A SOLUTION TO BLACK HOLE INFORMATION PARADOX 1

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ABSTRACT

This is a framework to unify black hole, dark matter and dark energy as faster-than-light moving perfect fluid. Two postulates to unravel the underlying physics behind the event horizon of black hole; by the virtue of these postulates we will be able to comprehend the nature and the evaporation of black hole. I establish a relationship between second order in ricci scalar curvature and dark energy current and also show that the current is conserved.

1. INTRODUCTION

Since the work of Stephen Hawking black hole information paradox has been one of the most sought after problem in theoretical physics. The hope is that a solution will reconcile the conflict between general relativity and quantum mechanics. This paper attempts at unification of black hole, dark matter and dark energy as faster-than-light moving perfect fluid. The approach to be followed in this paper is a deterministic hidden-variable description of quantum gravity and I am convinced that determinism gives rise to non-locality. I will try to reconcile the conflict between general relativity and quantum mechanics as much as i can. The whole ideas in this paper will heavily depend on the following two postulates that I put forward:

- *It is the nature of the Ground State of a Quantum field of a black hole to be Steady*.
- *Speed of Light Is Quantized*.

2.0 BLACK HOLE AND EPR PARADOX

Suppose a spin zero particle at the event horizon of black hole as shown in figure1 decays into electron-positron pairs as shown in figure2. what will be the fate of the ingoing and the outgoing particles.

- *A two dimensional black hole has no boundary*

$$\sigma(T) = \int_{\partial^2\Omega=0} T^2 \tag{1}$$

$$\frac{\partial}{\partial x^2} T = T^2 \tag{2}$$

Binomial approximation of scalar stress energy curvature $\mathrm{T^n} = 1 + \mathrm{nx}$ where $\mathrm{n} = \frac{\mathrm{v}}{\mathrm{c}}$, v is the velocity and c is speed of light. at $\mathrm{x} = -1$, $\mathrm{T^n} = 1 - \mathrm{n}$, when $\mathrm{v} = 1\mathrm{c}$, $\mathrm{T^1} = 0$; at $\mathrm{v} = 2\mathrm{c}$, $\mathrm{T^2} \neq 0$. Now if $\mathrm{n} = \chi$ is euler characteristic at $\mathrm{n} = 2$ in (3) which describe second order in scalar stress energy curvature for sphere $\mathrm{T^2} = -1$ and for torus $\mathrm{T^2} = 3$.

$$T^2 = 1 - \chi \tag{3}$$

Particle with spin zero decays into leptons $s \rightarrow e^- e^+$

Figure1

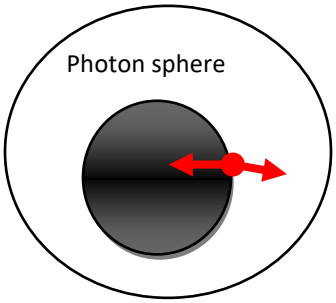
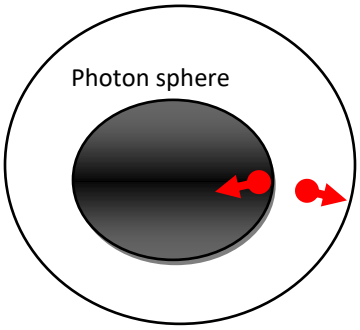


Figure2



A two dimensional black hole has no boundary in the sense that If we place either of the electron-positron pairs at a point in the interior of black hole and the other at a point in the photon sphere, I claim that the laws of physics are the same. The classical theory of electromagnetism does not change. Now we will establish the geometric description of gravity in form of second order in ricci scalar curvature and show that dark energy is current conserved.

$\langle \Lambda^2 \rangle$ represents vacuum expectation value of cosmological constant of black hole. Special orthogonal group $SO(2)$ formulation implies that $\det(A)^2 = \pm 1$, $SO(2) \cong S^1$ and 1-dimensional torus is isomorphic to S^1.

$$AA^T|n\rangle = det(A)^2|n\rangle \tag{4}$$

The vacuum expectation value of black hole cosmological constant can be calculated as follows, where n is number of ground state.

$$\langle \Lambda^2 \rangle \;=\; \tfrac{2}{3}\;\langle n|\;\; det(A)^2 = \pm 1 \;\; |n\rangle \tag{5}$$

$$\langle \Lambda^2 \rangle = \;\; \pm\tfrac{2}{3}\;\; n^2 \tag{6}$$

$$R_{\mu\nu} + \tfrac{1}{2} g_{\mu\nu} = 1 \tag{7}$$

$$\Psi \gamma^{\mu} \bar{\Psi} = J^{\mu} \tag{8}$$

$$\mathcal{L} = -\tfrac{1}{4} F_{\mu\nu} F^{\mu\nu} + \tfrac{\Lambda^2}{2n\pi} J^{\mu} A_{\mu} \tag{9}$$

$$J_{\mu} J^{\mu} cos^2\theta = 1 - A_{\mu} A^{\mu} sin^2\theta \tag{10}$$

$$\Lambda^2 J_{\mu} J^{\mu} cos^2\theta + \Lambda^2 A_{\mu} A^{\mu} sin^2\theta = 2n\pi \tag{11}$$

$$E^2 = 162 n\pi \times 10^{32} J \tag{12}$$

$$R_{\mu\nu}R^{\mu\nu} = \frac{\Lambda^2}{2\pi n}J_\mu J^\mu \tag{13}$$

AMPS firewall model claimed that the entanglement between ingoing and outgoing Hawking radiation is broken once the ingoing particle crosses the event horizon which creates firewall on the event horizon of a black hole ref [4]. EPR=ER model provided a solution by claiming the entangled particles are connected by wormhole ref [2] but in this article we will look at it from different perspective, according to the first postulate which state that it is the nature of the ground state of a quantum field to be steady by implication as the ingoing particle crosses the event horizon it distorts the steadiness of the ground state of the black hole which triggers the radiation of energy which flows from the interior of black hole to the photon sphere back and forth. The radiation arises not from the disentanglement of electron-positron pairs but from the distortion of ground state of black hole. this energy is what I describe as dark energy. this Hawking-like radiation is unitary as shown in (15), (16) and (17), I will show that the dark energy current is conserved (14), in (3) we showed how the speed is related to the dimension of the scalar stress energy curvature. Black hole complementarity ref [1] postulated that there exist a unitary S-matrix which describe the evolution from ingoing matter to outgoing Hawking-like radiation.

$$J_\mu J^\mu = 1 \tag{14}$$

$$E^2 - P^2 = 1 \tag{15}$$

$$aa^\dagger - a^\dagger a = 1 \tag{16}$$

$$\langle E^*|aa^\dagger|E\rangle + \langle P^*|a^\dagger a|P\rangle = bb^\dagger \tag{17}$$

The trace of dark energy current of the outgoing and incoming energy is conserved as shown in (14), and in (15) and (16) creation and annihilation operator act on the energy-momentum state of black hole to create dark energy as the result of particles invading black hole.

$$R_{\mu\nu}R^{\mu\nu} = \frac{\Lambda^2}{2n\pi} \tag{18}$$

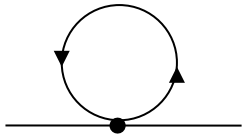
$$R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu} = 0 \tag{19}$$

$$R_{\mu\nu}R^{\mu\nu} = \frac{1}{4}R^2 g_{\mu\nu}g^{\mu\nu} = 1 - \frac{1}{4}g_{\mu\nu}g^{\mu\nu} \tag{20}$$

$$R^2 = 3 \tag{21}$$

if we substitute Einstein's equation in (19) into second order in ricci curvature tensor we will be able to calculate the second order in ricci scalar curvature as shown in (20) and (21). The values for second order in ricci scalar in (21) and second other of stress-energy scalar curvature in (3) are similar and it is obvious that they are interchangeable.

one State Diagram of Black Hole interacting with spin zero before decay

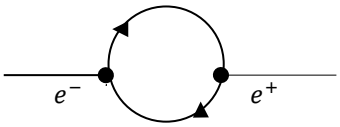


spin zero particle

$$\langle n|AA^T|n\rangle = \langle \Lambda^2\rangle = \pm\ \frac{2}{3} \approx 0.6666 \tag{22}$$

$$\alpha = \frac{\Lambda^2}{2\pi} = 0.1060 \tag{23}$$

Two States Diagram of black hole interacting with electron-positron pairs after decay



$$\langle n|AA^T|n\rangle = \langle \Lambda^2\rangle = \pm\frac{8}{3} \approx 2.6666 \tag{24}$$

$$\alpha = \frac{\Lambda^2}{4\pi} = 0.2121 \tag{25}$$

SUMMARY AND CONCLUSION

- I unified black hole, dark matter and dark energy as faster than-light moving perfect fluid.
- Two postulates to unravel the underlying physics behind the event horizon of black hole; by the virtue of these postulates we will be able to comprehend the nature and the evaporation of black hole.
- I showed that if a spin zero particle decays into electron-positron pairs at event horizon of black hole the electron-positron pairs will not leave photon sphere of the black hole.
- I established a relationship between second order in ricci scalar curvature and dark energy current and I showed that the current is conserved.
- The paradox is solved within the scope of this paper.

ACKNOWLEDGEMENT

The mighty hands that wrote beautiful equations that only a feeble mind could understand hallowed be thy name

I was taught by a friend greater than I and the only one greater than I was *I am that I am.* for I was convinced that I was taught by…

I want to thank my wonderful parents who has been supportive throughout my research work. financially, morally…In fact for all their assistance and also want to thank my reliable younger brother taiwo for his contribution towards the success of this work and my wuraola, sister jumoke and kehinde for all their support. I say thank you so much!!!

I will like to appreciate the following institutes:

Perimeter Institute for Theoretical Physics: for making PSI masters' video lectures available online. Massachusetts institute of Technology, National program on technology enhanced learning (NPTEL) Indian, abdus salam international centre for theoretical physics (ICPT), Stanford university, Harvard University, Yale University just to mention a few: for tons of lectures in physics and mathematics available on their website and on YouTube and all physics popularizers: Dr. Brian Greene, Dr. Don Lincoln, Socratica, Dr. Michio Kaku, Dr. Sabina Hossenfelder just to mention a few. all my friends and everyone who has put one or more physics and mathematics video on YouTube

I also want to thank DR physicsA (Bob Eagle), Dr. Sabieh Anwar, Dr. N.J. Wildberger, Dr. Frederic schuller (FAU) for their concise lectures on YouTube, Philip Gibbs for creation of vixra and also damilola who has been praying for me. I say thank you!!!

APPENDIX

Theorem: *A 2-dimensional disk on infinite dimensional surface has no boundary*

Proof: let $c_n(E)$ represents a chain complex on a fiber bundle E such that $\forall\ p, v \in E$

$$\partial_n = \frac{\partial}{\partial x^n}:\ c_n(p,v) \to c_{n-1}(p,v)$$

$$ker\partial_n:\ c_n(p,v) \to p_n\ ,\ \forall\ p_n \in \text{base } B \text{ on } manifold\ \ M$$

$$\exists\ \ T : p_n \to G\ \ (group)$$

Such that $H(c_n(p,v), T)$ forms a cohomology group on E with cochain complex

$$1 \leftarrow^{T\partial_{n-1}} c_{n-1} \leftarrow \cdots \leftarrow^{T\partial_3} c_3 \leftarrow^{T\partial_2} c_2\ \ \leftarrow^{T\partial_1} c_2 \leftarrow 1$$

Let's define a differential forms as a group on the manifold equipped with partition of unity

$$T : p_n \to \Omega^n$$

$$d :\ \ \Omega^n \to\ \ \Omega^{n+1}$$

$$the\ \ support\ \ of\ \ T = \sigma(\mathrm{T})\ \ \epsilon\ \ \Omega^n$$

$$\sigma(\mathrm{T})\ \ \text{and}\ \ \mathrm{e}\ \ \epsilon\ \ \Omega^n,\ \sigma(T)e = \sigma(T)$$

$$\sigma(T)^{-1}\ \ \epsilon\ \ \Omega^n\ \ \sigma(T)\sigma(T)^{-1} = e = 1$$

$$0 \le n \le \infty$$

$$1 \longrightarrow \Omega^1\ ^{d_1}\!\longrightarrow \Omega^2\ ^{d_2}\!\longrightarrow \Omega^3\ ^{d_3}\!\longrightarrow \cdots \to \Omega^n \to 1$$

$$d_0T^0 = \frac{\partial}{\partial x^0}dx^0\ \ ;\quad d_1T^1 = \frac{\partial\sigma(T)}{\partial x^1}dx^0 \wedge dx^1\quad ;\quad d_2T^2 = \frac{\partial\sigma(T)}{\partial x^2}dx^0 \wedge dx^1 \wedge dx^2;$$

$$d_3T^3 = \frac{\partial\sigma(T)}{\partial x^3}dx^0 \wedge dx^1 \wedge dx^2 \wedge dx^3\ \ \cdots\ \ d_nT^n$$

$$\Omega^1 \cong C^1(M) \cong R\quad \Omega^2 \cong C^2(M) \cong R^2 \cong D^2 = \text{2-dimensional disk}$$

$$\int_\Omega\ \ d_nT^n\,\sigma(T)^{-1} = \int_{\partial^n\Omega}\ \ T^n\,\sigma(T)^{-1} = 1$$

$$\sigma(T) = \int_{\partial^n\Omega} T^n$$

I claim that $\sigma(T) = ker\frac{\partial}{\partial x^n}T$

$$\sigma(T) = \int_{\partial^2\Omega=0}\ \ T^2\ \ \ at\ \ n = 2$$ Q.E.D

…physics is not equal to math but physics plus math is one

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. . . to God Be the Glory.

END.