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Reshuffled SIMP Dark Matter

Wednesday, 22 September 2021 14:45 (15 minutes)

In this talk, we reanalyze the multi-component strongly interacting massive particle (mSIMP) scenario using an effective operator approach. As in the single-component SIMP case, the total relic abundance of mSIMP dark matter (DM) is determined by the coupling strengths of $3 \rightarrow 2$ processes achieved by a five-point effective operator. Intriguingly, we find that there is an unavoidable $2 \rightarrow 2$ process induced by the corresponding five-point interaction in the dark sector, which would reshuffle the mass densities of SIMP DM after the chemical freeze-out. We dub this DM scenario as reshuffled SIMP (rSIMP). Given this observation, we then numerically solve the coupled Boltzmann equations including the $3 \rightarrow 2$ and $2 \rightarrow 2$ processes to get the correct yields of rSIMP DM. It turns out that the masses of rSIMP DM must be nearly degenerate for them to contribute sizable abundances. On the other hand, we also introduce effective operators to bridge the dark sector and visible sector via a vector portal coupling. Since the signal strength of detecting DM is proportional to the individual densities, thereby, obtaining the right amount of DM particles is crucial in the rSIMP scenario. The cosmological and theoretical constraints for rSIMP models are discussed as well.

Do you wish to attend the workshop on-site?

no

Summary

Primary authors: Dr LU, Chih-Ting (Korea Institute for Advanced Study); KO, Pyungwon (Korea Inst for Advanced Study (KIAS)); HO, Shu-Yu (Korea Institute for Advanced Study)

Presenter: HO, Shu-Yu (Korea Institute for Advanced Study)

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