**International Journal of High Energy Physics**
2016; 3(4): 25-32
http://www.sciencepublishinggroup.com/j/ijhep
doi: 10.11648/j.ijhep.20160304.11
ISSN: 2376-7405 (Print); ISSN: 2376-7448 (Online)

# The Experimental Evidences for a 34 $m_e$ Neutral Boson, Predicted by a Particles Cold Genesis Theory, as Argument for a Preonic Quark Model

**Marius Arghirescu**

State Office for Inventions and Trademarks, Bucharest, Romania

**Email address:**
arghirescu.marius@osim.ro

**To cite this article:**
Marius Arghirescu. The Experimental Evidences for a 34 $m_e$ Neutral Boson, Predicted by a Particles Cold Genesis Theory, as Argument for a Preonic Quark Model. *International Journal of High Energy Physics*. Vol. 3, No. 4, 2016, pp. 25-32. doi: 10.11648/j.ijhep.20160304.11

**Received**: June 10, 2016; **Accepted**: June 20, 2016; **Published**: July 23, 2016

**Abstract:** The new experimentally evidenced neutral boson of 34 $m_e$, supposed to be an X-boson of a fifth basic force, was predicted as being a basic $z^0$ preon of cold formed quarks by a pre-quantum model of elementary particle resulted from an etherono-quantonic theory of the author, and can be a strong argument for a Bose-Einstein condensate model of particle, resulted by magnetically confined gammons formed as pairs of quasielectrons. In the paper are brought arguments in the favour of the preonic structure of quarks and for the cold genesis of the elementary particles and is proposed a pre-quantum model of quark, resulted as cluster of quasi-electrons. The brought arguments sustain also the conclusion that the $z^0$ boson can be a "dark matter" constituent.

**Keywords:** Pre-quantum Model, Neutral Boson, Preon, Quark Model, B-E Condensate, Dark Matter, X Boson

## 1. Introduction

In a relative recent paper, [1], a research team of Science's Institute for Nuclear Research in Debrecen, Hungary, after some experiments for the detection of dark photons, announced that significant deviation from the internal pair creation during the ($e^+$ -$e^-$) transition to the ground state of an excited Be8* nucleus was observed at large angles, which indicates that, in an intermediate step, was transformed a neutral super-light particle with a mass of ~17 MeV/$c^2$, (~34 $m_e$), the excited Be8* state being obtained by proton interaction with a target of Li7, i.e. by a reaction of type:

$$\text{Li7} + p^+ \rightarrow \text{Be*} \rightarrow \text{Be8} + b^0;\ b^0 \rightarrow e^+ + e^-; \qquad (1)$$

In another paper, [2], a team of american physicists from California concluded that the evidenced new boson is not a dark photon and this experimental result could be the evidence for a fifth fundamental force mediated by the predicted X-boson, coupling quarks with leptons, which decay by a reaction of type:

$X \rightarrow e^+ + e^-$ or $X \rightarrow \nu+\overline{\nu}$, (neglijible), instead:$X \rightarrow u + u$; $X \rightarrow e+ +\overline{d}$,

Later, the considered X boson was theoretically identified as k = 113 light pion, by the p-Adic thermodynamics, [3].

But a particle with the same mass: 34 $m_e$, was considered by a cold genesis quark model as being the basic preon by which is composed the effective quark mass, according to a cold genesis pre-quantum theory of particles and fields of the author, (CGT), [4-6].

According to this theory, based on the galileian relativity, the magnetic field is generated by an etherono-quantonic vortex: $\Gamma_M = \Gamma_A + \Gamma_\mu$ of s-etherons (sinergons- with mass $m_s \approx 10^{-60} kg$)- giving the magnetic potential **A** by an impulse density: $p_s(r)=(\rho_s \cdot c)_r$ and of quantons (h-quanta, with mass: $m_h = h/c^2 \approx 7.37x10^{-51} kg$), giving the magnetic moment and the magnetic induction B by an impulse density: $p_c(r)=(\rho_c v_c)_r$, generated by a magnetic moment of a charged particle or by a magnet or electromagnet.

The theory deduces also a variation of the Compton radius and of the fermion's magnetic moment, inverse proportional with the density in which is placed the particle's super-dense kernel, (the particle's centroid) and sustains the possibility of a cold genesis of particles, which results theoretically in a chiral soliton model as Bose-Einstein condensate of photons- in the electron's case and of "gammons": $\gamma_c$ = ($e^+$–$e^-$) -

considered as pairs of degenerate electrons, i.e- of quasielectrons- in the case of mesons and of baryons, with the inertial mass $m_e^*$, formed by a superdense centroid and a quantum volume of vexons (vectorial photons, composed by vortexed vectons- considered as vectorial photonic quanta of the E- field: $m_v \approx 10^{-40}$kg), the particle's magnetic moment radius being given by its Compton radius.

This possibility was argued also in a previous work of the author, [4-8], by the conclusion that- because the physical contact between component electrons surface, their inertial masses and magnetic moments may be diminished because the decreasing of the density variation mean radius, $\eta^*$, according to the relations:

$$r_\lambda = \lambda / 2\pi = \hbar / m_p c \qquad (2)$$

$$\rho(\mathrm{r}) = \rho^0 |\Psi_e|^2 \ ; \quad |\Psi_e|^2 = k_d \Psi_e^- \cdot \Psi_e^+ \ ; \ (\Psi_e^- = R \cdot e^{-iS/\hbar} \ ; \ \Psi_e^+ = R \cdot e^{iS/\hbar}) \qquad (3a)$$

$$\Psi_e^{\pm *} = R^* \cdot e^{\pm iS/\hbar} \ ; \quad \text{with:} \ (R^*)^2 = e^{-r/\eta^*} = k_d R^2 \ ; \quad R^2 = e^{-r/\eta} \ ; \ \eta^* < \eta \qquad (3b)$$

where: $\Psi_e^-$; $\Psi_e^+$ -the wave function of the free negatron and positron structure and $k_d$ –degeneration coefficient, which depends on the distance 'l' between the component electrons, for a system with more electrons, $k_d$ depending also of the number n of gammons forming the neutral cluster $N^p$ of the particle, according to an empiric relation:

$$k_d \approx e^{-(n\cdot\gamma/l)\cdot r} \qquad (4)$$

(l- the distance between the superdense centroids of adjacent quasielectrons; γ-specific constant).

The value of the constant γ in eq. (4) was approximated by CGT with the case of a proton formed as B-E condensate of $N^p$ = 2104 quasi-electrons, i.e.- of n = 1052 gammons (degenerate hard-gamma quanta) and an attached positron, the mean radius η of the electron mass decreasing from $\eta_e$ = 0.965 fm (of the free electron) to: $\eta_n$ =0.849fm (of the quasielectron of protonic B-E condensate), according to CGT, value which is wery close to the experimentally determined root-mean-square radius of proton's charge density variation: $\eta_{ne}$ =0.841fm, (Pohl et al., 2010) and which results- for a proton with a considered effective radius: $r_p \approx a$ = 1.41fm, by the mass integral equation:

$$m_p = \int_0^a 4\pi r^2 \rho_p(r)\cdot dr; \quad \rho_p(r) = \rho_p^o \cdot e^{-\frac{r}{\eta_p}} = \rho_p^o \cdot |\Psi_p|^2 ; \quad \rho_p^0 = (2n+1)\rho_e^0 = 4.68x10^{17} kg/m^3 \qquad (5)$$

with $\rho_e^0 = 22.24x10^{13}$ kg/m$^3$, [4-6].

Also, because that- according to CGT, the degenerate electrons of the protonic B-E cluster are quasi-electrons, with the charge $e^* = (^2/_3)e$ -characteristic to quarks, by the specific dependence: e ~ $\rho_c(a)$, to the $\rho_c(r)$- density variation of the quasi-electron's magnetic moment vortex, $\Gamma_\mu^*$, it corresponds a mean radius of the $\Gamma_\mu^*$-vortex: $\eta_\mu = 0.755$ *fm*, [4-6] and it results that: $\gamma = \gamma_e \approx 6.75x10^{-6}$ for the electron mass decreasing and: $\gamma = \gamma_\mu \approx 1.35x10^{-5}$ for the electron's magnetic moment density decreasing.

The virtual radius: $r_\mu^n$ of the proton's magnetic moment, $\mu_p$, results by a degenerate Compton radius of the attached positron, which decreased when the protonic positron was included in the $N^p$ cluster volume, from the value: $r_\mu^e = 3.86x10^{-13}m$, to the value: $r_i = r_\mu^p = 0,59fm$, as a consequence of the increasing of the impenetrable quantum volume mean density in which is included the protonic positron centrol: $m_0$, from the value: $\bar{\rho}_e$ to the value: $\bar{\rho}_n \cong f_d N^p \cdot \bar{\rho}_e$, conformed with the equations:

$$\mu_p = k_p \frac{m_e}{m_p}\mu_e = k_p \frac{\bar{\rho}_e}{\bar{\rho}_n}\mu_e \cong k_p \frac{1}{f_d \cdot N^p}\mu_{Bp} = \frac{e.c.r_\mu^p}{2}; \quad k_p = \frac{g_p}{g_e} = 2.79 \qquad (6a)$$

$$k_p = \frac{\rho_n(r^+)}{\rho_n^0} = e^{-\frac{r^+}{\eta_d}} \qquad (6b)$$

in which: $k_P$-the gyromagnetic ratio; $\bar{\rho}_e$ ; $\bar{\rho}_n$ – the mean density of electron and nucleon; $r^+$ -the position of protonic positron centrol in report with the proton centre; $f_d$ -the degeneration coefficient of the quasielectron mass, $m_e$*.

The relation (6b) also gives: $r_e^+ = 0.96$ *fm* for the protonic positron axial position inside the protonic quantum volume.

The superposition of the ($N^p$+1) quantonic vortices: $\Gamma_\mu^*$ of the protonic quasielectrons, generates inside a volume with the radius: $r_\mu^a$ = 2.35fm, a total dynamic pressure: $P_n = (1/2)\rho_n(r)\cdot c^2$ which gives a nuclear potential: $V_n(r)$, in an eulerian form, having a variation according to eq. (5) and (6b), with: $\eta^* = 0.755fm$, that is: $V_n(r) = \upsilon_i P_n = V_n^0 \cdot e^{-r/\eta^*}$; $V_n(r) = \upsilon_i P_n^0$; ($\upsilon_i(0.6\text{fm}) \approx 0.9\text{fm}^3$- the impenetrable quantum volume).

-In a previous book, [4], the preon of 34 $m_e$ was considered formed as cluster of 34 quasielectrons, $e^*$, with degenerate magnetic moment and electric charge corresponding to the value: $\pm^2/_3$e, (specific to u-quark/antiquark), coupled in gammonic pairs: ($e^{+*}$-$e^{-*}$), but with un-degenerate mass.

-In the next variant, in english, [5-6], the preon of 34 $m_e$ was considered "quarcin", with a charge $e^* = \pm^2/_3$e, because that it was considered as formed by an odd number of 39 quasielectrons with degenerate mass: $m_e^* \cong 0.872 m_e$.

This $m_e^*$- value was approximated considering that the confination of vortexial photons inside the electron's quantum volume and of gammonic pairs: $\gamma^* = (e^{+*}$-$e^{-*})$ inside the particles quantum volume, complies with the chiral sub-solitons forming condition [9] which specifies that the energy density $\in_r = \rho_r c^2$ of the mass-generating vortexial field should be double, at least, comparing to the mass energy density: $\in_w = \rho_w c^2$ of the generated sub-solitons, ($\in(m_e^*) = 2\in(\Gamma_M)$), and considering a degeneration of $\Gamma_\mu$ corresponding to the charge $e^* = \pm^2/_3 e$, (a decreasing of the mean radius of $\Gamma_\mu$ from: $\eta_e = 0.965\ fm$ to $\eta_\mu = 0.755\ fm$) and an un-degenerate $\Gamma_A$ -vortex.

The necessity of the preon with ~34 $m_e$ resulted in CGT by the conclusion that –in a cold genesis scenario, the elementary particles could be formed in a magnetaric super-strong magnetic field, with $B_T \to 10^{13}$ T, in a cascade particles forming process, by masses given according to the sum rule and equal or very close to a value given as integer number of basic preons, $c_0$. As helpful theory for this issue was used a theoretical result of Olavi Hellman which deduces the value of elementary particles mass, by a simplified relation:

$$M_p = \frac{K_m}{2\alpha} m_e;\ \alpha = \frac{e^2}{hc} = \frac{1}{137};\ m_e = 9.1x10^{-31} kg \quad (7)$$

with a tolerance under 1%, neglecting the electromagnetic field contribution, by integer values of $K_m$, as a multiple of the mass: $M_0 = 68.5 m_e$; ($K_m$ = 3; 4; 14 for the mesons μ, π, K and $K_m$ = 27 for nucleons, etc.), obtained according to the sum rule.

## 2. Theoretical Arguments for a Preonic Structure of Quarks

### *2.1. The Arguments for the Basic Preon of 34 $m_e$*

It may be observed that- for nucleons, the theory of O. Hellman gives- by $K_m$= 27$m_n$: p/n =1849,5 $m_e$ instead ~1836$m_e$, i.e. – a difference which indicated that the $M_0$ = 68.5$m_e$ value is not enough plausible. Also, we may observe that the value $M_0$'= 68$m_e$ gives a very good correspondence with the nucleon mass but not gives a good correspondence with the mass of Σ -particle; ($m_\Sigma$ = 2312 $m_e$ or 2380 $m_e$ instead (2327; 2333; 2342) $m_e$).

This fact indicated in CGT as the most plausible value for the mass of the basic preon which may explain the mass of the elementary particles by quark masses (i.e- by their effective mass), the value: $c_0$ = 68/2 = 34 $m_e$.

The obtained effective masses of the resulted quarks and their preonic sub-structure was presented in the book: "The Cold Genesis of Matter and Fields", [5- 6] and in the previous book, [4].

The experimentally evidenced particle with 34$m_e$ as neutral boson which decay into a ($e^+$-$e^-$) pair suggests that- in accordance with CGT, in the decay of Be8* to its ground state, the excess energy was emitted in the form of a neutral preon, formed as cluster of an even number of quasielectrons (by an integer number of degenerate gammons), i.e- of n = 40 or n'= 42 quasielectrons with mass: 34/42 = 0.8095 $m_e$ given by the sub-solitons forming condition [9] by a degeneration of $\Gamma_\mu$ corresponding to the charge $e^* = \pm^2/_3 e$, (specific to quarks*)* and a degeneration of $\Gamma_A$ –vortex corresponding to a decreasing of the mean radius of $\Gamma_A$ from: $\eta_e = 0.965 fm$ to: $\eta_A = 0.839\ fm,$ (approximate- a half of the $\Gamma_\mu$ -vortex decreasing to $\eta_\mu = 0.755\ fm$).

The case: n = 40$m_e$* may be explained by the predicted quarcin: $c_0^\pm = 39\ m_e^*$, ($m_e^* \cong 0.872\ m_e$), considering that the expelled quarcin has left the nucleon with the un-paired quasielectron of the adjacent quarcin of the basic "zeron": $z^* = (c_0 + \overline{c}_0)$ forming a neutral boson which decayed in the form:

$$b^0 (c_0^0 + e^{+*} + e^{+*}) \to \gamma + e^+ + e^+, \quad (8)$$

by the transforming of quasielectron into electron, in a free state, according to eqs. (2)-(4), [6-8].

The case: n = 42$m_e$* may be explained considering a quarcin $c^{*\pm} = 21\ m_e^*$, ($m_e^* \cong 0.8095\ m_e$) and considering that the expelled boson $b^0$ is a basic preon: $z^0 = (c_0^* + \overline{c}_0^*)$ = 34$m_e$, which decayed in the form:

$$z^0(c_0^* + \overline{c}_0^*) \to c_0^+ + c_0^- \to e^+ + e^-; \quad (9)$$

by the transforming of the quarcin $c_0^*$ into a heavier electron, in the free state, by the transfer of the un-paired quasielectron (which gives the quarcin's charge) in the external part of its impenetrable quantum volume, according to eqs. (2)-(4) of CGT, [6-8].

In this last case, the nucleon results as formed by $N^p \approx$ 54x42= 2268 quasi-electrons which gives- by the superposed vortexes of their magnetic moments, $\Gamma_\mu^*(e^*)$, a nuclear potential $V_s^n(r)$ at d ≈ 2fm, according to:

$$V_s^n(r) = -\upsilon_i \cdot P_d(r) = -\frac{\upsilon_i}{2}\rho_n(r)\cdot v_c^2 = V_s^0 \cdot e^{-\frac{r}{\eta^*}};\ (v_c = c);\qquad V_s^0 = -\frac{\upsilon_i}{2}\rho_n^0 \cdot c^2;\ r \le r_\mu^a = 2.35 fm \quad (10)$$

in which the proton density in its centre has the value: $\rho_n^o \approx N^p \cdot \rho_e^o = 5.04x10^{17} kg/m^3$, $(\rho_e^0 = 22.24\ x10^{13}\ kg/m^3)$, giving- with $\upsilon_i(a_i)$ = 0.9 $fm^3$, $V_s^0 = 127.5\ MeV$; $V_s(d=2fm) \approx 9MeV$ – value specific to the mean binding energy per nucleon in the nuclei with the most strongly bound nucleons: 9.14÷9.15 MeV/nucleon for $^{56}Fe$, $^{58}Fe$, $^{60}Ni$, $^{62}Ni$; (i.e- it results a better fit with the experimental data).

In the same time, taking into account the experimental value for the mean radius of the nucleon density variation: $\eta_n^e$ =0.841fm, the proton mass and the $m_e$*- mass of the specific bound quasi-electron results- by eq. (5), for an effective radius: $a_n \approx$ 1.363 fm, (closer to the value: $r_0 \approx$1.25fm used by the equation of empirical nuclear radius: $R_n \approx r_0 \cdot A^{1/3}$).

Also, the neutron and its internal negative charge, experimentally evidenced, are explained according to the "dynamid" model of the theory [4-6], i.e.- by a revolving negatron with $v_e$ speed to an orbital of radius $r_e^* \leq a_n$, with a degenerate spinorial magnetic moment, $\mu_e^s$, given according to the equations:

$$\mu_e^S = \mu_N \cdot \frac{\rho_n^0}{\rho_n(r_e^*)} \;; \qquad \rho_n(r_e^*) = \rho_n^o \cdot e^{-\frac{r_e^*}{\eta_p}} \;; \quad \eta_p = 0{,}841\,fm; \tag{11}$$

$$\mu_n - \mu_p = (\mu_e^L + \mu_e^s) = (-1{,}91 - 2{,}79)\,\mu_N = -4{,}7\,\mu_N\,; \quad with:\ \mu_e^L = \frac{e \cdot v_e \cdot r_e^*}{2} \tag{12}$$

and by the equation of dynamic equilibrium on the tangent direction, given by the quanta density:

$$\rho_\mu(e, r_e^*) \cdot c^2 \approx (\rho_p(r_e^*) + N^p \rho_\mu^*(e^*, r_e^*)) \cdot v_e^2 \;; \Rightarrow (v_e / c)^2 = e^{-\frac{r_e^*}{\eta_e}} / N^p (e^{-\frac{r_e^*}{\eta_\mu}} + e^{-\frac{r_e^*}{\eta_p}}) \tag{13}$$

with: $N^p$ = 2268; $\eta_e$ = 0.965fm, (for $\rho_\mu$); $\eta_\mu$ = 0.755fm, (for $\rho_\mu^*$); $\eta_p$ = 0.841fm, (for $\rho_p$), the negatron being revolved by the pressure of $\Gamma_\mu^p$ –vortex of the protonic positron against a resistance force given by the quanta density of mass and of superposed $\Gamma_\mu^*$ -vortexes of the protonic quasielectrons, resulting that:

$r_e^* \approx$ 1.283fm; $v_e$ = 1.7x10$^{-2}$c, (1/τ = 6,33x10$^{20}$ Hz), or a free neutron, and: $\mu_e^s \approx$ - 4.597$\mu_N$; $\mu_e^L \approx$ -0.104$\mu_N$.

The speed of ~0.92c is obtained by the emitted $\beta^-$-electron by acceleration in the field of $\Gamma_\mu^p$ –vortex, according to CGT.

### *2.2. The Preonic Structure of Quarks in CGT*

By the basic z*-zeron it is possible also to deduce a quark model of cold formed particles with effective mass of quarks which gives the particle mass by the sum rule, considering as fundamental stable solitonic constituent of mesons and baryons, the basic preon $z^0 = 42 \cdot m_e^* \cong 34\ m_e$, which can form derived "zerons".

The resulted structure of the elementary particles, considered as formed "at cold" by quarks with effective mass and fractional electric charge q* = (+²/₃e; -¹/₃e), formed as preonic clusters, is given by the following sub-structures, according also to reference [4]:

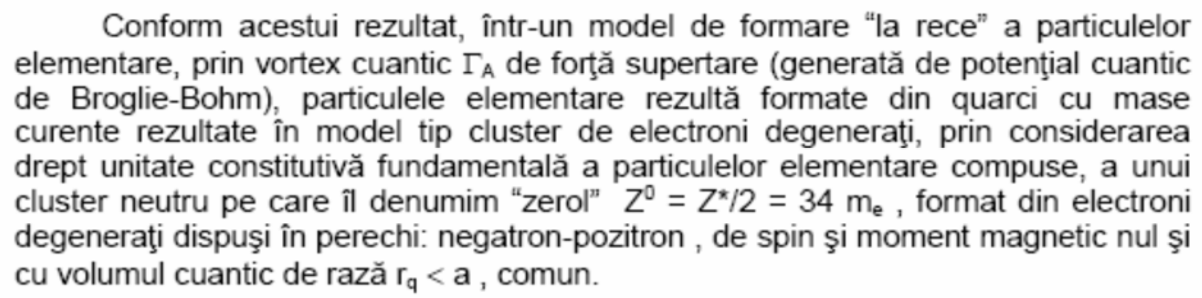
Conform acestui rezultat, într-un model de formare "la rece" a particulelor elementare, prin vortex cuantic $\Gamma_A$ de forţă supertare (generată de potenţial cuantic de Broglie-Bohm), particulele elementare rezultă formate din quarci cu mase curente rezultate în model tip cluster de electroni degeneraţi, prin considerarea drept unitate constitutivă fundamentală a particulelor elementare compuse, a unui cluster neutru pe care îl denumim "zerol" $Z^0 = Z^*/2 = 34\ m_e$ , format din electroni degeneraţi dispuşi în perechi: negatron-pozitron , de spin şi moment magnetic nul şi cu volumul cuantic de rază $r_q$ < a , comun.

***Figure 1.*** *The prediction for $z^0$ -preon according to ref. [4], p. 58.*

a) –basic zerons, (preons): $z^0 = 34m_e$; $z^* = 2z^0 = 68\ m_e$; $Z_1 = 3Z^0 = 102\ m_e$; $Z_2 = 4Z^0 = 136\ m_e$;

b) -derived zerons: $Z_3 = 2(Z_1 + Z_2) = 476\ m_e$; $Z_4 = 3(Z_1 + Z_2) = 714\ m_e$.

c) basic quarks: $m_1^+ = (Z_2 - m_e^*) = 135{,}2\ m_e$, (mark$_1$ - q* = +2e/3); $m_e^*(e^*) \approx 0.8\ m_e$);

d) derived quarks, (effective mass): $m_2^- = m_1 + e^- + \sigma$ = 137,8 $m_e$; (mark$_2$ - q* = +2e/3); ($\sigma = e^{*+} + e^{*-} = 2\ m_e^* \approx 1.6\ m_e$ – gluol)

$p^+ = m_1 + Z_3 = 611{,}2\ m_e$, (park- q* = +2e/3);

$n^- = m_2 + Z_3 = 613{,}8 m_e$, (nark- q* = -e/3);

$\lambda^- = m_2 + Z_4 = 851{,}8\ m_e$, (lark- q* = -e/3);

$s^- = \lambda + Z_2 = 987{,}8\ m_e$, (sark- q* = -e/3);

$v^- = s + Z_2 = 1123{,}8\ m_e$, (vark- q*= -e/3); $m_2 \rightarrow m_1 + e^- + \overline{\nu}_e$; $n \rightarrow p^+ + e^- + \overline{\nu}_e$

d) Elementary particles:

Mesons: (theoretic mass) / (experimentally obtained mass)

$\mu^- = 2Z_1 + e^- = 205\ m_e$; / ($\mu^+$ = 206,7 $m_e$)

$\pi^o = m_1 + \overline{m}_1 = 270{,}4\ m_e$; / ($\pi^0$ = 264,2 $m_e$)

$\pi^+ = m_1 + \overline{m}_2 = 273\ m_e$; / ($\pi^+$ = 273,2 $m_e$)

$K^+ = m_1 + \overline{\lambda} = 987\ m_e$; / ($K^+$ = 966,3 $m_e$)

$K^o = m_2 + \overline{\lambda} = 989{,}6\ m_e$; / ($K^o$= 974,5 $m_e$)

$\eta^o = m_2 + \overline{s} = 1125{,}6\ m_e$; / ($\eta^0$ = 1073 $m_e$) (s = s-antiquark)

Baryons:

$p_r$= 2p+n = 1836.2 $m_e$; $n_e$ = 2n+p = 1838,8 $m_e$; /
/ ($p_r^+$ = 1836,1 $m_e$; $n_e$ = 1838,7 $m_e$)
$\Lambda^o$ = s+n+p = 2212.8 $m_e$; / ($\Lambda^0$ = 2182,7 $m_e$)
$\Sigma^+$ = v+2p = 2346.2 $m_e$; $\Sigma^-$ = v+2n = 2351.4$m_e$; /
/ ($\Sigma^+$ = 2327 $m_e$; $\Sigma^-$ = 2342,6 $m_e$);
$\Sigma^o$= v +n +p = 2348.8 $m_e$; / ($\Sigma^0$ = 2333 $m_e$)
$\Xi^o$ =2s+p=2586.8 $m_e$; $\Xi^-$ =2s+n=2589.4 $m_e$; /
/ ($\Xi^0$ = 2572 $m_e$; $\Xi^-$ = 2587,7 $m_e$)
$\Omega^-$ = 3v = 3371.4 $m_e$; / ($\Omega^-$ = 3278 $m_e$)

-Some 'resonance' particles may be formed also 'at cold', according to the theory: $\Delta^o$ =2v+p =2858.8 $m_e$;
$\Delta^-$ =2v+n=2861.4 $m_e$; (known mass: 2850 $m_e$), and:
$\Xi^{-*}$ = $3s^-$ = 2963.4 $m_e$; (known mass: 3004 $m_e$).

-The theory predicts also the existence of the next particles:
$\Omega^{-*}$ = 2v+s = 3235.4 $m_e$; $\Phi^-$ = 2v + λ = 3099.4$m_e$;
$\Phi^{-*}$= 2s + λ=2827.4; 3s = 2963.4 $m_e$; $Z_5$= ($Z_1$+ $Z_2$)=238 $m_e$;
$\Lambda^+$ = s+2p = 2210.2 $m_e$; $\Lambda^-$ = s+2n = 2215.4 $m_e$;
$\phi^0$= $m_l$+2n = 1362.8 $m_e$; $\phi^+$ = $m_2$+2p = 1360.2 $m_e$.

It can be observed also that- excepting the particles Σ and Ξ, the masses of the principal elementary particles can be found as cluster of zerons: z* = $2z^0$= 68$m_e$ ≈ $\nu_\mu^*$, in the form:

a) $2^n z^*$, (n=1...5); b): (3 x$2^n$+n)·z*, (n =1...3);c): 3x$2^n$z*, (n = 4) (14)

which indicates the tendency of smaller particles to form clusters in the a)-form:

a): n = 1→ ($m_{1,2}$); n = 2→ ($\pi^{0,\pm}$); n = 4→($\eta^0$); n = 5→ ($\Lambda^0$); (specific specially to the mesons),
or triplets (specific to baryons), in a b)- or c)-form, (a tendency specific also to the baryons):
b): n= 0 → ($\mu^\pm$); n=1→ ($z_3$); n= 2→ ($K^{0,-}$); n= 3→ ($p_r$, $n_e$);
c): 3x$2^n$z*; n= 4→ ($\Omega^-$); d): [(4x$2^n$+n)z*- $z^0$];
n = 3→ ($\Sigma^{0,\pm}$); e) [$(3x2)^n$ + n]z*; n = 2→ $\Xi^{0,-}$

The obtaining of the particle's charge as sum of the internal quarks charge is equivalent- according to CGT, with the attachement of a positron, negatron or a negatron-positron pair, giving the same charge, to a neutral cluster:

$$N^0 = (N^p\text{-}1) \text{ or } (N^p \text{-}2).$$

The sum of the current quark charges and correspondent magnetic moments result as equal to the real charge: 0, e, 2e, and to the real magnetic moment of the initial particle, because that the impulse density of $\Gamma_\mu$ (e) -soliton vortex of the real elementary unpaired e-charge of the elementary particle is given as a sum of component vortexes corresponding to the component quark charges, according to the dependence: e ~ $\mu_e(\Gamma_e)$ ~ $\rho_\mu(a)\cdot c^2$; ($r_i$< r ≤ a), specific to the theory:

$$\rho_\mu\cdot c^2\cdot(e) = \rho_\mu\cdot c^2\cdot(^2/_3 n \text{ -m})\cdot e;\ \mu = (n\cdot\mu_p \text{ - } 4.7\mu_N\cdot m)\ [\mu_N] \quad (15)$$

where n; m- the total number of quarks and respectively- the number of quarks with negative charge, ($-^1/_3$e = $+^2/_3$e - e).

From eq. (15) and the relation: $\mu_{ne}/\mu_{pr}$≈ -2/3 - resulted in the quarks theory for the magnetic moments of nucleons, it results – for the magnetic moments of $p^+$- and $n^-$ - quark, that:

$$\mu_p= 8x4.7/15 \approx 2.5\ \mu_N;\ \mu_n = (\mu_p \text{ - } 4.7\mu_N) \approx \text{-}2.2\ \mu_N \quad (16)$$

By eq. (15), it can be explained also the fact that- in the $\beta^+$ disintegration, the whole proton charge is emitted by a single lepton - the emitted positron.

It results also from eq. (15), that the cold genesis of baryons with more than three quarks is possible.

It result also- from the theory, that the charged $\mu^\pm$; $\pi^\pm$ mesons has a non-null pre-quantum spin: $S^*_\pi$ =($m_e$/e)·$\mu_\pi$= ($\mu_\pi/\mu_e$)·$S_e$= 0.00185 ħ, given by a degenerate electron.

Also, if the bosons $z^0$ and $z^*$ are parts of the bosonic field of quantum vacuum, is possible– in CGT, also the reaction:

$$e^+ + e^- \rightarrow z^*(e^+ e^-) \rightarrow z_0^+ + z_0^-$$

### *2.3. The Weak and the Strong Reactions in CGT*

According to the model, in the weak interactions are transformed quarks: $m_2$; $n^-$; $\lambda^-$; $s^-$ or /and $v^-$ in their components, forming new particles, such as:

a1) (Exp.): $\Sigma^-$(v+2n)→ $\Lambda^o$ (s+n+p) + $e^-$ + $\overline{\nu}_e$;
$v^-$→ $s^-$ + $z_2$; $n^-$ → $p^+$ + $\overline{\nu}_e$; ⇒ $\Sigma^-$ → $\Lambda^o$ + $e^-$ +$\overline{\nu}_e$ + $z_2$;
$z_2$ = Q (released energy)
a2) (Exp.): $\Omega^-$ (3v) → $\Xi^o$(2s+p) + $\pi^-$ ($\overline{m}_1$+$m_2$);
$2v^-$ → $2s^-$ + $2z_2$; $v^-$ → $\lambda^-$ + $2z_2$ → $m_2$ +$z_4$ + $2z_2$;
$2z_2$ → $m_1$ +$\overline{m}_1$; $z_4$ → $z_3$ + ($z_1$ + $z_2$); $\overline{m}_1$ + $m_2$ → $\pi^-$;
$m_1$ + $z_3$ → $p^-$; $p^-$ + $2s^-$ → $\Xi^o$;
⇒ $\Omega^-$ → $\Xi^o$ + $\pi^-$ + ($z_1$ +3$z_2$); Q =($z_1$ +3$z_2$);
a3) $\Omega^-$ (3v) →$\Lambda^o$(s+n+p) + $K^-$($\overline{m}_1$+λ); (controversial reaction); $v^-$ → $\lambda^-$ + $2z_2$; $2z_2$ → $m_1$ +$\overline{m}_1$; $\lambda^-$+$\overline{m}_1$ = $K^-$
$v^-$ → $n^-$ + ($z_1$ + 3$z_2$); $v^-$ → $s^-$ + $z_2$; so:
⇒ $\Omega^-$ (3v) → $K^-$($\overline{m}_1$+λ)+ (s+n+ $m_1$ + $z_1$ + 4$z_2$),
but because that: p = $m_1$+2($z_1$ + $z_2$), the reaction is possible only if: $z_2$ (4$z^o$) → $z_1$ (3$z^o$) + $z^o$, so- it is less probable.

In the strong interaction of particles, the conservation of the "strangeness" quantum number is equivalent to a law of quarks conservation which states that the quarks which enters in strong interactions are not transformed by weak interactions, but they can forms zerons (neutral bosons) with other quarks or combinations with quarks resulted from zerons of the polarised quantum vacuum, in pairs: quark-antiquark, by the $Q_i$- interaction energy which transforms bosonic virtual q-$\overline{q}$ pairs of the quantum vacuum in real q-$\overline{q}$ pairs by quarks separation, when $Q_i$ ≥ $E_q$, ($E_q$ –the binding energy of q-$\overline{q}$ pairs), like in the examples:

b1) (Exp.): $\pi^-$($\overline{m}_1$ + $m_2$) + $p_r$($2p^+$+ $n^-$) + Q →
→ $\Lambda^o$(s+n+p) + $K^o$($m_2$+$\overline{\lambda}$);
$\overline{m}_1$+ $p^+$ + Q →$\overline{m}_1$ + $m_1$ +$z_3$+ Q = $z_2$ + $z_3$+Q → ($s^-$ +$\overline{s}^+$);
$\overline{s}^+$ →$\overline{\lambda}$ + $z_2$; $s^-$ + $n^-$ + $p^+$ → $\Lambda^o$; $\overline{\lambda}^+$ + $m_2$ → $K^o$;
⇒ $\Lambda^o$+ $K^o$ - permitted reaction.

b2) $\pi^-$($\overline{m}_1$+$m_2$) + $p_r$ ($2p^+$+$n^-$) + Q → $\Lambda^o$(s+n+p) + $\pi^o$($m_2$ + $\overline{m}_1$); (forbidden by the strangeness conservation law);

- indeed, for the reaction occuring, are necessary the transformations: $p^+$ → $m_1$ + $z_3$, and: $m_2$ + $p^+$ + Q → $s^-$ + $m_1$, but the last is forbidden by the considered quarks conservation law.

It results also that the reaction: μ− → e− + γ, which is forbidden in the Standard Model, is permitted in the form:

$$\mu^- \rightarrow e^- + 2z_1\text{, according to CGT.}$$

Also, if the bosons $z^0$ and $z^*$ are parts of the bosonic field of quantum vacuum, there are possible also the

Also, the quark-lepton coupling, which- according to the Standard Model, is possible by a X- boson, particularly – by the evidenced $b_0$- boson with 34 $m_e$, is specific- in CGT, to the preonic structure of quark: $m_2^- = m_l + e^- + \sigma = 137{,}8\ m_e$ and it results as mediated by the vortexial field: $2\Gamma_\mu^*$ of a σ - gluol which explain also the beta disintegration (the weak interactions- generally), by its transforming into an electronic neutrino by the releasing of the quantonic energy of its vortexial field: $\Gamma_\mu^* + \overline{\Gamma}^*_\mu$:

$$n^- \rightarrow p + e^- + \sigma;\ (\sigma \rightarrow \overline{\nu}_e + Q_k);\Rightarrow {}^0n_e \rightarrow {}^1p_r + {}^{-1}\beta + \overline{\nu}_e + Q_k\text{, with:}$$

$$Q_k = 728\text{keV};\ (Q_k \approx 2m_e{*}c^2 - m_\nu(\nu_e)), \qquad (17)$$

# 3. A Possible Explanation for the Proton's Stability

According to the theory, the possibility of a $z^0$-preon decaying into component quarcins $c^{*\pm}$ may results- by the interaction energy of couple (Li7, $p^+$), by a resulted resonant state of the (2p+n) quarks system of a proton, (2u+d–in QM), produced by the vibration of the quarks current masses.

In this sense, it may be oserved the fact that- even if the proton is formed by three quarks like other baryons, it is a very stable particle until a critical temperature: $T_c \approx 2x10^{12}$ K of quarks deconfination, compared to other baryons- for which may be considered a semi-empiric relation for the particle's lifetime- dependent to the total intrinsic vibration energy of the internal quarks, $\varepsilon_v$, in the form [3-7]:

$$\tau_k = \frac{\tau^0}{k_v \cdot 10^{2n}};\quad \tau^0 \cong 10^{-13}\text{sec.};\quad k_v = \frac{\varepsilon_v}{\varepsilon_v^o} == \frac{n\cdot T}{T_d};\quad T_d \cong 2x10^{12}\text{K} \qquad (18)$$

in which: $\varepsilon_c^0 = k_B T_d \cong h\nu_c^0$ represent the critical phononic energy of the particle's vibration which determines the quark deconfination, at: $T_d \cong 2x10^{12}$K.

This fact was explained by the pre-quantum model of nucleon derived from CGT, by a new proposed Bag Model for the nucleon's stability, [10], of type: with repulsive shell of the impenetrable quantum volume, given by a static pressure of kinetized quanta with a Gaussian variation and maximum value corresponding to the constant B of MIT, bag' model, without the hypothesis of intermediaries gluons.

In the mentioned paper [10] was hypothesized also- by eq. (18), that the higher stability of the proton indicates an axially magnetic coupling of the proton's quarks along its magnetic moment vector, $\mu_p$, favored by the quasi-equality between the effective mass of n- and p- quark deduced in CGT, (u- and d- quarks, in QM), this arrangement reducing the total intrinsic vibration energy of quarks inside the impenetrable quantum volume.

An argument for this conclusion may be the result of some high energy p-p elastic scattering experiments in the TeV region, based on an effective field theory model of the proton, [11], which deduced - from the hard collision of a valence quark of one proton with that of the other, the existence of a core region of size ~ 0.2 fm, where the current mass of the valence quarks are confined and of a layer of scalar particles that envelops the baryonic charge shell of the proton, which originates from a scalar field, (i.e- similar to the repulsive shell of the impenetrable quantum volume considered in the Bag model of CGT), resulting that the proton is a condensate enclosed Chiral, Bag'.

But according to other experiments, [12], the value of ~ 0.2 fm corresponds to the current mass quark radius, so the mentioned result of p-p elastic scattering indicates an alignement of the current masses of the protonic quarks along the proton's magnetic moment, in our oppinion.

A less stable state of the proton is obtained when the current masses of quarks- totally included into the impenetrable quantum volume of nucleon considered with a radius of ~ 0.6 fm, [10], are aligned perpendicular to the proton's magnetic moment, position in which the u-quarks (the p-quarks –in the CGT model), are rotated around the d-quark (the n-quark –in the CGT model). According to this conclusion, it results that – before the quarks deconfining at $T_c \approx 2x10^{12}$ K, it is possible to exist another critical thermal point, $T_m$, of proton's transition into a meta-stable state with current mass of quarks aligned perpendicular to the proton's magnetic moment, by a breaking of the axial alignement, (figure 2, a).

The experimentally evidenced boson of ~ 34 $m_e$ in (p-Li7) interaction at low energy, identified as the predicted preon $z_0$ in CGT, indicates - according to the previous conclusions, also the possibility of $z_0$ preon(s) emission at the considered $T_m$ transition temperature and to a close temperature, specific to nuclei with giant resonance.

Another possibility for experimentally verifying of the preonic nature of the 34 $m_e$ boson is to determine the mass of the Be8 nucleus resulted after the reaction:

(p; Li7) → (Be8; $z_0$), which must be:

$$M(Be8) \approx M(Li7) + m_p - m(z_0)$$

$$= [(7{,}016u + 1)x1836 - 34]/1836 = 7.997u; \qquad (19)$$

The stability of $z^0$ preon may results as consequence of a quasi-cristalline hexagonal form of the component quarcins: $c^\pm = 7x3 = 21m_e^* = 17\ m_e$ –considered by CGT, (figure 2, b), given by the specific interaction and arrangement between the component quasi-electrons with superdense centroids of $\sim 10^{-18}$ m radius and with a possible bar form, [3-6], which are magneto-electrically coupled.

The quark structure resulted by CGT is shown in figure 2, c), in which $r_q$ is the radius of quark's current mass, given by its impenetrable quantum volume and by the maximal density of the particle's kernel [10], and $\upsilon_q(r_p)$ is the quantum volume of its effective mass (which gives the particle's mass according to the sum rule), which is composed by confined vectorial photons (vexons, [4-7]), which forms- in CGT, the vortexial equivalent of the gluonic shell considered in Quantum Chromodymamics, 'Ss' being a scalar shell of ~0.1fm thickness, which envelops the current mas of the quark and which may explain- according to CGT, the value of ~ 0.3 fm determined for the quark radius by some scattering experiments as those realized at Fermilab, [12].

This scalar shell, evidenced for proton by p-p scattering at few TeV, [11], may be considered also for the quark structure, because that the same cause which forms the repulsive scalar shell of the protonic impenetrable quantum volume- according to CGT, [10], i.e: the attraction of kinetized quantonic clusters (vectonic inertial masses) by the vortexial field: $\Gamma_v = \Sigma(\Gamma^*_\mu)$ may generate a small scalar shell of scalar field quanta also around the current mass of an individual quark, contained by its impenetrable volume, in the model.

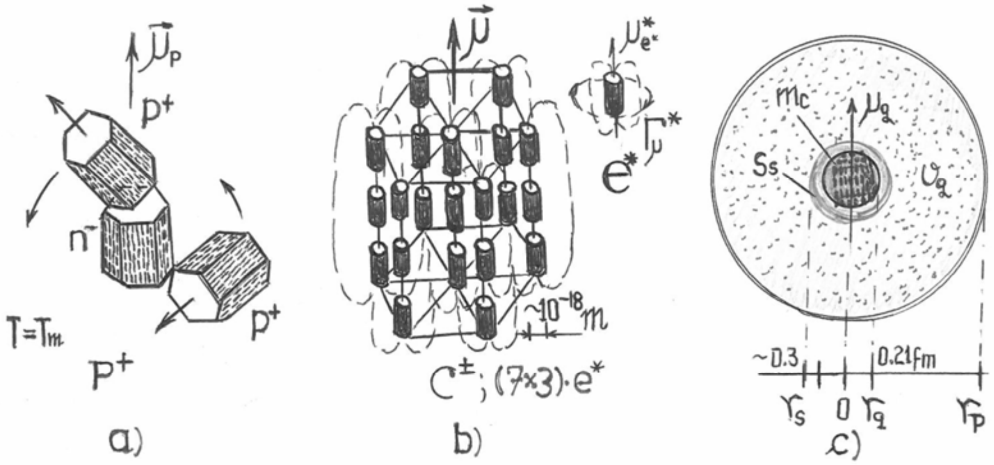


***Figure 2.*** *a) proton's transition to metastable state; b) quasi-crystalline structure of c±-quarcin;c) model of quark with scalar shell, (CGT).*

# 4. Conclusions

According to the etherono-quantonic theory resulted in CGT, based on the galileian relativity, which sustains the possibility of particles cold genesis by a vortexial nature of the magnetic field- given by an etherono-quantonic vortex: $\Gamma_M = \Gamma_A + \Gamma_\mu$ of sinergons and of quantons, the new experimentally evidenced neutral boson of 34 $m_e$, supposed to be an X- boson of a fifth basic force but predicted in CGT as being a basic $z^0$ preon of cold formed quarks, may constitute a strong argument for the pre-quantum Bose-Einstein condensate Model of elementary particle, resulted in CGT, and it may be also a bosonic component of the dark matter which may form- in the quantum vaquum, bigger bosons and quark-antiquark pairs as basic preon, according to the theory.

The principal argument for this conclusion is the possibility to explain the sub-structure of the elementary particles and their weak and strong interactions, in accordance with their known mass, by a preonic structure of quarks, based on the $z^0$ preon resulted as quasi-crystallin cluster of quasi-electrons, in CGT.

An indirect argument results by some astrophysical observations arguing the existence of galaxies composed by dark matter, (Saggitarius dwarf galaxy, [13])

According to CGT, the mentioned $z^0$ boson of 34 $m_e$ can be also –by the vortexial field of its quasi-electrons, an intermediary gluon between a quark and a lepton with mass $m_l > m(z^0)$, such as the heavy electron, $\mu^\pm$, (i.e- an X- boson), but as component of quarks, i.e.- as preonic constituent of the quark mass, identified as light pion by the p-Adic thermodynamics, and not as boson with null rest mass, this conclusion being more natural, in our opinion, in both cases the source of $z^0$ boson(s) being the quark structure.

It results- in consequence, that generally, the hypothesis of the role of X-boson used for the evidenced $z^0$ boson is less plausible than the conclusion of CGT regarding its role of basic preon, in our oppinion.

# References


[1] A. J. Krasznahorkay et al., 'Observation of Anomalous Internal Pair Creation in 8Be: 'A Possible Signature of a Light, Neutral Boson', arXiv: 1504.01527v1, [nucl-ex], 7 April (2015).

[2] Jonathan L. Feng et al., Evidence for a Photophobic Fifth Force from 8Be Nuclear Transitions', arXiv:1604.07411v1, [hep-ph], 25 April (2016).

[3] M. Pitkänen, 'X boson as evidence for nuclear string model', http://tgdtheory.com/public_html/. (2016).

[4] M. Arghirescu, “The Genesis of material structures and Field effects”, ed. Matrix Rom, Bucharest, (2006).

[5] M. Arghirescu, „The ColdGenesis", Ed. S. C. INVEL Multimedia S. R. L., Bucharest, (2011); viXra: 1104.0043, (2012).

[6] M. Arghirescu - ‘The ColdGenesis of Matter and Fields’, Ed. Science PG, (2015).

[7] M. Arghirescu,,A Quasi-Unitary Pre-Quantum Theory of Particles and Fields and Some Theoretical Implications’, IJHEP, July, 80-103, (2015).

[8] M. Arghirescu, ‚A Revised Model of Photon Resulted by an Etherono-QuantonicTheory of Fields’, Open Access Library Journal, 2: e1920, (2015).

[9] R. M. Kiehn-‘The Falaco Effect, A Topological Soliton’, Talk at 1987 Dynamics Days, Austin, Texas, jan. (1987).

[10] M. Arghirescu, ‘A Correspondence with the Bag Model of a Pre-quantum B.-E. Condensate Model of Nucleon’, IJHEP, Vol. 3, Issue 2, April, 10-17, (2016).

[11] M. M. Islama, R. J. Luddyb, “High Energy Elastic Scattering in Condensate Enclosed Chiral Bag Model and TOTEM Elastic Measurements at LHC at 7 TeV”, The EDS Blois, 9-13 Sept. (2013).

[12] Y. Yan, R. Tegen-, N-N Scattering and Nucleon Quark core’, Science Asia, 27, 251, (2001).

[13] S. Vegetti, D. J. Lagattuta, et. al, ‘Gravitational detection of a low-mass dark satellite at cosmological distance’, arXiv:1201.3643 [astro-ph.CO], (2012).