

Abstract Submitted  
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**Prospect of a Scalar Dark Matter candidate in the Electroweak Scale RH-model** SHREYASHI CHAKDAR, College of the Holy Cross, DILIP GHOSH, Indian Association for the Cultivation of Science, PHAM HUNG, University of Virginia, NAJIMUDDIN KHAN, Indian Association for the Cultivation of Science — The idea of with EW- $\nu_R$  model with additional GeV scale mirror fermions with large displaced vertices and extended Scalar sector is very appealing from the Collider perspective. The presence of a complex singlet scalar in this model helps to solve the strong-CP problem, satisfying the constraint coming from the present absence of neutron electric dipole moment, and without need of an axion. Based on this model, in this work, we study the detailed scalar mass spectrum, having  $\sim 125$  GeV Higgs-like scalar, which allowed by signal strength and lepton flavor violating constraints data. Besides explaining the  $\sim 125$  GeV Higgs-like scalar, this scenario can also accommodate a non-thermal scalar dark matter which can satisfy the relic density data. The imaginary part of the complex singlet scalar in this model serve as a viable non-thermal feebly interacting massive particle (FIMP) dark matter candidate. We identify the region of the parameter space for the freeze-in scenario, which is consistent with all the bounds from relic density and direct-indirect searches and discuss the possible future implications of this scenario.

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