

Resonance Search for a Heavy Photon in the 2015 Engineering Run Data of the Heavy Photon Search Experiment

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The Heavy Photon Search (HPS) is a new experiment at Jefferson Lab that will search for a new $U(1)$ vector boson (“heavy photon”, “dark photon” or A') in the mass range of 20-1000 MeV/ c^2 . An A' in this mass range is theoretically favorable and may also mediate dark matter interactions. The A' couples to the ordinary photon through kinetic mixing which induces their coupling to electric charge. Since heavy photons couple to electrons, they can be produced through a process analogous to bremsstrahlung radiation, subsequently decaying to narrow e^+e^- resonances which can be observed above the dominant QED trident background. For suitably small couplings, heavy photons travel detectable distances before decaying, providing a second signature. Using Jefferson Labs high luminosity electron beam 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 will access unexplored regions in the mass-coupling phase space.

The HPS engineering run took place in spring of 2015 using a 1.056 GeV, 50 nA beam and collected 1165 nb $^{-1}$ (7.29 mC) of data. This talk will present the results of a resonance search for a heavy photon using the engineering run data.