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Quantum Interpretation for Measurements in Physics

Gudrun Kalmbach H.E.
MINT, PF 1533, D-86818 Bad Woerishofen, Germany
email:mint-01@maxi-dsl.de

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Abstract*: The postulate in the Copenhagen interpretation is for quantum measures that in experiments from a set of operators only a subset of commuting operators can be measured simultaneously, the rest remains undetermined. As example the Stern-Gerlach measure shows for spin a 90 degree change and measures for instance spin up and down of the outcome particles only in the z-direction. The spacial xy-coordinates remain undetermined.Using octonion coordinates [1,2] for the quantum range this view can be applied to all octonion base GF triples which use the three noncommuting Pauli matrices. The coordinates are enumerated by indices 0,1,2,...,7. Entanglements of different GF are possible. Two examples are the spin-lepton cases 123 (for xyz) and 145 (1 for electrical EM charge, 4 for magnetism, 5 for leptonic mass) either in the gyromagnetic relation (EM) or the helicty (neutral leptons).A in the second case the Copenhagen interpretation is extended to a quantum interpretation for measurements of the GF. The systems and energies involved can be different. The neutrino N oscillations show that also the Heisenberg uncertainties HU play a role. Spin is aligned with the space coordinate 1 and the momentum p = mv on 6. The HU means that 1,6 cannot be measured sharp. Hence the leptonic kg measure 5 changes for p along the world line of N stochasticaly, observed as oscillation. The kg GF is 257 and has 6 possible values for leptons. The weights of the three GF coordinates are mostly positive real or complex numbers. There are seven octonion GF 123, 145, 167 (for electromagnetic interaction EMI), 246 (for heat, acoustics), 257, 347 (for rotational energy), 356 (for a nucleon inner dynamics). Beside these are for the strong interaction SI three more GF 126 as rgb-graviton , 345 for its dual Dg and 037 for a newly postulated color charge force cc.The new cc force has a different symmetry than the Pauli quaternions.The six complex cross ratios invariant under the Moebius transformations of the Riemannian sphere are discussed in relation to quantum measures.*
Keywords: quantum, interpretation, measurements, physics

INTRODUCTION

Cross ratios and other quantum measures

For the six complex cross ratios three reference points $0,1,\infty$ are chosen. They arise by inversion in (Heisenberg) pairs as complex fractions z, 1/z; (1-z), 1/(1-z); z/(z-1). (z-1)/z 5,1; 4.6; 2,3. Their coefficient matrices are for the nucleons quark triangle symmetry D_3. This group has an inner dynamics for states (figure 1).

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Figure 1 six states for generating a nucleons barycentrical coordinates and barycenter B

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Higgs sets the nucleons mass relativistic (with speed v) rescaled at B such that in a wave superposition of the three quarks it can move with speed v < c on its world line. The quarks mass is only about 10 percent of the nucleon mass.
In addition the position of the three quarks mass is fixed by the change of the blue momentum vector in figure 1 (figure 2).

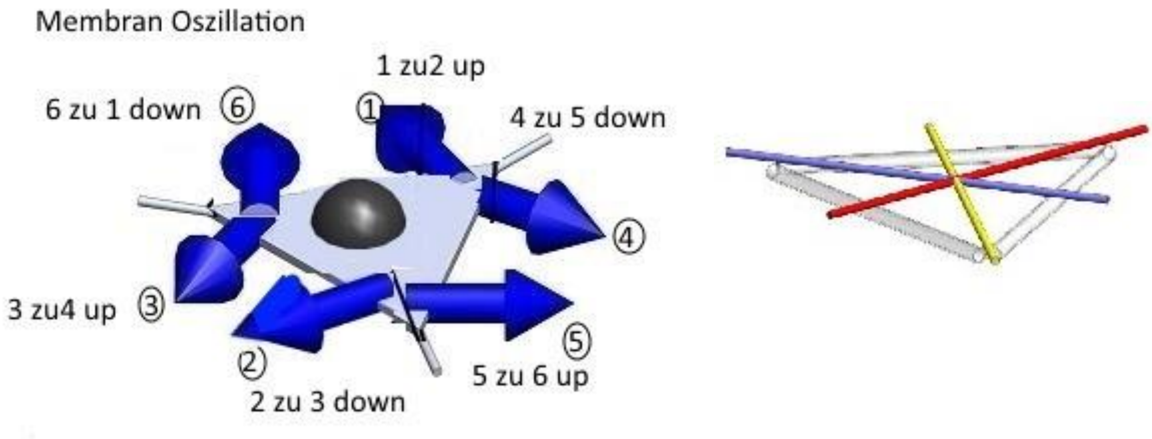

Figure 2 six locations of the mometum vector in figure 1; barycenter and barycentrical coordinates at right

The figures show a new kind of quantum measurement. The nucleon as particle gets through this a wave presentation. As observed for EMI this extends to 167 in the double split experiment for its ψ waves and photons. The photons can be presented as time generated winding of an (exponential functions) helix line in a circular U(1) cylinder Z. The cc are not involved in this. The EMI geometry is obtained as (helix) universal cover of the octonion coordinate 7 on Z.
The wave particle dualtiy extends to leptons, using the weak interactions WI Hopf fiber bundle SU(2) geometry. The Hopf map h has on $h(S^3) = S^2$ for the leptons charge e,n a rotation on a latitude circle V, either a magnetic momentum or a momentum (neutral case) aligned with spin s. The orientation cw clockwise or mpo counterclockwise on C determines the sign of e,n towards s.

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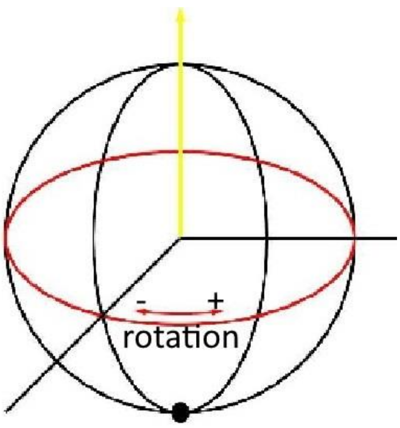

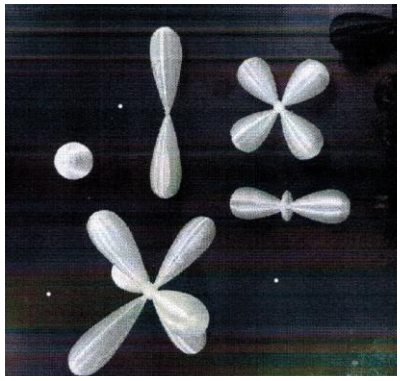

Figure 3 EM charge rotation, shells for electrons in atoms (from chemistry)

Measuring an electrons probabilistic location in an atoms shell means that also the inverse torus h^{-1}(C) can be used, clubs are deformed spheres. The Hopf map application is not mentioned in chemistry.

The cc force belongs to QCD, SI with the symmetry SU(3) and its GellMann matrices generators for 8 gluons. The geometries factor S^5 (5-dimensional unit sphere) determines for SI a new fiber bundle with fiber S^1 with a nucleons image. Beside presenting the cc as vectors in figure 1 they are
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in the superposition r,g,b of the *rgb*-graviton having their charge located on projective planes P^2 as Bohr shell (antipods are identified) hemispheres about a nucleon (figure 3).

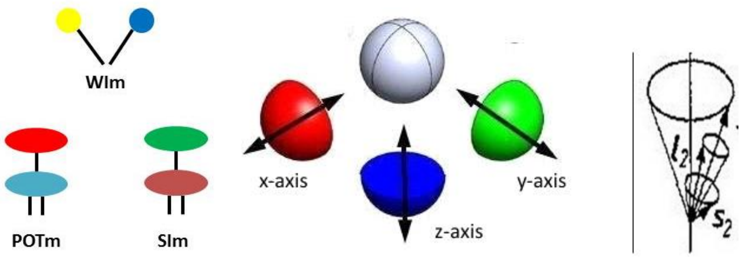

Figure 3 three driving motors POT, SI, Wi at left; cc hemispheres middle part; angle, angular momemtum HU for rotations of spin s, orbital rotation l and a rotation axis j = s + l at right

Measuring the cc on a condensor plate means that the cc vector is leaning towards a rotation axis and distributes its charge on a cone. This is similar to a magntic momentum vector with spin rotating under the Hopf h^{-1} image towards a rotation axis; the HU generated leaning is known for electrons (figure 3 right). For the cc a second set of reference points 0,-1,∞ can be chosen. In the G-compass figure 4 the G 2x2-matrix of order 6 has first row (1 -1) second row (1 0) which is also the (z-1)/z coefficient matrix for rotational energy. The discrete sixth' roots of unity are for cc segments and they decay along radii. The segments two radii are identified for the cc cones.

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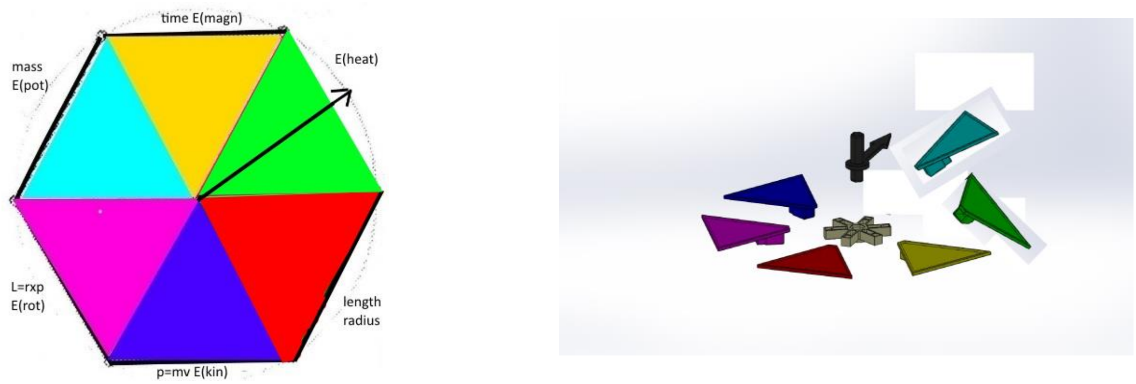

Figure 4 G-compass and cc segments

The six energy exchanges of a nucleon with its environemnt uses the hedgehog (figure 5) as extension for figure 3. At left in figure 3 are shown three driving motors POT as unified EM 1 red cc and GR 5 turquoise cc potentials, WI for magnetic 4 yellow cc and kinetic 6 blue cc energies and SI for heat 2 green cc and rotational 3 magenta cc energy.

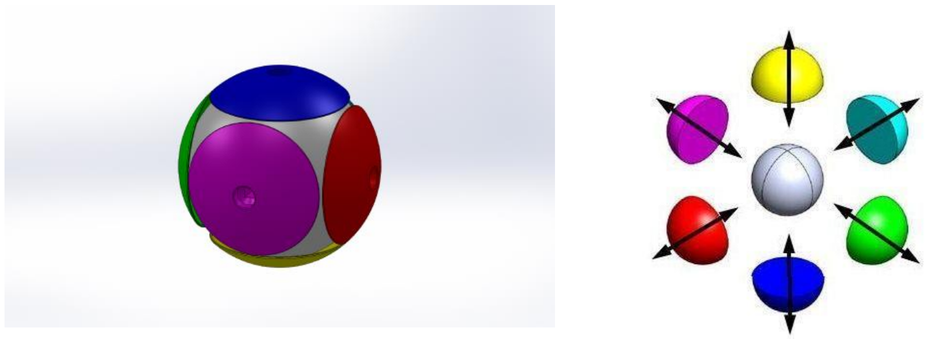

Figure 5 hedgehog with cc caps aout a nucleon kernel

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The change between input o routput energies is guided by a 6 roll mill catastrophe [3] and its elliptic umbilic cusps. The potential can have sudden changes between a cusps surface levels and the cc turns the vector in (out or in) direction.

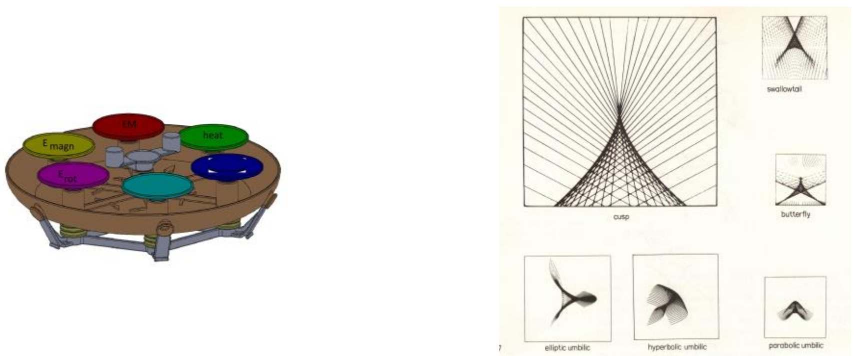

Figure 6 six roll mill and cusp (upper right) with 5 of the 7 catastrophes, the fold with two potential levels is another catastrophe

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Sudden changes of states of a system are often obtained by the potential levels of a catastrophe. It gives thresholds for the changes. The cc as in the previous case are not necessary for executing this.

CONCLUSION

The above examples with figures [4] added show that cc is an independent force, not only a property of quarks. Quantum measures differ and hava often different geometries, symmetries, spacial locations for the considered energy.

Quotation from Wikipedia: Over the years, there have been many objections to aspects of Copenhagen-type interpretations, including the discontinuous and stochastic nature of the "observation" or "measurement" process, the difficulty of defining what might count as a measuring device, and the seeming reliance upon classical physics in describing such devices. Still, including all the variations, the interpretation remains one of the most commonly taught.

The GF have been studied for quantum measures. They generate Gleason operators which have a probability distribution on subspaces [2]. The set of GF numerically values ranges from 1 to 6. Unsharp measures can occur for instance when the HU are involved. Many measuring cc examples extend the use of the GF. A general solution for the Planck era is given in [5].

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