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Primordial Helium In The Left-Right Symmetry Model With Extra Scalar Fields

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Big Bang Nucleosynthesis (BBN) represents a crucial phase in the universe's evolution, occurring approximately one second after the Big Bang. The BBN theory predicts a primordial Helium-4 abundance of about 25%, offering key limits on the number of light particles present at BBN temperatures. The Left-Right Symmetry Model with an Extra Scalar Field is a development of the Standard Model with the addition of a massive scalar field, which has the opportunity to decay into relativistic particles. This research aims to determine the temperature ratio between the right and left sectors, the mass limit of the massive scalar field according to BBN constraints, and the primordial helium abundance. This research is theoretical. The research objectives can be achieved with various methods; the Yukawa Lagrangian and the Scalar Potential are depicted in a Feynman Diagram, which then calculates each sector's decay rate and temperature changes. The temperature ratio of the right and left sectors when the BBN took place in this model was 0.08-0.09. The mass limit of the corresponding massive scalar field BBN Constraint is . The abundance of primordial Helium-4 in the left sector is 25%, according to the Standard Model, while primordial Helium-4 in the right sector is 79%-87%. Thus, the Left-Right Symmetry Model with Extra Scalar mode satisfies the constraints of BBN words.

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