Light Detection System of the DUNE Near Detector LAr TPC

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PAC, Dubna, 2022

ArgonCube Module Prototype

- Size - 670x670x1200 (1810) mm

- Cathode plane in the center

- Pixel plane 60x120 mm = 2 x 8 planes

- LCM/ArcLight ~
  30 cm x 120 cm - 4 planes

- Current solution
  LCM/ArcLight = 50/50%.

- 48 SiPM for LCM and 48 ArcLight

Light Detection System intention

- Provide t0-trigger for track connection

- Resolve event pileups

- Assigned detached energy events

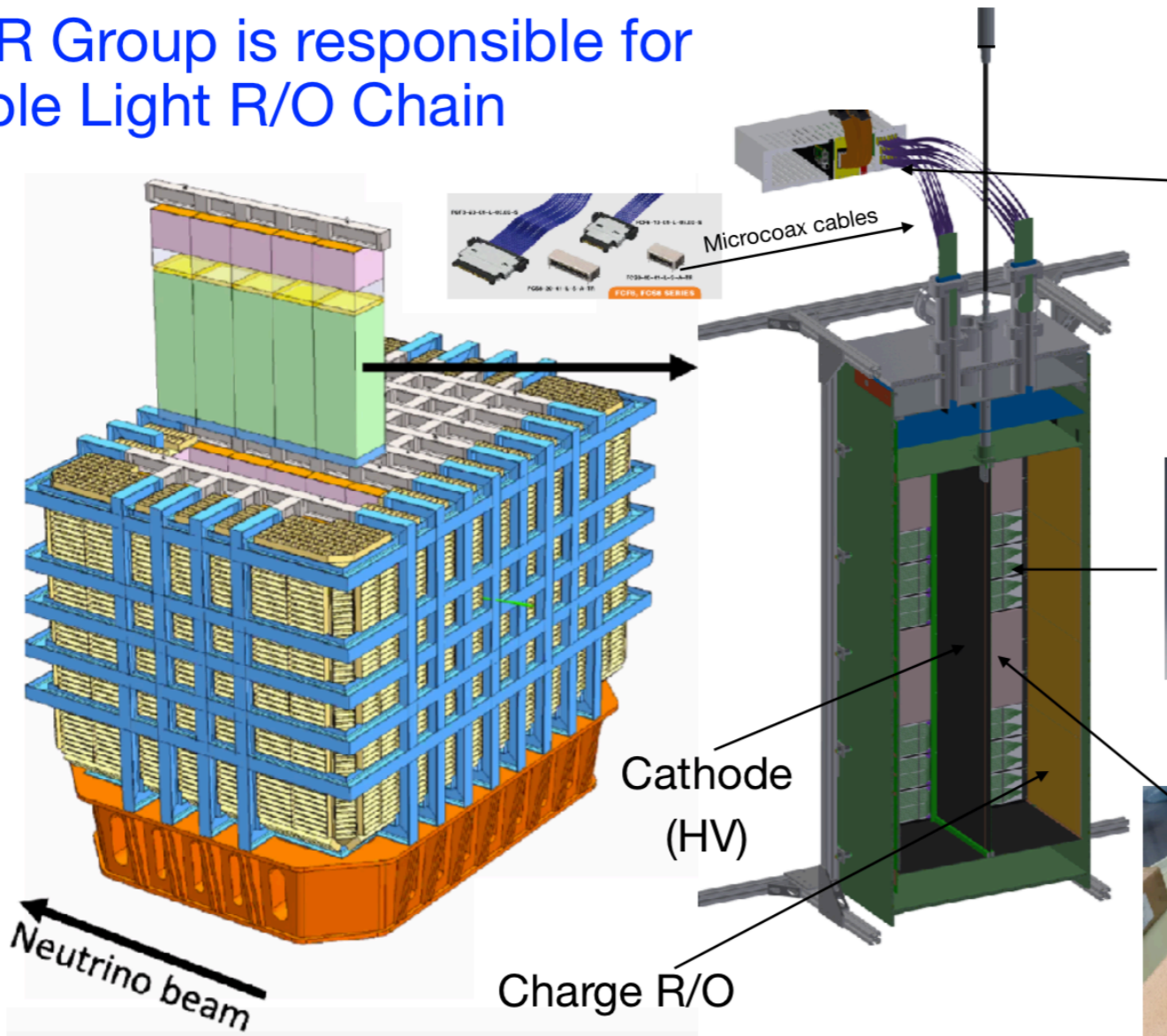- Improvement of the energy resolution
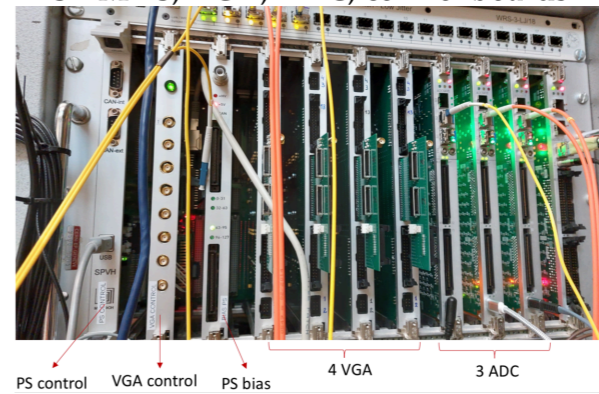 by the Light-Charge correlations
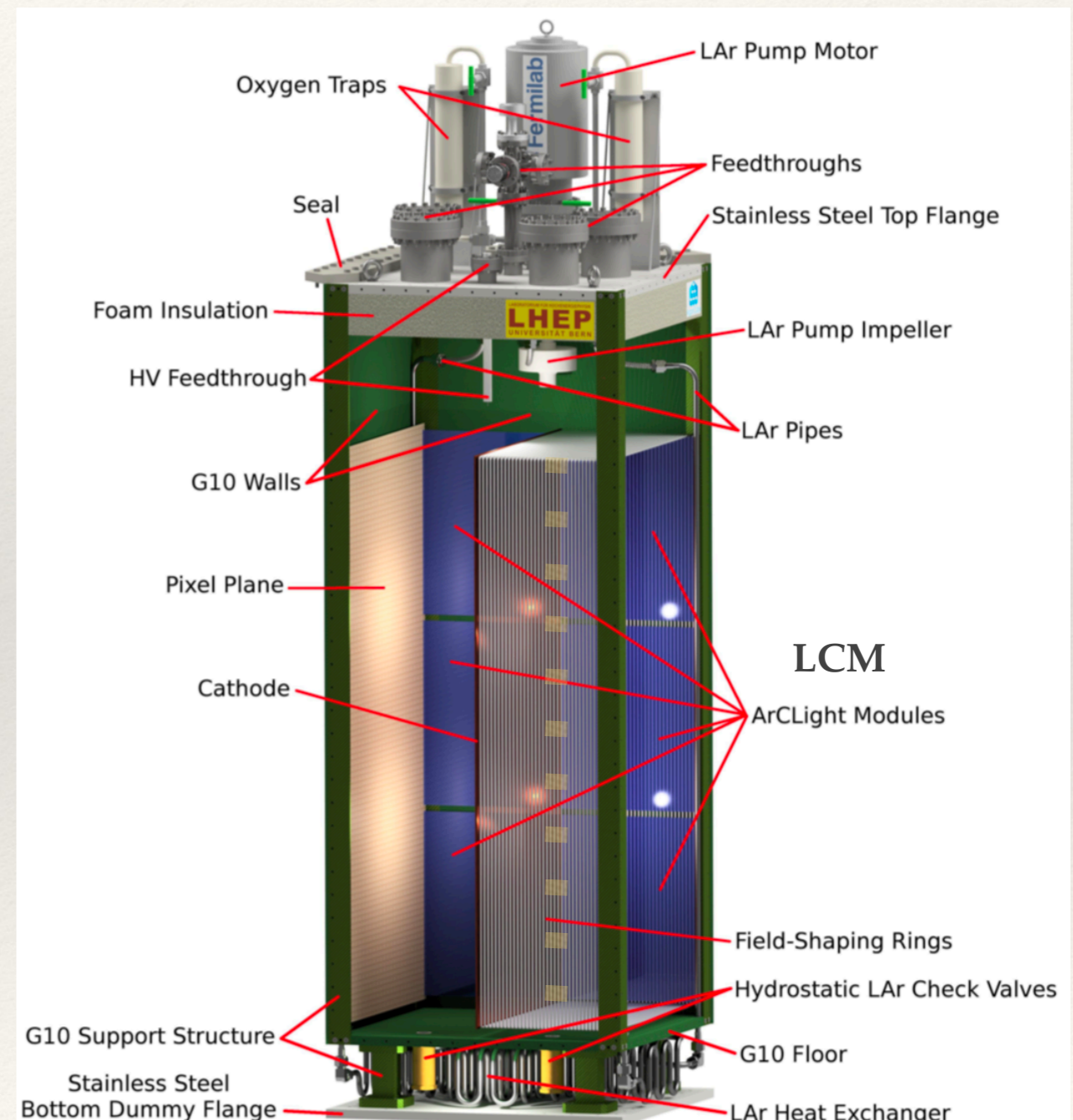
Full readout chain

Light R/O for LArTPC of the DUNE ND

JINR Group is responsible for whole Light R/O Chain
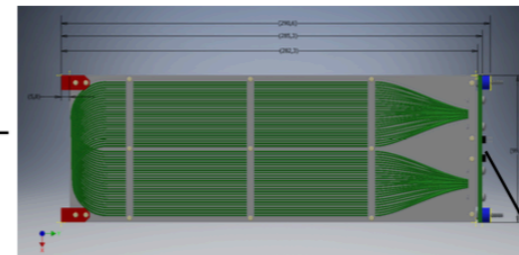
Crate with JINR custom electronics: SiPM PS, VGA, ADC, control boards

Slow Control Software

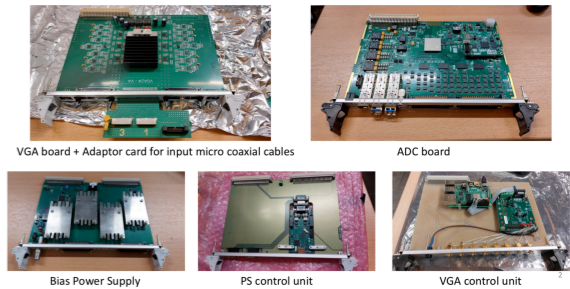Microcoax cables

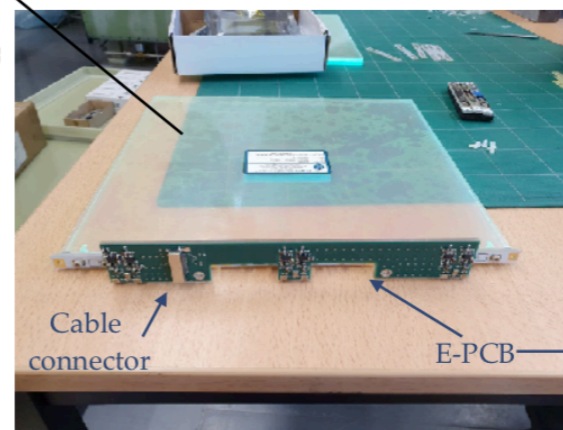PS control   VGA control   PS bias   4 VGA   3 ADC

LCM

LRO electronics

VGA board + Adaptor card for input micro coaxial cables   ADC board

Bias Power Supply   PS control unit   VGA control unit

DUNE ND LArTPC 7 x 5 Modules

Cathode (HV)

Neutrino beam

Charge R/O

ArcLight

Cable connector   E-PCB
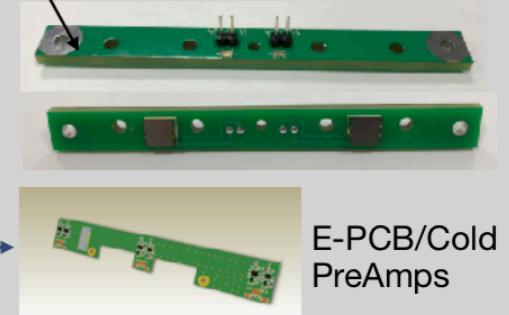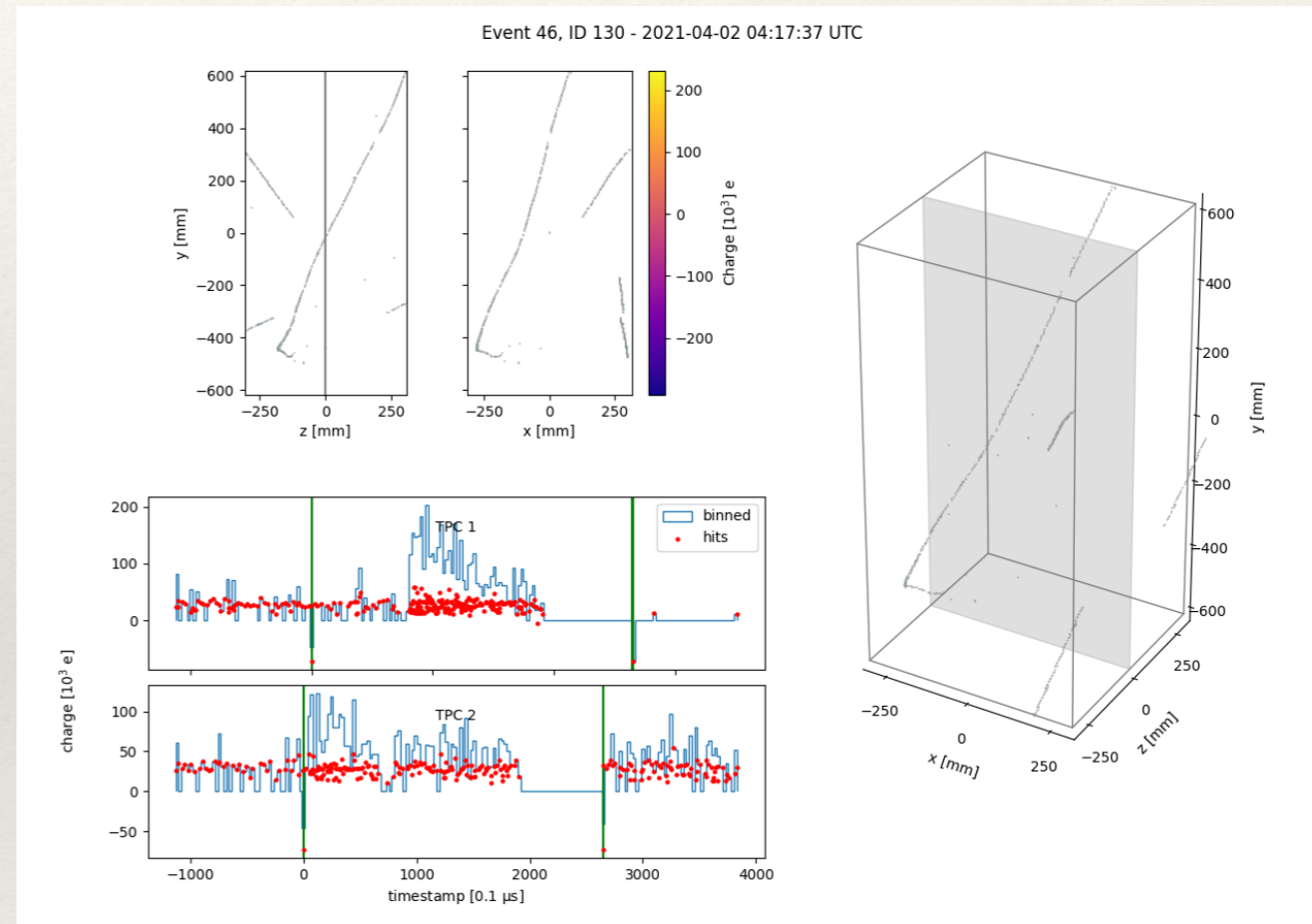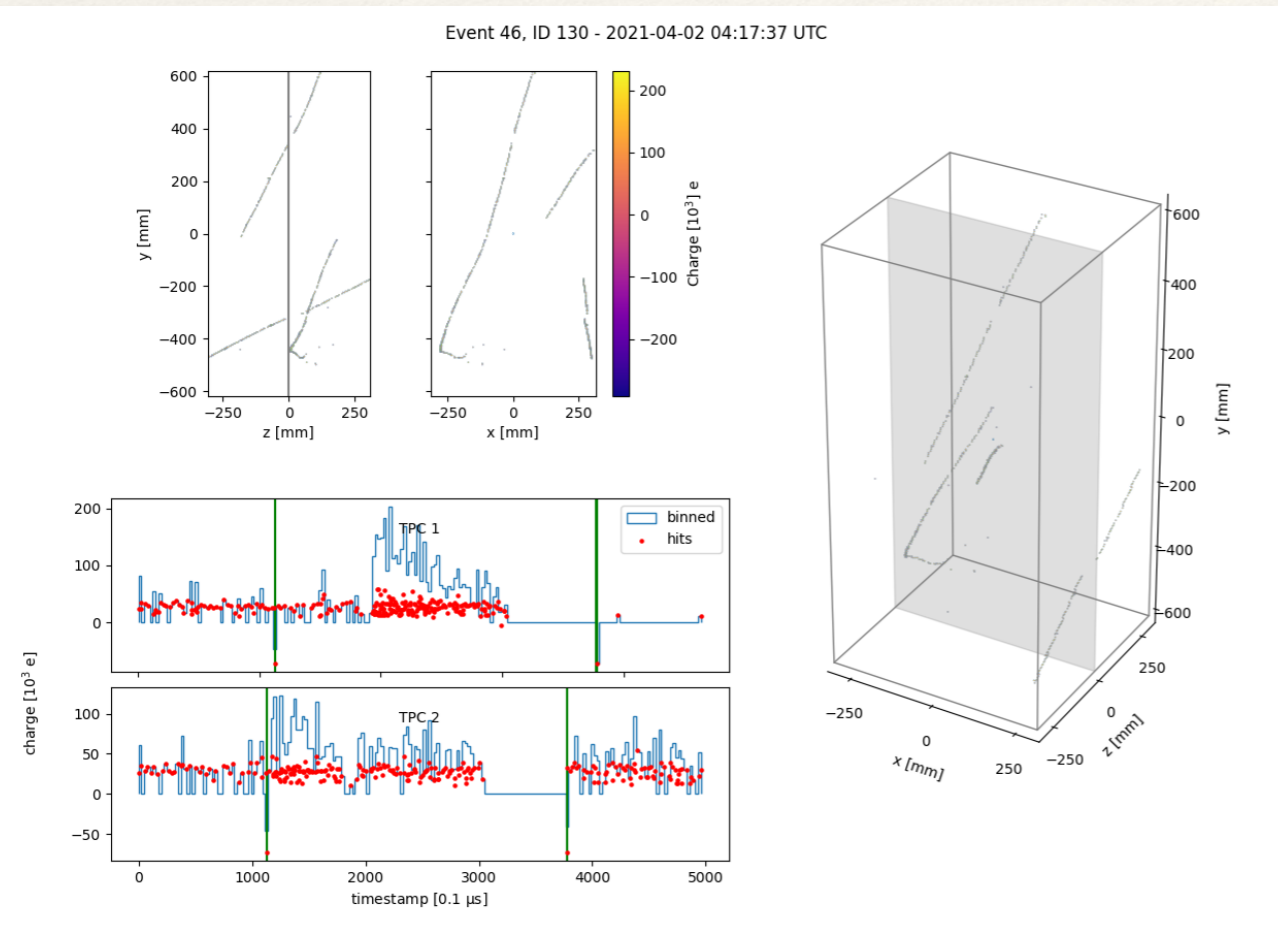
R/O Chain

SiPM Boards

E-PCB/Cold PreAmps

Including: Detectors, electronics, Front-End, DAQ, Slow Control, Calibration system

Events reconstruction
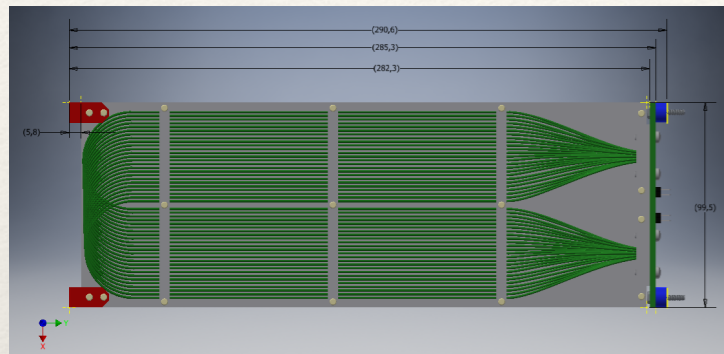
Without t0 reconstruction

t0 corrected

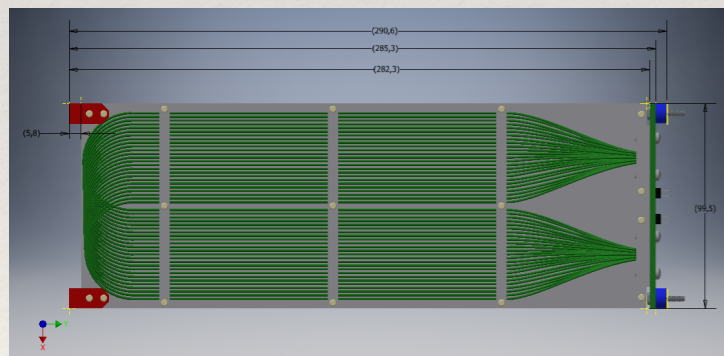Evaluated efficiency for the Light Detectors:

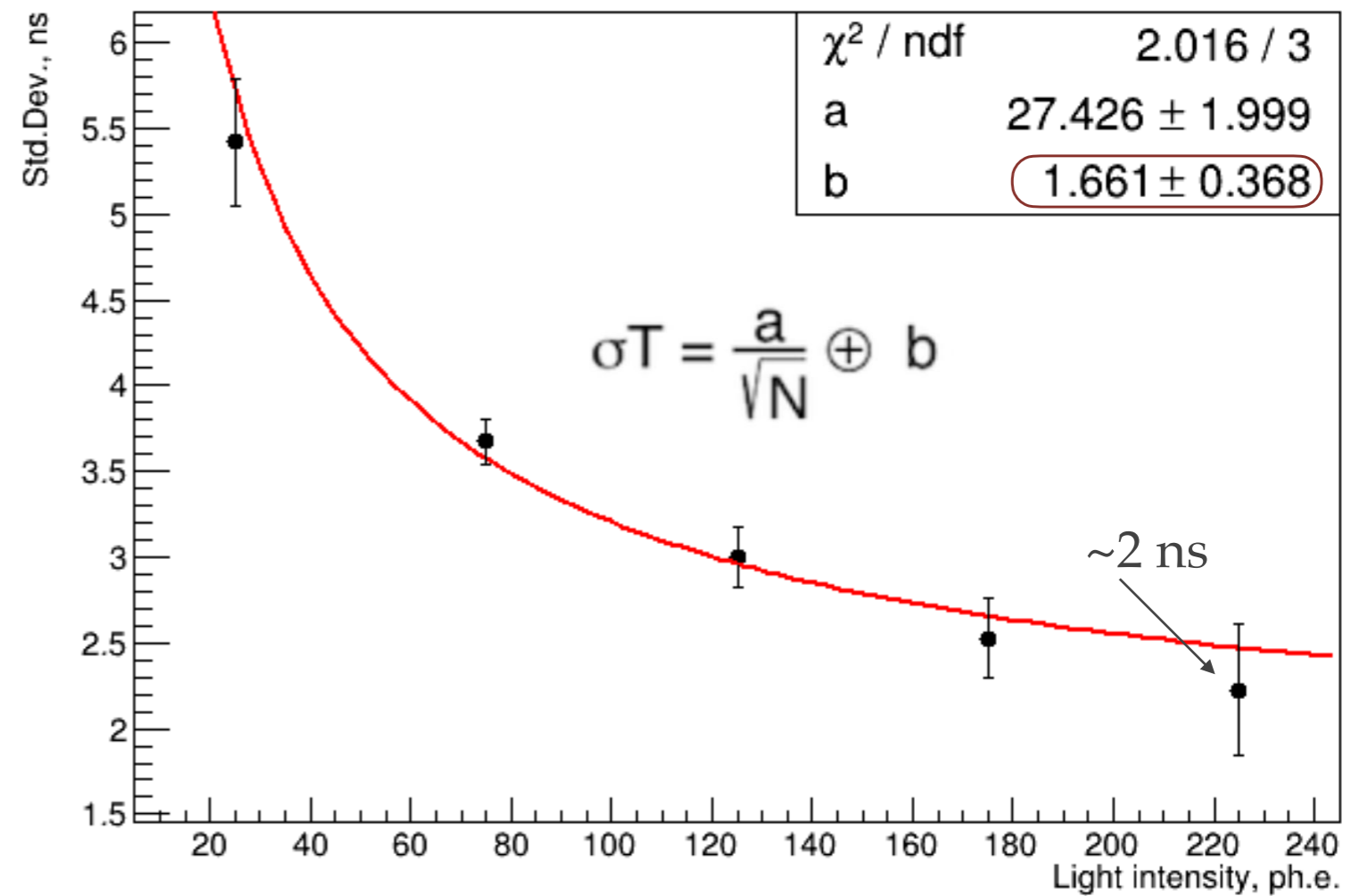LCM - ~1%

ACL - ~0.1 %

Time resolution (Slicing)

Michel event in LDS (short pileup)

20210405_172833

Michel event
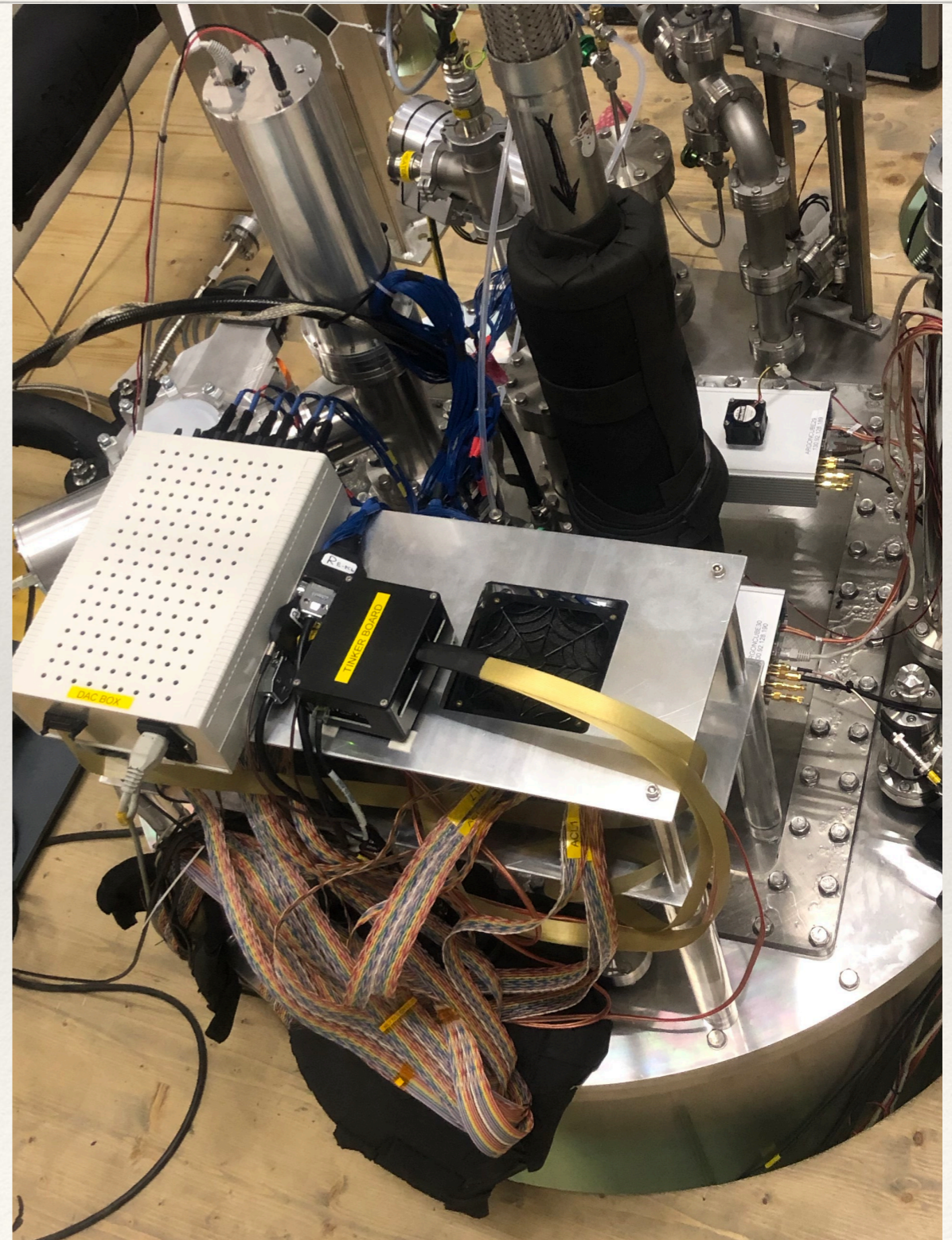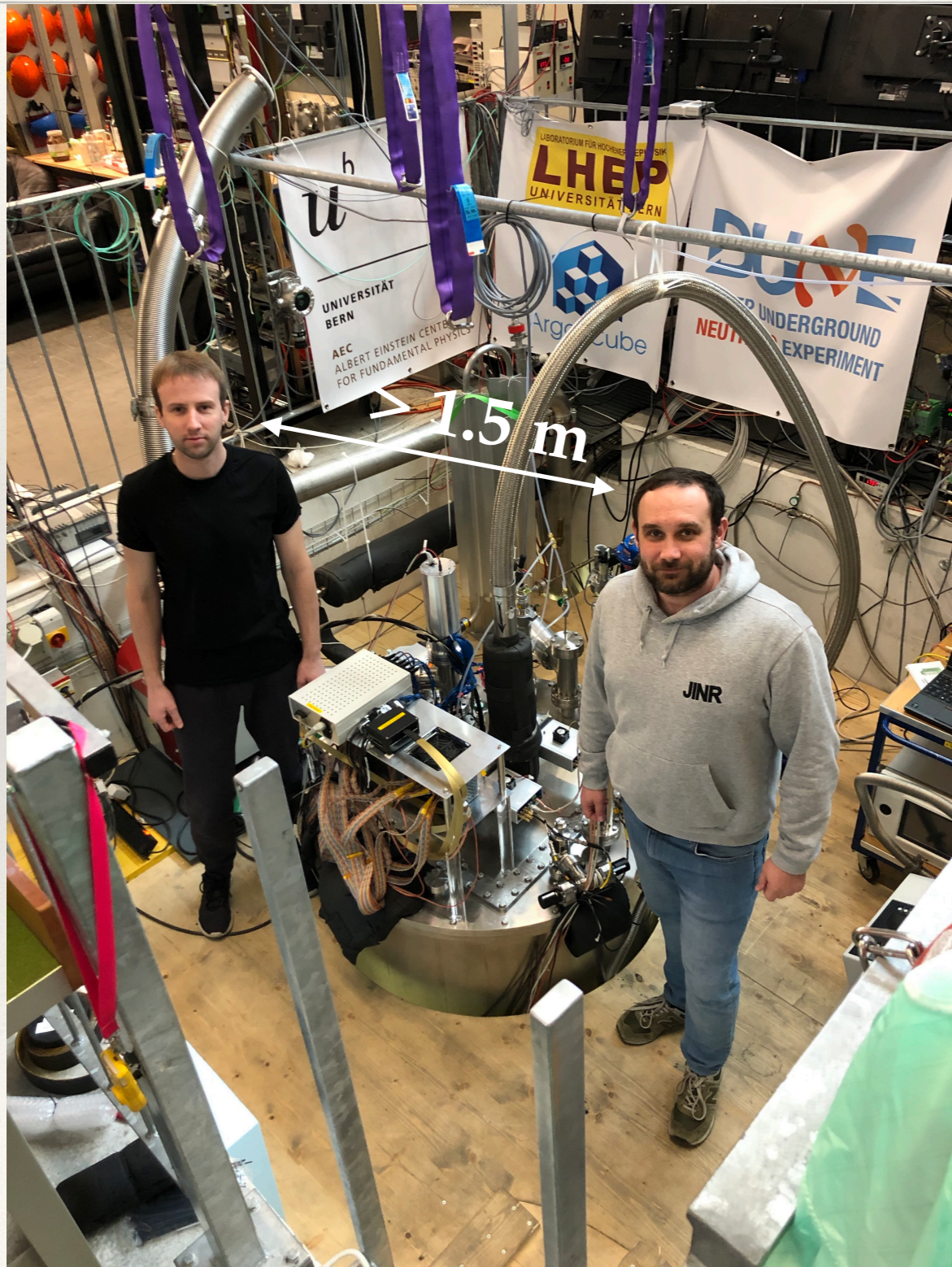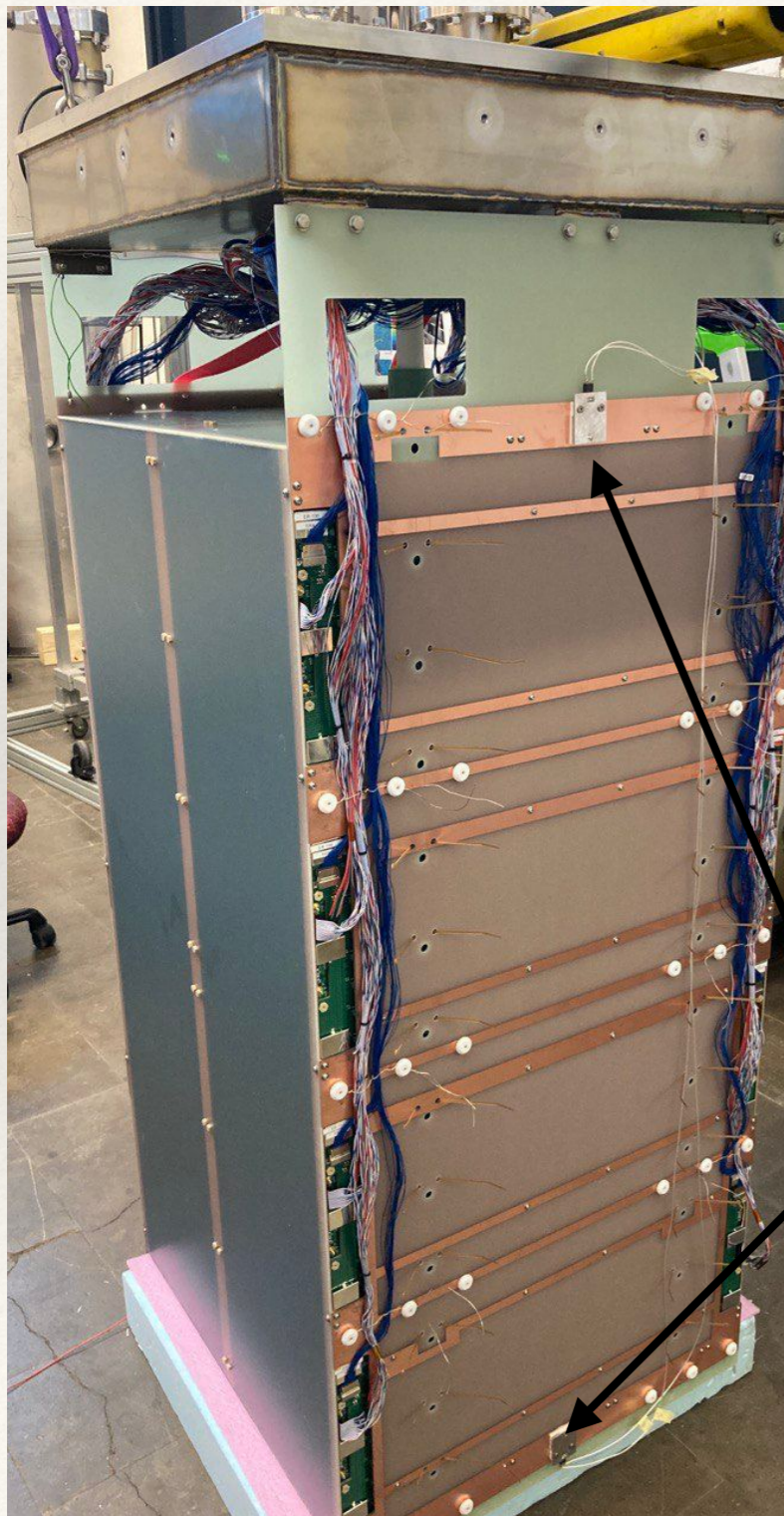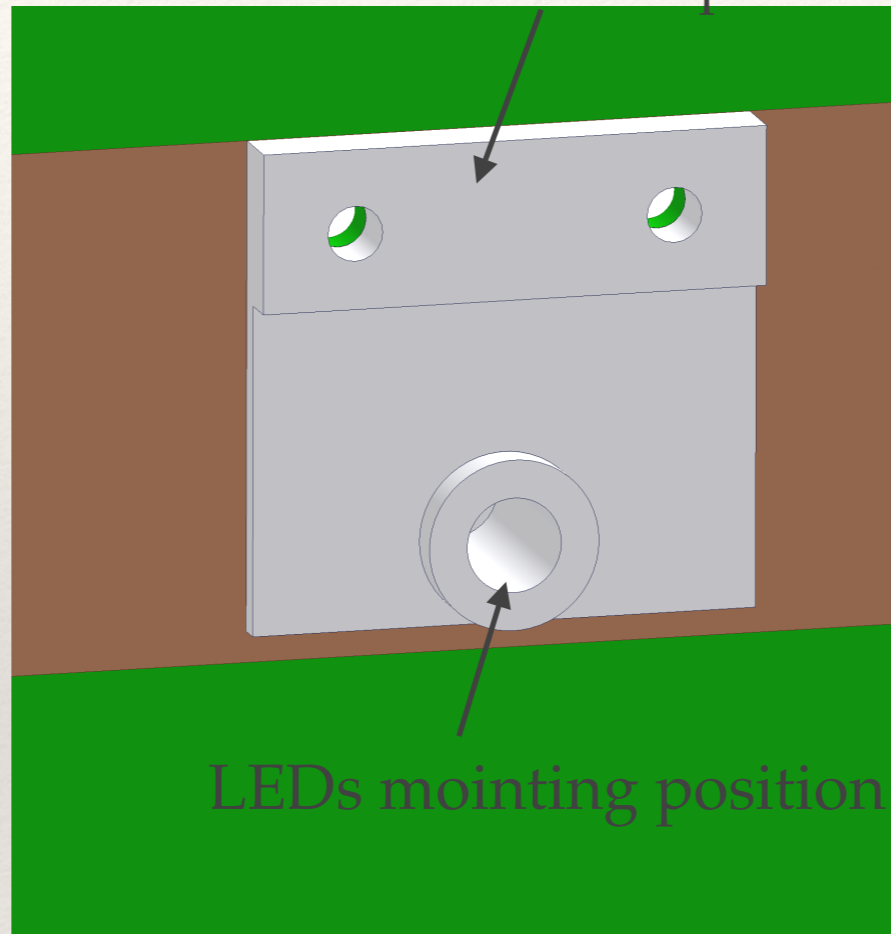LDS #139924-139923
CDS #246825
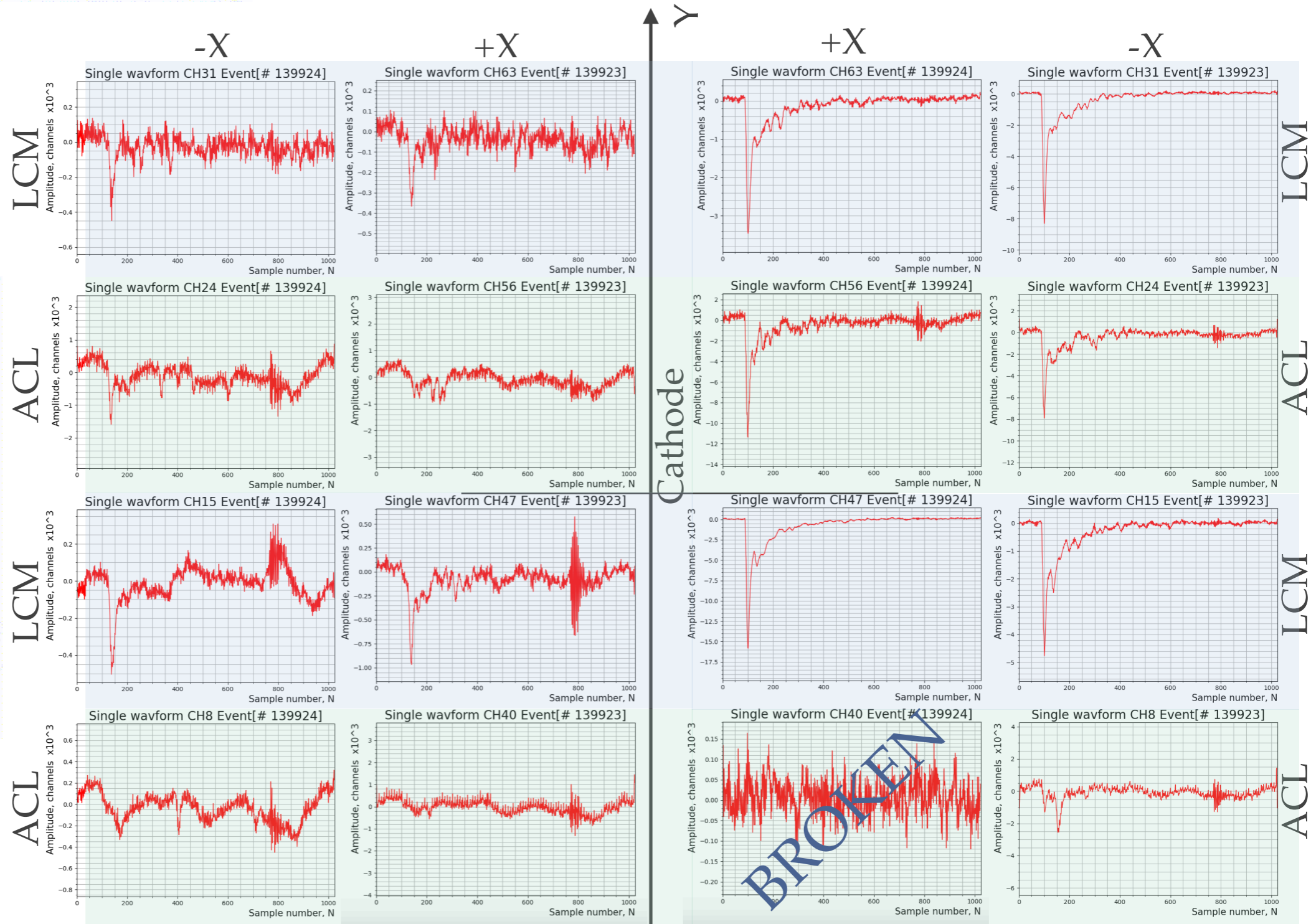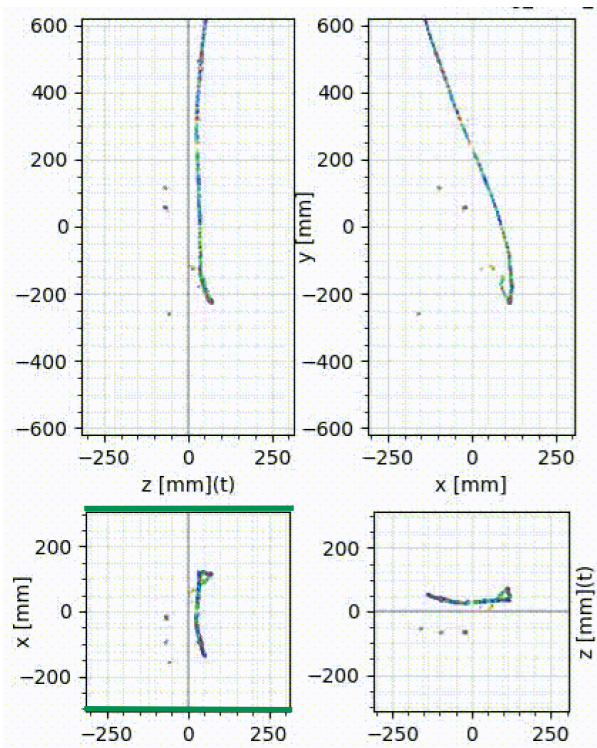
Pileup = 250 ns

Backup

Module0 Fully Instrumented

LDS calibration system

2 LEDs (UV&blue) holder with PTFE diffuser on TPC anode backplane

PTFE diffuser

LEDs mointing position

LEDs placement location