

D0 Luminosity Monitor - detector status -

2007. 8.1 Yuji Enari

Topic

- Update on VME halo measurement
 - Veto for In-time hit counting.
 - Change configuration from 22nd Mar 2007.
- Radiation damage to the scintillator

- Halo on the Acnet: NIM halo.
 - No change from RunIIa.
- Why VME halo is important?
 - Due to single hit TDC
 - No intime hit with Nearly = 24 hits
→ Source of inefficiency
- To avoid it, we are applying VETO.

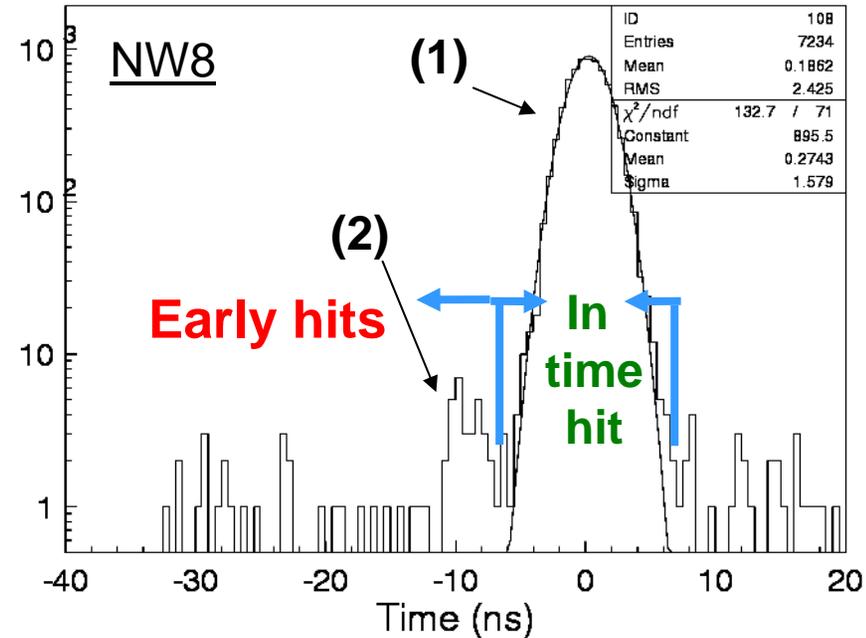
• Veto condition:

Better to apply low as possible

- To keep large acceptance.
- Higher cut makes inefficiency to low multiplicity event

The rate should not be too high.

- Prefer small correction.

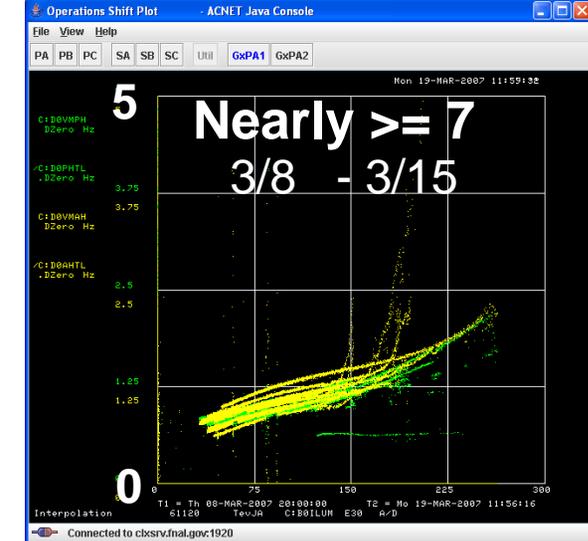
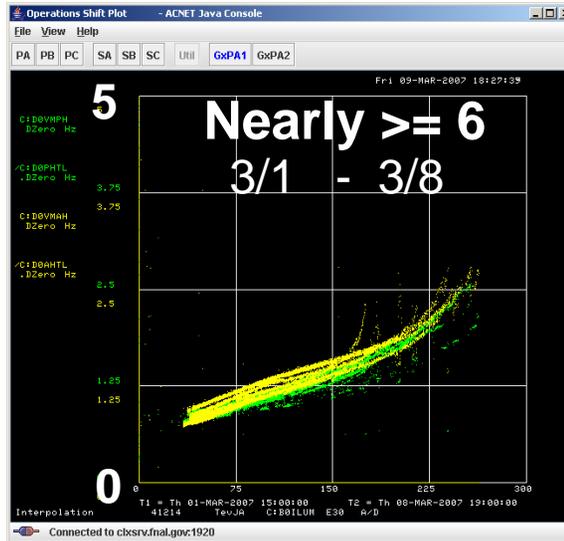
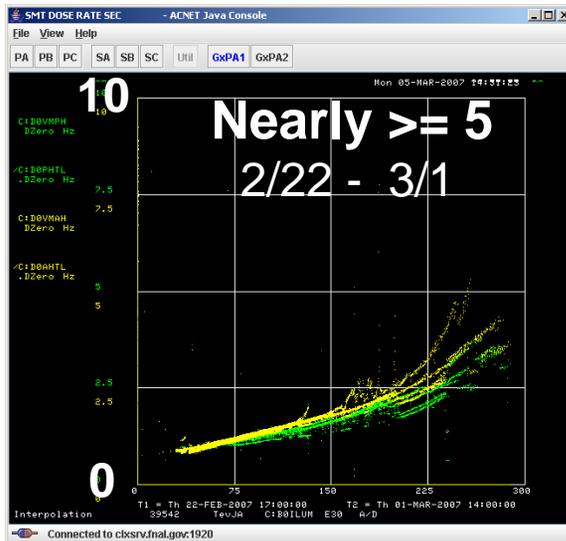
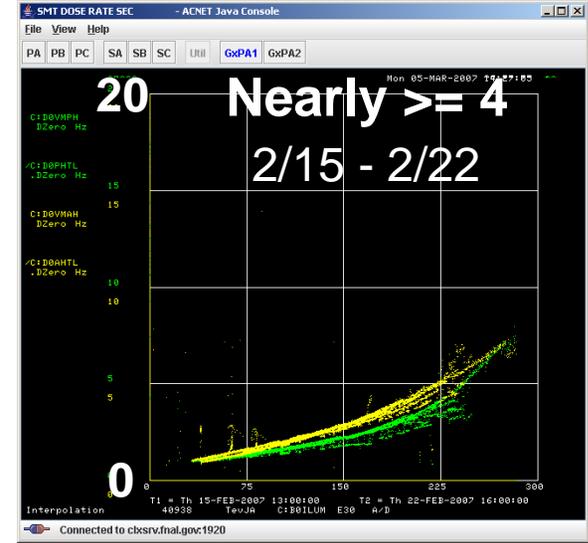
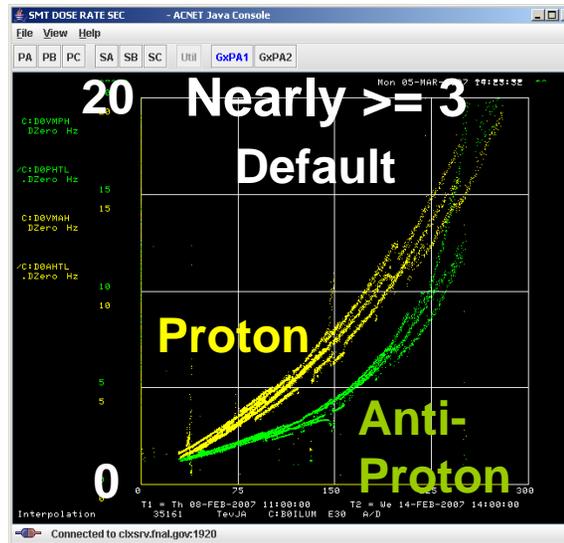


Previous VME halo event definition.

$$\left. \begin{array}{l} N(p\text{-halo}) \geq 3 \\ N(a\text{-halo}) \geq 3 \end{array} \right\} \text{OR}$$

Rates at 230e30:
 p-halo = 57.6kHz (7.6kHz in NIM),
 ap-halo = 11kHz (2 kHz in NIM).

- Lumi dependence
1 point / 1 week
- Dependence of p-halo and ap-halo converge when applying higher number.
- Nearly>=6 and 7 are almost same.
- **Set Nearly>=6 as new default setting**
VME/NIM = 1~2

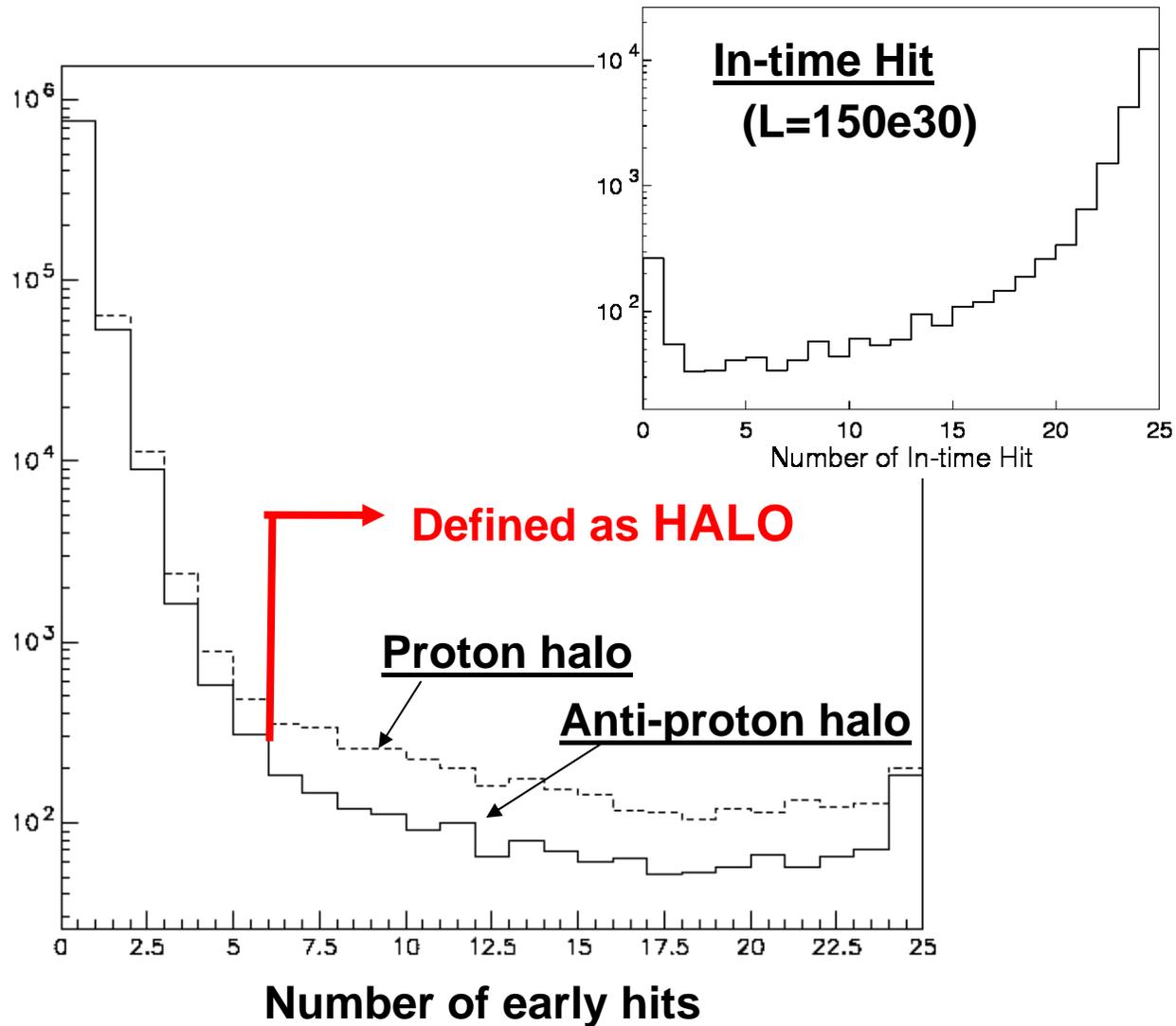


New setting is Nearly ≥ 6



New setting has been applied since 22nd March 2007

Effect on Luminosity measurement: $< 0.2\%$
No change in HALO rates on ACNET





Taken @ just after RunIIa

Study @ Last shutdown

Old counters have 74-79%
light yield of new counters
at small radius.

Consistent with expected
value of ~75% from
transparency
measurements.

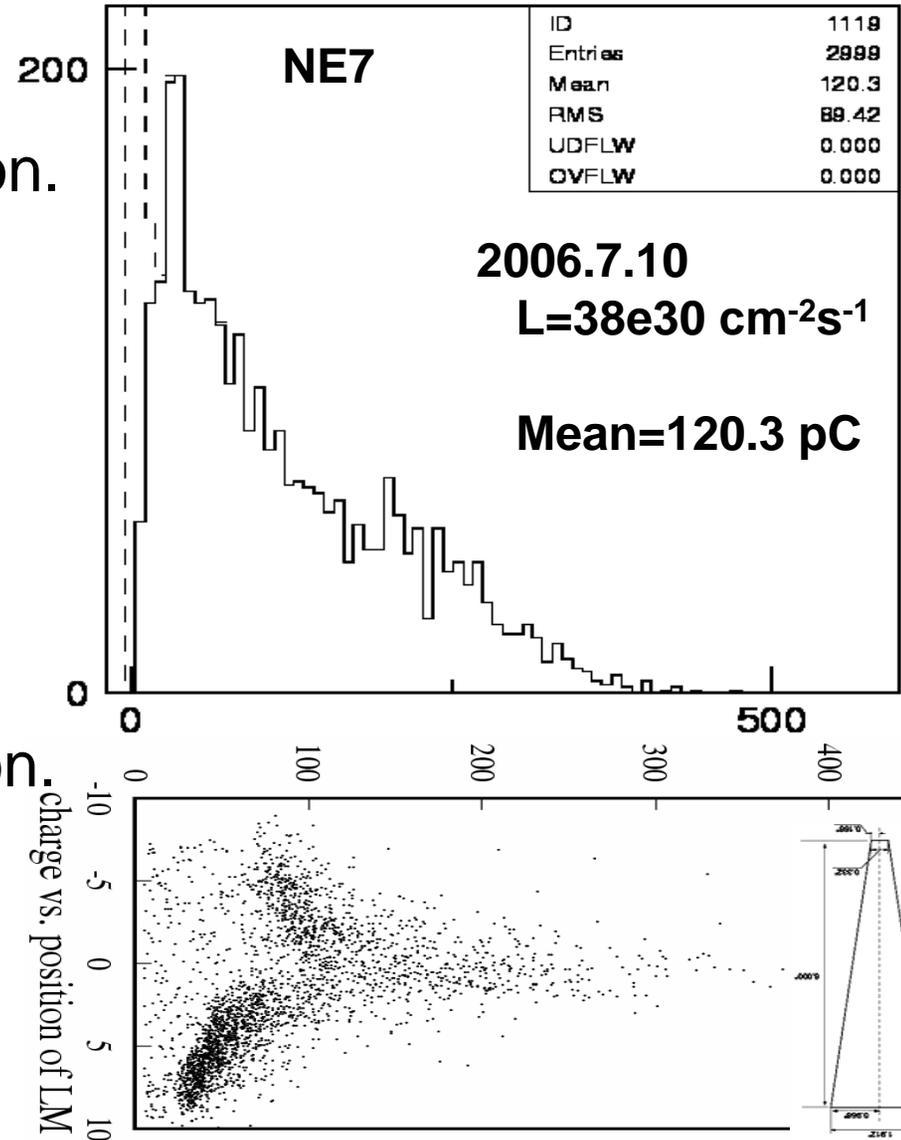
It is obviously getting yellow.

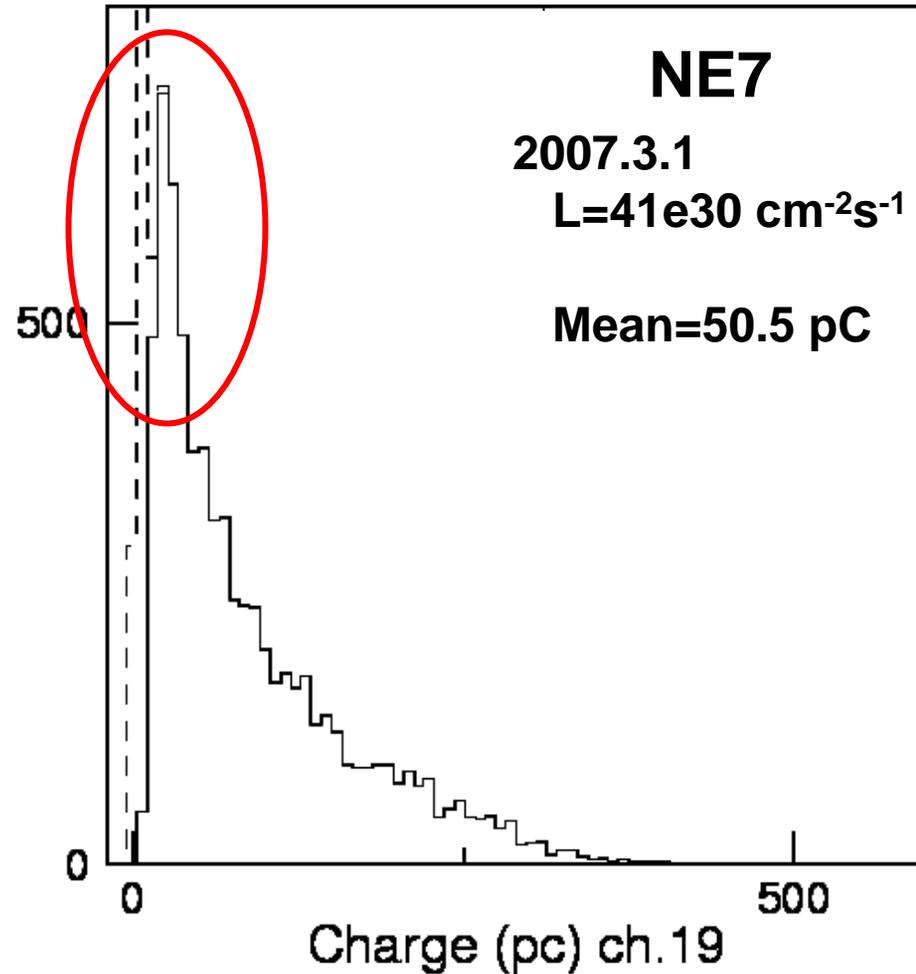
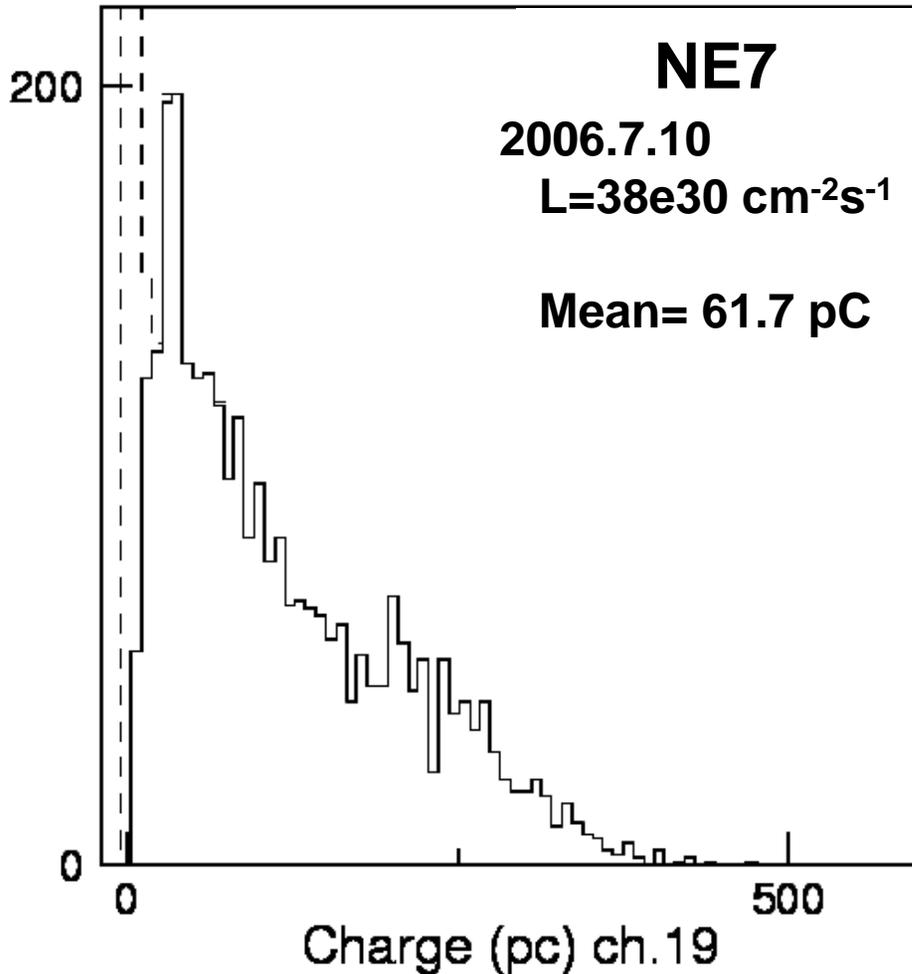
RunIIb: Delivered integrated luminosity is 1.2 fb⁻¹.

Can we observe Radiation damage effect?

Note:

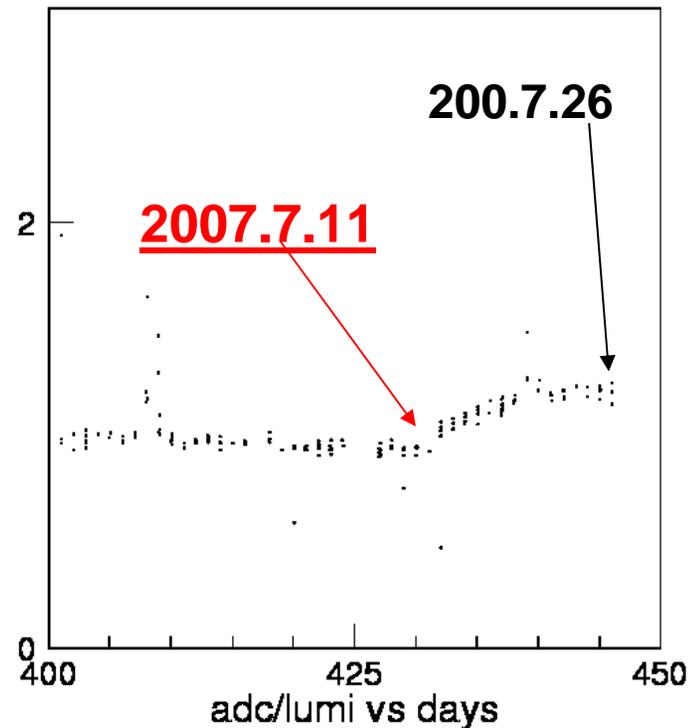
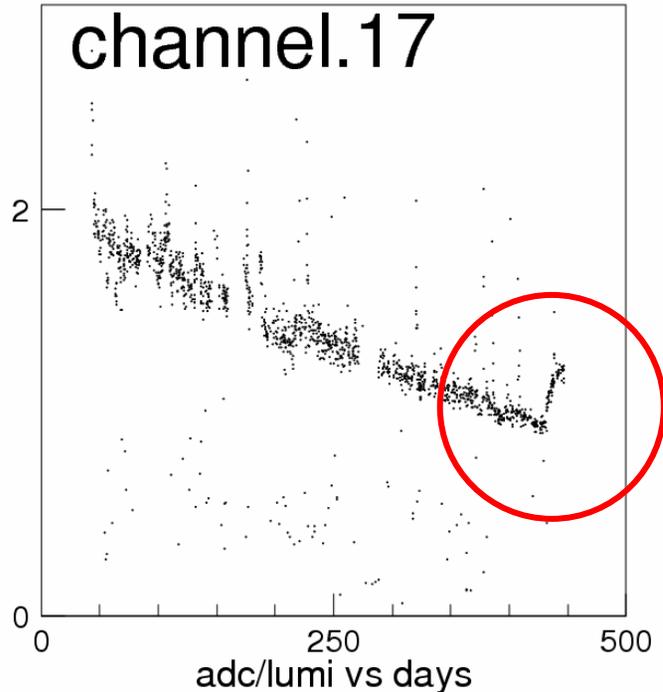
- Charge is function of hit position.
 - Higher tail: under PMT.
 - Middle: Inner (narrow) part
 - Lower tail: outer (wider) part
 - Dot hist: without TDC hit
 - Solid hist: with TDC hit
- Clear noise/signal separation.



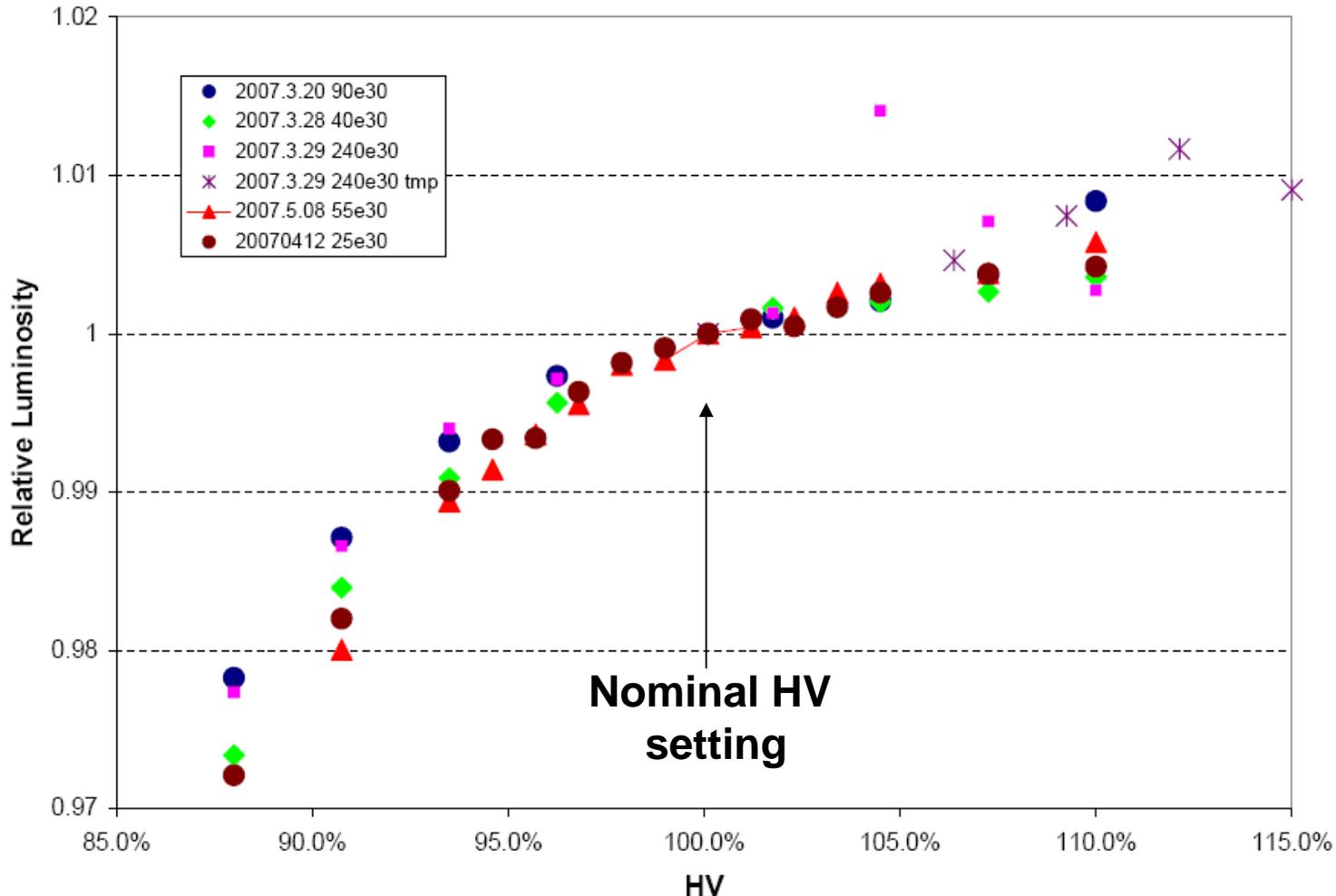


- ADC mean: 61.7 pc \rightarrow 50.5pc : 81% @ 2007.3.1
- We can see pedestal / signal separation.

- ADC mean / Luminosity = constant in case no damage.
 - Light yield gets loss due to radiation damage: 40-50%
- Annealing effect
 - From 11th July, 13:00, the purge for LM has been replaced with dry air from Nitrogen.
 - Clearly see annealing effect of the oxygen.
 - Now it looks saturated.



- HV scan vs Luminosity change.
 - PMT gain changes $\sim 40\%$ due to 5% HV changes.
 - We expect $\sim 1\%$ effect due to radiation damage.



Status

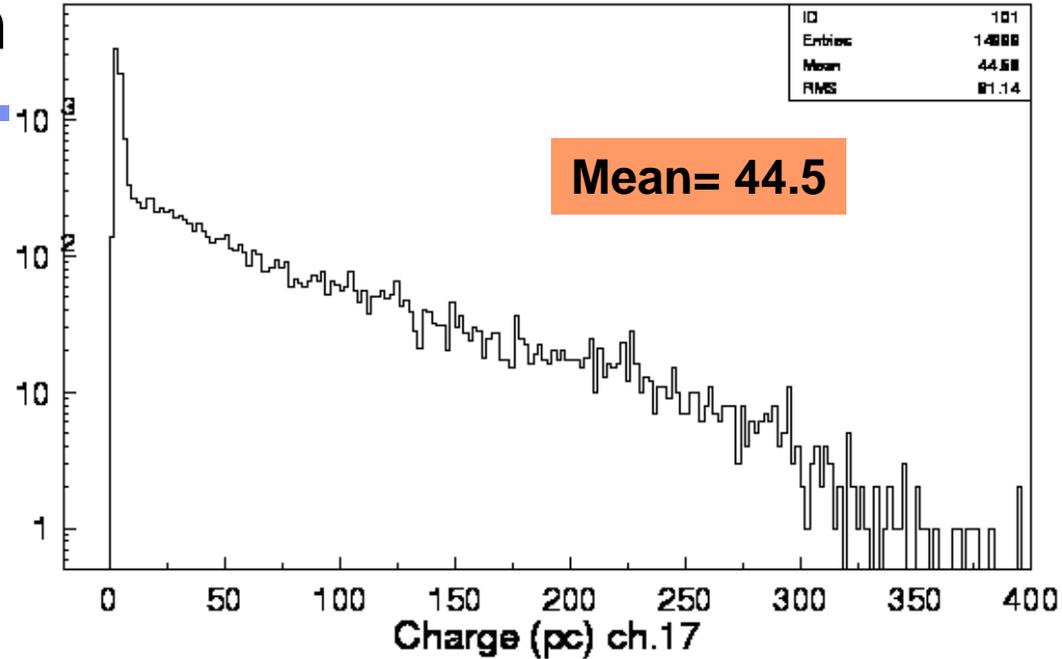
- Very stable operation during RunIIb
- VME intime hit veto condition has been changed from Nearly ≥ 3 to Nearly ≥ 6 since 2007.3.22.
 - **Less than 0.2% effect** on Luminosity
 - No changes in Halo rates on the ACNET.
- Radiation damage to the scintillator
 - **Light yield reduce by 40~50%** due to radiation damage.
 - **Expect ~ 1% effect** on luminosity measurement.
 - Observed annealing effect of Oxygen which recover light yield by 10~15 % within 1 week.

Plan

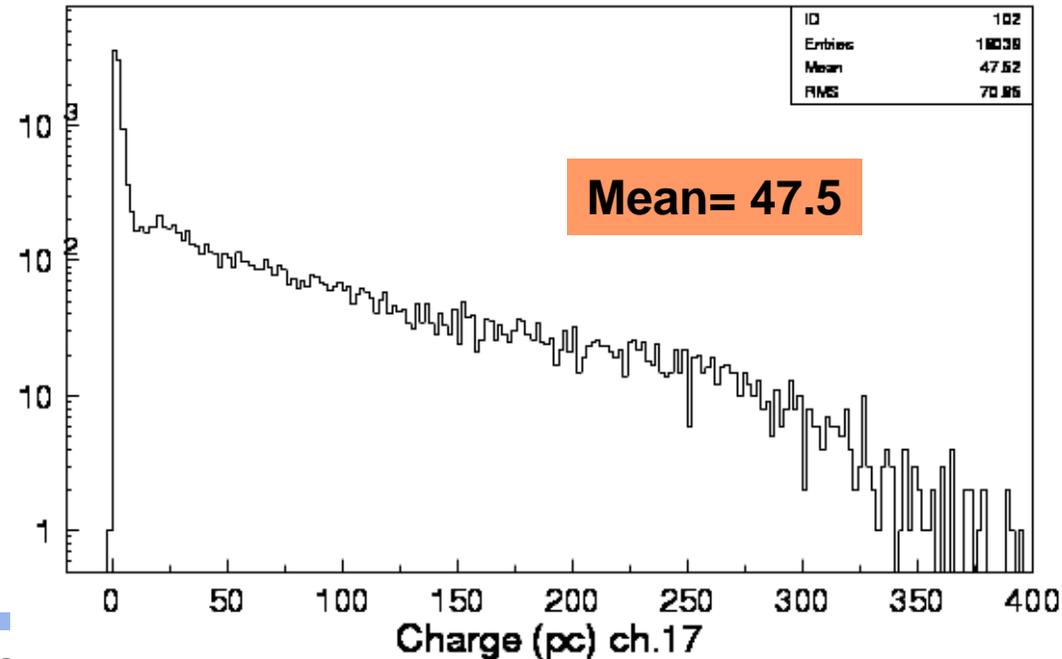
- **Replace all scintillators during shutdown.**

ADC distribution

- Run: 234194
 - Lumi=43-48e30



- run 234465
 - Lumi=40-50E30



**Recovery seems to be real.
Need to keep watching
possible further recovery.**