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Dark Matter and Vector Like Leptons from Gauged Lepton Number

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We investigate a simple model where Lepton number (L) is promoted to a local $U(1)_L$ gauge symmetry which is then spontaneously broken leading to a viable thermal DM candidate and vector-like leptons as a byproduct. The dark matter arises as part of the exotic lepton sector required by the need to satisfy anomaly cancellation and is a Dirac electroweak (mostly) singlet neutrino. It is stabilized by an accidental global symmetry of the renormalizable lagrangian which is preserved even after the gauged lepton number is spontaneously broken and can annihilate efficiently to give the correct thermal relic abundance. We examine the ability of this model to give a viable DM candidate and discuss both direct and indirect detection implications. We also examine some of the LHC phenomenology of the associated exotic lepton sector and in particular its effects on Higgs couplings.

Primary author: VEGA MORALES, Roberto (Northwestern University/Fermilab)

Presenter: VEGA MORALES, Roberto (Northwestern University/Fermilab)

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