The Remarkable Apparent Stoichiometry of Particle Creation at the Universe's Relativistic Horizon *

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Abstract

The factor $2GM/rc^2$ in the Schwarzchild metric is reinterpreted as a squared velocity equivalent of the local apparent cosmological expansion, also interpretable as a classical 'action' and the apparent particle creation at the universe's relativistic horizon is calculated in a universe with one local and one perpendicular non-local dimension. The squared velocity, previously obtained from the Bohr atom ground state, forms a right triangle with the masses of the W and Z bosons and adds to the W-boson the equivalent of the Higgs particle mass. In this construction the seemingly rotating Z boson is projected onto the squared local Hubble rate, equivalent of action, and onto the perpendicular W-boson's geometrized mass at an angle of 30^o. In this scenario the 4 % baryonic matter of the universe arises from five heavy pions, three forming a non-local plane and two forming an axis towards the black hole, pulling out three quarks along the three legs of a double tetrahedron having the angles indicated above. The results are discussed in terms of space-time geometry, nature of mass, and practical reversibility (tokamaks).

1 Introduction

Almost every educated individual on planet Earth has probably heard that the universe is the result of a 'Big Bang', an explosion-like stretchening of space. This has been the prevailing view for a century and quite recently it was even claimed in a distinguished reward motivation that the Big Bang theory now had been proved. However, it doesn't take much education to bother common sense and ask a few simple questions: 1. If the universe is created by expanding then what does it expand into if it doesn't already exist? 2. How is it possible that all its substance could have been contained in a point at the moment the 'Big Bang' started? 3. Is it stretching into infinity or is there a boundary somewhere? These important questions which can be knowledgeably asked starting at

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the elementary school level are boldly ignored by the physics community.

Fortunately, world pictures (mental conceptions about the physical world) have never persisted for ever even though they have often been ferrociously defended by the establishment, turned into pretexts for their benefits in society. An example of the latter would be the rituals performed by some ancient New World professions in order to make the sun rise every morning. The persecution and sometimes even burning alive of proponents of the pegan heliocentric world picture in Medieval Europe is another well-known example. Before that, in ancient times, the world was thought to be flat and the wonder of someone then at seing a departing merchant vessel apparently sink at the horizon when on its way towards the terrible waterfalls at the edge of the ocean corresponds in our contemporary world picture to the three questions of doubt raised above.

A good platform to start anew is the atom - a piece of real physics that the ancient philosophers did not know existed. It was known starting from the beginning of the 20:th century but not very well or motivatedly enough to help form the basis of a world picture. Now, a high school, or possibly even elementary school education is sufficient to conceive of a universe built similarly to the atom so as to be able to answer the three questions above. Namely, if one knows that the electron rotates around the nucleus so fast that it forms a wave when seen from the nucleus (or from here) it is easy to imagine the reverse, that the nucleus is seen rotating very fast from the point of view of the electron. This is a revisit of the Medieval issue of whether the Earth rotates around the Sun or conversely; it is the Sun that seems to rotate as seen from here but that is actually not the case if one puts the Sun in a wider context where *it* is stationary (like our biased view of the atomic nucleus). Whichever location in the atom one choses from where to observe either the electron or the atomic nucleus the atom forms a closed system with seemingly an outer border - which actually would turn out to be a point if one could change locations and move there. The outer border is the consequence of any observer having to choose one location in order to see the world and infer the other location - which always seems to form a shell. This would apply to the universe as a whole if it has the same geometry as an atom and its outer boundary as seen from here would correspond to the atomic nucleus seen rotating from the point of view of an electron, so fast that it forms a wave. This world geometry can easily be understood by anyone without advanced education and it provides answers to the three questions raised above. It also hints at conceptual errors in relativity theory, which highlights *one* observer versus the observed phenomenon and not like here *two* mandatory observers forming a closed system. Furthermore, in RT one has arbitrary locations in distorted Cartesian coordinates in 3+1 dimensions whereas here one has to choose one particular location for the observation, which always is at the center relative to the rotating second observer - the center of the universe. This origin of observation is non-local as can be realized by following the electron on its journey around the nucleus:

Everywhere along the electron's path around the atomic nucleus at any instant, it sees the nucleus smeared out - this corresponds to an observer anywhere in the universe seing the stars from some unique perspective. This observer will always judge himself to be at the center of the universe (like sitting on the orbiting electron), so on a large scale (neglecting the various celestial objects' apparent positions[1]) the universe looks the same from anywhere - it has the same fundamental geometry everywhere. Furthermore, if the universe's bulk mass is at its outer boundary (like if the electron sees a nucleus-matter wave) then any non-local observer at the universe's center will be surrounded by all the universe's outward-pulling mass, at different times of observation though. This brings in the so

[1]These objects seem to be local judging from their positions when emitting their light but the further away they were then the more uncertain is their current position

called 'black holes' and the issue of whether or not the universe may be regarded as an inverted black hole, as recently has been quantitatively evaluated in [1].

A critic of this world picture would nevertheless like to have some robust proof that the universe rotates. Attempts have been made to prove by local measurements the notion in Standard Cosmology that the universe literally expands but they have failed - collected in the safety net of the pliable relativity theory. Arguments that the universe rotates have been presented in [1]. In the linear universe of the present theory any source of a signal at the time of the emission may rotate visibly by as little as the local apparent cosmological expansion rate and this is perhaps too slow to be detectable. A more viable approach, which will be pursued here, is that the visible matter is carried by an invisible rotation of space. This is a robust concept borrowed from the planar wave of electromagnetic radiation wherein the nodes by theory harbor curls originating from rapidly changing electric and magnetic fields - these are not detectable like the antinodes of the radiationwhich have measurable field maxima.

In the following the author's theory about such a universe will be developed by identifying quantitatively which elementary particles are created at the universe's relativistic horizon and the mechanisms by which they are possibly created. These results are subsequently discussed in terms of space-time geometry, the nature of mass, and possible practical applications.

2 Results

Recently [1], it was shown that the relativistic Doppler redshift can be written as

$$\underbrace{\nu_r}_{receiver} \underbrace{\frac{v}{c}}_{A} = \underbrace{\nu_e}_{emitter} \underbrace{\left(1 - \frac{v}{c}\right)}_{B} \underbrace{\frac{v}{c\sqrt{1-\frac{v^2}{c^2}}}}_{rot} \quad ; \quad \frac{v}{c\sqrt{1-\frac{v^2}{c^2}}} = \frac{sin\ x}{cos\ x} \tag{1}$$

where the receding velocity in the factor B causes the receiver of the signal to see a loss of momentum (lower frequency) and the term $'rot'$ expresses the tangent of the angle an observer at the origin sees a rotating point delayed [2] [3] - a delay which is itself equivalent of a rotation. In this picture of electromagnetic radiation a non-local observer catches the invisible nodes of the wave at the center of curls generated by the rapidly changing electric and magnetic fields and the Faraday tensor is rearranged accordingly [4] [5] [6] [7]. Upon absorption of the signal a rotation at the matter-signalwave interface takes place, equivalent of a Lorentz transformation, and observer as well as signal turn local. This reinterpretation of the electric field component of the Faraday tensor is obtained by fitting the terms to a quantitative theory which identifies two observers one who is local and sees linear momentum whereas the other one is perpendicular and hence 'non-local' [8] [9].

In the recent paper this reinterpretation of the relativistic redshift as in Eq. 1 was also applied to signals coming from near black holes by making use of two characteristic features of the founding theory. First, the geometry [9] has a line increment, $\overline{\Delta q}$, which appears when cutting one unit of time - the line increment is the inverse of a radius. This allows the substitution $r \to \overline{\Delta q}^{-1} \to v$. The line increment is interpreted as the local apparent cosmological expansion (see below) and the radius is interpreted as the radius of the universe. Second, a linear universe is is inferred wherein every unit length along the line of sight has the same line increment associated with it (e.g. [10]). One then geometrizes the mass and makes the substitution $2GM \to v$ so that instead of the factor

$2GM/rc^2$ occurring in the Schwarzchild metric one obtains v^2/c^2. The substitution is interpreted as distributing the geometrized mass M equally along the line of sight. As a result, and by rearranging like in Eq. 1, one can write for the gravitational redshift (cf. [1])[2]

$$\underbrace{\frac{v_E}{c}\,\underbrace{\nu_E = \frac{v_E}{c\sqrt{1-\frac{v_E{}^2}{c^2}}}}_{A}\,\nu_\infty}_{B} \quad ; \quad \frac{v_E}{c\sqrt{1-\frac{v_E{}^2}{c^2}}}\nu_\infty \equiv \frac{sin\ x}{cos\ x}\nu_\infty \tag{2}$$

This equation differs from the previous Eq. 1 in lacking its factors B which was due to the literal (non-relativistic) Doppler recession of the emitting object. Eq. 2 can be interpreted similarly to Eq. 1: The local observer sees the frequency ν_∞ more redshifted and the signal more rotated the closer the emitter is to the black hole. At such remote distances the velocity added linearly to each unit length along the line of sight is greater. Since one is now in Eq. 2 dealing with radiation coming from black holes, it is natural to interpret this absence of a recoil (the absence of a physical emitter) in terms of particle creation, previously shown to be associated with black holes cf. [11], and try to solve the equation

$$\frac{2GM}{r_E} \longrightarrow 2GM\frac{r_E{}^{-1}}{s} \longrightarrow \frac{\overline{\Delta q}^2}{s^2} = H_o{}^2 = v^2 \tag{3}$$

where $G = 1$ in geometrized units and $\overline{\Delta q}/s$ is the line increment = the local apparent Hubble expansion which is added to each unit length along the line of sight. This local line increment per unit length has previously been linked numerically to the masses of the W and Z bosons of the Standard Model [12] and the present paper is a continuation of this work. In the current new perspective the question to ask is what kind of particles are created near a black hole or, if one regards the universe as an inverted black hole like argued in [13] and in [1] based on Eq. 2 , what kind of particles were created at the origin of space and time? Hydrogen is expected, possibly flavoured with a little Helium and even less Litium but solving Eq. 3 yields $M = 44.96\ GeV \approx 45\ GeV$. The value $v^2 = 45\ GeV$ comes from solving the apparent local cosmological expansion rate, 71.36 $km/second/Mparsec$, from the Bohr atom ground state [14] [15]:

$$\sqrt{\hbar} = \overline{\Delta q}\ 2\Big(\frac{ec}{2\alpha}\Big)\ \frac{1}{\pi\ Ampere}\ ; \quad \overline{\Delta q} = 7.714 \times 10^{-27}\ s^{-1} \tag{4}$$

whereby the physical units are adapted to the geometry of [9] by algebra described in [6][3]. Above, c is an invariant number amplifying the magnetic charge $Q = ec/2\alpha$ from the electric charge e. Instead of finding the value 45 GeV one would expect to retrieve as a primordial element the hydrogen atom at 938 MeV. It has previously been shown [16] [12] that the value 45 GeV can be linked to the masses of the W- and Z-bosons guided by the idea that the local Hubble 'rate' not is a literal expansion of space as widely believed but instead that it represents some kind of resonance. In the previous work the resonance was established simply by finding some fitting integers whereby the value 1.8 GeV, the mass of the known $\pi(1800)$ pion, (= 10.8 $GeV/6$ or $45GeV/25$) came into the focus. It was also shown then that the proton, the neutron and a pion could be identified in terms of quark charges-dipoles arising under an orbiting electron whereby the pion was seen at the nodes of the charge

[2] ν =signal frequency, v =velocity, E = emitter of the signal, ∞ = recipient of the signal, m = meter, s = geometrized time, non-standard notation, sec = SI unit time

[3] All physical units are assigned to either the local or the non-local observer and the algebra describes how to assign dimension to physical units that are compounded in terms of such frame signature

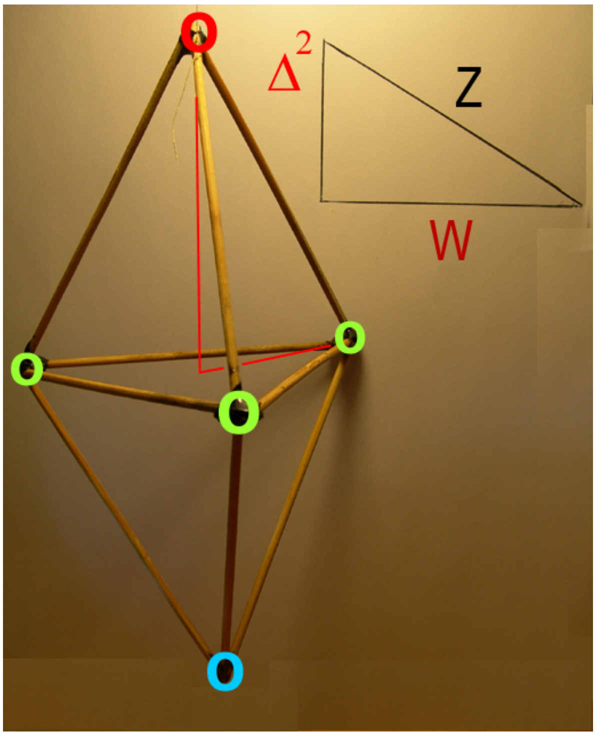

Figure 1: Illustration of a double tetrahedron as described in the text with five massive pions at its corners and a central axis (vertical red line) stretching between the upper and the lower pion, perpendicularly to the plane formed by the remaining three pions. The edges of the model tetrahedron to the left have the same lengths but the numerical fit with $\overline{\Delta}^2$, the W and the Z boson masses as described in the text is achieved by contracting its vertical axis so that the triangle drawn by the red lines to the left to get the angles 90^o, 60^o and 30^o as shown in the background to the right. The three pions at the center plane are capable of contributing to a hexagon jointly with adjacent double tetrahedrons as shown in Fig. 2. They are capable of donating quarks to simultaneously form a proton and a neutron at the upper and lower location, alternatively a nucleon and its antiparticle inside the black hole.

oscillation. The pion contains the quarks necessary for building a proton and a neutron so a massive member of the pion family, like the $\pi(1800)$, is a candidate for the particle creation indicated by Eq. 3.

The embedding geometry [9] only allows two strictly perpendicular dimensions, one harboring the local momentum - line increment and the other one harboring non-local measures such as mass and time. From the tangent, $sinx/cosx = 45/80.4$ the line increment and the W-boson form a right triangle with an acute angle of 29.21^o. Stretching this to 30^o, which can be justified as explained shortly, allows one to apply the Pythagorean theorem to get $45^2 + 80.4^2 = 91.1^2$ while at the same time implementing the embedding geometry, whereby 91.1 is recognized as the mass of the Z-boson. One also has the result that $45 + 80.4 = 125.4$, hinting att the Higgs boson. In the Standard Model of Elementary Particles the W, the Z, and the Higgs boson appear in symmetry-breaking processes in the early Big Bang scenario so retrieving these with the help of the local Hubble rate is reassuring that one is right in interpreting Eq. 2 as particle creation at the origin of space and time. The numerical fit so far is compelling but one still has not found the proton which is expected to be *the* primordial particle-element.

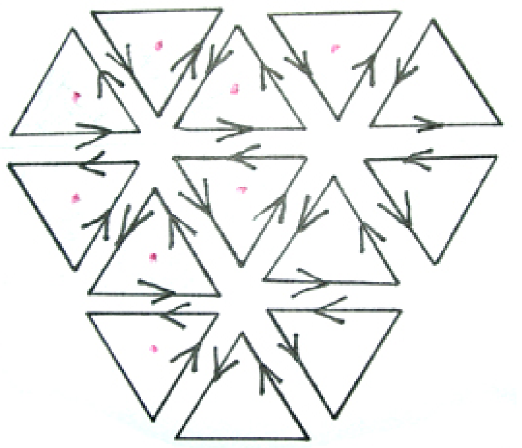

Figure 2: Schematic illustration of each other canceling Stokes curls in adjacent triangular planes composed of centerpieces of double tetrahedrons like in Fig. 1.

In order to find the proton it is possible to rely on yet another feature of Standard Cosmology, namely its failure to account for 95% of the universe's baryonic matter which purportedly instead resides in its mysterious 'dark matter' and 'dark energy'. In standard cosmology the latter is thought to be linked to a literally accelerating universe. In the present cosmology the redshift of light from remote astrophysical objects is instead attributed to a rotation at the recipient's matter-signalwave interface as described in e.g.[1] and [17] based on theoretical treatment in e.g. cf. [2] [3]. With the mysterious but well-documented matter-fraction of $\approx 4.5\%$ of standard cosmology in mind take five heavy $\pi(1800)$ mesons that were previously implicated in the resonance with $\overline{\Delta q}^2$ [16] [12]. They have a mass of $9GeV$, which is 20% of that available from the squared Hubble rate. Place them at the corners of a double tetrahedron like illustrated in Fig. 1. The double tetrahedron is a geometrical object that has all one wishes for here, it has an axis that may be directed towards the black hole along whose endpoints particles may be created, perhaps within the theoretical framework of [11], it has a perpendicular triangular surface that is capable of forming a non-local plane by way of canceling Stokes curls in adjacent triangular cells like in Fig. 2 (whereby the particles notably appear at its corners), it has three legs for three quarks to escape along when forming a proton and a neutron from the three heavy non-local π -mesons. Discarding the mass of the non-local π-mesons one is left with 2/5 of 9/45, = 8% which is actually 4% if one accounts for the factor 2 of the Schwarzchild gravitational potential above. There it is, the bosonic mass fraction of standard cosmology: Each time the line increment breathes on its platform of invariant space and geometrized time ($[H_o] = m/ms$) it provides at least one proton of 938 MeV from 45 GeV. This geometry in Fig. 1 and Fig. 2 also allows heavier nuclei to be created in hexagons composed of adjacent triangular center-planes of the double tetrahedron such as in Fig. 2 but such events would be expected to be rare. Even a documented event involving just three such heavy quark providers as just described might be rare. Neither Stokes curl representing a non-local surface or double tetrahedrons are in the mainstream of contemporary physics as can be verified by searching the arXiv but the latter have actually been linked to the build of atomic nuclei (cf. [18]). The present geometry is somewhat similar to the fashionable so called kagome-structures.

From the Pythagorean theorem it was established above that the squared local Hubble rate ($=\overline{\Delta q}^2$)

and the W boson can be regarded as projections of the Z boson on the local and non-local axis respectively as illustrated in Fig. 1. Then one can examine whether or not it is plausible that this projection involves an orbiting particle. Whereas it was expected from the geometry of [9] that the W boson and $\overline{\Delta}^2$ would form a 30^o angle one actually measures $tan^{-1}(sin\ 45/cos\ 80.4) = 29.2^o$. Using the formula for the angular delay of an orbiting point as seen from origo [2] [3] like previously in this series of papers [1] [12] the delay just calculated of 0.8^o corresponds to a velocity of 0.0138 in geometrized units. This is of the same magnitude as the electron's orbit velocity in the Bohr atom ground state, $\alpha c = 0.0073$, the latter corresponds to an angle delay of 0.418^o as seen from the origin. Hence it is reasonable to postulate that the Z boson or some proxy of it (like, e.g. its length in terms of geometrized mass) is in orbit and such a rotation would be consistent with its being a carrier of spin (and mass) in the Standard Model of elementary particles. The question immediately arises, was it only spinning at the origin of space and time or is it still spinning, generating our tangible world from a yonder place?

It is possible to evaluate this for the W boson (now a made proxy for the Z boson, both particles would be subject to the same time dynamics and they do have very similar meanlives [19]) by substituting the Planck length of Eq. 4 into the 'energy' quantum, $E = 2\pi\hbar\nu$, as outlined in [12],

$$\frac{\overline{\Delta q}^2\ \pi}{4}\ \overline{Q}^2 = \frac{\Delta E}{2}\ \Big(\frac{\pi}{4}\ Ampere\Big)^2 \tau \quad ; \quad Q = \frac{ec}{2\alpha} \tag{5}$$

and proceed as follows. In terms of the 'frame signatures' of the physical units in this geometry[4] with just $\overline{1} + \widetilde{0}$ dimensions (where the 0 stands for the non-local dimension) that of the 'action' of classical physics, $t \times \Delta E$ is $\sim\ \times\ ^{-}\ ^{-}/ \sim\ =\ ^{-}\ ^{-}$ which is the same as that of the line increment squared. Consequently it is justified to assign some measure of time to the line increment. Rearrange Eq. 5 into

$$\Big(\frac{\overline{\Delta q c}}{2}\Big)^2\ 4 = \Big(\frac{\pi Amp\ \alpha}{e}\Big)^2\ \frac{\Delta E\ \tau}{2\pi}; \quad \Delta E = 2\pi\hbar\nu; \quad \nu = \tau^{-1} \tag{6}$$

where c is just a number, a scaling factor to make magnetic charge out of electric charge. Then the numerical value in the bracket on the left side is $0.7714 \times 10^{-26} \times 3 \times 10^8\ /2 = 1.156 \times 10^{-18}$. Interpreting this number as a measure of time is consistent with applying the scaling factor 'c' to the length in order to get the right pitch on the time axis (cf: $[s] = sec \times c$). Compare with the mean life of the W boson calculated from its width (cf. [19]), $\tau_W = \hbar/\Gamma = 1.055 \times 10^{-34}/2.085\ GeV = 1.1142 \times 10^{-18}\ s$. The two values are close enough.

Then consider the bracket on the right side which contains a measure of the orbiting electron's velocity, $\alpha\ Amp/e$. Calculate the orbit period of the electron in the Bohr ground state, $\tau = 1/(\alpha c/2\pi r_B) = 1.521 \times 10^{-16}\ sec$ from the deBroglie wavelength-Bohr radius relation $\lambda_{dB} = 2\pi r_B$ and the orbit velocity $\alpha \to \tau^{-1} = v_e/\lambda_{dB} = 6.52 \times 10^{15}\ Hz$. τ is the duration of the electron's circular orbit. Multiply by α to get back to a luminal process, $\alpha \times \tau$, and project that shorter orbit period onto a linear axis running through the origin (eqv. $\alpha \times \tau \times \pi = 1.11 \times 10^{-18}$). This number, calculated previously in [16], can now be understood to be a projection of a luminal velocity onto a linear axis stretching the diameter of the hydrogen atom (the very same diameter is also seen from the electron's perspective as argued in the introduction above) This interpretation invokes a dynamic ongoing process like in Fig. 1.

[4] cf. the frame signature algebra in [6]

The three values of time thus obtained are sufficiently close to indicate that there could be some kind of resonance between the apparent cosmological expansion rate, the orbiting electron (or an equivalent entrained nuclear process) and the W boson in terms of the latter's mean life, especially when evaluated in the context of the evidence of a rotating Z-boson calculated in the previous two paragraphs and considering that the 'action' is a physical quantity of limited duration (like when a rotation is projected periodically on the x and y-axes, (sketch to the right in Fig. 1). All these results jointly stake out some fascinating unexplored territory for further research as outlined in the next section.

3 Discussion

The present results provide evidence of quantitative dynamics of the resonance particles W and Z at the relativistic horizon of the universe. This agrees with ideas in mainstream physics that these particles were seen in early epochs of the universe's evolution. Reinterpreting the cosmological red-shift as an effect of gravitation coming from the universe's reativistic horizon invokes the idea of particle creation at the boundary of a black hole, an idea that also is well establihed in contemporary physics. This leads, however, to a universe forming a closed system similarly to a hydrogen atom with one particle, electron or nucleus, seing the other one in the form of an enclosing outer boundary. The notion of a literal expansion of the universe as in standard cosmology must now be rejected while it doesn't explain why the apparent local Hubble expansion is quantitatively related to the W boson, the Z boson and the Higgs particle as shown to be the case in the 'Results' section.

Since every unit length of the universe has the same line increment associated with it, whether measured here or inferred to be at the universe's relativistic horizon the possibility arises that the same mechanisms that were active in the early universe are still ongoing. This was evaluated by calculating the aberration of a possibly rotating Z-boson seen from the origin in the present geometry, which has two strictly perpendicular observers with the W boson on the non-local axis and the line increment on the local axis. If the mass had been given to the particles once and for all very early one would not see any evidence of a rotation now but if there is perpetual rotation going on then one expects to see evidence of rotation. The latter being the case observed herein raises the possibility that the mass of the particles is regenerated perpetually from a non-local background. Even in classical physics one encounters 'weight-less mass' in the form of centrifugal and centripetal forces canceling from the point of view of an object in orbit and in the form of non-local 'force fields' incorporating many point-like sources. The present results raise the possibility that classical concepts such as 'force' and 'weight' are proxies for momentum generation from a non-local background at the particle level. This might provide an appropriate perspective for so called 'galaxy halos' and 'black matter' of contemporary astrophysics. It also harmonizes well with the 'inertia' concept of classical physics since the material pions in the model of Fig. 2 appear where the fluxes change directions.

As for the persistence of atomic matter it is known that the nuclei are held together by confined 'quarks'. In the Standard Model the mass is 'created' around the moment of the Big Bang relying on the 'Higgs particle' and the mass creation is popularized as a potential in a Mexican-style hat or friction in a 'Higgs field'. However, these ideas are heavily tainted by the hypothetical conception of a literal Big Bang from an unfathomable energy density and they do not provide a mechanism or stoichiometry for the particle creation. Furthermore, the idea of particles arising in an explosive event is fundamentally incompatible with the notion of particle creation at the horizon of a black hole, which is an alternative scenario much discussed very seriously in the literature but never evaluated for the mass of the entire universe. The present model based on a transitory energy threshold constituted by a penta-meson from which two stable nucleons may be created in the gravitational field of a black hole provides a concrete path forwards towards explaining why the world exists. It also nicely illustrates how general philosophical ideas about the world impact on practical matters: The idea of matter (or energy) generation in a hot 3-D quark 'soup' confined within a 'tokamak' now gets an antipole - using a cold 2-D quark plasma in a gravitational (or magnetic?) field. The latter possibility arises by applying the present 1+0 geometry which has, like in Fig. 1 and 2, a non-local plane perpendicular to where the matter is created (alternatively burned).

In a general sense, the present results confirm the previous conclusion from plain geometry [9] that the local observer is situated on the circumference of a circle looking along the line of sight towards the center, herein the black hole. However, the local observer also arises from the non-local one by a mathematical operation taking place in the signal wavefront [4] . The question arises: Is it necessary to be 'spaghettified' like in the established physics of general relativity in order to get across the horizon of a black hole? No, it is not, the local observer is already across, being both peripheral (truly local) and at the center of the universe (having been turned local) at the same time. This is why the same line increment counts both locally and at the relativistic horizon of the universe.

Consider now, finally, how our world just has been conjured forth by applying a geometry with fewer than the usual number of dimensions. In relativity theory, almost every important physical entity such as Planck's constant, the velocity of light, etc., are assigned to the geometry. This leads to a loss of physical meaning which obscures what is actually going on in terms of real processes. Instead of hiding these processes in a pletora of dimensions they can be made to appear clearly by throwing away those superfluous dimensions.

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