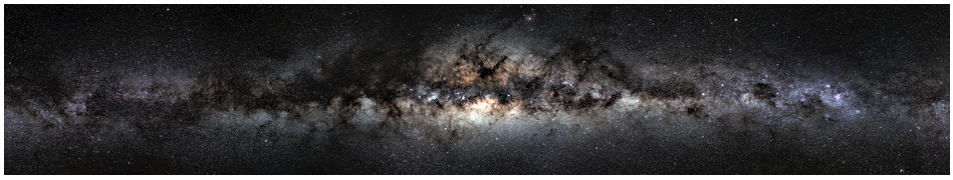

Contribution ID: **134** Type: **Poster**

Non-adiabatic Evolution of Dark Sector in the Presence of $U(1)_{L_\mu - L_\tau}$ Gauge Symmetry

Tuesday 7 December 2021 08:20 (30 minutes)

In secluded dark sector scenario, thermal equilibrium between dark and visible sector depends on the strength of portal coupling. To study the non-adiabatic evolution of the dark sector, we have considered a $U(1)_{L_\mu - L_\tau} \otimes U(1)_X$ extension of the standard model (SM). Here in this model the dark sector is charged only under $U(1)_X$ gauge symmetry whereas the SM fields are assumed to be singlet under this symmetry. In presence of tree-level kinetic mixing between $U(1)_X$ and $U(1)_{L_\mu - L_\tau}$ gauge bosons, we have studied the non-adiabatic evolution of the dark sector along with the temperature evolution of the dark sector. Furthermore we have also investigated the constraints on the model parameters from various laboratory and astrophysical searches. We have found that the parameter space is significantly constrained for $m_{Z'}$ $lesssim 100\,\mathrm{MeV}$ from the observations of beam dump experiments, stellar cooling etc. The relic density satisfied region of our parameter space is consistent with the bounds from direct detection, and self interaction of dark matter (SIDM) for the mass ratio $r \equiv m_{Z'}/m_\chi = 10^{-3}$. However the constraints from measurement of diffuse γ-ray background flux and cosmic microwave background (CMB) anisotropy are strongest for $r = 10^{-1}$.

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Session Classification: Break and Poster Session