Quantum Gravity Idea

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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 (*1*). 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.

Contents

1 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 (*2*):

$$\Delta_{\mu\nu} = \frac{1}{\sqrt{\det g}} \frac{\partial}{\partial \zeta^{\mu}} \left(\sqrt{\det g} g^{\mu\nu} \frac{\partial}{\partial \zeta^{\nu}} \right) \tag{1.0.1}$$

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:

$$\Delta_{\mu\nu} \Psi_{a\,\mu}^{\;\;\mu\,\varphi} \Psi_{\varphi\,\nu}^{\;\;\nu\,\phi} g_{\phi\,b} = \Delta_{\mu\nu} \Psi_{ab} \tag{1.0.2}$$

$$\kappa T_{a\,\varphi}^{\;\;\varphi\,\phi} g_{\phi\,b} = \kappa T_{ab} \tag{1.0.3}$$

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.

1.1 Solutions to field equation

In this chapter i will present wave equation solutions to field equations. Where i use standard spherical wave equation solution (3) (4), that is real part of wave equation solution:

$$\Psi = \sum_{l=0}^{\infty} \sum_{m=-1}^{l} \left(A_l r^l + \frac{B_l}{r^{l+1}} \right) P_l^m(\cos(\phi)) \left(C_m \sin(m\theta) + D_m \cos(m\theta) \right) \left(E_m \sin(\omega_k t) + F_m \cos(\omega_k t) \right) \tag{1.1.1}$$

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:

$$T^a_\phi \Delta_{\mu\nu} \Psi_{a\mu}^{\ \ \mu\varphi} \Psi_{\varphi\nu}^{\ \ \nu\phi} g_{\phi b} = \kappa T^a_\phi T_{a\varphi}^{\ \ \varphi\phi} g_{\phi b} \tag{1.1.2}$$

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

$$T^a_\phi \Delta_{\mu\nu} \Psi_{a\mu}^{\ \ \mu\varphi} \Psi_{b\varphi\nu}^{\ \ \ \nu} = T^a_\phi \Delta_{\mu\nu} \Psi_{ab} = \left(T \otimes \Delta_{\mu\nu} \Psi \right)_{\phi b} = \kappa g_{\phi b} \tag{1.1.3}$$

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

$$\left(T \otimes \Delta_{\mu\nu} \Psi \right)_{ab} = \kappa g_{\phi b} \delta^\phi_a = \kappa g_{ab} \tag{1.1.4}$$

Now only left is to choose constants, constants A_l, B_l will be equal to $A_l = r^{-l} c_l$ and B_l is equal to zero . For time coordinate it takes opposite sign than from space i will use notation $(-,+,+,+)$ (5). Constants E_{lm}, F_{lm} are equal to $E_{lm} = 0, F_{lm} = 1$, frequency is equal to $\omega = ck$ where k is wave number and c is speed of light (subscript P letter means Planck's unit) and constants C_m, D_m are equal to $C_m = 1, D_m = 0$. Where R is radius and mass and M is mass. Writing frequency I get:

$$\omega = \frac{M l_P \omega}{R m_P f_P} = ck \tag{1.1.5}$$

Where energy tensor with one index is equal to:

$$T_a = \begin{pmatrix} \frac{\epsilon_0}{\epsilon_P} & \frac{P_1}{p_P} & \frac{P_2}{p_P} & \frac{P_3}{p_P} \end{pmatrix} \tag{1.1.6}$$

Where ϵ_0 is energy density and P_a is momentum in a direction, ϵ_P means Planck's energy density and p_P means Planck's momentum , ρ is momentum density in a direction. General form of energy tensor is equal to:

$$T_{ab} = \begin{pmatrix} \frac{\epsilon_0^2}{\epsilon_P^2} & \frac{\rho_1\rho_1}{\rho_P^2} & \frac{\rho_1\rho_2}{\rho_P^2} & \frac{\rho_1\rho_3}{\rho_P^2} \\ \frac{\rho_1\rho_1}{\rho_P^2} & \frac{P_1^2}{p_P^2} & \frac{P_1P_2}{p_P^2} & \frac{P_1P_3}{p_P^2} \\ \frac{\rho_2\rho_1}{\rho_P^2} & \frac{P_1P_2}{p_P^2} & \frac{P_2^2}{p_P^2} & \frac{P_3P_2}{p_P^2} \\ \frac{\rho_3\rho_1}{\rho_P^2} & \frac{P_3P_1}{p_P^2} & \frac{P_3P_2}{p_P^2} & \frac{P_3^2}{p_P^2} \end{pmatrix} \tag{1.1.7}$$

Energy tensor limits energy to maximum energy of one unit (in Planck's unit) per one vibration of field. It means that energy of one Planck's length can't be more than Planck's energy. Energy tensor like metric tensor has only ten independent components it means wave function tensor has to be same- symmetric with respect to switching from indexes ab to indexes ba. It means that when system gains energy it can't gain more energy at one point of space than Planck's energy, it means that energy given to particle will eventually turn it into black hole when energy density gets to Planck's energy. Now i will write metric in full form, where constant $\kappa =$ is equal to Planck's length and $A_l = r^{-l}c_l$where $c_l(r)$ depends on wave function, writing metric i get:

$$\begin{aligned} ds^2 = &-\frac{1}{l_P}\frac{\epsilon_0}{\epsilon_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l0}(r)P_{0l}^m(\cos(\phi))\sin(m_0\theta)\cos(\omega t)c^2dt^2 \\ &+\frac{1}{l_P}\frac{P_1}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l1}(r)P_{1l}^m(\cos(\phi))\sin(m_1\theta)\cos(\omega t)dr^2 \\ &+\frac{1}{l_P}\frac{P_2}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2c_{l2}(r)P_{2l}^m(\cos(\phi))\sin(m_2\theta)\cos(\omega t)d\theta^2 \\ &+\frac{1}{l_P}\frac{P_3}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2c_{l3}(r)P_{3l}^m(\cos(\phi))\sin(m_3\theta)\cos(\omega t)d\phi^2 \end{aligned} \tag{1.1.8}$$

1.2 Many system field equation and energy tensor form

Field equation can be extend to many systems. First i write equation for two systems , that takes for of:

$$\Delta_{\mu\nu}\Psi^{r\mu}_{a\mu}\Psi^{\rho\nu}_{r\nu}\Psi^{k\varphi}_{k\rho}\Psi^{l\phi}_{l\varphi}g_{\phi b} = \kappa T^{r\rho}_{ar}T^{\phi\varphi}_{\rho\varphi}g_{\phi b} \tag{1.2.1}$$

To write general equation for many systems i first need to change how i label tensor indexes. I will use three letters $(q_1...q_{2n}, \phi_1...\phi_{2n}, r_1, r_2)$ where n is number of systems in field equation.

$$\begin{aligned}\Psi_{r_1r_2} = \Delta_{q_1q_2}\Psi^{q_1\phi_1}_{r_1q_1}\Psi^{q_2\phi_2}_{\phi_1q_2}\Psi^{q_3\phi_3}_{q_3\phi_2}\Psi^{q_4\phi_4}_{q_4\phi_3}...\Psi^{q_{2n-1}\phi_{2n-1}}_{q_{2n-1}\phi_{2n-2}}\Psi^{q_{2n}\phi_{2n}}_{q_{2n}\phi_{2n-1}}g_{\phi_{2n}r_2} \\ \kappa T_{r_1r_2} = \kappa T^{\phi_1\phi_2}_{\phi_1r_1}T^{\phi_3\phi_4}_{\phi_3\phi_2}..T^{\phi_{2n-1}\phi_{2n}}_{\phi_{2n-1}\phi_{2n-2}}g_{\phi_{2n}r_2}\end{aligned} \tag{1.2.2}$$

Putting that equation into one part i get field equation for N systems:

$$\Delta_{q_1q_2}\Psi^{q_1\phi_1}_{r_1q_1}\Psi^{q_2\phi_2}_{\phi_1q_2}\Psi^{q_3\phi_3}_{q_3\phi_2}\Psi^{q_4\phi_4}_{q_4\phi_3}...\Psi^{q_{2n-1}\phi_{2n-1}}_{q_{2n-1}\phi_{2n-2}}\Psi^{q_{2n}\phi_{2n}}_{q_{2n}\phi_{2n-1}}g_{\phi_{2n}r_2} = \kappa T^{\phi_1\phi_2}_{\phi_1r_1}T^{\phi_3\phi_4}_{\phi_3\phi_2}..T^{\phi_{2n-1}\phi_{2n}}_{\phi_{2n-1}\phi_{2n-2}}g_{\phi_{2n}r_2} \tag{1.2.3}$$

Energy tensor showed before (equation 8), was in trivial form. It was without summing all part of field equation. Now i will present it's specific form that is not simplest case- it's general case:

$$T_{00} = \sum_{\phi_1,...,\phi_{2n}}\frac{\epsilon_{\phi_1,...,\phi_{2n}}\epsilon_{\phi_1,...,\phi_{2n}}}{\epsilon_P^2} \tag{1.2.4}$$

$$T_{0b} = T_{a0} = \sum_{\phi_1,...,\phi_{2n}}\frac{\rho_{a\phi_1,...,\phi_{2n}}\rho_{0\phi_1,...,\phi_{2n}}}{\rho_P^2} = \sum_{\phi_1,...,\phi_{2n}}\frac{\rho_{0\phi_1,...,\phi_{2n}}\rho_{b\phi_1,...,\phi_{2n}}}{\rho_P^2} \tag{1.2.5}$$

$$T_{ba} = T_{ab} = \sum_{\phi_1,...,\phi_{2n}}\frac{P_{a\phi_1,...,\phi_{2n}}P_{\phi_1,...,\phi_{2n}b}}{p_P^2} = \sum_{\phi_1,...,\phi_{2n}}\frac{P_{b\phi_1,...,\phi_{2n}}P_{\phi_1,...,\phi_{2n}a}}{p_P^2} \tag{1.2.6}$$

It's most general case where summation can change depending on case of system equation solution, for one system $N = 2$ it means each ϕ_1, ϕ_2 component sums from 0 to 3 it gives ten independent summation terms. Energy tensor is symmetric, it means $ab = ba$. Indexes a, b go in energy tensor from one to three, from that symmetry of that tensor components reduce in case of $N = 2$ from sixteen to ten. That tensor says how many energy there is in a system.

1.3 Measurement of wave function field

For each point of spacetime there has to be one wave function that has a probability of system being in that place and all of those wave function can interact before measuring it and make it change from all point wave functions to one wave function. It means to each point of spacetime i assign a wave function with normalization number. Let's start with simple one scalar wave function where Ψ^* is complex conjugate of wave function and A is normalization factor, I write probability in four dimensions spacetime as :

$$P = \sum_{\pm(ijkl)} A_{\pm(ijkl)} \int_F \Psi_{\pm(ijkl)}(\zeta_0 \pm i, \zeta_1 \pm j, \zeta_2 \pm k, \zeta_3 \pm l)\Psi^*_{\pm(ijkl)}(\zeta_0 \pm i, \zeta_1 \pm j, \zeta_2 \pm k, \zeta_3 \pm l) d^4\zeta_a = 1 \tag{1.3.1}$$

This equation is for scalar wave function but field equation is a tensor field so to get from scalar to tensor field i just read probability in directions of spacetime movement, each direction has it's own probability that can be understand as scalar part of tensor field i write it as:

$$P_{ab} = \sum_{\pm(i,j,k,l)} A_{\pm(ijkl),ab} \int_F \Psi_{\pm(ijkl),ab}\Psi^*_{\pm(ijkl)ab} d^4\zeta_a = 1 \tag{1.3.2}$$

It means that before measurement there is a wave function for each point of spacetime that means that for example particle can be in any place and it's gravitation field spreads from that point as curvature of spacetime. That interacts with every other point of spacetime and final gravity field is sum all waves. After measurement it changes and all wave functions go to zero in Planck's time and only one of wave functions stays - that means only one geometry of spacetime is left where particle is located mostly at one point of spacetime and from it wave propagates in case of particle that is located as point in spacetime, if system is located in many point's after measurement what is left is sum of point like waves:

$$P_{ab} = \sum_{\pm(ijkl)} \sum_{\pm(s_0 s_1 s_2 s_3)} A_{\pm(ijkl)ab} \int_F \Psi_{\pm(s_0 s_1 s_2 s_3 ijkl)ab}\Psi^*_{\pm(s_0 s_1 s_2 s_3 ijkl)ab} d^4\zeta_a = 1 \tag{1.3.3}$$

1.4 Direct geometrical meaning of field equation

Field equation has direct geometrical meaning, it says for vector field (wave function) on any curved spacetime it's equal to energy vector field of that spacetime. And property of spacetime is that tensor field that is consequence of energy vector field and wave function vector field that means it some kind of cyclic change in curvilinear coordinates is equal to wave function vector field and energy vector field. It leads to closed curvilinear coordinates where cyclicity is equal to frequency of particular wave vector field. That means that for any given vector field that is cyclic (it obeys wave equation in curvilinear coordinates) change in curvilinear coordinates is equal to energy vector field of that change in curvilinear coordinates and it leads to direct change of curvilinear coordinates that is equal to tensor that comes from energy vector field and wave function vector field. I can solve field equation for any cyclic spacetime by special tensor let's say that we have a vector field X_i, X_j that depends on coordinates x_i, x_j, I can find surface of curved spactime. Where r_i, r_j is radius that starts from point $(0,0,0,0)$ and points to any point of a vector field. That tensor can be thought as 4-sphere drawing coordinates to change in radius . I can write tensor that is given me a 4-sphere and it's radius coordinates where r_i, r_j are radius in i, j direction:

$$F_{ij} = \sum_{n,m} \frac{\partial X_i}{\partial x_n} \frac{\partial X_j}{\partial x_m} dv_n \otimes dv_m = \sum_{n,m} \frac{\partial r_i}{\partial \zeta_n} \frac{\partial r_j}{\partial \zeta_m} dr_n \otimes dr_m \tag{1.4.1}$$

That radius has dependence on ζ_i, ζ_j 4-sphere components it means in curvilinear coordinates i can write tensor by changing vector field in vector space to vector field on 4-sphere. That tensor is equal to radius of 4-sphere in curved space. It means i can draw curved coordinates by tracking line perpendicular to radius vector. It gives curved spacetime where it curvature depends on change of vector field, thus radius of 4-sphere and for each radius i get a coordinate to where radius points.

1.5 Scale less than Planck's scale in field equation

Field equation has to be limited to match Planck's scale, it means time can't be lower than Planck's time same with measured distance. But it's possible to have a lower scale of spacetime, where speed of light is not the limit it means there can be less than Planck's unit of space and time. To make this idea work it still has to make local speed of light limit be preserved. If i have field equation i can write them in for example coordinates where speed of light is replaced with speed of light squared, and Planck's unit are squared , i can take limit to any speed of light limit and it gives Planck's unit to power of that limit. It's simple tensor transformation from one coordinate system to another, so i can rewrite field equation in coordinate system with letter n that means speed of light limit by:

$$\frac{\partial x_a}{\partial \chi_{a(n)}} \frac{\partial x_b}{\partial \chi_{b(n)}} \Delta_{\mu\nu} \Psi_{ab} = \kappa \frac{\partial x_a}{\partial \chi_{a(n)}} \frac{\partial x_b}{\partial \chi_{b(n)}} T_{ab} \tag{1.5.1}$$

It means more speed of light limit gets less wave function changes, so for example Planck's energy in our reference frame is maximum energy value but in reference frame where speed of light limit is speed of light squared it's energy of empty space. So maximum curvature in one reference frame can be empty spacetime with smallest possible curvature. It means massive particle can never jump from one level of speed of light to another- it will have less than minimum energy of higher speed of light reference frame so local limit of maximum speed is preserved. And even when it has Planck's energy from reference frame of higher speed of limit, it's just empty space energy, it means no information can still travel faster than speed of light. But from point of view of massless particle distance in spacetime is equal to zero, it means that massless particle can't tell what is speed of light limit in it's reference frame. It has energy same in any reference frame no matter what is speed of light limit. But in view of observer that is in reference frame that speed of light is higher , that massless particle still have less or equal energy to minimum energy of empty space so it can't send information.

2 Physical key ideas in field equation

In rest of chapters i presented mostly mathematical concepts that form a model of possible quantum gravity. In this chapter i will try to explain what physical idea that mathematical model creates and how it works. First idea is that spacetime is always locally four dimensional it does not matter how many body is in a system spacetime has always four dimensions. But curvature of spacetime varies from point to point it means that each point has it's own set of clocks and rods like in general relativity. But length of smallest rod can't be less than Planck's unit and same with clock- it can tick less that Planck's time. It leads to key idea that is change in field in one unit of time can't be more than one, it leads to Planck's energy being the limit of energy in system. Wave function is still a vector field that is continuous but lowest state of that vector field is Planck's unit of space and time. It means solutions are continuous functions with limits of frequency , frequency times Planck's time cant be more than one. On other hand geometry of spacetime is connected with wave vector field- curvature of spacetime is proportional to energy of vector field wave function that was presented in second chapter. It means more energy and more wave function changes more curved spacetime becomes to a extend where with maximum energy it creates a loop in spacetime. That loop is solution to problem of what is inside of a black hole- and it's key difference with General Relativity where spacetime curvature can't be defined inside a black hole, here it can be defined and it leads to time and space freezing. Any point can be start of event and any can be it's end. Key idea is that wave function is always some kind of cyclic function and it means on big scale like universe if we wait long enough we can get cyclic loops faster- it says same about taking big distance. If i take distance in space that is equal to opposite of Planck's length even empty space changes into loop. It means universe with zero matter has size limit- beyond that size even empty space turns into black hole.

2.1 Singularity - meaning of spacetime loops

One of most general ideas is that when energy goes to maximum wave nature of spacetime creates loops where from point of observer time is frozen, when time loops it loops once in Planck's time it means every tick of Planck's time there is same event it means that observer inside a black hole will not register flow of time, that loop can start from any point of loop- it means event is frozen but part of event that is frozen can change. For any event that creates a loop it means each part of loop is frozen and part of loop that is frozen depends on frame of reference of observer. Part of loop that is connected to where event's starts is amplitude of wave function, it can start from point zero or any other point in spacetime and then it stops at that point, if wave function is changed then point that is frozen changes. And collection of events looks like frozen slice of spacetime that are not changing. Another part is that inside a black hole anything that fall into it becomes massless, it means distance to any other point of that frozen spacetime is zero. Still if body goes around loop that points outside of a black hole it will go there and eventually spactime curvature will change to local curvature of that point in spacetime. It leads to very complex picture of black holes that connect all events in singularity, where spacetime is frozen and movement from one point of frozen spacetime to another takes zero time and distance. That body still needs to lose all energy to get out of a black hole but events that where happening outside of normal light cone influence can be reached by body inside a black hole it violates causality because one observer can be in same event many times. It means on quantum level if that idea is correct causality is broken and only locally preserved by energies that are smaller than Planck's energy. If in singularity time and space are frozen it means singularity itself can exist infinite amount of time and move infinite distance in one unit of time. It all happens from point of view of distant observer, because loops are reason of them self they don't need any causality they begin in any point and end in any point of loop.

2.2 Gravity as wave function field

Gravity in this idea is connected with wave function tensor field. In field equation that is :

$$\Delta_{\mu\nu}\Psi_{a\,\mu}^{\;\mu\varphi}\Psi_{\varphi\,\nu}^{\;\nu\phi}g_{\phi\,b} = \kappa T_{a\,\varphi}^{\;\varphi\phi}g_{\phi\,b} \tag{2.2.1}$$

There are two tensors of rank (2,2) that are wave tensors fields. It means wave function field is rank four tensor but in field equation it is summed and combined with another wave tensor field it means that tensor itself has 256 components and because there are two of them it gives for one system 512 components , but from symmetry of that tensor it gets to lower number. In chapter two i presented simple solutions to wave equation but only metric one, wave tensor field takes form of:

$$\Psi_{ab} = \left(\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{la}(r)P_{al}^{m}(\cos(\phi))\sin(m_a\theta)\cos(\omega_1 t) + c_{lb}(r)P_{bl}^{m}(\cos(\phi))\sin(m_b\theta)\cos(\omega_2 t)\right)\zeta_a\otimes\zeta_b \tag{2.2.2}$$

And metric tensor for that wave function where i write only diagonal components of metric that are not equal to zero:

$$g_{aa} = \begin{pmatrix} -\frac{1}{l_P}\frac{\epsilon_0}{\epsilon_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l0}(r)P_{0l}^{m}(\cos(\phi))\sin(m_0\theta)\cos(\omega t) \\ \frac{1}{l_P}\frac{P_1}{P_p}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l1}(r)P_{1l}^{m}(\cos(\phi))\sin(m_1\theta)\cos(\omega t) \\ \frac{1}{l_P}\frac{P_2}{P_p}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l2}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega t) \\ \frac{1}{l_P}\frac{P_3}{P_p}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} c_{l3}(r)P_{3l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega t) \end{pmatrix} \tag{2.2.3}$$

Those equations say that metric is some kind of cyclic function of spacetime. Gravity is understood as curvature of spacetime due those cyclic wave equations solutions. Important part is that wave function scalar part can be understood as just number of change in field in given time- and frequency of that change gives geometrical properties of spacetime. If there is many systems still equation gives one field of spacetime that can change from one event to another and from one point to another.

2.3 Wave function field for many systems

For simplest case i presented in previous chapter, wave field is just sum of two waves with only frequency changing. But for many systems that leads to sum of all frequency from each index. It means that for given point of spacetime wave field is sum of all systems fields. Field equation for n bodies has $4n$ wave function indexes. It means i sum by indexes $q_1 ... q_{2n}$ and $\phi_1 ... \phi_{2n}$, for any point of spacetime wave in field is sum of all waves in system, that means i can write wave field for solution presented before as:

$$\Psi_{ab} = \sum_{k=n(\phi)} \sum_{j=n(q)} \sum_{\phi_1=0}^{3} ... \sum_{\phi_{2n}=0}^{3} \sum_{q_1=0}^{3} ... \sum_{q_{2n}=0}^{3} \Big(\sum_{l=0}^{\infty} \sum_{m=-1}^{l} c_{laq_1...q_{2n}\phi_1,...,\phi_{2n}}(r) P^m_{alq_1...q_{2n}\phi_1,...,\phi_{2n}} \times cos(\phi)) \sin(m_a\theta) s \cos(\omega_{2k-1,2j-1} t) + c_{lbq_1...q_{2n}\phi_1,...,\phi_{2n}}(r) P^m_{blq_1...q_{2n}\phi_1,...,\phi_{2n}}(\cos(\phi)) \sin(m_b\theta) \times \cos(\omega_{2k,2j} t) \Big) \zeta_a \otimes \zeta_b \tag{2.3.1}$$

Where functions $n(\phi)$ and $n(q)$ are equal to n number of summation. For example if it's summed over ϕ_1, q_3 it means those functions are equal to $n(\phi) = 1, n(q) = 3$. For many summation signs it sums over all of them for example if i have $\phi_1 .... \phi_6, q_1 q_2 q_3$ it's summer over 1...6 and $1, 2, 3$. Where each number sums over that index of wave field. So for wave field that has $2n$ of q and ϕ indexes solution is sum over all indexes where for each four sum there are two frequencies it means for n body system there are $8n$ frequencies where $4n$ comes from summing indexes ϕ and second $4n$ comes from summing q indexes. Solution presented before was simplest case where summation of indexes is not account for. It means that for even one body system there is four times two frequencies and its total sum of $16 \times 16 = 256$ components. Each four components has one frequency but components are sum that mix those eight frequencies. And it's still equation for one body system- in many body system it's $8n$ frequencies and $256 \times n$ components of summation. But because only those $8n$ frequencies are unknown rest is just combination of them, only they are real unknown in wave field equation.

2.4 Black hole model

Black holes are regions of spacetime where inside it law of General Relativity breaks down. In my idea black holes have singularity inside that is a loop of spacetime where it shows after half of event horizon radius. I can write equation for event horizon radius as two times of singularity radius, where R_E is event horizon radius and R_S is singularity radius :

$$R_E = \frac{2Ml_p}{m_p} = 2R_S \tag{2.4.1}$$

$$R_S = \frac{Ml_p}{m_p} \tag{2.4.2}$$

In field equation solution for one system with simplest case of only two frequency event horizon is where rotation in θ coordinate is half of full angle, so i can write it as:

$$\begin{aligned}\Psi_{ab} = \Big(\sum_{l=0}^{\infty}\sum_{m=-1}^{l} & -c_{la}(r)P_{0l}^{m}(\cos(\phi))\sin(\theta\pi n)\cos(\omega_1 t) - c_{lb}(r)P_{0l}^{m}(\cos(\phi))\sin(\theta\pi n)\cos(\omega_2 t)\\ & +c_{la}(r)P_{1l}^{m}(\cos(\phi))\sin(\theta\pi n)\cos(\omega_1 t) + c_{lb}(r)P_{1l}^{m}(\cos(\phi))\sin(\theta\pi n)\cos(\omega_2 t)\\ & +c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_2 t)\\ & +c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_2 t)\Big)\zeta_a\otimes\zeta_b =\\ & \Big(c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_2 t)\\ & +c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_2 t)\Big)\zeta_a\otimes\zeta_b\end{aligned} \tag{2.4.3}$$

It means that is frozen (clock always gives zero time) and space distance is equal to radius part. I can write metric in this case as:

$$\begin{aligned} ds^2 = \frac{1}{l_P}\frac{P_2}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2 c_{l2}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega t)d\theta^2\\ +\frac{1}{l_P}\frac{P_3}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2 c_{l3}(r)P_{3l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega t)d\phi^2 \propto r^2\end{aligned} \tag{2.4.4}$$

It means time is giving zero and distance is proportional to distance from black hole . Distance is changing from zero to one that means rotation of an object i assume close to zero rotation.

Same idea is with center of black hole, only change is there are time loops. I can write same equation for center of black hole:

$$\begin{aligned}\Psi_{ab} = \Big(\sum_{l=0}^{\infty}\sum_{m=-1}^{l} & -c_{la}(r)P_{0l}^{m}(\cos(\phi))\sin(\theta 2\pi n)\cos(\omega_1 t) - c_{lb}(r)P_{0l}^{m}(\cos(\phi))\sin(\theta 2\pi n)\cos(\omega_2 t) \\ & + c_{la}(r)P_{1l}^{m}(\cos(\phi))\sin(\theta 2\pi n)\cos(\omega_1 t) + c_{lb}(r)P_{1l}^{m}(\cos(\phi))\sin(\theta 2\pi n)\cos(\omega_2 t) \\ & + c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_2 t) \\ & + c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_2 t)\Big)\zeta_a \otimes \zeta_b = \\ & \Big(c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega_2 t) \\ & + c_{la}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_1 t) + c_{lb}(r)P_{2l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega_2 t)\Big)\zeta_a \otimes \zeta_b\end{aligned} \tag{2.4.5}$$

Where frequency is equal to one in Planck's unit. It means metric gives same event every Planck's time. I can again write metric as:

$$\begin{aligned}ds^2 = \frac{1}{l_P}\frac{P_2}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2 c_{l2}(r)P_{2l}^{m}(\cos(\phi))\sin(m_2\theta)\cos(\omega t)d\theta^2 \\ + \frac{1}{l_P}\frac{P_3}{p_P}\sum_{l=0}^{\infty}\sum_{m=-1}^{l} r^2 c_{l3}(r)P_{3l}^{m}(\cos(\phi))\sin(m_3\theta)\cos(\omega t)d\phi^2 \propto r^2\cos(t)\end{aligned} \tag{2.4.6}$$

It means object does not only rotate in space but does so in time. That rotation in time means event with time of duration of $t = n$ repeats n times in it's duration. It leads to loop of event, each event with duration t is split into parts, each part is frozen but you can take another part of event and it will be frozen to. If event is $t = 10$ duration it means there are ten points of same state of time- so time is frozen. And because there is not smaller unit of time than Planck's time it does not matter how much time an event takes- from point of view inside a black hole it's always frozen, but if object moves away from black hole inside radius, then first event is frozen next after getting to that event that is outside of black hole object changes to being outside of a black hole. It happens where radius of event in space is greater than radius of singularity $R > R_S$. Time is still frozen and it does not matter how much time passes it does not change.

2.5 Big bang state

Big bang is state where all space energy goes to Planck's energy. it leads to global black hole like state. Because energy can't be more than Planck's energy it means frequency of any point of space can't go up- it has to go down. Let's first write wave field for two bodies:

$$\Psi_{ab} = \Psi^1_{ab} + \Psi^2_{ab} \tag{2.5.1}$$

Where super-script means first body and second body. First system frequency is equal to one and same with second one- only way to deal with it without energy getting bigger than Planck's energy is to create a another point of space where energy is lower. Let's say wave field energy is equal to at point A and at point B and it's sum stays Planck's energy i can write it by:

$$\Psi_{ab} = \Psi_{ab}(A)^1 + \Psi_{ab}(B)^1 + \Psi^2_{ab}(A) + \Psi^2_{ab}(B) \tag{2.5.2}$$

$$\omega_{11}(A) + \omega_{12}(A) + \omega_{21}(A) + \omega_{22}(A) = \omega_A \tag{2.5.3}$$

$$\omega_{11}(B) + \omega_{12}(B) + \omega_{21}(B) + \omega_{22}(B) = \omega_B \tag{2.5.4}$$

Still energy of points A and B is equal to Planck's energy so lets add another point C:

$$\Psi_{ab} = \Psi_{ab}(A)^1 + \Psi_{ab}(B)^1 + \Psi^2_{ab}(A) + \Psi^2_{ab}(B) + \Psi^1_{ab}(C) + \Psi^2_{ab}(C) \tag{2.5.5}$$

$$\omega_{11}(A) + \omega_{12}(A) + \omega_{21}(A) + \omega_{22}(A) = \omega_A \tag{2.5.6}$$

$$\omega_{11}(B) + \omega_{12}(B) + \omega_{21}(B) + \omega_{22}(B) = \omega_B \tag{2.5.7}$$

$$\omega_{11}(C) + \omega_{12}(C) + \omega_{21}(C) + \omega_{22}(C) = \omega_C \tag{2.5.8}$$

Because frequency can have value of $\frac{1}{n}$ still one point energy is equal to Planck's energy- this process repeats till there is a enough distance between points of Planck's energy and rest- that process is Bin Bang space expansion. First this expansion is fast then it slows down generating more and more space between bodies. More space it means lower energy and more distance to form singularity again. When it slows down empty space energy becomes present- there is enough space between bodies to feel it.

3 General field equation

Field equation that i presented is in form that captures only gravity- it's symmetry between energy and wave field. But it can be extended to where that symmetry is broken. For only gravity system there is equality between energy and field frequency but this equality can be broken. Let's rewrite field equation and add special term on right side K_{ab}:

$$\Delta_{\mu\nu}\Psi_{ab} = \kappa T_{ab} - K_{ab} \tag{3.0.1}$$

$$\Delta_{\mu\nu}\Psi_{ab} - \kappa T_{ab} = -K_{ab} \tag{3.0.2}$$

$$\kappa T_{ab} - \Delta_{\mu\nu}\Psi_{ab} = K_{ab} \tag{3.0.3}$$

For gravity only systems term K_{ab} is equal to zero, for forces it can change. That term has two symmetries, first symmetry is when wave part gives zero and second one is when K_{ab} is equal or greater than zero. Those two symmetries are basics for understanding more general idea of this field equation , if two symmetries do not apply i just get zero. Symmetries can be fulfilled or not fulfilled and third option is they do not account for field. Let's start with case when they do not apply to field if first symmetry does not apply i can write field equation as:

$$\kappa T_{ab} = K_{ab} \tag{3.0.4}$$

Only second part of equation is present in field, for second case idea is same but with only wave field term:

$$-\Delta_{\mu\nu}\Psi_{ab} = K_{ab} \tag{3.0.5}$$

I can name those symmetries by S^1, S^2 where superscript means first and second symmetry and states are equal to $-1, 0, +1$. It gives four possible pair of symmetries that and for each pair there are two numbers of states i can write them as:

$$Z = \left\{\left\{S^1_+, S^2_+\right\}, \left\{S^1_-, S^2_+\right\}, \left\{S^1_-, S^2_+\right\}, \left\{S^1_-, S^2_-\right\}\right\} = \left\{\{z_+, z_+\}, \{z_-, z_+\}, \{z_+, z_-\}, \{z_- z_-\}\right\}_{z=\{-1\vee 0\vee +1, -1\vee 0\vee +1\}} \tag{3.0.6}$$

3.1 Relation in general field equation

To general field equation i assigned set Z that has four pairs of symmetries. Each subset is composed of two numbers that have three possible states $+, 0, -$, from this set i can group how solutions to general field behave. For example quantum spin number can be calculated by relation with set elements by:

$$s = \left| z_+ + z_+ \right| + \left| z_- + z_+ \right| + \left| z_+ + z_- \right| + \left| z_- + z_- \right| \tag{3.1.1}$$

For example photon has spin of one and it has only first pair of symmetry equal to $\{1, 1\}$ it means it moves with speed of light and it's energy is equal to it's effect on gravity. Generally first symmetry says about mass or massless state of body, if symmetry is broken then body has mass if not it's massless. Second symmetry says is energy of system equal to it's effect on gravity, if it is second symmetry is fulfilled it means K_{ab} tensor is equal to zero or more than zero, if it's not it's less than zero it means wave field has more gravity effect on it than it's energy. Those two symmetries are key for general field equation. For each state there is opposite state that is anti-symmetrical for example photon has same symmetrical and anti-symmetrical state, but graviton has in first state it has first pair and four pair. In first state it has:

$$Z_{G+} = \left\{ \{1, 1\}, \{0, 0\}, \{0, 0\}, \{-1, -1\} \right\} \tag{3.1.2}$$

It means it has spin two and it is massless, but second anti-symmetrical state has same spin but it has mass i can write it by :

$$Z_{G-} = \left\{ \{-1, -1\}, \{0, 0\}, \{0, 0\}, \{+1, +1\} \right\} \tag{3.1.3}$$

For each system number of Z set says is that state is symmetry fulfilled or not, or in case of zero it does not apply. It means that graviton has first two symmetries fulfilled and last symmetries broken or the opposite- first two broken and last two fulfilled.

4 Summary

In this paper I presented mathematical and theoretical model for quantum gravity. Idea is that spacetime curvature is generated by wave field tensor that is connected to energy tensor. General field equation for N system takes form of:

$$\Delta_{q_1 q_2}\Psi^{q_1\phi_1}_{r_1 q_1}\Psi^{q_2\phi_2}_{\phi_1 q_2}\Psi^{q_3\phi_3}_{q_3\phi_2}\Psi^{q_4\phi_4}_{q_4\phi_3}...\Psi^{q_{2n-1}\phi_{2n-1}}_{q_{2n-1}\phi_{2n-2}}\Psi^{q_{2n}\phi_{2n}}_{q_{2n}\phi_{2n-1}}g_{\phi_{2n}r_2}=\kappa T^{\phi_1\phi_2}_{\phi_1 r_1}T^{\phi_3\phi_4}_{\phi_3\phi_2}..T^{\phi_{2n-1}\phi_{2n}}_{\phi_{2n-1}\phi_{2n-2}}g_{\phi_{2n}r_2} \tag{4.0.1}$$

Where constant κ depends on wave tensor field, constant must obey that both sides of equations are equal, for example in chapter two it had unit of Planck's length from metric tensor that is wrote in units of meters, for any other field equation solution it can change to match equality on both sides. Measurement if fiend is given by equation:

$$P_{ab}=\sum_{\pm(i,j,k,l)}A_{\pm(ijkl),ab}\int_F\Psi_{\pm(ijkl),ab}\Psi^*_{\pm(ijkl)ab}d^4\zeta_a=1 \tag{4.0.2}$$

For a point like source system, if system is not point like- it's summed over all point like functions it has:

$$P_{ab}=\sum_{\pm(ijkl)}\sum_{\pm(s_0s_1s_2s_3)}A_{\pm(ijkl)ab}\int_F\Psi_{\pm(s_0s_1s_2s_3ijkl)ab}\Psi^*_{\pm(s_0s_1s_2s_3ijkl)ab}d^4\zeta_a=1 \tag{4.0.3}$$

Energy tensor takes form with two indexes (a,b):

$$T_{00}=\sum_{\phi_1,...,\phi_{2n}}\frac{\epsilon_{\phi_1,...,\phi_{2n}}\epsilon_{\phi_1,...,\phi_{2n}}}{\epsilon_P^2} \tag{4.0.4}$$

$$T_{0b}=T_{a0}=\sum_{\phi_1,...,\phi_{2n}}\frac{\rho_{a\phi_1,...,\phi_{2n}}\rho_{0\phi_1,...,\phi_{2n}}}{\rho_P^2}=\sum_{\phi_1,...,\phi_{2n}}\frac{\rho_{0\phi_1,...,\phi_{2n}}\rho_{b\phi_1,...,\phi_{2n}}}{\rho_P^2} \tag{4.0.5}$$

$$T_{ba}=T_{ab}=\sum_{\phi_1,...,\phi_{2n}}\frac{p_{a\phi_1,...,\phi_{2n}}p_{\phi_1,...,\phi_{2n}b}}{p_P^2}=\sum_{\phi_1,...,\phi_{2n}}\frac{p_{b\phi_1,...,\phi_{2n}}p_{\phi_1,...,\phi_{2n}a}}{p_P^2} \tag{4.0.6}$$

Where tensor is summed depending on how many system is in equation, number $N=n$ is equal to number of body in equations. It means that for N bodies in equation there is $2n$ indexes that energy tensor is summed over- as field equations states.

References and Notes

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