The spherical solution of the quantum gravity and the revised gravity field equation

Sangwha-Yi

Department of Math , Taejon University 300-716

ABSTRACT

In the general relativity theory, using Einstein's revised gravity field equation (add the cosmological term), discover the spherical solution of the quantum gravity.

PACS Number:**04,04.90.+e,04.60**

Key words:The general relativity theory,

The revised gravity field equation

The quantum gravity

The spherical solution

The cosmological term

e-mail address:sangwha1**@nate.com**

Tel:051-624-3953

I.Introduction

This theory is that it discovers the spherical solution of the quantum gravity using the revised gravity field equation(add the cosmological term).

Think that use following the formula.

$$\alpha = \frac{hc}{GM^2} \text{ is non-Dimension number. } \alpha\text{'s Dimension is } \frac{J\cdot s\cdot m/s}{N\cdot m^2\cdot kg^2/kg^2} = \frac{J\cdot m}{J\cdot m} = 1$$

h is the plank constant, c is the light speed, G is the gravity constant, M is the matter's mass.

The spherical solution (The Schwarzshild solution) of the general relativity is

$$d\tau^2 = (1-\frac{2GM}{rc^2})dt^2 - \frac{1}{c^2}[\frac{dr^2}{1-\frac{2GM}{rc^2}} + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2] \quad (1)$$

II. Additional chapter -I

In this theory, the general relativity theory's revised field equation (add the cosmological term) is written completely.

$$R_{\mu\upsilon} - \frac{1}{2}g_{\mu\upsilon}R + \Lambda g_{\mu\upsilon} = -\frac{8\pi G}{c^4}T_{\mu\upsilon} \quad (2)$$

Eq (2) multiply $g^{\mu\upsilon}$ and does contraction,

$$g^{\mu\upsilon}R_{\mu\upsilon} - \frac{1}{2}g^{\mu\upsilon}g_{\mu\upsilon}R + \Lambda g^{\mu\upsilon}g_{\mu\upsilon}$$

$$= -R + 4\Lambda = -\frac{8\pi G}{c^4}T^{\lambda}{}_{\lambda} \quad (3)$$

Therefore, Eq (2) is

$$R_{\mu\upsilon} - \frac{1}{2}g_{\mu\upsilon}(4\Lambda + \frac{8\pi G}{c^4}T^{\lambda}{}_{\lambda}) + \Lambda g_{\mu\upsilon} = -\frac{8\pi G}{c^4}T_{\mu\upsilon}$$

$$R_{\mu\upsilon} = -\frac{8\pi G}{c^4}(T_{\mu\upsilon} - \frac{1}{2}g_{\mu\upsilon}T^{\lambda}{}_{\lambda}) + \Lambda g_{\mu\upsilon} \quad (4)$$

In this time, the spherical coordinate system's vacuum solution is by $T_{\mu\upsilon} = 0$

$$R_{\mu\upsilon} = \Lambda g_{\mu\upsilon} \quad (5)$$

The spherical coordinate system's invariant time is

$$d\tau^2 = A(t,r)dt^2 - \frac{1}{c^2}[B(t,r)dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2] \quad (6)$$

Using Eq(6)'s metric, save the Riemannian-curvature tensor, and does contraction, save Ricci-tensor.

$$R_{tt} = -\frac{A''}{2B} + \frac{A'B'}{4B^2} - \frac{A'}{Br} + \frac{A'^2}{4AB} + \frac{\ddot{B}}{2B} - \frac{\dot{B}^2}{4B^2} - \frac{\dot{A}\dot{B}}{4AB} = -\Lambda A \quad (7)$$

$$R_{rr} = \frac{A''}{2A} - \frac{A'^2}{4A^2} - \frac{A'B'}{4AB} - \frac{B'}{Br} - \frac{\ddot{B}}{2A} + \frac{\dot{A}\dot{B}}{4A^2} + \frac{\dot{B}^2}{4AB} = \Lambda B \tag{8}$$

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = \Lambda r^2 \tag{9}$$

$$R_{\phi\phi} = \sin^2\theta R_{\theta\theta} \tag{10}$$

$$R_{tr} = -\frac{\dot{B}}{Br} = 0$$

$$R_{t\theta} = R_{t\phi} = R_{r\theta} = R_{r\phi} = R_{\theta\phi} = 0 \tag{11}$$

In this time, $' = \frac{\partial}{\partial r}$, $\cdot = \frac{1}{c}\frac{\partial}{\partial t}$

By Eq(11),

$$\dot{B} = 0 \tag{12}$$

By Eq(7) and Eq(8),

$$\frac{R_{tt}}{A} + \frac{R_{rr}}{B} = -\frac{1}{Br}\left(\frac{A'}{A} + \frac{B'}{B}\right) = -\frac{(AB)'}{rAB^2} = 0 \tag{13}$$

Therefore,

$$A = \frac{1}{B} \tag{14}$$

If Eq(9) is inserted by Eq(14),

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = -1 + \left(\frac{r}{B}\right)' = \Lambda r^2 \tag{15}$$

If solve Eq(15)

$$\frac{r}{B} = r + C + \frac{1}{3}\Lambda r^3 \rightarrow \frac{1}{B} = 1 + \frac{C}{r} + \frac{1}{3}\Lambda r^2 \tag{16}$$

In this time, be able to think following the formula.

$$C = -\frac{2GM}{c^2} \quad , \quad \Lambda = \sum(M) = \alpha_0\left(\frac{c^4}{G^2M^2}\right)\exp\left[-\alpha_1\left(\frac{hc}{GM^2}\right)^{\beta_1}\right]$$

$\alpha_1 > 0, \beta_1 > 0$, $\alpha_0, \alpha_1, \beta_1$ are real numbers.

(17)

$$\frac{1}{B} = 1 - \frac{2GM}{rc^2} + \frac{1}{3}\sum(M) r^2$$

$$\sum(M) = \alpha_0\left(\frac{c^4}{G^2M^2}\right)\exp\left[-\alpha_1\left(\frac{hc}{GM^2}\right)^{\beta_1}\right]$$

$\alpha_1 > 0, \beta_1 > 0$, $\alpha_0, \alpha_1, \beta_1$ are real numbers.

(18)

Therefore, Eq(18) is

$$A = \frac{1}{B} = 1 - \frac{2GM}{rc^2} + \frac{1}{3}\Sigma(M)r^2$$

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[-\alpha_1 (\frac{hc}{GM^2})^{\beta_1}]$$

$\alpha_1 > 0, \beta_1 > 0$, $\alpha_0, \alpha_1, \beta_1$ are real numbers.

(19)

To know Eq(19)'s third term, does Newton's limitation

$$\frac{d^2 x^\lambda}{d\tau^2} = -\Gamma^\lambda{}_{\mu\upsilon} \frac{dx^\mu}{d\tau} \frac{dx^\upsilon}{d\tau}$$

$$\frac{d^2 r}{dt^2} \approx \frac{1}{2} c^2 \frac{\partial(-A)}{\partial r} = -\frac{GM}{r^2} - \frac{\alpha_0}{3} (\frac{c^6}{G^2 M^2}) \exp[-\alpha_1 (\frac{hc}{GM^2})^{\beta_1}] r \qquad (20)$$

To know Eq(20)'s second term, use Hubble's constant H_0,

$$V_{galaxxy} = \frac{r_{galaxy}}{T_0} = H_0 r_{galaxy},$$

$$a_{galaxy} = \frac{V_{galaxy}}{T_0} = \frac{r_{galaxy}}{T_0{}^2} = H_0 \frac{r_{galaxy}}{T_0} = H_0{}^2 r_{galaxy}$$

V_{galaxy} is the galaxy's velocity, r_{galaxy} is the distant of the galaxy and the other galaxy, a_{galaxy} is the galaxy's acceleration, T_0 is the present universe's time.

(21)

Therefore, Eq(20)'s second term is concerned about the universe's inflation. Therefore,

If $-\frac{GM_{galaxy}}{r_{galaxy}{}^2} \sim 0, 0 < \frac{1}{T_0{}^2} = H_0{}^2 = -\frac{\alpha_0}{3} (\frac{c^6}{G^2 M_{galaxy}{}^2}) \exp[-\alpha_1 (\frac{hc}{GM_{galaxy}{}^2})^{\beta_1}]$, $\alpha_0 < 0$

(22)

Therefore, the universe's time T is concerned about the galaxy's mass M_{galaxy}.

III. Additional chapter-II

About the spherical solution,

$$d\tau^2 = (1 - \frac{2GM}{rc^2} + \frac{1}{3}\Sigma(M)r^2) dt^2 - \frac{1}{c^2} [\frac{dr^2}{(1 - \frac{2GM}{rc^2} + \frac{1}{3}\Sigma(M)r^2)} + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2]$$

(23)

In Eq(23), if $h \to 0$,

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[\alpha_1 (\frac{hc}{GM^2})^{\beta_1}] \to \alpha_0 \frac{c^4}{G^2 M^2}$$

$$d\tau^2 = (1 - \frac{2GM}{rc^2} + \frac{\alpha_0}{3} \frac{c^4}{G^2 M^2} r^2) dt^2 - \frac{1}{c^2} [\frac{dr^2}{(1 - \frac{2GM}{rc^2} + \frac{\alpha_0}{3} \frac{c^4}{G^2 M^2} r^2)} + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2] \tag{24}$$

In Eq(23), if $M \to 0$,

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[\alpha_1 (\frac{hc}{GM^2})^{\beta_1}] \to 0$$

$$d\tau^2 = dt^2 - \frac{1}{c^2} [dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2] \tag{25}$$

In Eq(23), if $c \to \infty$,

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[-\alpha_1 (\frac{hc}{GM^2})^{\beta_1}] \to 0$$

$$d\tau^2 = dt^2 \tag{26}$$

In Eq(23), if $G \to 0$,

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[-\alpha_1 (\frac{hc}{GM^2})^{\beta_1}] \to 0$$

$$d\tau^2 = dt^2 - \frac{1}{c^2} [dr^2 + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2] \tag{27}$$

The spherical solution (the vacuum solution) of the revised gravity field equation (add the cosmological term) is

$$d\tau^2 = (1 - \frac{2GM}{rc^2} + \frac{1}{3} \Sigma(M) r^2) dt^2 - \frac{1}{c^2} [\frac{dr^2}{(1 - \frac{2GM}{rc^2} + \frac{1}{3} \Sigma(M) r^2)} + r^2 d\theta^2 + r^2 \sin^2 \theta d\phi^2]$$

$$\Sigma(M) = \alpha_0 (\frac{c^4}{G^2 M^2}) \exp[-\alpha_1 (\frac{hc}{GM^2})^{\beta_1}]$$

$\alpha_1 > 0, \beta_1 > 0$, $\alpha_0, \alpha_1, \beta_1$ are real numbers.

(28)

IV. Conclusion

It found the spherical solution of the quantum gravity.

Reference

[1]S.Weinberg,Gravitation and Cosmology(John wiley & Sons,Inc,1972)

[2]P.Bergman,Introduction to the Theory of Relativity(Dover Pub. Co.,Inc., New York,1976),Chapter V

[3]C.Misner, K,Thorne and J. Wheeler, Gravitation(W.H.Freedman & Co.,1973)

[4]S.Hawking and G. Ellis,The Large Scale Structure of Space-Time(Cam-bridge University Press,1973)

[5]R.Adler,M.Bazin and M.Schiffer,Introduction to General Relativity(McGraw-Hill,Inc.,1965)