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Clockwork Fermions contribution to neutrino mass generation and Charged Lepton Flavor Violation l_i > l_j + \gamma

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The clockwork mechanism generates small neutrino masses which includes Dirac mass terms as well as Majorana mass terms for the new fermions with exponentially
suppressed interactions in theories which contain no small parameters at the fundamental
level. We work on a general description of the clockwork mechanism valid for
fermions. This mechanism can be implemented with a discrete
set of new fields or, in its continuum version, through an extra spatial dimension. We derive analytic formulas for the masses of the new particles and for their Yukawa couplings to the lepton doublets, in the scenario where the clockwork parameters are universal. When the Majorana masses all vanish, the zero mode of the clockwork sector forms a Dirac pair with the active neutrino, with a mass which is in agreement with oscillations experiments for a sufficiently large number of clockwork gears. On the other hand, when the Majorana masses do not vanish, neutrino masses are generated via the seesaw mechanism. In this case, and due to the fact that the effective Yukawa couplings of the higher modes can be sizable, neutrino masses can only be suppressed by postulating a large Majorana mass for all the gears. Finally, we discuss the constraints on the mass scale of the clockwork fermions from the non-observation of the rare leptonic decay $\mu \longrightarrow e\gamma$.

Attendance type

Virtual presentation

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