

Multiverse Space-Antispace Dual Calabi-Yau 'Exciplex-Zitterbewegung' Particle Creation

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Modeling the 'creation/emergence' of matter from spacetime is as old as modern cosmology itself and not without controversy within each model such as Static, Steady-state, Big Bang or Multiverse Continuous-State. In this paper we present only a brief primitive introduction to a new form of 'Exciplex-Zitterbewegung' dual space-antispace vacuum Particle Creation applicable especially to Big Bang alternatives which are well-known but ignored; Hubble discovered 'Redshift' not a Doppler expansion of the universe which remains the currently popular interpretation. Holographic Anthropic Multiverse cosmology provides viable alternatives to all seemingly sacrosanct pillars of the Big Bang. A model for Multiverse Space-Antispace Dual Calabi-Yau 'Exciplex-Zitterbewegung' particle creation has only become possible by incorporating the additional degrees of freedom provided by the capacity complex dimensional extended Yang-Mills Kaluza-Klein correspondence provides.

Keywords: Multiverse, Particle creation, Space-Antispace, Zitterbewegung-Exciplex

1. Overview

Although Big Bang Cosmology strongly dominates current thinking, ultimate astrophysical bases of reality are far from settled. Alternative explanations exist for all 'pillars' of Big Bang Cosmology [1-3]. This paper presents a preliminary overview of a 'Zitterbewegung-Exciplex' model for particle creation in a higher dimensional covariant polarized Dirac vacuum.

In the usual 4D rendition of the stochastic quantum Zero-Point Field (ZPF) virtual particles with a half-life of the Planck time are annihilated and created in stochastic spacetime collisions. In the space-antispace C-QED Zitterbewegung-Exciplex particle creation model presented here since the vacuum field 'never falls to zero' (by definition) it is relatively easy for relativistic collisions to 'create' particles able to escape from the vacuum without violation of conservation of energy. It should be noted that this model also applies to our earlier black body Exciplex ZPF red-shift-CMBR absorption-emission equilibrium dynamics [2]. These are properties made possible by a covariant Dirac polarized vacuum, an indicia of our model suggested by the well-known gamma ray electron-positron pair creation scenario, $\gamma \rightarrow e^- + e^+$.

The general equations for a putative spacetime exciplex C-QED emission cavity are (see Fig. 1):

$$G^* + G^* \Leftrightarrow Z^*; \quad Z^* + m_\gamma \Leftrightarrow X^*$$

$$X^* - m_\gamma \xrightarrow{\text{emission}} Z^* \quad \text{or} \quad G^* \quad (1)$$

$$X^* + m_\gamma \rightarrow Z^* \quad \text{or} \quad G^*$$

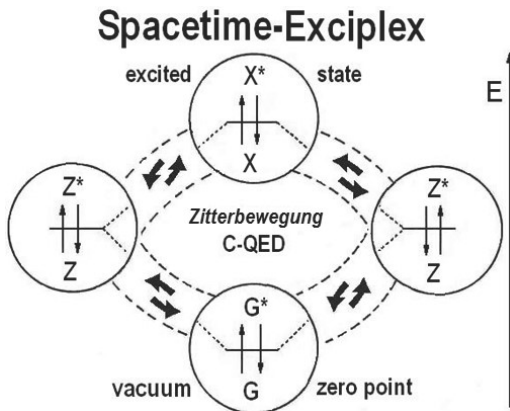


Figure 1. Geometric model for spacetime space-antispace C-QED Zitterbewegung-Exciplex vacuum particle creation.

where G is the ZPF (*Zitterbewegung*) ground, Z black body cavity excited states and X the spacetime C-QED exciplex coupling. The numerous configurations plus the large variety of photon frequencies absorbed allow for a full black body absorption-emission equilibrium spectrum. We believe the spacetime exciplex model also has sufficient parameters to allow for the spontaneous emission of protons by a process similar to the photoelectric effect but from spacetime C-QED spallation rather than from metallic surfaces. What the Exciplex provides especially is for particle creation to occur without the violation of the principle of conservation of energy.

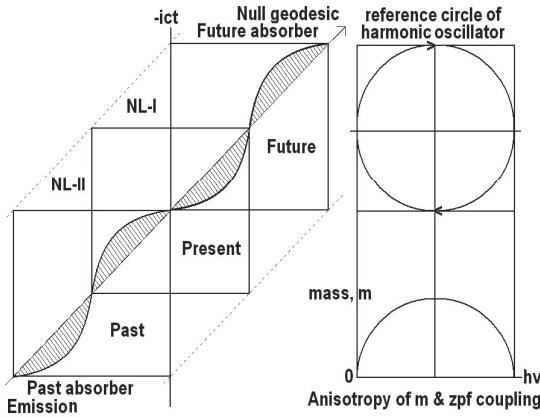


Figure 2. a) 2D drawing of a 3D view of a 4D hyperstructure. A Minkowski spacetime diagram of the electric vector only in terms of a present moment of 'tiled' Planck units utilizing the Wheeler-Feynman theory of radiation especially when extended to 'standing-wave' modes of Cramer's Transactional Interpretation (further extended to HD). The vertices represent absorption & emission. The observable present is represented by bold lines, and nonlocal components by standard lines. Each event is a hyperstructure of Past, Present, and Future interactions, ultimately governed by the quantum and super Q-Potential. b) In the reference circle photon mass and energy fluctuate harmonically during propagation of the wave envelope (wave) and internal rotation of the ZPF during coupling (particle).

For $+E$ and $-E$ or $+t$ and $-t$ states (*zitterbewegung*), or fermion and vacuum the Rowlands model states: 'A fermion may be represented by a row (or column) vector, whose components are four creation (or annihilation) operators':

- $(kE + ii p + ij m)$ fermion spin up
- $(kE - ii p + ij m)$ fermion spin down
- $(-kE + ii p + ij m)$ antifermion spin up
- $(-kE - ii p + ij m)$ antifermion spin down.

'The antifermion then takes up the corresponding column (or row) vector':

- $(-kE + ii p + ij m)$
- $(-kE - ii p + ij m)$
- $(kE + ii p + ij m)$
- $(kE - ii p + ij m)$ [4].

Real	Fermion		Antifermion
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Vacuum	Antifermion		Fermion

The existence of mirror image vacuum states for all fermionic particles accounts for the structure of the Dirac quaternion state vector. We incorporate both real and virtual components (interpreting the *zitterbewegung* as a switching between them). The four creation operators create both the real particle and its set of dual vacuum images [1,4].

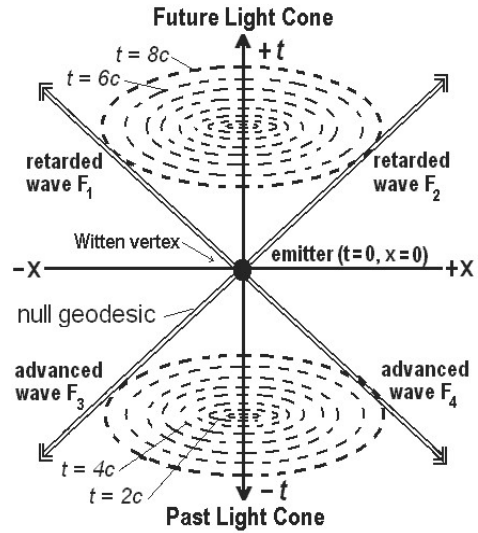


Figure 3. 4D Minkowski lightcone of advanced and retarded waves (Eq. 2) emitted from a locus at $(x,t) = (0,0)$. Adapted from quantum concepts of Cramer [5].

Retarded:

$$F_1 = F_0 e^{-ikx} e^{-2\pi ift}, \quad F_2 = F_0 e^{ikx} e^{-2\pi ift} \quad (2a)$$

Advanced:

$$F_3 = F_0 e^{-ikx} e^{2\pi ift}, \quad F_4 = F_0 e^{ikx} e^{2\pi ift} \quad (2b)$$

If this 'reality transformation' of HAM cosmology is carried to a 12D superspace, 12D can be said to describe an 'atemporal-acausality' because 12D is the minimum number of dimensions to be causally free of the virtual E_3/M_4 complex HD 'standing-wave'

nilpotent present, $\hat{M}_4 \pm C_4$ [1,6]. This is commensurate with a type of dual Calab-Yau 3-forms which in the Wheeler-Feynman formalism can be simplistically written (as adapted from Narlikar [7]) in unexpanded form as

$$F_{symM_4}^{S^N} = \frac{1}{2} \left[R_{retC_4}^{S^N} + R_{advC_4}^{S^N} \right] \quad (3)$$

This 3-torus cosmological least-unit [1, 6] singularity structure of the *advanced-retarded future-past standing-wave dynamics* is a foundational principle of the continuous-state anthropic multiverse [1, 6].

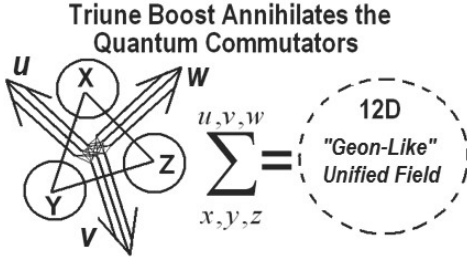


Figure 4. The continuous-state superluminal boost of $s \leftrightarrow t \leftrightarrow e$, signifying a new set of Noetic Transformations beyond the Galilean-Lorentz-Poincaré where states that ordinarily do not commute are able to commute in the HD regime if one applies a properly formalized complex quaternion Clifford algebra that is able to cycle through a commutative-anticommutative periodicity in higher dimensionality.

Vacuum fermions and vacuum antifermions have a similar relationship to real fermions and real antifermions, although both states, in this case, are virtual. The mirror image states of all possible fermion states constitute the zero point energy of the vacuum. Each possible state provides a virtual vacuum energy of $\hbar\omega/2$, like the ground state of a harmonic oscillator (which, of course, it is). To create a real fermion state, we excite a virtual vacuum state of $\hbar\omega/2$ up to the level $\hbar\omega/2$, using a total energy quantum of $\hbar\omega$. Counting real and virtual particles, we have the same number of fermions and antifermions in the universe, but, in a universe with a non-symmetric ground state (such as we will demonstrate must exist), fermions will be predominantly real and antifermions predominantly virtual; and, counting real and virtual particles, and assigning $+E$ to fermions and $-E$ to fermions, we obtain a total energy of zero [4].

2. Putative Model of Exciplex Proton Nucleosynthesis

In recent decades four types of nucleosynthesis have been considered:

- 1) Big Bang nucleosynthesis during the putative first three minutes of creation,
- 2) Stellar fission/fusion nucleosynthesis,
- 3) Explosive Supernova nucleosynthesis and
- 4) Cosmic ray spallation against the interstellar medium of gas and dust mostly by high energy protons.

Spallation is also known to occur in meteor rock, the Earth's atmosphere and lava [8-13]. Here we introduce a 5th form of 'gentle' nucleosynthesis by spacetime exciplex spallation utilizing the Vigier causal stochastic interpretation of quantum theory because of its legitimacy in dealing with the internal motion and structure of matter [1,6,14]. 3/4 of the mass of the universe is attributed to hydrogen. If the Big Bang is incorrect as a few cosmologists propose, there must be a mechanism for the 'creation' of protons [7,13,15].

Chatterjee and Banerjee have developed an XD model for Hoyle and Narlikar's C-Field cosmology [14]. Hoyle and Narlikar added an additional term to Einstein's field equations to introduce the C-field

$$R_{ik} - \frac{1}{2} g_{ik} R = -8\pi \left({}^m T_{ik} + {}^c T_{ik} \right) \quad (4)$$

where ${}^c T_{ik}$ is the C-field term,

$${}^c T_{ik} = -f \left(C_i C_k - \frac{1}{2} g_{ik} C^\alpha C_\alpha \right). \quad (5)$$

but Hoyle and Narlikar [10] formalized their C-Field with a negative energy density that drives expansion of the universe and is therefore not compatible with continuous-state HAM cosmology which is without expansion. For interest to HAM cosmology Chatterjee and Banerjee find a spontaneous compactification process in their HD derivation of C-field solutions utilizing the \dot{R} scaling factor key to the alternative for expansion in terms of the continuous-state process of HAM cosmology [1-3]; but they also align their formalism with an expanding universe. Recall that Hubble discovered redshift - not a Doppler expansion of the universe [1]. Another point of interest of the Chatterjee and Banerjee model [14] is that introduction of the C-Field is not *ad hoc* as in the Gold and Bondi or Hoyle and Narlikar models by the compactification process that also allows for the HD conservation of matter. We do not have time to develop this model to a rigorous formalism for this volume, but we hope to or that other works will utilize the richness of the exciplex paradigm to complete the model. The other factor we have ignored in this discussion is that the oscillation of

Planck's constant up to the size of the Larmor radius of the hydrogen atom [1] provides many additional C-QED parameters for this work especially when the plethora of SUSY parameters enters the picture. Don't forget the new noetic transform being developed...

1. A stochastically driven C-QED effect on Eddington free space Rabi/Rydberg atoms coupled to vacuum zero-point field fluctuations.

2. A composite *exciplex* of advanced - retarded spacetime topological cavity modes which may act as an atom-cavity «molecule» formed on the basis of gravito-quantum coherence effects by unitary action of the force of coherence of the unified field, $F_{(N)}$. Both postulated by only two new theoretical concepts, from already observed C-QED effects in the laboratory:

- A Dirac type vacuum coupling between the atom and vacuum QED cavities of the structure of spacetime itself, and
- CMBR photon emission can also occur from the Bohr-type boundary conditions of spacetime topology without the presence of an atom with E transport by topological switching in D-reduction as illustrated in, $d_s \rightarrow d_t \rightarrow E_{(N)}$.

3. Future Perspective

Hopefully a sufficient framework has been provided for a 'glimmer' to evanesce (pun intended) from the entelechies of the readers 'noetic exciplex'. The vacuum has infinite energy and particle pair creation is already reasonably well-understood. The ZPF in stochastic quantum field theory allows virtual particles to wink in and out of existence only for a half-life of the Planck time; however since a putative exciplex Large-Scale Additional Dimensionality (LSXD) by definition remains excited (never goes to ground) in contrast to ZPF parameters a framework for vacuum creation without violation of the Law of Conservation of Energy seems obvious by spin-spin coupling mediated by the 'force of coherence' of the U_F .

The standard operating procedure of high energy collider physicists is to accelerate particles to relativistic speeds, smash them together and observe the particle spray. In accelerator physics there is a "threshold energy" for particle production. Thus to accelerate a particle to relativistic speeds in this scenario implies giving it a K.E. of order of 1 GeV for example. This represents the current standard 4D model which does not apply in the Z-Exciplex model. As UFM becomes developed it will become clear that

LSXD Calabi-Yau dual mirror symmetric C-QED brane dynamics will allow in contrast 'low energy' particle creation by inherent background symmetry coupling interactions of the continuous-state spin-exchange dimensional reduction compactification process - a mirror symmetric component coupling.

We presented our model in primitive form primarily because of time constraints and proceeded anyway in case the occasion of a future opportunity does not arise.

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