

B-QUARKS, WI AND KLEIN BOTTLE

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Abstract. The quark geometry is postulated in an octonian world since they are not visible. For the weak interaction the octonians double up the coordinates for energy scalars. The rgb-gravitons are postulated for nucleon tetrahedrons with a three quarks dihedral D_3 . New finite dihedral symmetries guide also the neutrino oscillations. They are added to the standard models $U(1) \times SU(2) \times SU(3)$ and the CPT symmetry of physics. Eight energies or charges are postulated: color, electrical, mass charges, heat, electromagnetic/light, kinetic, magnetic, rotational/angular energies. A compass with a needle and circle $U(1)$ sets most six valued cycles in different form: six color or electrical or mass charges. Gleason frames are new quantum measuring apparati and carry three real or complex or quaternionic scalar values on their spin-like orthogonal base 3-dimensional frame. They are for the measurement Copenhagen interpretation. Wave descriptions for energy systems are on the last octonian coordinate which introduces through the $U(1)$ circle exponential or other functional descriptions for physical systems.

Keywords: *B-Quarks, weak interaction, projective, geometry*

Introduction

In this article methods from the MINT-Wigris research project (Frank, 1990) are applied to invisible quarks. The first method is to use the pole structure for charges like mass and electrical charge, having potentials b/r , r radius, b a real constant. There is a dihedral D_2 symmetry, a shape of a solid brezel of genus 2 and a 1-dimensional lemniscate retract as geometry of radius inverted quarks in black holes suggested. For a common 5-dimensional, projective electromagnetic and gravity potential field POT of (Schmutzer, 2004) quarks can serve as POT quantum. Their six color charges as third energy indicate that before the strong interaction confines them through gluon exchanges they are present in a complex 3-dimensional C^3 , real 6-dimensional R^6 projective space.

To the 5 dimensions is added a projective additional coordinate since the space in (Postan and Stewart, 2012) is a real linear vector space R^5 (norming one coordinate to a constant 1) having a 5-dimensional projector pr_5 . To the weak interactions spacetime as a complex C^2 space (z_1, z_2) with the weak symmetry $SU(2)$ a complex cross product $z_3 = (e_5, e_6) = z_1 \times z_2$ is added as an Einstein energy plane for a mass m coordinate e_5 and a frequency f coordinate e_6 with the line $mc^2 = hf$, c speed of light, h the Planck quantum. Projective duality uses correlations for changing dimensions and admits for quarks in R^5 to get as retract in black holes the 1-dimensional lemniscates, being 3-dimensional when radius inverted at the black holes Schwarzschild radius. Hitting frequencies admit their 2 pole geometry. For quarks energy exchange with an environment not only gluons (for the strong interaction) act.

One method for their decay is to provide quarks brezels with two polar caps as Klein bottle on a Bohr shell, An electrical charged weak boson can be emitted from a single quark through an input or output directed vector on one cap. This kind of decay can also happen when they are bound in a proton and neutron of a deuteron. An isospin exchange is postulated between a paired u - and d -quark. In case of single quarks this

cyclic energy transfer and a weak 4 roll rotor is missing. The weak rotor is discussed in the article independent of quarks (*Figure 1*).

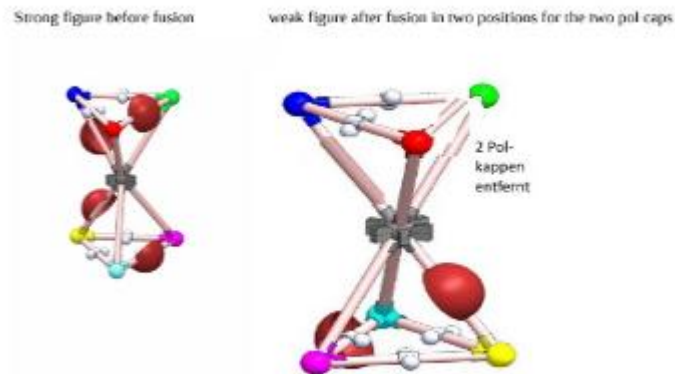


Figure 1. Two proton fusion states with polar caps for their positrons, at right deuteron with one lower proton, one upper neutron without one positron.

The second polar cap of the Klein bottle is carrying a quarks color charge as vector which can have a conic rotation (generating a whirl). Quarks mass as weight is located in nucleons at the endpoint of a spin-like *rgb*-graviton whirl. They present the neutral color charge red-green-blue of all nucleons independent of the quarks gluon exchange in nucleons and are superpositions of the three quark color charge whirls. In a crystalized version the *rgb*-graviton whirl has its tip in the center of a deuteron and forms as base triple a tetrahedron as model (*Figure 2*) with the quarks sitting at the endpoints of its three pairwise orthogonal vectors.

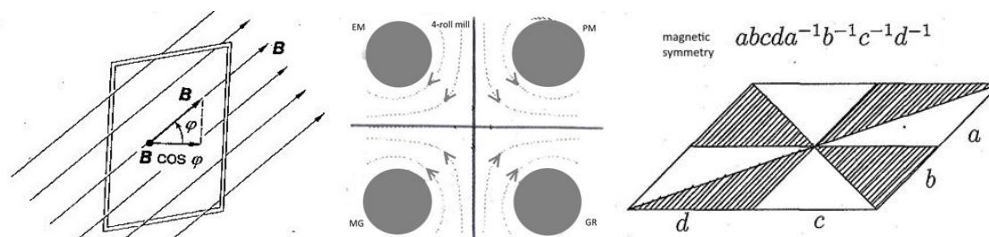


Figure 2. Loop and magnetic field at left, 4 roll mill middle, at right magnetic group.

The new tetrahedrons discrete symmetry of order 24 factozies through the quark dihedrals CPT Klein symmetry of order 4. Obtained are for the equivalence classes that each color charge has associated one of the C^3 coordinates, has a symmetry of the quark triangle D_3 group (similar as spin has the Pauli symmetry of $SU(2)$ generators). The fourth member in each class is one out of six basic energies (two for POT, kinetic, rotation, magnetic, heat). The D_3 symmetry has a presentation as an Si rotor which is not discussed in this article (Kalmbach, 2019a). Mentioned is that through conic rotations of the triangles sides barycentrical coordinates for a nucleon are generaed.

In their intersections a Higgs boson sets a nucleons mass. It is not the sum of the quarks mass m_0 . Quantum chromodynamics calculates m_0 down to about 10 or less percent of the nucleon mass which is used for *rgb*-gravitons POT field. Inner kinetic energies like $f = mc^2/h$ are added to the measured nucleon mass. If a nucleon is presented as a wave package, using the Schroedinger equation, also a Minkowski rescaling of nucleons mass $m = m_0 \cos \theta$ with $\sin \theta = v/c$, v relativistic speed, can contribute to the

high nucleon mass. It is needed for getting a common group speed of the nucleon parts with which it moves on its world line. This shows that for quarks not only the *rgb*-gravitons as a ninth color charge field quantum for gravity is important, but also the SI rotor which the generation of barycentric, not Euclidean (spin) space *xyz*-coordinates.

Materials and Methods

To the physics standard model with the $U(1) \times SU(2) \times SU(3)$ symmetry are added in this investigation finite symmetries like the Klein group of the quark dihedral D_2 , the quark triangle S_3 , S_4 of the tetrahedron. The affine special relativistic Minkowski geometry is projective extended to a real projective P^5 space which allows changes of dimensions. As new measuring devices according to the Copenhagen interpretation for quantum measures are added the Gleason frames GF as spin-like orthogonal vector base triples. Their weights attached to the three vectors can be non-negative real numbers with sum > 0 or complex or quaternionic numbers. Beside the new *rgb*-graviton GF, as well the SI rotor as the weak rotor have a measuring GF. The weak interaction allows a doubling of quaternionic to octonian coordinates which is useful for getting coordinate triples for the GF. Also the 8 dimensions of the strong symmetry $SU(3)$ allows them. The MINT-Wigris postulates are based on an octonian vector space. Beside the C^3 it has a G-compass as 2 more coordinates. One is a rolled Kaluza-Klein coordinate for the electromagnetic interaction $U(1)$ symmetry. The first octonian coordinate provides a vector needle for the $U(1)$ compasses disk. It can set units for measuring the energy coordinates and generates in discrete form numerical or energy based cyclic structures with the *n*th roots of unity (Figure 3).

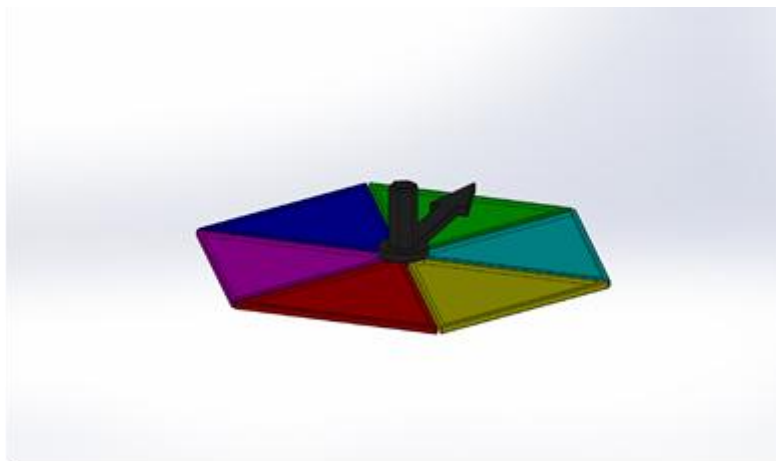


Figure 3. G-compass with six color charge condensor-like segments.

Results and Discussion

Quarks

As a MINT-Wigris postulate 1 in (Kalmbach, 2019b) it is assumed that quarks in black holes are 1-dimensional retracted to a lemniscate. As Lissajous figure, the lemniscate can be presented in the form that two frequencies in proportion 2:1 hit orthogonal in a *xy*-plane with $x = \cos \varphi$, $y = \sin \varphi \cdot \cos \varphi = (\sin 2\varphi)/2$. The lemniscate equation is $x^4 - x^2 + y^2 = 0$. In Postpon and Steward (2012), a unified 5-dimensional

projective field is presented as a unification of an electrical and gravity/mass potential. MINT-Wigris call its force POT and quarks are the quantum for POT. The two lemniscate foci are poles for a quarks mass and electrical charge. The inverted geometry for the lemniscate when a black hole decays at its Schwarzschild radius is a quark brezel of genus 2 (Figure 4).

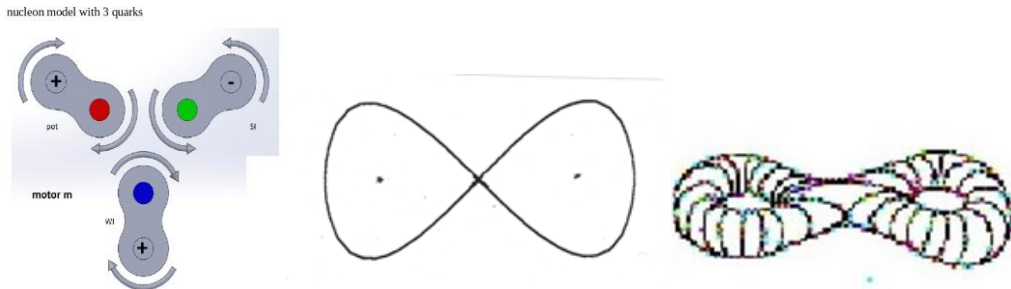


Figure 4. Lemniscate at left, quark brezel of genus 2 below, at right 3 r,g,b,quarks in a nucleon (2-dimensional section and a rotation marked).

For quarks a 2 roll mill applies as dihedral D_2 with the Klein group $Z_2 \times Z_2$ as CPT symmetry (Figure 5). C, P, T are the physics operators of order 2 conjugation, parity, time reversal. P is a rotation by 180 degrees of D_2 , C,T are reflections. C presents on a circle the cw or mpo rotation. P associates with a point p in a space its negative -p. For S^2 it means identifying these points that a projective space P^2 is generated. Instead of a P^2 it is suggested that the caps space for a quark is a Klein bottle where two Moebius strips are joined at their bounding circle. If presented as two polar caps of an atomospheric S^2 , on a Moebius strip in the upper (lower) cap rotate the vectors by 360 degrees and change from an up to an opposite down direction.

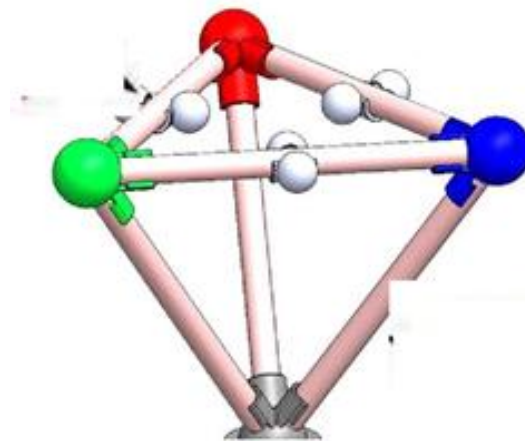


Figure 5. nucleon tetrahedron with three color charged r, g, b quarks at the upper triangle; the gluons as balls are marked on the sides of the triangle and the tip of the **rgb**-graviton is at the bottom point 4.

For the associated, exchanged energies on the caps it means that they can be absorbed or emitted from the quark in its environment. Decay of the quark means that a weak boson is emitted and the EM charge changes (red cap and vector). For single quarks decay is mentioned that in the MINT-Wigris postulate 3 the decay is blocked off by the tetrahedron figure where at the spin-like (e_1, e_2, e_6) octonian coordinates color

charged *rgb*-graviton whirl these vectors have a quark added, having as a measuring weight a quaternionic four tuple (EM electromagnetic charge, MG magnetic energy, GR gravity as mass, color charge) at e_j which presents the quark. Stable states confinement of quarks in their nucleon with neutral *rgb* color charge for the three belongs to the paired SI strong gluon exchange between quarks.

The WI rotor

The symmetry Z_4 of order 4 is generated by the second Pauli matrix with first row (0 1) and second row (-1 0). It presents the complex number i with $i^2 = -1$ in operator (transformation) form. The WI rotor is similar constructed as the SI rotor for nucleons (postulate 3 in Kalmbach (2019b) which uses the nucleons quark triangle symmetry D_3 and a symmetry 6-cycle for the change of states. The SI rotor has in the MINT-Wigris project functional integrations when states are changing. For the WI rotor three differentiations are assumed when states change. POT as function $-b/r$, r radius, b a scalar, is differentiated to b/r^2 . It can also be used for differentiating space x -coordinate functions $df(x)/dx$. Differentiating kinetic (rotational) energy $E(\text{kin}) = mv^2/2$ ($E(\text{rot}) = m\omega^2/2$) gives momentum $p = mv$, m mass, $v = dx/dt$, speed (angular momentum $L = r \times p = r^2 m \omega$, $\omega = d\phi/dt$) angular speed for rotation). As space coordinate x or polar r can be taken for POT and for $E(\text{rot})$ z or the spherical angle θ . Energies are attached to these coordinates: x or r is for the electrical potential EM(pot) (or EM), $E(\text{rot})$ for z or θ . For $E(\text{kin})$ a new octonian coordinate e_6 is added to the spacetime coordinates ($e_1 = x, e_2 = y, e_3 = z, e_4 = t$), t time, and for mass potential $E(\text{pot})$ (or GR, belonging to POT) an octonian coordinate e_5 . For time it is assumed that its magnetic energy $E(\text{magn})$ (or MG) as flow Φ is area dA differentiated to induction B as $B = d\Phi/dA$. The inverse integration from B uses an angle ϕ in $\Phi = B \cos \phi dA$ where the flow crosses transversally an electrical currents loop in this angle (*Figure 1*). As usual, B is an angular momentum for the loop rotation and defined as cross product. The spin matrix operators for x, y, z as Pauli matrices allow the magnetic dihedral group D_4 of order 8 as signed matrices. Similar to the 6 roll mill for the SI rotor of Kalmbach (2019a) (postulate 6 in Kalmbach (2019b) there is a 4 roll mill for the WI rotor whose rolles correspond to the four points of the dihedral D_4 .

There is a change of orientation for the $E(\text{kin})$ roll PM in *Figure 6* when compared with the 6 roll mill. The 4 roll mill is driven by two forces POT (EM,GR) and WI (MG,PM) where the third driving force strong SI (for $E(\text{heat}), E(\text{rot})$) of the 6 roll mill stopped working. $E(\text{heat})$ is the energy for temperature. In a Hopf geometry figure, the 4 roll mill can be interpreted on a Riemannian sphere S^2 as an EM charge rotation e on a latitude circle C (see also Bohr radii for electrons in an atoms shell), PM the directed speed with which C rotates with e (current like) MG sits with the north pole N at the S^2 north pole together with the initial point of the spin vector and at GR sits as scalar the mass m of a EM charged lepton at the south pole of S^2 (*Figure 6*). In the Hopf fiber bundle blow up points of S^2 are circles S^1 and m sits then on the core of the Hopf tori for C . The change of orientation is for EM + in counterclockwise mpo or clockwise cw in EM - direction. There are two measuring orthogonal base triples like spin as $s = (s_x, s_y, s_z)$ and octonian ($e_1 = x, e_4 = t, e_5$ (for mass)) on S^2 . They are in superposition and MG changes its direction towards s whith EM. For the - charge it points in the gyromagnetic relation in opposite direction as $s = s_z$, for the EM + charge in equal direction to s on the horizontal z -axis through the S^2 poles, setting $t = -z$ or $+z$. The WI

rotor is in this geometry then presented as four possible directions for the parallel normal vectors in the center of the caps $\uparrow\uparrow, \uparrow\downarrow, \downarrow\downarrow, \downarrow\uparrow$.

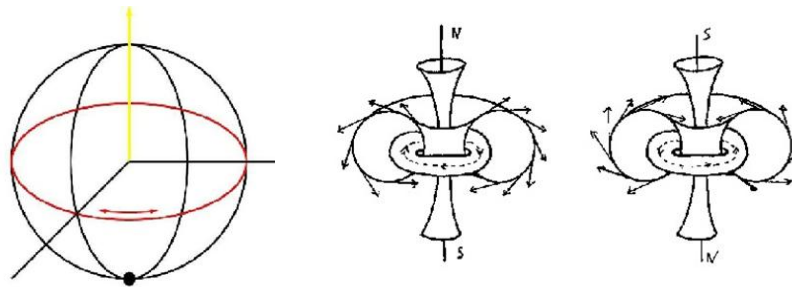


Figure 6. Hopf sphere S^2 at left, Hopf blow up at right.

The MG vector changes in *Figure 4* its direction towards spin too, sitting on a third (not drawn north pole S^2) cap. PM (turquoise cap) changes not towards a spin for the parity violation of the weak interaction, for instance when an electron is emitted from a system, but an emission direction is opposite for a positron. The above list of two vectors describes all possible vector combinations of the four. The WI rotor is in another form available in an article (Kalmbach, 2019b) of the author which introduces the octonians by doubling the quaternions as coordinates for physics.

Recommendations

In use is the MINT-Wigris Tool bag for models which can be used for demonstrations in MINT courses for high school students in Germany. Written materials are available in books or articles for the teachers or other interested persons. Discussions are with the scientific community around the world and locally mostly with teachers. Their models are not reconstructed but have DPMA patents.

Conclusion

It is necessary to add to older theories the new facts found experimentally or in written form since the middle of the last century. Unfortunately the technical, geometric mathematical way is rarely taken up. The MINT-Wigris theory and models is therefore badly needed, especially in teaching. Some books may help to understand the difference. Often the results are not respected or quoted by other authors. Independent of the above presentation the author mentions her 1981 logic result (Kalmbach, 1983) that the quantum range cannot use the Boolean logic modus ponens or deduction theorem when applied to noncommuting operators.

Important is that projective spaces and transformations are revising older geometries. Higher dimensions are necessary for the new computations, but linear octonians seem to be sufficient. The measuring process in the quantum range has to be out on the GF Gleason operator measures. They provide in the orthogonal base triple form the new needed measures according to the Copenhagen interpretation and allow for GF coordinates three real or complex or quaternionic scalars attached. Gravity has to be considered for their generation of nucleons, projectivity, for using central and spiralic maps. All this is discussed mostly in the authors quoted articles or books. Whirls have other computations than waves and have to be added as a third energy character to the

wave particle duality of physics. Symmetries – mostly finite ones - for including gravity have to added to the standard models $U(1)\times SU(2)\times SU(3)$. The new symmetries are for the new models and cannot be added as a product to the standard model.

Conflict of Interest

Author confirm there are no conflict of interest with any parties, group or society.

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