Another possible interpretation of SN 1a data - without kinematics: Comments on the paper astro-ph/0402512 by A. Riess et al.

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Abstract

It is shown here that for redshifts $z < 0.5$ the luminosity distance, which is predicted in author's model astro-ph/0005084 v2, fits well supernova observational data of astro-ph/0402512 by A.Riess et al. Discrepancies for higher z would be explained in the model as a result of specific deformation of SN spectra due to a discrete character of photon energy losses. The model does not require any dark energy; it is based on the conjecture that gravitons are super-strong interacting particles fulfilling a flat non-expanding universe.

In a presence of the graviton background with the Planckian spectrum (T is an effective temperature of the background), which is considered in a flat space-time, an energy of any photon should decrease with a distance r, and we have for a redshift z [1]: $z = \exp(ar) - 1$. Here $a = H/c$ with the Hubble constant: $H = (1/2\pi) D \cdot \bar{\epsilon} \cdot (\sigma T^4)$, where $\bar{\epsilon}$ is an average graviton energy, σ is the Stephan-Boltzmann constant, and D is some new dimensional constant. It is necessary to accept for a value of this constant: $D \sim 10^{-27} m^2/eV^2$. In this approach, the Newton constant G is connected with H [2], and one can compute: $H = 3.026 \cdot 10^{-18} s^{-1} = 94.576\ km \cdot s^{-1} \cdot Mpc^{-1}$ by $T = 2.7K$.

An additional relaxation of any photonic flux due to non-forehead collisions of gravitons with photons leads to the luminosity distance D_L :

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

where $b = 3/2 + 2/\pi = 2.137$ is a computable constant of this model.

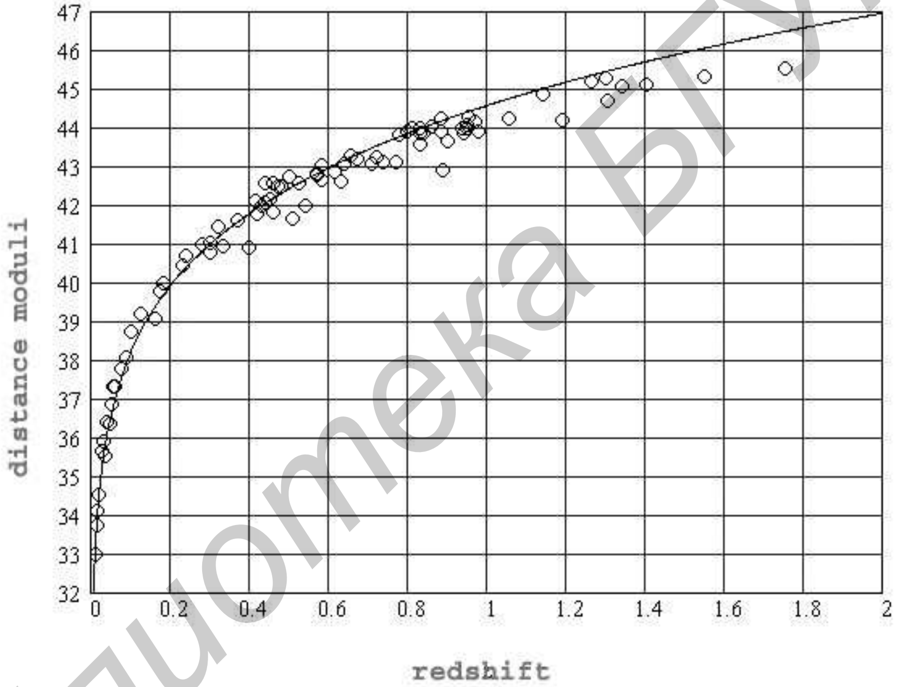

Figure 1: Comparison of the theoretical values of distance moduli $\mu_0(z)$ (solid line) with observations (points) from [3] by Riess et al.

To compare a form of this dependence by unknown, but constant H, with supernova data by Riess et al. [3], one can introduce distance moduli $\mu_0 = 5 \log D_L + 25 = 5 \log f_1 + c_1$, where c_1 is an unknown constant (it is a single free parameter to fit the data); f_1 is the luminosity distance in units of c/H. In Figure 1, the Hubble diagram $\mu_0(z)$ is shown with $c_1 = 43$ to fit observations for low redshifts; observational data (82 points) are taken from Table 5 of [3]. The predictions fit observations very well for roughly $z < 0.5$.

Discrepancies between predicted and observed values of $\mu_0(z)$ are obvious for higher z: we see that observations show brighter SNe that the theory allows, and a difference increases with z. It is better seen on Figure 2 with a linear scale for f_1; observations are transformed as $\mu_0 \to 10^{(\mu_0 - c_1)/5}$ with the same $c_1 = 43$.[1]

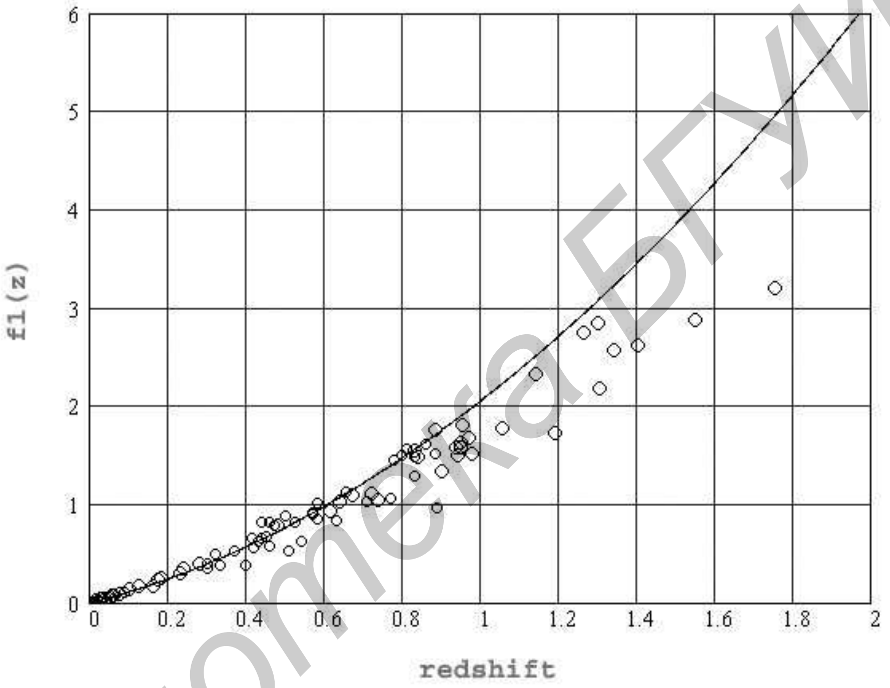

Figure 2: Predicted values of $f_1(z)$ (solid line) and observations (points) from [3] transformed to a linear scale

It would be explained in the model as a result of specific deformation of SN spectra due to a discrete character of photon energy losses. Today, a theory of this effect does not exist, and I explain its origin only qualitatively [4]. For very small redshifts z, only a small part of photons transmits its energy to the background. Therefore any red-shifted narrow spectral strip will be a superposition of two strips. One of them has a form which is identical with an initial one, its space is proportional to $1 - n(r)$ where $n(r)$ is an

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[1] A spread of observations raises with z; it might be partially caused by quickly raising contribution of a dispersion of measured flux: it should be proportional to $f_1^6(z)$.

average number of interactions of a single photon with the background, and its center's shift is negligible (for a narrow strip). Another part is expand, its space is proportional to $n(r)$, and its center's shift is equal to $\bar{\epsilon}_g/h$ where $\bar{\epsilon}_g$ is an average energy loss in one act of interaction. An amplitude of the red-shifted step should linear raise with a redshift. For big z, spectra of remote objects of the Universe would be deformed. A deformation would appear because of multifold interactions of a initially-red-shifted part of photons with the graviton background. It means that the observed flux within a given passband would depend on a form of spectrum: the flux may be larger than an expected one without this effect if an initial flux within a next-blue neighbour band is big enough - due to a superposition of red-shifted parts of spectrum. Some other evidences of this effect would be an apparent variance of the fine structure constant [5] or of the CMB temperature [6] with epochs. In both cases, a ratio of red-shifted spectral line's intensities may be sensitive to the effect.

In conclusion, it may be noted that grand kinematic maneuvers with the entire universe (acceleration after deceleration etc) need an engine to do them (given an engine, one may dream about a control system to operate it). A sea of super-strong interacting gravitons would appear to be a reasonable alternative; perhaps, it does not need any kinematics. New gravitational physics may underlie the remarkable results of astrophysical observations by A. Riess et al.

References

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