

# The Heavy Photon Search Test Detector

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## Abstract

Recent astrophysical data motivates searches for a massive, dark sector analog to the photon. The preferred parameter space for this "heavy photon" requires very high luminosity for direct production, favoring fixed target experiments, and results in long-lived decays of these new force carriers to pairs of light, charged fermions. Identification of these states on large backgrounds requires precision tracking and vertexing at high rates in a difficult experimental environment. The Heavy Photon Search, or HPS, proposes a novel silicon tracking and vertexing detector, the HPS Silicon Vertex Tracker (SVT), to search for these states in a fixed target experiment at Thomas Jefferson National Accelerator Facility (JLab). The HPS SVT employs actively cooled silicon microstrip sensors with fast readout directly downstream of a target and inside of a dipole magnet to instrument a large acceptance with a relatively small detector. The readout is triggered by a fast, radiation-hard, compact, lead tungstate electromagnetic calorimeter. As a first step; a simpler, small scale version of this detector has been assembled and operated on beam at JLab. A detector description and results on multiple Coulomb scattering models are outlined in this paper.

*Keywords:* silicon microstrips, tracking, vertexing, heavy photon, electromagnetic calorimeter

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## Notes:

Style of paper is important to decide how analysis is "handled"

Required analysis (my perspective)

- 1<sup>st</sup> stab SVT track-based alignment (Pelle)
- SVT angular distributions (Pelle)
- Ecal gain calibration (Sho will update existing one)
- Plots...

No obvious page size goal

- Intended to put in some text and see 1<sup>st</sup> draft
- It's 20 pages; can easily get down to 15p I think.

Will circulate a first version after initial glance by others