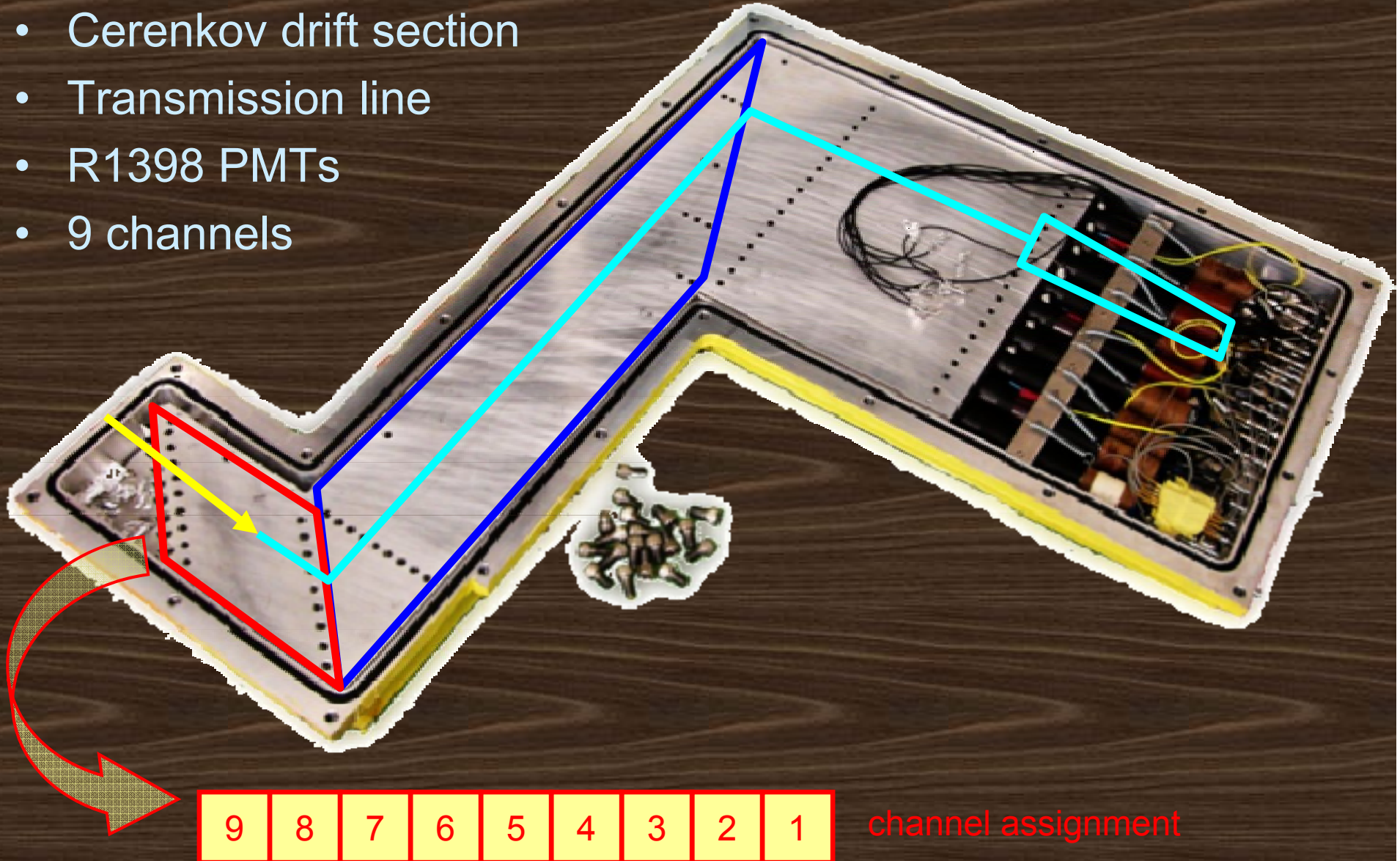

First Results
of the
SLD Cerenkov Polarimeter
at the DESY test beam

Oleg Eyser

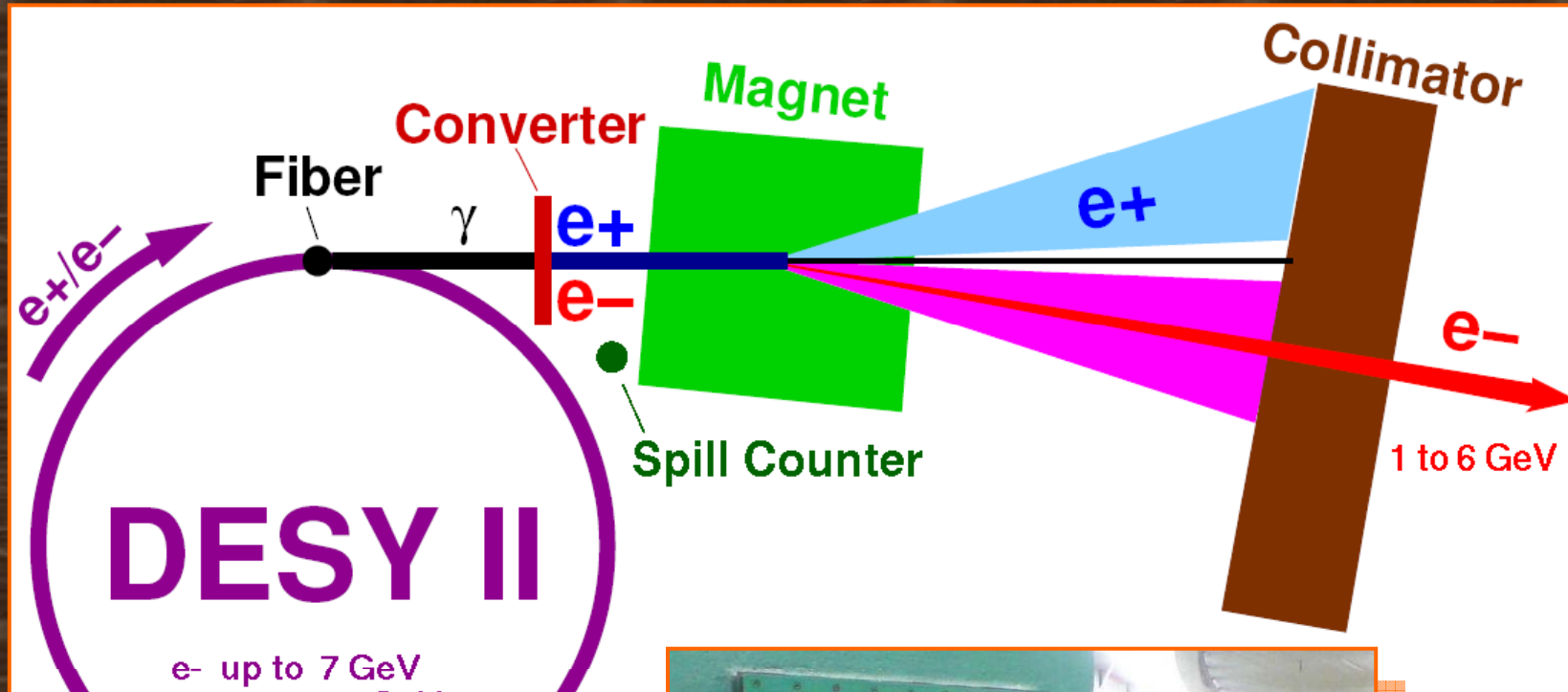
Daniela Käfer, Christian Helebrant, Jenny
List, Ulrich Velte*

A Cerenkov detector

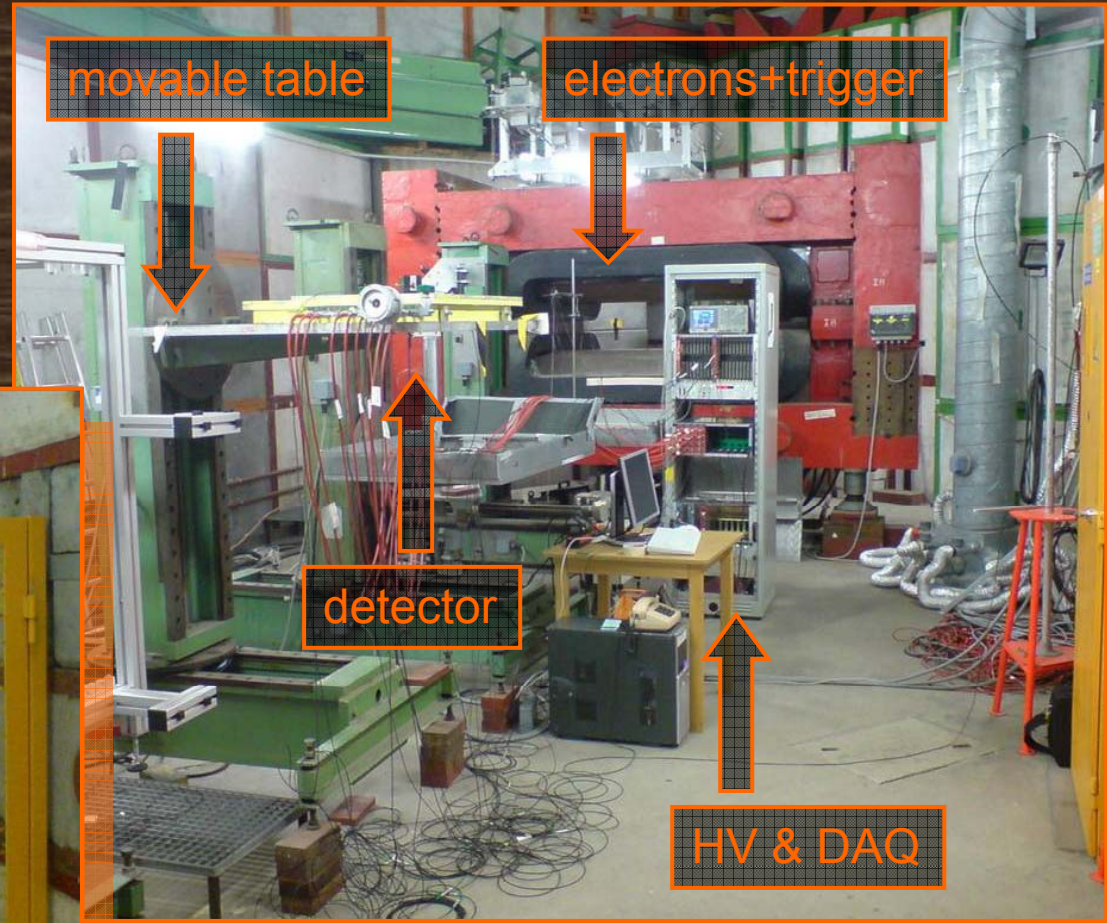
- Cerenkov drift section
- Transmission line
- R1398 PMTs
- 9 channels



DESY II Test Beam

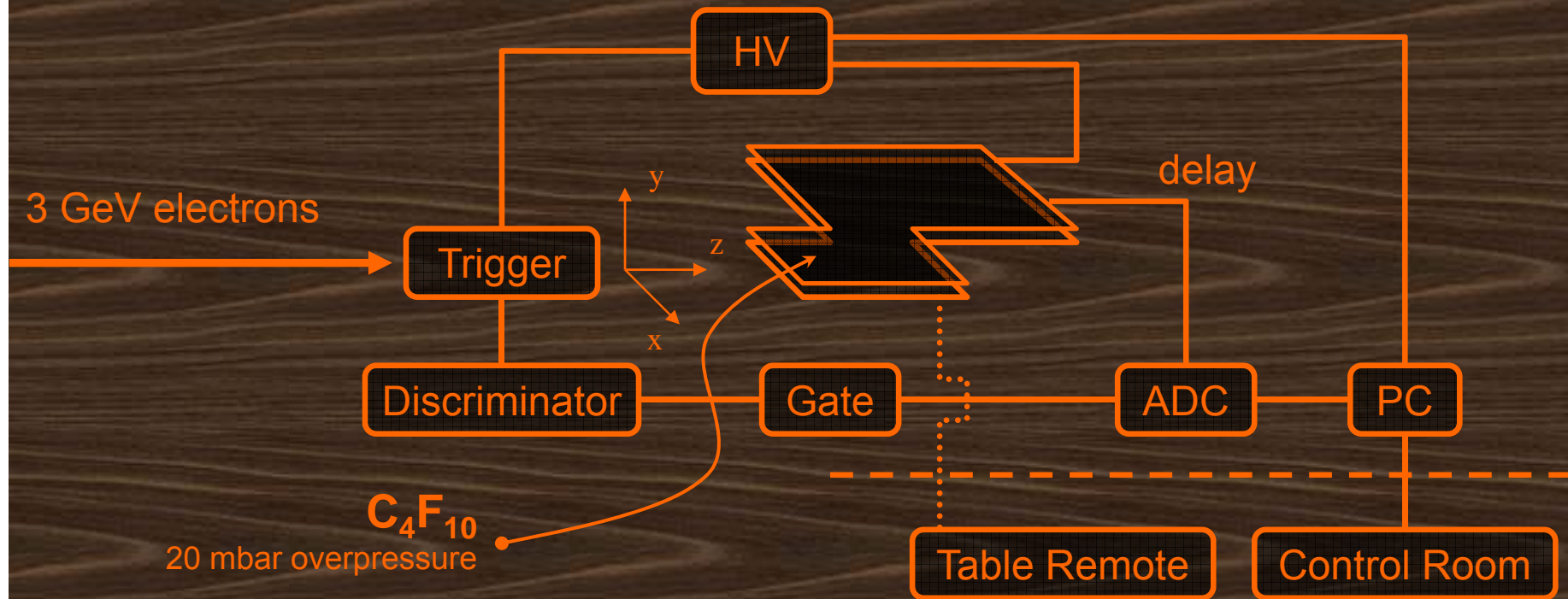


Test Beam Area 21



Setup

5



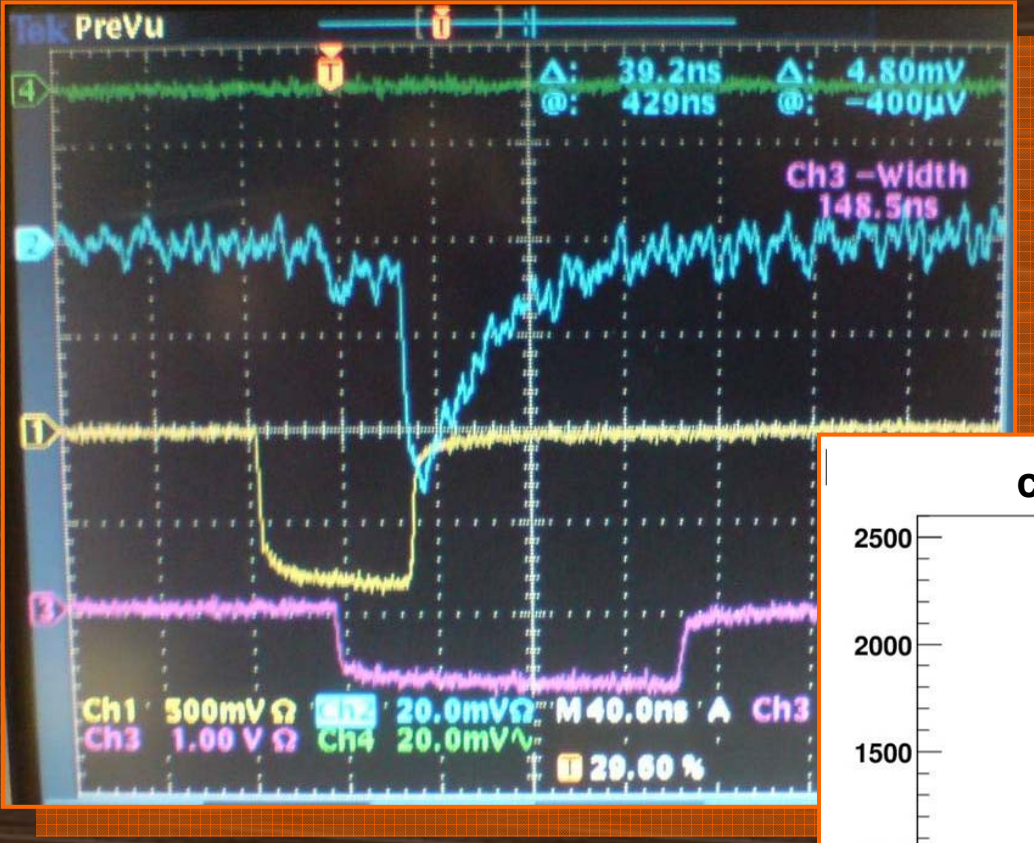
November 2007:

old PMTs
2 weeks with setup and first tests
Channels 1 & 2 bad
Channel 3 dead

December 2007:

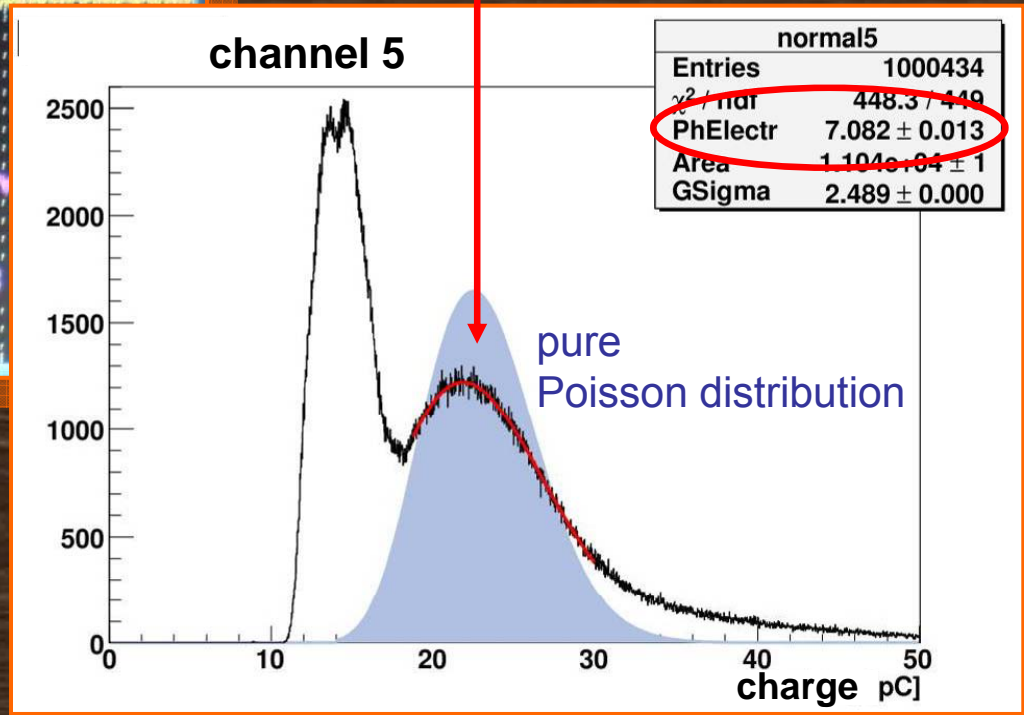
some channels with SiPMs and
multi-anode PMTs
Four days before holidays
Two dead channels (4 & 6)

Data Acquisition



Fit: Poisson ⊗ Gauss
→ Photo electrons
→ Effective gain
→ Pedestal

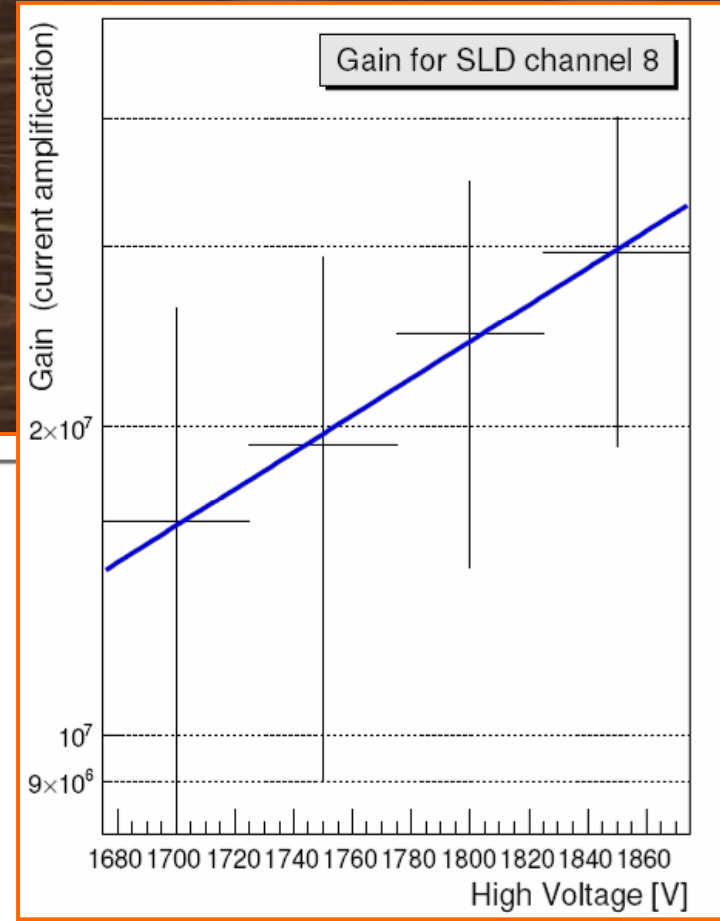
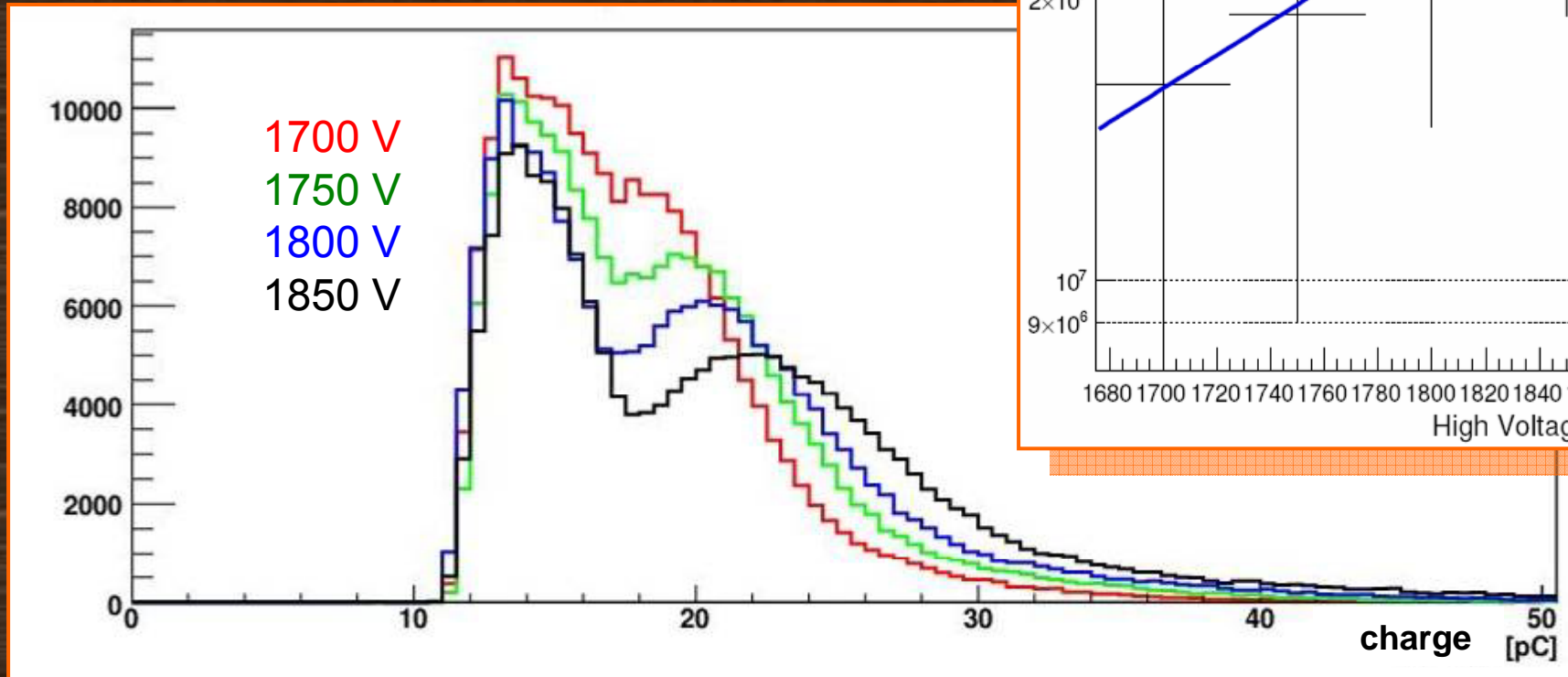
typically 200,000
to 1,000,000 events



Voltage Scan

Gain varies by a factor of two between channels (compare errors)

Working point at 1850 V



Cross Talk

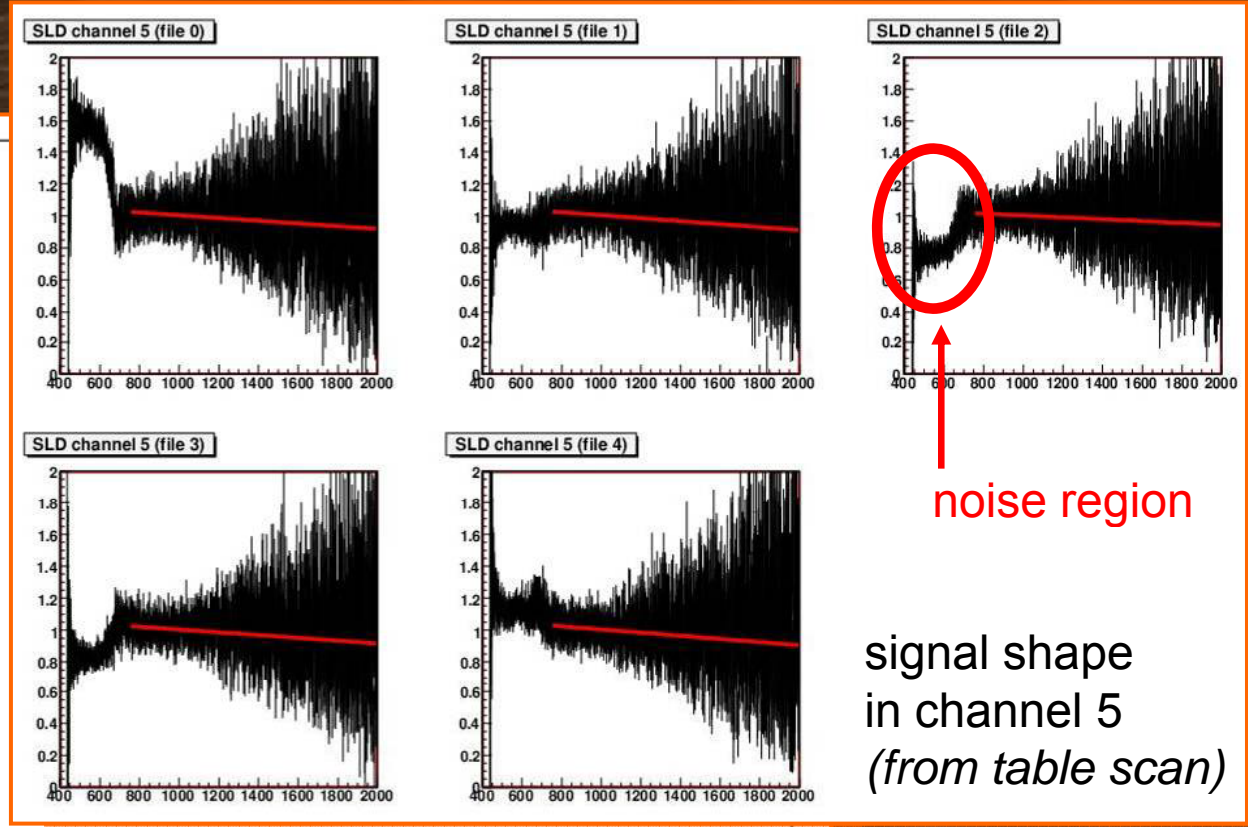
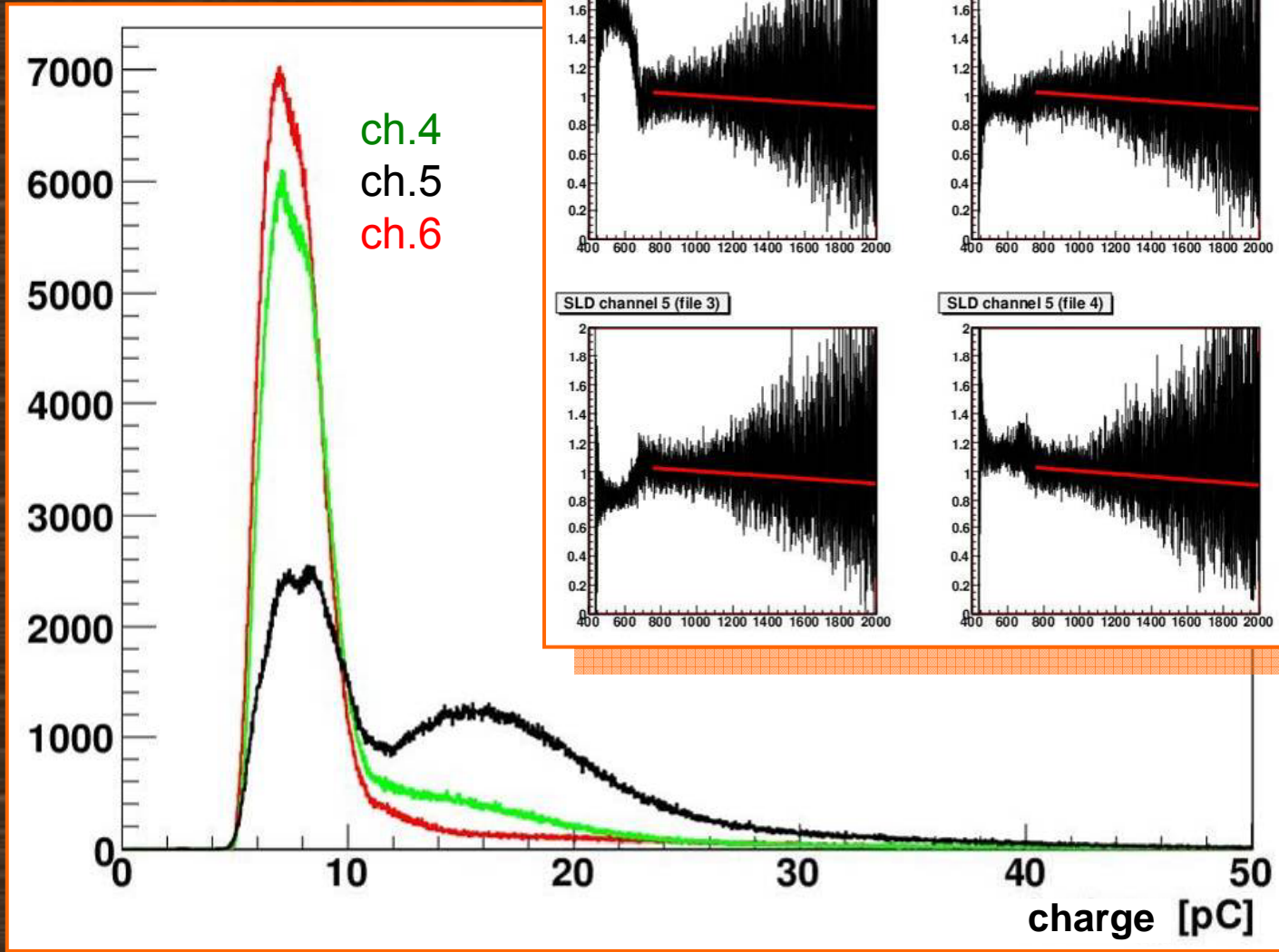
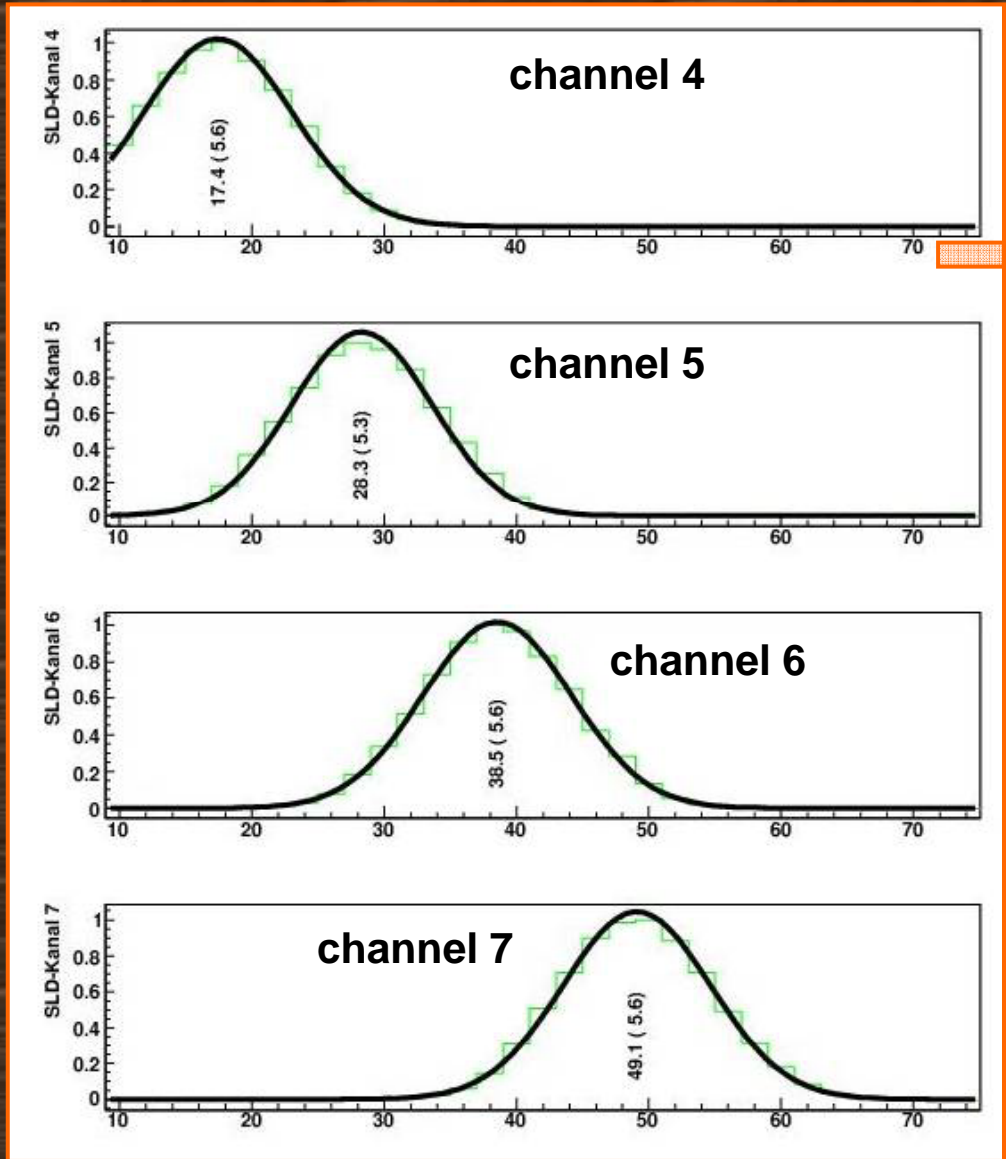


Table Scan



Detector position (mm)
Channel width 10 mm
Fold with beam spread
and Trigger:

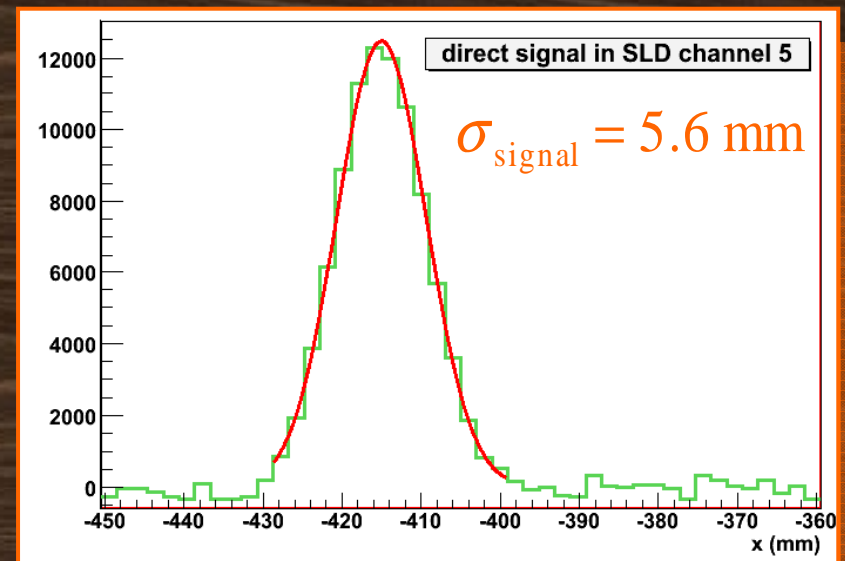
$$\sigma_{\text{signal}} = 5.3 - 5.6 \text{ mm}$$

Compare Simulation



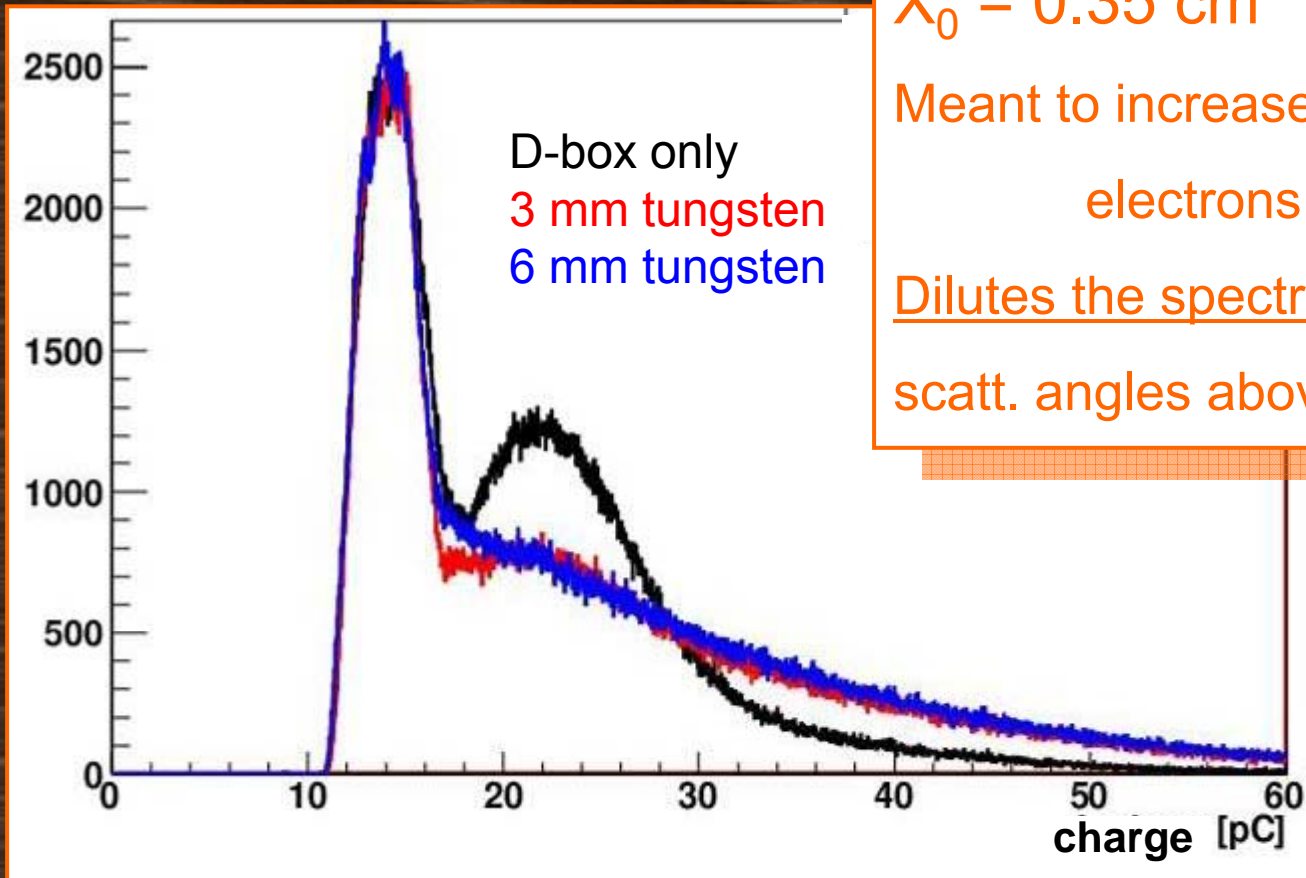
3 GeV electrons, $\sigma_x = 5$ mm
 C_4F_{10} refraction index $n \approx 1.0014$
Detector box walls 5 mm
Channel walls 500 μm
Reflectivity 92%

20 cm Cerenkov drift section
30-40 photons (200-650 nm)
Quantum efficiency ($\langle q_{\text{eff}} \rangle = 20\%$)



Pre-Radiator

Thin tungsten bars in front of the detector



$X_0 = 0.35$ cm

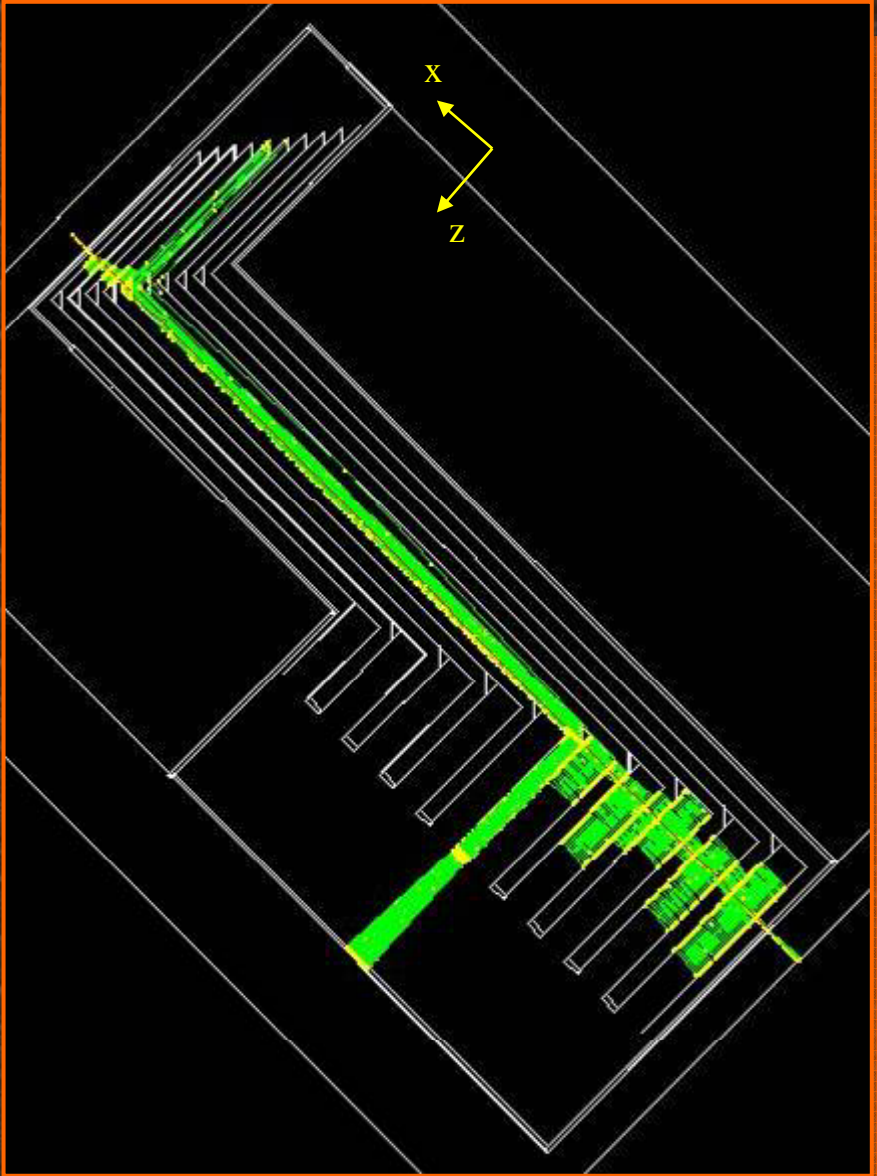
Meant to increase:

electrons \rightarrow photons \rightarrow signal

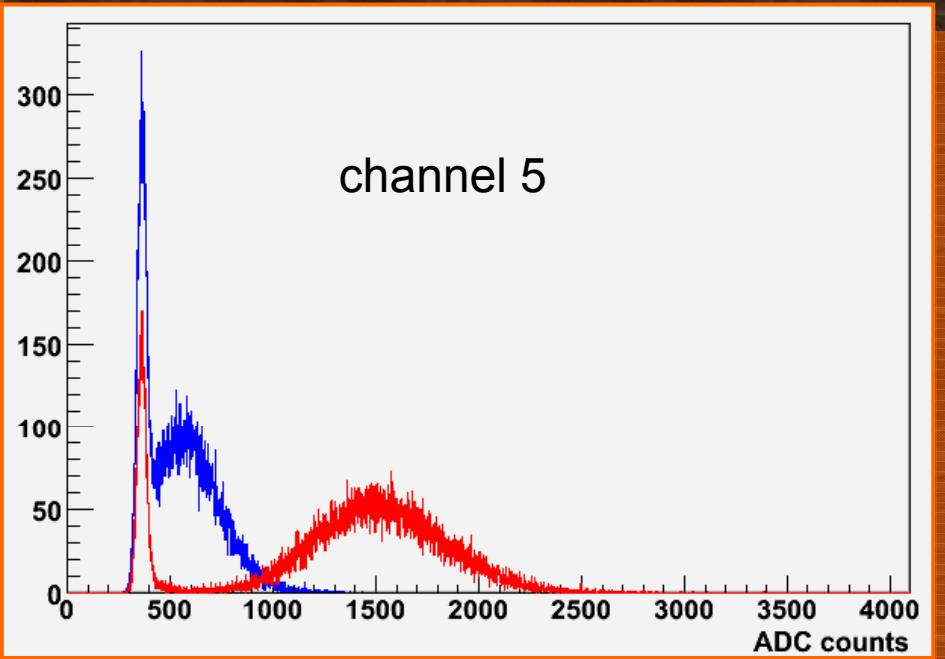
Dilutes the spectra instead

scatt. angles above 4° cross two tubes

Rotated Detector

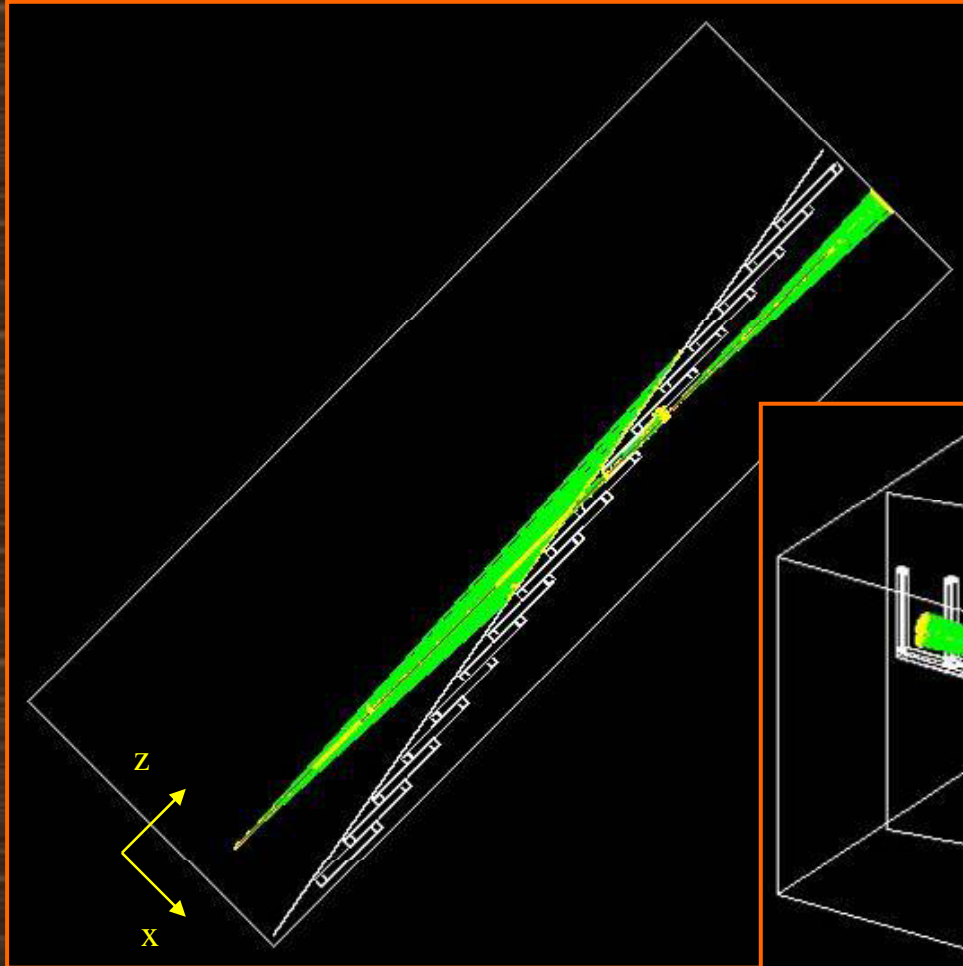


Transmission line 40-80 cm
Increased photon yield
(factor 2 – 4)

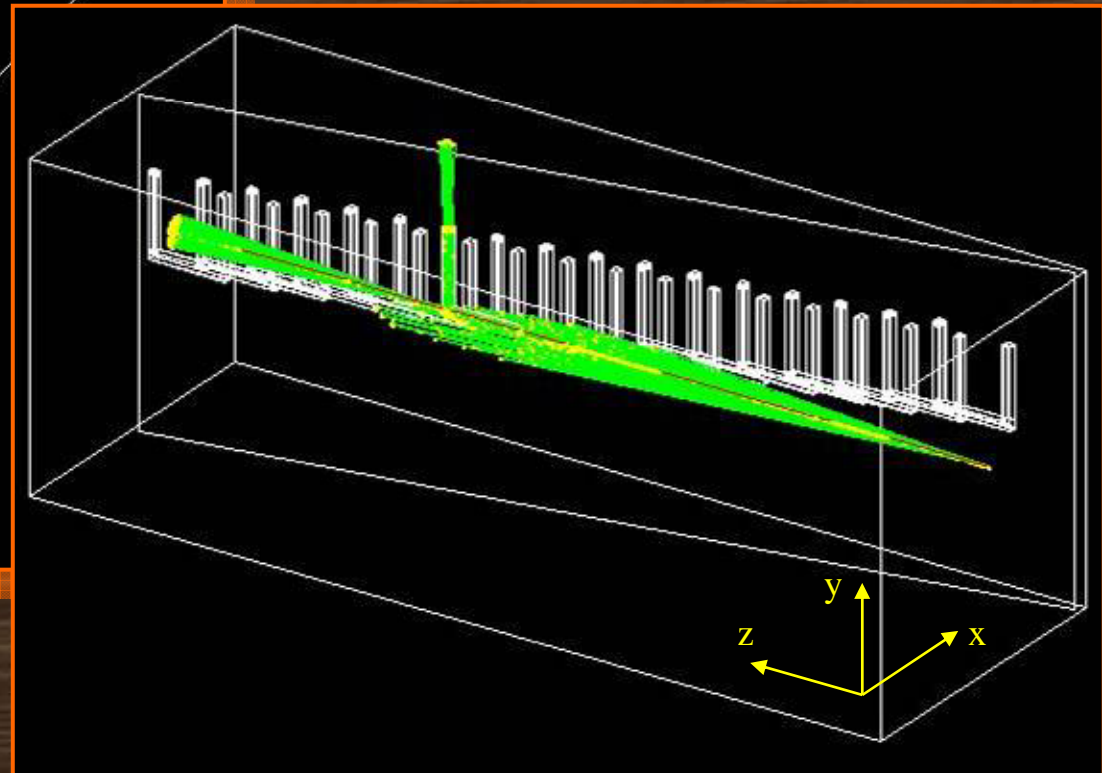


Additional gain due to reflection

An ILC Polarimeter Layout



Uses electron spectra from fast simulation
Can use ADC spectra to develop analysis technique



Summary

- Two Test Beam Periods
 - with old and new photo detectors
 - Detector layout is well understood
 - New data needs to be analyzed
- New Layout can be simulated
 - Compton spectra from fast simulation (include polarization)
 - Plan test beam with comparable electron intensity (10^3)
 - Tube design
- Polarization Measurement
 - Analyzing power extraction from electron spectra / asymmetry
 - Wall effects, bunch intensity, laser-electron alignment