Spherical Quantum Spacetime

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Understanding gravity at Planck scale is biggest goal of quantum gravity theory. In this paper i will present idea of quantum spacetime that can be thought as gravity in quantum scale, this spacetime is fixed it means this idea is not background independent it lives on specific modified spherical spacetime. That spherical spactime does not break at inside of black hole and works in low energy very close to general relativity- it changes mostly after passing event horizon. Key idea is to use Planck energy units of energy and momentum as measure of curvature of spacetime. Model predicts that if energy goes to Planck energy time stops-all light cones are frozen and it happens from point of view of observer falling into black hole. From field equation there is calculated wave function vector that represents state of quantum system and thus leads to it's gravity effects.

Field Equation

Energy tensor is extension of Einstein energy momentum relation (*1*) to sixteen parts where only ten of them are independent. Tensor itself has four indexes but i use contraction of one index to match metric tensor. I can write energy tensor components as, where indexes i, j, k go from one to three:

$$T^{0}_{000} = E^2$$
$$T^{0}_{0ij} = -p_i p_j$$
$$T^{k}_{kij} = -p^{0}_{0i} p^{0}_{0j} + p^{k}_{ki} p^{k}_{kj}$$
$$T^{k}_{k0j} = T^{k}_{kj0} = -E p^{0}_{0j} + E p^{k}_{kj}$$

Energy and momentum are dived by Planck units, it means energy is equal to energy divided by Planck energy and same with momentum- it is so maximum value of energy and momentum can be one. Field equation with wave function vector ψ_μ energy tensor and metric tensor is equal to :

$$\begin{cases} \Delta\psi_\mu + T^{\gamma}_{\gamma\mu\nu}\psi^\nu = 0 \\ T^{\gamma}_{\gamma\mu\nu}\psi^\nu - g_{\mu\nu}\psi^\nu = 0 \end{cases}$$

Where Δ is Laplace operator, metric tensor then is equal to, where primed is ν part:

$$g_{\mu\nu} = \left(1 - \sin(\phi_1)\sin(\phi_1')\right) - \frac{r^2}{dx^\mu dx^\nu}\left[(d\phi_3 d\phi_3' + \sin(\phi_3)\sin(\phi_3')\left(d\phi_2 d\phi_2' + \sin(\phi_2)\sin(\phi_2')d\phi_1 d\phi_1'\right)\right]$$

Radius is equal to: $r^2 = \frac{dx^\mu dx^\nu}{T^{0}_{0\mu\nu}}$, and ϕ_1 is equal to: $\phi_1 = \arcsin\left((T^{0}_{0\mu\nu})^{\frac{1}{2}}\right)$. Differential of angle is defined by $d\theta \to \frac{\theta_1 - \theta_0}{2\pi}$, that means that for angle 2π its equal to one, where θ_0 means begin angle and θ_1 final angle. When i want to calculate relative change in length in one frame of reference to another it's equal to:

$$dx'_\mu = dx_\mu \frac{\csc((T^{0}_{0\mu\nu})^{\frac{1}{2}}\pi)}{\csc'((T^{0}_{0\mu\nu})^{\frac{1}{2}}\pi)}$$

References and Notes

1. *Energy Momentum Relation*

   https://en.wikipedia.org/wiki/Energy-momentum_relation