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Dark matter and Leptogenesis in Type Ib seesaw model

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We study the connection between neutrino mass and two unsolved cosmological problems: the existence of dark matter (DM) and matter-antimatter asymmetry. To have a testable connection, we consider the low energy type Ib seesaw mechanism instead of the traditional type I seesaw mechanism. In the minimal type Ib seesaw mechanism, the effective neutrino mass operator involves two different Higgs doublets, and two right-handed neutrinos form a (pseudo-) Dirac pair. The DM candidate can be included by adding a neutrino portal with a dark fermion and a dark scalar, while the baryon asymmetry can be approached through resonant leptogenesis in an extended model where the type Ib seesaw mechanism is realised effectively. We explore the parameter space of the models consistent with both oscillation data and observations. Within this framework, we show how DM and leptogenesis can be directly related to laboratory experiments for a heavy Dirac neutrino mass around $1\sim 100$ GeV.

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