Some alternative possibilities in Cosmology

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Abstract

The observations of: Paal (1992), Perlmutter(1999) and Riess (1998) led to the possibility of accelerated expansion of the universe and the 'dark energy', but after fifteen years of search no trace of 'dark energy' is observed ; so this is time we start considering alternative possibilities of interpretations of the observations. Some arguments and alternative interpretations considered here include: (i) If the expansion of space can stretch the wavelength of the photon, then its gradual entry from expanding extra-galactic space into the non-expanded space within our milky-way galaxy should shrink the wavelength of the photon back to its original length. (ii) According to Einstein, if photons are point particles then expansion of space should only increase the path-length of photons without reducing their energy. (iii) The 'cosmic-coincidence', that the ratio of radius-of-the-universe and classical-radius-of-the-electron, and ratio of 'total-mass-of-the-universe' and 'mass-of-the-proton', matching strikingly with the ratio of electric-forces and gravitational forces, has happened only in the current epoch, is a very-very improbable coincidence; raising doubt about expansion of the universe (iv) the ratio of: energy lost by the cosmologically red shifted photons and the electrostatic potential energy lost by the electron at that distance is directly proportional to the strength-ratio of gravitational and electric forces. Can the big-bang be so precise? (iv) Cumulative phase alteration of galactic light passing through cosmic microwave background.

Detailed description:

Alternative mechanisms for the cosmological red shift have been rejected so far, under an assumption that they are not compatible with the observations of 'Time Dilation of Super Novae Light Curves' ; but it was shown by this author in (Tank, H. K. Adv. Studies Theor. Phys. Vol. **7**, no. 18, 2013) that any mechanism, which can cause cosmological red shift, will also cause time-dilation of super novae light curves. The following arguments will lead to the need for reconsidering the Doppler shift interpretation of the 'cosmological red shift' and the 'Big Bang Theory' .

1. According to the current interpretation of the cosmological-red-shift, the universe is expanding; and the rate of its expansion is getting accelerated with time. It is said that the distance between the galaxies is getting increased with the expansion of space; but since the galaxies are 'gravitationally-bound-structures', the space within the galaxies is not expanding. Now, the question is: what would happen at the edge of the galaxies, whose external-space is expanding but the space within it remains un-expanded? When the expansion of space is said to stretch the wavelength of extra-galactic-photon, then why the photon's wavelength does not shrink-back to its original-length, when it gradually enters the un-expanded space of our milky-way galaxy? Like the shrinking of wavelength of light while entering stronger and stronger gravitational field?

2. According to Einstein, the photons are 'point-particles'. If so, then the said expansion of space can only increase the path-length of photons; their arrival-time may get delayed, but there should be no other change of energy of them.

3. According to Copenhagen-interpretation-of-quantum-mechanics, the wavelength of light means the distance between to peaks of highest-density-detections of the particles called photons. If so, then 'expansion of space' can only increase the distance between two peaks of highest-density-detections of the photons, and not the quality of the 'particle'. Whereas in the case of 'cosmological-red-shift' we find that their energy and momentum gets reduced. Is the interpretation of q-m not correct; or the belief of 'expansion of space' is not correct?

4. Some authors have noticed the 'cosmic-coincidence', that the ratio of radius-of-the-universe & classical-radius-of-the-electron, and ratio of 'total-mass-of-the-universe' & 'mass-of-the-proton', matching strikingly with the ratio of: electric-forces & gravitational forces, has happened only in the current epoch, neither in the past, nor in future! This is a very-very improbable coincidence. It implies that the Doppler-shift-interpretation of 'cosmological-red-shift' is questionable.

5. P.A.M. Dirac's Large Number Coincidence (LNC) suggested that the strength of gravitational-interactions should vary with the expansion of the universe; but observations did not support such variation of *G* with time; so Dirac's Large-Number-Hypothesis was abandoned. But the strikingly matching of the three ratios on one hand, and non-observation of any variation of *G* on the other hand, implies that the universe may not be expanding. The Doppler-shift-interpretation of the cosmological-red-shift may not be correct.

6. According to Hoyle-Narlikar's Perfect Cosmological Principle (PCP), the universe must be homogenous and isotropic not only in space but also in time. But PCP-based Steady-State-Theory needed continuous creation of matter, which is not supported by experimental observations. The beauty of PCP on one hand, and non-observation of any spontaneous-creation of matter on the other hand, implies that the Doppler-shift-interpretation of the cosmological-red-shift may not be correct, and the universe may not be expanding; it is homogenous and isotropic always, as we see it to-day.

7. Can the big bang be so precise?

The 'cosmological red shift' less than unity, is expressed as:

$z_c = \Delta \lambda / \lambda_0 = H_0 D / c$.....(1).

i.e. $H_0 D / c = h H_0 / (h c / D)$.

Now, Weinberg has found an interesting relation that: $m_p^3 = h^2 H_0 / c G$,
where, *mp* is mass of a fundamental-particle, pi meson.

i.e. $G m_p^2 / (h / m_p c) = h H_0$ . .....(2).

So, from the expressions 1 and 2, we get:

$z_c = \Delta\lambda / \lambda_0 = [G m_p^2 / (h / m_p c)] / [h c / D]$. ……...….....(3).

i.e. $z_c = \Delta\lambda / \lambda_0 = [G m_p^2 / h c] [D / (h / m_p c)]$

i.e. $z_c = h \Delta\nu / h \nu = [G m_p^2 / h c] [D / (h / m_p c)]$. ……..…...(4).

That is, the reduction in energy of photon due to cosmological-red-shift is proportional to the strength-ratio of gravitational and electric forces.

Alternatively, let us define z_e as:

$z_e = [e^2 / r_e] – [e^2 / (r_e + D)] / [e^2 / (r_e + D)]$,

where e is electric-charge, r_e is 'classical radius of electron' and D is 'luminosity distance'

i.e. $z_e = e^2 [r_e + D – r_e] [r_e + D] / [r_e (r_e + D) e^2]$.

i.e. $z_e = D / r_e$.

From Dirac's Large-Number-Coincidence, we know, that:

$(G m_e m_p / e^2) = (r_e / R_0) = (m_p / M_0)^{1/2} = 10^{-40}$,

Where M_0 is total mass and R_0 radius of the universe.

i.e. $z_e = 10^{40} (D / R_0)$. ……..(5)

Because: $H_0 R_0 = c$ and $z_c = H_0 D / c = D / R_0$. ……..… ……..…..(6)

Comparing the expressions (5) and (6), we get:

$z_c = 10^{-40} z_e$. ……..(7)

That is: 'cosmological-red-shift' , at a distance D is $(G m_e m_p / e^2)$ times the reduction expected from the 'electrostatic potential energy' of an electron at that distance D. Can the big bang be so precise?

8. Cumulative Phase-Alteration of the Extra-Galactic-Light passing through Cosmic-Microwave-Background (CMB)

Let us imagine a horizontal arrow of three centimeter length representing instantaneous magnitude and direction of electric-field of the 'extra-galactic-light'. Then add a small arrow of just five mm length at an angle minus thirty degrees, representing instantaneous magnitude and direction of the 'cosmic-microwave-background'. You can see that the resultant vector has

increased in magnitude, but lagged behind by a small angle theta. As the wave of extra-galactic-light travels in space, a new arrow representing CMB keeps on getting added to the previous resultant-vector. This kind of phase and amplitude-alterations continue for billions of years in the case of 'extra-galactic-light'; producing a cumulative-effect. Since the speed of rotation of the vector representing CMB is much slower than that of light, the CMB-vector pulls-back the Light-vector resulting in reduction of cyclic-rotations. This process can be mathematically expressed as follows:

Electric field of pure light-wave can be expressed as:

$\Psi (X,t) = A[\cos \omega t + i \sin \omega t]$ …….(8)

When electric-fields of CMB get added, the resultant-sum can be expressed as:

$\Psi (X,t) = A[N(t)\cos \omega t + i \, \hat{}N(t)\sin \omega t]$….(9)

Where: N(t) represents instantaneous magnitude of alteration caused by CMB, and ^N(t) represents its Hilbert-transform. When all the spectral-components of N(t) are phase-shifted by +90 degrees, we get its Hilbert-transform ^N(t).

As a communications-engineer we use band-pass-filter to remove out-of-band noise. This author has also developed a noise-cancelling-technique, to reduce the effect of even in-band-noise by up-to 10 dB. But in the extra-galactic-space there are no band-pass-filters, so the phase-alterations caused by CMB keep on getting accumulated. After billions of years, when this light reaches our planet earth there is a cumulative-phase-alteration in the extra-galactic-light, observed as a part of 'the cosmological red-shift'.

9. We can express the cosmological red-shift z_c in terms of de-acceleration experienced by the photon, as follows (Tank, 2010, 2011):
For z_c smaller than unity:

$$z_c = (f_0 - f) / f = H_0 D / c$$

i.e. $(h \Delta f / h f) = H_0 D / c$

i.e. $h \Delta f = (h f / c^2) (H_0 c) D$ ……..(10)

That is, the loss in energy of the photon is equal to its mass (hf / c^2) times the deceleration $a = H_0 c$, times the distance D travelled by it. Where: H_0 is Hubble-parameter. And the value of constant deceleration a is: $a = H_0 c$, $a = 6.87 \times 10^{-10}$ meter/sec^2 , equal to the rate of said accelerated expansion of the universe.

This derivation raises a question: whether the expansion of the universe is accelerating, or the extra galactic photon is decelerating?

Conclusion:

The above discussion suggests the need for considering alternative possibilities to the big bang cosmology.

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