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Naturally small Dirac neutrino masses with intermediate $SU(2)_L$ multiplets

If neutrinos are Dirac fermions, certain new physics beyond the standard model should exist to account for the smallness of neutrino mass. With two additional scalars and a heavy intermediate fermion, we systematically study the general mechanism that can naturally generate the tiny Dirac neutrino mass at tree and in one-loop level. For tree level models, we focus on natural ones, in which the additional scalars develop small vacuum expectation values without fine-tuning. For one-loop level models, we explore those having dark matter candidates under Z_2^D symmetry. In both cases, we concentrate on $SU(2)_L$ multiplet scalars no larger than quintuplet, and derive the complete sets of viable models.

Experimental Collaboration

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