Gravity With Non-unitary Transform*

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For a long time scientists try to find methods to combine Gravity and standard model together. By calculate Einstein tensor G_{ab}, this article reach a solution with a form can help Gravity take part in particles' interaction like gauge transform. Different with gauge transform, this transform is not unitary. This transform can be linked in parallel or in series.

Keywords: Gravity, non-unitary transform, link, Higgs

1. Introduction

In the past standard modal use a SU(N) group to unify physical theory which use gauge transform satisfy $U^\dagger U = I$. But this theory cannot include gravity. This article induce a new transform $U^\dagger U \neq I$, which is non-unitary to describe gravity effect, and its transform results matched with general relative well. More study shows that this transform can be linked in parallel or in series. And with this theory, we can eliminate singularity in black hole center by relate this transform with Higgs field.

2. Riemann curvature calculation

Let use geometric metric satisfy:

$$ds^2 = -\frac{c^2 v^2}{\phi^\dagger\phi}dt^2 + \frac{\phi^\dagger\phi}{v^2}dr^2 + r^2(d\theta^2 + \sin^2\theta d\varphi^2) \tag{1}$$

With $\Gamma^c_{ab} = \frac{1}{2}g^{cd}(\partial_a g_{bd} + \partial_b g_{ad} - \partial_d g_{ab})$, we have:

$$\Gamma^0_{00} = -\frac{\partial_t(\phi^\dagger\phi)}{2\phi^\dagger\phi}, \Gamma^0_{11} = \frac{\phi^\dagger\phi\partial_t(\phi^\dagger\phi)}{2c^2v^4}, \Gamma^1_{01} = \Gamma^1_{10} = \frac{\partial_t(\phi^\dagger\phi)}{2\phi^\dagger\phi}$$

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$$\Gamma^0_{02}=\Gamma^0_{20}=-\frac{\partial_\theta(\phi^\dagger\phi)}{2\phi^\dagger\phi},\Gamma^1_{12}=\Gamma^1_{21}=\frac{\partial_\theta(\phi^\dagger\phi)}{2\phi^\dagger\phi},\Gamma^2_{00}=\frac{c^2v^2\partial_\theta(\phi^\dagger\phi)}{2r^2{(\phi^\dagger\phi)}^2}$$
$$\Gamma^2_{11}=-\frac{\partial_\theta(\phi^\dagger\phi)}{2r^2v^2}$$
$$\Gamma^0_{03}=\Gamma^0_{30}=-\frac{\partial_\varphi(\phi^\dagger\phi)}{2\phi^\dagger\phi},\Gamma^1_{13}=\Gamma^1_{31}=\frac{\partial_\varphi(\phi^\dagger\phi)}{2\phi^\dagger\phi},\Gamma^3_{00}=\frac{c^2v^2\partial_\varphi(\phi^\dagger\phi)}{2r^2\sin^2\theta{(\phi^\dagger\phi)}^2}$$
$$\Gamma^3_{11}=\frac{-\partial_\varphi(\phi^\dagger\phi)}{2r^2v^2\sin^2\theta}$$
$$\Gamma^0_{01}=\Gamma^0_{10}=-\frac{\partial_r(\phi^\dagger\phi)}{2\phi^\dagger\phi},\Gamma^1_{00}=-\frac{c^2v^4\partial_r(\phi^\dagger\phi)}{2{(\phi^\dagger\phi)}^3},\Gamma^1_{11}=\frac{\partial_r(\phi^\dagger\phi)}{2\phi^\dagger\phi}$$
$$\Gamma^1_{22}=-\frac{v^2r}{\phi^\dagger\phi},\Gamma^1_{33}=-\frac{v^2r\sin^2\theta}{\phi^\dagger\phi},\Gamma^2_{12}=\Gamma^2_{21}=\frac{1}{r}$$
$$\Gamma^2_{33}=-\sin\theta\cos\theta,\Gamma^3_{13}=\Gamma^3_{31}=\frac{1}{r},\Gamma^3_{23}=\Gamma^3_{32}=\cot\theta \tag{2}$$

With $g^{ab}\nabla_a\nabla_b(\eta)=g^{ab}(\partial_a\partial_b\eta-\Gamma^c{}_{ab}\partial_c\eta)$, we have:

$$g^{ab}\nabla_a\nabla_b\eta=-\frac{1}{c^2}\partial_t(\frac{\phi^\dagger\phi}{v^2}\partial_t\eta)+\frac{1}{r^2}\partial_r(\frac{v^2r^2}{\phi^\dagger\phi}\partial_r\eta)+\frac{\partial_\theta(\sin\theta\partial_\theta\eta)}{r^2\sin\theta}+\frac{\partial^2_\varphi\eta}{r^2\sin^2\theta} \tag{3}$$

Then we can get:

$$\begin{aligned}&g^{ab}\nabla_a(\frac{1}{\phi^\dagger\phi}\nabla_b(\phi^\dagger\phi))\\&=-\frac{1}{{(\phi^\dagger\phi)}^2}(-\frac{\phi^\dagger\phi(\partial_t(\phi^\dagger\phi))^2}{c^2v^2}+\frac{v^2(\partial_r(\phi^\dagger\phi))^2}{\phi^\dagger\phi}+\frac{(\partial_\theta(\phi^\dagger\phi))^2}{r^2}+\frac{(\partial_\varphi(\phi^\dagger\phi))^2}{r^2\sin^2\theta})\\&+\frac{1}{(\phi^\dagger\phi)}(-\partial_t(\frac{\phi^\dagger\phi}{c^2v^2}\partial_t(\phi^\dagger\phi))+\frac{1}{r^2}\partial_r(\frac{v^2r^2}{\phi^\dagger\phi}\partial_r(\phi^\dagger\phi))+\frac{\partial_\theta(\sin\theta\partial_\theta(\phi^\dagger\phi))}{r^2\sin\theta}+\frac{\partial^2_\varphi(\phi^\dagger\phi)}{r^2\sin^2\theta})\end{aligned} \tag{4}$$

For $R_{\mu\nu\sigma}{}^\rho=\Gamma^\rho{}_{\mu\sigma,\nu}-\Gamma^\rho{}_{\nu\sigma,\mu}+\Gamma^\lambda{}_{\sigma\mu}\Gamma^\rho{}_{\nu\lambda}-\Gamma^\lambda{}_{\sigma\nu}\Gamma^\rho{}_{\mu\lambda}$, we have:

$$\begin{aligned}R&=\frac{1}{(\phi^\dagger\phi)^2}(-\frac{\phi^\dagger\phi{(\partial_t(\phi^\dagger\phi))}^2}{c^2v^2}-\frac{v^2{(\partial_r(\phi^\dagger\phi))}^2}{\phi^\dagger\phi}+\frac{{(\partial_\theta(\phi^\dagger\phi))}^2}{r^2}+\frac{{(\partial_\varphi(\phi^\dagger\phi))}^2}{r^2\sin^2\theta})\\&-\frac{1}{\phi^\dagger\phi}(-\frac{1}{c^2}\partial_t(\frac{\phi^\dagger\phi}{v^2}\partial_t(\phi^\dagger\phi))-\frac{1}{r^2}\partial_r(\frac{v^2r^2}{\phi^\dagger\phi}\partial_r(\phi^\dagger\phi))+\frac{\partial_\theta(\sin\theta\partial_\theta(\phi^\dagger\phi))}{r^2\sin\theta}+\frac{\partial^2_\varphi(\phi^\dagger\phi)}{r^2\sin^2\theta})\\&+\frac{2v^2\partial_r(\phi^\dagger\phi)}{{(\phi^\dagger\phi)}^2r}+\frac{2}{r^2}(1-\frac{v^2}{\phi^\dagger\phi})-\frac{1}{{(\phi^\dagger\phi)}^2}(\frac{{(\partial_\theta(\phi^\dagger\phi))}^2}{2r^2}+\frac{{(\partial_\varphi(\phi^\dagger\phi))}^2}{2r^2\sin^2\theta})\end{aligned} \tag{5}$$

Compare these 2 equation, let $\phi=J(r)K(t,\theta,\varphi)$, we can simplify R with:

$$\begin{aligned}&R=g^{ab}\nabla_a(\frac{1}{B^\dagger B}\nabla_b(B^\dagger B))+2\Lambda\\&B=J/K\\&2\Lambda=\frac{2v^2\partial_r(\phi^\dagger\phi)}{{(\phi^\dagger\phi)}^2r}+\frac{2}{r^2}(1-\frac{v^2}{\phi^\dagger\phi})-\frac{1}{{(\phi^\dagger\phi)}^2}(\frac{{(\partial_\theta(\phi^\dagger\phi))}^2}{2r^2}+\frac{{(\partial_\varphi(\phi^\dagger\phi))}^2}{2r^2\sin^2\theta})\end{aligned} \tag{6}$$

Then for $G_{ab} = R_{ab} - \frac{R}{2} g_{ab}$, we have:

$$\begin{aligned}
G_{00} &= \frac{c^2 v^2}{\phi^\dagger \phi} \Lambda, G_{11} = -\frac{\phi^\dagger \phi}{v^2} \Lambda \\
G_{22} &= -\frac{r^2}{2} (g^{ab} \nabla_a (\frac{1}{B^\dagger B} \nabla_b (B^\dagger B)) + \frac{(\partial_\theta (K^\dagger K))^2}{2r^2 (K^\dagger K)^2} - \frac{(\partial_\varphi (K^\dagger K))^2}{2r^2 \sin^2\theta (K^\dagger K)^2}) \\
G_{33} &= -\frac{r^2 \sin^2\theta}{2} (g^{ab} \nabla_a (\frac{1}{B^\dagger B} \nabla_b (B^\dagger B)) - \frac{(\partial_\theta (K^\dagger K))^2}{2r^2 (K^\dagger K)^2} + \frac{(\partial_\varphi (K^\dagger K))^2}{2r^2 \sin^2\theta (K^\dagger K)^2})
\end{aligned} \tag{7}$$

Consider more simple situation when $\phi = J(r)$, we have:

$$\begin{aligned}
2\Lambda &= \frac{2v^2 \partial_r (\phi^\dagger \phi)}{(\phi^\dagger \phi)^2 r} + \frac{2}{r^2} (1 - \frac{v^2}{\phi^\dagger \phi}) = \frac{2}{r} \partial_r (1 - \frac{v^2}{\phi^\dagger \phi}) - (1 - \frac{v^2}{\phi^\dagger \phi}) \partial_r \frac{2}{r} \\
G_{22} &= -\frac{r^2}{2} g^{ab} \nabla_a (\frac{1}{\phi^\dagger \phi} \nabla_b (\phi^\dagger \phi)) \\
G_{33} &= -\frac{r^2 \sin^2\theta}{2} g^{ab} \nabla_a (\frac{1}{\phi^\dagger \phi} \nabla_b (\phi^\dagger \phi)) \\
G_{ij} &= 0, i \neq j
\end{aligned} \tag{8}$$

We can get:

$$\partial_r (r (1 - \frac{v^2}{\phi^\dagger \phi})) = \Lambda r^2 \tag{9}$$

Then we have:

$$\frac{\phi^\dagger \phi}{v^2} = (1 - \frac{\Lambda r^2}{3} - \frac{C}{r})^{-1} \tag{10}$$

It is Schwarzschild-de Sitter metrics. Equation 4 can be simplified as:

$$\begin{aligned}
& g^{ab} \nabla_a (\frac{1}{\phi^\dagger \phi} \nabla_b (\phi^\dagger \phi)) \\
&= -\frac{\partial_t^2 (\phi^\dagger \phi)}{c^2 v^2} - \frac{1}{r^2} \partial_r (r^2 \partial_r (\frac{v^2}{\phi^\dagger \phi})) + \frac{1}{r^2 \sin\theta} \partial_\theta (\frac{\sin\theta \partial_\theta (\phi^\dagger \phi)}{\phi^\dagger \phi}) + \frac{1}{r^2 \sin^2\theta} \partial_\varphi (\frac{\partial_\varphi (\phi^\dagger \phi)}{\phi^\dagger \phi})
\end{aligned} \tag{11}$$

From equation 10 and 11, we can get:

$$g^{ab} \nabla_a (\frac{1}{\phi^\dagger \phi} \nabla_b (\phi^\dagger \phi)) = 2\Lambda \tag{12}$$

We can divide field has above left term with two kinds, one has no gravity effect, the other relate with gravity transform:

$$2F_\iota \quad = g^{ab} \nabla_a (\tfrac{1}{\iota^\dagger \iota} \nabla_b (\iota^\dagger \iota)) \tag{13}$$

$$2F_\phi \quad = g^{ab} \nabla_a (\tfrac{1}{\phi^\dagger \phi} \nabla_b (\phi^\dagger \phi)) \tag{14}$$

When $\phi = J(r)$, it is:

$$g^{ab}\nabla_a(\frac{1}{\phi^\dagger\phi}\nabla_b(\phi^\dagger\phi)) = -\frac{1}{r^2}\partial_r^2(r^2\partial_r(\frac{v^2}{\phi^\dagger\phi})) \tag{15}$$

Then matter with quantity m for act term has:

$$2mF_\iota = g^{ab}\nabla_a(\frac{1}{\iota^{m\dagger}\iota^m}\nabla_b(\iota^{m\dagger}\iota^m)) \tag{16}$$

$$2mF_\phi = -\frac{1}{r^2}\partial_r(r^2\partial_r(\frac{mv^2}{\phi^\dagger\phi})) \tag{17}$$

For static vacuum, equation 17 is:

$$2mF_\phi = -\frac{1}{r^2}\partial_r(r^2\partial_r(m - \frac{2Gm}{c^2r})) = -\frac{1}{r^2}\partial_r(r^2\partial_r(1 - \frac{2Gm}{c^2r})) \tag{18}$$

Equation 16 and 18 indicate inertial mass and gravitational mass are equal.

3. Calculate Lagrange value

To get a field has form as equation 12, we can make a field satisfy:

$$\nabla_b\psi = (\beta - \gamma\psi^\dagger\psi)\int P_aP_b\psi dx^a \tag{19}$$

Then:

$$g^{ab}\nabla_a\frac{1}{\beta - \gamma\psi^\dagger\psi}\nabla_b\psi = g^{ab}P_aP_b\psi = \alpha\psi \tag{20}$$

This lead to:

$$\begin{aligned}&\frac{\beta - \gamma\psi^\dagger\psi}{-2\gamma}g^{ab}\nabla_a\frac{\nabla_b(\beta - \gamma\psi^\dagger\psi)}{\beta - \gamma\psi^\dagger\psi}\\ &= \frac{1}{2}(g^{ab}\nabla_a\nabla_b(\psi^\dagger\psi) + \frac{\gamma g^{ab}\nabla_a(\psi^\dagger\psi)\nabla_b(\psi^\dagger\psi)}{\beta - \gamma\psi^\dagger\psi})\\ &= g^{ab}\nabla_a\psi^\dagger\nabla_b\psi + \alpha\psi^\dagger\psi(\beta - \gamma\psi^\dagger\psi)\end{aligned} \tag{21}$$

When $\gamma = 0$, equation 19 will becomes:

$$\nabla_b\psi = \beta\int P_aP_b\psi dx^a \tag{22}$$

Which lead to:

$$\frac{1}{2}g^{ab}\nabla_a\nabla_b(\psi^\dagger\psi) = g^{ab}\nabla_a\psi^\dagger\nabla_b\psi + \alpha\beta\psi^\dagger\psi \tag{23}$$

In equation 22 the left term use field changing effect to express itself state, the right term use its accumulate value to express itself state. Both 2 terms relate with same field state, they should be transformable with each other. We call it event state match relation in space-time. But when part of field lose direct relationship with space-time for self acting will transform this relationship as equation 19.

Let:

$$\eta = \begin{pmatrix} \psi \\ \rho e^{i\theta} \end{pmatrix}, \rho = \sqrt{-\frac{\beta}{\gamma}} \tag{24}$$

Then:

$$\beta - \gamma\psi^\dagger\psi = -\gamma\eta^\dagger\eta = -\gamma(\psi^\dagger\psi - \frac{\beta}{\gamma}) \tag{25}$$

$$g^{ab}\nabla_a\eta^\dagger\nabla_b\eta = g^{ab}\nabla_a\psi^\dagger\nabla_b\psi + g^{ab}\nabla_a(\rho e^{-i\theta})\nabla_b(\rho e^{i\theta}) = g^{ab}\nabla_a\psi^\dagger\nabla_b\psi \tag{26}$$

We have:

$$\frac{\eta^\dagger\eta}{2}g^{ab}\nabla_a(\frac{1}{\eta^\dagger\eta}\nabla_b(\eta^\dagger\eta)) = g^{ab}\nabla_a\eta^\dagger\nabla_b\eta - \alpha\beta\eta^\dagger\eta - \alpha\gamma(\eta^\dagger\eta)^2 \tag{27}$$

Do transform as: $\eta \to u\eta = \tilde{\eta}$, we have:

$$\begin{aligned} &\frac{1}{2}\tilde{\eta}^\dagger\tilde{\eta}g^{ab}\nabla_a(\frac{1}{\tilde{\eta}^\dagger\tilde{\eta}}\nabla_b(\tilde{\eta}^\dagger\tilde{\eta})) \\ &= \frac{1}{2}\tilde{\eta}^\dagger\tilde{\eta}(g^{ab}\nabla_a(\frac{1}{\eta^\dagger\eta}\nabla_b(\eta^\dagger\eta)) + g^{ab}\nabla_a(\frac{1}{u^\dagger u}\nabla_b(u^\dagger u))) \\ &= g^{ab}D_a^\dagger\tilde{\eta}D_b\tilde{\eta} - \alpha\beta\tilde{\eta}^\dagger\tilde{\eta} - \frac{\alpha\gamma}{u^\dagger u}(\tilde{\eta}^\dagger\tilde{\eta})^2 \end{aligned} \tag{28}$$

In which transform field u satisfy:

$$g^{ab}\nabla_a(\frac{1}{u^\dagger u}\nabla_b(u^\dagger u)) = 0 \tag{29}$$

To be Lagrange density of quantum field, with equation 13 and 14 we can make η satisfy:

$$g^{ab}\nabla_a(\frac{1}{\eta^\dagger\eta}\nabla_b(\eta^\dagger\eta)) = 2(aF_\iota + bF_\phi) = 2\kappa \tag{30}$$

In which κ is a constant, similar to equation 12. Then we get Lagrange density like Higgs field as:

$$\begin{aligned} 2L &= g^{ab}D_a^\dagger\tilde{\eta}D_b\tilde{\eta} - (\alpha\beta + \kappa)\tilde{\eta}^\dagger\tilde{\eta} - \frac{\alpha\gamma}{u^\dagger u}(\tilde{\eta}^\dagger\tilde{\eta})^2 \\ &= g^{ab}D_a^\dagger\tilde{\eta}D_b\tilde{\eta} - \mu^2\tilde{\eta}^\dagger\tilde{\eta} - \frac{\lambda}{2u^\dagger u}(\tilde{\eta}^\dagger\tilde{\eta})^2 = 0 \end{aligned} \tag{31}$$

These calculation is reversible, so we can get equation 19 from Lagrange density also. When $u^{\dagger}u = I$, it is SU(N) group for gauge transform in standard model. Consider gravity, for static vacuum we have:

$$u^{\dagger}u = (1 - \frac{2Gm_g}{c^2 r})^{-1} \tag{32}$$

$$g^{ab}\nabla_a((1 - \frac{2Gm_g}{c^2 r})\nabla_b(1 - \frac{2Gm_g}{c^2 r})^{-1}) = 0 \tag{33}$$

In which m_g is gravity mass. As a result we have Higgs vacuum state:

$$v_0 = \sqrt{-\frac{\mu^2 u^+ u}{\lambda}} = \sqrt{\frac{-\mu^2}{\lambda(1 - \frac{2Gm_g}{c^2 r})}} \tag{34}$$

This will lead to particle mass m_0 become m_p:

$$m_p = \frac{m_0}{\sqrt{1 - \frac{2Gm_g}{c^2 r}}} \propto v_0 \tag{35}$$

Which is satisfied with general relativity.

4. Independent field component

By choose independent field components properly, for example we have components ψ_1 and ψ_2, they have:

$$\begin{aligned}
&\nabla_b(\psi_1, \psi_2)^T \\
&= \beta(1 - \frac{\gamma}{\beta}(\psi_1^+\psi_1 + \psi_2^+\psi_2)) \int P_a P_b (\psi_1, \psi_2)^T dx^a \\
&= \beta((1 - \frac{\gamma}{\beta}\psi_1^+\psi_1)(1 - \frac{\gamma}{\beta}\psi_2^+\psi_2) - \frac{\gamma^2}{\beta^2}\psi_1^+\psi_1\psi_2^+\psi_2) \int P_a P_b (\psi_1, \psi_2)^T dx^a
\end{aligned} \tag{36}$$

Let $\Phi = (\psi_1, \psi_2)^T$, it becomes:

$$\nabla_b \Phi = \beta(1 - \frac{\gamma}{\beta}\Phi^+\Phi) \int P_a P_b \Phi dx^a \tag{37}$$

Which has form as equation 19. In quantum theory $\gamma\psi^{\dagger}\psi$ is a possibility density. We can find intersection possibility density of these 2 independent event field.

$$P_c = \frac{\gamma^2}{\beta^2}\psi_1^+\psi_1\psi_2^+\psi_2 \tag{38}$$

Then the unite possibility density of these 2 independent event field is:

$$P_u = \frac{\gamma}{\beta}\psi_1^+\psi_1 + \frac{\gamma}{\beta}\psi_2^+\psi_2 - P_c \tag{39}$$

But the actual value in equation 36 is:

$$P_a = \frac{\gamma}{\beta}\psi_1^+\psi_1 + \frac{\gamma}{\beta}\psi_2^+\psi_2 \tag{40}$$

Because possibilities for independent field components in same field are not independent. For vaccum space it is similar as:

$$1 - \frac{G(m_1+m_2)}{c^2r} = (1 - \frac{Gm_1}{c^2r})(1 - \frac{Gm_2}{c^2r}) - \frac{G^2m_1m_2}{c^4r^2} \tag{41}$$

This is agree with Gravity.

5. Addable fields of Fermions

For fields of 2 independent Fermi particles field F_1 and F_2, which satisfy:

$$F_1^\dagger F_2 + F_2^\dagger F_1 = 0 \tag{42}$$

we should have:

$$\nabla_b(F_1 + F_2) \tag{43}$$

$$= \beta_F(1 - \frac{\gamma_F}{\beta_F}(F_1^\dagger + F_2^\dagger)(F_1 + F_2)) \int P_a P_b (F_1 + F_2) dx^a \tag{44}$$

$$= \beta_F(1 - \frac{\gamma_F}{\beta_F}(F_1^\dagger F_1 + F_2^\dagger F_2)) \int P_a P_b (F_1 + F_2) dx^a \tag{45}$$

We can easily get that Fermions' fields with quantity of n has:

$$\nabla_b \sum_{i=1}^{n} F_i = \beta_F(1 - \frac{\gamma_F}{\beta_F}\sum_{i=1}^{n}(F_i^\dagger F_i)) \int P_a P_b \sum_{i=1}^{n} F_i dx^a \tag{46}$$

$$\sum_{i=1}^{n} F_i = n\bar{F} \tag{47}$$

$$\nabla_b \bar{F} = \beta_F(1 - \frac{\gamma_F}{\beta_F} n\bar{F}^\dagger \bar{F}) \int P_a P_b \bar{F} dx^a \tag{48}$$

This is agree with Gravity.

6. Addable fields of Bosons

For bosons with quantity of n, it will becomes:

$$\nabla_b\psi = \beta(1 - \frac{\gamma}{\beta}n^2\psi^\dagger\psi)\int P_aP_b\psi dx^a \tag{49}$$

It has a Gravity proportion to n^2, which is not agree with Gravity relate with mass. This problem can be solved by use link in series as equation 16 and 17. But still there are another problem, equation 49 lead to equation 50:

$$\begin{aligned}&\frac{\beta - \gamma\psi^\dagger\psi}{-2\gamma}g^{ab}\nabla_a\frac{\nabla_b(\beta - \gamma\psi^\dagger\psi)}{\beta - \gamma\psi^\dagger\psi} \\ &= g^{ab}\nabla_a\psi^\dagger\nabla_b\psi + \alpha\psi^\dagger\psi(\beta - n^2\gamma\psi^\dagger\psi)\end{aligned} \tag{50}$$

Then Higgs vacuum state will become:

$$\tilde{v}_0 = \frac{v_0}{n} \tag{51}$$

It cannot be true, which make particles' mass effect by overlap of field ψ. Solution for this is to let β addable synchronously with field ψ as a special component in same particles' field as equation 24. We have:

$$\nabla_b\psi = n^2\beta(1 - \frac{\gamma}{\beta}\psi^\dagger\psi)\int P_aP_b\psi dx^a \tag{52}$$

Make these particles distribute evenly in space we have:

$$\frac{\beta - \gamma\psi^\dagger\psi}{-2\gamma}g^{ab}\nabla_a\frac{\nabla_b(\beta - \gamma\psi^\dagger\psi)}{\beta - \gamma\psi^\dagger\psi} = 0 \tag{53}$$

And Higgs vacuum state keeps as v_0. For overlapping times should be effect by these particle's density ρ_b, we can modify Gravity term as:

$$n_b{}^2 - \frac{2Gm_f}{c^2r} = n_b{}^2(1 - \frac{2Gm_f}{n_b{}^2c^2r}) \tag{54}$$

$$n_b = k\rho_b \tag{55}$$

We can image, in a local space with Quantum theory usually have:

$$m_f \approx c_0n_b \tag{56}$$

$$\delta n_b\delta r \approx c_1\delta r\delta mc \geq c_1\delta r\delta p \geq c_1\hbar/2 \tag{57}$$

In which c_0 and c_1 is constant, by this we can eliminate singularity in black hole center, for n_b will become very large.

7. Link fields together

There are 2 methods to link field. One is link in parallel as:$\phi = \phi_1 + \phi_2$ as previous sections, the other is link series as:$\phi = \phi_1\phi_2$, which can be reached by add left term of equation 12 as:

$$g^{ab}\nabla_a(\frac{1}{\phi^\dagger\phi}\nabla_b(\phi^\dagger\phi)) \tag{58}$$

$$= g^{ab}\nabla_a(\frac{1}{\prod\limits_i \phi_i^\dagger\phi_i}\nabla_b(\prod_i \phi_i^\dagger\phi_i)) \tag{59}$$

$$= \sum_i g^{ab}\nabla_a(\frac{1}{\phi_i^\dagger\phi_i}\nabla_b(\phi_i^\dagger\phi_i)) \tag{60}$$

With equation 27, link them in series, no consider gravity, we have:

$$\frac{n\eta^{\dagger n}\eta^n}{2}g^{ab}\nabla_a(\frac{1}{(\eta^\dagger\eta)^n}\nabla_b(\eta^\dagger\eta)^n) = g^{ab}\nabla_a\eta^{\dagger n}\nabla_b\eta^n - n^2\alpha\beta\eta^\dagger\eta - n^2\alpha\gamma(\eta^\dagger\eta)^{n+1} \tag{61}$$

For real field, let:

$$V = -n^2\alpha\beta\eta^{2n} - n^2\alpha\gamma\eta^{2(n+1)} \tag{62}$$

To get extremum:

$$\frac{dV}{d\eta} = -2n^3\alpha\beta\eta^{2n-1} - (2n+2)n^2\alpha\gamma\eta^{2n+1} = 0 \tag{63}$$

We have:

$$v_0 = \sqrt{-\frac{n\beta}{(n+1)\gamma}} \tag{64}$$

It will effect particles mass also which not agree with nature, so if a kind of fields can linked in series there should have no self act term. As a result Higgs fields cannot link in series. Links can be more complex if consider space-time's different between different particles, such as Feynman path integrals.

8. Conclusion

Now we have calculated act term which can combine Standard model and gravity together. We find that gravity transform is similar with gauge transform except it is non-unitary. We can connect field in parallel or in series, which is determined by particles' type, to form a space-time's network.

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