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A Strong Mathematical Correlation Between Cosmic Microwave Background Radiation and A Possible Natural Frequency of The Space-time Metric

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ABSTRACT

Does the space-time metric expand and contract at some natural frequency other than that which is implicated by the rate of expansion of the cosmos?

For example, a balloon may be inflated slowly, yet the rubber, of which it is composed, vibrates at a high natural frequency. A pendulum may likewise swing much more slowly than the frequency at which its molecules vibrate. Work done by Einstein and others towards a complete unified field theory suggests a connection between electromagnetism and gravity. Since gravity warps space-time and the most prevalent electromagnetic frequency observed in the cosmos is 160.2 Gigahertz it has been proposed in this report that this frequency may be the natural frequency of the space-time metric. The equation for length contraction in a gravitational field and the basic physics of waves were employed to estimate this natural frequency. A result of $2.75474x10^{11}$hertz was obtained. Thus, the supposed $1.602x10^{11}$hertz natural frequency of the space-time metric varies from the calculated value by only $1.153x10^{-11}$ percent of the entire observable electromagnetic spectrum. If this correlation can be linked with a cause, such as an electromagnetism-gravity connection between the two similar frequencies, then it would be possible to store energy in the oscillations of an expanding and contracting space-time metric, thus allowing for complete control of the shape of time-space itself. This would open the door to the creation of wormholes and warp-drives because energy would not need to be stored in man-made devices.

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INTRODUCTION

When Sir Isaac Newton defended the idea of absolute, and thus universal, time he knew nothing of the tumult that would arise from the results of the Michelson-Morley experiment. Yet remarkably $t'=t$ turns out to be accurate for most velocities and accelerations in our everyday experience. That is to say, one could argue that Newton made this assumption about time based on a certain naivete caused by his own location in time. His argument was based on common sense and it is not surprising that it is essentially correct until one reaches very high velocities or high accelerations. To this day, we still use his universal time for countless calculations which do not involve significant time dilation, length contraction, or changes in mass. In fact, one could easily argue that Newton's simpler view of the universe has served us quite well throughout history.

The calculation in this experiment is made using a similar 'simpler view' line of reasoning. Like Newton's it may disregard some of the etiquette considered necessary at the 'dinner table' of modern accepted physics. However, one will find that these arguments are based on logic. Like Newton's universal time, it may yet shed light on very real and heretofore unanswered questions surrounding time and space. When we consider the quandary in which the discrepancies between quantum mechanics and General Relativity have placed us, it becomes apparent that the academic atmosphere may be improved by a 'rude dinner guest'.

We know that gravitational waves permeate the cosmos. If time-space is changing its shape with simple harmonic or damped harmonic motion then logic would tend to tell us that there could possibly be some natural frequency f_o with which it expands and contracts. At face value, we might assume this oscillation to be transpiring in time with the expansion of the cosmos as a whole. However, this does not mean that the rate of cosmic expansion is indicative of the natural frequency of the 'fabric' of time-space itself. For example, a balloon may be inflated slowly, yet the rubber comprising its material vibrates at a high natural frequency. A pendulum may likewise swing much more slowly than the frequency at which its molecules vibrate. The matter in our universe, which is responsible for gravitational waves, is of course comprised of vibrating particles.

Since, Einstein has proposed a likely connection between electromagnetism and gravity and countless experiments and peer-reviewed publications (For proof of this see Millis, 1997.) have testified to the accuracy of this assumption, we might then reason that the most prevalent electromagnetic frequency in the cosmos might have some connection with the most prevalent gravitational frequency in the universe. This prompts us to look for the most prevalent electromagnetic frequency in the universe. We don't have to look very far, as it has already been found. The most prevalent electromagnetic frequency in the cosmos is the cosmic microwave background frequency, which is 160.2 Gigahertz.

It is logic, not book-learning, which then prompts one to ask the question,"If the universe has a natural electromagnetic frequency and if electromagnetic fields effect gravitational fields, then should it not be possible to create large scale contractions and expansions of time-space through forced electromagnetic vibrations at the natural

electromagnetic resonant frequency of the cosmos?”
In the following mathematical 'experiment', the equation for length contraction in a gravitational field was used with basic physics of waves to estimate the natural frequency of the space-time metric and compare the result to 160.2 Gigahertz.

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METHOD: MATHEMATICAL DERIVATION OF EQUAITIONS YIELDING THE $2.75474\text{x}10^{11}\text{hertz}$ RESULT

While the following calculations merely serve as a ballpark estimate for the accuracy of the above stated hypothesis, the numerical results of this thought experiment have proven to be astonishing to the author of this article.

$$t_o = t_f \sqrt{(1 - \frac{2GM}{rc^2})}$$

The above equation relates the mass of a spherical object to the amount of time (t_o) experienced by a person located at a radius r from the center of of the object when the amount of time (t_f), experienced by a person at an infinitely large distance from the object, is known. In the following calculation we will assume that the the person located at radius r is located outside and beyond the radius of spherical mass's outer surface. Also note that,

here, G is the gravitational constant $6.67259\text{x}10^{-11}\frac{N.m^2}{kg^2}$. C is the speed of light in a vacuum,

$2.99792458\text{x}10^8 m/s$. $E=mc^2$,so, we may say $M=\frac{E}{c^2}$ in our first equation:

$$t_o=t_f\sqrt{(1-\frac{(2\text{G}(\frac{E}{c^2}))}{rc^2})}$$

E = Joules = N.m = (newtons)(meters) so we can also say:

$$t_o=t_f\sqrt{(1-\frac{(2\text{G}(\frac{N.m}{c^2}))}{rc^2})}$$

And this simplifies to:

$$t_o = t_f \sqrt{(1 - (\frac{2G.N.m}{rc^4}))}$$

Then, of course, the question arises: To what do we attribute meters (m) in N.m in this equation? If we consider the mass M in this equation to be stationary relative the observer at radius r then m (meters) cannot be displacement of the object through space. Rather, m here represents the length contraction of space Δd created by the mass M which we have already concluded follows the relation

$M = \frac{E}{c^2} = \frac{N.m}{c^2}$. Indeed, to create a fluctuation in a gravitational field requires work. To change the gravitational field at any point in space one must move an object through space. This requires the expenditure of energy, E. So, by this line of reasoning there must be a certain amount of energy E needed to cause a unit change in length of space (d). Since energy is defined as N.m then meters must enter into our calculation even if the mass M is not observed by the observer to move relative to himself.

Now, according to the Lorentz transform:

$$\frac{t}{(t')}=\frac{1}{\sqrt{(1-\frac{v^2}{c^2})}}=\frac{L_o}{L}$$

where L and L_o represent two values of a length measured by two different observers in two different non-accelerated frames of reference. Similarly, we see in the equation for gravitational length contraction:

$$dr=ds\sqrt{(1-\frac{2\mathrm{GM}}{rc^2})}$$

where *dr* and *ds* are the the two values of a length measured by two different observers in two different frames of reference in relation to the gravitational field. When we rearrange the above equation, as we did with the Lorentz transform, and relate it to t_o and t_f we see:

$$\frac{t_o}{t_f}=\sqrt{(1-\frac{2\mathrm{GM}}{rc^2})}=\frac{dr}{ds}$$

We may use this equality to our advantage. Since

$\frac{t_o}{t_f}=\frac{dr}{ds}$ is a dimensionless ratio we need not worry about the change in units and may thus replace $\frac{t_o}{t_f}$ with its equivalent expression $\frac{dr}{ds}$. Thus, we get:

$$dr = ds\sqrt{(1-(\frac{2G.N.m}{rc^4}))}$$

Now, we see that for a given Δd, the amount of force in newtons needed depends on the radius r of location of the observer from the source of changing gravitation. Thus, the natural frequency of space-time which is observed may be relative to the observer and depend on his frame of reference. However, for the sake of argument, we will assume that, in the laboratory, the scientist (located at radius r and experiencing t_o) is one meter from the center of the source of fluctuating gravitation. So, r = 1m.

If Δd = $-3\text{x}10^{-8} m$ (exactly) and ds = 1m (exactly), then if we connect these two values by the relation $\Delta d = dr - ds$ then dr = 0.99999997 meters. Since Δd is very small, the amplitude of the time-space contraction is small and thus the amplitude of wave created in the 'fabric' of time-space is likewise small. Also, note that since Δd is small and because

$\frac{t_o}{t_f} = \frac{dr}{ds}$ we notice that $\frac{t_o}{t_f}$ very nearly equals one.

Thus, we see that for small Δd , no matter how far away the observer experiencing t_f is from the observer at radius r, he measures essentially the same frequency of expansion and contraction of space-time as does the observer at radius r. Thus, only under truly extraordinary conditions would the two observers disagree on the frequency observed. Since the amplitude of the wave is small and since electromagnetic waves are transverse in nature we make the bold assertion that we may be able to use the

equation $v = \sqrt{(\frac{F_T}{\mu})}$ to approximate μ for the 'fabric' of time-space itself. This stems from our earlier hypothesis that electromagnetic waves either cause or are themselves fluctuations in the time-space metric. Here μ is the mass per unit length(kg/m)of said 'fabric' of time-space. v ,here,stands for the wave's velocity and F_T is the force of tension per unit μ . So, solving for μ we get:

$$\mu=\frac{F_T}{v^2}$$

We know that the velocity of both electromagnetic waves and gravitational waves is $2.99792458\text{x}10^8 m/s$ = c. So knowing the velocity of the wave we get:

$$\mu=\frac{F_T}{(8.987551787\text{x}10^{16} m^2/s^2)}$$

with our significant figure place holder at 8.9875517<u>8</u>7E16 m^2/s^2 . Since we've decided m (meters) in the expression N.m is equivalent to Δd , we may now write:

$$(\frac{dr}{ds})^2=1-(\frac{(2\text{GN}\,\Delta\, d)}{rc^4})$$

Continuing to solve for newtons we get:

$$(\frac{dr}{ds})^2 - 1 = -(\frac{(2\text{GN}\,\Delta\,d)}{rc^4})$$

and finally:

$$\frac{(rc^4(\frac{dr}{ds})^2 - 1)}{(-2\,\Delta\,dG)} = \text{N} = \text{newtons} = F_T$$

Inserting the predetermined values for this equation we get:

$$F_T = \frac{((1\text{m})(2.99792458\text{x}10^8\,\text{m}/s)^4(\frac{0.99999997\text{m}}{1\text{m}})^2 - 1)}{(-2(-3\text{x}10^{-8}\,m)(6.67259\text{x}10^{-11}(\frac{N.m^2}{kg^2})))}$$

We find F_T = 2.0176<u>0</u>9411E51 newtons. Since $\text{N} = \frac{\text{kg.m}}{\text{s}^2}$ we see that the units of the equation for F_T above cancel out to newtons. We may now use F_T to calculate μ :

$$\mu = \frac{F_T}{\text{v}^2} = \frac{(2.017609411\text{x}10^{51}\,\text{N})}{(8.987551787\text{x}10^{16}\,m^2/s^2)} = 2.244893224\text{x}10^{34}\frac{kg}{m}$$

So μ = 2.2448<u>9</u>3224E34 kilograms per meter length of a slice of time-space. This seems like a ridiculous amount of mass, but when one considers that such a slice cuts all the way across our entire bubble of the so called *multiverse* or even the entire *multiverse (*or *Universe* with a capital *U)* then this amount doesn't seem so strange. This value of μ may even prove useful in determining the actual size of our particular area of the *multiverse* or even the entire *multiverse*, if such a thing is possible.

If ω_o is the natural angular frequency of time-space then:

$$\omega_o=\frac{(2\pi)}{\mathrm{T}}=2\pi f_o=\sqrt{(\frac{k}{m})}$$

So, the natural frequency of time-space is f_o which is expressed by:

$$f_o=(\frac{1}{(2\pi)})\sqrt{(\frac{k}{m})}$$

where k is the spring constant and m is the mass of an oscillating section of time-space undergoing expansion and contraction. We know μ = 2.24489̲3224E34 kilograms per meter length of a slice of time-space. The original length of time-space in question has a length of one meter (equal to *ds*) before N.m distorts it. So, we use these two facts to estimate mass m at

2.24489̲3224E34 kg. Furthermore, Δd = x in $F=-kx$, where F is force in newtons and x is the displacement in meters. Since F at displacement Δd = x is equal to F_T we can determine the value for k by solving for it and inserting the two known values:

$$k=\frac{-F_T}{x}=\frac{-(2.017609411\text{x}10^{51}\,kg.m/s^2)}{(-3\text{x}10^{-8}\,m)}=6.725364703\text{x}10^{58}\frac{kg}{s^2}$$

Now that we know k equals 6.72536̲4703E58 $\frac{kg}{s^2}$ we may calculate f_o :

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RESULTS

$$f_o=(\frac{1}{(2\pi)})\sqrt{(\frac{k}{m})}=(\frac{1}{(2\pi)})\sqrt{(\frac{(6.725364703\text{x}10^{58}\,kg/s^2)}{(2.244893224\text{x}10^{34}\,kg)})}$$

Thus we find f_o = 2.75473̲7412E11 (1/s)= $2.75474\text{x}10^{11}\text{hertz}$.

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DISCUSSION OF THE $2.75474\text{x}10^{11}\text{hertz}$ RESULT

Notice that the omission of the gravitational constant would cause no appreciable change in the result. So, the presence of the gravitational constant does not really effect the frequency we've sought. This would appear to be a very important observation.

Now recall that we hypothesized that the cosmic microwave background frequency is the resonant electromagnetic frequency of time-space because it is the most prevalent electromagnetic frequency in the observable cosmos. That frequency, as we said, is 160.2 Gigahertz which is equal to $1.602 \text{x} 10^{11} \text{hertz}$. We see that our result of $2.75474 \text{x} 10^{11} \text{hertz}$,for the natural frequency of the space-time metric, closely matches the predicted frequency of $1.602 \text{x} 10^{11} \text{hertz}$. If we compare the size of the discrepancy between these two frequencies as a percent of the entire observable electromagnetic spectrum which comprises a range of frequencies from zero to $1 \text{x} 10^{24} \text{hertz}$ we find:

$$\left(\frac{|(2.754737412 \text{x} 10^{11}\,\text{Hz} - 1.602 \text{x} 10^{11}\,\text{Hz})|}{(1 \text{x} 10^{24}\,Hz)}\right) x\,100$$ = 1.15<u>2</u>737412E-11% =

$1.153 \text{x} 10^{-11}$ percent

So our hypothesized natural frequency of the space-time metric varies from our calculated value by only 1.153E-11% of the entire observable electromagnetic spectrum.

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Possible Applications and Implications of Results

Of all the frequencies possible, our equation has hit the cosmic microwave background frequency with a significant degree of accuracy. If this prediction of ours is to believed it would then be possible to store energy in the oscillations of the space-time metric itself. If there is a coupling between electromagnetic disturbances and gravitational disturbances, as these findings seem to suggest, then this would allow us to control the shape of time-space with electromagnetic waves of a frequency close to the cosmic microwave background waves. This solves the problem of being able to store enough energy to make such a feat feasible since we no longer need to rely on man-made devices to do so. Clearly the creation of wormholes and warp-drives are on the top of the list of uses for this type of knowledge. If two regions of time-space opposite one another vibrate towards and away from each other at this natural frequency, this would allow us to increase the amplitude of this oscillation, thus bringing two separate regions of time-space in contact with one another.

As J. Richard Gott points out in his book *Time Travel In Einstein's Universe* (2001), there has been some difficulty in explaining why the microwave background radiation doesn't exhibit greatly varying temperatures in different parts of the sky. If the expansion and contraction of time-space has a natural electromagnetic as well as gravitational frequency relative to the average observer in our universe, as was previously proposed in the methods section of this paper, then such uniformity would not be surprising. We would then expect to see that frequency everywhere we looked since it is the frequency at which our universe most naturally resonates.

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Literature Cited

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