

# Search for a Long-Lived Heavy Photon with the Heavy Photon Search Experiment

*Friday 6 July 2018 14:00 (15 minutes)*

The Heavy Photon Search experiment (HPS) at Jefferson Lab seeks to discover evidence for a new dark-force mediator. A new  $U(1)$  vector boson could couple to the Standard Model photon through kinetic mixing and could be produced by an electron beam in a dense target in a process similar to bremsstrahlung. Subsequent decays into  $e^+e^-$  pairs, if kinematically allowed, would enable discovery either as a resonance peak on a large Standard Model continuum distribution or as vertices displaced from the target. Small couplings would lead to longer decay times, but also reduced cross sections, requiring high currents (to produce any signal) and large detector acceptance, especially close to the beam (to capture the boosted decay products). The HPS detector is a compact, large acceptance, forward spectrometer consisting of a silicon vertex tracker and lead-tungstate electromagnetic calorimeter. Installed at the Jefferson Lab electron beam facility, it conducted successful engineering runs in the spring of 2015 using a 1.056 GeV, 50 nA beam, and in 2016 using a 2.3 GeV, 200 nA beam. In this talk we will discuss the motivation for this heavy photon search, the detector and its performance during these two engineering runs, as well as present details of the displaced vertex analysis and prospects for discovery in the upcoming physics runs. A separate talk at this conference will present details of a complementary analysis searching for peaks in the invariant mass spectrum of the final-state electron-positron pairs

**Primary author:** SOLT, Matthew (SLAC National Accelerator Laboratory)

**Presenter:** SOLT, Matthew (SLAC National Accelerator Laboratory)

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