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Searching for a Strongly Interacting Dark Sector at MoEDAL MAPP

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There is strong evidence for the existence of Dark Matter. One possible form of Dark Matter is strongly self-interacting Dark Matter, or Strongly Interacting Massive Particles (SIMP), modelled after Quantum Chromodynamics (QCD). It should also be noted that, to date, no direct detection of any kind of dark matter has been made. Direct detection of dark matter at accelerators is a high priority and is part of the program for the MoEDAL experiment located at the LHC. The MAPP extension to the MoEDAL experiment focuses on searching for Mili-Charged Particles (mCPs), and Long-Lived Particles (LLP). In this talk, we will discuss meson-like SIMP, and its potential detectability at the MoEDAL MAPP experiment. In order to model this dark matter, we construct a Lagrangian describing dark-pions using an approach inspired by Chiral Perturbation theory, an effective field theory of QCD. To couple our model to the Standard Model, we include a vector portal term which kinetically mixes our dark gauge fields with standard model gauge fields. As part of our model, we also include a Wess-Zumino-Witten term, this term is important to control the overproduction of strongly self-interacting Dark Matter in the early universe. We focus on two processes: a Drell-Yan process involving a dark gauge field, which produces a pair of dark-pions, and photofusion of two dark photons to three dark-pions. Due to kinetic mixing, these dark-pions will have an effective electric charge that is a small fraction of that of the electron.

Supervisor

Pierre-Phillippe Ouimet

Funding Agency

NSERC

Supervisor Email

pierre-philippe.ouimet@uregina.ca

Your Email

sag498@uregina.ca

Primary author: ARIFEEN, Shafakat (University of Regina)

Presenter: ARIFEEN, Shafakat (University of Regina)

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