

The Origin of the UV-Photon Underproduction Crisis

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Abstract: Here, applying the lacking part of ultimate theory i.e. the Scale-Symmetric Theory, I described the origin of the UV-photon underproduction crisis. The observational facts lead to conclusion that the value of the metagalactic photoionization rate for the low-redshift Lyman-alpha forest should be larger than the predicted value. The Scale-Symmetric Theory shows that it is directly associated with the ratio of the present-day radius of the Universe to its initial radius.

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1. Introduction and motivation

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

The dark matter consists of the additional Einstein-spacetime components entangled with matter. It appeared due to the evolution of the cosmic structure (the Protoworld) which appeared after the inflation described within the Scale-Symmetric Theory but before the observed expansion of our Universe (the ‘soft’ big bang).

Here, applying the lacking part of ultimate theory i.e. the Scale-Symmetric Theory, I described the origin of the UV-photon “underproduction” crisis. It is directly associated with expansion of the Universe.

An energy dispersive X-ray spectroscopy (EDS) Spectrum of iron would have three peaks: an L alpha at 0.704 keV, a K alpha at 6.400 keV, and a K beta at 7.057 keV [3].

To explain the photon “underproduction” crisis consider the present-day energy of photons associated with the L alpha peak. Since the initial size of the Universe increased approximately 72.55 times [1] so the lower limit of energy of the Fe L alpha photons in the local Universe decreased to in approximation $704 \text{ eV} / 72.55 \approx 9.7 \text{ eV}$. The observed today most distant galaxies are in the time distance about 13.2 Gyr so today the detected energy of the Fe L alpha photons emitted by such galaxies is $704 \text{ eV} / (13.2 \text{ Gyr} / 0.1911 \text{ Gyr}) = 10.2 \text{ eV}$ (the initial radius of the double-cosmic-loop/very-early-Universe was 0.1911 Gyr whereas the front of the baryonic matter is today in time distance $13.866 \pm 0.096 \text{ Gyr}$ [1]). This value is equal to the energy of the Lyman-alpha spectral line $\sim 10.2 \text{ eV}$ (Lyman-alpha forest is a series of absorption lines arising from the Lyman-alpha electron transition of the neutral hydrogen atom). It causes that the value of the metagalactic photoionization rate for the low-redshift Lyman-alpha forest should be larger than the predicted value. The rate should be a

factor of five larger than the value predicted by “state-of-the art models for the evolution of this quantity” [4].

Such is origin of the photon “underproduction” crisis. We can see that the UV-photon “underproduction” concerns only the regions which sizes increased about 69 times i.e. concerns the present-day Universe only.

References

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