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Title:	Gauge-hierarchy Problem, Seesaw Mechanisms and Discrete Symmetries
Authors:	Chattopadhyay, Pratik (/jspui/browse?type=author&value=Chattopadhyay%2C+Pratik)
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Abstract:	<p>The physical mass of the Higgs particle is approximately 126 GeV, which also sets the electroweak scale. But the expected mass of the Higgs due to quantum corrections from heavier particles should be much higher, unless there is an unnatural fine-tuning cancellation in the parameters. Seesaw models of neutrino mass generation require extra heavy particles beyond the standard model which interact with the Higgs and contribute to the correction of its mass. We derive the loop amplitudes responsible for the mass correction of the Higgs due to these particles. Then we discuss about the naturalness criteria and the relations between the coupling constants and the mass scales of heavy particles. Next we motivate a framework which incorporates the natural electroweak seesaw. The naturalness of the electroweak scale in the light of type-I seesaw model with Yukawas of order unity leads to TeV scale masses for the extra heavy fermion singlets which play the role of right handed neutrinos. This requires the mechanism of seesaw cancellation through special correlations among the $O(1)$ Yukawa couplings which can be motivated through discrete flavor symmetries. We provide a candidate model based on the discrete group (81) and illustrate on the generic perturbations that lead to viable neutrino masses. We give phenomenological implications like flavor violating processes and analyse their branching ratios. We then briefly discuss the scenarios of leptogenesis and baryogenesis and elaborate on resonant leptogenesis as a viable process in the context of our model.</p>
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