The spherical solution of the quantum gravity

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ABSTRACT

In the general relativity theory, using Einstein's gravity field equation, discover the spherical solution of the quantum gravity.

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I.Introduction

This theory is that it discovers the spherical solution of the quantum gravity.

Think that use following the formula.

$\alpha = \frac{hc}{GM^2}$ is non-Dimension number. α '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

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

II. Additional chapter-I

In this theory, the general relativity theory's field equation is written completely.

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

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

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

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

Therefore, Eq (2) is

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

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

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

$$R_{\mu\upsilon} = 0 \qquad (5)$$

The spherical coordinate system's invariant time is

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

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

$$R_{tt} = -\frac{A''}{2B} + \frac{A'B'}{4B^2} - \frac{A'}{Br} + \frac{A'^2}{4AB} + \frac{\ddot{B}}{2B} - \frac{\dot{B}^2}{4B^2} - \frac{\dot{A}\dot{B}}{4AB} = 0 \qquad (7)$$

$$R_{rr} = \frac{A''}{2A} - \frac{A'^2}{4A^2} - \frac{A'B'}{4AB} - \frac{B'}{Br} - \frac{\ddot{B}}{2A} + \frac{\dot{A}\dot{B}}{4A^2} + \frac{\dot{B}^2}{4AB} = 0 \qquad (8)$$

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = 0 \tag{9}$$

$$R_{\phi\phi} = R_{\theta\theta} \sin^2\theta = 0 \tag{10}$$

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

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

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),

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = -1 + \left(\frac{r}{B}\right)' = 0 \tag{15}$$

If solve Eq(15)

$$\frac{r}{B} = r + C \rightarrow \frac{1}{B} = 1 + \frac{C}{r} \tag{16}$$

In this time,

$$C = -\frac{2GM}{c^2}\exp\left(-\frac{hc}{GM^2}\right) \tag{17}$$

$$\frac{1}{B} = 1 - \frac{2GM}{rc^2}\exp\left(-\frac{hc}{GM^2}\right) \tag{18}$$

Therefore, Eq(18) is

$$A = \frac{1}{B} = 1 - \frac{2GM}{rc^2}\exp\left(-\frac{hc}{GM^2}\right) \tag{19}$$

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

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

$$\frac{d^2r}{dt^2} \approx \frac{1}{2}c^2\frac{\partial(-A)}{\partial r} = -\frac{GM}{r^2}\exp(-\frac{hc}{GM^2}) \tag{20}$$

Therefore, by Eq(19) ,in this theory, the spherical solution of the quantum gravity is

$$d\tau^2 = (1-\frac{2GM}{rc^2}\exp(-\frac{hc}{GM^2}))dt^2 - \frac{1}{c^2}[\frac{dr^2}{(1-\frac{2GM}{rc^2}\exp(-\frac{hc}{GM^2}))} + r^2d\theta^2 + r^2\sin^2\theta d\phi^2] \tag{21}$$

III. Additional chapter-II

In Eq(21),

$$h \to 0 \qquad d\tau^2 = (1-\frac{2GM}{rc^2})dt^2 - \frac{1}{c^2}[\frac{dr^2}{1-\frac{2GM}{rc^2}} + r^2d\theta^2 + r^2\sin^2\theta d\phi^2] \tag{22}$$

In Eq(21),

$$M \to 0 \quad d\tau^2 = dt^2 - \frac{1}{c^2}[dr^2 + r^2d\theta^2 + r^2\sin^2\theta d\phi^2] \tag{23}$$

Eq(21) is rewritten.

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

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

$$M' = M\exp(-\frac{hc}{GM^2}) \tag{24}$$

Caution: M' isn't concerned about the real physical mass and only use for computing the other physical element.

1.First example, if M is the sun's mass, saves M'

$$M \sim 1.99\times10^{30}kg$$

$$\exp(-\frac{hc}{GM^2}) \sim \exp(-\frac{6.63\times10^{-34}J\cdot s\times3\times10^8 m/s}{6.67\times10^{-11}N\cdot m^2/kg^2\times1.99^2\times10^{60}kg^2})$$

$$\sim \exp(-0.75\times10^{-75}) \sim 1-0.75\times10^{-75}$$

$$M' = M\exp(-\frac{hc}{GM^2}) \sim 1.99\times10^{30}\times(1-0.75\times10^{-75})kg$$

$$= (1.99\times10^{30} - 1.49\times10^{-45})kg$$

Therefore, in the example.1, it is enough to use the Schwarzschild solution.

2.Second example, if M is the mass of the ball that the mass is $1kg$, saves M'

$$M = 1kg$$

$$\exp(-\frac{hc}{GM^2}) \sim \exp(-\frac{6.63\times10^{-34}J\cdot s\times3\times10^{8}m/s}{6.67\times10^{-11}N\cdot m^2/kg^2\times1kg^2})$$

$$\sim \exp(-2.98\times10^{-15})$$

$$\sim 1-2.98\times10^{-15}$$

$$M' = M\exp(-\frac{hc}{GM^2}) \sim 1\times(1-2.98\times10^{-15})kg$$

$$= (1-2.98\times10^{-15})kg$$

3.Third example, if M is the electron's mass, saves M'

$$M \sim 9.11\times10^{-31}kg$$

$$\exp(-\frac{hc}{GM^2}) \sim \exp(-\frac{6.63\times10^{-34}J\cdot s\times3\times10^{8}m/s}{6.67\times10^{-11}N\cdot m^2/kg^2\times9.11^2\times10^{-62}kg^2}) \sim \exp(-3.59\times10^{45})$$

$$M' = M\exp(-\frac{hc}{GM^2}) \sim 9.11\times10^{-31}\exp(-3.59\times10^{45})kg$$

Therefore, in the example.3, it must use this theory that includes the quantum gravity effect.

IV. Conclusion

It found the spherical solution of the quantum gravity.

In my theory, be able to think that have to use the reduced plank constant $\hbar$ instead of the plank constant h. In my opinion, the plank constant h is the fundamental constant better than the reduced plank constant $\hbar$, hence, in this theory, used the plank constant h.

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)