The Heavy Photon Search Experiment at Jefferson Lab

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Abstract

The Heavy Photon Search (HPS) is a new experiment at Jefferson Lab searching for massive U(1) vector bosons (also known as heavy photons, dark photons, or A') of mass 20–1000 MeV that couple to electric charge with relative coupling α'/α of 10^{-5}–10^{-10}.

The HPS experiment is designed to produce heavy photons in a process analoguous to bremsstrahlung using an electron beam on a fixed target, and detect decays to e^+e^- pairs with two signatures (invariant mass resonance and displaced decay vertex). The detector is a compact, large-acceptance forward spectrometer comprising a silicon microstrip tracker for momentum measurement and vertexing and an electromagnetic calorimeter for triggering on e^+e^-.

Precise beamline controls, high-rate trigger and DAQ, and good time resolution are needed for a detector that comes within 0.5 mm of the beam and is sensitive down to $\pm$ 15 mrad from the beam plane, and must cope with the intense beam background in this environment. A low-mass tracker and clean track reconstruction are needed for the best sensitivity.

This talk will describe the HPS experiment and its current status after test, commissioning, and engineering runs.