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Leptogenesis from magnetic helicity of gauged U(1)_{B – L}

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If the B –L symmetry is gauged with the addition of right-handed neutrinos, the standard model B –L current is anomalous with respect to the B –L gauge field itself. Then, the anomaly relation implies that the magnetic helicity of the B –L gauge field is related to the standard model B –L charges, although the whole universe is B –L neutral with right-handed neutrinos. Based on this, we propose a new leptogenesis scenario with the gauged B –L symmetry as follows. First, the magnetic helicity of the B –L gauge field is generated, e.g., by the axion inflation, together with the standard model and right-handed neutrino B –L charges, with the net B –L charge kept zero. The B –L charges in the standard model and right-handed neutrino sectors are then subject to washout effects from the interactions between them. After the washout effects decouple, the B –L gauge symmetry is Higgsed and the magnetic helicity of the B –L gauge field decays and generates B –L charges in the both sector; thanks to the washout effects, we obtain a non-zero B –L asymmetry. We show that the baryon asymmetry of the universe can be generated in this scenario, discussing the decay of the magnetic helicity of the B –L gauge field and the interactions between the right-handed neutrinos and the standard model particles. [JHEP 02 (2025) 192]

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