What Do We See: Signs Of Quantum Gravity Or Dark Energy?

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May 19, 2018

Abstract

Cosmological observations of remote objects may be interpreted in the model of low-energy quantum gravity by the author without dark energy. The theoretical Hubble diagram of the model fits observations very well. Additionally, this diagram should be the multivalued function of the redshift for soft and hard radiations; perhaps, this feature may be seen for the GRBs data set with the Yonetoku calibration. In the model, the ratio $H(z)/(1+z)$ should be equal to the Hubble constant; the constancy of this ratio is verified up to $z < 2$ with high probability using compilations of $H(z)$ observations.

$PACS$: 98.80.Es, 04.50.Kd, 04.60.Bc

In the model of low-energy quantum gravity by the author [1], it is suggested that the background of super-strong interacting gravitons exists with the temperature which is equal to the one of the CMB. If single gravitons are pairing, the pressure of such graviton pairs leads to the attraction of bodies. The Newton constant and the Hubble one are computable in the model. Dealing here with a flat non-expanding universe, we have the geometrical distance/redshift relation:

$$r(z) = \ln(1+z) \cdot c/H_0, \tag{1}$$

where H_0 is the Hubble constant, c is the velocity of light, z is a redshift, and the luminosity distance/redshift relation:

$$D_L(z) = c/H_0 \cdot \ln(1+z) \cdot (1+z)^{(1+b)/2}, \tag{2}$$

the "constant" b belongs to the range 0 - 2.137 ($b = 2.137$ for very soft radiation (this value is computed), and $b \to 0$ for very hard one). To fit this model, observations should be corrected for no time dilation as: $\mu(z) \to \mu(z) + 2.5 \cdot \lg(1+z)$, where $\lg x \equiv \log_{10} x$. Due to the interaction with gravitons, massive

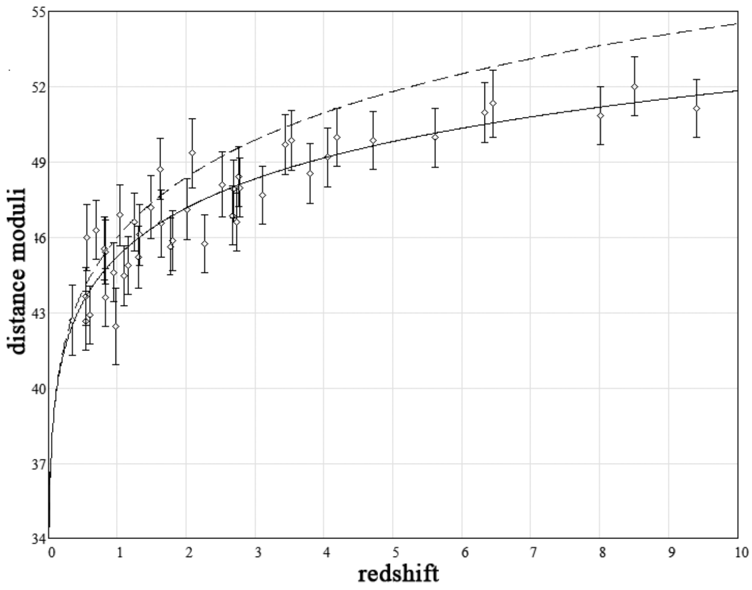

Figure 1: The theoretical Hubble diagram $\mu_0(z)$ of this model with the best fitting value of $b = 1.11$ (solid) and with $b = 2.137$ (dashed); GRB observational data with the Yonetoku calibration (44 points) are taken from Table 3 of [2] and corrected for no time dilation.

bodies should move with the anomalous deceleration w:

$$w = -w_0 \cdot 4\eta^2 \cdot (1 - \eta^2)^{0.5}, \tag{3}$$

where $\eta \equiv v/c$, v is a body velocity relatively to the background, $w_0 \equiv H_0 c = 6.419 \cdot 10^{-10}\ m/s^2$, if we use the theoretical value of H_0 in the model.

The theoretical Hubble diagram of the model fits supernovae Ia observations very well [3]. This diagram should be the multivalued function of the redshift for soft and hard radiations; perhaps, this feature may be seen for the 44 GRBs data set with the Yonetoku calibration in Fig. 1. In the model, we have for the Hubble parameter $H(z)$: $H(z)/(1+z) = H_0$, that gives a possibility to evaluate the Hubble constant using observed values of the Hubble parameter. The constancy of this ratio is verified up to $z < 2$ with high probability using compilations of $H(z)$ observations [3].

References

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