APCTP SEMINAR

Time evolution of lepton family number; application to non-relativistic neutrinos

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ZOOM Webinar

We derive a formulation of the time evolution of the lepton family number (LFN) for a neutrino that forms an SU(2) doublet with a charged lepton. The LFN is defined through a weak basis of the SU(2) doublet, where the charged lepton mass matrix is real and diagonal. The LFN carried by the neutrino is defined by the left-handed current of the neutrino family. In the first part of the talk, I will consider the case that the neutrinos are Majorana type. The Majorana mass term is switched on at $t=0$ and the LFN evolves. Then, we compute the time evolution of LFN by choosing a specific initial flavor eigenstate for a neutrino. In this work, we study both relativistic and non-relativistic neutrinos. The non-relativistic region is of particular interest for the cosmic neutrino background predicted from Big Bang Models. In that region, we find the LFNs are sensitive to the Majorana and Dirac phases, the absolute mass, and the mass hierarchy of neutrinos. In the second part of the talk, I will consider the Dirac type of neutrinos following the same procedure as the Majorana type.

References:
[1] A. S. Adam, et al. arXiv:2106.02783 [hep-ph].
[2] A. S. Adam, et al. arXiv:2105.04306 [hep-ph].
[3] A. S. Adam, et al. PTEP 053B01 (2021).

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