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Did LIGO Really Detect Gravitational Waves?

—The Existence of Electromagnetic Interaction Made the Experiments of LIGO Invalid

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Abstract

The paper proves that due to the existence of electromagnetic interaction, the experiments of LIGO cannot detect gravitational waves. This is also the reason why Weber's experiments of gravitational waves failed. In fact, the formulas of general relativity that gravitational waves affect distances are only suitable for particles in vacuum. LIGO experiments are carried out on the earth. The laser interferometers are fixed on the steel pipes on the earth's surface in the balanced state of electromagnetic force. Electromagnetic force is 10^{40} times greater than gravity. Gravitational waves are too weak to overcome electromagnetic force and change the length of steel pipes. Without considering this factor, the design principle of LIGO experiment has serious problem. The experiments to detect gravitational waves should move to space to avoid the influence of electromagnetic interaction. Besides, LIGO experiments have the following problems. 1) No explosion source of gravitational waves is really founded. 2) The argument that the Einstein's theory of gravity is verified is a vicious circle and invalid in logic. 3) The results of experiments cause sharp contradiction for the energy currents of gravitational waves. The difference reaches to 10^{24} times and is unacceptable. 4) The method of numerical relativity causes great errors due to the existence of singularities. The errors are enlarged by the effect of butterfly due to the non-linearity of Einstein's equation of gravity. 5) The so-called change of length 10^{-18} m between two glasses of interferometers detected in the experiment exceeds the ability of current technique. This kind of precise has entered micro-scalar. The uncertain principle of quantum mechanics makes it impossible. The signs appeared in LIGO experiments are not caused by distance change. 6) LIGO experiments have not detected gravitational waves. What detected may be the signs of disturbances coming from the middle region between two laser interferometers.

Keywords

LIGO Experiments, Gravitational Waves, General Relativity, Electromagnetic Interaction, Laser Interferometer, Weber Experiment, Singularity Black Holes

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1. Introduction

February 11, 2016, LIGO announced that for the first time mankind detected gravitational waves and observed a binary black hole merger directly. This piece of news becomes headline of many global leading media. However, there are many problems in the experiments of LIGO. Physicists should cool down to think the following problems carefully.

2. Where Was the Source of Gravitational Waves?

According to normal pressures of experiments, we should determine or observe the event of binary black hole merger which really happened in space by some methods at first. For example, the experiment observed optical afterglow caused by the material around black holes in merger process. Suppose the speed of gravitational wave is the same as that of light. When the light reached the earth, gravitational waves also arrived and caused stripe changes in interferometers.

The problem was, did LIGO really observe binary black hole merger? The authors read the PRL paper of LIGO but find no word to say they had observed astronomical phenomena about binary black hole merger [1]. They used the method of backward to deduce the event. Based on the signs detected in laser interferometers and the Einstein's theory of gravity, by fitting them with computer, LIGO declared that the event happened in a distance galaxy 1.3 billion years ago.

Therefore, so-called binary black hole merger is only the result of computer simulation, rather than a really observed event in astronomy and physics. By using so-called matching filter method, LIGO declared to find gravitational waves and binary black hole merger from their waveform library which had been established in advance, rather than find them from sky.

As well-known, we need to input many free parameters in the processes of computer simulations. If the method is used to deal with the Einstein's equation of gravity, dozen free parameters are needed. Just like Feynman's joke, using four free parameters may fit out an elephant and using five free parameters may let the elephant swing its nose.

Let's estimate the influence of gravitational wave's explosion on the material around the source of wave declared by LIGO. The corresponding energy of 3 solar mass is 5.4×10^{47} J. When they were transformed into energy in one second, the energy current density on the surface of sphere with radius 10 light's yeas was 4×10^{12} J/m$^2\cdot$s. We compare it with Hiroshima atomic bomb of 20,000 ton TNT corresponding energy to be 8.4×10^{13} J. Suppose that the explosion lasted one second, the energy current density was also 4×10^{12} J/m$^2\cdot$s on the surface of sphere with radius 1.3 meter. So the gravitational wave's explosion declared by LIGO was able to raise the temperature of material around the source to thousand degrees even dozens thousand degrees and destroyed all object's construction within the distance of 10 light's years.

The star density for common galaxies is about 2.5×10^{-3} sun/light's yeas. The sphere with radius 10 light's years contains 10.5 suns. Suppose that the mass of non-luminous material is 5 times more than that of luminous material, the material in the sphere with radius of 10 light's years re is about 50 solar mass. If theses material was vibrated 100 times in one second and heated to thousand degrees even dozens thousand degrees, a great amount of radiations with various frequencies would be produced. According to some informed reports, Gamma rays were detected in two places of south sky at the same time of gravitational wave's explosion. According the estimation, if the explosion of gravitational waves were true, what we observed would be the radiations of various frequencies, rather than Gamma rays only. Meanwhile, the radiations would last more than 10 years, rather than disappearing immediately. They would be observable phenomena, but astronomers did not find them.

However, the paper of LIGO described that the experiment was the first observation of binary black hole merger. That is to say, they really observed binary black hole's collision and merger.

3. Did the Experiment Verify the Einstein's Theory of Gravity?

According to the interpretation of LIGO, the experiments verified the gravitational wave theory of Einstein. However, what they observed were only two signs in laser interferometers, without really observing binary black hole merger and 3 solar mass being transformed into gravitational waves, how could they say that the gravitational wave theory of Einstein was verified?

The real conclusion should be that if the Einstein's theory of gravity was true and what LIGO detected were

real signs of gravitational waves, an event of binary black hole merger happened in a distant galaxy 1.3 billion years ago, in which 3 solar mass was transformed into gravitational waves and emitted into the universal space. That's all! We cannot say any more.

On the other hand, the logic of LIGO has some problem. At first, based on the datum observed in laser interferometer and the gravitational theory of Einstein (reason), they deduced that there was an event of binary black hole merger happened in a distance galaxy 1.3 billion years ago (result). Then, based on the so-called consistence between the event and the datum observed (reason), the Einstein's theory of gravity is verified (result). Obviously, the argument of LIGO is a vicious circle and invalid logically.

Besides, the Einstein's theory of gravity is not the only one. Up to now, many gravity theories have been put forward, for example, the gravity theory in flat space-time. All of these theories predict the existence of gravitational waves. The difference is that the gravitational wave of general relativity involves quadrupole moment, but the gravitational wave of flat space-time involves dipole moment, besides quadrupole moment [2] [3]. The effect of dipole moment is greater than quadrupole moment.

If fitting gravity theory in flat space-time with the signs detected in interferometers, we can also deduce different processes of astronomy and astrophysics. For example, the binary black hole merger (there are also black holes in the Newtonian theory) happened in the Milky Way Galaxy, instead of distance Galaxy. In the process, much less mass is transformed into gravity waves, rather than 3 solar mass.

Further on, there are two arms in laser interferometer. There is a pair of reflect glass in each arm. According to general relativity, gravitational wave's radiation involves quadrupole moment. By the actions of gravitational actions, four glasses are affected simultaneously. While the distance between one pair glasses increases, the distance of another pair glasses decreases. If gravitational wave's radiation involves dipole moment, there are three main models for the same process at least. 1) One pair glass's distance changes, another does not change. 2) One pair glass's distance increase while another decreases. Two pair glass's distances increases or decreases simultaneously.

The experiments of LIGO had not considered these possibilities. No methods were used to distinguish quadrupole moment and dipole moment. There were no wave forms of dipole moment in their waveform library, for they had not thought this possibility. Therefore, even though what detected were the gravitational waves of dipole moment radiations, the computer of LIGO may misunderstand them as that of quadrupole moment. The experiments to verify the theory of gravity in flat space-time may be considered as that to verify the theory of gravity in curved space-time. So, the experiment of LIGO has not verified the Einstein's theory of gravity.

4. There Are Contradictions Caused by the Energy Current Density of Gravitational Waves

According to general relativity, gravity causes space-time curved which changes the distance between objects. The basic principle of LIGO experiment was that gravitational waves affected the lengths of interferometer's two arms. Because two arms were vertical each other, the effects on them were different which leaded to the change of interference stripe.

However, according to general relativity strictly, the formulas of gravitational wave's effect of distances were only suitable for two particles moving along geodesic lines in vacuum [4]. This is the precondition of calculation. Whether or not are they also suitable for the experiments carried out on the earth's surface?

We should understand what the length change of interferometer's arm means. The Interferometers of LIGO were fixed on the vacuum steel pipes and the poles are fixed on the earth's surface. Reflect glasses hanged in interferometers through special fibers. So there are two possibilities in the experiments. The first was that the positions of hang glasses were unchanged, but the lengths of steel pipes were changed. The second was that the lengths of steel pipes were unchanged, but the positions of hang glasses were changed by the vibrations. The first is the standard opinion of general relativity which emphasizes spatial curvature and is used to explain the experiments of LIGO. But the second is not the standard opinion of general relativity. It represents the action of force to cause the vibration of glasses. In general relativity, there is no the concept of force. We only have the concept of spatial curvature caused by material.

The interferometer system was acted by electromagnetic force and reached balance. In the first case, only when the balance was destroyed, the distance between two glasses could change. Because electromagnetic interaction is 10^{40} times greater than gravitational interaction, gravitational waves cannot break the balance of electromagnetic force. So the effect of gravitational waves cannot be observed.

In the second situation, reflect mirrors hanged on interferometers, not be free in vacuum. Because the connections of mirrors with fiber are also controlled by electromagnetic force, in LIGO experiments, electromagnetic interaction cannot be avoided. Many important factors are neglected in the analysis of experiments.

Because the Einstein theory of gravity is equivalent to that of Newtonian under the condition of weak fields, we can a simplified method to estimate the energy current density of gravitational waves on the earth's surface. At first, we assume that two reflect mirrors suspend in vacuum and discuss the actions of gravitational waves on the motions of mirrors. After that, we discuss the effect of electromagnetic interaction on LIGO experiments.

For the stability of experiments, the mass of suspend glass is 40 kg. Suppose that the vibration frequency of gravitational wave is 100 Hz. In order to estimate the energy of gravitational waves roughly. The force acted on grass caused by gravitational wave is F which causes an acceleration a. For simplification, we suppose a to be a constant. Under the action of F, each glass moves $\Delta L = 0.5\times10^{-18}$ m in time 10^{-2} s. According to the formula of the Newtonian, we have

$$F = ma, \quad \Delta L = \frac{1}{2}a(\Delta t)^2 \tag{1}$$

$$\text{so} \quad F = \frac{2m\Delta L}{(\Delta t)^2} = 4\times10^{-13}\ \text{N} \tag{2}$$

The moving distance of glass is $\Delta L = 0.5\times10^{-18}$ m in 10^{-2} s, in which the work that gravitational wave does is

$$P = F\Delta L = 2\times10^{-31}\ \text{J} \tag{3}$$

In the unite time (1 second), the work that gravitational wave does is

$$T = 10^2\times2\times10^{-31} = 2\times10^{-29}\ \text{J}/\text{m}^2\cdot\text{s} \tag{4}$$

Suppose the surface area of glass is 0.5 m^2, correspondently, the energy current density of gravitational waves is

$$W_1 = \frac{2\times10^{-29}}{0.5} = 4\times10^{-29}\ \text{J}/\text{m}^2\cdot\text{s} \tag{5}$$

This is a very small quantity.

On the other hand, according to the calculation of LIGO, 3 solar mass was transformed into the energy of gravitational waves in a second and was emitted into space. Let's estimate the energy current density accepted on the earth's surface. The solar mass is 2×10^{30} kg , the energy of 3 solar mass is

$$E = 3mc^2 = 6\times10^{30}c^2 = 5.4\times10^{47}\ \text{J} \tag{6}$$

The distance of 1.3 billion light years is $R = 13\times365\times24\times3600\times10^8 c = 4.1\times10^{16}c$. The energy current density on the surface of the earth is

$$W_2 = \frac{E}{4\pi R^2} = \frac{6\times10^{30}\text{c}^2}{4\times3.14\times4.1^2\times10^{32}c^2} = 2.9\times10^{-4}\ \text{J}/\text{m}^2\cdot\text{s} \tag{7}$$

The ratio of energy current densities for two calculation methods is

$$\frac{W_2}{W_1} = \frac{2.9\times10^{-4}}{4\times10^{-29}} = 7.25\times10^{24} \tag{8}$$

Even we consider that the energy of gravitational waves absorbed by glasses was ten thousandth, the energy current density in (5) was increased ten thousand times, the ratio was still 10^{20}. The difference is so great that it cannot be accepted in physics. Unfortunately, physicists of LIGO have not noticed this contradiction.

5. The Effects of Electromagnetic Interaction Can Not Be Neglected

As mentioned above, the interferometers of LIGO are fixed on the earth's surface which are controlled by electromagnetic force and reach the situation of balance. To change the lengths of steel pipes, an extract force with

the same magnitude as electromagnetic force is needed at least. However, electromagnetic force is 10^{40} times greater than gravity. So wear gravitational waves on the earth's surface can not violate the balance of electromagnetic force to change the lengths of steel pipes and produce signs in LIGO experiments.

In fact, if we consider the action of gravitational waves on the objects fixed on the earth's surface, electromagnetic interaction between charged particles will be invoiced. In this case, the Einstein equation of gravity cannot be solved. No any problem can be discussed.

Therefore, in general relativity, electromagnetic interaction is not considered in general. The formulas about the effect of gravitational wave on the distances are only suitable for two particles located in vacuum [4]. For the interferometers of LIGO, controlled by electromagnetic interaction, the formulas are invalid. This is most foundational reason that LIGO experiments fail.

According to the calculation of LIGO, the distance change of two glasses was 10^{-18} m, corresponding to 3 solar masses was transformed into gravitational waves in one second in a distance galaxy 1.3 billion light years far away. But this calculation had not considered the effect of electromagnetic interaction. If electromagnetic interaction was considered, suppose that the distance change between two glasses was still 10^{-18} m, the energy of gravitational waves should be greater 10^{40} times. The energy current density of gravitational waves would reach $10^{12}\ \mathrm{J/m^2\cdot s}$.

What is that mean? On the earth's equator, the energy current density of solar light is $1.33\times10^{3}\ \mathrm{J/m^2\cdot s}$. So $10^{12}\ \mathrm{J/m^2\cdot s}$ corresponds to the radiation energy of 750 million suns on the surface of the earth, vibrating hundred times in one second. Under the action of this strong gravitational energy, let alone the laser interferometer of LIGO, even the earth itself would be destroyed.

In this way, we can explain why J. Weber's gravitational wave experiments failed. Weber put forward a method to detect gravitational waves. He used metal to made antenna and believed that gravitational waves would cause antenna resonance. He declared that he had accepted the signs of gravitational waves coming from the center of the Milky Way Galaxy. However, Weber's experiments cannot be repeated by other physicists. The signs Weber accepted was considered too great so that the Milky Way Galaxy would be exhausted in 1 billon years. Now, what Weber accepted is considered to be occasional interference signs, rather than gravitational waves.

The fail reason of Weber's experiments is the same as the experiments of LIGO. Gravitational waves are too weak to overcome electromagnetic force between irons in metal and cause antenna vibrating. In this meaning, all laser interferometers on the surface of the earth including LIGO, and Virgo in Italy and France, GEO600 in Germen, TAMA300 in Japan and so on cannot really observe gravitational wave's signs.

The experiment of gravitational waves should move to space, not only to avoid noises, mainly to avoid electromagnetic interaction. In fact, because there was no the effect of electromagnetic force, the J. H. Taylor and R. A. Hulse's observational of gravitational waves for double pulsar radio was credible [5].

6. Is the Method of Numerical Relativity Reliable?

The Einstein's equations of gravity are non-linear and difficult to be solved. Up to now, only a few strict solutions are obtained, most of them are static solutions. If the motions of source material are considered, motion speeds are contained in energy momentum tensor, so that the equations cannot be solved.

The process of binary black hole merger involved speeds, so the normal method of mathematical analysis losses efficacy. The method of numerical relativity is put forward to deal with this kind of problems [6]. However, black holes involved singularities and the law of physics invalid in singularities. The concrete realization of mathematical infinite is the crash of computer in the simulation process.

In order to make calculation possible, lots of revisions had to be introduced which cause great errors. The boundary and initial conditions have to be reset each time when computer is near to crash, so that the errors are introduced again and again. Because the Einstein's gravity field equations are non-linear, the Butterfly effect enlarged the errors.

The LIGO experiments used numerical relativity to calculate binary black hole merger. This was also another cause which leads to inconsistence. Because the Butterfly effect of non-linear process cannot be avoided, the effectiveness of numerical relativity is worth suspending.

Of course, most essential problem is, do singularity black holes with infinite great densities and infinite small volumes exist in nature [6]-[9]?

7. Can the Length's Change of 1000 Times Less than Nuclear Radius Be Measured?

According to the declaration of LIGO, the signs of gravitational waves correspond to the length change of 10^{-18} m for the interferometer's arms, 1000 times less than nuclear radius. What does this mean? As we know that the radius of atom is about 10^{-18} m. At this scalar, an object's boundary has become fuzzy. Looking it closely, the surface of an object is a pile of dazzle electron group, moving in very high speeds. How can the length change of 1000 times less than nuclear radius be distinguished and measured?

In fact, when laser shot at the mirrors of interferometers, the atomic displaces on mirror's surface were far more than 10^{-18} meters. It was meaningless to say that the length change of 10^{-18} m can be measured. This kind of precise has entered micro-scalar. Not only it is far beyond the limitation of mankind technology, it also violates the foundational principle of physics. According the uncertainty principle $\Delta x \cdot \Delta p \sim h$ in quantum mechanics, if atomic thermal motions are limited in the region of 10^{-18} meter, their momentum changes will reach the magnitude order of 10^{-16}. The speed changes of atoms will be very near light's speed and the mirrors cannot exist again.

Therefore, it is meaningless to say that gravitational waves caused the length change of 10^{-18} meter of interferometer's arms. The signs only come from mirror's vibrations caused by a certain unknown reason, or certain force. It had nothing to do with the length change of steel pipes. According to the formulas of general relativity, this kind of sign is not caused by gravitational waves. In the gravitational theory of curved space-time, there is no the concept of force. Gravitational waves only change the distances of space (the earth's surface).

8. What LIGO Accepted Was Really the Signs of Gravitational Waves?

In fact, this kind of vibrations happened frequently and were considered as noises and neglected by the computer of LIGO. Only when the source of vibrations just located at a place near middle position and accepted by two interferometers nearly simultaneously on September 14, 2015, it may be misunderstand as the signs of gravitational waves.

For example, LIGO declared that they had excluded the possibility of earthquake. But we still mention it. As we know, 5 million earthquakes happen on the earth each year which are perceptive by earthquake instruments. More small earthquakes cannot be detected by seismic detectors. The frequencies of perceptive earthquakes are below 20 Hz. The frequencies of slight earthquakes which cannot be detected by earthquake instruments are high than 20 Hz.

The frequencies detected by the interferometers of LIGO are 35 - 150 Hz, similar to that of slight earthquakes. Suppose that there was slight earthquake occurring at the point near the middle palace of two interferometers. The earthquake instruments did not detect it, but the interferometers of LIGO detected it. Though slight earthquakes are not the events of small possibility, it is not commonly possible to occur at the middle palace of two interferometers. The waves of earthquakes reached two interferometers with time difference of 7 milliseconds. Whether or not the computer of LIGO misunderstands it as the signs of gravitational waves? This possibility cannot be excluded.

Besides earthquake's waves, air vibration can also cause the disturbances of same frequencies (the frequencies of sound waves are 20 - 16,000 Hz). These disturbances may transit to the laser interferometers through earth's crust and cause the false judgment of computer. For example, a gust of wine occasionally blows at a rock which was just located at the middle place between two interferometers of LIGO and caused a vibration of shirt time. The computer of LIGO might consider it as an event of gravitational wave.

9. Conclusions

In general relativity, the formulas about the influences of gravitational waves on space distances are only suitable for particles in vacuum. If electromagnetic interactions exist, these formulas are invalid due to the fact that electromagnetic forces are 10^{40} times stronger than gravity. The interferometers of LIGO are fixed on steel pipes which are fixed on the earth's surface. The system is acted by electromagnetic force and reaches balance. The actions of gravitational waves are too weak to break the balance to cause the change of distance. So what LIGO interferometers detected were not the signs of gravitational waves. They may be caused by the vibrations happened on the surface of the earth, just located at the middle region of two interferometers. The signs were received almost simultaneously so that the computer of LIGO judged them as the signs of gravitational waves

wrongly.

In this meaning, all laser interferometers on the earth's surfaces including LIGO cannot really detect gravitational waves. The detections should move to space, not only to eliminate noises, but also to eliminate electromagnetic interaction more importantly. We should also consider the possibility of dipole radiations and the rationality of singularity black holes.

Besides, no explosion source of gravitational waves was found in LIGO experiments. The argument of LIGO about the verification of the Einstein theory of gravity was a vicious circle and invalid in logic. The results of experiments would cause serious contradiction for the energy current density of gravitational waves.

In sum, the LIGO experiments, the faster-than-light experiment of neutron in 2012, the gravitational wave experiment of early universe in 2014, as well as the GP-B experiment of Stanford University in 2011 provide us the lessons that the possibility of failure is great to establish huge scientific equipments to detect small effects. Especially, for gravitational experiments, the risk is very high.

Meanwhile, physicists should be cautious when they evaluate their academic achievement. It is improper to say too much to pursue sensational effect before the results are fully examined.

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