Gravitational acceleration waves

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Abstract: *The periodic motion always contains periodic acceleration. Thus the detection of gravitational acceleration waves is another approach for description of reality that helps to construct measurement devices.*

Keywords: *gravitational waves, acceleration, detection*

The finite speed of gravitational interaction allows production of retarded potential waves [1]. The local slope of potential wave corresponds to the acceleration and thus also waves of acceleration are propagated. This is more convenient description than the strain (deformation) propagation in the theory of relativity. The acceleration is given by

$$a(f) \approx \frac{GM_{eff}}{r_s} \frac{1}{\lambda},$$

where G is the gravitational constant and M_{eff} is radiative effective mass of source at distance r_s. The acceleration (radiation) wavelength λ decreases with increasing speeds (close to speed of light) and accelerations in its source body because

$$\frac{1}{\lambda} \approx \frac{\dot{\beta}}{c} = \frac{a_s}{c^2}$$

from the radiative term of retarded potential approach. Now we can write

$$a(f) \approx \frac{GM_{eff}}{r_s c^2} a_s$$

where the ratio of accelerations can be up to 10^{-20} (relative "strain") for objects with radiative effective mass of a few solar masses and with a common distance in observable universe. Thus binary star merging accelerations (10^{10} m/s^2) will produce measurable acceleration (nGal level) waves for expected rates f (10^2 Hz). It can be detected by a network of accelerometers (gravimeters) that allow a discrimination of signal from the terrestrial gravity waves that propagate with different speeds. And it also allows a better matching to the wavelength that is needed for the optimal signal [2]. The interferometer with a fixed length of arm (and shorter than wavelength) is not so convenient for receiver (the laser beam coupling is not necessary).

The "absolute" reference frame was not ruled out [3]. It is indicated by measurements of dipole anisotropies of the cosmic microwave background, high energy extragalactic cosmic rays and the refractive index (the susceptibility/potential) in cavities [4]. This (local) frame is given by a local retarded average of surrounding matter manifestations ("Machian" retarded equilibrium).

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