

Xenoscope

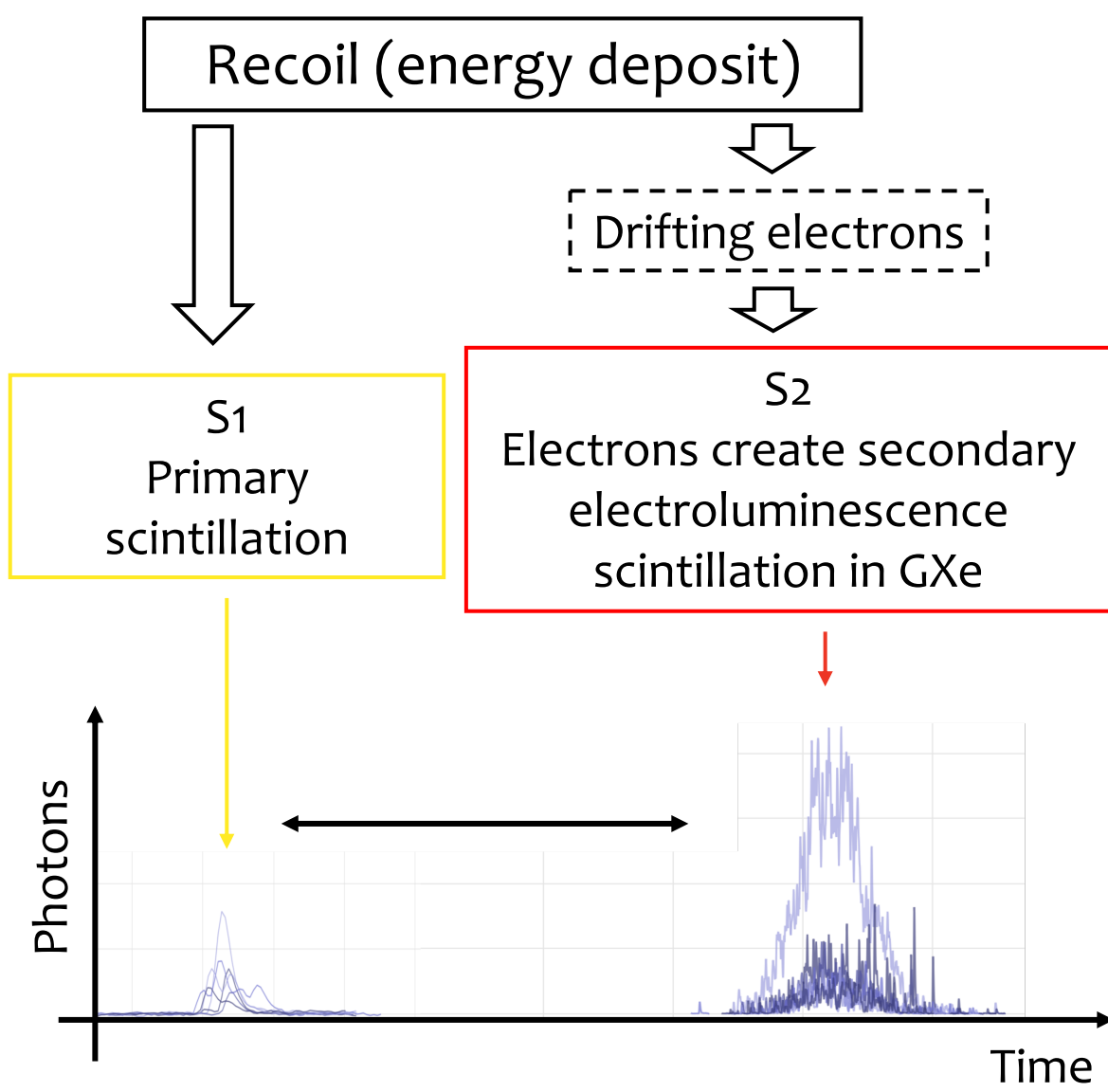
Rebecca Hampp on behalf of the Xenoscope team

XLZD

- Collaboration of XENONnT, LUX-ZEPLIN and Darwin
- Design and construction of next generation detector
- Rare event searches with focus on dark matter
- 3 meter in radius and height
- 60-80t active target mass



Liquid xenon TPCs

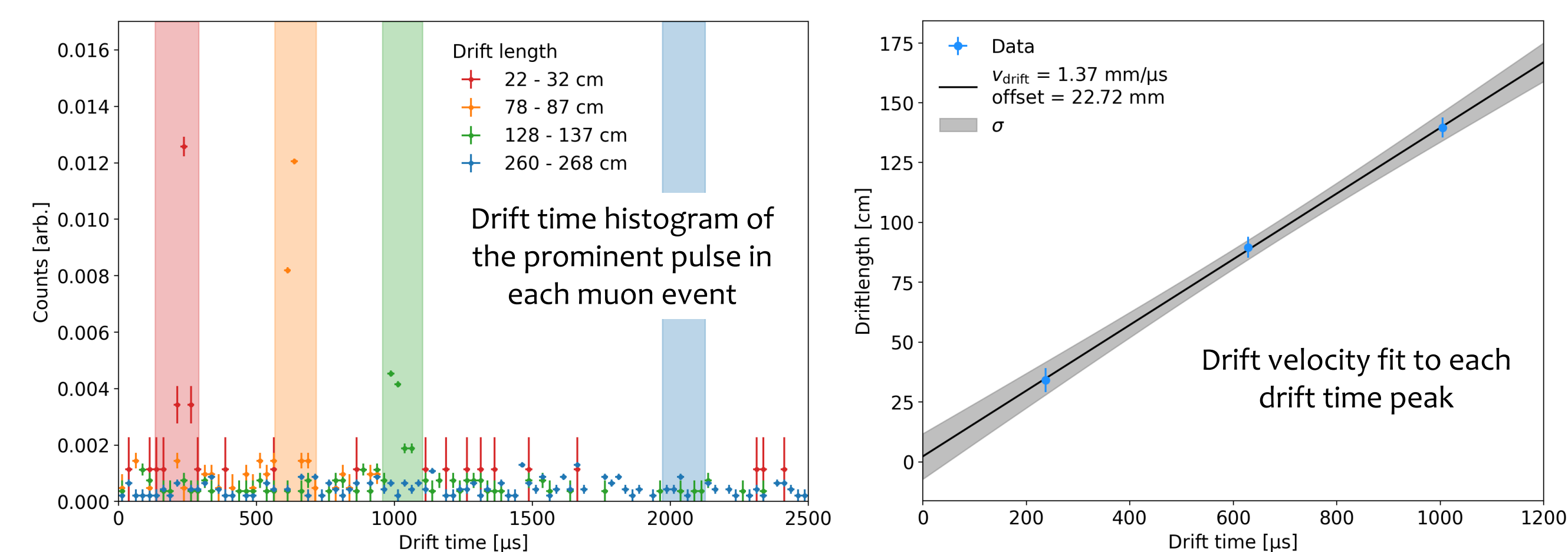


- Combined light (S1) and charge (S2) signal
- The S1/S2 ratio is different for recoiling electrons and atoms
- Drift time allows to determine Z position
- The horizontal position of the S2 gives the event XY position

Commissioning & Science Run 1

Goal: Prove of concept and drift demonstration from 260cm

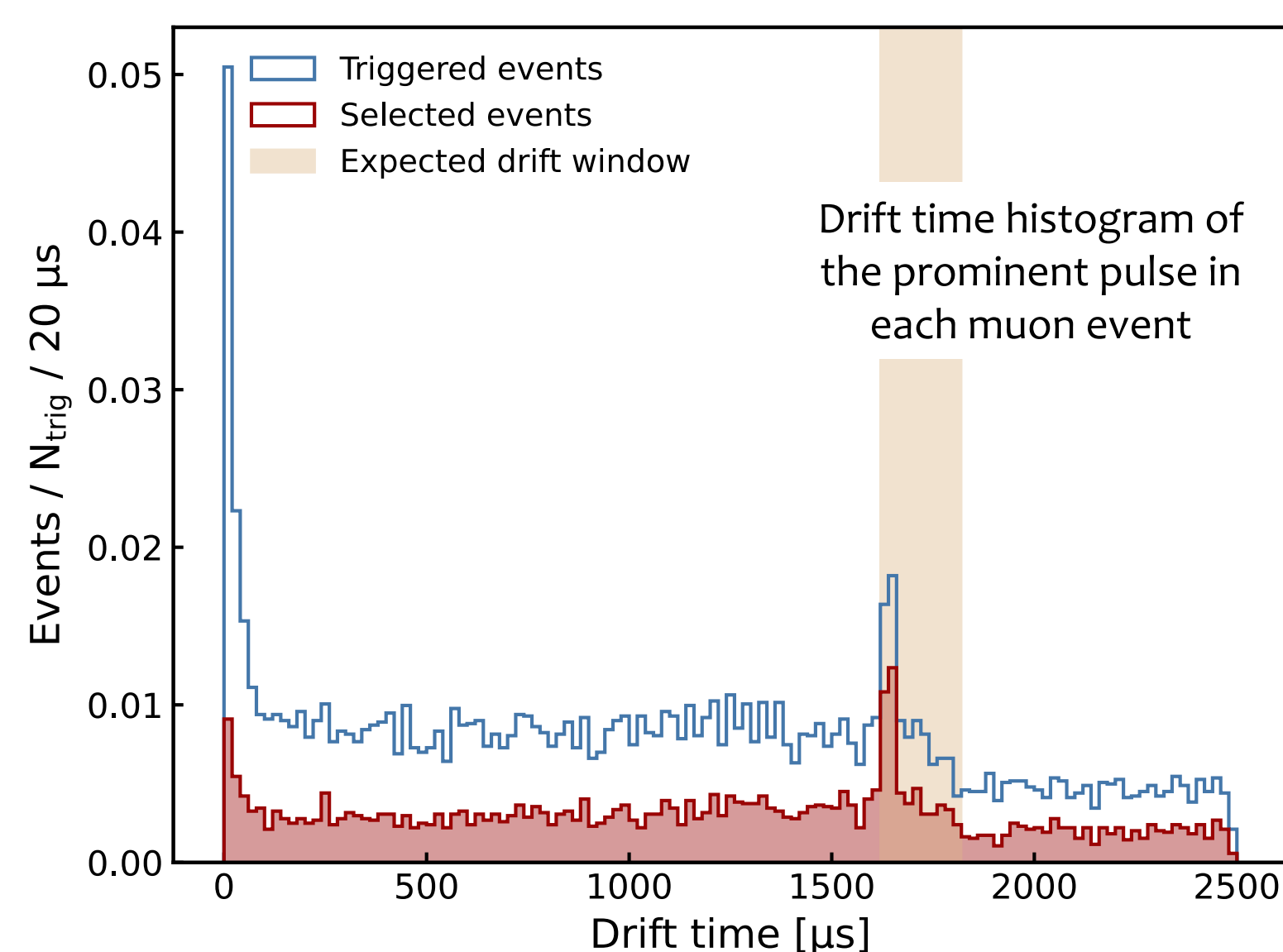
- Demonstrated S2 production and extraction from muons
- Pulse classification with a Difference-of-Gaussians algorithm tuned on muon data
- Drift speed measurement with muon interactions at different depths at a drift field of 80V/cm



Science Run 2 – Preliminary

Goal: Drift demonstration from 260cm

- Fully characterized the SiPM array in liquid xenon
- Muon coincidence measurement with a drift field of 95V/cm
- Demonstration of electron drift from muons over a drift length of 230cm
- No visible signal from the photocathode



Future

- Study light propagation in liquid xenon
- Electron cloud diffusion study
- Radon mitigation: Copper surface coating of the inner cryostat
- Liquid xenon skin tagging: Chains of SiPMs to improve light collection

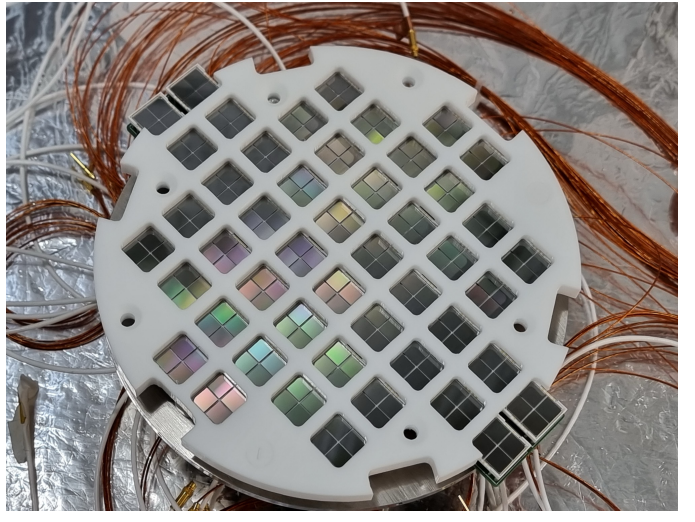
Large Scale Liquid Xenon Demonstrator

Read in this order

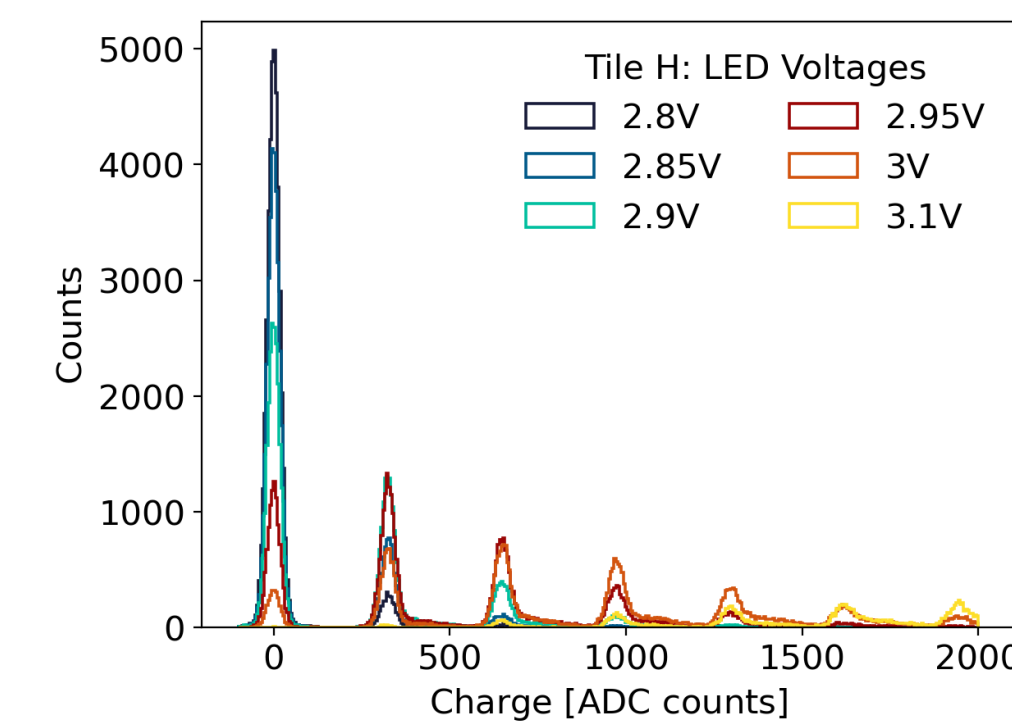


SiPM Array

- SiPMs: Hamamatsu S13371
- 12 tiles with $12 \times 12 \text{ mm}^2$ sensitive area each
- Array placed at the top of the TPC
- Parallel readout by two CAEN digitizers



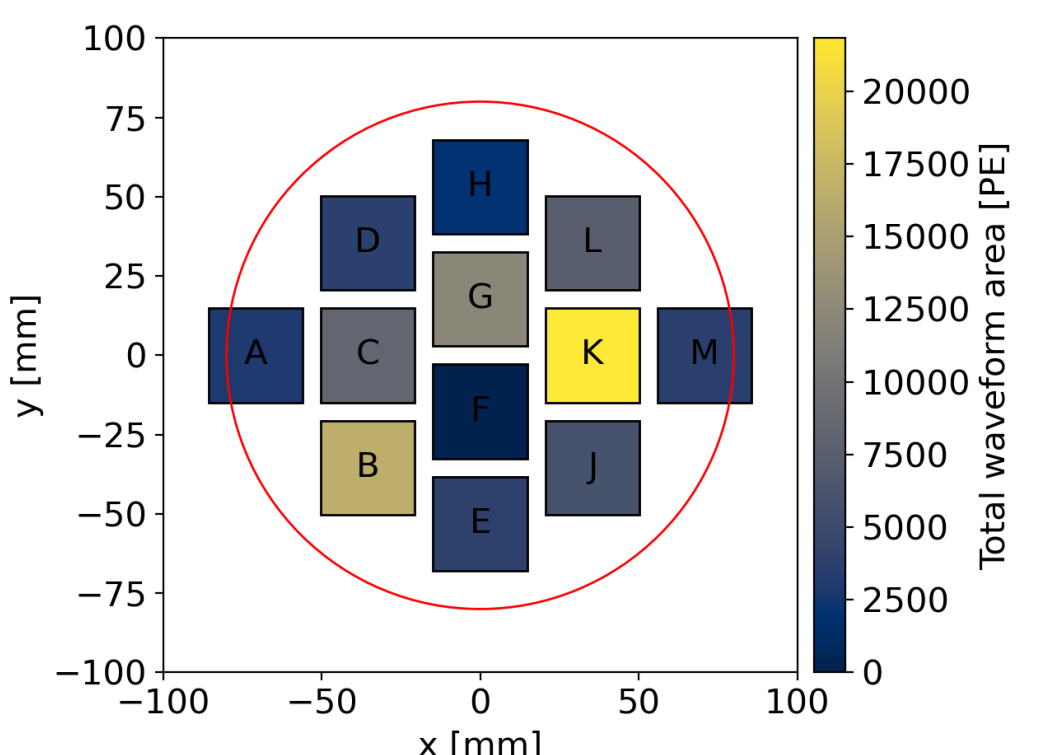
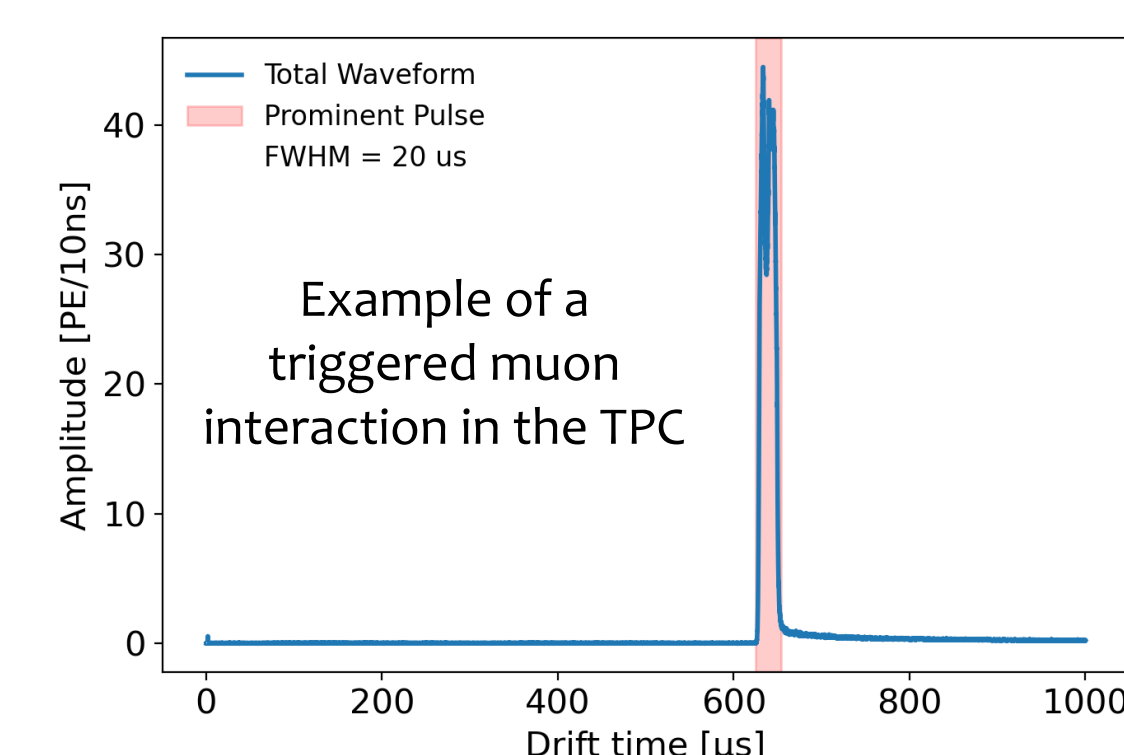
LED Calibrations



- Optimized LED voltage level for each tile based on occupancy
- Gain extraction via gaussian fit to the pedestal and 1 SPE peak
- Gain evolution with daily LED measurements

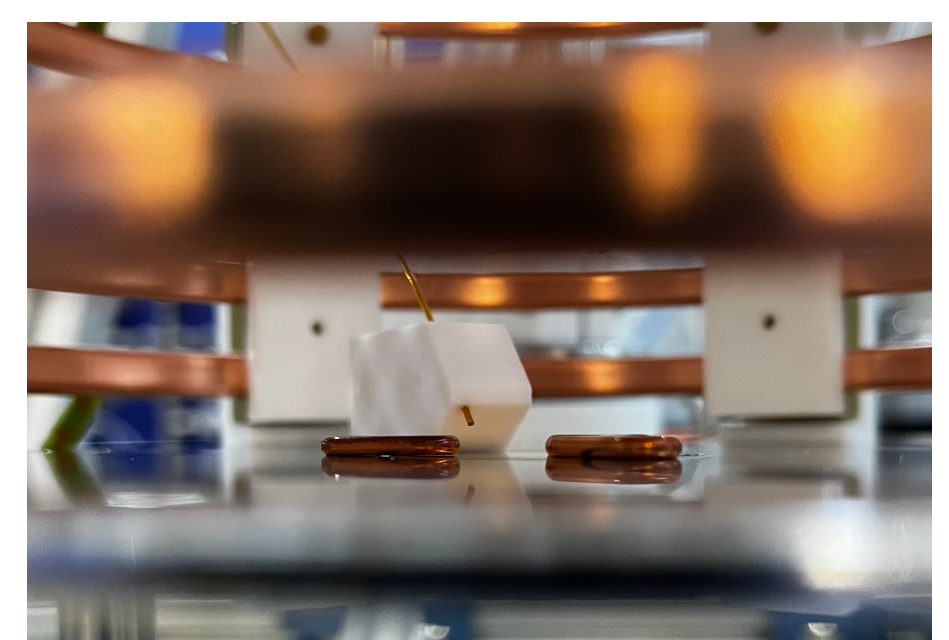
Muon Trigger

- Two plastic scintillators with a 3" PMT on each side of the TPC
- Variable height of the panels
- Used as a trigger in case of a coincidence
- Additional horizontal panel at the top of the TPC acting as a veto against vertical showers



Photocathode

- Gold coated photocathode (50 nm thickness) on a quartz substrate (2mm thick) on the cathode of the TPC
- Flash lamp pulse transmitted through optical fiber
- Liberating $\sim 10^6$ electrons / pulse at 1Hz



Facility

- Power distribution
- Heat exchanger
- Cooling tower
- Purification gas system
- High-pressure storage vessel of liquid recovery system
- Long term xenon storage

TPC

- 15cm in diameter, 2.6m in height
- 360 kg of xenon

