Some Views Of Time Trials for Fundamental Constants

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Article：

In recent years, many experiments prove that the fundamental constants is changing by the evolution of the universe , this paper tries to give some explanation.We have observed that the proton-to-electron mass ratio and the fine structure constant both are changing over time.Some scientists think the vaccum dielectric constant and the speed of light are changing,too.I agree them.So I finish this paper to explain those experments and develop those guesses.

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

In 2011, a large study of atomic transitions from distant quasars, combined with earlier observations, suggestedαwas higher or lower depending on where one looked in the sky, with a significance of4.2standard deviations [1].

Astrophysical observations determine shifts inαandμby comparing the spectra of light from3to10billion years ago to that from current laboratory measurements. In contrast, in an atom clock measurement ofαorμshifts 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 ofαcomes from NIST [2].

In these experiments, scientists measured the ratio of optical frequencies fromAl andHg ions, providing a limit on the time variation inαto-1.6±2.3×10-17per year[3].

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

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 ，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 ε0 ∝ 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 farer the electronic can reach, the longer the l, namely Ω ∝ l. Then we make the further conclusion: Ω ∝ 1/ε0. Ω = a/ε0. And because the entropy S = kln Ω ,we can get that: ε0 = a / [e ^ (S/k)].If we consider the relationship between entropy and time: ΔS ∝ Δ t. We get the S = bt. And get ε0 = 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 μ0ε 0 = 1 / (c ^ 2), the speed of light c is not static, c = {[e ^ (s/k)] / a μ0 } ^ (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. α = e' ^ 2 / (4πchε0) (including e' is the electronic charge, ε0 is vacuum dielectric constant, h is the Planck's constant, c is the speed of light in vacuum) α= e' ^ 2 / x,x=[4 π a / [e ^ (S/k)] {[e ^ (S/k)] / a μ0} ^ (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 destory the carbon atom and make us all die.

Time has always had a special status in physics because of its fundamental role in specifying the regularities of nature and because of the extraordinary precision with which it can be measured. This precision enables tests of fundamental physics and cosmology, as well as practical applications such as satellite navigation. Recently, a regime of operation for atomic clocks based on optical transitions has become possible, promising even higher performance. We report the frequency ratio of two optical atomic clocks with a fractional uncertainty of 5.2 × 10−17. The ratio of aluminum and mercury single-ion optical clock frequencies νAl+/νHg+is 1.05287183314899O438(55), where the uncertainty comprises a statistical measurement uncertainty of 4.3 × 10−17, and systematic uncertainties of 1.9 × 10−17and 2.3 × 10−17in the mercury and aluminum frequency standards, respectively. Repeated measurements during the past year yield a preliminary constraint on the temporal variation of the fine-structure constant α of Embedded Image.[4]

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 became bagger and bagger.The proton-to-electron mass ratio is changing by the change of the speed of light.

c = {[e ^ (s/k)] / a μ0 } ^ (1/2)=c'

There is no binding energy in the electron's mass but most of the proton's mass is made from the binding energy.If we presume that the binding energy is not change over time.We can use "E=mc^2" to calculate the mass of porton.

But the speed of light is changing,so the proton's mass is m=E/(c'^2).

From the equation we can see the change's(the proton-to-electron mass ratio) rate is slower and slower over time.

The electron's mass can't change ,so the proton-to-electron mass ratio is changing by the change of the proton's mass.[5]

That's why we have observed it changed from 12billion years ago but not changed from 6 billion years ago：

“Certain models predict that the dark energy that accelerates the Universe’s expansion is a field that evolves over cosmological times. This could mean that certain fundamental quantities related to forces and masses were different long ago. However, a new analysis of the spectrum from a very distant quasar finds no evidence of deviation in molecular lines produced 12 billion years ago, thus implying no change in the mass ratio of the proton to the electron.

One possible explanation for dark energy is that it comes from an all-pervasive scalar field, similar to the Higgs field. Such a field would likely interact with other particles, and these interactions could influence fundamental quantities, causing them to change as the scalar field evolves over time. To check for such evolution, scientists often study distant astrophysical bodies, whose light was emitted billions of years ago.

For the proton-electron mass ratio, astronomers look for unexpected shifts in the wavelengths at which molecules absorb light. Most molecules can only be seen in relatively nearby objects, but the hydrogen molecule (H_2) is abundant enough to be observed at great distances. Wim Ubachs of VU University Amsterdam, the Netherlands, and his colleagues

analyzed the spectrum of a very distant quasar (J1443+2724) and identifiedH2absorption lines from a galaxy in front of the quasar. This absorption signal was etched into the spectrum when the Universe was just 1.5 billion years old. The lines showed no shift (beyond the normal redshift) compared to values measured on Earth, allowing the authors to place an upper bound of a few parts per million on a varying proton-electron mass ratio. The results imply that a dark energy scalar field—if it exists—has evolved very little over90%the age of the Universe.[6]"

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 take 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 increasesed the entropy S, it loses energy E = ST, while its thermal radiation photon energy E = σT ^ 4, therefor T = (E / σ) ^ (1/4) a photon's Negative entropy -S = E / T = σT ^ 3 = σ (E / σ) ^ (3/4). Information is negative entropy, therefor 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 don't research matter, it only research information which the object have(We only can know the information of the object,and we only will know the infortation the object will have by the physics). Only the physical quantity(information) which we have observed by the experiments have 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.

It need more experiment to prove them.

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