HOW AN ARTIFICIAL KERR-NEWMAN BLACK HOLE CAN RELEASE GRAVITATIONAL WAVES

Andrew Walcott Beckwith

Physics Department, Chongqing University, College of Physics, Chongqing University Huxi Campus, No. 44 Daxuechen Nanlu, Shapinba District, Chongqing 401331, People's Republic of China

Rwill9955b@gmail.com; abeckwith@uh.edu

Abstract

Abstract. *We initiate a model of an artificially induced Kerr-Newman black Holes, with specific angular momentum J, and then from there model was to what would happen as to an effective charge, Q, creating an E and B field, commensurate with the release of GWs. The idea is that using a frame of reference trick, plus E + i B = - function of the derivative of a complex valued scalar field, as given by Appell, in 1887, and reviewed by Whittaker and Watson, 1927 of their "A Course of Modern Analysis" tome that a first principle identification of a B field, commensurate with increase of thermal temperature, T, so as to have artificially induced GW production. This is compared in part with the Park 1955 paper of a spinning rod, producing GW, with the proviso that both the spinning rod paper, and this artificial Kerr-Newman Black hole will employ the idea of lasers in implementation of their respective GW radiation. The idea is in part partly similar to an idea the author discussed with Dr. Robert Baker, in 2016 with the difference that a B field would be generated and linked to effects linked with induced spin to the Kerr - Newman Black hole. We close with some observations about the "black holes have no hair" theorem, and our problem. Citing some recent suppositions that this "theorem" may not be completely true and how that may relate to our experimental situation. We close with observations from Haijicek, 2008 as which may be pertinent to Quantization of Gravity.*

Keywords: Kerr Newman black hole, high-frequency gravitational waves (HGW), causal discontinuity.
PACS: 98.80.-k

I. INTRODUCTION

Our initial statement of this document, is to use a Kerr- Newman black hole event horizon, with a charge, Q, and a constant angular momentum J, as an induced state of affairs which will be then utilized, if fed by laser induced energy, for the generation of gravitational waves and gravitons. :Pursuant to this goal will be utilizing [1] by Ruffini et.al. the formation of an event horizon, which will be at the outer boundary of a matter-energy 'bubble' of space time, in a laboratory setting, and also utilizing [2] which has a criteria for spatial resolution of a graviton within a confined metric geometry . In addition, we use [3] to generalize the entropy, depending upon graviton production, due to infinite quantum statistics,[4] , [5] where we assume that graviton count, equivalent to N, i.e. a particle count, is equivalent to an entropy count, for reasons we go into in our manuscript. Furthermore, [6], [7], [8] , [9] give background as to the Kerr and Kerr Newman metric used, which is important for our write up, and in addition, we use the non standard treatment of electrodynamics as written up by [10], which is part and parcel of what is implied in [11], and [12] . Note that the treatment of the ergosphere, and the question of a nonzero Angular Momentum, associated with a black hole as given in [13] on page 1283 and 1284 means that we have far more detail as to Black hole physics, than is usually associated with [14], and so what we will do, in lieu of [10] is to assume that if we have a complex electric E and magnetic B field associated with a rotating Kerr metric, with charge Q, and with angular momentum J (which we set as a constant in space dimensions due to wanting to keep the complexity of our calculation down), that we employ the trick, as to frame of reference, of setting the complex contributions to the Electrodynamics equation associated with using a frame of reference trick, (plus E + i B = - function of the derivative of a complex valued scalar field, as given by Appell, in 1887, [10]) . So that if the imaginary part of E + iB vanishes, we then obtain a general magnetic field associated with the rotating Kerr Newman black hole. We do NOT call the angular momentum a constant in time, i.e. we have torque in our model!

In doing so, we use the approximation that to first order that the energy, as given, in this situation, is driven by the usual proportional value of temperature, T, as in standard statistical physics, [15] with the temperature, T, driven in part by a laser hitting a target, say of the sort given in Lawrence Livermore implosion pellet experiments. References [16], [17], and [18] pertain to fundamental questions as to the growth of entropy, i.e. why it may start off at absurdly low levels of entropy, as gone over by Penrose , and build up rapidly, why we are considering a laser implosion, and why we are referring to the strength of a signal, of GW, via [13] and its equation 9.51 on its page 505 which has a frequency dependent gravitational wave strain value which we could estimate the role of laser power W, and frequency in our laser experiment.

After this is described, and estimated, we will make reference, to [19] , [20], and [21] to describe some of the physics which may be inherent as to a rapid fire laser i.e. [19] is the Park description of how a rotating rod, of a given frequency, ω, of rapid rotation, gives a distinct GW / would be graviton creation if we had the ends of the spinning rod tapped by a laser. This also involves consideration of the type of laser, partly referencing [20] and [21]. The author also had his earlier treatment of this sort of situation in [22] with this present document to be a vastly more refined version of the same idea.[23] [24] [25] [26] add more to the possibility of graviton generation, as to a laboratory created dynamical process, whereas the reference [27] as given by Rindler, on page 154 , if we conflate one over the square root of a mass density as greater than the so called horizon of a black hole, a way to tie in the generation of massive gravitons via the spinning rod idea given in [19] (i.e are GW consistent with gravitons?) with the Kerr black hole.

Having said that, our thought experiment, if it is paired with the inquiry given in references, [19] to [27] as given above, should be tied into resolution of the Eq. (26.6) requirement as to the mass M, necessary as to the production of a black hole, as given by Peebles, [28] which famously has a 1/ (1+z)^2 dependence as far as red shift (the greater the red shift, the more likely the creation of black hole. I.e. in effect what we are doing is via laser powered application of energy to an implosion pellet duplicating the idea of formation of primordial black holes, and also answering, if we do graviton production right from an induced spinning black hole, what we can expect in relic conditions as far as GW, and gravitons at the start of cosmological expansion.

This should be seen as being in tandem with the idea of the author as given in [29] as to a Tokamak producing high frequency gravitational waves. If we have say 10^10 Hz, in the Tokamak generation of GW, we are in fact going to the idea of relic high frequency GW, produced at the start of the big bang, and multiply that figure by 10^-26 to obtain the effect of massive red shifting due to inflation, and a window into the primordial conditions allowing for GW production. At the start of the universe.

In a different way, we can use the idea of an artificial Kerr black hole generating GW, as also another cosmological window into relic conditions, of cosmology.

This, if verified, could be of fundamental importance and will be discussed in our paper. We close with the idea of a causal discontinuity, affecting the production of GW. This last part will be the concluding part of our introduction , and interested readers should access [30], which will be the very last part of our document.

Why reference [30] is important as to our document. In the end, the inquiry about the existence of an artificial Kerr Newman black hole is really about modified gravity. In [31] the three-body problem is analyzed, and in [32] the author submitted a suggestion as to modified gravity, which has been accepted by JHEPGC, and which is really an extension of the ideas given in our document. These in turn are also linkable to what Abraham and Marsden wrote up in pages 663 to 740 in [33].

The idea of modified gravity, so alluded to, should be contrasted with [34] which gives a graviton generation rate for Black holes, on page 45 of [34].

i.e. their rates for emission, as stated by Calmet et.al [34]., are for the main part extremely low, except in the case of higher dimensional black holes, as embedded in branes. And, more importantly are for NON rotating black holes, which is different from what we are considering as to the Kerr-Newman induced black hole.

We should keep in mind that there are no specifics given in [34] as to graviton production for rotating black holes, in page 46, so what we are doing is breaking new ground.

Moreover, if graviton production is, indeed generated by a laser implosion, it allows us to examine relic conditions for early black hole radiation which may allow for analysis of the relationship, if any, between electromagnetics and gravity.

There as of present, no confluence between electromagnetism, and gravity in Einstein's theory of relativity In an alternate modification of GR view this may not be true in the case of origins of nonsingular beginning treatments of initial cosmological conditions as given in [35], and which is elaborated upon in [36].

I.e. our inquiry, experimentally may be a way of testing the veracity of these two references, [35] and [36].

Our concluding remarks are in admitting that our inquiry may be a test as to the veracity of the 60 e fold expansion of the universe, as attested through in typical inflation theories, i.e. if inflation is correct, our GW and graviton induced fields are about 10^26 times stronger than would be, if inflation had not weakened or dispersed initial gravitational waves, as can be seen by [37]

Finally, our laboratory test, if initiated properly may falsify, or give credence to the 7.7 times 10^-23 eV/c^2 upper bound to a massive graviton, as reported by Maggiore, in [38], on page 320 which may clarify if there is, say a difference between relic gravitons, and later versions of what gravitons are, well after the onset of inflation.

We assert that a suitable inquiry as to this bound, is in part, an inquiry, once again, into the Mach's principle debate, which is alluded to, in cosmology, in page 167 of Volume 2, of [39], which was in part abandoned by Einstein, in the 1930s. But which is still worth looking at again, pending suitable experimental conditions.

All these topics, and others will be alluded to in part in our inquiry as to the next several pages of our document.

II. A brief recap as to Kerr – Newman black hole physics

[40] has a complete derivation of how the Lens and Thirring studied the derivation of how a spinning sphere of uniform density created a gravitational field, on page 257 of [40] which leads to a metric of

$$
\begin{aligned}
&dS^2 = \left(1-\frac{2m}{r}\right)\cdot c^2\cdot dt^2 - \left(1+\frac{2m}{r}\right)\cdot d\sigma^2 + \frac{4\kappa J}{c^2 r}\cdot\left(\sin^2\theta\right)\cdot d\varphi\cdot c\cdot dt \\
&r \equiv \sqrt{x^2+y^2+z^2} \\
&J = angular-momentum-of-sources \\
&d\sigma^2 = flat-space-line-element-3Dim \\
&Lens-Thirring, iff \quad J = -c^3 m\frac{a}{\kappa} \\
&and \quad set \quad r \equiv \rho \\
&\Leftrightarrow dS^2 = \left(1-\frac{2m}{\rho}\right)\cdot c^2\cdot dt^2 - \left(1+\frac{2m}{\rho}\right)\cdot d\sigma^2 - \frac{4ma}{c^2\rho}\cdot\left(\sin^2\theta\right)\cdot d\varphi\cdot c\cdot dt \\
&This-gives-us-rotating-Kerr
\end{aligned}
\tag{1}
$$

In our consideration, in order to simplify matters, we set J equal to a constant, i.e. this was for ease of calculation and it lead to, with the caveat of , if a is a measure of the angular momentum per mass, and if m, in Eq. (1) is mass, we can say that m is the "geometric mass" which can lead, to, as given in [40], page 260 with a Coriolis like force given by

$$
\rho\ddot{\varphi} + \left(\frac{-2ma}{\rho^3}\right)\cdot\dot{\rho} = 0 \tag{2}
$$

If we identify ρ replacing the angular velocity ω, the above is the Coriolis force, as given in page 130 of [40] this will in part, if we add a charge, Q into this business, lead to what is given in [41]

$$
\begin{aligned}
&dS^2 = \frac{\tilde{\rho}^2}{c^2}\left(-\frac{dr^2}{\Delta} + d\theta^2\right) - \frac{\Delta}{\tilde{\rho}^2}\left(c\cdot dt - \tilde{a}\cdot\left(\sin^2\theta\right)\cdot d\varphi^2\right) \\
&-\frac{\left(\sin^2\theta\right)}{\tilde{\rho}^2}\cdot\left(c\cdot dt - \tilde{a}\cdot\left(\sin^2\theta\right)\cdot d\varphi^2\right) \\
&\tilde{a} = J/m\cdot c \\
&\Delta = r^2 - r_S r + \tilde{a}^2 + r_Q^2 \\
&\tilde{\rho}^2 = r^2 + \tilde{a}^2\cdot\cos^2\theta \\
&r_S = \frac{2Gm}{c^2} \\
&r_Q^2 = \frac{Q^2 G}{4\pi\varepsilon_0 c^4}
\end{aligned}
\tag{3}
$$

We will for the sake of simplicity approximate J as a constant when we do our calculations.

III. What we obtain by using a charge Q in a rotating black hole solution.

Reference [42] gives an extremal condition as to the mass of a Kerr Newman black hole, being bounded below, by angular momentum J, and charge, Q. As given on page 12, of [42] we have that if we have a mass m, redefined, as the Christodoulou-Ruffini mass we could set as M by [43] will show the following set of inequalities made equalities. i.e.

$$
\begin{aligned}
&\mathrm{M} = m \\
&S = S_{ext} \\
&J = J_{ext} \\
&Then \\
&S = S_{ext} = \pi \cdot \sqrt{Q_{ext}^4 + 4J_{ext}^2} \equiv \pi \cdot \sqrt{Q^4 + 4J^2} \\
&\& \\
&\mathrm{M}^2 = m^2 = \frac{1}{2} \cdot \left(Q^2 + \sqrt{Q^4 + 4J^2} \right)
\end{aligned}
\tag{4}
$$

The last two parts of Eq.(4) can be interpreted using the ideas of Infinite quantum statistics, as a way of making a linkage between entropy, and the counting of numbers of emitted particles, using the relationship given in [4], and [5] of

$$
S = S_{ext} \approx n\left(partile - count \right) \tag{5}
$$

We then, can, using Eq. (4) and Eq.(5) make the following statement as to number of stimulated particles, from a laser hitting an artificial black hole, which we will in this first reading equate with Gravitons (massive) and the matter-energy input into the artificial black hole, i.e.

$$
\begin{aligned}
&If \\
&\mathrm{M} = m \\
&S = S_{ext} \approx n \equiv \left(partile - count \right) \\
&Then \\
&S = S_{ext} \approx c_1 n \propto \left(partile - count \right) \propto \pi \cdot \sqrt{Q^4 + 4J^2} \\
&\& \\
&E_{ext} = \frac{k_B}{2} \cdot T_{applied} \approx M \cdot c^2 \\
&\Leftrightarrow \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 = \frac{1}{2} \cdot \left(Q^2 + \frac{c_1 n}{\pi} \right) \\
&\Rightarrow Q^2 = 2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi}
\end{aligned}
\tag{6}
$$

The particle count, i.e. in this case, stimulated graviton emission from the black hole, and the temperature, $T_{applied}$ from a laser smashing into a target, will influence an effective charge, Q .

IV. Calculation of Electric and Magnetic fields, for the Kerr-Newman black hole, and how one can pick a frame of reference, where the E field vanishes

We begin our statement as to looking first at [44], which has a dipole approximation as to a Kerr – Newman black hole, if a charge Q is specified. Then we have a dipole approximation of the following electric field, with n, a count of particles per unit area radiated from the artificial Kerr-Newman black hole.

$$\vec{E} = \left(Electric - field \simeq \frac{Q}{r^2} \cdot \hat{e}_r \right)$$
$$Q = \sqrt{2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi}} \qquad (7)$$

What we will do, assuming this base, for the electric field, is to go to [10] where we will have the following electric and magnetic field coupling to consider, namely if we have a potential given by quantity omega in this last equation is similar to the Coulomb potential, except that the radius vector is shifted by an imaginary amount which could lead to the magnetic field given by the following representation.

$$\vec{E} + i\vec{B} = -\vec{\nabla} \cdot \tilde{\Omega} = -\vec{\nabla} \cdot \frac{Q}{\sqrt{\left(\vec{r} - i \frac{\vec{J}}{m \cdot c} \right)^2}}$$
$$\vec{B} = -i\vec{E} + i \left(\vec{\nabla} \cdot \frac{Q}{\sqrt{\left(\vec{r} - i \frac{\vec{J}}{m \cdot c} \right)^2}} \right) \qquad (8)$$

The approximation which will be used here, is that J is spatially almost invariant (initially) but that it has a distinct function in time, i.e. J=J(t)

i.e. we would be looking at how to have a way to make the following identification which could simply matters, first of all noting that there is, in this situation a B field which is given as in [44] as being approximately real valued with the far distance value of

$$\vec{B} = \frac{Q\left(\frac{J}{m \cdot c} \right)}{r^3} \cdot \left(2 \cdot (\cos\theta)\hat{e}_r + (\sin\theta)\hat{e}_\theta \right) \qquad (9)$$

If we apply the 2nd part of Eq. (8) above, with respect to finding an imaginary part of the B field to be cancelled out, we can write that if we apply Eq. (7), Eq. (8) and Eq. (9) we have if we look at

$$\theta = 0 \Rightarrow \vec{B} = \frac{Q\left(\frac{J}{m \cdot c}\right)}{r^3} \cdot \left(2 \cdot \hat{e}_r\right)$$

$$and \qquad (10)$$

$$\vec{E} = \left(Electric - field \simeq \frac{Q}{r^2} \cdot \hat{e}_r\right)$$

This is a case where one is having at theta = 0, both E and B fields, but we can simplify further by muse of

Then,

$$E + iB = \frac{\left[-Q \cdot (r^2 - (J/mc)^2) + Q \cdot (2irJ/mc)\right]}{\left[\left((r^2 - (J/mc)^2\right)^2 + (rJ/mc)^2\right]}$$

$$becomes \qquad (11)$$

$$iB = \frac{\left[+Q \cdot (2irJ/mc)\right]}{\left[+(rJ/mc)^2\right]} \Rightarrow B = +2Q/(rJ/mc); E = 0$$

$$iff \quad r^2 = (J/mc)^2$$

i.e. we have a vanishing E field in this situation , with a B field with J = J(t), allowing for Torque, which shows up all the time in black hole physics, but we do not have much spatial variation of J, the above should be seen as a first order approximation but it is revealing, at the same time, as one is then specifying an axis of rotation in the space-time continuum which contains the artificial, induced Kerr- Newman black hole

V. Specifying conditions for the Production of Gravitons, from the Artificial Kerr – Newman Black hole

We can consider working with the induced Kerr-Newman black hole assuming that there is a stimulated emission of particles from the artificial black hole assuming that there is a method of input from lasers, or possibly thermonuclear fusion for input into the formula we will write as

$$Q = \sqrt{2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied}\right)^2 + \frac{c_1 n}{\pi}} \qquad (12)$$

$$E_{ext} = \frac{k_B}{2} \cdot T_{applied}$$

We will be examining what would be possible input energy into this “induced Kerr- Newman “black hole.

We go back to optimizing

$$
\begin{aligned}
&Q = \sqrt{2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi}} \\
&E_{ext} = \frac{k_B}{2} \cdot T_{applied} \approx M \cdot c^2 \\
&2M^2 \geq Q^2 + \sqrt{Q^4 + 4J^2} \\
&\& \\
&2M^2 \geq 2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi} + \sqrt{\left[2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi} \right]^2 + 4J^2} \\
&\& \\
&B = +2Q / \left(rJ / mc \right)
\end{aligned}
\tag{13}
$$

Note that the expression of B, for magnetic field is commensurate with a specific value of r, such that we have E effectively disappear

In this case, we are assuming that, m, in the denominator of B, for when E is allegedly zero, is actually M. Going to [45] which restates the problem, to first order we are observing an equality in what is otherwise an inequality,

$$
\begin{aligned}
&2\left(\frac{B \cdot r \cdot J}{2c \cdot \left[2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi} \right]^{1/2}} \right)^2 \\
&\geq 2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi} + \sqrt{\left[2 \cdot \left(\frac{k_B}{2c^2} \cdot T_{applied} \right)^2 + \frac{c_1 n}{\pi} \right]^2 + 4J^2}
\end{aligned}
\tag{14}
$$

In the case where the above becomes an equality, where there is an extremized value of r, we can have that we are observing a situation where a B field, which can be measured, with a value of J, for the induced Kerr – Newman metric **will lead, to a value of n, which in this case would be the number of gravitons emitted by this configured induced Kerr- Metric black hole**. And this will be assuming that the temperature $T_{applied}$ will be created by either a battery of lasers, or by possibly induced fusion.

Our next section will be a description of how to put in $T_{applied}$ into this system, and we will close with a description of an already worked out protocol for graviton/ GW detection. To do this though we first of all need to understand what allows for GW release from a Kerr- Newman black hole. This is essential, since a count of gravitons so generated and released from this Kerr-Newman black hole, is proportional to the release of information, for reasons we will specify in the next section of our paper. To do this, we consider, both

VI. What makes this paper possible, a break down in the traditional Blackhole singularity block on information transfer, and different models of how to put in $T_{applied}$ into this system, for GW/Gravitons

First in this treatment is understanding a revolutionary idea, as given in [46[and [47[, which can be utilized and explained in the following quote

Quote

"In particular, if the exterior region of the Kerr family is proven to be dynamically stable---as is widely expected---then it will follow that the $\mathbb{C}^0$ -inextendibility formulation of Penrose's celebrated strong cosmic censorship conjecture is in fact false."

End of quote

The fact that we will discuss graviton release, as information release, will be in ;part linked to [48], ie a relationship between entropy, and information, which is also based upon Ng, as given in [4] and [5] where entropy is closely linked to particle count, but all this depends upon a falsification of [49] [50], [51] [52] which is in fact due that the temperature $T_{applied}$ may be applied in two specific ways

First, we may think in terms of a battery of lasers. I.e. see [53] , [54], [55] and secondly is due to the idea of applying an underground nuclear explosion as a way to generate sufficient thermal $T_{applied}$ as given in [56], [57]

The idea in all of this wold be to duplicate in part, say [58] , in either laser battery induced implosions, or by kiloton level deep; underground tests sufficient thermal $T_{applied}$ as to implement use of Eq. (14) above. For political reasons, it would be most advisable to go the route of a facility similar in part to the national ignition facility, for obtaining . sufficient thermal $T_{applied}$ whereas fine tuning the problem of applied magnetic fields taking into account [59]

Crowell, in [60] gave a working summary of what the modification of the singularity mathematics portends to, in a private note which is duplicated below

Quote, from [60]

With the Kerr solution there is behind the interior horizon r_- is a timelike region with the singularity. For the Kerr solution the horizon is a ring with closed timelike curves around it. Spacetime is in effect pretty twisted around. However this is a case for the eternal solution, which is a mathematical idealization. This may seem to reflect something unobservable, but in the Penrose diagram below it is the case that a spatial surface in the observable region can by a choice of frame connect with either the other time like region or this odd region. This paper by Defermos and Luk appears to say this region is similar to an exotic four manifold. Exotic or E8 manifolds have no metrizable structure and are not diffeomorphic, though they are homeomorphic. Atiyah, Donaldson. Freedman and Uhlenbeck pioneered this area of mathematics that has some strange implications. The two spatial surfaces are connected by what appears to be a monodromy with the singularity. There is then a connection with ordinary spacetime with this odd spacetime.

End of quote,

This is illustrated in the following diagram which Crowell gave in [60] which is given below which we call Figure 1

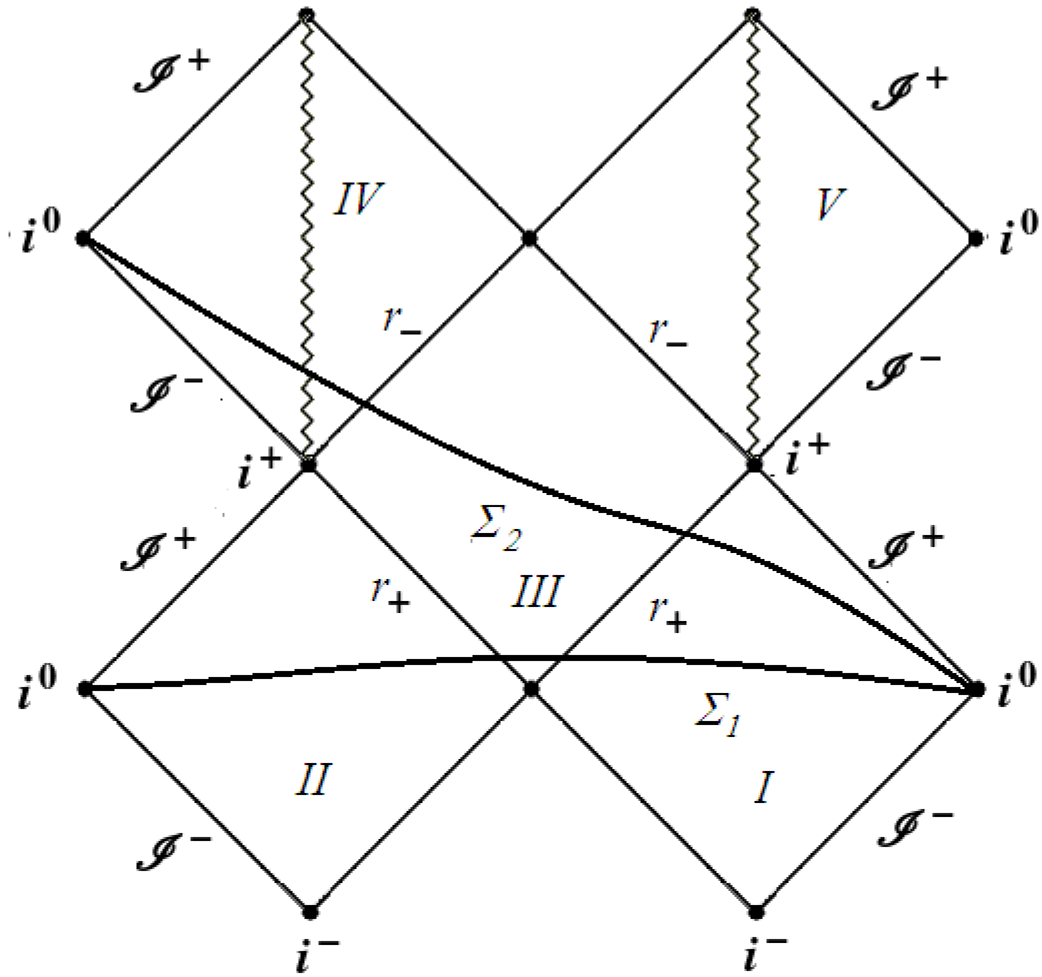

Figure 1, :Penrose Diagram supplied by Crowell, in [60] which compliments his information filled observations sent the author in [60]

which is, in fact fully backed by the following observations which were given to the author by Corda in [61]. Which are in part backed by work Corda did in [62] [63], [64] and [65], whereas much of the ideas are also reflected in the 2017 publication using AdS theory as given in reference [66].

Note that in [61] Corda proceeds with a very logical treatment of a self contained black hole, which has specific limiting cases as to quantum results. We will summarize what Dr. Corda did in the next section of our paper, but before moving forward, it is important to note the confluence of what was done by Kerr, and then earlier by Kurt Godel as given in his rotating model of the Universe as given in [67], [68] which is incidentally often over looked. [67] also makes the point of the inexact nature of what we call singularity theory and black holes. What [67] states is that the Penrose censorship conjecture breaks down, and this is also part and parcel of what we are intending to bring up in our artificial worm hole , of Kerr-Newman type with its charge, Q. The rotating universe, as given by Godel,

In [68] we have that, indeed, we can get some links to the Godel spacetime

See ***section 5.7*** for a classic discussion of CTCs in the Gödel spacetime. Note, that in Fig. 31, the light cones do indeed tip over, but they also widen, so that vertical coordinate lines are always time-like; indeed, these represent the world lines of the dust particles, so they are time-like geodesics

In [69] we also have the original Godel paper, which can be looked up as a precursor of the work done by Kerr and Newman, and this is a way also, to intellectually understand the problems inherent in the Penrose censorship conjecture. [70] and also review the issues brought up in [71] [72], [73] and [74]. Having said that, we will address the issues next which Corda raised in [61] about the idea of an effective temperature for black holes, and our comments as to its relationship to our problem.

VII. Comparing our work against the reference [61] results by Corda as to Effective Temperature for a black hole.

In [61] Dr.Corda did an explicit quantum physics analogy as to obtaining an effective temperature T for black holes which has many similarities as to our results. One aside, one big difference, is that our temperature $T_{applied}$ involves an applied upon by external temperature regime which we claim would induce conditions for the formation of a Kerr- Newman black hole, whereas what is done in [61] is to assume formation of a black hole leads to the effective temperature, of the black hole itself. I.e. the Corda results as of [61] involve an indigenous temperature for the black hole, which is created in the process of formation of the black hole. I.e. the [61] result does not explicitly assume creation of the black hole in question due to application of an external temperature, of the sort we did in our $T_{applied}$. Having said that, many of the results of [61] are , in part, extremely close to ours, and we can use [61] as a way to ascertain the degree of proximity to quantum processes, which is the main benefit of the analysis given in [61] by Corda.

In a word, [61] delineates a careful analysis of how much quantum process contribute to Black Hole entropy, which we also look at, and in turn is related to the temperature, T, which Corda derives in [61]

In [61] Corda delineated the effective temperature of the black hole in question as

$$\begin{aligned}
&T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M}-\omega\right)} \\
&\& \\
&\tilde{N} = \#-of-quanta \\
&\tilde{M} \approx Black-hole-mass \\
&\omega = frequency-emitted-radiation \\
&\& \\
&S_{Total} \xrightarrow[full-quantization]{} 2\pi\tilde{N} + \left(\frac{3}{2\pi\tilde{N}} - \ln 2\pi\tilde{N}\right)
\end{aligned} \tag{15}$$

If so, and we assume full quantization is achieved in our model of the quantum black hole idealization we can make the following identification. i.e. to make 15 consistent with our results we can do the following, i.e. assume that n = number of gravitons is approximately the same as the number of quanta, i.e. state that we can have an overlap between the results of [61] with our results if the following block of equations is utilized? I.e. in a word, the quantity $T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M}-\omega\right)}$ as an effective temperature for the black hole being formed, is added as a would be definition, separate from the applied external temperature $T_{applied}$ which presumably would be put into the formed Kerr – Newman black hole. I.e. we make the following block of equations to be considered as the main result of this section of our paper.

$$
\begin{aligned}
&T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M} - \omega\right)} \\
&\& \\
&\tilde{N} = \# - of - quanta \\
&\tilde{M} \approx Black - hole - mass \\
&\omega = frequency - emitted - radiation \\
&\& \\
&S_{Total} \xrightarrow[full-quantization]{} 2\pi\tilde{N} + \left(\frac{3}{2\pi\tilde{N}} - \ln 2\pi\tilde{N}\right) - Corda - result \\
&S \xrightarrow[full-quantization]{} c_1 \cdot n - My - result \\
&Question, can - we - pick - c_1 - such - that \\
&c_1 n \equiv 2\pi\tilde{N} + \left(\frac{3}{2\pi\tilde{N}} - \ln 2\pi\tilde{N}\right), if \quad n = \tilde{N}\,?
\end{aligned}
\tag{16}
$$

If we can satisfy Eq. (16) above, we then come to a very fundamental question for our inquiry which is as follows and will be briefly mentioned as framing one of the big questions this manuscript will raise, namely

VIII. What are Conditions Permitting $T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M} - \omega\right)} \cong T_{applied}$?

We submit that this is not a trivial question and answering it would lead to perhaps successful implementation of our idea as to forming a Kerr-Newman artificial black hole. To answer it will require well posed modeling and experimental constraint conditions which we will try to bring up in this section VIII.

First of all, to do this identification of $T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M} - \omega\right)} \cong T_{applied}$, we have to have the fix put in as far as Eq. (16). This is basic. Secondly, is to investigate the forwarded to inquiry as given to the author by Lawrence Crowell, August 30, 2019, namely [75]

We can create a sort of artificial black hole by recognizing that the Weyl tensor C_{abcd} defines symmetric 2-tensor components E_{ac} = g^{bd}C_{abcd} that are analogous to the electric field. That this is a rank 2 tensor means there are two polarization directions. The Hodge star or with Levi-Civita you can form the magnetic field analogue. With Bern and Dixon we have the phenomenological analogue between gravitation and gauge fields where a rank 2 tensor of this form may be formed by the entanglement of two gauge boson in a triplet state. So gluons can define a "sort of graviton" and for SU(4) --> SU(2,2) under an STU duality transformation this extended QCD has some duality with gravitation. SU(2,2) ~ SO(4,2) is the isometry group for AdS_5. It is not hard to work out the roots and weights of the SU(4), where it has an additional weight vector and 6 additional charges. Standard SU(3) QCD embeds into this theory. How SU(4) works in standard model or GUT physics is hard to know, but I think the 6 additional vector terms may form entanglements in singlet states that are the 3 Goldstone bosons of the Higgs field and the remaining weight with its anti-color field may form the left over Higgs particle h that was detected in 2012.

So in this way the heavy ion physics of the LHC with the A Large Ion Collider Experiment (ALICE) there is with the lead ions an atomic weight times the 13TeV of energy, which forms a quark-gluon plasma at considerable energy. The ALICE work is a bit of the forgotten last child in the LHC experiments, but in many ways it is just as interesting as proton collisions. This should form something analogous to a black hole. The decay of this results in gluon pairs that should have analogues with gravitational waves.

I.e. a mathematical investigation may, indeed yield conditions in which one can establish $T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M} - \omega\right)} \cong T_{applied}$. Furthermore, is to also investigate if we can have an investigation of the strength of gravitational waves, as discussed in [13] , as given on page 505 of [13] formula for GW 'strain', namely in the case of laser light implosion, as on **page 505 of [13]**, we have h~ strain strength of GW which may be measured from an induced black hole, as given by formulas from [13] which were initially for a laser interferometer system, in LIGO, with the following comparisons., i.e. looking at

$$
\begin{aligned}
& T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M} - \omega\right)} \cong T_{applied} \\
& if\, \omega = \omega_{GW} \\
& \tilde{M} \; = 'mass - induced - black - hole \\
& \omega_{Laser-light} \; = \; frequency - of \; - laser \\
& W_{Laser-light} \; = Laser - light - power \\
& h \sim GW - strength = \left(\frac{\hbar \omega_{GW}}{4\pi \omega_{Laser-light} W_{Laser-light}} \right)^{1/2}
\end{aligned}
\qquad (17)
$$

IX. What Eq. (17) portends for emitted GW(Graviton?) radiation from the Artificial Black hole

This Eq. (17) is for laser induced implosions on a black hole, Kerr- Newman style, which would in the case of the national ignition facility have an enormous power behind this, and this assumes a signal to noise ratio of about 1. Note this Eq.(17) in [13] was originally for laser interferometry in a LIGO style system, and to get what we are seeking, we are likely assuming that the laser light would be very high frequency and that we would be that both $\omega_{Laser-light}$ and ω_{GW} for frequency of emitted GW would be very high, likely in the 10^8 to 10^12 Hz range.

Furthermore as far as the size of the induced Kerr Black hole we would be looking at an induced ring singularity of at least an angstrom in 'width' i.e. likely much larger.

Our working assumption would be then that the emitted GW from the "induced black hole "would scale roughly as, if

$$\omega_{GW} \approx 2\tilde{M} - \frac{1}{4\pi\left(T_{applied}\right)}$$
$$if\,\omega = \omega_{GW} \qquad (18)$$
$$\tilde{M} = 'mass - induced - black - hole$$

This should be seen against the usual dimensional analysis, assuming that $k_B = \hbar = c \to 1$ in dimensional analysis which would be seen as akin to the more usual [15]

$$E_{ext} = \frac{k_B}{2} \cdot T_{applied} \approx \tilde{M} \cdot c^2 \xrightarrow[k_B = \hbar = c \to 1]{} \omega_{GW} \qquad (19)$$

i.e. the higher one is getting to a huge applied temperature we would be looking at a system approaching Eq. (19) .

In addition , if we are referring to a ring singularity[1] in an induced Kerr-Newman black hole, we would have say [76]

$$\lambda_{GW} v_{GW} \equiv 2\pi \lambda_{GW} \omega_{GW} \approx c \equiv 1$$
$$\Rightarrow \lambda_{GW} \approx 1/2\pi\, \omega_{GW}$$
$$If\,\lambda_{GW} \geq Radius - of - Ring \qquad (20)$$
$$Radius - of - Ring \approx 1/2\pi\, \omega_{GW}$$

If the radius of the (black hole Singularity) ring, is not on an angstrom scale, it is easy to postulate that one is having at least a 10^ 10 Hz frequency, in emitted radiation, and the strength of the GW, can be easily made, with adjustment in input parameters, so h ~ 10^ 23 is probable. I.e. this should be seen in the light of having a suitable applied temperature $T_{applied}$ applied to the artificial Kerr- Newman black hole provided that we are looking at, say

$$h \sim GW - strength = \left(\frac{\hbar \omega_{GW}}{4\pi \omega_{Laser-light} W_{Laser-light}} \right)^{1/2} \propto 10^{-23} \qquad (21)$$

Keep in mind, that we are considering how to come up with GW and graviton signals which could be experimentally tested, which is why we are writing up our next section.

X. Comparison of our idealized experiment with a rotating Rod for generation of GW and Gravitons

In doing this, we are assuming here that we can look at [19], [20], and [21] , which is in effect considering [77] and [78]

We argue that in effect we have something similar to a rotating rod, as far as the physics of GW, but without the problems inherent in merely applying a laser system to the end of a rod.

The bridge between the rotating rod, and the Kerr – Newman black hole would lie in the idea of J=J(t) i.e. that we could induce torque, in this problem, i.e. like a spinning top, but to definitely allow us to examine methods of GW release, say as of the early universe, which was brought up in [79], i.e. if we have small Kerr Newman black holes, at an early date, and this interlocks with quantum effects, we may be in a position as to understand [77] and [78] issues as far as quantum qubits and other information theory links of how black holes may contain quantum information which plays a role in cosmological evolution.

More to the point as of [19], [22], and [23] we would be avoiding some very practical problems which are in the idea of a spinning rod, which is what sort of material could possibly withstand the onset of extreme laser heat hitting the ends of a rotating rod, and also the issue of generation of stochastic noise, i.e. the old signal to noise ratio problem, in terms of what we could expect if a laser timed as having pulses down to 10^-9 second intervals firing and hitting the ends of a spinning laser rod.

In principle, this could be overcome, but in practicality, it would involve problems like scattering of laser light hitting the end of a rotating rod.

Again, in principle, with sufficiently refined engineering, assuming a fantastically well synchronized laser, with say up to laser shots of down to 10^-9 seconds, one could get a GW wave signal and satisfy all the issues inherent in [19], [22], and [23], without generating tons of stochastic noise.

This author doubts it.

The second requirement would be in having duration of a process of GW generation say of up to at least 10 or so seconds.

Meaning for 10^-9 separation of time from one laser shot hitting the end of a spinning laser rod, we would have 10 BILLION laser shots.

As a practical matter, the author does not see how this could possibly be done. The author would be happy to be wrong, but this is precisely why the author went to the idea of an induced rotating Kerr – Newman black hole, where the existence and dynamics of a B (magnetic) field would hopefully induce torque into the system, so as to avoid this experimental issue brought up.

Now that we have done this, we wish to discuss issues as connected to GW generation and our would be artificial Kerr-Newman black hole model

XI. Considering now the issue of how to possibly detect high frequency GW in this problem. And why we would like to avoid the problem of Super radiance for our would be an artificial Kerr Newman black hole.

In **Appendix A**, we duplicate in full the paper, about how to avoid the consequences of Super radiance in black hole physics. To put it mildly, super radiance would dynamite what we know about structure formation and would also lead to what we would not want, i.e. the laser physics input into this would be Kerr-Newman black hole would be for small masses highly UNSTABLE. Note that in [80] LARGE Kerr Newman black holes are deemed to be stable.

Hence, what we have in **Appendix A**, is that we wish to avoid the consequences of super radiance to begin with. The problem is discussed in [80] , and we should be aware of is that our would be simulated Black hole is small sized

From [80] we have the following quote

A wave impinging on a Kerr black hole can be amplified as it scatters off the hole if certain conditions are satisfied giving rise to superradiant scattering. By placing a mirror around the black hole one can make the system unstable. This is the black hole bomb of Press and Teukolsky. We investigate in detail this process and compute the growing timescales and oscillation frequencies as a function of the mirror's location. It is found that in order for the system black hole plus mirror to become unstable there is a minimum distance at which the mirror must be located. We also give an explicit example showing that such a bomb can be built. In addition, our arguments enable us to justify why large Kerr-AdS black holes are stable and small Kerr-AdS black holes should be unstable

Hence, we wish to avoid the “super radiance bomb”. We then advise readers to consider the physics of **Appendix A**, and this is, what we wish to avoid at all costs.

If we do so, then we have the situation as described that the small Kerr Newman black hole will NOT be unstable, but which can be actually measured. How can we do this ?

Fortunately, Dr. Li, Fangyu, and Dr. Hao Wen of Chongqing University have equipment which may be up to the problem of 10^10 Hz or higher laboratory measurements of GW, and we wish to refer interested readers into looking at [81] , and this is to find a way to measure in a laboratory the ejected gravitons which our artificial Kerr Newman black hole would be generating.

As to the interior to exterior version of the Kerr black hole, what we are doing is in essence, the traversing of quantum information across a causal barrier of space time. But in a manner which contravenes the problem given in [80]. I.e. we are showing how to avoid instability in our manufactured Kerr Newman black hole so we can come up with experimental conditions allowing for the detection of GW.

In doing so, we are, in effect crossing a causal structure boundary, how why do we bring this up?

In [82] Dowker outlines the essential issue, i.e. the Kerr Newman black hole is in essence the boundary of what can be called traditional Causal structure. To a degree, this involves what was set up in [83] i.e. we are creating by the superposition of external conditions the prototype of the something from nothing program, as referenced in [83] but we do it with regards to external applications of energy into our Kerr Newman structure. The issue is a cross between the mathematics described in [84], which is , if we conflate the similarities between entropy structure in the start of our universe, with black holes as given by Lousto et al, in [3], is a way of saying our external application of energy, leading to graviton production from the Kerr Newman black hole we wish to create, is similar to the flow of information problem we are outlining in the evolution of cosmological structure, through this problem.

In Appendix B , we outline an extension of Seth Lloyds information and computational evolution of the universe. i.e. we are through our black hole experiment, leading up to a possible test of the hypothesis gave in Appendix B

Even if we do not kill off superradiance, in black hole production , though our experiment in the laboratory, we may be able to get a bound on the admitted upper bound to massive gravitons.

In doing this, we are coming up with a model as to small black holes producing gravitons and information. However , if we cannot falsify Super radiance, as in Appendix A, we need to look at [85] giving at least an upper bound to the mass of a graviton. And to consider the situations given in [86], [87], [88] , [89] and [90]

This also may allow us to come up with a massive graviton version of the Calmert document, as to quantum black holes, as cited in [34]. The cited result as of page 45 of [34] is for massless gravitons, and in house laboratory experiments may allow us to expand this to the massive graviton case.

XII. Conclusion. A lot to do and how decoding the essence of GW radiation in the laboratory may help us get it done.

In [91], [92], [93], [94], [95], and [96] we currently have a lot of model related experimental work to consider, but we do not really have a consistent theory of gravity yet. This is also to move past the Author's presentation as given in [84]. I.e. in effect, our level of knowledge is equivalent to when Feynman outlined the Parton model [97] , [98]. We have excellent phenomenalistic models, but fail to get to the essence of why we see what we do, in many gravitational physics situations

Aside from necessary engineering work to do, if any of what we are trying to do is achieved, we can follow up on a suggestion made by Dr. Crowell as to this paper, "The interior of dynamical vacuum black holes" in [47]

As time permits, this author recommends following up on the suggestion made by Dr. Crowell in organizing a study group to go through this entire 217 page masterpiece.

Something along these lines will be organized, and in doing so, the essence of information transfer in and out of black holes should be analyzed as well as the essence of decoding what is meant by the cosmological singularities purportedly associated with Black holes.

Note our **Appendix C** also brings up the possibility, as first alluded to in [99] about the break down of the so called "black holes have no hair" conjecture.

Note that [99] has, in its introduction

Quote

We first show that the standard black hole no-hair theorem underlying this belief, although true in the abelian setting, does not necessarily extend to the non-abelian case. This indicates the possibility of solutions with non-trivial gauge and Higgs configurations decaying exponentially {\it outside} the horizon. We then find such solutions by numerical integration of the classical equations for the case of SU(2) coupled to a Higgs doublet (the standard model less hypercharge)

I.e. if there was a break in this no hair theorem(conjecture) it likely has to do with an equivalent development allowing for non abelian situations in our formulation of a problem concerning Kerr – Newman black holes.

Crowell, in [100] specifically alluded to having E =0 and B not equal to zero, with respect to black hole physics, as breaking of the "No hair conjecture" of black holes. The author does not deny it, and also that as Crowell correctly noted, that the E and B fields as used in this manuscript are for electromagnetic fields far from the Kerr Newman black hole

i.e. what was done is the leading order of electromagnetic field contributions, and the use of the magnetic field as the preferred venue is for, frankly, helping to allow for magnetic field to help induce torque, in the Kerr – Newman black hole, so we can have rotation, which is making our problem then akin to using reference [5] as cited by [99] plus the caveat offered in [99] which is called [6] which we quote, as actually being reference [101]

From [101]

Quote

We describe in detail two different types of black hole hair that decay exponentially at long range. The first type is associated with discrete gauge charge and the screening is due to the Higgs mechanism. The second type is associated with color magnetic charge, and the screening is due to color confinement.

Appendix C summarizes what can be said about the typical Black hole have no hair, idea, and also a simple suggestion as to how and why our problem may contravene this Conjecture (theorem?)

We note that in all of this we are in effect reviewing what was brought up in page 95 of [101]

Quote

Another, weaker but more profound way of interpreting the no-hair theorems is as statements about the classification of stationary black holes. According to this weaker interpretation, the properties of a black hole are completely determined, within any given theory, by the value of its mass, angular momentum, and continuous gauge charges. As we have seen, this weaker interpretation is violated non-perturbatively in $\hbar$, by discrete gauge hair. This form of hair expands the space of states of black holes. It is therefore appropriately called primary hair.

Reference [101], like [47] is a huge reference. Aside from reviewing [47] in a study group, this author will also recommend that in the non quantum case of black hole physics that some serious thought be given to the idea of non abelian structures which may encompass our experimentally induced Kerr – Newman black hole, whereas also, then, would be a review of if there is some evidence, emerging, in a quantum black hole case for the existence of “discrete gauge hair” which may indeed permit non abelian structure, if we are lucky or at least be consistent with the write up given by Coleman et al. for [101].

If both these approaches fail, we still can gain major benefits from a concerted study as to each of the chapters of [47]

Keep in mind, in all of this, that we are NOT abandoning in a conventional sense the possibility of a non zero E field in our experimentally induced Kerr- Newman black hole. As noted by Crowell, the E and B fields as referenced are for far field approximations.

We may wish to do , in a future date, in a study of Q, what we would expect from more detailed E and B fields connected to the Kerr – Newman black hole

This will of course present difficulties, but keep in mind that if the experimental apparatus for measuring gravity and gravitons is meters away from the induced Kerr – Newman black hole whereas the ‘event horizon’ of the Kerr Newman black hole, would be MUCH smaller, that up to a good approximation we are indeed in a far field zone experimentally

This will present many difficulties.

Finally we ascertain an entry from [110] which has the following area of a black hole (rotating) similar to the Kerr- Newman black hole surface area which is in turn compared to an earlier version of 2 times the square of mass, so obtained. With a value of Q, as a “topological charge’ earlier thrown in.

$$2M^2 = \frac{1}{2}\cdot\left(\frac{4\pi}{A}\right)\cdot\left[\left(\frac{A}{4\pi}+Q^2\right)^2+4J^2\right]$$

$$2M^2 \approx 2\cdot\left(\frac{k_B}{2c^2}\cdot T_{applied}\right)^2+\frac{c_1 n}{\pi}+\sqrt{\left[2\cdot\left(\frac{k_B}{2c^2}\cdot T_{applied}\right)^2+\frac{c_1 n}{\pi}\right]^2+4J^2} \quad (22)$$

&

$$Q=\sqrt{2\cdot\left(\frac{k_B}{2c^2}\cdot T_{applied}\right)^2+\frac{c_1 n}{\pi}}$$

From here, we can then if we equate the 2nd and third lines of Eq. (22) we could, numerically ascertain a value of the term, $T_{applied}$, while comparing this with the first line of Eq. (22) above. In doing so we would call this value of $T_{applied}$, as $\left(T_{applied}\right)_{derived}$ so that

$$\begin{aligned} &T_{applied} \xrightarrow[derived]{} \left(T_{applied}\right)_{derived} \\ &\Leftrightarrow \left(\Delta E\right)_{derived} = \frac{k_B}{2}\cdot\left(T_{applied}\right)_{derived} \approx \frac{\hbar}{\left(\Delta t_{applied}\right)_{derived}} \approx \hbar\left(\omega_{applied}\right)_{derived} \end{aligned} \quad (23)$$

If this is done and we then wind up with $\left(\omega_{applied}\right)_{derived}$ on the order of 10^10 Hz, with an inverse relationship roughly of the size of 10^10 seconds, with the n, above, as given by gravitons being counted, and with $c_1 n$ set by Eq. (16) and Eq. (17) we are then in terms of experimental input well on our way toward setting parameterization of a quantum theory of gravity which so far has eluded experimentalists and theorists.

This in its own way would be a follow up of what has been presented and marrying our work with the insights as given by Christian Corda which we have ascertained and used. It also sets the stage for utilization of [111] in a follow up which will, among other things, address the issue of quantum teleportation, and information transfer.

All this is unknown, and requires extreme risk taking. Both experimentally and theoretically speaking.

To which the author wishes best wishes for those brave enough to sail to the edge and to explore what we think we know, but may have no idea of.

ACKNOWLEDGMENTS

This work is supported in part by National Nature Science Foundation of China grant No. 11375279

REFERENCES

[1] Ohanian, H. and Ruffini, R. “Gravitation and Spacetime, 3rd edition”, Cambridge University Press, New York City, New York, USA, 2013

[2] Kuchiev, M, “Polarization of Instantons and Gravity”, https://arxiv.org/abs/hep-th/9411090, Europhys.Lett.28:539-544,1994

[3] Müller, R. and. Lousto, C., “*Entanglement entropy in curved spacetimes with event horizons”, https://arxiv.org/pdf/gr-qc/9504049.pdf ,* Phys. Rev. D **52**, 4512 – Published 15 October 1995

[4] Ng, Y. Jack, “Holographic foam, dark energy and infinite statistics,” Phys. Lett. B, 657, (2007), pp. 10-14

[5] Ng, Y.Jack,”Article: Spacetime Foam: From Entropy and Holography to Infinite Statistics and Nonlocality” Entropy 2008, 10(4), 441-461; DOI: 10.3390/e10040441

[6]*Newman, Ezra; Janis, Allen (1965). "Note on the Kerr Spinning-Particle Metric". Journal of Mathematical Physics. **6**(6): 915–917. Bibcode:1965JMP.....6..915N. doi:10.1063/1.1704350.*

[7] *Newman, Ezra; Couch, E.; Chinnapared, K.; Exton, A.; Prakash, A.; Torrence, R. (1965). "Metric of a Rotating, Charged Mass". Journal of Mathematical Physics. **6** (6): 918–919. Bibcode:1965JMP.....6..918N. doi:10.1063/1.1704351.*

[8] *Kerr, RP (1963). "Gravitational field of a spinning mass as an example of algebraically special metrics". Physical Review Letters. **11**: 237–238. Bibcode:1963PhRvL..11..237K*

[9] Kerr, R., “The Kerr and Kerr-Shield metrics, “ pp 38-72, in the volume, “The Kerr Spacetime, Rotating Black Holes in General Relativity”, edited by Wilkshire, D., Visser, M. and Scott,S. Cambridge University Press, New York City, New York, USA, 2009

[10] Appell, Math. Ann. xxx (1887) pp. 155–156. Discussed by Whittaker, Edmund and Watson, George. *A Course of Modern Analysis*, page 400 (Cambridge University Press 1927).

[11] Hackmann , E. and Xu , H.. “Charged particle motion in Kerr-Newmann space-times”, https://arxiv.org/pdf/1304.2142.pdf#page=4

[12] Plebasnki , J and Krasinki, A. “An Introduction to General Relativity and Cosmology”, Cambridge University Press, Cambridge, United Kingdom, 2007

[13] Thorne, K., and Blandford, R. “ Modern Classical Physics, “, Princeton University Press, Princeton, New Jersey, USA, 2017

[14] Ryden, B. “Introduction to Cosmology, 2nd edition”, Cambridge University Press, Cambridge, United Kingdom, 2017

[15] Reichl, L, “Modern Course in Statistical Physics”, University of Texas Press, at Austin, Austin, Texas, USA, 1980

[16] Narlikar, J. “ Introduction to Cosmology”, Jones and Barlett Publishers, Boston, Massachusetts, USA, 1983

[17] Penrose, R., " Difficulties with Inflationary Cosmology ", pp 249- 264 of the "Fourteenth Texas Symposium on Relativistic Astrophysics", Annals of the New York Academy of Sciences, Volume 571 , Editor Fenyves, E., Published by the New York Academy of Sciences, 1989, New York, New York, USA

[18] Kieffer, Cl, "Entropy of Gravitational waves and Primordial Fluctuations", pp 499- 504,of Cosmology and Particle physics, CAPP 2000, Verbier, Switzerland 2000, with editors of Duerrer, R, Garcia-Bellido, J. and Shaposhnikov, M. , of AIP conference proceedings 555, Melville, New York, USA, 2001

[19] Park, D. Radiations from a spinning rod," physical review, 99, no. 4, (1955), pp. 1324-1325.

[20] Schneider C., Lippert, T., "Laser Ablation and Thin Film Deposition", pp 89-112 of Laser Processing of Materials, Springer Series in Materials Science book series (SSMATERIALS, volume 139)

[21] Schoenlein, R. et al. Generation of femtosecond X-ray pulses via laser-electron beam interaction. Appl. Phys. B 71, 1–10 (2000).

[22] Beckwith, A. (2017) Variation in Gravity Due to Laser Inducing an Explosion—Comparison with the Spinning Barbell Driven by Lasers. *Journal of High Energy Physics, Gravitation and Cosmology*, **3**, 558-563. doi: 10.4236/jhepgc.2017.34042.

[23] Lightman, A., Press, W., Price, R. and Teukolsky, S. (1975) Problem Book in Relativity and Gravitation. Princeton University Press, Princeton, New Jersey.

[24] Weinberg, S. (1972) Gravitation and Cosmology, Principles and Applications of the General Theory of Relativity. John Wiley & Sons, Inc., New York.

[25] Baker Jr., R.M.L. (2006) Novel Formulation of the Quadrupole Equation for Potential Stellar Gravitational-Wave Power Estimation. Astronomische Nachrichten/Astronomical Notes, 327, 710-713.
http://www.drrobertbaker.com/docs/Astron.%20Notes%20GW%20Article.pdf
https://doi.org/10.1002/asna.200510617

[26] Beckwith, A. and Baker, R. The Generation of Gravitational Waves by Lasers. Proceedings of the Space Technology & Applications International Forum (STAIF II 2015), Albuquerque, New Mexico, 16-18 April 2015, 1-12.

[27] Rindler, W, "Essential Relativity, special, General, and Cosmological", 2nd edition, Springer Verlag, New York City, NY, USA 1977; http://202.38.64.11/~jmy/documents/ebooks/Rindler%202006%20Relativity%20(ISBN%2044198567324).pdf

[28] Peebles, P. "Principles of Physical Cosmology", Princeton University Press, Princeton, New Jersey, USA 1993

[29] Beckwith, A.W. (2017) Part 2: Review of Tokamak Physics to Construct a Device Optimal for Graviton Detection and Generation within a Confined Small Spatial Volume,

as Opposed to Dyson's "Infinite Astrophysical Volume" Calculations. Journal of High Energy Physics, Gravitation and Cosmology, 3, 138-155.

[30] Beckwith, A.W. (2016) Open Question: Could a Causal Discontinuity Explain Fluctuations in the CMBR Radiation Spectrum? Journal of High Energy Physics, Gravitation and Cosmology, 2, 186-208. http://dx.doi.org/10.4236/jhepgc.2016.22018

[31] VALTONEN M. AND KARTTUNEN, H,. "THE THREE-BODY PROBLEM", Cambridge University Press, New York, New York, USA, 2005

[32] A.W. Beckwith, "Structure formation in the Early Universe as a result of non Linear Electrodynamics influencing scale factor size with attendant changes in gravitational potential and its relationship to the 3 body problem.", accepted in JHEPGC, with earlier version in Vixra, as given by http://vixra.org/pdf/1805.0357v1.pdf

[33] Abraham, R. and Marsden, J ,"Mechanics, 2nd edition", Updated 1985 printing, Addison and Wesley, Menlo Park, California, USA, 1985

[34] Calmet, X, Carr, B. and Winstanley, W. "Quantum Black holes", Springer Briefs in physics, Springer Verlag, New York City, New York, USA, 2014

[35] C.S. Camara, M.R. de Garcia Maia, J.C. Carvalho, and J.A.S. Lima, " Nonsingular FRW cosmology and Non Linear dynamics", http://arxiv.org/pdf/astro-ph/0402311.pdf

[36] C. Corda, H. Cuesta "Removing Black Hole singularities with Non Linear Electrodynamics", Modern Physics A, Volume 25, No. 28 (2010), PP 2423-2429

[37] Freeze, K. (1992) Inflation. In: Nath, P. and Reucroft, S., Eds., Particles, Strings, and Cosmology, World Scientific, Singapore, 408-424

[38] Maggiore, M. "Gravitational Waves, Volume 2, Astrophysics and Cosmology", Oxford University Press, Oxford, United Kingdom, 2018

[39] Whittaker, E.," A History of the Theories of Aether and Electricity, two volumes bound as one, Volume 1, Classical theories, and Volume 2, The modern Theories, 1900 to 1926", Dover Publications, Inc. Mineola, New York, USA, 1989.

[40] Alder, R., Bazin, M. and Shiffer, M. , " Introduction to General Relativity, 2nd edition", McGraw – Hill book company, San Francisco, California, USA, 1975

[41] Hajicek, Petr et al. An Introduction to the Relativistic Theory of Gravitation, page 243 (Springer 2008)

[42] Astorino, M., Compere, Oliveri, R., Vandevoorde N. ; "Vandevoorde, N."Mass of Kerr-Newman Black Holes in an external magnetic field", https://arxiv.org/pdf/1602.08110.pdf

[43] Christodoulou, D., and R. Ruffini, R., " Reversible transformations of a charged black hole", Phys. Rev. D4 (1971) 3552-3555.

[44] Thorne, K., Price, R. MacDonald, D. Suen, W , Zhang, X., " Rapidly Rotating Black Holes", pp 67-120, of " Black Holes, the Membrane Paradigm", edited by Thorne, K., Price, R. and MaDonald, D. , of Yale University Press, New Haven, Connecticut, 1986 USA

[45] Yarmana, T., Kholmetskii, , A., Yarman, O., Arikd, M., Yarman, F., "Second law of thermodynamics is ingrained within quantum mechanics", Results in Physics 10 (2018) 818–821

[46] HARTNETT, K. " Mathematicians Disprove Conjecture Made to Save Black Holes", https://www.quantamagazine.org/mathematicians-disprove-conjecture-made-to-save-black-holes-20180517/

[47], Dafermos, M , Luk, J, "The interior of dynamical vacuum black holes I: The $\mathbb{C}^0$ -stability of the Kerr Cauchy horizon: https://arxiv.org/abs/1710.01722

[48] Lloyd, S. "Computational capacity of the universe," *Phys. Rev. Lett.* **88**, 237901 (2002).

[49[Penrose, Roger: "The Question of Cosmic Censorship", Chapter 5 in *Black Holes and Relativistic Stars*, Robert Wald (editor), (1994) (ISBN 0-226-87034-0)

[50] Penrose, Roger: "Singularities and time-asymmetry", Chapter 12 in *General Relativity: An Einstein Centenary Survey* (Hawking and Israel, editors), (1979), see especially section 12.3.2, pp. 617–629 (ISBN 0-521-22285-0)

[51] Shapiro, S. L., and Teukolsky, S. A.: "Formation of Naked Singularities: The Violation of Cosmic Censorship", Physical Review Letters **66**, pp 994-997 (1991)

[52] Wald, Robert, *General Relativity*, pp 299-308 (1984) (ISBN 0-226-87033-2)

[53] Nuckolls, John, "Early Steps Toward Inertial Fusion Energy (IFE)", LLNL, 12 June 1998

[54] Christopher Stolz, "The National Ignition Facility" The world's largest optical system", Optical Design and Testing III, edited by Yongtian Wang, Theo T. Tschudi, Jannick P. Rolland, Kimio Tatsuno Proc. SPIE Vol. 6834, 683402, (2007) ·

[55] Seaver, Lynda; Hirschfeld, Bob (2009-03-06). "NIF's future ignites with 192-beam shot". Lawrence Livermore National Laboratory. Archived from the original on 2010-05-28. Retrieved 2009-04-03.

[56] "The Containment of Underground Nuclear Explosions", Project Director Gregory E van der Vink, U.S. Congress, Office of Technology Assessment, OTA-ISC-414, (Oct 1989).

[57] Teller, E., Talley W, and Gary H. Higgins , G., Johnson, G. "The Constructive Uses of Nuclear Explosives", **McGraw-Hill; First edition (1968), New York City, New York, USA**

[58] *Ray, A. (2004). "Stars as thermonuclear reactors: Their fuels and ashes". arXiv:astro-ph/0405568 [astro-ph].*

[59] Reiners, A.; Basri, G. (March 2009). "On the magnetic topology of partially and fully convective stars". *Astronomy and Astrophysics*. **496**(3): 787–790. arXiv:0901.1659. Bibcode:2009A&A...496..787R. doi:10.1051/0004-6361:200811450

[60] Crowell, L., personal note, sent August 29, 2018

[61] C. Corda, “Effective temperature for black holes,” Journal of High Energy Physics, vol. 2011, no. 8, article no. 101, 2011.

[62] C. Corda, S. H. Hendi, R. Katebi, and N. O. Schmidt, “Hawking radiation-quasi-normal modes correspondence and effective states for nonextremal Reissner-Nordstrom black holes,” ¨ Advances in High Energy Physics, vol. 2014, Article ID 527874, 9 pages, 2014.

[63] C. Corda, “Effective temperature, hawking radiation and quasinormal modes,” International Journal of Modern Physics D, vol. 21, no. 11, 2012.

[64] C. Corda, S. H. Hendi, R. Katebi, and N. O. Schmidt, “Effective state, Hawking radiation and quasi-normal modes for Kerr black holes,” Journal of High Energy Physics, vol. 2013, no. 6, article no. 008, 2013.

[65] C. Corda, “Non-strictly black body spectrum from the tunneling mechanism,” Annals of Physics, vol. 337, pp. 49–54, 2013.

[66] Dao-Quan Sun, Zi-Liang Wang, Miao He, Xian-Ru Hu, and Jian-Bo Deng, “Hawking Radiation-Quasinormal Modes Correspondence for Large AdS Black Holes”, Advances in High Energy Physics Volume 2017, Article ID 4817948, 6 pages https://doi.org/10.1155/2017/4817948; https://arxiv.org/ftp/arxiv/papers/1708/1708.06869.pdf

[67] F J Tipler, C J S Clarke and G F R Ellis, Singularities and horizons: a review article, in: General relativity and gravitation: One hundred years after the birth of Albert Einstein edited by A Held (Plenum Press, New York, 1980) vol. 2, p. 97

[68] Hawking, Stephen; Ellis, G. F. R. (1973). The Large Scale Structure of Space-Time. Cambridge: Cambridge University Press. ISBN 0-521-09906-4.

[69] Gödel, K., "An Example of a New Type of Cosmological Solutions of Einstein's Field Equations of Gravitation", *Rev. Mod. Phys.* **21**, 447, published July 1, 1949.

[70] Penrose, Roger: "Gravitational collapse: The role of general relativity", Riv. Nuovo Cim. 1 (1969) 252-276

[71] Penrose, Roger: "The Question of Cosmic Censorship", Chapter 5 in *Black Holes and Relativistic Stars*, Robert Wald (editor), (1994) (ISBN 0-226-87034-0)

[72] Penrose, Roger: "Singularities and time-asymmetry", Chapter 12 in *General Relativity: An Einstein Centenary Survey* (Hawking and Israel, editors), (1979), see especially section 12.3.2, pp. 617–629 (ISBN 0-521-22285-0)

[73] Shapiro, S. L., and Teukolsky, S. A.: "Formation of Naked Singularities: The Violation of Cosmic Censorship", Physical Review Letters **66**, 994-997 (1991)

[74] Stephani, Hans; Kramer, Dietrich; MacCallum, Malcolm; Hoenselaers, Cornelius; Herlt, Eduard (2003). Exact Solutions to Einstein's Field Equations (2nd ed.). Cambridge: Cambridge University Press, Cambridge, UK. . *ISBN 0-521-46136-7.* See *section 12.4* for the uniqueness theorem.

[75] Crowell, L., personal note, sent August 30, 2018

[76] Haliday, D., Resnick, R., Walker, J, "Fundamentals of Physics, Volume 1, 6th edition", John Wiley and Sons, Hoboken, New York, USA, 2001

[77]; Beckwith, A.W. (2016) Linkage of Classical Mechanical (CM) Geometry (3 Dimensional) and Quantum Mechanical (QM) Geometry (2 Dimensional) via Hopf Mapping and Its Implications for Relic Gravitational Wave (GW) Power Production. Journal of High Energy Physics, Gravitation and Cosmology, 2, 447-456.

[78] G L. Borsten, M. Duff and P. Levay,' The Black hole/qubit correspondence; an up-to-date review", Class.Quantum.Grav.29(2012) 224008 (80 pp)

[79] Beckwith, A. (2015) How Graviton Power Values and a Graviton Count from the Electroweak Era, Give Strain and Heavy Gravity Values. In: Dumarchez, J., Fontaine, G., Klima, B. and Van, J.T.T., Eds., The Inaugural Confrence on ICISE "Windows to the Universe" under the Patronage of "Annee France-Vietnam 2013-2014" under the High Patronage of UNESCO, The Gioi Publishers, Hanoi, 411-412. http://vixra.org/abs/1308.0110

[80] Vitor Cardoso, Oscar J. C. Dias, Jose' P. S. Lemos, Shijun Yoshida "The black hole bomb and superradiant instabilities", Phys.Rev.D70:044039,2004; Erratum-ibid.D70:049903,2004,

https://arxiv.org/abs/hep-th/0404096

[81] Fangyu Li, , R.M.L. Baker Jr. , Zhenyun Fang, , G.V. Stephenson; and Zhenya Chen; "Perturbative photon fluxes generated by high-frequency gravitational waves and their physical effects", The European Physical Journal C, August 2008, Volume 56, Issue 3, pp 407–423; https://arxiv.org/abs/0806.1989

[82] Dowker, F., "Causal sets and the deep structure of space-time," in *100 Years of Relativity, Space-Time Structure: Einstein and Beyond*, with Abhay Akshtekar, editor, World Press Scientific, P.T.E., Republic of Singapore, Singapore, 2005, pp. 445-464, arXIV gr-qc/0508109v1 (26 Aug 2005).

[83] Barvinsky, A., Kamenschick, A., and Yu, A., " Thermodynamics from Nothing: Limiting the Cosmological Constant Landscape," *Phy Rev D* **74** 121502, Rapid communications (19 December 2006)

[84] Beckwith, A.W. (2016) Can Thermal Input from a Prior Universe Account for Relic Graviton Production? Implications for the Cosmological Landscape. Journal of High Energy Physics, Gravitation and Cosmology, 2, 344-361. http://dx.doi.org/10.4236/jhepgc.2016.23032

[85] *Beckwith, A.W., "Analyzing Black Hole Super-Radiance Emission of Particles/Energy from a Black Hole as a Gedankenexperiment to Get Bounds on the Mass of a Graviton",* Advances in High Energy Physics Volume 2014, Article ID 230713, 7 pages http://dx.doi.org/10.1155/2014/230713

[86] Beckwith, Andrew Walcott, "Geddanken Experiment for Quark Star Idea, Quantum Wavelength Limit, Minimum Time, and Early Universe Temperature, from First Principles," Journal of High Energy Physics, Gravitation and Cosmology, vol. 02, no. 04, pp. 478–485, 2016. View at Publisher · View at Google Scholar

[87] Beckwith Andrew Walcott , "Using a Multiverse Version of Penrose Cyclic Conformal Cosmology to Obtain Ergodic Mixing Averaging of Cosmological Information Transfer to Fix H Bar (Planck's Constant) in Each New Universe Created during Recycling of Universes Due to CCC, Multiverse Style," Journal of High Energy Physics, Gravitation and Cosmology, vol. 02, no. 04, pp. 506–511, 2016. View at Publisher ·View at Google Scholar

[88] Beckwith Andrew Walcott, "Examination of a Multiple Universe Version of the Partition Function of the Universe, Based upon Penrose's Cyclic Conformal Cosmology. Leading to Uniform Values of h bar (Planck's Constant) and Invariant Physical Laws in Each Universe of the "Multiverse"," Journal of High Energy Physics, Gravitation and Cosmology, vol. 02, no. 04, pp. 571–580, 2016. View at Publisher · View at Google Scholar

[89] Beckwith, Andrew Walcott, "Pre-Octonionic to Octonionic Gravity and Could Kinetic Energy Be Larger than Potential Energy before Inflation?," Journal of High Energy Physics, Gravitation and Cosmology, vol. 03, no. 04, pp. 693–707, 2017. View at Publisher · View at Google Scholar

[90] Beckwith, Andrew Walcott , "The Transition from Pre-Octonionic to Octonionic Gravity and How It May Be Pertinent to a Re-Do of the HUP for

Metric Tensors," Journal of High Energy Physics, Gravitation and Cosmology, vol. 03, no. 04, pp. 727–753, 2017. View at Publisher · View at Google Scholar

[91] B. P. Abbott *et al.* (LIGO Scientific Collaboration and Virgo Collaboration);" *Observation of Gravitational Waves from a Binary Black Hole Merger",* Phys. Rev. Lett. **116**, 061102 – Published 11 February 2016

[92] B. P. Abbott *et al.* (LIGO Scientific Collaboration and Virgo Collaboration) *"GW151226: Observation of Gravitational Waves from a 22-Solar-Mass Binary Black Hole Coalescence"* Phys. Rev. Lett. **116**, 241103 – Published 15 June 2016

[93] B. P. Abbott *et al.* (LIGO Scientific Collaboration and Virgo Collaboration) *"GW170104: Observation of a 50-Solar-Mass Binary Black Hole Coalescence at Redshift 0.2";* Phys. Rev. Lett. **118**, 221101 – Published 1 June 2017

[94] Corda, C. "**Interferometric detection of gravitational waves: the definitive test for General Relativity"; Int. J. Mod. Phys. D18:2275-2282,2009; https://arxiv.org/abs/0905.2502**

[95] Barcelo, C., and Visser, M., "Transversable Wormholes from massless conformally coupled scalar fields," *Phys Lett B*, 15123 (1999).

[96] Visser, M, "Sakarov's Induced gravity: A modern Perspective," arXIV gr-qc/ 0204062 (April 15, 2002).

[97] Sterman, George, YITP, Stony Brook , "Introduction to the Parton Model and Perturbative QCD", CTEQ school lecture, as given in http://www.hep.wisc.edu/cteq11/lectures/sterman_CQ11S_part_I_07.10.11.pdf

[98] Mueller,A.H., Perturbative Quantum Chromodynamics (World Scientific, Singapore, 1989).

[99] . Greene , B., Samir D. Mathur, S., O'Neill, C.," Eluding the no-hair conjecture: Black holes in spontaneously broken gauge theories", **Phys.Rev. D47 (1993) 2242-2259,** https://arxiv.org/abs/hep-th/9211007

[100] Crowell, L, in private e mail to the author, September 1st, 2018

[101] S. Coleman, J. Preskill, and F. Wilczek," Quantum Hair on Black Holes Nucl.Phys. B 378(1992), 175.' https://arxiv.org/abs/hep-th/9201059

[102] Bhattacharya, Sourav; Lahiri, Amitabha (2007). "No hair theorems for positive Λ". *Physical Review Letters*. **99** (20). arXiv:gr-qc/0702006. Bibcode:2007PhRvL..99t1101B

[103] Wald, Robert M. (1984). *General Relativity*. Chicago: The University of Chicago Press. pp. 158, 312–324. ISBN 978-0-226-87032-8

[104] Park, D.K., Kim, H., and Tamarayan, S., "Nonvanishing Cosmological Constant of Flat Universe in Brane world Senarios," *Phys. Lett. B* **535**, 5-10 (2002).

[105] Misner, Charles W.; Thorne, Kip S.; The Estate of Wheeler, John Archibald (2017). *Gravitation*. Princeton University Press, ,Princeton, New Jersey, USA, See page 863

[106] Carroll, S., Chatwin-Davies, A., "Cosmic equilibration: A holographic no-hair theorem from the generalized second law",
Physical Review D, Volume 97, Issue 4, id.046012 (PhRvD Homepage)
https://arxiv.org/abs/1703.09241

[107] Mavromatos, N., "Eluding the No-Hair Conjecture for Black Holes" **Oxford preprint OUTP-96-28P,**

https://arxiv.org/abs/gr-qc/9606008

[108] Heusler M. "No-Hair Theorems and Black Holes with Hair" ,
https://cds.cern.ch/record/312731/files/9610019.pdf

[109] Israel W. (1967), "Event Horizons in Static Vacuum Space-Times"
Phys. Rev. 164: 1776

[110] Hajicek, P.," An Introduction to the Relativistic Theory of Gravitation", Lecture Notes in Physics, 750, Springer Verlag, Berlin, Federal Republic of Germany, 2008

[111] Beckwith, A.W. (2016) Using a Multiverse Version of Penrose Cyclic Conformal Cosmology to Obtain Ergodic Mixing Averaging of Cosmological Information Transfer to Fix H Bar (Planck's Constant) in Each New Universe Created during Recycling of Universes Due to CCC, Multiverse Style. Journal of High Energy Physics , Gravitation and Cosmology,
2, 506-511.
http://dx.doi.org/10.4236/jhepgc.2016.24044

Appendix A, B, and C

Appendix A, the Super radiance paper (i.e. how we avoid Super radiance): **THIS PAPER HAS NEVER BEEN PUBLISHED!**

"Refining black hole physics to obtain Planck's constant from information shared from cosmological cycle to cycle (avoiding super-radiance)"

A. Beckwith[1]
Chongqing University *Department of Physics: Chongqing University*,

[1] To whom any correspondence should be addressed.

Chongqing , PRC , 400044

E-mail: abeckwith@uh.edu

Abstract. Padmanabhan elucidated the concept of super radiance in black hole physics which would lead to loss mass of a black hole, and loss of angular momentum due to infall of material into a black hole. As Padmanabhan explained it, to avoid super radiance, and probable break down of black holes, from infall, one would need infall material frequency, divided by mass of particles undergoing infall in the black hole to be greater than the angular velocity of the black hole event horizon in question. We should keep in mind we bring this model up to improve the chance that Penrose's conformal cyclic cosmology will allow for retention of enough information for preservation of Planck's constant from cycle to cycle, as a counterpart to what we view as unacceptable reliance upon the LQG quantum bounce and its tetrad structure to preserve memory . In addition we are presuming that at the time of z=20 in red shift that there would be roughly about the same order of magnitude of entropy as number of operations in the electro weak era, and that the number of operations in the z=20 case is close to the entropy at redshift z=0 . Finally we have changing Λ with the result that after redshift =20 there is a rapid collapse to the present day vacuum energy value. I.e. by z=12 likely Λ the same as today which would be about when Galaxies form**.**

1.**Introduction**

We start with the premise that LQG tetrad structure will in itself not be sufficient to preserve cosmological memory from cosmological cycle to cycle. Appendix A outlines how we view the well intentioned LQG memory preservation program and the alternative, a refinement of the conformal cyclic cosmology program of Penrose which will make use of refining the concept of super radiance and how to avoid it, so as to heighten the chance of preserving cosmological 'memory' from one cycle of creation to another One of the candidates for memory transfer would be given by data as supplied by Natarajan in GR 20 in pre galactic black holes formed at about z = 20 to z=12 (red shift) times by super massive black holes at least 500 times the mass of our star, Sol. The candidate for information inflow into the initially massive black holes as we choose it would be manifest in relic gravitational waves. To quantify infall into these primordial black holes we will represent GW by massive gravitons , with the mass of a graviton as given by

$$-3m_{graviton}^{2}h = \frac{\kappa}{2}\cdot T \tag{1}$$

Our work uses Visser's [1] analysis of non zero graviton mass for both T and h.

Furthermore, his version of $g_{uv} = \eta_{uv} + h_{uv}$ can be written as setting

$$h_{uv} \equiv 2\frac{GM}{r}\cdot\left[\exp\left(\frac{-m_g r}{\hbar}\right)\right]\cdot\left(2\cdot V_\mu V_\nu + \eta_{uv}\right) \tag{2}$$

If one adds in velocity 'reduction' put in with regards to speed propagation of gravitons[1]

$$v_g = c\cdot\sqrt{1-\frac{m_g^2\cdot c^4}{\hbar^2\omega_g^2}} \tag{3}$$

One can insert all this into Eq. (1) to obtain a real value for the square of frequency > 0, i.e.

Kim's article [5] is with regards to Gravitons in brane / string theory, but it is likely that the same dynamic for semi classical representations of a graviton with mass.

2. Conditions allowing for recycling of Planck's constant in Penrose's cyclic universe model revisited

The main methodology in the Penrose proposal has been in Eq. (4) evaluating a change in the metric g_{ab} by a conformal mapping $\hat{\Omega}$ to

$$\hat{g}_{ab} = \hat{\Omega}^2 g_{ab} \tag{4}$$

Penrose's suggestion has been to utilize the following

$$\hat{\Omega} \xrightarrow[ccc]{} \hat{\Omega}^{-1} \tag{5}$$

Infall into cosmic black hopes has been the main mechanism which the author asserts would be useful for the recycling apparent in Eq.(5) above with the caveat that $\hbar$ is kept constant from cycle to cycle as represented by

$$\hbar_{old-\text{cosmology}-cycle} = \hbar_{present-\text{cosmology}-cycle} \tag{6}$$

What would be crucial in doing both Eq. (5) and Eq.(6) would be in specifying how massive black holes as of at least 500 times the mass of the sun, i.e. 500 $M_{\odot}$, large mass of a black hole formed between z=20 and z=12 redshifts i.e before galaxy formation, would tend toward conditions for which Eq. (6) could be fulfilled. We do this by looking at details for $\hat{\Omega}$ satisfied by information gathering which we bring up now.

2a. Necessary construction details for the mapping $\hat{\Omega}$

The procedures for giving linkage to a formulation of $\hat{\Omega}$ means that one must consider basic constructions given by Penrose as to his ccc proposal which we will outline below , namely that one has

$$\begin{aligned}
&E = 8\pi \cdot T + \Lambda \cdot g \\
&E = source \quad for \quad gravitational \quad field \\
&T = mass \quad energy \quad density \\
&g = gravitational \quad metric \\
&\Lambda = vacuum \quad energy, rescaled \quad as \quad follows
\end{aligned} \tag{7}$$

$$\Lambda = c_1 \cdot [Temp]^{\beta} \tag{8}$$

For an invariant E for cycle to cycle no matter what Eq. (8) gives us, this leads to the following statement as to a formulation of $\hat{\Omega}$ I.e.

$$E\big|_{initial} = E\big|_{final} \Leftrightarrow \Lambda \cdot g\Big|_{initial} = \Lambda \cdot g\big|_{final}$$
$$\Lambda \cdot g\big|_{final} = \left(\Lambda\big|_{final}\right) \cdot \hat{\Omega}^2 \cdot \left(g_{ab}\big|_{initial}\right) \tag{9}$$

I.e. is this possible ? Only if there are very small initial wavelengths at/ before the electro weak regime. I.e. a wave length perhaps as small as Planck length. The problem is that in doing so, and this appears to be intuitive and obvious, something which is contradicted by Durrer's [7] treatment of early universe plasma waves generating early universe GW. We then state for hypothesis that if N is a numerical count which has lead us to hypothesize using

$$\hat{\Omega} \propto S_{entropy} \sim N \tag{10}$$

3. Information infall into early universe black holes and the problem of avoiding Super-radiance

Note that Beckwith[8] has used Y. Ng's [9] counting algorithm with regards to entropy, and non zero mass (massive) gravitons , where $S \approx N \cdot \left(\log\left[V/\lambda^3\right] + 5/2\right) \approx N$. Furthermore, making an initial count of gravitons with $S \approx N \sim 10^7$ gravitons, with Seth Lloyd's[10] $I = S_{total}/k_B \ln 2 = [\#operations]^{3/4} \sim 10^7$ as implying at least one operation per unit graviton, with gravitons being one unit of information, per produced graviton. **Note,** Smoot [11]gave initial values of the operations as

$$[\#operations]_{initially} \sim 10^{10} \tag{11}$$

The number of operations, if tied into bits of 'information' may allow for space time linkages of the following value of the fine structure constant, as from a prior to a present universe, once initial conditions of inflation may be examined experimentally, i.e. looking at inputs into[8], i.e. The fine structure constant given in [8], which has presumably the value of

$$\tilde{\alpha} \equiv e^2/\hbar \cdot c \equiv \frac{e^2}{d} \times \frac{\lambda}{hc} \tag{12}$$

As of the electroweak era

$$S_{entropy}\Big|_{ew} \sim N \sim 10^{53}\Big|_{ew} \propto [\#operations]^{3/4}\Big|_{ew}$$
$$\Leftrightarrow [\#operations]\big|_{ew} \sim 10^{71} \tag{13}$$

We are presuming that at the time of z=20 in red shift that there would be roughly about the same order of magnitude of entropy as number of operations in the electro weak era, and that the number of operations in the z=20 case is close to the entropy at redshift z=0

$$
\begin{aligned}
& S_{entropy}\Big|_{redshift=20} \sim N \sim 10^{67}\Big|_{redshift=20} \\
& \propto \left[\#operations\right]^{3/4}\Big|_{redshift=20} \\
& \Leftrightarrow \left[\#operations\right]\Big|_{redshift=20} \sim 10^{89}
\end{aligned}
\tag{14}
$$

After this is done it is useful to note that the number of operations as to the redshift =20 at the formation of the first set of super massive black holes would be about the same as entropy today which the author views as no accident. I.e. the number of super massive black holes is at least 100,000 or more with a mass of at least $\left(10^{2}-10^{5}\right)\cdot M_{\odot} \sim$ one hundred to ten thousand times the mass of the sun Then there could be an infall of less than $10^{84}-10^{87} operations/black-hole$ .After this is done, note that the particle infall per black hole is less than 10^{62} value. Interstellar space has 2.73 Kelvin and was only semi hotter at a red shift at z=20. The situation then is that a black hole five times the mass of the sun would have a temperature 12x10^{-9}Kelvin , and that could easily drop to about 10^{-11} Kelvin, which is about the temperature for a black hole 20-50 times the mass of the sun, and that due to

$$
T_{BH} = \frac{\hbar c^{3}}{8\pi kGM}
\tag{15}
$$

Then the next step would be to look at the resulting temperature differential flowing into the black hole which would be

$$
\Delta T\Big|_{near-BH} = T_{Background} - T_{BH} \sim 10^{\alpha}\, Kelvin \geq 2.73 Kelvin
\tag{16}
$$

We look at a black hole of would be mass $10^{22}\,Kg \propto 10^{58}\,eV/c^{2}$, mass of this value would be for a black hole having the temperature given in Eq.(15), leading to if each graviton having $10^{-29}\,eV/c^{2}$ number of gravitons of about 10^{87} gravitons; then leading to for 1000 super massive black holes an intake of $\sim 10^{90} \sim later-entropy$ value into 100-1000 black holes. This is close to the present value of entropy today and is similar to values given by Lloyd as to the entropy of the present universe, which we do not think is an accident. Therefore, the inflow of heat into 100-1000 pre galactic black holes which is a thermal energy, as given by 100-1000 super massive early black holes is equivalent to $10^{90} \sim later-entropy$ equivalent. Also the value of about $10^{84}-10^{87} operations/black-hole$, we look at less than or equal values of the number of operations set up to be processed as given by the electroweak era to be eventually generating approximately a $10^{90} \sim later-entropy$ numerical count as created about z=20 , which again we think is no accident.

4. A way to create conditions for Planck value from cycle to cycle, while tackling the problem of super radiance and black hole physics as of about z= 20 and making sense of $\hat{\Omega}$

To do this note that $\hat{\Omega}$ we write as proportional to entropy, specifically because of $\Lambda \cdot g\big|_{final} = \left(\Lambda\big|_{final}\right) \cdot \hat{\Omega}^2 \cdot \left(g_{ab}\big|_{initial}\right)$; we write entropy as given by Cai as , if $S \sim r_{\oplus}{}^2$ and $r_{\oplus}$ is the radius of the black hole horizon, then if M is the mass of a black hole

$$S \le N = 3\pi G^{-1}/\Lambda \Leftrightarrow \hat{\Omega} \sim 3\pi G^{-1}/\Lambda \Leftrightarrow S_{BH} \approx M^2 \tag{17}$$

Also for the angular velocity, as given by $\Omega_H \sim 1/r_{\oplus}$

$$\Omega_H \sim 1/r_{\oplus} \propto 1/\sqrt{S} \propto 1/\sqrt{N} \propto 1/\sqrt{Temp^{\beta}} \tag{18}$$

We write the angular velocity as intertwined into Padmanabhlan's description of super radiance by noting that for infall into a black hole creating instability and loss of angular momentum for the black hole we would have super radiance for frequency and for mass of an infalling particle into a black hole

$$0 < \omega_{particles}/\tilde{m} < \Omega_H \tag{19}$$

To avoid super radiance, we would have, conversely

$$\omega_{particles}/\tilde{m} > \Omega_H \tag{20}$$

Or

$$\omega_{particles} > \tilde{m}/\sqrt{N} \tag{21}$$

The frequency of incoming particles allowing for stable black holes would be extremely low, ie almost any gravitational radiation and graviton infall into Penrose mandated black holes would do it. If one looks at the contribution of four and five dimensional black holes to entropy, with L being the dimension of a fifth dimension we obtain

$$S_{BH}\big|_{4D} = 4\pi M^2 \tag{22}$$

$$S_{BH}\big|_{5D} = 4\pi M^2 \cdot \sqrt{8L/27\pi M} \tag{23}$$

The outcome would be to have for five dimensional black holes no super radiance if

$$\omega_{particles}\big|_{5D} > \left(\tilde{m}/\sqrt{N}\right) \cdot \left(27\pi M/8L\right)^{1/4} \tag{24}$$

The frequency goes down as L increases in size.

4. a: black hole physics as of about z= 20 and making sense of $\hat{\Omega}$

We also can write

$$\omega_{particles}\big|_{5D} > \left(\tilde{m}/\sqrt{\hat{\Omega}}\right) \cdot \left(27\pi M/8L\right)^{1/4} \tag{25}$$

From $\hat{\Omega}$ and $\hat{\Omega} \sim 3\pi G^{-1}/\Lambda$ and $\Lambda = c_1 \cdot [Temp]^{\beta}$, and making use of the relations $T_{BH} = \frac{\hbar c^3}{8\pi kGM}$, $\Delta T|_{near-BH} = T_{Background} - T_{BH}$, due to $\hbar$ in the relations we are able to ascertain per black hole

$$\hbar|_{per-BH} \propto \Delta T[background - BH] \cdot (8\pi kGM_{eff}/c^3) \tag{26}$$

Also if at z=20 there is the number of $N_{z=20BH}$ black holes at z=20, the contribution to $\hbar_{old-\text{cosmology}-cycle} = \hbar_{present-\text{cosmology}-cycle}$ then can be said to be

$$\hbar|_{z=20} \propto N_{z=20BH} \cdot \Delta T[background - BH] \cdot (8\pi kGM_{eff}/c^3) \tag{27}$$

We also look then at the value of $\hat{\Omega}$ at z= 20 and get from Eq. 27

$$\Omega|_{redshift=20} \sim N \sim 10^{67}|_{redshift=20} \tag{28}$$

And we keep in mind that

$$\left[\Omega|_{redshift=20} \sim N \sim 10^{67}|_{redshift=20}\right] \cdot \Lambda_{redshift=20} = \left[\Omega|_{redshift=0} \sim N \sim 10^{89}|_{redshift=0}\right] \cdot \Lambda_{redshift=0} \tag{29}$$

The above hypothesizes changing Λ with the result that after redshift =20 there is a rapid collapse to the present day vacuum energy value. Ie by z=12 likely Λ the same as today which would be about when Galaxies form.

Appendix A(of appendix A, this paper) : The generalized Stress Energy component of GR considered. Which part we evaluate.

To do this we look at, from [12] a GR Einstein stress energy tensor we write as, with u_a the four vector velocity. Also, ρ is the relativistic energy density, q_a the relativistic momentum density, and p is pressure, and π_{ab} the relativistic anisotropic stress tensor due to viscosity, magnetic fields. ρ has a gravitational radiation component . Effectively, Eq. (A1) has $\rho = \rho_{GW} + \rho_{Everything-else}$ such that

$$\begin{aligned} &T_{ab} = \rho u_a u_b + q_a u_b + u_a q_b p h_{ab} + \pi_{ab} \\ &\Leftrightarrow T_{ab} = T_{GW/Gravtitons} + T_{everthing-else} \end{aligned} \tag{A1}$$

References

1. M. Visser, http://arxiv.org/pdf/gr-qc/9705051v2

2. 2 B. H. Lavenda and J. Dunning-Davies,"Qualms concerning the inflationary scenario", Foundation of physics letters, Volume 5, number 2, 1990; http://milesmathis.com/dunning.pdf
3. R. C. Tolman,"Relativity and Cosmology",Clarion press, Oxford, UK, 1934
4. M. Maggiore, *Gravitational Waves , Volume 1 : Theory and Experiment*, Oxford Univ. Press(2008).
5. J. Y. Kim, http://arxiv.org/pdf/hep-th/0109192v3
6. A. Beckwith, http://vixra.org/abs/1006.0027
7. R. Durrer, http://arxiv.org/pdf/1303.7121.pdf; R. Durrer, Massimiliano Rinaldi , Phys.Rev.D79:063507,2009, http://arxiv.org/abs/0901.0650
8. A. Beckwith, http://journalofcosmology.com/BeckwithGraviton.pdf
9. Y. Ng, Entropy 2008, 10(4), 441-461; DOI: 10.3390/e10040441
10. S. Lloyd, Phys. Rev. Lett. 88, 237901 (2002).
11. G. Smoot, http://chalonge.obspm.fr/Paris07_Smoot.pdf.
12. G. Ellis, R. Maartens, and M.A. H. MacCallum;"Relativistic Cosmology", Cambridge University press,2012,Cambridge, U.K

APPENDIX B,

SETH LLOYD'S UNIVERSE AS A QUANTUM COMPUTER MODEL WITH MODIFICATIONS

We use the formula given by Seth Lloyd (2002) [48]]that defines the number of operations the "Universe" can "compute" during its evolution. Lloyd (2002)[48]] uses the idea attributed to Landauer that the universe is a physical system with information processed over its evolutionary history. Lloyd also cites a prior paper where he attributes an upper bound to the permitted speed a physical system can have in performing operations in lieu of the Margolis/ Levitin theorem. He specifies a quantum mechanically given upper limit value (assuming E is the average energy of the system above a ground state value), obtaining a **first limit** of a quantum mechanical average energy bound value of

$$\left[\#operations/\sec\right] \le 2E/\pi\hbar \qquad (1)$$

The **second limi**t to this number of operations is strictly linked to entropy, due to considerations of limits to memory space, which Lloyd writes as

$$\left[\#operations\right] \le S(entropy)/\left(k_B \cdot \ln 2\right) \qquad (2)$$

The **third limit,** based on strict considerations of a matter-dominated universe, relates the number of allowed computations (operations) within a volume for the alleged space of a universe (horizon). Lloyd identifies this space-time volume as $c^3 \cdot t^3$, with *c* the speed of light, and *t* an alleged time (age) for the universe . We further identify $E(energy) \sim \rho \cdot c^2$, with ρ as the density of matter, and $\rho \cdot c^2$ as the energy density (unit volume). This leads to

$$\left[\#operations/\sec\right] \le \rho \cdot c^2 \times c^3 \cdot t^3 \qquad (3)$$

We then can write this, if $\rho \sim 10^{-27} kil/meter^3$ and time as approximately $t \sim 10^{10}\, years$. This leads to a present upper bound of

$$\left[\#operations\right] \approx \rho \cdot c^5 \cdot t^4 \le 10^{120} \qquad (4)$$

Lloyd further refines this to read[48]

$$\#operations = \frac{4E}{\hbar} \cdot \left(t_1 - \sqrt{t_1 t_0}\right) \approx \left(t_{Final}/t_P\right) \le 10^{120} \qquad (5)$$

We assume that $t_1 =$ final time of physical evolution, whereas $t_0 = t_P \sim 10^{-43}$ seconds and that we can set an energy input by assuming, in early universe conditions, that $N^+ \neq \varepsilon^+ << 1$, and $0 < N^+ < 1$. So that we are looking at a graviton-burst-supplied energy value of

$$E = (V_{4-Dim}) \cdot \left[\rho_{Vac} = \frac{\Lambda}{8\pi G} \right] \sim N^+ \cdot \left[\rho_{graviton} \cdot V_{4-vol} \approx \hbar \cdot \omega_{graviton} \right] \tag{6}$$

Furthermore, assuming the initial temperature is within the range of $T \approx 10^{32} - 10^{29}$ Kelvin, we have a Hubble parameter defined along the route specified by Lloyd[48]. This is in lieu of time $t = 1/H$, a horizon distance defined as $\approx c/H$, and a total energy value within the horizon as

$$\text{Energy (within the horizon)} \approx \rho_C \cdot c^3 / \left(H^4 \cdot \hbar \right) \approx 1/\left(t_P^2 \cdot H \right) \tag{7}$$

And this for a horizon parameter Lloyd (2002) defines as[48]

$$H = \sqrt{8\pi G \cdot \left[\rho_{crit} \right] / 3 \cdot c^2} \tag{8}$$

And a early universe

$$\rho_{crit} \sim \rho_{graviton} \sim \hbar \cdot \omega_{graviton} / V_{4-Vol} \tag{9}$$

Then

$$\begin{aligned} \# operations &\approx 1 / \left[t_P^2 \cdot H \right] \approx \sqrt{V_{4-Vol}} \cdot t_P^{-2} \Big/ \sqrt{\left[8\pi G \hbar \omega_{graviton} / 3c^2 \right]} \\ &\approx \left[3 \ln 2 / 4 \right]^{4/3} \cdot \left[S_{Entrophy} / k_B \ln 2 \right]^{4/3} \end{aligned} \tag{10}$$

Appendix C,
The Black hole has no hair conjecture and the future of information theory connected with black hole physics

In examining this supposition, we first ask the readers to consider the supposition that black hole solutions of the Einstein-Maxwell equations of gravitation and electromagnetism can be characterized by only three *externally* observable classical parameters: mass, electric charge, and angular momentum. And that all other information of space time ‘matter-energy’ will then thereby disappear behind the event hole horizon and is not accessible to external observers. This is brought up in [102] even in the case of positive cosmological constants, and is applicable as to the situation given in [103]. Even if we have a modified situation of brane world physics, we can then use [104] and [105], which is also linked to [106] by Carroll et.al.

Note that in [107] we appear to have two ways out of this conjecture. Non Abelian structure, or curvature in higher dimensional space time.

This is what will be sought out to be confirmed, or falsified in our investigations. Note that Israel established the following, from [108], page 20 of this link

Quote:

The Israel Theorem This celebrated theorem establishes that all static black hole solutions of Einstein's vacuum equations are spherically symmetric [20]. Israel was able to obtain this result { and its extension to electrovac spacetimes { by considering a particular foliation of the static 3- dimensional hypersurface Σ *}*

This reference [20] in [108] is actually our [109] which has the following abstract

The following theorem is established. Among all static, asymptotically flat vacuum space-times with closed simply connected equipotential surfaces g_{00}=constant, the Schwarzschild solution is the only one which has a nonsingular infinite-red-shift surface g_{00}=0. Thus there exists no static asymmetric perturbation of the Schwarzschild manifold due to internal sources (e.g., a quadrupole moment) which will preserve a regular event horizon. Possible implications of this result for asymmetric gravitational collapse are briefly discussed.

We do not have, in our Kerr Newman black hole anything remotely spherically symmetric, and in fact, the impingement of external laser beams, or say an explosion generated by atomic weapons, or other means would definitely lead to anything but spherical symmetry, nor could we expect to have the highly simplified version of black hole mass, as given in [108] via what is called on page 23 of [108] An Electrovac Bogomol'nyi Equation which is given as Eq. 12.1 of page23 yields

$$
\begin{aligned}
&\mathrm{M}^2 = \left[\frac{\kappa \mathrm{A}}{4\pi}\right]^2 + \mathbb{Q}^2 + \mathrm{P}^2 \\
&\mathrm{M} = black-hole-mass \\
&\mathrm{A} = surface-area-BH \\
&\mathbb{Q} = electric-ch\arg e \\
&\mathrm{P} = Magnetic-ch\arg e \\
&\Rightarrow T_H = Hawking-temp = \frac{2}{\mathrm{A}} \cdot \sqrt{\mathrm{M}^2 - \mathbb{Q}^2 - \mathrm{P}^2}
\end{aligned} \tag{1}
$$

In the situation we outlined for our problem, we do not have spherical symmetry, and our electric field is missing so as to approximately have initially no real electric field contribution so to first order we would write instead a modification of Eq. (12.1) of page23 of [108] where we are still assuming 21]. Here we present a systematic approach to divergence identities for electrovac black hole configurations with nonrotating horizon

$$
\begin{aligned}
&\mathrm{M}^2 = \left[\frac{\kappa \mathrm{A}}{4\pi}\right]^2 + \mathbb{Q}^2 + \mathrm{P}^2 \\
&\mathrm{M} = black-hole-mass \\
&\mathrm{A} = surface-area-BH \\
&\mathbb{Q} = electric-ch\arg e = 0 \\
&\mathrm{P} = Magnetic-ch\arg e \\
&\Rightarrow T_H = Hawking-temp = \frac{2}{\mathrm{A}} \cdot \sqrt{\mathrm{M}^2 - \mathrm{P}^2}
\end{aligned} \tag{2}
$$

In a net sense, this would raise the effective Hawkings temperature and then we would compare this with the Eq.(17) of the main text we re;produce as

$$
\begin{aligned}
&T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M}-\omega\right)} \cong T_{applied} \\
&if\, \omega = \omega_{GW} \\
&\tilde{M} = 'mass-induced-black-hole \\
&\omega_{Laser-light} = frequency-of-laser \\
&W_{Laser-light} = Laser-light-power \\
&h \sim GW-strength = \left(\frac{\hbar\omega_{GW}}{4\pi\omega_{Laser-light}W_{Laser-light}}\right)^{1/2}
\end{aligned}
\tag{3}
$$

Eq. (2) is assuming a very high level of symmetry, or near symmetry, whereas Eq. (3) has a temperature dependence given by conditions not necessarily dependent upon symmetry whereas we do not have to have a non rotating horizon, and we then have to compare

$$
\begin{aligned}
&\mathrm{M}^2 = \left[\frac{\kappa \mathrm{A}}{4\pi}\right]^2 + \mathbb{Q}^2 + \mathrm{P}^2 \\
&\mathrm{M} = black-hole-mass \\
&\mathrm{A} = surface-area-BH \\
&\mathbb{Q} = electric-ch\arg e = 0 \\
&\mathrm{P} = Magnetic-ch\arg e \\
&\Rightarrow T_H = Hawking-temp \\
&= \frac{2}{\mathrm{A}} \cdot \sqrt{\mathrm{M}^2 - \mathrm{P}^2} - (for-non-rotating-BH) \\
&versus \\
&T_E(\omega) \equiv \frac{1}{4\pi\left(2\tilde{M}-\omega\right)} - (for-rotating-BH) \\
&\omega = emitted-radiation-frequency \\
&\tilde{N} = \#-of-quanta \\
&\tilde{M} \approx Black-hole-mass \\
&\omega = frequency-emitted-radiation
\end{aligned}
\tag{4}
$$

The mass dependence in these situations, corresponding to rotating and non rotating black holes, and the respective temperatures are completely different.

I.e. we argue that in the case of not necessarily close to spherically symmetric, rotating black holes, as we have outlined, that we may via the arguments given in [108] be seeing marked differences. The differences between the top and bottom temperature dependences which show up here have to be investigated as to their fundamental import and meaning, in our research work.