

[First Draft; October 21, 2017]

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Complex Tension Field (CTF) as a comprehensive platform for a new approach to a possible unified field theory

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1. *“The NIW-property requires a complex tension field (CTF)”*. This is the title of the Ch.11 of my book, *“Causal Physics: Photon by Non-Interaction of Waves”*, Taylor & Francis, 2014.

How does NIW imply the necessity of a “CTF”? Everywhere in the universe, the EM waves propagate through each other unperturbed in their individual diffractive wave properties. Our prolonged theoretical and experimental experiences indicate that waves, as linear excitations of a parent tension field, display this NIW property. Once generated by some dipole antenna, whether macro radio or nano atomic, they propagate perpetually with the same fixed velocity $c^2 = (\epsilon_0^{-1} / \mu_0)$ across the entire cosmic space. (a) The NIW property of EM waves, then (b) the same constant velocity c , and (c) the continuous diffractive spreading properties of the waves -- all these are also built into the foundational two equations of classical optics, known as (i) Maxwell’s wave equation and (ii) Huygens-Fresnel diffraction integral. [Recall that Maxwell’s equation accepts any linear superposition of harmonic waves.] ***These observations strongly guide us to propose the postulate that the entire cosmic space must be built out of some Complex Tension Field***, which, once stimulated by any excited dipole, the dipole-delivered energy will evolve into excited EM waves traveling out as waves with velocity c . This constant c is not imparted by the emitting dipole; but it is empowered by the ***uniform*** tension field as its inherent property. Separately, the dipole velocities affect a different property, the frequency, of the EM waves, which we know as Doppler Effect. Note also that I have used the word “complex” to imply that $(\epsilon & \mu_0)$ are only two of the many other intrinsic properties that we will have to properly define and connect with the CTF with justifications for the emergence of particles out of CTF, as for example, h & e (c.f. “fine structure constant”, etc.).

[***Reference:*** My book presents a wide range of experiments to ***re-establish*** NIW. One of the experiments have been done one thousand years ago. My personal experiments date back from 1973, and still continuing. *Causal Physics: Photon by Non-Interaction of Waves*, Taylor & Francis, 2014.]

2. ***The CTF postulate accepts the two key postulates of the Special Theory of Relativity (STR).***

The two key STR postulates are automatically accommodated by the CTF postulates without the need to introduce the ad hoc postulate of space-time four dimensionality. Stationary CTF is the inertial rest frame in which all the evolving cosmic drama is happening. The EM wave velocity c is same, as has been set by Maxwell’s wave equation. It is true everywhere in the CTF and for everybody wherever anybody attempts to measure it. If the specific space contains a material medium of refractive index n , the velocity of light in that medium would be (c / n) , which is again experimentally validated for several centuries.

If a material medium moves with respect to CTF with a certain velocity, the material medium, consisting of intrinsic dipolar properties, the EM wave packet would be “dragged”, which we already known as Fresnel Drag. This was derived and measured before SRT was conceived.

Thus, we are back to 3D space, instead of 4D space. This is a major simplification, and hence, advancement in physics for many reasons requiring a separate book-size document. CTF represents the cosmic *inertial rest frame* for everything and everybody. Then the postulate of *stationary CTF* also provides the justification as to why laws of physics remain same everywhere in this universe [further explanations later].

[*Reference.* I have underscored in many of my papers, as also in the 2014 book, that the *running time* is not a measurable physical parameter. Running time cannot be dilated or contracted. We measure time by inverting the physical parameter, “*frequency*”, of diverse physical oscillators to define new parameters, a “period” or a “time interval”. We must not impose physical behaviors onto nature, which is not directly measurable by some apparatus. Physics is a science of understanding transformations in the observable world. Therefore, the primary parameters of any theory must remain anchor-able through material based experiments.]

3. CTF accommodates null results for “ether drag” established by Michelson-Morley Experiment (MMX) when particles are modeled to be vortex-like localized and resonant self-looped oscillations of the same CTF.

If we postulate the electrons and protons as spatially localized self-resonant and vortex-like oscillations of the same tension field, we have a major breakthrough example in physics to build a unified field theory. However, we have, so far, identified only two of the multiple intrinsic tension properties of CTF, $c^2 = (\epsilon_0^{-1} / \mu_0)$. For particles, through diverse experimentations, we have found the fine-structure-constant, $\alpha = (e^2 / 2h)(\epsilon_0^{-1} \mu_0)^{1/2}$. Therefore, to leverage CTF as the foundation for the new unified field theory, we need to figure out how to model the existence of e & h as integral part of CTF, or as emergent properties of CTF. Let us assume that eventually we will succeed in defining appropriate measurable parameters and develop a rigidly causal theory. The very foundation of constructing our mathematical theories clearly imply that we always leverage the built in causality when we *equate* some measurable observable (“effect”) as due to some interaction (“cause”). It does not make sense to declare nature sometimes non-causal simply because our measured “effect” is not validated by the “working” theory. That is an opportunity to challenge the foundational postulate behind the theory and improve upon it.

Once we succeed in modeling stable electrons and protons as localized resonant oscillations of the same CTF, we would achieve a great unification. Then moving material blocks (interferometers etc.), built out of assemblies of vortex-like oscillations of CTF (electron and protons) will not drag the stationary CTF. The assembly of excited-state vortices will experience only translation with respect to the stationary CTF.

[We have submitted specific proposal for satellite based experiments to validate that CTF is the master stationary medium, or the master inertial reference frame.]

4. CTF holds hundred percent of the cosmic energy as its built-in tension. This eliminates the need for ad hoc postulates of “Dark Energy” and “Dark Matter”.

Experimental Astrophysicists have found, with extensive data on the velocity distributions of stars in well over 100 galaxies, that neither the Newtonian nor the Einsteinian gravity theory can systematically validate the measured data. This has led to the postulates of “Dark Energy” and “Dark Matter”. Our postulate is that

CTF holds hundred percent of the energy within its built-in tension. The observable universe constitutes EM waves and particles, both of which are excited states of the CTF. All the energy is still held by CTF.

[*Reference:* Ch.11 in my book. Alternately, download relevant papers from my website: <http://www.natureoflight.org/CP>]

5. *CTF provides the logical rationale behind our observations that the laws of physics are same behind the galactic evolution everywhere in our Cosmo-Sphere.*

We can gather evidence based knowledge about our *observable* universe only through interactions between EM waves and particles (and their assemblies). Quantum Mechanics provides us with the best possible theory, as of now, of the micro world of interactions. Spectrometry (QM level transitions) and classical Doppler Effect are two main experimental tools, besides many others, for experimental Astrophysics. The level-transition frequencies, ν_{QM} , and the corresponding energies, $h\nu_{QM}$, are assumed to be identical whether the physical location of the emission and absorption is the Earth, or the Sun, or any other stars in any other galaxy. Therefore, the detailed structures of atoms and molecules have to be essentially identical everywhere in the cosmic system, assembly of very complex in-phase oscillations of protons, neutrons and electrons. These “localized” assemblies must also be experiencing the identical physical environment in which they are embedded. Therefore, the postulates presented earlier, that atoms are built out of localized vortex-like oscillations of the stationary CTF (protons, neutrons and electrons), makes eminent sense.

[*Reference:* Ch.11 in my book. Individual papers from: <http://www.natureoflight.org/CP>]

6. *CTF provides the logical rationale for the observed universal rule of conservation of energy.*

We have postulated that CTF is a tension field. Material based classical tension fields (surface tension of liquids, pressure tension of air, mechanical tension in stretched solid material, etc.), which allow the perpetual propagation of diverse waves, have only weak energy dissipative property. We also assume that CTF has a very weak energy dissipative property (root of Cosmological Redshift, discussed later). Normally, the tension fields are incapable of assimilating perturbation energy. This is at the root of the origin of perpetual propagation of wave packets, or wavelets. As long as the perturbation is within its *linear* restoration range (Young’s Modulus), the perturbation is perpetually pushed away by CTF to regain the local equilibrium tension state. This *linearity* is of profound importance for the validity of the Superposition Principle, allowing for the validity of NIW property of waves. Only resonant material particles (detectors) can execute the square modulus operation to absorb energy out of the propagating (and stimulating) wave groups. And this energy exchange is essentially conserved everywhere in the universe.

However, the very weak dissipative property of CTF plays extremely important role in recycling the observable universe. The three neutrinos, which help preserve the energy conservations in some particle-particle interactions, most likely, are EM wavelets, as they propagate with the velocity of light. Possessing extremely low amount of energy, neutrinos remain susceptible to weak interactions with the weak dissipative properties of CTF.

7. *Cosmological Redshift is due to a very weak energy dissipative property of CTF; it is not due to optical Doppler Effect.*

Careful analysis of the origin of the characteristic spectral absorption (dark) lines in the spectra of distant stars that the dark lines are embedded by the cooler outer corona on the continuous white light emitted by the hotter inner corona. Therefore, the “red-shift” of the dark lines carried by the white light must happen

during its journey from one star to another due to red shift of the entire spectrum of white light. Besides, energy-deprived dark lines cannot undergo any physical interactions, or physical transformations. The Observations show that some galaxies have the tendency of clustering together; others are receding from each other. We should not explain away these behaviors of galaxies as due to Doppler Effect. Doppler Effect is very well defined as due to the velocities of the emitting source and the sensing detector with respect to the stationary CTF.

[*Reference:* Ch.11 in my book. I have explained this point extensively using Doppler Effects in spontaneous emissions and stimulated absorptions in gas lasers and the universality of quantum transitions $h\nu_{QM}$ in any star. Individual papers from: <http://www.natureoflight.org/CP>]

8. Phase-matched (self-looped) vortex-like resonant oscillations of CTF is behind the emergence of quantumness in the material universe (stability and statistics).

We have postulated that CTF is a “classical” continuous tension field with complex inherent properties. The emergence of quantumness in the elementary particles is due to the phase-matched self-looped oscillation, which is at the foundation of stability of this localized oscillation. Of course, *the degree of stability is determined by how precisely this phase match is preserved over a period* when the complex self-looped oscillation, for example, are $\sim 10\langle 20 \rangle$ Hz for electrons and $\sim 10\langle 23 \rangle$ Hz for protons and neutrons. Here we have assumed that the total rest-energy is given by hf_{in} , where f_{in} is the self-looped internal oscillation frequency, $\exp[i2\pi f_{in}t]$. We believe that the stabilities of complex structures of nuclei, atoms and molecules, all possess different kinds of complex in-phase oscillations, which QM formalism has succeeded in modeling using simple and complex Hamiltonians. However, *our new job is to “draw” mathematically the physical pictures of these diverse 3D (not 4D) oscillations of the CTF and consequent diverse gradients around these oscillations.* Thus, the emergence of everything observable is out of one single complex tension field, which possesses very complex properties, but it is fundamentally and mathematically “classical” in nature.

The intrinsic statistical behavior in the micro-world arises out of these varied degrees of stabilities of diverse phase-looped oscillations and their assemblies. This is further complicated by their inherent sensitivities to all the random collisions with the incessantly present other particles of different velocities and radiations of different frequencies, randomly knocking each other all the time. We simply would never succeed in enumerating the parametric values of interactions (linear and nonlinear) with all these fluctuating entities. Hence, like classical Thermodynamics, Quantum Mechanics is also being dealt with statistically. Only the origins and the specific varieties behind the emergence of the statistical environment in classical and the quantum world are somewhat different.

[*Reference.* C. Roychoudhuri, “Can photo sensors help us understand the intrinsic difference between quantum and classical statistical behavior?” pp.167-177, in *Foundation of Probability and Physics*, Vaxjo, 2008. AIP Conf. Proc. Vol.1101.]

9. Forces in the CTF emerges as different kinds of potential gradients of the CTF around the self-looped oscillations of the CTF.

This postulate is a generalization of Einstein’s definition of “gravity as a curvature of the space”. However, we literally mean the emergence of different kinds of *potential gradients, present simultaneously*, as due to the complex dynamic oscillations of the CTF, representing various particles, nucleons, atoms and molecules. Depending upon the different characteristic positive or negative gradients and the strengths of

the diverse slopes around themselves, the attractive, repulsive or neutral-state would be determined by the resultant curvature.

We want to underscore that CTF as a tension field and forces as various secondary curvatures of the same CTF, pave the way for the unification of all forces as its gradients. Gravity cannot simultaneously be a “curvature of the space” and mediated via Gravitons! We do not see the potential for a unified field theory when interaction between different elementary particles are assumed be mediated via various Bosons; while van der Waals forces between molecules assume a classical force structure. All, forces are due to interactions between mutual spatial range-limited potential gradients generated by the localized oscillations of the particles themselves. The gradients are inseparable property of the dynamically oscillating self-looped oscillations. It is important to note that CTF is stationary in both the macro sense, as well as micro and femto sense. It is only the local values of its different intrinsic parameters (or emergent properties), which oscillate in time and space, or remains as a distant dependent stationary gradient. We believe that gravity is a distant dependent stationary gradient and when a “massive” object explodes, the extended gravitational potential gradient collapses taking a finite time. Gravity is not a propagating harmonic wave, the way EM radiation is.

[Reference: Ch.11 in my book. Individual papers from: <http://www.natureoflight.org/CP>]

10. Free particles are harmonic oscillators, but free of “pilot waves” and “plane waves”.

A free particle of rest energy hf_{in} , executing a harmonic oscillation can be represented by $\exp[i2\pi hf_{in}]$. There is no causal or logical reason to describe these internal harmonic oscillations as either a “plane wave” or a “Pilot wave”. We use expression like $\exp[i2\pi hf_{in}]$ for any oscillator, classical or quantum mechanical, which has the characteristic resonance frequency f_{in} . Because of the rule of conservation of energy, nature cannot generate either a plane wave or a monochromatic Fourier mode existing in all space and time. Hence, use of such mathematical concepts, while quite elegant and yet simple, they are fraught with deceptive interpretations, which then require invoking arbitrary new postulates to accommodate the divergences, or other problems of the theory.

[Reference: Ch.11 in my book. Individual papers from: <http://www.natureoflight.org/CP>]

11. Schrodinger’s ψ represents a real physical “amplitude” of stimulation of a quantum entity.

Schrodinger’s ψ is not an abstract mathematical probability amplitude. It represent real physical “amplitude” of stimulation of a quantum entity. **Visualizing these “amplitudes” of very complex internal oscillations is the next level of task to advance the quantum theory for micro to femto world.** The current QM formalism has correctly defined the observables as $\psi^* \psi$, through energy exchange while exchanging energy with an entity we chose in a detector. However, the QM formalism has not been structured to probe (visualize) the physical structure of the detailed interaction processes that facilitates the energy exchange. In this sense, QM is clearly **incomplete**. Further, when ψ has a complex representation (“i”), $\psi^* \psi$ has a built-in integration period for a duration of one to two intrinsic oscillation cycles. We interpret this time as a required period to determine the internal resonant frequencies for quantum interactions. This integration time is defined in my book as the “quantum compatibility sensing period”.

12. Use of Fourier monochromatic amplitude modes and summing a set of Fourier modes represent non-causal physics.

A Fourier mode, representing a plane harmonic wave over all space and time, is by definition, a non-causal signal, as it would require infinite amount of energy. Therefore, we should not start modeling causal phenomena in nature starting with a Fourier modes and then, later, rationalize the approach by “bounding” the “extension” of the mode. There is a second serious problem when this Fourier mode literally represents a propagating wave because of the universal NIW property, already mentioned earlier. Linearity of the mathematics does not allow them exchange energy between themselves. The energy exchange is a non-linear quadratic process, $\psi * \psi$.

It is also important, while formulating a theory, to define carefully the measurable parameters, while identifying the primary vs. secondary vs. tertiary, etc., parameters. For example, take $c = \nu\lambda$. Here, ν is the primary parameter, as it remains unchanged while propagating through different material media, unlike c and λ , which change values from medium to medium. Planck underscored this point in his book [ref.], although not as a generalized principle as I am underscoring here. He expressed that the only way he could justify the self-congruent mathematical derivation of the Blackbody Radiation formula by expressing energy exchange between matter and radiation as $h\nu$. Of course, 25 years later, the formal QM formalism proved him to be right. Quantum energy transitions are always $h\nu$, where ν represents the internal dipolar resonant frequency of the atom (or molecule) for the particular quantum transition.

Glaring conceptual confusions are abundant in the field of classical and quantum optics in summing Fourier modes, as if they represent a physical interaction process. Some of these have been illustrated in my book, “Causal Physics”. One specific example is in Ch.5 on Spectrometry. I have derived the spectrometer response function by propagating a causal finite pulse, instead of a monochromatic Fourier mode. It reveals many interesting learning points. One important one is that all spectrometers have a finite time constant given by its resolving power, as $\tau = R\lambda / c$, where R is the resolving power number. This has been missed by the existing theory of spectrometry that we are accustomed to use.

It is of vital importance that when we construct a theory, we pay attention to frame it using causal postulates and real physical parameters, which are directly measurable. If we sneak in non-causal postulates and mathematics, we are bound to find divergences or incongruences. There are many such problems in our current theories, which have been rationalized using mathematical brilliance, and/or by introducing novel creative postulates. Through such rationalizations, we have been missing out the opportunities to correct the limitations of current “working” theories.

[Reference: My book, “Causal Physics”. Individual papers from: <http://www.natureoflight.org/CP>]

13. “Charge” and “Mass” are emergent properties of some in-phase self-looped dynamic oscillations (representing particles).

The pair production is an important clue. Massless and charge-less neutral gamma ray, interacting with heavy nucleons, can generate a pair of electron and positron with finite “masses”. As underscored earlier, I consider “quantumness” arises out of the stability of particles provided by the in-phase self-looped oscillations of the CTF. Then, both the mass and the charge have to be emergent properties of the self-looped oscillations. However, these two characteristic properties are remarkably different. Charge, while additive in the cumulative sense, is quantized, in the sense that its minimum value, whether +ve or -ve, which is carried by a single particle, always has the same value. However, mass, in reality, the inertial property, or resistance to translation in space, of all particles, is a variable parameter.

I would also like to comment that we should remove the word “mass” by “inertia” of motion in physics books. We already know, from the 19th century studies of chemical reactions to most modern nuclear

reactors, mass is not really an immutable property of so-called “material objects”. And, once we accept that particles are self-looped oscillations of the CTF, objective physics language would require us to accept inertia in place of mass.

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