

# PDE measurements with Daphne

## Preliminary Results

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## Setup for measuring X-ARAPUCA efficiency

- X-Arapuca characterization in liquid Argon,
- SiPM HPK ,
- Stainless steel chamber volume  $\sim 10$  liters,
- Digitizer->DAPHNE :
  - 14-Bit
  - 62.5 MHz

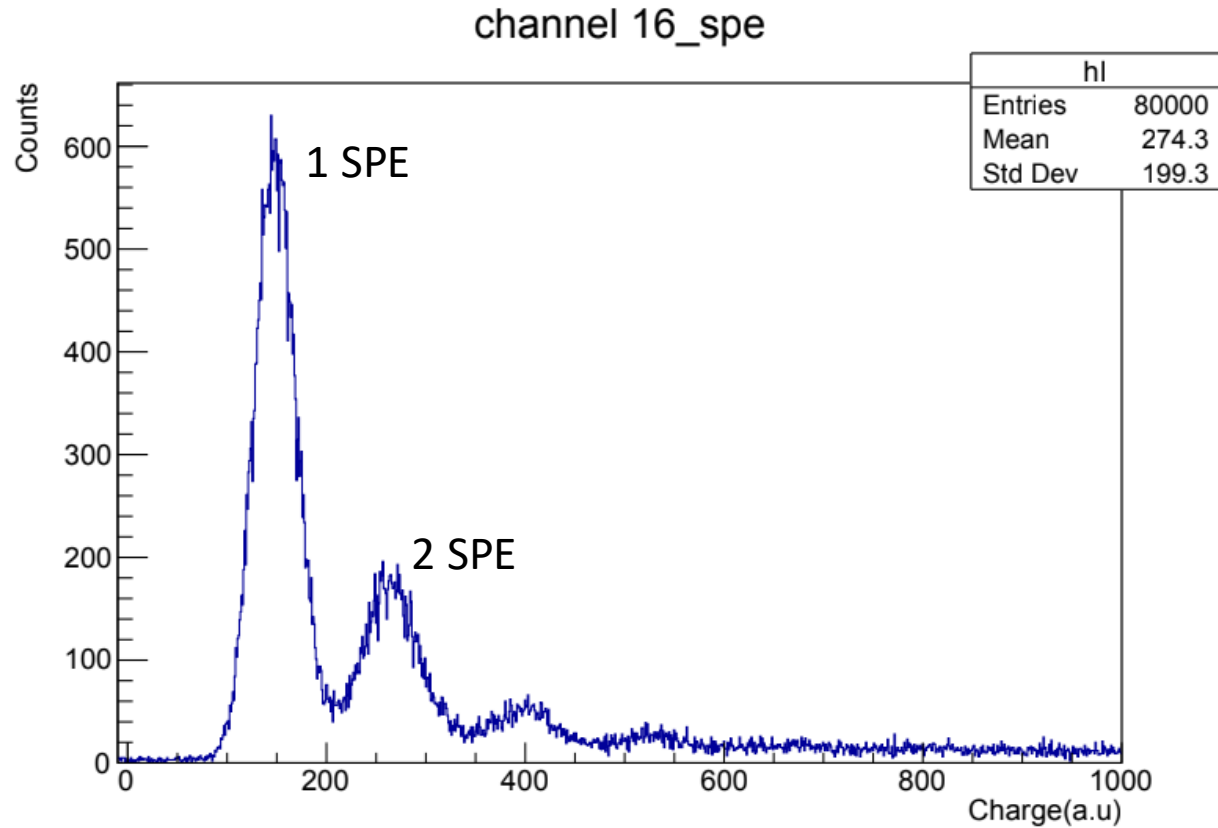


## Comparative measure between OPTO and ZAOT

- Measurement at 45 V (50%PDE)- HPK
- Source ( $^{241}\text{Am}$   $\alpha$ ) at the center of each dichroic filter:
  - Position 1, 2, 3, 4, 5, 6.
  - 40000 samples; 16 ns/sample.
- $\mu$  ->40000 samples; 16 ns/sample.
- Spe->80000 samples; 16 ns/sample.



## SPE- Charge Histogram



The light pulses are individually calibrated in term of SPE.

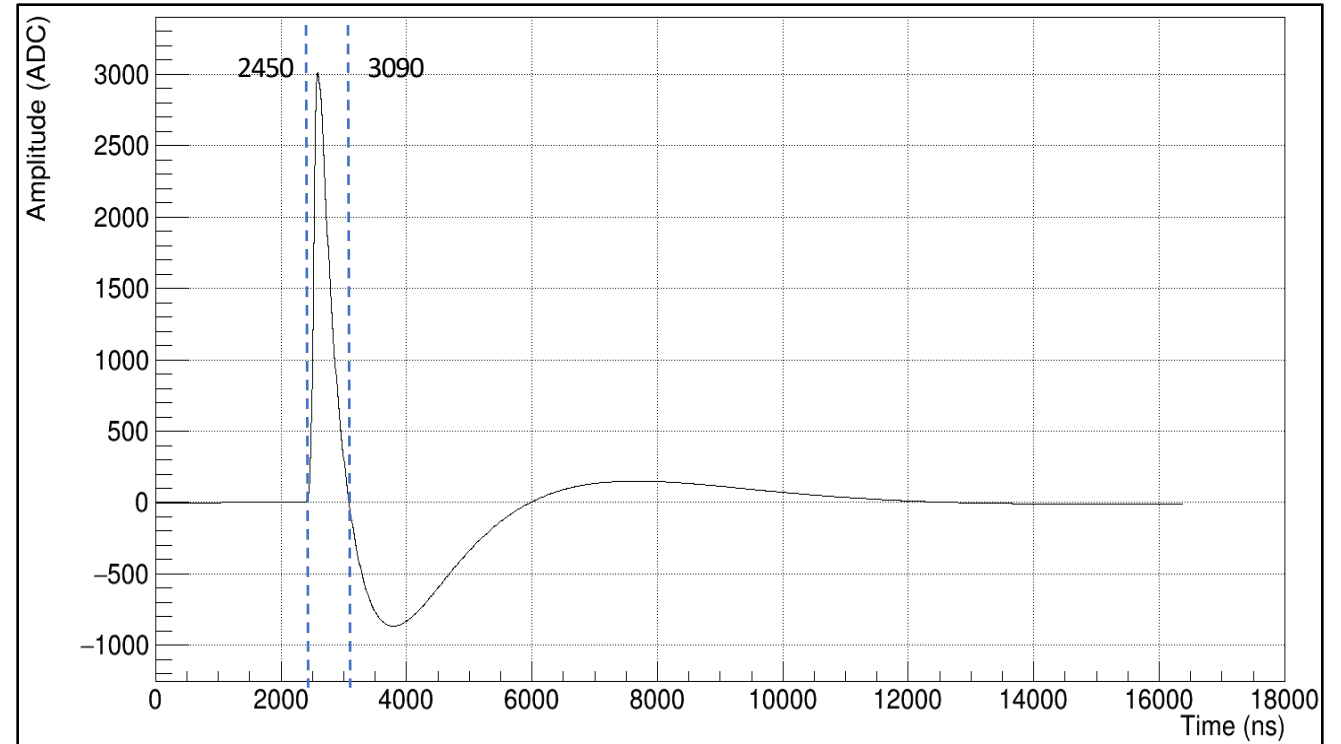
The gain and the S/N are derived, by fitting the charge histogram:

- S/N1=5.3
- Gain=2634 ADC\*ns

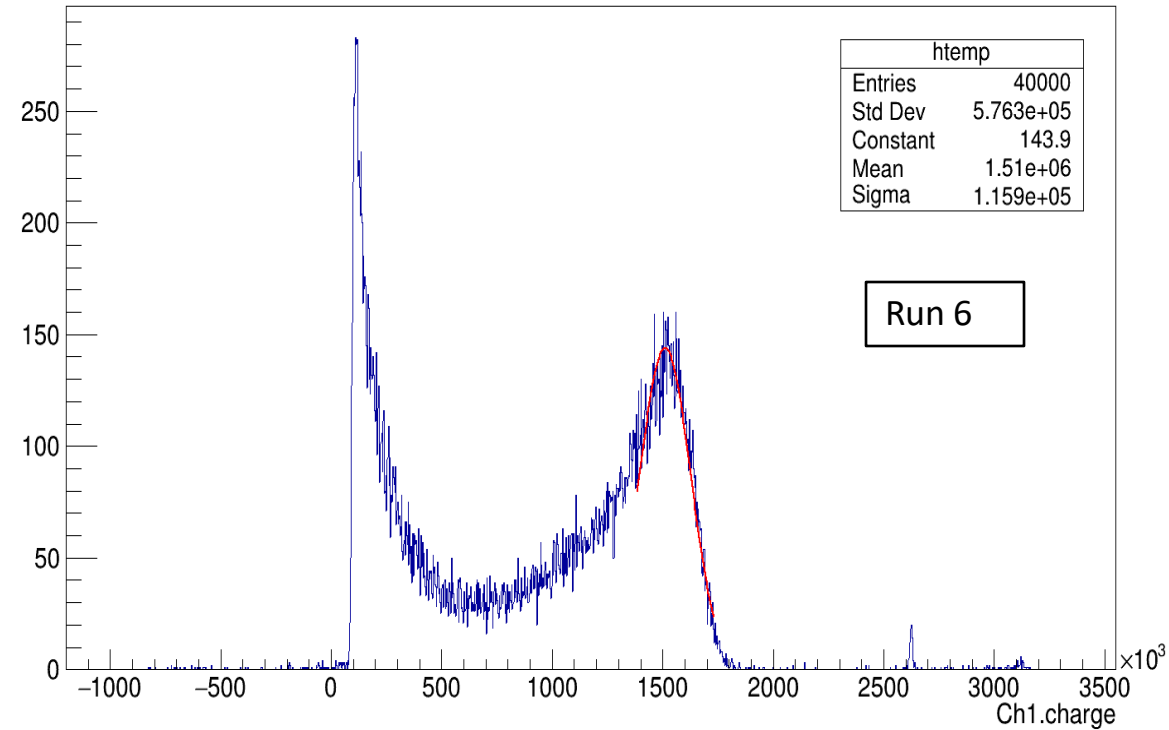
## Alpha average Waveform

Average waveform obtained from the X-ARAPUCA response to the scintillation light produced by  $\alpha$  particle.

For each of the 6 source positions, the waveforms are integrated at a defined time interval to avoid undershoot, e.g. at position 6 the waveform is integrated from 2.45 to 3.09  $\mu\text{s}$  .

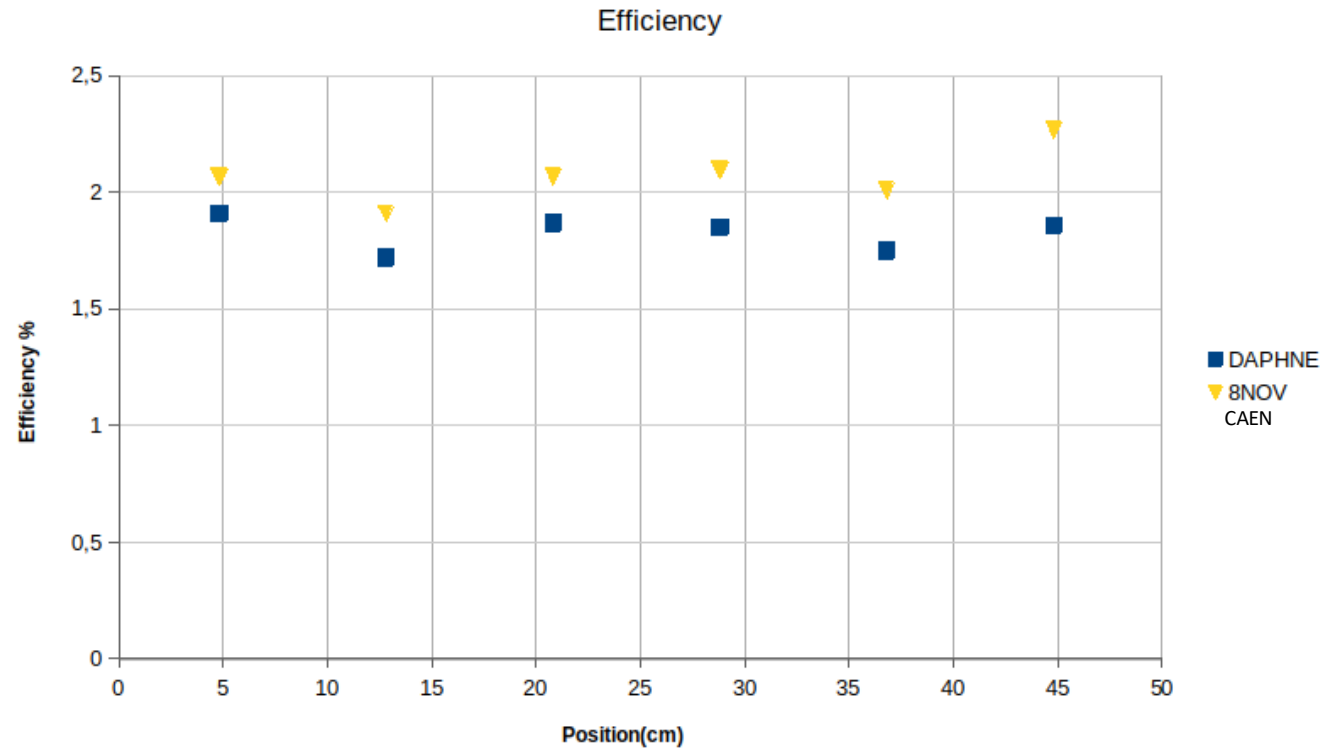


## Fit\_Alpha Spectra



To determine the position of the alpha peak, the mean was obtained from a Gaussian fit.

## Efficiency HPK



The efficiency of X-ARAPUCA is obtained from the following equation:

$$\epsilon = \frac{4\pi \cdot \alpha \text{ peak(ADC)}}{\text{s.p.h.e. (ADC)} \cdot f_{int} \cdot LY_{LAr} \cdot E_{n\alpha} \cdot q_{\alpha} \cdot \Omega}$$

where,

$f_{int}$  (HPK factor) = 0.86 ,

$LY_{LAr}$  = 50000

$E_{n\alpha}$  (alpha energy) = 5.48 MeV

$q_{\alpha}$  (quenching factor) = 0.7

## Next Steps and conclusions

- Include the statistical error of the efficiency and the systematic solid angle error.
- DAPHNE Calibration ->ADC scale DAPHNE & CAEN.
- Optimal results have been obtained with DAPHNE at this stage of digitization in LAr.