HMS
Aerogel detectors

R. Asaturyan

January 10, 2003

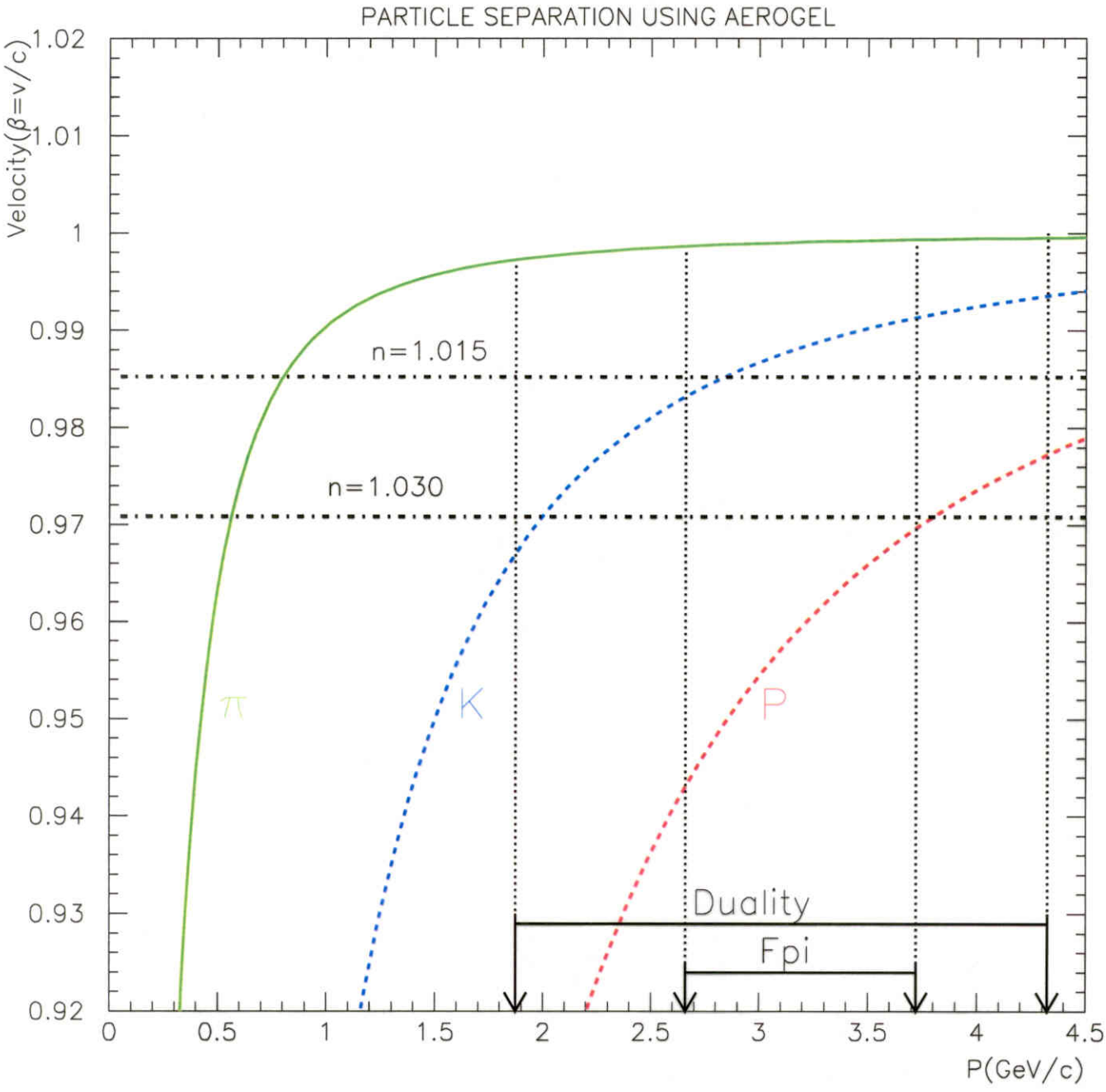
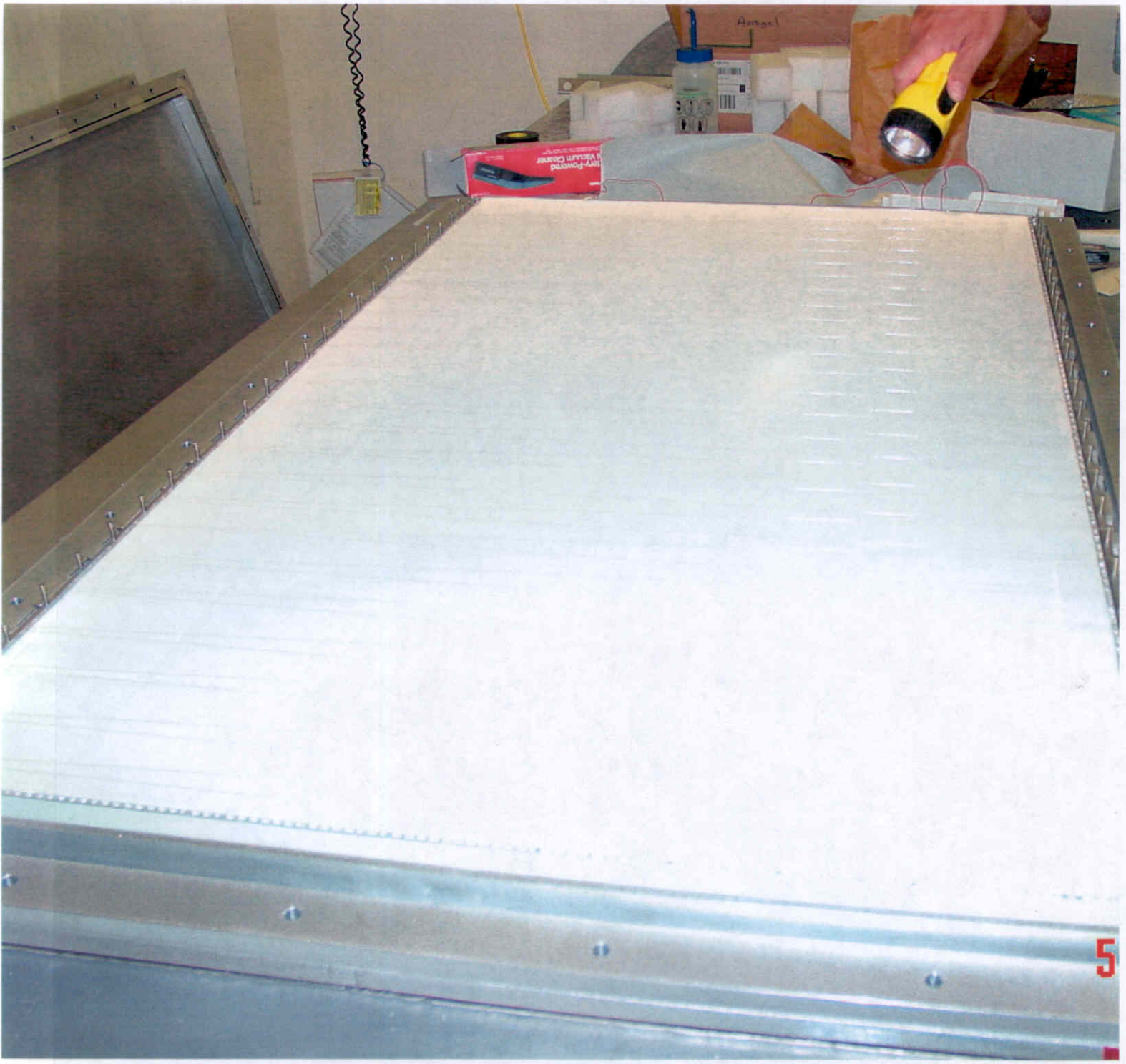


Figure 3: Velocity of particles (plotted as 1-β) versus momentum and the indices of refractive n-1.

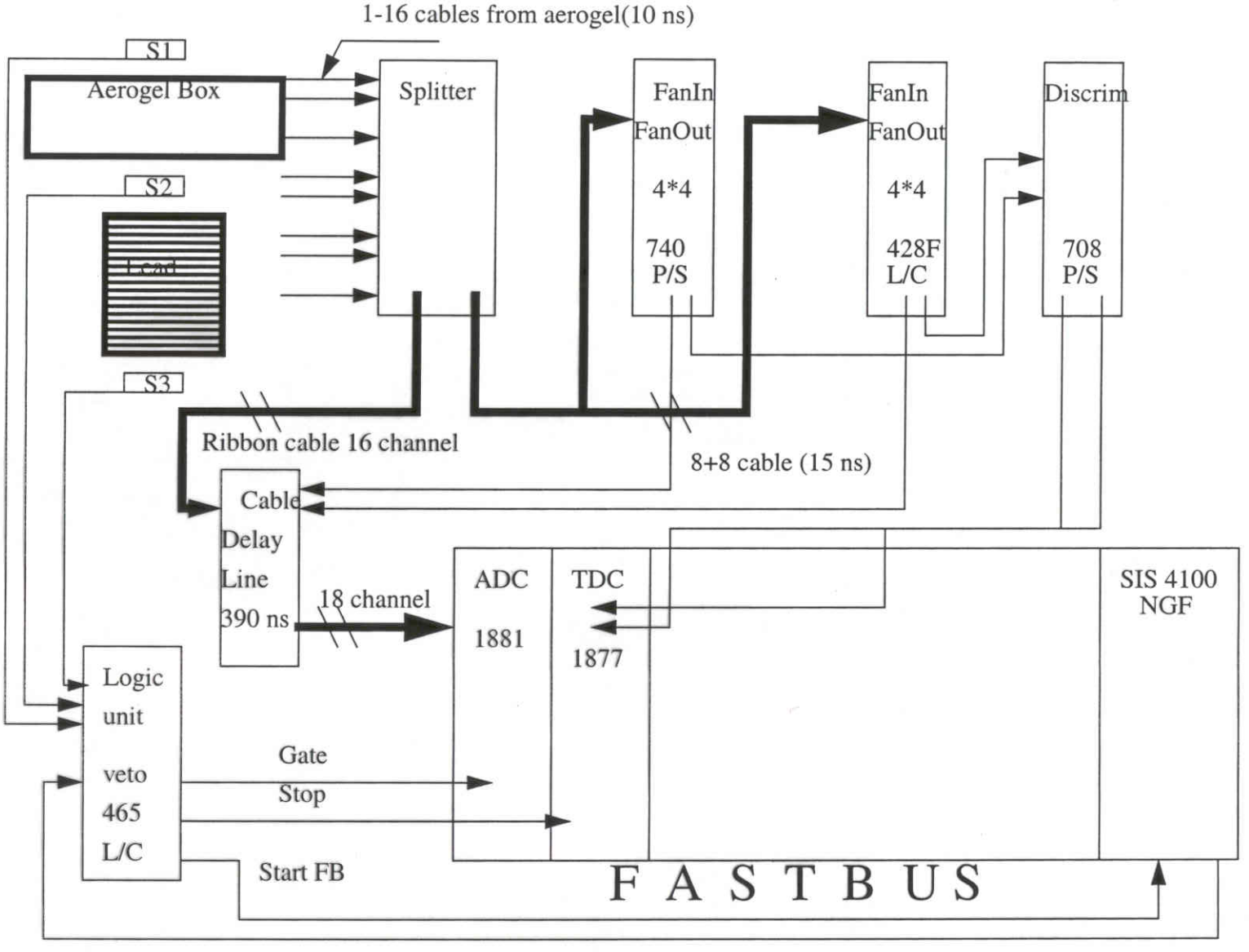
- At lowest momentum setting minimum momentum for pions (10% below central momentum) will be P_π=2.66 GeV/c for *Fpi* and 1.872 GeV/c *Duality* experiments.
- At highest momentum setting maximum momentum for pions (10% above central momentum) will be P_π=3.72 GeV/c for *Fpi* and 4.323 GeV/c for *Duality* experiments.
- We will use aerogel with n=1.030 for *Fpi* experiment. Threshold for pion detection is ~0.5 GeV/c and ~3.6 GeV/c for proton.
- For *Duality* experiment we will use aerogel with n=1.015. Threshold ~5.3 GeV/c for protons, ~2.84 GeV/c for kaons and ~0.8 GeV/c for pions.

- Aerogels (n(SiO_2)+2(H_2O)) produced in blocks of $\sim 110 \times 110 \times 10 mm^3$ tiles.
- Density range ρ from 0.05 to 0.2 g/cm^3.
- Refractive index of aerogel is in agreement with the relation $n - 1 = (0.210 \pm 0.001)\rho$.
- Matsushita produced high quality aerogel. The test of about 1000 aerogel tiles for HERMES give n=1.0303±0.0010.
- *Typical values of scattering length at the wavelength λ=400 nm are $\Lambda_s \sim 2$ cm.*
- *The absorption length Λ_a increases almost linearly in the interval 200-300 nm, and remains nearly constant above that.*
- *At wavelength $\lambda \sim 400$ nm $\Lambda_a \sim 20$ cm.*
- The optical properties of aerogel with n=1.015 and 1.050 at λ∼300-500 nm are similar within $\sim$ 10%.(*C. Zorn*).

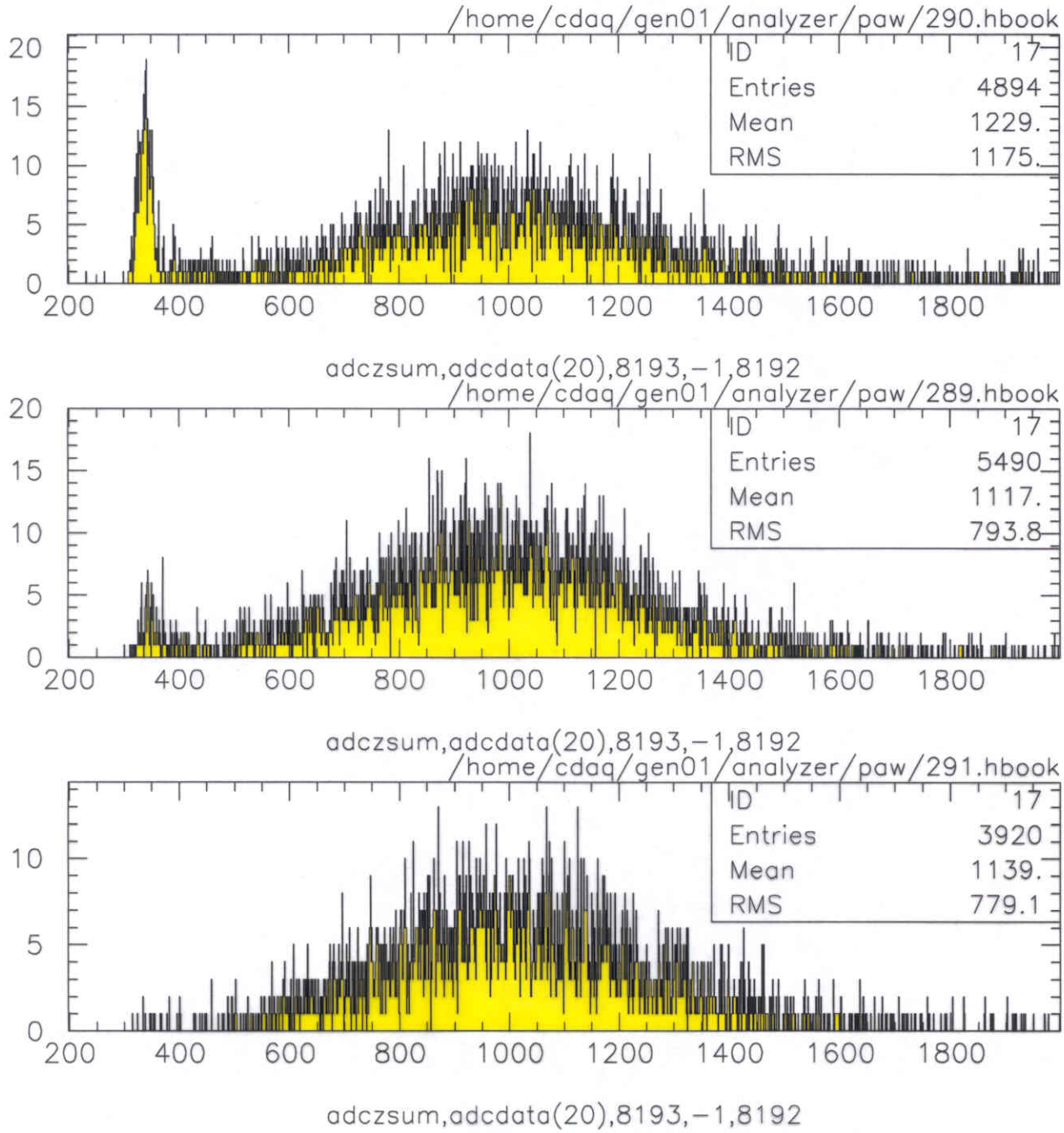

Angel
5

Aerogel Cosmic and LED Test

1



z2/07/15 16.53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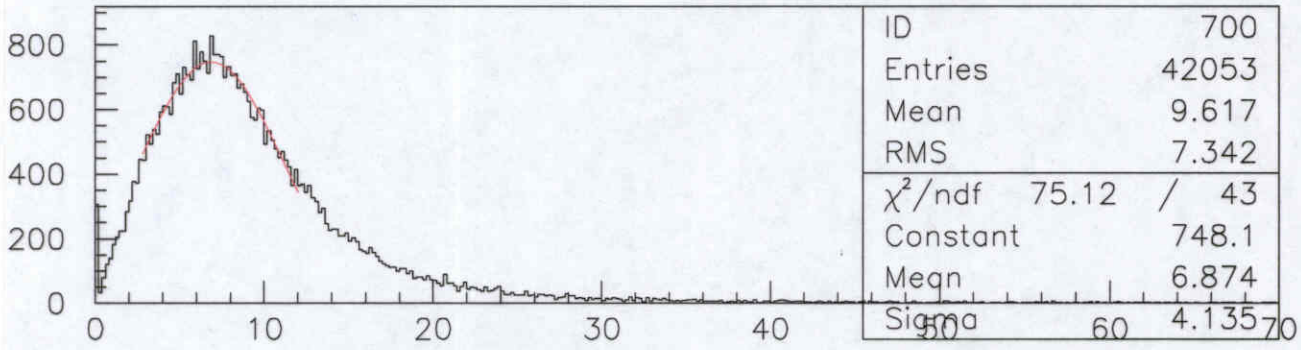
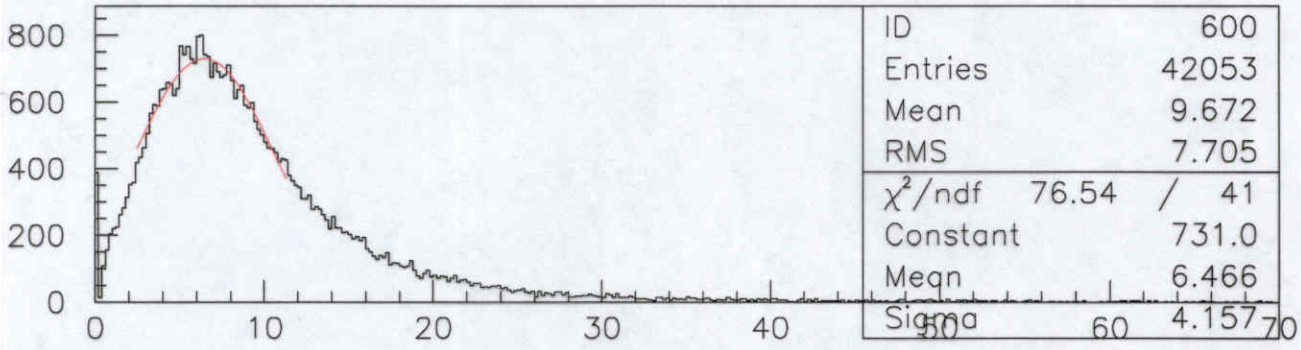
z2/09/19 15.06

Run 259



Responce of Right PMTs in photo−electrons



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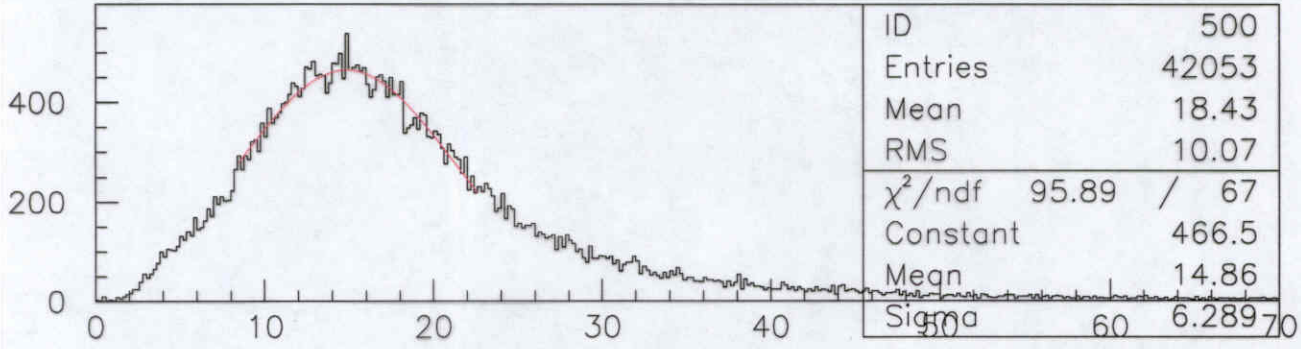
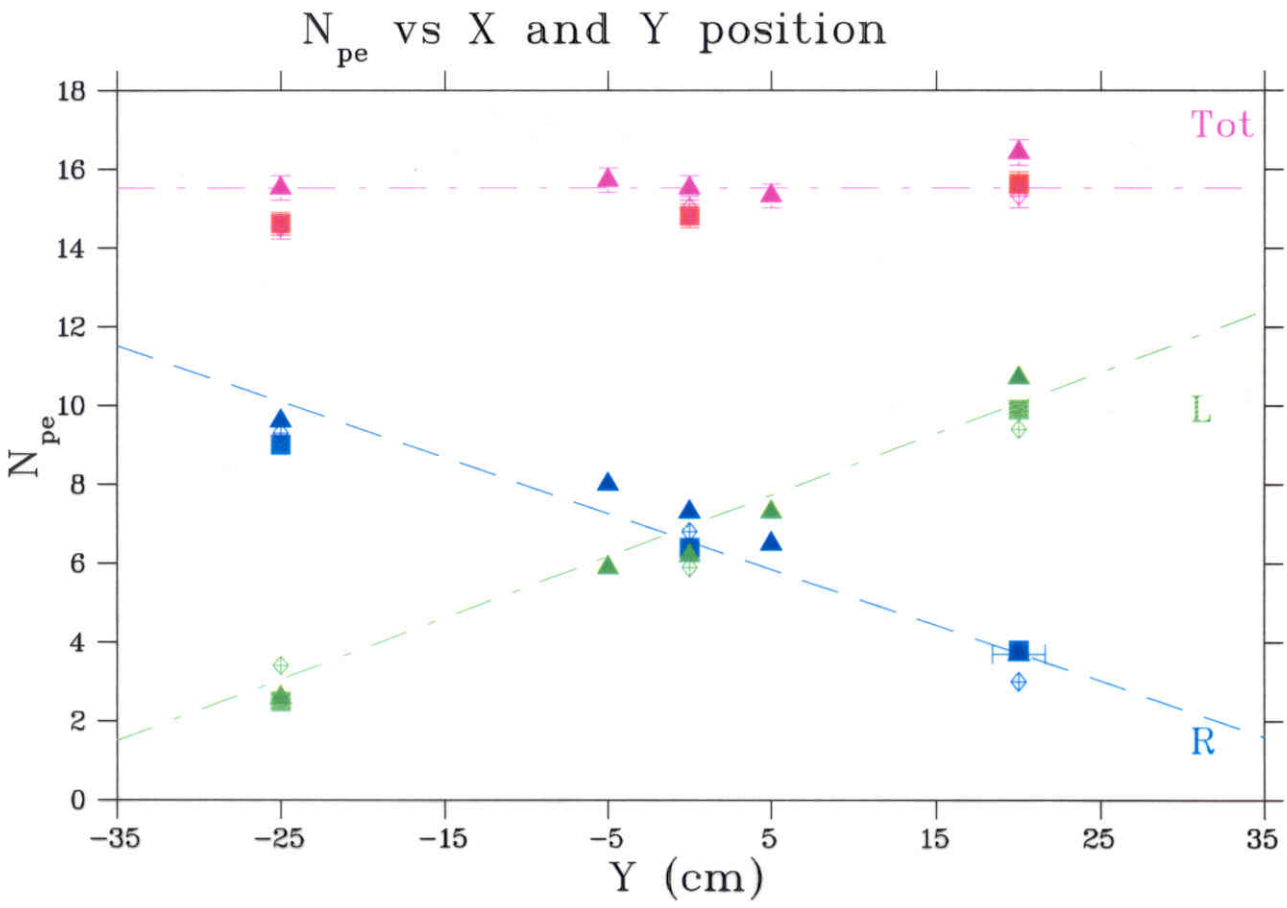
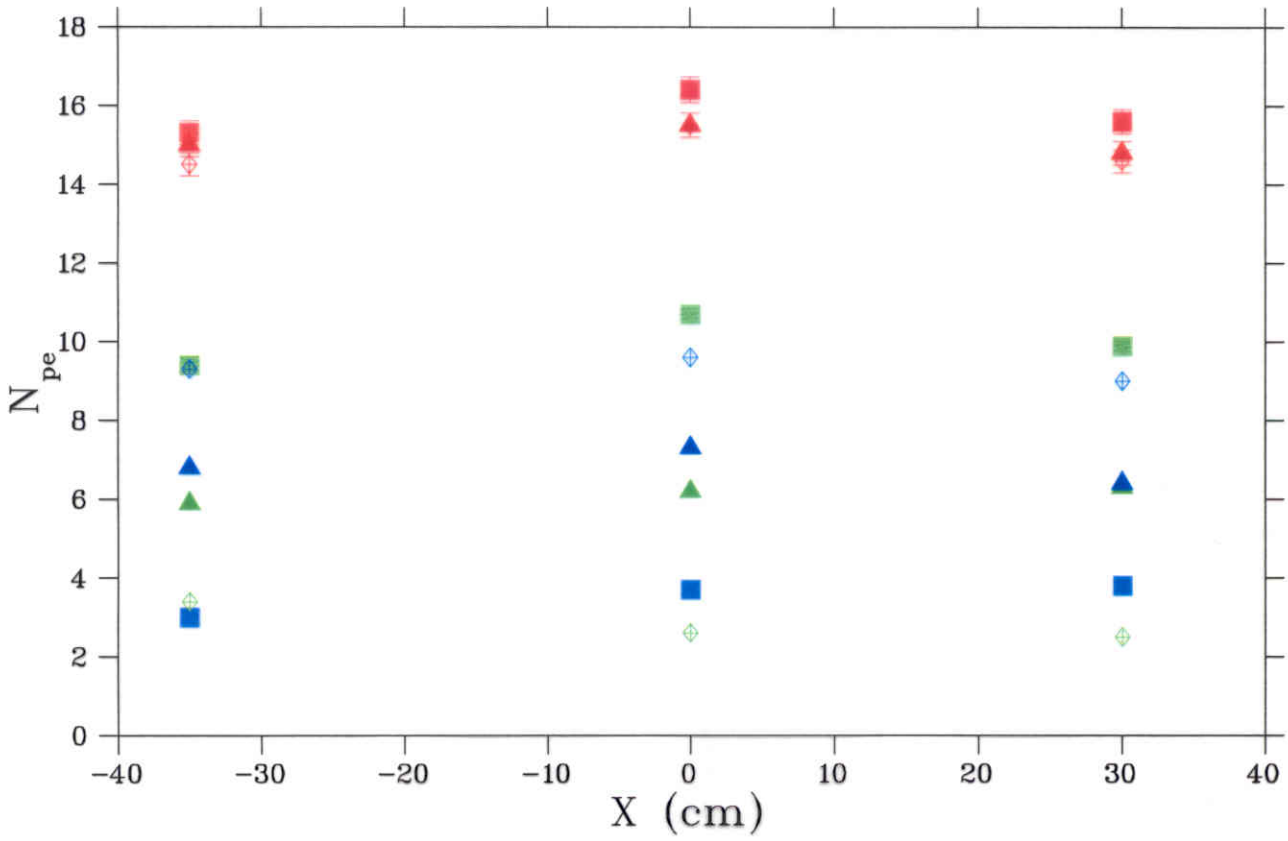
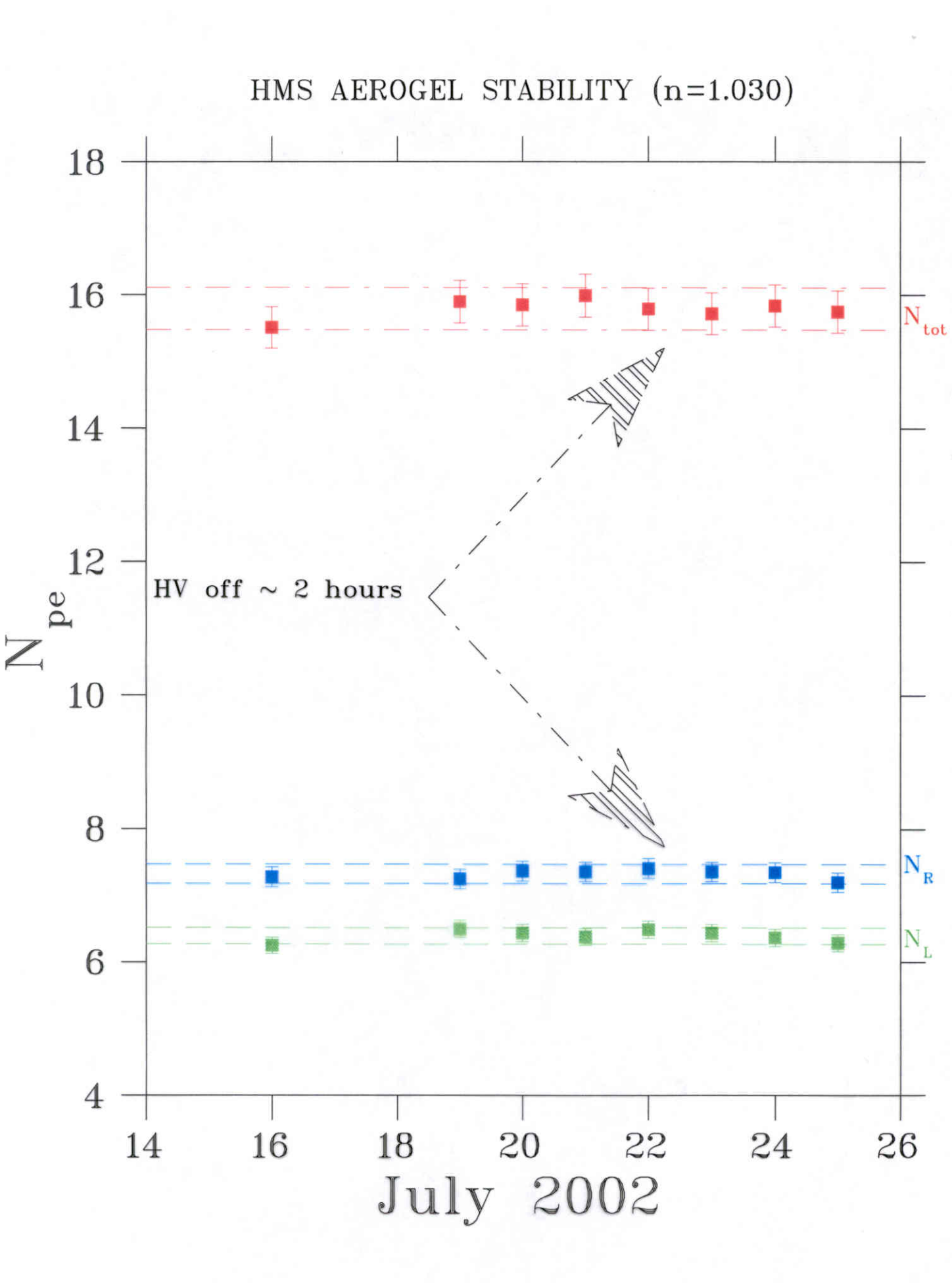


Total, Summed Responce in photo−electrons

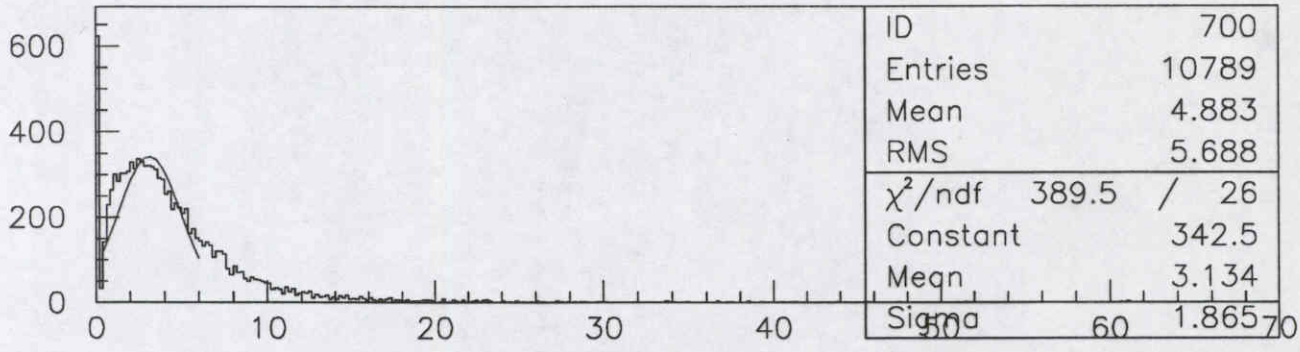

N pe vs X and Y position
Tot
L
R
N pe
Y (cm)


N pe
X (cm)

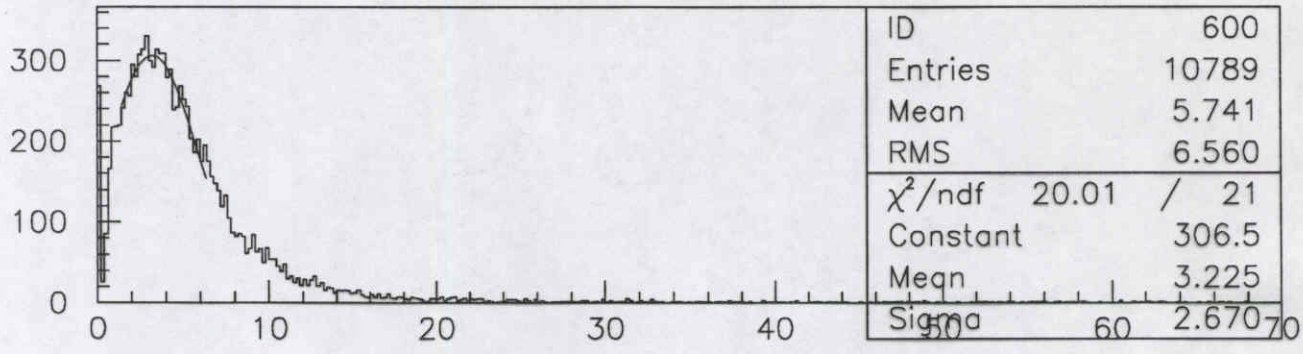

HMS AEROGEL STABILITY (n=1.030)
18
16
14
12
10
8
6
4
N pe
HV off ~ 2 hours
N tot
N R
N L
14
16
18
20
22
24
26
July 2002

z2/09/19 14.55

Run 256



Responce of Right PMTs in photo−electrons



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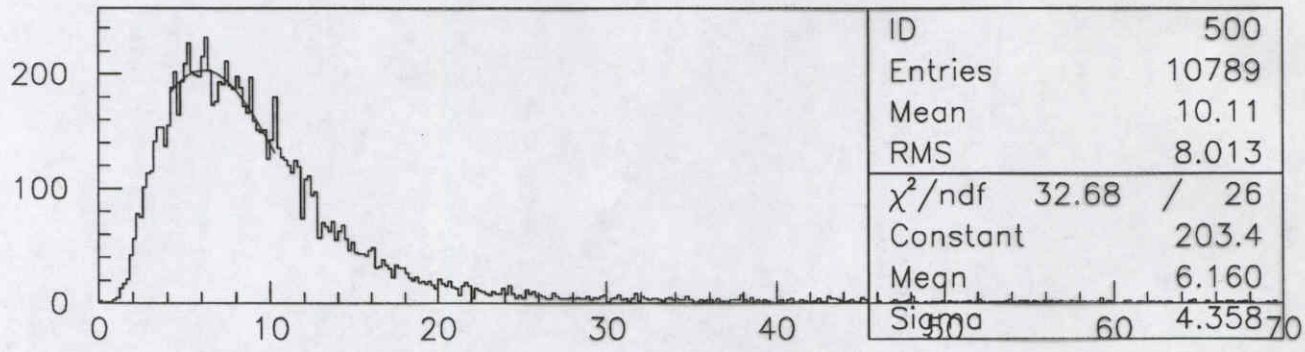

Total, Summed Responce in photo−electrons

2002/12/25 08.39

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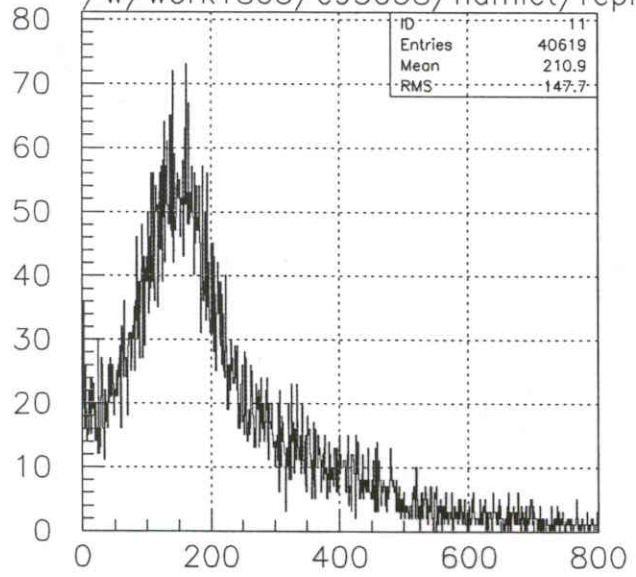
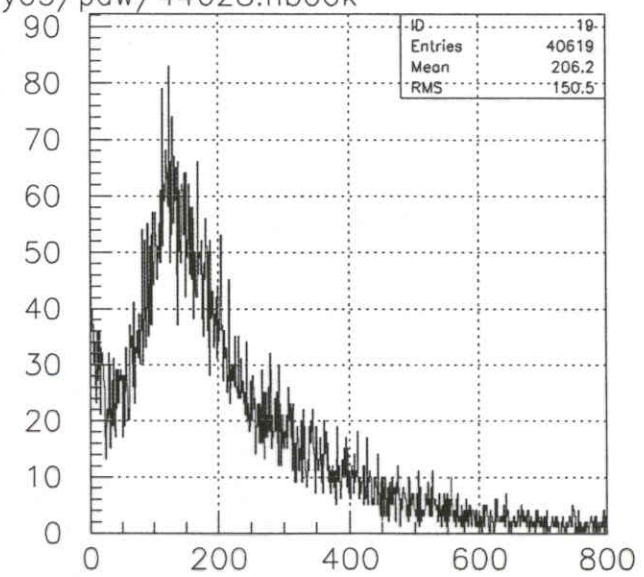
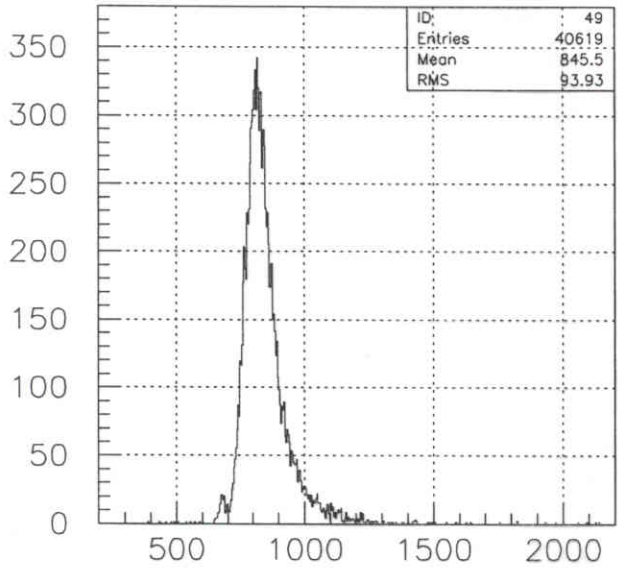


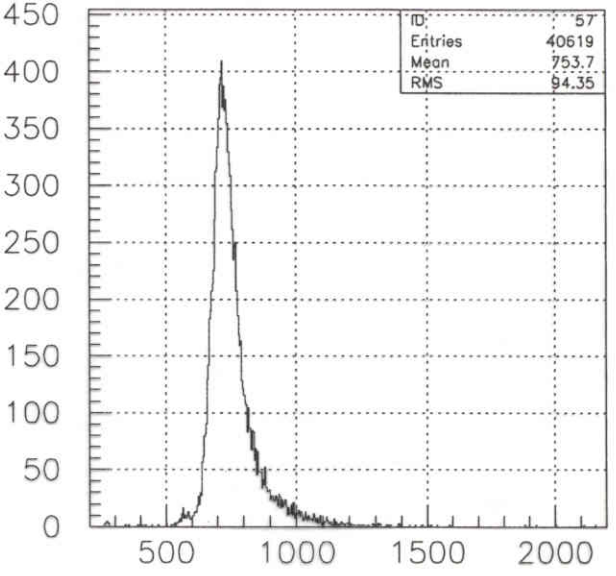
haero-rawadc-pos(4) t=goodhs1s2



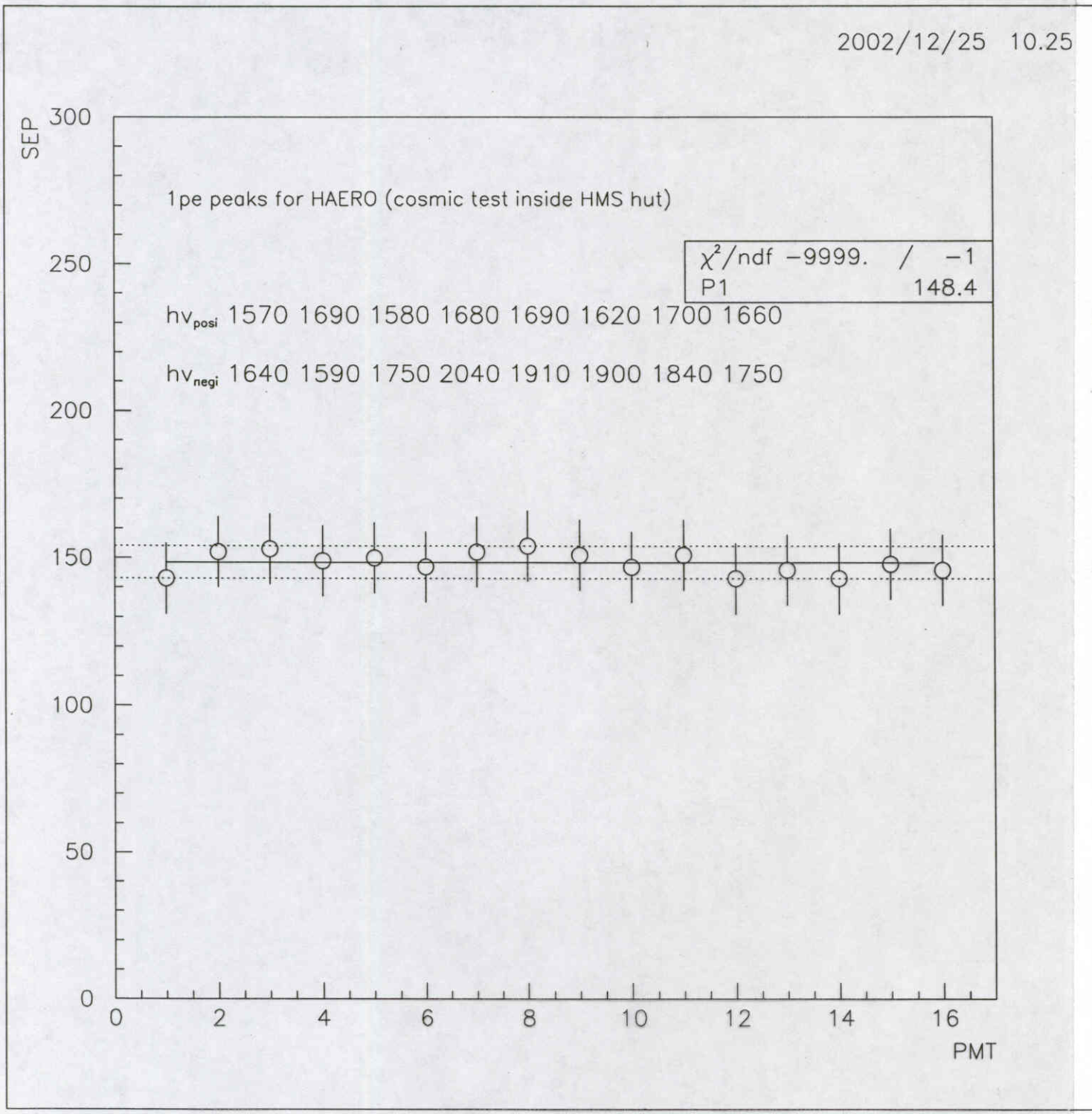
haero-rawadc-neg(4) t=goodhs1s2



haero-tdc-pos(4) t=goodhs1s2



haero-tdc-neg(4) t=goodhs1s2


2002/12/25 10.25
SEP
300
250
200
150
100
50
0
1pe peaks for HAERO (cosmic test inside HMS hut)
χ²/ndf −9999. / −1
P1 148.4
hv_posi 1570 1690 1580 1680 1690 1620 1700 1660
hv_negi 1640 1590 1750 2040 1910 1900 1840 1750
0
2
4
6
8
10
12
14
16
PMT

- Some data was taken also for the aerogel with n=1.015.

- The Aerogel was succesfully installed in HMS hut .
- All necessary electronics was assembled for aerogel in counting room.
- The 16 signal and HV cables were added in the HMS for aerogel.
- The software for aerogel on-line and of-line analysis were done.
- In EPICS part aerogel PMT's HV control was added.
- The some cosmic test runs with aerogel in HMS hut was done .

What else "To do" !

- To take some test date in real experimental conditions.
- To find and finalize the number of photoelectrons, and creat the different cut conditions.

- All PMT's was tested on subject of single electron peak, noise and gain-HV dependence.
- The HV bases was modified and now they are with amplifier.
- All inner surface of the detector were covered with high reflectivity millipore paper (Membrane GSWP-00010).
- Light (diffusion) box was assembled and its light leak , reflectivity with LED was tested.
- All aerogels with n=1.015 and 1.030 was cutted and assembled in separate aerogel boxes (we have two, one for n=1.015 and other for n=1.030).
- Assembling of the aerogel detector with n=1.030 completed.
- All electronics and DAQ assembled in EEL. Software for cosmic data taking and for the analysis ready.
- Beginning of July we taking cosmic data (aerogel n=1.030).