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An Outline Picture of a Growing and Rotating Planck Universe with Emerging Dark Foam

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Authors' contributions

This work was carried out in collaboration between both authors. Author UVSS designed the study, performed the statistical analysis, wrote the protocol, wrote the first draft of the manuscript and managed the literature searches. Author SL managed the analyses of the whole study with special focus. Both authors read and approved the final manuscript.

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ABSTRACT

With reference to Planck scale, Mach's relation, increasing support for large scale cosmic anisotropy and preferred directions and by introducing two new parameters Gamma and Beta, right from the beginning of Planck scale, we make an attempt to estimate ordinary matter density ratio, dark matter density ratio, mass, radius, temperature, age and expansion velocity (from and about the bay universe in all directions). We would like suggest that, from the beginning of Planck scale, 1) Dark matter can be considered as a kind of cosmic foam responsible for formation of galaxies. 2) Cosmic angular velocity is directly proportional to squared cosmic temperature. 3) Cosmic expansion velocity increases with decreasing total matter density ratio. 4) There is no need to consider dark energy for understanding cosmic acceleration.

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1. INTRODUCTION

According to the current notion of modern cosmology, if the known laws of physics are extrapolated to the highest density regime, the result is a singularity which is typically associated with the big bang [1,2]. Unfortunate thing is that, pre or post conditions and parameters of big bang physics are absolutely unknown. In this critical scenario, in a quantitative approach, it may not be wrong to consider a 'growing' or 'evolving' phase of 'Planck scale'. Even though massive nature is unclear - with known physical laws, Planck scale can be assigned with certain 'mass', certain 'radius', certain 'volume', certain 'density', certain 'temperature' and certain 'pressure'. Clearly speaking, Planck mass can be considered as a characteristic massive seed of the evolving universe and big bang can be replaced with an evolving Planck ball. Planck mass can be called as the 'baby universe'. Thinking in this way, by replacing big bang [3,4] with a growing Planck ball and considering 'Mach's relation' [5-9] as a deep cosmic probe, in a hypothetical approach, an evolving model of quantum cosmology can be developed [10-12]. Since Planck scale is associated with Quantum theory and 'spin' is a basic property of quantum mechanics, it may not be wrong to consider a growing and rotating model [13-35] of a Planck ball. Since nothing is known, it is absolutely not possible to simulate a big bang, but with future science, engineering and technology, it is certainly possible to simulate any 'Planck scale' physical event. Till that time, cosmic observations can be analyzed with a notion of 'growing Planck ball'. Center of the growing universe seems to depend on the location of the assumed Planck seed under consideration. In this paper, we try to establish an outline picture of an accelerating and rotating universe with an increasing ratio of Hubble parameter to angular velocity.

Important demerits of big bang notion can be understood with the following points:

1) Preconditions of big bang are absolutely unclear and unknown;
2) No quantitative description is available for the matter content associated with the big bang event;
3) Physical reasons that led to big bang are unclear and unknown;
4) Quantitative description for big bang bursting force or pressure is unclear and unknown;
5) Whether big bang followed known physical laws are not - is also unclear and unknown;
6) Quantum information associated with big bang is unclear and unknown;
7) Within a fraction of second, how, big bang allowed 'inflation' to happen? - is still a puzzling issue;
8) Applying Planck scale physics to big bang notion is a confusing issue;
9) Whether pre big bang or post big bang constitutes dark matter – is unclear and unknown;
10) Role of dark energy in big bang - is another complicated and questionable issue;

2. ASSUMPTIONS, CONCEPTS AND RELATIONS

2.1 Nomenclatures

1) $(\Omega_{OM})_t =$ Ratio of ordinary matter density to critical density.
2) $(\Omega_{DM})_t =$ Ratio of dark matter density to critical density.
3) $H_t =$ Hubble parameter and
   $H_{pl} =$ Planck scale Hubble parameter.
4) $\omega_t =$ Cosmic angular velocity and
   $\omega_{pl} =$ Planck scale angular velocity.
5) $\left(V_{\exp}\right)_t =$ Cosmic expansion velocity from and about the baby universe or baby Planck ball.
6) $\left(M_{OM}\right)_t =$ Cosmic ordinary mass content,
   $\left(M_{DM}\right)_t =$ Cosmic dark matter content.
7) $\left(M_{OM}+M_{DM}\right)_t \cong M_t =$ Total matter content = Total mass of evolving Planck ball.
8) $R_t =$ Cosmic radius associated with M_t = Radius of evolving Planck ball.
9) $T_t =$Cosmic temperature.
10) $\gamma_t \cong \left(\frac{H_t}{\omega_t}\right) \cong \left[1+\ln\left(\frac{H_{pl}}{H_t}\right)\right] \cong \sqrt{\frac{3H_t^2c^2}{8\pi G\left(aT_t^4\right)}} =$ Ratio of Hubble parameter to angular velocity.

11) $\beta_t \cong \frac{1+\sqrt{\gamma_t}}{2}$ = A new number defined to be associated with ordinary matter density ratio and dark matter density.
12) $(d_g)_t$ = Galactic distance from and about the baby universe or baby Planck ball.
13) $(v_g)_t$ = Galactic receding speed from and about the baby universe or baby Planck ball.

Note: For the above symbols, subscript 0 denotes current value and subscript pl denotes Planck scale value.

2.2 Proposed Assumptions

With respect to our earlier publications [36-40], in this paper we review the basic assumptions.

1) Planck scale and Mach's relation play a crucial role in entire cosmic evolution.
2) Ratio of Hubble parameter to angular velocity is $\gamma_t \cong \left(\frac{H_t}{\omega_t}\right) \cong \left[1+\ln\left(\frac{H_{pl}}{H_t}\right)\right] \cong \sqrt{\frac{3H_t^2c^2}{8\pi G\left(aT_t^4\right)}}$.
3) Ordinary matter and dark matter, both, play a crucial role in estimating cosmic expansion velocity.
4) Dark matter can be considered as a kind of cosmic foam responsible for formation of galaxies [41,42].

2.3 Role of the Planck Scale in Entire Cosmic Evolution

So far no mainstream cosmological model implemented Planck scale in current cosmic evolution. In this complicated situation, in a positive approach, we make an attempt to implement the 'Planck scale' in the entire cosmic evolution. With further study, our approach can be developed for a better understanding.

1) With reference to $T_0 \cong 2.722$ K and our proposed set of concepts, in this paper, we choose a magnitude of [43,44], $H_0 \cong 70\text{km/sec/Mpc} \cong 2.26853\times10^{-18}\,sec^{-1}$.
2) Based on quantum gravity, we define the Planck scale Hubble parameter, $H_{pl} \cong \sqrt{\frac{c^5}{G\hbar}} \cong 1.854921\times10^{43}$ sec^{-1}.
3) To proceed further, we define that,

$$\left(\frac{H_t}{\omega_t}\right) \cong \gamma_t \cong \left[1+\ln\left(\frac{H_{pl}}{H_t}\right)\right] \cong \sqrt{\left(\frac{3H_t^2c^2}{8\pi G\left(aT_t^4\right)}\right)} \quad (1)$$

$$\frac{3\omega_t^2c^2}{8\pi G} \cong aT_t^4 \quad \text{and} \quad \omega_t \cong \sqrt{\frac{8\pi GaT_t^4}{3c^2}} \quad (2)$$

4) Based on this relation, if defined $H_{pl} \cong 1.854921\times10^{43}\ sec^{-1}$, one can choose different values of γ in between $\gamma_{pl} \cong 1$ and $\gamma_0 \cong 141.2564$. For each assumed value of H, one can get a corresponding γ and all other physical parameters can be estimated.
5) For the Planck scale, $\sqrt{\left(\frac{3H_{pl}^2c^2}{8\pi G\left(aT_{pl}^4\right)}\right)} \cong \gamma_{pl} \cong 1$ and for the current case,

$$\left.\begin{aligned}&\sqrt{\left(\frac{3H_0^2c^2}{8\pi G\left(aT_0^4\right)}\right)} \cong \gamma_0 \cong \left[1+\ln\left(\frac{H_{pl}}{H_0}\right)\right]\\ &\cong \left(\frac{H_0}{\omega_0}\right) \cong 141.2564\end{aligned}\right\}.$$

6) In a simplified form, cosmic temperature can be expressed as,

$$\begin{aligned}T_t &\cong \frac{1}{\sqrt{\gamma_t}}\left(\frac{3H_t^2c^2}{8\pi Ga}\right)^{\frac{1}{4}} \cong \frac{1}{\sqrt{\gamma_t}}\left\{\frac{0.652632\hbar\sqrt{H_{pl}H_t}}{k_B}\right\}\\ &\cong \left\{\frac{0.652632\hbar\sqrt{\omega_{pl}\omega_t}}{k_B}\right\}\end{aligned} \quad (3)$$

7) If one is willing to define, critical temperature as $(T_c)_t \cong \left(\frac{3H_t^2c^2}{8\pi Ga}\right)^{\frac{1}{4}}$, then,

$$\sqrt{\gamma_t} \cong \frac{\text{Critical temperature}}{\text{Actual temperature}} \cong \frac{(T_c)_t}{T_t} \quad (4)$$

3. TO ESTIMATE THE COSMIC MASS, RADIUS AND EXPANSION VELOCITY

Let,

$$\begin{aligned}&(M_{OM}+M_{DM})_t \cong M_t\\ &\cong \left[(\Omega_{OM})_t + (\Omega_{DM})_t\right]\left(\frac{3H_t^2}{8\pi G}\right)\left(\frac{4\pi}{3}R_t^3\right)\end{aligned} \quad (5)$$

$$G\left(M_{OM}+M_{DM}\right)_t \cong GM_t \cong R_t c^2 \quad (6)$$

$$R_t \cong \frac{G\left(M_{OM}+M_{DM}\right)_t}{c^2} \cong \frac{GM_t}{c^2} \quad (7)$$

Based on these relations, it is possible to show that,

$$R_t \cong \frac{G\left(M_{OM}+M_{DM}\right)_t}{c^2} \cong \sqrt{\frac{2}{\left(\Omega_{OM}+\Omega_{DM}\right)_t}}\left(\frac{c}{H_t}\right) \quad (8)$$

$$\left(V_{\exp}\right)_t \cong R_t H_t \cong \sqrt{\frac{2}{\left(\Omega_{OM}+\Omega_{DM}\right)_t}}\left(c\right) \quad (9)$$

$$\left(M_{OM}+M_{DM}\right)_t \cong M_t \cong \sqrt{\frac{2}{\left(\Omega_{OM}+\Omega_{DM}\right)_t}}\left(\frac{c^3}{GH_t}\right) \cong \left(\frac{c^2\left(V_{\exp}\right)_t}{GH_t}\right) \quad (10)$$

Based on relations (6 to 10) and in terms of $\left(\Omega_{OM}\right)_t$ and $\left(\Omega_{DM}\right)_t$,

$$\left(M_{OM}\right)_t \cong \left[\frac{\left(\Omega_{OM}\right)_t}{\left(\Omega_{OM}+\Omega_{DM}\right)_t}\right]\left(\frac{c^2\left(V_{\exp}\right)_t}{GH_t}\right) \quad (11)$$

$$\left(M_{DM}\right)_t \cong \left[\frac{\left(\Omega_{DM}\right)_t}{\left(\Omega_{OM}+\Omega_{DM}\right)_t}\right]\left(\frac{c^2\left(V_{\exp}\right)_t}{GH_t}\right) \quad (12)$$

4. TREND OF ORDINARY AND DARK MATTER DENSITY RATIOS

With the help of defined $\gamma_t \cong \left(\frac{H_t}{\omega_t}\right) \cong \left[1+\ln\left(\frac{H_{pl}}{H_t}\right)\right]$, on ad-hoc basis and with reference to the current observed values of $\left(\Omega_{OM}\right)_0$ and $\left(\Omega_{DM}\right)_0$, we are making an attempt to estimate the past values of $\left(\Omega_{OM}\right)_t$ and $\left(\Omega_{DM}\right)_t$. In this context, the basic question to be answered is: Is there any scope for the existence for dark matter at Planck scale? In a positive approach, we hope that there exits ordinary matter as well dark matter at Planck scale in equal proportions. It needs further study.

Based on relation (4), starting from the Planck scale, to understand and fit the current density ratios of ordinary matter and dark matter, in a verifiable approach, we try to introduce an ad hoc coefficient β_t in such a way that,

$$\beta_t \cong \left(\frac{\sqrt{\gamma_{pl}}+\sqrt{\gamma_t}}{2}\right) \cong \left(\frac{1+\sqrt{\gamma_t}}{2}\right) \cong \text{Average of } \sqrt{\gamma_{pl}} \text{ and } \sqrt{\gamma_t} \quad (13)$$

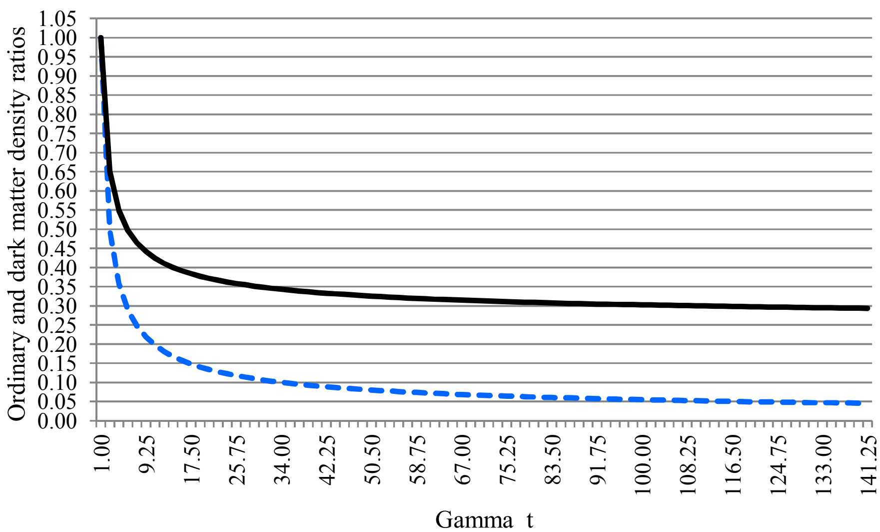

Fig. 1. Decreasing trend of ordinary and dark matter density ratios

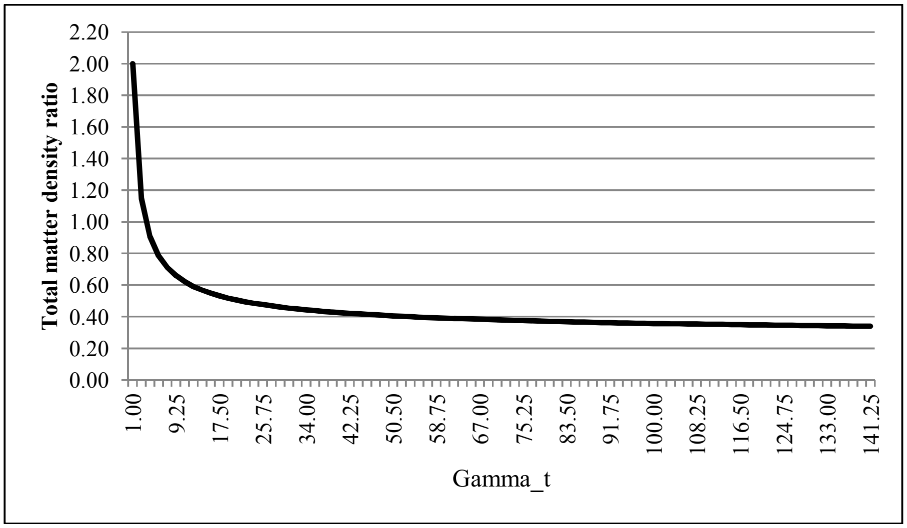

Fig. 2. Decreasing trend of total matter density ratio

Table 1. Current and Planck scale cosmic physical parameters

Current scale	Planck scale
$H_0 \cong 70\,\text{km/sec/Mpc}$ $\cong 2.26853\times10^{-18}\,sec^{-1}$	$H_{pl} \cong \sqrt{\frac{c^5}{G\hbar}} \cong 1.855\times10^{43}\ \text{sec}^{-1}$
$\gamma_0 \cong \left[1+\ln\left(\frac{H_{pl}}{H_0}\right)\right] \cong 141.2564$	$\gamma_{pl} \cong \left[1+\ln\left(\frac{H_{pl}}{H_{pl}}\right)\right] \cong 1$
$(\Omega_{OM})_0 \cong 0.04561$	$(\Omega_{OM})_{pl} \cong 1$
$(\Omega_{DM})_0 \cong 0.29384$	$(\Omega_{DM})_{pl} \cong 1$
$T_0 \cong \left(\frac{1}{\sqrt{\gamma_0}}\right)\left(\frac{3H_0^2c^2}{8\pi Ga}\right)^{\frac{1}{4}} \cong 2.721\ \text{K}$	$T_{pl} \cong \left(\frac{1}{\sqrt{\gamma_{pl}}}\right)\left(\frac{3H_{pl}^2c^2}{8\pi Ga}\right)^{\frac{1}{4}}$ $\cong 9.247\times10^{31}\ \text{K}$
$R_0 \cong \sqrt{\frac{2}{\left[(\Omega_{OM})_0+(\Omega_{DM})_0\right]}}\frac{c}{H_0}$ $\cong 3.207\times10^{26}\ \text{m} \cong 10.40\ \text{Gpc}$	$R_{pl} \cong \sqrt{\frac{2}{\left[(\Omega_{OM})_{pl}+(\Omega_{DM})_{pl}\right]}}\left(\frac{c}{H_{pl}}\right)$ $\cong 1.616\times10^{-35}\,\text{m}$
$\left(V_{\exp}\right)_0 \cong R_0H_0 \cong 2.42654c$	$\left(V_{\exp}\right)_{pl} \cong R_{pl}H_{pl} \cong c$
$(M_{OM})_0 \cong 5.836\times10^{52}\ \text{kg}$	$(M_{OM})_{pl} \cong 1.0882\times10^{-8}\ \text{kg}$
$(M_{DM})_0 \cong 3.752\times10^{53}\ \text{kg}$	$(M_{DM})_{pl} \cong 1.0882\times10^{-8}\ \text{kg}$
$\left[(M_{OM})_0+(M_{DM})_0\right]$ $\cong M_0 \cong 4.3352\times10^{53}\ \text{kg}$	$\left[(M_{OM})_{pl}+(M_{DM})_{pl}\right]$ $\cong M_{pl} \cong 2.176\times10^{-8}\ \text{kg}$
$t_0 \cong \frac{2R_0}{\left(\left(V_{\exp}\right)_0+\left(V_{\exp}\right)_{pl}\right)}$ $\cong 19.78\ \text{BillionYears}$	$t_{pl} \cong 0$

$$\left(\Omega_{OM}\right)_t \cong \left(\frac{1}{\gamma_t}\right)\left(\frac{1+\sqrt{\gamma_t}}{2}\right) \cong \frac{\beta_t}{\gamma_t} \quad (14)$$

$$\left(\Omega_{DM}\right)_t \cong \left(\frac{1}{\gamma_t}\right)\left(\frac{1+\sqrt{\gamma_t}}{2}\right)^2 \cong \frac{\beta_t^2}{\gamma_t} \quad (15)$$

$$\frac{\left(\Omega_{DM}\right)_t}{\left(\Omega_{OM}\right)_t} \cong \left(\frac{1+\sqrt{\gamma_t}}{2}\right) \cong \beta_t \quad (16)$$

$$\left(\Omega_{OM}+\Omega_{DM}\right)_t \cong \frac{\beta_t+\beta_t^2}{\gamma_t} \quad (17)$$

See Fig. 1 plotted with relations (14) and (15). With reference to critical density, dashed blue curve represents the trend of ordinary matter density ratio and black curve represents the trend of dark matter density ratio.

See Fig. 2 plotted with relation (17) for a drcreasing trend of total matter density ratio. Here, it is very importnt to note that, even though density ratios of ordinary matter and dark matter are assumed have a decreasing trend, their mass content can be shown to be increasing with incleasing cosmic radius and volume.

See Table 1 for various cosmic physical parameters associated with current and Planck scales.

5. COSMIC SCALE FACTOR AND RED SHIFT

With reference to the proposed relations (1) and (3) and with reference to the current definitions of cosmic redshift and scale factor, it is possible to show that,

$$\begin{aligned}\left(\frac{1}{a} \cong (z+1) \cong \frac{T_t}{T_0}\right) &\cong \sqrt{\frac{\gamma_0 H_t}{\gamma_t H_0}} \cong \sqrt{\frac{\gamma_0}{\gamma_t}}\sqrt{\frac{H_t}{H_0}} \\ &\cong \sqrt{\frac{\gamma_0}{\gamma_t}}\left\{\exp\left(\frac{\gamma_0-\gamma_t}{2}\right)\right\} \cong \sqrt{\left(\frac{\gamma_0}{\gamma_t}\right)\exp\left(\gamma_0-\gamma_t\right)}\end{aligned} \quad (18)$$

Redshift can be expressed in the following form.

$$z \cong \sqrt{\left(\frac{\gamma_0}{\gamma_t}\right)\exp\left(\gamma_0-\gamma_t\right)}-1 \quad (19)$$

We are working on interpreting this relation and it needs further study.

6. TO ESTIMATE THE CURRENT COSMIC AGE

From the beginning of cosmic evolution, based on the proposed cosmic expansion velocities, cosmic age can be approximated with the following relation.

$$t \cong \frac{\left(R_t-R_{pl}\right)}{\left[\left(\left(V_{\exp}\right)_t+\left(V_{\exp}\right)_{pl}\right)/2\right]} \quad (20)$$

where $\left[\left(\left(V_{\exp}\right)_t+\left(V_{\exp}\right)_{pl}\right)/2\right]$ can be considered as average expansion velocity. For the current case,

$$\begin{aligned}t_0 &\cong \frac{\left(R_0-R_{pl}\right)}{\left[\left(\left(V_{\exp}\right)_0+\left(V_{\exp}\right)_{pl}\right)/2\right]} \\ &\cong \frac{2R_0}{\left(\left(V_{\exp}\right)_0+\left(V_{\exp}\right)_{pl}\right)} \cong 19.78 \text{ Billion Years}\end{aligned} \quad (21)$$

For a temperature of 3000 K, it is possible to show that,

$$\left.\begin{aligned}&H_{3000K} \cong 2.49\times10^{-12}\ \text{sec}^{-1} \\ &\gamma_{3000K} \cong 1+\ln\left(\frac{H_{pl}}{H_{3000K}}\right) \cong 127.34774 \\ &Z_{3000K} \cong \sqrt{\gamma_{3000K}}-1 \cong 10.285 \\ &z_{3000K} \cong \sqrt{\frac{\gamma_0}{\gamma_{3000K}}\exp\left(\gamma_0-\gamma_{3000K}\right)}-1 \cong 1102.407\end{aligned}\right\} \quad (22)$$

Cosmic age corresponding to a temperature of T=3000K can be estimated to be,

$$t_{3000K} \cong \frac{\left(R_{3000K}-R_{pl}\right)}{\left[\left(\left(V_{\exp}\right)_{3000K}+\left(V_{\exp}\right)_{pl}\right)/2\right]} \cong 17987.07 \text{ Years} \quad (23)$$

This estimation is 21.13 times less than the current estimations and needs further study.

7. VELOCITY AND DISTANCE RELATION

In all directions, from and about the hypothetical baby Planck ball, current galactic receding speeds can be approximated with,

$$\left.\begin{array}{l}\left(v_g\right)_0 \cong \left(\dfrac{\left(d_g\right)_0}{R_0}\right)\left(V_{\exp}\right)_0 \\ \cong \left(\dfrac{\left(V_{\exp}\right)_0}{R_0}\right)\left(d_g\right)_0 \cong H_0\left(d_g\right)_0\end{array}\right\} \quad (24)$$

When $\left(d_g\right)_0 \to R_0$, $\left(v_g\right)_0 \cong H_0 R_0$. This can be compared with currently believed Hubble's law for the current expanding universe.

8. COSMIC ACCELERATION AND EXPANSION VELOCITY

We would like to suggest that, by considering a decreasing trend of ordinary matter and dark matter density, starting from the Planck scale, it is possible to get an expression for cosmic expansion velocity comparable to speed of light. It can be expressed as follows.

$$\frac{\left(V_{\exp}\right)_t}{c} \cong \sqrt{\frac{2}{\left[\left(\Omega_{OM}\right)_t + \left(\Omega_{DM}\right)_t\right]}} \quad (25)$$

Based on this expression, for the Planck scale, $\left(V_{\exp}\right)_{pl} \cong c$ and for the current scale, $\left(V_{\exp}\right)_0 \cong 2.427c$. Interesting point to be noted is that, after 20 billion years of cosmic expansion, increment in expansion velocity seems to be only $\left[\left(V_{\exp}\right)_0 - \left(V_{\exp}\right)_{pl}\right] \cong 1.427c$. See Fig. 3.

From Fig. 3, it is very clear that, right from the beginning of cosmic evolution, cosmic expansion velocity seems have an increasing trend. Interesting point to be noted is that, expansion velocity seems to depend on $\sqrt{\dfrac{2}{\left[\left(\Omega_{OM}\right)_t + \left(\Omega_{DM}\right)_t\right]}}$.

In near future, if decrease in $\left[\left(\Omega_{OM}\right)_t + \left(\Omega_{DM}\right)_t\right]$ is found to be significant, one can expect 'acceleration' and if decrease in $\left[\left(\Omega_{OM}\right)_t + \left(\Omega_{DM}\right)_t\right]$ is found to be insignificant, one can expect cosmic 'constant rate of expansion'. It is for further study.

9. COSMIC ANGULAR VELOCITY

With reference to our assumptions and relations, current angular velocity seems to be $\omega_0 \cong 1.606 \times 10^{-20}$ rad/sec $\cong 5.068 \times 10^{-13}$ rad/year. This can be compared with other modern studies [13-35]. The first experimental evidence of the Universe rotation was done by Birch [19], evidently. According to Birch, there appears to be strong evidence that the Universe is anisotropic on a large scale, producing position angle offsets in the polarization and brightness distributions of radio sources. These can probably be explained on the basis of a rotation of the Universe with an angular velocity of approximately 10^{-13} rad/year. Center of the universe seems to depend on the

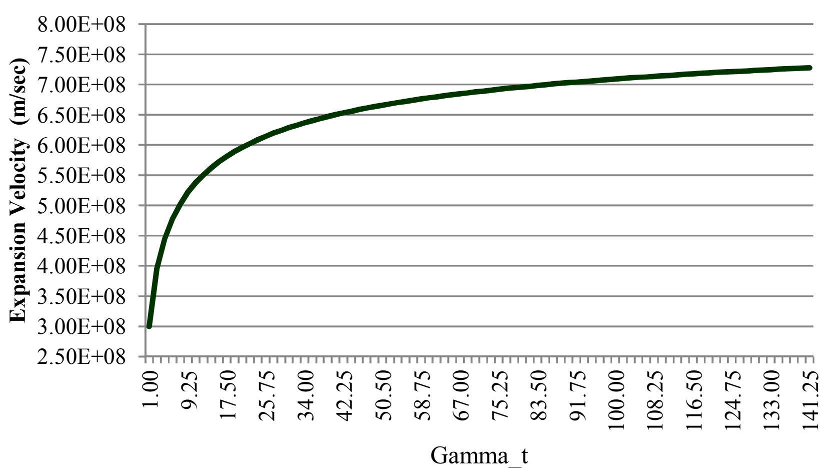

Fig. 3. Increasing trend of cosmic expansion velocity

early location of the assumed Planck mass under consideration. Observational effects of current cosmic rotation can be understood with the works of Obukhov [25], Godlowski [29,31], Longo [32]. Now a days L.M. Chechin [34,35] is seriously working on cosmic rotation.

10. DISCUSSION AND CONCLUSION

1. Mach's principle [45] is one of the iconic principles underlying general theory of relativity and can be given a priority in developing a workable or unified model of cosmology. We would like to suggest that, by considering the relation, $\left(GM_t \cong R_t c^2\right)$, currently believed 'horizon' problem can be reviewed and resolved.
2. Cosmic expansion, Lambda term, dark matter, cosmic temperature, inflation, cosmic acceleration and dark energy and vacuum energy are different concepts, by using which alternative models of GTR are emerging and are being extended in many ways. In this sequence, quantum cosmology can also be given some consideration.
3. Quantum cosmology is a wide range physical model intended for understanding the in-built cosmological quantum phenomena on small scale as well as large scale distances. So far, progress in this direction is very nominal and 'GTR' needs a serious review with reference to 'quantum cosmology'.
4. When universe is able to give birth to atoms, elementary parrticles and photons that show quantrum behaviour, universe can certainly be considered as a quantum gravitational object for ever.
5. What to quantize? How to quantize? When to quantize? and What to measure? are some interesting questions in current quantum cosmology and need a special focus. In this context, cosmic temperature can be considered as a characteristic feature of quantum cosmology.
6. With reference to particle physics, current technological limits on particle colliding energy, unidentified/unseen particles, unknown particle interactions and incomplete final unification scheme - to some extent, one can hopefully believe in the existence of dark matter [46].
7. Basically,'dark energy' was proposed for understanding cosmic acceleration. Careful analysis of improved supernovae data suggets that universe is coasting at constant veleocity and evidence for acceleration is only marginal [47-49]. In this context, now a days, a great debate has been initiated among mainstream cosmologists on the existence of dark energy [50-53]. According to a recent study [54], the nature of dark energy is 'dynamic' and conceptually seems to deviate from the famous cosmological constant or vaccum energy. According to another new study [55], evidence for dynamical dark energy is very poor.
8. Density perturbations [53] and interaction between dark mtter and baryons [52] seem to play a crucial role in understanding observed cosmic acceleration and need of introducing dark energy seems to be ad-hoc.
9. Even though redshift is an index of cosmic expansion, without knowing the actual galactic distances and actual galactic receding speeds, with 100% confidence level, it may not be possible to decide the absolute nature of cosmic expansion rate.
10. If the Universe is the same in all directions, as the big bang models require, the hot spots and cold spots of Cosmic microwave back ground ratiation (CMBR) in the afterglow of the big bang should be randomly splattered about the sky - the big temperature splotches and the small temperature goose pimples should have no preferred direction. The fact that they are aligned along the axis of evil leads Kate Land and Joao Magueijo [56] to suggest that, may be the assumptions behind the big bang models are wrong. In other words, the Universe is not the same in all places or directions, but has a special direction.
11. Considering a sample of 355 optically polarized quasars with accurate linear polarization measurements, Hutsem´ekers et al [57, 58], demonstrated that quasar polarization angles are definitely not randomly oriented over the sky. Polarization vectors appear coherently oriented over very large spatial scales, in regions located at both low and high redshifts and characterized by different preferred directions. These characteristics make the alignment effect difficult to explain in terms of local mechanisms, namely a contamination by interstellar polarization in our Galaxy.

12. According to Shamik Ghosh et al [59] -The tantalizing possibility that the cosmological principle may be violated is indicated by many observations. The most prominent of these effects is the so-called Virgo alignment, which refers to a wide range of phenomena indicating a preferred direction pointing towards Virgo. The Square Kilometer Array has the capability to convincingly test several of these effects. These include the dipole anisotropy in radio polarization angles [60], the dipole in the number counts and sky brightness [61-65] and in the polarized number counts and polarized flux [66]. These observations may indicate that we need to go beyond the standard Big Bang cosmology. Alternatively they may be explained by preinflationary anisotropic and/or inhomogeneous modes [67, 68]. In either case, confirmation of this alignment effect is likely to revolutionize cosmology.
13. According to Wen Zhao and Larissa Santos [69] - The foundation of modern cosmology relies on the so-called cosmological principle which states a homogeneous and isotropic distribution of matter in the universe on large scales. However, recent observations, such as the temperature anisotropy of the cosmic microwave background (CMB) radiation, the motion of galaxies in the universe, the polarization of quasars and the acceleration of the cosmic expansion, indicate preferred directions in the sky. If these directions have a cosmological origin, the cosmological principle would be violated, and modern cosmology should be reconsidered.
14. Nature loves symmetry. Subject of cosmic 'rotation' is not new and not against to General theory of relativity [23-27]. Quantum mechanics point of view, 'spin' is a basic and characteristic property. Quantum gravity point of view, it is reasonable to review the currently believed 'standard cosmology' with reference to cosmic rotation. In this context, in literature one can find interesting articles on cosmic rotation and angular velocity [13-35].
15. Even though it is ad hoc, proposed coefficient β_t seems to have an attractive feature of connecting the density ratios of ordinary matter and dark matter throught the cosmic evolution. With further study, such kind of other coefficients can also be developed with possible physics.
16. Interesting point to be noted is that, without considering the currently belived dark energy, cosmic expnasion velocity can be shown to be increasing with a drcreasing total matter density ratio. To some extent, this can be compared with currently believed cosmic acceleration concept [70,71,72].
17. Considering the updated supernovae redshift data, in 2016, cosmologists noticed that, universe is coasting at constant speed rather than acceleration. In this way, now a days, a great debate is going on among various groups of cosmologists on 'cosmic acceleration' [73-76]. Another group of cosmologists are developing models with speed of light [77-79]. In this context, we would like suggest that, observationally, by finding the trend of total matter density ratio, actual expansion speed can be figured out.
18. Strange point is that with our model, without considering 'inflation' concepts [80-83], starting from the Planck scale, it is possible to have a current cosmic radius of 10.4 Gpc and to some extent, it is consistent with current observations of 14.25 Gpc [84,85].
19. Our estimated cosmic age corresponding to 2.7 K is around 20 billion years whereas big bang model estimation is 13.8 billion years. At lower time scales, our estimated cosmic age corresponding to 3000 K is around 18,000 years whereas big bang model estimation is 3,80,000 years. Point to be discussed in depth is, with big bang and inflation, after 3,80,000 years of evolution, cosmic temperature is 3000 K where as in our model, without big bang and inflation, after 18000 years of cosmic evolution, temperature is 3000K. From this, it is very clear to say that, compared to big bang and inflation, in our model temperature drop is faster in the beginning and slower in the later stages. Even though universe is acceleratiing, at present, drop in temperature seems to be very small and and this can be considered as a hint for the observed large scale 'Isotropic' nature of CMBR.
20. Considering the very nature of Dark matter, new studies suggest that, a) Dark matter can be eliminated with emerging gravity concept [41]. b) Dark matter can be considered as a Bose-Einstein condensate [42]. c) Evidence for considering dark matter as a characteristic

weakly interacting massive particle (WIMP) is getting ruled out [86]. In this critical situation, our proposal of considering dark matter as a kind of 'galactic foam' can be given some consideration.

21. Dark matter may exist or may not exsit, gravity may be emerging or may not be emerging, based on relation (17) and fugure-2, observationally believed current total matter density ratio can be fitted and can be extrapolated to past and future in a verifiable approach. With further study, mystery of 'total matter density ratio' can be explored with respect to different theoretically extended ideas of general theory of relativity.
22. The discovery of the accelerating universe in the late 1990s was a radical idea in modern cosmology. To account for the observed cosmic acceleration, cosmologists hypothesized the presence of a hidden and dominating energy reservoir of the universe and called it as 'Dark energy'. Evidence for dark energy, the new component that causes the acceleration, has since become extremely strong, owing to an impressive variety of increasingly precise measurements of the expansion history and the growth of structure in the universe. Very unfortunate thing is that, till today, no one could understand the mechanism for the observed cosmic acceleration. It is one of the central challenges of modern observational cosmology [87]. Another puzzling issue is that, even though the standard Friedmann-Lemaitre-Robertson-Walker cosmological model (FLRW) is gaining a great success in explaining most of the modern observations, till today, observationally no one could identify a probable means of carrying agent for the well believed dark energy. It casts a serious doubt on the actual physical existence of dark energy and raises a general doubt on the scope of FLRW model to cosmic acceleration. In this context, our proposed method of 'increasing cosmic expansion velocity connected with decreasing total matter density ratio' [52], i.e. relation (25) can be given some consideration in reviewing and relinquishing [88] the currently believed dark energy concept.
23. In a cosmological approach, so far no physical model is successful in understanding the mass generation and proliferation mechanism for the observed photons, leptons, neutrinos, baryons, mesons and Higgs bosons from the cosmic energy reservoir. In this context, one can see a great initiative taken by Julian Schwinger [89] and Francisco Bulnes [90].
24. Based on these points and by considering the proposed concepts, asumptions and relations, an outline picture of a workable model of quantum cosmology can be developed. With further study, concepts of big bang nucleosynthesis can be reviewed in a quantum cosmological approach. We are working in this direction and it will be published elsewhere.

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Authors have declared that no competing interests exist.

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