Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3698** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Searching for a Strongly Interacting Dark Sector at MoEDAL MAPP

Monday 19 June 2023 17:30 (15 minutes)

There exists a large body of indirect evidence for the existence of Dark Matter (DM) but, to date, no direct evidence has been found. Because of this, the wide range of possible parameter space that would then be used to explain dark matter's observed effects has given rise to a large number of models. One possible form of DM is strongly self-interacting DM, which includes Strongly Interacting Massive Particles (SIMP), modeled after Quantum Chromodynamics (QCD). To narrow down possible models, direct detection of dark matter at accelerators is a high priority. Detecting or ruling out some possible DM models is a part of the experimental program for the MoEDAL experiment located at the LHC. The MAPP extension to the MoEDAL experiment, now approved for run 3, focuses on searching for Mili-Charged Particles (mCPs), and Long-Lived Particles (LLP). In this talk, we will discuss meson-like SIMP, and their potential detectability at the MoEDAL MAPP experiment. In order to model this DM, we construct a Lagrangian describing dark-pions using an approach inspired by Chiral Perturbation theory, an effective field theory of QCD. In addition to strong self interactions, our meson like DM also couples to dark gauge fields. 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 DM 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.

Keyword-1

Dark Matter Searches

Keyword-2

BSM Physics

Keyword-3

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Session Classification: (PPD) M3-10 DM / Neutrino 1 | DM / Neutrino 1 (PPD)

Track Classification: Technical Sessions / Sessions techniques: Particle Physics / Physique des particules (PPD)