Evidence for The Hubble Sphere Model of Cosmological Redshift and Dark Energy

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Abstract: The Hubble sphere model uses a single equation of frequency versus distance to describe the linear and non-linear cosmological redshift data. The non-linear portion of the cosmological redshift curve is what has been interpreted as Dark Energy, an unnecessary phenomena that can easily be described by the interaction of Hubble spheres, where the gravitational and electromagnetic forces are limited to the range of the Hubble radius. Analysis of Type Ia supernovae data reveals the simple, 3rd-order polynomial predicted by the Hubble sphere model.

I. Introduction

The Hubble sphere model is based on the assumption that the gravitational and electromagnetic forces are limited in range similar to the other forces of nature, with the gravitational and electromagnetic forces limited in range to the observed radius of the Hubble sphere. It is in fact the horizon limit that is the effect of the limitation of these force ranges, with increasingly non-linear redshift observed as the range limit is approached [1].

This model thus explains Olber's paradox, where the limiting range of EM forces severely diminishes the amount of light received from distant stars. Based on the observation point within a Hubble sphere, whose radius is defined as R_u (~10^{26} meters), the observed redshift of an object *m* viewed at a given distance *d* from the observation point (which is also less than R_u) will send out electromagnetic waves that reach our observation point and these waves will also reach points into the adjacent Hubble sphere (which is defined relative to our observation point). The common mass-energy density that the object *m* has between our Hubble sphere and the adjacent Hubble sphere is what limits the amount of energy we see from object *m* as it radiates (possibly related to Wheeler-Feynman absorber theory). The further away *m* is from us, the less energy it has in common with our Hubble sphere and therefore the greater the redshift that we see.

This model predicts that the distance *d* to *m* increases from our observation point, the non-linearity associated with two intersecting Hubble spheres that share less common volume will come into play. This non-linearity is believed to be associated with dark energy, a hypothetical phenomenon that is better described by observation of the redshift data than a new energy field. The frequency of light as viewed by our observation point relative to *m* from distance *d* is given by [1]:

$$\frac{\Delta\omega}{\omega} = -\frac{3d}{4R_u} + \frac{d^3}{16{R_u}^3}$$

Eq.1

To compute the redshift *z*, we note that the inverse of the above polynomial will result in a polynomial of a similar order.

II. Analysis

Eq. 1 allows for a comparison of the Type Ia supernovae data provided in the original paper by Goldhaber G. and Perlmutter [2]. The magnitude data from Table 1 (specifically M^{eff}_b) was converted to raw distance with the formula:

$$distance = 10^{M/5}$$

Eq. 2

where M = M^{eff}_b. The distance versus redshift (z) relationship is plotted in Figure 1 and demonstrates that the 3rd through 1st terms of the polynomial are the most significant. This demonstrates the simplicity of the dark energy phenomena – suggesting a simple polynomial for the Hubble relation.

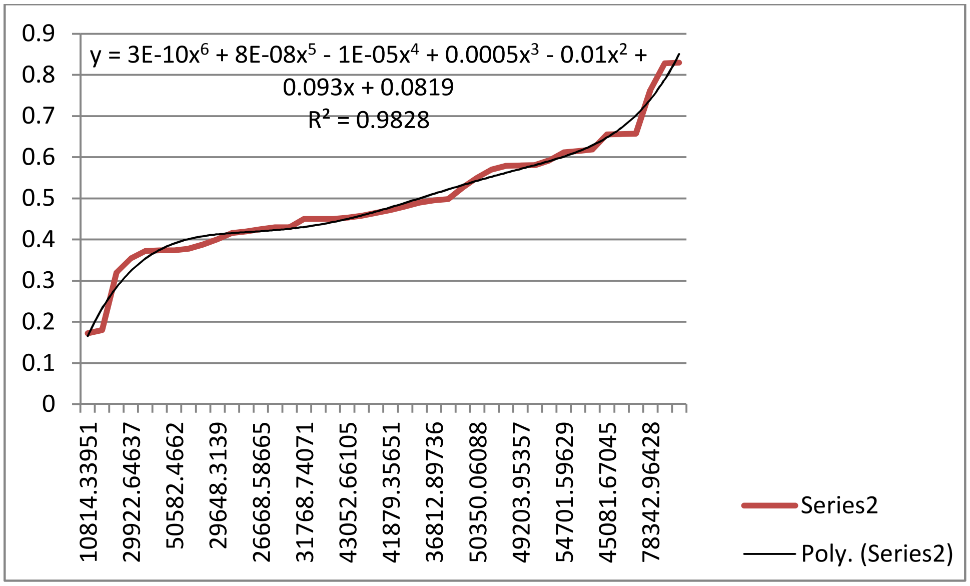

Figure 1 – ***Z*** versus $distance = 10^{\frac{M}{5}}$

Additional analysis from the frequency-polynomial (Eq. 1) shows that the terms in the polynomial relate to the fundamental forces as follows. With a change in energy that relates to frequency through *E = hω*, we change the polynomial in Eq. 1:

$$\frac{\Delta E}{E} = -\frac{3d}{4R_u} + \frac{d^3}{16{R_u}^3}$$

Eq. 3

We show that the first term in the polynomial is related to the Planck energy through the ratio of hc/λ to the rest-energy of the universe:

$$\frac{hc}{\lambda M_u c^2} = \frac{3d}{4R_u}$$

Eq. 4

Now, assuming $d = \lambda$ (the distance d in the ΔE relation is related to the wavelength at which this energy is applicable), $R_u = 2\text{x}10^{26}$ meters and $M_u = 5\text{x}10^{53}$ Kg:

$$\frac{4hcR_u}{3M_uc^2} = \frac{\lambda^2}{1}$$

Eq. 5

Resulting in **$\lambda \sim 10^{-35}$ meters**, which is nearly the Planck length (Pl), indicating that the 1st order term in the polynomial is related to the Planck energy. The second term in the polynomial (3rd order) is related in the same way as Eq. 4 except that the Planck energy ratio is replaced by the gravitational-scale energy ratio where a potential energy function ($1/2kd^2$) is used to describe gravitational energy at distances of R_u :

$$\frac{kd^2}{2M_uc^2} = \frac{d^3}{16{R_u}^3}$$

Eq. 6

Again, assuming $d = \lambda$ (the distance d in the ΔE relation is related to wavelength at which this energy is applicable), $R_u = 2\text{x}10^{26}$ meters, $M_u = 5\text{x}10^{53}$ Kg and $k = 10^{18}$ N/m as determined from the relation $M_uc^2 = k{R_u}^2$, we have the following

$$\frac{16{R_u}^3k}{2M_uc^2} = \frac{\lambda}{1}$$

Eq. 7

Resulting in **$\lambda \sim R_u$**.

III. Conclusions

As can be seen from the data from Goldhaber and Perlmutter, a 3rd order polynomial relation is evident between the redshift of Type Ia supernova versus distance when measured at high-z. This relation is explained by the intersection of Hubble spheres, which describes the dark energy problem as well as the cosmological redshift. The terms of this polynomial are related to the energy at the Planck and gravitational scales as seen by the determination of the Planck distance and the radius of Hubble sphere, found by setting these terms equal to the relative energy change at these scales. A simple explanation of quantum gravity results from this description of Hubble spheres.

References:

1. Harney, Michael and Haranas, Ioannis. The Dark Energy Problem, *Progress in Physics*. Vol. 4 2008

2. Goldhaber G. and Perlmutter S. A study of 42 type Ia supernovae and a resulting measurement of Omega(M) and Omega(Lambda). *Physics-Reports Review Section of Physics Letters*, 1998, v. 307(1–4), 325–331.