

Sp(4) SIMP Dark Matter on the Lattice

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LHCP 2021, June 10th/11th, online

Strongly Interacting Massive Particles

- The **SIMP** paradigm postulates
 1. additional strongly interacting gauge theory with
 2. additional Fermions ("dark quarks")
(at least 2 depending on Fermion representation)
- SIMP models then provide
 1. **Pseudo-Goldstone-Bosons (pGB) as Dark Matter**
 2. **$3 \rightarrow 2$ self-interaction** among Dark Matter
this constrains $m_{DM} \approx \mathcal{O}(100)\text{MeV}$

[1402.5143, 1411.3727, 1512.07917]

Building a **SIMP** Dark Matter model

- Needs sufficiently many fermions for $3 \rightarrow 2$
- Symplectic groups: At least $N_f = 2$ required
- **Sp(4) $N_f = 2$** : simplest non- $SU(N)$ setup
 - **5 pseudo-Goldstones** (larger global symmetry)
3 pion-like + quark-quark + antiquark-antiquark
- **Non-degenerate** fermions provide useful dynamics
 - 5 pGB \rightarrow 4 pGB + 1 pGB (π^0 -analogue)
 - Lattice methods for spectrum [based on **1909.12662**]
 - study introduction of mass-split in *dark quarks*
 - start degenerate and keep one bare mass fixed

Sp(4) Nf=2 : Goldstones and iso-non-singlet vector meson masses

