Recession velocity and the space-time parameters are restricted by the velocity of light

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Abstract

The results of an empiric simulation by parametric down-conversion (PDC) fitted observational evidence. This data was plotted in relationship to the radius of the universe (r_U) in Mpc multiplied by Hubble's constant (H_0): $H_0 \times \vec{r} = \vec{\mathrm{v}}$ and when $\mathrm{v} = c$, $H_0 = c/r_U = 71 \mathrm{km/s/Mpc}$, the observed reported value. Hence, expansion was characterized as subject to *c*, functioning as a relativistic causality horizon, determining at all times the value of H_0. In contraposition, it has been proposed that the universe may have expanded, to reach a radius of 4.5×10^9 light-years, within the widely accepted chronological age of 13.7×10^9 light-years. In the coordinates of the universe time versus cosmic radius, a plotting shows that the universe radius in light years corresponding to 1.3×10^{28} cm = 4213.01 Mpc, yields the observable H_0: 71 km/s/Mpc.

Introduction

A simulation by applying a wave function treatment to Planck energy limit E_{Pl} shows a stretching quantum- pace Big-Bang [1-7]. In this theoretical description the chronology of the space-time evolution, corresponds with a continuum process of wave-elongation ($\Delta\lambda$) discernible as an increment in the number of CMB-photons of decreasing energy [8-17]. This quanta-structure constitutes the matter-free vacuum.

Results

Figure 1 shows that the postulation of a universe radius of 45×10^9 light-years, correspond to value of H_0 = 232 km/s/Mpc which is not compatible with its observable value. The figure also shows that the projection of observable recession velocity as a function of space-time could be plotted as a straight line. A time-projection of value of H_0 in excess of 71 km/s/Mpc shows as an open curve and a lower one as a close curve.

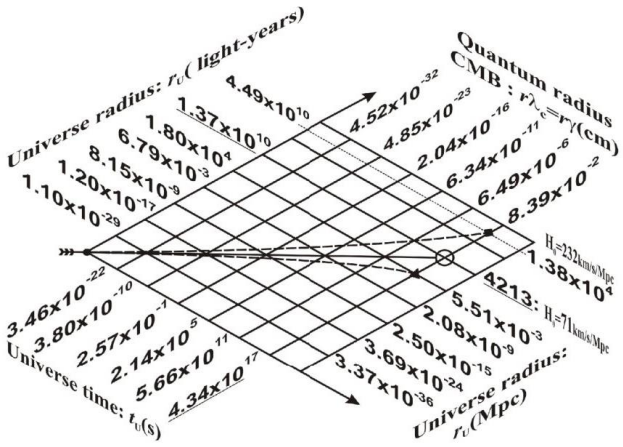

Figure 1: *The relationship between recessions of velocity vs. the coordinates of space (radius)-time. For present time 4.34×10^{17} s solving $H_0 \times \vec{r} = \vec{\mathrm{v}}$.*

■) $H_0 \times 4213\mathrm{Mpc} = \dfrac{1.38\times10^4 \mathrm{Mpc}}{4.34\times10^{17}\mathrm{s}}$ ∴

$H_0 = 7.5\times10^{-18}\dfrac{1}{\mathrm{s}}$ =233 km/s/Mpc value well in excess of observable H_0.

○) $H_0 \times 4213\mathrm{Mpc} = \dfrac{4213\mathrm{Mpc}}{4.34\times10^{17}\mathrm{s}}$ ∴

$H_0 = 2.3\times10^{-18}\dfrac{1}{\mathrm{s}}$ =71 km/s/Mpc observable.

▲) $H_0 \times 4213\mathrm{Mpc} = \dfrac{5.51\times10^{-3}\mathrm{Mpc}}{4.34\times10^{17}\mathrm{s}}$ ∴

$$H_0 = 3\times10^{-24}\frac{1}{\text{s}} = 9.3\times10^{-5}\ \text{km/s/Mpc}$$

Discussion

The Einstein-De Sitter model [2] proposed an equation in which the relationship between velocity and distance, for the present H_0 could be express as $H_0{}^2 = 8/3\times\pi\times G\times\rho_0$ where critical density $\rho_0 = 3H_0{}^2/(8\pi\times\text{G}) =$ 1.897 h^2 10^{29} g/cm^3. The formula allows a density relationship, mass/volume, constant and inversely proportional to volume, which is increasing as the cubic expression the expansion parameter.

Hence, in dependence of density determined by critical mass, the functional response of the expansion parameter could be shown by analytical geometry, shaping like either an open, flat, or close curve.

Conclusions

Figure 1 shows that the expansion parameter, $H_0 = da_{(t)}/a$ assay as the chronology of the H_0 within the space-time coordinates corresponding to the thermodynamic chronology, also shows a similar pattern. It could be concluded that the relationship between Planck's mass and the fundamental constants: $m_{Pl} = \hbar^{1/2}\times c^{1/2}\times G^{-1/2}$, allows that from Planck's energy limit to that of present CMB, shapes the cosmic thermodynamic structure. This one relates space-time parameters to c and also determines the CMB quantum radius, which settles on the shape of vacuum. Therefore, recession velocity could not be larger or smaller, because is conditioned at all times by *c*.

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