

The MoEDAL-MAPP* Experiment - Expanding the Discovery Horizon of the Large Hadron Collider

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Abstract : The MoEDAL (Monopole and Exotics Detector at the LHC) experiment deployed at IP8 on the Large Hadron Collider ring was the first dedicated search experiment to take data at the Large Hadron Collider (LHC) in 2010. It was designed to search for Highly Ionizing Particle (HIP) avatars of new physics such as magnetic monopoles, dyons, Q-balls, multiply charged particles, massive, slowly moving charged particles and long-lived massive charge SUSY particles. We shall report on our search at LHC's Run-2 for Magnetic monopoles and dyons produced in p-p and photon-fusion. In more detail, we will report our most recent result in this arena: the search for magnetic monopoles via the Schwinger Mechanism in Pb-Pb collisions. The MoEDAL detector, originally the first dedicated search detector at the LHC, is being reinstalled for LHC's Run-3 to continue the search for electrically and magnetically charged HIPs with enhanced instantaneous luminosity, detector efficiency and a factor of ten lower thresholds for HIPs. As part of this effort, we will search for massive long-lived, singly and multiply charged particles from various scenarios for which MoEDAL has a competitive sensitivity. An upgrade to MoEDAL, the MoEDAL Apparatus for Penetrating Particles (MAPP), is now the LHC's newest detector. The MAPP detector, positioned in UA83, expands the physics reach of MoEDAL to include sensitivity to feebly-charged particles with charge, or effective charge, as low as $10^{-3} e$ (where e is the electron charge). Also, in conjunction with MoEDAL's trapping detector, the MAPP detector gives us a unique sensitivity to extremely long-lived charged particles. MAPP also has some sensitivity to long-lived neutral particles. The addition of an Outrigger detector for MAPP-1 to increase its acceptance for more massive milli-charged particles is currently in the Technical Proposal stage. Additionally, we will briefly report on the plans for the MAPP-2 upgrade to the MoEDAL-MAPP experiment for the High Luminosity LHC (HL-LHC). This experiment phase is designed to maximize MoEDAL-MAPP's sensitivity to very long-lived neutral messengers of physics beyond the Standard Model. We envisage this detector being deployed in the UGC1 gallery near IP8.

Keywords : LHC, beyond the standard model, dedicated search experiment, highly ionizing particles, long-lived particles, milli-charged particles

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