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Wrong Definition and Wrong Implications of Cosmic Red Shift (Correction and Possible Solutions)

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ABSTRACT

Since 1912, cosmologists strongly believe in the currently accepted definition of cosmic red shift as - ratio of increase in wavelength to the laboratory wavelength of photon. We would like to emphasize the point that, this definition is absolutely wrong with reference to photon energy. Clearly speaking, true cosmic red shift must be defined as the ratio of loss in energy of photon to the energy of photon at laboratory. In terms of wavelength, photon red shift must be defined as the ratio of increase in wavelength to the observed wavelength of photon. We have published this definition in our recent publications and sincerely appeal the science community and cosmologists to review the basics of Lambda cosmology, cosmic acceleration and dark energy in an unbiased approach. Regarding Tolman Surface Brightness test, we sincerely appeal the cosmologists to review and reanalyze the observations and calculations as per the corrected cosmic redshift definition with reference to cosmic expansion and cosmic rotation. Here we would like to emphasize the point that, (1+z) should be replaced by $(1+z_{new})$. Upper limit of $(1+z_{new})$ is 2 and upper limit of $(1+z_{new})^4$ is 16.

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Introduction

Really it is a very great moment to note that, Hubble's and Slipher's galactic red shift observations inspired many scientists to think about cosmic expansion against to Einstein's work on static universe [1-3]. Both, Alexander Friedmann and Georges Lemaître independently derived relations for cosmic expansion rate [4, 5]. All these fascinating works have been well believed, well understood and well analyzed by other scientists and finally a well-developed model of expanding universe has come into existence. The key pillar for the well accepted expanding model is seriously depending on the basic definition of cosmic red shift as - 'ratio of increase in photon wavelength to the laboratory wavelength of photon'. Thousands of scientists strongly believe in this definition and lakhs of students are being educated in this direction. In this context, we are afraid, but we are sure to say that, something went wrong with the basic definition of cosmic red shift. In this paper, we make an attempt to highlight the mathematical mistake connected with cosmic red shift definition. Considering photon energy, mistake can be corrected. Most puzzling point to be noted is that, after correction, cosmic redshift seems to lie between 0 and 1 rather than 0 and infinity. It directly influences the currently believed various forms of cosmic scale factors (1+z), $(1+z)^2$, $(1+z)^3$ and $(1+z)^4$ very badly. For the maximum permissible cosmic red shift of z =1, cosmic scale factor seems to take a maximum value of (1+1) =2. If so, maximum permissible value of $(1+z)^4$ is $(1+1)^4$ = 2^4 =16. We sincerely appeal the science community to analyze the issue in an unbiased approach.

This paper is a simple and brief version of our recently published papers [6-9]. As the subject under consideration is very complicated to perceive and many years have been passed from the date of introduction of the cosmic red shift definition, it may take some time for any field expert to accept our views. But it seems to be a must to accept our corrected definition for further research in this field.

Correction to the 100 years Old Definition of Cosmic Red Shift

In a mathematical form, true definition of cosmic red shift can be expressed as [6-9],

$$z_{new} \cong \frac{E_{Galaxy} - E_{Observed}}{E_{Galaxy}} \cong \frac{\lambda_{Observed} - \lambda_{Galaxy}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Galaxy}}{\lambda_{Observed}} \quad (1)$$

If it is believed that, known physical laws of atomic and nuclear physics are applicable to other galaxies, then one can assume that, energy of photon at any galaxy is same as energy of photon coming from a laboratory resting in Milky Way. Then,

$$z_{new} \cong \frac{E_{Lab} - E_{Observed}}{E_{Lab}} \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Lab}}{\lambda_{Observed}} \quad (2)$$

Based on this approach, in terms of photon energy, current definition of cosmic red shift can be expressed as,

$$z \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Lab}} \cong \frac{\lambda_{Observed}}{\lambda_{Lab}} - 1 \cong \frac{E_{Lab} - E_{Observed}}{E_{Observed}} \cong \frac{E_{Lab}}{E_{Observed}} - 1 \quad (2B)$$

→ An illogical and invalid defintion in terms of Photon energy.

Based on relations (2A) and (2B),

$$z_{new} \cong \frac{z}{1+z} \quad \text{and} \quad z \cong \frac{z_{new}}{1 - z_{new}} \qquad (2C)$$

This new definition of cosmic red shift seems to be completely different from the currently believed definition of cosmic red shift and needs a review at fundamental level. With reference to current definition, 0 > z < Infinity. Based on our definition, $0 > z_{new} < 1$. Following relation (2A), observed farthest galactic distances can be estimated very easily with the following simple relation. It may be noted that, following our Hubble-Hawking models of cosmology and considering the current cosmic microwave background radiation temperature, estimated value of current Hubble parameter is $H_0 \cong 66.86$ km/sec/Mpc [6-9]. It is absolutely independent of galactic distances. With further studies, currently noticed tension in estimating current Hubble parameter can also be resolved with our approach. See Table 1. Accuracy point of view, within the uncertainty in the actual galactic red shifts and standard model of estimated galactic distances, our fit is very good.

$$d_G \cong (z_{new})\left(\frac{c}{H_0}\right) \cong \left(\frac{z}{1+z}\right)\left(\frac{c}{H_0}\right) \cong \left(\frac{z}{1+z}\right) 14.617 \text{ Gly}$$

$$\text{where } H_0 \cong \left(\frac{1}{H_{pl}}\right)\left(\frac{4\pi k_B T_0}{\hbar}\right)^2 \text{ and } H_{pl} \cong \frac{1}{2}\sqrt{\frac{c^5}{G\hbar}} \qquad (3)$$

For further analysis and data verification, readers are encouraged to visit the URLs, https://cosmocalc.icrar.org/. and http://www.atlasoftheuniverse.com/cosmodis.c. Here it is very important to note that, estimated galactic distances are independent of currently believed various density relations pertaining to cosmic matter and cosmic scale factors. It casts doubt on the well believed cosmic acceleration and dark energy concepts [10,11]. This is very a typical issue and bitter result to digest.

Table 1: To estimate and fit the Distances of Farthest Galaxies

Galaxy	Red shift	Standard Light travel distance (Gly)	Estimated Light travel distance (Gly)	%Error
JADES-GS-z13-0	13.2	13.576	13.59	-0.086
UNCOVER-z13	13.079	13.51	13.58	-0.507
JADES-GS-z12-0	12.63	13.454	13.54	-0.669
UNCOVER-z12	12.393	13.48	13.53	-0.337
GLASS-z12	12.117	13.433	13.50	-0.516
	11.58	13.41	13.46	-0.335
UDFj-39546284	11.44	13.4	13.44	-0.312
J141946.36+525632.8	11.04	13.45	13.40	0.351
CEERS2 588	10.6034	13.39	13.36	0.245
GN-z11	9.11	13.26	13.17	0.674
MACS1149-JD1	8.68	13.23	13.11	0.939
EGSY8p7	8.38	13.2	13.06	1.082
A2744 YD4	7.73	13.13	12.94	1.447
EGS-zs8-1	7.66	13.11	12.93	1.399
z7 GSD 3811	7.51	13.1	12.90	1.555
z8_GND_5296	7.215	13.17	12.84	2.589
SXDF-NB1006-2	7.213	13.07	12.84	1.813
GN-108036	7.109	13.05	12.81	1.838
BDF-3299	7.014	13.04	12.79	1.930
A1703 zD6	7.008	13.04	12.79	1.941
BDF-521	6.972	13.03	12.78	1.929
G2-1408	6.964	13.03	12.78	1.943
IOK-1				

Data source: https://en.wikipedia.org/wiki/List_of_the_most_distant_astronomical_objects

Corrected Cosmic Red Shift Definition and A Review on Hubble's law

Based on the corrected definition of cosmic red shift, starting from the Planck scale, by representing early light speed cosmic expansion and rotation as an outward spiral, it seems possible to consider Hubble's law as a representation of current cosmic light speed rotation having no further expansion [6,9,12-25]. It can be understood with,

a) Rate of decrease in cosmic temperature associated with current and decreased future cosmic temperature.
b) Rate of decrease in Hubble parameter associated with current and decreased future cosmic Hubble parameter.

Thus, Hubble's law for cosmic rotation applicable to whole Hubble volume can be expressed as,

$$d_G H_0 \cong \left(\frac{z}{z+1}\right)c \cong (z_{new})c \qquad (4)$$

By this time, if universe is not really expanding, it seems meaningful to consider H_0 as a representation of current cosmic angular velocity. Current observed cosmic thermal isotropy can be considered as a measure of current cosmic null expansion. Most recent observations on cosmic microwave background radiation pertaining to temperature and polarization anisotropy strongly suggest the possibility of considering a positively curved universe [26-29]. Based on these points, it seems logical to say that, at present, universe is having a positive curvature. If it is the case, based on Hubble's law, it is also possible to consider 'light speed' as the current cosmic rotation speed. Thinking in this way, currently believed cosmic acceleration and dark energy concepts can be relinquished at 100% confidence level. It needs an unbiased review and we are leaving the decision to the science community. If there is any mistake in our interpretation, we will correct our views and strictly follow standard model of cosmology in future.

Understanding the Cosmic Scale Factor and Age

As per the basics of Lambda cosmology, cosmic scale factor is defined as,

$$\frac{a_{then}}{a_{now}} \cong \frac{a_t}{a_0} \cong \frac{1}{1+z} \cong a_t \qquad (5)$$

$$\text{where, } z \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Lab}}; \quad \frac{a_{then}}{a_{now}} \cong a_{then} \cong a_t \quad \text{if } a_{now} \cong a_0 \cong 1$$

Based on our definition, $z_{new} \leq 1$ and $1 + (z_{new}) \leq 2$. Hence it seems quite complicated to follow the above relation (5). To resolve the problem, we appeal that,

$$\text{(Either)}\ a_t \cong \left(\frac{T_0}{T_t}\right) \ldots\ldots\ldots\ldots\ldots\ldots\text{(6A)}$$
$$\text{(Or)}\quad a_t \cong \frac{1}{1+(z_{new})} \ldots\ldots\ldots\ldots\ldots\text{(6B)} \qquad (6)$$

For further study, we appeal the science community to choose either (6A) or (6B). Choosing relation (6A) and following our Hubble-Hawking model related with Planck mass, $M_{pl} \cong \sqrt{\frac{\hbar c}{G}}$ currently believed cosmic time scale up to the formation of first hydrogen atom can be fitted with [30, 31],

$$t \cong \left(\frac{1}{1+z}\right)^{3/2}\left(\frac{1}{H_0}\right) \cong \sqrt{\frac{T_t}{T_0}}\left(\frac{1}{H_t}\right) \ldots\ldots\ldots\ldots\ldots\text{(7A)}$$
$$\cong \left(\frac{1}{T_0}\right)^{1/2}\left(\frac{1}{T_t}\right)^{3/2} 3.42646\times10^{18}\ \text{sec} \qquad (7)$$
$$tH_t \cong \sqrt{\frac{1}{a_t}} \cong \sqrt{\frac{T_t}{T_0}} \ldots\ldots\ldots\ldots\ldots \ldots\ldots\ldots\ldots\ldots\text{(7B)}$$

$$\text{where, } T_t \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_t M_{pl}}} \cong \frac{\hbar\sqrt{H_t H_{pl}}}{4\pi k_B}$$

$$\text{provided, } M_t \cong \frac{c^3}{2GH_t} \text{ and } H_{pl} \cong \frac{c^3}{2GM_{pl}} \cong \frac{1}{2}\sqrt{\frac{c^5}{G\hbar}}.$$

$$H_t \cong \left(\frac{1}{H_{pl}}\right)\left(\frac{4\pi k_B T_t}{\hbar}\right)^2 \cong 2.91846\times10^{-19}\,T_t^2$$

Note: For, $T_0 \cong 2.72548$ K, obtained $H_0 \cong 66.8624$ km/sec/Mpc.

Relation (7A) is a very nice fit for the currently believed cosmic time scale. Readers are encouraged to refer the data table presented (Table 1, page 18) in our published paper [31]. It is very essential to work on it for clarity and better understanding based on Hubble-Hawking cosmology. If so, interesting observation to be noted is that,

$$\frac{H_t}{H_0} \cong \left(\frac{T_t}{T_0}\right)^2 \cong \frac{1}{a_t^2} \qquad (8)$$
$$\text{where } a_t \neq \frac{1}{1+z_{new}}$$

Relation between Various Cosmological Distances

Based on the new red shift definition as discussed in section (2), various distances associated with galactic light can be understood in the following way. Readers are encouraged to refer to the data table presented in our published paper [8].

Light Travel Distance (LTD) can be approximated with,

$$LTD \cong z_{new}\left(\frac{c}{H_0}\right) \qquad (9)$$

Comoving Distance (CD) can be approximated with,

$$CD \cong \exp(z_{new}) * LTD \cong z_{new}\exp(z_{new})\left(\frac{c}{H_0}\right) \qquad (10)$$

Luminosity Distance (LD) can be approximated with,

$$LD \cong \frac{CD}{1-z_{new}} \cong \left[\frac{z_{new}\exp(z_{new})}{1-z_{new}}\right]\left(\frac{c}{H_0}\right) \qquad (11)$$

Based on above relations, Hubble's law for galactic comoving distances can be expressed as,

$$CD_{gal} \cong z_{new}\exp(z_{new})\left(\frac{c}{H_0}\right) \qquad (12)$$

For, $z_{new} = 1$, $CD_{gal} \cong \exp(1)\left(\frac{c}{H_0}\right) \cong 2.7183\left(\frac{c}{H_0}\right) \cong 39.74$ Gly.

Discussion on Hubble Tension, Cosmic Expansion Rate, Cosmic curvature and Rotation

In this section, we will try to highlight the drawbacks of Lambda cosmology, need of considering Planck scale in place of big bang, significance of Hubble-Hawking temperature relation, cosmic non-expansion associated with current thermal isotropy, understanding Hubble tension and need of reviewing Hubble's law with respect to cosmic rotation and curvature.

1) It may be noted that, Lambda cosmology point of view,
   a) No information on the physical properties of presumed big bang.
   b) No proper weightage to Planck scale.
   c) No clarity on the origin and ending mechanisms of inflation [32].
   d) Not clear about the existence and other applications of dark energy.
   e) No experimental support on super luminal speeds.
   f) No experimental evidence for the physical existence of dark matter [33].
   g) Completely based on a wrong definition of galactic red shift.
   h) Current cosmic thermal isotropy and acceleration are contradictory to each other.
   i) To have a big bang, a big crunch is required. In an accelerating universe, big crunch is beyond the scope and no clear views on future cosmic expansion rate and other physical properties.
2) If currently believed cosmic big bang is really a 'singularity', it seems more logical to depend on quantified Planck scale rather than big bang. It may be noted that, in general, gravitational singularities are not clear about "Where, When and How" like essential points that are believed to be the basics of developing any workable physical model.
3) Starting from the Planck scale, following our Hubble-Hawking model of cosmology, relation between cosmic temperature and Hubble parameter can be expressed as,

$$T_t \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_t M_{pl}}} \cong \frac{\hbar\sqrt{H_t H_{pl}}}{4\pi k_B}$$
$$\text{where, } \begin{cases} M_t \cong \dfrac{c^3}{2GH_t} \text{ and } \dfrac{2GM_t}{c^2} \cong \dfrac{c}{H_t} \\ H_{pl} \cong \dfrac{c^3}{2GM_{pl}} \cong \dfrac{1}{2}\sqrt{\dfrac{c^5}{G\hbar}} \end{cases} \qquad (13)$$

Recently Haug and Wojnow have derived this relation from the Stefan-Boltzmann law [34]. We are working on all possible derivations [6,18]. It may be noted that, following black hole concepts and considering cosmic thermal energy density and mass-energy density, there is a possibility to show that, $T_t \propto \frac{1}{\sqrt{M_t M_{pl}}}$. Based on relation (13),

$$T_t \propto \sqrt{H_t} \quad \text{and} \quad T_t^2 \propto H_t \qquad (14)$$

Thus, by considering $\left(\frac{dT}{dt}\right)$ and $\left(\frac{dH}{dt}\right)$ as the characteristic tools of understanding true cosmic expansion rate, an unambiguous model of cosmology can be developed independent of galactic distances.

4) Very surprising logic is that, the product of currently believed Hubble volume and critical density is leading to represent a very strange relation, $\frac{2GM_0}{c^2} \cong \frac{c}{H_0}$ which seems to have a strong connection with highly curved massive black hole like current universe. Hence, by following Hawking's relation for black hole temperature formula [35], relation (13) can be expressed as,

$$T_t \cong \sqrt{\frac{M_t}{M_{pl}}}\left(\frac{\hbar c^3}{8\pi k_B G M_t}\right) \cong \sqrt{\frac{H_{pl}}{H_t}}\left(\frac{\hbar H_t}{4\pi k_B}\right) \quad (15)$$

For the Planck scale, if $M_t \to M_{pl}$ and $H_t \to H_{pl}$,

$$T_{pl} \cong \left(\frac{\hbar c^3}{8\pi k_B G M_{pl}}\right) \cong \left(\frac{\hbar H_{pl}}{4\pi k_B}\right) \quad (16)$$

At present, scientists are seriously working on understanding and exploring the mystery of dark energy with black hole physics [36]. If it is the case, relations (13) to (16) can be given a high priority in exploring the secrets of the current universe. We are working on deriving and understanding the ratio, $\sqrt{\frac{M_t}{M_{pl}}} \cong \sqrt{\frac{H_{pl}}{H_t}} \cong \frac{T_{pl}}{T_t}$.

5) We would like to emphasize the point that, relation (13) is completely free from galactic distances and red shifts. As observed current cosmic temperature is very accurate, errors in estimating the current Hubble parameter are very limited and hence currently believed Hubble tension can be eliminated to some extent. In addition to that, it is very easy to extrapolate relation (13) to the past and future cosmic physical and thermal properties. Thus, by following future cosmic temperature, there is 100% scope for understanding and deciding the true nature of cosmic expansion rate independent of galactic distances.

6) It is important to note that, Hubble parameter [(73.04±1.04) km/sec/Mpc] estimated from currently believed galactic red shifts and galactic distances is not matching with the Hubble parameter [(67.4±0.5) km/sec/Mpc] estimated from cosmic microwave back ground radiation (CMBR) and baryon acoustic oscillations (BAO) [11, 37-39]. This mismatch is believed to be the root cause of Hubble tension [40-42]. In this context, based on relation (13) and by considering current cosmic temperature as 2.72548 K,

a) At first, we have fitted the current Hubble parameter with the lower limit of CMBR and BAO estimates as, $H_0 \cong 66.86 \cong 67.4 - 0.5 \cong 66.9$ km/sec/Mpc.

b) By correcting the cosmic red shift definition and by using the estimated current Hubble parameter and light speed, we have fitted the same galactic distances with $H_0 \cong 66.86$ km/sec/Mpc independent of the currently believed cosmic dark matter, baryon matter, dark energy proportions and red shift dependent scale factors [43].

c) Compared to CMB radiation, galactic distances are far beyond the reach of direct measurements. Hence, Hubble parameter estimated from galactic distances can be understood as inaccurate due to issues associated with long range indirect measurement errors.

7) Following our corrected cosmic red shift definition, there seems no need to consider and no need to believe in various cosmic densities proportions that are presumed to be essential for understanding the nature of galactic distances and cosmic expansion rate.

8) It is well believed that, thermal expansion is a true index of cosmic expansion and current cosmic temperature is absolutely constant. Currently believed cosmic acceleration and dark energy concepts are truly based on the estimated cosmic distances that seem to be well fitted without the role of cosmic density fractions. This is crystal-clear evidence for the non-existence of so-called cosmic acceleration and dark energy concepts.

9) Really, if current universe is having no thermal expansion and no physical expansion [44,45] as per the Tolman surface brightness test [46,47,48] and distance duality test [49] and if galactic distances are independent of dark energy like concepts, then observed cosmic stability against collapse and ordered structure of galaxies can be understood in terms of cosmic light speed rotation as per the current Hubble's law [1,24]. Clearly speaking, if one is willing to consider the case of current non-expanding universe, it seems logical to review the Hubble's law - in terms of rotational dynamics associated with $v = r\omega$. It may also be noted that, general theory of relativity is no way against to cosmic rotation.

10) Important point to be noted is that, to have rotation, universe should have a closed or positive curvature. Four most recent technical papers published in three very high impact journals, Physical Review D, Nature Astronomy and Astronomy & Geophysics seem to support a closed universe [26-29].

11) Regarding Tolman Surface Brightness test, we sincerely appeal the cosmologists to review and reanalyze the observations and calculations as per the corrected cosmic redshift definition with reference to cosmic expansion and cosmic rotation. Here we would like to emphasize the point that, $(1+z)$ should be replaced by $(1+z_{new})$. Upper limit of $(1+z_{new})$ is 2 and upper limit of $(1+z_{new})^4$ is 16.

12) As per the recent paper published in 'Proceedings of the National Academy of Sciences, USA' [25], Lambda cosmology is turning towards a big crunch based on dark energy dependent cosmic deceleration and halt. Very surprising point to be noted is that, this new paper has been reviewed by Saul Perlmutter, one of the founders of cosmic acceleration! [10].

13) If observed universe is assumed to be associated with only one big bang, then 'point of big bang' can certainly be considered as the characteristic reference point of cosmic evolution in all directions.

14) Without a radial in-flow of matter in all directions towards one specific point, one cannot expect a big crunch and without a big crunch, one cannot expect a big bang. Really if there was a "big bang" in the past, with reference to formation of big bang as predicted by general theory of relativity and with reference to the cosmic rate of expansion that might have taken place simultaneously in all directions at a "naturally selected rate" about the point of big bang: "point" of big bang can be considered as the characteristic reference point of cosmic expansion in all directions. Thinking in this way, point of big bang can be considered as a possible centre of cosmic evolution.

15) Till the detection and confirmation of dark energy, our views can be given a chance in understanding and exploring the secrets of the universe.

Brief Discussion on Dark Matter and Current Cosmic Halt

In this section, we express our views on dark matter [50,51] and cosmic halt.

1) To understand the galactic flat rotation speeds and exceptional stability, in our recently proposed papers, we have proposed the existence of increasing super gravitational behavior of galaxies having a minimum mass of 180 to 200 million solar masses [52-55]. This proposal is strictly in-line with recently observed dark matter deficient galaxies [56-59]. For a short review, our proposed relation can be expressed as,

$$\left(M_{dark}\right)_G \cong \frac{\left(M_{baryon}\right)_G^{3/2}}{\sqrt{\left(M_{\text{limit}}\right)_0}}$$

$$\text{where,}\begin{cases}\left(M_{dark}\right)_G \cong \text{Super gravitational mass of galactic baryon matter.}\\ \left(M_{baryon}\right)_G \cong \text{Galactic baryon matter.}\\ \left(M_{\text{limit}}\right)_0 \cong \left(180 \text{ to } 200\right) \text{ Million solar masses [54,55]}\\ \qquad \cong \text{Current super gravitational mass limit}\\ \cong \left[\left(\frac{3H_0^2c^2}{8\pi G}\right)\div\left(\frac{aT_0^4}{3}\right)\right]\left(\frac{M_0}{M_{pl}}\right)m_n \cong \left(\frac{9H_0c^5}{16\pi G^2 M_{pl}\left(aT_0^4\right)}\right)m_n\\ \text{where } m_n \cong \text{mass of nucleon}\end{cases} \tag{17}$$

Total mass of any galaxy can be expressed as,

$$\left(M_{Total}\right)_G \cong \left\{\left(M_{baryon}\right)_G + \left(M_{dark}\right)_G\right\} \tag{18}$$

It may be noted that, proposed super gravitational mass

a) is an outcome of ordinary baryon matter.
b) is a kind of super gravitational flux.
c) is directly proportional to (baryon mass)$^{3/2}$.
d) is significant for baryon mass greater than (180 to 200) million solar masses.
e) can be understood as a hidden layer covering a large baryon mass.
f) needs further study with respect to its distribution and other properties.

Galactic flat rotation speeds can be understood with [52-55],

$$V_G \cong 0.2904\left[\left(G\left(M_{Total}\right)_G\right)\left(cH_0\right)\right]^{1/4}$$
$$\text{where, } \left[1+\ln\left(\frac{H_{pl}}{H_0}\right)\right]^{-\frac{1}{4}} \cong 0.2904 \tag{19}$$

$$\frac{V_G}{c} \cong 0.244\left[\frac{\left(M_{Total}\right)_G}{M_0}\right]^{1/4} \cong 0.25\left[\frac{\left(M_{Total}\right)_G}{M_0}\right]^{1/4}$$
$$\text{where } M_0 \cong \frac{c^3}{2GH_0} \cong \text{Current cosmic Hubble-Hawking mass}$$
$$\cong \text{A kind of Huuble induced mass [60,61,62]} \tag{20}$$

With further research, these relations can be modified collectively for a better understanding.

2) Nearby or current cosmic halt can be understood with Hubble-Hawking model of cosmology with the following simple points. Starting from the Planck scale,

a) Cosmic growth and expansion speed are inversely proportional to increasing cosmic mass and directly proportional to decreasing cosmic temperature.
b) Speed of light can be considered as the initial cosmic expansion speed.
c) Cosmic rotation speed is a having a tight relation with speed of light.

Cosmological Approximate Mapping Relations

Considering initial cosmic expansion speed as 'light speed' and current expansion speed as '0', the following mapping relations (21) to (25) can be modified as per the observations and better understanding [9].

Concept 1: Throughout the cosmic expansion, numerically, cosmic expansion rate and angular velocity are equal in magnitude.

$$\omega_t \cong H_t \tag{21}$$

Concept 2: For a continuous light speed rotation, throughout the cosmic expansion, cosmic radius can be expressed as.

$$R_t \cong \frac{c}{H_t} \cong \frac{c}{\omega_t} \tag{22}$$

Concept 3: Throughout the cosmic expansion, cosmic red shift can be applied to know the cosmic expansion speed as,

$$\left(z_{new}\right)_t \cong \left(1-\frac{\left(V_{\exp}\right)_t}{c}\right) \cong \ln\left(\frac{H_{pl}}{H_t}\right)\Big/\ln\left(\frac{H_{pl}}{H_0}\right)$$
$$\text{where, } H_t \cong \left(9.275\times10^{42} \text{ to } 2.167\times10^{-18}\right) \sec^{-1}$$
$$\left(V_{\exp}\right)_t \cong \text{Cosmic expansion speed.} \tag{23}$$

See the following Figure 1 for a rough relation between true cosmic red shift and Hubble parameter.

Concept 4: Throughout the cosmic expansion, cosmic age can be expressed as.

$$\left(\frac{c+\left(V_{\exp}\right)_t}{2}\right)*t \cong \frac{c}{H_t} \tag{24}$$

Clearly speaking, starting from the Planck scale,

Average expansion speed × Cosmic age = Cosmic radius.

Hence, cosmic age can be expressed as,

$$t \cong \left(\frac{2}{2-\left(z_{new}\right)_t}\right)\left(\frac{1}{H_t}\right) \tag{25}$$

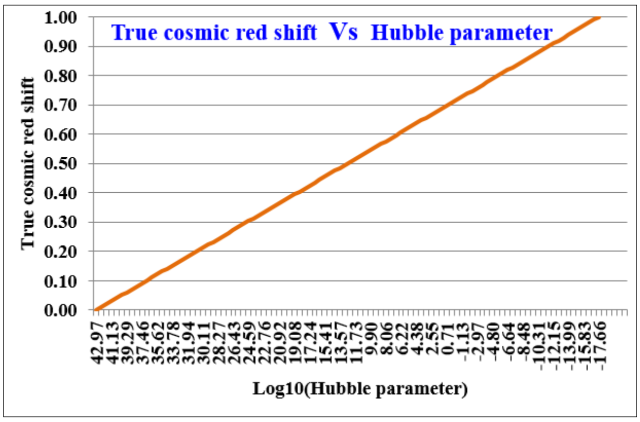

Figure 1: Approximate Relation between True Cosmic Red Shift and Hubble Parameter

For, the current case [63], $t_0 \cong \frac{2}{H_0}$ and for the Planck scale, $t_{pl} \cong \frac{1}{H_{pl}}$. Studying relations (21) to (25) in a systematic approach, actual cosmic time scale can be developed by means of considering or ignoring the cosmic scale factor.

Brief Discussion on Galactic Ages Revealed by James Webb Space Telescope

As per the observations of James Webb Space Telescope (JWST), fully developed galaxies are existing with an age of the order of million years against the expected age of the order of one billion year from big bang. This seems to be a major puzzle and Lambda cosmology seems to fall in a very big crisis. Barry Setterfield clearly explained the issue in the recent paper and highlighted the spectacular works of Anthony Peratt pertaining to Plasma physics related early galaxy formation mechanism [64]. Early age galaxy formation can be understood very easily in Hubble-Hawking model with relations (13) and (25). See the following Table 2 [65, 66].

In Hubble-Hawking model, from the beginning of Planck scale, considering a temperature of 3100 K, cosmic age corresponding to the formation of first hydrogen atom is around 20,500 years. From there onwards, one can expect the formation of hydrogen atoms and galaxies. This age estimation is 18.5 times lower than the age estimated (3,80,000 years) by Lambda model of cosmology. Based on the data presented in Table 2, it may be noted that, currently believed cosmic scale factors and galactic ages (blue color) can be estimated with the following relations.

$$\left(1+z\right) \cong \frac{T_t}{T_0} \quad \text{and} \quad t \cong \sqrt{\frac{T_t}{T_0}}\left(\frac{1}{H_t}\right) \cong \frac{\sqrt{1+z}}{H_t} \cong \left(\frac{1}{1+z}\right)^{3/2}\left(\frac{1}{H_0}\right)$$
$$\rightarrow \text{Hubble-Hawking model of } \left[\left(\frac{H_t}{H_0}\right) \cong \left(\frac{T_t}{T_0}\right)^2\right] \cong \text{Lambda model of } \left(1+z\right)^2 \qquad (26)$$

Table 2: Estimated Cosmic Physical Parameters in Hubble-Hawking Model of Non-Expanding Current Universe

Assumed Hubble parameter in Hubble-Hawking universe (1/sec)	Estimated Temperature in Hubble-Hawking universe (K)	Defined Red shift in Hubble-Hawking universe (From and about the Planck scale) znew	Estimated age in Hubble-Hawking universe (sec)	Estimated age in Hubble-Hawking universe (Million years)	Lambda model of cosmic age (Million years)	Estimated cosmic radius in Hubble-Hawking universe (m)	Estimated cosmic mass in Hubble-Hawking universe (kg)	Estimated cosmic expansion speed in Hubble-Hawking universe (m/sec)
9.27E+42	5.64E+30	0	1.08E-43	3.42E-57	4.91E-42	3.23E-35	2.18E-08	3.00E+08
1.85E+42	2.52E+30	0.0115282	5.42E-43	1.72E-56	1.64E-41	1.62E-34	1.09E-07	2.96E+08
3.71E+41	1.13E+30	0.0230564	2.73E-42	8.64E-56	5.49E-41	8.08E-34	5.44E-07	2.93E+08
7.42E+40	5.04E+29	0.0345846	1.37E-41	4.35E-55	1.84E-40	4.04E-33	2.72E-06	2.89E+08
1.48E+40	2.25E+29	0.0461129	6.90E-41	2.19E-54	6.14E-40	2.02E-32	1.36E-05	2.86E+08
2.97E+39	1.01E+29	0.0576411	3.47E-40	1.10E-53	2.05E-39	1.01E-31	6.80E-05	2.83E+08
5.94E+38	4.51E+28	0.0691693	1.75E-39	5.53E-53	6.87E-39	5.05E-31	3.40E-04	2.79E+08
1.19E+38	2.02E+28	0.0806975	8.78E-39	2.78E-52	2.30E-38	2.53E-30	1.70E-03	2.76E+08
2.37E+37	9.02E+27	0.0922257	4.42E-38	1.40E-51	7.68E-38	1.26E-29	8.50E-03	2.72E+08
4.75E+36	4.03E+27	0.1037539	2.22E-37	7.04E-51	2.57E-37	6.31E-29	4.25E-02	2.69E+08
9.50E+35	1.80E+27	0.1152822	1.12E-36	3.54E-50	8.58E-37	3.16E-28	2.13E-01	2.65E+08
1.90E+35	8.07E+26	0.1268104	5.62E-36	1.78E-49	2.87E-36	1.58E-27	1.06E+00	2.62E+08
3.80E+34	3.61E+26	0.1383386	2.83E-35	8.96E-49	9.60E-36	7.89E-27	5.31E+00	2.58E+08
7.60E+33	1.61E+26	0.1498668	1.42E-34	4.51E-48	3.21E-35	3.95E-26	2.66E+01	2.55E+08
1.52E+33	7.22E+25	0.161395	7.16E-34	2.27E-47	1.07E-34	1.97E-25	1.33E+02	2.51E+08
3.04E+32	3.23E+25	0.1729232	3.60E-33	1.14E-46	3.59E-34	9.86E-25	6.64E+02	2.48E+08
6.08E+31	1.44E+25	0.1844514	1.81E-32	5.74E-46	1.20E-33	4.93E-24	3.32E+03	2.44E+08
1.22E+31	6.45E+24	0.1959797	9.12E-32	2.89E-45	4.01E-33	2.47E-23	1.66E+04	2.41E+08
2.43E+30	2.89E+24	0.2075079	4.59E-31	1.45E-44	1.34E-32	1.23E-22	8.30E+04	2.38E+08
4.86E+29	1.29E+24	0.2190361	2.31E-30	7.32E-44	4.49E-32	6.17E-22	4.15E+05	2.34E+08
9.72E+28	5.77E+23	0.2305643	1.16E-29	3.68E-43	1.50E-31	3.08E-21	2.08E+06	2.31E+08
1.94E+28	2.58E+23	0.2420925	5.85E-29	1.85E-42	5.01E-31	1.54E-20	1.04E+07	2.27E+08
3.89E+27	1.15E+23	0.2536207	2.94E-28	9.33E-42	1.68E-30	7.71E-20	5.19E+07	2.24E+08
7.78E+26	5.16E+22	0.2651489	1.48E-27	4.70E-41	5.61E-30	3.85E-19	2.59E+08	2.20E+08
1.56E+26	2.31E+22	0.2766772	7.46E-27	2.36E-40	1.87E-29	1.93E-18	1.30E+09	2.17E+08
3.11E+25	1.03E+22	0.2882054	3.75E-26	1.19E-39	6.27E-29	9.63E-18	6.49E+09	2.13E+08
6.22E+24	4.62E+21	0.2997336	1.89E-25	5.99E-39	2.10E-28	4.82E-17	3.24E+10	2.10E+08
1.24E+24	2.07E+21	0.3112618	9.51E-25	3.01E-38	7.01E-28	2.41E-16	1.62E+11	2.06E+08
2.49E+23	9.24E+20	0.32279	4.79E-24	1.52E-37	2.34E-27	1.20E-15	8.11E+11	2.03E+08
4.98E+22	4.13E+20	0.3343182	2.41E-23	7.64E-37	7.84E-27	6.02E-15	4.05E+12	2.00E+08
9.96E+21	1.85E+20	0.3458465	1.21E-22	3.85E-36	2.62E-26	3.01E-14	2.03E+13	1.96E+08
1.99E+21	8.26E+19	0.3573747	6.11E-22	1.94E-35	8.76E-26	1.51E-13	1.01E+14	1.93E+08
3.98E+20	3.69E+19	0.3689029	3.08E-21	9.75E-35	2.93E-25	7.53E-13	5.07E+14	1.89E+08
7.97E+19	1.65E+19	0.3804311	1.55E-20	4.91E-34	9.79E-25	3.76E-12	2.53E+15	1.86E+08
1.59E+19	7.39E+18	0.3919593	7.81E-20	2.47E-33	3.27E-24	1.88E-11	1.27E+16	1.82E+08
3.19E+18	3.30E+18	0.4034875	3.93E-19	1.25E-32	1.10E-23	9.41E-11	6.33E+16	1.79E+08
6.37E+17	1.48E+18	0.4150157	1.98E-18	6.27E-32	3.66E-23	4.70E-10	3.17E+17	1.75E+08
1.27E+17	6.61E+17	0.426544	9.97E-18	3.16E-31	1.22E-22	2.35E-09	1.58E+18	1.72E+08
2.55E+16	2.96E+17	0.4380722	5.02E-17	1.59E-30	4.09E-22	1.18E-08	7.92E+18	1.68E+08
5.10E+15	1.32E+17	0.4496004	2.53E-16	8.02E-30	1.37E-21	5.88E-08	3.96E+19	1.65E+08
1.02E+15	5.91E+16	0.4611286	1.27E-15	4.04E-29	4.58E-21	2.94E-07	1.98E+20	1.62E+08
2.04E+14	2.64E+16	0.4726568	6.42E-15	2.03E-28	1.53E-20	1.47E-06	9.90E+20	1.58E+08

4.08E+13	1.18E+16	0.484185	3.23E-14	1.03E-27	5.12E-20	7.35E-06	4.95E+21	1.55E+08
8.16E+12	5.29E+15	0.4957133	1.63E-13	5.16E-27	1.71E-19	3.67E-05	2.47E+22	1.51E+08
1.63E+12	2.36E+15	0.5072415	8.21E-13	2.60E-26	5.72E-19	1.84E-04	1.24E+23	1.48E+08
3.26E+11	1.06E+15	0.5187697	4.14E-12	1.31E-25	1.91E-18	9.19E-04	6.19E+23	1.44E+08
6.53E+10	4.73E+14	0.5302979	2.09E-11	6.61E-25	6.40E-18	4.59E-03	3.09E+24	1.41E+08
1.31E+10	2.11E+14	0.5418261	1.05E-10	3.33E-24	2.14E-17	2.30E-02	1.55E+25	1.37E+08
2.61E+09	9.46E+13	0.5533543	5.30E-10	1.68E-23	7.15E-17	1.15E-01	7.73E+25	1.34E+08
5.22E+08	4.23E+13	0.5648825	2.67E-09	8.46E-23	2.39E-16	5.74E-01	3.87E+26	1.30E+08
1.04E+08	1.89E+13	0.5764108	1.35E-08	4.26E-22	8.00E-16	2.87E+00	1.93E+27	1.27E+08
2.09E+07	8.46E+12	0.587939	6.78E-08	2.15E-21	2.67E-15	1.44E+01	9.67E+27	1.24E+08
4.18E+06	3.78E+12	0.5994672	3.42E-07	1.08E-20	8.94E-15	7.18E+01	4.83E+28	1.20E+08
8.35E+05	1.69E+12	0.6109954	1.72E-06	5.46E-20	2.99E-14	3.59E+02	2.42E+29	1.17E+08
1.67E+05	7.57E+11	0.6225236	8.69E-06	2.75E-19	9.99E-14	1.79E+03	1.21E+30	1.13E+08
3.34E+04	3.38E+11	0.6340518	4.38E-05	1.39E-18	3.34E-13	8.97E+03	6.04E+30	1.10E+08
6.68E+03	1.51E+11	0.6455801	2.21E-04	7.00E-18	1.12E-12	4.49E+04	3.02E+31	1.06E+08
1.34E+03	6.77E+10	0.6571083	1.11E-03	3.53E-17	3.74E-12	2.24E+05	1.51E+32	1.03E+08
2.67E+02	3.03E+10	0.6686365	5.62E-03	1.78E-16	1.25E-11	1.12E+06	7.55E+32	9.93E+07
5.35E+01	1.35E+10	0.6801647	2.83E-02	8.98E-16	4.18E-11	5.61E+06	3.78E+33	9.59E+07
1.07E+01	6.05E+09	0.6916929	1.43E-01	4.53E-15	1.40E-10	2.80E+07	1.89E+34	9.24E+07
2.14E+00	2.71E+09	0.7032211	7.21E-01	2.29E-14	4.67E-10	1.40E+08	9.44E+34	8.90E+07
4.28E-01	1.21E+09	0.7147493	3.64E+00	1.15E-13	1.56E-09	7.01E+08	4.72E+35	8.55E+07
8.55E-02	5.41E+08	0.7262776	1.84E+01	5.82E-13	5.22E-09	3.50E+09	2.36E+36	8.21E+07
1.71E-02	2.42E+08	0.7378058	9.26E+01	2.93E-12	1.75E-08	1.75E+10	1.18E+37	7.86E+07
3.42E-03	1.08E+08	0.749334	4.67E+02	1.48E-11	5.84E-08	8.76E+10	5.90E+37	7.51E+07
6.84E-04	4.84E+07	0.7608622	2.36E+03	7.47E-11	1.95E-07	4.38E+11	2.95E+38	7.17E+07
1.37E-04	2.17E+07	0.7723904	1.19E+04	3.77E-10	6.53E-07	2.19E+12	1.47E+39	6.82E+07
2.74E-05	9.68E+06	0.7839186	6.01E+04	1.90E-09	2.18E-06	1.10E+13	7.37E+39	6.48E+07
5.47E-06	4.33E+06	0.7954468	3.03E+05	9.61E-09	7.30E-06	5.48E+13	3.69E+40	6.13E+07
1.09E-06	1.94E+06	0.8069751	1.53E+06	4.85E-08	2.44E-05	2.74E+14	1.84E+41	5.79E+07
2.19E-07	8.66E+05	0.8185033	7.73E+06	2.45E-07	8.16E-05	1.37E+15	9.22E+41	5.44E+07
4.38E-08	3.87E+05	0.8300315	3.90E+07	1.24E-06	2.73E-04	6.85E+15	4.61E+42	5.10E+07
8.76E-09	1.73E+05	0.8415597	1.97E+08	6.25E-06	9.12E-04	3.42E+16	2.30E+43	4.75E+07
1.75E-09	7.75E+04	0.8530879	9.95E+08	3.15E-05	3.05E-03	1.71E+17	1.15E+44	4.40E+07
3.50E-10	3.46E+04	0.8646161	5.03E+09	1.59E-04	1.02E-02	8.56E+17	5.76E+44	4.06E+07
7.01E-11	1.55E+04	0.8761444	2.54E+10	8.05E-04	3.41E-02	4.28E+18	2.88E+45	3.71E+07
1.40E-11	6.93E+03	0.8876726	1.28E+11	4.07E-03	1.14E-01	2.14E+19	1.44E+46	3.37E+07
2.80E-12	**3.10E+03**	**0.8992008**	**6.48E+11**	**2.05E-02**	**3.81E-01**	**1.07E+20**	**7.20E+46**	**3.02E+07**
5.61E-13	1.39E+03	0.910729	3.28E+12	1.04E-01	1.27E+00	5.35E+20	3.60E+47	2.68E+07
1.12E-13	6.20E+02	0.9222572	1.66E+13	5.24E-01	4.26E+00	2.67E+21	1.80E+48	2.33E+07
2.24E-14	2.77E+02	0.9337854	8.37E+13	2.65E+00	1.43E+01	1.34E+22	9.00E+48	1.99E+07
4.48E-15	1.24E+02	0.9453136	4.23E+14	1.34E+01	4.77E+01	6.68E+22	4.50E+49	1.64E+07
8.97E-16	5.54E+01	0.9568419	2.14E+15	6.77E+01	1.59E+02	3.34E+23	2.25E+50	1.29E+07
1.79E-16	2.48E+01	0.9683701	1.08E+16	3.42E+02	5.33E+02	1.67E+24	1.13E+51	9.48E+06
3.59E-17	1.11E+01	0.9798983	5.46E+16	1.73E+03	1.78E+03	8.36E+24	5.63E+51	6.03E+06
7.18E-18	4.96E+00	0.9914265	2.76E+17	8.76E+03	5.96E+03	4.18E+25	2.81E+52	2.57E+06
2.17E-18	2.73E+00	1	9.23E+17	2.92E+04	1.46E+04	1.38E+26	9.31E+52	0.00E+00

Conclusion

We would like to emphasize the point that current definition of cosmic red shift is absolutely wrong and our corrected definition can be given a chance in exploring the secrets of cosmic evolution. We appeal the science community, to replace z with $z_{new} \cong z/(1+z)$ and review the basics of standard model of cosmology for a better and correct understanding. Based on the corrected definition of cosmic red shift, Hubble's law can also be reviewed in terms of cosmic light speed rotation. In addition to that, based on Hubble-Hawking models of cosmology, cosmic curvature can be shown to be positive rather than 'flat' and following the rate of decrease in future cosmic temperature with reference to current cosmic temperature, true nature of cosmic expansion rate can be decided.

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