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Concepts and Results of a Practical Model of Quantum Cosmology

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Abstract

We have proposed new concepts and results pertaining to a very simple and practical model of quantum cosmology based on light speed expanding black hole universe having no dark matter and no dark energy. Big bang concept can be replaced with Plank scale. Cosmic temperature and expansion rate can be related with scaled Hawking's Black hole temperature formula. Starting from cosmic center to cosmic boundary, a decreasing trend of galactic acceleration can be understood with continuous light speed expansion at cosmic boundary. Issue of 'causal disconnection of galaxies at large scale distances' can be eliminated by cosmic black hole physical concepts. Dark matter concept can be eliminated with 'super gravity of galactic baryonic mass caused by weak interaction'. Cosmic inflation and dark energy concepts can be eliminated with 'light speed expansion'. To fit the estimated light travel distances and to eliminate the dark energy, cosmic red shift can be redefined as the ratio of change in photon wavelength to observed photon wavelength.

Keywords: Planck scale, Quantum cosmology, Black hole cosmology, Light speed expansion

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1. Introduction

Since 2010, we are working on publishing black hole cosmology models [1-6] and inspired by 'light speed expansion' concept that has been elevated by Eugene Terry Tatum [2], we have developed a practical model of quantum cosmology. We assure the reader that our ideas will certainly motivate young scientists and future generation in developing a real model of quantum cosmology [7].

2. Practical Quantum Cosmology

Current believed Lambda model of cosmology is an outcome of General theory of relativity and observations associated with galactic red shifts, galactic distances, galactic flat rotation speeds, galactic gravitational lensing effects, cosmic back ground radiation temperature and baryon acoustic oscillations [8-14]. Final unification point of view, it seems essential to work on developing a model of quantum cosmology (QC) that combines general theory of relativity (GTR) and quantum mechanics (QM). In the following section, we are presenting our concepts and results. It needs further study in developing a practical model of quantum cosmology.

3. New Concepts & Results

1) Planck mass, $M_{pl} \cong \sqrt{\frac{\hbar c}{G}}$ can be considered as a representation of mass of the baby universe.
2) Basic relation that connects growing black hole universe and light speed expanding universe can be expressed as, $R_t \cong \frac{2GM_t}{c^2} \cong \frac{c}{H_t}$ where (R_t, M_t, H_t) represent time dependent cosmic radius, mass and Hubble parameter respectively.
3) Based on Hawking's black hole temperature formula [1, 2], geometric mean of Planck mass and the so called current Hubble mass, $\left(\frac{c^3}{2GH_0}\right)$ seems to play a crucial role in estimating the observed cosmic microwave back ground temperature.

4) Current cosmic temperature can be expressed as, $T_0 \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_0 M_{pl}}}$ where $M_0 \cong \frac{c^3}{2GH_0}$ and $M_{pl} \cong \sqrt{\frac{\hbar c}{G}} \cong$ Mass of the baby universe.

5) In an alternative approach and without any controversy, galactic red shift can also be defined as, $z_{new} \cong \frac{\text{Change in wavelength}}{\text{Observed wavelength}} \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Observed}} \cong 1 - \frac{\lambda_{Lab}}{\lambda_{Observed}}$. Based on this new definition [3, 4], Dark energy based light travel distances can be understood with, $(z_{new})\left(\frac{c}{H_0}\right) \cong \left(\frac{z}{z+1}\right)\left(\frac{c}{H_0}\right)$ where $z \cong \frac{\lambda_{Observed} - \lambda_{Lab}}{\lambda_{Lab}}$. Thus, it is possible to conclude that, in reality there exists no dark energy.

6) As time is passing, to sustain continuous light speed expansion, galaxies maintain higher acceleration near to cosmic center and lower acceleration near to cosmic boundary. Clearly speaking, being higher in magnitude near to cosmic center, galactic acceleration, gradually disappears at cosmic boundary. In a mathematical form, for the current case, it can be expressed as, $(a_r)_0 = \left[c - (v_r)_0\right] H_0$ where r, (v_r) and (a_r) represent galactic distance, receding speed and acceleration from the cosmic center respectively.

7) In reality there exists no dark matter and equivalent mass of galactic dark matter can be defined as, $(M_{dark})_G \cong (M_{baryon})_G^{3/2} \Big/ \left(4\times 10^{38}\right)^{1/2}$ kg where 4×10^{38} kg (200 million solar masses) can be considered as the 'current reference mass unit' and it needs a theoretical derivation [3, 5].

8) With reference to neutral and weak bosons, it is possible to consider 200 million solar masses as a characteristic representation of current cosmic weak interaction mass unit and it can be expressed as,

$$\left(M_{\text{Ref}}\right)_0 \cong \ln\left(\frac{M_0}{M_{pl}}\right)\times\left(\frac{M_0}{M_{pl}}\right)\times\left[(2*80.4)+(2*91.2)\right]\text{GeV}/c^2 \cong 184\times10^6$$

solar masses where $M_0 \cong \frac{c^3}{2GH_0}$, $M_{pl} \cong \sqrt{\frac{\hbar c}{G}}$ and (80.4 GeV and 91.2 GeV) are the reset masses of charged and neutral weak bosons respectively.

9) Galactic masses less than 4×10^{38} kg will have decreasing trend of super gravity and galactic masses greater than 4×10^{38} kg will have an increasing trend of super gravity and it is proportional to $\left(M_{baryon}\right)_G^{3/2}$.

10) Total mass of galaxy can be expressed as, $M_G \cong \left(M_{baryon}\right)_G + \left(M_{dark}\right)_G$.

11) Galactic flat rotation speeds can be understood with a very simple relation of the form,

$$\frac{V_G}{c} \cong \frac{1}{4}\left[\frac{M_G}{M_0}\right]^{1/4} \cong \frac{1}{4}\left[\frac{\left[\left(M_{baryon}\right)_G + \left(M_{dark}\right)_G\right]}{M_0}\right]^{1/4}$$

where $M_0 \cong \frac{c^3}{2GH_0} \cong$ Current Hubble mass.

12) Hawking's black hole temperature formula pertaining to recombination epoch can be expressed as,

$$T_{\text{Recomb}} \cong \frac{\hbar c^3}{8\pi k_B G\sqrt{M_{\text{Recomb}} M_{pl}}} \cong \frac{\hbar\sqrt{H_{\text{Recomb}} H_{pl}}}{4\pi k_B G}.$$

13) Current baryon acoustic bubble radius can be expressed as,

$$\sqrt{\frac{T_0}{T_{\text{Recomb}}}}\left(\frac{c}{H_0}\right) \cong \frac{c}{H_{\text{Recomb}}^{1/4} H_0^{3/4}} \cong 150 \text{ Mpc}$$ where $T_{\text{Recomb}}, H_{\text{Recomb}}$ and M_{Recomb} represent recombination epoch temperature, Hubble parameter and mass respectively.

14) Cosmic age can be understood with a relation of the form, $R_t - R_{pl} \cong ct$ where $\left(R_t, R_{pl}\right)$ represent radius of any epoch at

time t and Planck scale radius respectively. For the current case, $t_0 \cong \left(\frac{R_0 - R_{pl}}{c}\right) \cong \left(\frac{R_0}{c}\right) \cong \frac{1}{H_0}$ where, $R_0 >> R_{pl}$.

15) Based on QM, one must consider 'Spin' as a basic property of quantum cosmology. Clearly speaking, cosmic rotation must be included in quantum models of cosmology. We emphasize the point that, 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 GTR 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, to some extent, point of big bang can be considered as a possible centre of cosmic evolution. If so, thinking about the universe without a center of rotation is illogical. Based on this logic, we appeal the science community to see the possibility of thinking about angular velocity, cosmic rotation and rotational axis [1, 15, 16].

16) Following the observed constrains on the magnitude of current cosmic angular velocity [17] and based on Planck scale, it is possible to define current cosmic angular velocity with a simple relation of the form, $\gamma_0 \cong \frac{H_0}{\omega_0} \cong 1 + \ln\left(\frac{M_0}{M_{pl}}\right) \cong 1 + \ln\left(\frac{H_{pl}}{H_0}\right) \cong 140.6$ where $H_{pl} \cong \frac{c^3}{2GM_{pl}} \cong \frac{1}{2}\sqrt{\frac{c^5}{\hbar G}}$. With this definition, it is possible to show that, $z + 1 = \sqrt{\exp(\gamma_0 - \gamma_t)} = \frac{T_t}{T_0}$ where $\gamma_t \cong 1 + \ln\left(\frac{M_t}{M_{pl}}\right) \cong 1 + \ln\left(\frac{H_{pl}}{H_t}\right)$.

17) Assuming cosmic angular acceleration $c(H_0/140.6) \cong c\omega_0 \cong 4.62\times10^{-12}$ rad/sec^2 as a global parameter, eliminating the factor $\frac{1}{4}$ and considering dark matter effect [5, 13], galactic flat rotation speeds can be expressed with a modified MOND like relation [18], $V_G \cong \sqrt[4]{G\left[\left(M_{baryon}\right)_G + \left(M_{dark}\right)_G\right](c\omega_0)}$. Using this relation and by knowing the galactic flat rotation speed, galactic total or effective mass and corresponding baryonic mass can be estimated [19,20].

18) Currently believed cosmic time scale up to $(1+z)=1100$, can be fitted with, $t \approx \left(\frac{1}{1+z}\right)^{3/2}\left(\frac{1}{H_0}\right) \approx \frac{\sqrt[4]{\exp(\gamma_0-\gamma_t)}}{H_t}$ where $\frac{H_t}{H_0} \cong \exp(\gamma_0-\gamma_t) \cong (1+z)^2$. See Table 1 prepared at $T_0 \cong 2.72548$ K and $H_0 \cong 2.1679\times10^{-18}$ sec^{-1}. Based on the data presented in Table 1, it needs an in-depth comparative study for $t \cong \frac{R_t - R_{pl}}{c}$ and $t \cong \frac{\sqrt[4]{\exp(\gamma_0-\gamma_t)}}{H_t}$.

19) Table 1- Accepted and fitted cosmic age

$(1+z)$	$\left(\frac{1}{1+z}\right)^{\frac{3}{2}}\left(\frac{1}{H_0}\right)$ Million Years	$\frac{\sqrt[4]{\exp(\gamma_0-\gamma_t)}}{H_t}$ Million Years	%Error $\left(\frac{b-c}{b}\right)*100$
(a)	(b)	(c)	(d)
1100	0.401	0.401	-0.001
1050	0.430	0.430	-0.001
1000	0.462	0.462	-0.001
950	0.499	0.499	-0.001
900	0.541	0.541	-0.001
850	0.590	0.590	-0.001
800	0.646	0.646	-0.001
750	0.712	0.712	-0.001
700	0.789	0.789	-0.001
650	0.882	0.882	-0.001

600	0.995	0.995	-0.001
550	1.133	1.133	-0.001
500	1.307	1.307	-0.001
450	1.531	1.531	-0.001
400	1.827	1.827	-0.001
350	2.232	2.232	-0.001
300	2.813	2.813	-0.001
250	3.698	3.698	-0.001
200	5.168	5.168	-0.001
150	7.956	7.957	-0.001
100	14.617	14.617	-0.001
50	41.343	41.343	-0.001
1	14616.951	14617.118	-0.001

4. Conclusion

Standard cosmology is strongly based on dark matter and dark energy and lagging in implementing quantum concepts. Even though it is having a history of 100 years, till today, no single experiment or observation confirmed the direct physical existence of dark matter. The hypothecated and unidentified dark energy is having no significant role or application in other branches of physics. Finding the hidden reasons of photon's light speed may help in exploring the identities of dark energy and Lambda term like strange cosmic parameters.

Quantum cosmology point of view, proposed characteristic current dark matter reference mass unit and super gravity of galactic baryonic mass can be studied with reference to weak interaction. Cosmological constant problem can be understood with $\left(\frac{H_{pl}^2}{H_t^2}\right) \cong \left(\frac{T_{pl}^4}{T_t^4}\right)$. By considering cosmic temperature, Hubble parameter can be estimated and there is no need to depend on galactic red shifts and distances. Cosmic thermal isotropy and increasing galactic distances can be studied with c, $z_{new} \cong \frac{z}{z+1}$, $\frac{d(T)}{dt}$ and $\frac{d(H)}{dt}$. Similar to Gamow's hot big bang model, cosmic time-

temperature relation can be understood with $T_t \cong \frac{0.18511\times10^{10}}{\sqrt{t}}$ K. This relation helps in understanding the early formation of matter and galaxies. With further study and future observations, a realistic model of basic quantum cosmology can be developed by 2050-2060.

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