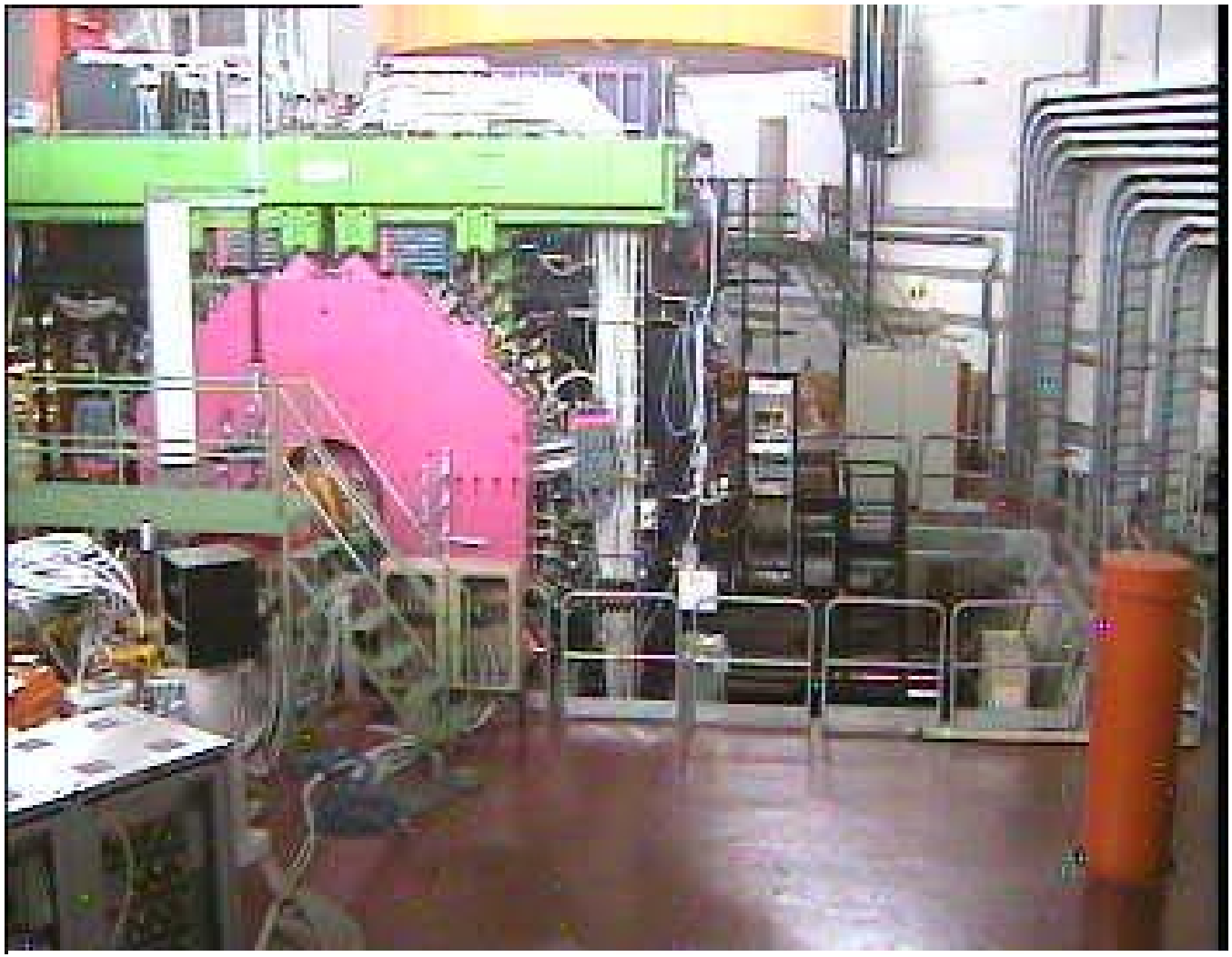
FINUDA: NEWS from the FLOOR

- The 2nd FINUDA roll-in
- Activities without beams
- Operation with beams in DAΦNE
- Status: DAQ, Detectors, Subsystems
- First outputs from the spectrometer
- Conclusion

V. Lucherini - LNF

July 18, 2006
2nd Roll-In of FINUDA on DAΦNE



Roll-Out was in March 30, 2004

Activity from 19 July to August 4

After the Roll-In: operations to align FINUDA respect to DAΦNE.
Beam pipe and cryogenic transfer lines connections-
Magnet cooling.

Filling the He chamber: in this phase, an important He leakage (up to 50%), was discovered. No leakages at all before the Roll-In.

After completion of alignment operations, end caps opened to try to solve this leakage: He Chamber leakage greatly reduced but not completely eliminated.

To solve the problem, need to partially extract some of the Drift Chambers, disconnecting piping and cabling also of the Vertex detectors. Since, however, magnet became cold (August 4th) and DAΦNE start rescheduled (due to LNF financial problems) to October 2nd, decision was taken to postpone this operation to the beginning of September, and use the rest of August to:

- close the end caps, to switch on the field of FINUDA solenoid (after more that 2.5 years and of being left OFF and warm); test and tune the whole new tofino at B=1 T.

- start data taking with cosmic rays and B=0 T, to debug the new DAQ with the full detectors, eventually collecting also first useful data for the alignment of the tracking detectors.

Activity from August 5 to October 1st

August 5-6

End caps closed. Magnet switched ON at field B=1 T: no problems.
New Tofino successfully tested at B = 1 T.

August 7-12

Begin of DAQ and detectors debugging using, for the fist time, all the detectors installed and operational in FINUDA, B = 0 T.

August 21* - September 3

End of DAQ and detectors debugging; Start Cosmic Ray Data Taking with the full apparatus, B=0 T.

September 4 – 28

End caps opened, and work to reduce the He chamber leakage. More time than forecast (14 days) needed. Leakage reduced to the level of 12%, well below the critical one for good data quality in Hypernuclear spectroscopy.

September 29 – October 1:

End-caps closed; Cosmic Ray Data Taking with the full detector, B=0 T.

* *August 13-20 LNF Summer closure*

Activity from October 2nd to November 26

October 2 - 28

FINUDA magnet switched ON again, DAΦNE switched on and first injections. While DAΦNE optimizes its performance, FINUDA performs:

- continuous monitoring of leakage currents in Vertex Detectors, since from previous experience on DAΦNE initial beams tuning is the most dangerous.

- switching ON to progressively higher H.V. all detectors, a part the Vertex one.

- study of background, detectors behavior & DAQ under beam conditions;

- control of the He chamber filling.

October 29, 2006:

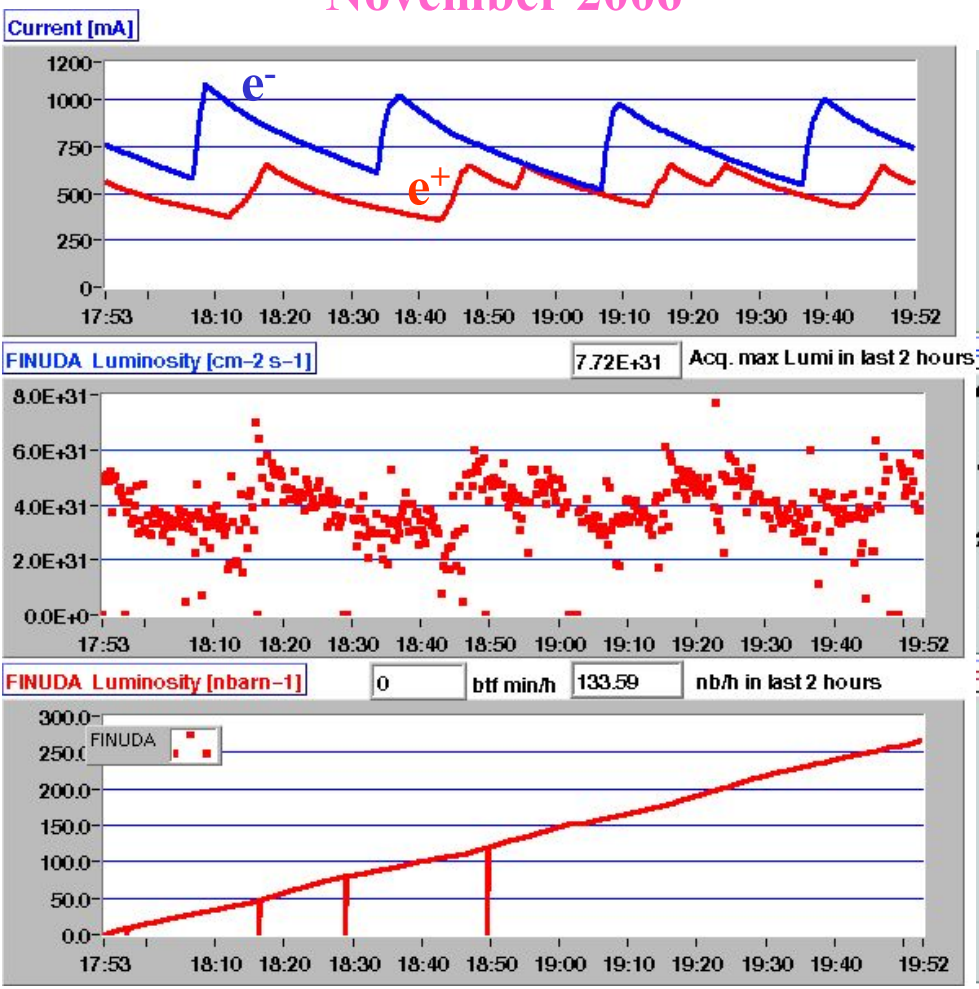
Switch On Vertex detector and checks on its behavior

October 30 - November 26

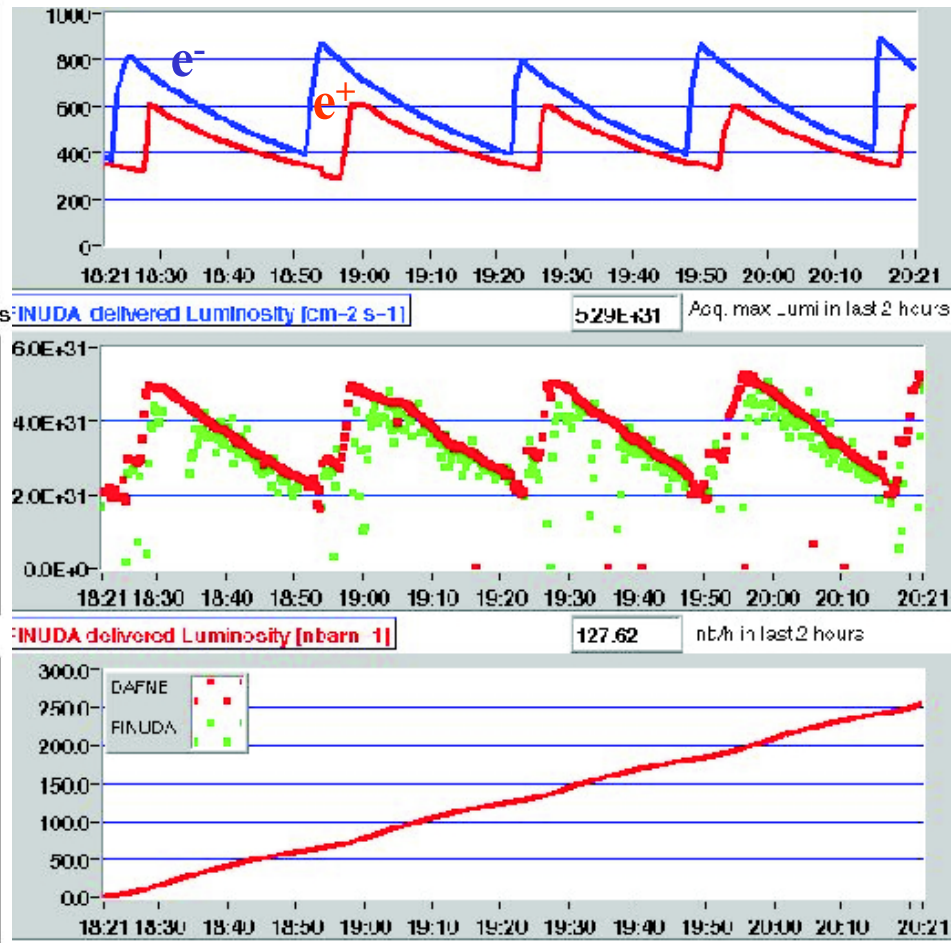
Steadily improvements of DAΦNE working conditions, using also FINUDA detectors information. Already at the beginning, machine Luminosity similar to that we get at the end of previous runs, in spite the circulating currents are a bit smaller.
In this initial phase, however, the background still several factors higher than in the past: anyway, regular data taking started from 20 November.

Currents and Luminosities

November 2006

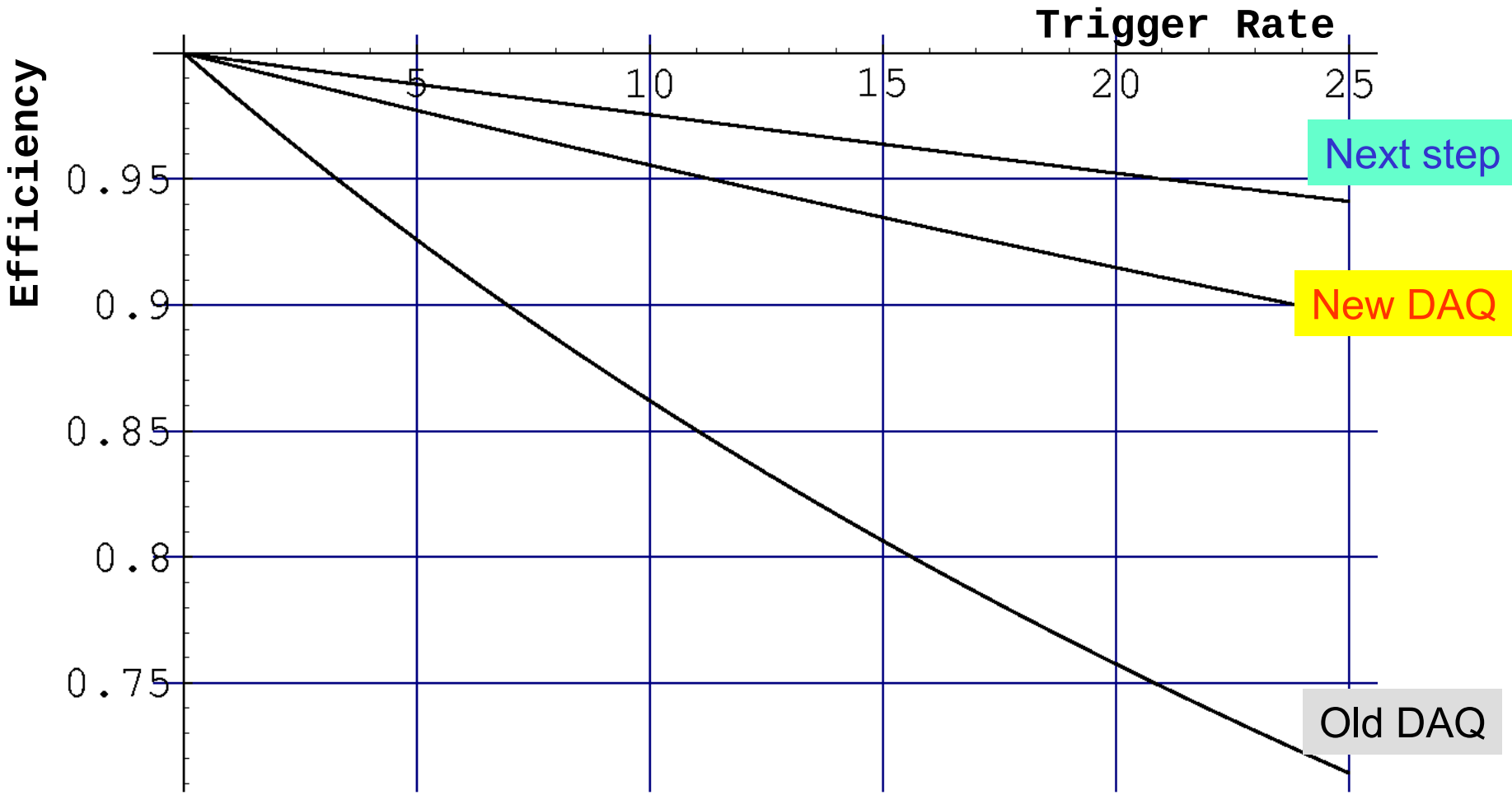


March 2004



Much better duty cycle: further gain improving e^+ current and injection

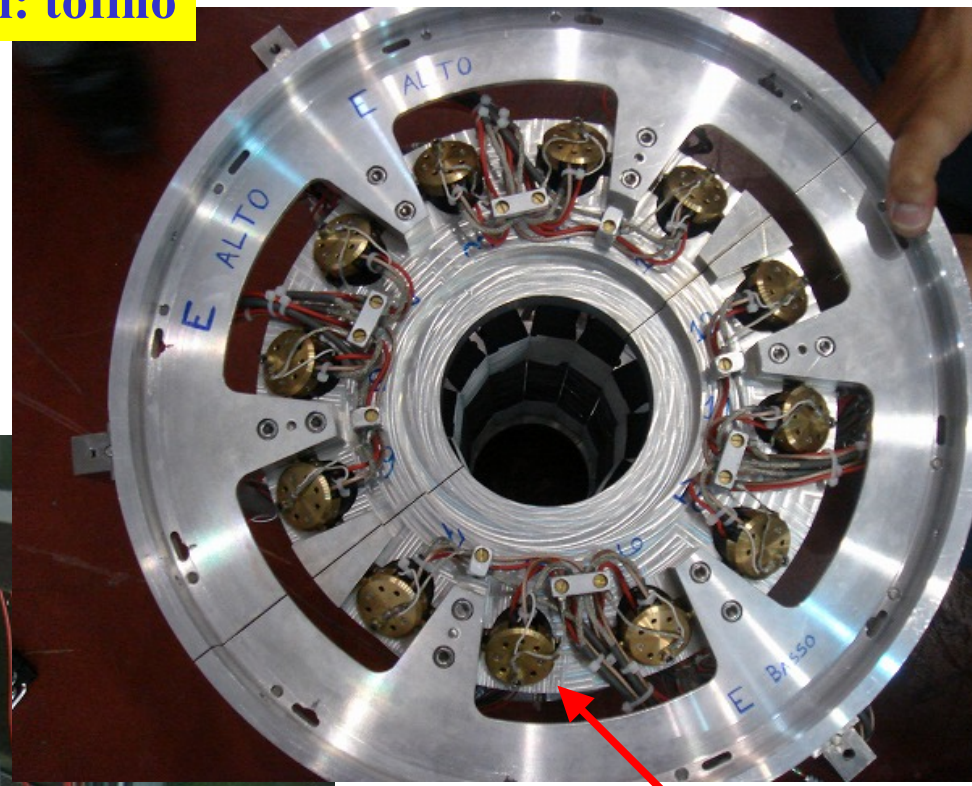
The New FINUDA DAQ

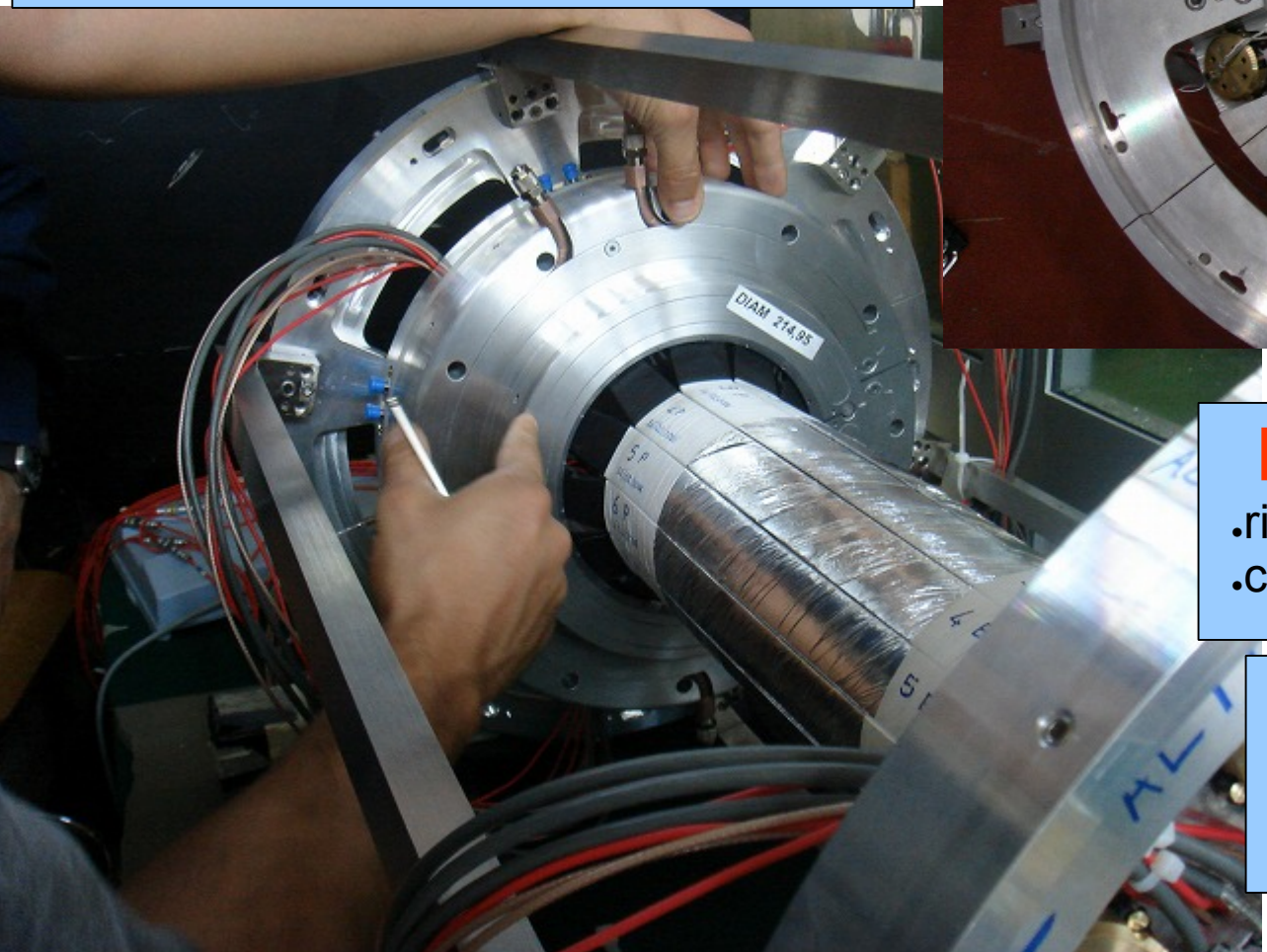


The innermost scintillator barrel: tofino

Photomultipliers (before HPD)
HAMAMATSU R5505-70

- Rise time:1.5 ns
- Transit Time : 5.6ns
- Transit Time Spread: 0.35ns



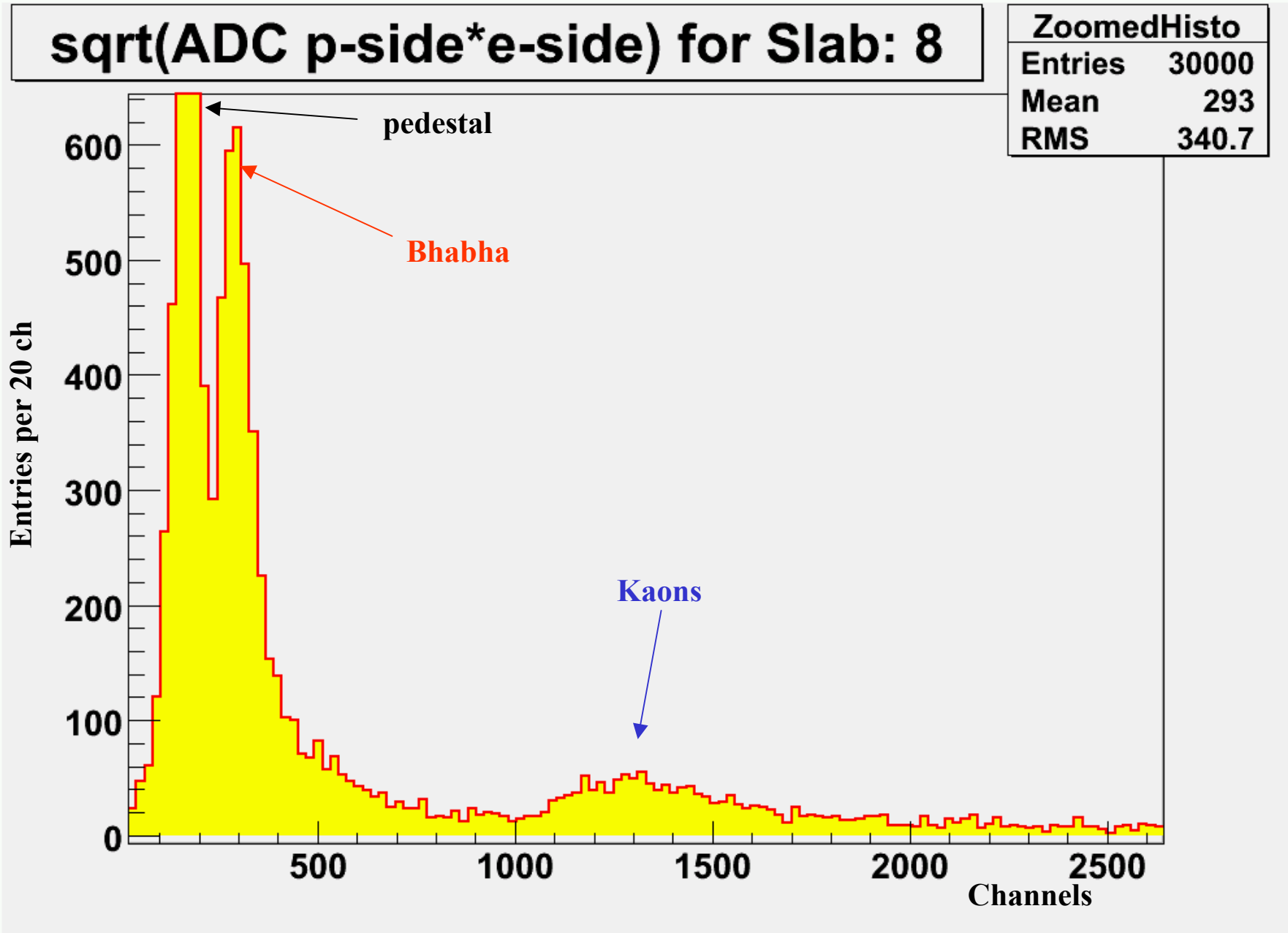


New pre-amplifiers:
- rise-time: 1 ns
- compensation for cable length

New discriminators
- ORTEC CFD 8200

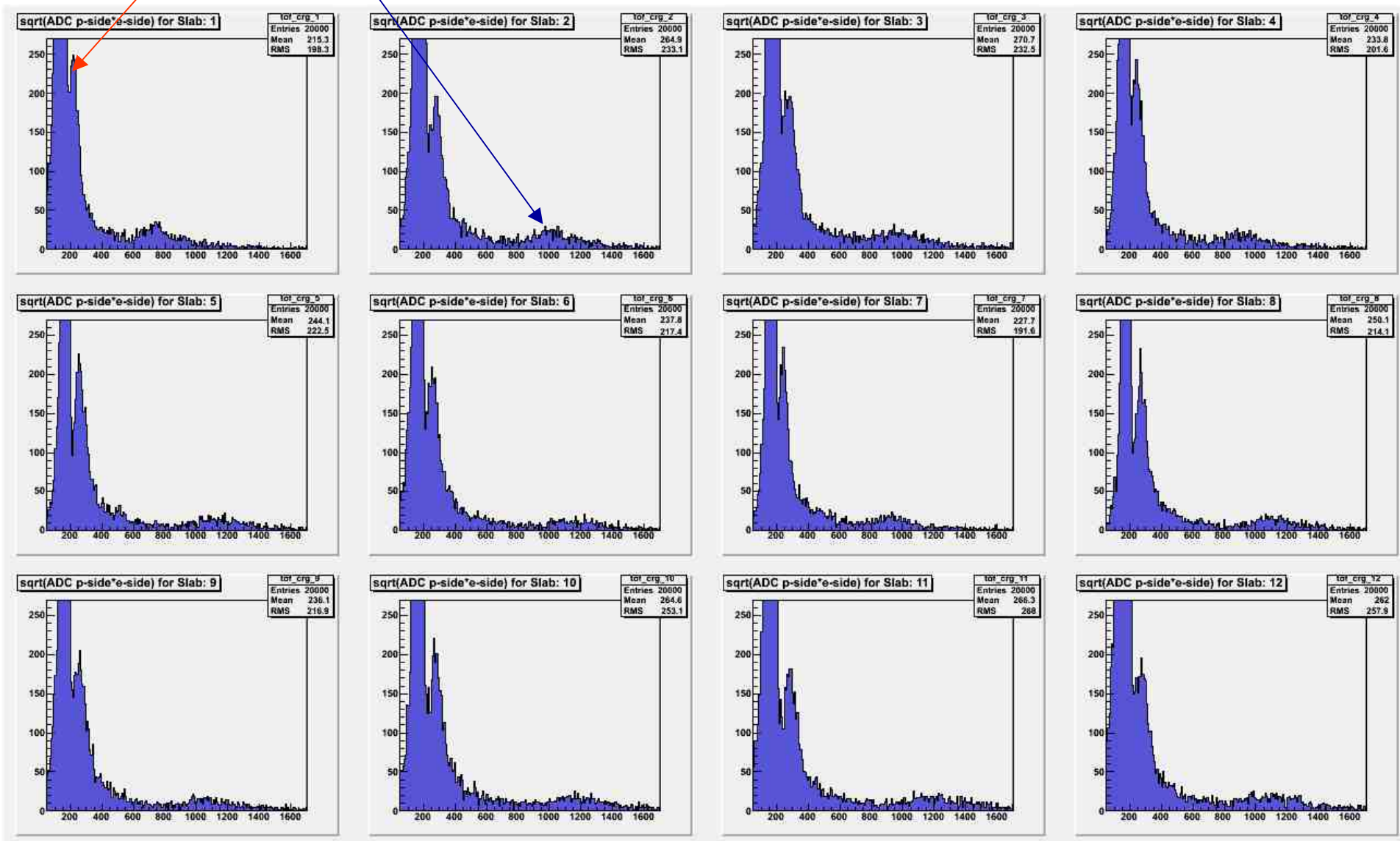
First Bhabha/Kaon detection (run FINU 02615) trig: HYP-BHABHA (1/1)

(02 Nov. 2006)



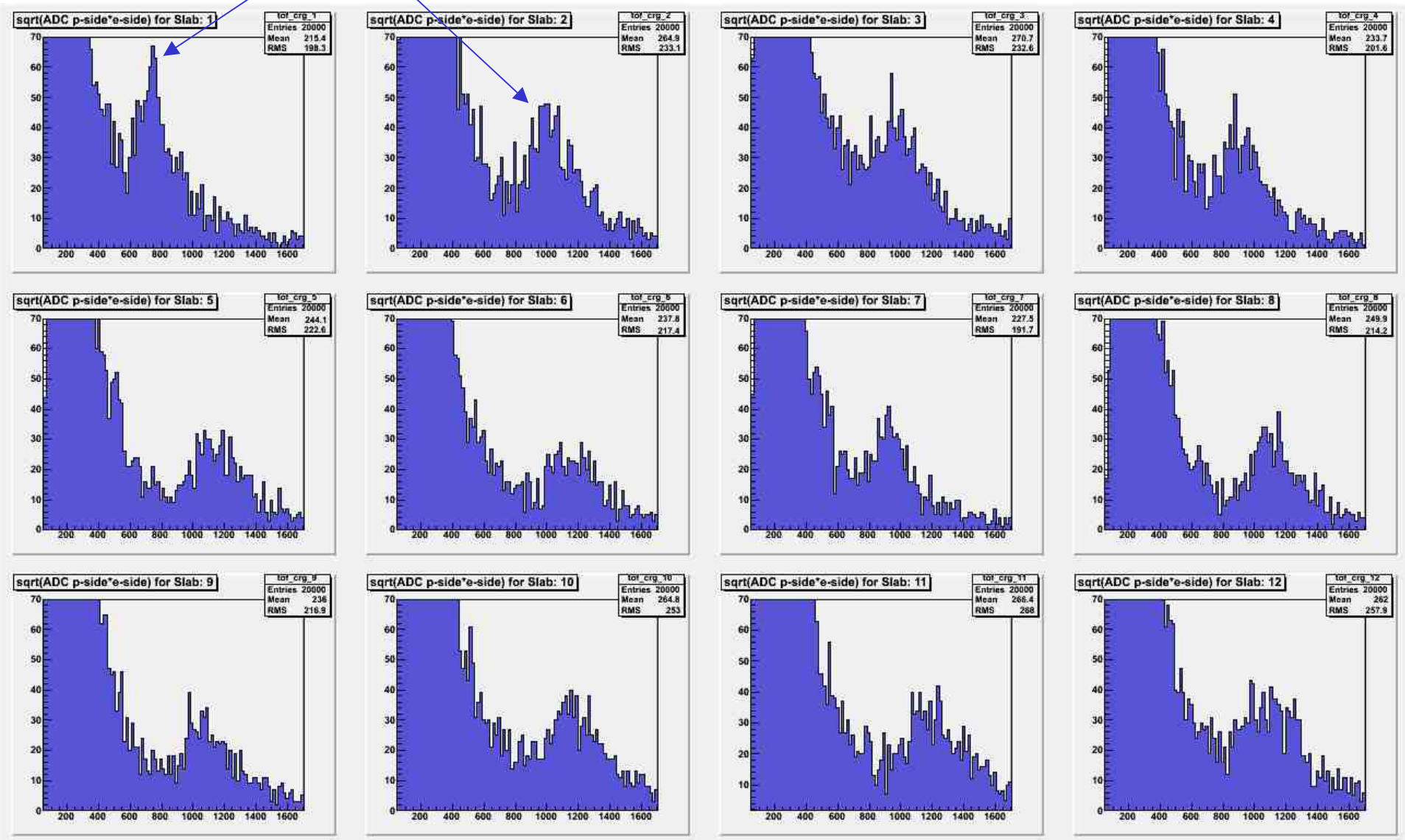
Bhabha/Kaons detection (run FINU3295) trigger: HYP-BHABHA (1/1)

(15 Nov. 2006)

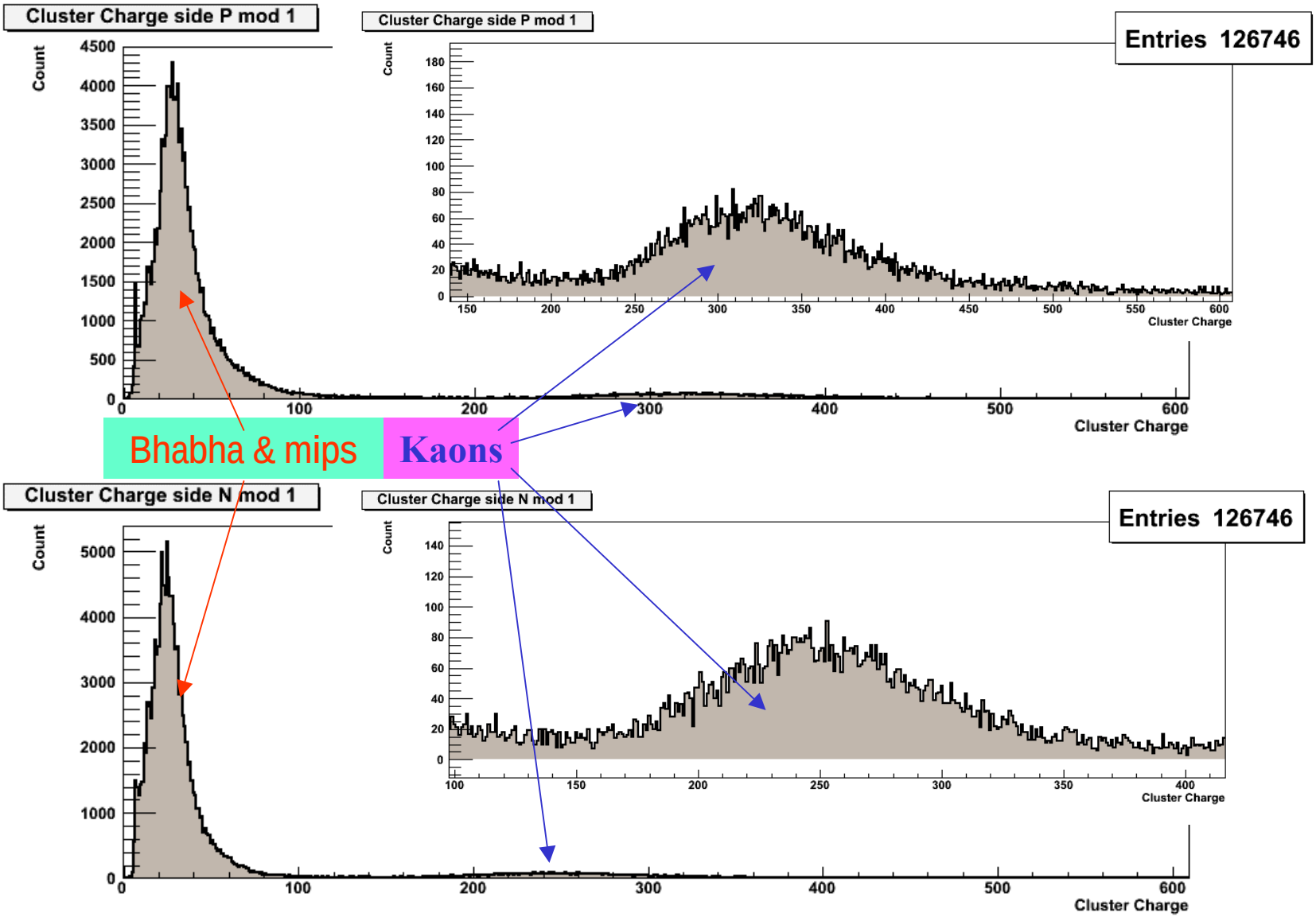


Zoom in the Kaon region

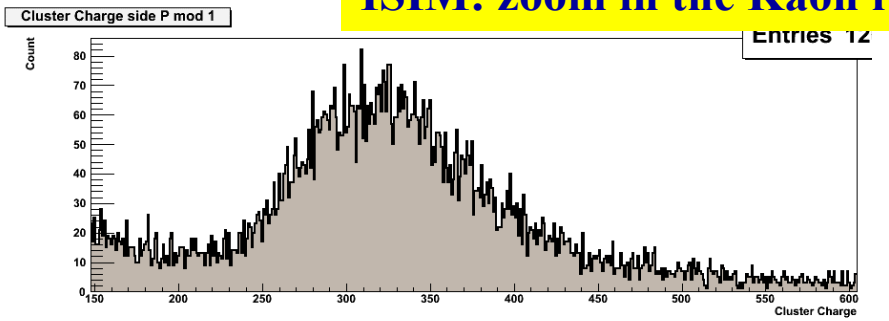
Bhabha/**Kaons** detection (run FINU3295) trigger: HYP-BHABHA (1/1)
(15 Nov. 2006)

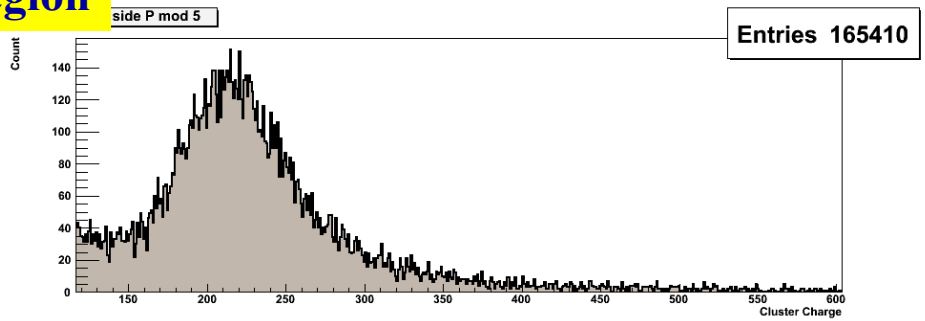


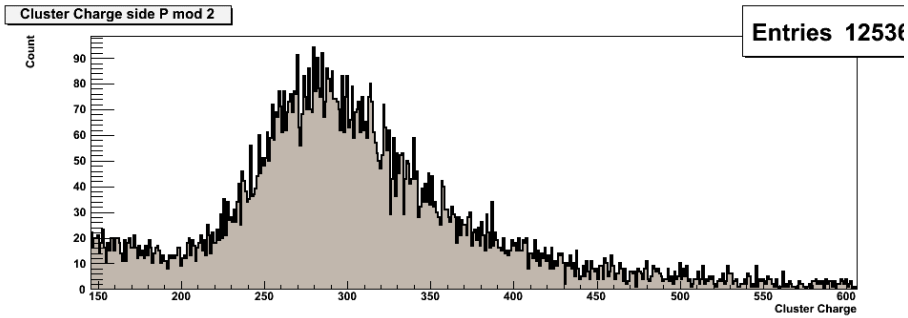
MICROVERTEX ISIM - the Inner SIlicon Microstrips

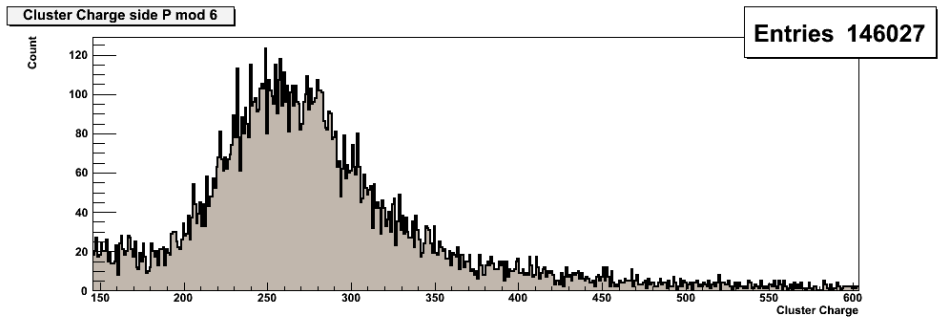


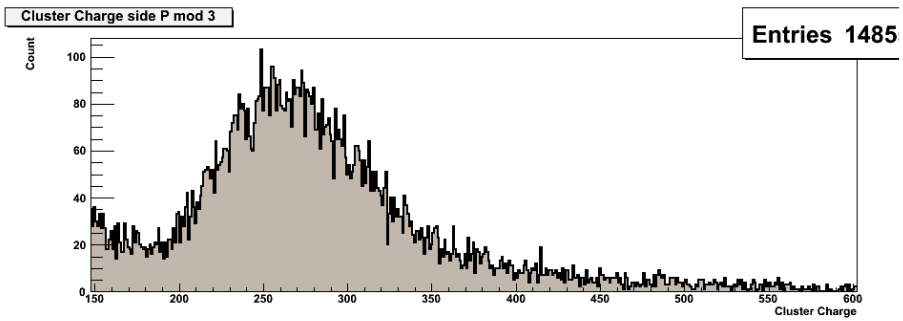
ISIM: zoom in the Kaon region

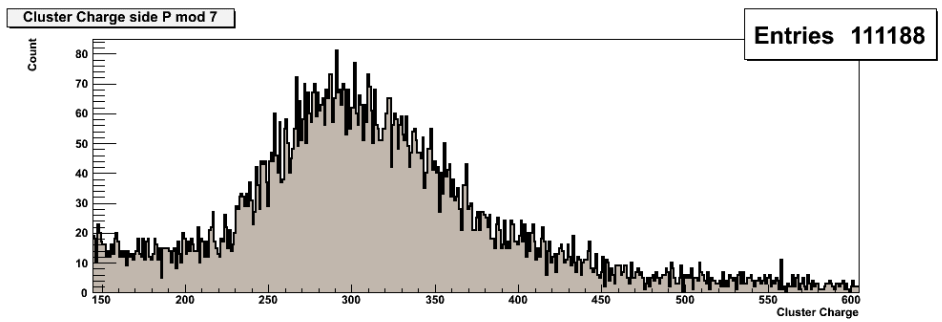


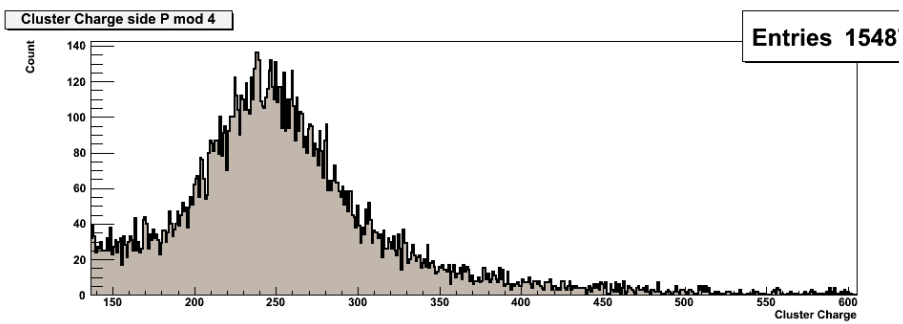


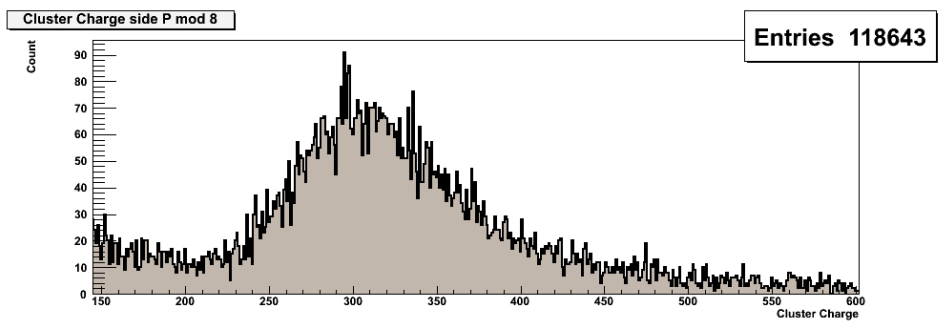




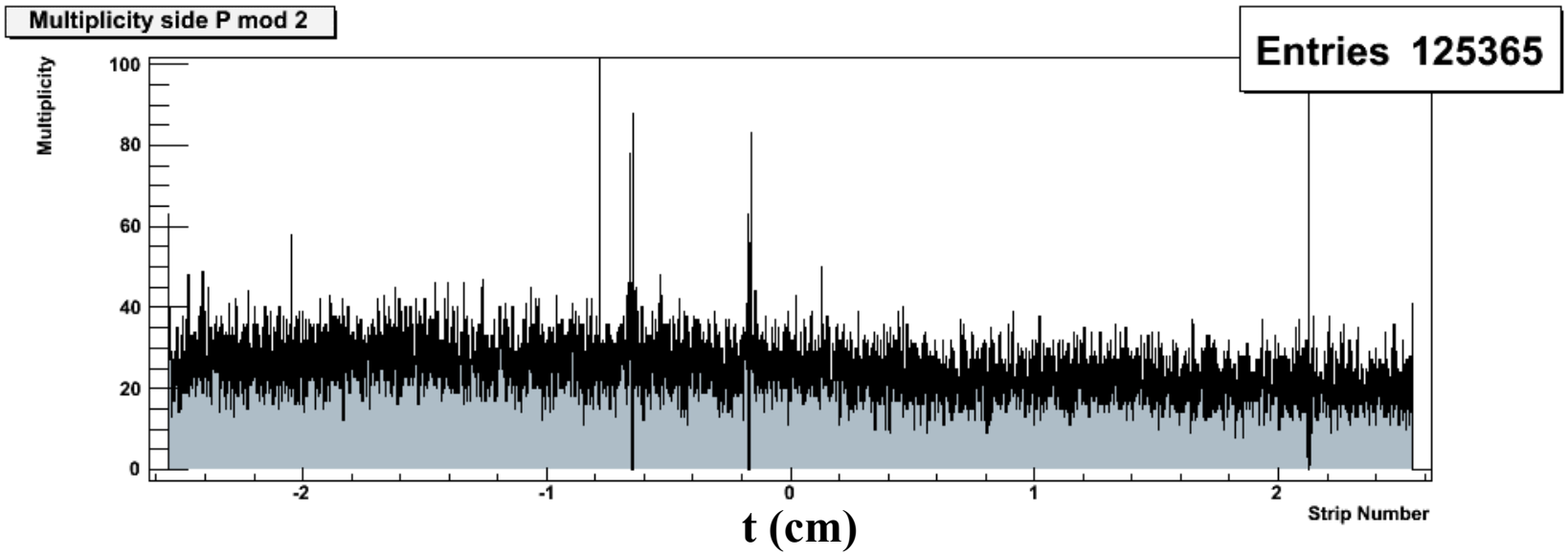




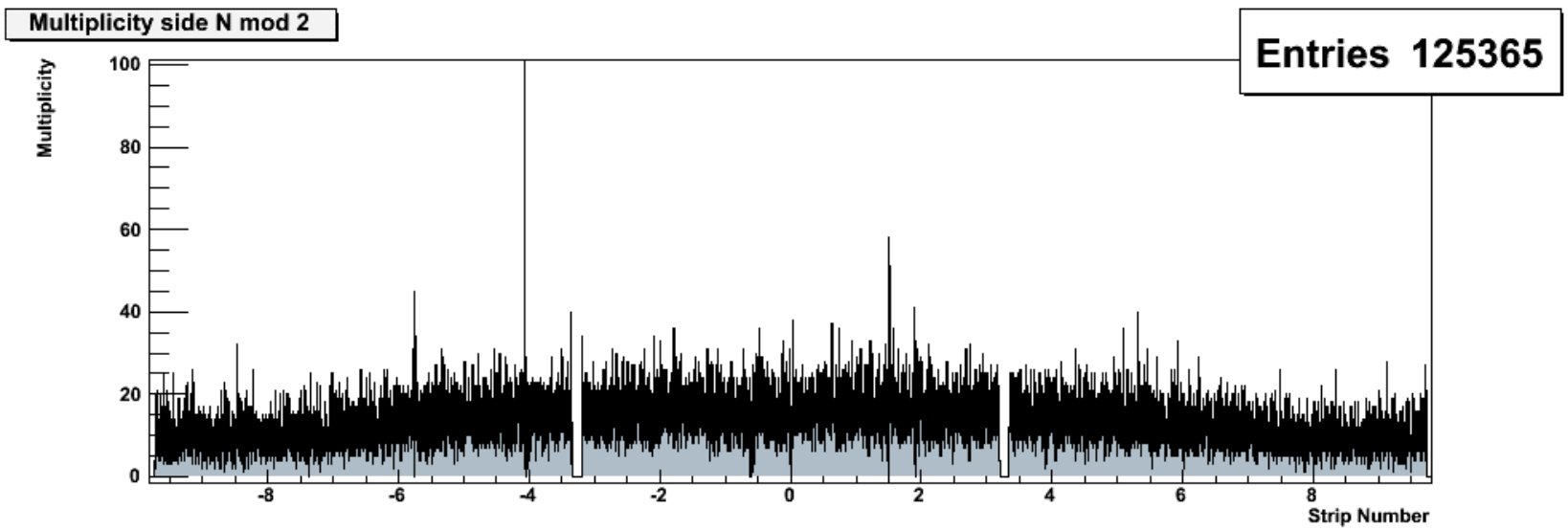




Hits distribution in ISIM module



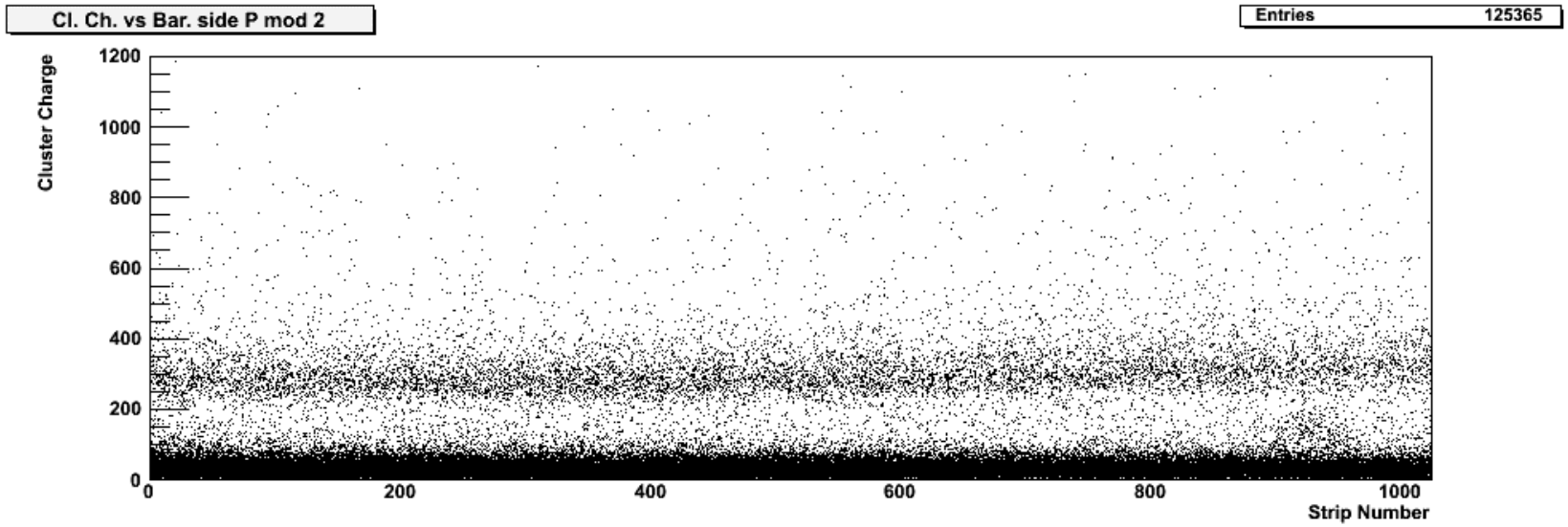
t (cm)

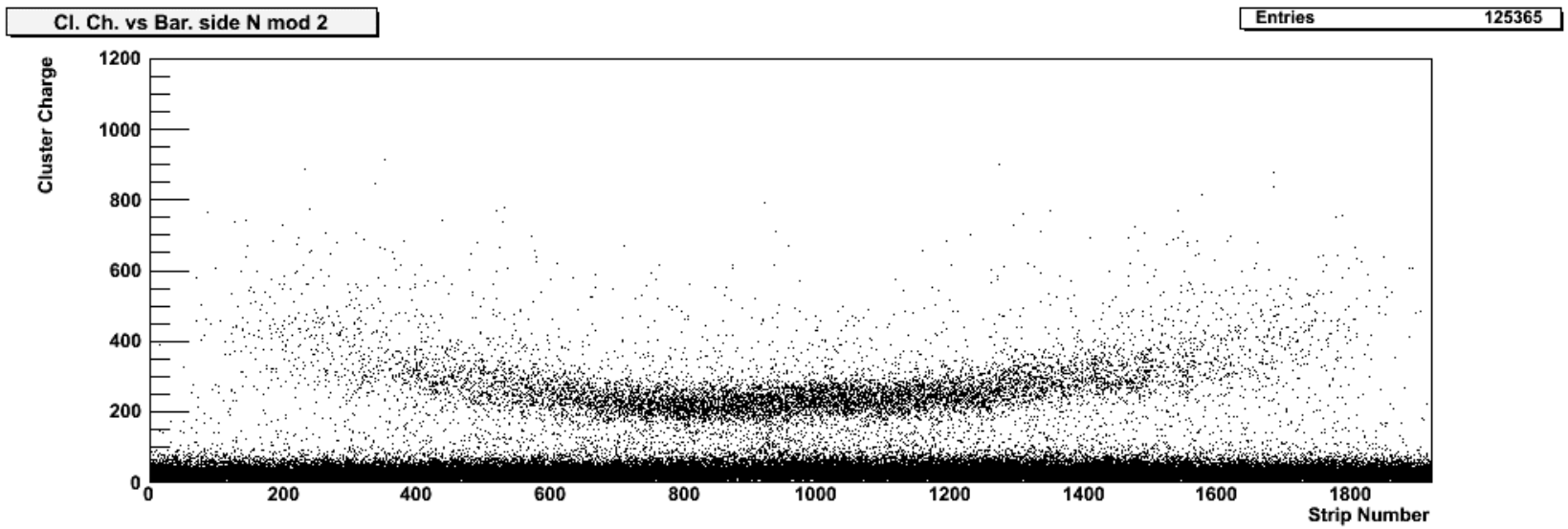


z (cm)

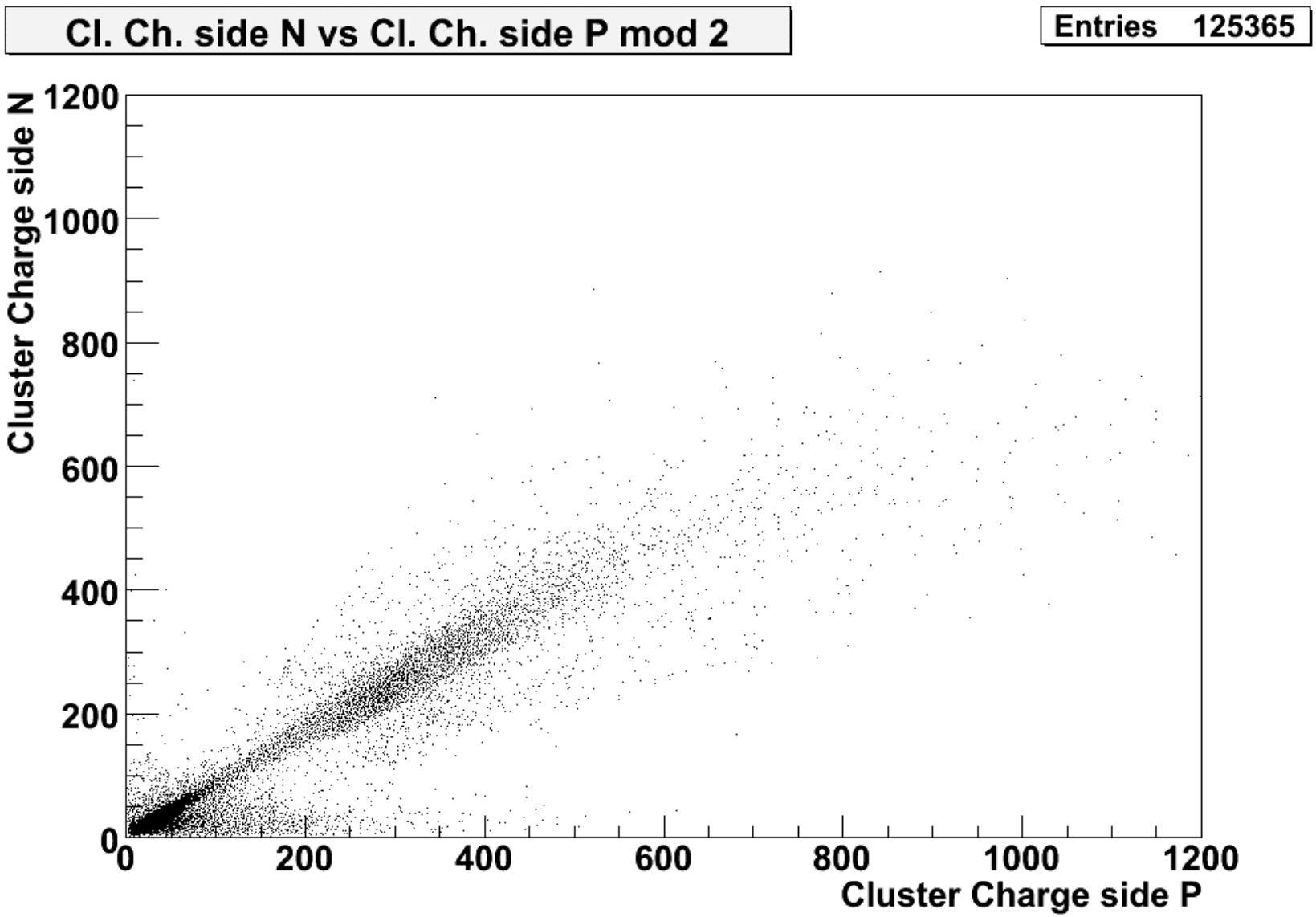
Possibility to eliminate noisy channels

Charge versus strip number

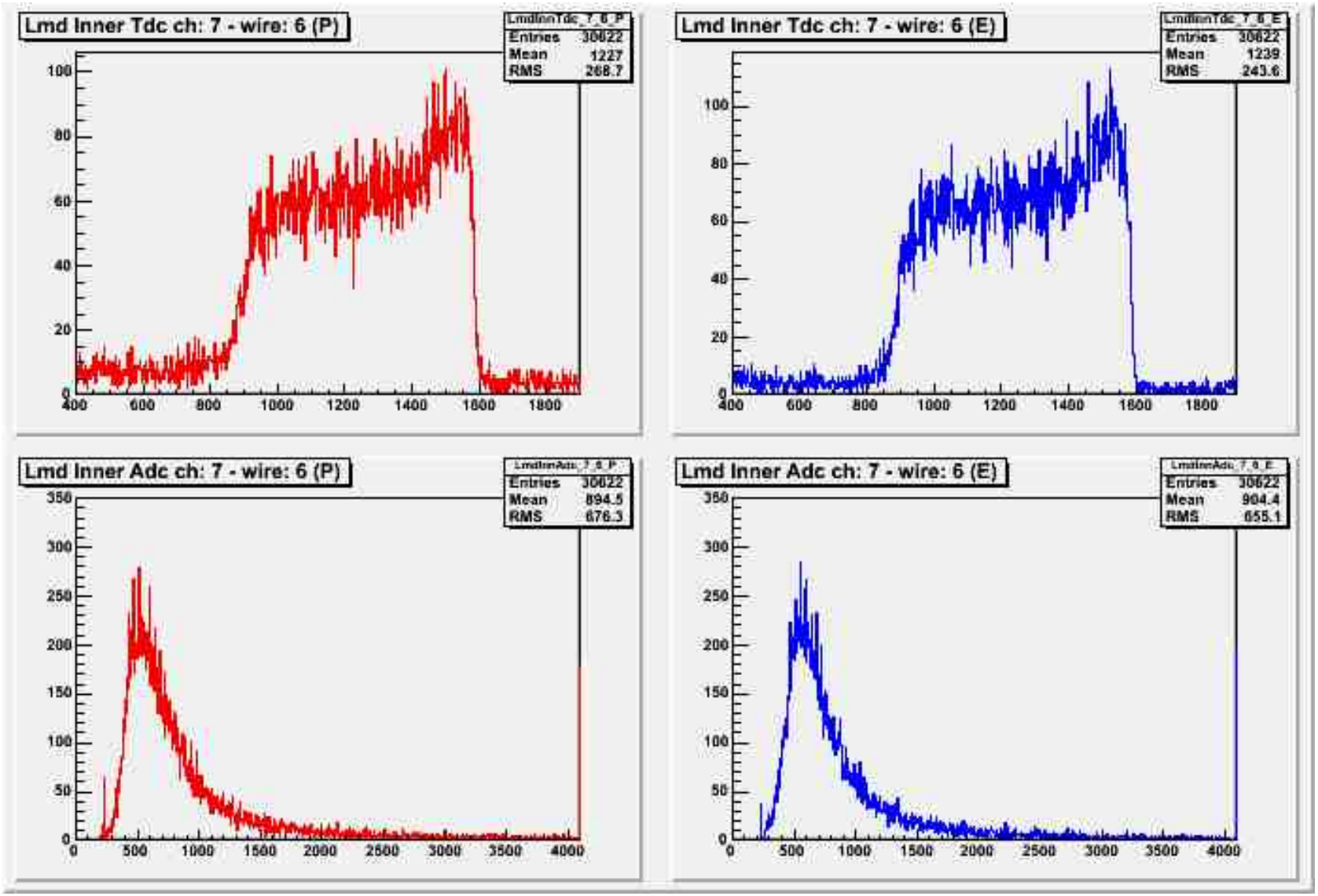




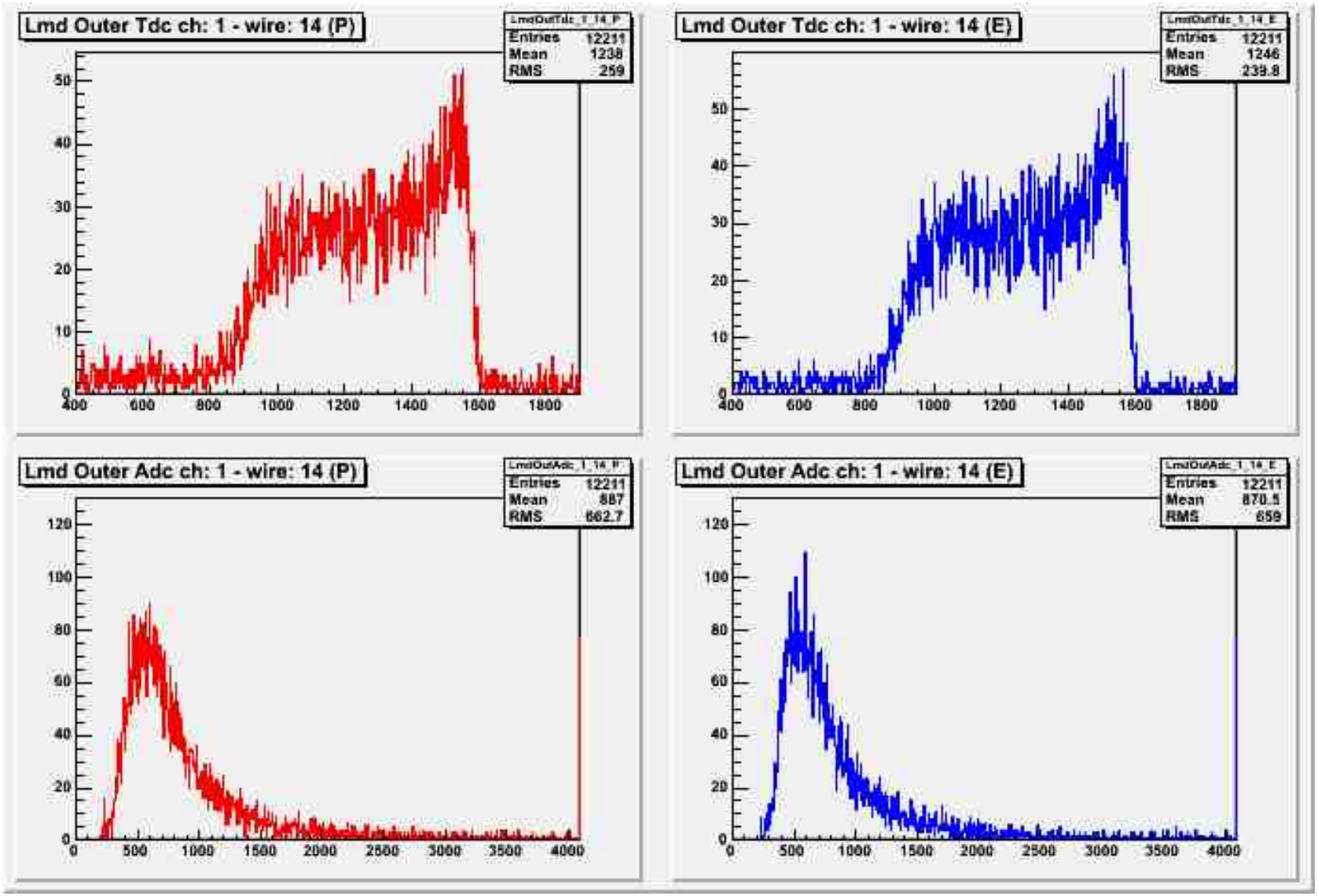
Scatter plot of N side versus P side charge



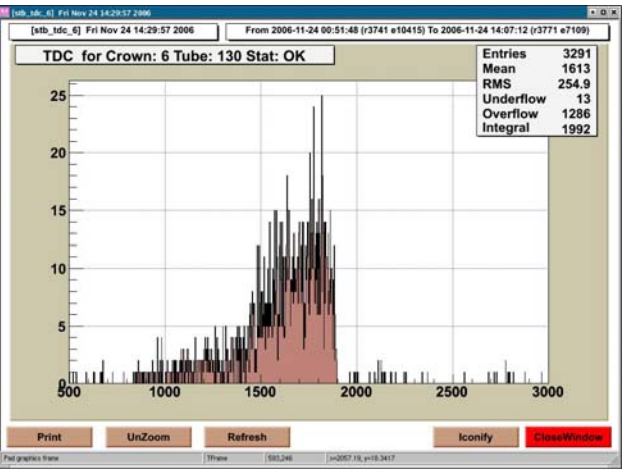
LOW MASS DRIFT CHAMBERS: Inner layer

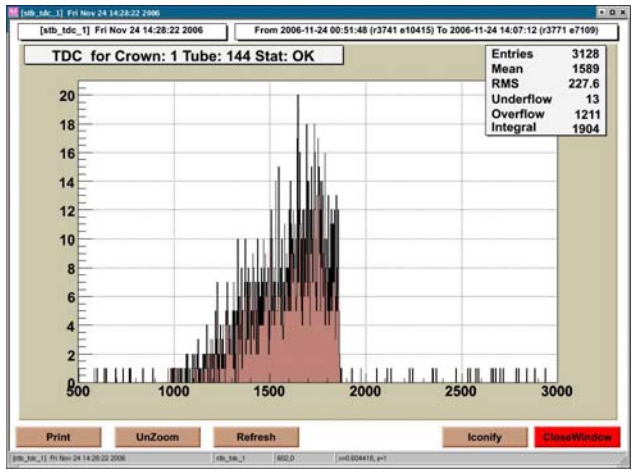


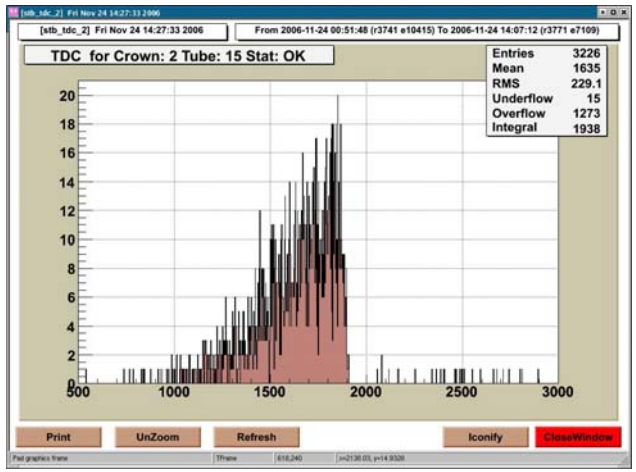
LOW MASS DRIFT CHAMBERS: Outer layer

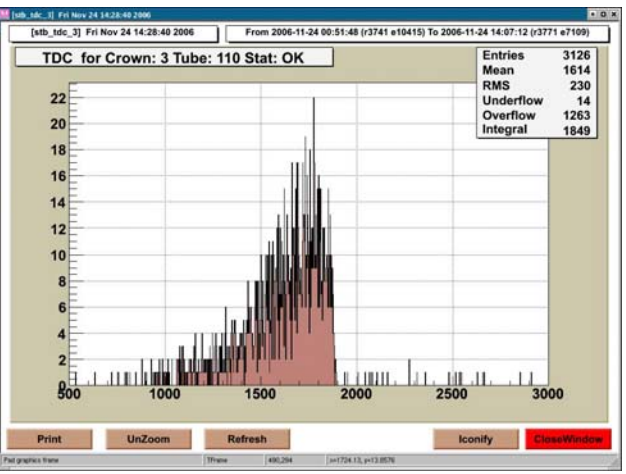


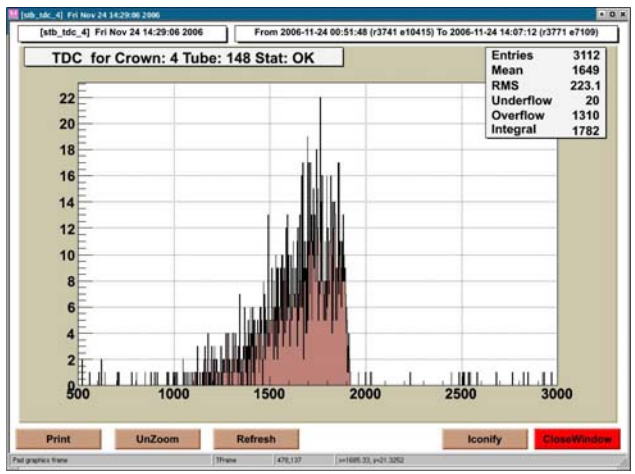
Straw Tube TDC distributions

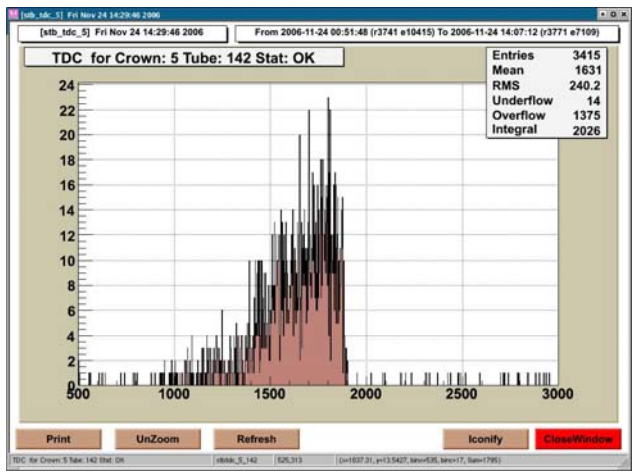








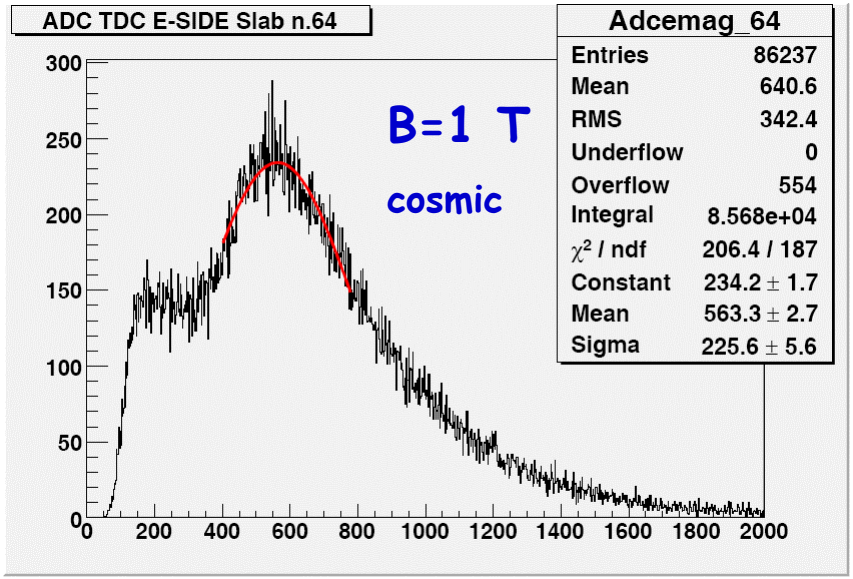


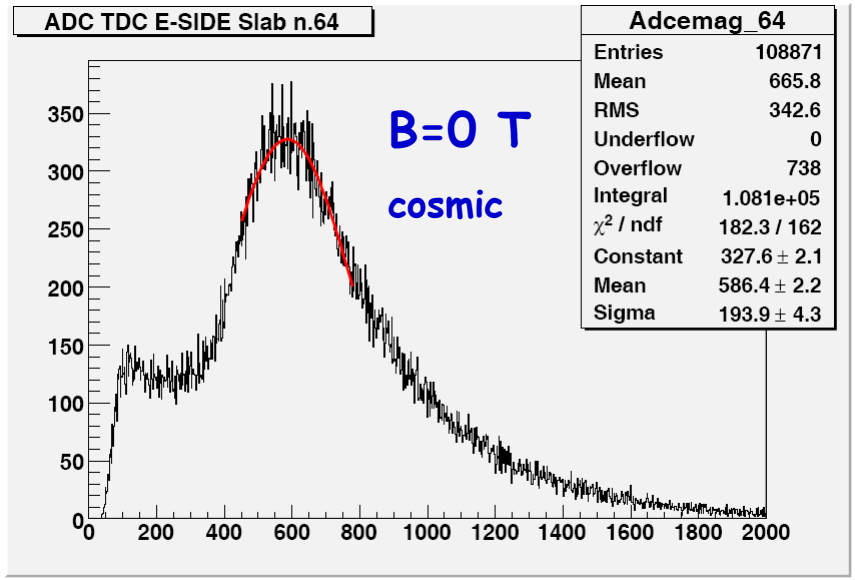


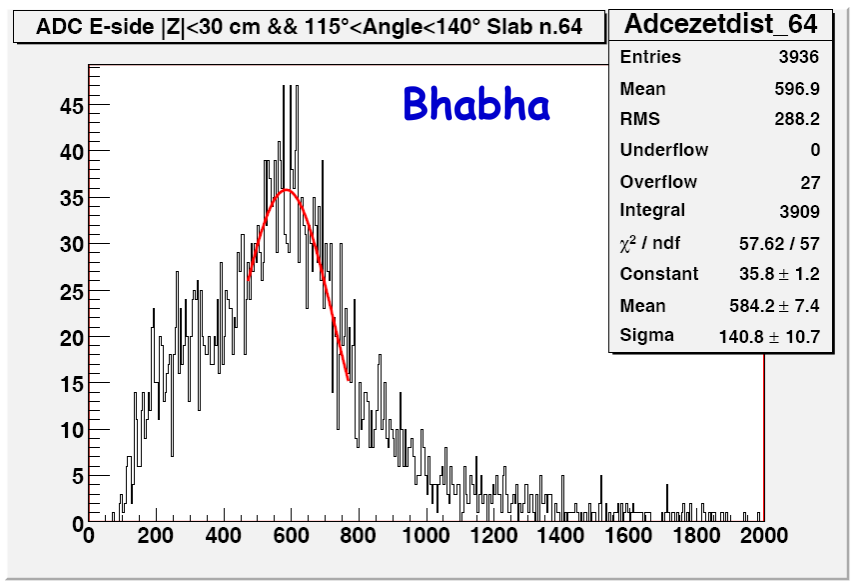
Ethane-Argon gas mixture changed, respect to previous runs, from 50%-50%, to 20%-80%:
higher efficiency, lower HV

Outermost scintillator barrel: Tofone

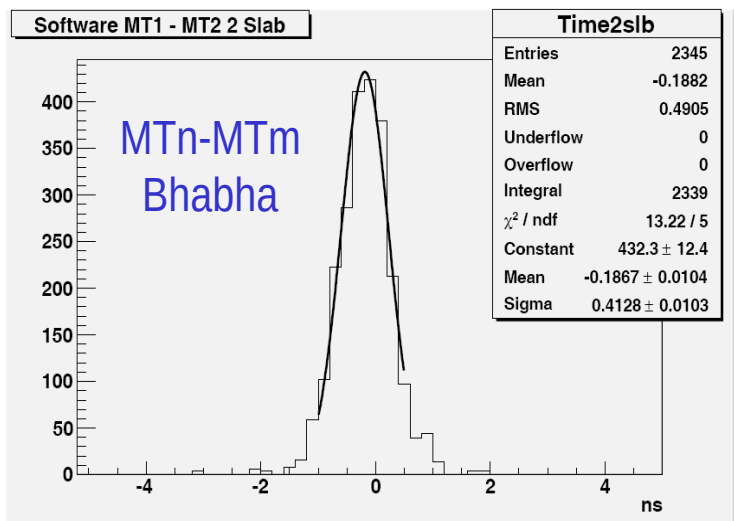
ADC calibration with Cosmic & Bhabha runs





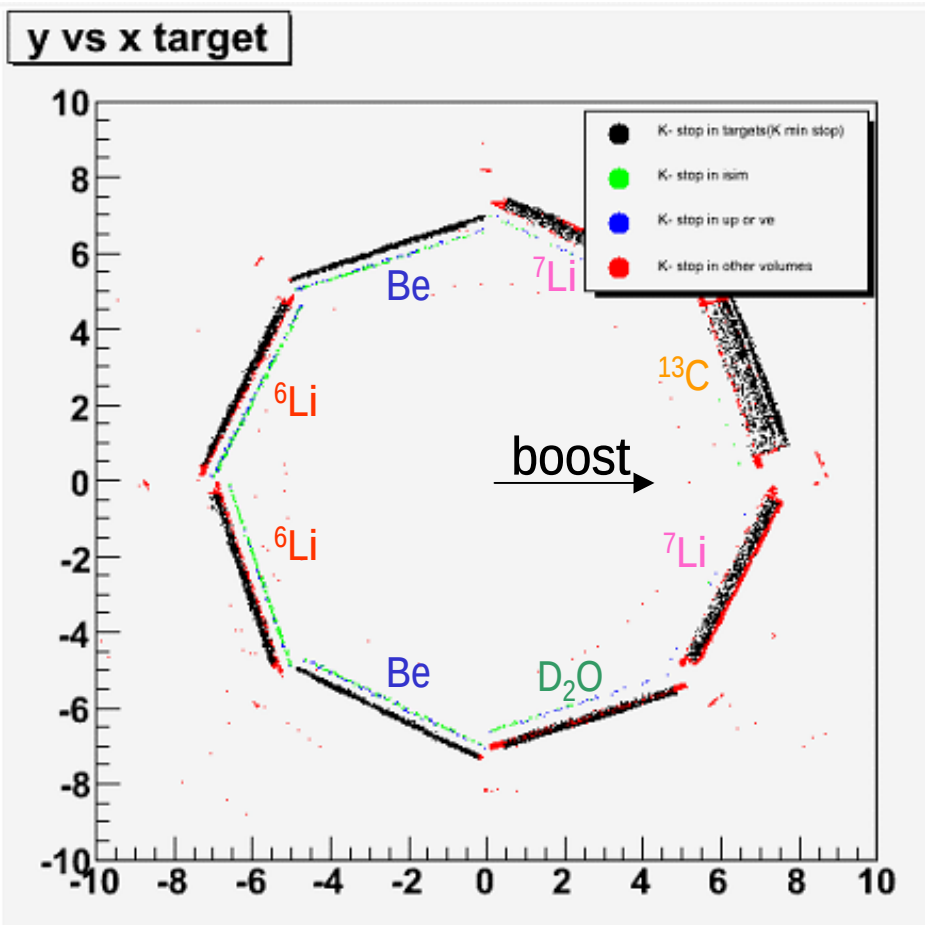


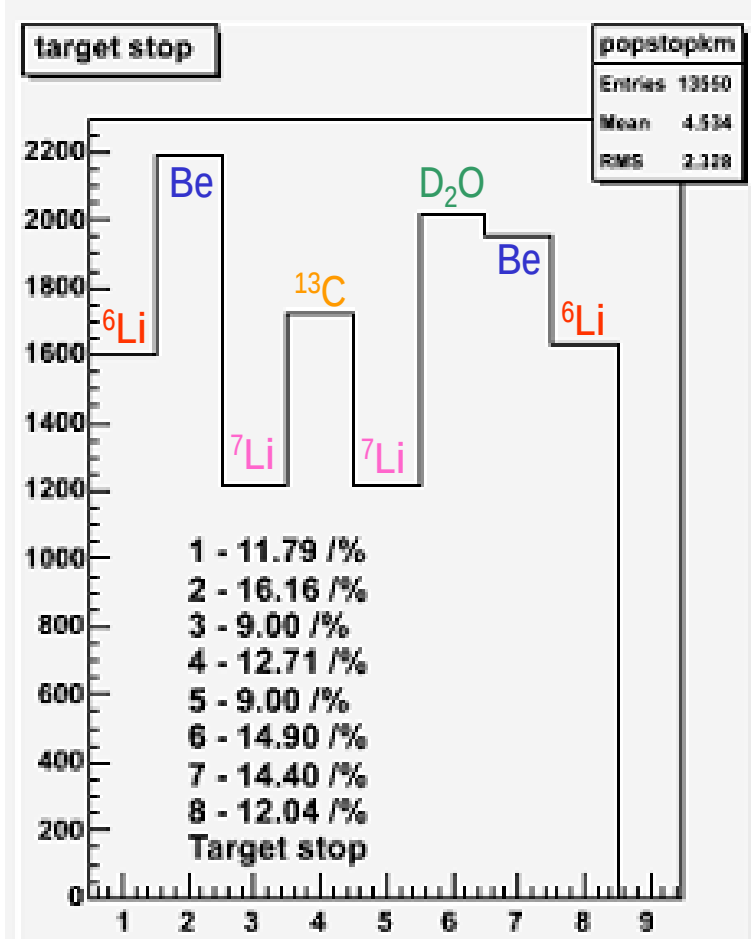
Time resolution



What are we getting?

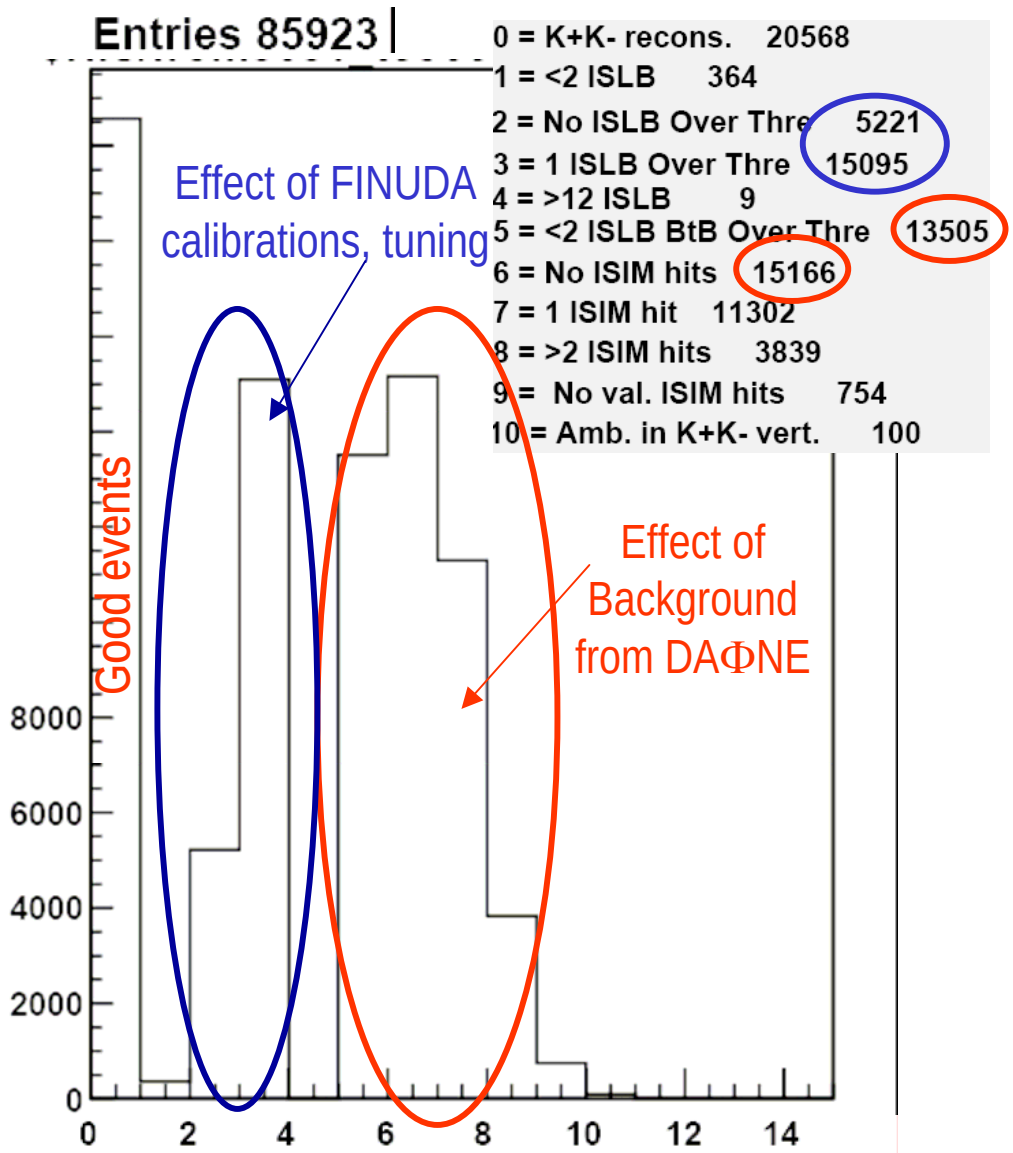
K^- stopping points



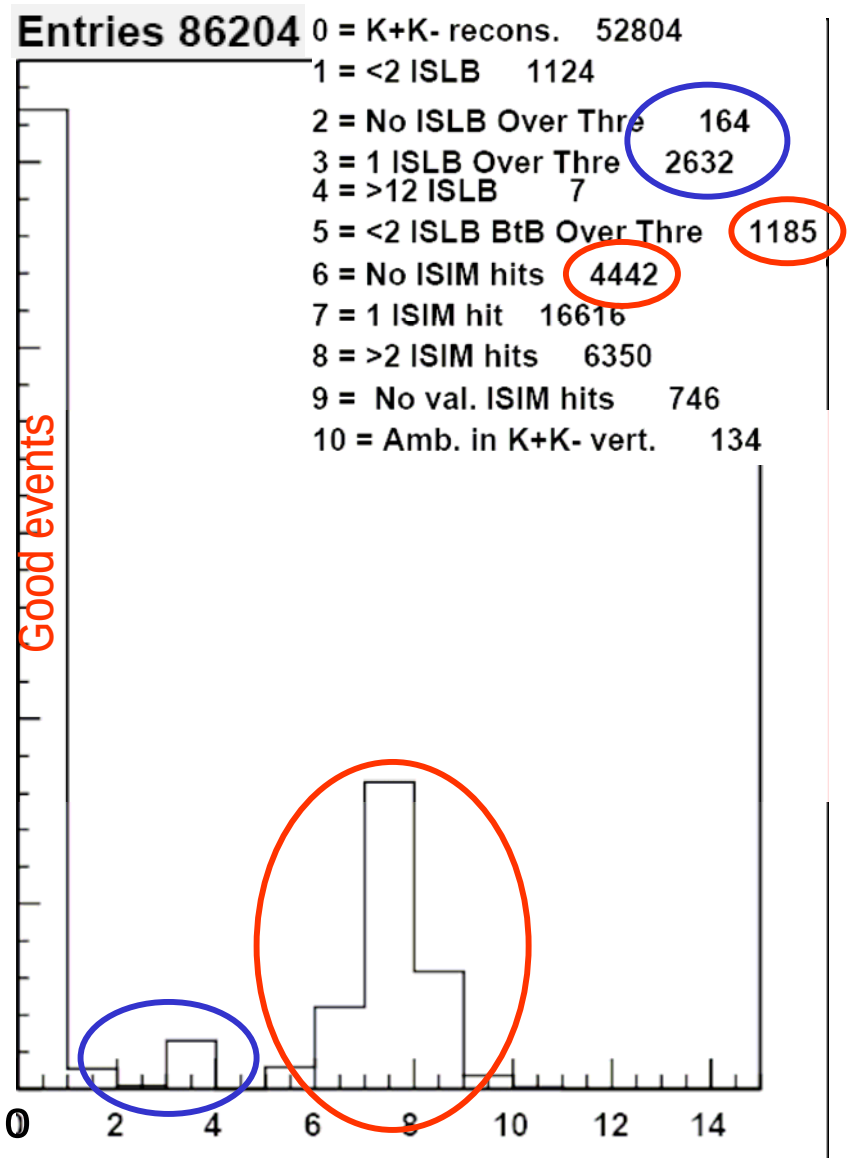


Trigger type: HYP

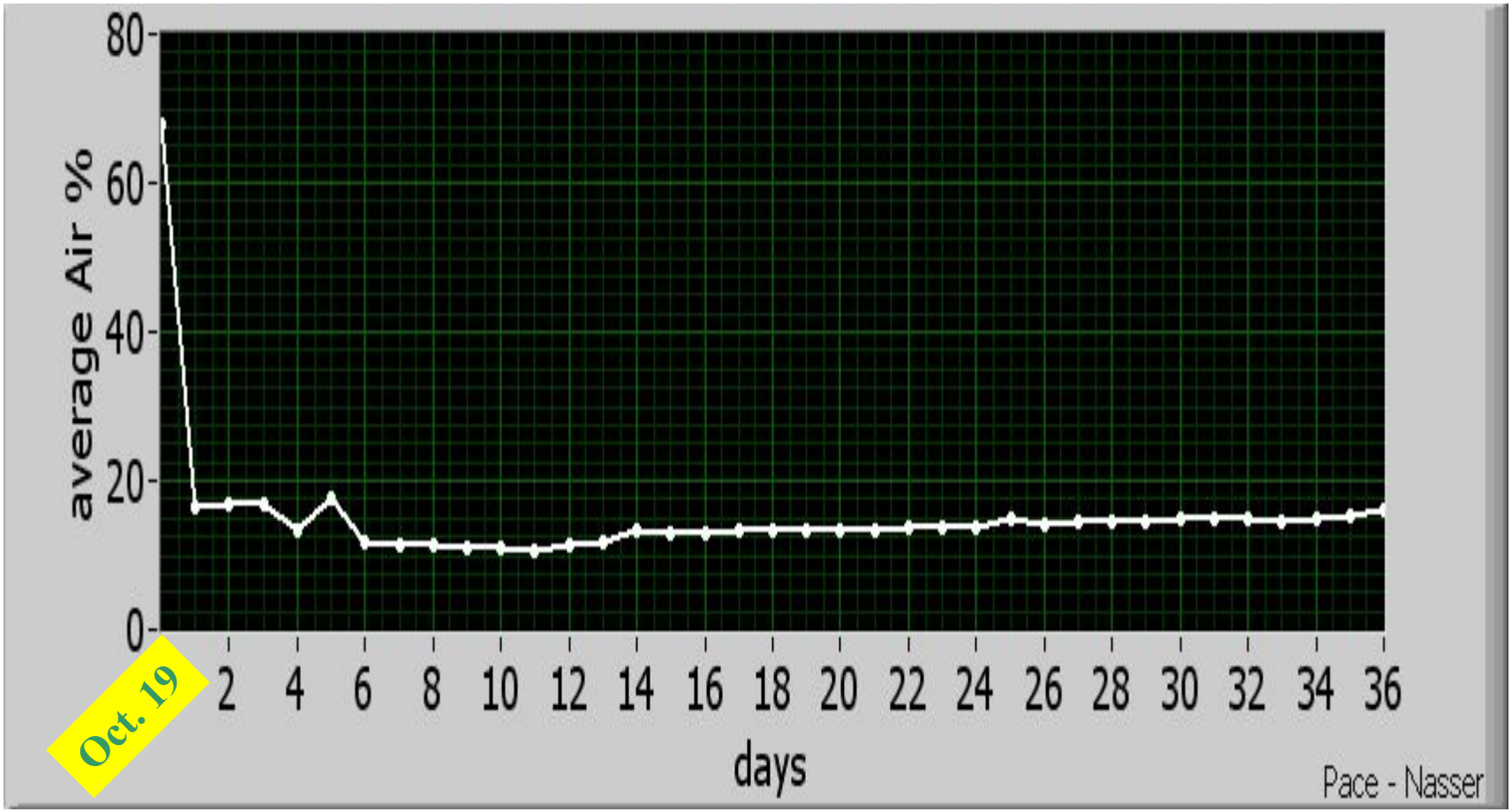
2006: situation on the floor, now



FINUDA situation in 2004



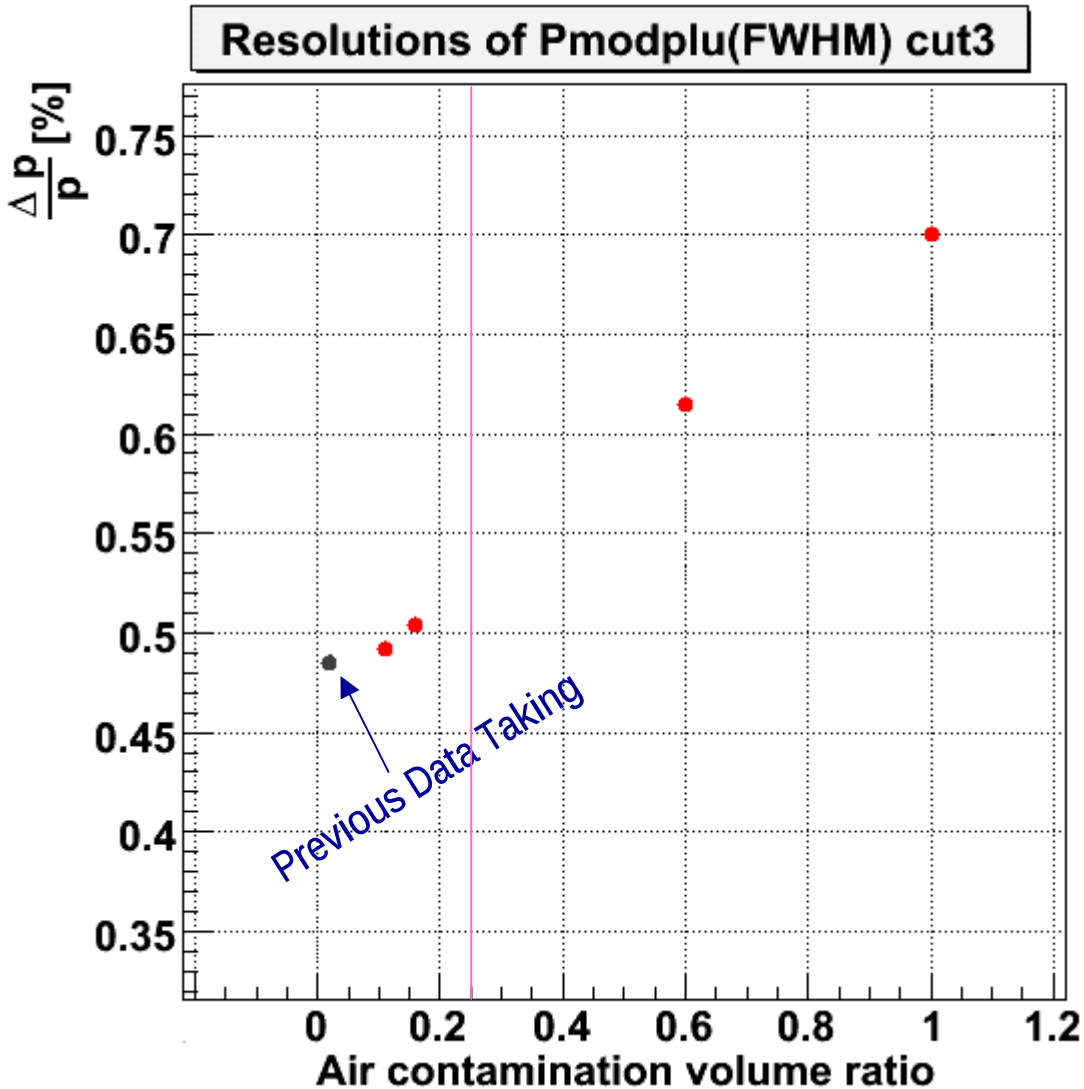
He Chamber, Air contamination



He flux used: 2000 l/hour (previous data taking 1500 l/h)

Possibility to safely increase He flux to 3600 l/hour
(He Chamber volume: 3600 l)

Resolution (for 270 MeV/c π^-) versus Air contamination



Tolerable Level : up to ≈ 25% of Air

CONCLUDING REMARKS

- Detectors: in good shape, running without relevant problems

- DAQ stable and reliable with dead time less than 10%.

-Debugging of FINUDA ended November 19. From November 20, physical data BEGUN
Calibrations will improve data quality as collected statistics increases

-Already good luminosity provided by DAΦNE. Further tuning still needed to reduce background

-He chamber filling under continuous check. Until now within acceptable values
Possibility to increase the He flux (actually 0.6 l/s) up to 1 l/s if situation getting worse.

-Due to the inconvenient with the He chamber and the longer time needed to repair it,
no significant statistics with cosmic rays and B = 0 could be collected before DAΦNE start
for the purpose of fine geometrical alignment of tracking detectors.
We are considering to use the Christmas-End of the Year LNF shut down period to partially recover this item