HERD Trigger Sub-System Design and Preliminary beam test results

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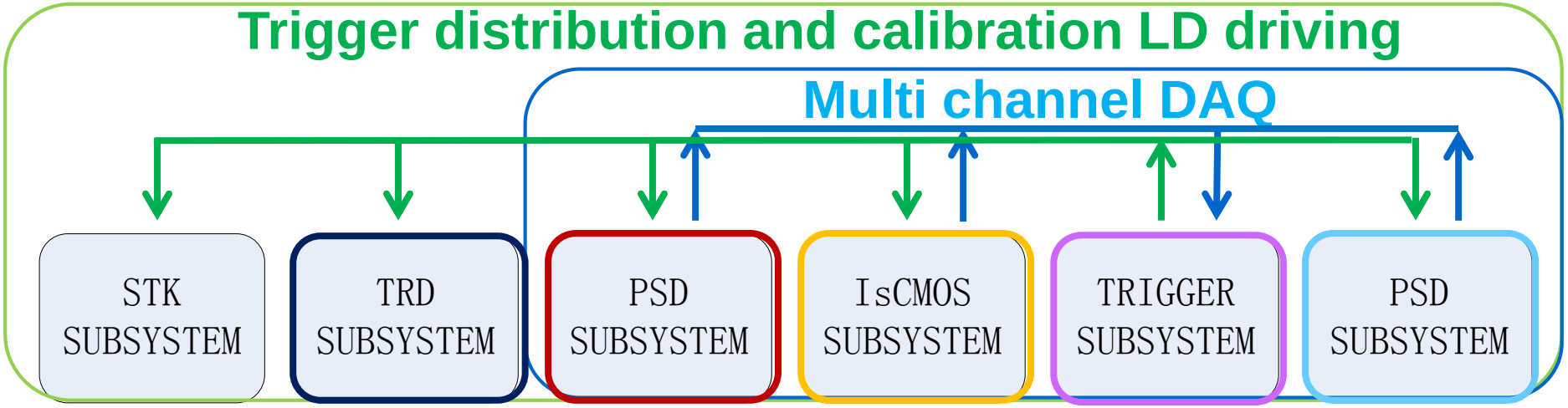
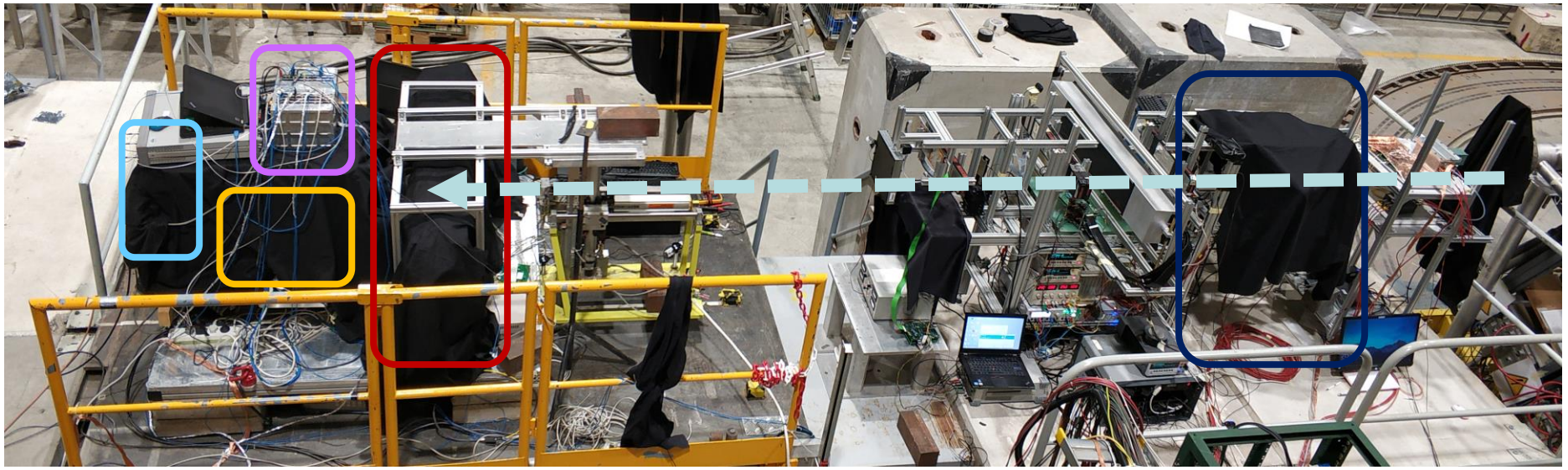
Introduction

HERD Trigger Sub-System Design and Preliminary beam test results

- Trigger sub-system design
- Beam test and DAQ status
- Preliminary beam test results

Trigger sub-system: role in the beam test

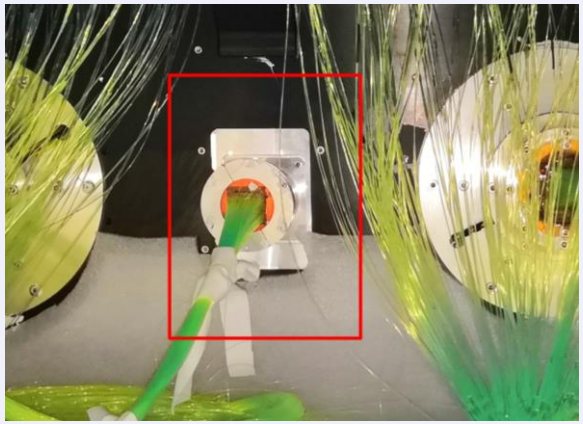




Trigger sub-system construction

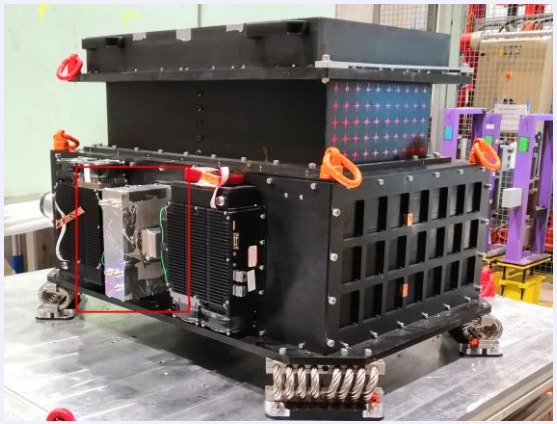
Trigger sub-system layout

Trigger fiber cluster and Attenuator



- 500 channels trigger fiber from CALO cell
- Attenuator transmittance:1%

PMT and Front-end electronics

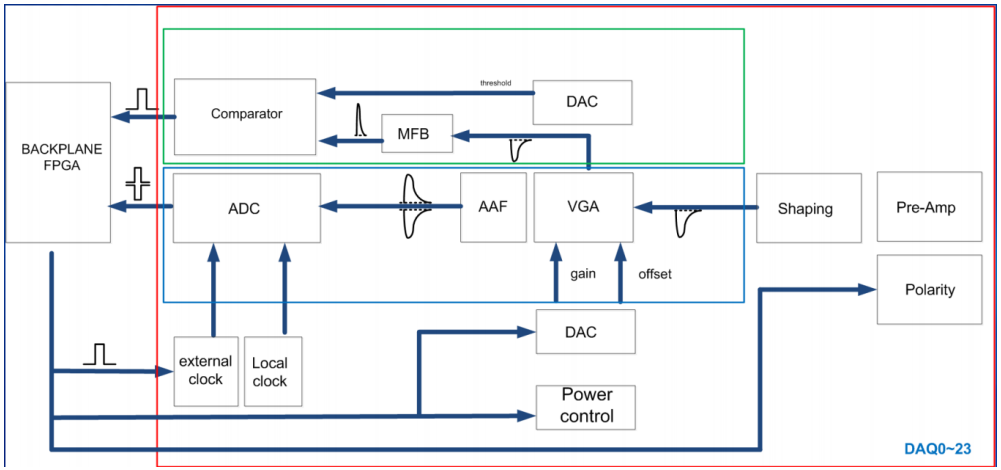


- Anode and dynode readout
- Preamplifier and Shaper integrated

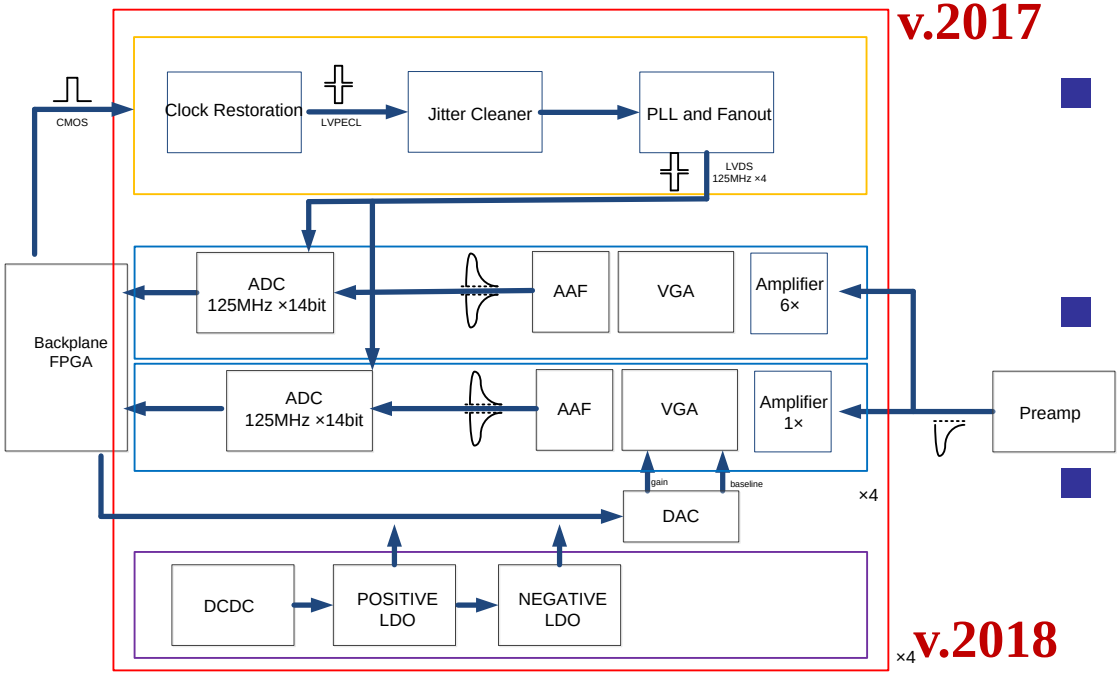
Multi channel DAQ electronics

- 125MSPS ×14bit continuous waveform acquisition
- Double channels readout

Multi channel DAQ system : v.2017 vs. v.2018



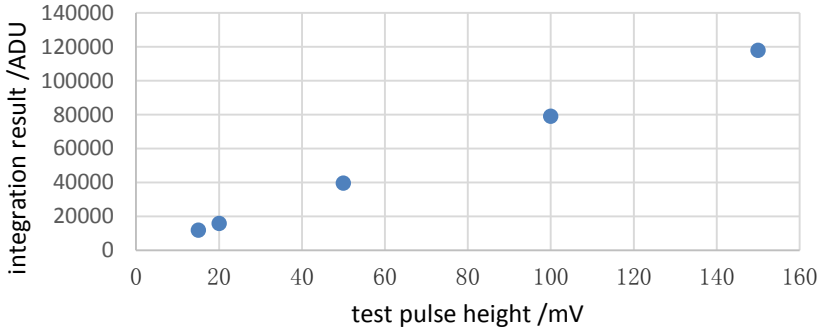
v.2017

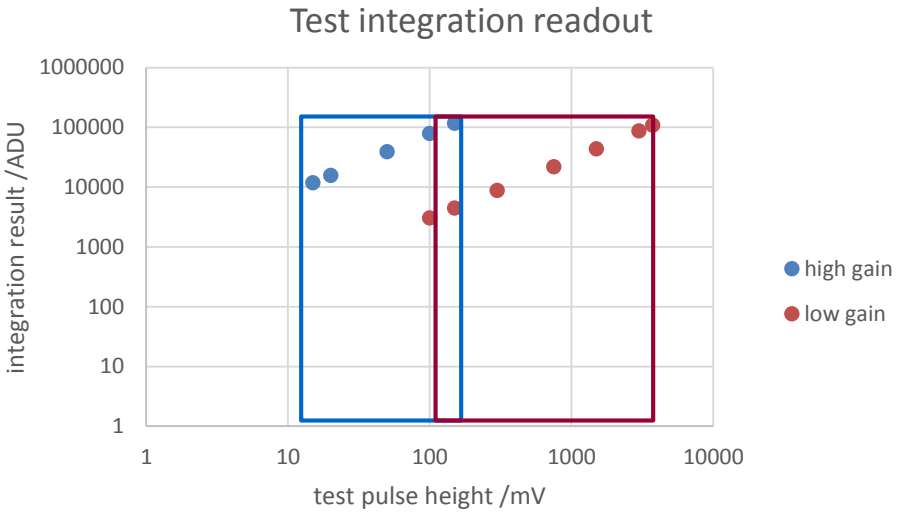


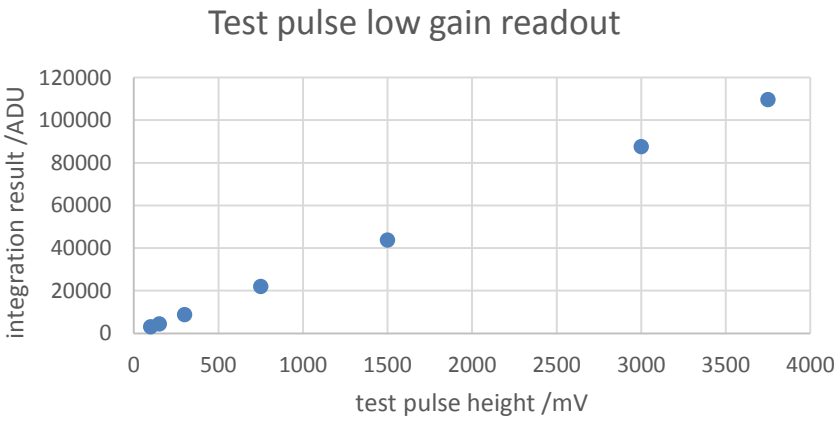
v.2018

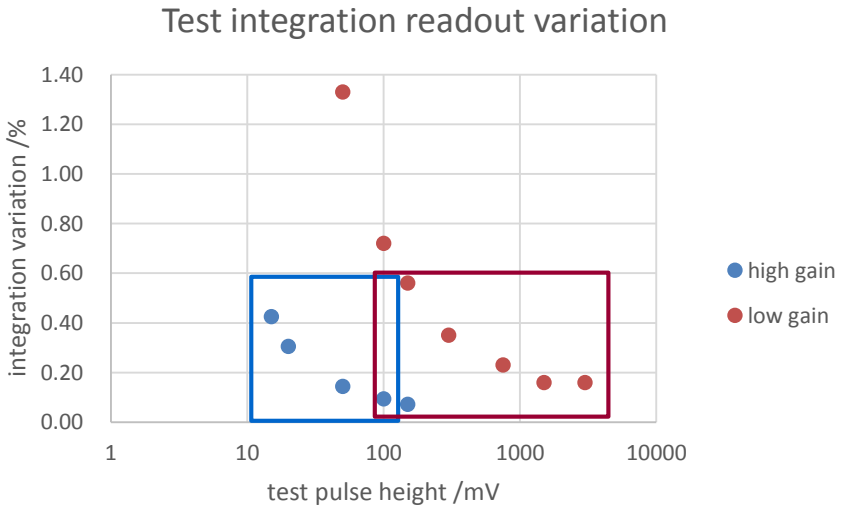
- From 20 ch×80MSPS×12bits to 32 ch×125MSPS×14bits
- New hardware: low jitter clock generation and distribution
- New hardware: double channels readout to improve effective dynamic range
- New hardware: low voltage power supply noise rejection
- New firmware: 100us×125MSPS continuous waveform acquisition

Double channels readout to improve the effective dynamic range



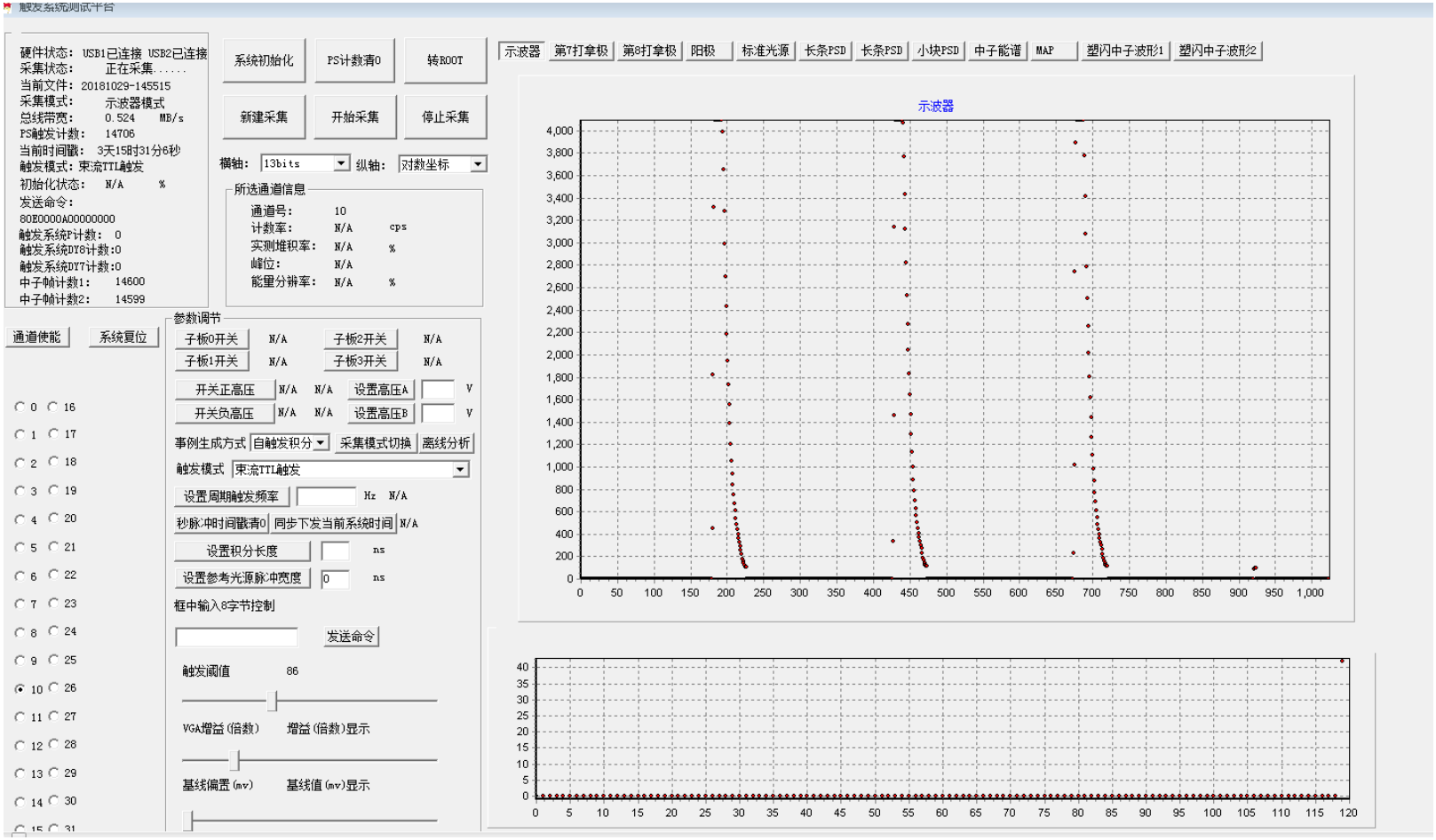






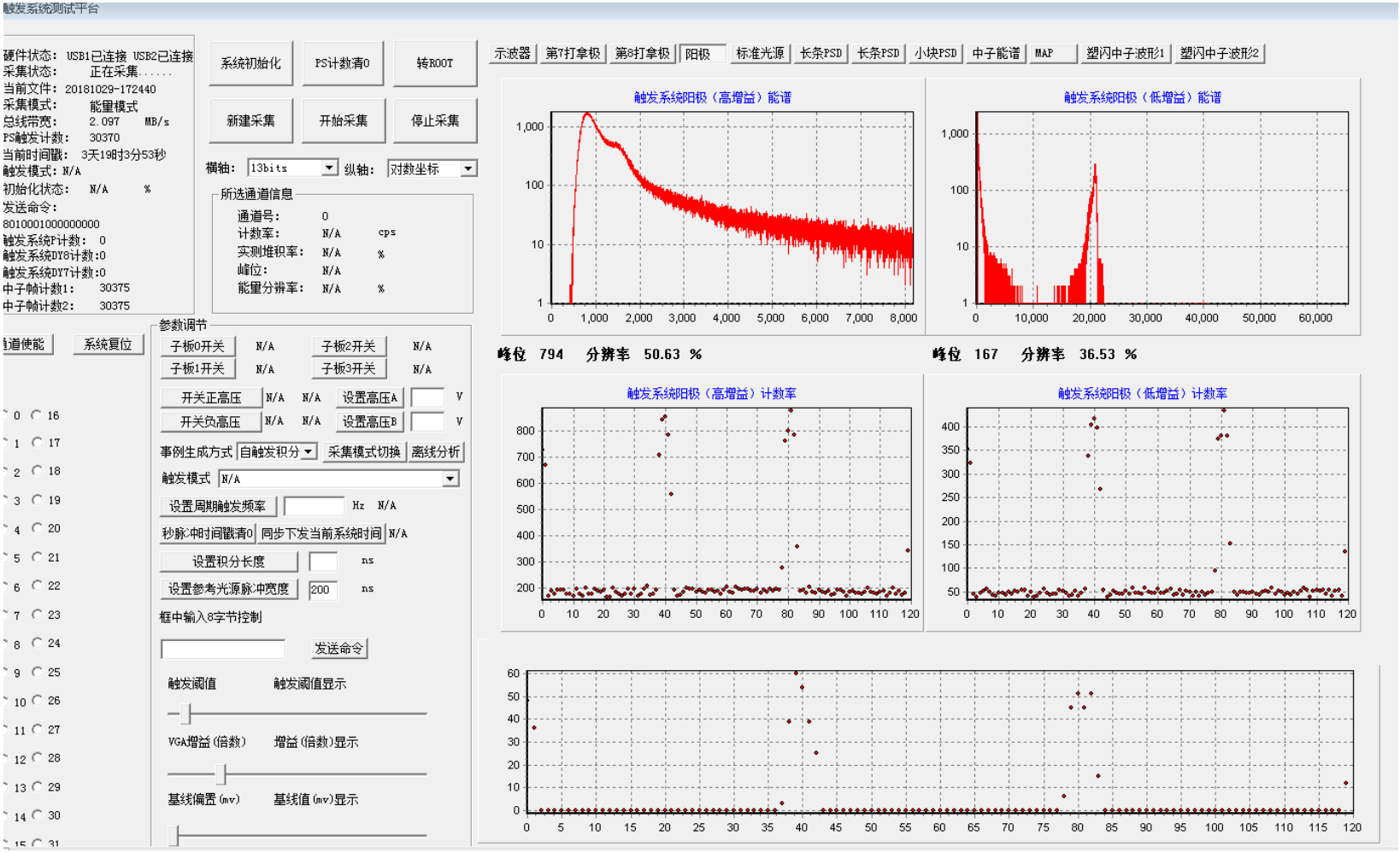
Multi channel DAQ during beam test

Real-time waveform monitor



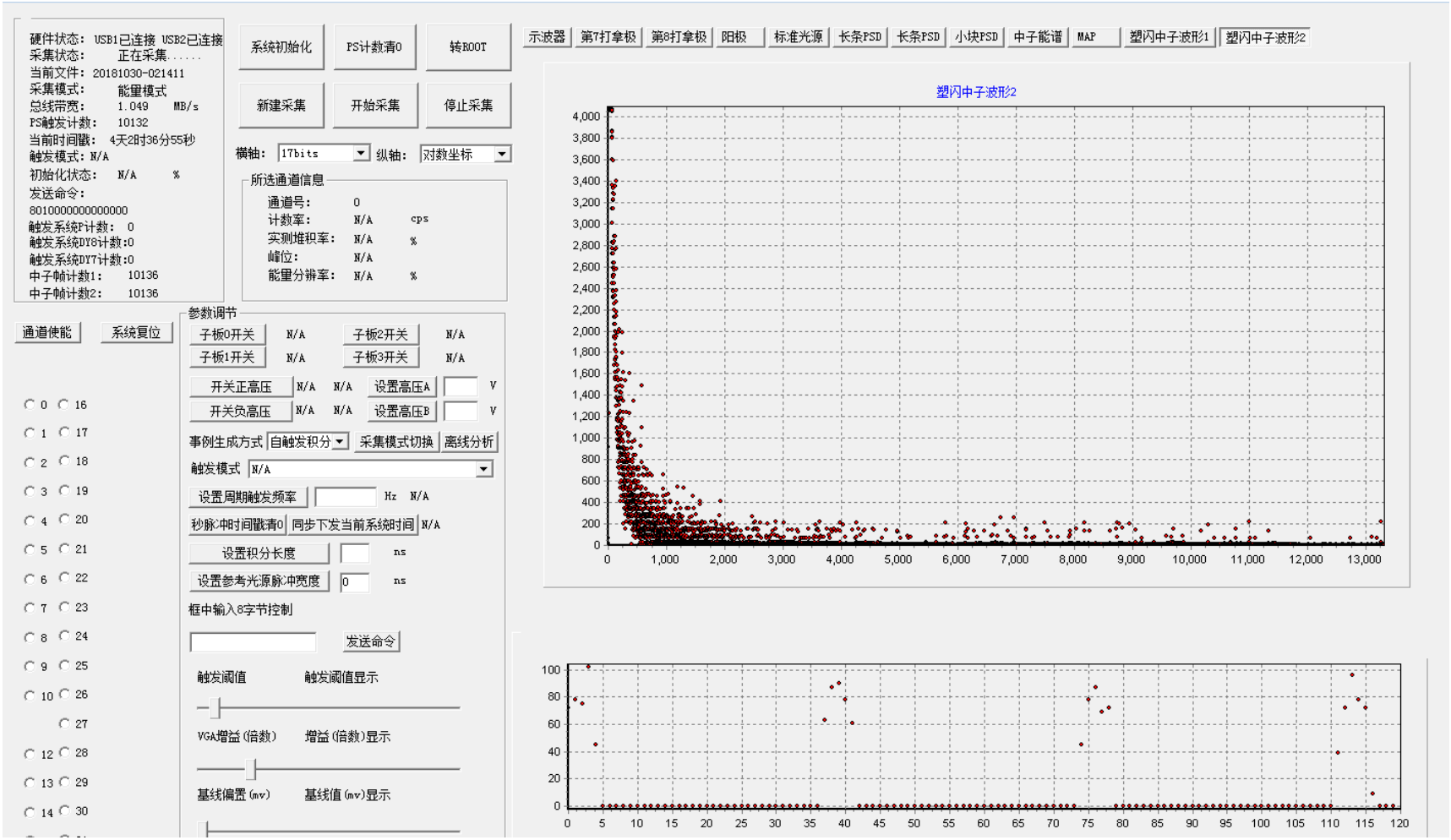
Multi channel DAQ during beam test

Real-time histogram, count rate, peak and FWHM



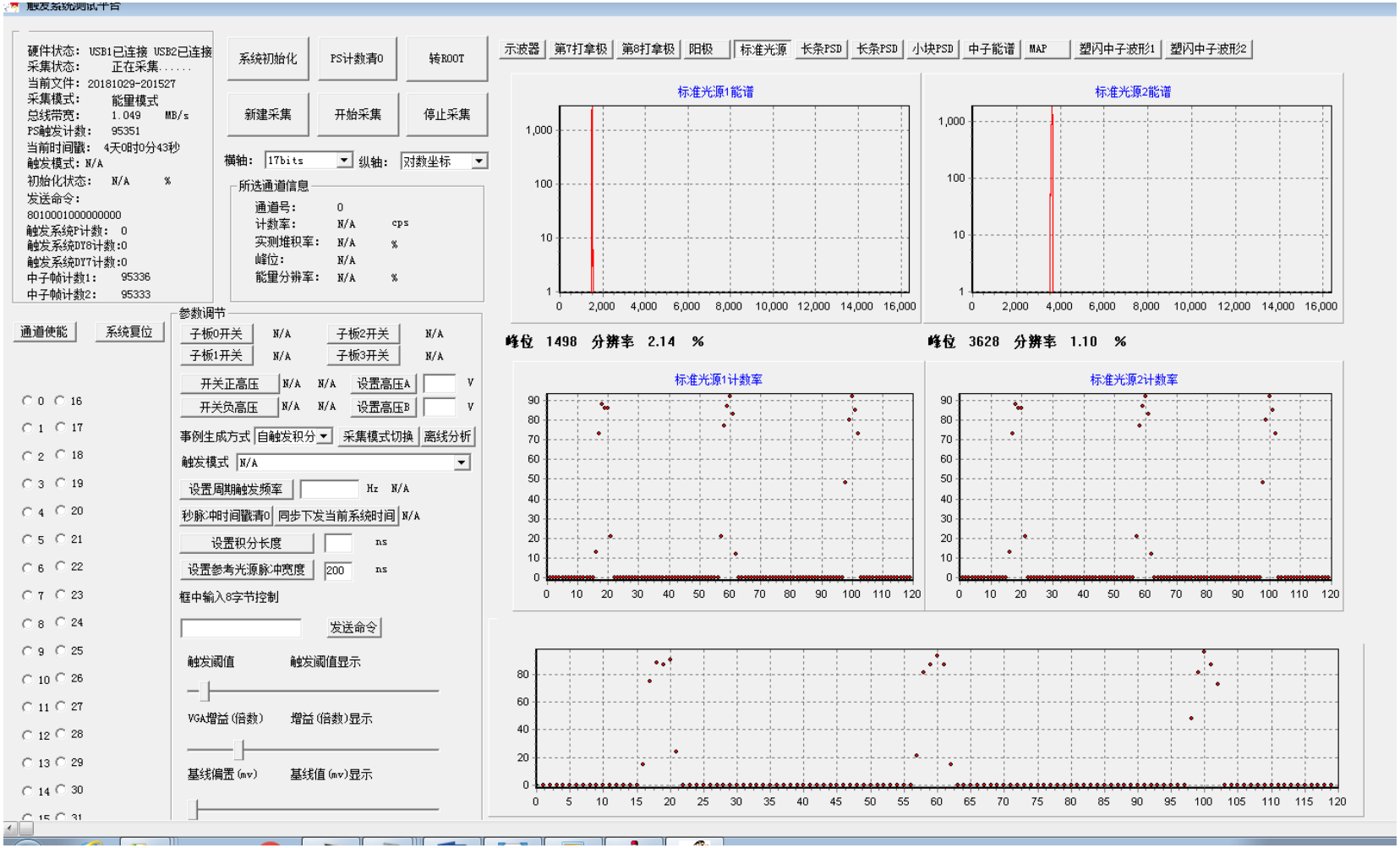
Multi channel DAQ during beam test

100us×125MSPS continuous waveform



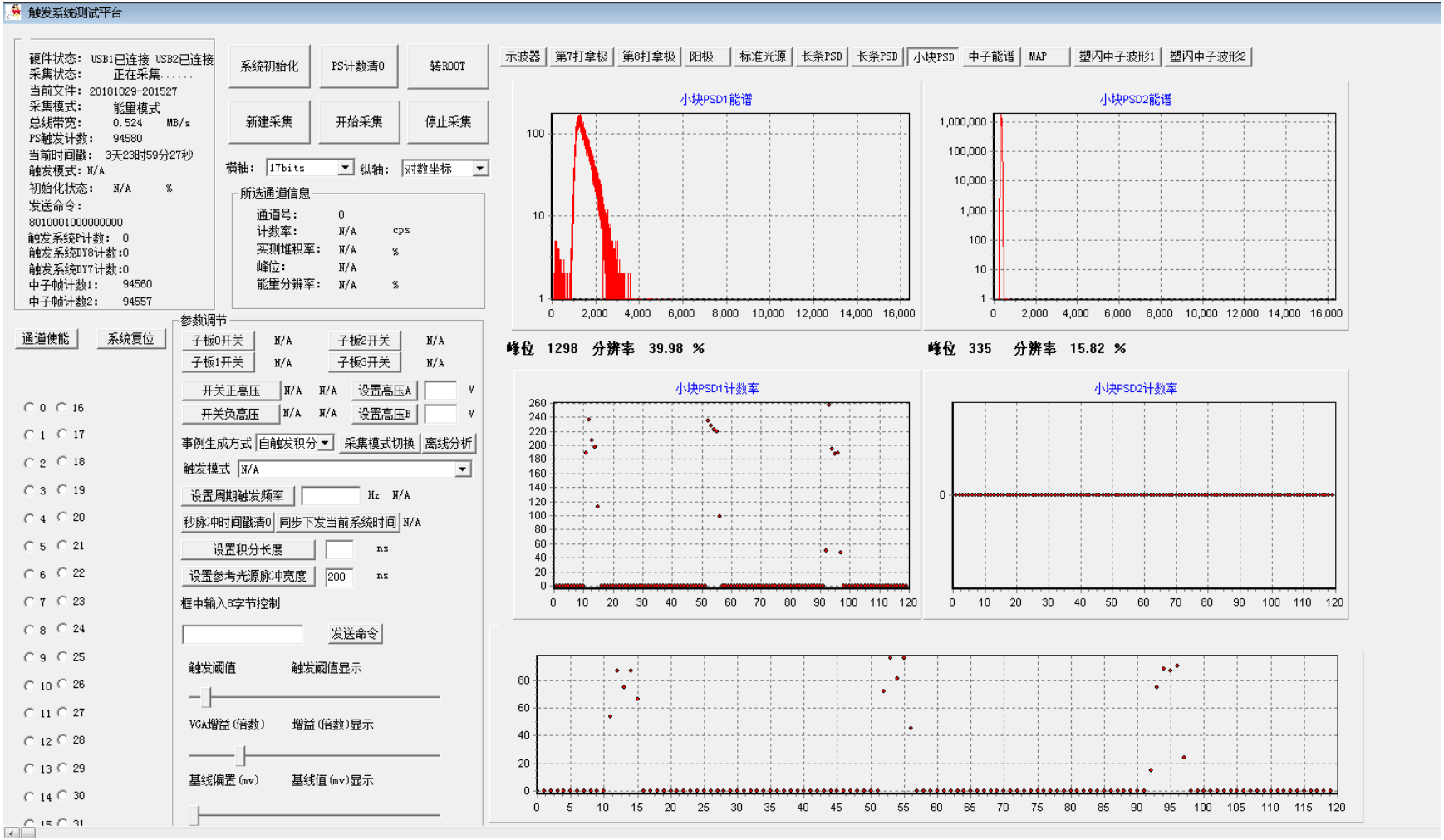
Multi channel DAQ during beam test

Standard calibration LD readout

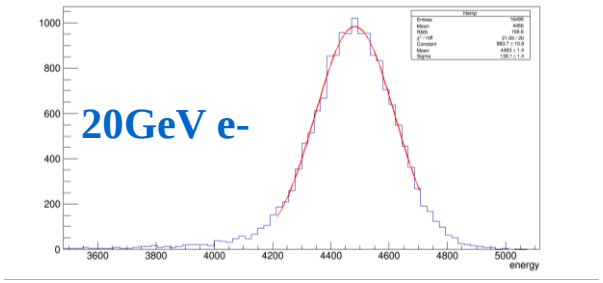


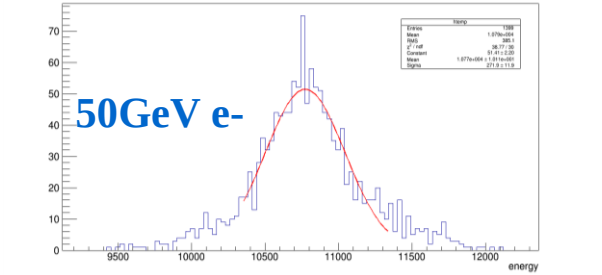
Multi channel DAQ during beam test

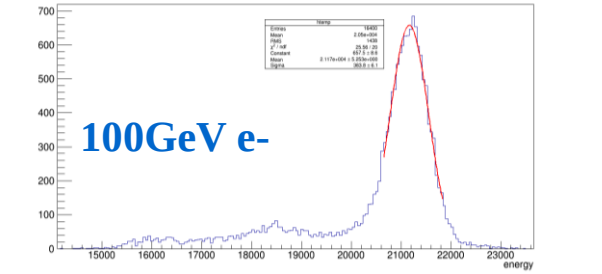
PSD readout

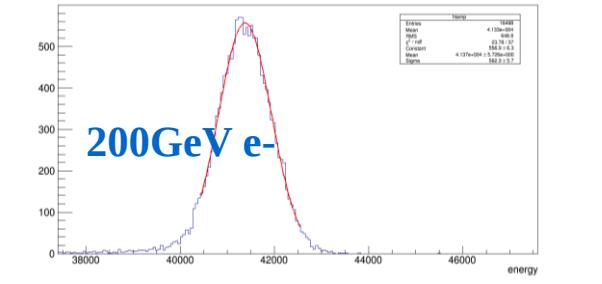


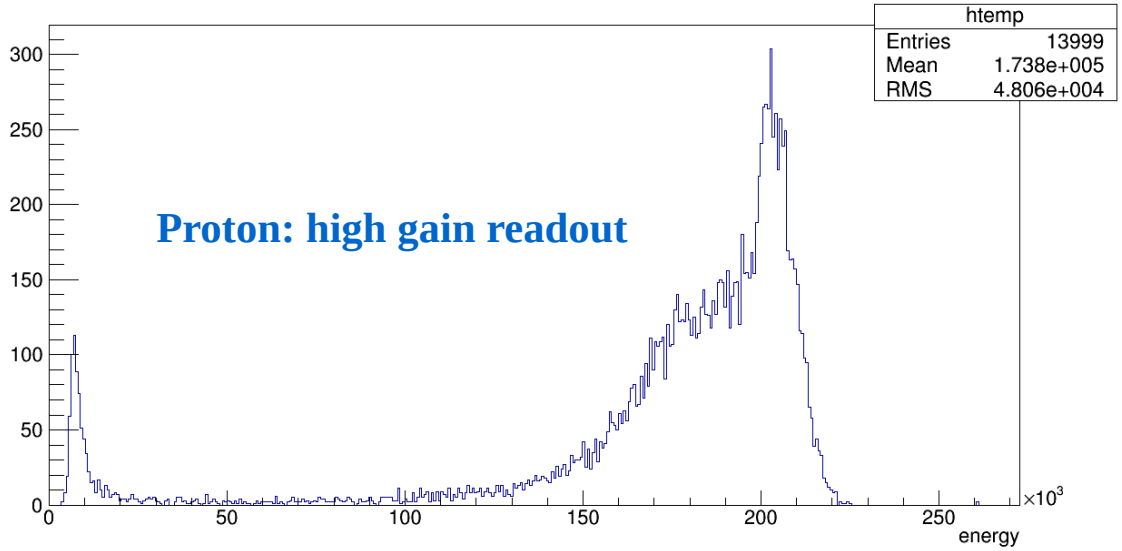
Preliminary beam test results

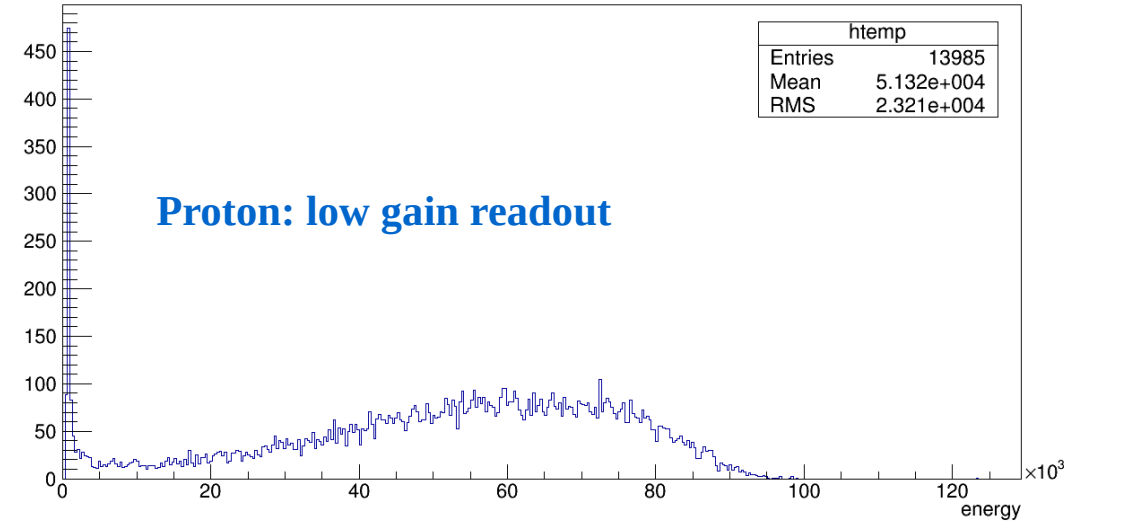




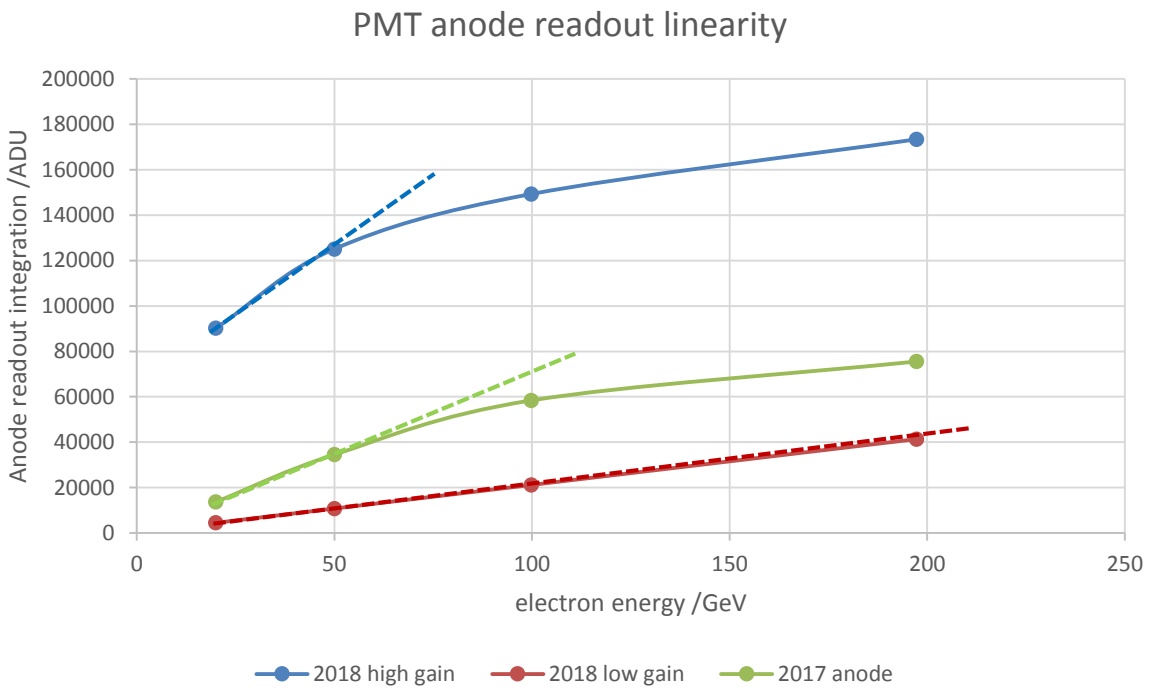






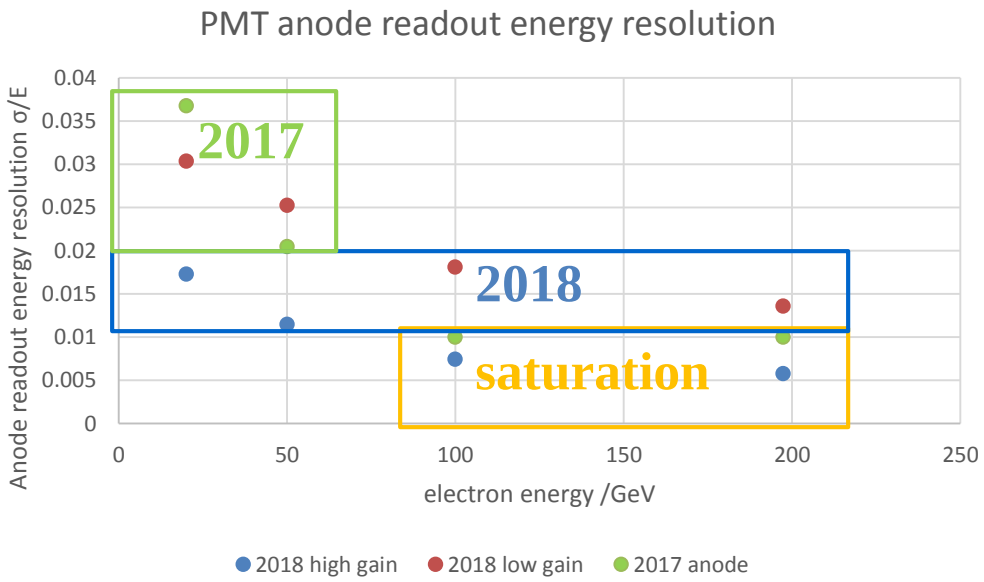


Preliminary beam test results: linearity vs. electron energy



- 2017: PMT anode saturated when the electron energy > 100GeV
- 2018: PMT anode NOT saturated. Low gain could cover the electron energy range from 20 GeV to 200 GeV
- 2018:anode high gain saturation happened during readout

Preliminary beam test results: resolution vs. electron energy



- Anode readout resolution improved from 2017 zone to 2018 zone
- High gain channel decreases the lower threshold and increases the effective dynamic range

Summary

- Trigger sub-system introduction
- Beam test progress
- DAQ for TRIGGER PMT, PSD SIPM, PSD PMT, Calibration LD
- Preliminary beam test results

Work in the future

- Continue the second stage of the 2018 beam test
- Calibrate trigger PMT data with IsCMOS data
- New design with dynode readout

Thank You !