A Counterpart of the Isotropic Gamma-Ray Bursts in the Centres of Created Baryons

Sylwester Kornowski

Abstract: Here, applying the dynamics of the cores of baryons described within the Scale-Symmetric Theory (SST), we explain the origin of the isotropic Gamma-Ray Bursts (GRB).

An introduction to the problems associated with the gamma-ray bursts (GRB) can be found in the paper [1].

Here we show how the dynamics in the cores of baryons described within the Scale-Symmetric Theory (SST) [2] leads to the origin of the isotropic Gamma-Ray Bursts (GRB).

In sufficiently energetic collisions of baryons are created the baryon-antibaryon pairs. At first there is created the torus-antitorus pair. The torus (i.e. electric-charge), which is placed in the core of baryons, produces the large loop with a mass of $m_{LL} = 67.544545084$ MeV. Circumference of it is $2\pi \cdot 2A/3$, where A is the equatorial radius of the torus/electric-charge.

Next there is transition from the circle to its radius so mass increases 2π times

$$Y^* = 2\pi\, m_{LL} = 424.394893 \text{ MeV} . \qquad (1)$$

We can see that there is the radial motion (collapse) of the mass Y^*. It behaves as a collapsing gas so we can apply the theory of stars to calculate the emitted energy. Finally there is created the “black hole” in respect of the nuclear weak interactions.

We know that emitted energy is directly proportional to four powers of temperature while from the Wien’s displacement law (it is for the black-body radiation) we have that absolute temperature is inversely proportional to wavelength (here it decreases from $2\pi r$ to r) i.e. emitted energy is directly proportional to $1/(2\pi)^4$

$$\Delta E = Y^* / (2\pi)^4 = 0.272302 \text{ MeV} . \qquad (2)$$

The resultant mass of the weak “black hole” is

$$Y = [Y^* (1 - 1 / (2\pi)^4] = 424.122588 \text{ MeV} . \qquad (3)$$

We can use formula (2) to calculate energies emitted in the isotropic gamma-ray bursts (GRB).

SST shows that there are the neutron “black holes” (NBHs) – spin speed of photons on their equators is equal to the speed of light in “vacuum”. Mass of the NBHs is 24.8 times higher than the mass of the Sun [3].

More massive “black holes” are the associations of the NBHs but due to the four-object symmetry, their numbers in the “black holes” are quantized [3]

$N = 4^d$, where d = 0, 1, 2, 4, 8, 16, 32 for flat spheroids
$N^* = 4^d$, where d = 3, 6, 12 for chains.

Notice that energy equivalent to the mass of the Sun is $E_o = 1.8 \cdot 10^{54}$ erg.

Applying formula (2) we can calculate, for example, the total energy emitted during production of $4^4 = 256$ NBHs

$$\Delta E = 256 \cdot 24.8\ E_o / (2\pi)^4 = 4.07\ E_o = 7.3 \cdot 10^{54}\ \text{erg}\ . \qquad (4)$$

It corresponds to the total energy emitted in the highest-energy gamma-ray emission from GRB 080916C: $8.8 \cdot 10^{54}$ erg [4].

Generally, most of the emitted photons should have energy about 0.27 MeV (see formula (2)).

Of course, the GRBs can be also the results of creation of neutron stars so emitted energy can be much lower.

References

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