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Anomaly-free abelian gauge symmetries with neutrino mass models

In this work, we show a study of the generation of neutrino masses is carried out from the seesaw type II Mechanism for Dirac neutrinos. These mechanisms not only explain the mass of the neutrino but also its small value compared to charged quarks and leptons. Therefore, a model is proposed to obtain the small neutrino masses by extending the visible content of the Standard Model (SM) with S and two right-handed singlet neutrinos (ν_{R_1}, ν_{R_2}). These right-handed neutrinos are charged under a new symmetry $U(1)_X$. In addition, it is necessary
to add a heavy scalar doublet to play the role of messenger between the visible sector (SM) and the hidden sector.
hidden sector.
Extending the SM with a new abelian symmetry automatically violates the invariant of Lorentz, therefore the following conditions must

\begin{equation}
\sum_{\alpha=1}^{N'} n_{\alpha} + 3m =0 \„
\end{equation}
%
\begin{equation}
\sum_{\alpha=1}^{N'} n'^{3}_{\alpha} +3m^{3} = 0\„
\end{equation}

where, n_α is defined as the charge of the chiral fermions under the new symmetry and $3m$ the sum of the charges of the SM and $m \equiv e + 2L$. If the SM is extended with an additional dark $U(1)_D$ gauge symmetry (under which it is uncharged), and N right-handed chiral fields singlets under the SM group, the $U(1)_D$ is not anomalous if the Diophantine equations are fulfilled

\begin{align}
\sum_{\alpha=1}^{N} n_{\alpha} =&0\„ &
\sum_{\alpha=1}^{N} n'^{3}_{\alpha} =& 0\,.
\end{align}

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