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Singlet-doublet fermion dark matter with Dirac neutrino mass, (g – 2)µ and ∆Neff

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We study the possibility of generating light Dirac neutrino mass via scotogenic mechanism where singletdoublet fermion dark matter (DM) plays non-trivial role in generating one-loop neutrino mass, anomalous magnetic moment of muon $(g-2)_{\mu}$ as well as additional relativistic degrees of freedom $\Delta N_{\rm eff}$ within reach of cosmic microwave background (CMB) experiments. We show that the Dirac nature of neutrinos can bring interesting correlations within the parameter space satisfying the $(g-2)_{\mu}$ anomaly and DM relic density and the effective relativistic degrees of freedom $\Delta N_{\rm eff}$. While we stick to thermal singlet doublet DM with promising detection prospects, both thermal and non-thermal origin of $\Delta N_{\rm eff}$ have been explored. In addition to detection prospects of the model at DM, (g-2) and other particle physics experiments, it remains verifiable at future CMB experiments like CMB-S4 and SPT-3G.

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