

Gravity caused by TEM waves operating on dipoles in atoms

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Abstract

The study displays the existence of a gravitational singularity in the universe generating synchronized and extremely low frequency plane TEM (transverse electromagnetic) waves. It is proposed that atomic intrinsic electromagnetic fields create resonance with these plane TEM waves, causing particles and atoms to receive and to re-emit synchronized plane TEM waves. The energy flow of synchronized plane TEM waves, travelling in opposite directions between e.g. two atoms, creates mutual force of attraction, i.e. gravity. Consequently, gravity is not an intrinsic atomic feature; however, the result of fully passive atoms exposed to electromagnetic energy. The study describes how plane TEM waves emitted by the gravitational singularity were measured. The study also displays how gravity was measured and how gravity was simulated using an electronic device. The present electromagnetic law of gravity is compared with Newtonian geometric law of gravity.

1. Introduction

Newton made the geometric description of gravity. Despite elapsed time the theoretical description of gravity remains unsolved.

It's known that the atom contains charge, static electric- and magnetic dipole moment. These fields decrease with the square of the distance and can consequently not create gravity. It seems unlikely that the atom generates alternating electromagnetic fields by itself, and hence electromagnetic energy is often ruled out as the origin of gravity. The prevailing track is to explain gravity by string theory.

The present study builds on the observation that gravity comprises plane TEM (transverse electromagnetic) waves or energy. The theory of plane TEM waves is well known and hence, it is possible to describe gravity entirely by the laws of electromagnetism. All theory is found in university grade textbooks, e.g. (Bleaney, 1965) or (Melrose and McPhedran, 1991).

The study builds on the observation that the universe contains one generator emitting plane TEM waves. All emitted plane TEM waves are quasi synchronized, facilitated by its extremely low frequency and origin. This generator or gravitational singularity can consist of circulating charge and is called the GravitySource in the present study.

Electric, \mathbf{E} , and magnetic, \mathbf{B} , field vectors are linked in plane TEM waves and in this case they are almost static. An elementary particle that contains a static electric field, \mathbf{E}_i , merged with a static magnetic field, \mathbf{B}_i , creates resonance with this type of plane TEM waves; it receives plane TEM waves and re-emits them without changing content. It is called EQ (energy quantum) in the present study.

In order to illustrate the simplicity of gravity a grossly simplified universe is described. This simplified universe contains a GravitySource and only two EQs, EQ₁ and EQ₂. The GravitySource emits plane TEM waves, TEM₁, to EQ₁. EQ₁ creates resonance, receives and re-emits TEM₁ to EQ₂. EQ₂ creates resonance, receives and re-emits TEM₁ to the GravitySource. Simultaneously the GravitySource emits plane TEM waves, TEM₂, to EQ₂, EQ₂ re-emits it to EQ₁ and EQ₁ re-emits it to the GravitySource. Consequently, this simplified universe contains circulating, synchronized plane TEM waves travelling in opposite directions between the GravitySource, EQ₁ and EQ₂. According to the laws of electromagnetism, synchronized plane TEM waves travelling in opposite directions create mutual force of attraction, i.e. gravity. This model can be scaled up to any number of EQs, e.g. to today's universe.

In the present study the hypothesis is that gravity is electromagnetic energy generated centrally in the universe, distributed within the universe, received and re-emitted by fully passive elementary particles or energy quantum in atoms.

This theory was verified in Section 2. Synchronized, plane TEM waves travelling in opposite direction were mapped on the laws of electromagnetism. It resulted in an equation describing the relation between the number of involved EQs, their distance and the mutual force of attraction. This relationship can be called the electromagnetic law of gravity and which was compared with the Newtonian geometric law of gravity.

Section 3 describes an electronic device that simulated the EQ. This device was used in Section 4 in order to empirically verify the theory in Section 2. Measurements were made according to a method developed by Giertz (2010). Section 3 also describes an electronic device that contained a static magnetic field merged to an alternating electric field and where the frequency of this field was

adjusted to the frequency of plane TEM waves emitted by the GravitySource. It facilitated measurement of the GravitySource frequency.

Conclusions are made in Section 5.

Section 6 covers discussion and where the measured (gravity) TEM wave's characteristics are mapped on the atom's nucleus. It results in a better understanding of the atom.

The photon-wave duality implies that the gravitational energy can be described as a photon and by the photon's generated plane TEM wave (Giertz 2013). In the present paper the gravitational energy is described by the photon's generated plane TEM wave.

Aim of the study. The aim of the study is to present and to verify a theoretical model of gravity.

2. Theoretical model of gravity

Maxwell's equations $\text{curl } \mathbf{H} = \mathbf{i} + \frac{\partial \mathbf{D}}{\partial t}$ and $\text{curl } \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$ result in plane TEM (transverse electromagnetic) waves (Bleaney, 1965). This is the most common electromagnetic energy in the universe resulting in e.g. radio waves, light and X-rays depending on frequency.

The behaviour and characteristics of plane TEM waves is independent of its frequency. The field vectors \mathbf{E} and \mathbf{B} or \mathbf{H} ($\mathbf{B} = \mu_0 \mathbf{H}$) are linked and perpendicular. The field vector amplitudes relate as $E = cB$, where c is the speed of light. The electric and magnetic field vector amplitudes E and B decrease with the distance from the source as $1/r$. The Poynting vector \mathbf{S} describes the TEM energy flow density (Bleaney, 1965);

$$\mathbf{S} = \mathbf{E} \times \mathbf{H} \quad (1)$$

The energy stored in the magnetic field is just equal to that in the magnetic field. The direction of energy flow is reversed for a wave travelling in the opposite direction because the phase of \mathbf{E} and \mathbf{H} is reversed.

Assume that one source, Source 1, radiates plane TEM₁ waves, described by its Poynting vector $\mathbf{S}_1(r)$ at the distance r from Source 1. Source 2 is positioned at the distance r . Source 2 is switched on whereby it radiates plane TEM₂ waves uniformly. In the direction towards Source 1 plane TEM₁ and TEM₂ waves interact because of the force between their synchronized field vectors. This also implies that there is energy transfer from TEM₁ to TEM₂ when TEM₂ propagates towards Source 1. In equilibrium there is energy transfer in both directions, i.e. from TEM₁ to TEM₂ vice versa. Note that \mathbf{E} and \mathbf{H} are always perpendicular and hence $\mathbf{S} = \mathbf{E} \times \mathbf{H}$ can be replaced by $S = E \cdot H$. Equilibrium is defined by the amount of energy that Source 1 is able to deliver at Source 2, e.g. at the distance r , $S_1(r)$, and the amount of energy that Source 2 is able to deliver at Source 1, i.e. $S_2(r)$. This results in back reaction force $F(r)$ proportional to $S_1(r)$ on Source 1 and $S_2(r)$ on Source 2, i.e. radiation reaction (Melrose and McPhedran, 1991), and where γ is a constant;

$$F(r) = \gamma \cdot S_1(r) \cdot S_2(r) \quad (2)$$

This creates mutual force of attraction $F(r)$.

It is now assumed that each source is an EQ (energy quantum, defined below) and where its Poynting vector is $\delta \mathbf{S}(r)$ and where r denotes the distance from the source. \mathbf{E} and \mathbf{H} decrease linearly with the distance r implying that $\delta \mathbf{S}(r)$ decreases with the square of the distance; $\delta \mathbf{S}(r) = \delta \mathbf{S}(0)/r^2$. The mutual force of attraction $\delta F(r)$ between two EQs at distance r is;

$$\delta F(r) = \gamma \cdot \delta S \cdot \delta S/r^2 \quad (3)$$

It is now assumed that one EQ acts on p collocated EQs, belonging to the set \mathbf{P} of all EQs at Source 2, and where each force can be described by $\delta F(r)$. These EQs are synchronised resulting in the force;

$$\sum_{p \in \mathbf{P}} \delta F(r) = \gamma \cdot \delta S \cdot \sum_{p \in \mathbf{P}} \delta S/r^2 = \gamma \cdot (\delta S \cdot \delta S) \cdot p/r^2 \quad (4)$$

It is now assumed that n collocated EQs, belonging to the set \mathbf{N} of all EQs at Source 1, act on p collocated EQs, belonging to the set \mathbf{P} of all EQs at Source 2, resulting in the total force $F(r)$:

$$F(r) = \gamma \cdot \sum_{n \in \mathbf{N}} \delta S \cdot \sum_{p \in \mathbf{P}} \delta S/r^2 = \gamma \cdot (\delta S \cdot \delta S) \cdot n \cdot p/r^2 \quad (5)$$

$\delta S \cdot \delta S$ is a constant described by the intrinsic characteristics of the EQ, and hence Eq. (5) is simplified into;

$$F(r) = \text{constant} \cdot \frac{n \cdot p}{r^2} \quad (6)$$

In the present study Eq. (6) is called the law of gravity between two clusters, at distance r containing n respectively p EQs. Note that the cluster can be a particle, an atom, a mass or a planet.

The implication of Eq. (3) is that a particle or atomic EQ (energy quantum) generates gravity quantum and consequently, the present theory applies to quantum gravity.

It is proposed that elementary particles or more precisely energy quanta EQs, in the atomic nucleus, contain intrinsic, combined electric and magnetic fields or electromagnetic dipoles. Every EQ creates resonance and receives GravitySource plane TEM waves. This results in emitted TEM waves. Two EQs and their emitted TEM waves create mutual force of attraction $\delta F(r)$. This is illustrated with gravity between the earth and the sun. The earth contains n energy quanta (EQs) creating a force $n \cdot \delta F(r)$ on every energy quanta (EQ) in the sun. The sun contains p energy quanta (EQs), thus the total force of attraction is $n \cdot p \cdot \delta F(r)$ and that is equal to Eq. (6). The earth's mass m_1 is proportional to the number of EQs on earth, i.e. $m_1 \propto n$, and the sun's mass $m_2 \propto p$. Eq. (6) is then approximately equal to the Newtonian geometric law of gravity;

$$F_G = \text{constant} \cdot \frac{n \cdot p}{r^2} \cong F_{\text{Newton}} = G \frac{m_1 \cdot m_2}{r^2} \quad (7)$$

Note that F_G , G and the *constant* decreases with the distance to the GravitySource.

3. Materials and methods

All experiments were performed using one or many identical devices called EQ. The EQ created resonance with plane TEM waves; it received and emitted plane TEM waves. Each EQ consisted of two neodymium magnets, with diameter 22 mm, spaced by a thin (0.05 mm) plastic foil. The south pole of one magnet attracted the north pole of the other. This created an internal magnetic field \mathbf{B}_i . One magnet was connected to the positive pole of a voltage source U . The other magnet was connected to the negative pole, Fig. 1. This created an internal electric field \mathbf{E}_i , e.g. 10^6 V/m at $U = 50$ V. \mathbf{B}_i and \mathbf{E}_i were merged within the thin space between the magnets and could be described as electromagnetic dipoles. Measurements were performed with the neodymium magnets connected to a 9 V battery, forming a portable EQ, detached from external influence (e.g. AC, ground). This EQ was used in experiments 5-10.

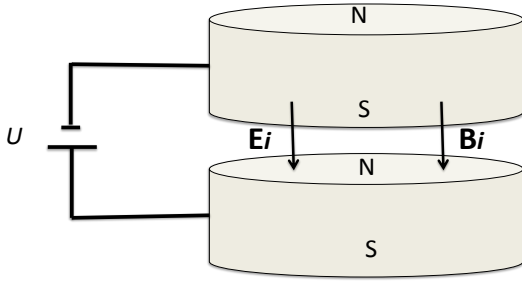


Fig. 1. Generating TEM waves.

Two neodymium magnets, with a diameter 22 mm, were spaced by a thin (0.05 mm) plastic foil with the south pole of one magnet attached to the north pole of the other. This created an internal magnetic field \mathbf{B}_i . One magnet was connected to the positive pole of a voltage source U , and the other magnet to the negative pole. This created an internal electric field \mathbf{E}_i , combined with \mathbf{B}_i . This device, called EQ (energy quantum) received and re-emitted plane TEM waves.

Experiments 1-4 and 11 were performed with the magnets connected to a low frequency signal generator with output voltage 0.5 mV RMS. Hence, the static electric field was replaced by an alternating electric field. The EQ created resonance at the signal generator frequency; it received and re-emitted plane TEM waves having this frequency. This device, also called EQ, was used in order to measure the frequencies of plane TEM waves originating from the GravitySource.

Measurements of plane TEM wave field vector amplitudes were made as described by Giertz (2010). That report describes in detail how the position and amplitude of electric and magnetic field vectors were measured using a charge meter. The charge meter is described in detail. Measurements in the present study were made almost identically to those described in (Giertz, 2010). In summary the charge meter contained a probe with charge density ρ . This probe was moved, with constant speed, through the TEM wave electric field vectors \mathbf{E} . This resulted in an electric body force $\rho\mathbf{E}$ on the probe charge ρ . This current pulse was amplified and displayed. In this case \mathbf{E} was field vectors, implying that $\text{div}\mathbf{E}$ was large and resulted in a

distinct current pulse. This probe was also moved, with constant speed, through the TEM magnetic field vectors \mathbf{B} , which resulted in a magnetic body force $\mathbf{J}\times\mathbf{B}$ on current \mathbf{J} in the probe. In this case \mathbf{B} was field vectors, implying that $\text{div}\mathbf{B}$ was large and resulted in a distinct current pulse. The measurement method had one important feature. The field vector's physical length was proportional to its amplitude, and in the present study between 0.1 – 10 m. It was easy to measure and determine the physical length of the field vectors since $\text{div}\mathbf{E}$ and $\text{div}\mathbf{B}$ were large. Hence, this was an accurate measure of the relative amplitude. Consequently, all results are presented as relative amplitude.

A permanent magnet with magnetic field \mathbf{B}_M (1 μT) was inserted within the TEM wave's path. The propagating TEM wave consisted of electric \mathbf{E} and magnetic \mathbf{B} field vectors. The magnetic field \mathbf{B}_M created a force on the positive magnetic field vectors \mathbf{B}^+ and on the negative magnetic field vectors \mathbf{B}^- . According to (Giertz, 2010 and 2013) it made the TEM wave's positive magnetic field vectors \mathbf{B}^+ divert the distance d_1 to one side and the negative magnetic field vectors \mathbf{B}^- divert the distance d_2 to the opposite side. TEM waves propagating in one direction (e.g. from Source 1 to Source 2) were influenced so that their field vectors were diverted in the horizontal plane, see Fig. 3. TEM waves propagating in the opposite direction (e.g. from Source 2 to Source 1) were influenced so that their field vectors were diverted in the vertical plane, see Fig. 4. This enabled measurement of the two directions separately. The field vectors propagated in smooth bows distanced by the magnetic field \mathbf{B}_M .

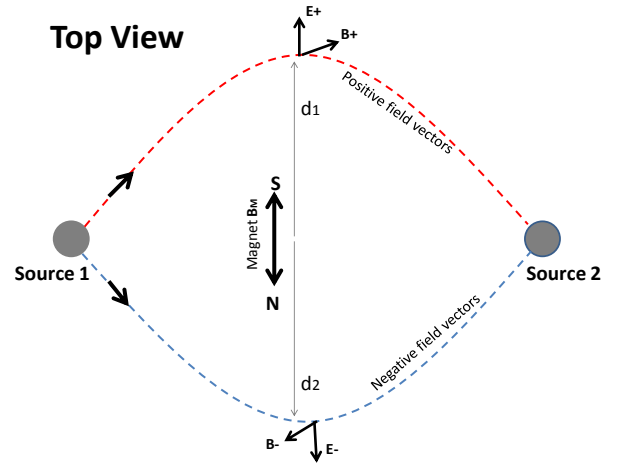


Fig. 2. Measuring TEM waves propagating from Source 1.

Two EQs, as described in Fig. 1, Source 1 and Source 2, were positioned at 10 m distance. Source 1 was connected to a 9 V battery and Source 2 was also connected to a 9 V battery. This resulted in TEM waves propagating between the two sources. A permanent magnet \mathbf{B}_M was inserted within the flow of TEM waves. TEM waves propagating from Source 1 to Source 2 were diverted in the horizontal plane. This resulted in that positive field vectors \mathbf{E}^+ and \mathbf{B}^+ were diverted the distance d_1 in the horizontal plane. The negative field vectors \mathbf{E}^- and \mathbf{B}^- were diverted the distance d_2 to the opposite side in the horizontal plane. This enabled separate measurement of TEM waves propagating from Source 1 to Source 2, respectively from Source 2 to Source 1.

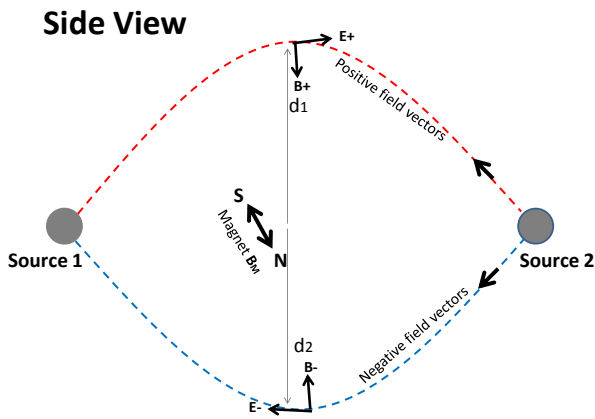


Fig. 3. Measuring TEM waves propagating from Source 2.

Two EQs, as described in Fig. 1, Source 1 and Source 2, were positioned at 10 m distance. Source 1 was connected to a 9 V battery and Source 2 was also connected to a 9 V battery. This resulted in TEM waves propagating between the two sources. A permanent magnet \mathbf{B}_M was inserted within the flow of TEM waves. TEM waves propagating from Source 2 to Source 1 were diverted in the vertical plane. This resulted in that positive field vectors \mathbf{E}^+ and \mathbf{B}^+ were diverted the distance d_1 in the vertical plane. The negative field vectors \mathbf{E}^- and \mathbf{B}^- were diverted the distance d_2 to the opposite side in the vertical plane. This enabled separate measurement of TEM waves propagating from Source 2 to Source 1, respectively from Source 1 to Source 2.

Measurements were performed 50 km south of Stockholm, Sweden.

Analysis. The experiments were performed blindly, randomly and repeated 3 times.

4. Results

Experiments 1 - 4 were made with the EQ connected to the signal generator. The purpose with these experiments was to verify plane TEM wave frequency and its origin. Initially the signal generator frequency was increased from 1 to 100 Hz in increments of 0.1 Hz. TEM wave amplitude close to the EQ was measured as a function of frequency. It was observed that the EQ received and emitted plane TEM waves from the object being measured at two distinct frequencies; 69.9 Hz and 91.9 Hz. The signal generator was adjusted to these two frequencies in experiments 1-4. It was also observed that the EQ always received and emitted plane TEM waves from the earth (i.e. ground). Hence, the EQ did not generate TEM waves; its only function was to create resonance at the plane TEM wave frequency.

Experiment 1. One EQ, connected to a signal generator, was positioned on a table and this was called Source 1. The signal generator frequency was 69.9 Hz and then changed to 91.9 Hz. The generator frequency was carefully adjusted to maximum TEM wave field vector amplitude. 1 % deviation in frequency resulted in approximately 50 % change in TEM wave field vector amplitude, which illustrated the demand for accuracy. The EQ was activated at the frequency 69.9 Hz for 48 hours in order for the experiment to stabilize. It was observed that the field vector amplitude increased approximately 10 times during 48 hours. It also continued to increase after 48 hours by approximately 10 % daily. It

produced plane TEM₁ waves propagating from Source 1 towards north (earth's rotational axis). It followed a diurnal, counter-clockwise circle with approximately 20 degrees cone angular radius. Its peak altitude was approximately 75 degrees and occurred at noon (in Sweden) and the direction was towards the geographical north +/- 5 degrees. Plane TEM₂ waves propagated from a source in the universe towards Source 1, aligned along and merged with TEM₁. It was possible to measure TEM₁ and TEM₂ separately by inserting a magnet, with magnetic field \mathbf{B}_M , as explained in Fig. 2 and in Fig. 3. The procedure is also explained in experiment 10. Measurements displayed electric field vectors \mathbf{E}^+ and \mathbf{E}^- and magnetic field vectors \mathbf{B}^+ and \mathbf{B}^- perpendicular to the direction from Source 1 to Source 2 and from Source 2 to Source 1. In each direction the field vectors \mathbf{E}^+ and \mathbf{B}^+ respectively \mathbf{E}^- and \mathbf{B}^- were perpendicular, i.e. separated 90 degrees as in any plane TEM wave, e.g. radio wave (Bleaney, 1965). In each direction the amplitudes were identical, i.e. $E^+=E^-$ and $B^+=B^-$; however, they varied between the two directions. Positioning an electric or magnetic field close to the field vectors changed their positions, confirming their nature and polarity. The method is described by (Giertz, 2010). The experiment was repeated, using generator frequency 91.9 Hz, displaying similar results. It is proposed that Source 2 was the GravitySource generating plane TEM waves with the frequency 69.9 Hz and 91.9 Hz. The experiment displayed that the EQ, Source 1, received TEM₂ waves from the GravitySource and that it produced TEM₁ waves which propagated in the direction towards the GravitySource.

Experiment 2. The above experiment was repeated; however, in this case TEM₁ and TEM₂ waves to and from the sun were measured at 69.9 Hz and then at 91.9 Hz. Measurements displayed results similar to experiment 1. It was possible to determine the sun's position in the daytime. The amplitude of plane TEM waves to/from the sun were less than 5 % of the plane TEM waves to/from the GravitySource, indicating the huge influence of the GravitySource.

Experiment 3. The above experiment was repeated; however, in this case plane TEM₁ and TEM₂ waves to and from the moon were measured at 69.9 Hz and then at 91.9 Hz. Measurements displayed results similar to experiment 2.

Experiment 4. The above experiment was repeated; however, in this case plane TEM₁ and TEM₂ waves to and from a nearby object (e.g. 10 kg iron) were measured at 69.9 Hz and then at 91.9 Hz. Measurements displayed results similar to experiment 2 and 3. The amplitude of $E^+=E^-$ and $B^+=B^-$ were proportional to the object's mass and inverse proportional to the objects distance r to the EQ.

Experiments 5 - 7 aimed at verifying the theoretical model, presented in Section 2. One EQ or many collocated EQs were positioned at Source 1. Source 2 was located at the distance $r = 10$ m and one or many EQs were positioned at Source 2. All EQs were connected to a 9 V battery each. It produced plane TEM₁ waves propagating from Source 1 to Source 2 and plane TEM₂ waves propagating from Source 2 to Source 1. Measurements displayed electric field vectors \mathbf{E}^+ and \mathbf{E}^- and magnetic field vectors \mathbf{B}^+ and \mathbf{B}^- perpendicular to the direction from Source 1 to Source 2 and from Source

2 to Source 1. In each direction the field vectors \mathbf{E}^+ and \mathbf{B}^+ respectively \mathbf{E}^- and \mathbf{B}^- were perpendicular, i.e. separated 90 degrees as in any plane TEM wave, e.g. radio wave (Bleaney, 1965). In each direction the amplitudes were identical, i.e. $E^+=E^-$ and $B^+=B^-$. It was also observed that Source 1 and Source 2 received and emitted plane TEM waves from the GravitySource and from the earth (i.e. ground). Hence, the energy in TEM₁ and TEM₂ originated from these sources. Consequently, the EQs did not generate TEM waves; their only function was to create resonance with low frequency plane TEM waves and to re-emit them.

Experiment 5. One EQ was positioned at Source 1 and one EQ at Source 2. The amplitude of the field vectors \mathbf{E}^+ were measured in both directions (i.e. TEM₁ from Source 1 to Source 2 and TEM₂ from Source 2 to Source 1). Then the number n of EQs at Source 1 was increased to 4 in steps of 1. Subsequently the number p of EQs at Source 2 was increased to 4 in steps of 1. Measurements displayed that the amplitude of the electric and magnetic field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were proportional to $n \cdot p$ in both directions. Subsequently the EQ at Source 1 was connected to a variable voltage source and the voltage U on Source 1 was varied from 0 to 40 V in steps of 5 V. Measurements displayed that the amplitude of the electric and magnetic field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were proportional to U in both directions, see Fig. 4.

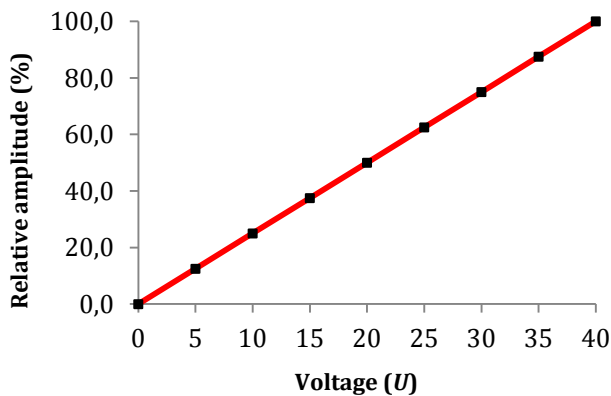


Fig. 4. Field vector amplitude as function of voltage on one EQ. Two EQs, as described in Fig. 1, Source 1 and Source 2, were positioned at 10 m distance. Source 2 was connected to a 9 V battery. The voltage U on Source 1 was varied from 0 – 40 V in steps of 5 V. The amplitude of the plane TEM₁ and TEM₂ wave's electric and magnetic field vectors (\mathbf{E}^+ , \mathbf{B}^+ , \mathbf{E}^- and \mathbf{B}^-) was measured as a function of the voltage U . The amplitudes of all four field vectors were proportional to U and $E^+=E^-$ and $B^+=B^-$ in both directions. E^+ amplitude in TEM₁ as function of U is displayed in Fig. 4.

Experiment 6. One EQ was positioned at Source 1 and one EQ at Source 2. The distance r between Source 1 and Source 2 was varied, starting with $r = 1$ m, then increased to 10 m in steps of 1 m. The amplitude of the field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were measured in both directions as a function of the distance r . Measurements displayed that the amplitudes of the electric and magnetic field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were inverse proportional to the distance r in both directions, see Fig. 5.

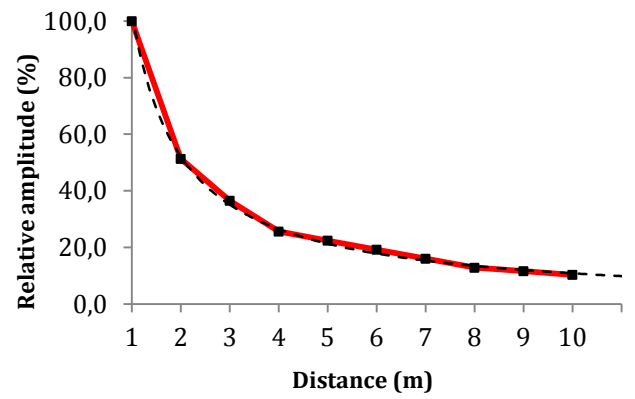


Fig. 5. Field vector amplitude as a function of distance.

Two EQs, described in Fig. 1, were positioned at the distance r , which was initially 1 m and then increased to 10 m in steps of 1 m. The amplitude of TEM₁ and TEM₂ wave's electric and magnetic field vectors (\mathbf{E}^+ , \mathbf{B}^+ , \mathbf{E}^- and \mathbf{B}^-) was measured as a function of the distance r in both directions. The amplitudes of all field vectors were proportional to $\frac{1}{r}$ and $E^+=E^-$ and $B^+=B^-$ in both directions. E^+ amplitude in TEM₁ as function of r is displayed in Fig. 5. The dotted line represents the theoretical decline $\frac{1}{r}$.

Experiment 7. One EQ was positioned at Source 1 and one EQ at Source 2 and the distance between them was 10 m. The amplitude of the field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were measured at different distances from Source 1 along the straight direction from Source 1 to Source 2, and measured in both directions. Measurements displayed that the amplitude of the sum of electric and magnetic field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- from both directions (i.e. TEM₁ + TEM₂) were constant at every position between Source 1 and Source 2. \mathbf{E}^+ , \mathbf{B}^+ , \mathbf{E}^- and \mathbf{B}^- were spaced 90 degrees in both directions, as in any plane TEM wave.

In the following experiments 8 and 9 an EQ, connected to a 9 V battery, was positioned at Source 1. Source 2 was a mass in experiment 8 and the sun in experiment 9.

Experiment 8. A mass (Source 2) which consisted of iron was positioned 5 m from the EQ at Source 1. The mass was increased from 0 to 10 kg in increments of 1 kg. Measurements displayed plane TEM₁ waves propagating from Source 1 to the mass and plane TEM₂ waves propagating from the mass to Source 1. The amplitude of the field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were measured, in both directions, as a function of the mass. Measurements displayed that the amplitude of the electric and magnetic field vectors \mathbf{E}^+ , \mathbf{E}^- , \mathbf{B}^+ and \mathbf{B}^- were proportional to the mass in both directions, see Fig. 6. It was also observed that the mass received and emitted plane TEM waves to and from the GravitySource and the earth (i.e. ground).

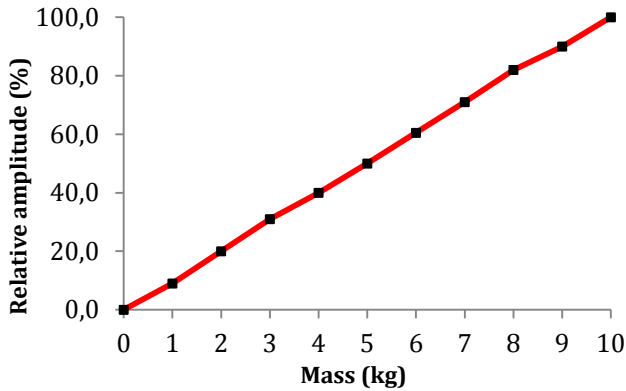


Fig. 6. Field vector amplitude as a function of mass.

One EQ (Source 1) was positioned 5 m from a mass which consisted of iron (Source 2). The mass was changed from 0-10 kg in steps of 1 kg. The amplitude of TEM₁ and TEM₂ wave's electric and magnetic field vectors (E^+ , B^+ , E^- and B^-) was measured as a function of mass m . The amplitudes of all four field vectors were proportional to m in both directions and $E^+=E^-$ and $B^+=B^-$. E^+ amplitude in TEM₁ as function of the mass m is displayed in Fig. 6.

Experiment 9. Source 1 (the EQ connected to a 9 V battery) was positioned on a table. Measurements were performed outside Stockholm, Sweden during the daytime. Measurements were performed 2 m in front of Source 1 and roughly in the direction of the sun. Measurements displayed plane TEM₁ waves propagating from Source 1 in direction towards the sun (Source 2) and plane TEM₂ waves propagating in the opposite direction. The amplitude of the field vectors E^+ , E^- , B^+ and B^- were measured as a function of time (i.e. the sum of TEM₁ and TEM₂). Measurements displayed that the amplitude of the sum of TEM₁ and TEM₂ electric and magnetic field vectors E^+ , E^- , B^+ and B^- increased approximately six times the initial amplitude within 16 minutes. Then they remained stable displaying no change in amplitude, see Fig. 7.

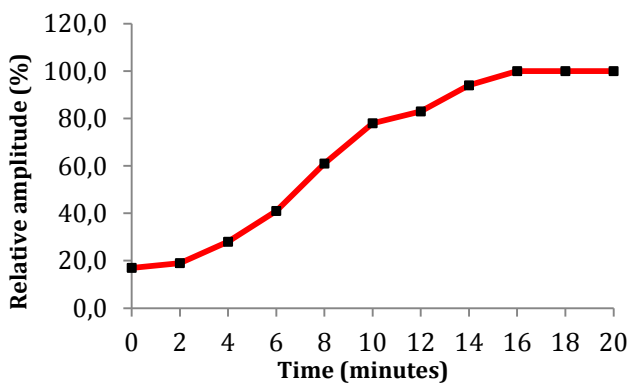


Fig. 7. Field vector amplitude towards the sun as a function of time.

One EQ, Source 1, was positioned on a table. The sun constituted Source 2. Measurements displayed plane TEM₁ waves propagating from Source 1 in direction towards the sun and plane TEM₂ waves propagating in direction from the sun to the EQ, Source 1. The amplitude of the combined (i.e. the sum of) plane TEM₁ and TEM₂ waves electric and magnetic field vectors (E^+ , B^+ , E^- and B^-) was measured as a function of time. The amplitudes of field vectors were $E^+=E^-$ and $B^+=B^-$ at all times. The sum of field vector amplitudes E^+ from both directions was measured as a function of time. After 16 minutes the amplitude was constant during an 8 hour measured period. The direction of plane TEM₁ waves and plane TEM₂ waves followed the position of the sun.

After 16 minutes the length of TEM₁ field vectors were approximately 0.4 m at $U = 9$ V, indicating that the electric and magnetic field strength was significant and thus the field divergence $\text{div}E$ was significant and easy to measure. Measurement was also performed on plane TEM waves to and from the GravitySource (after 48 hours). TEM wave amplitude of the GravitySource was more than 20 times larger than the TEM wave amplitude towards the sun, indicating its large influence. Note that TEM wave amplitude from the GravitySource continued to increase after 48 hours by approximately 10 % daily. Hence, it is reasonable to assume that the influence from the GravitySource is very large.

Experiment 10. All above experiments were enhanced in the following way; a static magnetic field B_M (i.e. a 1 μT magnet) was inserted at the centre of the plane TEM₁ and TEM₂ waves, 0.5 m from Source 1, see Fig 2 and Fig. 3. It was observed that in experiment 1, TEM₁ was diverted much further than TEM₂, which provided a way to measure the plane TEM waves to and from the GravitySource separately and to make a relative comparison between TEM₁ and TEM₂ amplitudes. It was also observed that in experiment 9, TEM₁ was diverted much further than TEM₂, during the initial 8 minutes. It facilitated a way to measure the plane TEM waves to and from the sun separately and to make a relative comparison between TEM₁ and TEM₂ amplitudes.

Experiment 11. One EQ, connected to a signal generator, was positioned on a table and this was called Source 1. The signal generator frequency was changed from 0.1 Hz to 1 Hz in steps of 0.01 Hz. The generator voltage was 0.5 mV RMS. It was observed that the EQ created resonance at 0.74 Hz and received plane TEM₂ waves from the direction of the GravitySource. It was also observed that the EQ radiated 0.74 Hz plane TEM₁ waves to every type of matter, Source 2, in its vicinity. The amplitude of TEM₁ was proportional to the mass of Source 2. Furthermore, the amplitude of TEM₁, at Source 1, decreased linearly with the distance to Source 2. It was also observed that the amplitude of TEM₁ along the straight line between Source 1 and Source 2 decreased linearly with the distance from Source 1. It was not possible to observe any TEM₂ waves propagating from matter, Source 2, to the EQ, Source 1. It was concluded that the GravitySource radiated plane TEM waves at 0.74 Hz and that this energy was absorbed by matter. Hence, TEM waves at 0.74 Hz were not re-emitted by matter. The amplitude of the 0.74 Hz TEM wave, absorbed by matter, was significantly higher than the amplitude of 69.9 Hz and 91.9 Hz TEM waves propagating to the same matter (approximately 10 times larger).

It was observed in experiments 1-11 that vertically propagating plane TEM waves (e.g. to/from the earth) resulted in that magnetic field vectors were oriented north to south caused by influence from the geomagnetic field. Otherwise the magnetic field vectors were oriented vertically, also the result of influence from the geomagnetic field. Consequently, the plane TEM waves were polarized which explains the efficiency of the measurement method used in experiments 1-11.

5. Conclusions

The study proposes that gravity is created by plane TEM (transverse electromagnetic) waves, which is the solution to Maxwell's equations $\text{curl } \mathbf{H} = \mathbf{i} + \frac{\partial \mathbf{D}}{\partial t}$ and $\text{curl } \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$. The gravitational force or mutual force of attraction between two synchronized plane TEM waves travelling in opposite direction is proportional to the scalar product of their Poynting vectors according to Eq. (2). According to the photon-wave duality this energy can also be described by its photon (Giertz, 2013).

It is proposed that a gravitational singularity called the GravitySource emitted plane TEM waves to elementary particles, or more precisely, to energy quanta, EQs, within the atom's nucleus. It is proposed that the EQ contained intrinsic, merged electric and magnetic fields or electromagnetic dipoles or one electric dipole. These almost static merged fields created resonance with the plane TEM wave's almost static field vectors. The received plane TEM waves were re-emitted as plane TEM waves and distributed to, in principle, every EQ in the universe and where the amplitude decreased linearly with the distance to the EQ. The content of these plane TEM waves remained unchanged. Simultaneously every EQ in the universe received plane TEM waves from, in principle, every other EQ in the universe. The plane TEM wave amplitude was inverse proportional to the distance between the EQs. This created a state of equilibrium where energy emitted by the GravitySource equalled energy re-emitted to the GravitySource. Hence, every EQ was also exposed to gravity from the GravitySource.

The mutual force of attraction between two EQs is described by Eq. (3). The mutual force of attraction between two masses (i.e. the sum of contributions from many EQs) is described by Eq. (6), which is approximately equal to the Newtonian geometric law of gravity according to Eq. (7).

The plane TEM wave frequency was measured in experiments 1-4 using a device, EQ, which created resonance at a predetermined frequency; it received and re-emitted plane TEM waves at one particular frequency. It consisted of an internal alternating electric field \mathbf{E}_i with frequency 0.74 Hz, 69.9 Hz or 91.9 Hz, merged with an internal static magnetic field \mathbf{B}_i .

Experiment 1. This experiment confirmed the existence of the GravitySource generating plane TEM waves with the frequency 69.9 Hz and 91.9 Hz. The direction towards the GravitySource was to the north and followed a diurnal, counter-clockwise circle with approximately 20 degrees cone angle radius. It was assumed that the diurnal change of direction was caused by the rotation of the earth and where the earth's axis was misaligned 10 degrees relative to the direction towards the GravitySource.

Experiment 2. This experiment displayed that plane TEM wave's amplitude to/from the GravitySource was at least twenty times the plane TEM wave's amplitude to/from the sun, confirming its large influence.

Experiments 2-4. These experiments confirmed that the sun, the moon, the earth and an object (e.g. iron) positioned in

close proximity to the EQ, produced and received synchronized and mutually coupled plane TEM waves with frequency 69.9 Hz and 91.9 Hz. It indicated that these objects produced 69.9 Hz and 91.9 Hz plane TEM waves and that these plane TEM waves were synchronized to the GravitySource's plane TEM waves.

Experiment 5. In this experiment n respectively p EQs were positioned at a distance r. Results displayed that E^+ , B^+ , E^- and B^- amplitudes were proportional to n·p confirming Eqs. (3, 4, 5, 6). This was simulated by varying the voltage U on Source 1, resulting in proportional change in field vector amplitude.

Experiment 6. In this experiment the distance r between EQs was varied, displaying that field vector amplitudes E^+ , B^+ , E^- and B^- were proportional to $\frac{1}{r}$ confirming Eqs. (3, 4, 5, 6) (Note that field vectors decreased with $\frac{1}{r}$ while energy decreased as $\frac{1}{r^2}$).

Experiment 7. Plane TEM waves propagating between two EQs displayed that the sum of TEM_1 and TEM_2 field vector amplitudes were constant all the way from one EQ to the other EQ. It indicated the mutual coupling between synchronized plane TEM_1 and TEM_2 waves propagating in opposite direction. It is proposed that there was a transfer of energy between the two TEM waves. This transfer of energy and the back reaction force that the plane TEM waves created on its source created mutual force of attraction or gravity according to Eq. (2). Hence, experiment 7 supports the theoretical model.

Experiment 8. This experiment proved that an object (mass) produced gravity proportional to its mass, confirming Eq. (6) and Eq. (7). This experiment showed that a mass produced plane TEM waves identical the GravitySource, the sun, the moon and also the electronic device used in experiments 1-7. This indicates that the mass, the sun and the moon contained similar type of mechanism of intrinsic nature and similar to the function of the electronic device called EQ. It is proposed that the mass, the sun and the moon contained an elementary particle or energy quantum which created resonance and re-emitted gravity TEM waves originating from the GravitySource. It is proposed that the energy quantum consisted of an intrinsic electric field or dipole merged with a magnetic field or dipole.

Experiment 9. It took approximately 16 minutes to stabilize the TEM_1 waves propagating from Source 1 (the EQ) to Source 2 (the sun) and the TEM_2 waves propagating from Source 2 to Source 1. The field vectors reached their maximum amplitude after approximately 16 minutes. The round trip to the sun was 16.6 minutes at the speed of light. It can be explained as follows. The EQ at Source 1 was switched on at time $t=0$ minutes. After 8.3 minutes ($t=8.3$) TEM_1 waves reached the sun creating the force $F(r) = \gamma \cdot S_1(r) \cdot S_2(r)$ at the sun. Then it took another 8.3 minutes ($t=16.6$) before the influenced TEM_2 waves reached Source 1. The two synchronized TEM_1 and TEM_2 waves created mutual force of attraction between Source 1 and Source 2, and full gravity (at $t=16.6$). The experiment confirmed the mutual exchange of energy between the two sources according to Eq. (2) and also that plane TEM waves (off course) propagated with the speed of light.

Experiment 10 displayed that it was possible to separate TEM_1 waves from TEM_2 waves and that it was possible to measure the two directions separately.

Experiment 11 displayed that investigated matter contained some type of mechanism that absorbed plane TEM waves at 0.74 Hz, originating from the Gravity Source. However, these plane TEM waves were not re-emitted. Hence, TEM waves at 0.74 Hz were absorbed by matter and its atoms.

The conclusion is that the universe contained a gravitational singularity called the GravitySource. It generated plane TEM waves with the frequency 69.9 Hz and 91.9 Hz. Energy quanta, EQ, consisting of intrinsic, merged static electric and magnetic fields or dipoles created resonance with these plane TEM waves. They were then re-emitted to other EQs as plane TEM waves with the frequency 69.9 Hz and 91.9 Hz. EQs in the universe were synchronized to the GravitySource which resulted in that received and emitted plane TEM waves were synchronized, causing exchange of energy and mutual force of attraction, which is called gravity. The atom consisted of many EQs. This resulted in an equation called the electromagnetic law of gravity, Eq. (6). It was compared with the Newtonian geometric law of gravity, Eq. (7). In addition the GravitySource radiated plane TEM waves at 0.74 Hz, which was absorbed by matter and the absorbed plane TEM wave amplitude was linear to the mass, indicating an intrinsic atomic mechanism.

The following offers a possible explanation to the origin of the GravitySource. It is proposed that the GravitySource consisted of a kernel of charge rotating at three speeds (i.e. $T=1/0.74$ s, $T=1/69.9$ s and $T=1/91.9$ s), constituting a gigantic electromagnetic generator. It emitted photons and their plane TEM waves with frequency 0.74 Hz, 69.9 Hz and 91.9 Hz.

Experiments 1-11 can also be summarized as follows. Gravity consisted of extremely low frequency plane TEM waves. Using state of the art measurement technique would require unrealistically long antennas. The method was to create plane TEM wave spatial divergence, which was created with the electronic device called EQ and polarization created by the geomagnetic field. The plane TEM wave spatial divergence created TEM wave field vector divergences $\text{div}\mathbf{E}$ and $\text{div}\mathbf{B}$ which were measured with a charge meter. This innovative measurement technique enabled unbundling of gravity.

6. Discussion

Experiments 2 and 9 displayed that gravity between the electronic device EQ (Fig.1) and the GravitySource was much larger than gravity between the electronic device EQ and the sun. From Section 4 and 5 follows that gravity between the electronic device EQ and the GravitySource was significant. It is proposed that the EQ within the atom (atom's EQ) behaves similar to the electronic device EQ. Consequently, the atom's EQ was exposed to two different gravity components, gravity between the atom's EQ and all other atom's EQs in the universe and gravity between the atom's EQ and the GravitySource. It is proposed that the former is called gravitational gravity and the latter is called

inertial gravity. The inertial gravity results in that the universe rotates around the GravitySource. Exposing the atom's EQ to force accelerates the atom's EQ relative to all other atom's EQs and the GravitySource. It can be illustrated with an EQ travelling through space, far away from planets and stars. It is primarily influenced by TEM waves from and to the GravitySource. Its reference frame is the GravitySource or more precisely TEM energy at EQ proximity. Its energy state relative to its reference frame (i.e. TEM energy generated by the GravitySource) is changed when the EQ is accelerated and hence $\delta F = \gamma EQa$. a is the acceleration created by the quantified force δF on the inertial mass quantum γEQ . A mass on earth experiences two reference frames; the first is the earth and its gravity and the second is the GravitySource and its gravity. Hence, this mass m can be described as inertial mass, $m_i = \gamma \sum EQ$ and gravitational mass, $m_g = \beta \sum EQ$ according to Eq. (6) and Eq. (7). γ and β are constants. This explains why, according to classical mechanics, the gravitational mass is proportional to the inertial mass. It is proposed that mass does not exist. Mass is only the observation of electromagnetic energy (i.e. TEM waves originating from the GravitySource) operating on electric and magnetic fields, i.e. $\sum EQ$. In that case Einstein's mass-energy equivalence may relate to the EQ, $E = mc^2 = \zeta \sum EQ$, where ζ is a constant.

The atom is in traditional physics described by its particles, quarks, gluon graviton, baryon, proton, electron etc. and by its forces, the strong interaction, the weak interaction, electromagnetism and gravity. The present paper describes the atom's EQ (energy quantum) as a particle creating gravity and inertia. The EQ consists of a static electric field in parallel with a magnetic field.

In its simplest form the EQ may consist of only two charges, a positive and a negative elementary charge forming an electric dipole. This dipole is exposed to plane TEM waves from the GravitySource with the frequency 0.74 Hz and this induces a magnetic field with the frequency 0.74 Hz. Hence, this dipole consists of a static electric field and an almost static magnetic field. Consequently, the dipole can be regarded as an electromagnetic dipole which also creates resonance with plane TEM waves (gravity waves) at 69.9 Hz and 91.9 Hz. This dipole is called EQ in the present paper and it is the atom's elementary particle and also the atom's energy quantum.

The dipole (EQ) has electric and magnetic fields, electric and magnetic dipole moments, it produces gravity (mass) and it produces inertia (inertial mass). The force from all dipoles (EQs) in an atom which act on one dipole (EQ) in the atom is entirely electromagnetic. They consist of the vector sum of electric forces (Coulomb force) from all dipole's charges, the vector sum of electric dipole moments from all dipoles, the vector sum of the induced magnetic force (at 0.74 Hz) from all dipoles and the vector sum of the magnetic dipole moment (at 0.74 Hz) from all dipoles.

The (induced) magnetic force (at 0.74 Hz) dominates within the atom's nucleus. It is proposed that this magnetic force represents what is commonly called gluon and the strong interaction. The electric force (Coulomb force) is strong within a dipole and between adjacent dipoles. Hence, the electric force can contribute to the strong interaction.

However, within the atom's nucleus the electric force is normally smaller than the magnetic force. The force from electric and magnetic dipole moments is probably small. It is proposed that the electric force and the dipole moments normally represent what is commonly called the weak interaction and electromagnetism. The commonly called gravity or graviton is a photon. Due to the photon-wave duality the photon can also be described by the generated plane TEM wave. In the present paper the TEM wave is described. In the case of gravity the photon frequency and the TEM wave frequency is 69.9 Hz or 91.9 Hz. These photons can be called gravity photons.

The conclusion is that the atom can be described by only two forces; the magnetic force (strong interaction) and the electric force (weak interaction). In addition the atom's EQs (dipoles) create resonance with gravity photons and re-emit them. The flow of gravity photons between two EQs creates mutual force of attraction, i.e. gravity. Thus gravity is an electromagnetic force. Hence, all forces encompassed by the atom are electromagnetic and can be described by the laws of electromagnetism.

It is proposed that there are three quanta. The positive and the negative elementary charges are the Charge Quantum. The atom's dipole is the Energy Quantum. The photon consists of a positive elementary charge loosely coupled to a negative elementary charge and is a quantum according to Giertz (2013). Hence, the photon is the Wave Quantum. Consequently, the three quanta consist of the same elementary charges; however configured in different ways. All three can be included in (modified) quantum physics.

Positioning two EQs (dipoles) side-by-side results in strong magnetic force, fusing the EQs. EQs can be added forming a matrix. Such configuration can be described as a quark and various configurations can be described as various types of quarks.

Amalgamated quarks result in baryons, e.g. neutron. A proton is created when a positive charge is added to one EQ in a neutron. An electron is created when a negative charge is added to one EQ in a small configuration of EQs (e.g. a dipole with one positive charge and two negative charges). The sum of these particles is the atom.

Consequently, the photon and the atom may consist of only positive and negative elementary charges configured into photon, EQ, electron, quark, neutron, proton etc. Hence, the universe may consist of only positive and negative elementary charges and different configurations of these charges. All forces in the universe are electromagnetic forces induced by the position and motion (i.e. velocity and acceleration) of these elementary charges and their configurations.

It is proposed that the present study unifies gravity, described by Eq. (6), with electromagnetic theory and quantum physics. Hence, this electromagnetic theory of gravity supplements Newtonian geometric theory of gravity, relativistic metric theory of gravity, Newton's second law of motion and Einstein's mass-energy equivalence.

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