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Neutrino mass genesis in Scoto-Inverse Seesaw with Modular A_4

We propose a hybrid scotogenic inverse seesaw framework in which the Majorana mass term is generated at the one-loop level through the inclusion of a singlet fermion. This singlet Majorana fermion also serves as a viable thermal relic dark matter candidate due to its limited interactions with other fields. To construct the model, we adopt an
A_4 flavour symmetry in a modular framework, where the odd modular weight of the fields ensures their stability, and the specific modular weights of the couplings yield distinctive modular forms, leading to various phenomenological consequences. The explicit flavour structure of the mass matrices produces characteristic correlation patterns among the parameters. Furthermore, we examine several testable implications of the model, including neutrinoless double beta decay ($0\nu\beta\beta$), charged lepton flavour violation (cLFV), and direct detection prospects for the dark matter candidate. These features make our model highly testable in upcoming experiments.

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