What Is Gravity and How Is Embedded in Mater Particles and the Pure Gravity (Gravitons) Dark Matter Particles? (simplistic analysis)

Stefan Mehedinteanu[1]

[1] CITON –Romania (retired) Senior Researcher; E-Mail: mehedintz@yahoo.com

"When Einstein was asked bout the discovery of new particles, the answer it was: firstly to clarify what is with the electron!"

Abstract

It will be shown how the Micro-black-holes particles produced at the horizon entry into a number of $N \cong 10^{80}$ and of total Universe energy $\cong 10^{70}[J]$, by quantum fluctuation as virtual micro-black holes pairs like $e^{+}e^{-}$ creation, stay at the base of: the origin and evolution of Universe, the *pure* gravity Dark Matter particles, of the free photons creation of near mass-less as by radiation decay that condensate later at Confinement into the structure of gauge bosons (gluons) . Also, these ex-Micro-black-holes which adjust its dimensions to remains after theirs decay of all free photons as *pure* gravity Dark Matter particles , or if kipping someone else, as electrons, others leptons (quarks) and uncharged particles (neutrinos). After radiation decay, the heritage of gravitational charge (gravitons) quantized as $GM_P^2 \cong (\hbar c)$ inside (or on event horizon) into equilibrium with the inner field like electrostatic Coulomb field as being generated by the few photons remained, finally give the mass. Thus, is explained how the gravity is embedded in matter particles, and in the *pure* gravity Dark Matter particles of gravitational charge only (gravitons), an old waited answer.

Also, in this context it results that a equal part of the ex-Micro-black-holes generated are frozen at horizon entry that correspond to *Reheating* period during Universe evolution ($2.4\text{x}10^{13} \div 8.85\text{x}10^{9}$ GeV) keeps only the gravitational charge, so becoming Dark Matter particles of very low mass $10^{-43}[kg]$ and of huge dimension ~ 2.6[m] and of low frequency 10^{8}Hz. Thus, these particles interact only gravitationally with others including that of the gravitational charges embedded in matter particles, thus, slow downing the initially fast Universe expansion. A proof of the model is done by applying it to light bending due of Earth.

A very stranger result is obtained if we divide the gravitational charge $\hbar c$ to the Compton length for every particle, or in other words the gravitational energy of the particle distributed in their Compton length is just the particle energy or the "mass".

Keywords: Origin of gravity, gravitons, gravitational charge, Dark Matter, virtual black holes, free photons, color magnetic charges, gluons, photons mass, electrons

1. Introduction

Independently and for the first time, in my work [1c], I got the idea that a nucleon has inside a field in equilibrium with the gravity charge. This match with the idea of the electron which is in fact a sphere with a very small radius and inside this is distributed the

momentum of photon energy in equilibrium with gravitational charge $\sqrt{G}M_{Planck}$ as it was presented in [1d;1e]. In effect, this particular model would state that the electron is in fact just a form of "trapped light". In this paper, I have taken the theory further with numerical examples, not only to reconcile the original idea's that the classical (or perhaps) semi-classical electron has a mass of electromagnetic nature and that the gravitational charge (the inertial mass) is in fact intrinsically-related to the same electromagnetic features. To do this, "I have had to read for many years now, the theories of times past which involved the photon configuration inside of particles "- Lloyd Motz [1e]; which he was the first to propose a gravitational charge to a particle and even speculated on bound photon particles in a type of orbital motion; the original idea's brought forth in this paper is how to think of the gravitational charge in terms of the electromagnetic field and we will also study the implications of certain equations under the same investigative field. To make short, the electron is taken in this paper, as a fluctuation of either bound or single photons following toroidal or other topological paths in a dense curved spacetime. To finish off, we will also study what it means to talk about the spin of an electron.
I will show that, only few free photons of photons dimension could remain embedded in ex-like-Micro-black-holes which it adjusts its dimensions to electrons, other leptons, non-charged particles (neutrinos, Higgs) in order to equilibrate the gravitational charge $\sqrt{G}m$ as it was explained before following electron model [7]. Also we shown how is generated a huge number (initially $\sim 10^{70}$ and finally 10^{80}) into each Quantum bubble of one Micro-black-holes (virtual micro black holes) as by Quantum fluctuations. In [5b] is interpreted in the topological fluctuations $S^2 \times S^2$ bubbles in spacetime foam as virtual black hole loops. It needs electric or magnetic charges to produce a pair of black holes from Ernst solution. However the quantum bubbles form even in absence of any field. The reason for that is that virtual black holes are not classical geometries and hence need not satisfy Einsteins equations. They are rather solutions of the Wheeler-DeWitt equation [6] and hence need not have any electric or magnetic charges as would be required if they satisfied Einstein equations. Virtual black holes lead to the loss of quantum coherence, which is calculated in this paper. Virtual black holes also lead the space-time to have an intrinsic entropy. The soft photons radiated during these virtual micro-black holes inherently decay its being of the same order as the Micro-black-holes, these are later incorporated as gluons into hadrons. In the same context is considered that at horizon entry a large part of the ex-Micro-black-holes keep only the pure gravitational charge becoming dark matter particles.

2. The concept of like-Micro-black-holes particle at the origin of Universe

We consider that the firstly Universe beginning is due of the Quantum fluctuation into a volume of minimum possible dimension- $l = 10^{-23}[m]$, and when the wave energy is given as $\varepsilon_{\mu BH} \cong 2.4 \times 10^{13}\, GeV$

Therefore, from Quantum instability fluctuations is obtained a lot of Micro-black-holes particle and which we will consider its as to be the *primordial seeds* of Universe, in the following we will argue this hypothesis.

First of all, I present some of known data. Thus, in [1a] it is therefore assumed, that "potential energy" caused by gravitation and "kinetic energy" caused by expansion of the Universe are equal to each other (using the relations $R_U = ct$ and $E_U = M_U c^2$):

$$\frac{GM_U^2}{R_U} = M_U c^2 \rightarrow G = \frac{c^5 t}{E_U} \rightarrow G = \frac{R_U^5}{t^4 E_U} \quad ,$$

$R_U = 1.6 \times 10^{26} [m]$, the radius of Universe; $t = 5 \times 10^{17} s$, the age of the Universe;
$M_U = 2.2 \times 10^{53} kg$.

In fact as already noted [23] from [1b], a Micro-black-holes mass particle decays via the Bekenstein radiation.

The Maxwell equations in a vacuum with a non zero conductivity coefficient, can be shown to lead to a loss of energy ($z - shift$) of a photon during its propagation, see [2a]. This is because the dissipating mechanism leads to an extra term in the usual Maxwell's equations proportional to $\partial E / \partial t$, see [1b].

This immense energy $\varepsilon_{\mu BH}$ can constitutes a spectrum for blackbody radiation when photon creation takes place has also been proposed by author in [2a] , but now I consider that this radiation is obtained by the decaying of Micro-black-holes (μBH) viewed as virtual micro black-holes with hair [5a; [5b]; [5c].

Virtual black holes

The picture of virtual black holes given here also is suggested that macroscopic black holes will evaporate down to the Planck particles $(10^{-35}[m])$ size and then disappear in the sea of virtual black holes [5b]. However, in his paper Hawking says: "I shall be less concerned with real processes like pair creation, which can occur only when there is an external field to provide the energy, than with virtual processes that should occur even in the vacuum or ground state".

However, in addition to black holes formed by stellar collapse, there might also be much smaller black holes which were formed by density fluctuations in the early universe [5a]. These small black holes, being at a higher temperature, would radiate more than they absorbed. They would therefore presumably decrease in mass. As they got smaller, they would get hotter and so would radiate faster.

In quantum gravity, a **virtual black hole** is a black hole that exists temporarily as a result of a quantum fluctuation of spacetime [5b], [6]. It is an example of **quantum foam** and is the gravitational analog of the **virtual electro-positron pairs** found in quantum electrodynamics. At such small scales of time and space, the Heisenberg uncertainty principle allows energy to briefly decay into particles and antiparticles and then annihilate without violating physical conservation laws. Theoretical arguments suggest that virtual black holes should have mass and the lifetime on the order of the Planck particles, but we have changed to a not so small dimension since not respect the general terms of energy and mass of universe. Therefore, we consider also Micro-black-holes pairs, but that occur with a number density of approximately *one per Quantum bubble [6], initially it was considered per* Planck volume [2b] , that means $n \cong d_H^{-3} \cong 10^{69} m^{-3}$, for Hubble constant $d_H = H^{-1} = 10^{-23}[m]$ at horizon entry when the field becomes $V = 1.15 \times 10^{13} GeV$, $a_{end} = 2.6$, $n_{end\_Inflation} = 10^{69} \times a_{end}^3 = 5.6 \times 10^{67}$, see below.

Thus, it was established that these "vacuum fluctuations" which in fact take place at *Reheating* in Universe evolution when the field of Quantum bubble becomes $V = 1.15 \times 10^{13}\, GeV$, $T = 2.66 \times 10^{26}$; $t = H^{-1}/c = 3.3 \times 10^{-32}$, and when the curvature radius at Horizon entry is $R = 2.4 \times 10^{-23}[m]$; Hubble constant is $H_{end}^{-1} = 10^{-23}[m]$; and the mass of μBH particle is $m_{\mu BH} = 2 \times 10^{-14}\, kg$ (see below), and these affect the properties of the vacuum, giving it a nonzero energy known as vacuum energy, itself a type of *zero-point energy*.

A second example is de Sitter space which contains an event horizon. In this case the temperature T is proportional to the Hubble parameter H, i.e. $T \propto H$, such a conclusion being used by author in [2a] to calculate the evolution of Universe.

To estimate the horizon entry we use some derivations done in [2a].

Here [2a], in Inflation models , the scale leaving the horizon at a given epoch is directly related to the number $N(\varphi)$ of e-folds of slow-roll inflation that occur after the epoch of horizon exit. Indeed, since H-the Hubble length is slowly varying, we have $d\ln k = d(\ln(aH)) \cong d\ln a = \frac{\dot{a}dt}{a} = Hdt$. From the definition Eq. (38) of [2a] this gives $d\ln k = -dN(\varphi)$ as of eq.(46) from [2a], and therefore $\ln(k_{end}/k) = N(\varphi)$, or, $k_{end} = ke^N[m]$ where k_{end} is the scale leaving the horizon at the end of slow-roll inflation, or usually $k^{-1} << k_{end}^{-1}[m]$, the correct equation being $k = k_{end}e^N[m^{-1}]$. When the wavelength $(k^{-1}[m])$ is large compared to the Hubble length $(H^{-1}[m])$, the distance that light can travel in a Hubble time becomes small compared to the wavelength, and hence all motion is very slow and the pattern is essentially frozen in.

Since, the FLRW metric of the universe must be of the form $ds^2 = a(t)^2 ds_3^2 - c^2 dt^2$ where ds_3^2 is a three-dimensional metric that must be one of **(a)** flat space, **(b)** a sphere of constant positive curvature or **(c)** a hyperbolic space with constant negative curvature, or for small commoving time $dt = \frac{1}{aHc}$, we can consider the distance as $L = ds \cong a = a_{end}$, so the volume is given by:

$$V_{matter} = (a)^4 \frac{1}{c}[m^3 s]$$

During Universe evolution [2a], the *horizon leave* is when $a_{leave} = k_{leave}/H_{leave} = 1$,; $k_{leave}^{-1} = H_{leave}^{-1} = 10^{-27}[m]$, $t_{leave} = H_{leave}^{-1}/c = 3.3 \times 10^{-36}\, s$; when the Electroweak epoch begins. Here the Hubble constant is defined as $H^2 = \frac{8\pi}{3}GV \rightarrow \frac{8\pi GV^4}{3(\hbar c)^3 c^4}$,

, the field is $V = \varepsilon_{\mu BH} = 1.15 \times 10^{13}\, GeV \rightarrow 1840[J]$; the volume of μBH particle is $V_{vol} = \lambda_C^4/c = 2.3 \times 10^{-124}\, m^3 s$, the Compton length being $\lambda_C = \hbar/mc$; $\lambda_C = 1.6 \times 10^{-29}[m]$

.

Here, we introduce the following our derivation. Thus, from [2a], the Ricci scalar curvature is $\Re = -6(\ddot{a}/a + \dot{a}^2/a^2)$, which reduces to $\Re = \frac{6}{c^2 a^2}\dot{a}^2$, or

$$\frac{6}{c^2}\left(\frac{\dot{a}^2}{a^2}\right) = \frac{V^4 \hbar c}{3M_{Plank}^2 (\hbar c)^3 c^4} + 2\Lambda \;; \qquad (1)$$

$$\Re = \frac{1}{R^2} = \frac{6H^2}{c^2}[m^{-2}],$$

Since, $a \approx e^{Ht}$,

$\dot{a} = He^{Ht}$;

$H[s^{-1}] = \frac{c}{\sqrt{6}R}$; with $V = 1.15\times 10^{13}\,GeV$ at quantum fluctuations, the curvature R is $R \cong 2.4\times 10^{-23}[m]$, see below, and horizon-entry is when $k_{end} = k_{leave}e^{-N}$;
$k_{end} = 2.6\times 10^{23}[m^{-1}]$, $a_{end} = 2.6$, $H_{end} = 10^{23}[m^{-1}]$, $t_{end} = H_{end}^{-1}/c = 3.3\times 10^{-32}\,s$ we chose $N = 8.25$ to match the iterations cycle:
$m_g \to \hbar\nu \to k_B T \to \varepsilon \to R \to H_{end}^{-1} \to a_{end} \to N$, and
the scale arrives at $a_{end} = k_{end}/H_{end} \cong 1$ with $H_{end}^{-1} = 10^{-23}[m]$ at horizon entry.

The number of μBH pairs could be estimated as $N_{\mu BH} = \frac{M_{Universe}}{m_{\mu BH}} = 10^{67}$; where
$m_{\mu BH} = 2\times 10^{-14}\,kg$
and the necessary volume is $V_{necessary} = N_{\mu BH}\times\lambda_c^3 = 4.6\times 10^{-20}[m^3]$,
$V_{Universe} = a^4/c \cong 1.56\times 10^{-7}[m^3 s]$
, and the available volume is; $V_{available} = (a)^3 = 17.8[m^3]$.
The proof is given as: the energy of Universe is
$E_{Universe} = M_U c^2 = 2.2\times 10^{53} c^2 = 1.9\times 10^{70}\,J$, so
$N_{\mu BH} = E_{Universe}/\varepsilon_{\mu BH} = 1.9\times 10^{70}/1840 = 10^{67}$ that verifies the above value.

Another proof-the light bending by Earth

Now, in same way as for a nucleon [1c] we can derive a similar formula for the Earth, where in place of the Lorenz force F_L we use the gravitational pressure due of gravity charges on the curvature radius ζ_{Earth} of Earth, which is given as:

$$\left(\frac{\zeta_{Earth}}{R_{Earth}}\right)^2 = \frac{4\pi G(\sqrt{G}M_P)^2 n_{Earth}}{c^4\cdot a_{entry\_Horizon(end)}^2} = 2.46\times 10^{-18}$$

where, $\sqrt{G}M_P = (\hbar c)^{1/2}$ is the gravity charge embedded in the quarks of nucleons of number $n_{nucleons\_Earth}$ inside the Earth: $597.e24/1.67e-27 = 3.57e51$, and the Earth radius is $R_{Earth} = 6.37e6[m]$,
and the Schwarzschild radius

$$\zeta = \frac{2GM}{c^2} = 8.86e-03[m]$$

, or

$$\frac{\zeta^2}{R^2} = \frac{0.00886^2}{(6.37\times 10^6)^2} = 2.1\times 10^{-18}$$

, and the light bending is $\theta = \zeta/R = 1.4\times 10^{-9}$

, that proves the concept of gravity charges.
Now, we will verify for entire Universe, when we have

$$\left(\frac{\zeta_U}{R_U}\right)^2 \equiv \frac{4\pi G(\sqrt{G}M_P)^2 n_U}{c^4\cdot a^2_{entry\_Horizon(end)}} = 4.56$$

; where $\zeta_U = \frac{2GM_U}{c^2} = 3.25\times 10^{26}[m]$, and the curvature radius of Universe is $R_U = 1.29\times 10^{26}[m]$, and the number of particles is $n_U \cong 10^{70}$, so $\frac{\zeta_U^2}{R_U^2} = 6.36$

Also, the force and the energy of **pure** gravity charge (or gravitons) result to be $\varepsilon \cong \mathrm{E} = (\sqrt{G}M_P)^2/a_{end} = \hbar c/a_{end} = 1.14\times 10^{-26}J$ which remain *frozen* at horizon entry ($a_{end} \cong 2.6$) , that could be considered as dark matter particles near without mass $m_{dark} = \mathrm{E}/c^2 = 1.28\times 10^{-43}[kg]$, but of very high Compton length $\lambda_C = \hbar/m_{dark}c = 2.6[m] \cong a_{end}$, and of frequency $\omega = c/\lambda = 1.14\times 10^8[Hz]$, :
$E_{dark} = 10^{69}\cdot a^3_{end\_dark}\cdot \hbar c/a^1_{end} = 4.7\times 10^{70}$, $a_{end\_dark} = 4.2\times 10^9[m]$ at $V = 7.17TeV$,
$t = 6.7\times 10^{-12}s$ when the **dark particles production ceases** , see bellow.

The average magnitude of the electric field (negative charge) in the event horizon of a micro-black-hole is like that of the model electron given in [7], and where the inside "trapped" photon is similar with the "absorbed" photon from thermal energy V in case of μBH particle, or in other words the electron is a decaying μBH particle, see below equation (4):

$$\langle E\rangle = \sqrt{\frac{6\hbar c}{\pi\varepsilon_0\lambda_C^4}}$$

, it results $\langle E\rangle = 2.9\times 10^{50}[N/C]$, and where the gravity charge formally corresponds as $\hbar c \to e^2$.

2.1 The μBH particles production end

The Compton space-time volume μBH particle has the size
$V_{Compton} = \lambda_C^3\times(\lambda_C/c) = 6.6\times 10^{-112}[m^3 s]$.

Where, $\lambda_C = \hbar / m_* c = 2.1 \times 10^{-26} [m]$,

, that result the quarks pairs of mass: $m_* = 1.6 \times 10^{-17} [kg] \to 8.85 \times 10^9 GeV$

$H_{end}^{-1} = 10^{-16} [m]$; $a_{end\_quarks} = 3.4 \times 10^3$; $k_{end}^{-1} = 2.9 \times 10^{-20} [m]$; $N = 17.2$;

$H_{leave}^{-1} = k_{leave}^{-1} = 10^{-27} [m]$, $t = 3.35 \times 10^{-25} s$

$\varepsilon_q = 3 \times 10^{13} / a_{end} = 8.85 \times 10^9 GeV$, $T = 2 \times 10^{23} K$

$n_{pairs} = 10^{69} \cdot 3.8 \times 10^{10} \cong 3.8 \times 10^{79}$

This represent the final number value of future particles like quarks.

The necessary volume is $V_{necessary} = N_{pairs} \times \lambda_c^3 = 1.3 \times 10^{-7} [m^3]$,

, and the available volume is; $V_{available} = (a)^3 = 3.9 \times 10^{10} [m^3]$.

The curvature radius from eq. (1) becomes $R = 4.1 \times 10^{-17} [m]$.

To note that in mean time a lot of the as produced before μBH particles, these already are decayed partially mainly into quarks and gluons, so, the total energy remaining $\cong 10^{70} J$

2.2 The μBH dark particles production end

Where, $\lambda_C = \hbar / m_* c = 2.6 \times 10^{-20} [m]$,

, that result the quarks pairs of mass: $m_* = 1.3 \times 10^{-23} [kg] \to 7.17 \times 10^3 GeV$

$H_{end}^{-1} = 2 \times 10^{-3} [m]$; $a_{end\_quarks} = 4.19 \times 10^9$; $k_{end}^{-1} = 4.8 \times 10^{-13} [m]$; $N = 33.8$;

$H_{leave}^{-1} = k_{leave}^{-1} = 10^{-27} [m]$, $t_{end\_dark} = 6.7 \times 10^{-12} s$

$\varepsilon_{end\_dark} = 3 \times 10^{13} / a_{end\_dark} = 7.17 TeV$, $T = 6 \times 10^{17} K$

$E_{dark} = 10^{69} \cdot a_{end\_dark}^3 \cdot \hbar c / a_{end}^1 = 4.7 \times 10^{70} J$

, where available volume is; $V_{available} = (a_{end\_dark})^3 = 7.34 \times 10^{28} [m^3]$.

The curvature radius from eq. (1) becomes $R = 6.1 \times 10^{-5} [m]$.

It is possible that the collision (~7TeV) of two protons at LHC to mean the collision of two nucleon quarks which transform in two dark particle, by “losing” the rest of the insight light as two photons of high energy~125 GeV

2.3 The Confinement into nucleons

The Compton space-time volume

$V_{Compton} = \lambda_C^3 \times (\lambda_C / c) = 2 \times 10^{-73} [m^3 s]$.

Where, $\lambda_C = \hbar / m_* c = 8.8 \times 10^{-17} [m]$,

the effective quarks mass is

$m_* = \sqrt{m_e^2 c^4 + qB\hbar c^2} / c^2$

Or, $m_* = 7 \times 10^{-28} [kg] \to 0.39 GeV$

, which is just the $q\bar{q}$ string tension σ . ;

$H_{end}^{-1} = 1.5\times 10^{3}[m]$; $a = a_{end} = 1.4\times 10^{13}$; $k_{end}^{-1} = 1.06\times 10^{-10}[m]$; $N = 39.2$;
$H_{leave}^{-1} = k_{leave}^{-1} = 10^{-27}[m]$,
$\varepsilon_{gluon} = 3\times 10^{13}/a_{end} = 2.1GeV$, $T = 1\times 10^{13}K$;t=10^{-6}s
From [2a], we have H_0-an "external" electro-magnetic field of a dipole created by the pair $u\bar{u}$ (the chromoelectrical colors field)

$$H_0 = E_0 = \frac{de}{4\pi\varepsilon_0 r^3} = 8.33e24\left[\frac{N}{C}\right]$$

,where $r \cong 0.05[fm]$-is the electrical flux tube radius, $d = 0.48[fm]$-the distance between the two quarks charges, this is in fact equilibrated by the gluons field , and respectively, from eq. (2.a;2.b;2.c) at a more deep penetration $\lambda_{C\_q\bar{q}} = 4.7\times 10^{-16} > \lambda_{C\_g} = 8.6\times 10^{-17}$, see below.
Because the magnetic induction of the color magnetic gluons current which is powered by electric field given by a pair of quarks (H_0), $B^{gluon} \geq 2\cdot H_0 \cong H_{c2}$, it has the raw flow consequences squeezing this cromoelectrical flux into a vortex line, followed by forcing an organization into a triangular Abrikosov lattice, see figure 1.
From [2a], we have the lower critical field:

$$B_0 = H_{c1} = \frac{2\Phi_0}{2\pi\lambda^2}\log\left(\frac{\lambda}{\xi}\right) = \frac{\pi\hbar c}{\pi\lambda^2 c}\log(\kappa) = 1.e15\left[\frac{J}{Am^2}\right]$$

, where $\xi = 0.1114$, and when near the axis, for $x = 0.116 \cong \xi$, when the induction is
$B(\xi) \cong 2\times 10^{15}[T] \cong 2H_{c1}$; $E = cB \cong 6\times 10^{23}$
In the case of a homogeneous potential directed along the z-axis, the Einstein stress-energy tensor is:

$$T^{00} = T^{11} = T^{22} = -T^{33} = \rho_B = \frac{\varepsilon_0 c^2 B^2}{8\pi}; \; T^{0i} = 0,$$

where $\rho_B[J/m^3]$-the magnetic energy density.
The equivalence between the Lorenz force energy which squeezes the electrical field E_e done by quarks is $\varepsilon_L = ec\lambda_C B$, and at the interface between normal and superconducting phase we have $B \cong E/c$, with $e^{\pm}$ (the quarks as decaying μBH particles) pairs giving E as: $k_B T = \hbar\nu = \varepsilon_L = ec\lambda_C \dfrac{\hbar}{e\lambda_C^2} = c\dfrac{\hbar}{\hbar}mc = mc^2$, and accounting that the inverse of the penetration length $\lambda \cong \lambda_C$.
Also, the interaction energy at interface $E-B$, see figure 1. is:

$$\varepsilon = \frac{V_{vol}\varepsilon_0 c^2 B^2}{8\pi} = \rho_B V_{vol} = V[J], \tag{2.a}$$

$V_{vol} = 2\pi\lambda_C\lambda_c(4\lambda_C) \cong 8\pi\lambda_C^3$, at Compton length equally with the penetration length $\lambda_C = \lambda$, that results

$$E^2 = \frac{(V)}{\varepsilon_0(\lambda_C^{e*})^3} \tag{2.b}$$

With V as above is obtained $B \cong E_{q\bar{q}}/c = 1.98 \times 10^{15}[T]$, where $E_{q\bar{q}} = 5.9 \times 10^{23}$ with eq. (2.a), that are identically with the above values, **indubitable** meaning that this force creates the spacetime curvature and this is equilibrated by the gravity charge, see below.
The cosmological time being $\tau = H^{-1}/c = 5 \times 10^{-6}[s]$; $dt = 10^{-16}s$; and the necessary volume is $V_{necessary} = N_{pairs} \times \lambda_c^3 = 2.7 \times 10^{31}[m^3]$,
, and the available volume is; $V_{available} = (a)^3 = 2.8 \times 10^{39}[m^3]$.
The curvature radius from eq. (1) with $V = 2.1GeV$ becomes $R = 722[m]$.
The total energy is $E_U = 3.8 \times 10^{79} \cdot 3.38 \times 10^{-10} = 1.29 \times 10^{70} J$, near the value calculated above.

3. The Quantization of Mass (or Gravitational Charge)

In the classical Abraham-Lorentz theory of the electron, as in references [26, 27, 28] cited in [7], the energy contained in the Coulomb field of a charge e in all space outside its radius R is

$$U_{elect} = \int_{\vec{r} \geq R} \frac{\varepsilon_0}{2} E^2 d\vec{r} = \int_R^\infty \frac{e^2}{8\pi \varepsilon_0 r^2} dr = \frac{e^2}{8\pi \varepsilon_0 R} \qquad (3)$$

For a point charge, with $R = 0$, the total energy U_{elec} is infinite. The physical mass of the electron, $m_e = U/c^2 = 0.5MeV$, then imposes a lower limit on its size of the order of the so-called classical electron radius $r_0 = 2R = 2.82 \times 10^{-15}[m]$.

From [7], our main motivation for the central postulate stated above arises from a consideration of the experimentally well-established (parapositronium) electron-positron annihilation and creation processes as in the here cited reference [36].

$$e^+ e^- \leftrightarrow \gamma\gamma$$

Otherwise, in all the Feynman diagrams is considered the particles transformation as been accompanied by $\gamma\gamma$ (vortex).

We envisage a quantized solution where, just as is the case for the free photon, we have time varying fields, but where the field distribution is self-confined in space.
The mass of any confined photon will be $m = U/c^2$ where $U = \hbar c/\lambda$ is the energy of the photon of wavelength λ. From relation $e^+ e^- \leftrightarrow \gamma\gamma$ it is clear that for the case where the electron and positron annihilate at rest, the decay photon wavelengths λ are just the electron Compton wavelength $\lambda_C = \hbar/m_e c \cong 3.7 \times 10^{-13}[m]$. We therefore, in the first instance, look for a quantized solution defined by periodic boundary conditions of length one Compton wavelength λ_C, which is confined to some closed path in 3-D space.

The magnitude of the apparent charge of our model object is based on the length scales estimated in the previous section. We confine an arbitrary photon with wavelength λ to a spherical volume $V = \frac{4}{3}\pi\left(\frac{\lambda}{2}\right)^3$.

The energy density of the electromagnetic field in the volume is $W = \frac{1}{2}\left(\varepsilon_0\left|\overline{E}\right|^2 + \mu_0^{-1}\left|\overline{B}\right|^2\right)$

.

For a propagating photon inside the volume, where space is curved, we take $E = cB$ and $c^{-2} = \varepsilon_0\mu_0$ as is the case for a free-space photon.

The electric field energy U_E and the magnetic field energy U_B are then one half of the total confined photon energy U (i.e. $U_E = U_B = 1/2U$). We find for the average energy density of the electric field in the volume V, $W_E = U_E/V = \frac{1}{2}U/V$ and also $W = \frac{1}{2}\varepsilon_0 E^2$

. The average magnitude of the electric field inside the model electron is then

$$\langle E\rangle = \sqrt{\frac{6\hbar c}{\pi\varepsilon_0\lambda^4}} \qquad (4)$$

, it results $\langle E\rangle = 5.7\times 10^{17}[N/C]$, for electrons of $\lambda_C = \hbar/m_e c \cong 3.7\times 10^{-13}[m]$

In case of quarks we have

$\langle E\rangle = 3.7\times 10^{23}[N/C]$, for $m_q = 7.2\times 10^{-28}kg \leftrightarrow 0.4GeV$,

$\lambda_C \cong \hbar/m_q c \cong 4.6\times 10^{-16}[m]$,

that corresponds with the value from [2a] for a pair $\cong 6\times 10^{23}[N/C]$.

To estimate the charge in our model we need to compare the magnitude of the inward directed electric field to that for a point charge at the origin. Making the plausible assumptions that the relevant length scale from where the electric field is effectively inward-directed is the mean radius of energy transport $\bar{r} = \lambda/4\pi$, and that the average electric field of the confined photon, Eq. (3), is a good estimate of the field at this radius, we obtain the effective charge, q, by comparing this to the Coulomb field of a point charge at distance $\bar{r} = r$

$$E = \frac{q}{4\pi\varepsilon_0 r^2}$$

which then yields the charge from our model in terms of the elementary charge e

$$q = \frac{1}{2\pi}\sqrt{3\varepsilon_0\hbar c} \cong 0.91e \qquad (5)$$

, where this apparent charge arises from the electric field of the confined photon. Note that q is independent of the energy of the photon (the size of the object) and is a result of the toroidal topology.

The rotational energy of a relativistic object is $U_{rot} = L\omega$, with L the angular momentum, and ω the angular frequency. For a photon $L = \hbar$, and the total energy of a photon with frequency ω is $U_{photon} = \hbar\omega$. Thus, the energy of a photon is entirely electromagnetic and contained in its spin. The confined photon in our model has to travel

around twice to complete its path of length $\lambda = 2\pi c/\omega$. Consequently, the internal rotational frequency of the model is twice the photon frequency $\omega_s = 2\omega$. The internal rotational energy is equal to the confined photon energy, and we may write $U_{model} = L\omega_s = \hbar\omega$. Our model must then have an intrinsic angular momentum $L = \hbar\omega \big/ \omega_s = \frac{1}{2}\hbar$. We see that this describes an object of half-integer spin. If the spin-statistics theorem applies, our self-confined photon should be fermions. This is again a direct consequence of the topology of our model; the
field vectors must rotate through 720° before coming back to their starting position with the same orientation. In quantum mechanics, the spin angular momentum has a fixed value $s = \frac{1}{2}$, therefore we cannot take the intrinsic spin to a classical limit by letting $s \to \infty$ and there is no classical correspondence with half-integer spin. In our model this is ensured because, for our topology, we have necessarily one and only one wavelength, and this gives a fixed, length-scale independent value of s .
If the electron is indeed constituted by a photon, other elementary particles may also be composed of photon states, but in some other configuration [7]. The possibility that muons and tauons may be formed by electron-like states with a different internal curvature has been discussed in the literature [8]. We speculate that the hadrons may be described by composite confined photon states as gluons [2a] together with quarks pairs at the origin of an electrical field and of gravity. If we identify a quark with a confined photon state which is not sufficient in itself to complete a closed loop in space, but transforms a photon going in one spatial direction to one travelling in another, it would then only be possible to build closed three-dimensional loops from these elements with qqq and $q\bar{q}$ combinations.
The gravitational theory here proposed [1e] says that the intense interior gravitational field of the electron is just sufficient to compensate for the repulsive forces in an electron of finite size. It shows that if the electronic charge is pictured as being distributed over a region with a radius equal to the classical radius of electron (e^2/mc^2), and the gravitational mass is distributed over a region with a radius of order $\lambda_C = \hbar/mc$, a balance can be achieved between the repulsive force of spin and electric and attractive gravitational forces. We see from the basic equation of the quantized gravitational charge see section 3. , respectively

$$G \cong \frac{\hbar c}{M_P^2}, \qquad (6)$$

that $\sqrt{GM_P^2} \cong (\hbar c)^{\frac{1}{2}}$. Since the gravitational charge is distributed over a region of the order of $\hbar/mc$ it gives a negative energy of the order of
$\hbar c/(\hbar/mc) = mc^2$
while the electric charge distributed over a region of the order of e^2/mc^2 (since $E = \frac{e^2}{\varepsilon_0 r} = m_e c^2 \to r = \frac{e^2}{\varepsilon_0 E} = \frac{e^2}{\varepsilon_0 m_e c^2}$) gives a positive self energy of

mc^2. Since the two self energies are of the same order of magnitude, they be brought into balance.
Consider now a photon and suppose that it maintain its identity in virtue of an interior gravitational filed. I we pictures the gravitational mass m of the photon as being distributed over a volume whose radius is of the order of λ , the wavelength of the photon, we see that the energy of the photon, in virtue of gravitational mass $m = M_P$,
must be of the order of Gm^2/λ or $Gm^2\nu/c \rightarrow 10^9[J]$. But the energy of the photon is also $h\nu \rightarrow \cong 10^9[J]$. Hence we see again that $Gm^2 \cong \hbar c$, that means for $\nu = 10^{43}s^{-1}$.
The same at confinement in nucleons, $\nu = 6.8\times 10^{24}Hz$, it results the photons energy $Gm^2\nu/c \rightarrow 3.4\times 10^{-10}[J] \rightarrow 2.1GeV$
In case of Higgs particle $H \rightarrow \gamma\gamma$ it results $Gm^2\nu/c \rightarrow 8.3\times 10^{-08}[J] \rightarrow 112GeV$, with $\nu = 8\times 10^{26}Hz$; and $\hbar\nu = 8\times 10^{-8}[J]$.
A very stranger result is obtained if we divide the gravitational charge to Compton length of any particle (example μBH particle decayed till at Confinement)
$\lambda_C^H = \hbar/m_{\mu BH}c \rightarrow 8.8\times 10^{-17}[m]$; $\varepsilon_H = \hbar c/\lambda_C^H \rightarrow 3.37\times 10^{-10}[J] \rightarrow 2.1GeV$, or in other words the energy of particle as to be distributed in their Compton length is just the energy or the "mass".
The neutrino, according to this picture, must be represented as consisting of two photons bound together gravitationally and revolving around a common center. To account for the spin of the neutrino, which is a Fermi particle, we need assume that the sum of the orbital angular momenta of photons equals $\hbar/2$. The two photons must then be revolving such a way that : 1) their own intrinsic spins (each equal to $\hbar$ are antiparallel , and 2) that the electromagnetic field of one cancels that of the other. This can always be achieved. A neutrino consisting of two photons, has, of course, zero rest mass, and therefore this gravitational of the neutrino accounts for one of its remarkable properties. For other type of neutrinos see [1e].
With above value $T = 2\times 10^{23}K$ as Beckenstein radiation of μBH particle of the like Quantum bubbles (QB) , of volume $V = (H^{-1})^3 \cong (10^{-23})^3[m^3]$ at horizon entry (when the scale factor is $a \cong 2.6$), it results the total number of primordial high energy photons following the "decay" of a like-μBH particle and which *"fill"* the vacuum till are embedded as a Bose Einstein Condensate (B.E.C) in matter (gluons) at symmetries breakings, or when is attained a critical temperature (like in case of superconductors!) as: $n_{\gamma\gamma}^{total} = 10^{80}$ as above. To mention as an argument of the like-Micro-black-holes decay into photons in t_P is the Hawking radiation where, the gravitational field is so strong that it causes the spontaneous production of photon pairs (with black body energy distribution) and even of particle pairs.
Sure, only few free photons of photons dimension could remain embedded in ex-like-Micro-black-holes which it adjusts its dimensions to electrons, other leptons, non-charged particles (neutrinos, Higgs) in order to equilibrate the gravitational charge $\sqrt{G}m_{Planck}$ as it was explained before following electron model [7].

Very early in 1960 L.Motz [1d] has elaborated a new theory of the structure of fundamental particles, which introduces gravitational field into the interior of particles such as electrons to account for their stability.
Thus, $\sqrt{G}m_P$ is the gravitational charge defined by L. Motz [1d] as resulting from:
$F_G = \dfrac{\sqrt{G}m_1\sqrt{G}m_2}{r^2}$, where it can say that the gravitational charge $\sqrt{G}m_1$ is the source of gravitational field $\sqrt{G}m_1/r^2$ at the distance r, and that this field is coupled to the gravitational charge $\sqrt{G}m_2$ at the position r (relative to the source of the field) via the product of the field strength and the charge. L. Motz [1d] derived the quantization condition on gravitational charge in a similar manner by noting that moving particle with velocity $\vec{V}$ and with gravitational charge $\sqrt{G}m_P$ is coupled not only to the Newtonian gravitational fields of all other particles (the gravielectric field) in the usual way, but also to the Coriolis inertial force (defined as $F_C = -2m_P\omega \times v$) field $2\vec{\omega}cr^2/\sqrt{G}$ (the gravimagnetic field) by means of the cross product $\left(\sqrt{G}m_P\vec{V}/c\right)\times\left(2\vec{\omega}r^2/\sqrt{G}\right)$, see below the possible Motz's derivation (my guess) , where $\vec{\omega}$ is an appropriate angular velocity.
This cross product term give rice to an angular momentum ($L = rmv$; $v = r\omega$) component in the motion of the particle which is of the order of $L = 2m_Pr^2\omega$ and is parallel to the field $\vec{\omega}$.
Therefore, it is obtained the *quantization condition* as: $L = 2m_Pr^2\omega = \hbar$.
Since it was interested in the quantization of fundamental gravitational charge, it is found a value for r and ω that must be associated with such charge. To do this, L.Motz considered the Universe to two such charges in gravitational equilibrium and resolving about each other in the first Bohr orbit. The radius of this orbit is just $r = \hbar^2/Gm_P^3$, which it was taken as to be r . He also noted that the Coriolis field $2\omega cr^2/\sqrt{G}$ must, according to Mach's principle, produces the centrifugal force $m\omega^2$. "A very general statement of Mach's principle is "*Local physical laws are determined by the large-scale structure of the universe*".
The Motz derivation seems to have come from that the Coriolis acceleration which is
$a = 2(\omega \times v)$
, and the force is

$$F_C = -2m_P\omega \times v \qquad (7)$$

, so we can get Motz quantity by dividing the both forces F_C and the gravitational
$F_G = \dfrac{\sqrt{G}m_1\sqrt{G}m_2}{r^2}$ by the gravitational charge $\left(\dfrac{\sqrt{G}m}{r^2}\right)$, and with $v \cong c$

$$\frac{Fvr^2}{\sqrt{G}m_P} \times \frac{2\omega\, m_Pcr^2}{\sqrt{G}m_P}$$

Such a coupling of the charge to gravimagnetic field is achieved, as explained by Motz

$\sqrt{G}m_P \frac{v}{c} \times \frac{2\varpi r^2}{\sqrt{G}}$, that becomes just the angular momentum $L = 2m_P r^2 \omega$ according to Motz.

This will be so only if $v = \omega r$ is of the order of c since the centrifugal force (being charge times field) is just $\left(\sqrt{G}m_P\right) \cdot \left(2\omega r^2 / \sqrt{G}\right)$. Introducing these two relationships into the above quantization equation, is obtained

$L = 2m_P cr = \hbar$, or substituting for r as Bohr orbit we have

$2m_P c \frac{\hbar^2}{Gm_P^3} = \hbar$, or

$$\frac{Gm_P^2}{c} = \hbar \qquad (8)$$

Independently, the author in [1c] has obtained the same quantization condition in case of the calculation of nucleons structure.

Thus, the ratio of the forces of gravity and of electromagnetic between the vortex and the quark flux tube (electric field), see figure 1. , becomes

$$\frac{|F_G|}{|F_{M\_condensate}|} = \frac{\frac{Gm_{Planck}^2}{r^2}}{\frac{ec\pi\hbar c}{\pi ec\lambda^2}} = \frac{G\hbar c}{r^2 G} * \frac{\lambda^2}{\hbar c} = 1 \quad ; \text{For } \lambda \cong r \qquad (9)$$

, where the Lorentz force is $F_{M-condensate} = ecB$ (10)

$$B\big|_{x \lhd\lhd \lambda} = \frac{2\Phi_0}{2\pi\lambda^2 c}$$

$$\Phi_0 = \pi\hbar c/e \rightarrow usually \frac{\pi\hbar}{e} = 2.07e-15[Tm^2]$$

$$\frac{|F_G|}{|F_{quark}|} = \frac{\frac{Gm_{Planck}^2}{r^2}}{\frac{e^2}{4\pi\varepsilon_0\lambda^2}} = \frac{G\hbar c}{r^2 G} * \frac{4\pi\varepsilon_0\lambda^2}{e^2} = \alpha_s = 137 \qquad (11)$$

If we consider only an electric Coulomb field of the quark dipole in the middle of the gluons condensate, we obtain an another very important result, namely, the value of fine structure constant α_s:

Therefore, if we consider the string force due of the Coulomb flux tube as given by the colors quarks $\bar{q}q$ pairs, see figure 1. , results

$$G = \frac{\alpha_s F_{quarks}\lambda^2}{m_{Planck}^2} \rightarrow \frac{137*1636*3.75e-16^2}{2.2e-08^2} \rightarrow 6.65e-11m^3/kg \cdot s,$$

Or again, $$G = \frac{4\pi\varepsilon_0\hbar c\lambda^2}{e^2 m_{Planck}^2} \times \frac{e^2}{4\pi\varepsilon_0\lambda^2} = \frac{\hbar c}{m_{Planck}^2} \qquad (12)$$

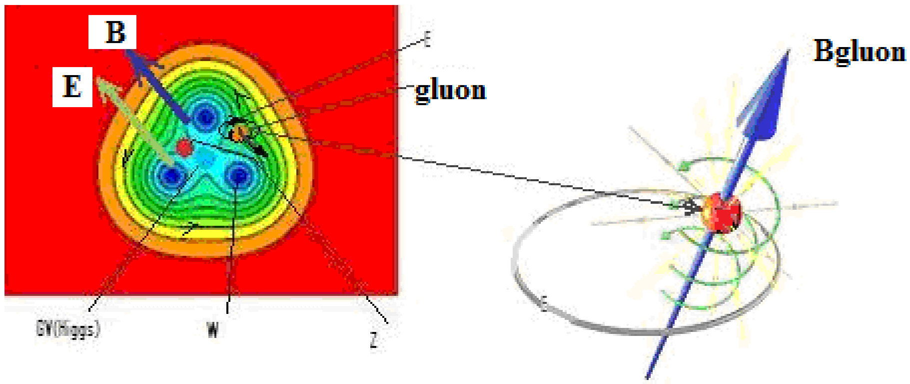

Fig.1. The gluons embedded in Giant-Vortex [2a] that could be also the arrangement for the nucleon (only illustration). A spin-orbit nonabelian field is shown.

Gamma-gamma interactions can either give up mass in the form of special types of decay processes or, vice versa, the energy can come from antiparticle interactions. This is called the parapositronium decay. Such a phase transition is given as

$\gamma\gamma \leftrightarrow e^- e^+$

Now, with data from [2a], in case of gluon's condensate of soft photons

$\varepsilon_{gluon\_condens} \cong 2.1 GeV \to 3.38 \times 10^{-10} [J]$

, we have $r_{gluon-condensate} = \lambda_C = \hbar / m_{gluon-condensate} c \to 8.8 \times 10^{-17} [m]$,

$m_{gluon-condensate} = 3.8 \times 10^{-27} [kg]$ it results the frequency

$$\omega = \varepsilon_{gluon\_condens} / \hbar \cong 6.7 \times 10^{24} Hz . \qquad (13)$$

4. Cosmological and other consequences of the uniton existence

If the square of quantum charge is, indeed $\hbar c$, we can account for the stable electrically charged particles such as electrons by balancing the explosive positive electro-static energy with the negative binding energy of the gravitationally charge. Accordingly to this point of view electrons and nucleons are the lowest bound states of two or more *unitons* that collapsed down to the appropriate dimensions gravitationally and radiated anyway most of their energy in the process. It is clear that a gravitational charge of magnitude $\hbar c$ will contribute negative gravitational binding energy of the order of mc^2 if this charge is distributed over a region whose dimensions are equal to the Compton wave length of the particle. To note again that each uniton of a total 10^{80} it produces by radiation $\cong 10^{80}$ of soft photons as due to hair concept of micro-black-holes [5c], that represent the gluons which again together with quarks condensate at Confinement (1×10^{13}K; V=2.1GeV, t=5×10^{-6}s) into nucleons, see more details in [2a].

The binding energy will be sufficient to balance the positive electrostatic energy of the charge e distributed over the classical radius $e^2/4\pi\varepsilon_0 m_e c^2$, as from

$$E = \frac{e^2}{4\pi\varepsilon_0 r_e} = m_e c^2 \qquad (14)$$

, it results $r_e = 2.8\times 10^{-15}[m]$,

5. The origin of Dark Matter Particles

If during the radiation decay of ex-Micro-black-holes, it is a total decay (no photons remaining embedded), that these particles keeping only the gravitational charge $\hbar c$. Thus, further these interact only gravitationally forming a stopping *web,* that impede the fast Universe expansion. It is possible that all the radiation falling on them to be absorbed (not light bending!), these being in fact micro black-holes at origin, that, these could not be directly observed, and only by effects.

6. Conclusions

In the work by proceeding to simplistic analysis is answered to the main open questions today about how is embedded the gravity in matter. Thus, it is found that a number of 10^{80} primordial micro-black-holes particles as generated by quantum fluctuations , in fact these represent the today known particles: electrons, leptons etc., when theirs dimension is adjusted during radiation decaying with soft photons production which by cooldown at a critical temperature (confinement), condensate into particles (gluons). The quantization of gravitational charge inside particles contributes to the confinement of some photons into (onto) electrons, quarks, others leptons and non-charged particles: neutrinos. Also, in this context it results that a equal part of the ex-Micro-black-holes generated are frozen at horizon entry that correspond to *Reheating* period during Universe evolution ($2.4\text{x}10^{13} \div 8.85\text{x}10^{9}$ GeV) keep only the gravitational charge, so becoming Dark Matter particles of very low mass $10^{-43}[kg]$ and of huge dimension ~3[m] and of low frequency 10^8Hz. Thus, these particles interact only gravitationally with others including that of the gravitational charges embedded in matter particles, thus, slow downing the fast Universe expansion. A proof of the model is done by applying it to light bending due of Earth. It is obtained the timeline of Universe.

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