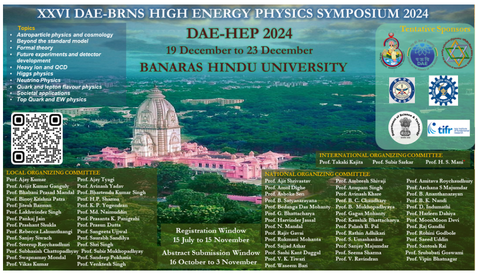

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Low scale thermal leptogenesis and gravitational waves from breaking of a discrete symmetry

In a canonical type-I seesaw scenario, the SM is extended with three singlet right-handed neutrinos (RHNs) $N_i, i = 1, 2, 3$ with masses $M_i, i = 1, 2, 3$ to simultaneously explain sub-eV masses of light neutrinos and baryon asymmetry of the Universe. In this paper, we show that a relatively low-scale thermal leptogenesis accompanied by gravitational wave signatures is possible when the type-I seesaw is extended with a singlet fermion (S) and a singlet scalar (ρ), where S and ρ are odd under a discrete Z_2 symmetry. At a high scale, the Z_2 symmetry is broken spontaneously by the vacuum expectation value of ρ and leads to : (i) mixing between RHNs (N_2, N_3) and S, and (ii) formation of Domain walls (DWs). In the former case, the final lepton asymmetry is generated by the out-of-equilibrium decay of S, which dominantly mixes with N_2. We show that the scale of thermal leptogenesis can be lowered to $M_S \sim 4 \times 10^8$ GeV. In the latter case, the disappearance of the DWs gives observable gravitational wave signatures, which can be probed at NANOGrav, EPTA, LISA, etc. We also add a vector-like fermion doublet Ψ and impose a Z_2' symmetry under which both N_1 and Ψ are odd while all other particles are even. This gives rise to a singlet-doublet Majorana fermion dark matter in our setup.

Field of contribution

Phenomenology

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