Triplet Fermions as the Possible Source of Dark Matter, Neutrino Mass and Baryon Asymmetry of the Universe

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The motivation of this talk will be to explain three well-accepted standard model (SM) problems namely dark matter (DM), neutrino mass and baryon asymmetry of the Universe (BAU) which need beyond SM physics to be tackled. In this context, I will try to discuss the triplet fermions as a suitable dark matter candidate and the possible origin of the neutrino mass and BAU. First, I will discuss the present bounds on the triplet fermions coming from direct detection, indirect detection and collider search of DM. The bounds reflect that the neutral part of the triplet fermion can not satisfy the full abundance of DM. As a remedy, I elaborate on the possible ways to make it a viable DM candidate. The first approach is by adding a minimal set of particles which will help us to have either a WIMP or FIMP type DM candidate depending on the neutral components mass. An interesting finding of this study will be to probe the FIMP type DM at the proposed MATHUSLA detector. The second approach will discuss another possibility of making it a viable DM with full DM abundance by introducing the non-standard cosmology where we assume the presence of an extra species before BBN whose energy density dominates over the radiation in the early times. With the non-standard cosmology, we will discuss the possible origin of BAU and the change of the leptogenesis scale to the usual standard case which has been studied before. As usual, the triplet fermions which take part in the leptogenesis will generate neutrino mass by the Type III seesaw mechanism.

Everyone is invited to attend

Head, PAMU