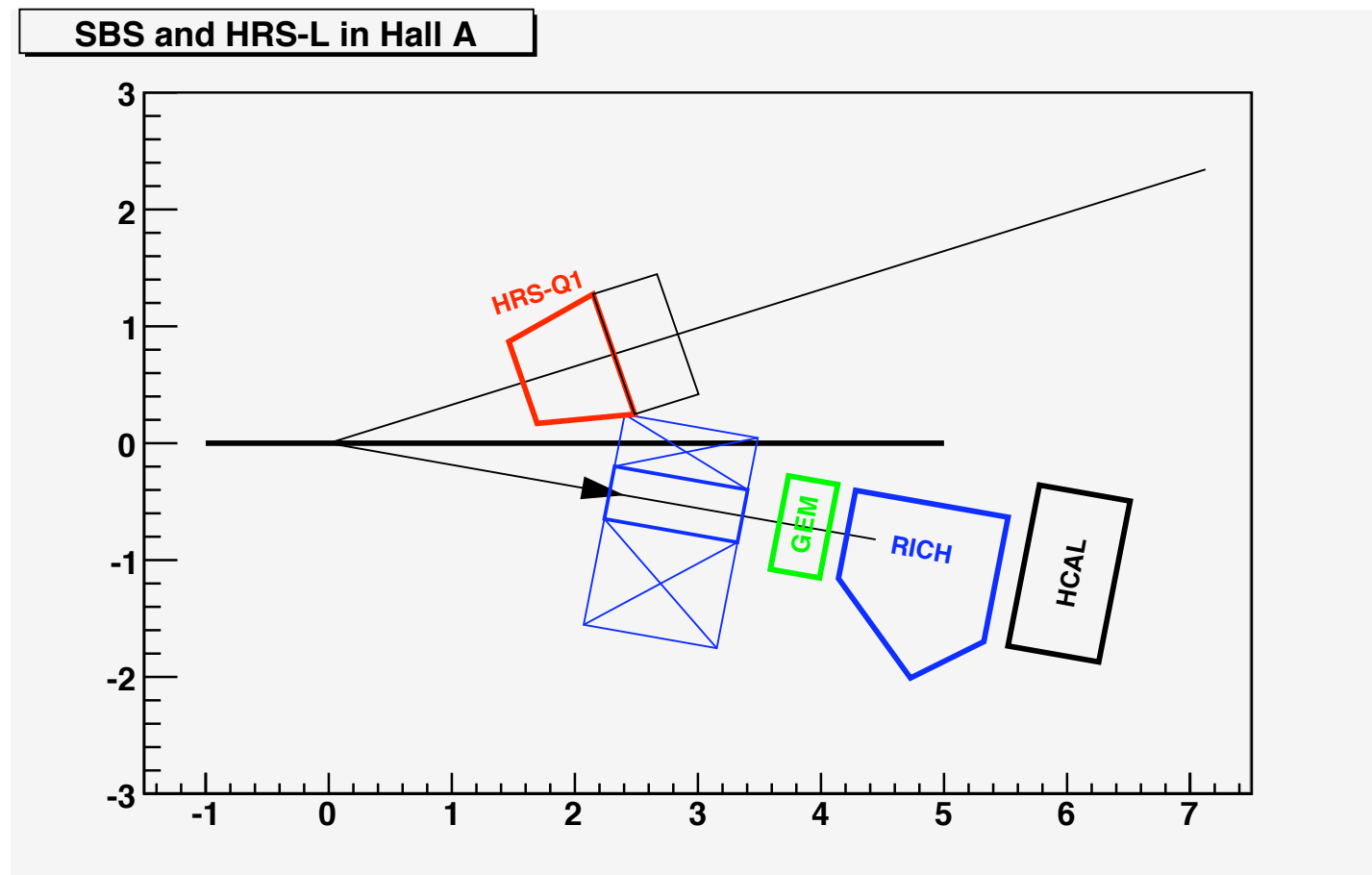


The HERMES RICH Counter in Super Big Bite

Charles Hyde

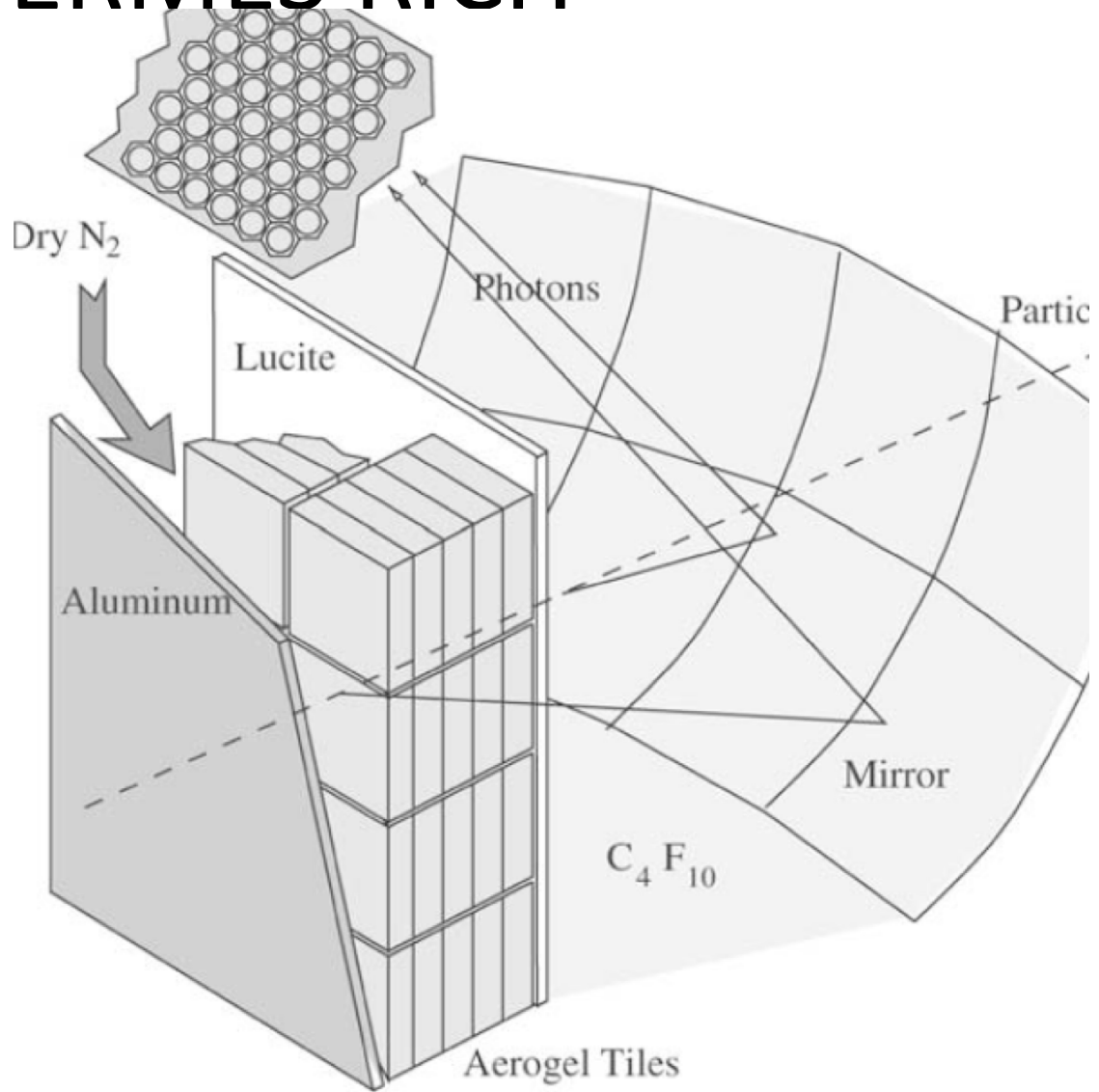
Configuration for Deep Φ

- LOI PAC35



HERMES RICH

- Aerogel + Gas
 - 5.5 cm C₄F₁₀
 - 0.16 g/cm³
- ≈2000 PM collecting light from ≈0.5 m² active area
- in SBS: 4m from target
 - 16 μsr/pixel

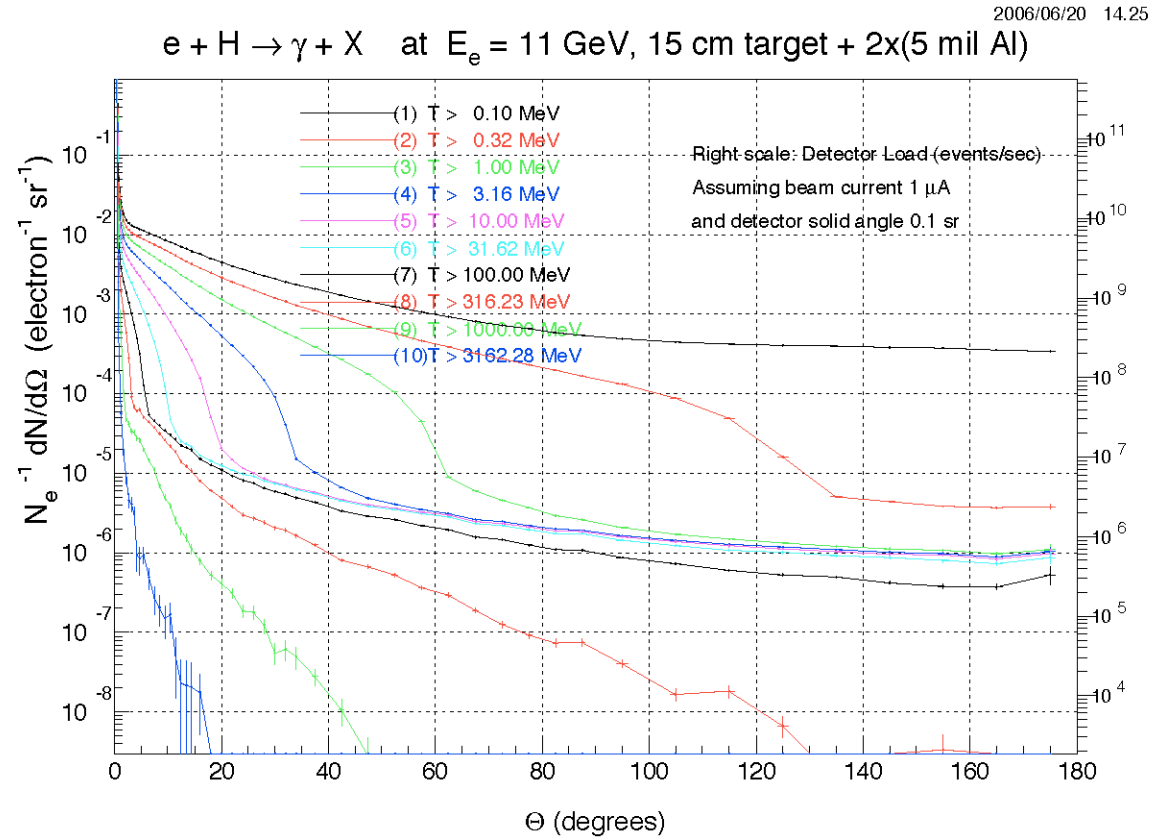


Luminosity, Background, Readout

- HERMES $\sim 10^{32}/\text{cm}^2/\text{s}$
 - PCOS 4 Readout
 - 100 ns integration time
 - Digital latch only
- Hall A : $10^{37}/\text{cm}^2/\text{s}$
 - New front end discriminator
 - Improve timing to 1 ns,
 - Multi-hit TDC
 - Leading/trailing edge?
 - Analog readout of sum of every 16 chan?
 - Factor of 1000 increase in background

Atomic Backgrounds from Target

- Dominated by one-step Compton, Moeller
- Electrons will be screened by Dipole

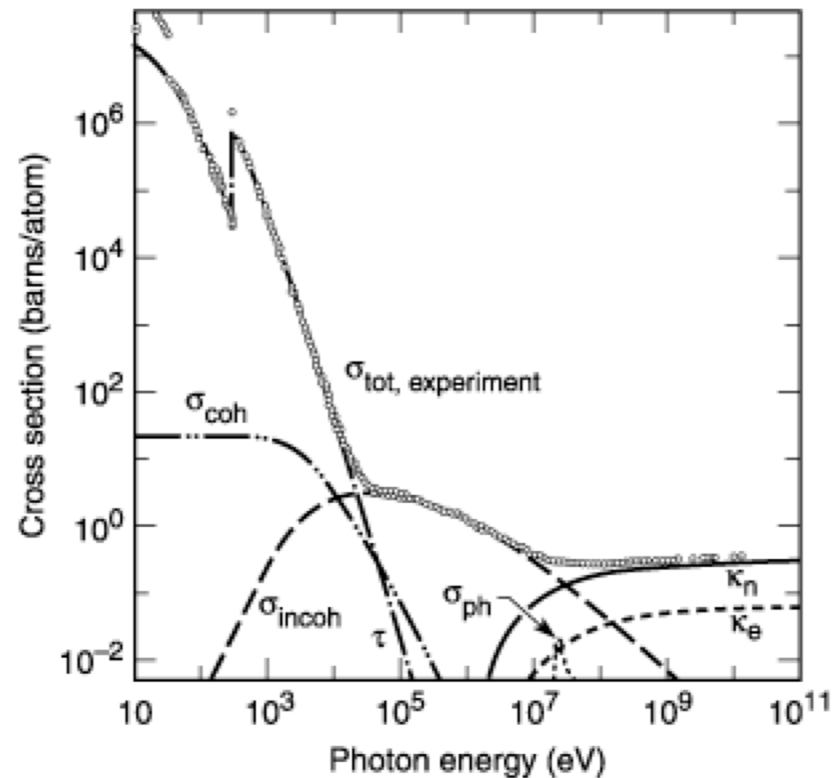


Photon Background at 10°

- Integrated for $E_\gamma > 1 \text{ MeV}$
 - Threshold for minimum-ionising Compton recoil electron in Aerogel + Lucite ($1\text{g}/\text{cm}^2$).
 - Photon (gamma) flux is
 - $\approx 5 \cdot 10^{10}/\text{sr}/\text{sec}$ at $10^{37}/\text{cm}^2/\text{s}$
 - $\approx 8 \cdot 10^5/\text{sec}/\text{pixel}$ (PMT)
 - Conversion probability in Aerogel, lucite and Al frame?
 - $2 \text{ g}/\text{cm}^2$

Compton Conversion Electrons

- Photons above 1 MeV
- Carbon
 - $\sigma \approx 1$ b/atom
- $1 \text{ g/cm}^2 \text{ SiO}_2$
 - $\rho\sigma X = 0.05$
 - Total $\rho\sigma X = 0.1$
- Conversion rate
 - $\approx 80 \text{ kHz / pixel}$
 - 10 photo electrons/
MIP electron
 - 800 kHz random hits
 - 1% occupancy in 10 ns

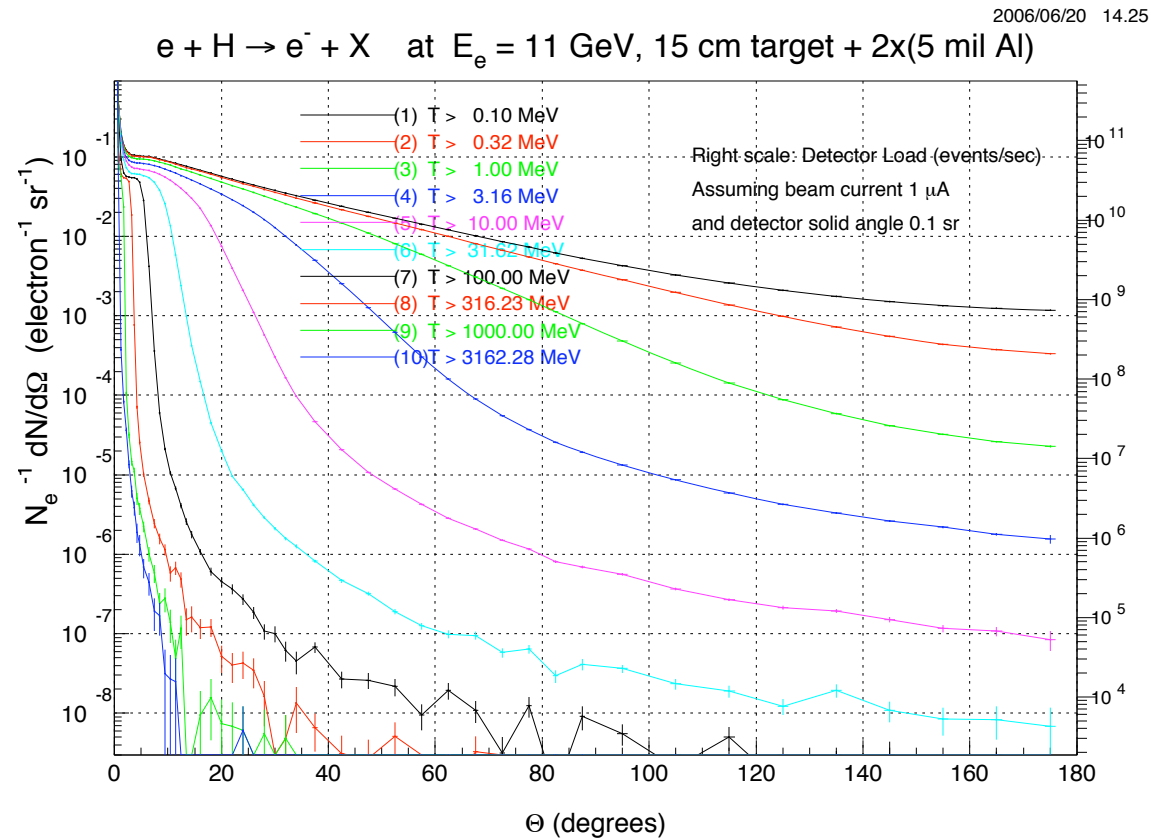


Conclusion

- “Back-of-envelope” estimate
 - Random rates look low
 - Even lower effective threshold and 100x secondary electron flux is low.
 - Recheck
- Other effects?
 - Photon conversions on magnet yoke?
 - Knock-on electrons from hadrons
- GEANT simulation possible in 2011.

Electron Background

- Screened by B-field



Pion Background

- Dominant hadronic channel

