

Searching for the Heavy Photon at Jlab.

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Abstract

In recent years much interest has been given to new physics models which have hidden sectors with massive extra U(1) gauge bosons, so-called heavy photons (or dark photons). Such theories could account for Dark Matter annihilation and explain excess electrons and positrons in cosmic rays. The Heavy Photon Search (HPS) and APEX experiments at Jefferson Lab are designed to look for these heavy photons in the mass range 20-1000 MeV that couple to electrons through kinetic mixing with couplings α'/α in the range 10^{-5} to 10^{-10} . The HPS will search for the e^+e^- or $\mu^+\mu^-$ decay of the heavy photon, possibly with a displaced vertex, using a compact forward spectrometer, which employs silicon microstrip detectors for vertexing and tracking, and a PbWO4 electromagnetic calorimeter for fast triggering and electron identification and a muon detector for muon identification. The APEX experiment will search for the heavy photon using the spectrometers of Hall-A at Jefferson lab. The design, performance, and results from the test runs will be discussed, along with the collaborations plans for future construction and data taking.