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RESEARCH ARTICLE

PROPERTIES ON QUANTIFIED HIGGS FIELD IN ALTERED STABILITY CONDITIONS GOVERNED BY THE EXPANSION OF SPACE

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ABSTRACT

Expansion of universe is the prime factor for the existence of mass in the universe. If for some reason expansion stops which is believed due to the presence of Dark energy present in the universe, the mass of the subatomic particle reduces to zero because the contraction of Higgs field is not balanced by the expansion.

INTRODUCTION

Mass is considered as fundamental property of matter. Mass can be transformed into energy in special circumstances and it releases a lot of energy. Along with energy released Mass – Energy conservation theory is well established. It has been proved that due to the interaction with Higgs field different sub-atomic particles of the same size have different mass content which is expressed in terms of GeV.

Theory

In this paper the approach is to be established that the mass of a particular particle will be altered if the expansion of the universe is changed at constant rate. Even if in the uniform Higgs [1] field the mass of a particular type of sub-atomic particle is not unique. It will change from zone to zone governed by stability conditions of the Higgs field. The stability is not only dependent on space but also time. The spatial and temporal distribution of Higgs field creates the stability of the field, and governs the mass which is passing through it. It differs from stability zone to instability one in the infinite distribution of uniform Higgs field in different conditions. We can express the causal Higgs field equation, in the form $x[n] = a^n \varphi^n$ where, a is the period of the Higgs lattice, φ is the Higgs field and n is the time index. Here the normalized value of φ is considered as unity.The spatial distribution equation [2] of the field will be

$$X[z] = \sum_{n=0}^{\infty} (az^{-1})^n \tag{1}$$

As the total energy is to be finite, so that the required condition must be $\sum_{n=0}^{\infty} (az^{-1})^n < \infty$ which gives the stability of the field exists beyond a or $|z| > |a|$. The non-causal form of Higgs field equation is $x[n] = -b^n \varphi(-n-1)$, where b is Higgs lattice constant at time $t < 0$ in the space time distribution. From this equation we find the spatial distribution equation is

$$X[z] = 1 - \sum_{n=0}^{\infty} (bz^{-1})^n \tag{2}$$

The stability of the non-causal field is $|z| < |b|$.

A particle having finite mass is not only governed by causal Higgs field rather it is a superimpose effect of both causal and non-causal Higgs field as the non-causal part contributes significant amount on the mass in the field.

So overall stability of a finite mass lies between

$$|a| < |z| < |b| \tag{3}$$

Now for the continuity of the spatial field, the necessary condition is be fulfilled is

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$$|b| > |a| \quad (4)$$

This effect has a continuous impact on the space and time and one can conclude that in this fashion the present lattice period of the Higgs field a keeps on decreasing and at one point of time it reduces to a negligible quantity. As the Higgs fields are initially distributed in nature and it contributes mass to different particles, so when the lattice period a approaches to zero the entire Higgs fields distributed in space infinitely superimpose in one place and gives rise to a single Higgs field of infinite amplitude. As a consequence the matter is also reduced to a negligible quantity to all the places except one single place where the superimposed Higgs field of infinite energy exists in the form of an impulse function.

But in reality we do not see such kind of phenomenon. Here, the quantity $|a_{\text{present}}|$ which is derived from the transformed value of $|b_{\text{previous}}|$ must act as input for the next transformation, termed as $|b_{\text{next}}|$ where it may satisfy the relation $|b_{\text{previous}}| > |a_{\text{present}}|$. But before that it is going to be multiplied by a factor γ and the product $|a_{\text{present}}|.\gamma$ will act as b_{next} for the next transformation in the place of $|a_{\text{present}}|$. This factor γ is a Universal Constant and it can be termed as Universal expansion coefficient due to ever expanding Universe [3,4]. So the modified condition will be for the stability of mass at any point of time is $|b_{\text{previous}}| > |a_{\text{present}}|.\gamma$. For the boundary case $|b_{\text{previous}}| = |a_{\text{present}}|.\gamma$ is the permissible condition but it should not be $|b_{\text{previous}}| < |a_{\text{present}}|.\gamma$ because it will violate the basic stability condition given by equation (4).

RESULTS AND DISCUSSION

Here in the first case we have taken the Higgs field is distributed in a exponential manner where most of the field is concentrated in the center and faded away gradually as we go longer distance. The field is complex in nature as it has both real and imaginary part. The nature of the field is extremely complex and depends on the amplitude or strength of the field. Here for the calculation purpose we have taken 1000 Higgs points spanned in a very long distance. The nature of the field is shown in Figure 1. The transform of the above field in space is shown in Figure 2, where the region of stability of the fields exists within the area of an ellipse. A sub atomic particle experiences the influence of the Higgs field within the area of the ellipse which is quiet large shown in Figure 2. Now, we applied an complex quasi-opposite field where the amplitude is opposite but the phase is similar to the first one which is originated due to expansion of universe depicted in Figure 3. As at the point of investigation both the fields acting upon the particles are causal, for that we introduced another set of fields of the same phase but opposite in magnitude of the previous one otherwise it manifest in the third quadrant distributions which is not correct due to non-causality. The transform of the second fields are shown in Figure 4, to avoid the confusion we can describe it from now Higgs-expansion field. Here also and it is also obvious that the region of stability of the fields exists within the area of an ellipse.

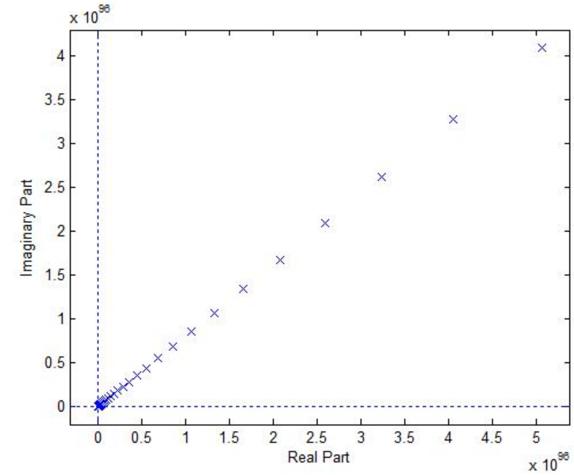

Figure 1. Distribution of Temporal Higgs fields

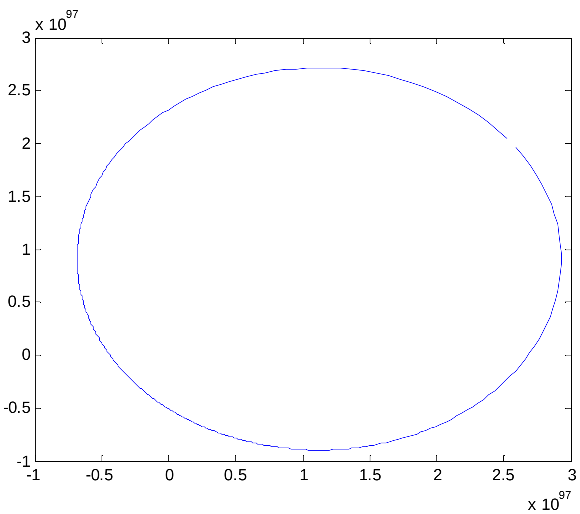

Figure 2. Region of stability of the Higgs field shown in Figure 1

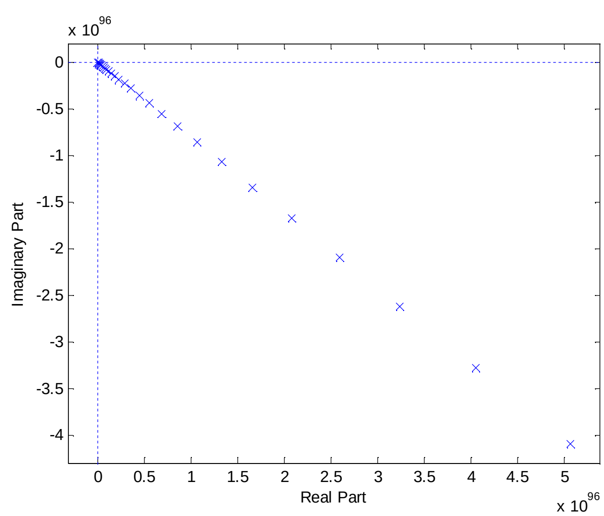

Figure 3. Distribution of Temporal Higgs fields due to expansion of space

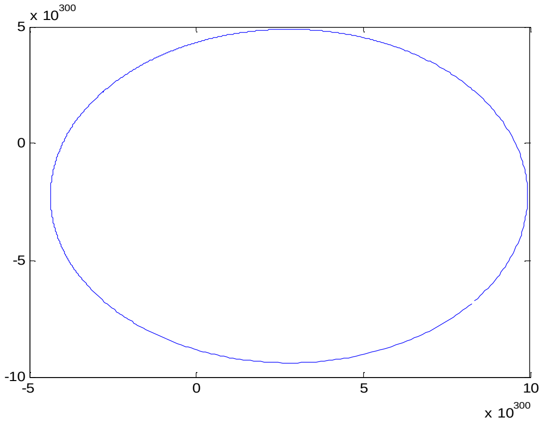

Figure 4. Region of stability of the Higgs-expansion fields shown in Figure 3

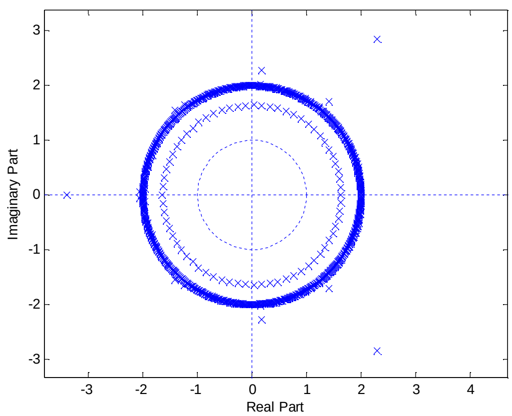

Figure 5. Distribution of Combined Temporal Higgs Field

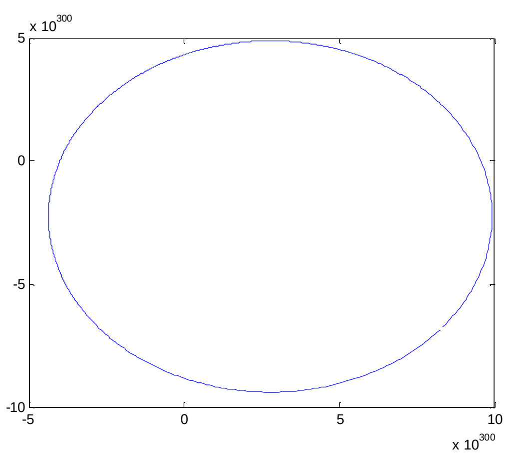

Figure 6. Region of Stability of the Combined Higgs Field

Now if we investigate the combine effect of the Higgs field and Higgs expansion field for that we should calculate the mean of the two complex fields. So we calculated and ploted the mean of those two complex fields we find that the resultant field is redistributed in the form of two spheres shown in Figure 5. The field distributions are denser in the outer sphere and the inner sphere is not at all dense. Outside of the outer sphere field distributions are negligible. One can conclude the effect of Higgs combined field is in between two spheres and the particle experience maximum mass at the boundary of outer sphere and minimum in the boundary of the inner sphere. In the intermediate space the particle experience intermediate value of mass. If we take the transform of the mean of Higgs field which is originated from the combination of both the fields, we find that the stability range is theoretically spanned in the order of 10^{300} and that to in the form of an ellipse as shown in Figure 6. The major and minor axis of that ellipse is very large and also of the order of 10^{300}. Although the stability zone of the field is very large but the actual temporal zone where a particle suffers its actual mass is very small and is confined between two spheres of Combined Temporal Higgs fields.

Conclusion

From this one can conclude that expansion of universe plays a pivotal factor for the existence of mass in the universe. It is expanding in a fixed amount of space in unit time. If for some reason the universe stops expansion then the matter will gradually lose its mass which leads to instability and $|b_{\text{previous}}| < |a_{\text{present}}|.\gamma$ condition will arise. Here, after comparing from Figure 2 and Figure 4 we find that the ratio between the region of stability between the Higgs field and Higgs expansion field is in the order of $\frac{10^{300}}{10^{97}} = 10^{203}$. Also from the Figure 6 we observed that the range of stability of the Combined Higgs field is also of the order of 10^{300}, which is same as the Higgs expansion field. So it is well understood the region of stability of the Higgs expansion field governs the region of stability of the Combined Higgs field. So the nature cannot expand beyond the rate which is expanding now with a constant value γ. The value from the figure is measured as $\gamma \approx 10^{203}$.

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