

# Gravitational Wave Miracles?

D. Chakalov  
35A Sutherland St  
London SW1V 4JU  
chakalov.net

## 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 a century ago [1], poses a number of non-trivial questions, which have not been resolved by the theoretical physics community. A very brief, and certainly incomplete, list of three questions is presented below. Until we have their definite resolutions, I’m afraid the idea of GW will look like a bunch of “miracles”, which is of course totally unacceptable in science [2].

Let me begin with the crucial **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 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 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 these “gravitons” could 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] while interacting with matter and fields and other GWs, for over one billion years [7]?

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

## References

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