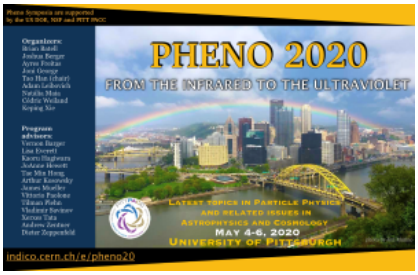

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A sub-GeV dark matter model

Monday 4 May 2020 15:30 (15 minutes)

We propose an extension of the Standard Model gauge symmetry by the gauge group $(1)_3$ in order to address the Yukawa coupling hierarchy between the third generation and the first two generation fermions of the SM. Only the right-handed Standard Model fermions transform non-trivially under the $(1)_3$ group. In addition to the new dark gauge boson, we have a dark scalar particle whose vacuum expectation value (vev) breaks the $(1)_3$ symmetry down to $_2$ symmetry and also explains the hierarchy problem. A vev of $\mathcal{O}$(GeV) is required to explain the mass parameters of the light flavor sector naturally. The dark matter (DM) particle arising from the model naturally has mass in the $\mathcal{O}$(1–100)MeV range. The model satisfies all the current constraints. The dark matter obtains the correct thermal relic density by annihilation. We also consider the effect on early Universe cosmology of the dark photon associated with the gauging of $(1)_3$. We find that cosmological constraints on this scenario are qualitatively much more severe than on other well-studied cases of a new ⊠(1) gauge group, because the dark photon couples to chiral fermions.

Summary

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