The Lower Limit for Mass of Stars with Stable Hydrogen Burning

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Abstract: Here, on the basis of the star-quantum resonance described in the Scale-Symmetric Theory (SST), we calculated the lower limit for mass of stars with stable H burning - it is 0.0818 solar mass.

Introduction and motivation

According to the Scale-Symmetric Theory (SST) [1], [2], the mass of a star, M_{Star}, defines the energy of the quanta, E_E, with the highest number density [3]. Such energies are directly proportional to masses of stars. When energies/quanta equal to the energies characteristic for the atom-like structure of baryons appear [1], phenomena occur that lead to the characteristic thresholds for stars, for example, to the maximum and minimum mass of the neutron stars (NSs) or to the mass of the Type Ia supernova, and so on [2], [4], [5]. We can see that stars (the NSs as well) with well-defined masses and the corresponding quanta fall into resonance (the star-quantum resonance), which leads to a rapid transformation of the star.

Here we show that such a star-quantum resonance leads also to the lower limit for mass of stars with stable H burning.

The formula for the star-quantum resonance looks as follows

$$M_{Star} / M_{NBH} = E_E / M_{Neutron} , \quad (1)$$

where $M_{NBH} = 24.81$ **solar masses** is the mass of the neutron black hole (NBH) [2], and $M_{Neutron} = 939.565$ MeV is the mass of neutron calculated in SST [1].

In the theory of baryons, there appears the electromagnetic binding energy of electron with the core of baryons – it is $E_E = 3.097$ MeV which is needed to produce the virtual and real Higgs bosons with a mass of 125.0 GeV [1] (see formula (160) in [1]).

Production of the virtual *massive* Higgs bosons from the SST Einstein-spacetime (Es) components (so the local density of the Es radically decreases) in the core of a star, significantly reduces creation of other virtual quanta what counteracts the transformation of hydrogen into helium. Such phenomena cause that the star transforms into a brown dwarf. To transform protons into neutrons, nuclear plasma needs virtual quanta with energy of 7.12 MeV [1].

From (1), for $E_E = 3.097$ MeV, we obtain $M_{Star} = 0.0818$ **solar mass** which is the lower limit for mass of stars with stable burning of hydrogen.

References

[1] Sylwester Kornowski (25 September 2020). “Foundations of the Scale-Symmetric Physics (Main Article No 1: Particle Physics)” http://vixra.org/abs/1511.0188

[2] Sylwester Kornowski (14 February 2019). “Foundations of the Scale-Symmetric Physics (Main Article No 2: Cosmology)” http://vixra.org/abs/1511.0223

[3] Sylwester Kornowski (17 January 2016). “The Tower of the Chandrasekhar Limits and Spin Periods of Pulsars” http://vixra.org/abs/1501.0213

[4] Sylwester Kornowski (3 November 2020). “The Lower Limit for Mass and Radius of Neutron Stars” http://vixra.org/abs/2011.0037

[5] Sylwester Kornowski (30 October 2020). “The TOV Limit as an Illusion” http://vixra.org/abs/2010.0231