

A quantum injective frame is a frame capable of differentiating states based on their respective frame measurements, whereas the quantum-detection problem associated with frames endeavors to delineate all such frames. In the present paper, the concept of injective frames in infinite dimensional quaternionic Hilbert spaces is introduced. Further, some ...

Our proposed quadratic quantum battery exhibits various desirable features, including storing only relatively small amounts of useless energy, allowing for the possibility of ...

Our findings indicate that in the limiting case of  $n_0 \gg N_b$  or  $N_b \gg n_0$ , a distinct  $SU(2)$  symmetry emerges in the dynamics, thereby ensuring the realization of optimal energy ...

The Cauchy equation of motion and the overall energy density of the deformation field in the quaternion formulation equal [14]  $\frac{1}{2} \rho_0 v^2 + \frac{1}{2} \rho_0 \dot{\phi}^2$  where  $\rho_0$  denote the deformation energy and the mass densities in the P-KC respectively,  $v$  is the mass velocity in the quaternion representation:  $\phi = \frac{1}{2} \text{tr}(\mathbf{L} \mathbf{L}^T)$

The suppressed information in question, is a new solution to the equations of Maxwell, that will apparently solve questions of: neutrino theory; gravitational expression and propagation speed ...

We present a statistical simulation replicating the correlation observed in EPR coincidence experiments without needing non-local connectivity. We define spin coherence as a spin attribute that complements polarization by being anti-symmetric and generating helicity. Point particle spin becomes structured with two orthogonal magnetic moments, each with a spin of ...

Quaternions are a natural framework of 4D space-time, where the unit element relates to time, and three others relate to 3D space. We define a quaternion set of differential torsion operators (shifts with rotations) that act to the energy-momentum tensor written on the same quaternion basis. It results in the equations of gravity-torsion (gravitomagnetic) fields that ...

The Fourier transform plays a crucial role in statistics, applied mathematics, and engineering sciences. In this study, we give a definition of the two-dimensional quaternion Fourier transform, which is an extension of the two-dimensional Fourier transform. We present a new convolution theorem including this transformation. We study the characteristic function in the ...

We show that quaternion quantum mechanics has well-founded mathematical roots and can be derived from the model of the elastic continuum by French mathematician Augustin Cauchy, i.e., it can be regarded as representing the physical reality of elastic continuum. Starting from the Cauchy theory (classical balance

equations for isotropic Cauchy-elastic material) and using the ...

The correspondence between classical and quaternion quantum equations permits one to consider the universe (vacuum) as an ideal elastic solid. . . . The energy computed using Formula (33) is per definition always positive due to the constraint (31). The system (34) is a hyperbolic-elliptic quaternion representation of a the wave and has ...

The correspondence between classical and quaternion quantum equations permits one to consider the universe (vacuum) as an ideal elastic solid. ... Tension induced by the compression and twisting of the elastic medium would increase energy density, and as a result, generate gravity forcing and affect the wave speed. Consequently, gravity could ...

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Quaternions are hypercomplex numbers that are similar to complex numbers in values but noncommutative. Quaternions were extensively used in quantum mechanics by S.L. Adler [98, ]. Recently, quaternions are gaining much popularity since their use in relativistic quantum mechanics by S. Giardino [10], B.C. Chanyal [11] and in

We presented the foundation of Quaternion Quantum Mechanics based on the Cauchy model of the elastic continuum. Cauchy model of an ideal elastic solid with the Helmholtz decomposition theorem and the quaternion algebra generates the transverse, longitudinal and ...

In recent years, quaternions have emerged as powerful tools in higher-dimensional quantum mechanics as they provide homogeneous four-dimensional structures in relativistic quantum mechanics and provide representations in terms of compact notations [1,2,3]. Also, spin is a natural outcome of using quaternion as they are represented in terms of ...

where  $A$  is a Hermitian matrix.. Since the quaternions were first proposed by the Irish mathematician W. R. Hamilton in 1843 [], which provided methods and theoretical tools for the fields of quantum mechanics, relativity, etc [3,4,5,6,7]. Moreover, many researchers have studied quantum theories with two or more independent anticommuting ( $\{\mathrm{i}\}$ ) "s, have ...

The correspondence between classical and quaternion quantum equations permits one to consider the universe (vacuum) as an ideal elastic solid. Elementary particles would have to be standing or ...

Quaternion quantum mechanics, QQM, presented by us is ontic in the sense that it answers the central question of interpretation of quantum mechanics. It is directly related to being ... However, the problem stays

when one asks what happens with the mass and energy of a particle when its wave-function collapses. Notice that the instantaneous ...

This work explores dual quaternions and their applications. First, a theoretical construction begins at dual numbers, extends to dual vectors, and culminates in dual quaternions. The physical foundations behind the developed theory lie in two important fundamentals: Chasles' Theorem and the Transference Principle. The former addresses how to represent rigid-body ...

Sulfur cathode materials in rechargeable lithium-sulfur (Li-S) batteries have a high theoretical capacity and specific energy density, low cost, and meet the requirements of portable high electric storage devices []. Due to their small particle size, large surface area, and adjustable surface function, [] quantum dots (QDs) can be used as the modified material of ...

Entropy 2020, 22, 1424 4 of 20 particle-wave duality and the assumption of covariant &#230;ther [23,24]. Recently Gantner demonstrated the equivalence of complex and quaternionic quantum mechanics [25].

Quaternion quantum mechanics has well-founded mathematical roots and can be derived from the model of the elastic continuum by French mathematician Augustin Cauchy, i.e., it can be regarded as representing the physical reality of elastic continuum. ... A particle in this universe is essentially localized wave energy, so a volume of space that ...

The quaternions that commute with all other quaternions are just the reals. The quaternions that commute with a given nonreal quaternion form a subset isomorphic to the complex numbers. There exists an operation  $q \rightarrow qQ$  on the quaternions that is involutory ( $qQq=Q$ ), Hermitian definite ( $qQq$  is real, and vanishes

A quaternionic wavefunction consisting of real and scalar functions is found to satisfy the quaternionic momentum eigen value equation. Each of these components is found to satisfy a generalized damped wave equation. This reduces to the massless Klein-Gordon equation for certain cases. For a plane wave solution the angular frequency is complex. This ...

holds for all quaternions, it follows that the group  $Sp(1)$  is isomorphic to the group of unit quaternions that form a sphere  $S^3$  in  $\mathbb{H}$  for  $2 \leq n \leq 3$ . The Geometry of a Single Qubit The "quantum bit" or "qubit" plays the role of a "bit" in quantum computing [8] and constitutes a unit of quantum information [8-9].

In recent years, quaternion matrix decomposition theory, quaternion matrix eigenvalue theory, special solutions (Hermitian, generalized Hermitian, positive definite, real part symmetric) to quaternion matrix equation or systems, to name but a few examples, have been active areas of research. In color image processing, we can encode the red ...

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# Quaternion quantum energy storage

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