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Case Presentation

Leptonic Octonians

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Leptonic octonians are a new model for leptons technical demonstation. In the weak interactions symmetry SU(2) there are figures arising from the Hopf geometry. For the inner dynamics it is necessary to double up the quaternionic, Euler angle generated calculus to octonians. The listing is: Electrical charge, demonstrated as a rotating point on a Riemannian sphere and set by an electrical field. The neutral charged case is also demonstrated in figure 1.

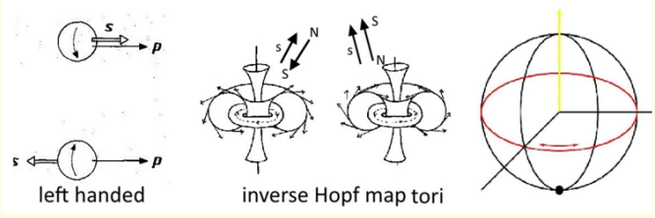

Figure 1: At right Riemannian sphere S^2 with an electrical charge rotating on a Bohr radius of S^2 as point charge (pole), cw for -, mpo counterclockwise for + charges, magnetic momentum μ yellow rotating on the vertical z-axis together with spin s; the charge fills the circle like an electrical or neutral charged current; at left for neutral leptons spin and S^2 surface: momentum p aligned for (right and mpo rh or) left handed lh orientation and cw rotation of the charge in its environment; +μ (-μ) is replacing p in the electrical gyromagnetic relation for the rh (lh) case; at right the 3-dimensional Hopf blow up arising when leptons are generated from weak bosons decay; the figure show the dotted core as retract of the tori which carries the leptons mass at rest, in the S^2 figure it sits at the south pole: the Hopf fiber replaces points on S^2 by a circle/fiber; for the electrical or neutral charge it is a twisted, leaning circle on the tori (cut open in front) with retract to the core; the torus is rotating about the z-axis and the charge is filling the tori area like a condensor plate; the z-axis and the spin plus signed μ or p are leaning in 45 degree towards the z-axis.

The quaternionic coordinate or vector e for the charge is the x-axis. The vector e carries at its tip the electrical (neutral) charge e_0 (n_0).

The magnetic momentum is in the S^2 model along the z-axis as vector, rotating as a whirl together with the rotating spin vectors cone. In figure 1 right it is shown together with the tori rotations.

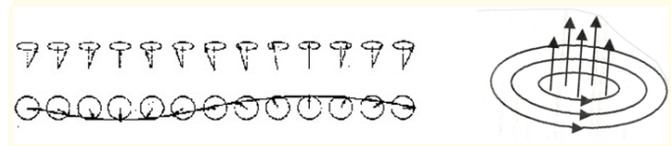

Figure 2: Magnon quasiparticles driving conic rotations, below magnetic field.

In the quaternionic coordinates the magnetic force vector is aligned on the time coordinate. The momentum for the neutral leptons is located on a new octonian e_6 coordinate.

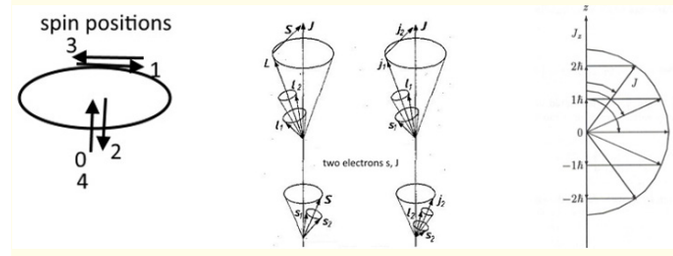

Figure 3: At right electron distributions in atomic shells, middle figure their three cones for spin s, orbital momentum l, both rotating because of the Heisenberg angle-angular momentum uncertainty about a central J = s + l axis; vector addition is generated for physics vectors this way; when spin changes its direction (see the Stern-Gerlach experiment) it rotates on a Moebius strip (left figure) by 360 degrees; Moebius strips arise through the Einstein octonian (e5,e6)-plane where the fifth coordinate is for measuring mass m in kg: the plane contains the Einstein line $mc^2 = hf$, c speed of light, h Planck constant, f frequency; this plane is projective extendend to [m,f,w] coordinates as projective 2-dimensional space P^2; it arises from S^2 by identifying antipodes.

Spin s = (sx,sy,sz) has the three space vectors aligned on the x-, y-, z-axis of quaternions. In octonians they are e_1, e_2, e_3 and time is e_4. Electrons in atomic shells use the nth roots of unity for the different electrons locations of their spins.

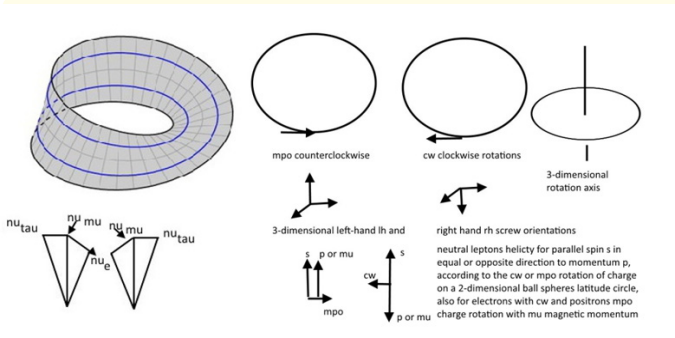

Figure 4: Moebius strip at left, spiralic pendulum contraction or expansion for neutral leptons below, some more figures for the above discussion at right.

For the three cases of inverse Hopf tori surfaces there are retractions of the central xy-plane diameter. The tori of figure 1 are in the next figure (left) as cross section two disjoint circles, when they touch in retraction, a Horn torus with touching point as singularity is for a dark matter or black hole geometry. When they overlap they form a spindle for a neutral leptons Hopf geometry.

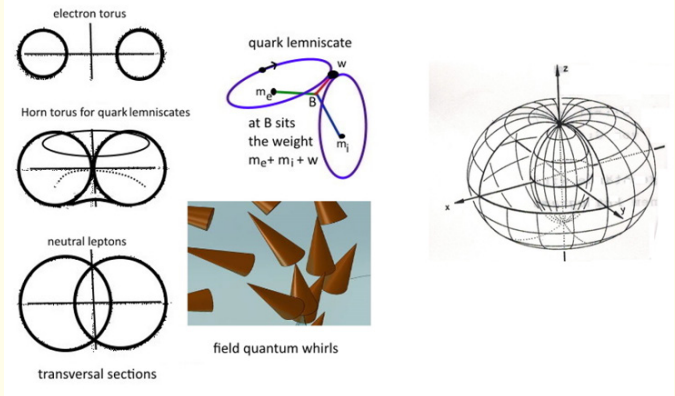

Figure 5: Cross section through tori at left, another quark cross section upper middle (not discussed), below magnetic fields quantum cones, at right a spindle torus for neutral leptons.

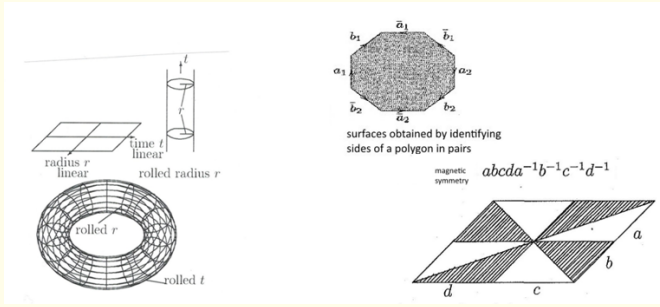

Figure 6: light cylinder and Hopf torus as geometry for periodic functions; at right the construction for surfaces of genus n from identifying pairs of sides from a polygon; genus 1 is for the torus, genus 2 for the (3-dimensional blown up) quark brezel (next figure), genus 3 for a nucleon and its 3 quarks, genus 4 for a weak WI rotor, 6 for a strong dynamical SI rotor and its 6 roll mill; lower right: magnetic group.

The wave presentation of leptons requires a new octonian e_7 coordinate. In figure 6 is is shown that in a plane a line for the light expansion in time is periodically rolled by cutting the plane into vertical infinite strips of width 2π. The wave equations of physics use the complex exponential function exp(iφ) = cos φ + i sin φ (= x + iy) with period 2π. By identifying the sides of the strip, for the electromagnetic interactions coordinates an infinite cylinder arises. The Kaluza Klein cross cut circle arises from closing projective the octonian linear coordinate e_7 to a circle. The stereographic map can be used by mapping from a north pole ∞ of the circle to a tangent line in the south pole as e_7. The former light expansion world line is a helix line on the cylinder. When also in the horizontal direction is a period for leptons, the former torus is obtained by identifying a finite cylinders upper and lower circles.

The weak Heegard decompositions are shown in the next figure. Colliding particles are intermediately stored in weak boson S^3 as solid 3-dimensional unit sphere in spacetime. They decay mostly into two particles. For a neutral Z^0 boson two photons as finite cylinders with an integer number of helix lines on the cylinder are generated, also an electron and positron can be generated. They arise in W- or W+ weak boson decays together with their corresponding neutral lepton, antineutrino in the first, neutrino in the second case.

One new octonian coordinate is e_0, a unit vectors setting cross product of the former seven real coordinates. It is understood like the e_7 coordinate as a vectorial direction in which an energy force or speed is acting when projected into spacetime. The unit vectors set for energies on the coordinates, listed by indices: on 1 either length in meter or electrical charge e, on 2 either length or heat measured in k Kelvin, on 3 either length or rotational energy with a E(rot) measure, on 4 either time measured in seconds or magnetic strenght measured in Tesla, on 5 mass measured in kg, on 6 frequency measured in Hz. The Kaluza-Klein circle is used for a compass in the (e_0,e_7)-plane. On it the vector of e_0 can be turned using discrete steps of the nth roots of unity. It generates for different values of n often cycles. A 6-cycle for instance arises from the general relativistic scaling factor in form of a normed matrix of order 6 with first row (1-1) and second row (10). Turning in angular π form gives the 6 electrical charges -1, -2/3,-1/3,1/3,1/2,1. It gives also the 6 color charges where the turns of the vector put the color charge on the area between two adjacent positions (Figure 7).

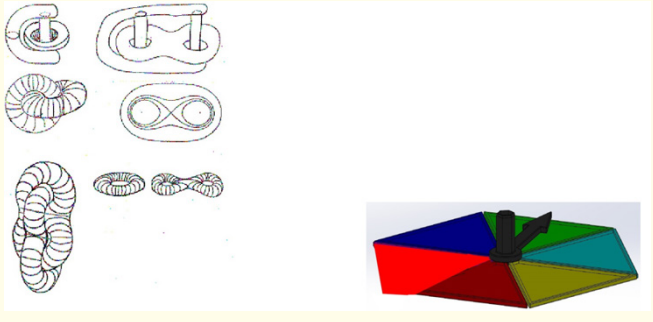

Figure 7: Heegard decompositions of S^3 into tori and brezels; in the middle right a transversal section through a quark brezel with two foci for a mass and electrical charge pole and a lemniscate retract as central core; at right a G-compass of order 6.

Octonian coordinates for the leptonic models: take the figure for a magnetic group (figure 6), having to its vertices the quaternion vectors projected. Put two quadrangles of this kind one on top of the other in parallel position and turn it be an angle, for instance of 135 degrees. An 8 edge is obtained when the two quadrangles are mapped onto a central parallel plane to the quadrangles. At its vertices sit the octonian vectors, projected in this plane. In an 135 degree angle to the lower quaternion (x,y,z,t) coordinates correspond then in the upper rotated quadrangle the coordinates (e_5,e_7,e_0,e_6). The first pair is as usual for the Heisenberg uncertainty position-momentum, the last pair for time-energy. The other pairs are for an angle φ in polar complex coordinates, replacing y and e_7 as exp(iφ), and the last match (z,e_0) is for an angle θ in spherical coordinates replacing z and θ sets an angle for the e_0 vector leaning against the z-axis. The 8 edge can be interpreted similar to the 6 edge as a 8 roll mill. The 6 roll mill was driven by three motors, driving each two rolls. Th reader is referred to [1]. Similarly the 8 roll mill can be driven by four forces each driving the above pairs of coordinates as rolls of the mill. One difference between the 6 roll and 8 roll mill is for vector generated dimensions of coordinates or rays as their linear extension.

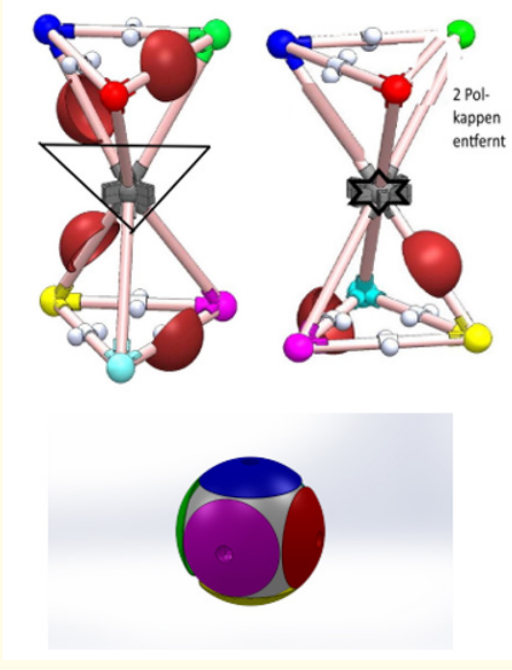

Figure 8: Two protons at left with a positron drawn as polar caps, during fusion one upper u-quark which is above another lower u-quark decays and the upper positron is emitted when it becomes a d-quark; at right the upper neutron has added the hedgehog (figure below) energy caps for the energy exchange of deuteron with its environment, also the lower proton adds polar caps for this.

In figure 8 is shown the deuteron tetrahedron at right, arising through fusion from the two proton tetrahedrons at left. For the protons the matching of vectors is in a plane which contains two u-, d-quarks vectors and one with two u-quarks vectors. In fusion the last pair has the upper u-quark decaying and a W+ boson plus a d-quark is generated. The W+ decays in an emitted positron and neutrino. When the upper tetrahedron is rotated during this pro-

cess by 180 degrees (use a Moebius strip for this) the three planes are lines and the vectors point in opposite direction on two rays of the x-, y- or z-line of space. The upper tetrahedron has the additional listing of the three Heisenberg vectors: x is position and on the same line is momentum, y is an angle and its partner is angular momentum (or E(rot) for rotational energy), z is replaced by a time coordinate in the positive direction and its partner is energy as frequency vector. When also the lower tetrahedron gets polar caps as in the hedgehog, the additional energies are EM(pot) for the electrical potential on +x, E(heat) in the +y direction for temperature, E(magn) for magnetic energy on +t. The polar caps are for the energy exchange of deuteron and nucleons with the environment. In the figure the quark partners on a coordinate are u,d and they exchange in a WI rotor 6 cycle an isospin as energy. It exchanges each time the nucleons states position of the proton, neutron pair in deuteron (or an atomic kernel). In this presentation, the three vector generated planes for the tetrahedron at left in figure 8 show the octonian complex six e_j coordinates, j = 1,...,6. Fusion linearizes 3-dimensional them to the three space x-,y-,z-coordinates. In comparison, the 8 roll mill rotation from two parallel quadrangles to the twisted 8 edge central projection have in the first parallel location 4 dimensions as their central drawn diagonals, connecting opposite upper and lower vertices. When rotated they show the 8 octonian coordinates.

The 8 roll mill action is in this case that measuring triples are set through Gleason frames GF operator bases for S^2 as subset of a real space R^3. The octonians are below listed by their indices.

The electrical motor drives in the flat projection of the 8 edge the rolls (x,t) for an electrical 1 and magnetic 4 triple 145 (adding 5). This presents with 5 magnetic induction B as cross product of 1,4 which generates a rotational momentum of an electrical (current like) loop, traversed by a magnetic field.

2,6 with 246 for counting rotational windings about a circle or helix (figure 6): it can also adjust the windings when they are not fitting to the circles circumference. The computation for the spectral series (Bohr radii and Schroedinger equation) can be consulted for this.

0, 3 for neutral leptons 037 as kg GF where for instanc the three neutral leptons weights m_j are attached at the vectors 0, 3, 7 and

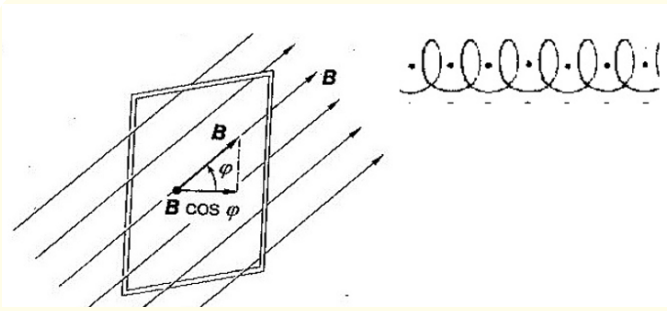

Figure 9: Magnetic field crossing an electrical charged loop; at right a helicon.

measure a mass density per volume of the three neutral leptons in superposition. The GF weights can be extended to quaternions as weights, representing the leptons scalar properties, (n_0,I_3 = bn_0xp,m_j,p) with n_0 neutral charge, I_3 third isospin coordinate and cross product like induction, b a suitable constant and p momentum. For the difference in weights some inner dynamical leptons frequency energy (or speeds) are transformed by m_fc^2 = hf for an added frequency to the smallest m_0 mass, $m_j = m_0 + m_f$.

5, 7 are driven by gravity as 057 *rgb*-gravitons, acting as central projections, spiralic expansion/contraction and for cosmic speeds v_1, $v_2 = v_1\sqrt{2}$ with the third vector for 5 as Schwarzschild radius of a mass system.

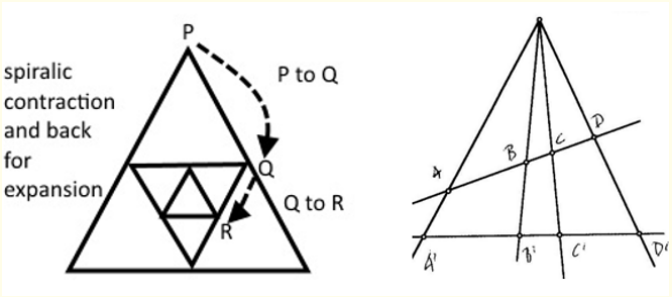

Figure 10: Spiralic gravitational contraction or expansion; at right central projection.

Octonians provide these and other orthogonal base triples (spin-like, see figure 3) GF's. The Fano memo shows seven as line/

intervals or circle, each having three points for their three base vectors. Additional GF's arise from adding the octonian vector e_0 to a triple and seven from the strong interactions SU(3) matrix generators [1-16].

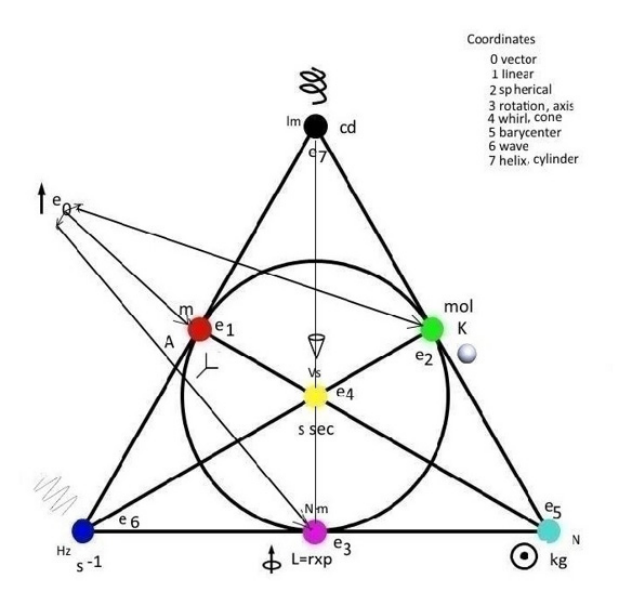

Figure 11: Fano memo for the octonian GF's with logos for energies added.

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