The Running Hubble Constant Once Again

Sylwester Kornowski

Abstract: The Scale-Symmetric Theory (SST) shows that the quantum entanglement fixes the speed of light in "vacuum" c in relation to its source or a last-interaction object (it can be a detector). It causes that the spatial distances to galaxies differ from the time distances (the light travel time) - it is the duality of relativity. The duality of relativity leads to the running Hubble constant. According to SST, for the nearest Universe, the time Hubble constant is 70.52. SST gives for mean time Hubble constant 64.01 - it should be the mean observed Hubble constant when we apply the General Relativity (GR) to the whole observed Universe. If we neglect some part of distant Universe then the GR/observed time Hubble constant should be defined by following interval <64.01, 70.52>. But emphasize that the real mean spatial Hubble constant calculated within SST is 45.24. It leads to the age of Universe 21.614 +- 0.096 Gyr but time distance to most distant observed Universe cannot be longer than 13.866 +- 0.096 Gyr. SST shows that evolution of galaxies accelerated about 13.1 Gyr ago - it leads to an illusion that cosmic objects are not older than 13.1 Gyr.

Motivation

According to the Scale-Symmetric Theory (SST) [1], the front of baryonic matter expands with recessional velocity $0.6415c$ [1B]. The redshift higher than $z_{front} = 0.6415$ was a result of protuberances of dark matter produced at the beginning of the expansion of the Universe but with time they were suppressed [1B] – the suppression causes that we can see galaxies with redshift higher than 1.

SST shows that mean effective observed redshift for whole universe is $z_{eff,mean} = 0.6415/2 = 0.32075$. Applying the GR cosmic calculator [2], we obtain the mean effective light travel time $T_{eff,ltt} = 3.570$ Gyr.

SST shows that the quantum entanglement fixes the speed of light in "vacuum" c in relation to its source or a last-interaction object (it can be a detector). It causes that the spatial distances to galaxies differ from the time distances (the light travel time) – it is the duality of relativity [1B]. The speed of light emitted by the nearest galaxies in relation to an observer on Earth is close to c so the time Hubble constant for the nearest Universe is

$$H_{o,T,nearest} = c / T_{Observed} \approx 70.52 \text{ km s}^{-1} \text{ Mpc}^{-1}, \quad (1)$$

where $T_{Observed} = 13.866 \pm 0.096$ Gyr [1B].

The real spatial Hubble constant $H_{o,S,real}$, which is equal to the time Hubble constant $H_{o,T,distant}$, for the observer placed in time distance $T_{Observed}$ is

$$H_{o,S,real} = H_{o,T,distant} = c\, z_{front} / T_{Observed} = c / T_{Universe} \approx 45.24 \text{ [km s}^{-1}\text{ Mpc}^{-1}], \quad (2)$$

where $T_{Universe}$ = 21.614 ± 0.096 Gyr [1B].

We can see that the running time Hubble constant decreases for the observed Universe from 70.52 for the nearest Universe down to 45.24.

Calculate the mean time Hubble constant for whole observed Universe

$$H_{o,T,mean} = H_{o,T,nearest} - T_{eff,ltt}\,(H_{o,T,nearest} - H_{o,T,distant}) / T_{Observed} \approx$$

$$\approx 64.01 \text{ [km s}^{-1}\text{ Mpc}^{-1}]. \quad (3)$$

If we neglect some part of distant Universe then the GR/observed time Hubble constant should be defined by following interval

$$H_{o,T} \equiv \langle 64.01, 70.52 \rangle. \quad (4)$$

We can compare it with the last (67.6 + 0.7 – 0.6) and earlier results [3].

But emphasize that the real mean spatial Hubble constant calculated within SST is 45.24. It leads to the age of Universe 21.614 ± 0.096 Gyr but time distance to most distant observed Universe cannot be longer than 13.866 ± 0.096 Gyr.

SST shows that evolution of galaxies accelerated about 13.1 Gyr ago – it leads to an illusion that cosmic objects are not older than 13.1 Gyr [4].

References

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