

Lucite Cerenkov Hodoscope

A. Ahmidouch, S. Danagoulian

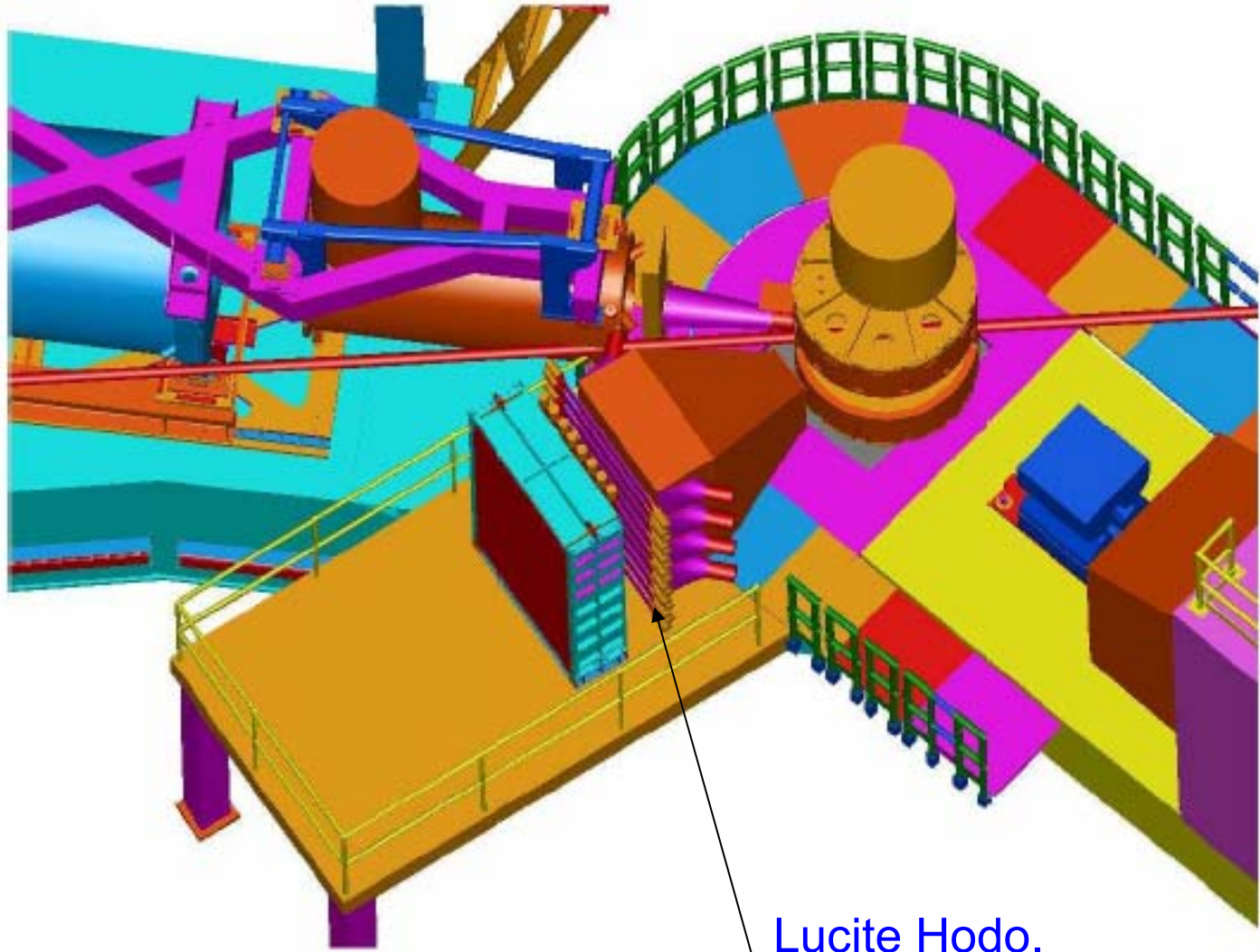
SANE Readiness Review Meeting, July 2nd, 2007

Placed in front of BigCal at 240 cm from the target

Needed to:

1. Detect charged particles above threshold primarily electrons and pions with high efficiency.
2. Provide useful position resolution at a reasonable cost.
3. Be insensitive to background particles coming from outside of the target chamber

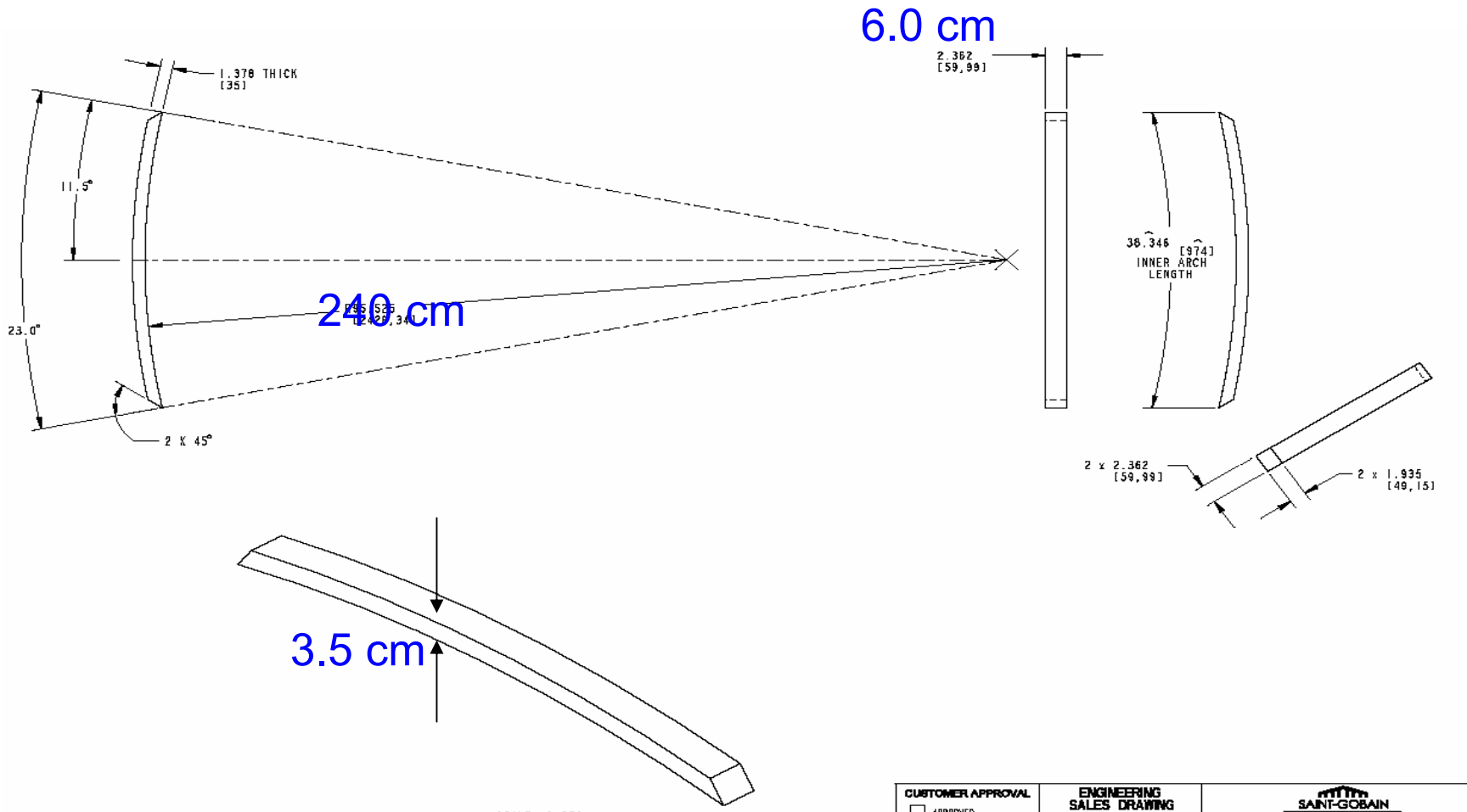
SANE Setup



Lucite Hodo.

Lucite Cerenkov Hodoscope

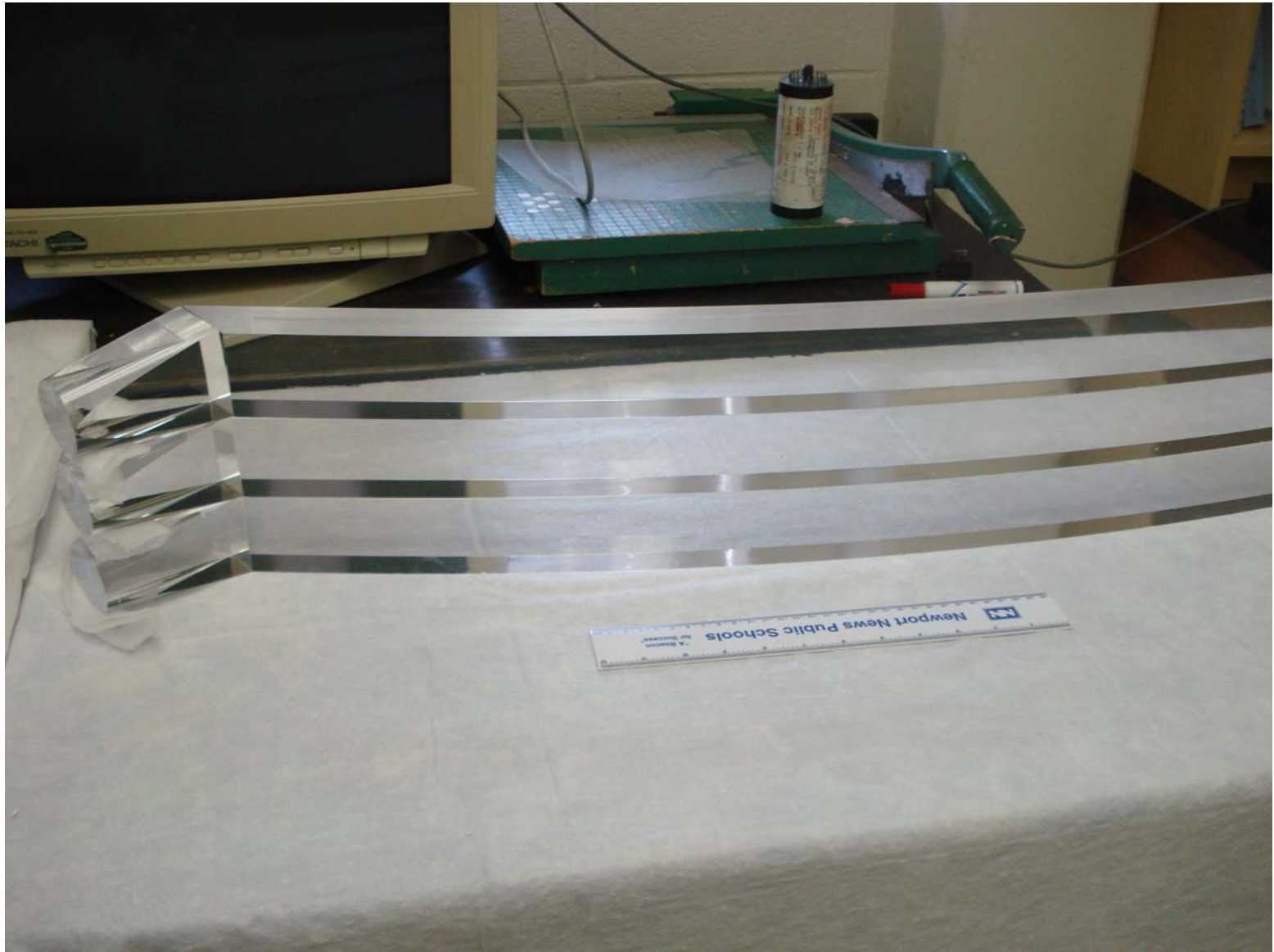
28 BC-800 bars: 3.5 x 6.0 x 96.7--91.5 cm³ curved



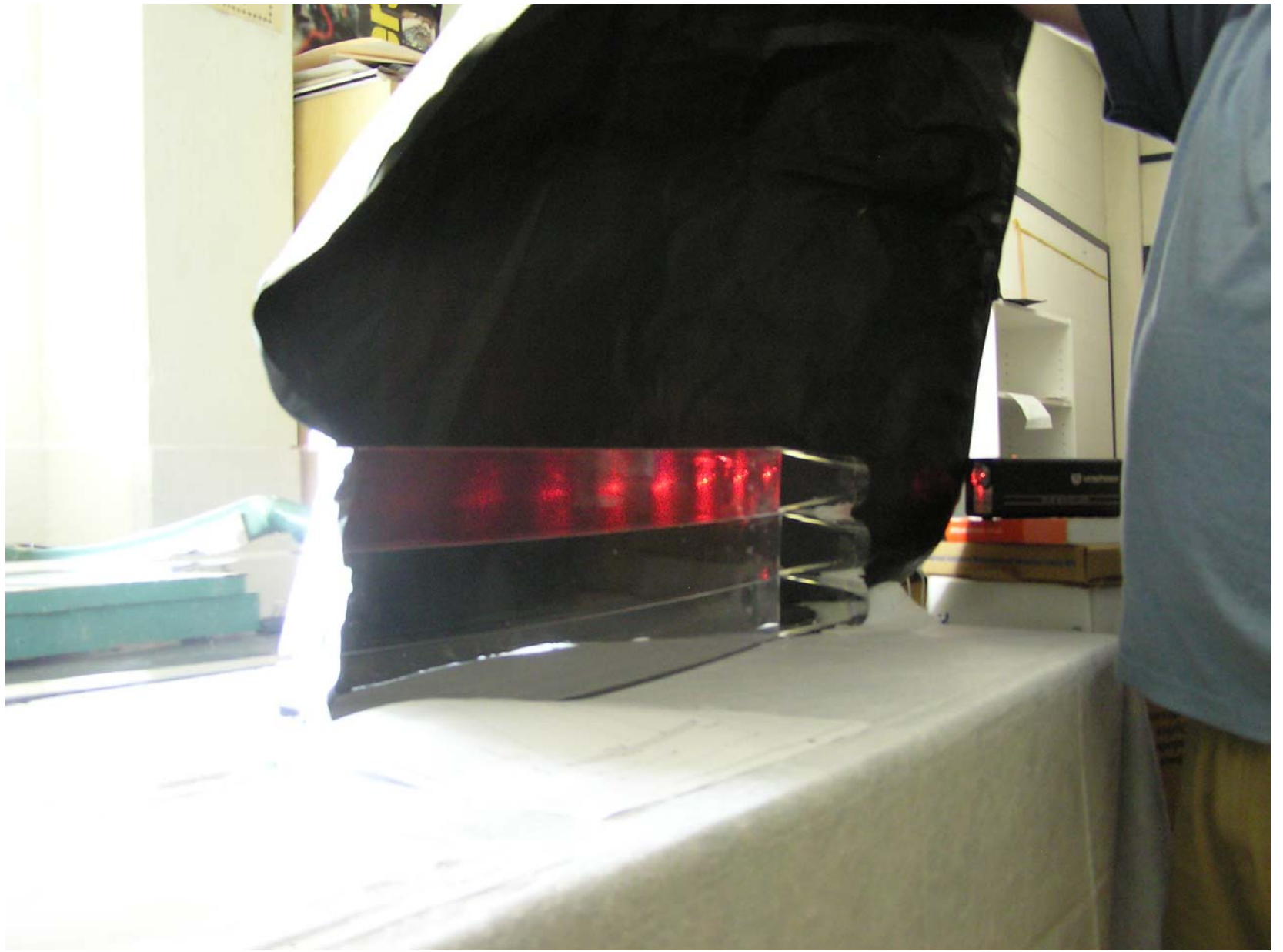
CUSTOMER APPROVAL <input type="checkbox"/> APPROVED <input type="checkbox"/> APPROVED AS NOTED	ENGINEERING SALES DRAWING DO NOT SCALE THIS DRAWING THIS DWS IS IN ACCORDANCE WITH	SAINT-GOBAIN CRYSTALS 12948 Cerenkov Rd., Mendota, OH 44864
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Specs:

- 28 Lucite bars: BC-800, $3.5 \times 6.0 \times 96.7\text{--}91.5 \text{ cm}^3$, $n=1.49$, $\text{Beta_threshold} = 0.67$, propagation of C-light by total Internal reflection.
- Curved to 240 cm, Normal incidence from target
- Edges cut at 45 deg (avoids reflections)
- Light guides ($4.9 \times 6.0 \text{ cm}^2$) to 4.9 cm (circular)
- 2" PMTs: Photonis xp2268, 1.5 mm mu-metal

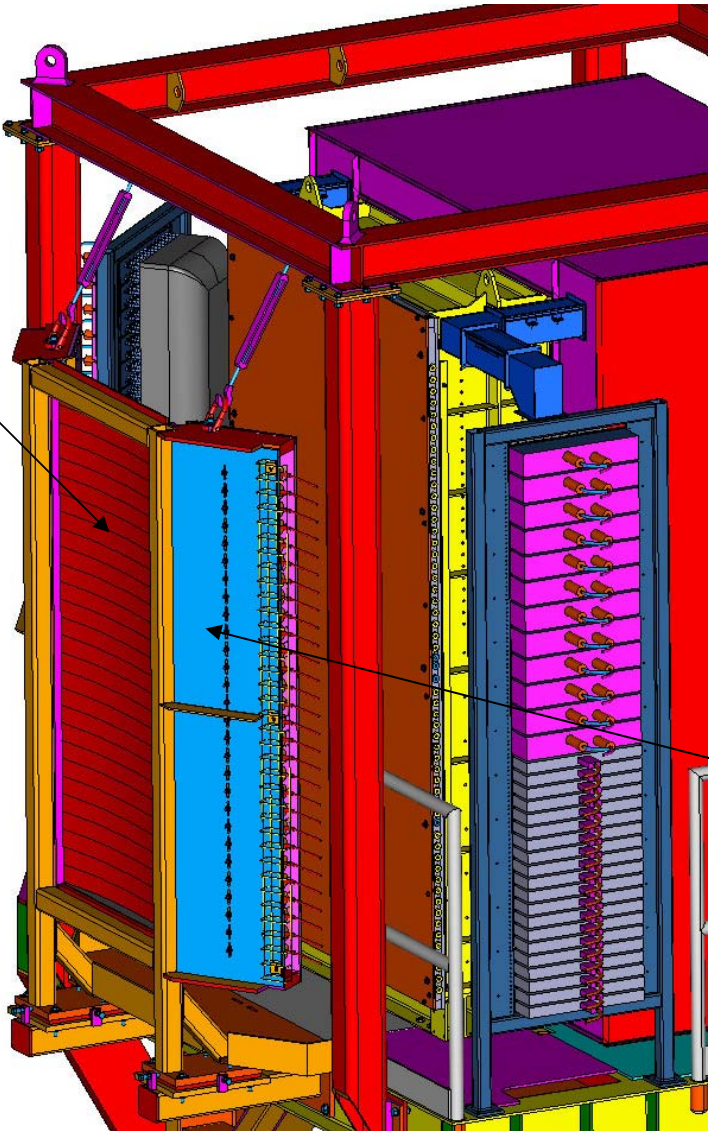






Hodoscope / Platform (designed by A. Metzger)

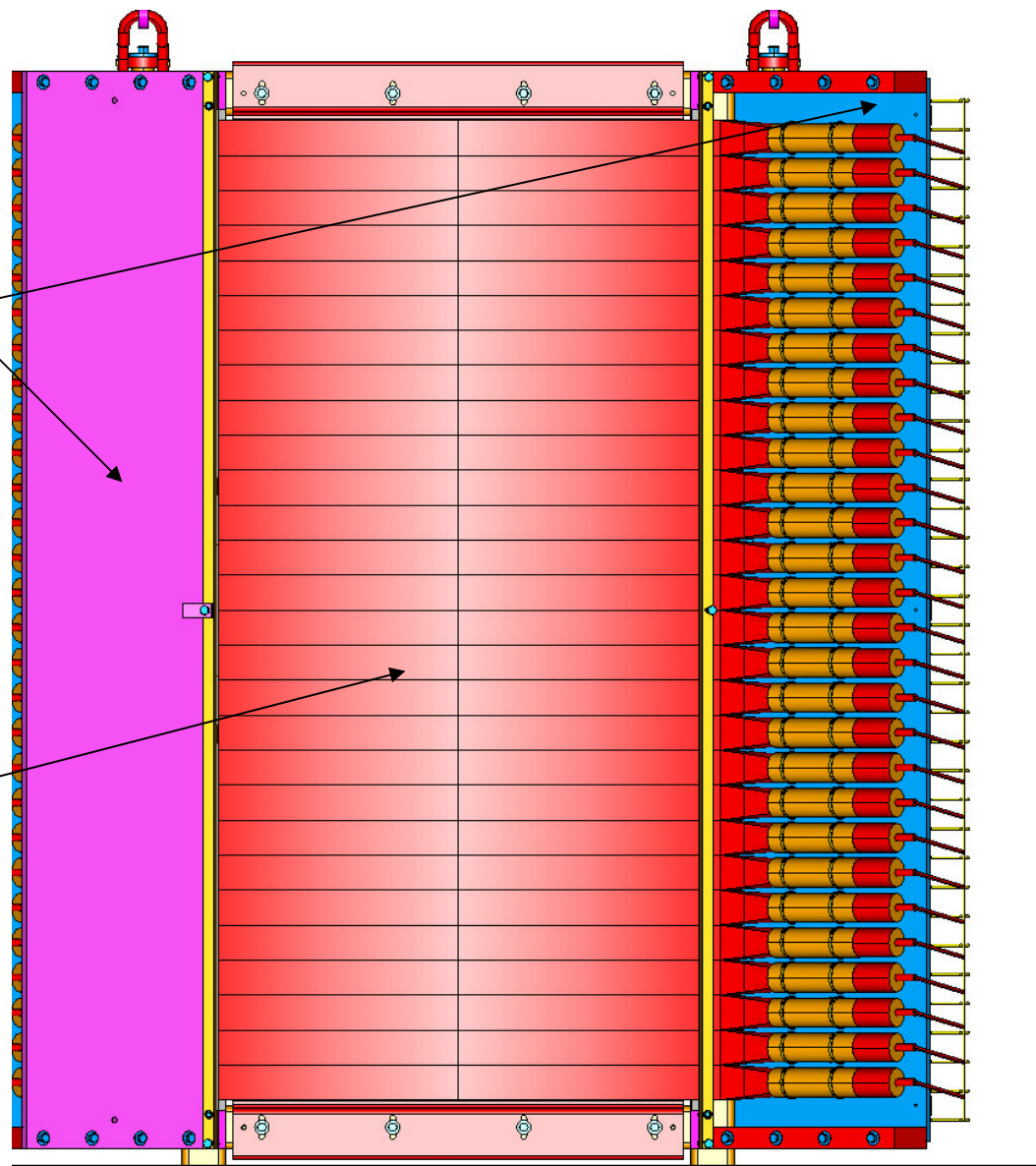
28 Lucite bars



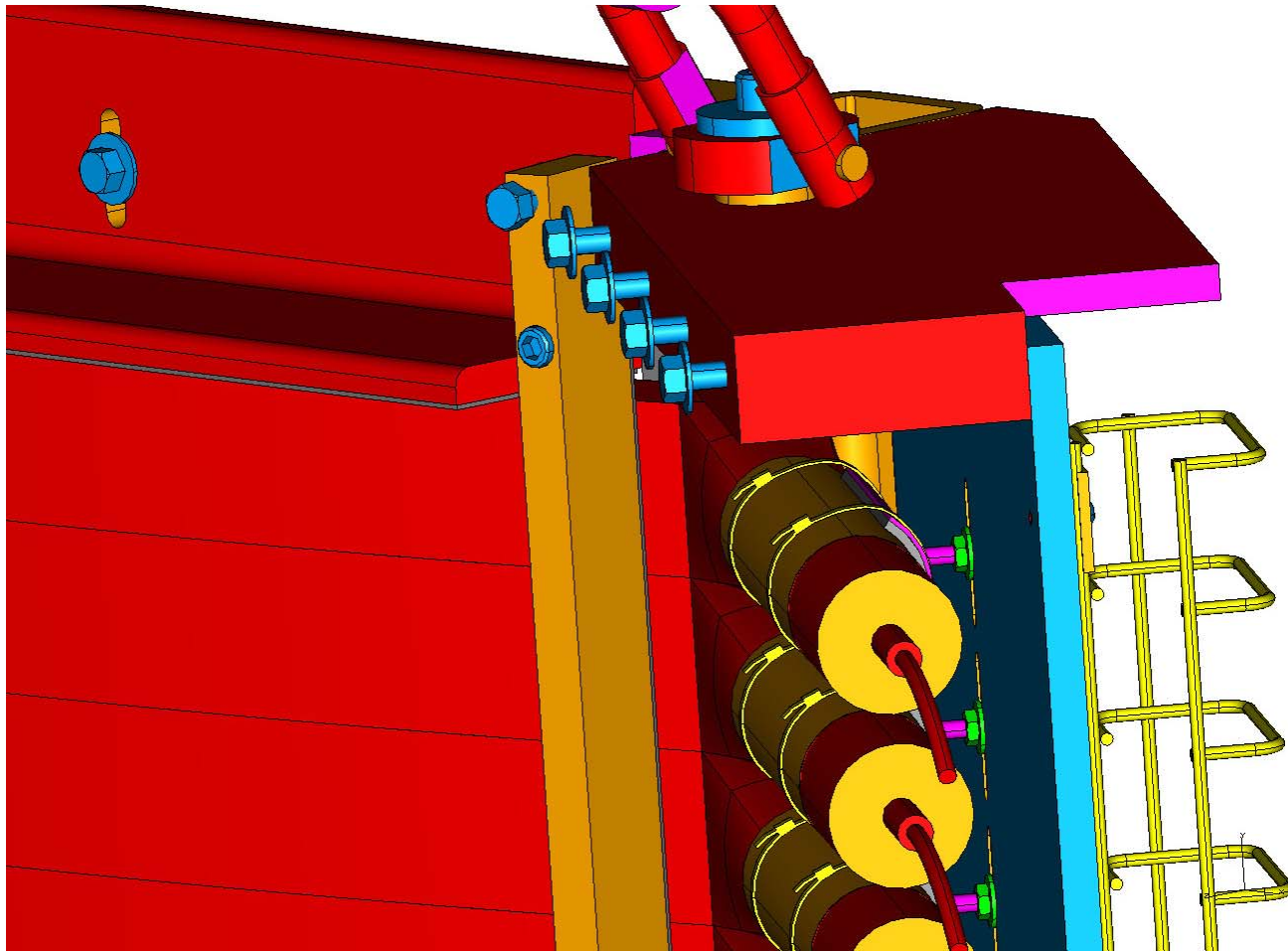
Mag. Shielding box
(0.5" thick)

Mag. Shielding
box

Lucite bar



Magnetic shielding box



Electronics

60 (56+ 4 spares) channels of:

- Discriminators (16-ch. Lecroy 4413), available from LEGS/BNL
- Splitters available at JLab
- Amplifiers “
- TDCs “
- ADCs “
- Delay cables (need to be ordered)

Schedule of Tasks

- Prototype 1 construction July 2006
- Prototype 1 cosmic tests July 2006 – March 29, 2007
- SOS Hall test (1), E05-017 March 30 – July 7
- Prototype 2 ordered/received Feb 22 / June 14, 2007
(3 Lucite bars and 6 light guides)
- 60 XP2268 PMTs & bases June 21, 2007
- Mu-metal order July 2007
- Frame design March 1st – June 14, 2007
- Receive all 28 Lucite bars July 26, 2007
& 56 light guides
- Full construction July 26 – December 20, 2007
- Detectors on frame December 30, 2007
- Lucite Detector ready January 2008
- GepIII test March 2008
- Hall-Beam test October 2008

	Activity Name	Duration	Start	2006				2007				2008				2009											
				D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N
1	- SANE	1090	09/15/04																								
2	- BETA	954	09/15/04																								
3	+ BigCal	623	09/15/04																								
4	+ Gain Monitor	697	09/27/04																								
5	+ Gas Cherenkov	857	09/15/04																								
6	- Forward Tracker	830	10/18/04																								
7	Lucite tests	60	10/18/04																								
8	Quartz procurement	40	11/01/04																								
9	Quartz tests	60	02/20/06	tests M. Khandaker, V. Dharmawardane																							
10	Fibers on scintillator	0	08/07/06	08/07/06 Fibers on scint																							
11	Final design & Parts procureme	280	08/07/06	ts procurement																							
12	Partial construction	60	01/22/07	Partial construction																							
13	SOS tests	60	04/16/07	SOS tests																							
14	Full construction	60	09/03/07	Full construction M. Khandaker, E. Jensen, A. Marsh																							
15	GEp-III tests?	18	11/26/07	GEp-III tests?																							
16	- Lucite Hodoscope	484	07/04/06	07/04/06																							
17	Prototype 1 construction, cosm	194	07/04/06	, cosmic tests																							
18	SOS/In Hall Tests	69	04/02/07	SOS/in Hall Tests S. Danagoulian																							
19	Prototype 2 procurement	80	02/26/07	Prototype 2 procurement A. Ahmidouch																							
20	Frame design	97	02/01/07	Frame design B. Metzger																							
21	Complement procurement	110	02/21/07	Complement procurement A. Ahmidouch																							
22	Full construction	108	07/25/07	Full construction S. Danagoulian, A. Ahmidouch, Martin, Pawlos, J																							
23	Assembly	5	12/24/07	Assembly																							
24	GEp-III test period	49	03/03/08	GEp-III test period																							

Project: Start Finish
 Subproject: Start Finish
 Critical Activity: Name R source Names
 Non Crit. Activity: Name R source Names
 Event: Start Name

Manpower

- Two faculty: AA & SD

Spring 07

- One graduate student: Martin Jones
- One undergraduate: Angela Edwards

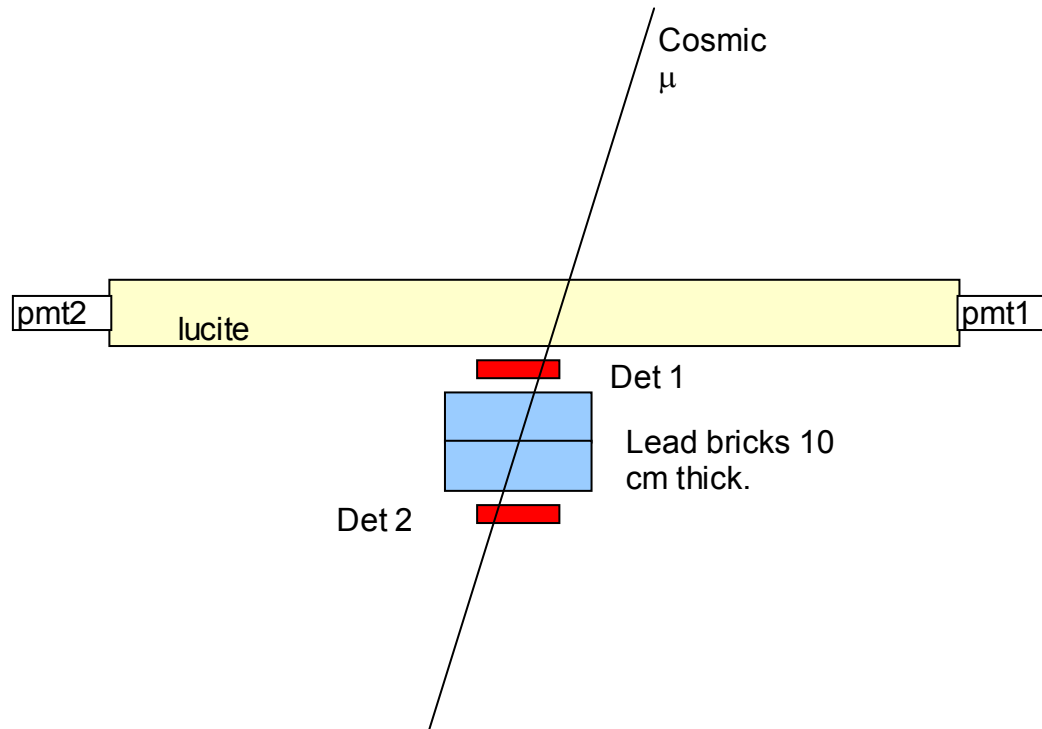
Summer 07 and Fall 07

- One graduate student: Martin Jones (Will pursue a MS-thesis on SANE)
- Two undergraduates: Steven Vilayoung & Christopher James

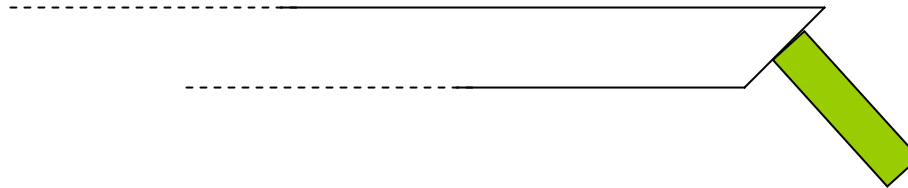
Cosmic Ray Test

- TDC spectra
- Position reconstruction
- ADC histo.

A- Cosmic Ray Test (cont'd)



Edge cuts



Specs:

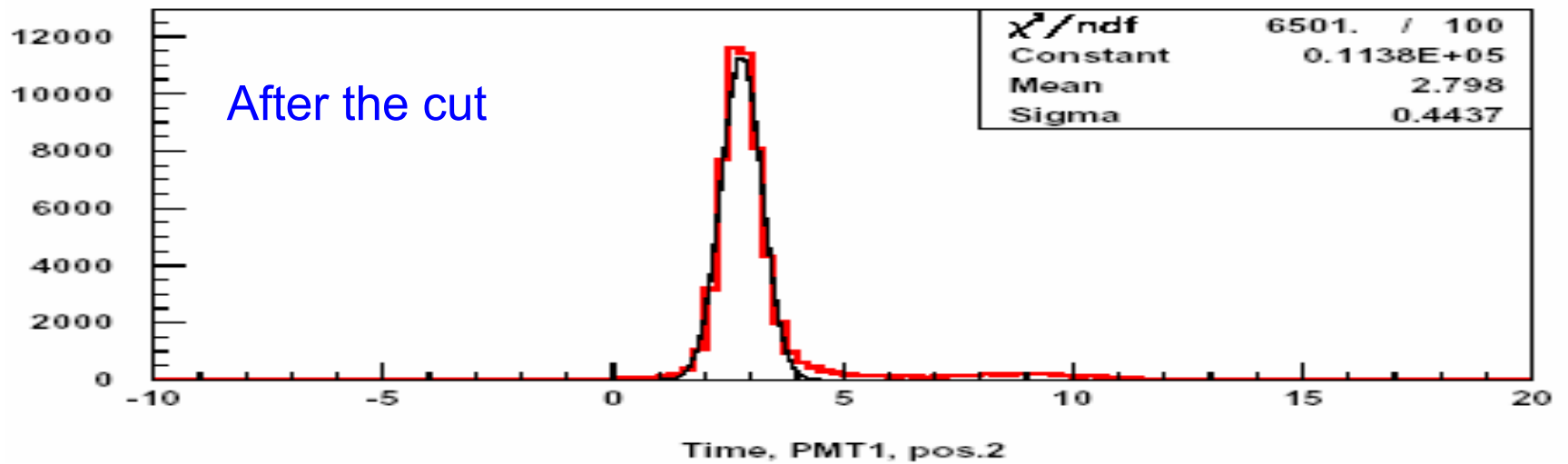
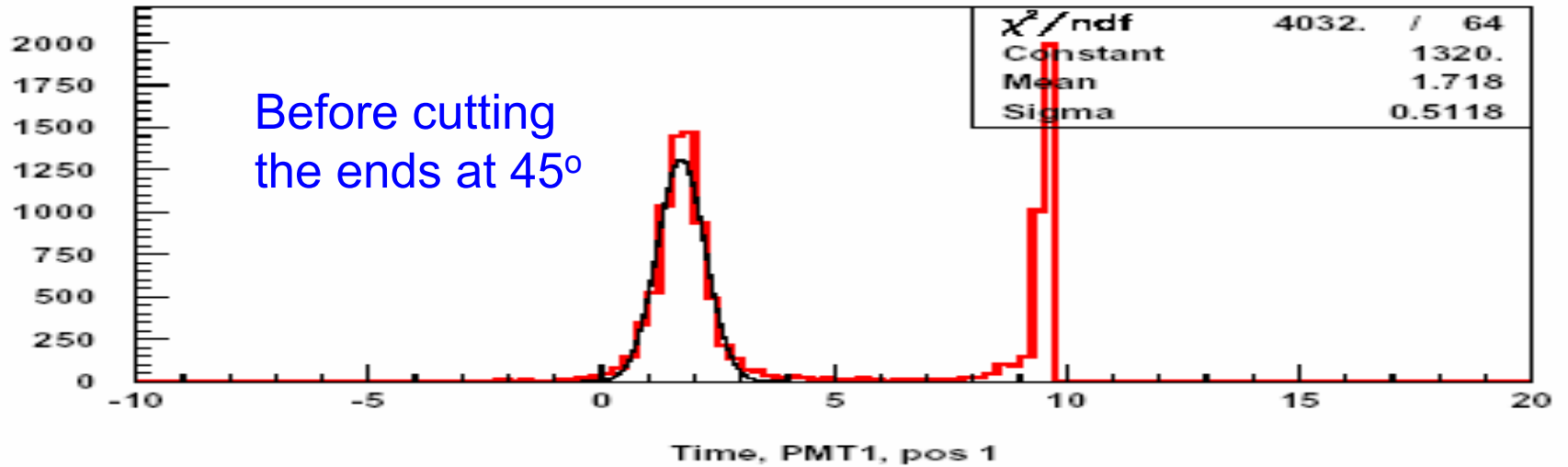
Lucite bar: $3.1 \times 6 \times 80 \text{ cm}^3$

PMTs: Photonis xp2020 and Photonis xp2268

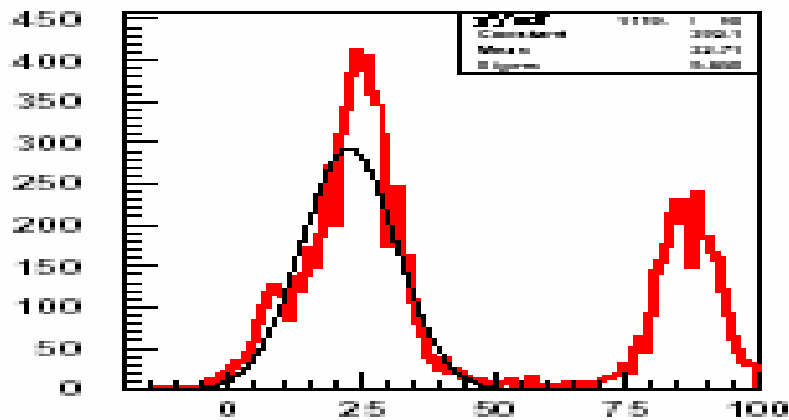
Det1 and Det2: $10 \times 10 \times 1 \text{ cm}^3$

Lead bricks: $T > 168 \text{ MeV}$

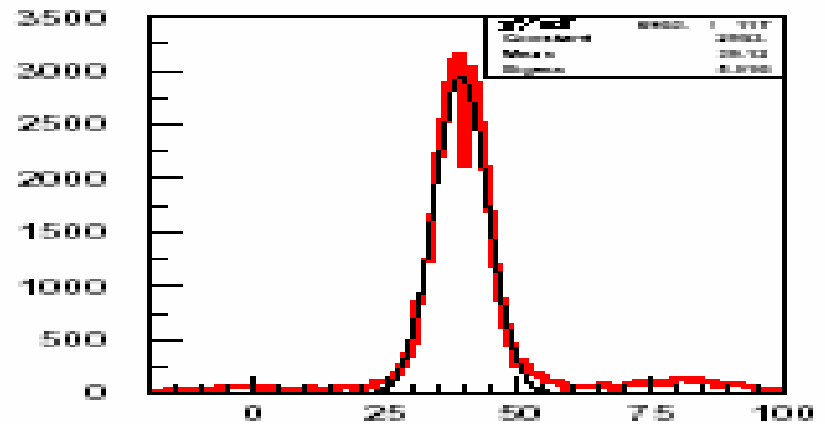
TDCs



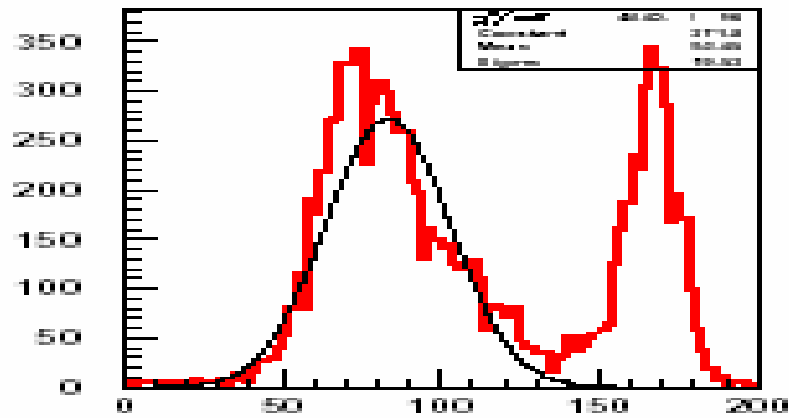
Coordinate reconstruction



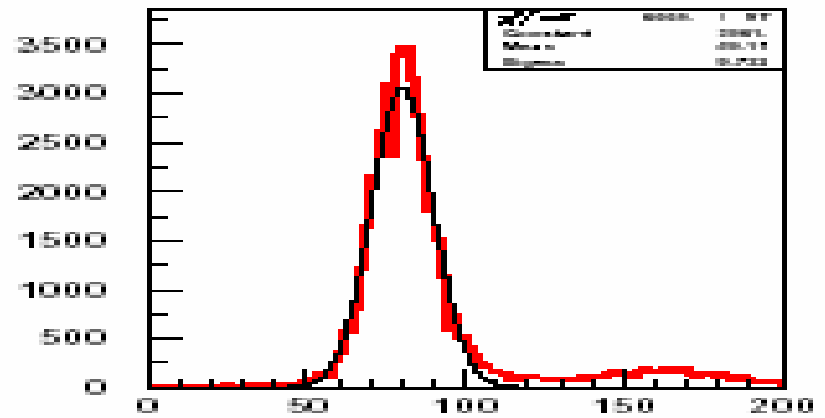
Z coordinate, pos.1, cm



Z coordinate, pos.2p, cm

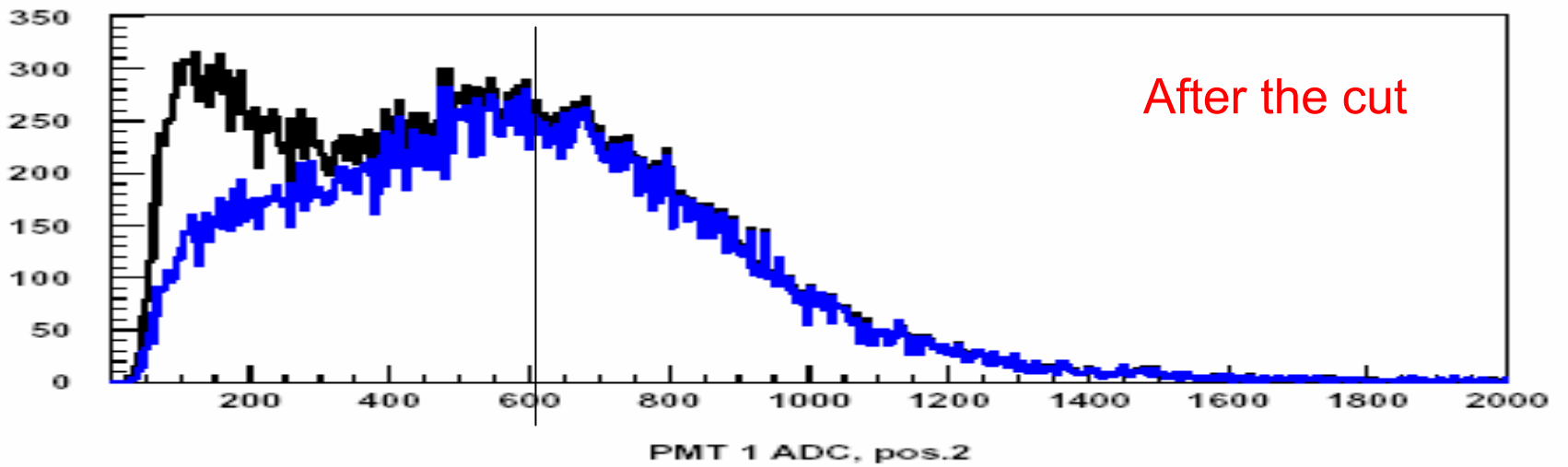
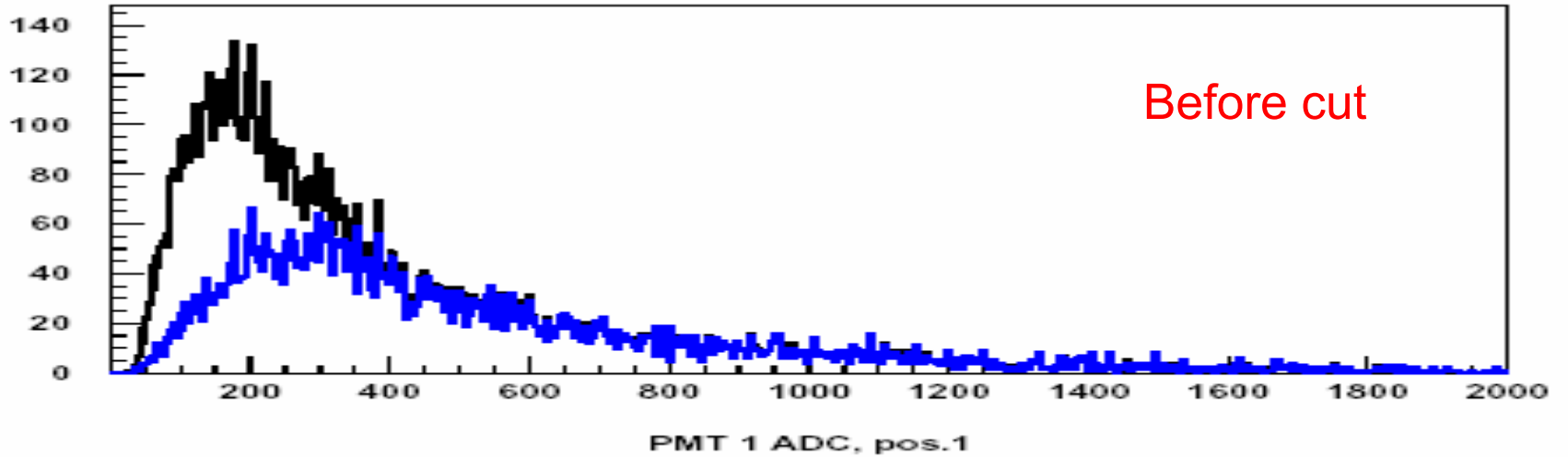


Total length of the bar, pos.1, cm

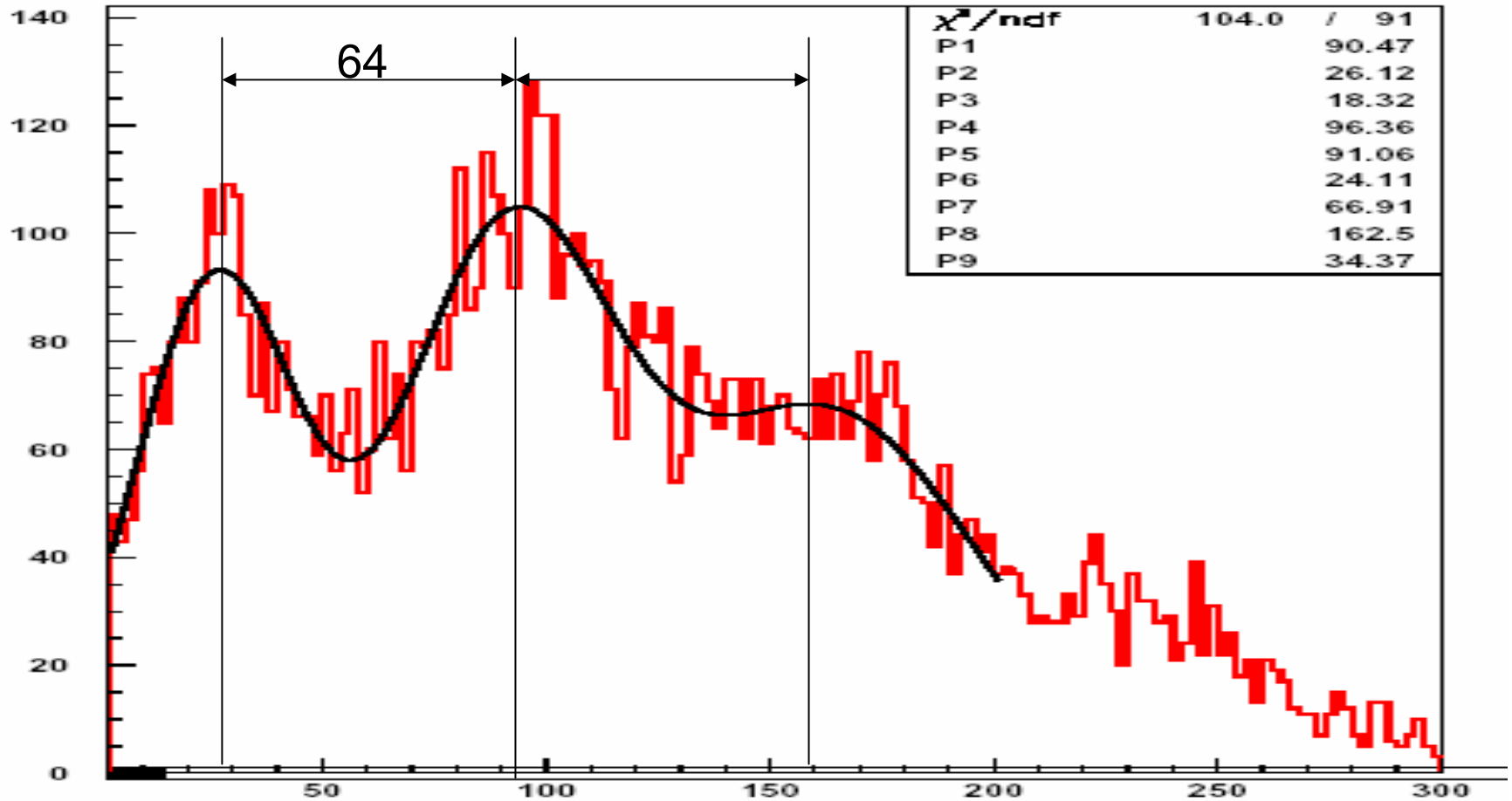


Total length of the bar, pos.2, cm

ADC spectra



ADC spectra



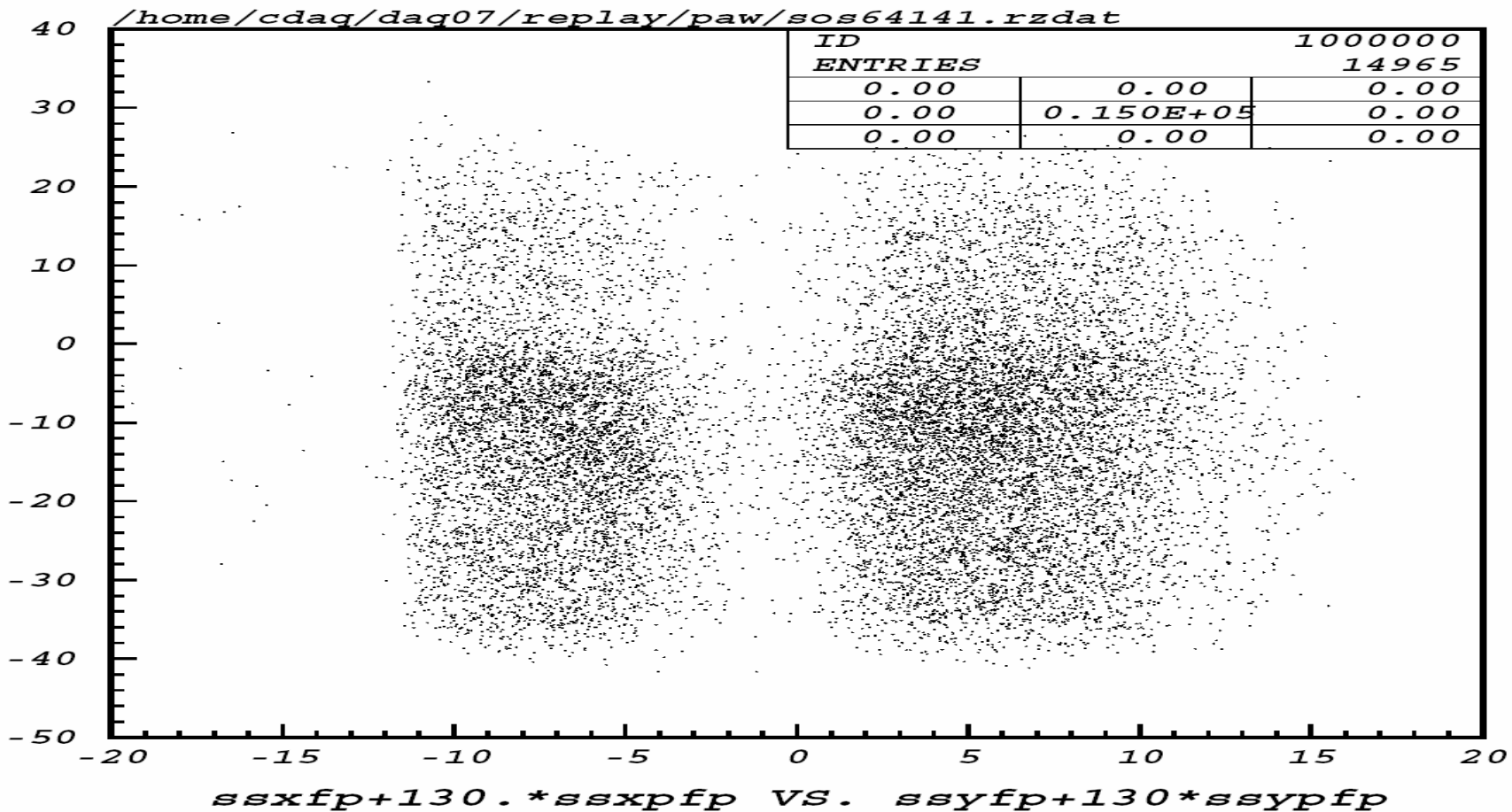
Number of photoelectrons= ~10

Test 1: Parasitic run with E05-017

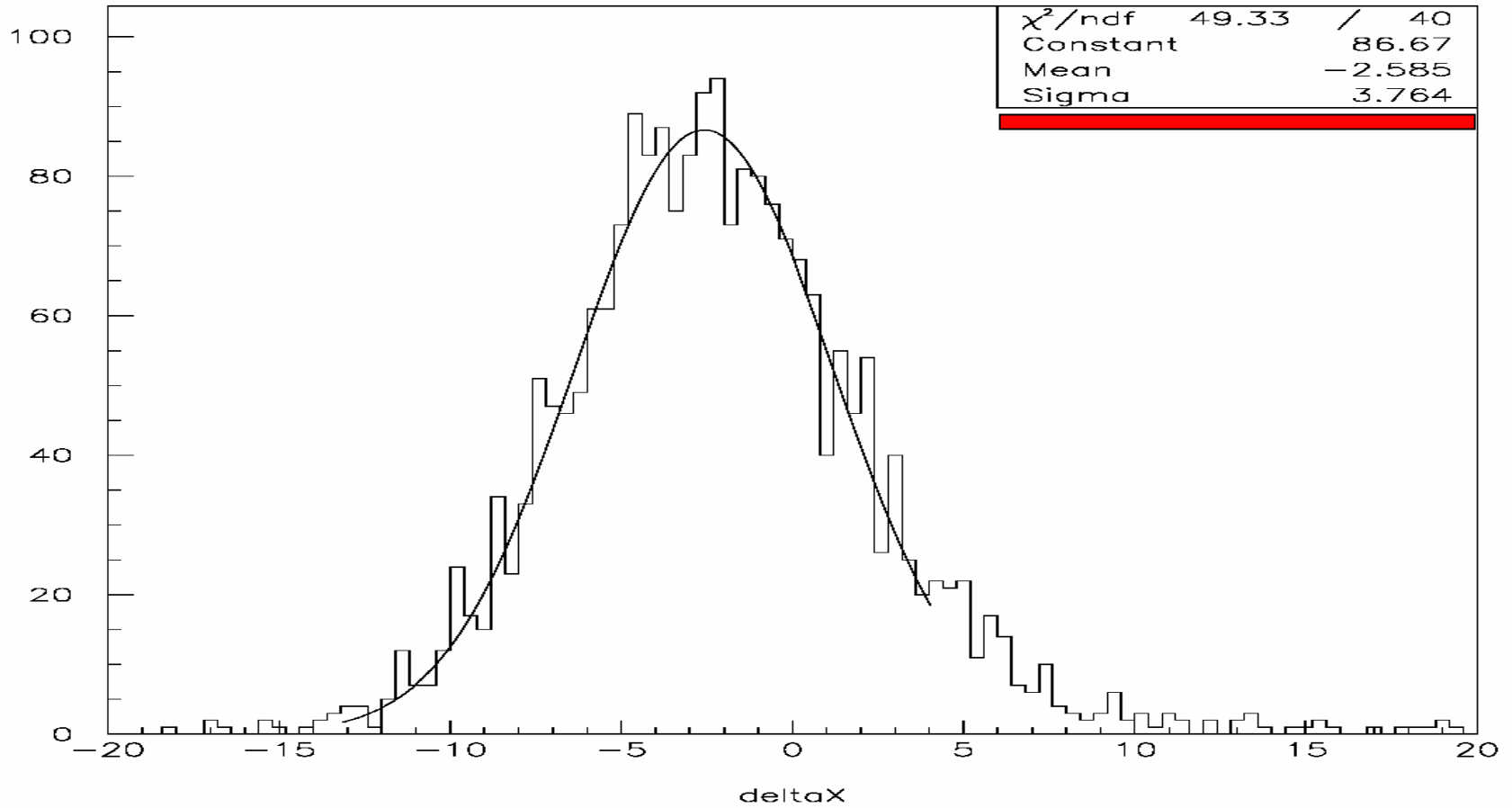
Set up the detector behind the SOS chambers or in front of the HMS calorimeter.

1. Measure the detector efficiency
2. Measure the coordinate resolution
3. Dependence on:
 - momentum
 - angle of incidence
 - position

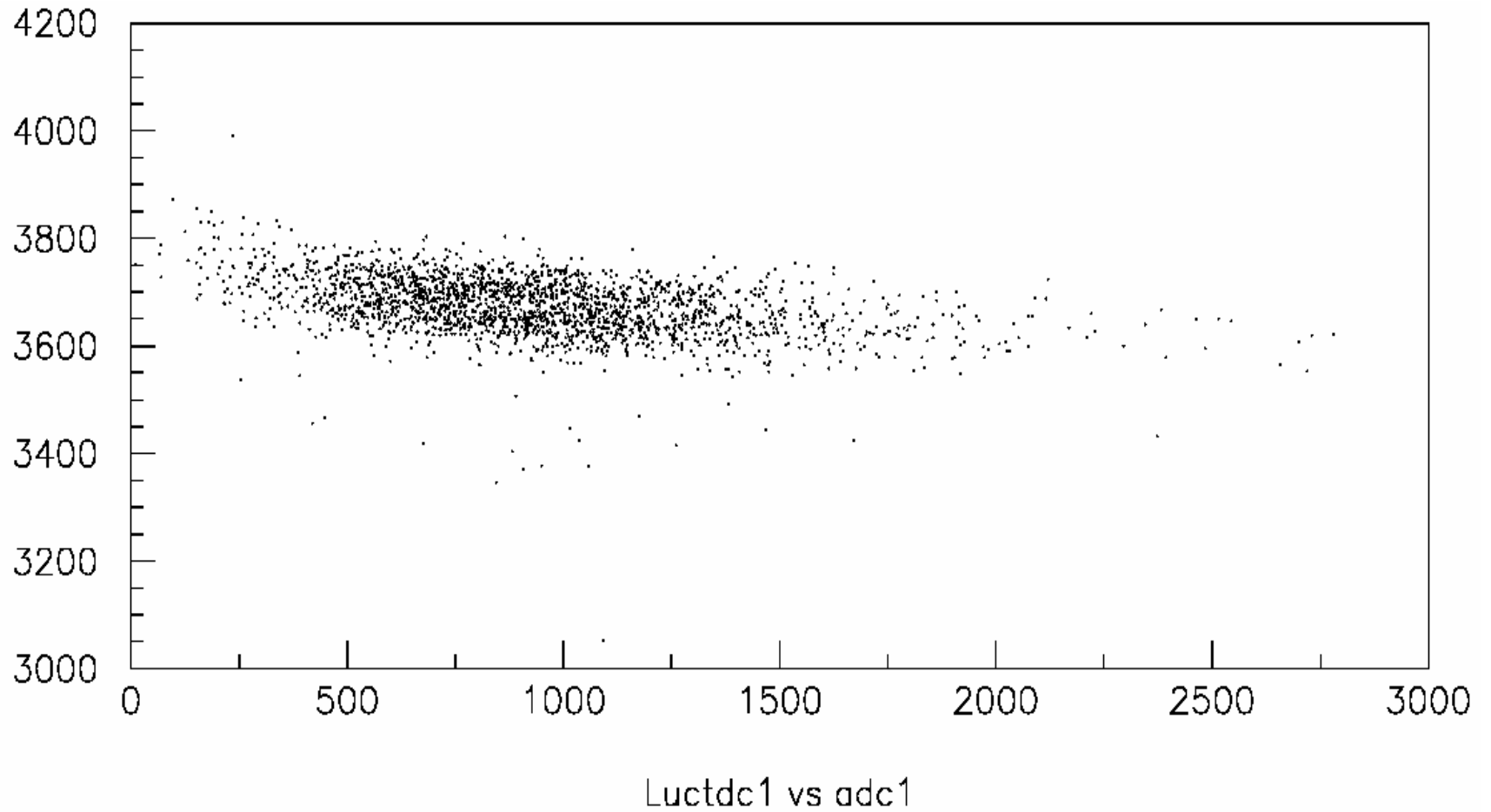
x vs y (Lucite in anticoincidence)



Position resolution, still preliminary



ADC-TDC correction



GepIII Test Plans

Hall Beam Test

Test 2:

- Mount the prototype on the frame
- Use BigCal for hit reconstruction.
 1. Study the background conditions
 2. Coordinate resolution
 3. Detector efficiency at high rates

Beam test: Use two narrow scintillators at 40 deg.

Summary

- Results of tests → no surprises
- Construction on schedule
- Manpower adequate
- Start assembly of all detectors in July 2007
- Delivery to JLab: January 2008