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Two-component dark matter in a new B-L model

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We propose a new extension of the Standard Model by a U(1)B–L gauge symmetry in which the anomalies are canceled by two right-handed neutrinos plus four chiral fermions with fractional B-L charges. Two scalar fields that break the B-L symmetry and give masses to the new fermions are also required. After symmetry breaking, two neutrinos acquire Majorana masses via the seesaw mechanism leaving a massless neutrino in the spectrum. Additionally, the other new fermions arrange themselves into two Dirac particles, both of which are automatically stable and contribute to the observed dark matter density. This model thus realizes in a natural way, without ad hoc discrete symmetries, a two-component dark matter scenario. We analyze in some detail the dark matter phenomenology of this model. The dependence of the relic densities with the parameters of the model is illustrated and the regions consistent with the observed dark matter abundance are identified. Finally, we impose the current limits from LHC and direct detection experiments, and show that the high mass region of this model remains unconstrained.

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