

Clockwork Neutrinos

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The Clockwork (CW) mechanism can explain the smallness of neutrino masses without introducing unnaturally small input parameters. We study the simplest CW neutrino model, the “uniform” clockwork, as well as a broader class of “generalized” clockwork models. We derive constraints on such models from lepton-flavor violating processes, as well as precision electroweak fits. These constraints allow excited CW neutrino states with masses of order 100 GeV - 1 TeV, within reach of the LHC and proposed lepton colliders, as long as the input neutrino Yukawa coupling is of order $10^{-1} - 10^{-2}$. We study collider phenomenology of these models. At the LHC, models with light (~ 100 GeV) CW neutrinos can be discovered using the $3\ell + \text{MET}$ signature. Lepton colliders will be able to discover the CW neutrinos as long as they are within their kinematic range.

Primary authors: KURUP, Gowri (Cornell University); Dr HONG, Sungwoo (Cornell University); Prof. PERELSTEIN, Maxim (Cornell University)

Presenter: KURUP, Gowri (Cornell University)

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