Super-strong interacting gravitons as a main engine of the universe without expansion or dark energy

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Abstract

The basic cosmological conjecture about the Dopplerian nature of redshifts may be false if gravitons are super-strong interacting particles. A quantum mechanism of classical gravity and the main features of a new cosmological paradigm based on it are described here.

If we assume that the background of super-strong interacting gravitons exists, then the classical gravitational attraction between any pair of bodies arises due to a Le Sage's kind mechanism. A net force of attraction and repulsion will be non-zero if one suggests that graviton pairs exist and these pairs are destructed by collisions. This pairing is like to the one having place in a case of superconductivity. The portion of pairing gravitons, $2\bar{n}_2/\bar{n}$, a spectrum of single gravitons, $f(x)$, and a spectrum of subsystem of pairing gravitons, $f_2(2x)$, are shown on Fig. 1 as functions of the dimensionless parameter $x \equiv \hbar\omega/kT$ (for more details, see [1]).

By the Planckian spectra of gravitons we find for the Newtonian constant [1]:

$$G = \frac{2}{3} \cdot \frac{D^2 c (kT)^6}{\pi^3 \hbar^3} \cdot I_2 \qquad (1)$$

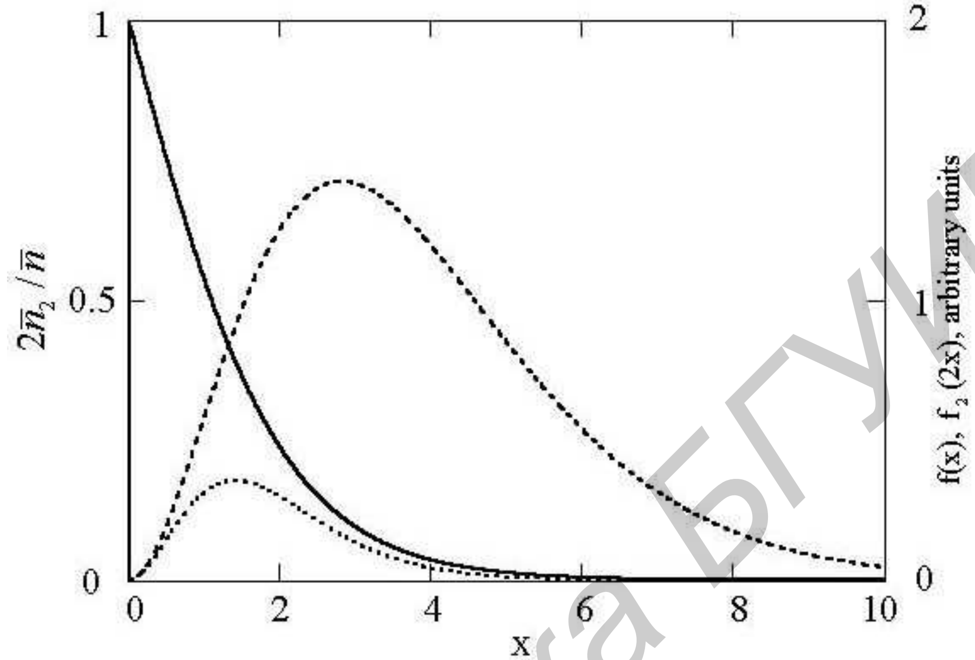

Figure 1: The portion of pairing gravitons, $2\bar{n}_2/\bar{n}$, (solid line), a spectrum of single gravitons, $f(x)$, (dashed line), and a spectrum of graviton pairs, $f_2(2x)$, (dotted line) versus the dimensionless parameter x.

where $I_2 = 2.3184 \cdot 10^{-6}$, T is an effective temperature of the background, and D is some new dimensional constant. It is necessary to accept for a value of this constant: $D = 1.124 \cdot 10^{-27} m^2/eV^2$.

In a presence of the graviton background, which is considered in a flat space-time, an energy of any photon should decrease with a distance r, so we have for a redshift z [2]: $z = \exp(ar) - 1$, where $a = H/c$ with the Hubble constant:

$$H = \frac{1}{2\pi} D \cdot \bar{\epsilon} \cdot (\sigma T^4), \tag{2}$$

where $\bar{\epsilon}$ is an average graviton energy, σ is the Stephan-Boltzmann constant.

It means that in this approach the two fundamental constants, G and H, are connected between themselves:

$$H = (G \frac{45}{32\pi^5} \frac{\sigma T^4 I_4^2}{c^3 I_2})^{1/2}, \tag{3}$$

with $I_4 = 24.866$. Using the known value of G, one can compute:$H = 3.026 \cdot 10^{-18}s^{-1} = 94.576\ km \cdot s^{-1} \cdot Mpc^{-1}$ by $T = 2.7K$.

From another side, an additional relaxation of any photonic flux due to non-forehead collisions of gravitons with photons leads to a luminosity distance D_L :

$$D_L = a^{-1} \ln(1+z) \cdot (1+z)^{(1+b)/2} \equiv a^{-1} f_1(z), \tag{4}$$

where $b = 3/2 + 2/\pi = 2.137$.

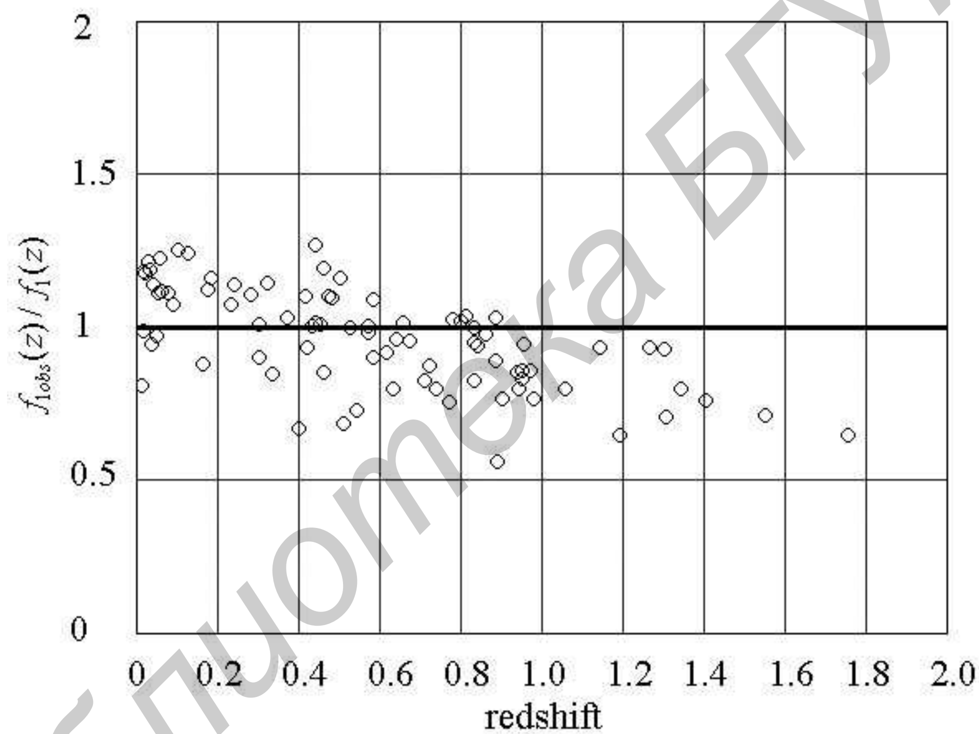

Figure 2: The ratio of observed to theoretical functions $f_{1obs}(z)/f_1(z)$ (dots); observational data are taken from Table 5 of [3]. If this model is true, the ratio should be equal to 1 for any z (solid line).

This function fits supernovae data well for $z < 0.5$ [4]. It excludes a need of any dark energy to explain supernovae dimming. If one introduces distance moduli $\mu_0 = 5 \log D_L + 25 = 5 \log f_{1obs} + c_1$, where c_1 is a constant, $f_{1obs}(z)$ is an observed analog of $f_1(z)$, we can compute the ratio $f_{1obs}(z)/f_1(z)$ using recent supernovae observational data from [3] (see Fig. 2).

The question arises: how are gravitons and photons connected? If the conjecture by Adler et al. [5] (that a graviton with spin 2 is composed with two photons) is true, one might check it in a laser experiment. Taking two lasers with photon energies $h\nu_1$ and $h\nu_2$, one may force laser beams to collide on a way L (see Fig. 3). If photons self-interact, then photons with energies $h\nu_1 - h\nu_2$, if $h\nu_1 > h\nu_2$, would arise after collisions of initial photons. If we *assume* that single gravitons are identical to photons, then an average

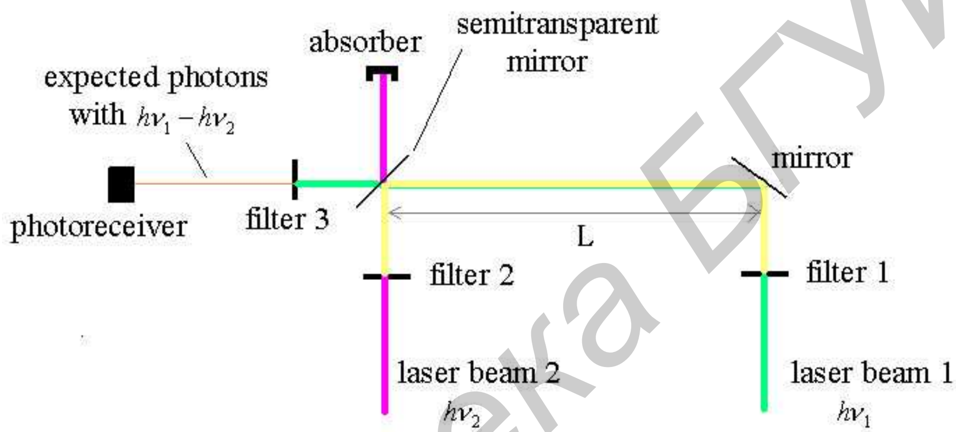

Figure 3: The scheme of laser beam passes.

graviton energy should be replaced with $h\nu_2$, the factor $1/2\pi$ in (2) should be replaced with $1/\varphi$, where φ is a divergence of laser beam 2, and one must use a quantity P/S instead of σT^4 in (2), where P is a laser 2 power and S is a cross-section of its beam. It means that we should replace the Hubble constant with its analog for a laser beam collision, H_{laser}: $H \rightarrow H_{laser} = \frac{1}{\varphi} \cdot D \cdot h\nu_2 \cdot \frac{P}{S}$. Taken $\varphi = 10^{-4}$, $h\nu_2 \sim 1\ eV$, $P \sim 10\ mW$, and $P/S \sim 10^3\ W/m^2$, that is characterizing a He-Ne laser, we get: $H_{laser} \sim 0.06\ s^{-1}$. Then photons with energies $h\nu_1 - h\nu_2$ would fall to a photoreceiver with a frequency which should linearly rise with L, and it would be of $10^7\ s^{-1}$ if both lasers have equal powers $\sim 10\ mW$, and $L \sim 1\ m$. It is a big enough frequency to detect easy a flux of these expected photons in the IR band.

In this approach (its summarizing description [6] will be soon published), every massive body would be decelerated due to collisions with gravitons [2] that may be connected with the Pioneer 10 anomaly [7].

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