Negative Sonic Mass & The Big Bang & Gravity Waves

https://arxiv.org/pdf/1807.08771.pdf

M = −(ρm/cs)*(dcs/dP)*E

-((((c^5) / (hbar * (G^2))) / c) * (c / ((c^7) / (hbar * (G^2)))) * ((6.5248925 ((kg m) / s)) * c)) = -2.17646986e-8 kg

1 planck length / (2.17647019e-8 kg * ((1 kg * G) / (c^2))) = 1 kg^-1

(0.5 planck length) / (3.71295774e-28 kg) = 2.1764702e-8 m / kg

((0.5 / (5^0.5)) * atomic mass units) / kg = 3.71307817e-28

((6.6742965e-11 * pascals) / (((1 / (5^0.5)) * atomic mass unit) / (m^3))) / (c^2) = 1

6.6742965e-11 / gravitational constant = 1.00003244

Mass of Sound

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Bjerknes forces & inversion of sign

http://cds.cern.ch/record/516564/files/0109005.pdf

https://docs.google.com/document/d/14dGOjOuRXXIBSg-0N-vBovhwDCnrMbBioONasYH9FG0

https://docs.google.com/document/d/13PJme9FAyVj-7VIRHvctd41w449BLr-IGwiokfUuD7g

https://en.wikipedia.org/wiki/Friedmann_equations#Density_parameter

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It is usually said that sound waves do not transport mass. They carry momentum and energy, and lead to temporary oscillations of the local mass density of any region they happen to pass through, but it is an accepted fact that the net mass transported by a sound wave vanishes. Here, we want to question this "fact". A first indication that sound waves can in fact carry a

nonzero net mass is contained in the results of [1]: there, using an effective point-particle theory, it was shown that phonons in zero-temperature superfluids have an effective coupling to gravity, which depends solely on their energy (or momentum) and on the superfluid's equation of state. For ordinary equations of state, such a coupling corresponds to a negative effective gravitational mass: in the presence of an external gravitational field, such as that of Earth, a phonon's trajectory bends upwards.

Now, this effect is completely equivalent to standard refraction in the form of Snell's law: in the presence of gravity, the pressure of the superfluid depends on depth, and so does the speed of sound. As a result, in the geometric acoustics limit sound waves do not propagate along straight lines. Because of this, one might be tempted to dismiss any interpretation of this phenomenon in terms of "gravitational mass". However, since in the formalism of [1] the effect is due to a coupling with gravity in the effective Lagrangian or Hamiltonian of the phonon, the same coupling must affect the field equation for gravity. That is, the (tiny) effective gravitational mass of the phonon generates a (tiny) gravitational field. And the source of this gravitational field travels with the phonon. Thus, in a very physical sense, the phonon carries (negative) mass. Moreover, this is not due to the usual equivalence of mass and energy in relativity: the effect survives in the non-relativistic limit. And, finally, it is not a quantum effect, because the formalism of [1] applies unaltered to classical wave packets.

In this paper we want to confirm this result by computing explicitly the mass carried by a classical sound wave packet. As we will see, from the wave mechanics standpoint the fact that such a mass is nonzero is a non-linear effect, and that is why from a linearized analysis we usually infer that sound waves do not carry mass. We also want to generalize the result to sound waves in ordinary fluids and to longitudinal and transverse sound waves in solids. The universal result that we will find is that, in the non-relativistic limit, the mass M carried by a sound wave packet traveling in these media is its energy E times a factor that only depends on the medium's equation of state: