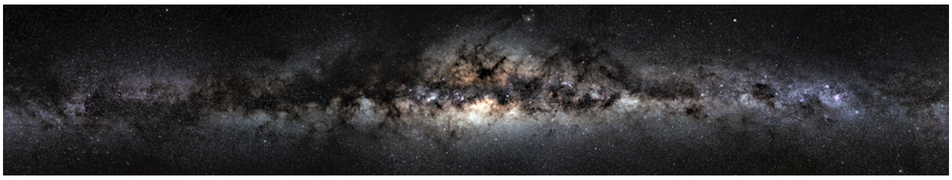
Dark Sectors of Astroparticle Physics (AstroDark-2021): Axions, Neutrinos, Black Holes and Gravitational Waves



Contribution ID: **117**

Type: **Poster**

Dark Sector Freeze-out due to a Non-Boltzmann Suppression

Tuesday 7 December 2021 08:20 (30 minutes)

Commonly known as Boltzmann suppression is the key ingredient to create chemical imbalance for thermal dark matter. In a degenerate/quasi degenerate dark sector chemical imbalance can also be generated from a different mechanism which is analogous to the radioactive decay law, known as co-decaying dark matter. In this work, we have studied the dynamics of a multicomponent thermally decoupled degenerate dark sector in a hidden $U(1)_X$ extension of the Standard Model. We compute the relic density and the temperature (T') evolution of the hidden sector by considering all possible $2 \to 2$ and $3 \to 2$ processes. We find that the production of energetic particles from $3 \to 2$ processes increase the temperature of the dark sector whereas the rate of growth of temperature is decelerated due to the presence of $2 \to 2$ processes and expansion of the Universe. We also study the prospect of detecting neutrino and $gamma$-ray signals from DM annihilation via one step cascade processes. We find that in the present scenario, all the existing indirect detection constraints arising from measured fluxes of atmospheric neutrinos by Super-Kamiokande and diffuse γ-rays by EGRET, Fermi-LAT, and INTEGRAL respectively can easily be evaded for the degenerate dark sector. However for the quasi degenerate scenario the constraints are significant.

Primary authors: BISWAS, Anirban; GANGULY, Sougata (Indian Association for the Cultivation of Science); ROY, Sourov

Presenter: GANGULY, Sougata (Indian Association for the Cultivation of Science)

Session Classification: Break and Poster Session