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The Constant *Q*

Marc Pérez Mateos

Instituto Anna Murià, Tarrasa, Spain
Email: neomarc1978@gmail.com

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Abstract

It was in 2020, during the pandemic, that I deduced the Q constant, a gravitational constant. I call it that to distinguish them from all other physical constants, as I believe there is no other constant with the same name. Deducing Q and explaining it is not overly complicated, as you will see in this treatise. If you are a physicist, I hope you find my work enjoyable and useful; and if you are not a physicist, I hope you do as well.

Keywords

Q Constant, Relativity, Physical Constants

1. Introduction

The constant Q is totally relativistic. It is based on Einstein's theories, on Relativity. I honestly think it is correct and accurate [1].

Q is made up of 3 physical constants, mathematically ordered, as you will see shortly.

Being a gravitational constant, it is strange that it does not include Newton's constant G in the equation, since it has a margin of error. The different measurements made in recent years do not coincide. The current value is

$$6.67430\times10^{-11}\ \mathrm{N}\cdot\mathrm{m}^2/\mathrm{kg}^2$$

The exact value of Newton's constant G is still an experimental challenge today, and it has even been heard that its margin of error can be 1% (0.01), or even 2% (0.02) [2].

2. Presentation of "*Q*"

Now, without further ado, I will show the value of this novel constant.

Q has a value of

$$Q=\frac{1}{8\pi c}\,\mathrm{kg}\cdot\frac{\mathrm{s}}{\mathrm{m}}\left(\text{or kg/m/s}\right)$$

1 is one kilogram of mass;

π is the number pi (3.14159…etc);

c is the exact speed of light in a vacuum (299,792,458 m/s).

As you can see, Q is made up of 3 exact constants: 1, 8π, and c.

Its value is exactly

$$Q = 1.327209365 \times 10^{-10}$$

We observe that Q is equal to $2G$ (Newton's constant multiplied by 2).

In quantum physics, the value of G is equal to

$$G = \ell_p^2 c^3 / \hbar$$

which is equal to $6.677920 \times 10^{-11}\ \mathrm{N} \cdot \mathrm{m}^2/\mathrm{kg}^2$.

ℓ_p is the Planck length;

c is the speed of light;

$\hbar$ is the reduced Planck constant.

A value considerably higher than the currently used value of G. This means that both ℓ_p and $\hbar$ are inaccurate; one of them, or both. When the exact value of G is discovered, their measurements can be adjusted [2] [3].

3. Theoretical Development of the Constant *Q*

The Division of 1 Kilogram of Compact, Spherical Mass by the Speed of Light "*c*"

1 kg/c is part of the inverse relationship, where energy is converted into mass. It's an application of Relativity, and shows that mass and energy are interchangeable.

If we divide 1 kg by the speed of light c, we get a minuscule number of seconds, exactly

$$3.335610952 \times 10^{-9}\ \mathrm{s}\left(\mathrm{seconds}\right)$$

This unit of time represents the time it takes a photon to travel a distance of 1 meter in a vacuum.

$1/c$ is related to $E = mc^2$, which shows that compressed mass and energy, and the calculation represents an inverse relationship between mass and high speed, indicating the large amount of energy that mass possesses.

Dividing 1 kg of mass by c gives us the "time magnitude" that one kg has in the context of the speed of light, which is inversely proportional to the energy it would release.

But returning to the amount of time that $1/c$ causes a photon to travel 1 meter in a vacuum, it must be viewed from another perspective; I would interpret it not only as a photon, which is also interesting, but also adding the word "gravity" to the word "photon", since the speed of propagation of gravity is the speed of light, c, which causes the geometric modification of spacetime.

Thanks to Einstein's Theory of General Relativity, we know that this propagation of gravity travels at the speed of light. In this sense, in the gravitational constant Q, c does not represent the speed of photons traversing spacetime, but rather the speed of gravity itself.

1 kilogram

1 kg of mass is a universal constant and is found in the International System of Units (SI). The kilogram of mass is invariable in space and time.

8π, explanation

In the Einstein field formula, the term 8π is a fundamental scaling factor that connects the curved geometry of spacetime with the matter and energy that cause it. The 8π of geometry (the inverse square law formula) and the conversion between different units provide the "coupling constant" between matter and curvature.

Newtonian gravity has a factor of 4π related to the surface of a sphere; in General Relativity, this 4π is doubled to 8π. 8π is a fundamental constant that scales matter and energy to produce the curvature of spacetime, making Einstein's theory compatible with Newtonian gravity and accurately describing gravity at all scales.

The $8\pi G/c^4$ factor of the Einstein field acts as the "rigidity" of spacetime. The 8π ensures that the curvature density is correct to match the gravity we experience.

π

π is the geometric nature related to curvature, a property of spacetime described using differential geometry.

8

8 is a factor that arises from the mathematics of General Relativity and its connection to Newton's Law in the limit of weak fields.

The 8π factor is crucial for the geometric description of gravity; it is a constant that emerges from the mathematical formulation related to G and c.

8 reflects multidimensional geometry, and π the circular/cyclic nature of curved spacetime. It represents the intrinsic geometry of spacetime, connecting curvature with matter and energy.

In short, 8π is a fundamental physical constant in General Relativity that establishes the magnitude of the gravitational interaction, determining how many curvatures a given amount of mass/energy produce in the fabric of spacetime [1].

4. The Usefulness of the Constant *Q*

$$1/8\pi c$$

In General Relativity, the formula for the Schwarzschild radius R_s, the radius of a black hole, is equal to

$$R_s = 2GM/c^2 \text{ meters}$$

M is the mass, G is Newton's constant, and c is the speed of light.

The constant Q must be multiplied by the mass M, or vice versa.

If we substitute $2G$ for Q, (QM/c^2), we deduce that the exact radius R of a black hole is equal to:

$$R = M/8\pi c^3 \text{ meters}$$

And knowing the exact radius R, we deduce that the exact mass M of a black hole is equal to:

$$M = 8\pi R c^3 \text{ kilograms}$$

The expression $8\pi c$ appears when describing the energy density of a field. $8\pi c$ is a factor that arises from combining wave physics (π, c) with quantum mechanics to define how energy and light behave [4].

5. Discussion

For example, our Sun does not have enough mass to become a black hole. But if that were the case, and it were to become a black hole, using Newton's constant (currently accepted) to calculate its radius R, we find that it is equivalent to

$$R = 2954.12 \text{ meters}$$

And using the constant Q, the radius R is equal to

$$R = 2937.19 \text{ meters}$$

That is, in a radius of almost 3 kilometers, we find a difference of 16.93 meters. And I ask myself: Is this difference small, or is it large? And I answer: It is just enough to realize that the gravitational constant Q is correct.

To reach this conclusion, he used the exact mass of the Sun, which is equal to $M_{\odot} = 1.989 \times 10^{30}$ kilograms

We observe that between $2G$ and Q, we find a difference of 0.01 (one hundredth).

He also calculated the Planck length (ℓ_p) with the constant $Q/2$, and the difference we found is only 0.005085. This was also calculated using the currently accepted reduced Planck constant ($\hbar$).

6. Conclusions

The gravitational constant Q is composed of three exact, and entirely relativistic, constants or factors. I believe that, like Newton's gravitational constant G, Q should be used, in both relativity and quantum mechanics, as a kind of bridge between the large and the small. It should be considered an additional or parallel constant to G, or $2G$, since the difference is small or nonexistent, from my point of view.

The constant Q is novel, its theoretical development is quite concise, and despite the difficulty of understanding it entails, I think it is impeccable. I think the examples written in this manuscript are striking and accurate, but in reality, many comparisons and applications of Q could be made.

And here, I conclude my theory, "the constant Q".

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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