General Relativity Incorrectly Describes the Expansion of the Universe

Sylwester Kornowski

Abstract: Here, applying the Scale-Symmetric Theory (SST), we derived formula that converts the SST spatial distance to the SST light travel time that for redshift up to 0.6415 is about 14 - 17% longer than the General Relativity (GR) light travel time. It causes that the Type Ia supernovae are fainter than they should be - it leads to an illusion of acceleration of the expansion of the Universe about 6 - 7 Gyr ago. SST shows that in reality, to describe correctly the expansion of the Universe, we must take into account the initial conditions for the expansion, the mechanisms of creation of photons and the quantum entanglement of photons in pairs of them. We showed that there is a stepwise change in the light travel time for redshift about 0.64 - it suggests that there is not a smooth transition from the near Universe to distant Universe - it is inconsistent with GR. The GR formula correctly describes galaxies in the same spatial distance moving with different recessional velocities i.e. concerns the distant Universe.

1. Introduction

The Scale-Symmetric Theory (SST) is based on four stepwise phase transitions of the Higgs field and on the atom-like structure of baryons [1A], [1B]. It leads to conclusion that there are five levels of Nature.

According to SST, 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.

2. Calculations

Spatial distance to the front of baryonic matter, at the moment of emission of light we can see today on Earth, was $L_{Front,spatial} = 4.971$ Gyr [2]. According to SST, due to the quantum entanglement between emitted light and its source, the speed c of emitted light is the speed in relation to its source. Consider a photon (the first photon) emitted by the front towards Earth. Such photon can be a result of decay of a neutral pion to two photons or a result of annihilation of a fermion-antifermion pair. The velocity of such photon in relation to Earth is $+(1 - z_{front})c$. But such photon is entangled with the second photon of a pair. The second photon is moving away from Earth with velocity $-(1 - z_{front})c$. Due to the quantum entanglement between the first and second photon, we can treat the second photon as the frame of reference. It means that the frame of reference of the first photon is moving away from Earth with speed $(1 - z_{front})c$ – it means that spatial distance that must cover the first photon increases i.e. there increases the spatial distance for the first photon according to following formula (it is the SST light travel time $L_{SST,ltt}$)

$$L_{SST,ltt} = L_{Front,spatial} + L_{Front,spatial}\,(1 - z_{front}) = L_{Front,spatial}\,(2 - z_{front})\,. \tag{1}$$

This formula is valid for $0 \le z \le z_{front}$

$$L_{SST,ltt} = L_{SST,spatial}\,(2 - z)\,, \tag{2}$$

where $L_{SST,spatial} = z\,L_{Front,spatial} / z_{front}$. We can rewrite formula (2) as follows

$$L_{SST,ltt,z<0.6415} = L_{Front,spatial}\,z\,(2 - z) / z_{front}\,. \tag{3}$$

In Table 1, we collected the results for the GR light travel time $L_{GR,ltt}$ (the $L_{GR,ltt}$ we calculated applying the cosmic calculator [3] with the SST parameters: H_o = 70.52 km s^{-1} Mpc^{-1}, $\Omega_M = 0.3137$, flat Universe), for $L_{SST,ltt}$ and $L_{SST,spatial}$.

Table 1. *GR versus SST*

Z	$L_{GR,ltt}$: [3] with SST parameters [Gyr]	$L_{SST,ltt}$: formula (3) [Gyr]	$L_{SST,spatial}$ [Gyr]	Excess 3 : 2 [%]
1	2	3	4	5
0.1	**1.290**	**1.472**	**0.7749**	**+14**
0.2	**2.409**	**2.790**	**1.5498**	**+16**
0.3208	**3.570**	**4.174**	**2.4855**	**+17**
0.6415	**5.888**	**6.753**	**4.971**	**+15**
		From [3]		
0.7	**6.220**	**6.220**	**~5**	**0**
0.8	**6.735**	**6.735**	**~5**	**0**
0.9	**7.194**	**7.194**	**~5**	**0**
1	**7.603**	**7.603**	**~5**	**0**
2.70	**10.895**	**10.895**	**~5**	**0**
3.63	**11.55**	**11.55**	**~5**	**0**
7.10	**12.48**	**12.48**	**~5**	**0**
11.18	**12.81**	**12.81**	**~5**	**0**

The SST light travel time (Gyrs ago) for redshift $2.70 \le z \le 11.18$ we incorporated from [4] – there are the exact results. The GR light travel time calculated for redshift concerning the era of reionization is equal to the SST light travel time [4]. It suggests that the GR cosmic calculator describing the light travel time as a function of redshift is correct for galaxies in the same spatial distance (in SST it is ~5 Gyr) moving with different recessional velocities – emphasize that such SST interpretation of the GR formula differs from the GR interpretation.

SST shows that the GR formula we can apply for redshift higher than 0.6415. (see row 4 in Table 1).

From Table 1 (see rows 3 and 5) results that there is a stepwise change in the light travel time for redshift about 0.64 – it suggests that there is not a smooth transition from the near Universe ($z < 0.6415$) to distant Universe ($z > 0.6415$) – it is inconsistent with GR.

3. Summary

Here, applying the Scale-Symmetric Theory, we showed that the real light travel time for redshift up to 0.6415 is about 14 – 17% longer than it follows from GR. It causes that the Type Ia supernovae are fainter than they should be. The comparison of the SST and GR data show that GR incorrectly suggests that an acceleration of the expansion of the Universe took place about 6 – 7 Gyr ago.

SST shows that in reality, to describe correctly the expansion of the Universe, we must take into account the initial conditions for the expansion, the mechanisms of creation of photons and the quantum entanglement of photons in pairs of them.

We showed that there is a stepwise change in the light travel time for redshift about 0.64 – it suggests that there is not a smooth transition from the near Universe ($z < 0.6415$) to distant Universe ($z > 0.6415$) – it is inconsistent with GR. Emphasize that according to SST, the GR formula $L_{GR,ltt} = f(z)$ correctly describes galaxies in the same spatial distance moving with different recessional velocities i.e. concerns the distant Universe.

References

[1] Sylwester Kornowski (2015). *Scale-Symmetric Theory*
[1A]: http://vixra.org/abs/1511.0188 (Particle Physics)
[1B]: http://vixra.org/abs/1511.0223 (Cosmology)
[2] Sylwester Kornowski (2016). “The Evolution of Massive Galaxies”
http://vixra.org/abs/1406.0014
[3] Edward L. Wright (6 December 2014). “Cosmology Calculator”
PASP, 118, 1711 (2006)
http://www.astro.ucla.edu/~wright/DlttCalc.html
[4] Sylwester Kornowski (14 January 2017). “Cosmic Reionization of Hydrogen and Helium and the Supermassive Black Holes in Very Distant Universe”
http://vixra.org/abs/1701.0465