

Asymmetric Dark Matter from Low-Scale Spontaneous Leptogenesis

Tuesday, 17 February 2026 17:20 (20 minutes)

“We investigate a novel type of asymmetric dark matter (ADM) model in which the dark matter asymmetry and the baryon asymmetry in our universe (BAU) are produced simultaneously via low-scale spontaneous leptogenesis, where the mass scale of right-handed neutrino is much lower than the Davidson-Ibarra bound $M_1 \ll 10^9$ $mrGeV$.

In our scenario, both asymmetries are predominantly sourced by a dynamical CP phase, namely the majoron. Its kinetic misalignment provides a sufficiently large, time-dependent effective CP phase, allowing efficient asymmetry production even for low-scale right-handed neutrinos.

In our framework, the sources of CP violation responsible for the BAU and ADM are correlated with each other, leading to a predictive relation for the dark matter mass. In particular, when the dark matter asymmetry reaches its equilibrium value before freeze-out, the dark matter mass is typically predicted to lie in the range $\mathcal{O}(0.1)$ GeV

$lessimm_\chi$

$lessim\mathcal{O}(100)$ GeV,

which lies within the sensitivity of direct detection experiments.

On the other hand, if the dark matter asymmetry does not reach its equilibrium value due to weak coupling, the allowed mass range extends over a broader interval,

$\mathcal{O}(0.1)$ GeV

$lessimm_\chi$

$lessim\mathcal{O}(10)$

$mrTeV$.”

Presenter: TAKAHASHI, Hiroki

Session Classification: parallel session A: DM