to 133 embedded in an N dimensional UZS. 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 I-max 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 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 or one growth plus one shrink cycle)) of a neutron pattern before the same layout turns up again. *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 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 mentioned 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 neighbor 3D patterns will reduce the local free set to even less. 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).*
- 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 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.
- 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)) <u>which gives us a Higgs mass of 125 GeV/c²</u>. 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 replication states of colliding particles) broken EZO. If we combine the masses of both EZK's of such virtual EZO, the <u>absolute value</u> 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 meson with an absolute 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 – s*ee before*). *The order of magnitude of an electron's null-energy content would be the square root of twice the Higgs energy, so in fact about 500 keV , a figure that seems to be consistent with the proposed replication schema's of both, a neutron and an electron.*
- *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 EZK. If (e.g.) this zeron stores already a special offset phase shift close to 133 (in one or several orthogonal directions), it is obvious that I-max in the replicating strings will be quickly reached leading ultimately to a speed close to the speed of light c (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 (eventually 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 electrons in QM.*
- *Frequent axion-like interactions between connectors of electron-like generatrices of conic baryon strings explain why their magnetic spin are much smaller than for an electron that maintains its sign during the full replication process, producing spins reflecting stable 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:

Random and non-exhaustive list of phenomena and scientific observations, leading to by Physics adequately addressed issues but also to unanswered questions and indirectly to proven or to unproven theories. Many of these items are subject to distinct or to equivalent explanations in a PhR perspective . A more exhaustive list can be found under Wikipedia's "List of unsolved problems in Physics". Many of these problems are due to the absence in Physical theories of a correct integrated model of our cosmos, its behavior and its evolution. It is clear that (e.g.) the non-existence of a Big-bang, the finite size of a point and zeron filled spacetime volume, reflection of photons on the outer cosmic layer and the presence of contra-matter make most of the present cosmological models inadequate. Application of the principles proposed by this PhR model would shorten the Wikipedia list substantially.

A1:How can a unique creation event of a single charged point (PhR) lead to the emergence of a complex cosmos, although conservation laws apply ?
A2: Why must objects and properties as observed by physics quantized (charge, mass, energy, momentum…) ?
A3: What is mass? And what could be negative mass ?…
A4: Dark matter, contramatter –quid ?
A5: What is the origin of the huge (and conserved ?) energy content of the cosmos (hereby including all the particles' null masses) ?
A6: Why must the speed of particles be limited, in casu to a constant value c (not just because Einstein told us)?
A7: Why (under standard conditions) does one observe (and is physics able to describe successfully) particle behavior in just 3 spatial dimensions ?
A8: Why are there apparently only 3 subclasses (e.g. electrons, muons, tau) for each main particle class (leptons, baryons …) ?
A9: Questions arise about hypothetical (contra-) gravitons (physics) and their equivalent neutral-EZP patterns (PhR): quid their properties, their link to particles, quid their origin and their (density) distribution as gravity fields ?
A10: Einstein's special relativity: what is right and what is wrong in PhR terms?
A11: Einstein's GR and the locality principle – what is missing? – gravitons are needed to solve the puzzle.
A12: Quantum state superposition and dimensionality: what is a PhR compliant interpretation?
A13: A particle's spin properties in a PhR perspective: link between ordinary and magnetic spin ?
A14: Big-bang models and the origin of the energy stored in the cosmos: are the theories in cosmology PhR compliant ?

A15:Abstract spacetime (physics) versus the dynamic superposed CPS-UZS frames in PhR. Quid ?
A16:Dimensionality (their number and a generic definition) – the role and the PhR interpretation of the prime number 137,.. (inverse fine structure constant) .
A17:Parameters ε and μ in physics and their equivalent double raster patterns in PhR.
A18: Forces (Physics) and their equivalent terms in PhR (axion- polaron interactions).
A19: Action (h in physics) - the link with q (the elementary charge quantum), c and the point state transition time τ.
A20: Similarities between the Base laws in PhR and Maxwell's laws (Physics).
A21: Higgs particle – its observed mass, compared to a neutron's null-mass, as based on a PhR compliant particle model .
A22: EPR effects and PhR.
A23: Particle motion on a double grid (PhR). How does it work?
A24: The breach of symmetry in a particle's core antenna – replication patterns, base laws and Feynman's propagator concept in field theories.
A25: Although physics in 3D is a good approximations of PhR (see A7), why proposing a higher number of spatial (and other) dimensions (e.g. in string theory)?
A26: Lorentz transformations as a valid approximation of replicating particles with an I-max value near to value 1.
A27: What would be the PhR conform content of a black hole ?What are white holes ?
A28: Concentric matter / contramatter condensation: speculative models of the sun.
A29:Differences between matter, antimatter and contramatter.
A30: Gravity waves and LIGO: this theory in cosmology is not PhR compliant.
A31: Mesons: why about half mass figures ?
A32: Cosmic expansion – inflation and Einstein's cosmological constant.
A33: Why fundamental physical parameters seem to be the same all over the cosmic space ?
A34: Double slit experiment: a PhR compliant final statement about this phenomenon.
A35: Why can math describe successfully cosmic behavior down to a very small scale, although a simple particle does not know math ? How is it even able to "count" ?
A36: What is the PhR conform explanation of the magnetic spin ratio between an electron and a proton, taking their mass values into account ?
A37: What photon patterns really are in PhR terms.
A38: Although an EM wave is mass-less, a photon seems to acquire mass when a target is hit – how comes ?.
A39: Why (as required in Physics) should a valid mathematical expression of a physical law described in an appropriate reference frame, be covariant ? And is this requirement indeed required or correct in PhR terms ?
A40: How can a PhR compliant behavior of a particle properly be described without math, just by counting point life cycles ?
A41: What is the size of the cosmos? what happens if an EM wave would hit an hypothetical border of a finite cosmic volume, taking conservation rules into account ?

A42: Do all the stars that cosmologists observe exist or are they multiple copies (due to reflection – see A41) of a limited number of real stars ?
A43: Are we sure that the sun is a nuclear fusion reactor, driven by confinement of massive repulsive particles, locally involved in strong interactions, a model assumed by physics ?
A44: Quid LENR- why does it work or is this possible under critical circumstances only ? Could our sun be a combination of an LENR and a nuclear fusion reactor ?
A45: What are candidate sources of cosmic rays? What can this PhR model add to that list ?
A46: Why is there so little antimatter in the cosmos or why is the cosmos not charge-balanced per particle class (or perfectly anti-symmetric)?
A47: Why is the Michelson and Morley experiment irrelevant to prove the validity of Lorentz transformations?
A48: Why is the speed of (e.g.) the sun (and of other stars in our galaxy) along its orbit around to the center of our galaxy in conflict with its distance to its virtual center, according to Newtonian mechanics ?
A49: What is the fundamental link in PhR terms between electricity and magnetism?
A50; Why are the orbits of planets around the sun planar, as explained in PhR terms?
A51: Why can a complex biological system not propagate (as a pattern) at a speed as high as c ?
A52: If a neutrino has mass, it is sensitive to a non-flat neutral-EZP (gravity) field impact (PhR), so it can mutate (neutrino oscillations).Why?
A53: What could explain (a mysterious) "A.Parkhomov"- radiation ?
A54: Why is "action at a distance" possible in a Coulomb field ? Which PhR compliant raster pattern materializes a Coulomb field line?
A55: What about magnetic monopoles and PhR ? Do they exist ?
A56: In an all encompassing cosmic model, entropy of a closed system must increase in the course of its evolution: quid its initial state (entropy must be zero) and how would the evolution of this system could come to an end ?
A57:How is ***information*** *defined and treated in Physics ? In PhR terms, it is an active source of change, so how and where does it appear in mathematical formula's in physics ?*
A58: Why is CPT conservation a rule that has to be respected in particle physics, as well as in QM ?
A59: Where are all the positrons, a particle class apparently missing in our cosmos (Physics)?
A60: Why is the existence of a displacement current (electricity- Physics) required in vacuum, in order to explain EM emission in an open antenna circuit?
A61: If vacuum is not empty (PhR), what makes it up (physics) ?
A62: Is there a theoretical absolute maximum for the number of protons in an atom (Bohr, Dirac, Feynman….) ?
A63: Are spontaneous transmutations at room temperature in organic material really impossible (Dr Kervran, winner of the ignoble price) ?

A64: How to explain non-local interactions between colliding particles and phase jumps in their wave functions (QM) ?
A65:What does confinement (strong interactions – physics) mean in PhR terms ?
A66: Why is the strong interaction force 137 times stronger than the electromagnetic force?
A67: Why is the coupling factor of the gravity force so small ?
A68: Why are there two distinct kaon types, violating CP symmetry conservation?
A69: Why did the orientation of the magnetic field on earth changed a few times in the course of its evolution (in fact an interchange of north and south pole - quid a similar more frequent process in the sun) ?
A70: Why can a local gravity field on earth, applied on a free moving object, not be sensitive to the real time impact of the sun's gravity field? What is wrong in GR ?
A71: Does the c limit (speed of light) also apply to propagation of charge info exchanged between (all type of) patterns?
A72: Why is the Higgs mass relatively small compared to its predicted value? Is the Higgs a boson or part of a meson ?
A73: Is the energy conservation law violated by LENR experiments ?
A74: Why do successful LENR experiments not require proton collisions at low temperature, what implies that arguments against their results are irrelevant?
A75: Why are the success rates of LENR experiments sensitive to the location and the date-time where and when they took place ?
A76: How to explain fractional charge amounts in protons and neutrons (Physics) ?
A77: Quid Majorana fermions and PhR ?
A78: Which QM interpretation of superposed particle states is PhR compliant ?
A79: What is time?
A80: What means T under a CPT conservation rule in QM and in PhR terms ? Could this concept be applicable to global time ?
A81: All stationary processes need to be cyclic: how to maintain this principle approximately for a randomly moving particle in Physics ?
A82: If the cosmos has to be super-symmetric, what is missing ?
A83: The link between charge conservation and energy conservation in PhR ?
A84: Action, Planck's constant and a point life cycle in PhR terms. The relationship.
A85: Must a particle speed slightly higher than c really be excluded?
A86: Is it possible to directly observe the impact of a contramatter particle on our instruments ?
A87: Why have Coulomb's law and the law of gravity a similar mathematical format (in physics and in PhR)?
A88: In physics all stable elementary particles of the same class (electrons or protons) are identical. In PhR terms, they can be different. Quid ?
A89: What is PhR behind the Fermi exclusion principle ?
A90: Is physics able to observe the difference between neutrino's, antineutrino's and contra-neutrino's ?
A91: Why in PhR terms, is particle mass increasing at speeds close to c ?

A92: In this PhR model , particles do not interact with contra-photons as the outcome of electromagnetic- (or polaron- in this model) coupling. Can there be a different impact as based on modified local graviton and contra-graviton densities (LIGO) ?
A93: How will a neutron / contra-neutron pair acquire momentum and separate after the split of an EZO pattern in flat spacetime ?
A94:Why must the inverse fine structure constant 137 necessarily be a prime number ? Why this value ?
A95: Why makes particle spin the particle quantum state unique (spin ½ and Pauli)?
A96: What is PhR of the orbital quantum number l=0 in an electron ground state s=1?
A97: Why and how can particle collisions induce new, most often short living particles in spacetime ?
A98: What is PhR behind the particle-wave duality in physics?
A99: What is a valid definition of the term "energy" in physics, applicable to all its appearances and forms ?
A100: What is the nature and the origin of the Microwave background radiation ?
A101: Why (in a PhR context) is the Lagrangian formalism in physics successful ?
A102: What is the PhR explanation of the signs of the Coulomb interactions (<u>why</u> are forces between particles with the same sign repulsive and attractive when they have opposite signs) ?
*A103:Why (in PhR terms) is the impact of a spherical central symmetric gravity field on the motion of a fixed mass-particle about correctly described (at sub-relativistic speeds) by a Newton conform force F and a first order derivative of the particle's speed F = G*M*m/r = m*dv/dt ?*
A104: Why is it difficult to include gravity in the Standard model (particle Physics) ?
A105: Is it correct to conclude (PhR) that a single particle pattern in the course of its life cycle stand still on the (in PhR terms) double cosmic spacetime raster? Is this even valid for an elementary light pattern component (a fotino) ?
A106: Why can math be used to describe cosmic behavior successfully even if we have to accept that elementary particles cannot use it to figure out how to behave ?
A107: What is negative time in Physics and in PhR ?
A108: Why is there a link between c (speed of light) and the ε and μ properties of spacetime ? How to explain the impact of dense matter presence on the value of c ?
A109: What could explain the presence of a halo of light, as recently observed around a distant black hole ?
A110: Which event could have triggered the emergence of life on earth, probably 1 billion of years after its origination 4,5 billion years ago ?
A111: What is persistent in a human being when he (or she) is moving over the double cosmic grid ?Are humans in fact "spokes" ?
A112: What is the PhR – equivalent of Fermat's principle (and behind the "least action principle" as applied to Lagrangiaan formalism in RQFT) ?
A113: In PhR there are two kind of light (and EM waves) ? Quid the difference ?

*A114: Is there a relationship between the inverse fine structure constant 137 and the estimated age of the cosmos (137 * 10.exp8 years) or is this just a matter of a coincidence ?*
A115: Why are the Lorentz transformations in SR at first site correct, although the cosmos (conform PhR) is unable to calculate square roots ? The only math the cosmos can and will physically perform is counting by +1/-1 and comparing the result, stored in a natural number counter, with 137 or with zero.
A116: Why must $kq^2/h.c$ be a dimensionless constant although the quantities q, h, c belong to different domains of physics (q = Coulomb unit charge – q, h , c expressed in consistent units – k a constant depending on choice of physical unit system) ?
A117: What is dark energy ?
A118: Why are perturbation based calculations often successful in physics (QM) ?
A119: Why is the Higgs mass equal to (137 -4) times the neutron mass ?
A120: Why have Physicists difficulties to find a valid PhR model ?
A121: Why did planet mass concentrate precisely in the actual positions around the sun as cosmologists do observe ?
A122: What phenomena and properties materialize distinct baryon types emerging in case of high energy particle collisions ?
A123: Could a contramatter world coexist with ours in a shared spacetime volume ?
A124: How to explain in physics symmetry breaking in certain nuclear processes ?
A125: Could statistically the numbers of white and black holes be different in the cosmos ?
*A126: Why should (charge) info propagate at a speed at least as high as 137*c ?*
A127: In some galaxies exists a critical orbit separating stars propagating on a Newton conform orbit from those with a non-Newton conform behavior. The latter need dark matter inside to explain their velocity. Why ?
A128: What is the interpretation of a cosmological constant in a PhR model ?
A129: Why is there a relationship between the cosmological constant (A128) and the presence of a critical orbit in some galaxies (A127) (Milgrom's law) ? Is there a PhR conform explanation, other than changing GR or Newton's laws (e.g. MOND) ?
A130: Why stopped the process of reduction of the dimensionality of the point raster (CPS) at a factor 137, leading to a fundamental property of the UZS (in PhR) and an important parameter in physics ? Or why would this process even stop at all ?

……etc…..