A NEW ROBUST THEORY OF EVERYTHING WITH EXPECTED 10-100 PPB ANOMALIES IN SOME GRAVITATIONAL EXPERIMENTS DEPENDING ON THE RATIO NEUTRON-PROTON.

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Abstract. A New Robust Theory of Everything with Expected 10-100 ppb Anomalies in some Gravitational Experiments depending on the total ghost hypercharges of the proton-electron pair and on the total ghost hypercharges of the neutron. Here, the meaning of the word robust is the use of the concept of n-irreducible sequents and n-irreducible numbers to constraint the possible theories of everything into a single one with a maximized n-irreducible number. We try to write the definitions of the theory of everything in the most rigorous mathematical way and in a compatible way with every known experiments. A kind of Nobel Prize experiment is proposed for detecting anomaly between orbital parameters of identical metallic balls orbiting around Earth with different neutron-proton ratio. An anomaly between $10^{-8} - 10^{-12}$ is expected and the current precision is $10^{-8.7}$.

In this article, I present my new robust theory of everything as an n-irreducible theory with the largest irreducible natural number n (after 11 years of research). I have done my studies at the Ecole Polytechnique de Lausanne in theoretical physics. I also spend one year in an elite master program at the The Arnold Sommerfeld Center for Theoretical Physics. On my own, I started to develop my theory of everything there. At first, I was developing a Sign postulate in order to solve the strong CP problem and studying more deeply about the physical meaning of the Signs of the Lagrangian terms (flipping any sign terms of some allowed Lagrangian configurations do not create a physically consistent and a physically different Lagrangian configuration). That Sign postulate has also the great advantage to reduce the number of gravity terms to a single one and to confirm the standard theory of gravity and to not allow an incalculable infinite number of gravity terms. The third advantage of that Sign postulate is to allow different spacetime disconnected (one matter field can not be coupled with two different spacetime metric fields) and to introduce the concept of probability distribution of the matter fields over the spacetime fields. Few years later (during my PhD in quantum optics), I started thinking how to unified the gravity theory and the Standard Model. I thought that gravity is not necessary quantum and could be a slave semi classical field in the specific gauge: $g_{0\mu} = \delta_{0\mu}$ (I was inspired by the slave fields in LASER equations). The spacetime metric fields could be just the ones which extremalize the action for some concrete path of the quantum fields. We can regularize the Standard Model by setting to zero the standard probability amplitude $exp(iS)$ of a quantum field path which produce a singularity in the resulting spacetime metric fields or the absence of spacetime metric field solution for that specific path. Therefore, the Standard

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Model cutoff is around the Planck Mass scale M_p and there is no need to do a well known running coupling constant standard procedure. From those considerations, only Quasi Black Holes can exists, the gravity become repulsive for the inward and closest matter with respect to some Quasi Black Hole (it will reflect the closest particles with inward velocities with respect to some Quasi Black Hole). Now, we can argue the following fact: if by simplicity argument, we use the spacetimes metric fields like the other quantum fields instead of the semi classic ones, it will produce a not well defined theory. That's why the gravity theory is achieved with semi classical fields and the Standard Model needs that gravity theory in order to be mathematically rigorous since it is regularized with the Plank mass scale M_p. Later after my quantum optics PhD (I did not write the thesis because I was obsessed with my theory of everything), I developed with the help of my brother (Dimitri Zaganidis with a PhD and a Postdoc in mathematics at the Ecole Polytechnique de Lausanne), at second order of logic, the concept of n-irreducible theories and their irreductible natural number n (which is a formal and mathematical definition of the simplicity argument):

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From there, I try to write the Standard Model in a n-irreducible form: the index of generation for the spacetime metric fields runs between $0 < i_{ST} < R$ where R is the largest irreducible real (if $R = 1$ by sequent reduction, we have therefore only one Lagrangian configuration ($\mathcal{L}_i = 0$) and the n-irreductible number of that reduced theory of everything is $n = 1$). The maximal volume of a ball of n dimensions with radius 1 is a good candidate for the largest irreducible real: $R = V_5 \cong 5.26$. Therefore, there is 5 spacetime metric field generations. We define the integer N_0, the smallest integer such that the index of generation for the matter quantum fields (quantum gauge fields are included) runs between $0 < i_N < N_0$ such that CP violation occurs in every fermion-complete Lagrangian configuration $\mathcal{L}_i$ (if by simplicity we remove the CP violation constraint, we consider only spacetime metric fields in the Lagrangian and therefore the n-irreductible number of that reduced theory of everything is $n = 1$ with one Lagrangian configuration without quantum matter fields). With the Sign postulate constraint, $N_0 = 2(\lceil R \rceil - 1) + 2 = 12$ since we need at least 3 generations of quantum matter fields in one spacetime for CP violation. With the integer variable definition, From the definition of integer variable N_0, we can define the index of the symmetry $U(N_0) = U(12)$ running between $0 < i_U \leq N_0$ (since by sequent reduction, $U(1)$ can not produce a CP violation). Finally, we can define the integer hypercharge coefficient c_Y of the generators of the symmetry $U(N_0) = U(12)$ running between $i_Y < N_0$ and $-i_Y < N_0$ where the maximal hypercharge is $Y_{max} = N_0 - 1 = 11$. If by sequent reduction $Y_{max} = 0$, $U(N_0)$ become the trivial identity and can not produce a CP violation.

Remark 1: The generators of $U(N_0) = U(12)$ have a different integer hypercharge coefficient c_Y each of them (if we suppress the integer hypercharge coefficients c_Y, we have only one kind of super symmetric Fermion field and we can not have a CP violation).

Remark 2: The definition of a complete Lagrangian configurations: no more term can bee added to any Lagrangian configurations without breaking the Sign postulate constraint or other constraints. More precisely, we consider the relevant different classes of Lagrangian configurations with respect to the observables of quantum matter fields.

Remark 3: We consider only fermion-complete Lagrangian configurations: a fermion-complete Lagrangian configuration $\mathcal{L}_i$ is a complete Lagrangian configuration such that for every complete Lagrangian $\mathcal{L}'_i$, its fermion part $\mathcal{L}_i^{F'}$ do not strictly include $\mathcal{L}_i^F$ the fermion part of the Lagrangian configuration $\mathcal{L}_i$. This definition is made to prevent that Yukawa terms can not be added because of the required scalar fields are coupled to another spacetime metric field.

Since the weak interaction (asymptomatic freedom at low energy) for the nuclear fusion in the Sun and the strong interaction (asymptomatic freedom at high energy) for the stability of atom's nucleus are vital for the emergence of the life and the intelligence. Only the following symmetries can be allowed inside $U(12)$ by anthropological argument:

$U(1) \times SU(2)$ with $2-3$ generations
$U(1) \times SU(3)$ with $2-5$ generations
$U(1) \times SU(4)$ with $2-7$ generations
$U(1) \times SU(2) \times SU(3)$ with $3-4$ generations
$U(1) \times SU(2) \times SU(4)$ with $3-5$ generations
$U(1) \times SU(2) \times SU(5)$ with $2-6$ generations$U(1) \times SU(2) \times SU(6)$ with $2-8$ generations

$U(1) \times SU(n)$ can not produce a CP violation needed for the baryogenesis and the emergence of life and intelligence. $SU(4)$,$SU(5)$ and $SU(6)$ allow none vanishing box anomalies and the cancellation may not be possible or only with more fields than the case with $U(1) \times SU(2) \times SU(3)$ with 3 generations.

The implications are crucial: there is a huge number of fields and a much larger number of Lagrangian configurations. The most probable by far is to couple all the quantum fields with the same spacetime metric field. From anthropological argument and in order to have the emergence of the life and the intelligence, a minimal number of fields with the highest symmetries should be coupled with another spacetime metric field (our spacetime metric field).

The "sterile" Neutrinos are not sterile and have multiple ghost integer hypercharges like the other leptons and baryons of the Standard model. Ghost integer hypercharges means the coupling of the ghost gauge field is negligible in order that the "sterile" Neutrinos and the ghost gauge fields can be approximated as cold and hot dark matter and play their crucial role for the formation of universe structure, stars and planets and for the emergence of life and intelligence. The couplings of the ghost gauge fields should be also much smaller than the gravity coupling in order that the repulsive forces are small enough to allow the formation of universe structure, stars and planets with a high number of atoms which is essential for the emergence of life and intelligence.

Moreover, the "sterile" Neutrinos are not optional and are required for the gauge anomaly cancellations. In some way, it is more probable to have 6 more components from the sterile Neutrinos and few more ghost gauge fields increasing the symmetries of the Fermion fields than less symmetries for the Fermion fields without ghost gauges symmetries and 6 components less without the "sterile" Neutrinos.

In order to have massive particles under the Sign postulate constraint and the cosmological constant tuning constraint, we need one Higgs and two Dilaton fields with opposite ghost hypercharges:

$$\pm\left(M_p^2+\varphi^\dagger\varphi+\chi_1^*\chi_1+\chi_2^*\chi_2\right)\mathcal{R}\pm\left(\left(\varphi^\dagger\varphi-\chi_1\chi_2\right)^2-\left(\chi_1^*\chi_1\right)^2-\varphi^\dagger\varphi\chi_2^*\chi_2-M_p^4\right)$$

where the Dilatons χ_1 and χ_2 have opposite ghost integer hypercharge between them.

The PMNS matrix under the Sign postulate constraint and under the ghost hypercharge constraints and under the constraint of the observed lepton parameters can only be written as (the i factor is crucial for CP violation and the unit-less coefficients are ignored for readability):

$$PMNS=\begin{pmatrix} i\chi_1 & M_p & M_p \\ M_p & \chi_2 & 0 \\ M_p & 0 & 0 \end{pmatrix}$$

In fact, a Mathematica notebook was used to check all possible solutions with the constraints of the invariant Fermion mass terms and the constraints of the anomaly cancellations without the one involving gravitons (we have separated the three Fermion generation in 2+1 generations with respect to the ghost integer hypercharges), 2 generic solutions and 1 specific solution was found for the ghost integer hypercharges:

$Q_{L,1}, Q_{L,2} = 1$
$u_{R,1}, u_{R,2} = u_{R,2} = 3, 4, 5$
$d_{R,1}, d_{R,2} = 2 - u_{R,2}$
$L_{L,1}, L_{L,2} = -11 + 2u_{R,2}, 13 - 4u_{R,2}$
$N_{R,1}, -N_{R,2} = -12 + 3u_{R,2}$
$e_{R,1}, e_{R,2} = -10 + u_{R,2}, 14 - 5u_{R,2}$
$\phi = 1 - u_{R,2}$
$\chi_1, -\chi_2 = 24 - 6u_{R,2}$

$Q_{L,1}, Q_{L,2} = Q_{L,1} = -1, 0, 1$
$u_{R,1}, u_{R,2} = 1 + 4Q_{L,1}$
$d_{R,1}, d_{R,2} = -1 - 2Q_{L,1}$
$L_{L,1}, L_{L,2} = 2 - 3Q_{L,1}, -4 - 3Q_{L,1}$
$N_{R,1}, -N_{R,2} = 3$
$e_{R,1}, e_{R,2} = 1 - 6Q_{L,1}, -5 - 6Q_{L,1}$
$\phi = -1 - 3Q_{L,1}$
$\chi_1, -\chi_2 = 6$

$Q_{L,1}, Q_{L,2} = -1$
$u_{R,1}, u_{R,2} - 1$
$d_{R,1}, d_{R,2} = -1$
$L_{L,1}, L_{L,2} = 9, -9$
$N_{R,1}, -N_{R,2} = 9$
$e_{R,1}, e_{R,2} = 9, -9$
$\phi = 0$
$\chi_1, -\chi_2 = 2$

solve-ghost-hypercharges-with-two-dilatons-generation.nb

We can notice that we have 2+1 Fermion generations with respect to the ghost hypercharge symmetries instead of the 3 Fermion generations with respect to the other usual symmetries. The 2+1 "sterile" Neutrinos have also opposite ghost integer hypercharges like the 1+1 Dilatons. A large number of ghost gauge fields is expected and the resulting total ghost hypercharge of the proton-electron pair and the neutron may take values in a large set of possible values.

The Dilaton fields, the ghost $U(1)$ gauge fields and the "sterile" Neutrinos may be involved in the dark matter.

No more fundamental discovery is predicted except a important one: measuring the total ghost hypercharge of the proton-electron pair and the neutron from the tiny anomalies of some standard gravitational experiments. Since the ghost hypercharge force is proportional to the square of the ghost hypercharge couplings, we may expect a factor 10^{-3} smaller than the value from which the gravity is negligible: 10^{-3}. Finally, some tiny anomaly around $10^{-6} \sim 10^{-4} - 10^{-8}$ depending on the ratio neutron-proton should be found in experiments involving the gravitational constant G. The standard gravitational parameter of the Sun and the Earth have a precision of 7×10^{-11} and 6×10^{-9}. Since the ratio of neutron-proton of the telluric planets are inside the interval range 1.05-1.15, we should detect anomaly around $10^{-7} \sim 10^{-5} - 10^{-9}$ between the orbital parameters of the telluric planets derived from their ephemerides. Only the orbital parameters of the Earth are known within a precision of 2×10^{-12} and the anomaly of the gravitational constant from the ghost gauge fields can be detected only with the comparison between orbital parameters of two orbits or more. The most accurate orbital parameters of the planets except the Earth is Venus with an insufficient precision of only 10^{-6}. The ratios of neutron-proton of the satellites around earth are 10% different between them about. Therefore, some anomaly should be detected between the different measures of the standard gravitational parameter of the earth with different satellites around the Earth if the experimental precision is beyond $10^{-7} \sim 10^{-5} - 10^{-9}$. Currently, the precision of the standard gravitational parameter of the Earth is almost beyond that range: $10^{-8.7}$.

From the Sign postulates, some relationship can be found between the mixing angles, the phase and the masses of the quarks and confirmed with very precise measures (to be more precise: only 20 discrete solutions about for the CP violating phase of the quarks can be derived from the other standard quark parameters.

From the Sign postulates, some relationship can be found between the mixing angles, the phases and the masses of the leptons (including the "sterile" Neutrinos) and confirmed with very precise measures (to be more precise: only a few discrete solutions for the CP violating phases of the left neutrinos, the mass of the lightest neutrino and the mixing angle θ_{13} of the left neutrinos can be derived from the standard neutrinos parameters Δm^2_{21}, Δm^2_{31}, θ_{13} and θ_{23}).

The irreducible natural number of the theory of everything is the total number of Lagrangian configurations and by my axiom (see my above viXra article link or the next link), it is the largest.

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Remark 4: If the gravitational constant is too low, the perturbation theory of QED failed. The difference between the observed cross sections calculated with a cutoff around the Planck Mass and the cross section calculated with a cutoff running to infinity is about $\alpha^4 (m_e/M_p)^2 \cong 1.2 \times 10^{-52}$ at second order in the QED theory.

More generally, the rigorous theory start suppressing term at the following order n_s:

$$\frac{\alpha_s^n}{n_s!}\frac{(2n_s)!}{2^{n_s}n!}\frac{n_s!}{2^{n_s}/2(n_s/2)!}\frac{1}{2^{n_s}} \cong 1$$
$$\alpha^{n_s}\left(\frac{n_s}{e}\right)^{n_s/2} \cong 1$$
$$n_s \cong \frac{e^2}{\alpha^2}$$
$$n_s \cong 50\ 987$$

We can notice that perturbation order n is much larger than the classic QED derivation for the most precise perturbation order n_p:

$$\alpha^{n_p}\left(\frac{n_p}{e}\right)^{n_p/2} \cong 7 \times 10^{-85} \text{ with } n_p \cong 57$$

More important, the perturbation QED theory break down if the following ratio (m_e/M_p) is smaller than:

$$\left(\frac{n_s-1}{e}\right)^{n_s-1}\frac{m_e}{M_p} \gtrsim 1$$

$$\frac{m_e}{M_p} \lesssim 1.5 \times 10^{-218\ 024}$$

because the rigorous theory will start suppressing terms of the perturbation theory with orders larger than the orders where the terms are smaller than one.

Finally, the rigorous theory will add corrections to the usual cross sections up to $\alpha^4(m_e/M_p)^2 \cong 1.2 \times 10^{-52}$ with respect to the standard QED.

Remark 5: The particle masses may change with time if the background spacetime metric field involve with time. It will affect how the gravity regularize the Standard Model: the physical masses depend on the cutoff which depend on the current Planck mass value and on the expansion rate of the spacetime (virtual particles with higher energy is required in order to make a singularity in a faster expansive spacetime). Since the rate of expansion H_0 is not completely constant. From the value of $\dot{H}_0$, we can calculate the annual variation of the mass ratio between the electron and the nucleons: $\frac{d(m_e/m_p)}{dt} \sim 10^{-49}\,(3600 \times 24 \times 365.25\ s)^{-1}$.

Remark 6: The automatic CP violation over Lagrangian configuration requires both left and right Fermions. If else, only Majorana matrices is allowed, those matrices could be diagonal and complete under the Sign postulate. Those diagonal mass matrices do not produce CP violation. Finally, scalar fields are also required for the CP violation. Without scalars fields, the Fermion mass terms are diagonal with respect to the symmetry index and therefore Fermion mass matrices can be diagonalized.

Remark 7: My theory of everything with the Quasi Black Hole concept is consistent with the observed frequency of the gravitational waves of the binary Quasi Black Holes when they reach their maximal amplitude.

In my theory of everything, there are also a Polynomial postulate and a Renormalizable postulate in order to ensure a finite number of terms in the Lagrangian. The Polynomial postulate is imposing a polynomial Lagrangian when the spacetime coordinate are chosen in order to have $Det(g) = 1$. It is a polynomial of the fields and the couplings (the couplings can be seen as some kind of coordinates). Every coefficients of the polynomial terms of Lagrangian configuration are restrict to the factors $1, i, -1$. The indices of the couplings are defined like the indices of the fields. The Renormalizable postulate impose some convergence limit for the observable and their derivative with respect to the Standard Model couplings when the none minimal coupling with gravity goes to infinity and in the same time the couplings of the Standard model goes to zeroes.

Remark 8: The spacetime metric fields $g_{\mu\nu}$ is not an elementary field but rather the spin connection fields e_μ^a:

$$g_{\mu\nu} = e_\mu^a \eta_{ab} e_\nu^b$$

Remark 9: We can estimate the n-irreducible number of the theory of everything (the largest one by definition) from its main component in the potential scalar part:

$N_Z \cong \left(2^{9\times 17^{9^2}}\right)!$ with permutations of the coupling coordinate.

Remark 10: In order to have massive particles under the Sign postulate constraint and the cosmological constant tuning constraint, we may need alternatively two Higgs with opposite ghost integer hypercharges and one Dilaton field:

$$\pm\left(M_p^2 + \chi^*\chi + \varphi_1^\dagger\varphi_1 + \varphi_2^\dagger\varphi_2\right)\mathcal{R} \pm \left(\left(\varphi_1^\dagger\varphi_2 - \chi^2\right)^2 - \left(\varphi_1^\dagger\varphi_1\right)^2 - \varphi_2^\dagger\varphi_2\chi^*\chi - M_p^4\right)$$

solve-ghost-integer-hypercharges-with-two-higgs-generation.nb

Remark 11: In the slave spacetime metric fields approach, the initial constraining Einstein equations $G_{\mu 0} = 8\pi G T_{\mu 0}$ are not relevant. Only the Einstein equations $G_{ij} = 8\pi G T_{ij}$ are relevant and involve only the pressure. The pressure scale of the virtual particles is around M_p^4 and some tuning of the effective cosmological constant from the scalar potential should counterbalance it in order that the rate of expansion is not too fast for the galaxy formations which are essential for the life and intelligence emergence.

Remark 12: More precision about the regularization with the gravity: the paths of virtual particles of wave length λ which create microscopic black holes have a zero probability to occur and they roughly satisfy the following Schwarzschild equation:

$$\lambda \lesssim r_s = 2\frac{GE}{c^4} = 2\frac{Ghc}{c^4\lambda} = 2\frac{Gh}{c^3\lambda}$$

$$\lambda \lesssim \sqrt{2\frac{Gh}{c^3}}$$

That condition leads to the following effective cut-off Λ for the virtual particles:

$$\Lambda \cong \frac{h}{\lambda_{min}} = \sqrt{\frac{hc^3}{2G}} = \sqrt{4\pi}\frac{M_p}{c}$$

Remark 13: The hot dark matter can be up to 1% of the total dark matter. If the ghost gauge fields are the candidates of the hot dark matter, we may have a maximum of ~ 183 ghost gauge fieds:

$$0.01\frac{\rho_{DM}}{\rho_\gamma} = 0.01\frac{c\rho_{crit}}{4\sigma T^4} \cong 183$$

A higher number of ghost gauge fields would be not be compatible with the observed structure formation, emergence of life and intelligence. The total number of ghost gauge fields available is:

$$2 \times (1+2+2+Y_{max}) \times (2Y_{max}+1)^{N_0-6} =$$
$$2 \times (1+2+2+(N_0-1)) \times (2N_0-1)^{N_0-6} =$$
$$4\ 737\ 148\ 448$$

Remark 14: The Eötvös ratio, which is a measure of the WEP violation has an experimental upper bound of 10^{-14} with the MICROSCOPE space experiment and an experimental upper bound of 10^{-13} with earth experiments using some Eötvös torsion balances. Since those experiments are protected by magnetic and electrostatic shields, the shields will also vanish the ghost gauge fields of the attractors (in fact, the sum of the different $U(1)$ gauge fields is vanished by the shields). Therefore, in that kind of experiments, no anomaly is predicted. However in Shapiro time delay experiments involving the sun, some anomalies around 10-100 ppm are expected with respect to the sun mass parameter measured with the ephemerides of planets. The current precision of the Shapiro time delay experiments involving the sun is only 10^{-5}.

Remark 15: Nobel Prize Experiment proposal: detecting some anomaly between the different measures of the standard gravitational parameter of the earth. Two mixed trains of identical metallic balls in circular orbit around the Earth at an altitude above 1000 km and with 100-1000 m of separation between the orbiting balls. Both trains of orbiting balls have the same radius and the same mass but have a significantly different neutron-proton ratio. Some other measuring satellites have precise propulsion to stay at 100 m of the main circular orbit in retrograde motion and they have LASER pulse in order to adjust finely the position of orbiting balls on the same circular orbit and they have LASER telemetry to detect the time difference and the orbital position difference of the orbiting balls of both trains. Some anomaly in the range $10^{-8} - 10^{-12}$ should be detected between the circular orbits of the orbiting balls with different neutron-proton ratio.

Remark 16: The Higgs-dilaton cosmology written in the general case:

$$\mathcal{L} = \pm f\left(\phi_{i_U,i_N}\right)\mathcal{R} \pm \mathcal{L}_{matter}$$
$$G_{ij} = \pm\frac{1}{f\left(\phi_{i_U,i_N}\right)\sqrt{-g}}\frac{\partial\left(\sqrt{-g}\mathcal{L}_{matter}\right)}{\partial g_{ij}}$$
$$G_{ij} = \pm\frac{1}{f\left(\phi_{i_U,i_N}\right)}\left(\frac{\partial(\mathcal{L}_{matter})}{\partial g_{ij}} - \frac{g_{ij}}{2}\mathcal{L}_{matter}\right) = \frac{T_{ij}}{f\left(\phi_{i_U,i_N}\right)}$$

If the polynomial function f has some roots, the spacetime metric fields will diverge when we consider quantum scalar paths arbitrary close to the roots of the polynomial function f (if the quantum scalar path reach the roots of the polynomial function f, the spacetime metric fields diverge and the amplitude probability is zero by definition). In that root limit case, the amplitude probability oscillate infinitely fast and therefore, the amplitude probability of the quantum matter fields paths are not well defined. To conclude that remark, the amplitude probability of the quantum matter fields paths are well defined only if the polynomial function f has a strictly positive lower bound or a strictly negative upper bound.

To conclude, to be able to calculate the observables at some time t, we need to define in an irreducible way, at $t = t_i$, some uniform initial conditions for the fields and their first derivatives. Some final time parameter t_f for the path integral can be defined as well.

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