

Some views of fine-structure constant and the speed of light

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Abstract:In recent years, many experiments prove that the speed of light is changing by the evolution of the universe , this paper tries to give some explanation.

Key words:

The fine-structure constant; The speed of light;Entropy; Evolution of the universe

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In 2011, a large study of atomic transitions from distant quasars, combined with earlier observations, suggested was higher or lower depending on where one looked in the sky, with a significance of 4.2 standard deviations [1].

Astrophysical observations determine shifts in α and μ by comparing the spectra of light from 3 to 10 billion years ago to that from current laboratory measurements. In contrast, in an atom clock measurement of α or μ shifts the frequencies of two atomic transition lines—either on the same atom or on different atoms—are compared over time. So far, the most precise laboratory test of α comes from NIST [2].

In these experiments, scientists measured the ratio of optical frequencies from Al⁺ and Hg⁺ ions, providing a limit on the time variation in α to $-1.6 \pm 2.3 \times 10^{-17}$ per year [3].

I think we not only need to know how it will change but also need to know why it had changed.

1. the change of the vacuum dielectric constant

First of all, we set up an ideal model. A is a object in a vacuum, A have some electric charges q , then we found that electrons move from A to another object B, the distance from A to B is l . (we assum that electrons only can move on AB line)

l became a valuable amount at this moment, because if vacuum dielectric constant can change, if we want to make the B's electric charge is a constant Q , we need to change l , the longer the l is meaning that the smaller the vacuum dielectric constant, we can get the vacuum dielectric constant $\epsilon_0 \propto 1/l$. And then we will know that the l is really changing in the next paragraph.

At the same time, l and microscopic quantum number Ω also has a lot of concerns: the larger the electronic's Ω , the farther the electronic can reach, the longer the l , namely $\Omega \propto l$. Then we make the further conclusion: $\Omega \propto 1/\epsilon_0$. $\Omega = a/\epsilon_0$. And because the entropy $S = k \ln \Omega$, we can get that: $\epsilon_0 = a / [e^{S/k}]$. If we consider the relationship between entropy and time: $\Delta S \propto \Delta t$. We get the $S = bt$. And get $\epsilon_0 = a / \{e^{(bt)/k}\}$. We can make the conclusion that the vacuum dielectric constant is changing over time, although the time is very long.

2. The speed of light also is changing

Owing to the vacuum dielectric constant changes, and $\mu_0 \epsilon_0 = 1 / (c^2)$, the speed of light c is not static, $c = \{[e^{S/k}] / a \mu_0\}^{1/2}$. So we can know the speed of light is changing over time. And the pace of the change is faster and faster.

3. the change of the fine-structure constant

The fine-structure constant is also changing, and the pace of the change is slower and slower. $\alpha = e'^2 / (4\pi c h \epsilon_0)$ (including e' is the electronic charge, ϵ_0 is vacuum dielectric constant, h is the Planck's constant, c is the speed of light in vacuum) $\alpha = e'^2 / \{4\pi a / [e^{S/k}] \} \{[e^{S/k}] / a \mu_0\}^{1/2} h$. We can learn that its growth is very slow, and tend to

be a constant, so we don't have to worry about the changing will destroy the carbon atom and make us all die.

4, proton and electron mass ratio

if the speed of light is changing, we can make a conclusion: the protons and electron mass ratio is becoming bigger and bigger, this is due to if there is the same energy in the proton, speed of the light faster, the quality will be smaller ($E = MC^2$), and the speed of light change faster and faster, shows that this numerical change slower and slower, so in 6 billion we have not observed in observing the change of it but we have observed this change in 12 billion years.

It makes that a molecular hydrogen absorber at a lookback time of 12.4 billion years, corresponding to 10% of the age of the universe today, is analyzed to put a constraint on a varying proton-electron mass ratio, μ . A high resolution spectrum of the J1443+2724 quasar, which was observed with the Very Large Telescope, is used to create an accurate model of 89 Lyman and Werner band transitions whose relative frequencies are sensitive to μ , yielding a limit on the relative deviation from the current laboratory value $|\mu - 1| = (-9.5 \pm 5.4_{\text{stat}} \pm 5.3_{\text{sys}}) \times 10^{-6}$ [4].

5, information and energy

If we accept that the speed of light is changing fast, in the past has the same properties of particles with higher energy, this energy is gone. Entropy takes away energy (the total energy of the universe is fewer), proved that the entropy and negative energy is the same thing.

A object is emitting thermal radiation, it increases the entropy S , it loses energy $E = ST$, while its thermal radiation photon energy $E = \sigma T^4$, therefore $T = (E / \sigma)^{1/4}$ a photon's Negative entropy $-S = E / T = \sigma T^3 = \sigma (E / \sigma)^{3/4}$. Information is negative entropy, therefore the greater the photon energy, the greater its information, and information and energy are equivalent, it is like the mass-energy equivalence.

6, our souls

The same information and energy, the same energy and mass, so the information is matter. In fact physics doesn't research matter, it only research information which the object has (We only can know the information of the object, and we only will know the information the object will have by the physics). Only the physical quantity (information) which we have observed by the experiments has the really physical significance. So we do not need consider the object exist, we can consider that there is only information. Most information formed in the Big Bang, which controls all things in the future. It evolved out of two parts: I and the "not me." "Not me," is divided into "I love, I hate" and so on. "I" and evolve the ability to get the information. "I" is the subconscious, then "I" evolved into consciousness. Then evolved sense: visual sense, sense of hearing and so on. Our consciousness and anything is evolve from the same information. This is the living things. Therefore our souls and the matter is the same thing, so I think it is very foolish that the debate between the materialism and the idealism.

It needs more experiment to prove them.

References

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