PHYSICS SEMINAR

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"Dark Matter searches with the HPS Experiment at JLAB"

Abstract

The Standard Model (SM), which has been very successful in describing the physics of ordinary matter, is known to be incomplete and new physics must be responsible for the presence of Dark Matter in the Universe. A hidden, or "dark", sector interacting with the SM particles via new force carriers would be a natural scenario to explain the features of Dark Matter. In the last decade, growing interest has been dedicated to the search for dark sectors with force carriers in the MeV-GeV mass range. A well motivated model envisions the presence of a U(1) gauge boson, the heavy photon A', whose existence can be probed with fixed-target experiments at accelerators.
The Heavy Photon Search Experiment (HPS) at the Thomas Jefferson National Accelerator Facility (JLAB) searches for heavy photons and other new force carriers that are produced via electro-production and decay to electron-positron pairs. The HPS experiment can explore a wide range of heavy photon masses ($m_{A'} \sim$ 20-200 MeV/c^2) and couplings ($\varepsilon^2 \sim 10^{-10}$-$10^{-6}$) using both resonance search and displaced vertex strategies.

In this seminar, I will give an overview of the searches for Dark Photons at the HPS experiment, providing a summary of the latest results from the 2016 Engineering Run based on a 200 nA electron beam at E_{beam} = 2.3 GeV. I will also discuss the recent developments in reconstruction and calibration of the 2019 Data Run at E_{beam} = 4.55 GeV and present the physics prospects for the 2021 Data Run.

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