What is gravity?

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Abstract

We present a proposal, alternative to the curved spacetime of Einstein, which we replaced by the curved quantum vacuum, caused by its gravitational interaction with the masses of the stars, as the source of Newtonian anomalies of celestial mechanics, restoring gravity as one of the fundamental forces of nature.

1. Introduction

In the current paradigm of Einstein, gravity is not a force while in Newton's previous one it is. The paradigm shift occurred because the Einstein-Grossmann equations, for a Lorentz spacetime, give roughly coincident estimates with the perihelion precession of the planets, the deflection of the electromagnetic wave that includes the gravitational lens and partially the Shapiro's delay, which they are in the modern interpretation of the equations, called modern relativity, attributed to the curvature of spacetime. Too, the local frame drag; in this case, taking the spacetime as a material entity. All these effects refer to celestial mechanics.

Other consequences of the equations such as the gravitational redshift and the rest of Shapiro's delay are obtained from Einstein's strong equivalence principle, which can be explained from Newton's gravitational potential, which would determine, in inverse proportion, the time of the physical processes, according to the author.

With respect to gravitational waves, whose equations correspond to quadrupole waves of space [1], lacking support in the impulse-energy tensor, were formulated by Einstein, during a period of strong Lorentz pressure until he accepted the static gravitational field like the relativistic ether. Einstein resigned to the gravitational waves in 1938, but they survived due to the obstinacy of the relativists. The so-called LIGO waves reaffirm the material character of spacetime [2], [3], [4], [5] genuinely geometric, breaking logically with the mathematical model of Einstein-Grossmann. Since 2016, the author has formulated that they should be quantum vacuum waves [6].

Einstein had two major prejudices in his scientific work that were: to be an absolute relativist unlike Galileo and Newton and to identify spacetime with absolute emptiness despite the theories about ether that clashed with that conception. Although, between 1916 and 1938, due to Lorentz, Einstein admitted the relativist ether, another name that transiently gave to spacetime. These prejudices prevented him from including the vacuum, as a fluid, it could be the physical cause of the anomalies of the celestial mechanics, which according to his equations, are due to the curvature of spacetime.

2 The quantum vacuum

Quantum physics disputes the current relativist paradigm. It is based on the coherence of the quantum phase, dynamic vacuum and complex scalar field existing in the vacuum in which the universe is

immersed. In phase dynamics it describes the universe as a super fluid.

In its totality, the universe is quantum vacuum formed mainly by fields of virtual bosons and virtual gluons, radiation constituted by fields of real bosons and fermionic matter composed of elements and substances. Together they are the Matter. And according to the author, spacetime is the structural geometric form of Matter [7].

Dark matter and dark energy can be opposite effects of the vacuum, in the first case, trapped by the cosmic fermionic macro structures manifesting as only gravity within spheroid spacetimes and, in the second case, free of them acting as only pressure within a Minkowskian spacetime [8]. Thus, the author proposes that the vacuum exerts pressure and gravitates.

Matter cosmologically is a fluid described by the equations:

$$T_{(\mu\nu)}^{Matter} = T_{(\mu\nu)}^{vacuum} + T_{(\mu\nu)}^{(bosonic\ radiation)} + T_{(\mu\nu)}^{(fermionic\ matter)} \quad \text{(Eq. 1)}$$

$$T_{(\mu\nu)}^{Matter} = \left(\rho c^2 + p\right) u_\mu u_\nu + p g_{(\mu\nu)} \quad \text{(Eq. 2)}$$

$$w = p/\rho \quad \text{(Eq. 3)}$$

Eq. 2 is the cosmological equation of the perfect fluid. Although, according to the author, $g_{\mu\nu}$ determine the geometry of spacetime as a structural form of dynamic matter. Eq. 3 is the cosmological state equation.

The quantum vacuum is a medium that totally impregnates the universe, mainly the outer space, that is to say, the almost totally empty space existing between the stars, where the density is 10^{-24} g / cm^3, and in the almost empty regions 10^{-33} g / cm^3. In addition, atoms are more than 99.999 percent empty. This means that Matter is mainly quantum vacuum.

The quantum vacuum is full of virtual particles, which are in a continuous state of fluctuation; these virtual particles are created in quantum vacuum fluctuations, which are the temporal change in the amount of energy at a point in space, as explained by Heisenberg's uncertainty: $\Delta E.\Delta T \geq \hbar / 4\pi$. The quantum vacuum satisfies the functions that were attributed to the ether, able to propagate transverse waves, since the quantum vacuum is a bosonic, elastic, inertial medium, subject to the Bose-Einstein superposition principle, of viscous and fluid nature, which according to the author, in the Gravity Probe-B, NASA mistakenly attributes to a material spacetime [9], which is not supported in the Einstein-Grossmann equations [10].

The equation of the vacuum as a fluid is:

$$T_{\mu\nu}^{vacuum} = \left(\rho^{vacuum} c^2 + p^{vacuum}\right) u_\mu^{vacuum} u_\nu^{vacuum} + p^{vacuum} g_{\mu\nu}^{vacuum} \quad \text{(Eq. 4)}$$

According to the author, the gravitational interaction of the quantum vacuum with the fermionic macro structures of the cosmos causes the vacuum to curve spheroidly with a metric of the Einstein-Florides type (1974) [11]:

$$R_{\mu}^{\nu}-\frac{1}{2}R\,\delta_{\mu}^{\nu}=-8\,\Pi\,T_{\mu}^{\nu} \qquad \text{(Eq. 5)}$$

3 Our proposal

We propose a model of celestial mechanics, for the solar system, based on a force of quantum gravity, which can be described by the Newton-Poisson equations and the parameters PPN α that measures the curvature of spacetime as a structural geometric form of the quantum vacuum trapped in this system. The curvature of the quantum vacuum is produced by the mass of the solar system by interacting gravitationally with it and PPN λ, which measures the nonlinearity in the superposition of gravity. These are the so-called parameterized Newtonian equations. That is to say, the effects of curvature are not gravity that, therefore, even invalidates the relativistic theory of the gravitation of Logunov [12], which considers the curvature of spacetime, in the sense of Einstein, and the virtual graviton causes of the gravity. For the author, the effects of the curvature of the spacetime geometry of the vacuum in celestial mechanics are external, without being gravity.

While from the Einstein-Grossmann equations gravity results from the interaction of particles with the geometry of spacetime, we propose that it is the result of quantum virtual interactions between the particles of material fluids. We consider that the Grossmann-Einstein equations unify the effects of the force of gravity and the curvature of the vacuum, describing it only as the curvature of geometric spacetime. In philosophical interpretation of Einstein's spacetime due to the lack of the $t_{\mu\nu}$ based on the static gravitational field of the Entwurf theory: For the dualistic idealist Substantialism, spacetime is a metaphysical entity, an immaterial entity whose curvature is the field static gravitational, a geometric property of spacetime; therefore they are nothing. For idealistic relationalism, spacetime is a category of thought that expresses metric relationships encoded in the static gravitational field, which is a geometric field; therefore they are nothing [13].

Of course, in celestial mechanics there is a curvature effect. At the cost of sacrificing the materiality of the static gravitational field, Einstein had to abandon the Entwurf theory because the tensors in Minkowski's spacetime do not give the precession of Mercury while in the Lorentz spacetime they do. In addition, Logunov had to use a dual spacetime model from Minkowski-Lorentz. Undoubtedly, there is an effect of something that curves, that we propose, it is the quantum vacuum under the action of the force of gravity of the stars.

In a note at the end of his treatise, Opticks, 1704, Newton formulated that light particles should be affected by gravity in the same way as ordinary matter. Henry Cavendish (1784) and Johan Georg von Soldner (1801) calculated the deviation of light in the vicinity of the Sun, by an angle of 0.875 second arc. Actually, the deviation is by an angle of 1.75 arc seconds that coincides with Einstein's calculation. According to the author, the force of gravity and the curvature of the vacuum each contribute one half. If the effect of gravity is eliminated, then the effect of the curvature is obtained, since according to the observations of the propagation of the gamma rays of the GLAST project, the gravitational interaction between the photons and the vacuum is extremely weak, being quantitatively insignificant, not contributing to gravity. Thus, we propose for celestial mechanics two causes that explain it: the force of Newtonian gravity and the curvature of the quantum vacuum according to the model:

Newton effect + Einstein effect corrected, that is:

$$[\![F_g = \frac{GMm}{r^2}]\!] + [\![\frac{1}{2}(R_{\mu\nu} - \frac{1}{2}Rg_{\mu\nu}) = \frac{8\Pi G}{c^4} T_{\mu\nu}]\!] \quad \text{(Eq. 6)}$$

4 Conclusions

Gravity presents two mechanical manifestations: The first is the free fall of the bodies absent of weight and the second the repose of the bodies subjected to a gravitational field, therefore, endowed with weight. As free fall it manifests only as acceleration while as weight it manifests only as force. Newton on the day he hit the apple (it does not matter if it is fable) felt gravity as weight and understood it as a force. Whereas, when he had his happiest thought, Einstein imagined that if he were in free fall he would have no weight and he understood gravity as mere acceleration. Newton and Einstein considered gravity only in one of its two mechanical aspects. Newton was right because he coincided with the fundamental aspect (in short a stroke of luck); Not so Einstein who, in his role as contradictor of Newton, assumed the secondary aspect as true. Gravity is a force.

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