New Interpretation of Relativity

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Abstract:

The laws for Newtonian gravity (1642), and the electromagnetic laws for the Coulomb electric force (1785) and the Biot Savart magnetic force (1820) have been known to be instantaneous since they were developed and are true today as they were when they were developed. Heaviside (1893) presented a field model of gravity based on an equivalent set of Maxwells equations for gravity (later called Gravitoelectromagnetism) and predicted gravity propgates at speed c, then Einstein (1915) introduced General Relativity completely changing the model of Gravity from a field theory to a geometric theory, but which also predicted gravity waves propagate at the speed of light c. It has been proven since that for weak fields, General Relativity reduces to Gravitoelectromagnetism. Maxwell presented his electrodynamic equations (1865) and used it to predict light is an electromagnetic field that propagates at the speed of light c. Both Maxwell and Heaviside used their theories to develop wave equations for the propagating fields, but set the equations to zero which only predict how the fields propagate in the farfield, and does not disprove the instantaneous nearfield laws. More recent calculations, confirmed by many researchers, show that setting the wave equations to an oscillating source, shows that both General Relativity and Maxwells laws confirm that these fields propagate instantaneously in the nearfield, and within a wavelength, reduce to the speed of light c, as the fields propagate into the farfield. Experiments in both gravity and electrodynamics confirm this and match the theoretical results very well. This corresponds to not only the phase speed and group speed, but also the information speed of these propagating fields. So, these results confirm the instantaneous laws, as well as confirming the farfield speed of these fields is the speed of light c.

Relativity is based on the fact that the speed of light is only a constant c. Since this is not true, Relativity is rederived taking into account the instantaneous nearfield. The results show that using nearfield instantaneous fields yields Galilean transformations, and using farfield speed c fields yields Lorentz transformations. Because space and time are real and cannot depend on the frequency of the fields used to measure the effects of time and space on moving bodies, then it is concluded that the effects of Relativity are an optical illusion. Moving objects may appear to contract in length and time appears to slow down, but the effects are not real. Simply measuring the effects using instantaneous nearfield propagating fields shows that time and space are unchanged. Time and space are concluded to be absolute, according to Galilean Relativity.

Since General Relativity is based on Special Relativity, then its effects on space and time are also concluded to be an optical illusion. Spacetime is flat and gravity must be a propagating field, which can be quantized, enabling the unification of gravity and quantum mechanics. Researchers have shown that in the weak field limit, which is what we only observe, General Relativity reduces to Gravitoelectromagnetism, which shows gravity can be modeled as 4 Maxwell equations similar in form to those for electromagnetic fields, yielding electric and magnetic components of gravity. This theory explains all known gravitational effects, as well as the instantaneous nearfield and speed of light farfield propagating gravitational fields.

Quantum mechanics has many interpretations, with the Copenhagen interpretation being the most popular interpretation. But this theory is a statistical theory and requires particles to be in a superposition of states, and not real until measured. Pilot wave theory is much more intuitive and physical, since it assumes particles are real with real positions and trajectories at all times, and are

guided by real Pilot Waves. It yields the same predictions as the Copenhagen interpretation but requires the real pilot waves to act instantaneously across space with other particles (non-local), and time and space to be absolute, which are both not compatible with Special Relativity, but is compatible with Galilean Relativity. Consequently, given that his paper shows that fields can be instantaneous, and that Galilean Relativity should replace Special Relativity, Pilot Wave theory should become the preferred theory in Quantum Mechanics.

Section 1 - Instantaneous nearfield laws:

Many physical laws, used every day by engineers and researchers, are known to act instantaneously across space. The law of Newtonian gravity is known to be instantaneous and is as valid today as it was when Newton developed it (Newton, 1642). Newtons gravity is used to accurately calculate the orbits of planets, stars, galaxies, and satellites. Simon Laplace, in his famous book on Celestial Mechanics (Laplace, 1799–1825), showed that experimental observations of the orbits of the planets in the gravitational nearfield of the sun would not be stable if the gravitational force were not instantaneous. This is because gravitational forces tangential to the orbit of the planets would result in slowing the planets, causing the planets to spiral away, due to conservation of angular momentum. Heaviside then presented a model of gravity based on Maxwells equations (later called Gravitoelectromagnetism), and used the model to predict gravity waves, showing that they propagate at the speed of light c (Heaviside, 1893). But he set the resultant 2nd order wave equation to zero, which is only valid in the farfield. Later, Einstein published the theory of General Relativity (Einstein A. , 1915) and later he used it to predict that gravity waves propagate at the speed of light (Einstein A. , 1918), but the solution is only valid in the farfield. Later it was confirmed by researchers that General Relativity reduces to Gravitoelectromagnetism for weak gravitational fields (Forward, 1961), which is what we only observe. But these solutions do not disprove Newton's instantaneous force law, which is still known to be valid for weak gravitational fields.

Electrodynamics also has two equations that are known to act instantaneously across space. Coulomb published the instantaneous electrical force law (Coulomb, 1785), and Biot-Savart published the instantaneous magnetic force law (Savart, 1820). Both forces are easily calculated using Maxwells laws of electrodynamics (Maxwell, 1865), where Maxwell showed that his theory predicts electromagnetic fields propagate at the speed of light, which was done by deriving a 2nd order wave equation and setting it to zero. But this homogeneous solution is only known to generate solutions valid in the farfield and does not disprove that electromagnetic fields propagate instantaneously in the nearfield of a source. Again, this should have been known by Maxwell, Heaviside, and Einstein, because many researchers had shown by then that the nearfield can be only theoretically observed by setting the wave equation to a source and solving the resultant equation (d'Alembert in 1747, Cauchy, 1784, Fourier 1822, Hertz 1887).

Section 2 - Electromagnetic fields generated by an oscillating dipole source:

To analyze the nearfield, one has to analyze the inhomogeneous solution, where the wave equation is set equal to source.

- E field wave equation: $\nabla^2 E - \frac{1}{c^2}\frac{\partial^2 E}{\partial t^2} = 4\pi\nabla\rho + \frac{4\pi}{c^2}\frac{\partial J}{\partial t}$ *Eq. 1*
- B field wave equation: $\nabla^2 B - \frac{1}{c^2}\frac{\partial^2 B}{\partial t^2} = \frac{-4\pi}{c}(\nabla \times J)$ *Eq. 2*

where, E= Electric field, B = Magnetic field, t=time, c farfield speed of light, ρ = charge density, J= current density

The dipole solution for the oscillating charge has been presented by many authors using Maxwells equations (Hertz, 1893), (W. Panofsky, 1962), (Jones, 1964), (Jackson, 1975). Note that the solutions for an oscillating magnetic dipole would be identical with the E and B fields interchanged.

- Er equation: $$E_r = \frac{2p_o Cos(\theta)}{r^3} e^{i(kr-\omega t)} \left[1 - i(kr)\right]$$ *Eq. 3*
- E_θ equation: $$E_\theta = \frac{p_o Sin(\theta)}{r^3} e^{i(kr-\omega t)} \left[\left\{1 - (kr)^2\right\} - i(kr)\right]$$ *Eq. 4*
- B_ϕ equation: $$B_\phi = \frac{\omega p_o Sin(\theta)}{cr^2} e^{i(kr-\omega t)} \left[-kr - i\right]$$ *Eq. 5*

where, E = Electric field, B = Magnetic field, p_o = electric dipole, r = distance from dipole to observation point, k = wave number, I = imaginary number, ω = angular frequency, θ = phase angle from dipole to observation point vector: r

To analyze the propagation of the fields, the following formulas can be used and are found in the famous Born & Wolf optics book (Born, 1980). A detailed derivation of these formulas, and a numerical verification, can be found in the following PhD thesis (Walker W. D., 1997) and conference paper (Walker W. , 1999):

- Phase speed formula: $$c_{ph} = -c\, k \Big/ \frac{\partial \theta}{\partial r}$$ *Eq. 6*
- Group speed formula: $$c_g = -c \left[\frac{\partial^2 \theta}{\partial r \partial k}\right]^{-1}$$ *Eq. 7*

where, c = farfield speed of light, k = wave number, r = distance from dipole to observation point, θ = phase angle from dipole to observation point vector: r

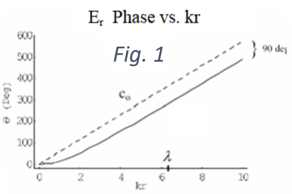
When applied to the above fields, one gets the following results:

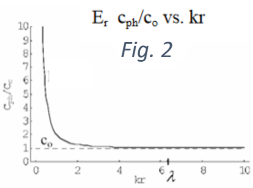
- Er phase speed, group speed - formulas, and plots:

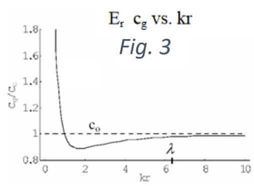
$$\theta = kr - Tan^{-1}(kr) \underset{kr<<1}{\approx} -\frac{1}{3}(kr)^3$$ *Eq. 8*

$$c_{ph} = c_o\left(1 + \frac{1}{(kr)^2}\right) \underset{kr<<1}{\approx} \frac{c_o}{(kr)^2} \underset{kr>>1}{\approx} c_o$$ *Eq. 9*

$$c_g = \frac{c_o\left(1+(kr)^2\right)^2}{3(kr)^2 + (kr)^4} \underset{kr<<1}{\approx} \frac{c_{ph}}{3} \underset{kr>>1}{\approx} c_o$$ *Eq. 10*





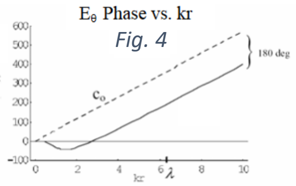


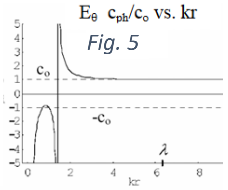
- E_θ phase speed, group speed - formulas, and plots:

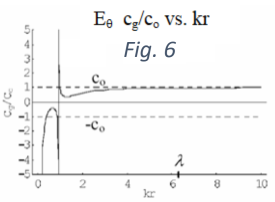
$$\theta = kr - Cos^{-1}\left(\frac{1-(kr)^2}{\sqrt{1-(kr)^2+(kr)^4}}\right)$$ *Eq. 11*

$$c_{ph} = c_o\left(\frac{1-(kr)^2+(kr)^4}{-2(kr)^2+(kr)^4}\right)$$ *Eq. 12*

$$c_g = \frac{c_o\left(1-(kr)^2+(kr)^4\right)^2}{-6(kr)^2+7(kr)^4-(kr)^6+(kr)^8}$$ *Eq. 13*





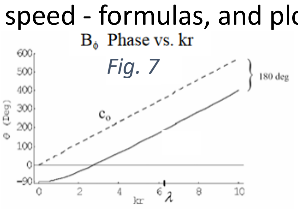


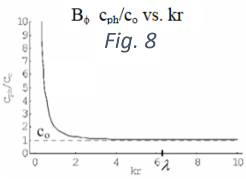
- B_ϕ phase speed, group speed - formulas, and plots:

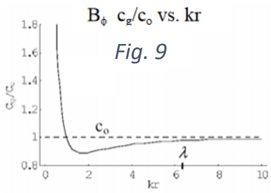
$$\theta = kr - Cos^{-1}\left(\frac{-kr}{\sqrt{1+(kr)^2}}\right)$$ *Eq. 14*

$$c_{ph} = c_o\left(1 + \frac{1}{(kr)^2}\right)$$ *Eq. 15*

$$c_g = \frac{c_o\left(1+(kr)^2\right)^2}{3(kr)^2+(kr)^4}$$ *Eq. 16*







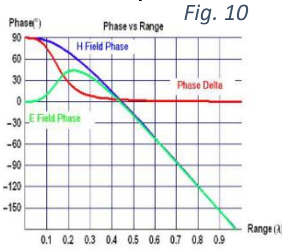
where, E= Electric field, B= Magnetic field, k = wave number, r= distance from dipole to observation point, θ = phase shift of the field, c_o = farfield speed of light, c_{ph} = phase speed of field, c_g = group speed of field

These results clearly show that both the phase speed and group speed, and hence the information speed are instantaneous near the source, and within a wavelength reduce to the speed of light. Several researchers have independently confirmed this (Walker W. D., 1997), (Walker W. , 1999), (Wang, 2003), (Hujanen, 2006), and are summarized in (Walker W. D., 2006).

Numerical solutions with an electromagnetic simulator NEC model were also presented, assuming a 60 MHz transmission frequency, where the wavelength is 5 m. (Hujanen, 2006). The results match very well with theory. Another paper presented, not only an electromagnetic simulation using a Ansoft HFSS model, but also experimental confirmation showing the results match very well (Schantz, 2005). The Ansoft HFSS model assumed a 10mm antenna element, transmitting at 299.79 MHz frequency, where the wavelength is 1 m. The experimental verification was done by transmitting radio waves between two antennas in an open field and measuring the propagation delay as the antennas were moved apart from the nearfield to the farfield, matching very well with theory. The transmission frequency used was 1295 kHz, where the wavelength = 231.5 m (Schantz, 2005). The theoretical prediction breaks down within about 3 m where the antenna dimensions become a significant fraction of the range.

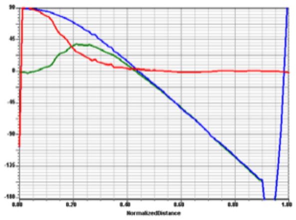
Theory

Fig. 10



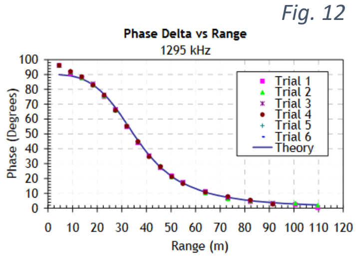
Simulation

Fig. 11



Experiment & Theory (6 trials)

Fig. 12



Section 3 - <u>Gravitational fields generated by a quadrapole oscillating mass source</u>:

It is known that for weak gravitational fields, General Relativity reduces to Gravitoelectromagnetism, where gravity can be modeled by 4 equivalent Maxwell equations for gravity, and was predicted by Heaviside (Heaviside, 1893), and later improved by other researchers such as Forward (Forward, 1961). Analysis of an oscillating mass source yields propagating fields very similar to the electromagnetic fields generated by an oscillating electric dipole source (Walker W. D., 2006). This analysis yields a 2^{nd} order wave set equal to an oscillating mass source.

- Gravitational wave equation: $\nabla^2 V - \frac{1}{c^2}\frac{\partial^2 V}{\partial t^2} = 4\pi G\rho$ *Eq. 17*
- Solution: $V = -N\left(i\left(\frac{1}{kr} - \frac{3}{(kr)^3}\right) - \frac{3}{(kr)^2}\right)(3Cos^2\theta - 1)e^{i(kr-\omega t)}$ *Eq. 18* $B = \frac{\omega}{c^2}(r \times \nabla V)$ *Eq.19* $E = \frac{ic^2}{\omega}(\nabla \times B)$ *Eq. 20*

where, V = gravity potential, E = Electric field, B= Magnetic field, N = -G m s^2 k^3, G = Grav const, m = mass, s= dipole length, k = wave number ρ = mass density, t = time, c = farfield speed of light, ω = angular frequency, r = distance from dipole to observation point, θ = phase angle from dipole to observation point vector r, i = imaginary number

But since mass is always positive and not negative, then the dipole solution cannot exist, so one must then use the quadrapole solution, also noted by (Einstein A. , 1918).

- E_r equation: $E_r = 6Nk\left[\left(\frac{-3}{(kr)^3}\right)i - \frac{1}{(kr)^2} + \frac{3}{(kr)^4}\right]\left[3Cos^2(\theta) - 1\right]e^{i(kr-\omega t)}$ *Eq. 21*
- E_θ equation: $E_\theta = 6Nk\left[\left(\left(\frac{1}{kr}\right) - \frac{6}{(kr)^3}\right)i + \frac{6}{(kr)^4} - \frac{3}{(kr)^2}\right]\left[Cos(\theta)Sin(\theta)\right]e^{i(kr-\omega t)}$ *Eq. 22*

B_ϕ equation: $B_\phi = \frac{6N\omega}{c^2}\left[\left(\frac{1}{kr} - \frac{3}{(kr)^3}\right)i - \frac{3}{(kr)^2}\right]\left[Cos(\theta)Sin(\theta)\right]e^{i(kr-\omega t)}$ *Eq. 23*

where E = Gravity electric field, B= Gravity magnetic field, N = -G m s^2 k^3 , G = Grav const. m = mass, s = Dipole length, k = wave number, ω = angular frequency, k = wave number, r = distance from dipole to observation point θ = phase angle from dipole to observation point vector r, i= complex number, t =time, c = far field speed of light

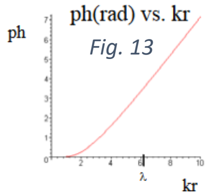
Applying the same phase and group speed formulas (ref. Eq. 24, Eq. 25) and applying them to the resultant gravitational fields yields:

- E_r phase speed, group speed - formulas, and plots:

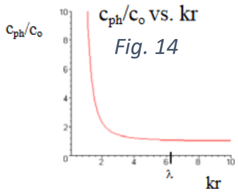
$$ph = kr + ArcTan\left[\frac{3}{kr - \frac{3}{kr}}\right] \underset{kr<<1}{\approx} \frac{1}{45}(kr)^5 + O(kr)^7 \quad \textit{Eq. 26}$$

$$c_{ph} = c_o\left(1+\frac{3}{(kr)^2}+\frac{9}{(kr)^4}\right) \quad \textit{Eq. 27}$$

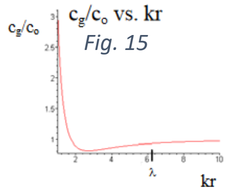
$$c_g = \frac{c_o\left[(kr)^4+3(kr)^2+9\right]^2}{(kr)^4\left[(kr)^4+9(kr)^2+45\right]} \quad \textit{Eq. 28}$$



ph(rad) vs. kr *Fig. 13*



c_{ph}/c_o vs. kr *Fig. 14*



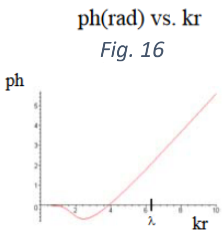
c_g/c_o vs. kr *Fig. 15*

- E_θ phase speed, group speed - formulas, and plots:

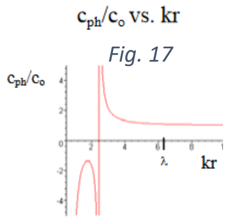
$$ph = kr + ArcTan\left[\frac{\frac{-6}{(kr)^3}+\frac{1}{kr}}{\frac{6}{(kr)^4}-\frac{3}{(kr)^2}}\right] \underset{kr<<1}{\approx} -\frac{1}{30}(kr)^5 + O(kr)^7 \quad \textit{Eq. 29}$$

$$c_{ph} = c_o\left(\frac{36-3(kr)^4+(kr)^6}{(kr)^6-6(kr)^4}\right) \quad \textit{Eq. 30}$$

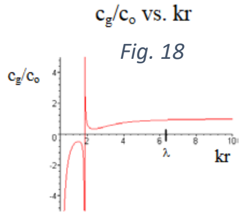
$$c_g = \frac{c_o\left[36-3(kr)^4+(kr)^6\right]^2}{(kr)^{12}-3(kr)^{10}+18(kr)^8+252(kr)^6-1080(kr)^4} \quad \textit{Eq. 31}$$



ph(rad) vs. kr *Fig. 16*



c_{ph}/c_o vs. kr *Fig. 17*



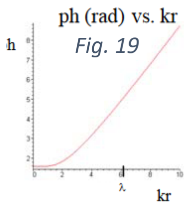
c_g/c_o vs. kr *Fig. 18*

- B_ϕ phase speed, group speed - formulas, and plots:

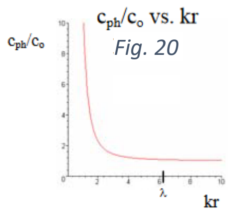
$$ph = kr - ArcTan\left[\frac{kr}{3}-\frac{3}{kr}\right] \underset{kr<<1}{\approx} \frac{\pi}{2}+\frac{1}{45}(kr)^5 + O(kr)^7$$

$$c_{ph} = c_o\left(1+\frac{3}{(kr)^2}+\frac{9}{(kr)^4}\right)$$

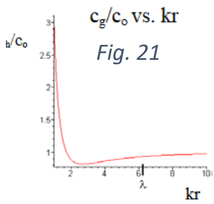
$$c_g = \frac{c_o\left[3(kr)^2+(kr)^4+9\right]^2}{(kr)^4\left[45+9(kr)^2+(kr)^4\right]}$$



ph (rad) vs. kr *Fig. 19*



c_{ph}/c_o vs. kr *Fig. 20*



c_g/c_o vs. kr *Fig. 21*

where, E= Gravity electric field, B= Gravity magnetic field, k = wave number, r= distance from dipole to observation point, ph = phase shift of the field, c_o = farfield speed of light, c_{ph} = phase speed of field, c_g = group speed of field

The results show that the gravitational fields generated by an oscillating mass source propagate instantaneously in the nearfield, and within a wavelength reduce to the speed of light, as they propagate into the farfield. Gravity waves propagating at the speed of light were theoretically predicted by (Heaviside, 1893), and later by Einstein (Einstein A. , 1918) and was recently confirmed experimentally by LIGO (Abbott, 2017).

Section 4 - <u>Effects on Special Relativity</u>:

In 1905 Einstein published his theory of Special Relativity (Einstein A. , 1905), which is based on the fact that the speed of light is a constant, But since this has been shown to not be true, then the transformations predicted by Relativity need to be rederived. It will be shown that using instantaneous nearfield propagating fields yields Galilean transformations, but using farfield speed c propagating fields yields Lorentz transformations. But, because time and space are real, and because they cannot depend on the frequency of the light used to measure the effects of time and space of moving bodies, then the effects of Relativity on time and space must be an optical illusion. Time and space can appear to change for moving bodies when measured with farfield propagating fields, but the effects are not real, and can be verified by using nearfield propagating fields, showing that they have not changed. Time and space are absolute as indicated by Galilean Relativity.

This analysis was done by (Walker W. , 2007) and showed that if an electric dipole source generates a propagating magnetic field (Eq. 14, Eq. 15), then the phase speed of the observed magnetic field in a moving frame of reference would be as shown below. Analysis using the other fields generated by a dipole source would yield similar results, since their phase curves (ref fig?) have a minimum in the nearfield and become linear after propagating one wavelength from the source. This is because the fields are instantaneous when the phase curve has a minimum and reduce to the speed of light when the phase curve becomes linear. Note that one would get similar results for the group speed since it has similar instantaneous nearfield and farfield speed c behavior.

- The phase speed observed in the stationary dipole source frame - equation, and plot:

$$c_{ph} = c_o\left(1+\frac{1}{(kr)^2}\right) \quad \textit{Eq. 35}$$

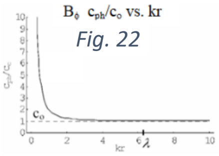


Fig. 22

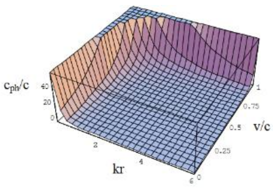
where, k = wave number, r= distance from dipole to observation point, c_o = farfield speed of light, c_{ph} = phase speed of field, λ = wavelength

- The group speed observed in the moving frame - equation, and plot:

$$c_{ph} = c_o\left\{1+\frac{1}{(kr)^2\left[1-\frac{v}{c}\right]}\right\} \quad \textit{Eq. 36}$$

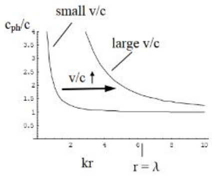
C_{Ph}/c vs kr and v/c

Fig. 23



C_{Ph}/c vs kr

Fig. 24



where, k = wave number, r= distance from dipole to observation point, c_o = farfield speed of light, c_{ph} = phase speed of field, λ = wavelength, v = velocity of moving frame of reference

Calculation of the Relativistic gamma (γ) factor yields:

- Gamma factor equation:

$$\therefore \gamma = \frac{1}{\sqrt{\left(1+\frac{\frac{v}{c}}{1+\frac{1}{(kr)^2}}\right)\left(1+\frac{\frac{v}{c}}{1+\frac{1}{(kr)^2\left[1-\frac{v}{c}\right]}}\right)}} \underset{r\ll\lambda}{=} 1 \quad \text{(reduces to one in nearfield)}$$

$$\underset{r\gg\lambda}{=} \frac{1}{\sqrt{\left(1+\left(\frac{v}{c}\right)^2\right)}} \quad \text{(reduces to Einstein relativity gamma function in farfield)} \quad \textit{Eq. 37}$$

where γ = Relativistic gamma factor, c = far field speed of light, k = wave number, r = distance from dipole to observation point, v = velocity of moving frame of reference, λ = wavelength

The resultant equations for time and space then become:

- Time:

$$t' = \gamma\left(t - \frac{x}{v}\left\{\frac{1}{\gamma^2}-1\right\}\right) \underset{r\ll\lambda}{=} \gamma\, t \quad \text{get Galilean relativity time transform in nearfield}$$

$$\underset{r\gg\lambda}{=} \gamma\left(t - \frac{v}{c^2}x\right) \quad \text{get Einstein relativity time transform in farfield} \quad \textit{Eq. 38}$$

where γ is the function derived above

$$t = \gamma\left(t' + \frac{x'}{v}\left\{\frac{1}{\gamma^2}-1\right\}\right) \underset{r\ll\lambda}{=} \gamma\, t' \quad \text{get Galilean relativity time transform in nearfield}$$

$$\underset{r\gg\lambda}{=} \gamma\left(t' - \frac{v}{c^2}x'\right) \quad \text{get Einstein relativity time transform in farfield} \quad \textit{Eq. 39}$$

where γ is the function derived above

- Space:

$$x' = \gamma(x - vt) \underset{r\ll\lambda}{=} x - vt \quad \text{get Galilean relativity space transform in nearfield} \quad \textit{Eq. 40}$$

$$\underset{r\gg\lambda}{=} \gamma(x - vt) \quad \text{get Einstein relativity space transform in farfield}$$

$$x = \gamma(x' + vt') \underset{r\ll\lambda}{=} (x' + vt') \quad \text{get Galilean relativity space transform in nearfield} \quad \textit{Eq. 41}$$

$$\underset{r\gg\lambda}{=} \gamma(x' + vt') \quad \text{get Einstein relativity space transform in farfield}$$

- Velocity:

$$\dot{x} = \frac{v\left(1+\frac{v}{\dot{x}'}\right)}{1+\frac{v}{\dot{x}'}-\frac{1}{\gamma^2}} \underset{r \ll \lambda}{=} \dot{x}'+v \quad \text{get Galilean relativity velocity transform in nearfield}$$
$$\underset{r \gg \lambda}{=} \frac{\dot{x}'+v}{1+\frac{v}{c^2}\dot{x}'} \quad \text{get Einstein relativity velocity transform in farfield} \qquad \textit{Eq. 42}$$

$$\dot{x}' = \frac{v\left(1-\frac{v}{\dot{x}}\right)}{\frac{1}{\gamma^2}+\frac{v}{\dot{x}'}-1} \underset{r \ll \lambda}{=} \dot{x}-v \quad \text{get Galilean relativity velocity transform in nearfield}$$
$$\underset{r \gg \lambda}{=} \frac{\dot{x}-v}{1-\frac{v}{c^2}\dot{x}} \quad \text{get Einstein relativity velocity transform in farfield} \qquad \textit{Eq. 43}$$

- Dopler shift:

$$\frac{f'}{f} = \gamma\left(1+\frac{v}{c}\right) \underset{r \ll \lambda}{=} 1+\frac{v}{c} \quad \text{get Galilean Doppler shift in nearfield}$$
$$\underset{r \gg \lambda}{=} \frac{\sqrt{1+\frac{v}{c}}}{\sqrt{1-\frac{v}{c}}} \quad \text{get Einstein relativity Doppler shift in farfield} \qquad \textit{Eq. 44}$$

where ɣ = Relativistic gamma factor, c = far field speed of light, v = velocity of moving frame of reference, λ = wavelength, c= far field speed of light, x = position reference stationary frame, x' = position reference moving frame, t = time reference stationary frame, t' = time reference moving frame, f = frequency reference stationary frame, f' = frequency reference moving frame

The resultant equations for time dilation and space contraction then become:

Eq. 45

- Time: $\Delta t' = t_2' - t_1' = \gamma\left(t_2 - \frac{x_2}{v}\left\{\frac{1}{\gamma^2}-1\right\}\right) - \gamma\left(t_1 - \frac{x_1}{v}\left\{\frac{1}{\gamma^2}-1\right\}\right)$, thus for $x_1 = x_2$: $\Delta t' = \gamma\Delta t$ and $\Delta t = \frac{\Delta t'}{\gamma}$

- Space: $\Delta l' = x_2' - x_1' = \gamma(x_2 - vt_2) - \gamma(x_1 - vt_1)$, thus for $t_1 = t_2$: $\Delta l' = \gamma\Delta l$ and $\Delta l = \frac{\Delta l'}{\gamma}$ *Eq. 46*

where ɣ = Relativistic gamma factor, v = velocity of moving frame of reference, x = position reference stationary frame, x' = position reference moving frame, t = time reference stationary frame, t' = time reference moving frame, Δ = change

These results clearly show that the nearfield instantaneous fields generated by an electric dipole yields Galilean transformations, and the speed c fields generated in the farfield yield Lorentz transformations. This can easily be understood, because in the nearfield, the relativistic gamma factor $\gamma = 1$, since c = infinity. In the farfield, γ = the Relativistic gamma formula, since c = farfield speed of light. Since time and space are real, they can not depend on the frequency of light used. This is because c = wavelength x frequency, thus wavelength = c/frequency defines the nearfield from the farfield. Consequently Relativity is an optical illusion. Objects moving near the speed of light will appear to contract in length, and time appears to slow down, but this is just what one observes using farfield light. Using nearfield light, one will measure that the object has not contracted and time has not really changed. Relativity is still important for predicting the observed changes in time and space using farfield light, but the effects are an optical illusion and not real. Time and space are absolute as indicated by Galilean Relativity.

Section 5 - <u>Effects on General Relativity</u>:

Since General Relativity is based on Special Relativity, then the effects of General Relativity on space and time must also be an optical illusion. Spacetime is flat as indicated by Galilean Relativity. Since General Relativity has been shown to be invalid, what theory can replace it? Newtonian gravity is very accurate in the nearfield, but assumes gravitational fields propagate instantaneously over all space, which is known to not be true in the farfield, as recently measured by LIGO (Abbott, 2017). A better model is Gravitoelectromagnetism (Heaviside, 1893), which accurately predicts the speed of gravity in the near and farfield, as was shown above (Section 3). Gravitoelectromagnetism predicts all known gravitational effects. Consequently, gravity is a propagating field that can finally be quantized (Graviton), enabling the unification of gravity and quantum mechanics.

It has been shown that propagation of information via electromagnetic fields and gravity is not limited by the speed of light and is instantaneous less then a wavelength from the source. For low frequencies the nearfield can extend to astronomical distances. So everything is in electromagnetic and gravitational communication with everything thoughout the universe. Recently it has been found that quantum entanglement involves quantum information propagating instantaneously across space and violates Relativity (Clauser, 1972). It has been shown in this paper that instantaneous propagation of information is possible and occurs for many phenomena including electromagnetic fields and gravity. This may explain the superluminal propagation of information observed in quantum entanglement.

Quantum Mechanics currently has many interpretations, with the Copenhagen interpretation being favored over the others, where it assumes particles are in superposition of states, and not real until measured. It is a statistical, nondeterministic, local interpretation. Pilot Wave theory on the other hand is a deterministic and non-local interpretation, where it assumes particles always have real positions and trajectories, and are guided by pilot waves that can interfere and act on other particles instantly across space. Pilot wave theory is completely compatible with instantaneous propagating fields and Galilean Relativity, where time and space are absolute. Because of the results presented in this paper, and because of its deterministic simplicity, Pilot Wave theory should now become the preferred interpretation of Quantum Mechanics.

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