LIGO and Cosmic Dust

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Abstract
Confirmation of Einstein's theory of general relativity based on LIGO measurements [1] of gravitational waves from black hole coalescence requires resolution of pico-meter displacements in Earth based on interferometers having mirrors separated by 4 km long arms. LIGO resolution verges on the impossible as the desired detection sensitivity is $< 1 \times 10^{-19}$ m, far less the size of the proton. Resolution aside, noise is of particular concern as LIGO measurements of sensitivity over the audible frequency range from 20 - 2000 Hz comprise a continuum of narrow band low frequency spikes thought caused by multiples of 60 Hz measurement noise.

Difficulties in resolution and noise suggest LIGO may not be measuring gravitational waves, but rather light from heating NPs of cosmic dust during black hole coalescence modulated [2] by audible sound produced in NP collisions with debris prior to being carried by the light to Earth. NPs stand for nanoparticles, typically < 500 nm diameter amorphous silicates. But light created in cosmic dust carrying audible sound is unlikely because NPs are compact solids lacking the compliance to allow modulation of light in the frequency range 20 - 2000 Hz. For cosmic dust NPs of silicate having diameters < 500 nm, the breathing mode resonances which would be excited in collisions with black hole debris are in the far IR at about 300 GHz, far higher than the audible range sensed by LIGO. Therefore, LIGO sensitivity from light produced in cosmic dust NPs is produced by another mechanism.

In this regard, LIGO sensitivity is proposed to be light produced in cosmic dust modulated by the dispersion of rotational speeds in the inspiral of the coalescing black holes, the spikes of narrow band noise depending on the local concentration of cosmic dust. In this interpretation of LIGO sensitivity, there is no physical sound - only frequencies f of light produced in the inspiral that happen to coincide with the audible range from 20 – 2000 Hz. LIGO sensitivity is explained by light created as cosmic dust is heated during black hole coalescence and modulated in frequency f depending on its time dependent radial location R(t) in the inspiral of the black hole, $f = V/2\pi R(t)$, where V is a constant velocity. Hence, the slower rotating outer region of the inspiral generates the prominent 35 Hz low frequency end of LIGO sensitivity; whereas, the faster rotating dust in inner region giving the sensitivity at 250 Hz, a continuum of frequencies produced between 20 and 2000 Hz. The continuum of LIGO low frequency narrow band noise spikes most likely do not depend on 60 Hz measurement noise, but rather are proportional to the local concentration of cosmic dust. LIGO may not be measuring Einstein's gravitational wave from the coalescence of black holes, but nevertheless LIGO has sensed the coalescence of a black hole – a historic discovery in itself.

Physicists did not consider NPs of cosmic dust in the intense heat of coalescing black holes produce light that upon travelling to Earth confuses LIGO gravitational wave measurements. Proceeding on the basis of classical physics, heat absorbed in NPs was thought to increase their temperature, although the Planck law based on QM over a century ago precludes atoms in NPs under EM confinement from having the heat capacity to increase in temperature. QM stands for quantum mechanics and EM for electromagnetic. By QM, heat is conserved in NPs by QED inducing the creation of light prior to being carried to Earth. QED stands for quantum electrodynamics.

However, the QED of light-matter interaction in the creation of light in NPs is far simpler than the complex QED theory advanced by Feynman and others. Briefly stated: Under the QM restriction that heat capacity of the atom vanishes, simplified QED conserves heat supplied to a nanoscale QM box having refractive index n and sides d by creating standing EM radiation having wavelength $\lambda = 2$ nd. Because of the high surface-to-volume ratio of NPs, the absorbed heat is deposited almost entirely in their surfaces thereby providing the momentary EM confinement necessary to create standing EM radiation. Once EM radiation is created from the surface heat, the momentary EM confinement vanishes allowing the standing EM radiation to promptly escape to the surroundings. See diverse QED applications at http://www.nanoqed.org, 2010 - 2016.

References
[1] B. P. Abbot, et al., "Observation of Gravitational Waves from a Binary Black Hole Merger," PRL 116, 061102, 2016.
[2] A. G. Bell, "On the Production and Reproduction of Speech by Light", Am. J. Science, vol. 20, 305-324,1880.