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Novel Weinberg-like operators from new scalar multiplets

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The Weinberg operator, the unique dimension-5 effective operator LLHH, can generate tiny Majorana masses for neutrinos. In the presence of new scalar multiplets acquiring vacuum expectation values (VEVs), novel Weinberg-like operators emerge, subsequently contributing to Majorana neutrino masses. We consider scenarios involving one or two new scalars transforming under higher SU(2) representations $\mathcal{R}$, up to $\mathcal{R} \leq 5$. We start our analysis from an Effective Field Theory approach and subsequently investigate potential tree-level UV completions for the newly introduced dimension-5 operators.

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