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Low-energy effective description of dark Sp(4) theories

Tuesday 19 July 2022 19:00 (1 hour)

Whereas weakly interacting massive particles (WIMPs) - a promising DM candidate - were intensively studied in the past, the theory of strongly interacting massive particles (SIMPs) has been comparably less investigated. A possible way to generate such SIMPs is through chiral symmetry breaking, similar to the production of pions in QCD. We consider a dark gauge group Sp(4) and $N_f = 2$ fermions in the pseudo-real fundamental representation. In absence of the mass term in the Lagrangian, a global flavor symmetry is present. Whenever a continuous global symmetry is broken, the Goldstone theorem guarantees the existence of low-energy massless Goldstone bosons. The dynamics of these bosons is described by the chiral Lagrangian (low energy effective theory). However, in presence of a mass term, the flavour symmetry is explicitly broken and the Goldstone bosons - SIMPs - gain non-zero masses. We determine the chiral Lagrangian with the inclusion of the Wess-Zumino-Witten term for degenerate and non-degenerate flavors. We analyse the breaking patters and mutiplet structure including a coupling to the Standard Model with a dark U(1) sector. This opens the door to phenomenology. In addition, we introduce vector and axial-vector states of the theory. The complete model is supported by lattice simulations.

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