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PHYSICS

# Fundamentals of Relativization II with Computational Analyses

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## ABSTRACT

Relativization: The act of constructing a physical model which obeys the Einstein equivalence principle. This paper corrects and extends the initial results regarding black hole thermodynamics revealed in the preceding paper. In the process of correcting and extending those initial upper bounds on the intensity of Hawking radiation from a micro black hole, I will Quantitative find much more. It will be demonstrated that a Schrodinger like equation derived in the previous papers once solved in position basis with the proper boundary conditions will give a model which works on any imaginable length scale. This will be worked out analytically with accuracy precision by the aid of



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## INTRODUCTION

In light of reviewer comments on this paper and due to having noticed an error in section 4.2 of[2]. I have taken another more mathematically rigorous and numerically precise look at my findings. I did find one error in section 4.2 of [2] and a better derivation of the results in that section. Crucially the major result does not change, a number that was an upper bound is here given an exact value. In the pursuit of the exact expression for the intensity of Hawking radiation, I have been lead by the math to a much more fundamental conclusion. A set of solutions to the equations which would govern such a black hole, in this framework, which would apply to any strongly gravitationally bound system at any length scale what so ever without any divergences or singularities.

The key quantity for answering questions about small scale gravity derived from my model is the potential energy as found in equation 27 of [2] . Expressed in the momentum representation the potential can be used to set up a Schrodinger like equation which will involve an integral. After working on this equation more, the results are not so easy to interpret. One has intuition about what should be the boundary conditions at the surface of a black hole in position space but not in momentum space.

To be most conservative I have decided to switch to a position space representation of the local Feynman diagram expansion which still leads to a potential approximately equal to hyperbolic cosine.

Regarding the objections of the reviewers to the very concepts of the Fundamentals of Relativization. Prior to submitting the first article in this series to The Winnower I did submit to a well known scholarly open access journal. One which is associated with a well known institution/society of people who study physics. It does not matter which one. Rather mysteriously two editors said this work was “incremental”, the third felt it did not make sense. (A sign of genuine review is that at least 1/3 of experts won’t agree on a paper one way or the other.) I did not ask incremental building on what. At that point the opportunity to publish on The Winnower arose.

After a careful reading of a very fine textbook [1] on String/M-Theory the very concepts of relativization are not totally new or unique. What is new is my insistence that then Einstein Equivalence principle would be promoted to a basic principle of nature in such a formulation. Which I implemented by switching the roles of Poincare-Lorentz invariance and Diffeomorphism invariance. In standard String/M-Theory Poincare symmetry is the global symmetry [1]. In this model there is global diffeomorphism symmetry and local Lorentz symmetry. I have not used the language of branes and strings and world sheets etc up to this point. Just spaces and manifolds of different kinds coexisting at the same time in the same equations.

This paper was initially prepared with Mathematica for the sake of completeness I have included Mathematica input and output where appropriate for publication. In addition the actual notebook file, a PDF based on it, or a CDF will also be published with it.

*This Mathematica notebook used to compose this work should be considered as important as the web or the PDF version on The Winnower. Every effort will be made to make this version identical to the Mathematica notebook which will have more details of the calculations than can fit nicely on a PDF.*

**ANALYSIS IN A POSITION-LIKE BASIS.**

By working with the a Lorentz invariant x, $x = \gamma^a x_a$ , instead of the invariant momentum p the nature of the equations is more easily revealed. Each value of x, $x = \gamma^a x_a$ , represents a set of values of x,y,z and t for which x is the same. A set of isometric four dimensional surfaces. This locally Lorentz invariant x is a parameter which specifies a set of equivalent geometries. Each x defines a set of physically equivalent four dimensional surfaces. In the language used in relativization theory x is a locally Lorentz invariant parameter used to write a Schrodinger equation for the Hilbert space H over the Minkowski space. In stringy M-Theory language x is a fifth dimension in which these D4 branes may move.

The important thing to remember is these functions which define vectors in Hilbert space depend on their geometry of the underlying local Minkowski space which is tangent to the curved Spacetime manifold. So this “position” with the dimension of “length” is a bit deceptive! Yet this simplifies the analysis considerably.

**THE SCHROEDINGER EQUATION IN X BASIS WITH HYPERBOLIC COSINE POTENTIAL.**

My reasoning which will lead to the exact solutions for the position basis quantum states for a relativistically bound system. That means, bound in such a way that there is an event horizon. This would include systems such as black holes of any size. This model could also apply to the whole of the universe near the time of the big bang.

The key to setting the length/energy scale via the parameter L which stands for length here and not a momentum operator. L needs to be chosen so as to encompass the magnitude of whatever system is of interest. In the case of the universe L would best be the Hubble length. In the case of “quantum” black holes L should be the Planck length. In the following it will be shown that for the solutions to a Schrodinger type equation with the potential derived in the previous paper in this series [1]. L could even be zero. This model will work and give reasonable results at any imaginable length scale! I will enter the equations in a dimensionless form by introducing the simplest combination of parameters to cancel out the dimensionality.

$$\text{Clear}[\text{“Global`*”}]$$

$$v(\text{x\_}) := \cosh\left(\frac{x}{L}\right)$$

$$\text{DSolve}\left[\left\{-\frac{\hbar^2\psi''(x)}{2M}\frac{L}{hc} + \frac{\hbar^2 R_0}{2M}\frac{L}{hc}v(x)\psi(x) - \text{En}\frac{L}{hc}\psi(x) = 0\right\}, \psi(x), x\right]$$

$$\left\{\left\{\psi(x) \to c_1\text{MathieuC}\left[-\frac{8\text{En}L^2M}{\hbar^2}, -2L^2R_0, \frac{ix}{2L}\right] - c_2\text{MathieuS}\left[-\frac{8\text{En}L^2M}{\hbar^2}, -2L^2R_0, \frac{ix}{2L}\right]\right\}\right\}$$

$$\text{Solve}\left[\text{MathieuCharacteristicA}\left[n+\frac{1}{2}, -2L^2R_0\right] == -\frac{8\text{En}L^2M}{\hbar^2}, \text{En}\right]$$

$$\left\{\left\{\text{En} \to -\frac{\hbar^2 a_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right\}\right\}$$

and the odd eigenvalues

$$\text{Solve}\left[\text{MathieuCharacteristicB}\left[n+\frac{1}{2}, -2L^2R_0\right] == -\frac{8\text{En}L^2M}{\hbar^2}, \text{En}\right]$$

$$\left\{\left\{\text{En} \to -\frac{\hbar^2 b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right\}\right\}$$

**EVEN SOLUTIONS**

For symmetric solutions $\psi'$[0]=0. In the periodic Fouquet-Bloch form of the solution $\psi$[L]=$e^{i\left(n+\frac{1}{2}\right)}$ where $\mu$ is the Mathieu Characteristic exponent.

$$\text{DSolve}\left[\left\{-\frac{\hbar^2\psi_a''(x)}{2M}\frac{L}{hc} + \frac{\hbar^2 R_0}{2M}\frac{L}{hc}v(x)\psi_a(x) - \left(-\frac{\hbar^2 a_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right)\frac{L}{hc}\psi_a(x) = 0, \psi_a'[0] = 0, \psi_a(L) = e^{i\left(n+\frac{1}{2}\right)}\right\}\right.$$

$$\left\{\left\{\psi_a(x) \to \frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}\right\}\right\}$$

**ODD SOLUTIONS**

The odd, antisymmetric states are a bit different.

$$\text{DSolve}\left[\left\{-\frac{\hbar^2\psi_b''(x)}{2M}\frac{L}{hc}+\frac{\hbar^2R_0}{2M}\frac{L}{hc}v(x)\psi_b(x)-\left(-\frac{\hbar^2b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right)\frac{L}{hc}\psi_b(x)=0,\psi_b[0]=0,\psi_b(L)=e^{i\left(n+\frac{1}{2}\right)}\right\},\right.$$

$$\left\{\left\{\psi_b(x) \to \frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}\right\}\right\}$$

The full solution will be

$$\psi(\text{x})=\lambda_a\frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}+\lambda_b\frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}$$

The set of eigenvalues are

$$\text{En}=-\left(\lambda_a\frac{\hbar^2a_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}+\lambda_b\frac{\hbar^2b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right)$$

For a black hole the lambda's would have to be 1/2. This would make the state of the hole a state of maximum entropy in accordance with established theory. Thus I can write down the relativized quantum state of a black hole in this framework as a function of x which in this paper is $x=\gamma^a x_a$ . The

$$\psi_{\text{BH}}(x)=\frac{1}{2}\frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuC}\left[a_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}+\frac{1}{2}\frac{e^{i\left(n+\frac{1}{2}\right)}\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{ix}{2L}\right]}{\text{MathieuS}\left[b_{n+\frac{1}{2}}\left(-2L^2R_0\right),-2L^2R_0,\frac{i}{2}\right]}$$

$$\text{Enbh}=-\left(\frac{1}{2}\frac{\hbar^2a_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}+\frac{1}{2}\frac{\hbar^2b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right)$$

**NUMERICAL EIGENVALUES**

Here I will compute some of the energy eigenvalues numerically for a one Planck mass black hole in the lowest energy state. First I will compute them symbolically. Then with realistic numbers for the physical constants. Let us consider the even values of n for $a_n$.

To find these eigenvalues I need to input several constants from particle physics and parameters from cosmology to find the values. First I will enter the Planck Mass.

Clear["Global\`*"]

$$\boldsymbol{n=\{1,2,3,4,100,\infty\}}$$

$$\{1,2,3,4,100,\infty\}$$

$$\boldsymbol{M=n(1.2209*10\hat{}19)*10\hat{}9}$$

$$\left\{1.2209\times10^{28},2.4418\times10^{28},3.6627\times10^{28},4.8836\times10^{28},1.2209\times10^{30},\infty\right\}$$

Then the reduced Planck constant.

$$\boldsymbol{\hbar=6.58211928*10\hat{}-16}$$

6.582119279999999\`*^-16

The exact speed of light will also be useful.

$$\boldsymbol{c=299792458}$$

299792458

The Cavendish constant with eV/c^2 units for mass is also required. So I need a conversion factor which I will have obtained using WolframAlpha but which will not show up in the Latex processed PDF of this paper.

To express Newtons gravitational I perform the following calculations.

$$\mathrm{conv} = \mathrm{kg}\left(\mathbf{5.60959 * 10\hat{}35}\mathrm{eV}\boldsymbol{c}\,\hat{}\mathbf{-2}\right)\hat{}\mathbf{-1}$$

$$\frac{1.6021762352272048\grave{}*\hat{}\text{-19kg}}{\mathrm{eV}}$$

$$\left(\mathbf{6.67384 * 10\,\hat{}- 11}\boldsymbol{m}\hat{}\mathbf{3}\mathrm{kg}\,\hat{}\mathbf{-1}\boldsymbol{s}\,\hat{}\mathbf{-2}\right)\mathbf{*}\,\mathrm{conv//FullSimplify}$$

$$\frac{1.0692667845708729\grave{}*\hat{}\text{-29}m^3}{\mathrm{eV}s^2}$$

For the sake of the numerical evaluations I now enter the value without the units indicated.

$$\boldsymbol{G} = 1.190*\hat{}\text{-46}$$

1.18972\`*^-46

The Schwarzschild radii of planck scale black holes.

$$\boldsymbol{L} = \mathbf{2}\boldsymbol{GM}$$

$$\{2.905\grave{}*\hat{}\text{-18}, 5.810\grave{}*\hat{}\text{-18}, 8.715\grave{}*\hat{}\text{-18}, 1.162\grave{}*\hat{}\text{-17}, 2.905\grave{}*\hat{}\text{-16}, \infty\}$$

Notice this is much more than the Planck length still very tiny as small as 2.9 attometers. The cosmological constant which I will take to be accurate to three significant figures. I am going to take the ground state curvature eigenvalue to be identical to lambda.

$R_0 = \Lambda = 2.036 \times 10^{-35} s^{-2} = 2.265*\hat{}\text{-52} m^{-2}$ [3].

$$\boldsymbol{R_0} = 2.26536*\hat{}\text{-52}$$

2.26536\`*^-52

$$\mathrm{Enbh} = -\left(\frac{1}{2}\frac{\hbar^2 a_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M} + \frac{1}{2}\frac{\hbar^2 b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{8L^2M}\right)$$

$$\{-1.183\grave{}*\hat{}\text{-24}, -4.106\grave{}*\hat{}\text{-25}, -2.385\grave{}*\hat{}\text{-25}, -1.663\grave{}*\hat{}\text{-25}, -5.309\grave{}*\hat{}\text{-27}, 0.\}$$

As shown above a black hole, and really any gravitational system, are ones where the higher the energy eigenvalue the more difficult it becomes to escape. Indeed for a gravitationally bound system you can get very close to freedom but a particle can never really be free. Or can it?

**HAWKING RADIATION IN THE FRAMEWORK OF RELATIVIZATION**

In the framework of relativization the form of the problem of Hawking radiation is that of barrier penetration and tunneling. There are two ways to approach this. One is to compute the probability current density vectors using the Inner product on a relativized Hilbert space (if this were M theory this would be an inner product on the world sheet of the brane describing the black hole). Instead of doing that I will use the WKB approximation. It is a simple and straight forward calculation that one hopes Mathematica can easily automate . This transmission coefficient times the value of the energy eigenvalue divided by the area of the black hole and a unit of time, say the Planck time, will give the Luminosity of Hawking radiation for a black hole.

The luminosity of a black hole due to Hawking radiation in this model will be given exactly by.

$$L_{BH} = \frac{\left|\frac{\hbar^2\left(a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)\right)}{L^4Mt_p}\right| e^{-\frac{iLE\left(\frac{i}{2}\left|-\frac{16L^2R_0}{-8R_0L^2+a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}\right.\right)\sqrt{\frac{\hbar^2\left(4\left(1+e^2\right)L^2R_0-e\left(a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)\right)\right)}{L^2M}}}{2\hbar\sqrt{\frac{e\left(a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)\right)-4\left(1+e^2\right)L^2R_0}{a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)-8L^2R_0}}}}}{64\pi} \tag{1}$$

Mathematica generates a conditional expression let us consider each condition. . Let us consider each possible “OR” $\vee$ condition.

$$\Re\left(\frac{a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{L^2R_0}\right)<8$$

This condition is telling us that for this integral to exist and for tunneling from the center of the black hole to the surface to occur this value has to be less than eight. Since $R_0$ is tiny and L is going to be large $a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)$ will be of order unity. So this number in many realistic situations will also be of order unity. The next condition is

$$e\Re\left(\frac{a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{L^2R_0}\right)>4+4e^2$$

which is telling us that when e times the above number is greater than $4+4e^2$ that Hawking radiation will be possible when this is true. The last condition is more mysterious.

$$\frac{a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{L^2R_0}\notin\mathbb{R}$$

This condition is saying that when $\frac{a_{n+\frac{1}{2}}\left(-2L^2R_0\right)+b_{n+\frac{1}{2}}\left(-2L^2R_0\right)}{L^2R_0}$ is not a real number, that it is at least a complex number, tunneling is also possible from the center of the black hole to its surface. Since all the values input will be real and the Mathieu characteristic functions have real output this situation need not be considered physical.

The exponential term is a complicated oscillatory function of L. L would be the Schwarzschild radius of the black hole. Haking and Bekenstein's theory would predict a perfectly smooth variance in the Luminosity of the black hole with mass and Schwarzschild radius. This theory predicts that the black hole will radiate with a slightly and rapidly varying intensity as it looses mass. For a black hole which is in a stable or metastable state the luminosity of the black hole due to Hawking radiation simplifies to…

$$L_{BH}\approx\frac{1}{16}\left|\frac{\hbar^2\left(a_{n+\frac{1}{2}}\left(-8G^2M^2R_0\right)+b_{n+\frac{1}{2}}\left(-8G^2M^2R_0\right)\right)}{G^4M^5t_p}\right| \quad (2)$$

**THE LUMINOSITY DUE TO HAWKING RADIATION OF A SELECTION OF BLACK HOLES INCLUDING SAGITTARIUS A***

A formal equation is fine. However, a numerical result which can be compared to observations is much better. One of the most observed black holes today is Sagittarius A*. The super massive black hole at the center of the galaxy. I will also consider a black hole with a mass of one kilogram and a black hole with a mass of the minimum it would take to create a stellar mass black hole.

I will assume that black hole will stay in its lowest energy eigenstate for what ever mass it happens to be. So for all these numerical calculations n=1.

M in the below will be a list starting with one kilogram. Eight solar masses and the Mass of Sagittarius A* in solar masses but converted to kilograms. This will give us the final answers in easily measurable and relateable SI units.

$$\boldsymbol{M}=\left\{\mathbf{1},\mathbf{8}(1.989{*}^{\wedge}30),(4.318{*}^{\wedge}6)(1.989{*}^{\wedge}30)\right\}$$

The luminosity of the Hawking Radiation from a 1kg, 8$M_\odot$, and the black hole at the center of the galaxy will be.….

$$L_{BH}\approx\frac{1}{16}\left|\frac{\hbar^2\left(a_{n+\frac{1}{2}}\left(-8G^2M^2R_0\right)+b_{n+\frac{1}{2}}\left(-8G^2M^2R_0\right)\right)}{G^4M^5t_p}\right|$$

$$\{1.159`{*}^{\wedge}17, 1.137`{*}^{\wedge}\text{-}139, 1.151`{*}^{\wedge}\text{-}165\}$$

With Stefan's constant…

$$\boldsymbol{\sigma}=\mathbf{5.670*10^{\wedge}-8}$$

5.67`*^-8

and a standard formula the temperatures are.

$$T_{\mathrm{BH}} = \frac{\sqrt[4]{L_{\mathrm{BH}}}}{2\sqrt[4]{\pi}\sqrt{G}\sqrt{M}\sqrt[4]{\sigma}}$$

{5.500`*^10, 1.372`*^-44, 5.923`*^-54}

For a hypothetical one kilogram black hole the temperature due to hawking radiation would be 55 billion Kelvin. For a stellar mass black hole the Hawking radiation would be $1.4 \times 10^{-44}$ Kelvin. For Sagittarius A* this corresponds to a temperature of$5.9 \times 10^{-54} K$ . A run of the mill stellar mass black hole, and the super-massive Sagittarius A* are orders of magnitude colder than the cosmic microwave Background. Right now there should be a net inflow of radiation into any astrophysical black hole. There should be no observable Hawking radiation from a stellar mass black hole.

**FIGURE 1: A PLOT OF HAWKING RADIATION TEMPERATURE WITH RESPECT TO BLACK HOLE MASS DUE TO THIS MODEL AND HAWKINGS MODEL.**

The predictions of my model derived by very different means are very close to those of standard Hawking radiation. This model differs from the Hawking model in one other way to see how examine this plot

**FIGURE 2: A PLOT OF HAWKING RADIATION WITH RESPECT TO MASS USING THE MODEL IN THIS PAPER. NOTICE THE SHARP CHANGES IN SLOPE.**

This model predicts that a black hole with a mass of$1.2 \times 10^{36}$ kg will be warmer than one of $1.0 \times 10^{36}$ kg by about $0.3 \times 10^{36}$ Kelvin. Put another way a black hole 14 percent of the mass of Sagittarius A* will be warmer than one 12 percent of the mass of Sagittarius A*.

This result corrects, extends and replace that of section 4.2 of "The Fundamentals of Relativization". This model predicts that for black holes of mass less than 15 petagrams Hawking's model predicts a lower temperature. This model predicts a lower temperature than Hawking's for higher masses than that. This model predicts no observable Hawking radiation from any known black hole of stellar mass or higher.

This model could be confirmed by precise enough observations of black holes of various masses and deduction for the radiation due to any influxes of matter.

## DISCUSSION.

This paper reveals one minor and two major results of this investigation both theoretical and observational in nature..

### EXACT SOLUTION FOR THE RELEVANT SCHROEDINGER EQUATION.

To correct an issue with a previous paper I needed to find an exact solution to the relevant Schrodinger equation. In the process I found the solutions, boundary conditions and eigenvectors in position basis for the solution which will work at any length scale. With these solutions I can write down, at least formally, Eigenstates and Eigenvectors for any gravitationally bound system at any length scale and obtain finite results as long as the length scale is not infinite. When the length scale tends toward zero the eigenvalues and eigenvectors will tend towards equation 4.

### CORRECTION TO SECTION 4.2 OF THE FUNDAMENTALS OF RELATIVIZATION.

In a previous paper I attempted to write down a formula for the Hawking radiation which would flow from a micro black hole given the framework of Relativization. The result was basically correct but the estimate for the magnitude of the radiation was much to high as it was at best an upper bound. With the exact solution to the relevant Schrodinger equation I have been able to calculate the correct formula for the intensity of Hawking radiation from such a black hole.

### AN INDEPENDENT CALCULATION OF HAWKING RADIATION

In this above I have calculated the Hawking radiation temperature of a black hole in my model and achieved a high level of agreement with Hawking's calculation. However, while my model agrees in terms of the shape of the curve it differs enough that if we can ever observe black holes with high enough precision we may be able to distinguish between the two. The agreement of this model derived from the fundamental principles of relativization with the Hawking radiation results speaks to the consistency of this result with known accepted theoretical astrophysics.

**MY LEVEL OF CONFIDENCE IN THESE RESULTS.**

I am humble enough to know I could be wrong I just can't find a obvious reason no matter how I try. So I submit this paper looking for a non obvious reason. I reserve the right to ignore anonymous comments or those which do not relate to the contents of this paper. The previous papers have their own comment and review areas.

Reviews are welcome to the extent that they are useful for finding flaws in the paper. i.e. If you find a non-refutable flaw in the math physics or logic. Bear in mind this math has been done with the computer algebra system Mathematica. It is very unlikely that a simple error in calculation has been made here. What could happen here is an error in one of my basic assumptions or in my assignment of units. To check this I made sure to have Mathematica call on Wolfram Alpha to check the units. The units are correct in my calculations so far as I can tell. Bad units in an equation would be an easy and real sign of something wrong, yet easily corrected.

Any criticism which seeks to simply rudely dismiss this paper must address the numerical calculations presented herein. Comments which are more appropriately related to the previous papers will be ignored unless posted with those papers.

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