Published in the Slovak Republic
Russian Journal of Astrophysical Research. Series A
Has been issued since 2015.
E-ISSN: 2413-7499
2017, 3(1): 29-32

DOI: 10.13187/rjar.2017.3.29
www.ejournal28.com

Cosmological Redshift by Photon-Tachyon Interactions

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Abstract

In the early twentieth century, Slipher, Hubble and others made measurements of the redshifts of distant galaxies. Hubble discovered a rough correlation between the increasing redshifts and the increasing distance of galaxies. Theorists realized that these observations could be explained by an expansion of the Universe. However, some anomalous phenomena were found, which could not explain redshift by the Doppler effect of receding galaxies. Instead of expanding Universe, this article tries to explain the cosmic redshift from the standpoint of photon-tachyon interactions.

Keywords: photon-tachyon interactions, zero-point field, Cherenkov radiation, redsift.

1. Introduction

The current interpretation of observed redshift of light from distant galaxies is due to the expansion of the universe. Contrary to this interpretation, alternative explanations for the cosmological redshift were proposed by some researchers (LaViolette, 1994; Petit, 1988; Hannon, 1998). The tired light effect was proposed by Fritz Zwicky in 1929 as a possible alternative explanation for the observed cosmological redshift. The basic proposal amounted to light losing energy due to the distance it traveled rather than any metric expansion or physical recession of sources from observers. Other proposals for explaining how photons could lose energy included the scattering of light by intervening material in a process similar to observed interstellar reddening. However, all these processes would also tend to blur images of distant objects, and no such blurring has been detected. The author has shown that the cosmic background radiation can be created by tachyon pairs created from the zero-point fluctuation (ZPF) field (Musha, 2001; Musha, Hayman, 2013).

Contrary to conventional explanations for the cosmological redshift, the author propose the alternative mechanism of redshift of light from interactions of photon and tachyons which are created from ZPF field in a vacuum.

2 Photon-tachyon interactions

Instead of the Big Bang model, which considers the cosmic background radiation (CBR) as the afterglow of the Big Bang, a Zero Point Field (ZPF) model is proposed, in which cosmic background radiation is generated by the Cherenkov effect from superluminal particle (tachyon) pairs created in a zero-point fluctuation of vacuum (Musha, 2001; Musha, Hayman, 2013). The calculated result of CBR by this model shows the spectrum and the mass density of energy due to the Cherenkov radiation closely coincides with of the cosmic background radiation observed

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(Musha, Hayman, 2013).

The energy density of Cherenkov radiation generated from pairs of superluminal particles can be given by

$$\rho_C = 2\int_0^\infty \rho(\omega)d\omega = \frac{\hbar}{\pi^2 c^3}\int_0^\infty \omega^3 \exp\left(-\gamma\, l_p\omega\right)\cdot\left[\exp\left(\frac{\hbar\omega}{k_B T}\right)-1\right]^{-1} d\omega$$

$$= \frac{k_B^4 T^4}{\pi^2 c^3 \hbar^3}\int_0^\infty x^3 \exp(-\alpha x)/[\exp(x)-1]dx = \frac{6}{\pi^2}\frac{k_B^4 T^4}{\hbar^3 c^3}\zeta(4,1+\alpha)\ , \qquad (1)$$

where $\hbar$ is a Plank constant divided by 2π, k_B is a Boltzmann constant, T is an absolute temperature, $\zeta(m,n)$ is a Hurwitz zeta function and $\alpha = \gamma\, l_p k_B T/\hbar$.

After virtual tachyons created in a ZPF vacuum lose their energy by Cherenkov radiation, they become low energy tachyons and fill the Universe.

According to the paper by Ljubicic, Pisk and Logan (Ljubicic et al., 1979), it is kinematically possible for a photon to absorb a tachyon. After absorption the photon energy is E' and is related to the original photon energy E by

$$E' = \frac{-\mu^2}{2(\cos\theta - 1)E}, \qquad (2)$$

where θ is the angle between the directions of photons and μ is the liberty mass of the tachyon. If isotrophy of tachyons is assumed, about 90 % of the interactions are such that θ ranges from $30°$ to $150°$ (Ljubicic et al., 1979), the mean value of energy yields $0.83\mu^2/E$.

It is considered that $\mu \le E$, then we have $E' < E$ and it is evident that traveling photons are attenuated in low energy tachyon cloud.

3. Redshift of photons by the photon-tachyon interactions

If isotropy of tachyon cloud is assumed, the attenuation of photon energy can be approximately described as

$$\frac{dE}{dr} \approx -\beta E, \qquad (3)$$

where r is a distance from the source and β is an arbitrary constant.

From which, we have

$$E(r) \approx E_0 \exp(-\beta r), \qquad (4)$$

As the energy of photons can be given by

$$E = \frac{hc}{\lambda}, \qquad (5)$$

where h is a Plank constant, c is a light speed and λ is a wavelength of the light.

Introducing Eq.(5) into (4), we have

$$\frac{hc}{\lambda} \approx \frac{hc}{\lambda_0}\exp(-\beta r), \qquad (6)$$

If we suppose $\lambda \approx \lambda_0 \exp(\alpha r)$, where λ_0 is the wavelength of the photon at the time of emission, then we have approximation as

$$z(r) = \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\lambda_0 \exp(\beta r) - \lambda_0}{\lambda_0}$$

$$= \exp(\beta r) - 1 \approx \beta r\ , \qquad (7)$$

which shows the linear redshift-distace relation.

By substituting $\beta = \dfrac{H_0}{c}$, where H_0 is the Hubble constant, we have

$$z(r) \approx \frac{H_0 r}{c}, \tag{8}$$

which is the Hubble redshift-distance relation.

From which, it is seen that the cosmological redshift can be explained by photon-tachyon interactions.

A minority of astrophysicists has been unconvinced that the cosmological redshifts as shown in Fig.1 are associated with a universal cosmological expansion. Skepticism and alternative explanations began appearing in the scientific literature in the 1960s.

In particular, G. Burbidge, W. Tifft and H. Arp were all observational astrophysicists who proposed that there were inconsistencies in the redshift observations of galaxies and quasars (Arp, 1998).

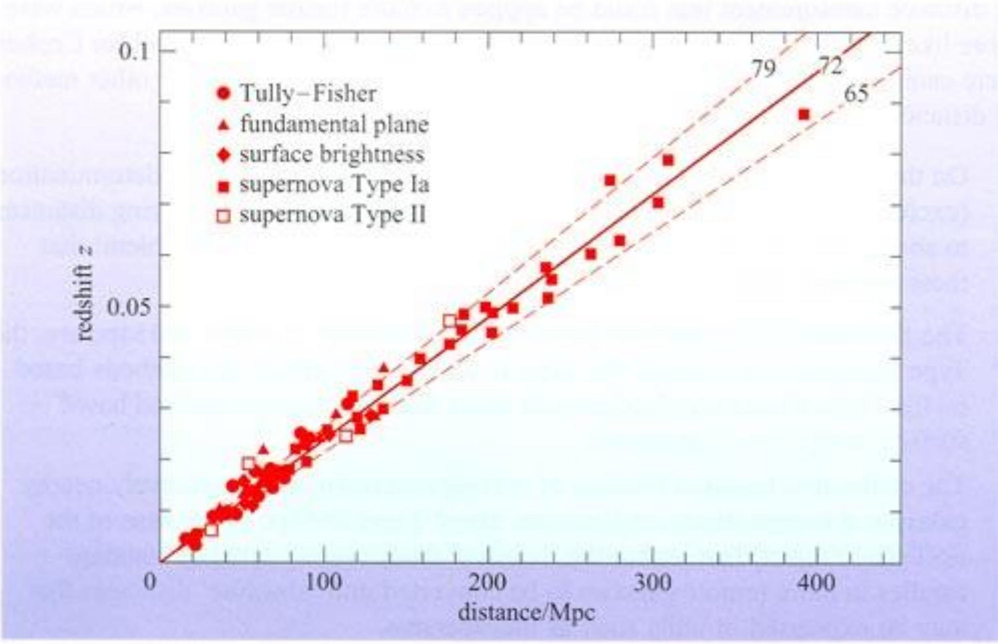

Fig. 1. Cosmological redshift of distant astronomical bodies (www.astro.virginia.edu)

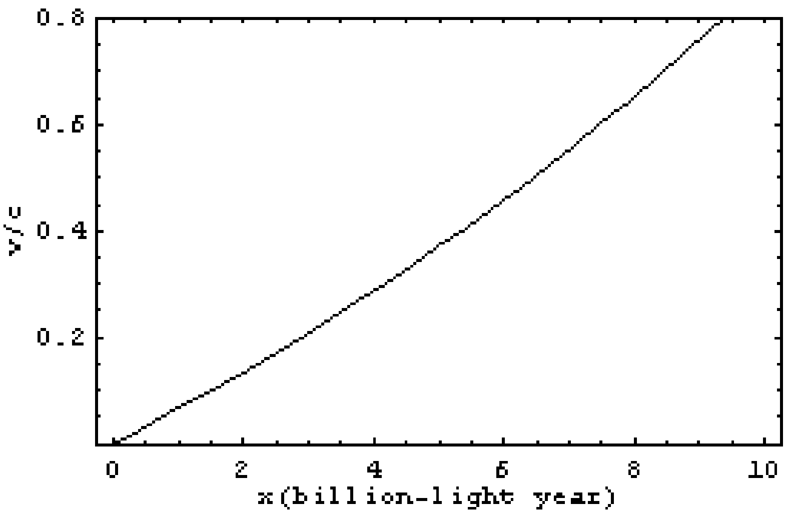

Figure 2. Speed of the distant galaxy predicted by Eq.(9)
($\beta = 6.67 \times 10^{-27}$)

As shown in the Figure.2, the calculation result considering higher terms in Eq.(7) shows that the receding speed of galaxies is accelerated with increased distance from us, which can be given as follows.

If v is a receding velocity of distant galaxies, we obtain higher order approximation of Eq.(7) as

$$v/c = \beta r + \frac{1}{2}\beta^2 r^2 + \frac{1}{6}\beta^3 r^3 + \cdots, \qquad (9)$$

which can be shown in Fig. 2.

where the horizontal line is for a distance in billion light years and the vertical line is for the receding speed divided by the light speed.

Recently astronomer groups have revealed the cosmic expansion is speeding up from the observation of very distant supernovae (Schwarzschild, 1998). They concluded that their observation result is due to the repulsive cosmological constant, but it might also explained by the attenuation of photons traveling in a tachyon cloud generated from ZPF in a vacuum.

4. Explanation of other anomalous phenomena

During the quasar controversies of the 1970s, these same astronomers were also of the opinion that quasars exhibited high redshifts not due to their incredible distance but rather due to unexplained intrinsic redshift mechanisms that would cause the periodicities and cast doubt on the Big Bang (Arp, 1998). If we suppose that the tachyon cloud surrounding quasar is more dense than that of the intergalactic space by unknown mechanism, since the energy output required to explain the apparent brightness of cosmologically-distant quasars was far too high to be explainable by nuclear fusion alone, we can explain high redshift of quasars observed by the experiments.

This interpretation of the cosmological redshift is also compatible with the finding that redshifts increases with distance in discrete values, rather than in a continuous curve. Spectral studies indicated that cosmological redshifts are quantized (Tifft, 1976; Tifft, 1978; Tifft, Cocke, 1984), that cannot explained by Doppler shift of the conventional theory. Instead of the conventional theory, observed quantized represents discrete steps in the decay of photon energy by the propagation of photons through tachyon cloud.

5. Conclusion

By the photon-tachyon interactions, the mechanism of the cosmic redshift can be explained. Moreover, it can also explain the acceleration of receding speed of far distant galaxies.

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