Further Comments on:

"Ligo Gravitational waves: Ripples in Spacetime or Electromagnetic"

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After attending the APS April 16-19 meeting, and having the opportunity to see and discussing some of the results with the authors, there were a few points pertinent to the above paper that should be made:

On the weekend of April 16 the author attended the APS conference in Salt Lake, where there were a number of the LIGO team presenting papers on the observatories, and the detection of Sept 14, 2015. I had the opportunity to speak with some of the members from MIT and CALTECH as well as other members of the team.

My having a theory of gravitation based in E&M, caused me, of course, to be looking for clues as how an electromagnetic signal could insert itself into the signal path of the detectors, without triggering the physical environment monitor (PEM) sensors. Most of the team seems to believe that if the signal is electromagnetic there is sufficient shielding to prevent contamination, and the PEM system has sufficient sensitivity to detect its presence.

There is little doubt that the detected signal GW150914 is gravitational radiation from a collapsing binary, thus from my perspective the E&M radiation must have intensity sufficient to someway couple into the data stream, and still fall below the threshold of the environmental detectors. This may be a narrow window, but there are blips of unknown origin that show in the in the gravitational wave signal h(t), that do not trigger the PEM detectors.

It's not clear that that there are no electromagnetic wave coupling. This unfortunately leads to the circumstance that it's hard to prove a negative, but at this point the possibility of an E&M signal hasn't eliminated.

Possible Alternative: Momentum Impact of Electromagnetic Wave 7/13/2016

It is difficult to estimate the magnitude of electromagnetic strain induced into the LIGO detector if the gravitational radiation is actually electromagnetic. This is primarily because every effort has been made to shield the detector from electromagnetic interference, and whatever electromagnetic coupling is present is only that which inadvertently leaks into the system.

There is however coupling that is impervious to electromagnetic shielding, and it can be shown to be on the order of magnitude of the signal. That would be the momentum transfer of the electromagnetic signal to the surface of the detector and the surrounding soil. Since the energy per unit area can be determined by the distance and dynamics of the stellar merger the impact displacement can be estimated. It can be easily be shown that the impact of the electromagnetic waves onto the system and the local area, can induce displacements on the order of the displacements attributed to the Gravitational waves, and could be the source of the signal attributed to the gravitational waves.

An estimate of the momentum displacements induced into the area by an electromagnetic wave can be inferred from the energy flux [1]. This is:

$$F = 1e5 \text{ ergs/meter}^2 = 10 \text{ ergs/cm}^2$$

Then the average force applied per cm^2 to the ground is:

$$f = \frac{dp}{dt} = \frac{dE}{dt}\frac{1}{c} = \frac{F}{c}$$

The total momentum transferred over a cycle is then:

$$p = \int_o^T \frac{F}{c} dt = \frac{\bar{F}T}{c}$$

or:

$$m\Delta\bar{v} = \frac{\bar{F}T}{c}$$

And the displacement is:

$$d = \Delta\bar{v}T = \frac{\bar{F}T^2}{2mc} = \frac{\bar{F}}{2mcv^2}$$

If the energy is absorbed in about one meter of soil with a density of 1.5 then the accelerated mass is m ~ 150 grams thus:

$$d = 1.1e-16 \text{ cm}$$

The displacement sensitivity [2], for the advanced Ligo at 100 hz is about:

$$S = 4.e-17 \text{ cm}$$

If the entire Ligo assembly and surrounding surface is thus impacted with a displacement in phase with the gravitational radiation, having a displacement above the detection level, and it is hard to see why this would not couple into the detectors.

[1]Properties of the binary black hole merger GW150914
[2] The Advanced LIGO Detectors in the Era of First Discoveries

NANOGrav Pulsar Gravitational Detection

Shannon et al. from the Parkes Pulsar Timing Array writing in “Gravitational waves from binary supermassive black holes missing in pulsar observations”, has concluded that there is a negative results for Gravitational Wave detection in their data. This implies no gravitational waves as distortions of spacetime. The result is therefore consistent with an electromagnetic basis for gravitational radiation, so it was a topic of interest for me at the conference.

Similarly, at this time, though there has been no conclusion, data from the NANOGrav system has also not detected a gravitational wave signal.

Papers on the results of the NANOGrav system and results were presented, and the question of the Parkes result was asked by me. The answer was that the samples used by the Parkes group were too small and not taken over a sufficiently long span of time to rule out a future detection. They believed that it will take a bigger number of pulsars, and a few more years to give a definitive answer.

Original Paper Abstract

Ligo Gravitational waves: Ripples in Spacetime or Electromagnetic

http://www.arxdtf.org/css/Gravitational%20waves.pdf

On Thursday Feb. 2016 the Ligo team announced the detection of gravitational waves from a collapsing black hole on Sept 14 2015. This definitively answers the question of the existence of gravitational radiation, and confirms the pulsar radiation energy Measured by Hulse, R. A. & Taylor [1], [2], but it has not yet answered definitively the question of the nature of gravitational radiation. That question is whether the radiation is a ripple in spacetime, or an electromagnetic wave, clearly the most important issue since the theory's origination in 1915. GR theorists would consider the question already answered, but there have been a number of theorists that have postulated an electromagnetic origin of gravitation, and even now the experimental evidence is not certain.