

Resonance Search for a Heavy Photon with the Heavy Photon Search Experiment

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The Heavy Photon Search (HPS) experiment at Jefferson Lab is searching for a hypothetical new $U(1)$ vector boson ("heavy photon", "dark photon" or A') in the mass range of 20–500 MeV/ c^2 . An A' in this mass region is natural in hidden sector models of light, thermal dark matter. The A' couples to the ordinary photon through kinetic mixing, which induces its coupling to electric charge. Since heavy photons couple to electrons, they can be produced through a process analogous to bremsstrahlung, subsequently decaying to an e^+e^- , which can be observed as a narrow resonance above the dominant QED trident background. For suitably small couplings, heavy photons travel detectable distances before decaying, providing a second signature. Using the CEBAF electron beam, located at the Thomas Jefferson National Accelerator Facility, incident on a thin tungsten target, along with a compact, large acceptance forward spectrometer consisting of a silicon vertex tracker and lead tungstate electromagnetic calorimeter, HPS can access unexplored regions in the mass-coupling parameter space.

HPS conducted successful engineering runs in 2015 using a 1.056 GeV, 50 nA beam and 2016 using a 2.3 GeV, 200 nA beam. This talk will present the results of a resonance search for a heavy photon using the 1165 nb $^{-1}$ (7.29 mC) of data collected during the 2015 engineering run.

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Heavy Photon Search

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