

## **(Preliminary) Results Cosmic Tests Superlayer 15 [Aachen]**



Gas: *Ar CO<sub>2</sub>* (15%)

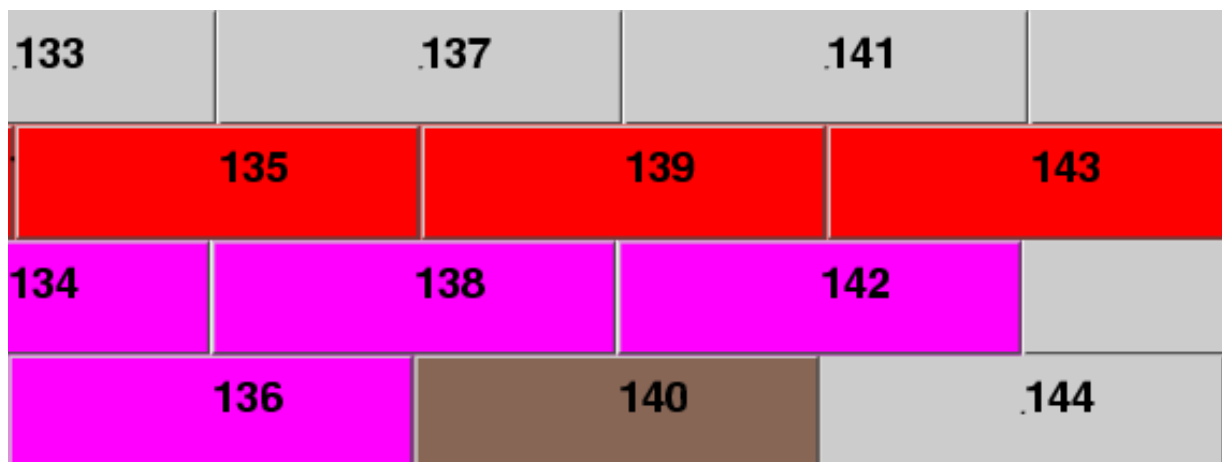
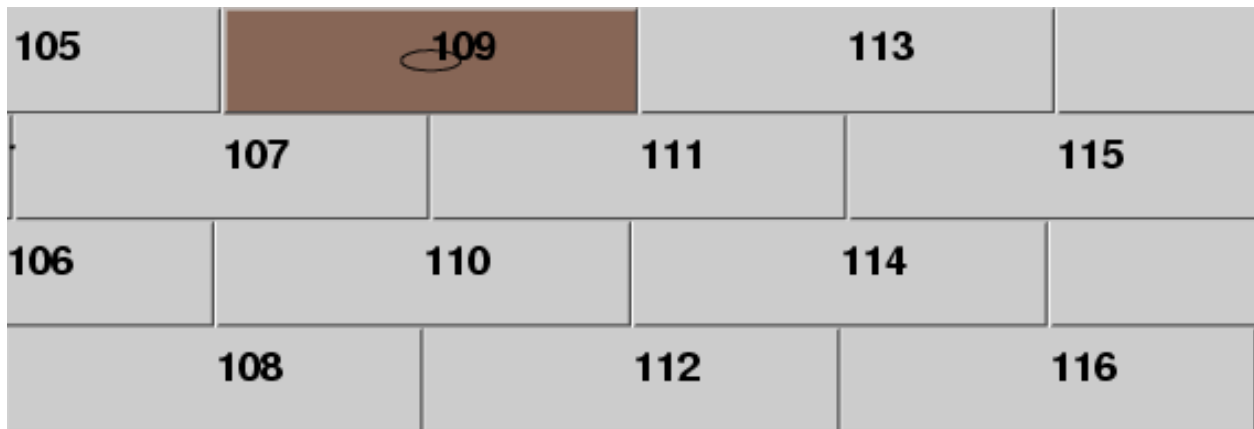
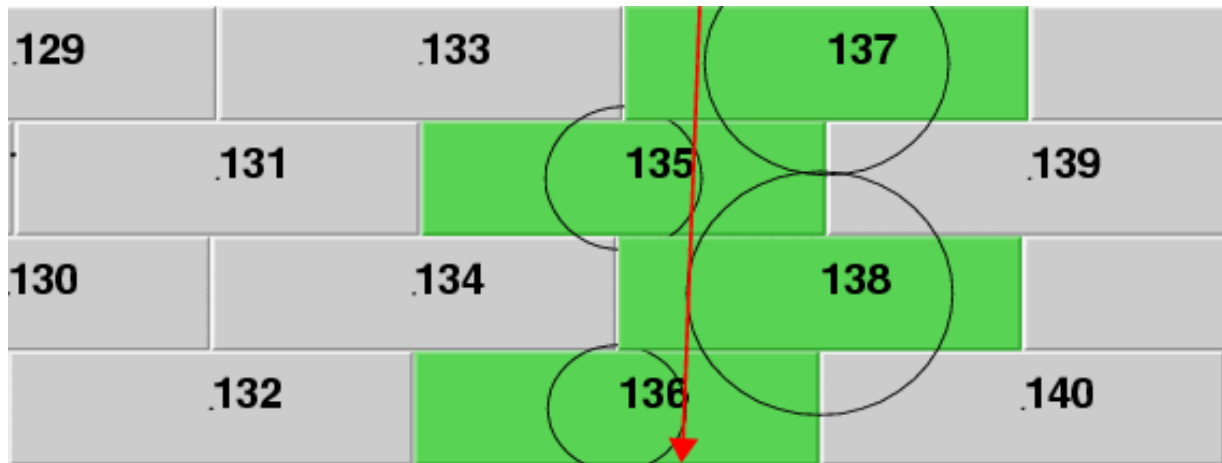
HV: 3600/1800/ – 1200 V (pressure  $\approx$  993 hPa)

Threshold:  $\approx$  15 mV

Trigger: scintillators top and bottom

TDC: Le Croy 2277 (in March only 16 channels at a time)

# Examples



# dead cells

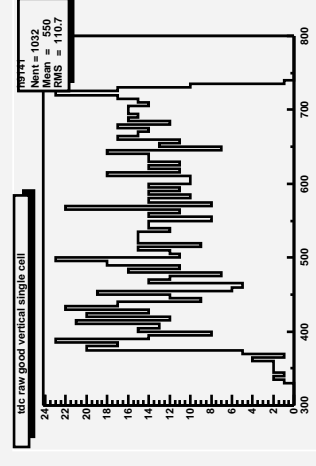
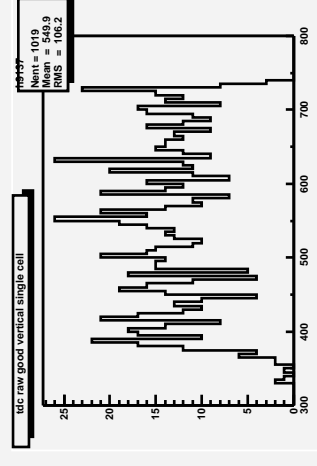
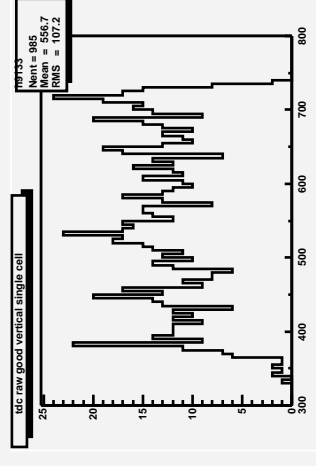
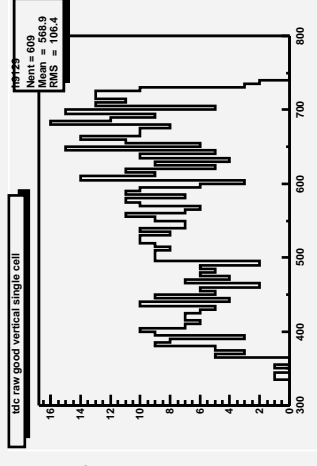
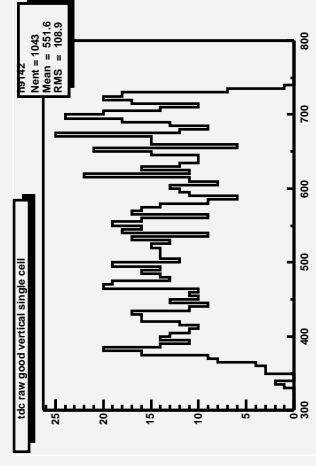
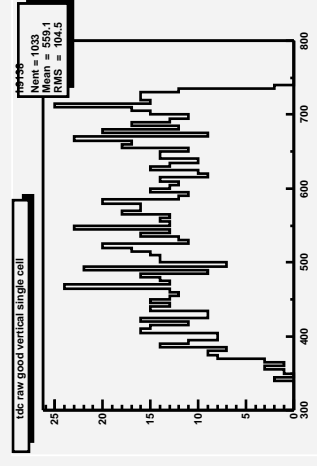
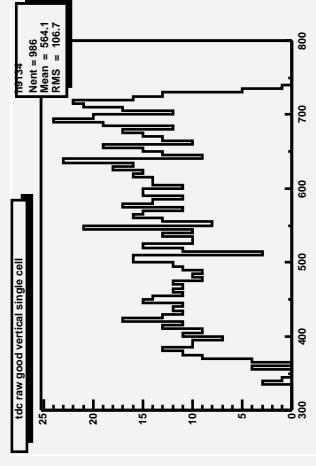
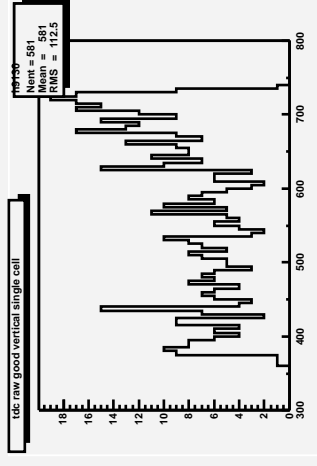
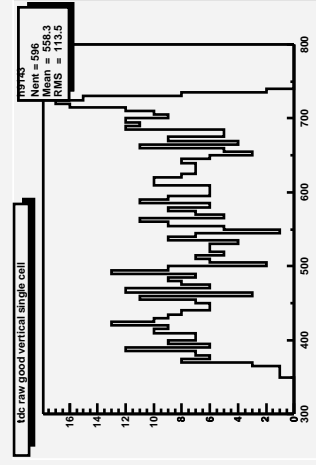
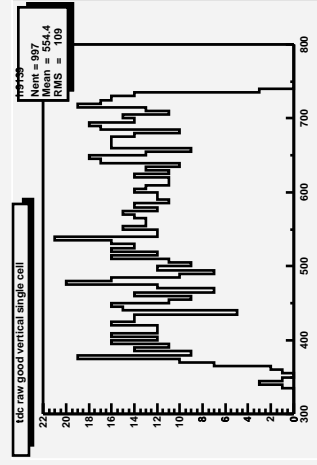
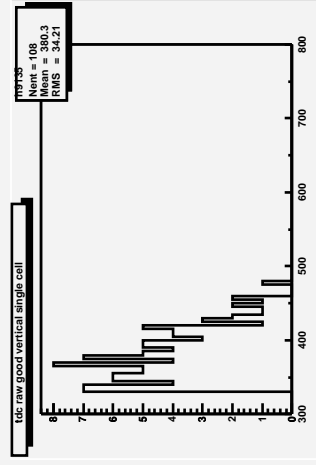
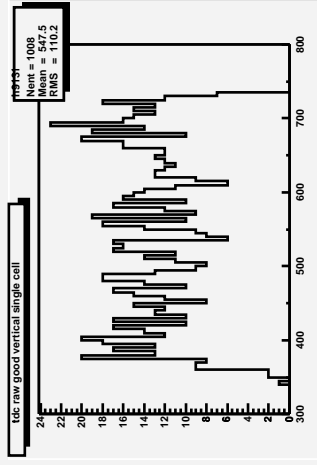
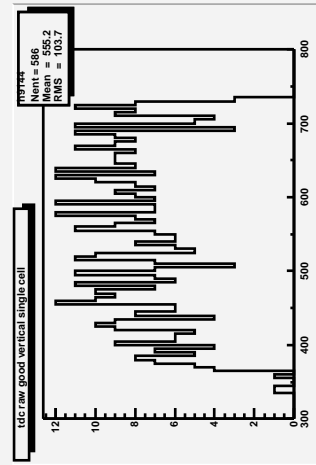
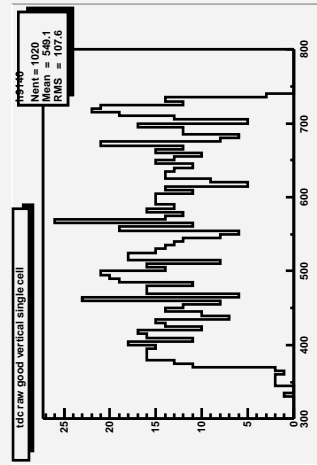
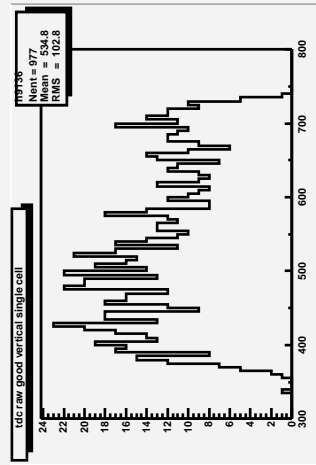
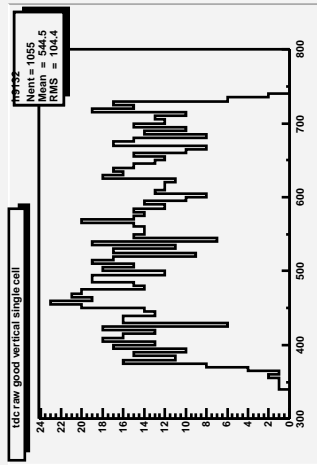
= cells with  $< 50\%$  of expected number of hits  
(in drifttime window)

excluded from all analyses

Superlayer 15:

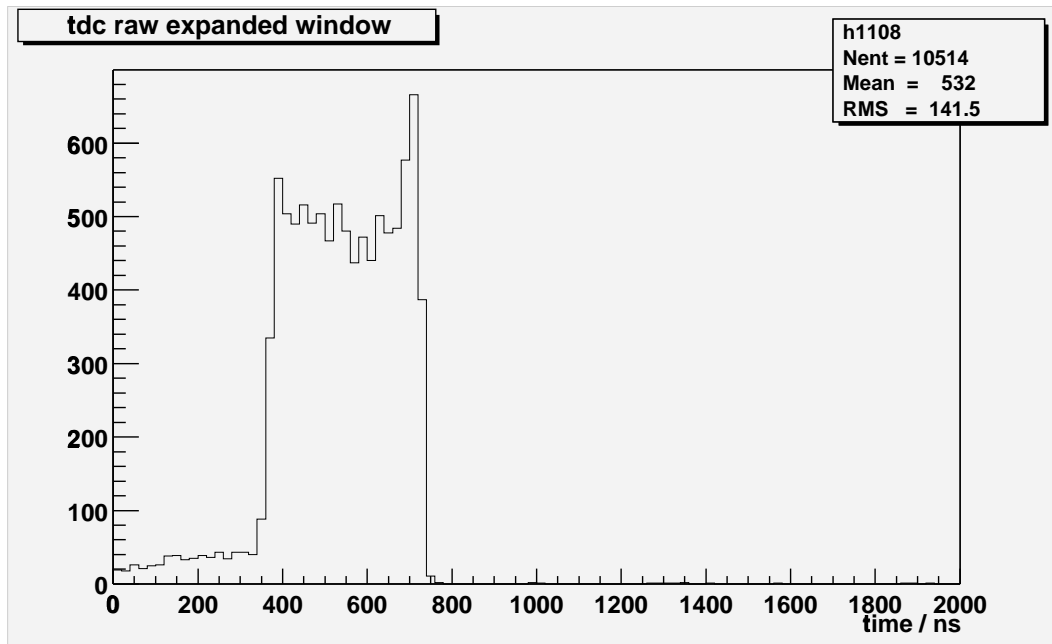
5 dead cells

all problems on FEB side, to be fixed



# hit classification

$$time = t_{common\ stop} - T_{TDC\ hit}$$



- NOISE hit  
*uncorrelated with cosmic*  
time values above drift-window
- WINDOW hit  
*correlated with cosmic*  
time values inside drift-window ( $\approx 370$  ns)
- AFTERPULSE hit  
*correlated with cosmic (secondary electron emission ?)*  
following a WINDOW hit,  
time values inside or up to  $\approx 370$  ns below drift window
- GOOD hit  
*cosmic*  
WINDOW and NOT AFTERPULSE

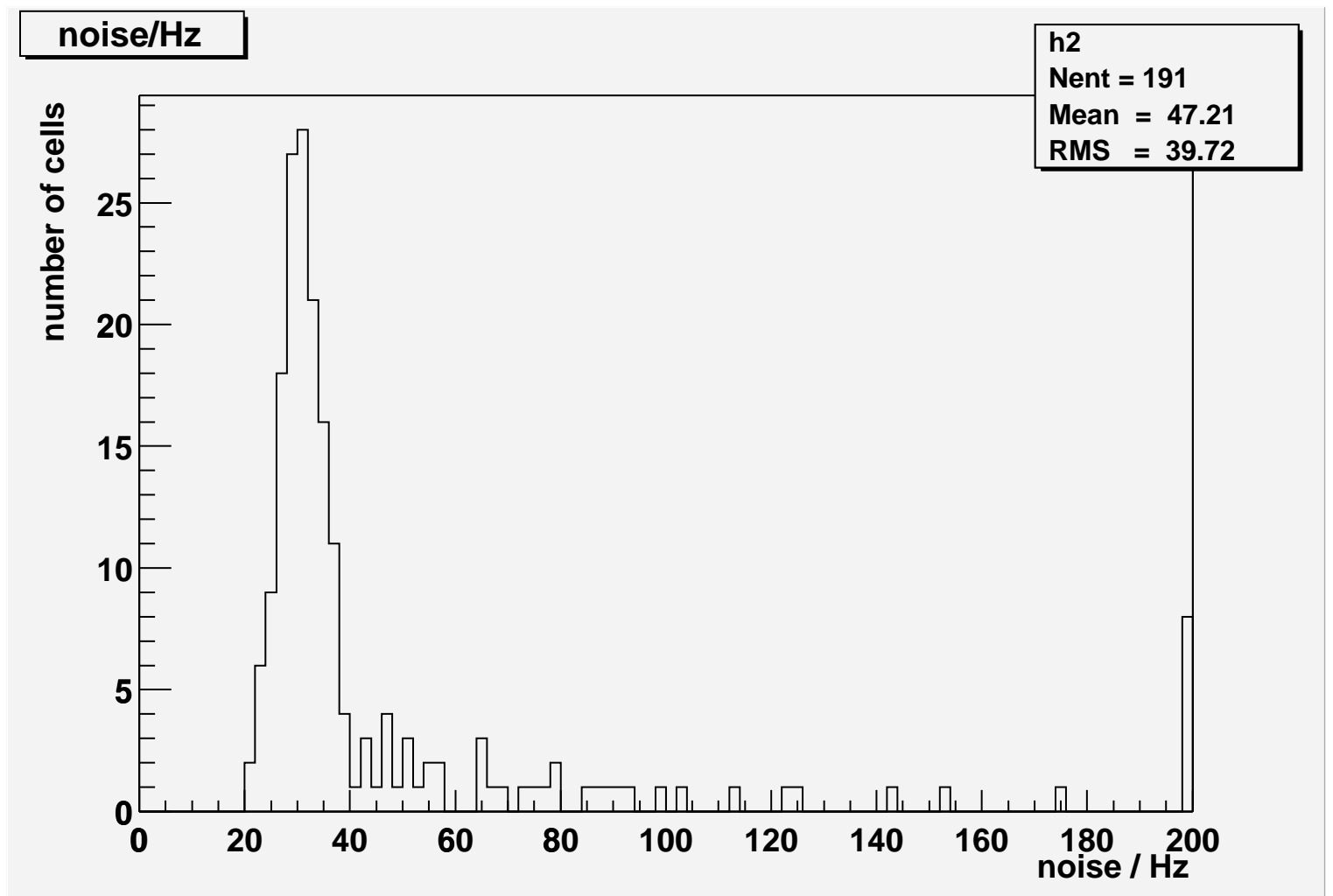
# noise rate

= number of NOISE hits / time

data = normal cosmic run (HV on)

Superlayer 15 (standard conditions):

average noise **per cell**:



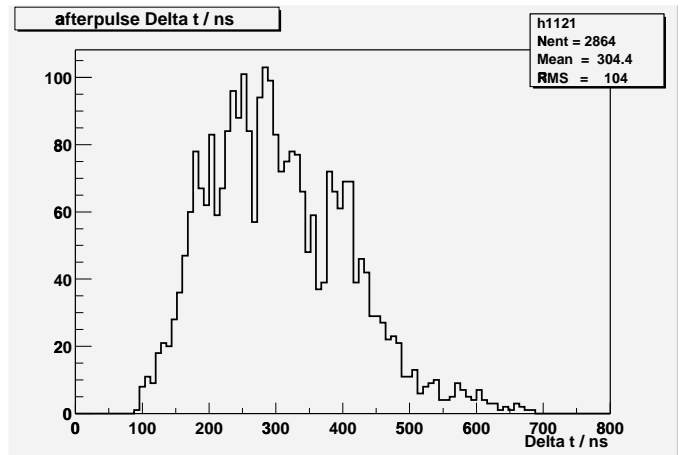
typical value = **30 Hz**

above **200 Hz**: 8 cells = 4 %

maximum value = **364 Hz**

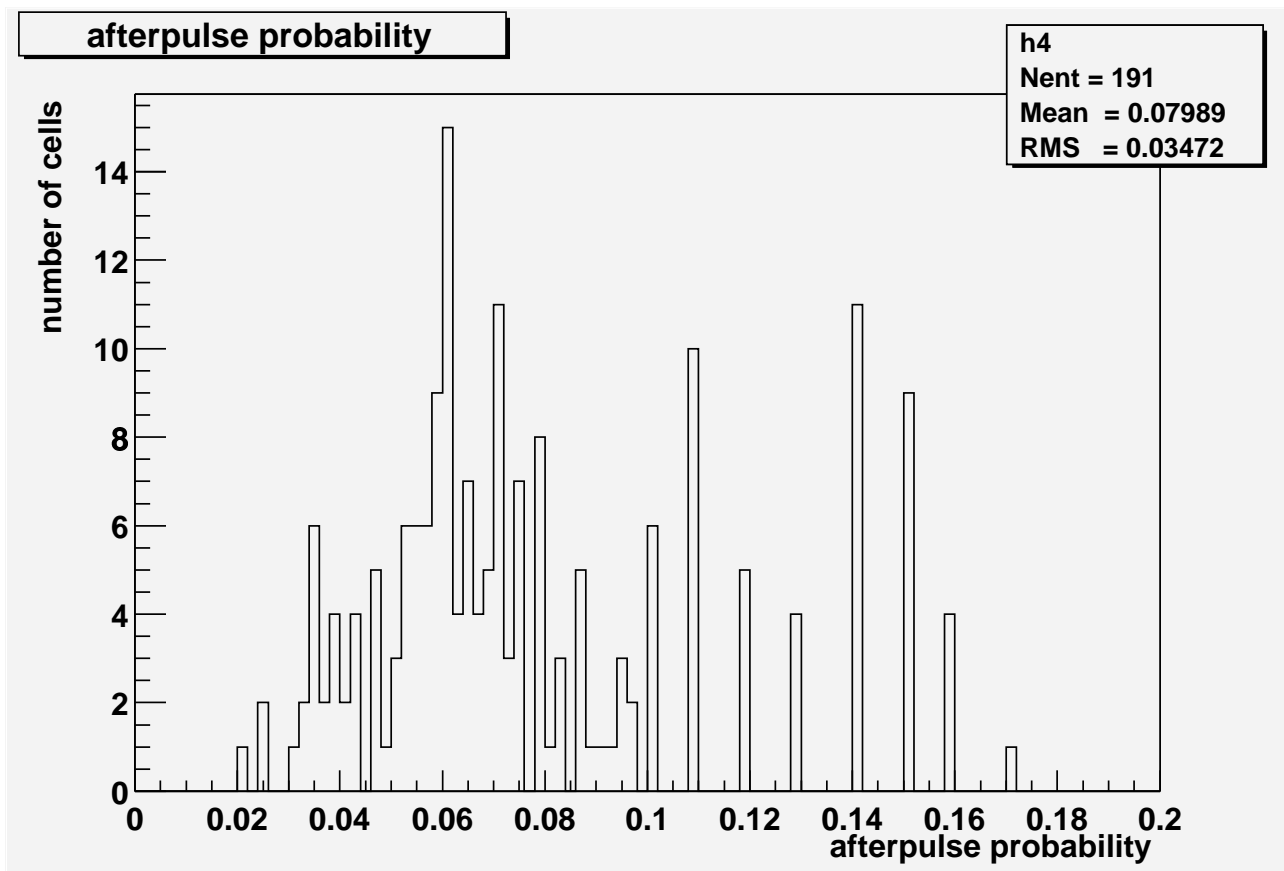
# afterpulse “probability”

= number of AFTERPULSE hits / number of WINDOW hits



Superlayer 15 (standard conditions):

average afterpulse probability **per cell**:



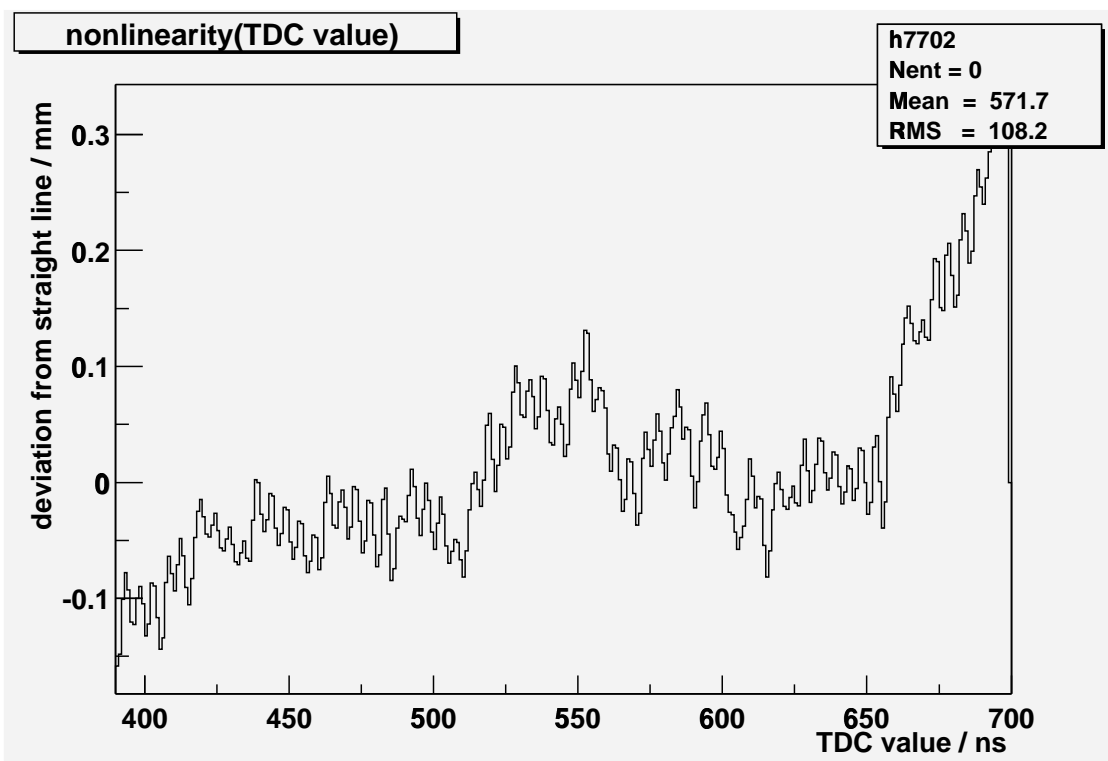
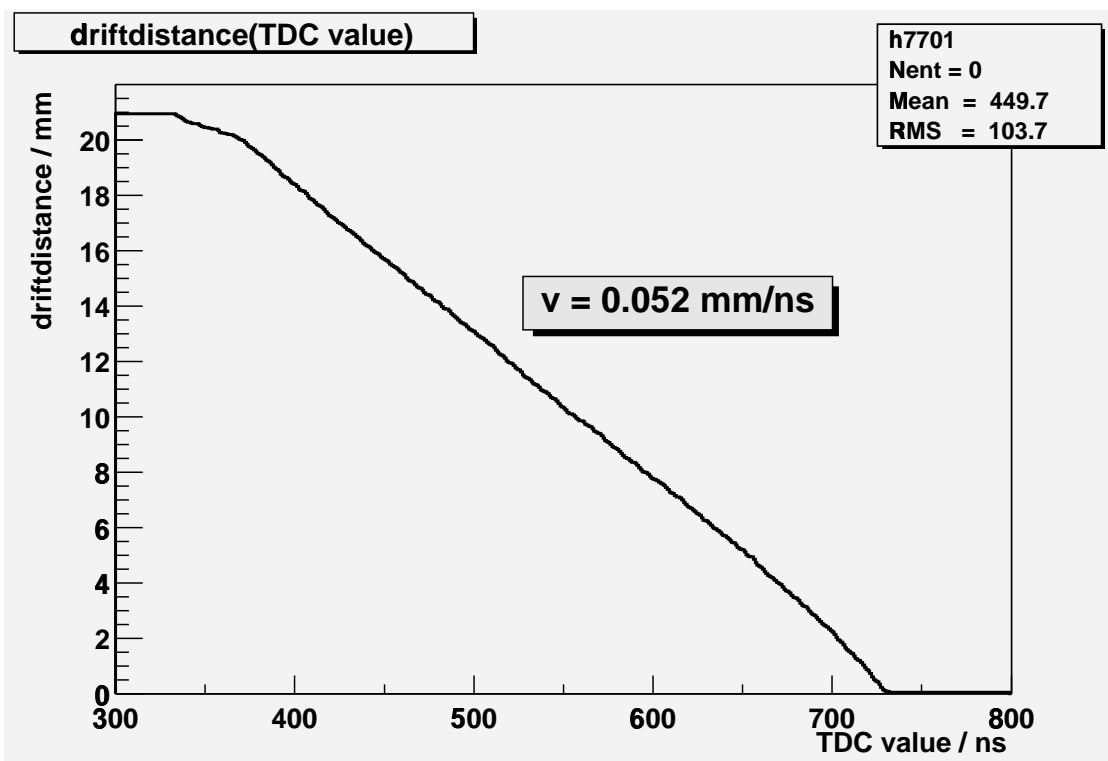
mean value = 0.08

# drifttime calibration

crude procedure:

- GOOD hits, projected zenith angle  $< 15^\circ$
- groups of 16 cells together

FEB 6:



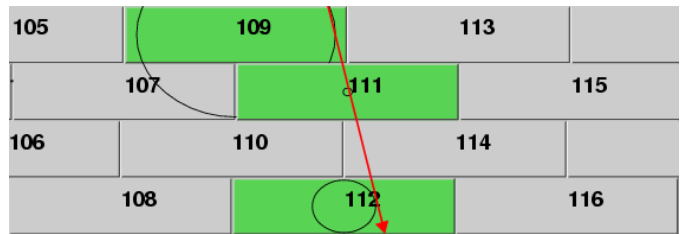


# efficiency per cell

= number GOOD hits on track / expected number of hits

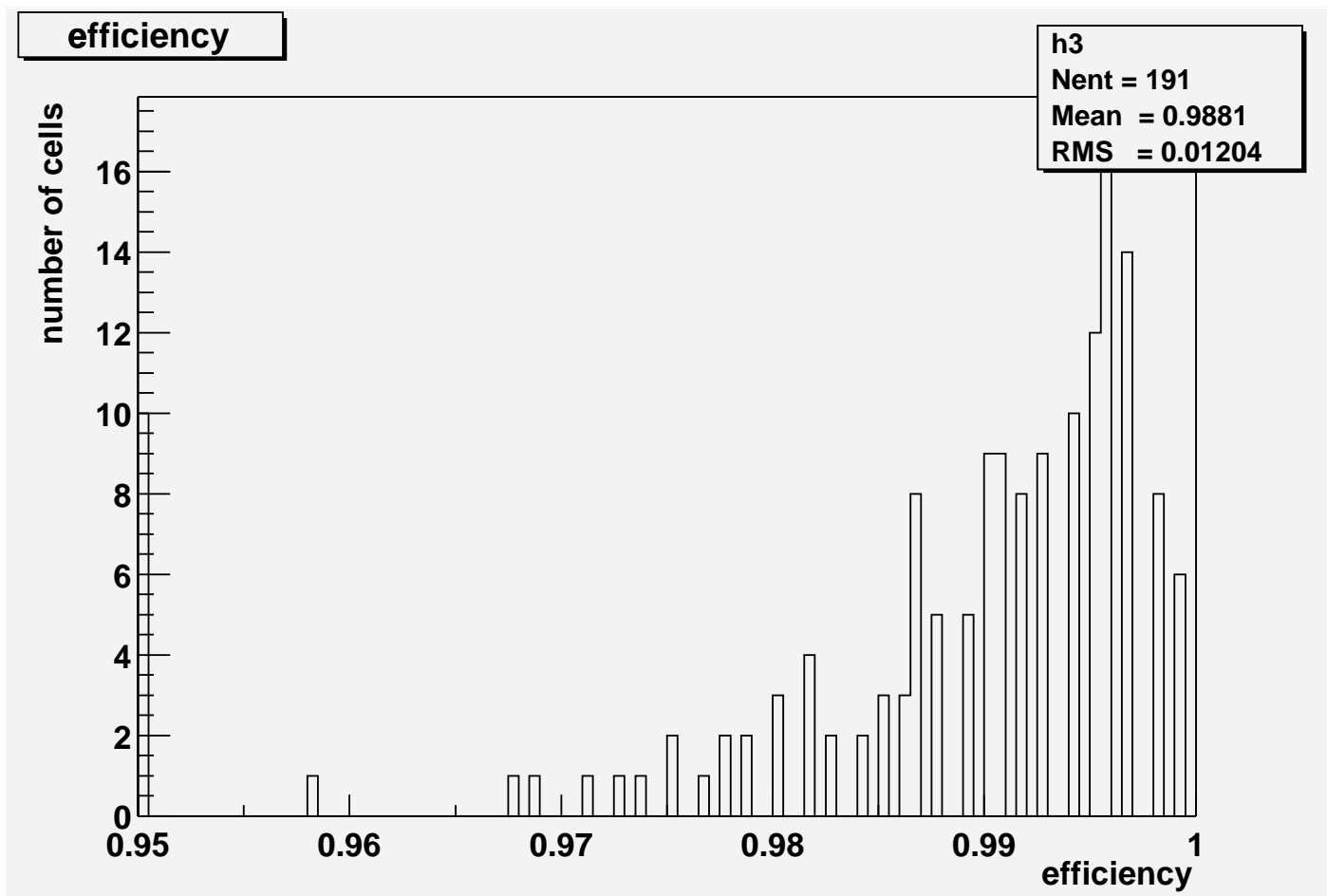
procedure:

- calibration, GOOD hits, track fit, projected zenith angle  $< 15^\circ$
- the ‘other’ three layers must have hits
- consider only cases with track-wire distance  $< 19$  mm.
- count . . .



Superlayer 15 (standard conditions):

average efficiency **per cell**:

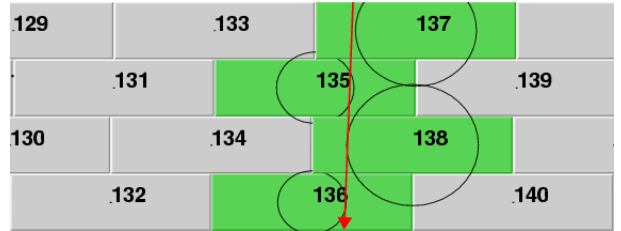


median value  $> 99\%$

# resolution per cell

$$\text{meantime} = \frac{1}{2} [\text{dist}(1) + \text{dist}(3)] + \text{dist}(2)$$

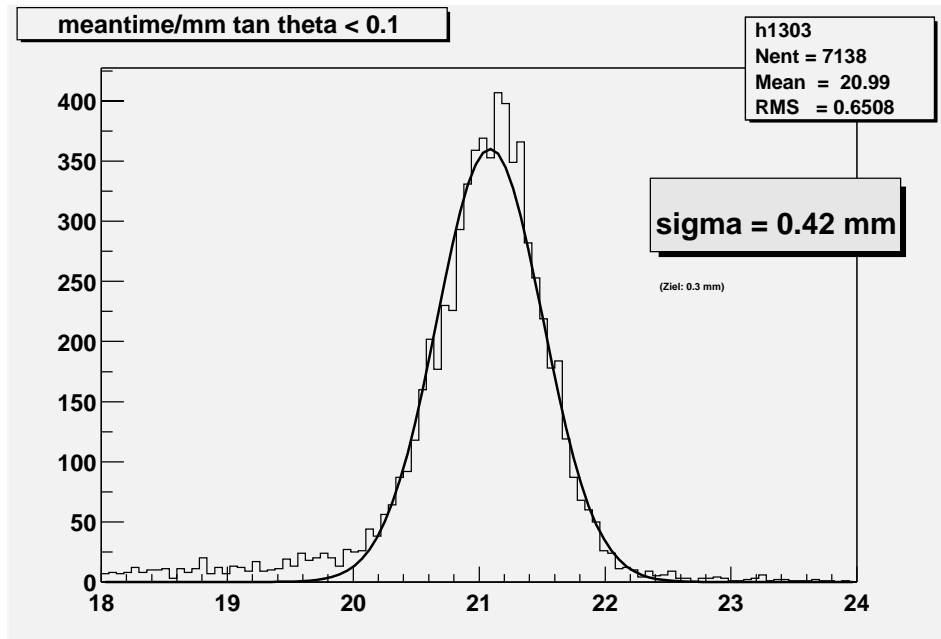
$$\sigma_{\text{wire}} = \frac{\sigma_{\text{meantime}}}{\sqrt{1.5}}$$



procedure:

- GOOD hits, track fit, projected zenith angle  $< 6^\circ$

Superlayer 15 FEB 8 (standard conditions):



correction:

for calibration/trigger timing uncertainties of  $\sigma_{\text{corr}} \sim 0.2 \text{ mm}$

$$\sigma_{\text{wire}} = \sqrt{\left(\frac{\sigma_{\text{meantime}}}{1.23}\right)^2 - \sigma_{\text{corr}}^2}$$

→ first estimate:

$$\sigma_{\text{wire}} \sim 0.28 \text{ mm} \quad (\sigma_{\text{wire}} < 0.34 \text{ mm})$$

# documentation (quality)

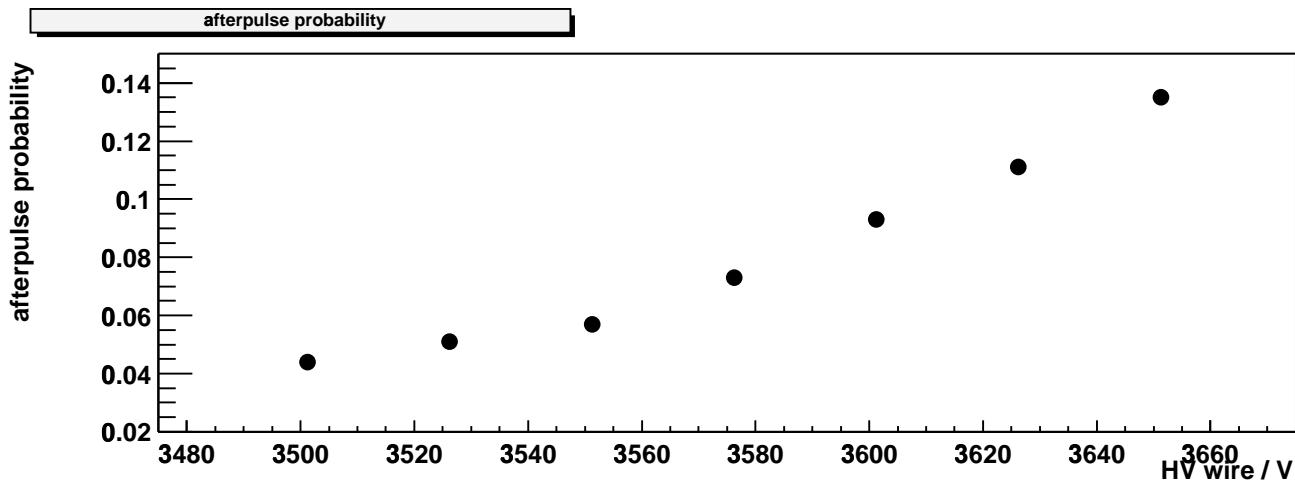
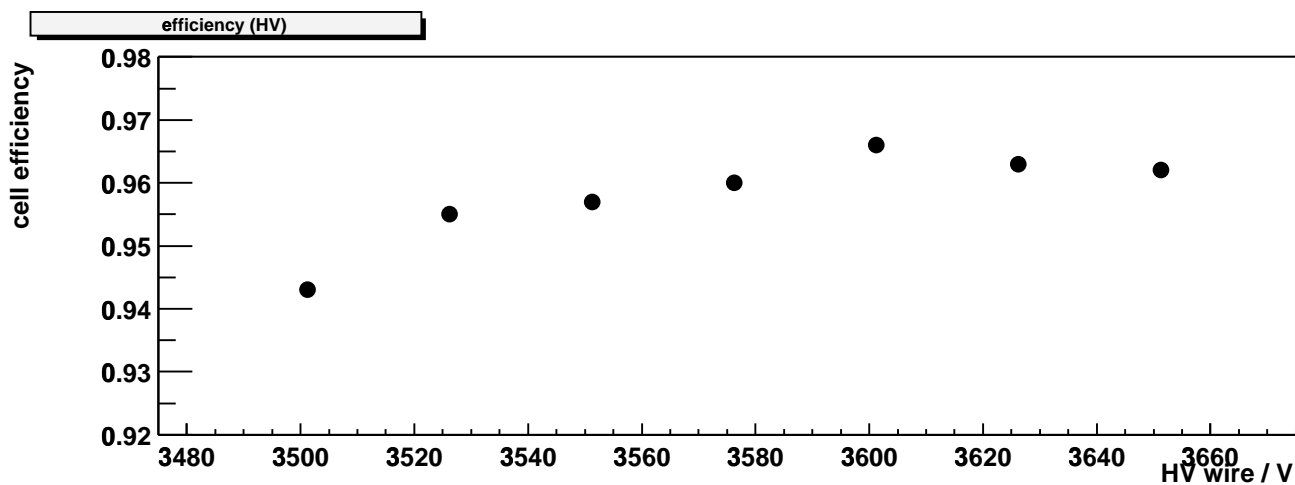
ASCII file:

cell	noise / Hz	efficiency	afterpulse prob.	meantime	...
...					
103	143 +- 5.9	0.990 +-0.0037	0.071 +-0.0058	21.1 +-0.056	...
104	36.7 +- 3	0.997 +-0.0019	0.089 +-0.0063	21.2 +-0.075	...
105	31.6 +- 2.8	0.999 +-0.0014	0.061 +-0.0053	20.9 +-0.086	...
106	86 +- 4.6	0.999 +-0.0015	0.078 +-0.006	21.0 +-0.054	...
107	277 +- 8.2	0.997 +- 0.002	0.130 +-0.0078	20.9 +-0.053	...
108	30.9 +- 2.7	0.993 +-0.0031	0.062 +-0.0054	20.9 +-0.074	...
109	30 +- 2.7	0.989 +-0.0038	0.079 +-0.0061	20.9 +-0.077	...
110	57 +- 3.7	0.995 +-0.0027	0.063 +-0.0054	20.9 +-0.059	...
...					

# HV dependence

variation of anode voltage (strip and cathode 1800 and -1200 V)

FEB 8:

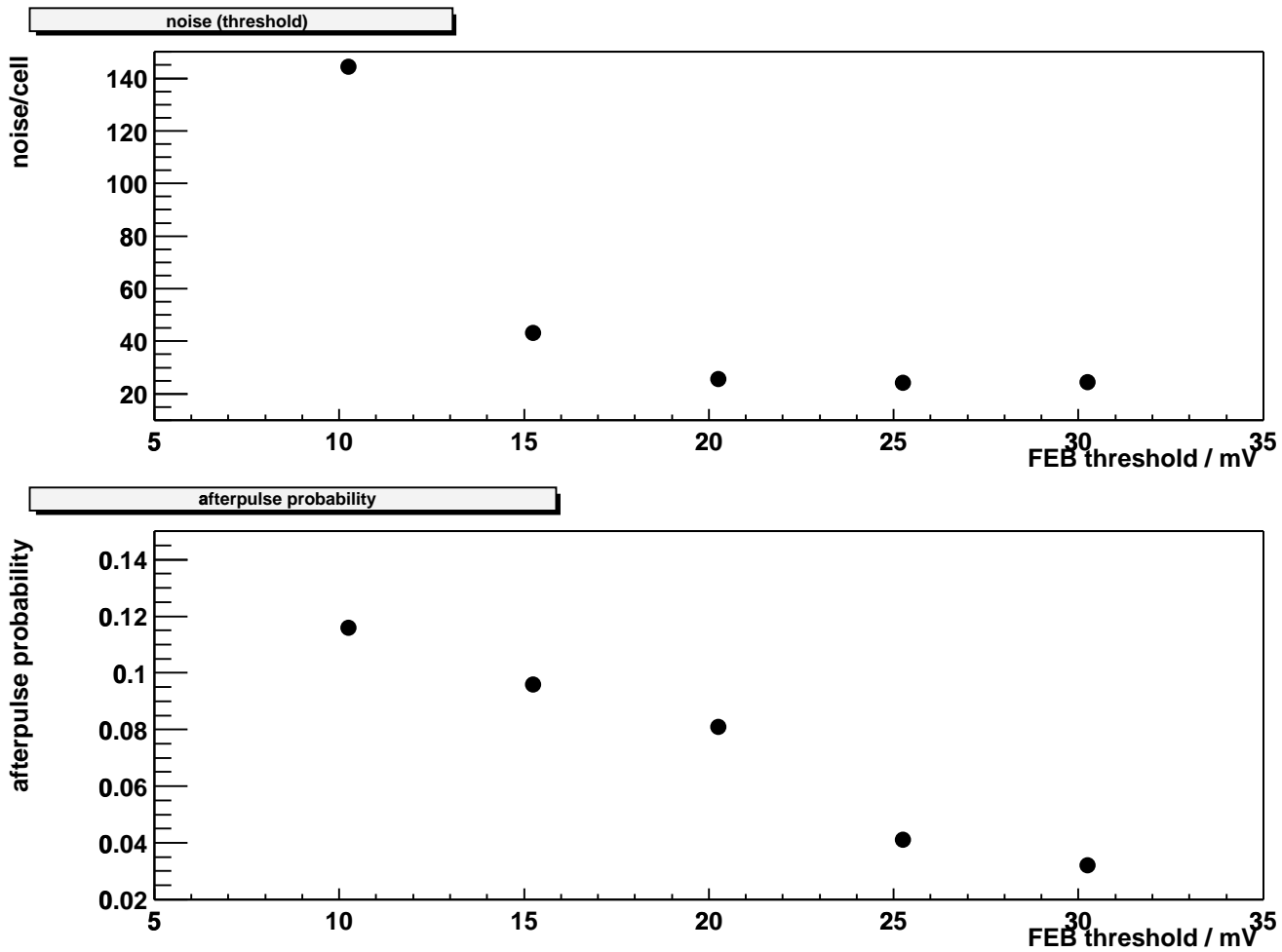


no clear correlation to noise rate

# threshold dependence

variation of FEB threshold (voltages = normal)

FEB 8:



no significant correlation to efficiency