The Origin of the Missing Galaxy Clusters

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Abstract: The Planck CMB data lead to conclusion that there should be about two times more galaxy clusters than we observe. Here, applying the lacking part of ultimate theory, i.e. the Scale-Symmetric Theory, I show that the discrepancy follows from the collisions/mergers of protogalaxy clusters at the beginning of the expansion of the Universe. The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are 7.75 Gyr old so we cannot see the collisions of protogalaxy clusters. It is a wrong assumption that creation of galaxies can last a few hundred million years only. For 4 times more spiral galaxies than elliptical galaxies, we obtain that there should be observed 2.4 times less galaxy clusters than it follows from the Planck CMB data.

1. Introduction

The Scale-Symmetric Theory starts from the expansion of the cracked space (it is the inflation of the Higgs field – the big bang) which leads to the Einstein spacetime [1], [2], [3]. There appear the four succeeding phase transitions of the Higgs field and the atom-like structure of baryons [1].

The dark matter consists of the additional Einstein-spacetime components entangled with matter. It appeared due to the evolution of the cosmic structure (it was the Protoworld that appeared due to the fourth phase transition of the Higgs field) which appeared after the inflation described within the Scale-Symmetric Theory but before the observed expansion of our Universe (the 'soft' big bang) [1].

Inside the Protoworld was created the Double Cosmic Loop (the very early Universe) composed of protogalaxies. Due to the quantum entanglement and the four-particle symmetry that follows from the fact that there are the two species of neutrinos i.e. the electron- and muon-neutrinos (the third "neutrino", in assumption the tau-neutrino, consists of entangled three different neutrinos), the protogalaxies were grouped in bigger structures. The quantum entanglement leads to following formula which describes the number of binary systems of protogalaxies in the very early structures of the Universe [1]

$$D = 4^d, \tag{1}$$

where d = 0, 1, 2, 4, 8, 16 for a flattened-spheroid-like/disc-like structures, and d = 3, 6, 12 for a chain-like structures. Formula (1) concerns particles as well [1].

Each protogalaxy consisted of 4^{16} neutron black holes. Mass of each protogalaxy was about $M = 2.1 \cdot 10^{41}$ kg [1]. The inflows of the dark matter caused the exit of the black holes from their black-hole state.

The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are 7.75 Gyr old [4]. It leads to conclusion that we cannot see the collisions of protogalaxy clusters which took

place at the beginning of the ‘soft’ big bang. These collisions decreased number of the galaxy clusters. We can see that the CMB is 7.75 Gyr older than the most distant galaxies so the CMB should lead to more galaxy clusters than we actually observe. It is a wrong assumption that creation of galaxies can last a few hundred million years only.

Here I proved that the collisions of the protogalaxy clusters lead to a ratio of 2.4 for the predicted clusters to actually observed clusters. On the other hand, the comparison of the analysis of the primary CMB temperature anisotropies given in Planck Collaboration XVI (2014) with the Planck Sunyaev-Zeldovich cluster counts leads to a factor of 2 [5].

2. Calculations

The upper limit for mass of an elliptical galaxy is about 10^{13} solar masses whereas for spiral galaxy it is about 10^{12} solar masses i.e. about 10 times smaller. It suggests that typical massive elliptical galaxy was produced in collision of two groups of protogalaxies each containing 4 binary systems of protogalaxies i.e. total number of protogalaxies was 16. On the other hand, the massive spiral galaxies evolved from binary systems of protogalaxies i.e. total number of protogalaxies was 2 [6]. It means that typical massive elliptical galaxy should have mass about 8 times greater than typical massive spiral galaxy. We can see that the collisions/mergers decreased number of massive galaxies. Denote the ratio of massive spiral galaxies to massive elliptical galaxies by f. If X denotes present-day number of spiral galaxies (total number of binary systems of protogalaxies associated with spiral galaxies is X) then number of elliptical galaxies is X/f but each elliptical galaxy consisted of 8 binary systems of protogalaxies so total number of binary systems of protogalaxies associated with elliptical galaxies is 8X/f. We can see that number of binary systems of protogalaxies Y calculated from CMB should be $Y = X + 8X/f$ whereas we should observe following number of spiral and elliptical galaxies $Z = X + X/f$. Assume that the ratio of massive spiral galaxies to massive elliptical galaxies is $f = 4$ – then the collisions/mergers of binary systems of protogalaxies decrease number of galaxies the R times

$$R = Y / Z = 3X / 1.25X = 2.4. \quad (2)$$

Already at the beginning of the ‘soft’ big bang there were the greater cosmic structures composed of the binary systems of protogalaxies so we can apply the above described mechanism to colliding/merging protoclusters composed of binary systems of protogalaxies. We should observe about 2.4 times less the galaxy clusters than it follows from the CMB. It is consistent with the observational facts [5].

We can see that the final result depends on the ratio of the spiral to elliptical galaxies (for greater f the ratio R is smaller – for $f = 5$ is $R = 2.17$).

3. Summary

The Planck CMB data lead to conclusion that there should be about two times more galaxy clusters than we observe. Here, applying the lacking part of ultimate theory, i.e. the Scale-Symmetric Theory, I show that the discrepancy follows from the collisions/mergers of protogalaxy clusters at the beginning of the expansion of the Universe. The time distance to most distant galaxies is 13.866 ± 0.096 Gyr but they are 7.75 Gyr old so we cannot see the collisions of protogalaxy clusters. It is a wrong assumption that creation of galaxies can last a few hundred million years only.

For 4 times more spiral galaxies than elliptical galaxies, we obtain that there should be observed 2.4 times less galaxy clusters than it follows from the Planck CMB data.

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