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Physics Formalism Helmholtz Matrix to Coulomb Gage

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Abstract

Iyer Markoulakis Helmholtz Hamiltonian metrics have been gauged to Coulombic Hilbert metrics, representing Gilbertian and Amperian natures of electromagnetic fields from mechanics of vortex rotational fields acting with gradient fields, typically in zero-point microblackhole general fields, extending to vacuum electromagnetic gravitational fields gauge.

This ansatz general gaging helps to properly isolate field effects with physical analyses – mechanical, electric, magnetic components within the analytical processes. Vacuum gravitational fields and the flavor Higgs-Boson matter inertial gravitational fields have been thus quantified extending to stringmetrics constructs matrix showing charge asymmetry gauge metrics.

Physical Analysis with applications to particle physics, Quantum ASTROPHYSICS, as well as grand unification physics have been advanced. Particle physics gauge matrix pointing to Dirac seas of electrons, monopoles with positrons, electron-positron annihilation leading to energy production, and the relativistic energy generating matter provided literature correlations. Quantum astrophysics extending gauge metrix analyzes of superluminal profile of signals velocity generating electron-positron chain like "curdling" action validates formalism with physics literature of electron-photon observed oscillatory fields configurations. Mechanism of creation of neutrino antineutrino pair orthogonal to electron positron "curdling" planes, that may lead to formation of protonic hydrogen of stars or orthogonally muon particles. These proposals will help to explain receding or fast expanding universe with the dark matter in terms of flavor metrics versus gauge associating metrics fields. Vacuum and gravitational monopoles, that are representation of compressed mass out of vortex Helmholtz decomposition fields have been interpolated to energy generation via electron positron monopole particles at cosmos extent of infinity.

Keywords: Quantum, Electrons-positrons monopoles, Matrix Algebra, Amperian Gilbertian fields, Switches, Modeling Parameters, Transforms, Astrophysics, Signal energy generating.

1. Introduction

Gauge transforms are necessary part of physics today to match relativity with quantum physics, developing consistency to observables classically, where all the basic forces are unified at the scale set by gauge-coupling unification quantitatively, thus for example, explaining observed feebleness of gravity [1]. Gauge fields are included in the Lagrangian to ensure its invariance under the local group transformations, also called gauge invariance [2, 3, 4, 5, 6]. Typical classical Maxwellian electrodynamics have gauge fields, that are like equation 41 in [7]. Gauge theory is a class of quantum field theory, a mathematical theory involving both quantum mechanics and Einstein's special theory of relativity that is commonly used to describe subatomic particles and their associated wave fields, also may constitute scalar gauge fields [8]. In

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author's original conceptuality, gauge invariance is like removing variables using high differentiation to get to constants, that will have consistent values across the board of all types – mechanical, electronic, and magnetic fields.

Typical gauge transformation in general can be any formal, systematic transformation of the potentials that leaves the fields invariant, although in quantum theory it can be perhaps a bit more subtle than that because of the additional degree of freedom represented by the quantum phase [8, 9]. These gauge transformations between possible gauges tend to form a Lie group, in general referred as symmetry group or the gauge group of the theory; Lie algebra of group generators quantifies a lie group [9].

Gauge conversions are quite useful to invariantly transfer information of fields of one type, like mechanics onto the fields of another type, like electromagnetism, as above literature suggests. For example, Helmholtz Hamiltonian mechanics metrics quantifying mechanical fields can be gauged to Coulombic Hilbert metrics, representing Gilbertian and Amperian natures of electromagnetic fields [6, 21, 22].

Iyer Markoulakis Helmholtz Hamiltonian mechanics formalisms mathematically modeled the physics with vortex rotational fields acting in cohort to gradient fields, typically in a zero-point as well as of microblackhole general fields, modelled by abstracting observations with Ferrolens of vortex magnetic fields within a real magneton configured to synthetic magnetic monopole assembly [10, 11]. Author has extensively successfully applied this ansatz formalism to general as well as specific problem solving of attractive and repulsive forces specially encountered in all electronic and magnetic entity forms, like monopoles within a dipole quagmire; here, physical analysis will specifically concentrate on the process physics [12].

In the present paper, ansatz formalism quantifies gauge to electromagnetic fields mathematically. Section 2 models mathematically with Theoretical Results Physics Gaging Formalism showing construction of gauge matrices fundamentally from field and energy forms to gauge metrics by applying original micro macro connectivity formalism that author has recently developed [13]; Section 2.1 models by configuring constructs that will abstract derivative formalism of Helmholtz Hamiltonian mechanism partial differential equation sets already developed earlier, formulating Iyer Markoulakis metrics general formalism [11]. Section 3 expounds Physical Analysis with Results and Discussions. Section 3.1 shows with a brief note about how Helmholtz metrics will gauge to axial eccentric quantum fields gravity. Section 3.2 superimposes conceptually model of Signal Superluminal Profile Graph onto Proper Real Extended Time. Section 3.3 applies ansatz gauge metrix formalism to Particle Physics Gauge Matrix to model a way to quantify Helmholtz Hamiltonian Mechanics to Dirac Monopoles. Section 3.4 shows Quantum Astrophysics Gauge Matrix conceptualizations, then Section 3.5 extends formalism with interpretations on virtual gravitational dipoles, as well as newly developing concept gravitational monopoles at Planck dimensions. Section 4 summarizes modeling ansatz gauge general formalisms with application to unitarization, linking to special unitary groups.

2. Theoretical Results Physics Gaging Formalism

Problem 2.1. Hamiltonian Schrodinger wave function is not a gauge invariant Lagrangian, hence it will have to undergo transformation also called gauge transformation in this context obtaining the unitary equivalent Schrödinger equation [14]; per author's explanations that will constitute essentially acting like functor, i. e. physically distinct categories.

Hint literature solving problem: In recent years, functor – category of cobordisms - extending topological quantum field theory (TQFT) has been completely formalized with action functional that generates geometrically quantized models [15]. Schrodinger equation will be made invariant under gauge transformation, by changing the wavefunction by a phase $e^{ie\Lambda/\hbar c}$ [16], acting like a function that generate functional coupling categories. In Schwarz-type TQFTs, the correlation functions or partition functions of a system are computed by the path integral of metric-independent action functionals. For example, in time-dependent correlation functions, the time-ordering operator is included; these typical correlation functions are also simply called correlators. The correlation function can also be interpreted physically as the amplitude for propagation of a particle or excitation between y and x parameters, having equations-like with product of wave functions [17]. The Fock complex vertex operator implements the aspects of those interactions in the

BRST-BV formulation of the theory, for example [18]. The Fock space special unitary group is built upon the spin 0 ground state, then getting natural grading [19]. Fock space may be considered as an algebraic technique used in quantum mechanics to construct the quantum states space of a variable or unknown number of identical particles from a single particle Hilbert space; also, one may infer informally, a Fock space is the sum of a set of Hilbert spaces representing zero particle states, one particle states, two particle states, and so on [20]. If the identical particles are bosons, the n-particle states are vectors in a symmetrized tensor product of n single-particle Hilbert spaces; for example, if the identical particles are fermions, the n-particle states are vectors in an anti-symmetrized tensor product of n single-particle Hilbert spaces; also, technically the Fock space is the Hilbert space completion of the direct sum of the symmetric or antisymmetric tensors in the tensor powers of a single-particle Hilbert space [19, 20].

Solution: Applying above ïnt literature", having a coupling function to the quantum wave function may enable transforming of a typical functor, which is mathematically equivalently logic of physically distinct categories, compatibly to gauge functional, that will equivalently make tensor or vector to scalar. To achieve this, author has developed matrix process general formalism with Equation (11) [13]: $F_t^E = \rho(t)(< \Psi_\mu(t)|\Psi^\mu(t) >)^{-1}V$ that can be graphed by setting $Y = f(X)$, with $X = \rho(t)$ and $Y = F_t^E$, representing observables' functional commutator varying with quantum density matrix, $\rho(t)$ characterizing pure state, like coupling constant of general relativity. From these, we can interpret that f, the function operator transforms micro to macro parametrically quantum density matrix, $\rho(t)$ to functional commutator, F_t^E, with inner product of up and down aspects of vortex action wave eigenfunctions, $\Psi_\mu(t)$ and $\Psi^\mu(t)$, acting alongside general energy fields, V, like scalar potential in general relativity. Author has also inferred that effectively, quantum density matrix, $\rho(t)$ can be seen to be influencing time event process via energy quanta, wherein time fields that are typical of micro-blackholes analytically are extractable from partial differential equations (43) and (46) that have already been developed and presented all within modeling of Iyer Markoulis formalism [11] characterizing these processes. Notable is also that outliers with $X - Y$ plot of real data may provide observables of monopoles that may be measurable systematically with physical analysis, such as observables measured experimentally in Bose-Einstein condensates as well as within experimental measurements of monopoles using spin ice specifics [11, 12]. Author will exemplify these further in subsequent analysis here, applying this formalism enabling gaging of Helmholtz Hamiltonian mechanics to electromagnetic quantum fields, following transformation of Helmholtz metrics via Coulomb gauge in Section 2.1.

2.1. Configuring Abstraction through Derivative Formalism from Iyer Markoulakis Helmholtz Hamiltonian to the Amperian Gilbertian Hilbert Coulomb Matrix Gauge

Originally, Helmholtz matrix operating Density Field Matrix Eigenvector Operators per magneton [10, 11] observations lead to physical mathematical quantum constructs [11, 12] that shows the Helmholtz matrix equated to gauge parameters:

$$\begin{pmatrix} \hat{\varepsilon}_{r,\mu\nu} & \hat{\varepsilon}_g^{\mu\nu} \\ \hat{\varepsilon}_{g,\mu\nu} & \hat{\varepsilon}_r^{\mu\nu} \end{pmatrix} \tag{2.1}$$

with $\hat{\varepsilon}_{r,\mu\nu} = 0$ and $\hat{\varepsilon}_r^{\mu\nu} = \hat{M}$ for rotational vortex fields, while $\hat{\varepsilon}_g^{\mu\nu} = \hat{G}$ and $\hat{\varepsilon}_{g,\mu\nu} = \hat{G}^{-1}$ for gradient fields, according to gauge and non-gauge field tensor operationally. M's are Hilbert gauge like Higgs metrics mass of Higgs-Boson matter, while $\hat{G}$is the Coulomb gauge equivalent fields representation, with the $\hat{G}^{-1}$ is the Coulomb inverse equivalent fields representing vortex.

Partial differential equations characterizing zero-point microblackhole entities Hamiltonian operator physics have been developed elsewhere [11, 12]:

- (i) Zero_point Hamiltonian operator eigen fields tensor zero_point gradient differential equations energy gradient fields are given by [11] erratum sent to the journal PAIJ:

$$\nabla^3 E_g^{\mu\nu}.\nabla^2 E_{g,\mu\nu} = \nabla^3 E_{g,\mu\nu}.\nabla^2 E_g^{\mu\nu} \tag{2.2}$$

- (i) microblackhole Hamiltonian operator eigen fields rotational tensor microblackhole differential equations with Helmholtz rotational fields are given by [11]:

$$\nabla^2\varepsilon_{r,\mu\nu} - \{i(t_f - t_i)/\hbar\}[\varepsilon_{r,\mu\nu}(1+\ln|\varepsilon_{r,\mu\nu}|)]^{-1}(\nabla\varepsilon_{r,\mu\nu})^2 + \{i(t_f - t_i)/\hbar\}[\varepsilon_{r,\mu\nu}/(1+\ln|\varepsilon_{r,\mu\nu}|)] = 0 \tag{2.3}$$

$$\nabla^2\varepsilon_r^{\mu\nu} - \{i(t_f - t_i)/\hbar\}[\varepsilon_r^{\mu\nu}(1+\ln|\varepsilon_r^{\mu\nu}|)]^{-1}(\nabla\varepsilon_r^{\mu\nu})^2 + \{i(t_f - t_i)/\hbar\}[\varepsilon_r^{\mu\nu}/(1+\ln|\varepsilon_r^{\mu\nu}|)] = 0 \tag{2.4}$$

To conform with system of P.D.E.s, $\hat{\varepsilon}_g$ must be transformed to the energy form characteristics like: $\hat{\varepsilon}_g :=> E_g$; however, $\hat{\varepsilon}_r$ must be in field forms $\hat{\varepsilon}_r :=> \hat{\varepsilon}_r$. Therefore, applying Equations 2.2, 2.3, & 2.4, Equation 2.1 equivalent Helmholtz matrix will have characteristics:

$$\begin{pmatrix} \hat{\varepsilon}_{r,\mu\nu} & \hat{\varepsilon}_g^{\mu\nu} \\ \hat{\varepsilon}_{g,\mu\nu} & \hat{\varepsilon}_r^{\mu\nu} \end{pmatrix} =>::<= \begin{pmatrix} \hat{\varepsilon}_{r,\mu\nu} & \nabla^2\hat{E}_g^{\mu\nu} \\ \nabla^2\hat{E}_{g,\mu\nu} & \hat{\varepsilon}_r^{\mu\nu} \end{pmatrix} \tag{2.5}$$

Note: It is possible to transform from Helmholtz metrics, using Coulomb gauge that will link to Coulomb branch gauge group with Hilbert series having SuperSymmetry (SUSY) Quantum Field Theory (QFT) charge conjugation [21, 22]. Subsequent to that it is possible to link charge conjugation to rotating charges per Dirac Maxwell Einstein Kerr Newmann metrics [23, 24].

Based on the arguments [11, 12, 21-24] and above explanations, we transform Helmholtz matrix Equation 2.5 onto gauge matrix, i.e. we convert Helmholtz to gauge by having equivalently Helmholtz metrics to Coulomb gauge: $\{\nabla^2 E_{g,\mu\nu}, \nabla^2 E_g^{\mu\nu}\}| => \{\hat{G}_{g,\mu\nu}, \hat{G}_g^{\mu\nu}\}$, with branching to Hilbert gauge $\{\hat{\varepsilon}_{r,\mu\nu}, \hat{\varepsilon}_r^{\mu\nu}\}| => \{\hat{M}_{r,\mu\nu}, \hat{M}_r^{\mu\nu}\}$, having M's like Higgs metrics mass of Higgs-Boson matter. Equation 2.5 then will become:

$$\begin{pmatrix} \hat{\varepsilon}_{r,\mu\nu} & \nabla^2\hat{E}_g^{\mu\nu} \\ \nabla^2\hat{E}_{g,\mu\nu} & \hat{\varepsilon}_r^{\mu\nu} \end{pmatrix} | =><= | \begin{pmatrix} \hat{M}_{r,\mu\nu} & \nabla^2\hat{G}_g^{\mu\nu} \\ \nabla^2\hat{G}_{g,\mu\nu} & \hat{M}_r^{\mu\nu} \end{pmatrix} \tag{2.6}$$

Additionally, per arguments [11], gradient zero-point $\{\nabla^2\hat{E}_{g,\mu\nu}, \nabla^2\hat{E}_g^{\mu\nu}\}| => \{\hat{G}_{g,\mu\nu}, \hat{G}_g^{\mu\nu}\}$ will have Gilbertian nature, and the $\{\hat{\varepsilon}_{r,\mu\nu}, \hat{\varepsilon}_r^{\mu\nu}\}| => \{\hat{M}_{r,\mu\nu}, \hat{M}_r^{\mu\nu}\}$ will have Amperian nature. We can show that in vacuum gravitational fields, $\hat{M}_{r,\mu\nu} -> 0$ and $\|\hat{M}_r^{\mu\nu}\| \equiv M$, representing like the flavor Higgs-Boson matter mass, quantifying inertia with gravitational field manifestations. Wherefore, Equation 2.7 will become in vacuum gravitational fields:

$$\begin{pmatrix} \hat{M}_{r,\mu\nu} & \nabla^2\hat{G}_g^{\mu\nu} \\ \nabla^2\hat{G}_{g,\mu\nu} & \hat{M}_r^{\mu\nu} \end{pmatrix} | =><= | \begin{pmatrix} 0 & \hat{G} \\ \hat{G}^{-1} & \hat{M} \end{pmatrix} \tag{2.7}$$

with $\hat{G} \equiv$ gauge, $[G]$; $[G]^{-1} \equiv$ gauge inverter, $[G]^{-1}$; $\hat{M} \equiv$ flavor or the dark matter energy, $[M]$, giving determinant equation of 0. $M - \hat{G}^{-1}\hat{G} = 0 - I$, having magnitude of -1. We may also rewrite:

$$\begin{pmatrix} 0 & \hat{G} \\ \hat{G}^{-1} & \hat{M} \end{pmatrix} \tag{2.8}$$

to have unitary determinant

$$\begin{pmatrix} 0 & \hat{G} \\ -\hat{G}^{-1} & \hat{M} \end{pmatrix} \tag{2.9}$$

so that determinant of this matrix is an identity I, instead of $-I$. Further, $-\hat{G}^{-1}$ will represent a point mirror symmetry of $\hat{G}$. These aspects will be addressed further in crystal point mathematical formalism proofs with "Rotation Matrix" in later publications of the Materials Science Group Theory, deriving formalism with point matrix reflection imaginary parity value.

3. Physical Analysis with Results, Discussions, and further Applications

It can also be noted by comparison with physics literature these results have similarity or an analogous model reflective of non-Hermitian quantum CPT physics [25]. We may also note that this matrix in Equation 2.9 can represent PT symmetry with quaternion typically having typical "-1 problem" [25-30]. In subsequent papers, author will highlight analyzing these aspects. What the above foregoing results and discussions analytically project will be capable is to have extension of gauge matrix metrics, having Equation 2.9 like stringmetrics, shown below.

$$\left(\begin{matrix} \overbrace{\qquad}^{0} & \hat{G} \\ \left(\begin{matrix} \overbrace{\qquad}^{0} & \hat{G} \\ \left(\begin{matrix} \overbrace{\qquad}^{0} & \hat{G} \\ \begin{pmatrix} 0 & \hat{G} \\ \hat{G}^{-1} & \hat{M} \end{pmatrix} G^{-1} & \hat{M} \end{matrix}\right) G^{-1} & \hat{M} \end{matrix}\right) G^{-1} & \hat{M} \end{matrix}\right) \tag{3.1}$$

Graphic Figure Equation 3.1 Matrix construct showing charge asymmetry gauge metrics key.

Essentially, $\hat{G}^{-1} -> \hat{G}$, cross-diagonal, will extend like gauge "ray" analogous to negative charge like fermion or electron of Gilbertian nature from infinity bringing to real spacelike volt or potential; it is like classical definition of potential unit volt. However, non-gauge with $\hat{G}^{-1}$ also refer to point mirror symmetry of $\hat{G}$, as pointed out earlier, which is adequately considerable as gauge field having "star ray". In essence, therefore $\hat{G}^{-1} -> \hat{G}$ will represent Coulomb gauge fermion charge of microblackhole from infinity of vacuum to real space gauge field of radiation wave. These aspects link charge conjugation to rotating charges per Dirac Maxwell Einstein Kerr Newman metrics [23, 24].

Whereas $0 -> \hat{M}$, the diagonal Hilbert Higgs metrics within physics literature [22], perhaps quantifies Higgs mechanistic field operator generator, signifying action to matter inertia effectively operating with gravitational field moving from vacuum to matter; M in general will represent Helmholtz transformation symplectics to Higgs field, having subsequent Higgs mechanism to originate God particle giving flavor in the particle mass of Higgs Boson system [11, 12,21-29].

4. Summary conclusions

Physical analysis explaining Helmholtz metrics gaging to axial eccentric quantum fields gravity, superimposing model of signal superluminal profile Graph onto proper and real extended time gauge, particle physics gauge matrix to model a way to quantify Helmholtz Hamiltonian mechanics to Dirac monopoles, quantum astrophysics gauge matrix conceptualizations, formalism applying to interpretations on virtual gravitational dipoles, vacuum, and gravitational monopoles at Planck dimensions.

Author is already working to have verification of physical observables with experimental physicists, that will also span quantum, mesoscopic, astrophysical quantum relativistic and classical consistency within a material environmental system having order of magnitude validity, thus narrowing the current range of trillions differential magnitude existing presently. Fundamental logical physical mathematics abstracting observable phenomena mechanisms provide key to physics natural quantifiability that these formalisms demonstrate adequately. Gauge metrics set proper situations to apply unitarization processes that help in gauge matching special unitary group mathematical physics will be next step that author is hoping to undertake. Author hopes having applications spanning across many branches of science, engineering, technology, algorithmic mathematics application to Information Systems, specifically extending to artificial expert systems with quantum computing physics.

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