

PR-10-009, E12-10-009

A' Experiment ("APEX")

Search for a New Vector Boson A' Decaying to e^+e^-

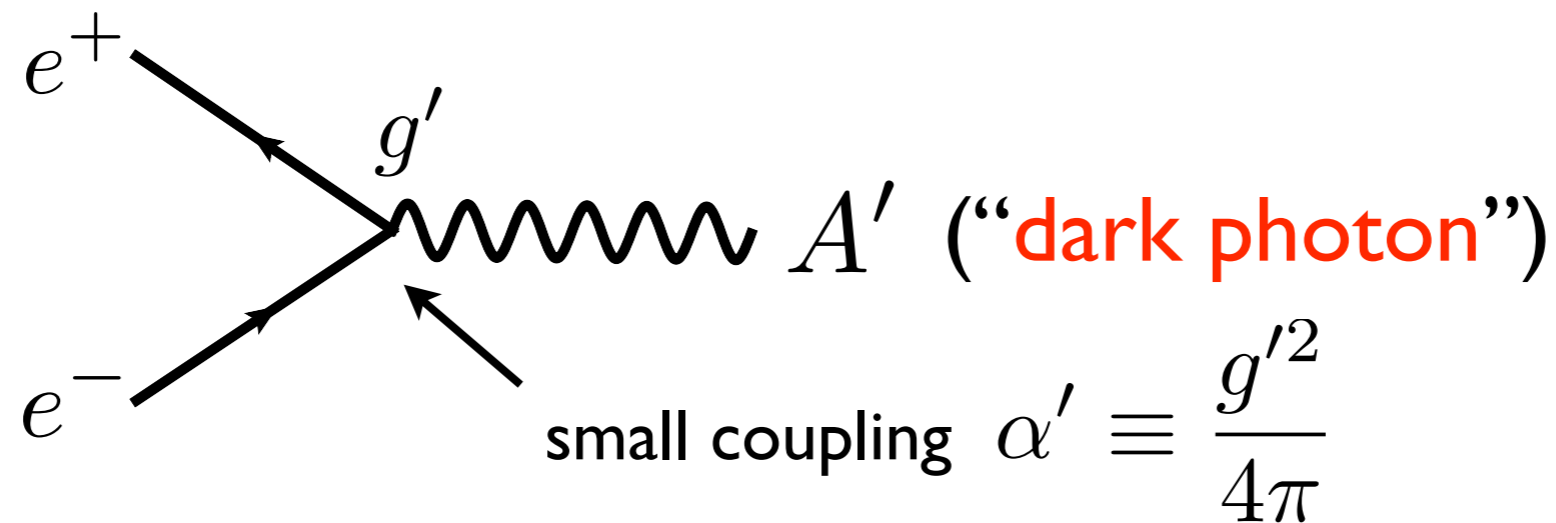
Collaboration Meeting, Feb 17 2010

J. D. Bjorken*, **R. Essig (spokesperson)**, M. Graham, J. Jaros,
T. Maruyama, K. Moffeit, A. Odian, R. Partridge,
P. Schuster (spokesperson), **N. Toro (spokesperson)**, P. Bosted,
A. Camsonne, E. Chudakov, M. Dalton, A. Deur, J. Gomez, O. Hansen, D.W.
Higinbotham, C.W. de Jager, J. J. LeRose, R. Michaels, S. Nanda, Y. Qiang, A.
Saha, **B. Wojtsekhowski (spokesperson and contact person)**, R.
Lindgren, N. Liyanage, V. Nelyubin, B. E. Norum, S. Riordan, P. Markowitz,
A. Glamazdin, M. Khandaker, V. Punjabi, R. Gilman, G. Kumbartzki,
R. Ransome, Jin Huang, V. Sulkosky, D. Armstrong, T. Averett, Bo Zhao,
M. Mihovilovič, S. Širca, G. Ron

and The Hall A Collaboration

Goal of APEX

Search for new forces mediated by ~ 100 MeV vector boson A' with weak coupling to electrons



Significant new reach in α' (~ 2 - 3 orders of magnitude)

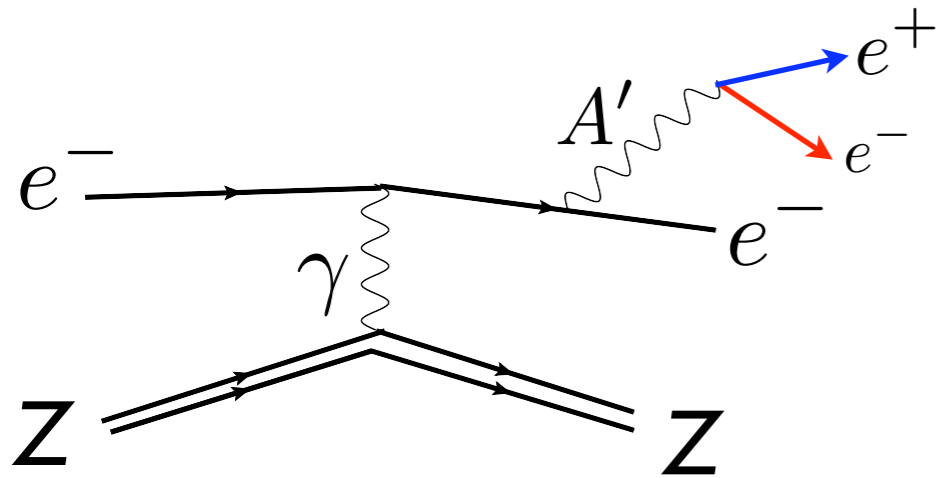
Broad interest in particle physics community

- new gauge force
- dark matter interactions?
- $(g-2)_\mu$ and HyperCP anomalies

See talk this Friday Feb. 19th @JLab (11am, Cebaf Center Auditorium)
by N. Weiner (NYU) on Dark Matter motivation

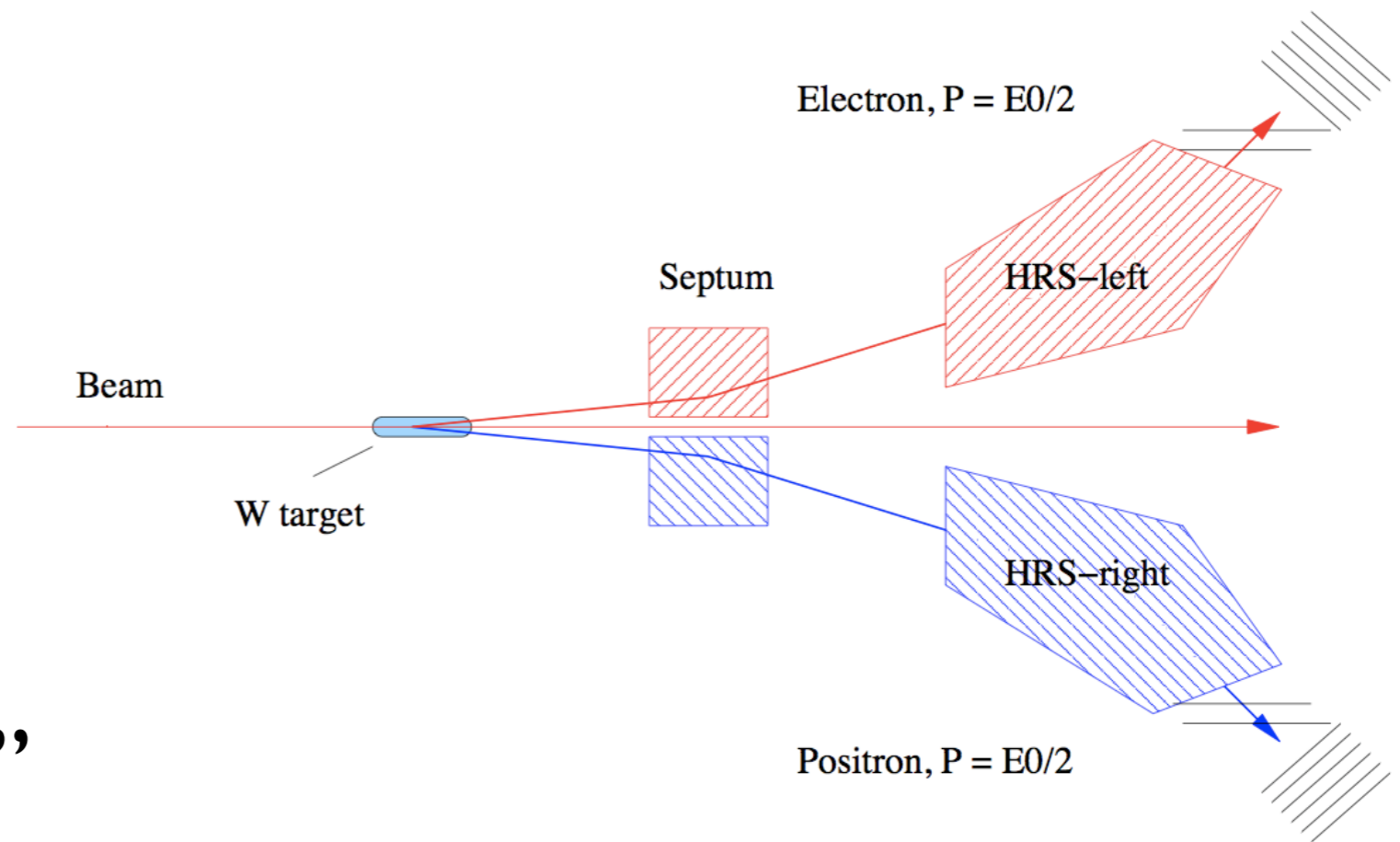
The Experiment

Produce A' via bremsstrahlung off e^- beam on tungsten target



A' produced forward carrying most of energy & promptly decays to e^+e^- pair

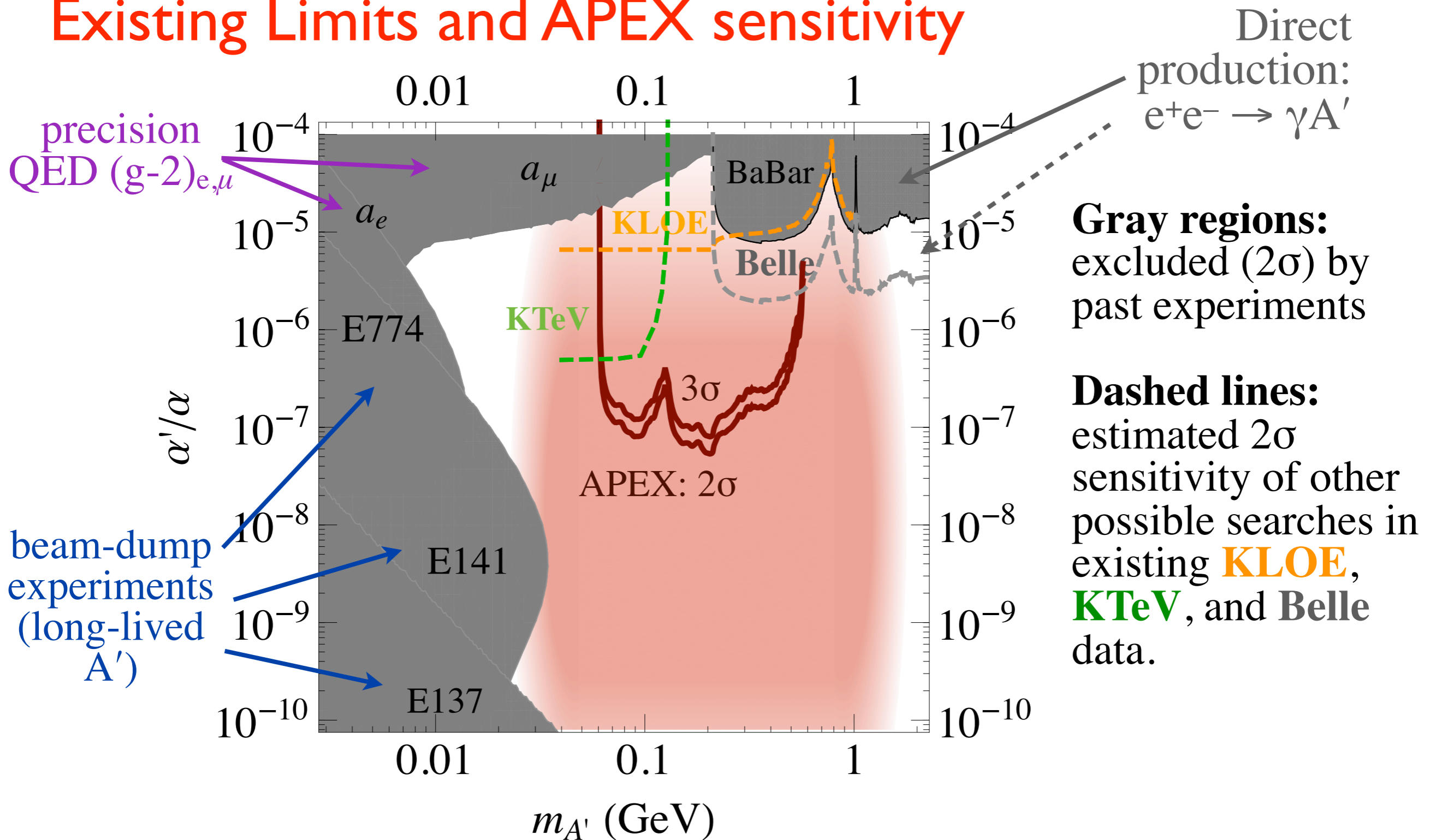
Use existing Hall A equipment, PREX septum, wire target



perform “bump hunt”

A' appears as small resonance on QED background

Existing Limits and APEX sensitivity



No past experiment has **sufficient statistics and mass resolution** to see A' if its coupling is below the dashed lines.

This is a theoretically motivated region

– relevant for dark matter

– predicted by grand unification

Purpose of this Meeting

APEX has been conditionally approved by PAC 35
(Kees will discuss status of proposal)

Conditions include that we prove we can achieve required mass resolution, high statistics, and control backgrounds

This meeting will discuss these conditions in more detail and describe how we plan to address them

We are also requesting a test run to address PAC concerns

Agenda

- 1. 1:00 pm:** Introduction: Purpose and Plan of meeting: [Rouven Essig](#) (10')
- 2. 1:10 pm:** Status of APEX proposal: [Kees de Jager](#) (10'+10')
- 3. 1:30 pm:** List of concerns from PAC: [Rouven Essig](#) (15'+5')
- 4. 1:50 pm:** Signal and Background Reactions: [Natalia Toro](#) (20'+5')
- 5. 2:15 pm:** HRS & Septa optics: [John Le Rose](#) (20'+5')
- 6. 2:40 pm:** VDC analysis: [Ole Hansen](#) (20'+5')

- 3:05 pm:** *30-minute break, room change at SLAC (to Ballam)*

- 7. 3:35 pm:** Target design: [Ken Moffeit](#) (30'+10')
- 8. 4:15 pm:** Target installation and survey: [Dave Meekins](#) (10'+5')
- 9. 4:30 pm:** Run Plan: [Bogdan Wojtsekhowski](#) (20'+10')
- 10. 5:00 pm:** Discussion and Summary: [Philip Schuster](#) (30')