Spherical Solution of Classical Quantum Gravity

Sangwha-Yi

Department of Math , Taejon University 300-716

ABSTRACT

In the general relativity theory, using Einstein's gravity field equation, we discover the spherical solution of the classical quantum gravity. The careful point is that this theory is different from the other quantum theory. This theory is made by the Einstein's classical field equation.

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

Key words:General relativity theory,

Classical quantum gravity

Spherical quantum solution

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

Tel:010-2496-3953

1.Introduction

This theory's aim is that we discover the spherical solution of the quantum gravity.

We can think the following formula.

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

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

The classical vacuum solution (Schwarzschild solution) of the general relativity is

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

2. Spherical quantum solution in vacuum state

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

$$R_{\mu\upsilon} - \frac{1}{2} g_{\mu\upsilon} R = -\frac{8\pi G}{c^4} T_{\mu\upsilon} \qquad (3)$$

The Ricci tensor is by $T_{\mu\upsilon} = 0$ in vacuum state.

$$R_{\mu\upsilon} = 0 \qquad (4)$$

The proper time of spherical coordinates is

$$d\tau^2 = A(t,r)dt^2 - \frac{1}{c^2}[B(t,r)dr^2 + r^2 d\theta^2 + r^2 \sin^2\theta d\phi^2] \qquad (5)$$

If we use Eq(5), we obtain the Ricci-tensor equations.

$$R_{tt} = -\frac{A''}{2B} + \frac{A'B'}{4B^2} - \frac{A'}{Br} + \frac{A'^2}{4AB} + \frac{\ddot{B}}{2B} - \frac{\dot{B}^2}{4B^2} - \frac{\dot{A}\dot{B}}{4AB} = 0 \qquad (6)$$

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

$$R_{\theta\theta} = -1 + \frac{1}{B} - \frac{rB'}{2B^2} + \frac{rA'}{2AB} = 0 \qquad (8)$$

$$R_{\phi\phi} = R_{\theta\theta} \sin^2\theta = 0 \qquad (9)$$

$$R_{tr} = -\frac{\dot{B}}{Br} = 0 \qquad (10)$$

$$R_{t\theta} = R_{t\phi} = R_{r\theta} = R_{r\phi} = R_{\theta\phi} = 0 \qquad (11)$$

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

By Eq(10),

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

By Eq(6) and Eq(7),

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

Hence, we obtain this result.

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

If Eq(14) inserts Eq(8),

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

If we solve Eq(15),

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

In this time, we are able to think the following formula.

$$C = -\frac{2GM}{c^2}\exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ...\alpha_i(\frac{hc}{GM^2})^{\beta_i} ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}]$$

$$N_i > \alpha_i \geq 0, \beta_i \geq 1 - \varepsilon_{0i}, \ 0 < \varepsilon_{0i} << 1$$

$\alpha_1, \alpha_2, ...\alpha_n, \beta_1, \beta_2, ...\beta_n$ are real numbers.

N_i is the large number. ε_{0i} is the smallest number.

(17)

The reason of $\beta_i \geq 1 - \varepsilon_{0i}$ is because if $0 \leq \beta_i < 1 - \varepsilon_{0i}$, we are not able to represent the real gravity situation. In this time, the large number N_i is the number that befit the real gravity situation. The smallest number ε_{0i} is the positive number.

Therefore, Eq(14) is

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

$$\sum(M) = \exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ...\alpha_i(\frac{hc}{GM^2})^{\beta_i} - ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}]$$

$$N_i > \alpha_i \geq 0, \beta_i \geq 1 - \varepsilon_{0i}, \ 0 < \varepsilon_{0i} << 1$$

$\alpha_1, \alpha_2, ...\alpha_n, \beta_1, \beta_2, ...\beta_n$ are real numbers.

N_i is the large number. ε_{0i} is the smallest number.

(18)

If we want to know the gravity acceleration of Newton's limitation,

$$\frac{d^2r}{dt^2} \approx \frac{1}{2}c^2\frac{\partial(-A)}{\partial r} = -\frac{GM}{r^2}\exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}] \tag{19}$$

Therefore, the spherical solution of the quantum gravity is

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

$$\Sigma(M) = \exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ...\alpha_i(\frac{hc}{GM^2})^{\beta_i} - ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}]$$

$$N_i > \alpha_i \geq 0, \beta_i \geq 1 - \varepsilon_{0i}, 0 < \varepsilon_{0i} << 1$$

$\alpha_1, \alpha_2, ...\alpha_n, \beta_1, \beta_2, ...\beta_n$ are real numbers.

N_i is the large number. ε_{0i} is the smallest number.

(20)

3. Classical limitation of spherical quantum solution

In Eq(20), if $h \to 0$,

$$\Sigma(M) = \exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}] \to 1 \tag{21}$$

In this time, Eq(20) does the Schwarzschild solution.

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

In Eq(20), if $M \to 0$,

$$M\Sigma(M) = M\exp[-\alpha_1(\frac{hc}{GM^2})^{\beta_1} - \alpha_2(\frac{hc}{GM^2})^{\beta_2} - ... - \alpha_n(\frac{hc}{GM^2})^{\beta_n}] = 0 \tag{23}$$

In this time, Eq(20) does the Minkowski space-time.

$$d\tau^2 = dt^2 - \frac{1}{c^2}[dr^2 + r^2 d\theta^2 + r^2\sin^2\theta d\phi^2] \tag{24}$$

If the speed $u = 0$ in gravity field, the proper time is in the classical quantum gravity solution

$$u^2 = \frac{g_{rr}dr^2 + g_{\theta\theta}d\theta^2 + g_{\phi\phi}d\phi^2}{dt^2} = 0$$

$$d\tau^2 = (1 - \frac{2GM}{rc^2}\Sigma(M))dt^2 \tag{25}$$

In this time, if particles' mass are m_i, the fusion energy is e,

$$E = Mc^2 = m_1c^2 + m_2c^2 + ... + m_nc^2 + e \tag{26}$$

In this time, if the binding energy of particle's mass m_i and m_j is e_{ij}, the proper time is

$$d\tau^2 = (1 - \frac{2GM}{rc^2}\sum(M))dt^2$$

$$= dt^2 - \frac{2Gm_1}{rc^2}\sum(m_1)dt^2 - \frac{2Gm_2}{rc^2}\sum(m_2)dt^2 ... - \frac{2Gm_n}{rc^2}\sum(m_n)dt^2$$

$$-[\frac{2Ge_{12}}{rc^4}\sum(e_{12}/c^2) + \frac{2Ge_{13}}{rc^4}\sum(e_{13}/c^2) + \frac{2Ge_{23}}{rc^4}\sum(e_{23}/c^2) + ... + \frac{2Ge_{n(n-1)}}{rc^4}\sum(e_{n(n-1)}/c^2)]dt^2$$

$$\sum(e_{ij}/c^2) = \exp[-\alpha_1(\frac{hc^5}{Ge_{ij}{}^2})^{\beta_1} - \alpha_2(\frac{hc^5}{Ge_{ij}{}^2})^{\beta_2} - ... - \alpha_n(\frac{hc^5}{Ge_{ij}{}^2})^{\beta_n}]$$

$$N_i > \alpha_i \geq 0, \beta_i \geq 1 - \varepsilon_{0i}, 0 < \varepsilon_{0i} << 1$$

$\alpha_1, \alpha_2, ... \alpha_n, \beta_1, \beta_2, ... \beta_n$ are real numbers.

N_i is the large number. ε_{0i} is the smallest number. (27)

4. Conclusion

We found the spherical solution of the classical quantum gravity. Careful point is this theory is different from the other quantum theory. This theory is made by the Einstein's classical field equation.

References

[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)