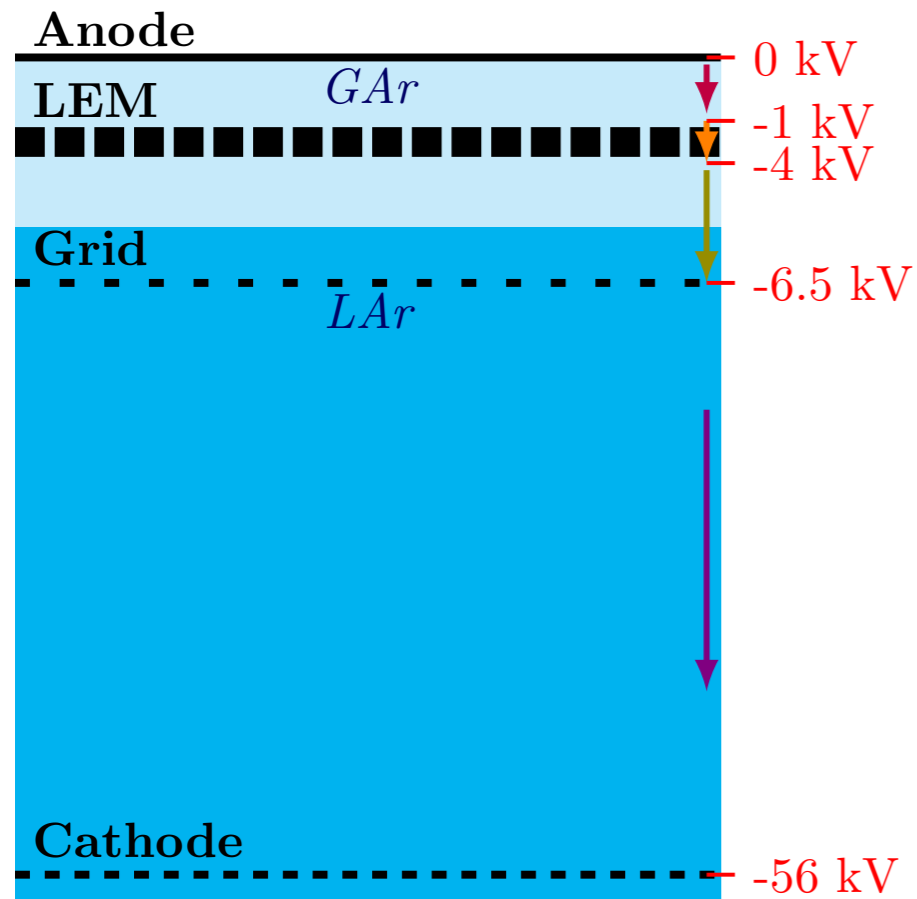


## Results obtained so far - charge analysis -

Christoph Alt (ETHZ)  
Philippe Cotte (CEA Saclay)  
Andrea Scarpelli (CNRS/APC)  
Robert Sulej (FNAL, NCBJ)  
Dorota Stefan (CERN, NCBJ)  
Laura Zambelli (CNRS / LAPP)

# Charge runs

Nominal Voltages :



**Drift Field**, nominal at 0.5 kV/cm

↳ Achieved [0.3 ~ 0.7] kV/cm

**Extraction Field**, nominal at 2 kV/cm in LAr

↳ Achieved with a maximum voltage applied of -5 kV

**Amplification Field**, nominal at 30 kV/cm

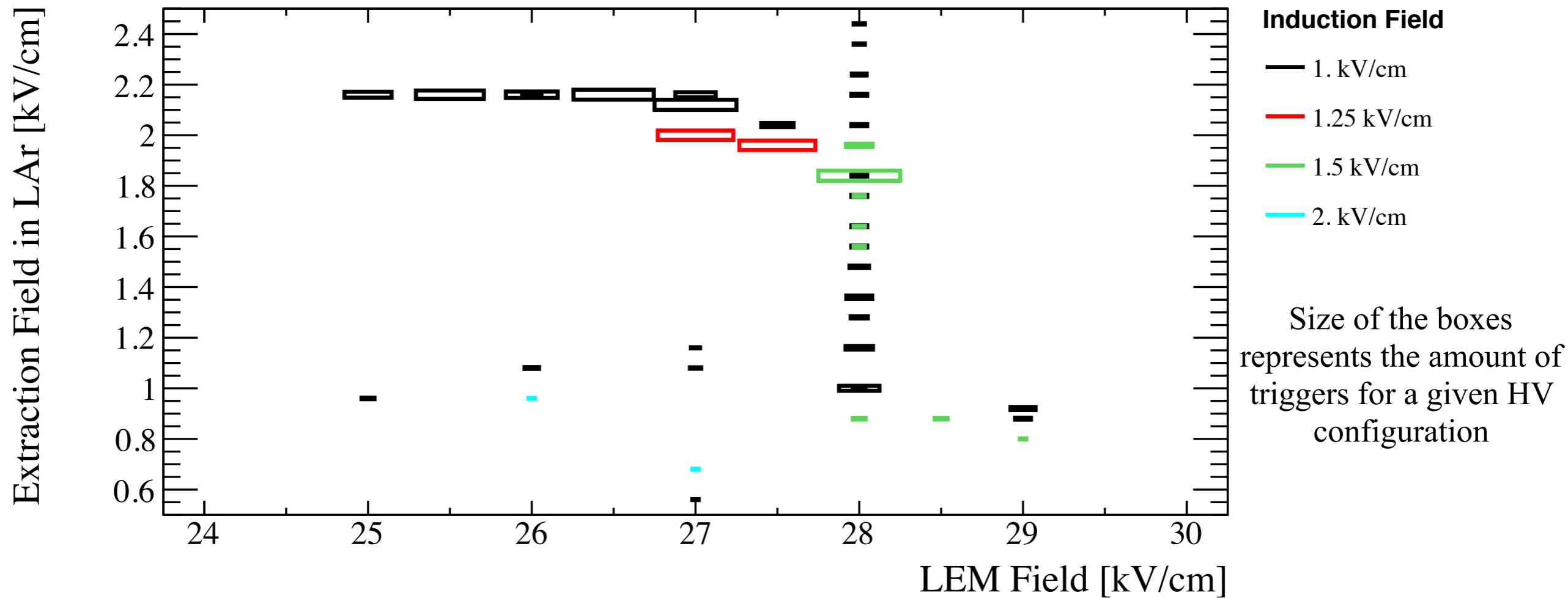
↳ Limited by the grid, maximum field achieved of 29 kV/cm

**Induction Field**, nominal at 5 kV/cm

↳ Limited by the grid, maximum field achieved of 2 kV/cm

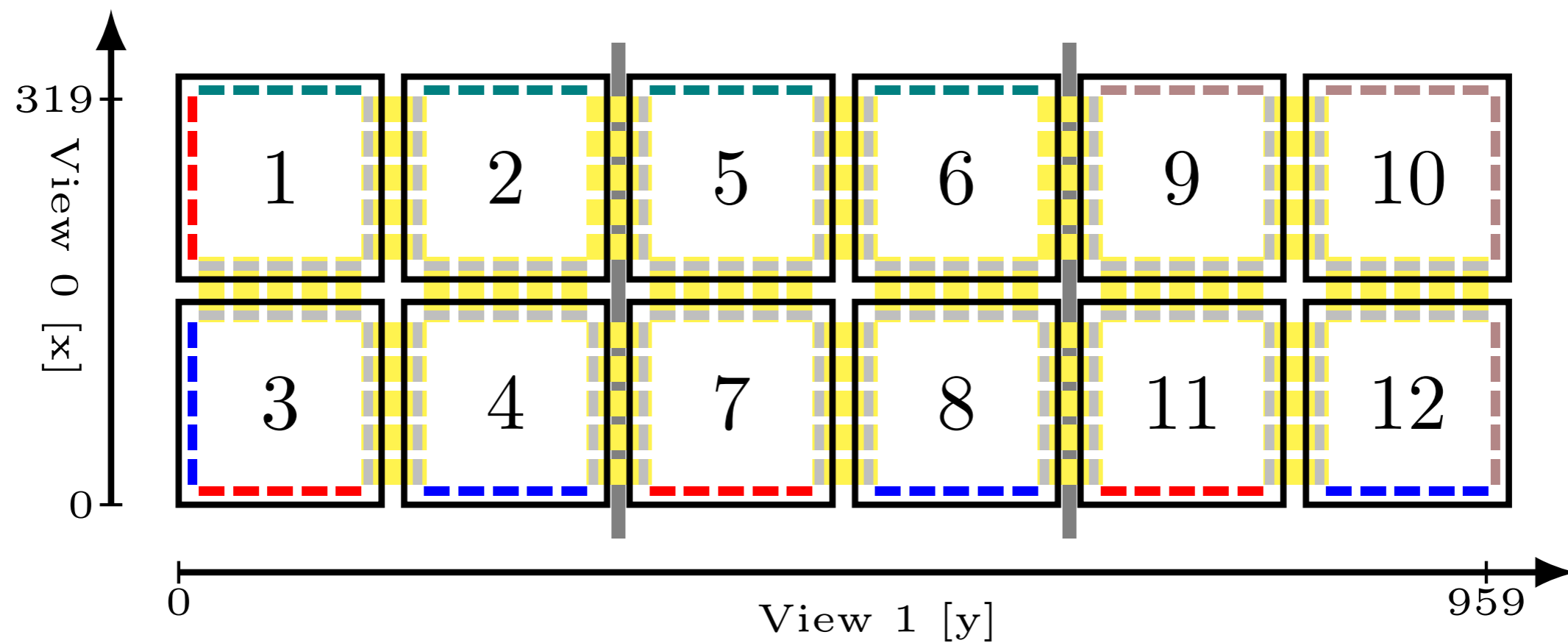
# Charge runs

→ Total of 340 000 triggers taken in more than 40 different HV configurations



Drift field and different trigger conditions are not shown on this plot

# Conventions



## View 0

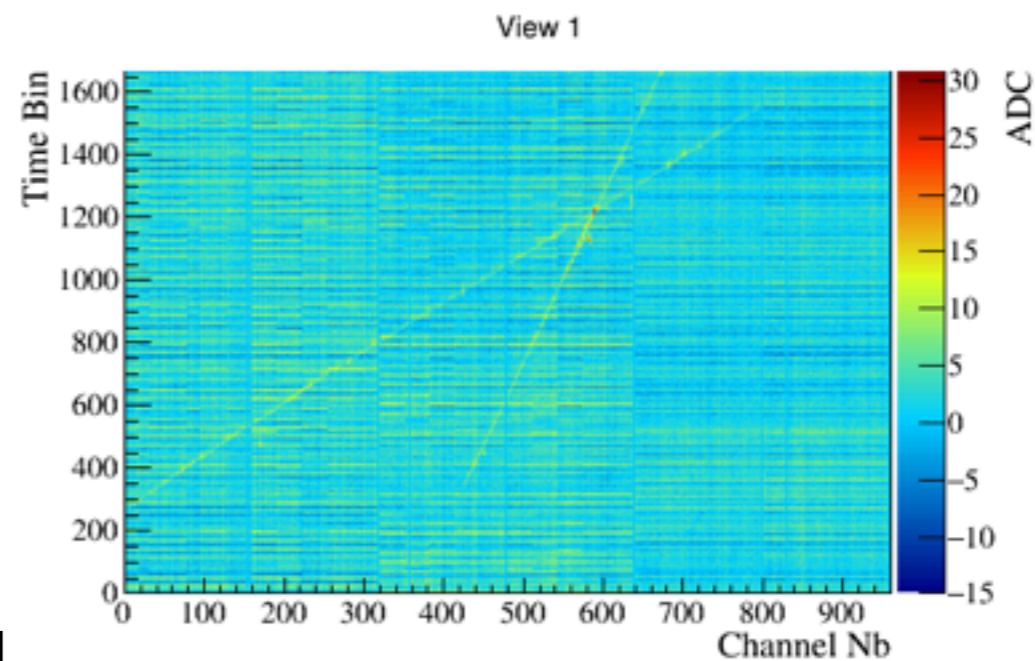
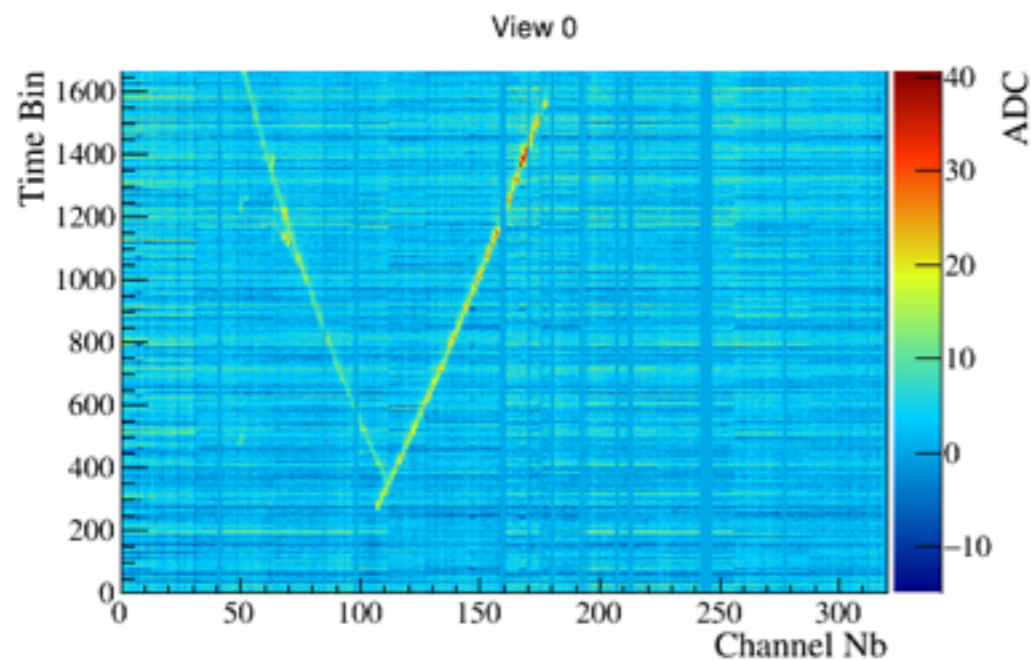
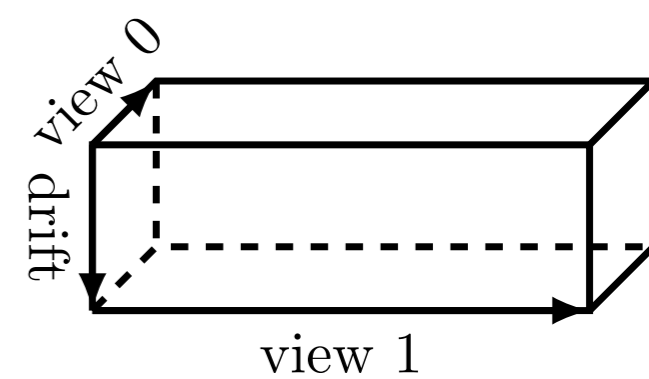
is 1m long  
reading 3m strips  
with 320 channels

## View 1

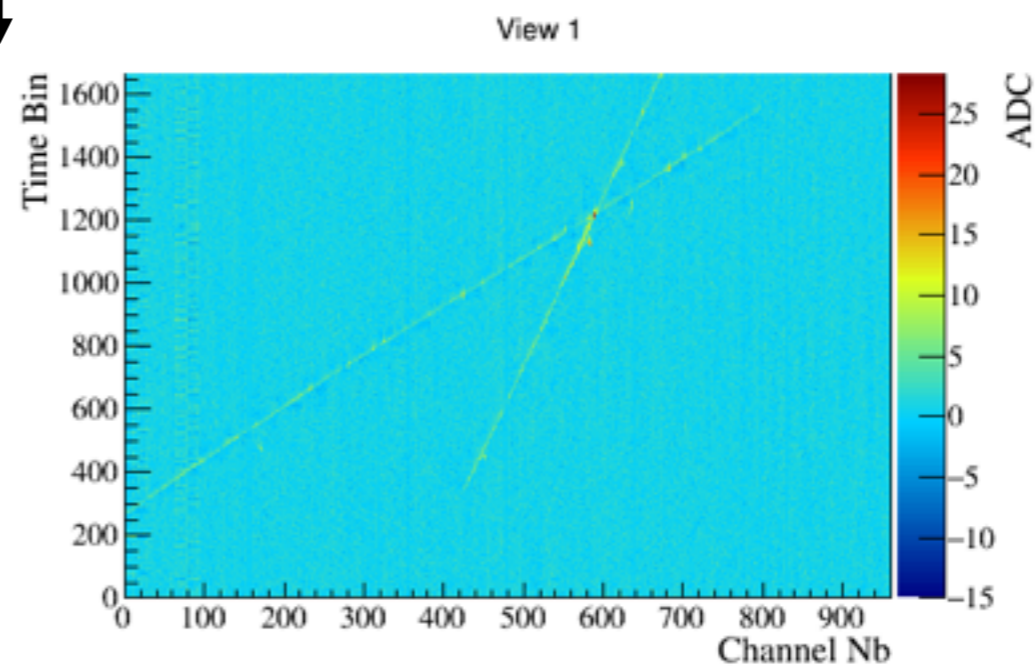
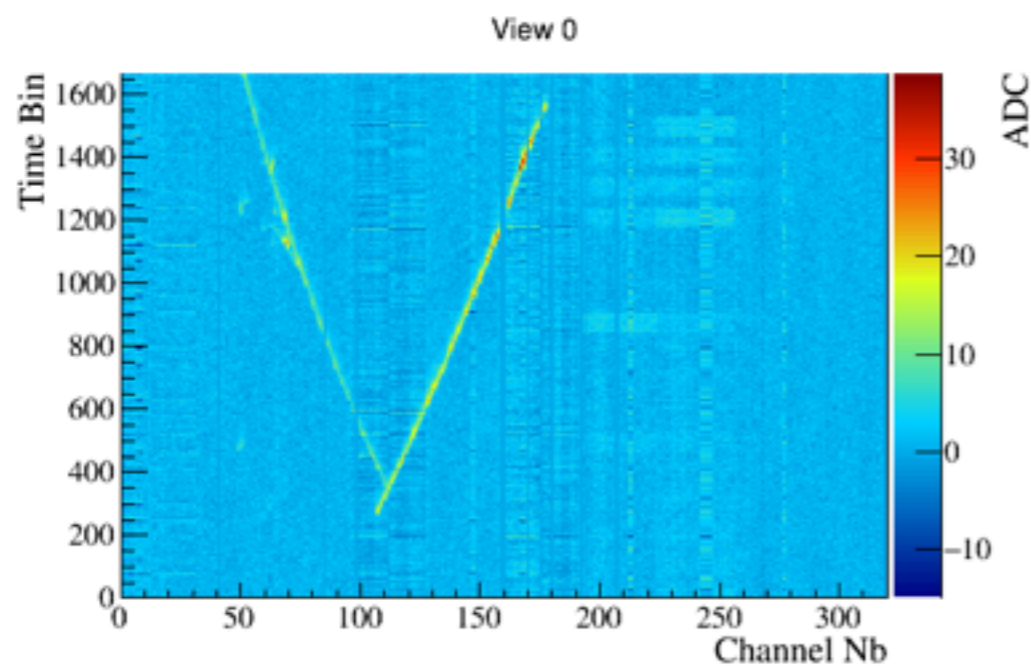
is 3m long  
reading 1m strips  
with 960 channels

17 problematic channels out of 1280  
12 LEMs [panels of 50 cm<sup>2</sup>] numbering shown

# Noise Filtering for low gain runs



Coherent noise filter



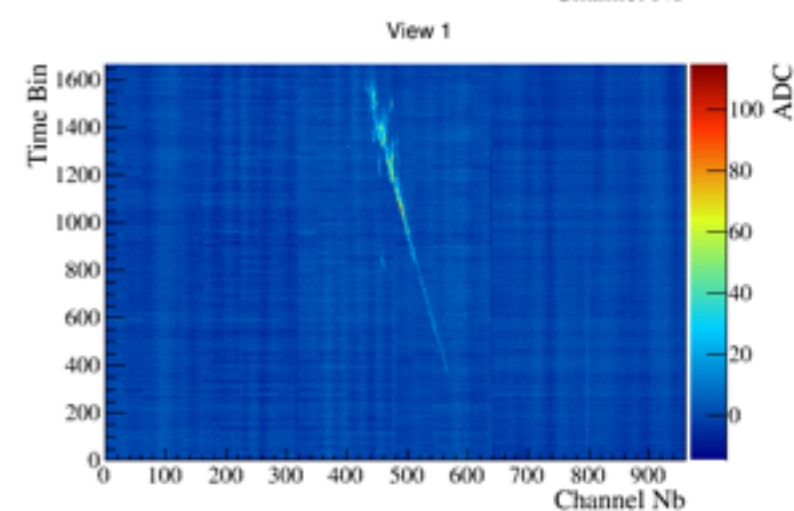
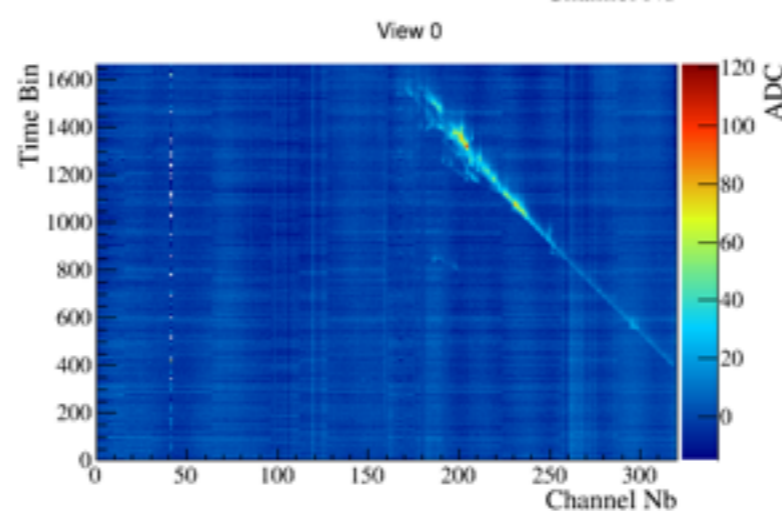
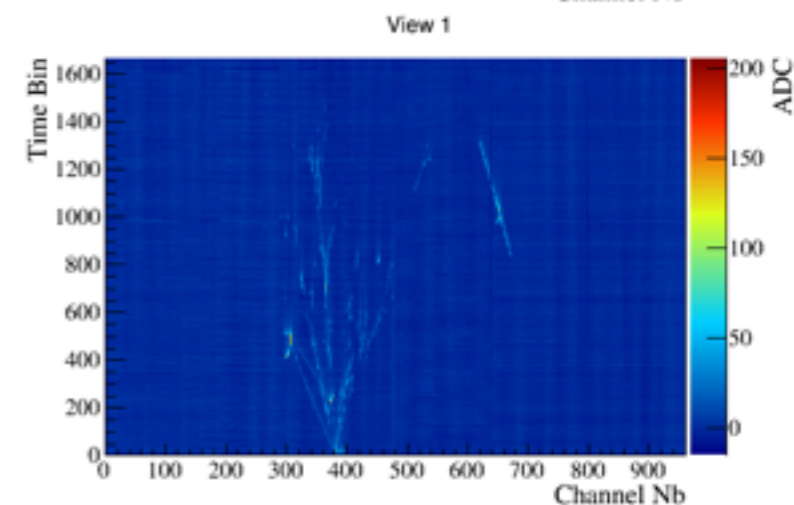
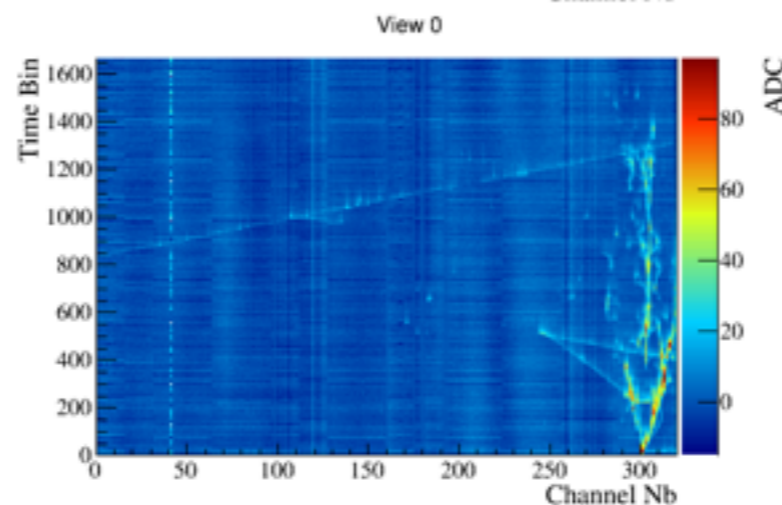
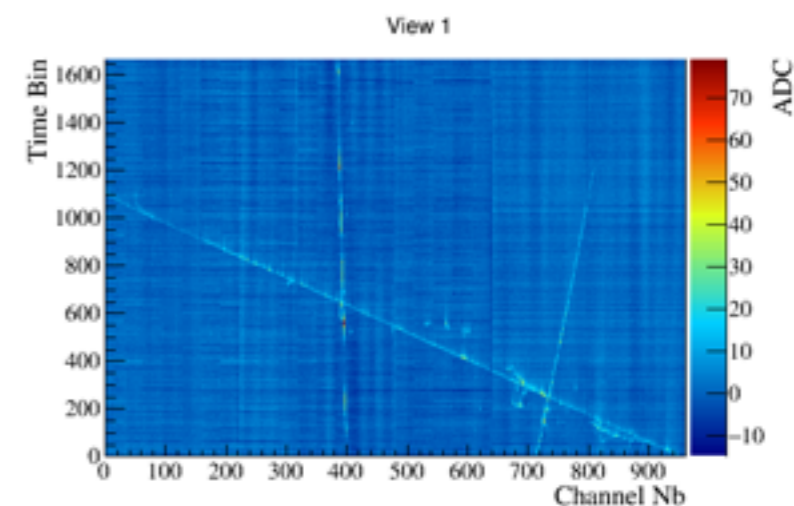
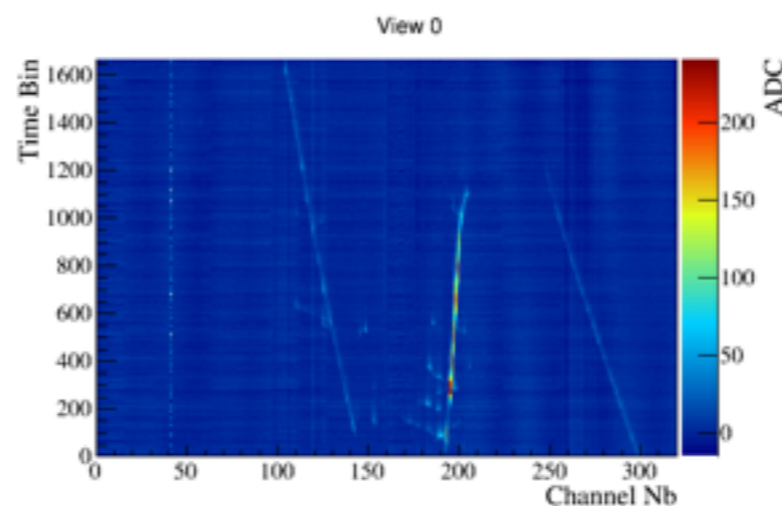
# Run 840

Using run 840, with this HV settings :

- PMT trigger
- ~10h long, ~40 ktriggers
- Drift field at 500 V/cm
- Extraction field at 1.85 kV/cm in LAr
- Amplification field of
  - 28 kV/cm in central LEMs
  - 24 kV/cm in corner LEMs
- Induction field at 1.5 kV/cm

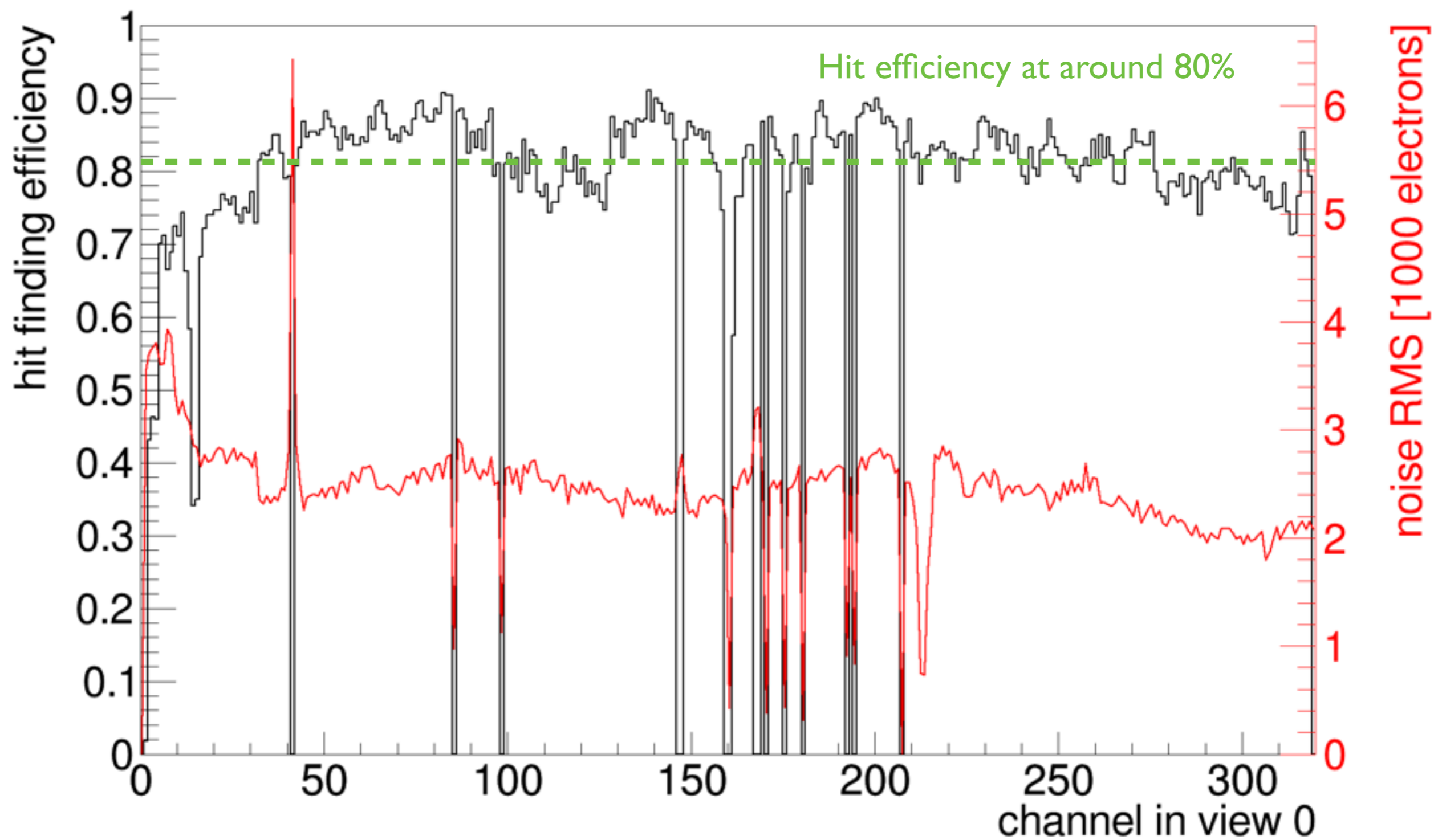
1	2	5	6	9	10
3	4	7	8	11	12

LEMs 1,3,10, 12 at lower field



# Hit Finding efficiency

Hit finding efficiency vs. channel in view 0 (run 840)



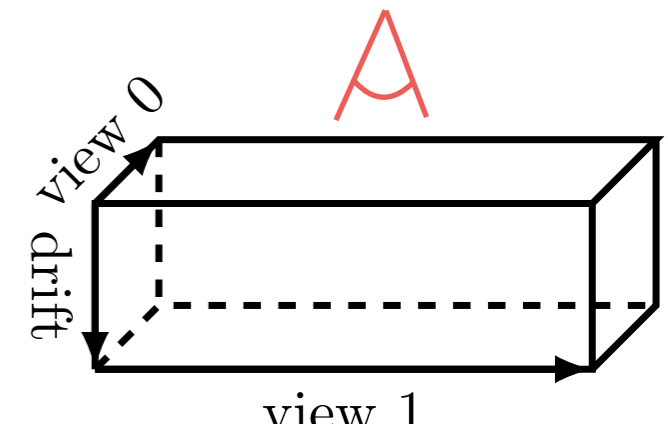
# Gain Uniformity

1	2	5	6	9	10
3	4	7	8	11	12

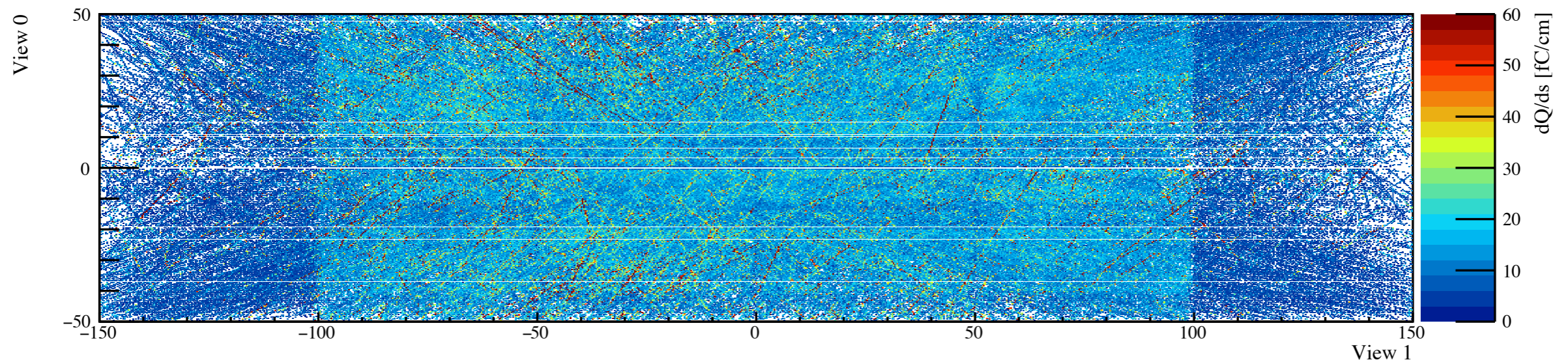
LEMs 1,3,10, 12 at lower field

All reconstructed 3D tracks with a length of 50 cm, starting at the anode or ending at the cathode  
[6 878 track selected in 30 736 triggers]

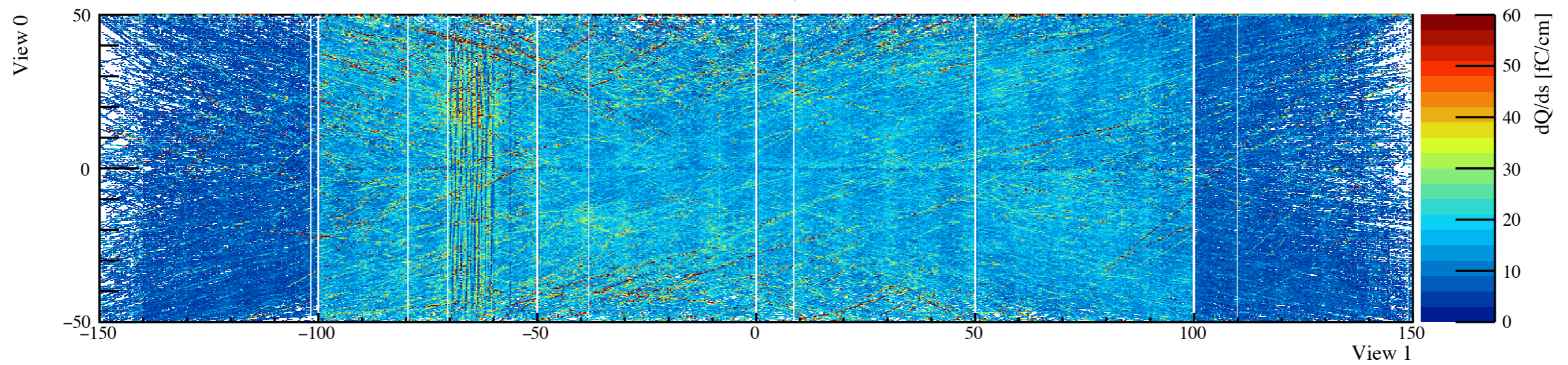
Each entry is the mean of deposited charge for each channel.



From view 0 path

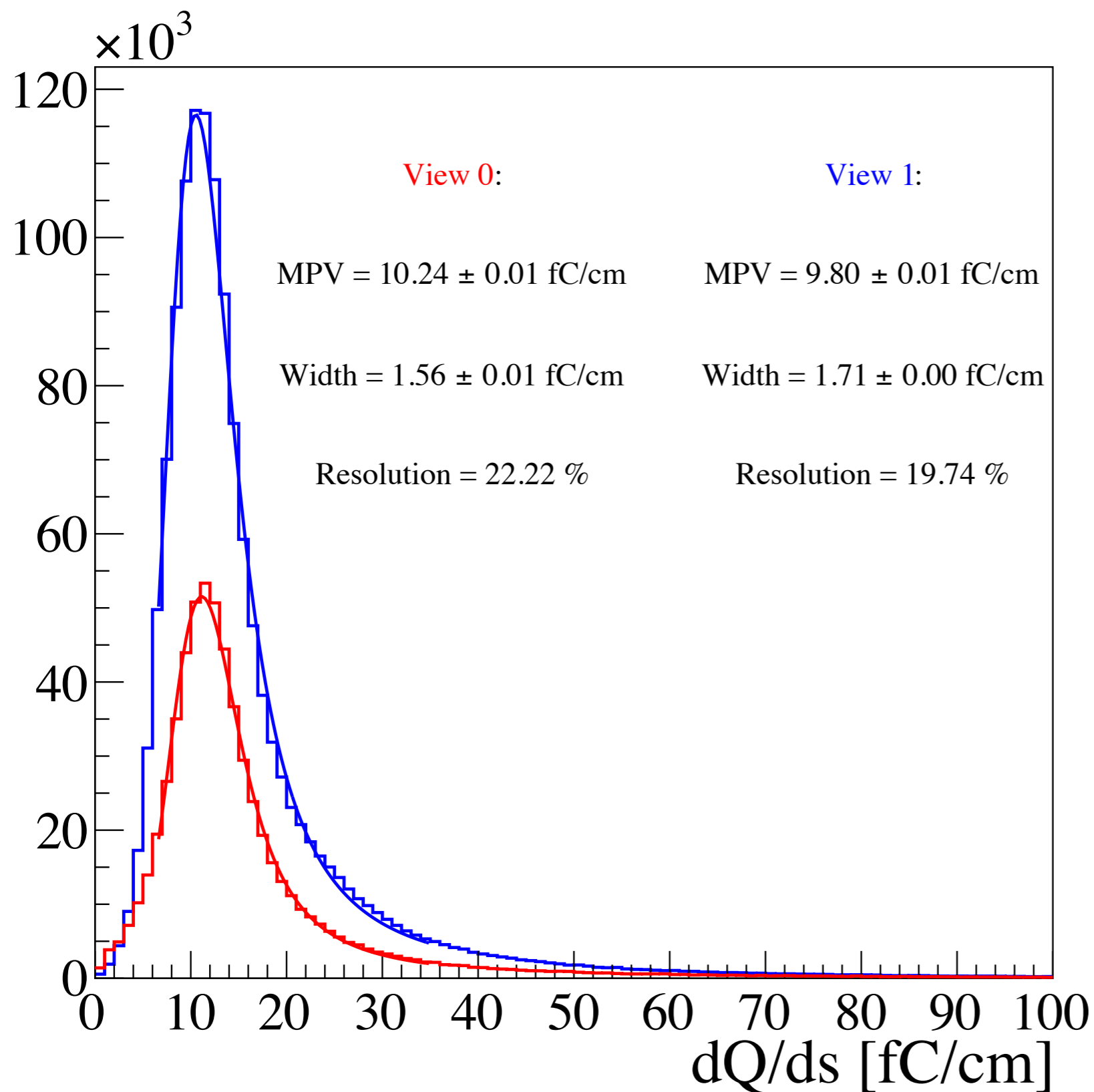


From view 1 path





# Response of the two views

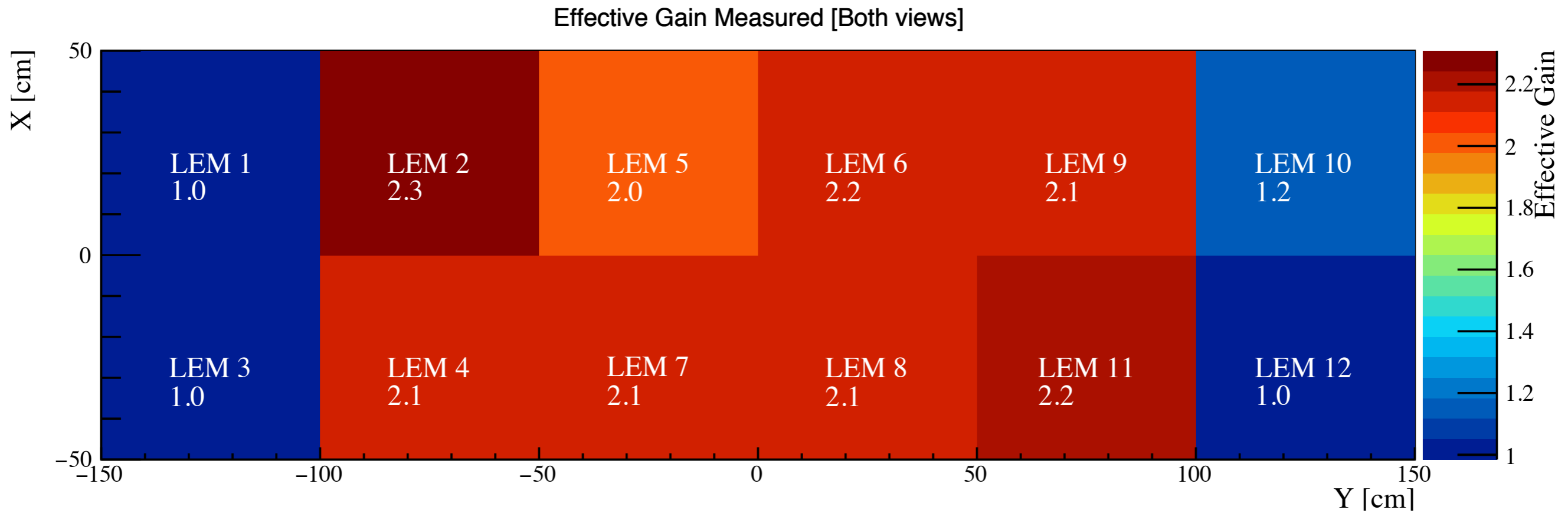


Hit charge distributions are fitted with a landau convoluted with a gaussian

# Gain Uniformity

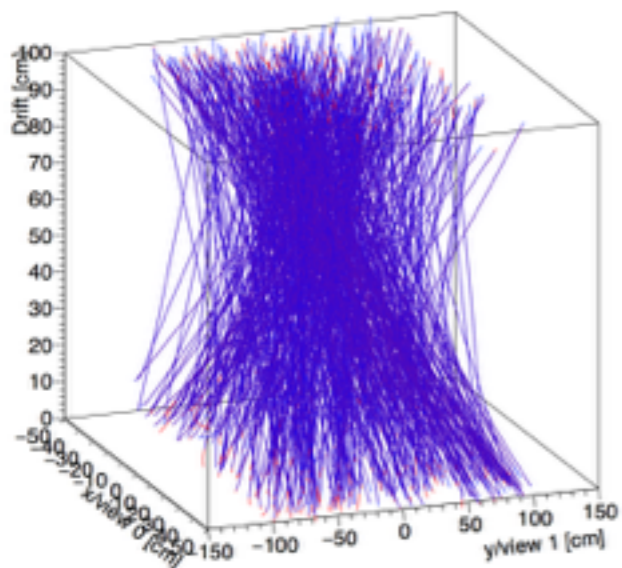
1	2	5	6	9	10
3	4	7	8	11	12

LEMs 1,3,10, 12 at lower field



Quite uniform response across all LEMs

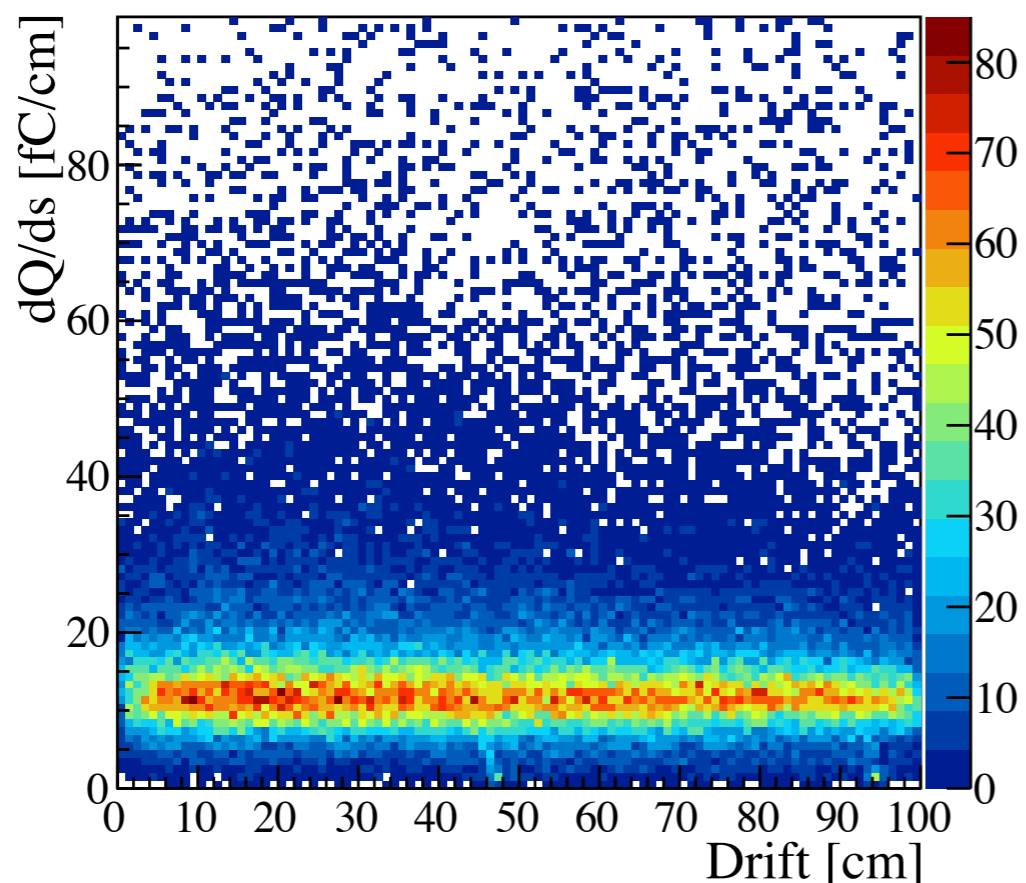
# Estimation of the purity



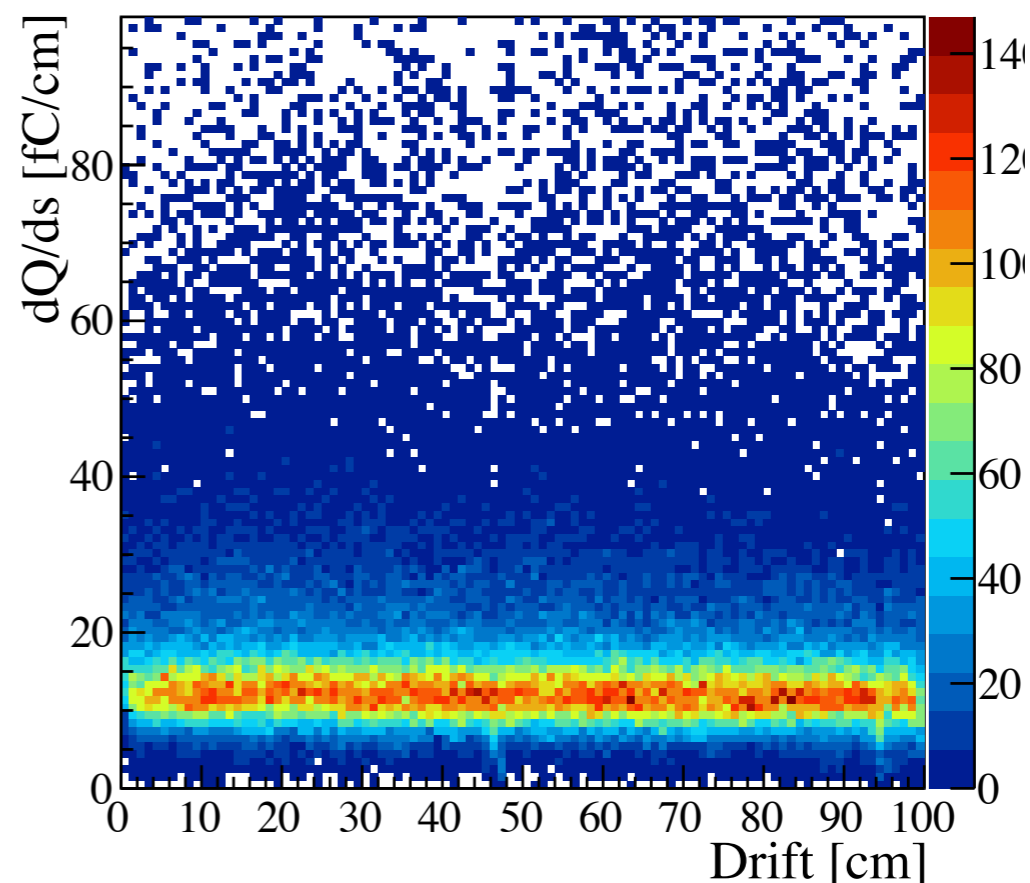
Using the same run, through going tracks underneath central LEMs are selected

Hit charge as a function of the drift length :

View 0

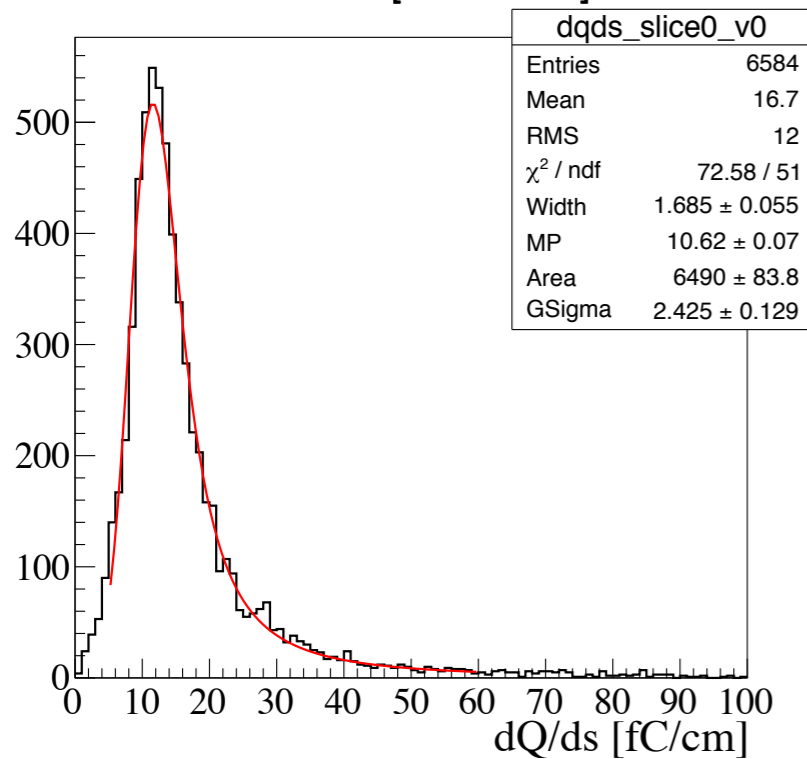


View 1

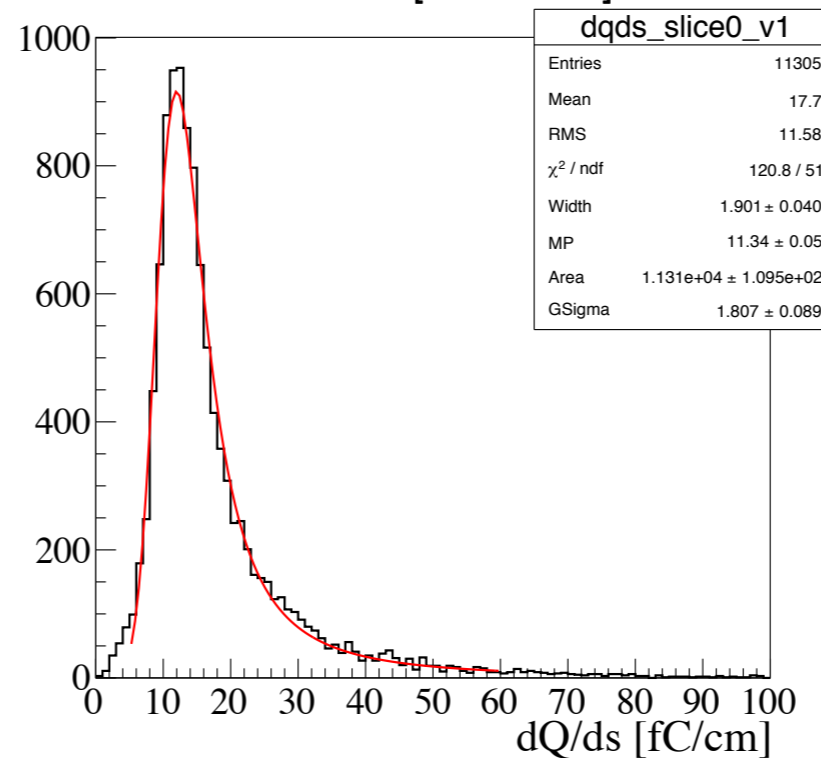


# Estimation of the purity

View 0 - drift [0.00-10.00] cm



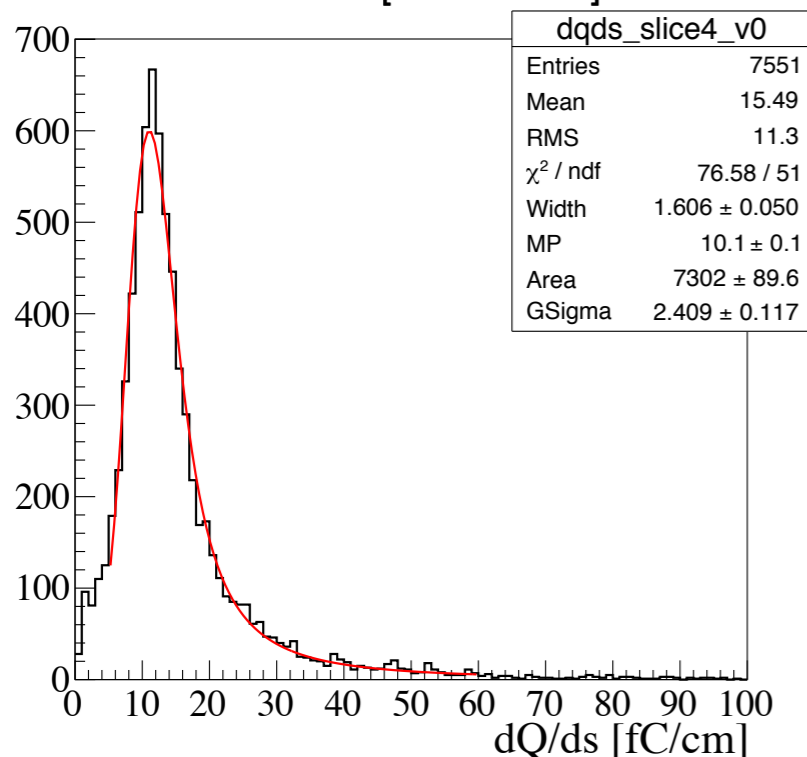
View 1 - drift [0.00-10.00] cm



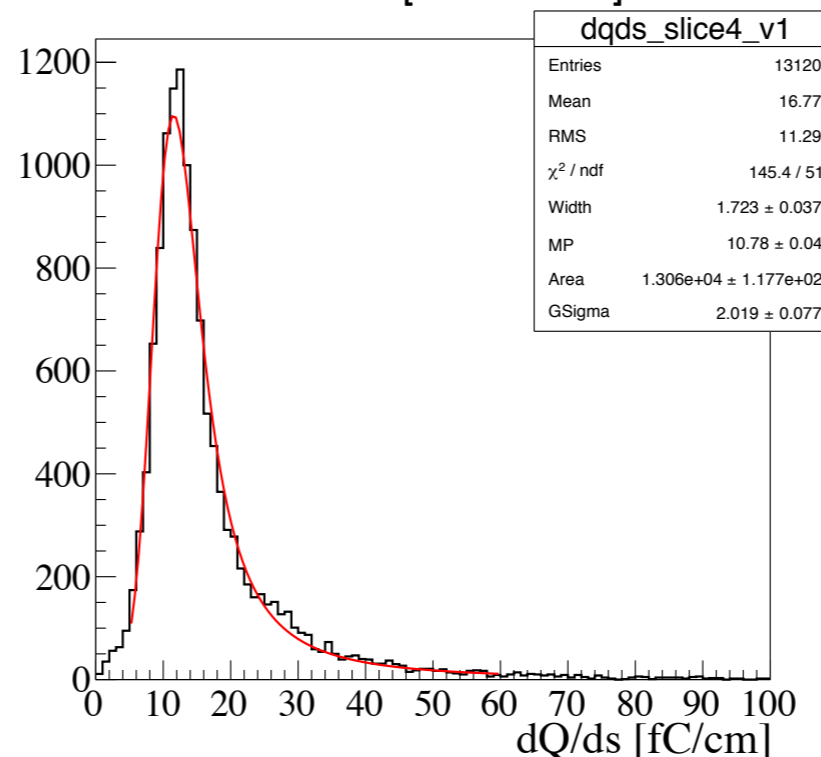
The 2D distributions are sliced in 10 bins of 10 cm drift in each view.

The distributions are fitted with a landau convoluted with a gaussian.

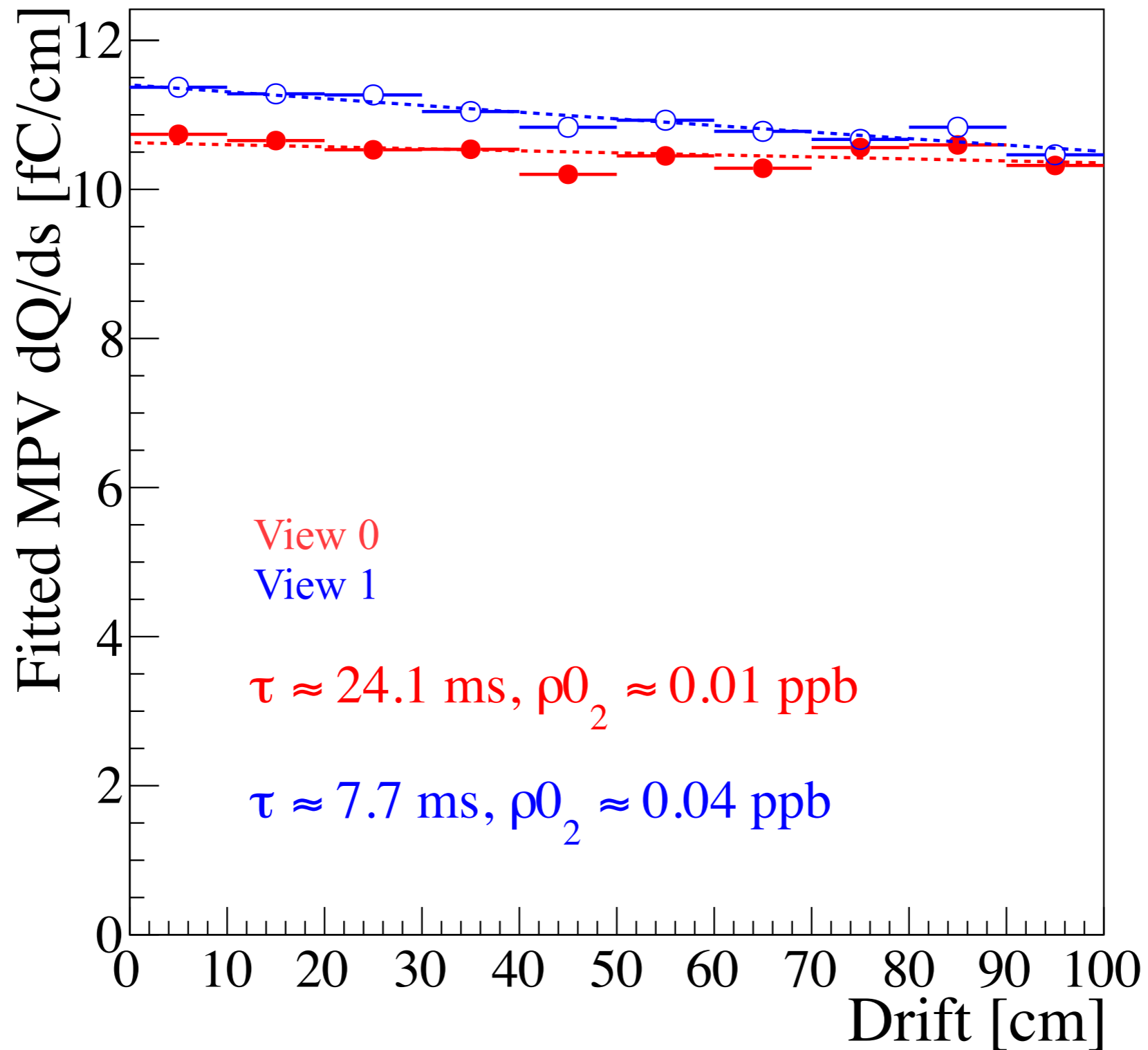
View 0 - drift [40.00-50.00] cm



View 1 - drift [40.00-50.00] cm



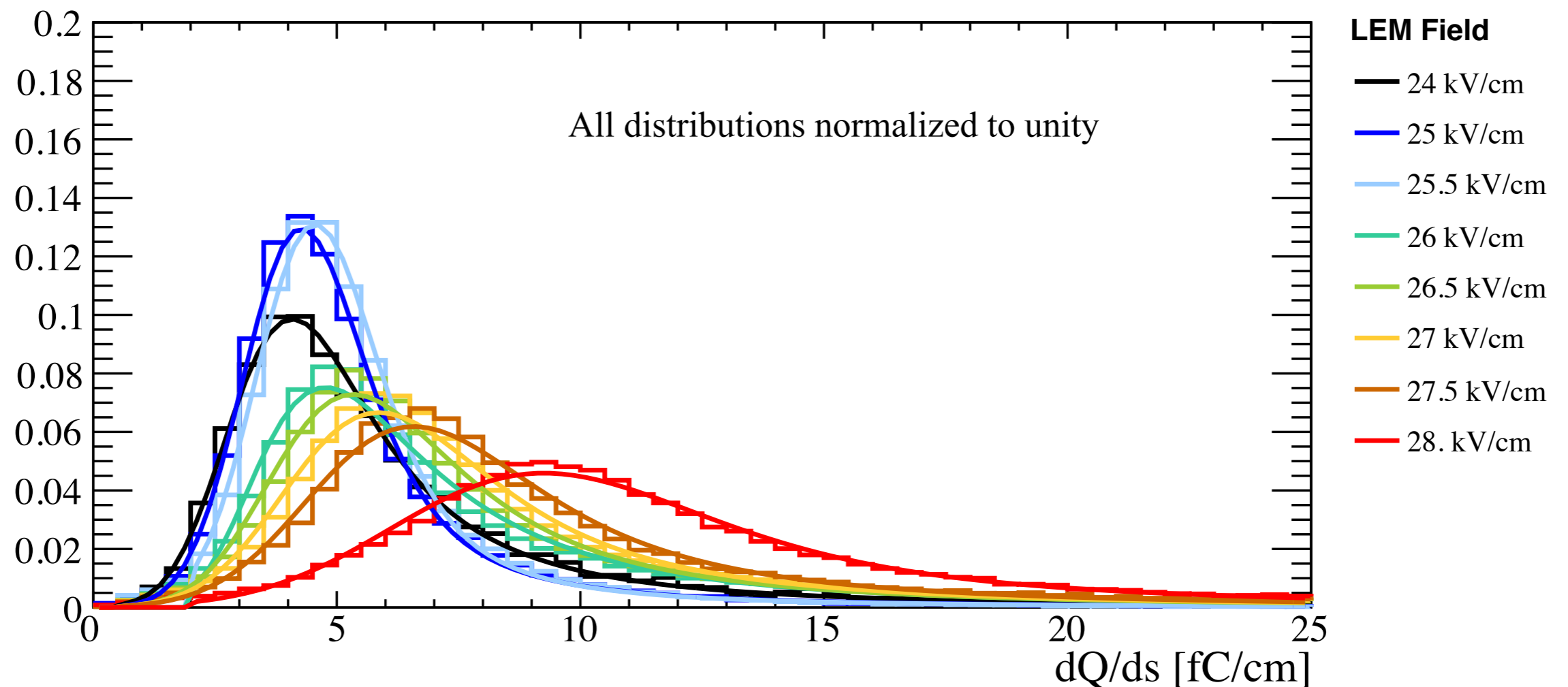
# Estimation of the purity



The preliminary estimation of the electron lifetime highlights a purity at the level of  $10^{-2}$  ppb

# Preliminary look at the LEM field scan

Charge collected in view 0 for different LEM field



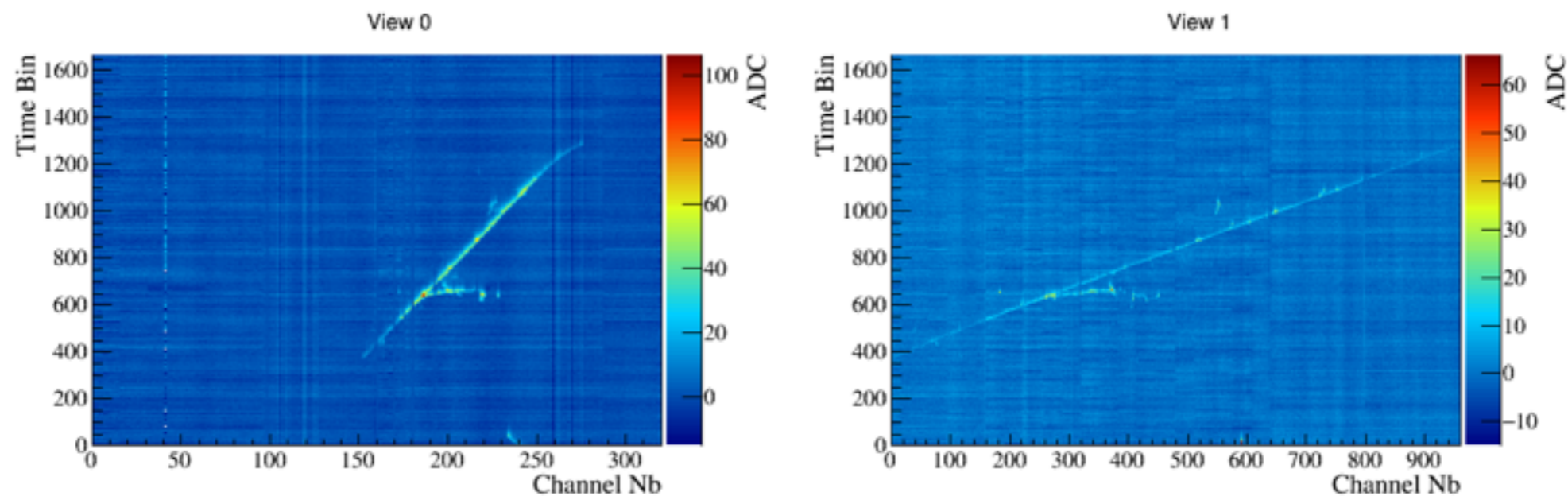
Using runs taken at high extraction field [extraction efficiency being at 90% or higher] and at the same induction field of 1 kV/cm.

The relative increase of the mean collected charge as a function of the amplification field is visible.

# Ongoing software activities

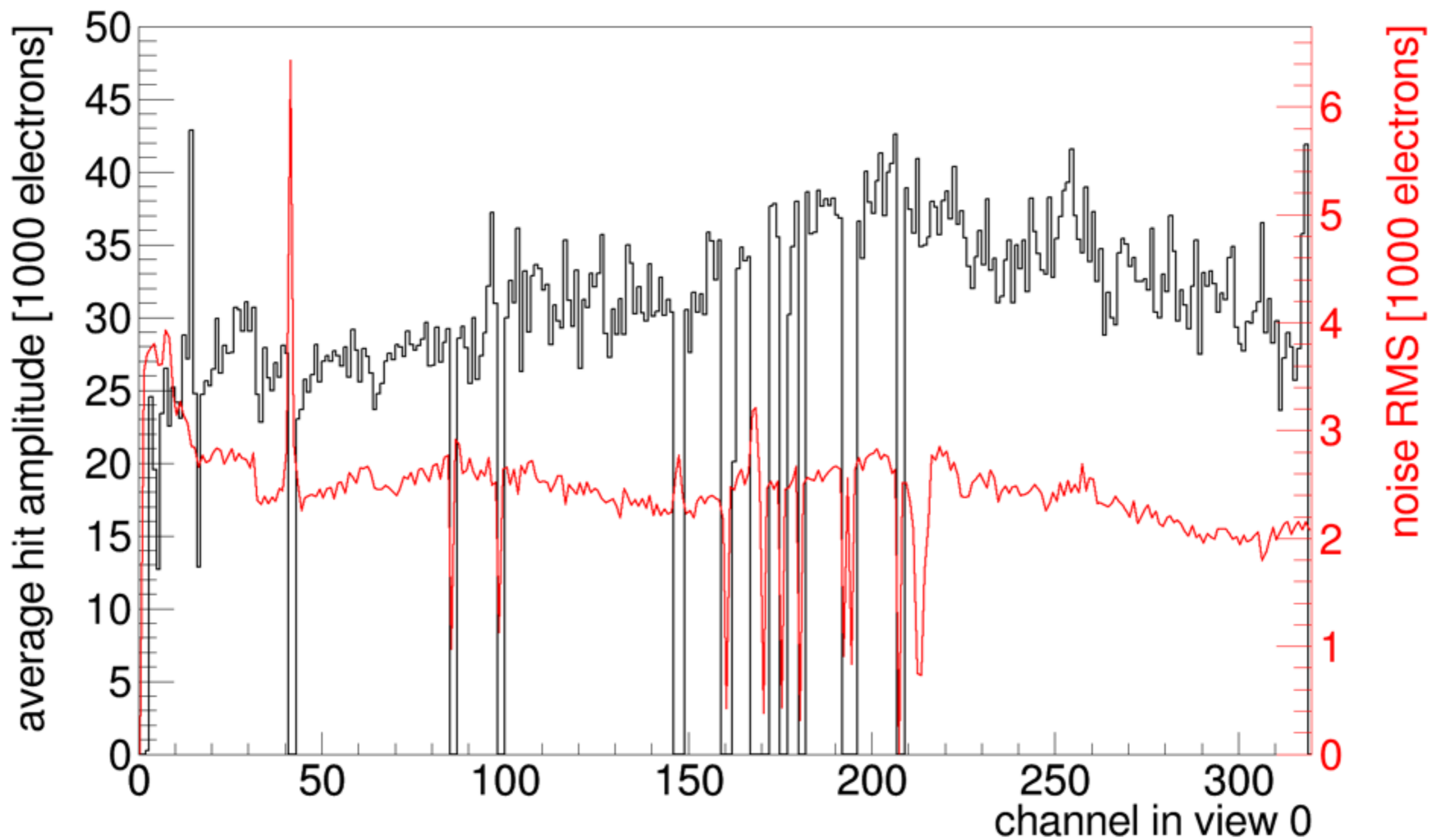
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- Improvement on hit and track finding algorithms
- Realistic simulations of the  $3 \times 1 \times 1$  detector, in particular to study the drift field distortions and space charge effect
- Simulation of the field lines in the gaseous phase, in particular understand the effect of the induction field
- Ongoing studies of effective gains achieved, LEM field scan, extraction field scan



# Hit Finding efficiency

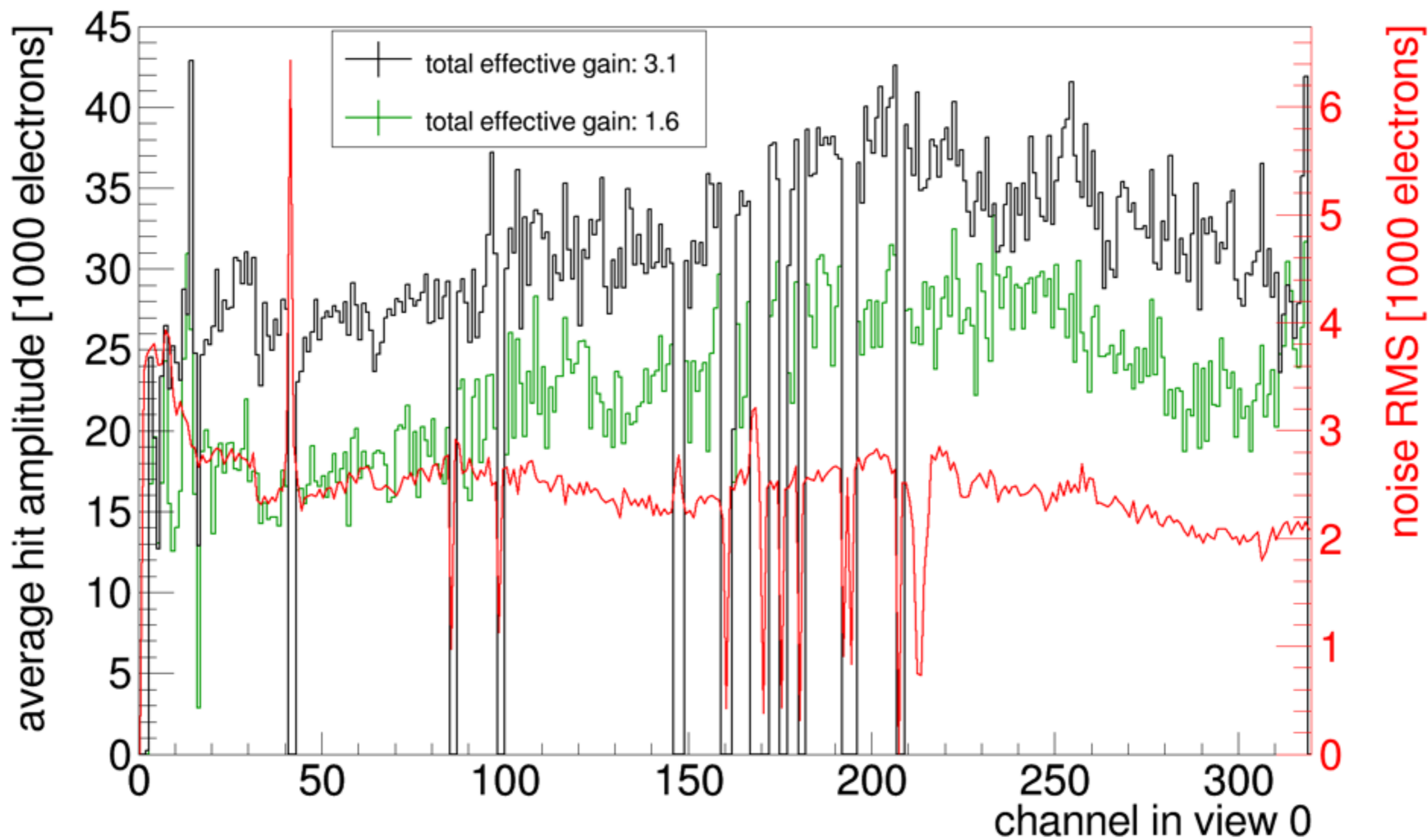
Average hit amplitude vs. channel in view 0 (run 840)





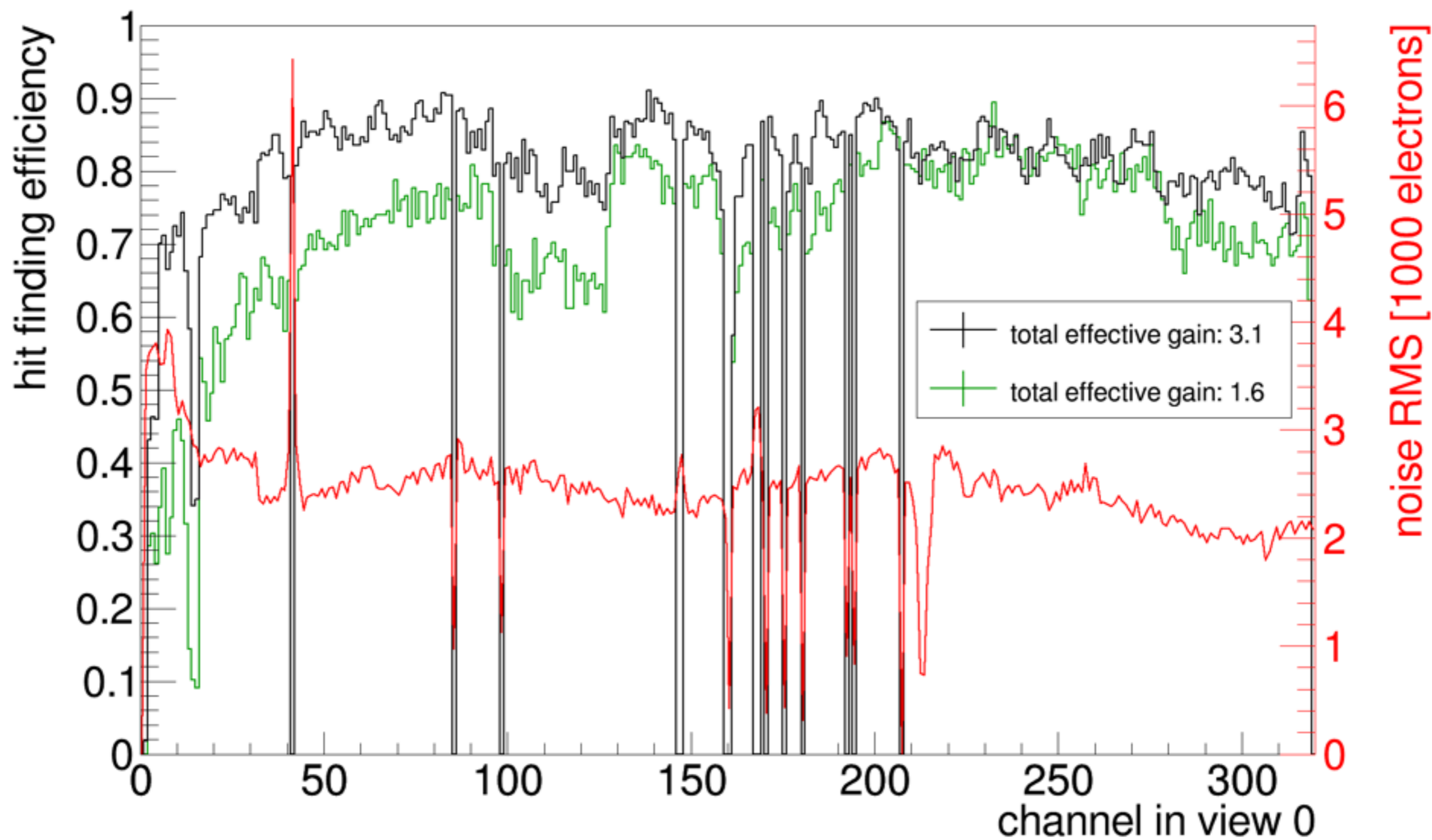
# Hit Finding efficiency

Average hit amplitude vs. channel in view 0



# Hit Finding efficiency

Hit finding efficiency vs. channel in view 0



# Hit Finding efficiency

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View 0: hit finding efficiency vs. effective gain

