Welcome
&
Introduction

APEX phone meeting, 10/17/2014

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Today's meeting

- Introduction (10')

  (Dark Photon Status + APEX overview)

- Summary of Outstanding Tasks (20')
- Discussion of Outstanding Tasks (20')
- Discussion of draft authorship rules (10')

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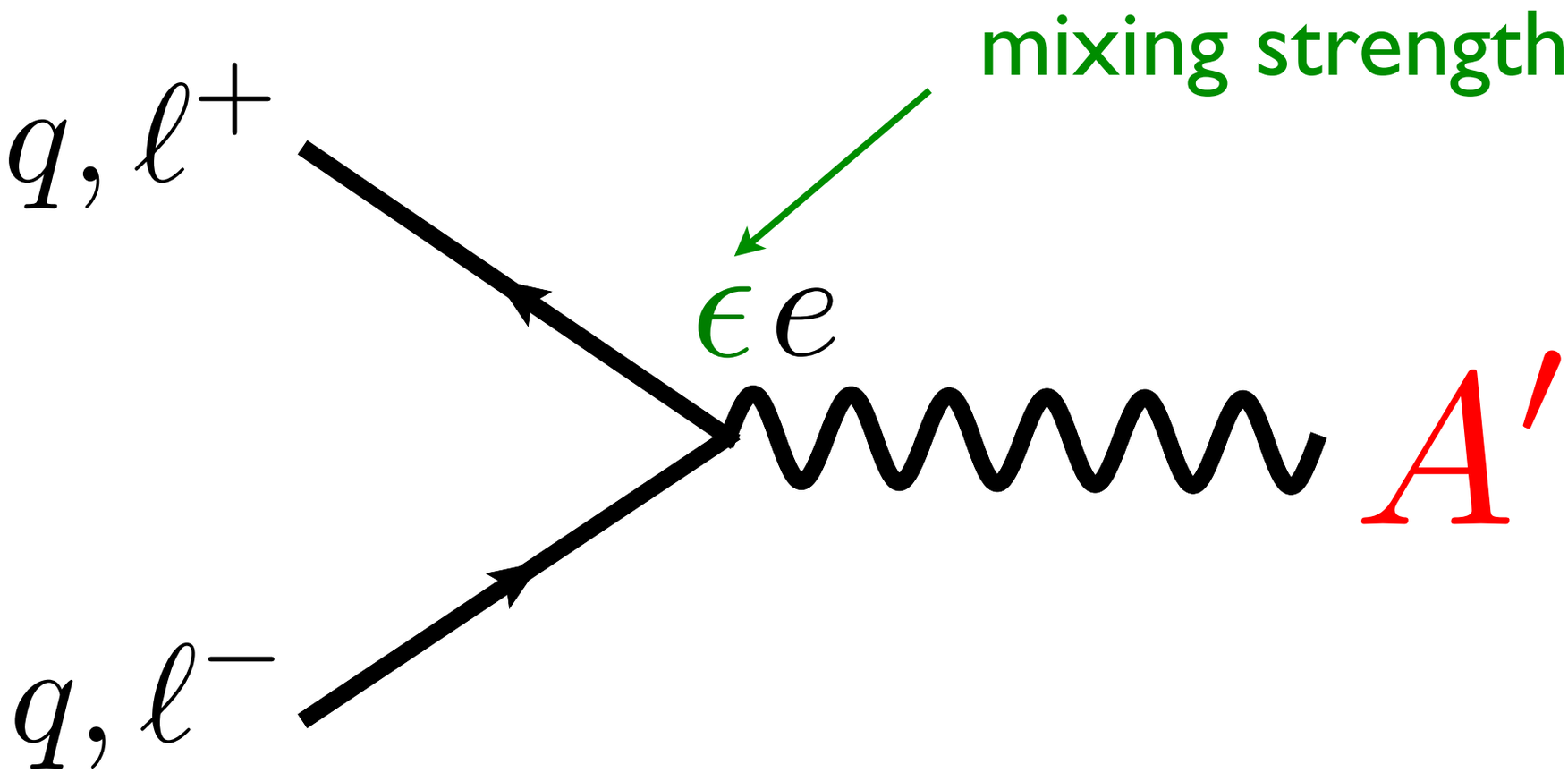
Dark Photons
&
Current Status

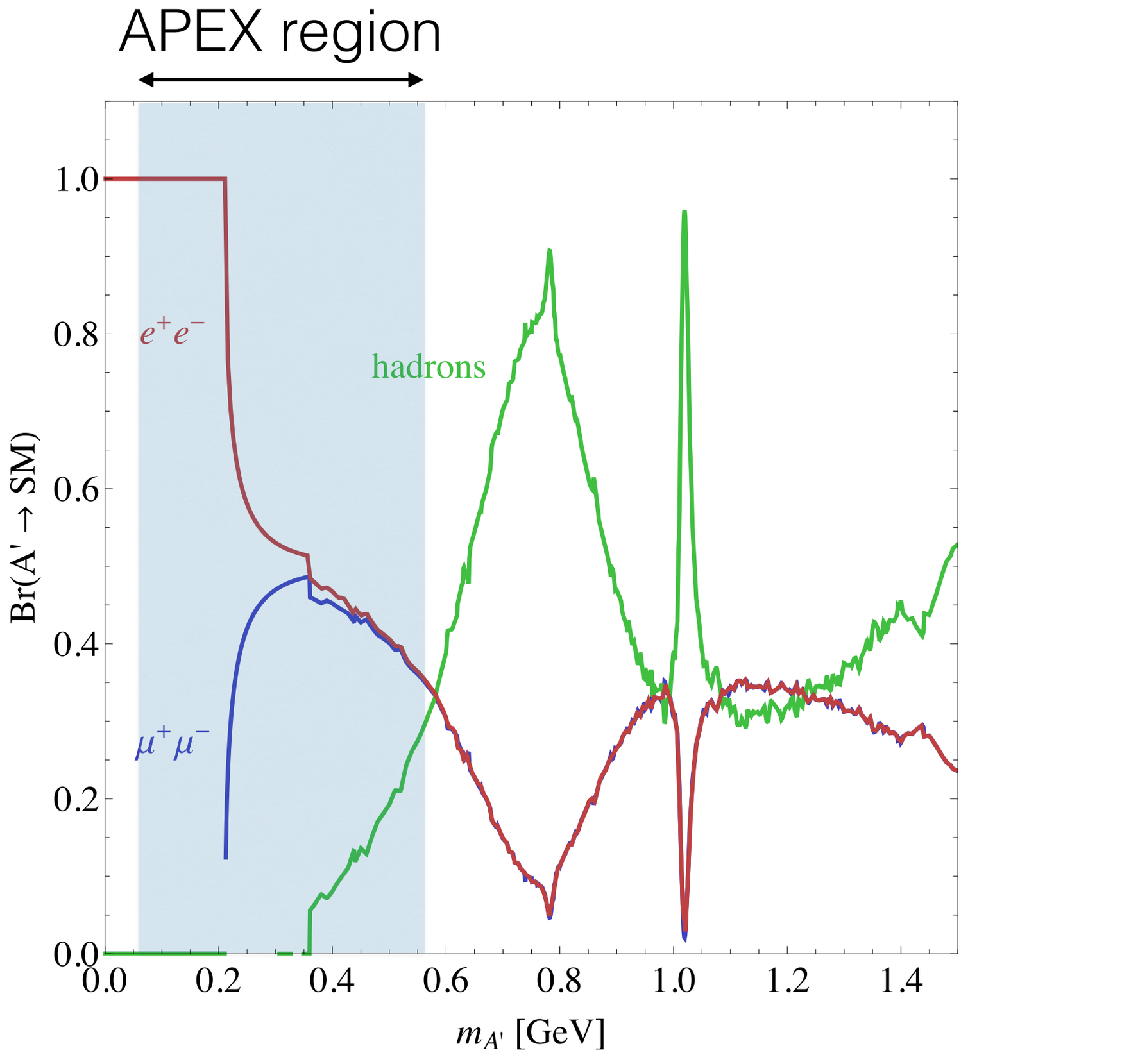
A′ couples to Quarks and charged Leptons



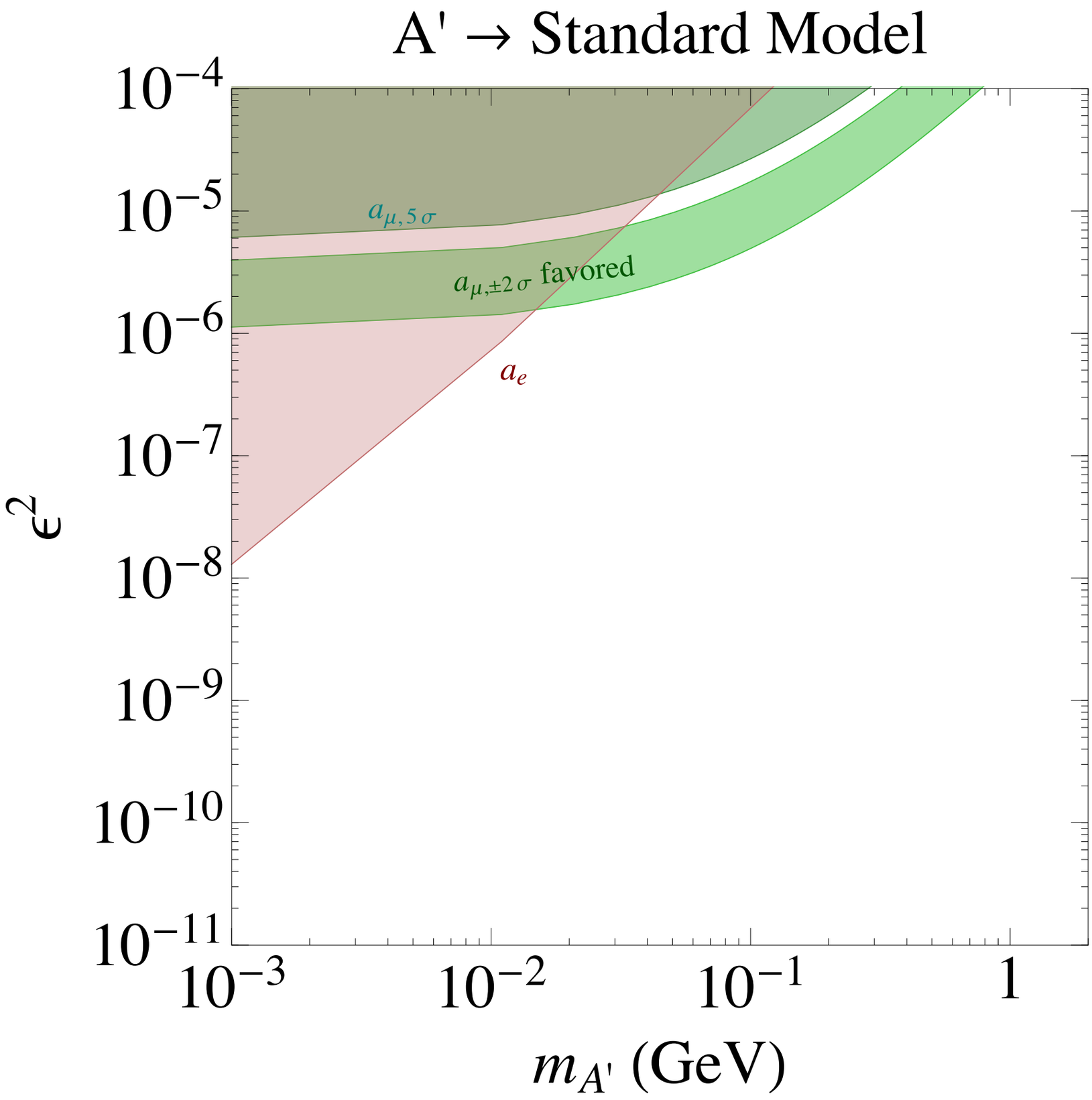
allows production of A′ in e^+e^- colliders, electron & proton beam dumps, meson decays etc.

consider only A′ masses > 1 MeV

A′ decays

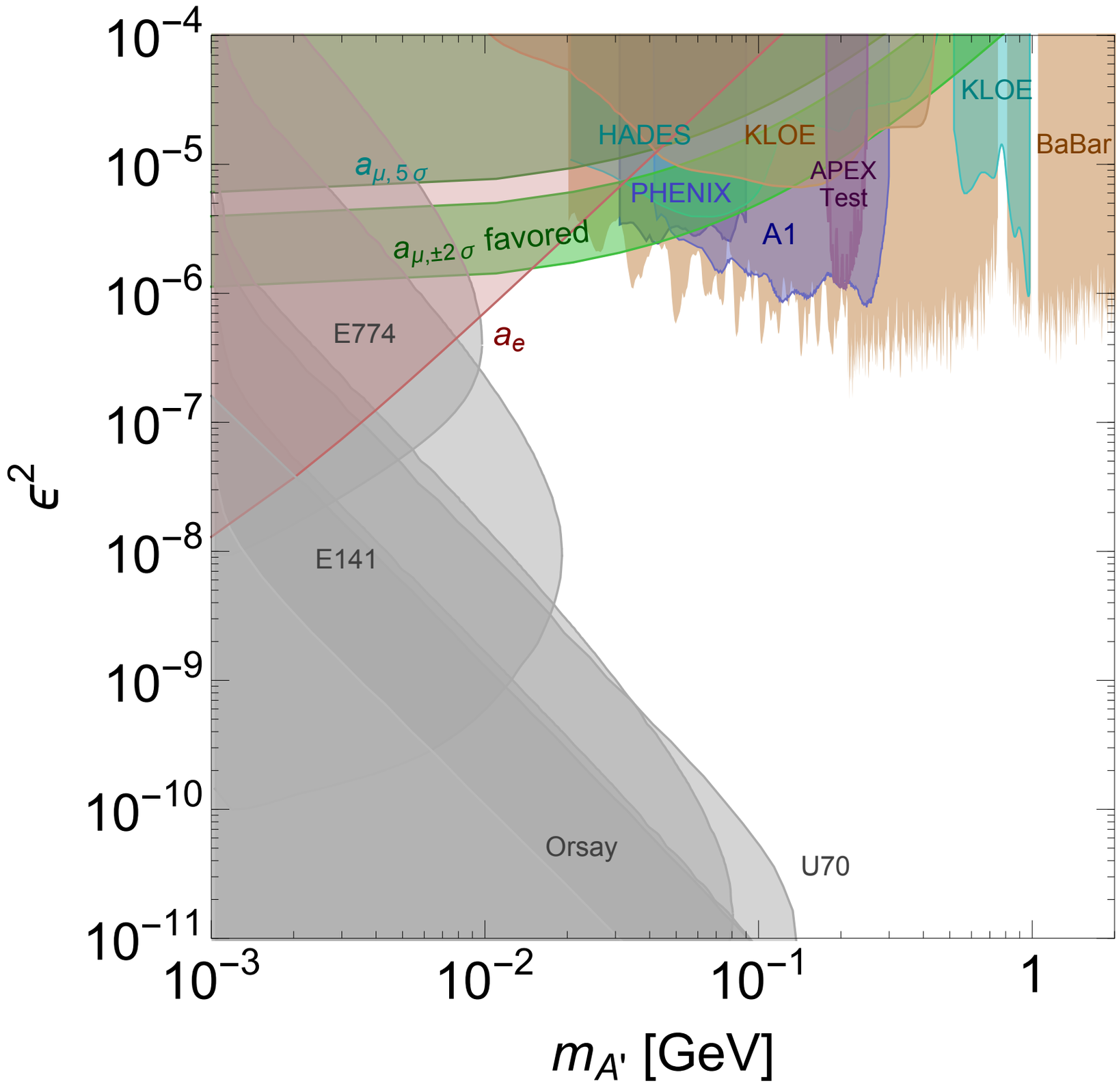


Status ~2008

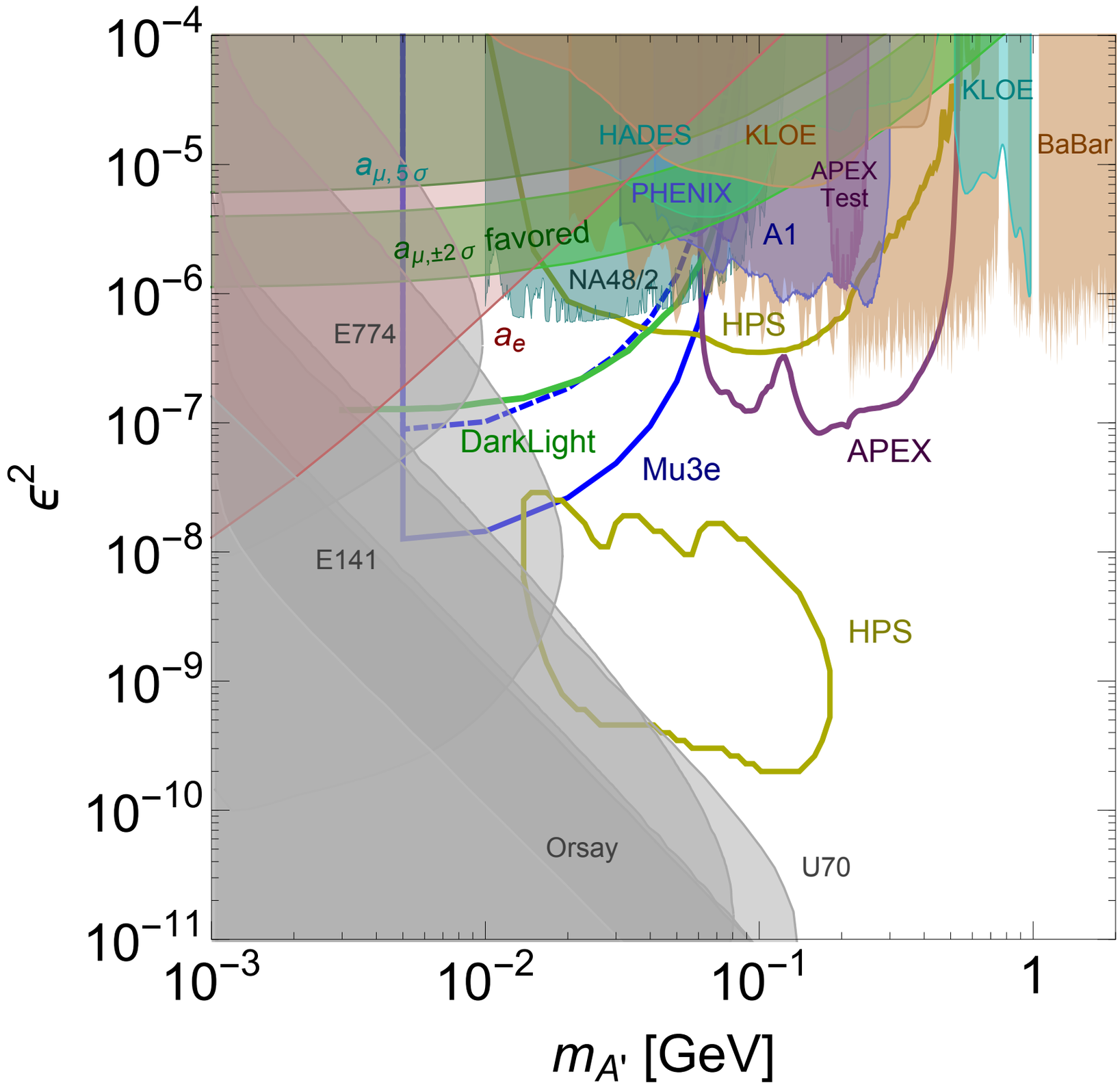


dark photons considered well before 2008, but constraints never discussed in detail

Status ~Today (published results)

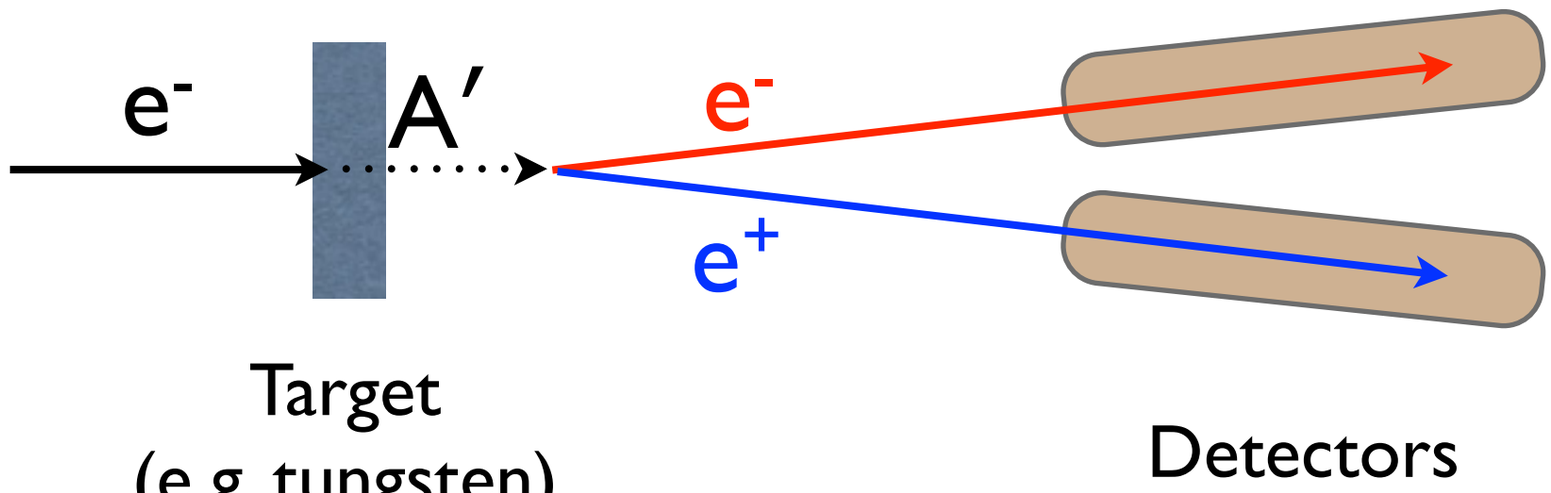


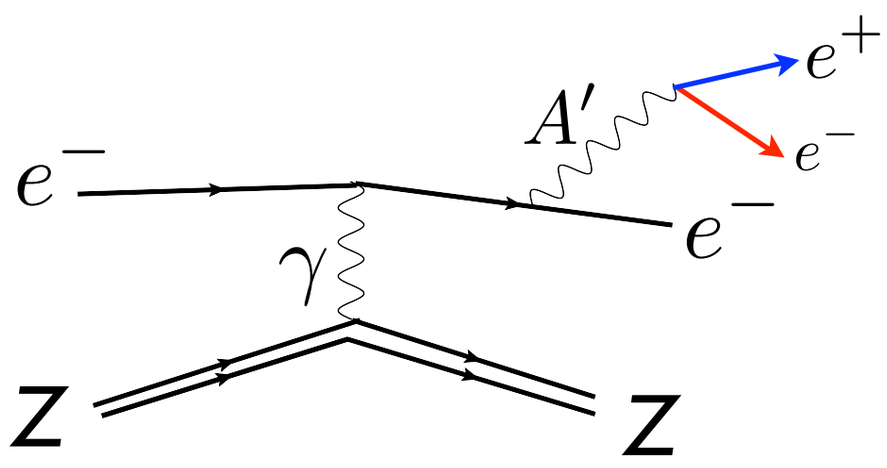
APEX vs The World



How does APEX work?

Electron-beam Fixed-Target Concept



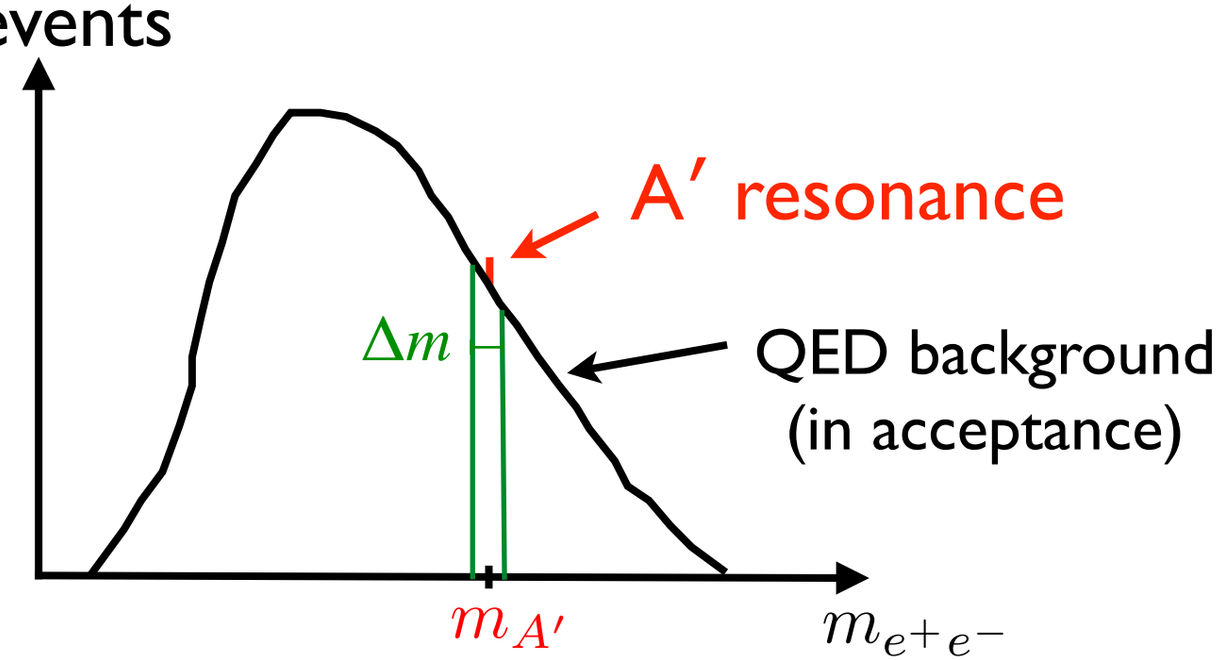


APEX Goal and Strategy

Goal: find an A′ resonance!

Challenge: find it over large, but smooth, background

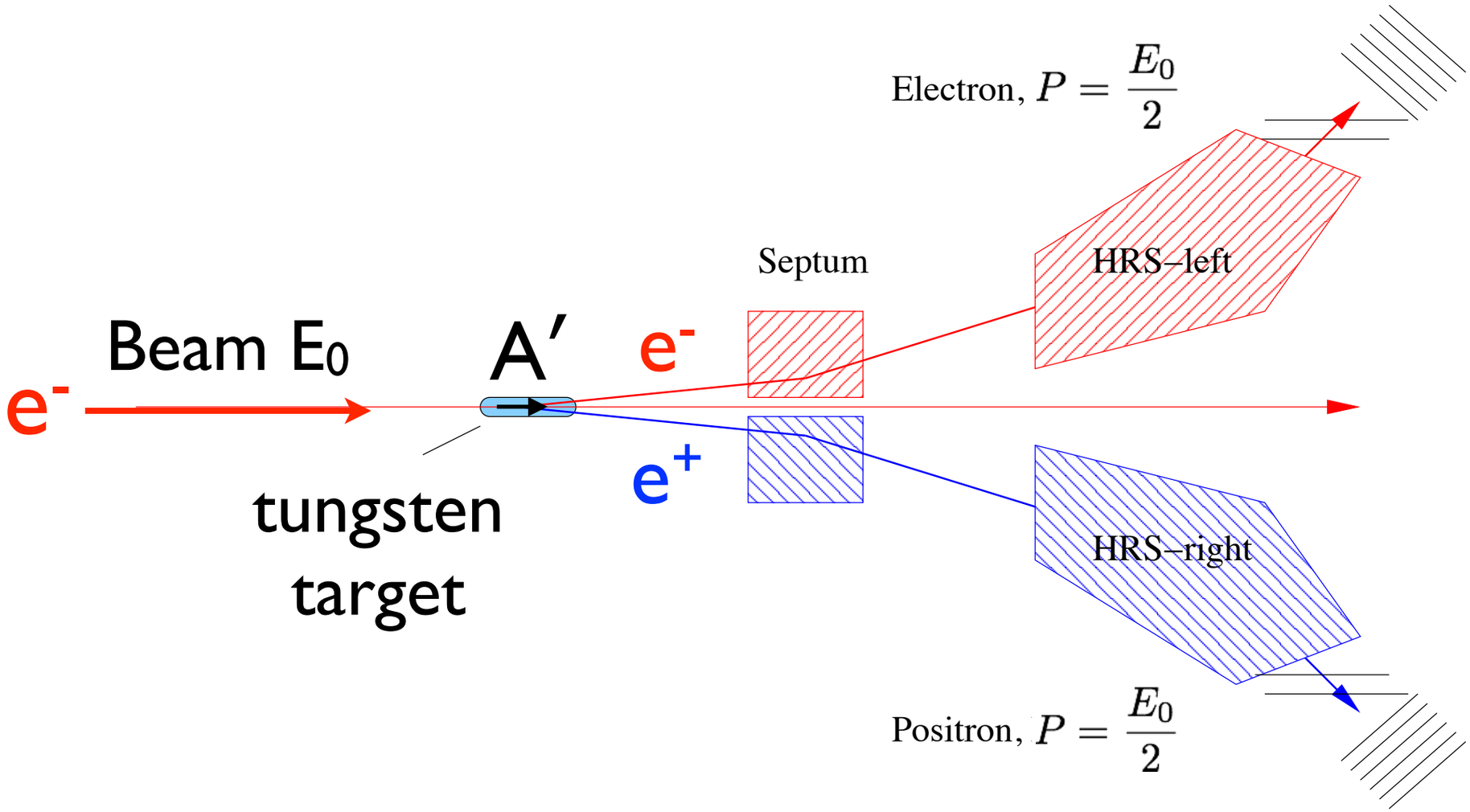
Requires large statistics & excellent mass resolution!



Sensitivity controlled by $S/\sqrt{B}$ in mass window Δm,

$$\frac{S}{\sqrt{B}} \sim \frac{\epsilon^2}{\alpha}\sqrt{N_{QED}\left(\frac{m_{A'}}{\Delta m}\right)}$$

Experimental Setup



high-resolution spectrometer (HRS-left)

high-resolution spectrometer (HRS-right)

APEX is designed and optimized for A′ resonance search with large statistics and excellent mass resolution:

- JLab Hall A: High-current CW beam & high-resolution spectrometers (HRS's)
- Spectrometer configuration with septum maximizes signal acceptance while reducing background
- HRS detectors & DAQ allow for high singles rate operation
- Minimize contributions to angular resolution from spectrometer optics reconstruction and multiple-scattering in target

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