

Another origin of cosmological redshifts

Michael A. Ivanov
Physics Dept.,
Belarus State University of Informatics and Radioelectronics,
Minsk, Belarus
Email: ivanovma@gw.bsuir.unibel.by.

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Abstract

If gravitons are super-strong interacting particles which fulfill a flat non-expanding universe, we would have another possibility to explain cosmological redshifts - in a frame of non-kinematic model. It is shown by the author that in this case SNe Ia data may be understood without any dark energy and dark matter. A value of relaxation factor is found in this paper. In this approach, we have Newton's law of gravity as a simplest consequence, and the connection between Newton's and Hubble's constants. A value of the latter may be theoretically predicted.

1 Introduction

If one assumes that the graviton background exists with the Planckian spectrum and an effective temperature T , which we will consider in a flat space-time, an energy of any photon decreases with a distance r , so a redshift z is equal to [1]: $z = \exp(ar) - 1$. Here $a = H/c$, where the Hubble constant $H = (1/2\pi)D \cdot \bar{\epsilon} \cdot (\sigma T^4)$, $\bar{\epsilon}$ is an average graviton energy, σ is the Stephan-Boltzmann constant, D is a new constant. It is necessary to have the following value of this constant: $D \sim 10^{-27} m^2/eV^2$, i.e. gravitons should be super-strong interacting particles. In this approach, the Newton

constant G is connected with H , that gives the following value of it [2]:
 $H = 3.026 \cdot 10^{-18} s^{-1} = 94.576 km \cdot s^{-1} \cdot Mpc^{-1}$ by $T = 2.7K$.

Additional photon flux's average energy losses on a way dr due to rejection of a part of photons from a source-observer direction should be proportional to $badr$, where the relaxation factor b is equal to: $b = 3/2 + 2/\pi = 2,137$, as it is shown in the next section.

2 How to calculate the factor b

It is shown here how to find the value of relaxation factor b which was used in author's paper [1]. Let us assume that by non-forehead collisions of a graviton with a photon, the latter leaves a photon flux detected by a remote observer (an assumption of narrow beam of rays). So as both particles have velocities c , a cross-section of interaction, which is "visible" under an angle θ (see Fig. 1), will be equal to $\sigma_0 |\cos \theta|$ if σ_0 is a cross-section by forehead collisions. The function $|\cos \theta|$ allows to take into account both front and back hemispheres for riding gravitons. Additionally, a graviton flux, which falls on a picked out area (cross-section), depends on the angle θ . We have for the ratio of fluxes:

$$\Phi(\theta)/\Phi_0 = S_s/\sigma_0,$$

where $\Phi(\theta)$ and Φ_0 are the fluxes which fall on σ_0 under the angle θ and normally, S_s is a square of side surface of a truncated cone with a base σ_0 (see Fig. 1). Finally, we get for the factor b :

$$b = 2 \int_0^{\pi/2} \cos \theta \cdot (S_s/\sigma_0) \frac{d\theta}{\pi/2}. \quad (1)$$

By $0 < \theta < \pi/4$, a formed cone contains self-intersections, and it is $S_s = 2\sigma_0 \cdot \cos \theta$. By $\pi/4 \leq \theta \leq \pi/2$, we have $S_s = 4\sigma_0 \cdot \sin^2 \theta \cos \theta$.

After computation of simple integrals, we get:

$$b = \frac{4}{\pi} \left(\int_0^{\pi/4} 2 \cos^2 \theta d\theta + \int_{\pi/4}^{\pi/2} \sin^2 2\theta d\theta \right) = \frac{3}{2} + \frac{2}{\pi} \simeq 2.137. \quad (2)$$

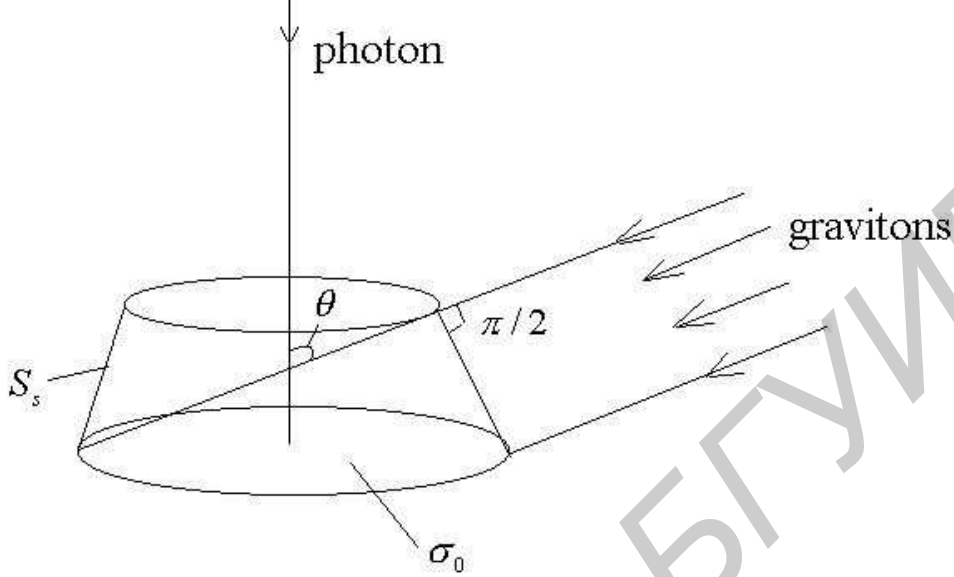


Figure 1: By non-forehead collisions of gravitons with a photon, it is necessary to calculate a cone's side surface square, S_s .

3 Comparison with SNe 1a data

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

$$D_L = a^{-1} \ln(1+z) \cdot (1+z)^{(1+b)/2} \equiv a^{-1} f_1(z). \quad (3)$$

The model may be compared with supernova data by Riess et al. [3] if one introduces distance moduli $\mu_0 = 5 \log D_L + 25 = 5 \log f_1 + c_1$, where c_1 is a constant (it is a single free parameter to fit the data); f_1 is the luminosity distance in units of c/H . In Figure 2, taken from my paper [5], the function $\mu_0(z)$ is shown with $c_1 = 43$ to fit observations for low redshifts; observational data are taken from Table 5 of [3]. The predictions fit observations very well for roughly $z < 0.5$. Given this concordance between the theory *without any kinematics* and observations for low redshifts, we can think that any expansion of the universe *is not necessary* for higher redshifts, too.

There are discrepancies between predicted and observed values of $\mu_0(z)$ for higher z . It would be explained in the model as a result of deformation of SN spectra due to a discrete character of photon energy losses. Today, a theory of this effect does not exist, and its origin may be explained only qualitatively [4, 5].

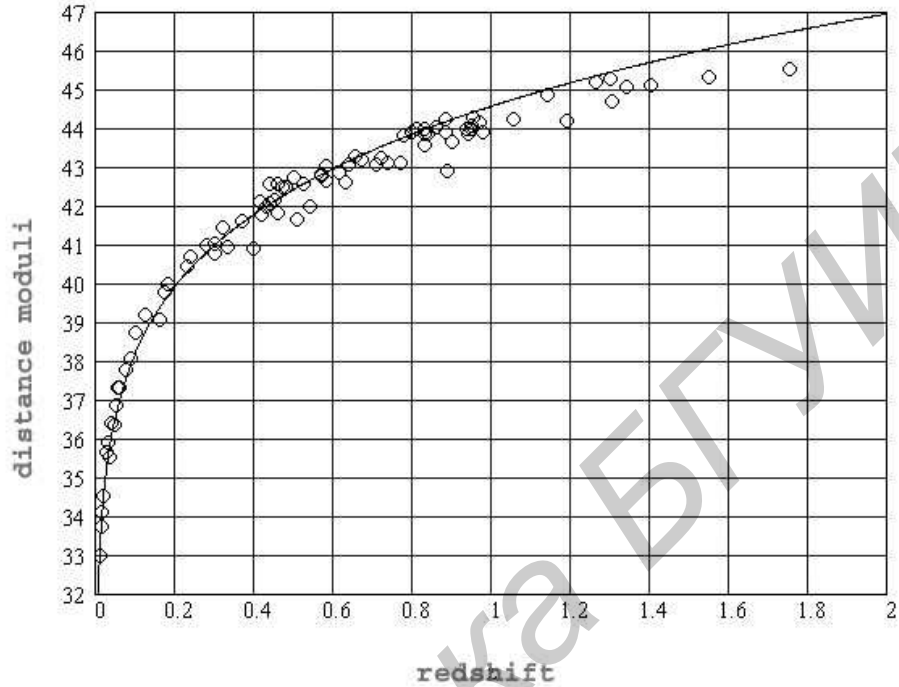


Figure 2: Comparison of the theoretical function $\mu_0(z)$ (solid line) with observations (points) from [3] by Riess et al.

4 Conclusion

A main goal of any physical model is not to fit observational data but to understand them to have a possibility to build an adequate picture of the nature. There are a few facts - the Pioneer 10 anomaly [6], an existence of redshifts and SNe 1a specific dimming, - which may be explained from one point of view in the considered approach. This approach needs an existence of the graviton background with very unexpected properties. Today, there is not any model in physics of particles dealing with *an external sea of particles* with a fixed spectrum. Our understanding of cosmology, gravitational physics and physics of particles would be essentially changed if this background really exists.

References

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