Quantum Electric Gravity:
Direct Experimental Verification

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Abstract

Quantum Electric Gravity (QEG) is a new theory of quantum gravity predicated on EM and QM. Unlike the classical Newton and Einstein's General Relativity theories, QEG can derive gravity from the fundamental pillars of EM, QED and QCD, and can potentially reveal the origin and root cause of gravity. The long-range bi-directional EM–QED force, mediated by force-carrier messenger particles between charge entities, give rise to continuous QM quark vibrations. The QCD gluon force imposes asymmetrical restrictions on these vibrations leading to a net energy-change that can account for the force of gravity due to energy conservation. To date, most theories of quantum gravity like string theory, loop quantum gravity and others are not amenable to direct experimental verifications, largely due to their high level of abstractions that lacks significant connection to fundamental physics. In contrast, QEG is fundamentally different in many respects, including the following. First, it is theoretically derived from the fundamental pillars of QM, leading up to the complete QEG equation comprising QCD binding energy, QED quantum probability, and EM parameters and entities. Second, the QEG equation and parameters are experimentally verifiable and testable by well-established laboratory experiments. This leads to the interesting outcome that appears to support and corroborate QEG with a relatively high-level of confidence.

Keywords: Experimentally Verifiable Quantum Gravity, Testable Quantum Gravity, New Theory of Quantum Gravity.

1. The QEG Equation

The general QEG equation was derived in detail in [1, S6], [2, S2], [3], and [4], leading up to

$$\boxed{U_{\mathrm{QEG}} = D_{\mathrm{qe}} \frac{n_1 n_2}{U_0\, r} ECF_{\mathrm{qe}}}$$

$$ECF_{\mathrm{qe}} = \left(\frac{1}{U_{01}/U_0 \;\; U_{\mathrm{N1}}} + \frac{1}{U_{02}/U_0 \;\; U_{\mathrm{N2}}} \right) \tag{1}$$

$$U_{\mathrm{N}} \quad = 1 + U_{\mathrm{s}} + U_{\mathrm{g}} + U_{\mathrm{a}} + U_{\mathrm{t}} + \cdots \equiv \text{normalised energy parameter}$$

$$U_{\mathrm{s}} \equiv \text{self-gravity}, \quad U_{\mathrm{g}} \equiv \text{gravity}, \quad U_{\mathrm{a}} \equiv \text{acceleration}, \quad U_{\mathrm{t}} \equiv \text{temperature}$$

Parameter ECF_{qe} is the dimensionless Quantum Electric (QE) Energy Coupling Factor, and D_{qe} is the QE parameter defined as follows [1, S5]

$$D_{\mathrm{qe}} = 2\left(\frac{A_{\mathrm{vib}}\, e^2 P_{\mathrm{qp}}}{4\pi\varepsilon_0} \right)^2 \;\; 1/n_{\mathrm{qk}} - 1 \qquad \left(\frac{\mathrm{J^2 m}}{\mathrm{nuc}^2} \right) \text{or} \left(\frac{\mathrm{N^2 m^3}}{\mathrm{nuc}^2} \right) \tag{2}$$

$$D_{\mathrm{qe}} = 2 \;\; A_{\mathrm{vib}}\, \alpha\, \hbar\, c\, P_{\mathrm{qp}} \;\; ^2 \;\; 1/n_{\mathrm{qk}} - 1 \qquad \text{alternative}$$

2. Experimental Determination and Verification of $\boldsymbol{D_{\mathrm{qe}}}$

The value of the key parameter D_{qe} and its sub-parameters are already determined from theory as detailed in [1, S3, S4, S5]. The aim of this section is to determine the value of the D_{qe} directly from experiment, then use this experimental value to assess and calculate the value of its sub-parameters (2). The D_{qe} parameter can be determined from laboratory experiments, such as by using the actual force $\boldsymbol{F}_{\mathrm{exp}}$ measured by the torsion balance experimental setup similar to that of Sir Henry Cavendish or other more modern experiments [SS7.1]. Since such experiments are conducted in the weak gravity of Earth, one can let $U_{\mathrm{N1}} \approx U_{\mathrm{N2}} \approx 1$, $ECF_{\mathrm{qe}} = 2$, and $U_{\mathrm{a}} \approx U_{\mathrm{t}} \approx 0$ (1), assuming objects of the same compositions (Au). One can differentiate eq. (1) to obtain the force $\boldsymbol{F}_{\mathrm{QEG}}$, which can then be equated to $\boldsymbol{F}_{\mathrm{exp}}$, as follows

$$\boldsymbol{F}_{\mathrm{QEG}} = D_{\mathrm{qe}} \frac{2\, n_1 n_2}{U_{0\mathrm{Au}}\, r^2} = -\boldsymbol{F}_{\mathrm{exp}} \tag{3}$$

Re-arranging (3) leads to

$$D_{\mathrm{qe}} = -\frac{U_{0\mathrm{Au}}\, r^2}{2\, n_1\, n_2}\, \boldsymbol{F}_{\mathrm{exp}} \tag{4}$$

It is important to note that equation (4) provides an unequivocal direct experimental means to calculate the actual value of parameter D_{qe} regardless of theory, sub-parameters (2) or G. It is worth noting that classical gravity uses units of weight like the kg, which is normally insensitive to object composition as well as to the effect of strong gravity. Therefore, for the most accurate value of D_{qe}, it is highly recommended to obtain the force $\boldsymbol{F}_{\mathrm{exp}}$ directly from a new experiment with accurately known object compositions (atomic weight A and atomic number Z), QCD binding energies, and other relevant parameters [1]. Absent the availability of such accurate experiment, one can use the following approximate method as an alternative for now, by working out the approximate value of $\boldsymbol{F}_{exp}$ from Newton using the latest CODATA value of G = 6.67430E-11 for any given setup in weak gravity here on Earth, on the understanding that this readily available method is somewhat less accurate. It is preferable to use objects of the same compositions with similar protons to neutrons ratios such as stable gold (Au) objects. We shall use object masses m_1 = 10 kg, m_2 = 1 kg with number of nucleons $n_1 = m_1/m_{nuc1}$ and $n_2 = m_2/m_{nuc2}$ in objects 1 and 2, respectively, wherein m_{nuc} is the average nucleon mass in the object. The centre-to-centre distance between the two objects is r = 0.06 m. This leads to the force $\boldsymbol{F}_{exp}$ = -1.853972222E-7 N from Newton.

For QEG, one can calculate the number of nucleons in the same gold objects (above) of Z=79 and A=197 using $n = m/m_{nuc}$ [1, S5], which leads to the effective QCD binding energy of U_{0Au} = 1.487110247E-10 (J) [1, S5]. Substituting these values in (4) yields the following D_{qe} value

$$D_{qe} \approx -1.390692721\times 10^{-74} \quad \text{J}^2\text{m/nuc}^2 \tag{5}$$

Having determined the value of D_{qe} from experiment, one can now determine the value of its sub-parameters P_{qp}, n_{qk} , and A_{vib} in (2) using the D_{qe} value from (5), as follows

1) Equation (2) can be rearranged as follows:

$$\boxed{(A_{vib}P_{qp})^2\left(1/n_{qk}-1\right)=\frac{(4\pi\varepsilon_0)^2}{2e^4}D_{qe}=\text{const} \qquad \approx 1.306283\times 10^{-19}} \tag{6}$$

2) The interaction cross section or probability P can be determined from QED, e.g., by squaring the fine structure constant, which leads to $P \approx$ 5.325E-5 and to the probability of a Quantum Ping (Qping) event of $P_{qp} = P^2$ [1, SS3.3].
3) Knowing the value of P_{qp}, one can write the combined values of A_{vib} and n_{qk}, as follows

$$A_{vib}^2\left(1/n_{qk}-1\right)=\frac{(4\pi\varepsilon_0)^2}{2e^4P_{qp}^2}D_{qe}=0.0162465 \tag{7}$$

4) The analysis of the QE Mass [2, S8], corroborated by $E=mc^2$, points to the value of the QCD binding energy exponent n_{qk} = 4.
5) Substituting the above values of P_{qp} and n_q in (7) yields the vibration amplitude $A_{vib} \approx$ 1.3246/9 ≈ 0.147177, which is well within the 1/9 – 2/9 range expected from theory [1].

3. Remarks

1) D_{qe} is a complex composite QM parameter.
2) The sign of QEG originates from the D_{qe} parameter via its embedded sub-parameter X_D [1, SS4.2, eq. (12)], which can be considered as an intrinsic negative or positive indicator that can determine whether gravity is attractive or repulsive, respectively.
3) Physicists have been searching for a mechanism relating to anti-gravity in order to explain some puzzling phenomena relating to the evolution of the universe, as well as a

potential mechanism behind supernova explosions. In QEG, the attractive and repulsive signs are automatically built in D_{qe}.

4) Parameter D_{qe} demonstrates how QEG depends on the fourth power of probability (P^4). This highlights the gigantic role played by the QM probability P in "blunting" the colossal raw EM force and cutting it down to size. On its own account, P alone effectively reduces the EM (ES) force by at least a factor of ≈100 million billion times, leaving behind the "ashes" from which gravity can then emerge.
5) The analysis above assumes weak gravity (U_g) and negligible object's self-gravity (U_s). For higher accuracies, however, one should use the full QEG equation (1) by taking into account the contribution arising from planet Earth, the solar system, the Milky Way galaxy, and indeed the universe at large, all of which have negligible but none zero effect on U_g and U_s in the experiment above.
6) As mentioned above, a more accurate D_{qe} value can be obtained from an experiment with accurately known object parameters and data, as well as accounting for point (5) above.
7) By combining all the relevant QM parameters and attributes, the powerful QEG parameter D_{qe} may be viewed as the key parameter to quantum gravity.

Conclusion

To date, there is no theory of gravity, let alone QG, capable of combining theoretical construct based on fundamental physics with the backing of direct experimental verification. Newton's law of universal gravitation is experimentally verifiable, but it lacks theoretical foundations. GR is an abstract theory lacking robust physics foundations like the SM and QM. Most tests attributed to GR are largely due to its reliance on the value of Newton's Big G, rather than providing its own new or original parameters. Most other theories like String and LQG are all built on highly theoretical abstract concepts that are not amenable to experimental verifications. QEG is the only theory of QG that can be tested in the laboratory via unequivocal direct experimental means, as explained above. In addition, QEG is also supported by observations [1] [2]. The agreement between theory and experiment in QEG can potentially provide a unique and interesting outcome that can attest to the veracity of QEG, and its deep-rooted fundamental pillars of EM, QED, and QCD.

References

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