High Energy Physics - Phenomenology

A4 Flavor Models in Split Seesaw Mechanism

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A seesaw mechanism in an extra-dimension, known as the split seesaw mechanism, provides a natural way to realize a splitting mass spectrum of right-handed neutrinos. It leads to one keV sterile neutrino as a dark matter candidate and two heavy right-handed neutrinos being responsible for leptogenesis to explain the observed baryon asymmetry of the Universe. We study models based on A_4 flavor symmetry in the context of the split seesaw mechanism. It is pointed out that most of known A_4 flavor models with three right-handed neutrinos being A_4 triplet suffer from a degeneracy problem for the bulk mass terms, which disturbs the split mechanism for right-handed neutrino mass spectrum. Then we construct a new A_4 flavor model to work in the split seesaw mechanism. In the model, the experimentally observed neutrino masses and mixing angles can be realized from both type I+II seesaw contributions. The model predicts the $\mu-\tau$ symmetry in the neutrino mass matrix at the leading order, resulting in the vanishing θ_{13} and maximal θ_{23}. The flavor symmetry A_4 is broken via the flavon vacuum alignment which can be obtained from the orbifold compactification. The model can be consistent with all data of neutrino oscillation experiments, cosmological discussions of dark matter abundance, leptogenesis, and recent astrophysical data.

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