***Title*: About Physical Reality.**

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

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

Comments: *V(ersion)2 of this text contains a new chapter (7) on the Higgs boson that shows how its null-mass can be calculated within a hypothetical sub-particle architecture wholly in accordance with this PhR model. A paragraph about polarization has been added at the end of chapter 6. The rest of v1 remains unchanged.*

1. The challenge :

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

any point involved in the change event. Any emitter of charge info will be called an antenna. 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).

- Law3 (the induction-reset law): Whenever charge info 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: 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. If, on the other hand, properly synchronized charge info hits 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 info. The probability of any successful impact of emitted info has to respect the other base laws but as a general rule applying to the precise order of events, the impact of a micro info package that is first able to take place will effectively happen first (an events priority or local time ordering rule).
- Law4 (the coupling-conservation law): whenever charge info resets an existing point, the antenna and the target point are temporarily coupled (a unidirectional coupling). 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, 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 or reset an existing point (an effect called secondary emission): charge conservation applies at any moment globally 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, encompassing the creation point without any need for additional creation events or adjustments. 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 are and remain null and conserved.

- 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 CPT (or CST) conservation rule (not to be confused with, but nevertheless the PhR behind a similar CPT rule in QM). 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. 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.
- For reasons to be explained further on, the maximum cosmic info velocity v_e must be well above the speed of light.
- Law6 (the superposition law): Charge cannot be superposed in a single location at exactly the same time. 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 driven location set as space-time manifold, of a dynamic discrete but dense topology, eventually with a metric (math).
- 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 charge info is an overall conserved quantity, destructive interference 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 emitted by several synchronized but properly phase shifted correlated antennas. This rule is 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.
- 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, 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. 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 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. Superposition and averaging make that the composition of these paths gradually migrate from micro-segments at point level up to macro-trajectories between large objects in a later evolutionary stage.

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

- **The Cosmic Point Set (or CPS):**
- There is no (diachronic or other) hierarchy among the base laws: they all simultaneously apply since the creation event. They express 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 to the creation of a growing, chaotic space-time volume consisting of short-lived +q/-q point versions, all of them equal or inversed clones of the creation point. 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.

- If this set of laws would be expressed in other terms their outcome must be equivalent to the one used in this text.
- 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 density spread is strictly related to the unknown M-dim value of a steady state cosmic volume. The still available excess number of dimensions (between M and infinite) explains 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 explains the recently observed accelerated Hubble expansion of a super-distant cosmic shell where similar steps in the evolution that took place billion years ago in point volumes close to the creation location, are still ongoing).
- We call a non-border M-dim volume in its initial steady state and still devoid of complex point patterns (see below), an (perfect) CPS (Complementary Point Set). CPS points have standard properties (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 their reset state can be lengthened, leading to distinct and varying local point and charge densities. An "ideal" CPS volume has, on average, 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 a first phase of 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). Those standard objects belong to a common class and the smallest pattern 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 collective properties of the parent.
- In special states pattern components emit charge info quanta 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 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 each make a successful impact (a matter of coincidence). In keeping with the base laws (destructive interference), this type of hypothetical bidirectional exchange requires that the two partial emission patterns are properly positioned (at short distances) and phase shifted over at least a value of magnitude τ and/or are propagating along distinct paths (or directions) avoiding destructive interference. 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.

- **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 the CPS of anti-symmetric pairs of the smallest composite point patterns, monadic patterns each called zeron.
- Their collection is a dense subset of CPS points, as the growth of a single zeron pattern comes to an end by point charge info exchange with one of the properly synchronized and formatted neighbor zerons that are in a similar growth state.
- Zerons are dynamic and cyclic patterns (singletons) capable of maintaining locally a +/-q net charge excess for half of their period ($T/2 >> \tau$). In the course of a time lapse T/4 and over a corresponding volume the pattern maintains simultaneously a single point density excess or shortage, so that the complementary local empty location (or hole – symbol H) density can be (in relative terms) positive or negative versus the standard average CPS empty state density value (PhR behind the non-exhaustive physical term "(positive) null- mass of a particle").
- Each single zeron emerged "historically" in an ideal CPS with a growth cycle that was the outcome of a single initial bidirectional charge info exchange between orthogonal phase-shifted 2-point pairs. They behave as a potential complex antenna with a tetrahedron format 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 in order to guarantee charge conservation (creating two dual local anomalies – in fact a spontaneous symmetry breaking). Growth means that coherent CPS points are added step by step to each side of every once mutated 2-point antenna, implementing a two sided chain of points (an axial string or fastest replication path) at a pace that decreases with every step of its growth (indeed, each point has to wait for properly synchronized charge info packages from an increasing number of enclosed points that belong to the same growing string). This process is leading to a multiple sequence of additional periodic constructive couplings (knots) with neighbor patterns involved in a similar process over a distinct but compliant and nearby dimension set, around a shared central hole location and through properly synchronized 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 core antenna, a cyclic or persistent property.
- Each two sided process (called axial (point) replication) requires per growth step auxiliary short living transversal CPS point pairs distributed along twisted paths

around the axial point chain, to complete each knot's point cycle (a full point period requires indeed four info exchanges). The growing chain of coupled axial and transversal points is called a (point) string. One dynamic branch connector of a string carries the initial excess charge, the other an excess (or shortage) hole density. Each step is numbered by a string quantum number 1 up to i-max.

- Growth by replication continues in accordance with the reduction of the remaining number of available M-x dimensions around a common core location, until a critical value N (3<<N<<M – see also chapter 7) and a corresponding string index i-max was reached, a limit set by the unavoidable 180° phase shifted interaction between connectors of adjacent zerons in the appropriate state (no free orthogonal dimensions around a common antenna are left between growing neighbor zerons enabling fastest constructive couplings with a probability higher than any external coupling). This CPT-wise distinct charge info exchange situation between adjacent zerons (called a return state - DZ or CZ) is the beginning of a cascade of phase shifted exchanges and a cycle of shrinking for both patterns involved. In fact, the application of the CPT rule on these i-max connector states involved in the extra interaction explains the behavior and properties of each: charge excess type conservation, but a switch in mass type (mass being a hole density excess or shortage maintained, here conserved over the two in i-max interacting patterns together) and in their space-time behavior (in PT terms, shrinking implies a change in replication direction (P in CPT) but equally negative local time or a 180° phase shift on a scale of a full zeron period =n*360° (T in CPT). As far as the PhR of mass type is concerned, any net +charge excess can indeed be the outcome of either a local –point reset or a +point induction. The distinction between constructive and destructive interactions during growth refers to both signs (or phase angles) of the charges involved (appropriate interactions between patterns with conserved charges in each will force both replication processes into a P as well as a T switch).
- Shrinking processes cause the release of all previously connected points back into the CPS set and end with a contracted "empty or pure charge info" state, followed (through an inversion process) by the emergence of a new version (or next generation) of a zeron with opposite charge as well as mass type connectors in nearby locations (in fact, a CPT conservation compliant process, but this time over two successive zeron versions conserving P but not T and Q - the latter is base laws 2 and 3 compliant). Each single growth-and-shrinking sequence is called a single (point) replication cycle or zeron version. So once emerged in an empty CPS state, zerons are persistent as a pattern (not as version) and subsequent versions have 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. Flipping states periodically means that their intense internal charge info exchange activity during transition (a point string is indeed a fastest connected path) protects them against external perturbations over a much longer period than a single point life cycle.

- In the course of a full period a zeron behaves alternatively as a magnetic north and 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 that is the outcome of phase shifted and properly interfering charge info packages).
- 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 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).
- This second raster materializes the 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 lies somewhere between 10exp(-43) and 10exp(-24) sec, fixing a standard i-max value with flipping properties precluding, of course, any experimental observation of a single zeron oscillator.
- 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) in their Standard Model. It implies also the existence in our cosmos of a preferred be it dynamic and flexible reference frame, a statement that is formally in contradiction with the principle of relativity (SR).

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

- **Dimensionality:**
- The generic definition of dimensionality (see above) applies to simple and more complex patterns. However, as complex behavior is determined by the superposition 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 once or twice. 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 symmetries and the relevant connector processes at component level.

- The number of dimensions might be further reduced in case of even more complex patterns with gradually more restricted symmetry properties. One has to understand that all underlying dynamic processes, at point as well as at zeron level, maintain 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 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 reduce dimensionality by selective, ad hoc couplings (<u>cycle steeling</u>) 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 successive 3D pattern versions show rotational degrees of freedom in a N dim raster (a stochastic distribution of orientations). Frequent successful interactions between patterns along particular 3D subsets will lead to a local or global reuse of dimensions in a raster. This phenomenon is perceived as a kind of polarization in N- or M-dim of a large number of auxiliary 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.

- **Energy:**
- A second example is the definition of the term <u>energy</u> (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 content) through a combination of internal and external charge info exchanges. Any change of a cosmic state will have to take pattern creation and annihilation processes into account. 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.
- 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 of what has been changed or produced.
    - On the effective velocity of coded information (think on EM waves).
    - On restrictions like conservation rules etc….
- A fundamental overall restriction (C and CPT conservation) says that the total average energy density in an appropriate closed cosmic volume has to be zero (for stock exchange transactions– the 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 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.

- The same kind of one-shot initial interactions or bifurcations (compliant with CPT conservation rules) that once took place in a young cosmic volume lie at the root of the separation in space of large volumes filled with chiral patterns, according to a particular discriminating factor (the type or sign of their internal mass property, not observable by physics). 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 polaron coupling (in physical terms, by real or virtual photon exchange).
- Those chiral pattern pairs store equal but opposite (with mass type as criterion 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 - dimensional as well as spatial- environment, have intrinsic net mass values with an identical – by convention positive – sign. 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.
- **Elementary interactions:**
- The definition and the use of the term "interaction" is a third relevant example. In PhR terms it relates to structured charge info exchanges, and along with the point interactions mentioned earlier at single zeron level, there exist only two primitive types of interaction capable of mutating connectors in I-max or contracted states of multiple zeron-made patterns. The first, what we call an axion exchange process, entails the single flipping of a DH-CH transition in the contracted state of two interacting zerons into a DH-CH-DH (or CH-DH-CH) sequence, which means that a mutated zeron (a component of an enclosing pattern) induces locally a net persistent charge excess (+/-q) observed over the life cycle of the entire replicating patterns (thus e.g. a DZ-DH-CH-DH-DZ … instead of a zeron regime state sequence DZ-DH-CH-CZ…).
- The second interaction is the polaron exchange between two compliant and coherent zeron pairs (EZP's) in I-max. These twice phase shifted interactions will delay or shorten the DH-CH (or CH-DH) transition in the contracted state after a number of replication cycles by an even multiple of τ (thus DH-(CH-DH)-CH or even DH-(CH-DH)-CH-DH) without changing the ultimate net charge state of the pattern .
- The first axion kind of interaction induces, in each pattern involved in the interaction, an opposite energy quantum at zeron level by changing the charge property of a pattern connector; the second stores initially in the central antenna (by constructive interference – law 6 - in a pattern's contracted state) a standard time quantum , expressed in point level units that will be often gradually cumulated by a cyclic replication process at zeron level, as initiated once by that

mutation (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 in more complex patterns and couplings.

- The way standard interactions in general (at point or zeron level) impact a pattern's behavior depends on the symmetry and complexity of the replicating pattern's internal layout (at zeron level: lepton-like, baryon-like…). Their combined effect is, in any case, subject to a rule like +/- h/2 (or h) = δE*δT (the * sign is representing a convolution between time and energy – h is a constant named in physics an "action" quantum - and it is the amount of effective charge info impact needed in order to force a point in two successive identical charge states): once stored as an anomaly, a longer lifetime of the emerging pattern (e.g. a replication-) cycle implies a smaller potential external energy impact (and mass) on the environment. Indeed any external effective interaction is only feasible in layout dependent i(or I)-null or i(or I)-max sensitive states: longer periods T mean less frequent potential interactions with other patterns. This rule applied to zeron made patterns explains indirectly the intrinsic relationship in physics (the fine-structure constant) between the apparently unrelated constants c, h and q.
- All so called "forces" in physics between particles or fields and particles can be expressed in terms of these two interaction types (or their corresponding charge info exchanges) mutating the behavior of the patterns involved. The strength of an interaction depends on its probability to take place and on its impact on a pattern's life cycle layout and duration, which in turn determines the frequency with which a similar successful interaction could be repeated.

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 emission of a pattern's pseudo-ideal core antenna. Each antenna is a small subset of correlated zerons with particular properties that have a certain probability to emerge spontaneously in a standard (or flat) UZS environment. The more complex the combination, the lower the probability of its appearance in a UZS. An antenna is persistent or cyclic if its intrinsic symmetry in space-time assures that periodic internal and "fastest" interactions between components (points and zerons) implement a 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 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 towards DH or CH states in a pattern's zeron life cycle - a form of pattern state degeneration).
- The impact of each successful external perturbation on a zeron pattern's behavior, what we called a mutation or perturbation , might lead to a change in its antenna format or behavior or to a secondary change in its point or zeron replication format

in space-time. Successful 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 symmetry-wise perfect antenna patterns, i.e. zeron compositions with a decreasing probability of appearance in a flat UZS (more complex formats than those 3 are, for statistical reasons, unrealistic):
    - <u>EZP</u>: a dense zeron pair, each zeron in a relative 180° phase shifted interchangeable state (DZ & CZ - in fact a magnetic dipole).
    - <u>EZK</u>: a dense zeron-hole quartet, meaning synchronous DZ-DH-CZ-CH state combinations of two phase shifted EZPs showing a tetrahedron 3D geometry and symmetry (PhR of a so called "God's particle").
    - <u>EZO</u>: a dense zeron octet made of two anti-symmetric, in M-dim space overlapping EZK tetrahedrons with a common central symmetry location with a cyclic opposite point/ hole density sign.
- Persistency of these quasi-ideal core patterns requires at point level small internal dynamical charge info exchanges with a random rotational character which generate small, interchangeable deviations from the hypothetical super-symmetric lowest energy state. This effect, together with symmetry, implies that multiple phase-shifted versions of a pattern are present in quasi superposition. Processes being the cause of rotating discriminating properties (originated as a result of point and/or axion perturbation) over components in special states , will be called "dynamic role interchanges".
- When two of these quasi-ideal pattern states are able to interact and successfully exchange axion and/or polaron info packages (internally or externally while respecting all conservation rules), several types of observable primary or secondary processes may emerge. Examples are:
    - **Replication**: e.g., a local bidirectional 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 non-shared (i.e. orthogonal) dimensions (a case of spontaneous symmetry breaking). Each EZK replicates in superposition along 3 perpendicular symmetry axes of the tetrahedron in two opposite directions per axe. This dynamic process explains indirectly our spatial 3D view of the cosmos, as polaron based effective interactions between patterns with an EZK nucleus necessarily take place along (dynamic in N-dim) collinear or at least coplanar versions of symmetry axes. Zeron replication is a process similar to point replication in a CPS. Replication patterns behave initially as local oscillators around the core antenna's symmetry center. Each single version grows and shrinks according to its specific layout but is anyhow unable to move in the course of a time lapse between two contracted states.
    - **Particle formation:** In a young cosmos and/or in flat environmental conditions, the emergence of chiral (in CPT terms) particle pairs. Indeed,

one of the previous replication patterns matches (in physics and PhR) a neutron, while the other is, at least in PhR terms, a dual contra-neutron. The latter is almost undetectable for “matter-made” observers like us (connectors of matter and contramatter patterns do not interact by polaron coupling) and shows by convention negative internal energy and mass ($-E=-mc^2$). In order to take place, this process requires global (in a young cosmic slice) or at least locally flat conditions (i.e. zeron related DH-CH type-neutral hole densities, extremely rare in our present local cosmic region except under artificial conditions).

- **Momentum:** Polaron exchanges, as the result of a secondary interaction between EZP connectors (e.g. particle strings in an I-max state), will import a point level unit phase shift that gives a replicating particle a change in momentum, which means that after a number of contractions of a once mutated replication cycle, the central antenna pattern is able to shift one zeron position over the UZS raster. EZPs involved in this effective 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 EZP field pattern. The latter might be an EM field (an EZP emission pattern might correspond physically to the B field component of a photon particle) or a gravity field particle (a graviton), where in both cases variable EZP densities have been dropped “recently or historically” by moving or accelerated or replicating EZK based particles. In fact, standalone EZP- gravitons materialize physics’ mysterious dark matter (or dark contramatter). As elementary two-zeron patterns, EZPs are not capable of shifting over the UZS raster (contrary to photon patterns being the outcome of the net charge info emission in the contracted state of two phase shifted (by a one-sided mutation) EZK based components). This means that gravity waves propagating on the UZS grid like replicating photons do, will never be observed. Recent experimental results (LIGO) are important in physics but equally in the context of this model (where black holes are condensed contramatter particles thus potential emitters of contra-photons). In a PhR perspective they do not prove the existence of gravity waves but they confirm the negative mass impact of intense contra-EM ray bundles emitted by interacting sets of contra-stars (contra-photons do not couple electromechanically with ordinary matter - their B-field is at point or fotino level 90° phase-shifted, ahead of the E-field or 180° shifted versus a dual photon’s B-field, an extremely small effect transparent to physics – but contra-photons curve spacetime just like photons, although much less than particles do).
- The unit “UZS raster distance per displacement” for EZK based particles is the same for every successful contraction event, 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 character of momentum). A frequency that

depends on its turn on a pattern's layout , its internal symmetry and obviously on the I-max value (in fact a unique quantum number) of a replication cycle (PhR behind the adequacy of a second order differential equation to describe a particle's motion according to Newton's law). I-max has "1" as its lower limit, so a particle's maximum velocity must be limited to some absolute value on an homogeneous non-biased UZS grid (PhR deduction in accordance with Einstein's c value in SR). Further EZP import has only an impact on the internal behavior of the EZK nucleus' (the growth rate of the phase counting mechanism at point level leading to a particle's capability to "move" on the grid, is reduced by an increasing compensation effect of phase shifted quanta stored in the two opposite branches of an accelerated string). This effect increases its mass (Lorentz compliant) but not its ability and frequency to move.

- A contra-intuitive but PhR compliant statement says that the nucleus of a single replicating version of a particle never moves. Physics observes in fact the path in spacetime followed by subsequent short living versions of a particle pattern connected by appropriate charge info exchanges.
- **Unstable particles:** Additional secondary axion exchanges between two adjacent, properly synchronized particles (or a particle and a field pattern) might bind or mutate their replication processes further, leading to unstable complex patterns with a single (e.g. baryons like Ω or Σ) or double properly synchronized EZK nucleus (e.g. mesons like K). 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 contraction will lead to a pattern's decay and/or its transformation.
- **Field particles:** All abstract fields in physics including spacetime itself have a specific PhR- compliant content represented by one or several pattern (or field particle) densities. Field impact on particles comes down to a probability calculation of basic interactions between these particles and field particles. Internal constructive superposition of charge info emitted by mutated particle components in special states, might produce such patterns (emitted as charge info due to the antenna's unbalance in subsequent contracted states – in fact sequences of polaron-axion quanta stored as fotino's in EM waves) or will drop local field particles (connector in a return state), which in an UZS will behave as autonomous patterns (structured waves or oscillators, as field theory calls them (physics)): dark matter EZP oscillators, neutrinos (mixed matter-antimatter (or contramatter?) combinations), electrons, W and Z patterns are some examples. Their properties and the distribution of their effective emission paths are sensitive to the 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, velocity etc… All these decay and transformation processes strictly obey global and locally relevant conservation rules (net charge, CPT …).

- **Polarization (of elementary CPS/UZS field patterns):** in accordance with this model most replicating patterns are able to create and maintain (through changing subsets of N dimensions of the UZS) sub-particle fields that are materialized by chains of free zerons or zeron-pairs (EZP's). These dynamic patterns showing a coherent layout and behavior in space and time are called "polarization field lines (unobservable in physics)". Some examples:
  - New charge-neutral particles (e.g. neutrons or atoms) contracting towards the center of a spherically symmetric volume (even if this center contains initially only a small particle-density excess), are creating by acceleration a fast growing field materialized by unconnected but correlated EZP strings (see **Field particles**). Any reduction of a particle's I-max value will release pseudo-static (meaning: a pattern unable to move over the UZS) EZP connector patterns with a net local number density in N-dim UZS- space that increases gradually towards the volume's symmetry center. Acceleration is due to the statistically unbalanced impact of field EZP densities on a particle version's hole connector(s) that are interchanged each time a replicating string is contracting. In this way they implement growing radial hole density gradients around and inside young stars, planets ... observed by cosmologists as 3D gravity fields (PhR behind dark matter). The impact of those fields on local matter particles (and vice versa – e.g. their huge spherical volumes are able to copy or drag, with excess EZPs filled gravity fields, along their orbits) can be approximately and mathematically described in accordance with Newton's gravity law and/or Einstein's GR-theory. A similar process takes place in black hole volumes where contramatter particles condensate as contra-stars.
  - Subsequent replicating particle versions with a quasi-isotropic distribution of their internal 3D symmetry directions (as a result of rotational degrees of freedom in N-dim) and fitted with free charge connectors, will periodically induce and align in their I-max return states coherently connected chains of UZS zerons. They materialize a centrally symmetric Coulomb field which is fundamental to the understanding, in PhR terms, of non-local interactions and momentum transfers (through polaron exchanges along those field lines) between charged particles. The 4 subsequent charge/hole states of UZS zerons make them capable to fit (by small phase shifts) the compliance rules imposed by free charges at both ends of a chain (PhR of charge displacement current in

vacuum – see Maxwell's laws). Particles (e.g. neutrons) with free charges with mixed signs in their 6 connectors (they are slightly phase shifted and compensate each other "on average") have polarization chains interconnecting these charged zeron states. These local or internal field lines remain even indirectly transparent to observers (except as a residual charge info field (PhR) – in fact a weak magnetic spin effect (physics) of some baryon-type particles).

- The above examples explain why in physics classical pseudo-static gravity (hole) and Coulomb (charge) fields show a similar 3D mathematical format for both kind of field forces and potential energy distributions. They reflect a similar spherical probability distribution of successful interactions by polaron exchange between properly 3D-aligned and synchronized pattern connectors. The difference in coupling factor between the two is well understood by combining the field properties with the symmetry properties of a particle's replication pattern. As stated 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 3D symmetry.
- Two simultaneously emitted coherent and anti-symmetric particles like fotino or electron pairs, propagating in two opposite collinear directions and replicating as subsequent versions of the initially emitted patterns, can, under critical environmental conditions and step-by-step (or version by version), align coherent sets of EZPs, each zeron pair transversal to their central contraction-location path. Their centers form a quasi-linear persistent point- and hole-filled polarization field line. According to the base laws charge info exchanged end-to-end between both particles (in fact a hole-point displacement current in CPS spacetime similar to the charge displacement current in the UZS) is able to propagate along an existing coherent "point-hole" connection path at velocities c_p , much greater than c (137 times the speed of light). Abandoning the universal principle of locality, widely accepted in physical theories (including this PhR model but limited to typical UZS phenomena), this would explain EPR effects (whereby locality is extended to phenomena at CPS level).

7. The Higgs boson as an object conform to this PhR concept.

- **The context.**
- 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. 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 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) are part of their spacetime behavior (in accordance with the base laws). The pattern requires that the theoretical value of 137, i.e. the hypothetical standard maximum number (i-max) of point-like components 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.
- The impact on i-max of these 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 common EZK set). As explained earlier, this - on an UZS-scale - standard phenomenon is, on a local 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 can be the outcome of the induction of an extra CP in emptiness but also of the elimination of an existing DP in the CPS. This subtle "discriminating" effect (in fact 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 zeron spin orientations (e.g. a DZ-CH or DZ-DH point sequence). The ratio between a local (i.e., in an i-max contact area) point-versus-hole density is sensitive to this phenomenon and it is a conserved property during a zeron's growing or shrinking replication cycle. Also, it is the underlying principle of what has been called positive or negative particle mass (or null-energy since $+/-E=+/-mc^2$ in physics), i.e. the fundamental difference between matter and contramatter. At CPS level a

reset of a charged point state or the induction of a new point are phase shifted processes on a common virtual time scale (a phase shift of 90° or a quarter of a point's period), a subtlety that explains certain incompatibilities between interacting matter and contramatter patterns (e.g. no EM (physics) or no fotino (PhR) coupling).

- Nevertheless 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 over the UZS: each EZK is a closed pattern that "behaves" within its own subset of dimensions even while the sum 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) to an unknown number N (the UZS). N, in this case, is the (dynamic in M-dim) ultimate number of quasi-simultaneously and spherically distributed superposed point string directions per zeron replication cycle. Thus, it is also the number of compliant neighbor zerons that are a priori eligible for an efficient interaction in i-max between properly aligned and synchronized replicating point string connectors, ultimately depending on the reduction 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+1 strings start shrinking). The "winner" will never be the same twice in a row because of a 2 X 90° phase shift at the moment of contact between "neighbors" in i-max.
- The value of N depends on M, on c_v and on the value i-max (the number of points in a string with maximum length), here considered to be an integer 137. It must be an identical prime number for all UZS zerons (there exists no CPS property to make them different except from the zeron-spin effect in a contact point). The figure 137 is the rounded value of the reciprocal fine structure constant in physics and it has to be investigated to what extend this value relates indeed to N. Our model assumes that zeron growth stops when the number of available 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 equals the chance of an extra constructive interference with another partial and phase-shifted string version, replicating around the same common nucleus in N + x dim. This reasoning reflects the rule that string growth evolves dynamically towards the construction of the fastest and "superposition law" compliant internal connection path - just like successful external pattern interactions always takes place along one or several shortest connection paths between two pattern connectors - until an internal or external interaction (a discontinuity) stops growth. The term "shortest" combines spatial distance and time (or phase angle), so it is more complex than just a classical geodesic. This rule is ultimately PhR behind any organic growth process in nature and it confirms the universal character of the

base laws. UZS zeron's 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. all elements of the electron class are physically the same).

- However, an ideal EZO is just theoretically a perfect anti-symmetric pattern and this configuration is highly unstable as the base laws indicate that nothing 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 rotate randomly around their common (though slightly phase shifted) central symmetry location.
- When 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 means that replication will start off immediately in each of them. The small difference in point string length that was mentioned before (mass and contra-mass) and applies to both zerons involved in the axion exchange, is conserved in the two EZKs. These rules also entail that zeron strings in each EZK rotate in opposite sense (or have opposite string spin, not to be confused with particle spin but rather a PhR equivalent of isospin in physics).
- Particle replication is a mechanism that conserves the initially net imported charge and hole excesses 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. I-max is reached when the marginal coupling between the nucleus (the central EZK) and the connectors flips the roles of the transversal connector zerons of the longest branches. The reason for this is that in a nucleus one of the four zerons is temporarily "free" which means that (as the result of the imported axion perturbation) its relative phase angle shift in subsequent versions and expressed in point 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. Each nucleus version is copied, step by step at point and at zeron level, into the dynamic connector zerons.
- Stated in equivalent but more quantitative terms: a 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 double 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 like elementary point periods are counted in a 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 stored 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 memory storage of all +/- point-phase quanta resulting from polaron-import along any string direction). 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, they will be shorter. Particles that lose kinetic energy will increase their string lengths. In both cases their nucleus contain a free zeron with a relevant phase angle offset value. Conclusion: a 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 axion impact) into account, this EZO symmetry-breaking mechanism creates a positive unit mass and a negative (contra) mass ($+/-m = +/- E/c^2$) in a pair of emerging particles. These mass amounts correspond with the replication duration (or life-time or half-period T/2) induced by the single h/2-action amount. As stated before, the link between T and the maximum length of a particle's growth cycle expressed in zeron periods (I-max) and the number of effective zeron-connector phase shifts expressed in point cycles or UZS zeron periods (i-max), depends on the lay-out of each growing replication mechanism which in its turn depends on the symmetry properties of the core antenna.
- 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 axion induced energy 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 an opposite string spin, 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 lead to the local induction in vacuum of a series of decaying EZOs in subsequent locations along a path that takes even the smallest difference of velocities of two interacting particles into account. This would explain their breach of Einstein's $E^2 = m^2 c^4 + p^2c^2$ equation (p the 4-momentum of a relativistic particle).
- Bearing all this in mind, it makes indeed sense to assimilate an EZK with a Higgs in physics. The ideal 137 point string figure in uncoupled UZS-zerons has to be adjusted for 4 equivalent points per EZK, due to the internal binding of a non-

replicating EZK within an EZO plus the impact of an extra axion-exchange in the EZO, leading to replication (counted as I). So an hypothetically isolated neutron nucleus has, compared to the i-max value of a free zeron, 133 remaining rotational states or degrees of freedom in the UZS: the initial 137 value minus its own 3 internal degrees (set by internal couplings in/with the nucleus) and one local time degree of freedom (the phase angle of a free zeron acting as a double layered local clock). An hypothetical single pattern version without momentum determines those properties directly or indirectly observable for physics in 3D: the particle spin plus its spatial quark directions, including connector properties (charge, mass) and their external impact (observed as jets). So the constraint that any successful replicating EZK has to behave as a 3D spin ½ particle, embedded in an 137 dim UZS, will reduce the EZK's natural dimensionality from 137 to 133 whereby each observation or external coupling selects a single 3D version out of this free set (in accordance with QM in physics).

- The remaining 133 dimensions 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 contraction 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 interactions needed for the particle's internal binding.
- When a neutron starts to replicate, net charge added over 12 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 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.
- **Momentum and I-max.**
- Extra perturbation-like interactions in I-max between neutrons (or neutrons and other particles or EZP fields) could implicitly reduce on average the initially high number of degrees of freedom. A reduction of I-max gives them the capability to exchange more frequently and successfully momentum quanta (packaged as EZP's or polarons) with other particles or fields.
- To fully understand the origin of the enormous amount of kinetic energy stored in this way in our present cosmos, a brief aside concerning the consequences of these 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 repetitive polaron (or even axion?) exchanges between matter and contramatter connectors remain possible at first (in terms of CPT conservation) with I-max values of replicating EZKs being simultaneously reduced. 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.

- In our present mainly matter-dominated and -curved environment the rule no longer applies: an interaction between two matter particles (or between two contramatter particles within a “black hole volume”) 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 a successful “emitter” in an exchange process, on average losing momentum to the other i.e. the receiver, that shows on top a higher I-max and dimensionality value in N-dim). Without this subtlety, we would be hard put to explain why and how matter and matter started to separate after their simultaneous emergence in a new spacetime slice, a process that stored massive energy quantities in huge cosmic volumes of matter and contramatter, but also justifying afterwards the use of classical conservation rules for momentum and potential energy in each partial volume.
- Immediately after an initial EZO split, matter as well as contramatter particles were both able to acquire momentum without the need for e.g. a mysterious anti-gravity force. This PhR consistent conclusion goes some way towards explaining Einstein’s dilemma about the need for a cosmological constant in GR.
- **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 I-max equals an adjusted i-max value 133.
  - A neutron without momentum has an amount of null- energy that depends solely on the energy content of an EZK nucleus with a broken symmetry and 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)) which gives us a Higgs mass of 125 GeV/c². This corresponds fairly well with what has been observed, calculated and published by CERN.
- It is also in line with what the electroweak theory predicts to be the symmetry breaking energy level (250 GeV) that leads to the emergence of Z and virtual Z’ boson pairs: indeed, these particles too, have to find their origin in a by collision-induced, stochastically broken EZO. If we combine the masses of both EZK’s of such EZO, the absolute value of the null-energies is 250 GeV. In cases where some of the directly or indirectly observed particles (e.g. an off-shell Z’) are decay

products of contramatter particles, the “real” Higgs boson would rather be the short living EZO with its broken symmetry, i.e. a meson with an absolute energy content of 250 GeV.

- Another 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). The order of magnitude of an electron’s null-energy content should be the square root of twice the Higgs energy or about 500 keV (to be adjusted for the axion impact).
- 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.
- Anyhow, taking into account what has been proposed earlier in “viXra: 1701.0287” about energy conservation and what has been said about EPR effects in chapter 6 of this text, its capability to consistently deduce the Higgs mass from the neutron mass value seems to confirm the validity of this PhR model: results like these are unlikely to be a matter of mere coincidence

8. Conclusion.

- We would like to point out once more that the (unproven) processes described briefly in this document, take place in 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 combinations) and the subsequent macro-behavior of those sophisticated patterns (molecules, crystal lattices…and galaxies) increases dramatically due to high numbers of components and averaging, reduced or particular symmetry, superposition and polarization etc.
- In our opinion, this conceptually straightforward 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 simulate cosmic behavior on a computer.