PROCEEDINGS OF SCIENCE

On a Singular Solution in Higgs Field (5) -The degenerates into the candidates for dark matter and dark energy from ur-Higgs bosons

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We study the degenerates into the candidates for dark matter and dark energy from ur-Higgs bosons which has appeared as a mother for SM Higgs boson above. It is shown that only about a tenth of them (ur-Higgs) can be transformed to the Higgs boson with corrected mass by γ-irradiation from surroundings, which is in electroweak interaction with particles. The remainder degenerate into the hybrid molecules of a glueball and pseudo-scalar mesons (candidate of dark matter); and into the quasi-crystals of fullerene consists of σ mesons and some ω mesons (candidate of dark energy) which will raise repulsive strong force as soon as the (free) fullerenes approach very near each other. Where we regard the developed fullerene as a finite nucleus of the limit of N(p, n)→0, namely, m(p, n)→0 in Dirac equation of mean-field theory. And large amount of condensing (latent) heat from (tt_bar)* gas to the liquid (Higgs boson) might be considered as at last transformed to dark energy, by which the quasi-crystal above would be annealed (or sublimated) to more developed fullerene. Then the content ratio between matter (atom), dark matter and dark energy is consistent with the latest result of WMAP (9 Years). It is interesting that if we choose reciprocal of the fine structure constant (1/α) as a mass contributing factor (number) of gluon in QGP for matter, the content ratio is completely in accordance with WMAP. Also our mass of dark matter (considered at around 120.611 GeV/c^2) seems relevant to the result of Fermi-LAT.

The European Physical Society Conference on High Energy Physics
18-24 July, 2013
Stockholm, Sweden

1 Presenter

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PoS(EPS-HEP 2013)002

1. Introduction

Recently the mass, structure [1] of Higgs boson (H^0) and the relation[2] between the calculated mass (120.611 GeV/c^2) and latest results of LHC were discussed by the author, where the corrected mass of Higgs boson by replacing the masses of consisting mesons with the ones of their 1st excited (or upper-resonant) states respectively, was at 125.28 GeV/c^2 which met the latest masses of ATLAS and CMS. In this paper we review above and then discuss about;

(1) Brief review

Higgs mass correction with the mesons' masses of excited or resonant states:

(2) Degenerate into a candidate of dark matter

Almost ur-H^0 degenerates into the hybrid molecules of a glueball and pseudo-scalar mesons as a candidate of dark matter

(3) Degenerate into the candidate of dark energy

The ur-H0 degenerates also into the quasi-crystals of fullerene consists of σ mesons and some ω mesons, as the candidate of dark energy, which will rise repulsive strong force

(4) Comparison to observations.

2. Brief review [2]

- Corrected Higgs mass formula with the respective mass of excited states as equation (2.1):

$$M_{(\mathrm{H}^0)^*} \equiv \sum_{M_i}\left[3\chi_{c^0}(1\mathrm{p}),\ \rho_3(1990)\overline{\rho_3}(1990)\ +4\left\{\left(B_S{}^*\overline{B}_S{}^*\right)\left(B_C{}^*\overline{B}_C{}^*\right)\left(D_S{}^{*+}D_S{}^{*-}\right)\right\}\right]\cong 125.28\ \mathrm{GeV/c^2}.$$

-Its multiwall-fullerene representation of glueballs, having ρ mesons inside, as an excited state of the ur-H^0 as equation (2.2):

$$M_{(\mathrm{H}^0)^*} \equiv \sum_{M_i}\left[40\times \mathrm{f}_6(3100)\right]\cong \sum_{M_i}\left[6\times\left\{(\mathrm{GB}_{40})+\rho(770)\right\}\right]=\sum_{M_i}\left[6\times(\mathrm{GB}_{40})+3\rho(770)\overline{\rho}(770)\right].$$

3. Degenerate into the candidate of dark matter (DM)

3.1 Transformation to excited H^0 from ur-H^0

The mass difference between them is $\Delta\mathrm{m} = 125.28 - 120.611 = 4.669\ \mathrm{GeV/c^2}$. On the other hand, the energy of γ-ray from $(\mathrm{tt\_bar})^*$ was $E_\gamma = 492.35$ MeV. So the total number (N_e) of $(\mathrm{tt\_bar})^*$ decay reaction to ur-Higgs, corresponding to Δm is $N_\mathrm{e} = \Delta\mathrm{m}\bullet\mathrm{c}^2/E_\gamma = 9.483$ which means that only ($1/N_e$) of these ur-Higgs bosons can be transformed finally to the H^0 with corrected mass (125.28 GeV/c^2) through multi-photon resonances of its component by irradiated γ-rays from neighboring $(\mathrm{tt\_bar})^*$ s, onto H^0.

3.2 Degenerate into a candidate of DM from ur-H^0

We consider that the rate of excited Higgs boson would be equivalent to the rate of Atom itself. Then from the phase transition diagram [1], we compute the rate as

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$$R_{(\mathrm{Atom})}{}' = \frac{1}{N_{\mathrm{e}}} \times \left(1-\eta_{+Q}\right) = \frac{1}{N_{\mathrm{e}}} \times \left(1 - \frac{2M_{\mathrm{t}} - M_{\mathrm{t}}/\sqrt{2}}{2M_{\mathrm{t}}}\right) = \frac{1}{9.483}\left(\frac{1}{2\sqrt{2}}\right) = 0.03728. \qquad (3.1)$$

whose value will be modified as 0.04609 by considering mass contribution of gluon from QGP.

$$R_{(\text{total matter})}{}' = \left(1-\eta_{+Q}\right) = \frac{1}{2\sqrt{2}}. \qquad (3.2)$$

Since the rate of fullerene of pure Glueballs (GBs) has been computed as one third of the 'total matter' ((3.2), above) which was represented by the mixture of fullerenes of pure GBs and the hybrid molecules (one-GB and several certain light pseudoscalar mesons) in preceding paper [1],

$$\left(1-1/3\right) \times R_{(\text{total matter})}{}' = \frac{1}{3\sqrt{2}} = 0.2357 \equiv R_{(\mathrm{DM})}{}' \qquad (3.3)$$

as the rate of remainder, that is, the rate of degenerate into a candidate of DM from ur-H^0.

4. Degenerate into the candidate of dark energy (DE)

We consider that $\rho \rightarrow$ π+π- / e+e- decays will be suppressed by the outer-wall made of σ mesons during the decay process of multi-wall fullerene (2.2) to developed fullerene (the candidate of DE) in Figure 1. The detailed behavior of DE is to be discussed elsewhere.[3]

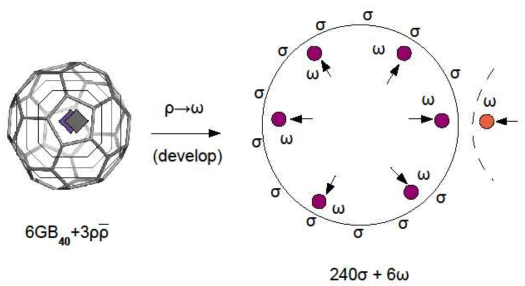

Figure 1: Decay to the candidate of DE

5. Comparison to observations regarding the content ratios

- With the result of *WMAP (content of matter, dark matter and dark energy):* [4]

	Atom	Dark Matter	Dark Energy
WMAP (9 Years)	0.0463 ± 0.0024	0.233 ± 0.023	0.721 ± 0.025
This calculation	0.04609	0.2357	0.7182

References

[1] K. Kitazawa, *On a Singular Solution in Higgs Field (III)*, *J. Phys. Sci. Appl.* **3** (2013) 115.

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[4] G. Hinshaw et al., *WMAP Observations: Cosmological Parameter Results, arXiv:*1212.5226.

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