

# Status of light studies for the 3x1x1 review

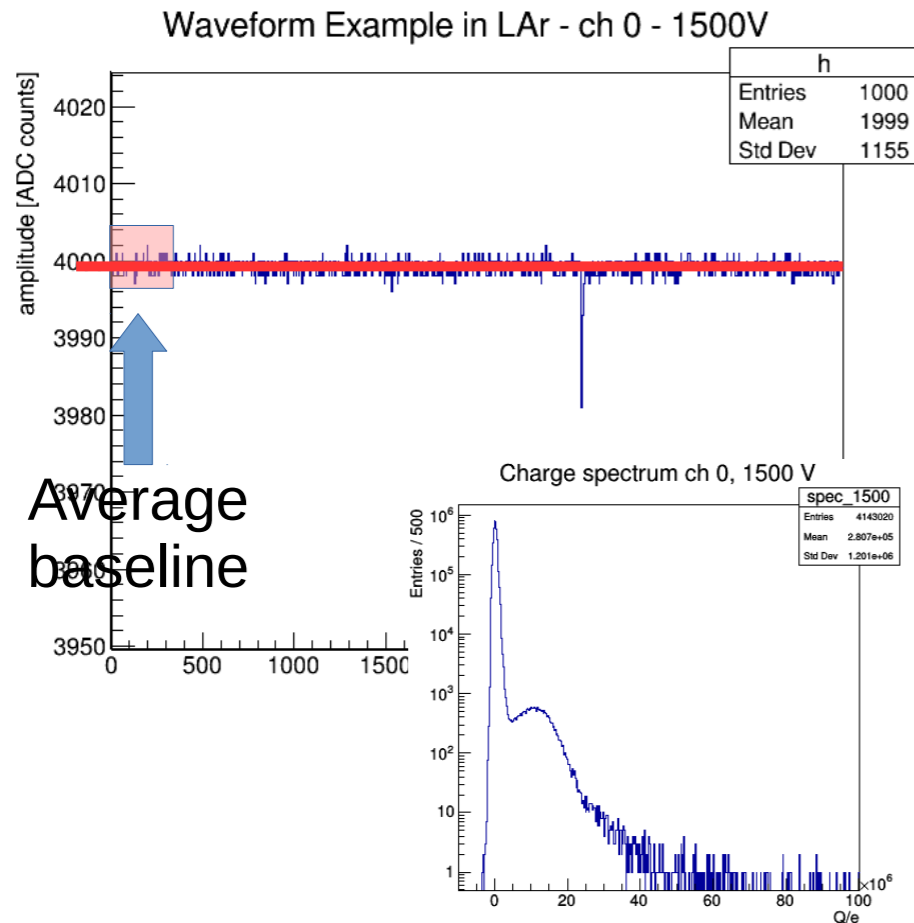
Alberto Remoto, Jose Alfonso

# Highlight

- Summary of the studies ongoing for the 3x1x1 review
  - PMT calibration and bases comparisons
  - LAr purity monitoring
  - S1 studies
  - S2 studies
- All studies are still ongoing...

# **PMT calibration and base comparisons**

# Summary of PMTs calibration



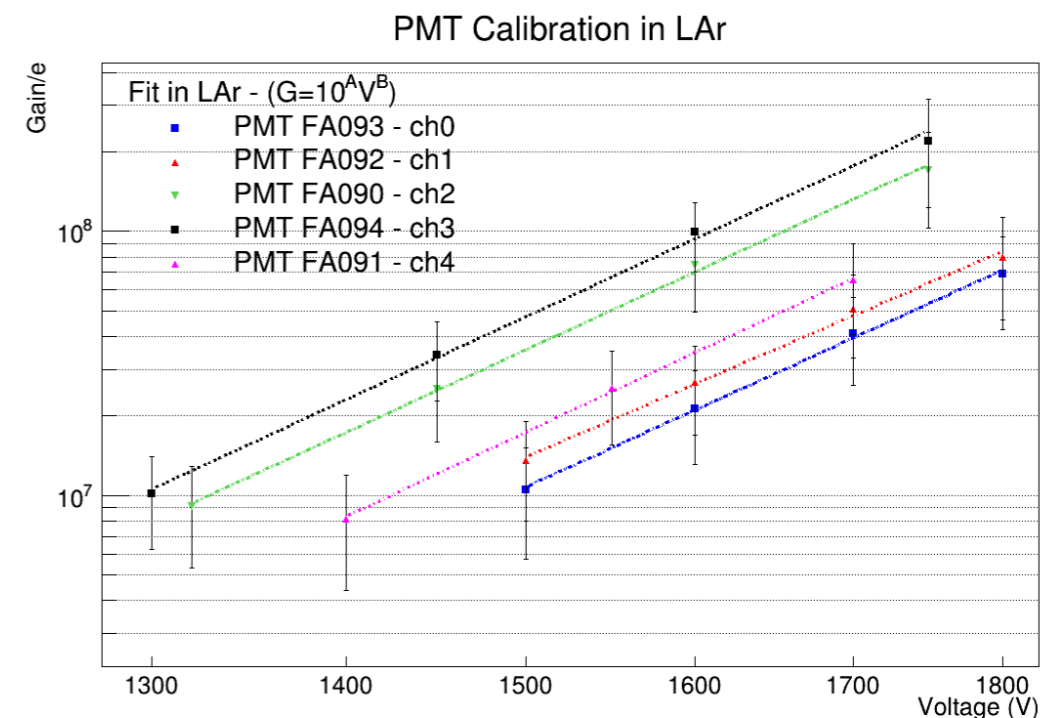
- 3x1x1 PMTs has not been calibrated in Lar with a dedicated set-up, but only in air at Room Temperature.
- We don't have a dedicated calibration system as we will have in the 6x6x6.
- Thus, the calibration has been performed reconstructing the SPE spectrum integrating every fluctuation below the baseline, from data taken with a pulser (“random trigger”) inside the detector.

- An increase in the gain for 3 of the PMTs has been observed (in comparison with Room Temperature). To be understood.

**A gain stability studies is ongoing**

For more detail:

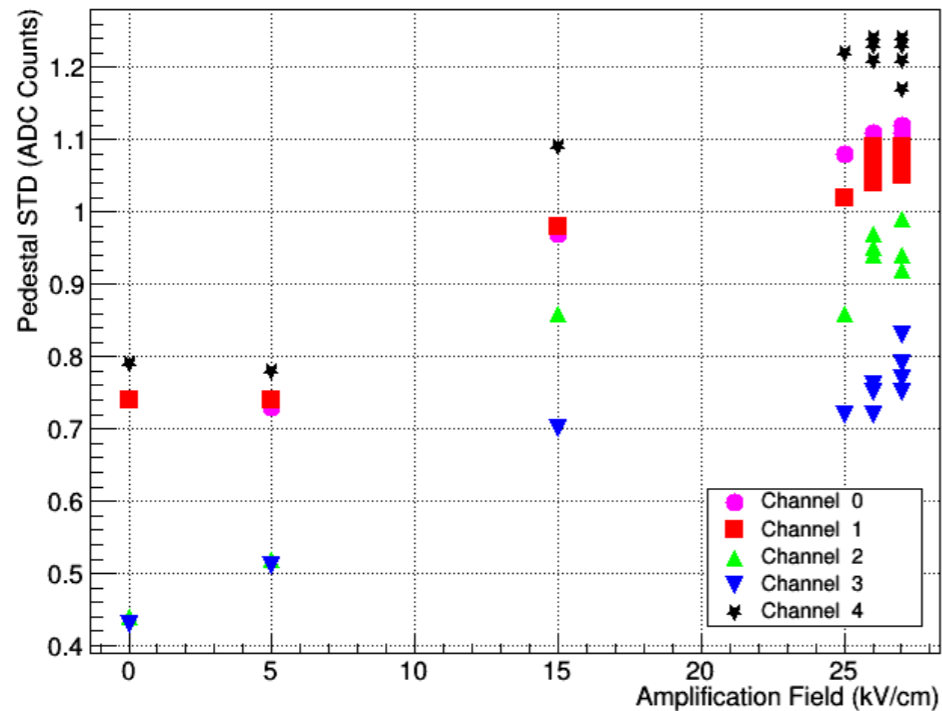
[See Jose's slides from 4 August 2017 Operational Meeting](#)



# Summary of the waveform studies

Jose

Pedestal studies

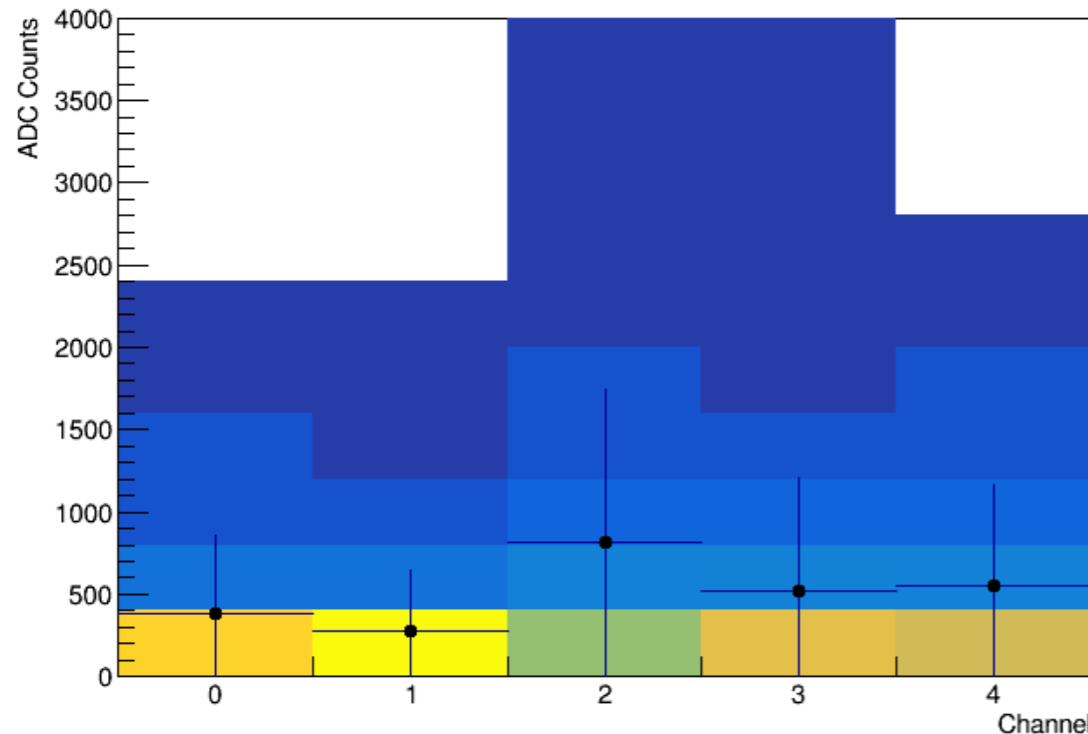


- Pedestal width remain quite stable ( $\sim 1$ ADC), even under high amplification fields.
- One-cable based (positive) PMTs show a thinner pedestal.

Negative based PMTs:	Channel 0, 1 & 4
Positive based PMTs:	Channel 2 & 3

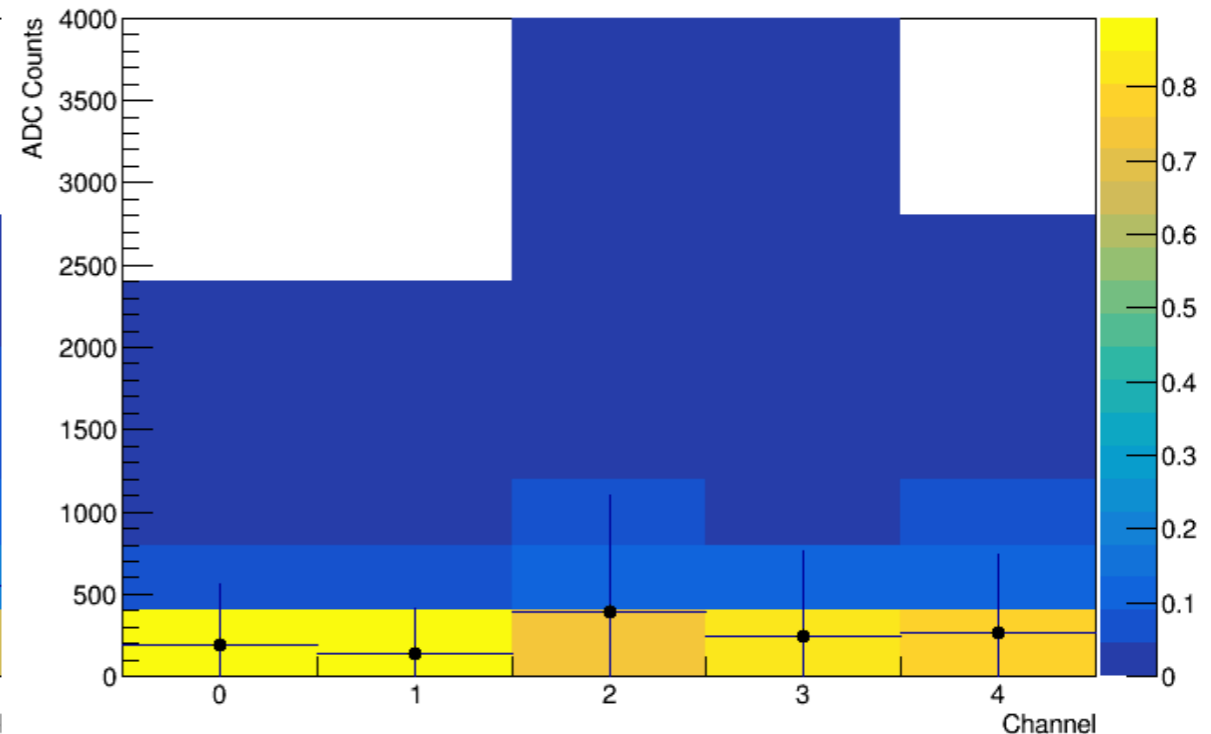
No Drift Field

Signal Amplitude vs Channel - Run 1610



Drift Field 0.53kV/cm

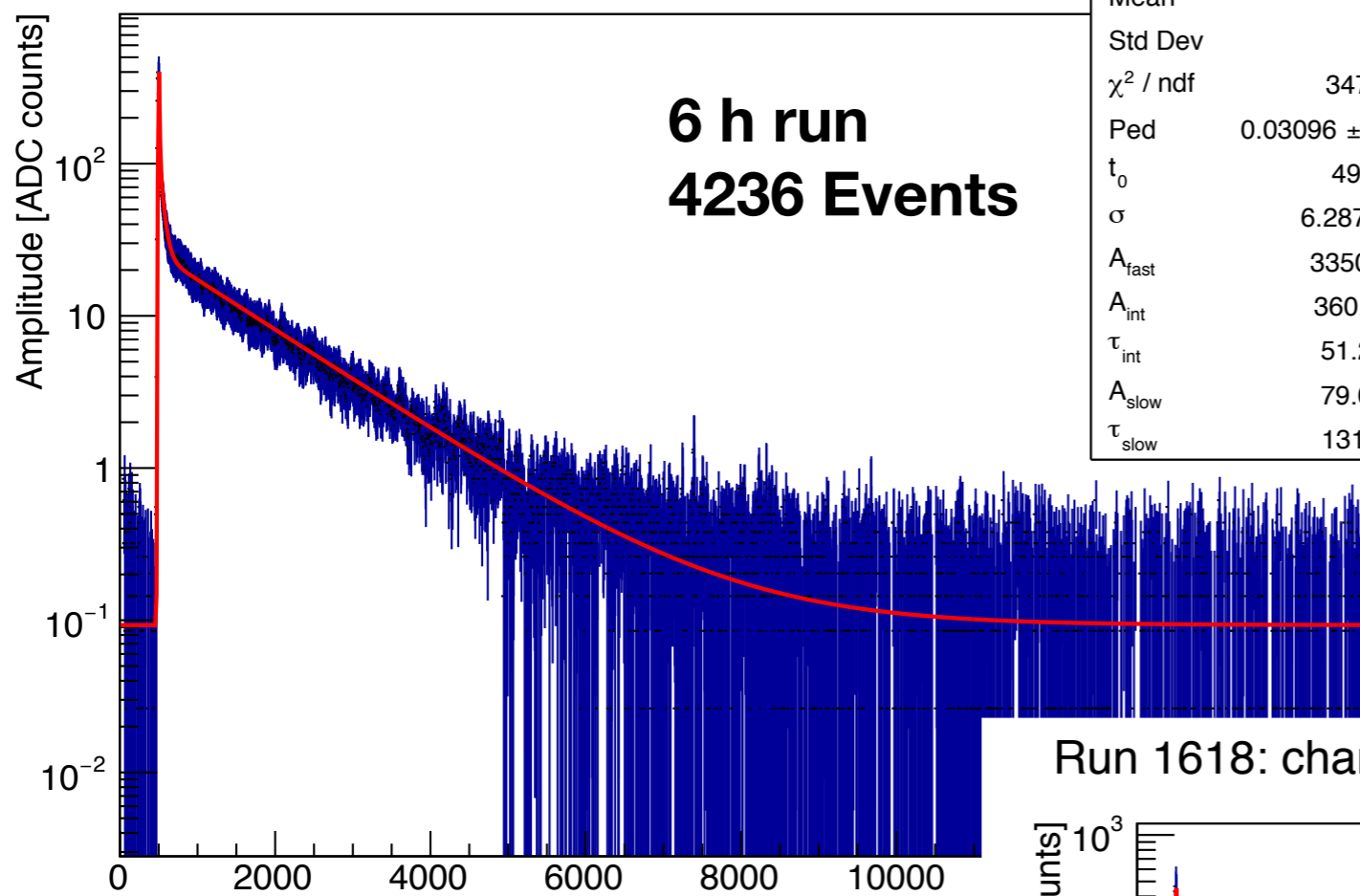
Signal Amplitude vs Channel - Run 1618



As the drift field increase, the S1 amplitude is reduced, since less recombination occurs.

# Purity monitoring

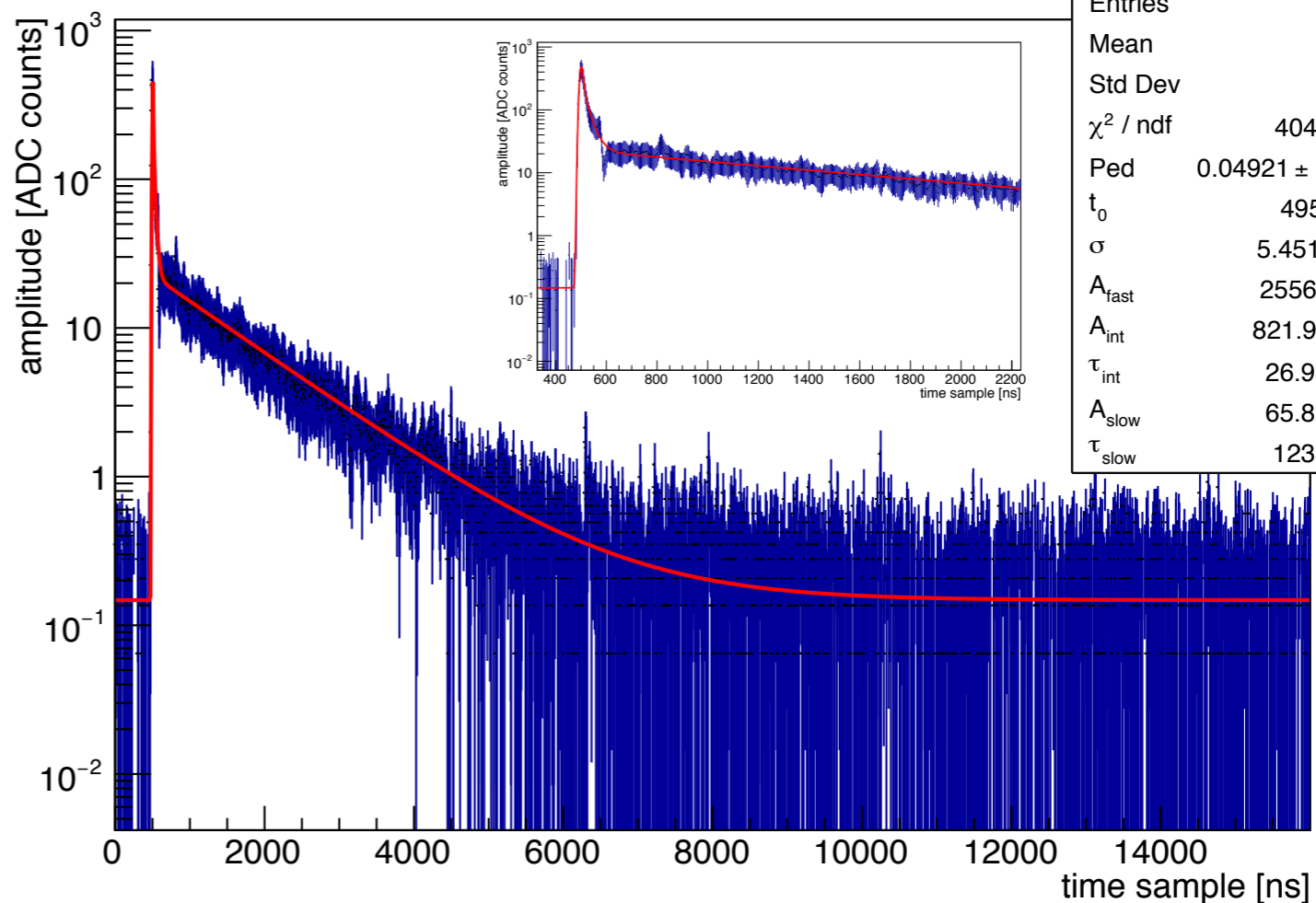
Run 1618: CRT trigger, Cathode 56 kV, Grid 0 V, LEM Down 200 V, LEM Up 0 V



Entries	68000
Mean	1472
Std Dev	1109
$\chi^2 / \text{ndf}$	3473 / 3992
Ped	$0.03096 \pm 0.00249$
$t_0$	$496.3 \pm 0.3$
$\sigma$	$6.287 \pm 0.245$
$A_{\text{fast}}$	$3350 \pm 238.2$
$A_{\text{int}}$	$360.7 \pm 46.3$
$\tau_{\text{int}}$	$51.29 \pm 5.61$
$A_{\text{slow}}$	$79.08 \pm 2.11$
$\tau_{\text{slow}}$	$1317 \pm 20.4$

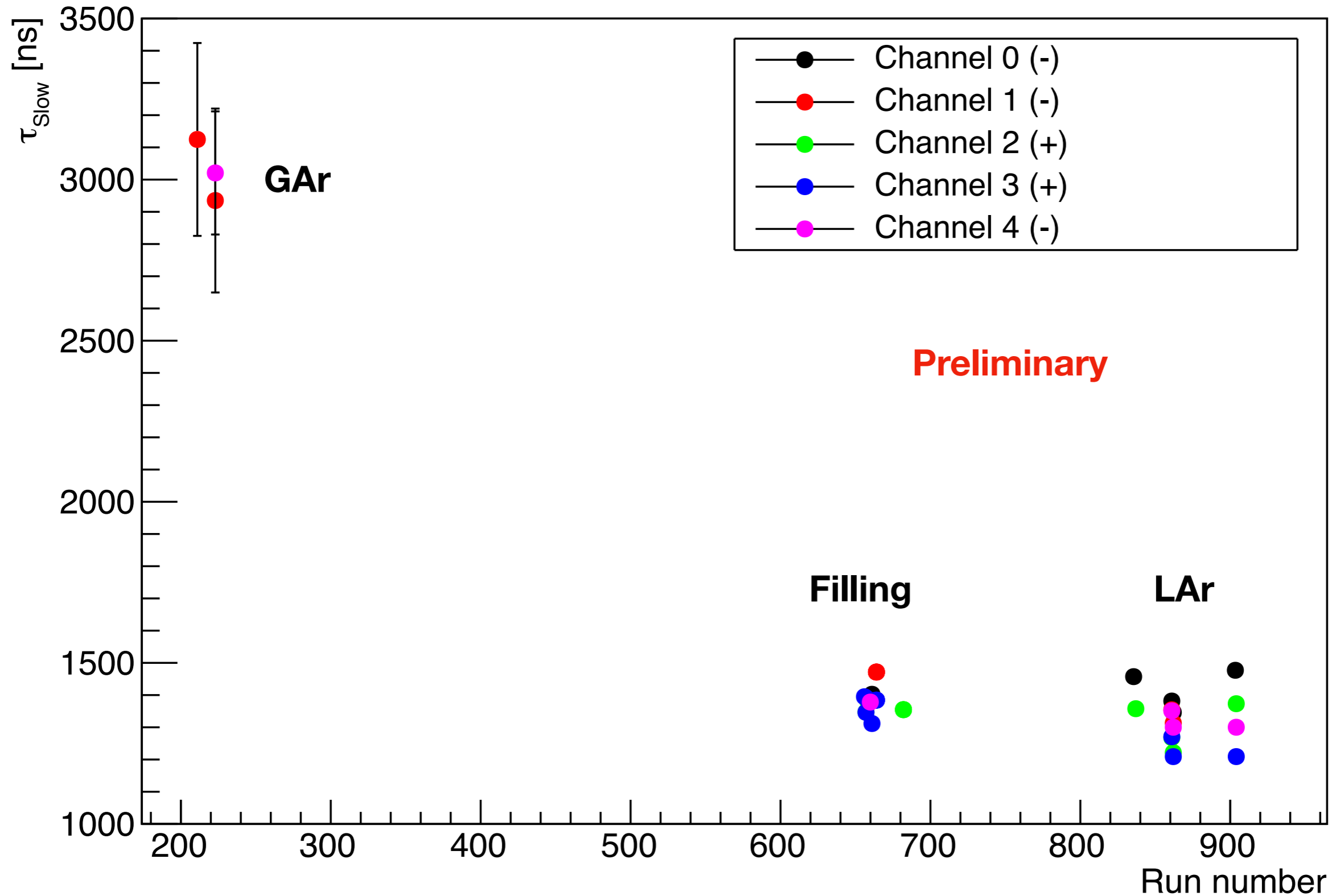
**The slow scintillation component can be monitored run by run on every PMT**

Run 1618: channel 2



Entries	56000
Mean	1567
Std Dev	1763
$\chi^2 / \text{ndf}$	4048 / 3992
Ped	$0.04921 \pm 0.00288$
$t_0$	$495.6 \pm 0.4$
$\sigma$	$5.451 \pm 0.238$
$A_{\text{fast}}$	$2556 \pm 340.0$
$A_{\text{int}}$	$821.9 \pm 106.0$
$\tau_{\text{int}}$	$26.98 \pm 1.97$
$A_{\text{slow}}$	$65.82 \pm 1.90$
$\tau_{\text{slow}}$	$1238 \pm 20.0$

# Purity measurement from scintillation light

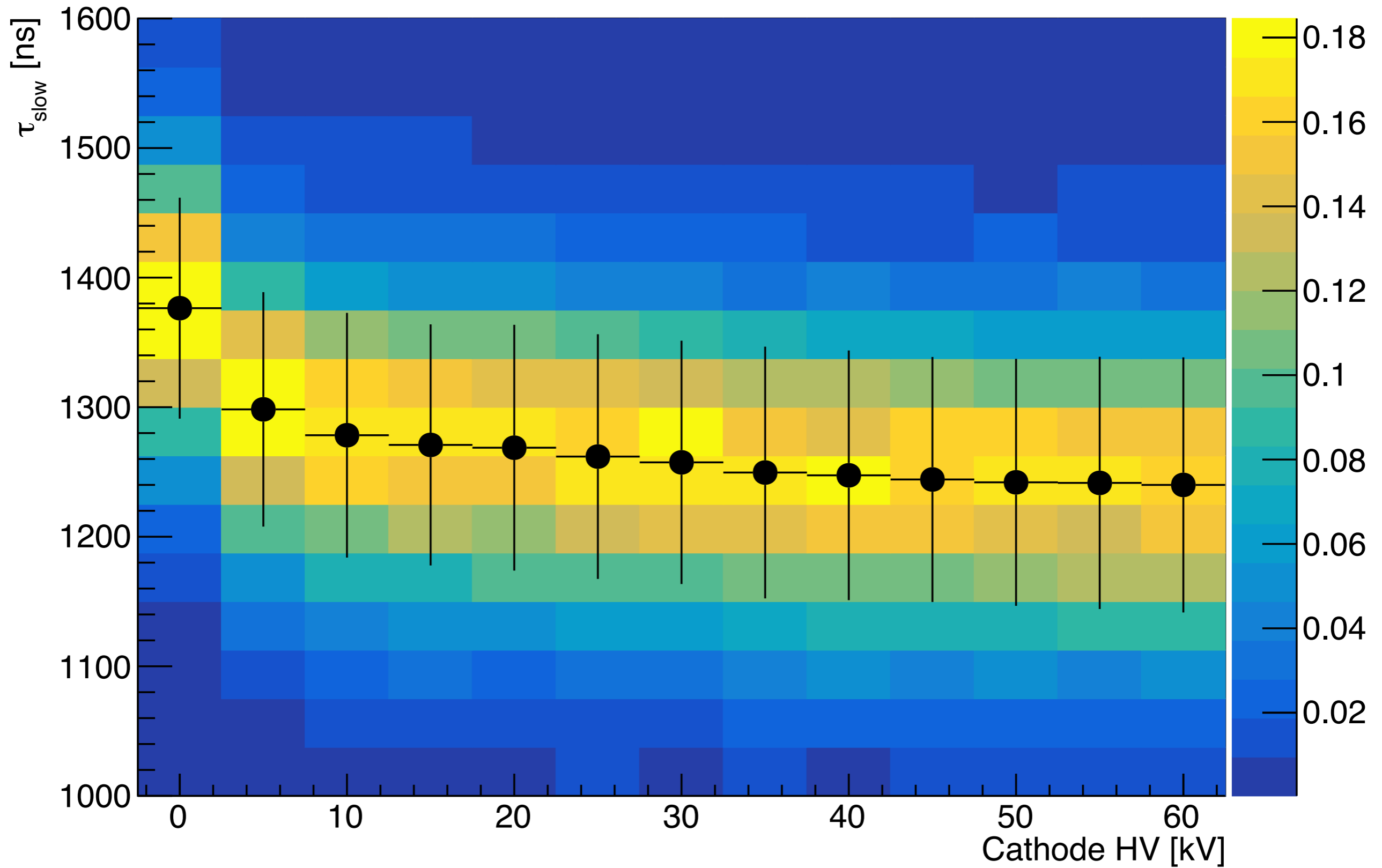


More runs being processed right now



**S1 studies**

# Scintillation fit $\tau_{\text{slow}}$

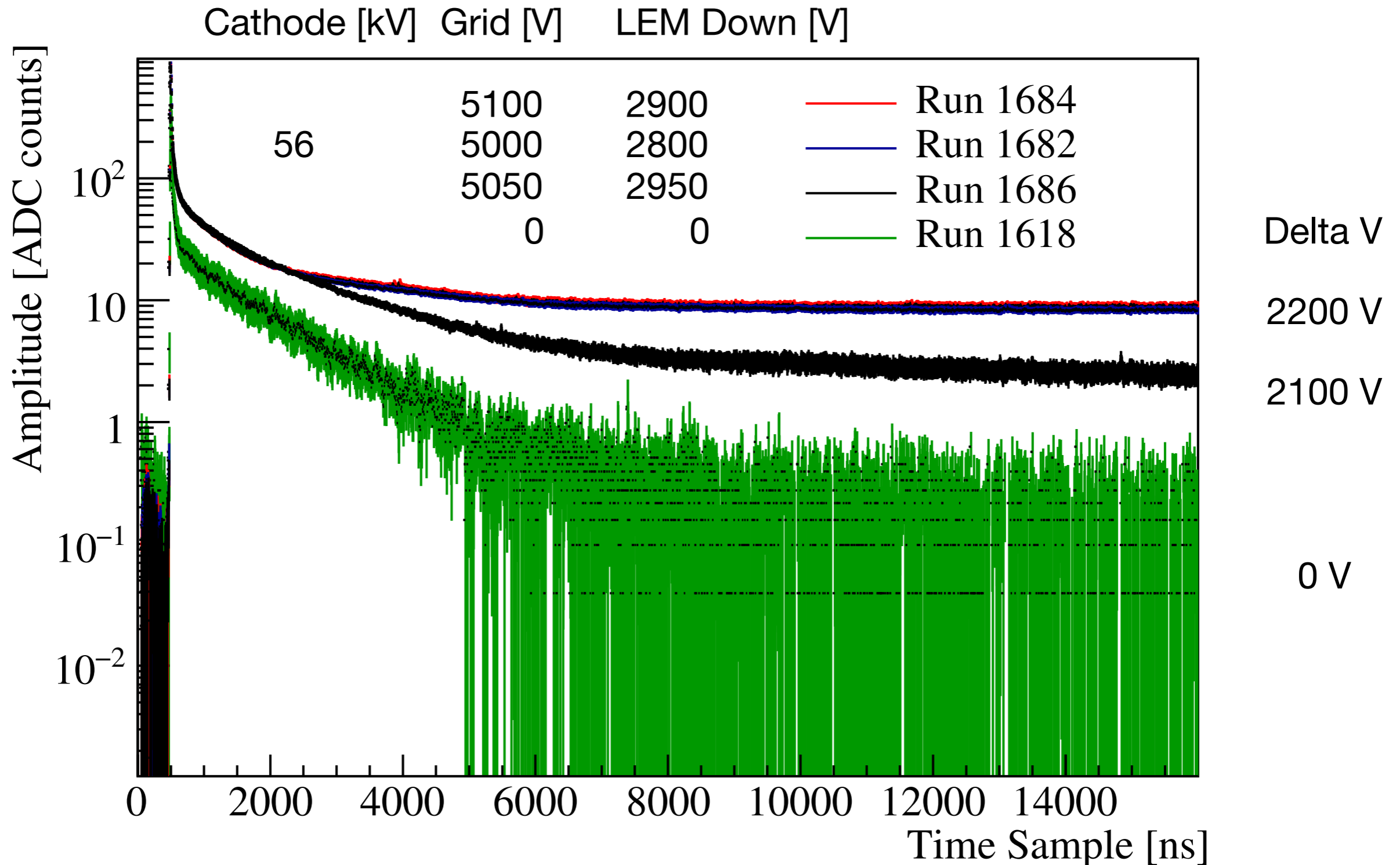


**Observe a dependence of the slow scintillation time component w.r.t. the drift field**

**S2 studies**

# S1/S2 vs extraction and amplification fields

Anne



# Summary

- Data analysis for the 3x1x1 review is ongoing
- Few studies are being proposed:
  - PMT calibration and bases comparisons
  - LAr purity monitoring: scintillation time stability
  - S1 studies: charge, scintillation time
  - S2 studies: charge, S1/S2, drift time
- Thanks to all contributors: Anne, Carlos, Jose, Silvestro