Wave detected by LIGO is not gravitational wave

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Abstract

General Relativity defines gravity like the metric of a Lorentzian manifold. Einstein formulated spacetime as quality structural of gravity, i.e, circular definition between gravity and spacetime, also Einstein denoted " Space and time are modes by which we think, not conditions under which we live " and "We denote everything but the gravitational field as matter", therefore, spacetime is nothing and gravity in first approximation an effect of coordinates, and definitely a geometric effect. The mathematical model generates quantitative predictions coincident in high grade with observations without physical meaning. Philosophy intervened: in Substantivalism, spacetime exists in itself while in Relationalism as metrical relations. But, it does not know what spacetime. The outcomes of model have supported during a century, validity of the General Relativity, interpreted arbitrarily. Einstein formulated, from quadrupoles of energy, the formation of ripples in spacetime propagating as gravitational waves abandoned, in 1938, when he said that they do not exist. LIGO announced the first detection of gravitational waves from a pair of merging black holes. They truly are waves of quantum vacuum.

KEYWORDS: Relativity, gravitational waves, quantum vacuum, mechanical quantum waves.

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1 Introduction

General Relativity keeps the two approaches of their authors since in its version called Entwurf was compound of the Physical Part of Albert Einstein and the Mathematical Part of Marcel Grossmann, being his equations limited generally covariant. Einstein sought generalize the inertial to accelerated motion while Grossmann treats gravitation geometrically. In November 1915, Einstein, helping by the philosopher Moritz Schlick, overcomes his hole argument the main reason of his embarrassing, in front of Grossmann equations, and in hard competition with David Hilbert reached the full generally covariance publishing, in 1916, the final work.

The fundamental question in the General Relativity is that a homogeneous static gravitational field is an effect of coordinates due to the equivalence between inertial and gravitational masses that supports the equivalence between inertial, accelerated and gravitational motions; therefore, through of changes of coordinates it passes between them. The homogeneous static gravitational fields exist in plane spacetime. When the inertial motion of the plane spacetime is generalized to curved spacetime, Grossmann-Einstein used the functions g_{uv} to describe the static gravitational field and, since the functions g_{uv} express geometric relations between events, then it is a geometric field, geometrizing gravity. Of all ways, gravity an effect of coordinates although with change of geometry, during a long time no understanding. Is gravity, effect of curvature? Of course not, gravity is an effect of coordinates; without change of geometry in

Minkowskian geometry or with change of geometry in Lorentzian geometry. In both cases, the geometry determines the path of the movement; and the functions $g_{uv,}$ according to their values assigned, determine the character Lorentzian or Minkowskian of the geometry since the functions g_{uv} are general. Thus, Einstein never defined gravity as space-time curvature, who use wrong the concept are the majority of their followers. To Einstein there exists geometric inertia-gravitational field, that is, one only geometric structure of the spacetime from that arise inertia and gravity. When it breaks like inertia it corresponds to flat spacetime [1], [2]. At the geodesic equation such fundamental structure, of General Relativity, is clearly expressed:

$$\frac{d^2 x_\mu}{ds^2} + \Gamma^{\mu}_{\alpha\beta} \frac{dx_\alpha}{ds} \frac{dx_\beta}{ds} = 0 \qquad \text{(Eq. 1)}$$

Since if it is annulled all the components $\Gamma^{\mu}_{\alpha\beta}$ of the gravitational field then this equation gives a straight line [3].

Under pressure from his most important colleagues, mainly of Lorentz, Einstein had that call during 1916-1938, the static gravitational field as relativistic aether; therefore, denoting it as a material field, however through a witty wordplay, he was always faithful to his original thesis.

With relation to the spacetime as an object real Einstein considered was a mistake, consequence of the accelerated systems of Newton that disappears due to the equivalence between inertial and accelerated systems. About spacetime, Einstein believed was a thinking category associated to the geometric gravitational static field. However, during the time that he had admit the relativistic aether, in 1918, as mathematical exercise, once free of errors, it introduced the gravitational waves, ripples of the spacetime, question inadmissible from his original conception of gravity like effect of coordinates. Of course, when Einstein could finish, in 1938, with the relativistic aether too he finished with the gravitational waves but his followers no, consequence that they understand the equations of the model Grossmann-Einstein without understand the General Relativity conceptually.

The reduction of the General Relativity to the mathematical model is consequence that as theory is based in three principles sufficiently discussed by the philosophers being their consensus that they are not working [4] and that were used only as heuristic guides. As there is no theory, the results of the model lack of physical meaning, being them interpreted arbitrarily by the physicists. The philosophical schools of the substantivalism and the relationalism sought resolve the problem about what spacetime? To the backs of the physicists that due to their scientific formation are sceptics of the philosophy but strongly formed in mathematics.

The philosophical theories supported by the mathematical model are strictly restricted to:

- Spacetime is metaphysical fundamental entity whose curvature is gravitational static field, i.e., a geometric property of spacetime; therefore they are nothing as in dualistic idealist substantivalism.
- Spacetime is a thinking category that expresses metric relations codified in the gravitational static field, which is a geometric field; therefore they are nothing as in idealist relationalism.

Other versions that endow of materiality to spacetime or to gravitational field are out of the mathematical model because they violate the metric tensor:

- Spacetime is a special substance belonging to material substances whose curvature is gravitational static field, i.e., a geometric property of spacetime; therefore gravitational static field is nothing as in monistic materialist substantivalism (Schaffer, 2009, [5]; Turishev, 2011, [6]; Worden, 2012, [7]; Delplace, 2014, [8]).
- Spacetime is a thinking category that expresses metric relations codified in the gravitational field, which is a dynamic material field; therefore spacetime is nothing as in materialist relationalism (Indirectly: Lorentz, 1916; Weyl, 1918; Eddington, 1920; due to that they considered gμv= relativistic aether) (Directly: Cala, 2006, [9]; Bain, 2014, [10]; etc.; due to that they do not differentiate between the static gravitational field of the metric tensor and the dynamic gravitational field that would be of the energy-momentum tensor).

The result is: "Space-time is still an enigma to science and philosophy" [11] because “We really do not know what spacetime” [12].

In this work, we development the themes of gravitational waves and quantum vacuum, presenting our conclusion that the waves detected by LIGO are not gravitational waves impossible in General Relativity but quadru pole transverse waves of the quantum vacuum, a physical medium, sufficiently proved in the experiments, that necessarily must produce waves as consequence of the extraordinary magnitude of energy received from the coalescence of the two black holes.

2 Gravitational wave

On 22 June 1916, from the mathematical model, Einstein formulated the existence of gravitational wave caused by perturbations at values of g_{uv} that it should propagate through space [13]. Einstein abandoned his philosophical idealist relationalism of spacetime, since, how could exist perturbations of spacetime that is nothing? But, as the metric tensor is the static gravitational field, their disturbances should generate the dynamic gravitational field. ¡They would be perturbations of an immaterial gravitational field!

Lorentz was who led to Einstein to formulate the gravitational wave when, on June 6th 1916, wrote: field $g_{\mu v}$=aether [14], thus, he pressed to Einstein will accept the relativistic aether, consistent in Lorentz, but amazing in Einstein, since it violated the geometric nature of the metric tensor, turning it into matter. In addition, Einstein should answer the question asked by Max Born on the speed of propagation of gravity [15].

Due to the complexity of the original equations, Einstein worked with an infinitely weak gravitational field in linearized version:

$$g_{\mu v} = -\eta_{\mu v} + h_{\mu v} \qquad \text{(Eq. 2)}$$

”It was de Sitter who gave Einstein the idea to follow this route by sending him the values of the metric previous in a letter” [15]. Einstein calculated $h_{\mu v}$ in a manner analogous to the retarded potentials of Liénard-Wiechert in electrodynamics. However, both are not metric expressions of a perturbation occurring in a material phenomenon since this is true in electrodynamics but false in the static geometric gravitational field. “From this follow next that gravitational fields propagate at speed of the light” [13], conclusion based in a spurious similitude. In reality, gravity lacks of speed according Einstein although the tensor energy-impulse changes of configuration since the speed will be of the propagation of such change. How can have speed, a simple effect of coordinates?

The real result was the mathematical exploratory exercise to find the equations of six possible gravitational waves grouped in longitudinal and transverse waves that are apparent waves due they transport no

energy while the third new type Einstein believed real since, they would transport energy. However, mathematical results obtained by Nordström, 1917, and Schrödinger, 1918, contradicting Einstein [15], who in his new paper: "Ûber Gravitationswallen" [16] published, in February 1918, corrected his mistake.

Einstein abandoned the third type of the new wave. His new result gave only the two standard types of longitudinal and transverse waves of physics. As longitudinal wave does not transport energy was discarded. Thus, Einstein found that like the electromagnetic wave, the gravitational wave is a transverse wave but it is a quadrupole wave while the electromagnetic wave is a monopole wave. Quadrupole wave simultaneously would squeeze and would stretch to matter in two perpendicular directions.

Einstein identified cosmic events of quadrupole energy. These events are originated by asymmetric systems of quadrupole, as a binary pulsar with forms ellipsoids and/or elliptical orbits. In these pulsars with the variation of time has place within the dipole variations of the common center of masses of the system, that produces a quadrupole that reunites the relation of the energy of four nonsymmetrical angular moments of two masses, therefore, the inertial masses that determine the moment of the quadrupole is the same mass that generates the quadrupole waves causing the decay of the period of its orbits, due to the first law of the thermodynamics that establishes: the mass or the energy cannot be destroyed but transformed. Too, these waves, it would produce in the gigantic asymmetric physical processes of minimum four poles, as the asymmetric outbreaks of supernovas, gravitational asymmetric collapses, symmetric explosions in the nuclei of the Galaxies, or in the asymmetric sprouting of a stellar system or at the moment of Big Bang, called fundamental quadrupole waves.

In 1936, Einstein and Rosen sent the paper: "Do Gravitational Waves Exist?" to "The Physical Review", formulating gravitational wave no exists, result that Einstein had told to Max Born, after two years of reflection on this theme. The paper was rejected by the anonymous referee Harvey Robertson, professor of Princeton, citizen of USA while Einstein a distinguished immigrant. Due to departure of Rosen for Russia, Einstein had as assistant to Leopold Infeld who finally was accord with Robertson, his secret interlocutor, that Einstein and Rosen were wrong. Infeld presented to Einstein the solution of Robertson of the cylindrical gravitational wave in instead of the flat wave, following valid locally; then, Einstein said, he had also found a mistake that with Infeld corrected. Surprising to Infeld, Einstein gave thanks to Robertson. Thus, Einstein reintroduced the existence of the gravitational wave, again pressed and renaming his paper and of Rosen as "On gravitational waves" was published, in 1937, by the "Journal of the Franklin Institute" [17].

However, in 1938, overpassing any tactic compromise with Robertson "Einstein proposed a new method of approximation for determining the gravitational field of a moving particle – choose a weak field approximation and consider very low accelerations". "Einstein with his assistants, Infeld and Hoffmann, calculated the first two stages of this approximation and found that in the first stage the equations of motion take the Newtonian form. In this approximation, if we consider very low accelerations then the exact equations of motion indeed take the Newtonian form and we obtain a material particle that cannot radiate. In this state of affairs, we have revived the good old assumption that there could be no gravitational waves" [17]. Einstein, Infeld and Banesh Hoffmann published, in 1938, "The Gravitational Equations and the Problem of Motion" in Annals of Mathematics and, too in that year, Einstein definitely broke with the relativistic aether, vestige of Lorentz deceased, in 1928, and whose influence was extinguished during decade of 1930. Thus, Einstein reached his full autonomy; Einstein himself and for himself coming back to his conception of General Relativity as the extension of the relativity of motion from inertial motion to accelerated motion. But the mathematical physicists follow adhered to the mathematical model and intuitively devotees of the relativistic aether of Lorentz although to their backs. Therefore, they defend the existence of the relativistic gravitational wave because they believe intuitively that the static gravitational field of the General Relativity is material.

3 The equation of the undulatory motion

The undulatory motion is the propagation of disturbance of a static material field (such variation is a dynamic physical magnitude, i.e, impulse and energy) ξ described by a certain dynamic field ξ, through a medium.

The wave can be a mechanical, electromagnetic or quadrupole wave. The medium in the mechanical wave is a fermionic medium or the quantum vacuum as in the electromagnetic or quadrupole waves.
The undulatory motion is described by the differential equation of waves of D'Alembert that Einstein applied to quadrupole wave [18]. Of course, the equation works well but its interpretation is wrong:

$$\nabla^2 h_{\mu\nu} = \frac{1}{V^2}\frac{\partial^2 h_{\mu\nu}}{\partial t^2} \qquad \text{(Eq. 3)}$$

In the equation of D'Alembert V implies a constant speed of the wave in function of the space x_μ and time.

The disturbance is measured by displacement, a scalar value, of the particles of a mechanical medium or vector quantity variations, as in the case of electromagnetic waves. In Einstein the disturbances $h_{\mu\nu}$ lack itself of physical meaning due to that are variations of metric quantities. However, erroneously substantivalism may say: "Gravitational waves are propagations of spacetime itself while relationalism may respond: "Gravitational waves are propagations in the metric field." [10].

4 Quantum vacuum

If substantivalism hypothesis were true then the bare spacetime would exist, i.e. the absolute empty would exist therefore, the spacetime could be observed directly. Furthermore, as said Aristotle, the vacuum is something because whether vacuum was nothing it not would exist. Of course, without vacuum all matter it would rush upon itself to form an unstable Universe that would implode.

Universe is quantum vacuum, matter and radiation. They are material forms of existence, by being objectives and, have physical reality, in last instance, they are the Matter. Quantum vacuum is a medium that permeates totally the Universe, mainly the called outer space, i.e the space almost totally emptiness between stars, where the density is 10^{-24} g/cm^3, and in the Universe 10^{-30} g/cm^3 and empty regions in space 10^{-33} g/cm^3 [19]. Also, atoms are mostly empty space, more than 99,999 percent. This means that Matter is mainly quantum vacuum.

The quantum vacuum satisfies the functions that were attributed to the aether, specially in the close approximation of Lorentz, theoretical support of his proved electrodynamics of moving bodies [20], without the inconvenient of its mechanical fermionic structure, because the quantum vacuum is a bosonic medium, elastic, gifted of inertia, subject to the superposition principle of Bose-Einstein, and viscous fluid nature that in the Gravity Probe-B, NASA [6], [7], [8] attributes mistakenly to the spacetime deduced of General Relativity. Therefore, vacuum supports the transport of transverse waves.

According to the Standard Model, matter is made up of leptons and quarks with three basic types of electromagnetic, weak and strong interactions. Electromagnetic and weak forces are unified in the

electroweak theory (Glashow-Salam-Weinberg theory), while the strong interaction is pending of unify. The Standard Model includes an additional coupling of its constituent fields to Higgs fields which play a crucial role both in constructing the electroweak theory, and in generating the masses of the Standard Model particles. The Higgs boson was experimentally confirmed by the CERN on 4 July 2012 that permeates totally the vacuum.

In 1948, experimentally was confirmed in the Philips laboratories, the vacuum energy effect that Casimir predicted. The Casimir energy is a pure vacuum energy; real particles are not involved, only virtual particles [21]. The Casimir effect is a small attractive force which acts between two closed parallel uncharged conducting plates. It is due to quantum vacuum fluctuation of the electromagnetic field. All fields, in particular electromagnetic fields, have fluctuations. This effect proves that the vacuum is not really empty. It is filled with virtual particles, which are in a continuous state of fluctuation. Virtual particle-antiparticle pair can be created from vacuum and annihilated back to vacuum. These virtual particles are created in quantum vacuum fluctuations, which are the temporary change in the amount of energy in a point in space, as explained by Heisenberg uncertainty: $\Delta E.\Delta T \geq \hbar/4\pi$. Virtual photons are the dominant virtual particles, but other particles produced as well. As vacuum is as a superposition of many different states of electromagnetic field, the creation and subsequent absorption of a photon by the vacuum implies the vacuum fluctuates [22].

From the cosmology, near thirty three years later, starting in 1980, when worked in the two first years with Gennady Chibisov in the Lebedev Physical Institute, Viatcheslav Mukhanov, established that in the present the structure of the Universe in the scale $\leq 10^{-27}$ cm [23] are quantum fluctuations, that produced originally the spectrum of inhomogeneities, as the galaxies and their clusters, in the early Universe [24]. Thus, they are authors of the theory of Quantum Origin of the Universe Structure. The numerous experiments, during the era of the high precision cosmology, characterized by the use of the satellites COBE, in 1992, WMAP, in 2003, and completed by mission Planck, in 2013, in which there were measured the temperature fluctuations of the Cosmic Microwave Background Radiation, CMB, discovery by Penzias and Wilson in 1965, are in highly agree with their predictions confirmed definitely that assures us that everything in our Universe was originated from quantum fluctuations. CMB measurements have robustly proved quantum origin of the Universe structure irrespective of any alternative theories to inflation.

Since the perspective of the author, especially remarkable of the work of Mukhanov is his correct understanding on the great division of the physical existence: in the bosonic matter (quantum vacuum and radiation) and the fermionic matter (the rest) fixing the quantitative limit between both and deducing the existence of the second from the first, i.e., without quantum vacuum no would exist fermionic matter.

5 Quadrupole transverse waves of quantum vacuum

According to Einstein, 1936, and definitely, 1938, derived of the General Relativity, the gravitational waves do not exist. “The gravitational field is not a physical field possessing an energy-momentum density. Consequently, Einstein´s formula for gravitational waves does not follow from General Relativity. The gravitational wave flux can always be destroyed by the proper selection of the reference frame and, hence, the quadrupole formula for gravitational wave is not a corollary of General Relativity. Basically it does not follow from General Relativity that a binary system loses energy in the form of gravitational waves” [25]. However, there are cosmic events that must produce quadrupole transverse waves that Einstein established when, in 1918, he made mathematical exercise on gravitational waves. An event that produces quadrupole waves is a pair of black holes orbiting asymmetric around each other.

On September 14, 2015 at 5:51 a.m. Eastern Daylight Time (09:51 UTC) by both of the twin Laser Interferometer Gravitational-wave Observatory (LIGO) detectors, located in Livingston, Louisiana, and Hanford, Washington, USA [26], LIGO detected the last fraction of a second of a coalescence event of black holes, about 29 and 36 times the mass of the sun that occurred 1.3 billion years ago.

From the corpuscular theory of light of Newton, his equations on movement, gravity and escape velocity, in 1783, John Michell formulated the existence of stars, very massive, which would be invisible because their light could not escape from their gravity. In 1915, Albert Einstein at the General Relativity reaffirmed that light is subject to gravity and Karl Schwarzschild applying the Einstein's equations for a spherical body, confirmed that a star with a mass and a certain radius, its gravity would catch its light. In 1930, Subrahmanyan Chandrasekhar determined the critical mass in 1.5 times the mass of the Sun. In 1939, Robert Oppenheimer found that it should produce the gravitational collapse of the star. In 1967, Stephen Hawking and Roger Penrose proved that any solution of the equations of General Relativity for a collapsed star generates a singularity. In 1969, John Wheeler called black hole to the singularity [27]. Of other hand, in the Relativistic Theory of Gravitation of Anatoly Logunov and M. Mestvirishvili [25], alternative of the General Relativity, obtained directly from the Special Relativity, of course, it is not based on the inconsistent equivalence principle [28], the theorems of Hawking and Penrose on singularities do not apply; therefore, blackened stars would exist.

Independently, whether the binary system was of black holes or blackened stars it detected its coalescence and about 3 times the mass of the sun was converted into energy in such fraction of a second, on the quantum vacuum and, therefore, transferring this energy as mechanical quadrupole transverse waves through of this viscous quantum medium, according D'Alembert-Einstein equation (Eq. 3). Is it possible that such event is not caused ripples on the quantum vacuum? Of course, LIGO is bad initials since would be of Laser Quadrupole-wave Observatory, i.e., LIQO.

According Einstein, quadrupole transverse waves are polarized in agreement with both states in which the vibration of the wave can happen and whose effects are cross-sectional with respect to the directions of the propagation of the wave. In state + the vibration stretches or squeezes the wave transported by the quantum medium, in the orthogonal directions. And in state x the vibration does the same with the wave but in the rotated directions 45 degrees with respect to the directions of state +. Its effect on matter is perpendicular to the direction of its motion. On two free particles arranged at an angle 90 degrees simultaneously, their equal distances with relation to a common origin point in a direction occurs increase-decrease while in the other occurs decrease-increase, in equal magnitude, rhythmically as the wave passes, at a frequency corresponding to that of the wave. Therefore, $h_{\mu\nu}$ are disturbances of the continuum, elastic, gifted with inertia of the quantum vacuum due of the pass of the quadrupole wave.

6 Conclusions

There are two recognized cases in that the rectifications about formulations made by great scientists are not served by the scientific community that the appropriated:

- The non-existence of gravitational waves of Einstein [16].
- The non-existence of the notion of an event horizon at the black hole of Hawking [29].

It is incredible that the final conclusion of Einstein was ignored and, therefore, it follows speaking on the existence of gravitational waves, no is a mistake of Einstein but of his followers.

Einstein, the first man that understood his work, had sufficient reason because inside of context of General Relativity is impossible gravitational waves. However, his mathematical exercises, in 1918, drive us to detect quadrupole transverse waves of quantum vacuum an extraordinary find. Of course, this detection is more important than the discovery of soliton.

The equations of Grossmann-Einstein model have great heuristic power to new phenomena in nature sadly called arbitrarily because while there are a large number of scientists understanding the equations of Grossmann-Einstein by the contrary there are very few who understand conceptually the work of Einstein.

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