Exploration

On Galaxy Rotation Curves & Galactic Radial Distances in Black Hole Cosmology

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Abstract

Previously the authors established that, beginning from the Stoney scale, universe is a growing and primordial black universe rotating at light speed. Cosmic light speed rotation certainly leads to galactic revolution about the cosmic black hole center. Along with the mass of galaxy, galactic cosmological revolution speed plays a vital role in understanding the galaxy rotation curve. With the MOND result, rotational speed of a star in any galaxy can be represented as $v_s \approx \sqrt[4]{GM(cH_0)}$ where M is the mass of galaxy. Considering the galactic revolving speed V_g about the center of the cosmic black hole (that rotates at light speed), we find that, for any galaxy magnitude of (cH_0) can be assumed to vary as (V_gH_0). Thus rotational speed of a star in any galaxy can be represented as $v_s \approx \sqrt[4]{GM(V_gH_0)}$. The advantage of this proposal is that the constancy of the galactic rotational curves can be understood qualitatively and galactic revolving speed and hence radial distance between galaxy and the cosmic black hole center can be estimated by knowing the galactic mass and star's rotational speed.

Key Words: Stoney mass, Black Hole cosmology, galaxy rotation curves.

1. Introduction

In this paper,we attempt to understand the constant rotational speeds of galactic stars by considering the light speed rotating cosmic black hole concepts [1-6], [7-17] and extending the MOND concept [18-23]. If the cosmic black hole is rotating at light speed then certainly galaxies will have a revolving speed proportional to their distance from the cosmic center. If one is willing to consider the current hubble constant as the the current cosmic black hole's angular velocity, then for any galaxy, the product of galaxy's revolving speed and the Hubble constant can be considered as galaxy's cosmological acceleration. With this idea and guessing the galactic revolving speed to lie in between (0.1 to 0.25) of the speed of light the currently believed empirical MOND acceleration parameter $a_0 \cong (1.2 \pm 0.3) \times 10^{-10}\ m.\sec^{-2}$ can be given a fundamental cosmological significance. With this proposal it is possible to confirm that there is no need to invoke the concept of Dark matter concept in understanding the galactic rotational curves.Advantage of this proposal is that, by knowing the galactic mass and rotational speeds of it's stars, galactic revolving speed and hence distance between galaxy and the cosmic black hole

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center can be estimated. To move further at first authors begin the paper with the following major short comings of standard cosmology [24-36].

1.1 Short comings of standard cosmology

1. So far no ground based experiment directly confirmed the Hubble's redshift based increase in photon wavelength/loss in photon energy.
2. So far no ground based experiment directly confirmed the actual galaxy receding and galaxy acceleration.
3. So far no ground based experiment directly confirmedthe existence dark energy.
4. So far no ground based experiment directly confirmed the existence of dark matter.
5. So far no ground based experiment directly confirmed Friedmann's second assumption [36]. So far nobody reached any other galaxy to make comments on how the universe looks from that galaxy.
6. So far no ground based experiment directly confirmed the role of dark energy/dark matter in the primordial nucleo-synthesis.
7. So far no ground based experiment directly confirmed the basic physically observable characteristics of dark energy.
8. So far no ground based experiment directly confirmed the basic physically observable characteristics of dark matter.
9. So far no ground based experiment directly confirmed the current magnitudes of dark matter content /dark energy content /observable cosmic matter content. Thus so far no body quantified the distance cosmic back ground.
10. So far no ground based experiment directly confirmed the applications of current magnitudes of dark matter/dark energy/observable cosmic matter in current microscopic physics.
11. So far nobody is sure about the detection of dark energy and dark matter with the known experimental techniques.
12. So far nobody explained the real picture of big bang.
13. So far nobody considered the point of big bang as a characteristic reference point of cosmic expansion in all directions.
14. So far no theoretical/experimental proof is available for cosmic non-rotation.
15. So far no theoretical/experimental proof is available for cosmic or celestial bodies super luminal rotational speeds.
16. So far nobody considered the rate of increase in Hubble length as an index of true cosmic rate of expansion.
17. So far no cosmic parameter has been obtained from the microscopic physics theoretically.
18. So far no theoretical model proposed and highlighted the minimum and maximum mass limits of a black hole.
19. So far many MOND like interesting dark matter alternative concepts are available for understanding the galaxy rotation curves.
20. So far no theoretical model or no experimental result disproved the model of black hole cosmology. (When Hubble Friedmann cosmology was taking its full shape, black hole physics was in its beginning stage).

2. Basics of black hole cosmology

Based on the above facts, authors proposed a theoretical model of evolving and light speed rotating black hole cosmologyin contrast to the currently believed standard cosmology. The advantages of the proposed model can be expressed as follows:

1) Unquantified big bang physical parameters can be replaced with the quantified Planck scale/Stoney scale and can be easily be implemented.
2) Based on the Mach's principle distance cosmic background [37,38] can be quantified in terms of cosmic size, volume and mass.
3) Based on the quantification of distance cosmic back ground, observed current thermal energy density and matter density can be fitted and the corresponding past/future data can be extrapolated.
4) Observed galactic redshift can be re-interpreted as an index of cosmological thermo-dynamic atomic light emission mechanism. With reference to the decreasing CMBR temperature and considering the current and future photon energy emitted from ground based laboratory hydrogen atom - the actual or true cosmic rate of expansion can be understood experimentally.
5) Based on the quantification of distance cosmic back ground, cosmology and microscopic physics can be studied in a unified manner and the true current cosmic rate of expansion can be understood.
6) Along with the mass of galaxy, current mass of the black hole universe play a vital role in understanding the galaxy rotation curve.

Previously the authors established that:

1) Beginning from the Stoney scale universe is a growing and light speed rotating primordial black universe.
2) At any time Hubble length can be considered as the gravitational or electromagnetic interaction range.
3) CBR temperature can be considered as the cosmic black holes thermal radiation temperature.
4) With reference to zero rate of change in the 'current CMBR temperature' (from Cobe/Planck satellite data) [39-41] and zero rate of change in the 'current Hubble's constant' (from Cobe/Planck satellite data) it can be suggested that, current cosmic expansion is almost all saturated and at present there is no significant cosmic acceleration. Clearly, Stoney scale cosmic black hole's growth rate is equal to the speed of light and current cosmic black hole is growing at 14.66 km/sec in a decelerating trend. It can also be possible to suggest that currently believed 'dark energy' is a pure, 'mathematical concept' and there exists no physical base behind its confirmation. To understand the ground reality of current cosmic rate of expansion, sensitivity and accuracy of current methods of estimating the magnitude of Hubble constant must be improved and alternative methods must be developed.
5) As cosmic time passes, decreasing cosmic black hole temperature makes hydrogen atom to emit increased quanta of energy.

2.1 Understanding cosmic redshift in black hole cosmology

During cosmic evolution, at any time the past , in hydrogen atom emitted photon energy was always inversely proportional to the cosmic temperature. Thus past light emitted from older galaxy's hydrogen atom will show redshift with reference to the current laboratory data. There will be no change in the energy of the emitted photon during its journey from the distant galaxy to the observer. Aged super novae dimming may be due to the effect of high cosmic back ground temperature. In the past , cosmic black hole temperature was very high and hence bond between proton and electron in hydrogen atom was weak resulting in less excitation energy to break the bond resulting in less photon energy. As cosmic black hole temperature is decreasing, bond between proton and electron increase and demands more excitation energy to break the bond resulting in increase in emitted photon energy. This concept can be applied to ground based laboratory hydrogen atom also. In future, with reference to current laboratory hydrogen atom, decreasing current black hole temperature and measured rate of increase in emitted photon energy - true rate of (current and future) cosmic expansion can be understood.

$$\frac{E_t}{E_0} \cong \frac{\lambda_0}{\lambda_t} \cong \frac{T_0}{T_t} \tag{1}$$

Here, E_t is the energy of emitted photon from the galactic hydrogen atom and E_0 is the corresponding energy in the laboratory. λ_t is the wave length of emitted and received photon from the galactic hydrogen atom and λ_0 is the corresponding wave length in the laboratory. T_t is the cosmic temperature at the time when the photon was emitted and is T_0 the current cosmic temperature. If one is willing to consider this proposal, in hydrogen atom emitted photon energy can be understood as follows. As the cosmic time increases cosmic angular velocity and hence cosmic temperature both decrease. As a result, during cosmic evolution, in hydrogen atom, binding energy increases in between proton and electron. As cosmic temperature decreases, it requires more excitation energy to break the bond between electron and the proton. In this way, during cosmic evolution, whenever it is excited, hydrogen atom emits photons with increased quantum of energy. Thus past light quanta emitted from old galaxy's excited hydrogen atom will have less energy and show a red shift with reference to the current laboratory magnitude. During journey light quanta will not lose energy and there will be no change in light wavelength. Galactic photon energy in hydrogen atom when it was emitted can be estimated as follows.

$$\left.\begin{aligned} E_t &\cong \frac{hc}{\lambda_t} \cong \left(\frac{T_0}{T_t}\right)\left(\frac{hc}{\lambda_0}\right) \cong \left(\frac{T_0}{T_t}\right) E_0 \\ z_0 &\cong \frac{\lambda_t - \lambda_0}{\lambda_0} \cong \frac{E_0 - E_t}{E_t} \cong \frac{T_t - T_0}{T_0} \end{aligned}\right\} \tag{2}$$

z_0 can be called as the current red shift. In literature many definitions are available for the cosmic redshift. From laboratory point of view, above concept can be understood in the following way. After some time in future,

$$z_f \cong \frac{E_f - E_0}{E_0} \cong \frac{E_f}{E_0} - 1 \tag{3}$$

Here, E_f is the energy of photon emitted from laboratory hydrogen atom after some time in future.

E_0 is the energy of current photon emitted from laboratory hydrogen atom. z_f is the redshift of laboratory hydrogen atom after some time in future. From now onwards, as time passes, in future - $\left[d(z_f)/dt\right]$ can be considered as an index of the absolute rate of cosmic expansion. As cosmic time passes, within the scope of experimental accuracy of laboratory hydrogen atom's redshift, if magnitude of $\left[d(z_f)/dt\right]$ is gradually increasing, it is an indication of cosmic acceleration. If magnitude of $\left[d(z_f)/dt\right]$ is practically constant, it is an indication of uniform rate of cosmic expansion. If magnitude of $\left[d(z_f)/dt\right]$ is gradually decreasing, it is an indication of cosmic deceleration. If magnitude of $\left[d(z_f)/dt\right]$ is zero, it is an indication of cosmic halt. In support of this idea, rate of decrease in 'current Hubble's constant' and rate of decrease in 'current CMBR temperature' can be considered as a true measure of current cosmic 'rate of expansion'.

The same concept can be applied to protons and neutrons and it is possible to suggest that, nuclear binding energy increases with decreasing cosmic black hole temperature and decreases with increasing cosmic temperature resulting in nuclear instability causing free protons and neutrons at the beginning.

2.2 To quantify the physical parameters of the current and Stoney scale black hole universe

At any time, H_t being the angular velocity, relation between cosmic black hole's radius R_t and mass of the cosmic black hole M_t can be expressed as follows.

$$R_t \cong \frac{2GM_t}{c^2} \cong \frac{c}{H_t} \Rightarrow M_t \cong \frac{c^3}{2GH_t} \tag{4}$$

If current magnitude of the hubble constant [39-42] is $H_0 \cong 70$ km/sec/Mpc,

$$R_0 \cong \frac{c}{H_0} \cong 1.32\times10^{26} \text{ m} \cong \frac{2GM_0}{c^2} \tag{5}$$

$$M_0 \cong \frac{c^3}{2GH_0} \cong 9\times10^{52} \text{ kg} \tag{6}$$

To quantify the physical parameters of the Stoney scale black hole universe it is assumed that, Stoney mass play a vital role in past , current and future cosmology [43].

$$\text{Let, } M_S \cong \sqrt{\frac{e^2}{4\pi\varepsilon_0 G}} \cong 1.86\times10^{-9} \text{ Kg} \cong \frac{c^3}{2GH_S} \tag{7}$$

where H_S is the Stoney scale Hubble constant.

$$H_S \cong \frac{c^3}{2GM_S} \cong 1.086\times10^{44} \text{ rad/sec} \tag{8}$$

2.3 Cosmic thermal energy density and matter energy density

It may be noted that connecting CMBR energy density with Hubble's constant is really a very big task and mostly preferred in cosmology. At any given cosmic time, thermal energy density can be expressed with the following semi empirical relation.

$$aT_t^4 \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2}\left(\frac{3H_t^2c^2}{8\pi G}\right) \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2}\left(\frac{3H_t^2c^2}{8\pi G}\right) \tag{9}$$

$$T_t \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-\frac{1}{2}}\left(\frac{3H_t^2c^2}{8\pi Ga}\right)^{\frac{1}{4}} \tag{10}$$

At present, if H_0 is close to 71 km/sec/Mpc, obtained CMBR temperature is 2.723 K [44,45,46].This is a remarkable discovery and an accurate fit.

$$aT_0^4 \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\left(\frac{3H_0^2c^2}{8\pi G}\right) \cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2}\left(\frac{3H_0^2c^2}{8\pi G}\right) \tag{11}$$

$$T_0 \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-\frac{1}{2}}\left(\frac{3H_0^2c^2}{8\pi Ga}\right)^{\frac{1}{4}} \tag{12}$$

With reference to the current cosmic temperature, at any time in the past,

$$\frac{T_t}{T_0} \cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]\ H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]\ H_0}\right\}^{\frac{1}{2}} \tag{13}$$

Based on this relation, if $H_0 \cong 2.035\times10^{-18}$ rad/sec and $H_t \cong 2.52\times10^{-12}$ rad/sec, obtained cosmic temperature, cosmic redshift and cosmic age are 2999 K,1099 are 27514 years respectively. Obtained redshift and temperature are in agreement with the estimates of standard model of cosmology but differing in the estimates of cosmic age.

Mostly at the ending stage of expansion, rate of change in H_t will be practically zero and can be considered as practically constant. Thus at its ending stage of expansion, for the whole cosmic black hole as H_t practically remains constant, its corresponding thermal energy density will be 'the same' throughout its volume. This 'sameness' may be the reason for the observed 'isotropic' nature of the current CMB radiation.

It can be suggested that, at the beginning of cosmic evolution, at the Stoney scale,

$$aT_S^4 \cong \left(\frac{3H_S^2c^2}{8\pi G}\right) \tag{14}$$

Matter-energy density can be considered as the geometric mean density of volume energy density and the thermal energy density and it can be expressed with the following semi empirical relation.

$$\begin{aligned}(\rho_m)_t c^2 &\cong \sqrt{\left(\frac{3H_t^2c^2}{8\pi G}\right)\left(aT_t^4\right)} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-1} \left(\frac{3H_t^2c^2}{8\pi G}\right) \\ &\cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-1} \left(\frac{3H_0^2c^2}{8\pi G}\right)\end{aligned} \tag{15}$$

Here one important observation to be noted is that, at any time

$$\frac{8\pi G(\rho_m)_t}{3H_t^2} \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-1} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-1} \cong (\Omega_m)_t \tag{16}$$

Thus at present,

$$\begin{aligned}(\rho_m)_0 &\cong \frac{1}{c^2}\sqrt{\left(\frac{3H_0^2c^2}{8\pi G}\right)\left(aT_0^4\right)} \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-1} \left(\frac{3H_0^2}{8\pi G}\right) \\ &\cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-1} \left(\frac{3H_0^2}{8\pi G}\right) \cong 6.6\times 10^{-32}\,\text{gram}/\text{cm}^3\end{aligned} \tag{17}$$

Based on the average mass-to-light ratio for any galaxy present matter density can be expressed with the following relation [38].

$$(\rho_m)_0 \cong 1.5\times 10^{-32}\eta h_0 \;\; \text{gram/cm}^3 \tag{18}$$

Here $\eta \cong \left\langle \frac{M}{L} \right\rangle_{\text{galaxy}} \Big/ \left\langle \frac{M}{L} \right\rangle_{\text{sun}}$, $h_0 \cong H_0/100$ Km/sec/Mpc $\cong 0.71$ Note that elliptical galaxies probably comprise about 60% of the galaxies in the universe and spiral galaxies thought to make up about 20% percent of the galaxies in the universe. Almost 80% of the galaxies are in the form of elliptical and spiral galaxies. For spiral galaxies, $\eta h_0^{-1} \cong 9 \pm 1$ and for elliptical galaxies, $\eta h_0^{-1} \cong 10 \pm 2$. For our galaxy inner part, $\eta h_0^{-1} \cong 6 \pm 2$. Thus the average ηh_0^{-1} is very close to 8 to 9 and its corresponding matter density is close to (6.0 to 6.7) $\times$ 10^{-32} gram/cm^3 and can be compared with the above proposed magnitude of 6.6×10^{-32} gram/cm^3.

2.4 Cosmic growth rate and age of the growing cosmic black hole

At any given time, ratio of volume energy density and thermal energy density can be called as the cosmic growth index and can be expressed as follows.

$$\frac{3H_t^2c^2}{8\pi GaT_t^4} \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^2 \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^2 \cong \text{Cosmic Growth index} \tag{19}$$

Thus at the Stoney scale,

$$\frac{3H_S^2c^2}{8\pi GaT_S^4} \cong \left[1+\ln\left(\frac{M_S}{M_S}\right)\right]^2 \cong \left[1+\ln\left(\frac{H_S}{H_S}\right)\right]^2 \cong 1$$

At any given time, cosmic black hole's growth rate can be expressed as $g_t \cong \left(\frac{3H_t^2c^2}{8\pi GaT_t^4}\right)^{-1} c$. With this idea and by considering the average growth rate cosmic age can be estimated.

$$g_t \cong \text{Cosmic growth rate} \cong \frac{c}{\text{cosmic growth index}} \cong \left(\frac{3H_t^2c^2}{8\pi GaT_t^4}\right)^{-1} c \cong \left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2} c \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} c \tag{20}$$

At the Stoney scale,

$$g_S \cong \left(\frac{3H_S^2c^2}{8\pi GaT_S^4}\right)^{-1} c \cong \left[1+\ln\left(\frac{M_S}{M_S}\right)\right]^{-2} c \cong \left[1+\ln\left(\frac{H_S}{H_S}\right)\right]^{-2} c \cong c \tag{21}$$

At present,

$$g_0 \cong \left(\frac{8\pi GaT_0^4}{3H_0^2c^2}\right) c \cong \left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2} c \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2} c \approx 14.66 \text{ km/sec} \tag{22}$$

Clearly, at present, Hubble volume is growing at 14.66 km/sec in a decelerating trend. With reference to (H_S, H_0), current hubble length is growing at a rate of 14.66 km/sec. As a result, at present, within the current hubble length galaxy distance from the cosmic center increases as $\left(\frac{r_g}{R_0}\right)14.66 \cong \left(\frac{r_g H_0}{c}\right)14.66$ km/sec where $r_g \le \left(R_0 \cong \frac{c}{H_0}\right)$ and r_g is the distance between galaxy and the cosmic center and R_0 is the current hubble length. Thus $\left(\frac{r_g H_0}{c}\right)14.66$ km/sec can be called as the current receding speed of any galaxy. As the current hubble length is increasing, again the magnitude of future hubble constant decreases, and hence the growth rate of future hubble length falls down to 14.66 km/sec. In this way, theoretically the current cosmic deceleration can be understood.

Age of the growing cosmic black hole can be assumed as the time taken to grow from the assumed Stoney scale to the current scale. Starting from the Stoney scale, if the assumed growth rate is gradually decreasing, at any time average growth rate can be expressed as follows.

$$\frac{g_S+g_t}{2} \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{M_t}{M_S}\right)\right]^{-2}\right\}c \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2}\right\}c \tag{23}$$

For the current scale, average growth rate can be expressed as follows.

$$\frac{g_S+g_0}{2} \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{M_0}{M_S}\right)\right]^{-2}\right\}c \cong \frac{1}{2}\left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}c \tag{24}$$

Time taken to reach from the Stoney scale to any assumed scale can be expressed as follows.

$$\left(\frac{g_S+g_t}{2}\right)t \cong \left(R_t - R_S\right) \cong R_t \tag{25}$$

where, $R_t \gg R_S$ and $R_S \approx 0$. Hence for the current scale,

$$\left(\frac{g_S+g_0}{2}\right)t_0 \cong \left(R_0 - R_S\right) \cong R_0 \cong \frac{c}{H_0} \tag{26}$$

$$t_0 \cong \left(\frac{g_S+g_0}{2}\right)^{-1}\frac{c}{H_0} \cong \left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}^{-1}\frac{2}{H_0} \cong \text{ 27.496 Gyr.} \tag{27}$$

where $\left\{1+\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2}\right\}^{-1} \cong 0.99995$. This proposal is for further study. Based on this proposal, after one second from the Stoney scale, cosmic angular velocity is 2 rad/sec, growth rate is 29 km/sec and cosmic temperature is 3×10^{9} K. With reference to the current and past cosmic temperatures, at any time in the past, at any galaxy, for any hydrogen atom,

$$\frac{E_0}{E_t} \cong \frac{\lambda_t}{\lambda_0} \cong \frac{T_t}{T_0} \cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right] H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right] H_0}\right\}^{\frac{1}{2}} \cong \left\{\frac{\left[1+\ln\left(\frac{R_0}{R_S}\right)\right] R_0}{\left[1+\ln\left(\frac{R_t}{R_S}\right)\right] R_t}\right\}^{\frac{1}{2}} \cong \left\{\frac{(\Omega_m)_t\ H_t}{(\Omega_m)_0\ H_0}\right\}^{\frac{1}{2}} \tag{28}$$

By guessing H_t, (z_0+1) can be estimated. It seems to be a full and absolute definition for the cosmic redshift. Thus at any time in the past,

$$\left.\begin{array}{l} \left(\frac{E_0}{E_t}-1\right) \cong \left(\frac{\lambda_t}{\lambda_0}-1\right) \cong \left(\frac{T_t}{T_0}-1\right) \\ \cong \left\{\frac{\left[1+\ln\left(\frac{H_S}{H_0}\right)\right] H_t}{\left[1+\ln\left(\frac{H_S}{H_t}\right)\right] H_0}\right\}^{\frac{1}{2}} -1 \cong \left\{\frac{(\Omega_m)_t \; H_t}{(\Omega_m)_0 \; H_0}\right\}^{\frac{1}{2}} -1 \cong z_0 \end{array}\right\} \quad (29)$$

2.5 To reinterpret the Hubble's Law

Based on the assumptions of Black hole cosmology, it is possible to say that, during cosmic evolution, as the universe is growing and always rotating at alight speed , at any time, any galaxy will have revolution speed as well as receding speed simultaneously and both can be expressed in the following way.

$$\left(V_g\right)_{revolution} \cong \left(\frac{r_g}{R_t}\right) c \cong r_g H_t \text{ where } r_g \leq \left(R_t \cong \frac{c}{H_t}\right) \quad (30)$$

r_g is the distance between galaxy and the cosmic center and R_t is the cosmic radius at time t.

$$\begin{array}{l} \left(v_g\right)_{receding} \cong \left(\frac{r_g}{R_t}\right) g_t \cong \left(\frac{r_g}{R_t}\right)\left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} c \\ \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} r_g H_t \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^{-2} \left(V_g\right)_{revolution} \end{array} \quad (31)$$

$$\frac{\left(V_g\right)_{revolution}}{\left(v_g\right)_{receding}} \cong \left[1+\ln\left(\frac{H_S}{H_t}\right)\right]^2 \quad (32)$$

At present,

$$\begin{array}{l} \left(v_g\right)_{receding} \cong \left(\frac{r_g}{R_0}\right) g_0 \cong \left(\frac{r_g}{R_0}\right)\left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2} c \\ \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2} r_g H_0 \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^{-2} \left(V_g\right)_{revolution} \end{array} \quad (33)$$

$$\frac{\left(V_g\right)_{revolution}}{\left(v_g\right)_{receding}} \cong \left[1+\ln\left(\frac{H_S}{H_0}\right)\right]^2 \quad (34)$$

3. The galaxy rotation curves & the galactic distance from the cosmic center

The current dominant paradigm is that galaxies are embedded in halos of cold dark matter (CDM), made of non-baryonic weakly-interacting massive particles. However, an alternative way to explain the observed rotation curves of galaxies is the postulate of that for gravitational accelerations below a certain value $a_0 \cong (1.2 \pm 0.3) \times 10^{-10}\ m.\sec^{-2}$, the true gravitational attraction g approaches $\sqrt{g_N g}$ where g_N is the usual Newtonian gravitational field (as calculated from the observed distribution of visible matter): this paradigm is known as modified Newtonian dynamics (MOND). MOND explains [18-23] successfully many phenomena in galaxies, among which the following non-exhaustive list:

(1) it predicted the shape of rotation curves of low surface-brightness (LSB) galaxies before any of them had ever been measured;
(2) tidal dwarf galaxies (TDG), which should be devoid of collisionless dark matter, still exhibit a mass-discrepancy in Newtonian dynamics, which is perfectly explained by MOND;
(3) the baryonic Tully-Fisher relation, one of the tightest observed relations in astrophysics, is a natural consequence of MOND, both for its slope and its zero-point;
(4) the first realistic simulations of galaxy merging in MOND were recently carried out, notably reproducing the morphology of the Antennae galaxies; and
(5) it naturally explains the universality of “dark” and baryonic surface densities within one core radius in galaxies.

So far in MOND model , the origin of acceleration constant $a_0 \cong (1.2 \pm 0.3) \times 10^{-10}\ m.\sec^{-2}$ is purely empirical and is unknown from first principles.By fitting the rotation curves its magnitude isbeing determined empirically.The fundamental question to be answered is: Does MOND reflect the influence of cosmology on local particle dynamics at low accelerations? The coincidence between a_0 and (cH_0) would suggest a connection.To understand the issue here authors assume that:

1) The acceleration constant a_0 is not a constant but a variable and depends on the galactic revolving speed about the center of the cosmic light speed rotating black hole universe.
2) Its magnitude can be assumed to be proportional to the current hubble constant and can be called as the cosmological galactic acceleration.In a simplified form it can be expressed as

$$a_g \cong \left(V_g/c\right)(cH_0) \cong (V_g H_0) \tag{35}$$

With reference to the MOND results,empirically rotational speed of a star is being represented as

$$v_s \cong \sqrt[4]{GMa_0} \tag{36}$$

where $a_0 \cong (1.2 \pm 0.3) \times 10^{-10}\ m.\sec^{-2} \approx (cH_0/6) \approx (cH_0/2\pi)$, M is the mass of galaxy. In the light speed rotating black hole universe, by considering the galactic revolving speed V_g about the center of the cosmic black hole, magnitude of (cH_0) can be assumed to vary as

$$\left(V_g / c\right)(cH_0) \cong (V_g H_0) \cong a_g \,. \tag{37}$$

Thus authors replace the empirical acceleration constant a_0 with (a variable) cosmological galactic acceleration, $a_g \cong V_g H_0$. Now rotational speed of a star in any galaxy can be represented as follows.

$$v \cong \sqrt[4]{GM(\mathrm{V}_g\ H_0)} \cong \sqrt[4]{GMr_{\mathrm{g}} H_0^2} \qquad \left(\text{since } V_g \cong r_{\mathrm{g}} H_0\right) \tag{38}$$

Here if it is assumed that, galaxies under observation possesses a cosmological revolving speed in the range 0.1 to 0.25 times the speed of light currently observed all galactic rotational speeds can be fitted well.Clearly speaking, ratio of galactic revolving speed and light speed may lie in between 0.1 to 0.25. If current $H_0 \cong 70$ km/sec/Mpc, $cH_0 \cong 6.8\times10^{-10}\, m.\sec^{-2}$ and $0.1\left(cH_0\right) \cong 0.68\times10^{-10}\, m.\sec^{-2}$ and $0.25\left(cH_0\right) \cong 1.7\times10^{-10}\, m.\sec^{-2}$. Advantage of this proposal is that, by knowing the galactic mass and rotational speeds of it's stars, galactic revolving speed and hence distance between galaxy and the cosmic black hole center can be estimated. This is for further study. It is true that this proposal is:

1) Qualitatively suitable for understanding the galactic rotation curves in the light of light speed cosmic rotation.
2) By knowing the galactic rotational speeds quantitatively suitable for estimating the galactic cosmological revolution speed and distance from the cosmic center.

4. Conclusion

The following conclusions can be drawn from the above sections:

1) In comparison to the standard cosmology, new cosmic redshift reinterpretation, numerical data fitting on current CMBR energy density, matter density suggest that the concepts of black hole cosmology may be given priority.
2) In the future, true rate of (current and future) cosmic expansion can be understood through current laboratory hydrogen atom, decreasing current black hole temperature and measured rate of increase in emitted photon energy.
3) Even though the existence of 'dark matter' was proposed in 1930, so far ground based laboratory could not detect it. Its intended purpose is being well understood by MOND concepts and light speed the concept of rotating black hole universe. Hence the dark matter concept may be relinquished forever.
4) Galactic cosmological revolving speeds and hence their distance from the cosmic black hole center can be estimated with galactic rotational curves and the current Hubble constant.

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