Status of the APEX experiment

The A' Experiment (APEX) Searching for a new Vector Bosons A' Decaying to e⁺e⁻ Jefferson Laboratory

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APEX Collaboration List Goes Here

APEX Dark Photon Production and Detection





The APEX A' Signal



- Narrow peak on broad background
- Region of sensitivity: $\alpha'/\alpha >9 \times 10^{-8}$ 65 MeV $\leq m_{A'} \leq 525$ MeV
- Requires missing mass resolution $\delta m=0.5\%$
- APEX achieves this using:
 - 1) JLab's twin High Resolution Spectrometers
 - 2) Novel tungsten-ribbon target

Coverage Achieved With 4 Kinematic Settings

 $65 \; \text{MeV} \leq m_{A'} \leq 525 \; \text{MeV}$



1 Month Beam Time
A) 6 days @ 2.3 GeV
B) 12 days @ 4.5 GeV
C) 6 days @ 1.1 GeV
D) 6 days @ 3.3 GeV

Status:

- Test run performed in Hall A, July 2010
- Verified all key aspects of apparatus performance
- 700k good trident events

JHEP 1102:009,2011, <u>arxiv:1001.2557</u> PRL 107:191804,2011, <u>arxiv:1108.2750</u>



Status: The APEX Septum Magnet

Electron, P = E0/2





Funding was provided by five universities: NCCU, CMU, CSULA, SBU, UW(Ca) 8

Status: Tungsten-Ribbon Target





Accepted e⁺e⁻ pairs miss downstream foils Holders compensate for temperature increases



SLAC-designed target at JLab

- Ongoing Preparations
- Motion interface
- Heat-load analysis
- Procure target holders

Status: SciFi Detectors

• "Active sieve-slit" – enables optics calibration without switching beam energy & e^+ arm polarity





- For low-current optics calibration runs only; will be removed during production runs
- Two hodoscopes assembled 2012 & 2013
- New readout electronics (FADC) being installed
- Testing this summer
- Need commissioning and incorporating in optics fit

- Vacuum chamber & corrector magnet design
- Radiation study & shielding
- Analysis: High-rate VDC reconstruction, online software
- Update reach & QED background model

- Ready to run Spring 2015
- WHAT ELSE DO WE WANT TO SAY?