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, we 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 General Relativity leads to the non-gravitating Higgs field composed of tachyons [1A]. On the other hand, the Scale-Symmetric Theory (SST) shows that the succeeding phase transitions of such Higgs field lead to the different scales of sizes [1A]. Due to the saturation of interactions via the Higgs field and due to the law of conservation of the half-integral spin that is obligatory for all scales, there consequently appear the superluminal binary systems of closed strings (entanglons) responsible for the quantum entanglement, stable neutrinos and luminal neutrino-antineutrino pairs which are the components of the luminal Einstein spacetime (it is the Planck scale), cores of baryons, and the cosmic structures (protoworlds) that evolution leads to the dark matter, dark energy and expanding universes (the “soft” big bangs) [1A], [1B]. The non-gravitating tachyons have infinitesimal spin so all listed structures have internal helicity (helicities) which distinguishes particles from their antiparticles [1A]. SST shows that a fundamental theory should start from infinite nothingness and pieces of space [1A]. Sizes of pieces of space depend on their velocities [1A]. The inflation field started as the liquid-like field composed of non-gravitating pieces of space [1A]. During the inflation, the liquid-like inflation field (the non-gravitating superluminal Higgs field) transformed partially into the luminal Einstein spacetime (the big bang) [1A], [1B]. In our Cosmos, the two-component spacetime is surrounded by timeless wall – it causes that the fundamental constants are invariant [1A], [1B].

Due to the symmetrical decays of bosons on the equator of the core of baryons, there appears the atom-like structure of baryons described by the Titius-Bode orbits for the nuclear strong interactions [1A].

Here, applying the SST, we 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 [2].

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 72.56 times [1B] so the lower limit of energy of the Fe L alpha photons in the local Universe decreased to in approximation 704 eV / $72.56 \approx 9.7$ 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 eV / (13.2 Gyr / 0.1911 Gyr) = 704 eV / $69 = 10.2$ eV.

Notice that the initial radius of the double-loop (of the very early Universe) was 0.1911 Gyr, whereas the front of the expanding baryonic matter is today in time distance 13.866 ± 0.096 Gyr [1B].

The obtained value 10.2 eV for iron is equal to the energy of the Lyman-alpha spectral line ~10.2 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" [3].

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

References

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