Gravitational Wave Miracles?

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Abstract

The hypothesis of gravitational wave, suggested by Albert Einstein in 1916, still poses outstanding challenges, which have to be resolved by the theoretical physics community as soon as possible.

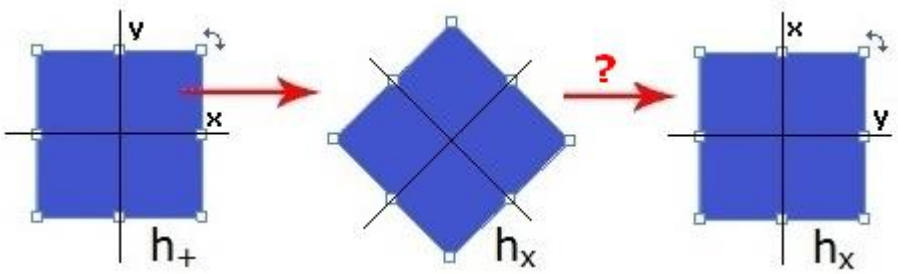
The idea of 'gravitational wave' (GW), suggested by Albert Einstein in 1916 [1], poses a number of non-trivial questions, which still have not been resolved by the theoretical physics community. We do not know how to define GWs in the full non-linear regime where the spacetime itself is dynamic [8]: 'waves with respect to what?' is the crucial question about the *boundary* of spacetime [12], which could be discussed only after we resolve the three issues below. Until then, I'm afraid the ideas of GW and its detection [9] will continue to look like a bunch of "miracles", which is totally unacceptable in science [2].

Let me begin with the critical **45° angle** between two linearly independent polarization states h_+ and h_x, which are instructed to be in "superposition" along time (**t**) read with a clock. As explained by M. Vallisneri *et al*. in [3, p. 6], "the effect of each GW polarization is to contract fractionally the proper distance along one axis, while expanding it along the other (these axes being (x; y) for h_+, and axes rotated by **45°** with respect to (x; y) for h_x)." Look also in [4, p. 33]: "A generic gravitational wave can thus be understood as a superposition of two oscillating tidal fields that propagate at the vacuum speed of light."

Q1: What phenomenon could possibly produce an **exact 45° angle** between h_+ and h_x *and* keep it **exactly** fixed **within** the "superposition" of two oscillating metric fields, in such way that the latter will *never* conflate and intermingle? What could sustain the *phases*?

The two linearly independent polarization states h_+ and h_x, each of which "has its own gravitational-wave field" [10], are "akin to "stereo sound" information" [4, p. 8], but the physical nature of such "superposition" of *metric* fields is totally unclear. It is certainly not like a superposition of two quantum states of the famous Schrödinger's cat, live cat & dead cat. According to Freeman Dyson [2, p. 8], a generic GW "may be considered to be a *coherent* superposition of a large number of gravitons." Here comes the second question.

Q2: How could these "gravitons" [10] be arranged to keep the **45° angle** between h_+ & h_x ? For if the angle reaches **90°**, the net effect from h_+ & h_x will be **zero**.



Moreover, while “it would be hopeless to look for exact solutions for the gravitational waves emitted by realistic astrophysical sources” [5], we must nevertheless assume that strong GWs at the vicinity of a hypothetical “binary black-hole merger” [6] do exist, which brings us to the last question.

Q3: How could strong GWs sustain their properties of *very* weak GWs [3, 4, 9, 10] while interacting with matter and fields and other GWs, for over one billion years [7]?

We must not sweep these crucial questions under the rug: “miracles” do not exist. It is impossible to observe something that cannot exist, such as pink unicorns dancing with red herrings or some “back hole” merger [6] emitting “gravitons” by linearized GWs [2, 11]. The so-called GW150914 [7] is an insult to our intelligence.

If the reader disagrees, I suggest to consult Albert Einstein and prove that the Universe is “a spatially bounded material system” [12], and then install GW “mirrors” [9] *exactly* at null-and-spacelike infinity.

References

1. Albert Einstein, Näherungsweise Integration der Feldgleichungen der Gravitation, *Sitzungsberichte der Königlich Preußischen Akademie der Wissenschaften* (Berlin), Seite 688-696 (22. Juni 1916).

2. D. Chakalov, GW150914: Are Cows Spherical? viXra:1606.0228v5, 19 July 2016.

3. Michele Vallisneri *et al.*, The Emergence of Gravitational Wave Science, arXiv:1607.05251v1 [gr-qc], 18 July 2016.

4. Alexandre Le Tiec, Jérôme Novak, Theory of Gravitational Waves, arXiv:1607.04202v1 [gr-qc], 13 July 2016.

5. Michele Maggiore, *Gravitational Waves: Theory and Experiments*, Oxford University Press, 2007. Excerpt from p. 32 at this http URL.

6. Remo Ruffini *et al.*, What can we really infer from GW 150914? arXiv:1605.04767v2 [gr-qc], 24 May 2016.

7. The LIGO Scientific Collaboration, the Virgo Collaboration, Observation of Gravitational Waves from a Binary Black Hole Merger, arXiv:1602.03837v1 [gr-qc], 11 February 2016.

8. Angelo Loinger, On Gravitational Motions, arXiv:0804.3991v1, 24 April 2008. *Idem*, On the displacements of Einsteinian fields et cetera, arXiv:physics/0506024v2, 4 June 2005.

9. B. Schutz, Mathematical and Physical Perspectives on Gravitational Radiation. In *50 years of the Cauchy problem in General Relativity*. Electronic proceedings of the Cargèse Summer School on Mathematical General Relativity. July 29 - August 10, 2002, Cargèse, Corsica, France. Excerpt at this http URL.

10. Kip Thorne, *Gravitational Waves*, Part A: Gravitational-Wave Theory and Sources, Overview of GW Science, Slides for Lectures 1 and 2, Caltech's Physics 237-2002, Caltech, 28 July 2002. Two slides available at this http URL.

11. D. Chakalov, Gravitational Wave Astronomy: RIP. Online paper, 18 May 2016, available at this http URL.

12. Albert Einstein, Über Gravitationswellen, *Sitzungsberichte der Königlich Preußischen Akademie der Wissenschaften* (Berlin), Seite 154-167 (31. Januar 1918).

> Let us consider a spatially bounded material system, whose matter density and electromagnetic field vanish outside some region. Let $\mathcal{S}$ be the boundary surface, at rest, which encloses the entire material system. Then, by integration of the fourth equation over the domain inside $\mathcal{S}$, we get
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> $$-\frac{\mathrm{d}}{\mathrm{d}x^4}\int_{\mathcal{V}}\left(\mathcal{T}_4^{\,4}+t_4^{\,4}\right)\mathrm{d}V=\int_{\mathcal{S}}\left(t_4^{\,1}\cos(nx_1)+t_4^{\,2}\cos(nx_2)+t_4^{\,3}\cos(nx_3)\right)\mathrm{d}\sigma.$$
>
> One is not entitled to define $t_4^{\,4}$ as the energy density of the gravitational field and $(t_4^{\,1},\ t_4^{\,2},\ t_4^{\,3})$ as the components of the flux of gravitational energy. But one can certainly maintain, in cases where the integral of $t_4^{\,4}$ is small compared to the integral of the matter energy density $\mathcal{T}_4^{\,4}$, that the right-hand side represents the material energy loss of the system. It was only this result that was used in this paper and in my first article on gravitational waves.

Quoted after: Carlo Cattani and Michelangelo De Maria, Conservation Laws and Gravitational Waves in General Relativity (1915-1918), in *The Attraction of Gravitation*, ed. by John Earman *et al.*, Birkhäuser, 1993, pp. 63-87 (emphasis mine - D.C.).

Addendum

Let's look at the facts about GWs and their detection. A peculiar astronomical object, dubbed PSR 1913+16, has been losing kinetic energy, and Russell Hulse and Joseph Taylor decided to explain the "energy loss of the system" [12] by applying the old Tanzanian saying:

> How do we know that Father Christmas has a beard? We know it, because snow falls when he shakes his beard.

Then Russell Hulse and Joseph Taylor were awarded Nobel Prize in 1993 for explaining how we could get snow from Father Christmas' beard, and in February 2016 many people claimed to have detected it [7]. But what if the "snow" had *completely* different origin?

In my opinion, we must first define the spacetime “globally in a consistent way” (Piotr Chrusciel), without any GW “mirrors”, and seek explanations of (i) the “dark” origin of gravitational rotation and (ii) the ‘tug of war’ manifestation of gravity, known as “dark matter” and “dark energy”. One century ago, Albert Einstein could not have predicted such gravitational phenomena.

Nowadays we know that energy conservation in the presence of gravity cannot be defined: watch Paul Steinhardt. It is manifestly pointless to try to “explain” how snow falls from Father Christmas’ beard by postulating such non-existent energy conservation, as suggested by Russell Hulse and Joseph Taylor.

Again, it is impossible to observe something that cannot exist, such as pink unicorns dancing with red herrings or some “back hole” merger [6] emitting “gravitons” by linearized GWs [2, 11]. The so-called GW150914 [7] is an insult to our intelligence. Period.

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