Quantum Gravity Idea

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In this paper i will present hypothesis that may be model for quantum gravity. Basic idea is field equation that field equation leads to cyclic nature of space-time. Model does not break at Planck's scale, it predicts spacetime loops at singularity of inside of a black hole where energy goes to Planck's energy.

Introduction

Quantum gravity is one of biggest puzzle in modern physics. Idea behind it is that spacetime has quantum nature. General Theory of Relativity is a classical theory but from theoretical point of view quantum physics must apply to gravity. In this paper i will present possible model that describes wave function as tensor field in curved spacetime. Idea is that Planck's scale is fundamental and can't be lower scale than it, it means that smallest unit of time is Planck's time and so on, it means that energy can go to maximum of Planck's energy and in Planck's time there can't be more than one vibration of field. It connects cyclic nature of waves in scalar part of tensor field with geometry of spacetime. That cyclic nature of spacetime leads to loops that are closed surface in spacetime, it means that at inside of a black hole or any place where energy goes to Planck's energy there are loops in spacetime where events repeat.

Field equation

In this paper i will present wave function as a tensor field that depends on curved spacetime coordinates. I will write Laplacian with down indexes that means that it goes with respect to that indexes wirting it:

$$\Delta_{\mu\nu} = \frac{1}{\sqrt{\det g}} \frac{\partial}{\partial \zeta^{\mu}} \left(\sqrt{\det g} g^{\mu\nu} \frac{\partial}{\partial \zeta^{\nu}} \right) \tag{1}$$

In this form field equation takes a tensor form, where Einstein summation convention is used, where κ is some constant and T is energy tensor as:

$$\boxed{\Delta_{\mu\nu} \Psi_{a\,\mu}^{\ \ \mu\,\varphi} \Psi_{\varphi\,\nu}^{\ \ \nu\,\phi} g_{\phi\,b} = \kappa T_{a\,\varphi}^{\ \ \varphi\,\phi} g_{\phi\,b}}$$

This equation when summed over all indexes gives just a, b indexes left so it reduces to form of field equation that Laplacian goes with respect to μ, ν summed coordinates, and energy tensor has only two indexes, i can write that form where both wave field tensor and energy tensor are summed as in equation above as:

$$\boxed{\Delta_{\mu\nu} \Psi_{ab} = \kappa T_{ab}}$$

By it i can write equality of those two equations:

$$\Delta_{\mu\nu} \Psi_{a\,\mu}^{\ \ \mu\,\varphi} \Psi_{\varphi\,\nu}^{\ \ \nu\,\phi} g_{\phi\,b} = \Delta_{\mu\nu} \Psi_{ab} \tag{2}$$

$$\kappa T_{a\,\varphi}^{\ \ \varphi\,\phi} g_{\phi\,b} = \kappa T_{ab} \tag{3}$$

That are definitions of tensor field equation. Solution to that equation is some kind of cyclic functions in curved spacetime. Idea is that frequency can't be higher than Planck's frequency and mass in one Planck's length can't be more than Planck's mass that gives maximum energy per Planck's length equal to Planck's energy.

Solutions to field equation

In this chapter i will present wave equation solutions to field equations. Where i use standard spherical wave equation solution (*1*) (*2*),

$$\Psi(t,r,\theta,\phi) = \sum_{l.m}\left(A_{lm} + \frac{B_{lm}}{r^{l+1}}\right)Y_{lm}(\theta,\phi)\left(D_{ml}\sin(\omega_k t) + E_{ml}\cos(\omega_k t)\right)$$

I want to solve field equation for metric tensor, to do it first i rewrite it with additional term T^a_ϕ in both sides:

$$T^a_\phi \Delta_{\mu\nu}\Psi_{a\,\mu}^{\;\mu\,\varphi}\Psi_{\varphi\,\nu}^{\;\nu\,\phi}g_{\phi\,b} = \kappa T^a_\phi T_{a\,\varphi}^{\;\varphi\,\phi}g_{\phi\,b} \tag{4}$$

From right side of equation i just get metric tensor $\kappa g_{\phi b}$ from left side of equation i get:

$$T^a_\phi \Delta_{\mu\nu}\Psi_{a\,\mu}^{\;\mu\,\varphi}\Psi_{b\varphi\,\nu}^{\;\;\nu} = T^a_\phi \Delta_{\mu\nu}\Psi_{ab} = \left(T\otimes\Delta_{\mu\nu}\Psi\right)_{\phi b} = \kappa g_{\phi b} \tag{5}$$

Now i need to use Knocker delta to change indexes in equation to get metric tensor with indexes a, b so I get:

$$\left(T\otimes\Delta_{\mu\nu}\Psi\right)_{ab} = \kappa g_{\phi b}\delta^\phi_a = \kappa g_{ab} \tag{6}$$

Now only left is to choose constants, constant first constant A_{lm} will be equal to zero, constant B_{lm} will be equal to $B_{lm} = \cos^2(\frac{\omega_{lm}}{2})$ it's part that says how much coordinate direction changes from it's normal direction, if it's equal to zero it mean direction of coordinate is 90 degrees from it's normal form, it means it will never point to it's normal coordinate direction, for time coordinate it takes opposite sign than from space i will use notation $(+,-,-,-)$. Constants D_{lm} and E_{lm} are equal to one , and energy tensor is just change in angle with respect to coordinate $T_a = \frac{\partial\alpha_a}{\partial\zeta_a}$,frequency is equal to $\omega_{k,b} = \frac{Ml_P\omega_b}{Rm_P f_P}$ (subscript P letter means Planck's unit) where R is radius form mass and M is mass ,writing it as one equation i get:

$$g_{ab} = \sum_{l.m}\frac{1}{\kappa}\frac{\partial\alpha_a}{\partial\zeta_a}\frac{-\cos^2(\frac{\omega_{lm,b}}{2})}{r^{l+1}}Y_{lm,b}(\theta,\phi)\left(\sin(\omega_{k,b}t) + \cos(\omega_{k,b}t)\right)\Bigg|_{a=b=1,2,3\wedge a=b=0\rightarrow B_{lm}=+\cos^2(\frac{\omega_{lm}}{2})}$$

References and Notes

1. *Wave equation in spherical polar coordinates*

   https://www.nptel.ac.in/courses/115101005/downloads/lectures-doc/Lecture-15.pdf

2. *Spherical Waves*

   https://www2.ph.ed.ac.uk/ paboyle/Teaching/PhysicalMaths/Notes_2010/notes_2010_part3.pdf