On the question of «Great Unification» in the Binary Model of Distribution of the Substance Density

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1. Introduction

In present days a physicists – theorists give ever more attention for creation Theories of Great Unification and for models of «supergravitation» as a instrument for possibility of explanation phenomena that occur and for predictions of new effects in big range of the existing physical conceptions: from quantum physics to cosmology.

Existing physical conceptions already allow to explain big number new phenomena as a magnetic monopole, quantums of interactions, the specific phase transmissions in substance, domain structure in observed Universe and so on [1, 3, 4, 5].

In the meantime, modern experimental data in region of high and superhigh energies prove that exist need in modification of modern theories for explanation of four types of well-known interactions [9, 10].

An idea in this direction is hope of scientists on so called «indefinite metrics», which would useful for decision many of non conformities by simplest way [1, 3].

But the Binary Model in comparison with well-known case have some essential difference: the conditions for substance and space-time is determined in terms of substance density, velocity, length range and time. This allow making exact decisions for some cases and look for nature of Great Unification in distribution and in dynamics changing of parameters of substance density [18, 19].

2. Frequency spectrum of interactions in the Binary Model of Distribution of the Substance Density. Additional gravitated mass

According submitted distribution in The Binary Model for frequency spectrum in space-time [19]

$$\begin{aligned} &\nu_{gr,\min} = c\frac{\rho_{sub,\min}}{\rho_{sub,\max}}\sqrt{\frac{\rho_{sub,\min}}{V_{effM}}}, \nu_{gr,\max} = \nu_{el-magn,\min} = c\frac{\rho_{sub,\min}}{\sqrt{V_{effM}\times\rho_{sub,\max}}}, \\ &\nu_{el-magn,\max} = \nu_{str,\min} = c\sqrt{\frac{\rho_{sub,\max}}{V_{effM}}}, \nu_{str,\max} = c\frac{\rho_{sub,\max}}{\sqrt{V_{effM}\times\rho_{sub,\min}}} \end{aligned} \tag{2.1}$$

The Binary Model predict two «particular points» for distribution of the substance density that supply conception of «effect of the observer» [19]

$$\rho_{pec,sub,1} \approx 9{,}53\times10^{3}\left[\frac{kg}{m^3}\right]; \rho_{pec,sub,2} \approx 1{,}65\times10^{17}\left[\frac{kg}{m^3}\right] \tag{2.2}$$

The first of them in (2.2) determine the beginning for intervals of the substance density when velocity of distribution of electromagnetic radiation in vacuum is rescaled. But comparison of values in (2.2) with measured range of the substance density [18] demonstrate that weak interaction begin action in vicinity of «first particular point»

$$\Delta\rho_{pec,sub,1} \approx \rho_{pec,sub,1} \pm 1{,}57\left[\frac{kg}{m^3}\right] \tag{2.3}$$

The second of them in (2.2) is the limit of substance density (including nuclear and subnuclear interactions) and in its vicinity occur violations of scale invariant law and baryon symmetry into observed region of the Universe. [1], [9].

Then we have from equations for frequency spectrum (2.1)

$$\begin{aligned}
&\nu^2_{gr,\min} = c^2\,\frac{\rho^3_{sub,\min}}{\rho^2_{sub,\max}} \times \frac{1}{V_{effM}} = G \times \frac{\rho^3_{sub,\min}}{\rho^2_{sub,\max}}; \nu^2_{gr,\max} = \nu^2_{el-magn,\min} = G \times \frac{\rho^2_{sub,\min}}{\rho_{sub,\max}};\\
&\nu^2_{el-magn,\max} = \nu^2_{str,\min} = G \times \rho_{sub,\max}; \nu^2_{str,\max} = G \times \frac{\rho^2_{sub,\max}}{\rho_{sub,\min}}
\end{aligned} \tag{2.3.1}$$

And for the region of values

$$\rho_{sub} \le \rho_{pec,sub,1} \tag{2.3.2}$$

all components in (2.3.1) gives next result

$$\begin{aligned}
&\frac{\nu^2_{gr,\min}}{\nu^2} = \frac{\rho^2_{sub,\min}}{\rho^2_{sub,\max}}; \frac{\nu^2_{gr,\max}}{\nu^2} = \frac{\nu^2_{el-magn,\min}}{\nu^2} = \frac{\rho_{sub,\min}}{\rho_{sub,\max}};\\
&\frac{\nu^2_{el-magn,\max}}{\nu^2} = \frac{\nu^2_{str,\min}}{\nu^2} = \frac{\rho_{sub,\max}}{\rho_{sub,\min}}; \frac{\nu^2_{str,\max}}{\nu^2} = \frac{\rho^2_{sub,\max}}{\rho^2_{sub,\min}}
\end{aligned} \tag{2.3.3}$$

But in particular for the condition

$$\rho_{sub} \le \rho_{pec,sub,1} \tag{2.3.3.1}$$

$$\begin{aligned}
&\nu_{gr,\min} = 2{,}9979 \times 10^8\,\frac{\left(5{,}202 \times 10^{-27}\right)^{3/2}}{9{,}53 \times 10^3 \times \sqrt{V_{effM}}} \approx 3{,}21 \times 10^{-49}\,(Hz) << \nu^{obs}_{Universe};\\
&\nu_{gr,\max} = \nu_{el-magn,\min} \approx 4{,}35 \times 10^{-34}\,(Hz);\\
&\nu_{el-magn,\max} = \nu_{str,\min} \approx 7{,}97 \times 10^{-4}\,(Hz); \nu_{str,\max} \approx 1{,}08 \times 10^{12}\,(Hz)
\end{aligned} \tag{2.3.4}$$

Thus, for (2.3.1)...(2.3.4) the Binary Model predictes transformation electromagnetic interaction into gravitational, but nuclear – into electromagnetic. According with the Binary Model in this region of values for substance density occur intermodulation from gravitational interaction together with induced components from electromagnetic interaction and occuring, as a result from it, additional gravitated mass [18]. In particular, from the analysis in [18] we have two equations for additional gravitated mass

$$\begin{aligned}
&-M_{gr} \times R_{sub}\,\frac{\rho^2_{sub}}{\rho_{sub,\max}}\left[\begin{array}{l}\left(2\tau + 6c \times \rho_{sub,\max} - \sqrt{\frac{\rho_{sub,\max}}{\rho_{sub}}}\right)\sqrt{\frac{\rho^3_{inv}}{\rho_{sub}}} - \\ -\left(2\tau \times \rho_{sub,\max} + \sqrt{\frac{\rho_{sub,\max}}{\rho_{sub}}}\right)\frac{\rho^2_{sub}}{\rho_{sub,\max}}\end{array}\right] \approx\\
&\approx K_f \times V^2_{effM}\sqrt{\frac{\rho_{sub}}{\Delta\rho_{sub}}}\left(\sqrt{\rho_{sub}} - \sqrt{\Delta\rho_{sub}}\right)^2, \rho_{sub} << 1{,}85 \times 10^{-8}\left[\frac{kg}{m^3}\right]
\end{aligned} \tag{2.3.4.1}$$

and

$$-M_{gr}\times R_{sub}\frac{\rho_{sub}^2}{\rho_{sub,\max}}\left[\begin{array}{l}\left(6c\times\rho_{sub,\max}-\sqrt{\frac{\rho_{sub,\max}}{\rho_{sub}}}\right)\sqrt{\frac{\rho_{inv}^3}{\rho_{sub}}}-\\-\left(2\tau\times\rho_{sub,\max}+3c+\sqrt{\frac{\rho_{sub,\max}}{\rho_{sub}}}\right)\frac{\rho_{sub}^2}{\rho_{sub,\max}}\end{array}\right]\approx$$
$$\approx K_f\times V_{effM}^2\sqrt{\frac{\rho_{sub}}{\Delta\rho_{sub}}}\left(\sqrt{\Delta\rho_{sub}}-\sqrt{\rho_{sub}}\right)^2,\rho_{sub}>>1{,}85\times10^{-8}\left[\frac{kg}{m^3}\right] \quad (2.3.4.2)$$

when

$$\tau=\sqrt{\frac{V_{effM}}{\rho_{sub}\times c^2}} \quad (2.3.4.3)$$

In continue of the analysis we have for region of values of substance density into interval between vicinity of first and second «particular points»

$$\rho_{pec,sub,1}<\rho_{sub}<\rho_{pec,sub,2} \quad (2.4)$$

when equations for frequency spectrum we can write as

$$\nu_{gr,\min}^2=G\times\frac{\rho_{sub,\min}^3}{\rho_{sub,\max}^2}\times\frac{\rho_{sub}}{9{,}53\times10^3};\nu_{gr,\max}^2=\nu_{el-magn,\min}^2=G\times\frac{\rho_{sub,\min}^2}{\rho_{sub,\max}}\times\frac{\rho_{sub}}{9{,}53\times10^3};$$
$$\nu_{el-magn,\max}^2=\nu_{str,\min}^2=G\times\rho_{sub,\max}\times\frac{\rho_{sub}}{9{,}53\times10^3};\nu_{str,\max}^2=G\times\frac{\rho_{sub,\max}^2}{\rho_{sub,\min}}\times\frac{\rho_{sub}}{9{,}53\times10^3} \quad (2.4.1)$$

But together with additional multiplication component that is in charge for «effect of the observer»

$$\frac{\nu_{gr,\min}^2}{\nu^2}=\frac{\rho_{sub,\min}^2}{\rho_{sub,\max}^2}\times\frac{\rho_{sub}}{9{,}53\times10^3};\frac{\nu_{gr,\max}^2}{\nu^2}=\frac{\nu_{el-magn,\min}^2}{\nu^2}=\frac{\rho_{sub,\min}}{\rho_{sub,\max}}\times\frac{\rho_{sub}}{9{,}53\times10^3};$$
$$\frac{\nu_{el-magn,\max}^2}{\nu^2}=\frac{\nu_{str,\min}^2}{\nu^2}=\frac{\rho_{sub,\max}}{\rho_{sub,\min}}\times\frac{\rho_{sub}}{9{,}53\times10^3};\frac{\nu_{str,\max}^2}{\nu^2}=\frac{\rho_{sub,\max}^2}{\rho_{sub,\min}^2}\times\frac{\rho_{sub}}{9{,}53\times10^3} \quad (2.4.2)$$

From (2.4.2) we can see that view of curve which characterize change of frequency spectrum in (2.4.1), have identity with (2.3.3.), but values in (2.4.2.) is located in more high region of values in proportion as substance density more than value of «first particular point» in (2.3).

Not casual also that in (2.3.3), (2.4.2) the values of frequency spectrum for region of gravitational and nuclear interactions change in according with square-law. In the meantime for region of electromagnetic (weak in low range of energy) interaction this law is linear.

Ones more interesting result from [18], [19] for distribution of effective potential of mass is consequence for micro- world then it is expressed in next equation

$$\frac{\Delta m_{sub}}{\Delta r_{sub}}=\Delta\nu^2\times\frac{C_M^2}{c^2\times V_{effM}},\alpha\le2\pi^2\times K_f\times\frac{r_{sub,\max}^2}{l_{Pl}^2}\times\frac{\Delta m_{sub}^4}{C_M^4} \quad (2.5)$$

Then, without rescaling, we have result

$$r_{sub,\max}=\frac{\Delta r_{sub}}{\Delta m_{sub}}\times e\times K_f\times\sqrt{\frac{1}{\pi\times G}}\rightarrow\alpha=\frac{2\pi\times e^2}{G\times C_M^2} \quad (2.5.1)$$

and from (2.5.1) we can see that «constant of electromagnetic interaction» under conditions (2.3.4) is not changing.

But in case the measured length less than Compton's wavelength for electron, the substance density that concentrated in «channel» of reaction (or interaction) will rise to substance density of electron, which equal

$$\rho_{e-} \approx \frac{m_{e-}}{V_{e-}} \approx 2{,}8\times 10^{4}\left[\frac{kg}{m^{3}}\right] \approx \frac{\rho_{pec,sub,1}}{\pi} \tag{2.6}$$

Therefore for conditions

$$\Delta r < \lambda_{e-} \approx 2{,}4\times 10^{-12}[m] \tag{2.6.1}$$

in the Binary Model occur condition for rescaling of the charge, constant of Newton's gravity and for velocity of distribution electromagnetic radiation in vacuum. But value of «constant electromagnetic interaction» in (2.5.1) decrease together with increase of the substance density. Although its chahging according with (2.3.3), (2.4.2) occur by linear law. It have well agreement (with accuracy till coefficient of form) with well-known modern physical conceptions.

From this we can conclude that value of the «constant electromagnetic interaction» also function of distribution of the substance density in space-time. But in the Binary Model the empiric law for its changing may be introduced as more regular law.

Proceeding this analysis into framework of the Binary Model we can write for vicinity of the «second particular point» the distribution of the frequency spectrum as

$$\begin{aligned}
&\frac{\nu^{2}_{gr,\min}}{\nu^{2}} = \frac{\rho^{2}_{sub,\min}}{\rho_{sub,\max}\times 9{,}53\times 10^{3}}; \frac{\nu^{2}_{gr,\max}}{\nu^{2}} = \frac{\nu^{2}_{el-magn,\min}}{\nu^{2}} = \frac{\rho_{sub,\min}}{9{,}53\times 10^{3}};\\
&\frac{\nu^{2}_{el-magn,\max}}{\nu^{2}} = \frac{\nu^{2}_{str,\min}}{\nu^{2}} = \frac{\rho^{2}_{sub,\max}}{\rho_{sub,\min}\times 9{,}53\times 10^{3}}; \frac{\nu^{2}_{str,\max}}{\nu^{2}} = \frac{\rho^{3}_{sub,\max}}{\rho^{2}_{sub,\min}\times 9{,}53\times 10^{3}}
\end{aligned} \tag{2.7}$$

From (2.7) we can conclude that in vicinity of the «second particular law»

$$\Delta\rho_{pec,sub,2} \approx \rho_{pec,sub,2} \pm \rho_{pec,sub,1} \tag{2.8}$$

the distribution of the frequency spectrum have essence differences from (2.3.3), (2.4.2). In (2.7) the substance density always changing by linear law, but angle of inclination for straight lines that characterize these changing have difference for various types of interactions. In particular, with «effect of the observer» [19] we have next equations

$$\begin{aligned}
&\nu_{gr,\min} \approx 5{,}58\times 10^{-36}(Hz) << \nu^{obs}_{Universe}; \nu_{gr,\max} = \nu_{el-magn,\min} \approx 7{,}54\times 10^{-21}(Hz);\\
&\nu_{el-magn,\max} = \nu_{str,\min} \approx 1{,}38\times 10^{10}(Hz); \nu_{str,\max} \approx 1{,}87\times 10^{25}(Hz)
\end{aligned} \tag{2.9}$$

From (2.7)...(2.9) we can conclude that in vicinity of «second particular point» occur reverse shift of the frequency spectrum for interactions: the gravitational interaction have shift to region of the electromagnetic interaction, but electromagnetic interactions have shift to region of the nuclear (strong) interaction. And equations (2.3.4.1), (2.3.4.2) for additional gravitated mass have transformation in one new equation

$$M_{gr}\times R_{sub}\times 3\rho^{2}_{sub,\max}\times c \approx K_{f}\times V^{2}_{effM}\sqrt{\frac{\rho_{sub,\max}}{\Delta\rho_{pec,sub,2}}}\left(\sqrt{\rho_{sub,\max}} - \sqrt{\Delta\rho_{pec,sub,2}}\right)^{2} \tag{2.9.1}$$

3 Interactions in the Binary Model of Distribution of the Substance Dencity

All types of interaction in the Binary Model is introduced through set of four types: gravitational and magnetic as a reaction of environment on perturbations on the substance density (wave component);

electrical and nuclear as perturbation of the substance of particle (particle component). As a model object we look on symmetrical oscillator with distribution of the substance density which divides on submitted wave component and particle component. The null and first harmonic on the graphical view is appropriate dividing on the wave and particle components in the Binary Model.

From here in the Binary Model is selected some possible scenarios of evolution baryon and antibaryon matter in period one oscillator.

For every moment of time, relative interval of the substance density [18] equal

$$\delta\rho_{\max,sub}^{\min,sub} = 2^{32\pi} \approx 1{,}83\times10^{30} \tag{3.1}$$

But for interval with «effect of the observer» not equal zero

$$\delta\rho_{\max,sub}^{sup\,er\,\max,sub} = 2^{14\pi} \approx 1{,}74\times10^{13} \tag{3.2}$$

Thus, full relative interval of the substance density in the Binary Model equal

$$\delta\rho_{\min,sub}^{sup\,er\,\max,sub} = 2^{46\pi} \approx 3{,}18\times10^{43} \tag{3.3}$$

and it include all the substance density from critical to nuclear density of substance in the observed region of the Universe [1]

$$\begin{aligned}&\rho_{\min,sub} \approx \rho_{crit,sub} \approx 5{,}2\times10^{-27}\left[\frac{kg}{m^3}\right], \rho_{sup\,er\,\max,sub} \approx \rho_{str-\max,sub} \approx \\ &\approx \rho_{\min,sub}\times\delta\rho_{\min,sub}^{sup\,er\,\max,sub} \approx 1{,}65\times10^{17}\left[\frac{kg}{m^3}\right]\end{aligned} \tag{3.4}$$

The beginning in the observed region of the Universe is

$$\rho_{14,EL} = \rho_0 \approx 1{,}57\left[\frac{kg}{m^3}\right] \tag{3.5}$$

The law of the symmetry in the Binary Model is consequence of location of the terms in main matrix relatively of the main diagonal [18, 19]

$$\left\|\begin{matrix} +\frac{\partial\rho}{\partial\rho} & -\frac{\partial\rho}{\partial\upsilon} & +\frac{\partial\rho}{\partial r} & -\frac{\partial\rho}{\partial\tau} \\ -\frac{\partial\upsilon}{\partial\rho} & +\frac{\partial\upsilon}{\partial\upsilon} & -\frac{\partial\upsilon}{\partial r} & +\frac{\partial\upsilon}{\partial\tau} \\ +\frac{\partial r}{\partial\rho} & -\frac{\partial r}{\partial\upsilon} & +\frac{\partial r}{\partial r} & -\frac{\partial r}{\partial\tau} \\ -\frac{\partial\tau}{\partial\rho} & +\frac{\partial\tau}{\partial\upsilon} & -\frac{\partial\tau}{\partial r} & +\frac{\partial\tau}{\partial\tau} \end{matrix}\right\| \equiv \left\|\begin{matrix} +1 & -GR\tau & +GR\tau^2 & -\frac{R^2\lambda}{cV_{effM}} \\ -\frac{1}{GR\tau} & +1 & -\tau & +\frac{R'}{\tau} \\ +\frac{1}{GR\tau^2} & -\nu & +1 & -\frac{1}{c} \\ -\frac{cV_{effM}}{R^2\lambda} & +\frac{\tau}{R'} & -c & +1 \end{matrix}\right\| \tag{3.6}$$

In the Binary Model predict evolution of the substance by using some «channels». But in this point of view symmetrical is only such «channels» with terms that is located symmetrical relatively of the main diagonal of matrix (3.6).

The asymmetry of «channels» in the Binary Model is cause for violation of the law baryon of symmetry, but the presence in the Binary Model «of effect of the observer «is cause for violation of the scale invariant law.

Look on the one oscillation of the symmetrical oscillator and reaction of the substance environment in accordance with submitted dividing. So, for one period of the oscillation we have four function

$$\sin(\alpha),\sin(2\alpha),\cos(\alpha),\cos(2\alpha);\alpha=\log_2\left(\frac{\rho[\tau]}{\rho_0}\right)\approx 57{,}2978^\circ\times\frac{\lg\left(\rho[\tau]/\rho_0\right)}{\lg 2}\approx$$
$$\approx 190{,}33917^\circ\times\lg\left(\frac{\rho[\tau]}{\rho_0}\right) \tag{3.7}$$

In the graphical mode for all four function this modulation is showed in appendix, on the picture 7.1

The values of the function distribution on the picture 7.1, that is present in positive mode, is appropriate in the Binary Model for baryon matter, but, that is present in negative mode, is appropriate for anti- baryon matter.

Deciding in graphical mode the equation that present on the picture 7.1, for cases of crossing different functions, we have:

– for baryon matter

$$\sin(2\alpha)=\cos(2\alpha)\to\alpha=22{,}5^\circ;\sin(2\alpha)=\cos(\alpha)\to\alpha=30^\circ;\sin(2\alpha)=\sin(\alpha)\to\alpha=60^\circ;$$
$$\cos(2\alpha)=\sin(\alpha)\to\alpha=150^\circ;\cos(2\alpha)=\sin(2\alpha)\to\alpha=202{,}5^\circ \tag{3.7.1}$$

– for anti- baryon matter

$$\cos(2\alpha)=\sin(2\alpha)\to\alpha=112{,}5^\circ;\cos(2\alpha)=\cos(\alpha)\to\alpha=120^\circ;\cos(2\alpha)=$$
$$=\cos(\alpha)\to\alpha=240^\circ;\sin(2\alpha)=\cos(2\alpha)\to\alpha=292{,}5;\sin(2\alpha)=\sin(\alpha)\to 300^\circ;\sin(2\alpha)= \tag{3.7.2}$$
$$=\cos(\alpha)\to 150^\circ;\sin(\alpha)=\cos(\alpha)\to\alpha=225^\circ$$

From (3.7.1), (3.7.2) we have equation for four «channels»in relative units:

– for baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[0{,}00;0{,}17];[0{,}17;0{,}83];[0{,}83;1{,}00] \tag{3.7.3}$$

2) symmetrical «channel»for zero harmonic of wave component

$$[0{,}00;0{,}17];[0{,}17;0{,}75];[0{,}75;1{,}00] \tag{3.7.4}$$

3) non symmetrical «channel» with one excess point of transformation for first harmonic of particle component

$$[0{,}00;0{,}25];[0{,}25;0{,}33];[0{,}33;0{,}67];[0{,}67;1{,}00] \tag{3.7.5}$$

4) non symmetrical «channel»for first harmonic of wave component

$$[0{,}00;0{,}25];[0{,}25;1{,}00] \tag{3.7.6}$$

– for anti- baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[0{,}00;0{,}25];[0{,}25;0{,}67];[0{,}67;1{,}00] \tag{3.7.7}$$

2) non symmetrical «channel» with two excess points of transformation for zero harmonic of wave component

$$[0{,}00;0{,}17];[0{,}17;0{,}33];[0{,}33;0{,}75];[0{,}75;0{,}83];[0{,}83;1{,}00] \tag{3.7.8}$$

3) symmetrical «channel»for first harmonic of particle component

$$[0{,}00;0{,}25];[0{,}25;0{,}67];[0{,}67;1{,}00] \tag{3.7.9}$$

4) symmetrical «channel»for first harmonic of wave component

$$[0,00;0,17];[0,17;0,75];[0,75;1,00] \quad (3.7.10)$$

In the graphical mode for «channels»of baryon and anti- baryon matter is showed in appendix, on the picture 7.2

Comparison (3.7.3)...(3.7.6.) with (3.7.10) is show, that «channels» of evolution for baryon and anti-baryon matter is not symmetrical. In this mind the baryon asymmetry, violation of the scale invariant law in region of superhigh energy in frame of the Binary Model exist as consequence of asymmetry of the «channels».

So, in phase units (3.7.3)...(3.7.10) have following view:

– for baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[0,0°;30,0°];[30,0°;150,0°];[150,0°;180,0°] \quad (3.7.3.1)$$

2) symmetrical «channel»for zero harmonic of wave component

$$[135°,0;150,0°];[150,0°;202,5°];[202,5°;225,0°] \quad (3.7.4.1)$$

3) non symmetrical «channel» with one excess point of transformation for first harmonic of particle component

$$[0,0°;22,5°];[22,5°;30,0°];[30,0°;60,0°];[60,0°;90,0°] \quad (3.7.5.1)$$

4) non symmetrical «channel»for first harmonic of wave component

$$[180,0°;202,5°];[202,5°;270,0°] \quad (3.7.6.1)$$

– for anti- baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[180,0°;225,0°];[225,0°;300,0°];[300,0°;360,0°] \quad (3.7.7.1)$$

2) non symmetrical «channel» with two excess points of transformation for zero harmonic of wave component

$$[90,0°;120,0°];[120,0°;150,0°];[150,0°;225,0°];[225,0°;240,0°];[240,0°;270,0°] \quad (3.7.8.1)$$

3) symmetrical «channel»for first harmonic of particle component

$$[180,0°;225,0°];[225,0°;300,0°];[300,0°;360,0°] \quad (3.7.9.1)$$

4) symmetrical «channel»for first harmonic of wave component

$$[225,0°;240,0°];[240,0°;292,5°];[292,5°;315,0°] \quad (3.7.10.1)$$

In units of relative interval of the substance density (3.7.3.1)...(3.7.10.1) is showing in the next equations:

– for baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[1,00;1,44];[1,44;6,14];[6,14;8,82] \quad (3.7.3.2)$$

2) symmetrical «channel»for zero harmonic of wave component

$$[5,12;6,14];[6,14;11,58];[11,58;15,21] \quad (3.7.4.2)$$

3) non symmetrical «channel» with one excess point of transformation for first harmonic of particle component

$$[1,00;1,31];[1,31;1,44];[1,44;2,07];[2,07;2,97] \quad (3.7.5.2)$$

4) non symmetrical «channel»for first harmonic of wave component

$$[8,82;11,58];[11,58;26,21] \quad (3.7.6.2)$$

– for anti- baryon matter

1) symmetrical «channel»for zero harmonic of particle component

$$[8,82;15,21];[15,21;37,68];[37,68;77,88] \quad (3.7.7.2)$$

2) non symmetrical «channel» with two excess points of transformation for zero harmonic of wave component

$$[2,97;6,14];[6,14;11,58];[11,58;15,21];[15,21;18,23];[18,23;26,21] \quad (3.7.8.2)$$

3) symmetrical «channel»for first harmonic of particle component

$$[8,82;15,21];[15,21;37,68];[37,68;77,88] \quad (3.7.9.2)$$

4) symmetrical «channel»for first harmonic of wave component

$$[15,21;18,23];[18,23;34,41];[34,41;45,18] \quad (3.7.10.2)$$

From (3.7.3.2)...(3.7.10.2)and from pictures 7.2, 7.3 in appendix is showing, that for particle component of baryon matter increasing full energy into symmetrical «channel» occur to big value of relative gradient of the substance density, than for non symmetrical «channel». In the meanwhile, for wave component, such non symmetrical «channel» have more relative gradient of the substance density, than symmetrical «channel» and, consequently, more energy of field, than symmetrical «channel».

For particle component of anti- baryon matter in frame of the Binary Model is predicting equal increasing of full energy as for symmetrical, so and for non symmetrical «channel». But for wave component in this case the symmetrical «channel» have more relative gradient of the substance density, than non symmetrical.

Additional asymmetry in frame of the Binary Model occur from difference of beginning values of relative gradient of the substance density for zero harmonic and for first harmonic of oscillator in cases for baryon and anti- baryon matter. In particular, it means, that for increase of relative gradient of substance in case of baryon matter, the particles had forming earlier than was formed the fields interactions; but increase of relative gradient of substance for case of anti- baryon matter, the fields interaction had forming earlier, than was formed the particles.

Non casual also that forming of particle component for anti- baryon matter not occur together with particle component of baryon matter. It completely accord with experimental data [1], [3], [4], [9] and with researching of other authors, which have relation for various scales in frame of cosmology [6]...[8], [11]...[14], [16].

In this mind, for first harmonic of baryon matter the particle and wave components always are shared by gradient of the substance density. Both components is forming in non symmetrical «channel». For anti- baryon matter both components is forming in symmetrical «channel» and relative gradient of the substance density for particle component completely include relative interval of the substance density for wave component.

Relative graphical view for units of relative gradient of the substance density in (3.7.3.2)...(3.7.10.2) is showing in appendix on the picture 7.3.

4. The basic conclusions and problems of modern conceptions «Great Unification»

In accordance with modern conceptions, strong, electromagnetic and weak interaction between particles exist due to reactions of radiation and absorption of other particles – of interactions agents [1].

For example, the electromagnetic interaction have photons as a these agents. But law for interaction of particles with charge allows to enter indefinite constant, which experimentally not depend upon distance, if this distance more than Compton's wavelength for electron, i.e.

$$\alpha = const \approx \frac{1}{137}, l \geq \lambda = \frac{\hbar}{m_{e-} \times c} \approx 4 \times 10^{-13} [m] \tag{4.1}$$

Is like as for electromagnetic interaction, weak interaction exist due to changing by three intermediates particles – bozons *W(+)*, *W(-)* и *Z(0)*. The constant of weak interaction have close value to constant of electromagnetic interaction. But due to essential mass of agents interaction, the radius of action for this interaction is limited by wavelength *W*-бозона and equal approximately,

$$l_W \leq 10^{-18} [m] \tag{4.1.1}$$

that is equivalent for energy more than *100 GeV*, and mass of agents of the weak interaction, determined from experimental and conterminous with prediction of theory, is equal

$$m_{W^{\pm}} \approx (81 \pm 2) GeV, m_{Z^0} \approx (93 \pm 2) GeV \tag{4.1.2}$$

Due to necessary symmetry between electromagnetic and weak interactions, in modern theory is entered definition for electro- weak interaction, that is determined by two undependent constants and through these constants we can give determination for constant of electromagnetic or weak interaction in next way

$$\alpha_1, \alpha_2 : \alpha(r_2) = \frac{\alpha(r_1)}{1 + b \times \alpha(r_1) \times \ln\left(r_2^2 / r_1^2 \right)}, r \leq \lambda = \frac{\hbar}{m_{e-} \times c} \tag{4.2}$$

The dependence *a(r)* have slow logarithmic character, which we can learned through energy of interacted particles: than more energy, when closer in distance one to other. The value and sign of constant *b* in (4.2) is depended from character of interaction. Changing in (4.2) is determined completely by «shielding» of charge of the virtual particles which are born in vacuum [1].

Strong interaction is defined by exchange one additional type of intermediate bozon – gluion, which have «colour» change and, in accordance with modern physical conceptions, such charge exist in three types and, consequently, exist eight types of gluions. The constant for strong interaction is determined as *a(c)* [1].

Theoretically, all three types of constants *a(1)*, *a(2)*, *a(c)* are becomes equal each to other in energy approximately,

$$\varepsilon_{GU} > (10^{14} \div 10^{15}) GeV \tag{4.2.1}$$

that is appropriate the distance

$$R \leq 10^{-31} (m) \tag{4.2.2}$$

on which all three types of interactions must is determined of one constant and have universal nature.

Main conclusions from modern models of «Great Unification» are baryon asymmetry of Universe, which have convoying in transformations of particles each in other; «cellular» structure of vacuum, when regions with various conditions of vacuum, which are divided each from other by «walls» with huge density of energy; magnetic monopoles – such particles, which have elementary magnetic charge.

In the meantime, present models of «Great Unification» requires introduction of additional vectorial particles – agents of interactions for adrons with leptons. The mass these particles is shown in (4.2.1) and is located far from limits of energies, which might be really possible in the near future. In time of interaction these particles, the baryon and lepton charges not conservate and number of such particles, which predicted by modern theories, are grown up to one hundred things. Such requiring of «expand-

ing» quality of particles is pure theoretical requiring, but not from experiment. Therefore we can't exclude theoretical scheme, which would allow to avoid without especial expanding a lot of particles that also is known. One from many such possibilities is search more fundamental objects, which could be components of all particles: from superlight leptons to superheavy bozons. The main problems in this direction is absence of good decision for equation in quantum mechanics concerning such objects, where

$$\left(\frac{h}{m\times c}\right)\times r\approx 1\rightarrow \frac{h}{m\times c}\approx \frac{1}{r} \tag{4.2.3}$$

Besides, well-known problem is violation of scale invariance. The form of equation for scale invariant in section square of reaction (*d /sigma*) and for energy, more than some *GeV* may be written in next view

$$d\sigma = f\left(s,q^2\right)\times\begin{cases}\alpha^2\\ G_f{}^2\end{cases} \tag{4.3}$$

where */alpha* is constanta of electromagnetic interaction, *G(f)* is constant of Fermi for weak interaction [9].

This conception predict that if values square of full energy into systems of centre inertia (*s*) and square of impulse in four dimensions from lepton (q^2) are essentially exceed square of mass lepton or (and) square of mass adron, which take place in reaction, these masses of lepton and adron in (4.3) equals zero. But radiation additional components, which occur in case of high energies, not equal zero, but amount, which proportionally component in next formula

$$\alpha\times\ln\left(\frac{s}{m_e{}^2}\right) \tag{4.3.1}$$

and not give hope about exact formulation in conception of scale invariance.

Next very serious problem is limit of applying in theory of Fermi. Most of known reactions for weak interaction we can define with using effective lagrangian with account of constant Fermi and current from lepton and adron

$$L_{eff} = \frac{1}{\sqrt{2}}\times G_f\times\left(J_\lambda^+ + j_\lambda^+\right)\times\left(J_\lambda + j_\lambda\right) \tag{4.4}$$

However, also in limit of energy that equal approximately 300 *GeV* this prediction of theory Fermi go to contradiction with requiring of unitary and, consequently, is obviously not well [9].

Same we can say concerning so called problem «not convergence» of masses, when theoretically predictable correction in mass of particles, which is determined by electromagnetic interaction, is infinity. Nevertheless, it have not confirmation in experiment.

Simplest method for avoiding this contradiction is indefinite metrics. The essence such method consist in entering complex field with metrics with different charges instead of ordinary field of photons with zero mass and metrics [9].

5. The basic parameters of Theory «Great Unification» in the Binary Model of distribution of the substance density

As we can see from analysis in [18], [19] and in this paper, in frame of the Binary Model exist all four known types of interactions. These exist through radiation and absorption of particles for agents of interactions. But, in difference from other modern conceptions, the process for birth of particles – agents

of interactions occur due to changing of value of the substance density, which concentrate into «channel» of reaction (interaction) between interacting particles.

The distribution for frequency spectrum is presented in (2.1). In according with it, in the binary Model all four types of interactions are divided in time.

As presented in earlier paper [18], for gravitational and electromagnetic interaction

$$E_{el,0} = \frac{1}{2} h\nu_{el,\min} = \frac{1}{2} C_M \times l_{Pl} \times c; E_{gr,0} = \frac{1}{2} M_{gr} \times c \times \nu_{gr,\min} \times \frac{V_{effM}}{\sqrt{\rho_{sub,\min} \times \rho_{sub,\max}}} \tag{5.1}$$

In the Binary Model [18] is presented, that nature for these two interactions is determined in distribution of gradient of the substance density in space-time. The constant of electromagnetic interaction till vicinity of first «particular point» is constant, because condition for rescaling is absent. But if density of substance, which concentrate in «channel» of reaction (interaction), is not excess value for vicinity of first «particular point», weak and nuclear interactions in the Binary Model are absent. For electromagnetic and gravitational types of interactions for baryon matter the symmetrical «channels» (3.7.3.2), (3.7.4.2) are accordance, when for anti- baryon matter for electrical component of electromagnetic interaction is accordance symmetrical «channel» (3.7.7.2), but for magnetic component of electromagnetic interaction and for gravitational interaction – non symmetrical «channel» (3.7.8.2). Thus, in whole for anti- baryon matter, the Binary Model predict non- symmetrical «channel» of evolution for interactions in vicinity of first «particular point».

The distribution for frequency spectrum in this region of values for the substance density is defined in (2.3.3).

For interval of the substance density between first and second «particular points» in the Binary Model begin acting the «effect of the observer» as a result of rescaling (restructuring) of velocity for electromagnetic interaction, constant of Newton gravity and other physical functions, which in frame of the binary Model are functions of distribution of the substance density in space-time.

As a result such rescaling in the Binary Model occur excess of pressure for the groups of vertical distribution [19], that, in particular, is reason for non stability of nucleus of atoms if they have density of substance more than value of first «particular point» and, as a consequence, occur non zero weak interaction.

By these conditions instead (4.2) for common conceptions of «Great Unification», in the Binary Model occur more regular law for changing of constants of the electromagnetic and weak interactions,

$$\alpha_{em} \approx \alpha_{weak} \approx \frac{2\pi \times e^2(r)}{C_M \times l_{Pl} \times c^2(r) \times \sin^2[\varphi(r)]}, e(r) = C_M \times l_{Pl} \times 2\pi \times V_{effM} \times \frac{\sqrt{G(r)}}{m(r)}, \tag{5.1.1}$$
$$m(r) = \rho_{sub} \times V[1], V[1] = 1[m^3]$$

in which exist condition for rescaling of charge, like for function of gradient of the substance density in space-time.

In the meantime, for vicinity of boundary for dividing of the substance density in groups of vertical distribution, when density in «channel» of reaction (interaction) exactly is multiple to boundary value of the substance density

$$\frac{\rho_{sub}}{\rho_0} = 2^{\pm n \times \pi} \tag{5.2}$$

occur additional stability for nucleuses of atoms due to that such values in distribution of the substance density in space-time are barriers.

From (2.5) the radius and density of substance for nucleuses are calculate in the Binary Model

$$r_{nuclear} \approx \frac{2{,}2\times10^{-42}}{m_{nuclear}}[m], \rho_{nuclear} \approx \frac{m_{nuclear}^4}{2{,}51\times10^{-125}}\left[\frac{kg}{m^3}\right], m_{nuclear} \approx \sum\left(m_p + m_N\right) \tag{5.3}$$

Comparison with calculations in [18] and (5.3), (3.7.3.1)...(3.7.10.1) is show that in the Binary Model existance of «magic» nucleuses have explanation due to phase balance in these nucleuses baryon and anti- baryon matter. Thus, the Binary Model predict the symmetry conservation for baryon and anti-baryon matter for «magical» nucleuses [1]. But reaction of interaction of baryon and anti- baryon matter in this case not act, because these components in such nucleuses are dividing in space-time (appendix, picture 7.3).

On the limit of vicinity of the first «particular point» occur change in evolution of baryon and anti-baryon matter. Thus for weak and strong interactions for baryon matter are accordance non symmetrical «channels» (3.7.5.2), (3.7.6.2), when for anti- baryon matter these «channels» are (3.7.9.2), (3.7.10.2).

Distribution for frequency spectrum in this region of values of the substance density is defined in (2.4.2).

In time of changing of the substance density on interval (2.4) from first «particular point» to second «particular point» in additional to change of «channels» of reaction occur changes for law of distribution of frequency spectrum, that is defined in (2.7). The constant of Fermi in the binary Model under these conditions is function of rescaling from constant of Newton gravity in dependence from distribution gradient of the substance density in space-time, i.e.

$$G_f = func\left[G, \frac{\Delta\rho_{pec,sub,2}}{\Delta\rho_{pec,sub,1}}\right] \tag{5.5}$$

In this case the scale of energy, in which all types of interaction is described by using universal constants, have not such specific importance, as for modern physical conceptions of «Great Unification». It is possible due to «effect of the observer» in the frame of the Binary Model and due to rescaling basic values in region of gradient of the substance density, which more than value of first «particular point» in (2.2).

In summary, we can see, that in frame of the Binary Model for every type of interactions exist oneself views for main matrix. For gravitational interaction this view accordance in (3.6). For electromagnetic interaction it have transformation in

$$\left\|\begin{matrix} +1 & -\sqrt{\frac{h^3}{m_{sub}^2\times C_M^2\times\rho_{sub}}} & +\frac{h}{m_{sub}\times\rho_{sub}\times c} & -\frac{m_{sub}^3\times c^8}{h^3\times V_{effM}} \\ -\sqrt{\frac{m_{sub}^2\times C_M^2\times\rho_{sub}}{h^3}} & +1 & -\frac{h}{m_{sub}\times c} & +\frac{2\rho_{sub}\times l_{Pl}\times c^2}{C_M} \\ +\frac{m_{sub}\times\rho_{sub}\times c}{h} & -\frac{m_{sub}\times c}{h} & +1 & -\frac{1}{c} \\ -\frac{h^3\times V_{effM}}{m_{sub}^3\times c^8} & +\frac{C_M}{2\rho_{sub}\times l_{Pl}\times c^2} & -c & +1 \end{matrix}\right\| \tag{5.6}$$

For weak interaction

$$\left\| \begin{array}{cccc} +1 & -\sqrt{\frac{h^3 \times \rho_{sub}^{1/2}}{m_{sub}^2 \times C_M^2 \times \rho_{pec,sub,1}}} & +\frac{h}{m_{sub} \times \rho_{sub} \times c} & -\frac{m_{sub}^3 \times c^8}{h^3 \times V_{effM}} \times \frac{\rho_{sub}^{5/2}}{\rho_{pec,sub,1}^{5/2}} \\ -\sqrt{\frac{m_{sub}^2 \times C_M^2 \times \rho_{pec,sub,1}}{h^3 \times \rho_{sub}^{1/2}}} & +1 & -\frac{h}{m_{sub} \times c} & +\frac{2\rho_{sub}^2 \times l_{Pl} \times c^2}{C_M \times \rho_{pec,sub,1}} \\ +\frac{m_{sub} \times \rho_{sub} \times c}{h} & -\frac{m_{sub} \times c}{h} & +1 & -\frac{\rho_{pec,sub,1}^{1/2}}{c \times \rho_{sub}^{1/2}} \\ -\frac{h^3 \times V_{effM}}{m_{sub}^3 \times c^8} \times \frac{\rho_{pec,sub,1}^{5/2}}{\rho_{sub}^{5/2}} & +\frac{C_M \times \rho_{pec,sub,1}}{2\rho_{sub}^2 \times l_{Pl} \times c^2} & -c \times \frac{\rho_{sub}^{1/2}}{\rho_{pec,sub,1}^{1/2}} & +1 \end{array} \right\| \quad (5.7)$$

and for strong interaction

$$\left\| \begin{array}{cccc} +1 & -G_f^{1/2} \frac{C_M^2}{V_{effM}^{3/2} m_{sub} \rho_{pec,sub,2}^{1/2}} & +\frac{C_M^2}{m_{sub} V_{effM} \rho_{pec,sub,2}} & -\frac{C_M^4}{G_f^{1/2} m_{sub}^2 V_{effM}^2 \rho_{pec,sub,2}^{1/2}} \\ -\frac{m_{sub} V_{effM}^{3/2} \rho_{pec,sub,2}^{1/2}}{G_f^{1/2} C_M^2} & +1 & -\sqrt{\frac{1}{G_f \rho_{pec,sub,2}}} & +\rho_{pec,sub,2} G_f \\ +\frac{m_{sub} V_{effM} \rho_{pec,sub,2}}{C_M^2} & -\sqrt{G_f \rho_{pec,sub,2}} & +1 & -\frac{1}{c} \\ -\frac{G_f^{1/2} m_{sub}^2 V_{effM}^2 \rho_{pec,sub,2}^{1/2}}{C_M^4} & +\frac{1}{G_f \rho_{pec,sub,2}} & -c & +1 \end{array} \right\| \quad (5.8)$$

6. Brief conclusions

This analysis is show, that the Binary Model would is useful not only for particular cases of modeling of behavior gravitational field, what was presented in earlier paper [19], but for more common cases, when the modeling in frame conceptions of Great Unification or Supergravity is possible. In this case the universal form for all well-known types of interaction is gradient of the substance density, distributing in space-time.

As we can see from [18], [19], the Binary Model of distribution of the substance density have in essence such predictable force as and modern physical conceptions of «great unification». But, in difference from them the Binary Model, in this mind, more closer to scheme of «supergravitation», when we add the gravitational interaction to uniform nature of electromagnetic, weak and strong interactions. All these four types of interactions we can describe in frame of the Binary Model with using of universal functions, which partially rescaling into interval between from «first» to «second» «particular points». In addition to it, in the Binary Model occur four various «channels» against one symmetrical «channel» in modern physical conceptions.

It show, that in frame of the Binary Model the transformations of various types of interactions is possible together with increasing of values of the substance density, concentrated in «channel» of reaction (interaction), what not had been researched earlier till present paper.

In addition, in frame of the Binary Model exist prediction about preservation of symmetry for baryon and anti- baryon matter in substance with nucleuses, which are appropriate for sequence from so called «magic» numbers for observed region of Universe.

In this mind, the Binary Model can be showing as a appendix of modern quantum mechanics, where behavior of weak interaction in region of high and superhigh energy have essence difference from behavior in region of low energy, when the theory well agree with experimental data [3], [9].

7. Appendix

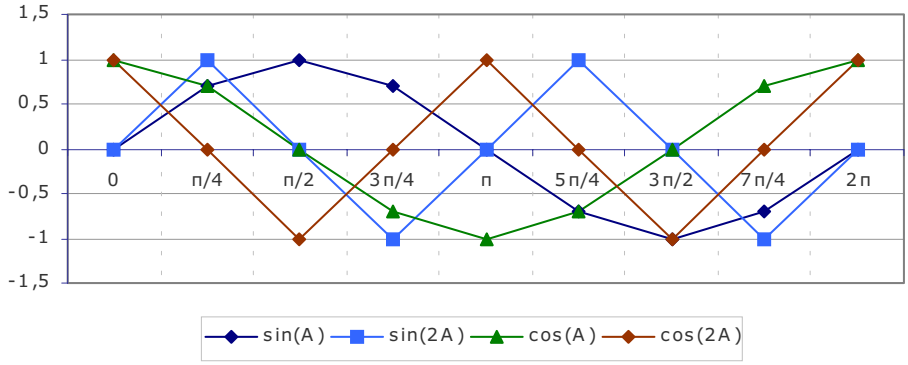

Fig. 7.1. The distribution of harmonic function in the Binary Model

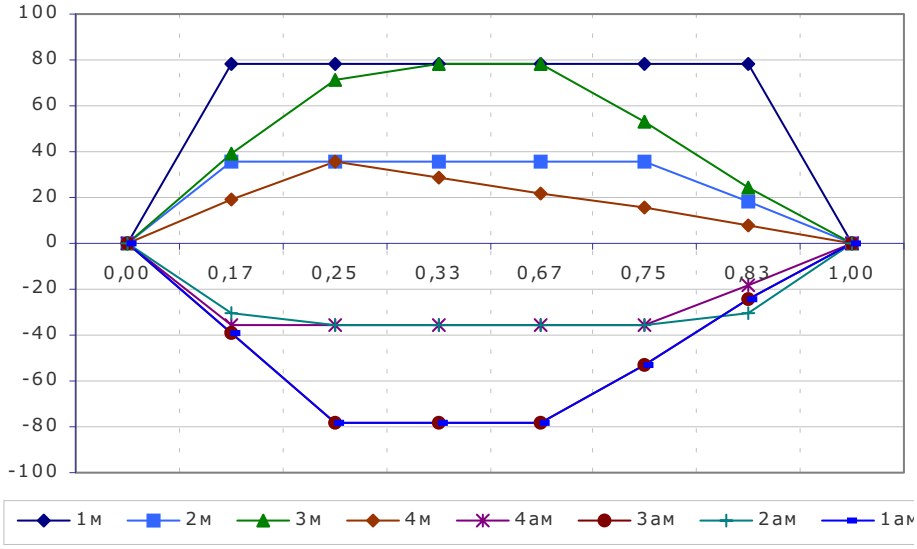

Fig. 7.2. The "channels" of evolution for matter (м) and anti- matter (ам) in the Binary Model

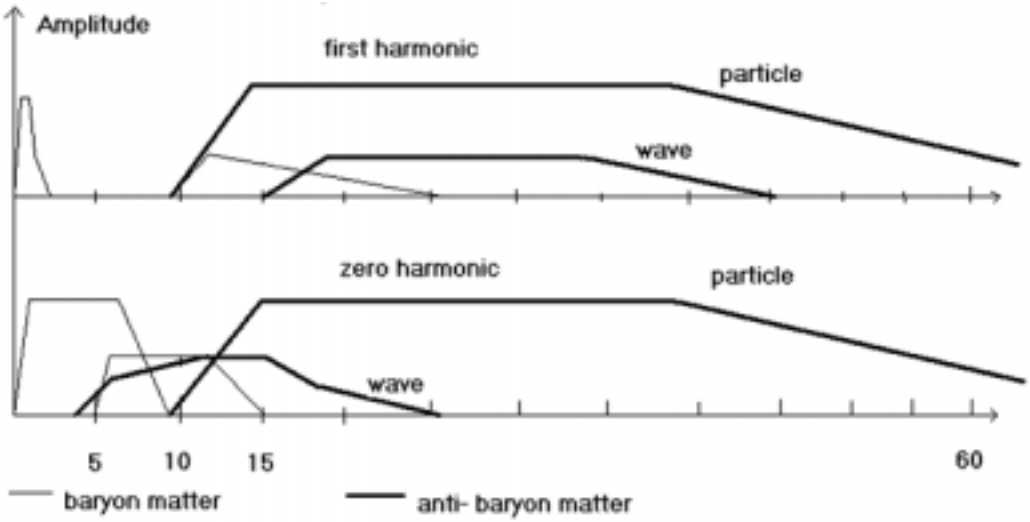

Fig. 7.3. The distribution of «channels» for baryon and antibaryon matter on the axis of relative gradient of the substance density

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