

Gravitational Wave Miracles?

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Abstract

The idea of ‘gravitational wave’ (GW), suggested by Albert Einstein in 1916, still poses a number of unsolved questions, 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, 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 of course 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 tidal fields”, in such way that the latter will *never* conflate and intermingle?

It may be tempting to visualize the two linearly independent polarization states as “akin to “stereo sound” information” [4, p. 8], but the physical nature of such “superposition” is totally unclear in General Relativity. 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” be arranged to keep the **45° angle** between h_+ & h_x ?

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 immediate vicinity of a putative “binary black-hole merger” [6] do exist, which brings us to the last question.

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

Again, we cannot sweep there crucial questions under the rug: “miracles” do not exist.

References

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