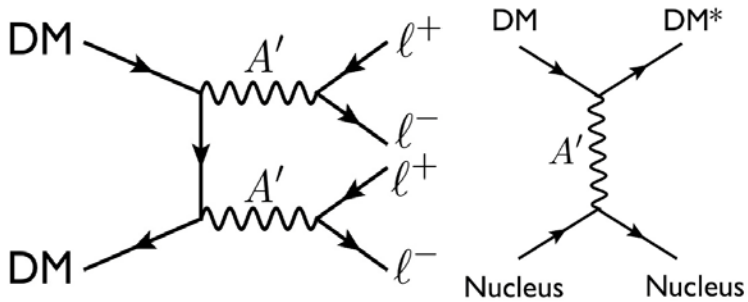
The **Heavy Photon Search Group** at SLAC is collaborating with physicists at Jefferson Lab, Fermilab, and UCSC in two experiments aimed at discovering a hidden-sector, heavy photon.

A heavy photon, or A', would have mass in the range 0.1 to 1.0 GeV, couple weakly to electrons, and decay to e^+e^-. It would be produced by electron bremstrahlung on a heavy target, and be identified as a narrow e^+e^- resonance. Weak couplings of this heavy photon to electrons account for its not yet having been discovered and they can give rise to long heavy photon lifetimes and separated vertices in its decay, providing a spectacular signature. Seeing these decays above the copious Quantum Electro Dynamic trident background is the trick.

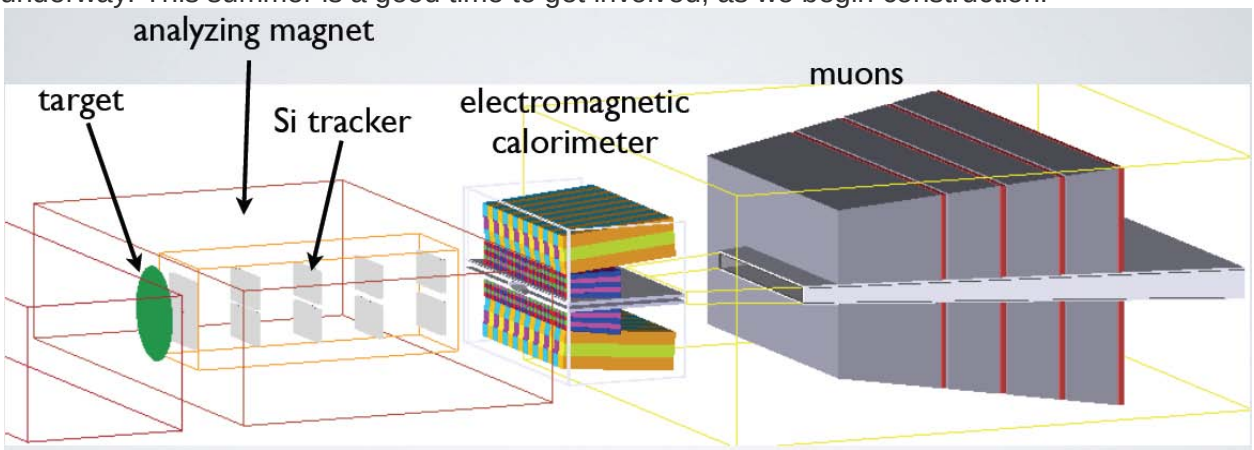
Heavy photons have become a hot topic recently because they may explain excess high energy electrons and positrons in the cosmic rays, and be responsible for dark matter annihilation and interactions with regular matter.



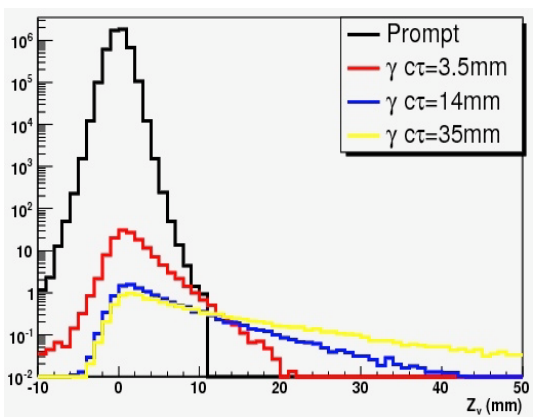
The APEX experiment uses existing Jlab apparatus to search for heavy photons. It has been conditionally approved at Jlab and completed a test run last summer. Data taking runs may be scheduled in 2011-2012. Our group at SLAC will participate in providing the APEX target, data taking, and physics analysis.

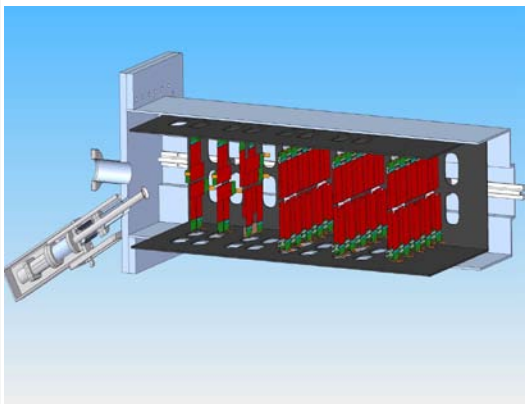
The **Heavy Photon Search experiment (HPS)** has received Jlab approval for its first phase, the HPS Test Run, and conditional approval for the full experiment. This is a grounds-up effort which uses LHC readout for its silicon microstrip detectors and a $PbWO_4$ crystal calorimeter to take data at very high rates. The experiment will measure the invariant mass of e^+e^- pairs to search for resonances, and their point of origin to detect long lived heavy photon decays.

Funding is expected soon, and engineering design and electronics development is already underway. This summer is a good time to get involved, as we begin construction.



HPS is a very small experiment by modern standards, but uses cutting edge detection and readout technologies, and provides an uncommon opportunity for HEP thesis students, offering all aspects of experimental work, from design and hardware construction and test, to commissioning apparatus, taking data, and data analysis. We hope to take test beam data in 2012, and run the full experiment beginning in 2014.





Learn more about HPS on our website:
https://confluence.slac.stanford.edu/display/hpsg/Heavy+Photon+Search+Experiment

Talk to HPS collaborators at the SLAC HEP Open House:

Matt Graham	B84 Rm B275	mgraham@SLAC.Stanford.EDU
Takashi Maruyama	B84 Rm B100	tvm@SLAC.Stanford.EDU
Homer Neal	B48 Rm 128	homer@SLAC.Stanford.EDU
Tim Nelson	B84 Rm B257	tknelson@SLAC.Stanford.EDU
Rich Partridge	B84 Rm B220	richp@SLAC.Stanford.EDU

Contact:

Prof. John Jaros	B84 Rm B228	john@SLAC.Stanford.EDU