Implementation of 3x1x1 detector in LArSoft

Kevin Fusshoeller
HEP Masters - ETH Zurich/Université Paris-Saclay
Cern, May 3rd 2017
ProtoDUNE‘s Sim/Reco meeting.

Outline

1. Introduction.
2. Importing Data from 3x1x1 to LArSoft.
3. Reminder: the 3x1x1 Geometry.
4. Example: Imported pulsing data + crosscheck with QScan

1. Introduction

Status and Goals

Current status:

- Geometry of the 3x1x1 detector is implemented in LArSoft.
- It is possible to import single events from 3x1x1 raw data.

Goal: Take the data from the 3x1x1 and start using LArSoft for noise and pulsing analysis.

Tasks: → Import full raw data files from 3x1x1 to LArSoft.

2. Importing data from 3x1x1 to LArSoft

Data Import from 3x1x1 up till now.

Until now another code, called QScan or WA105Soft, was used to analyze the 3x1x1 data.
Now we wish to do the same in LArSoft.

Problems: -) Data structure of raw data has to be adapted to LArSoft format.
-) „Daq Channel“ is not the same as the „view Channel“. → mapping

Operating way:
Create an empty event (source) and use a new module to fill it with data.

Steps: -) Read in data (Using Slavic‘s code from QScan).
-) For each „view channel“:
-) Find the corresponding „daq Channel“.
-) Extract the ADC counts for that channel.
-) Create a raw::Digit and store it in the art::event.

But: only single event can be read in.

Data import from 3x1x1

Update: Create a new source, which reads in and stores all the events in a file. The different steps are the same as before, but now repeated for each event.

Named the new source: QScanRawInputSource. (adapted from LArRawInputSourceUBooNE)

```
QScanRawInputDriver.h
QScanRawInputDriver_service.cc
QScanRawInputSource_source.cc
RawToRootConvert.fcl
```

→ Implements your source module.
→ Defines and registers your art input source.
→ Job configuration.

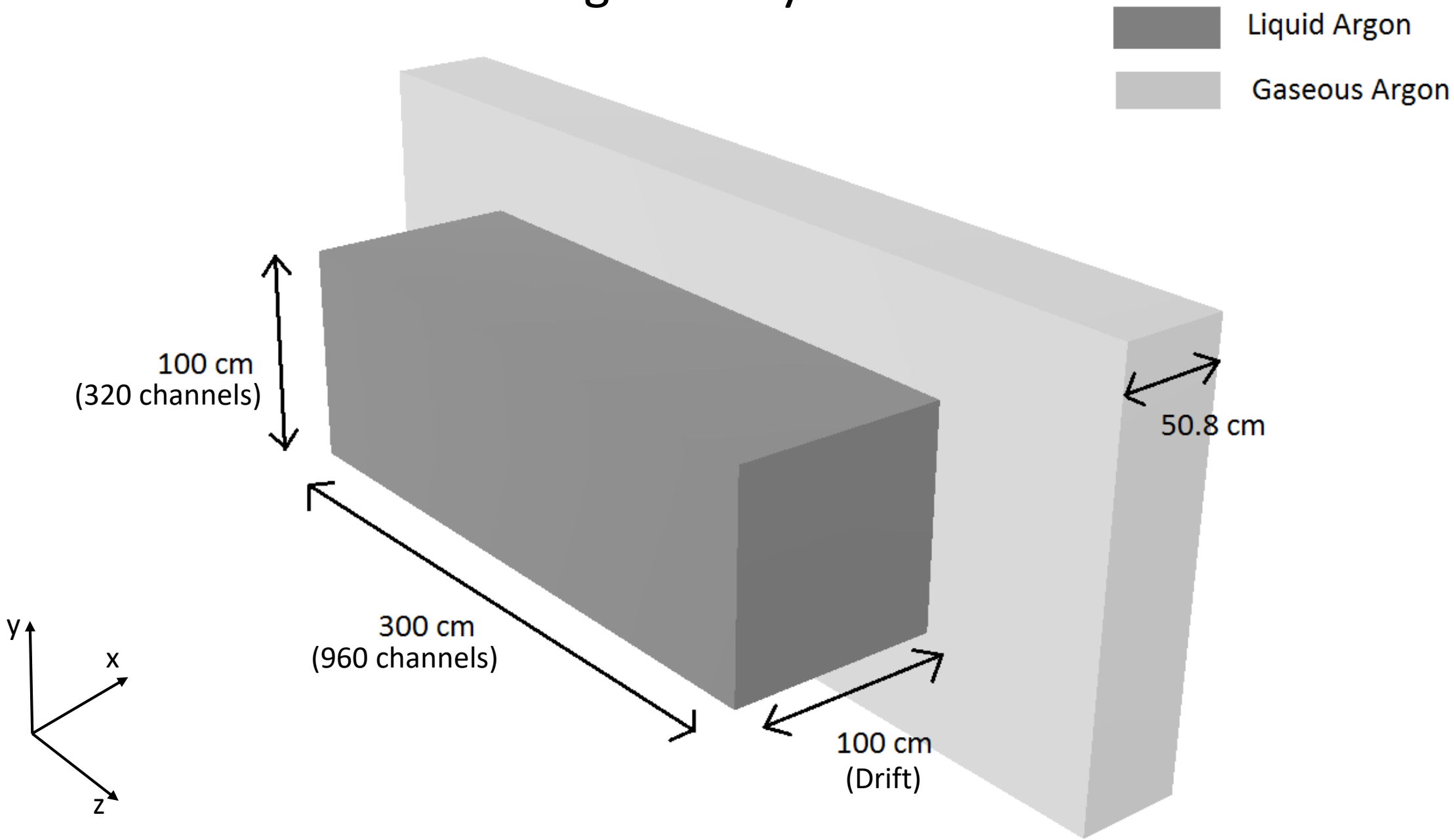
Test run with 633-0.dat:

```
first_QScan_data_file.root
```

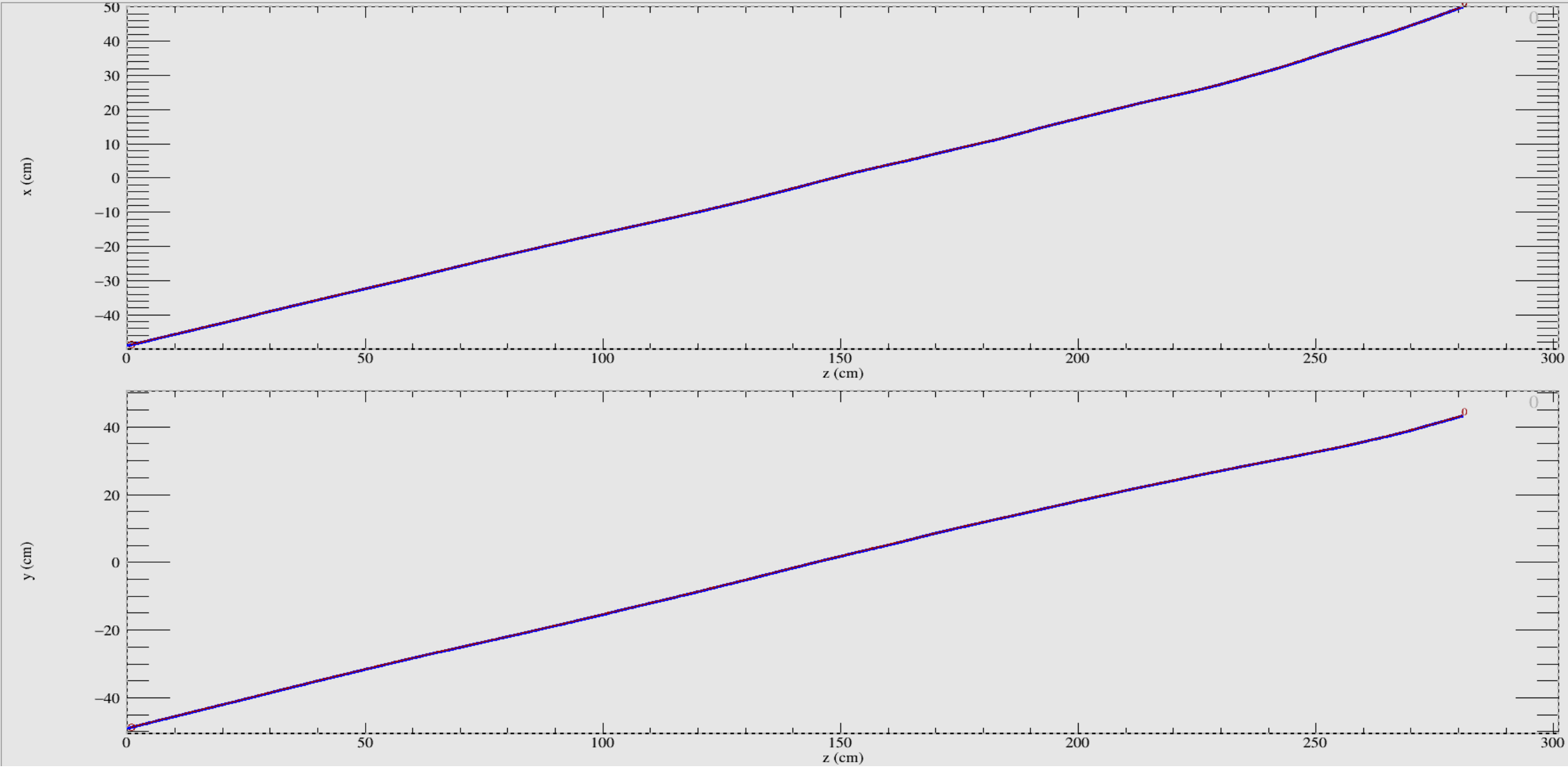
The job managed to read in all files, but still the results should be compared to what we get from QScan.

3. Reminder: The 3x1x1 geometry

3x1x1 geometry

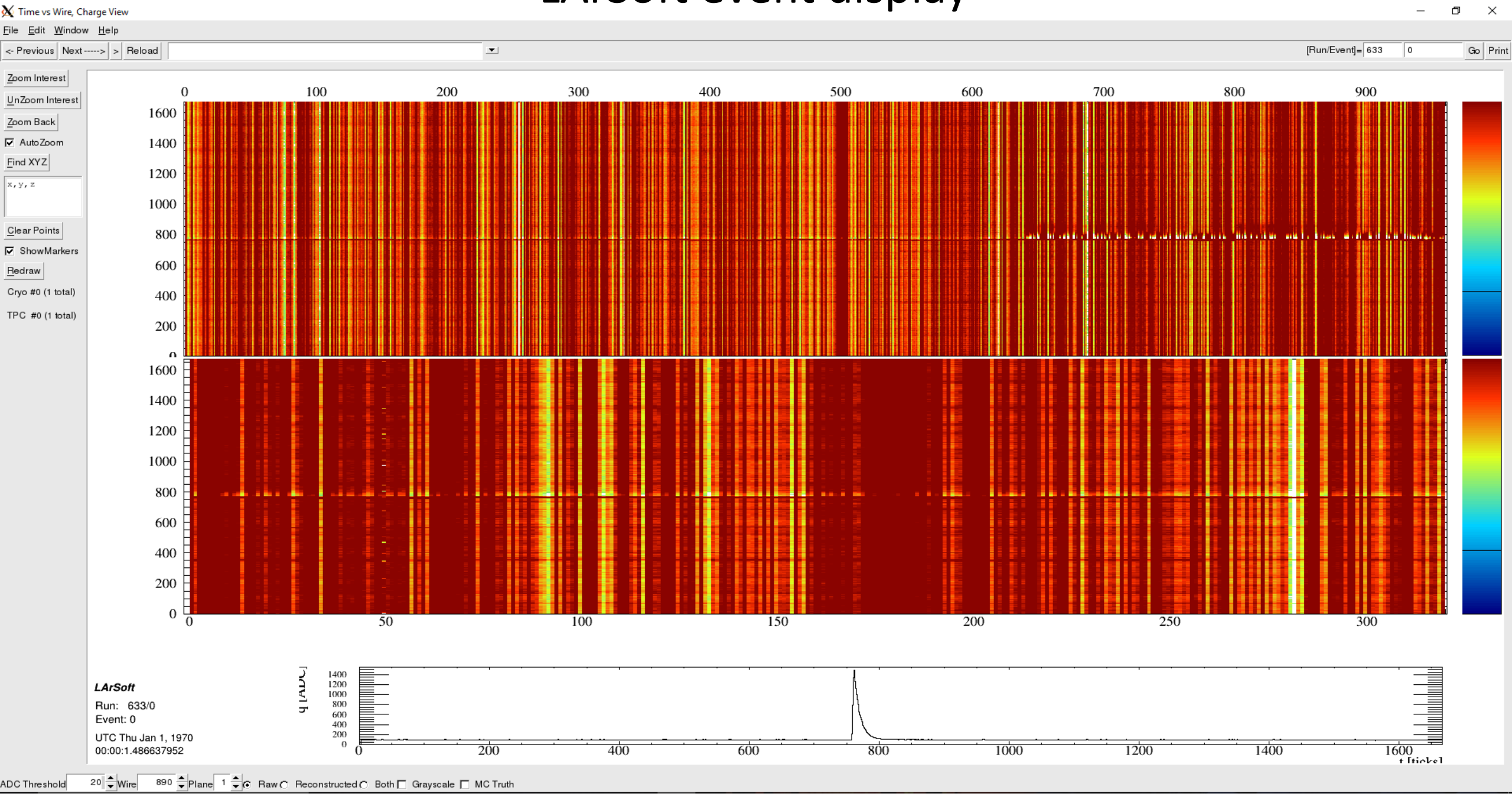


Test: simulate a muon → geometry accepted

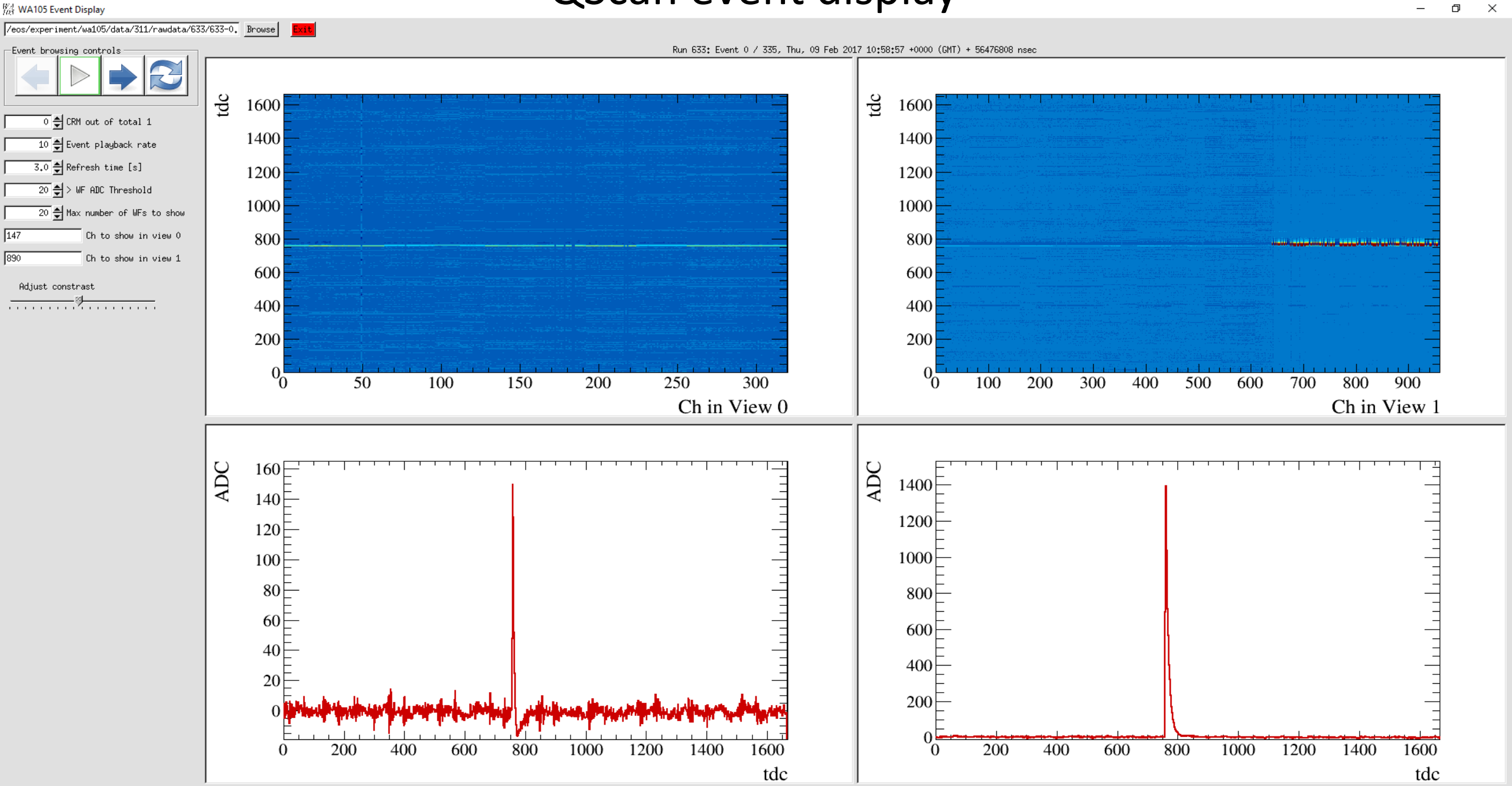


Example:
Imported pulsing data + crosscheck with QScan

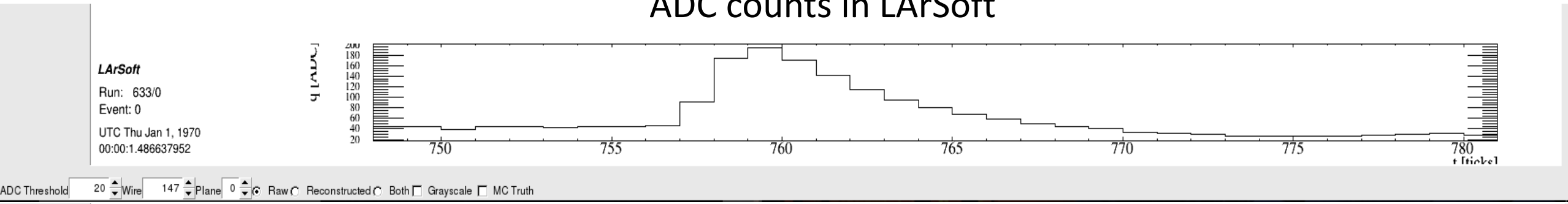
LArSoft event display



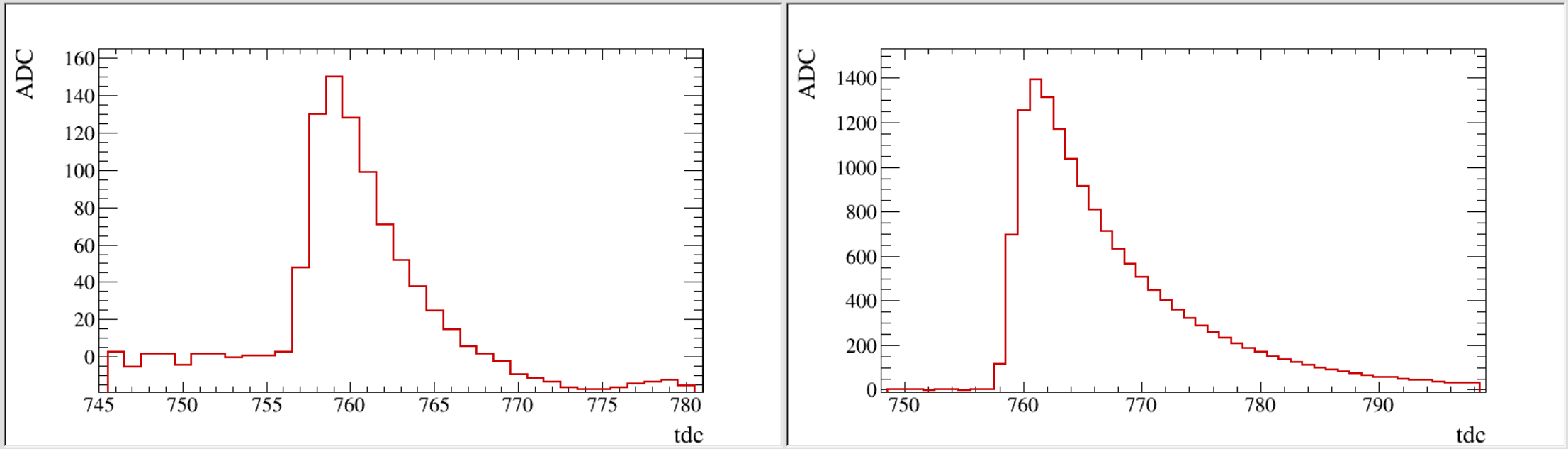
QScan event display



ADC counts in LArSoft



ADC counts in QScan



Conclusion

How to use QScanRawInputSource:

In the command line type: lar -c RawToRootConvert.fcl -i your_input_file -o your_output_file

(Not pushed yet, I will send an email to CENF-WA105-larsoft@cern.ch once done.)

Conclusion:

- 3x1x1 geometry is implemented in LArSoft.
- Import of data is successful.
- Next step: start analyzing pulsing data and noise measurements.

Thank you for your attention!