

# Data analysis on Si slab CERN TB

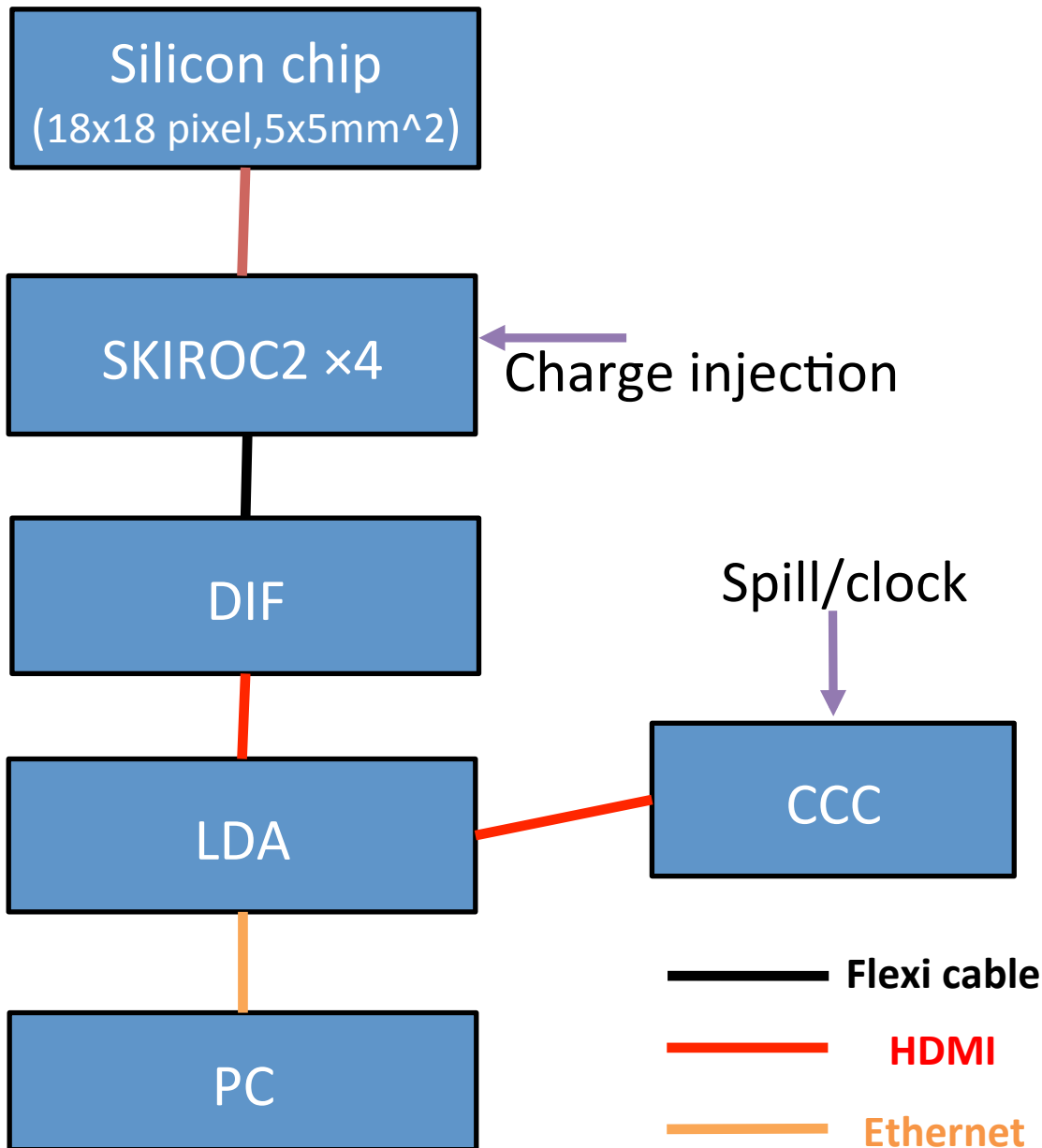
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# Outline

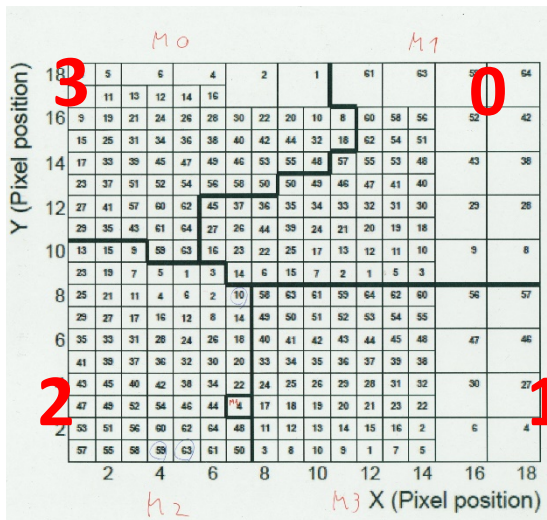
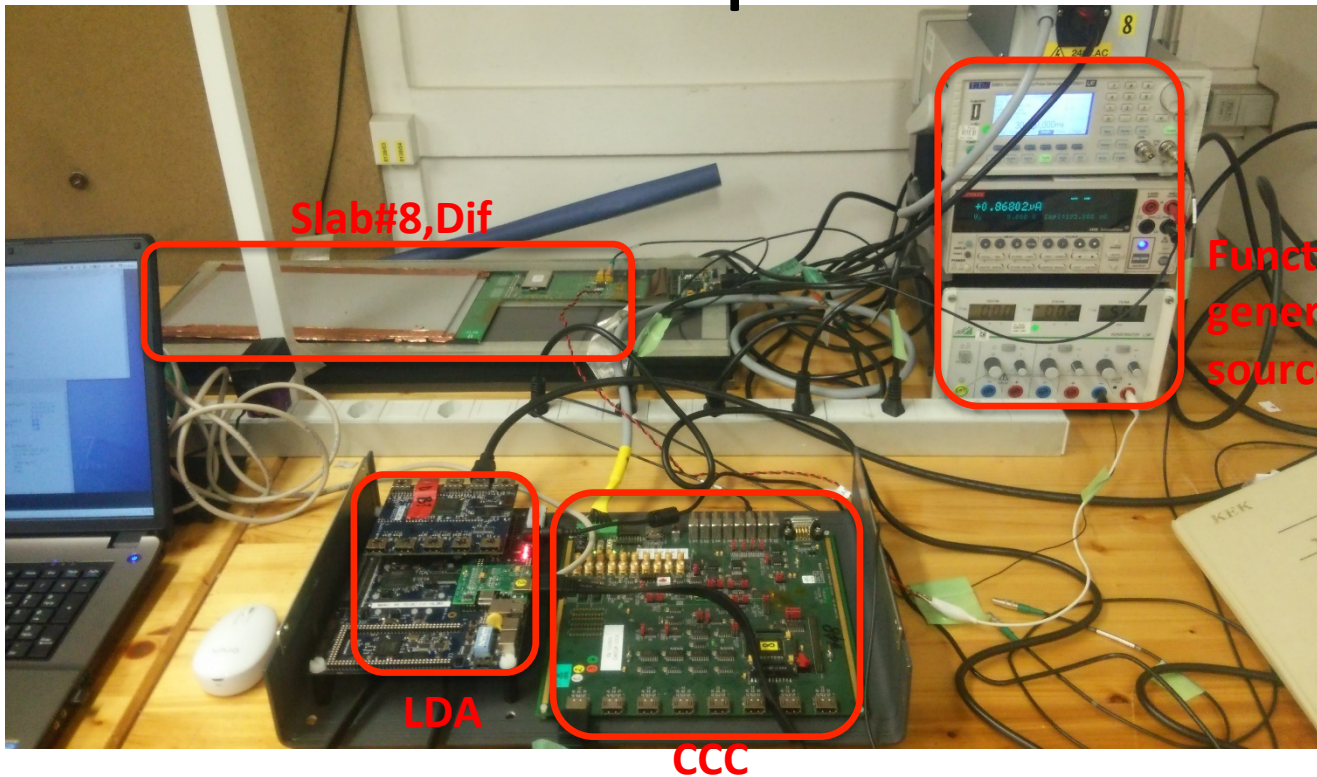
- Setup(@CERN PS)
- Gain calibration
- 7 GeV muon run MIP result
- Pion run result
- Si & Sc combined result
- summary

# Si detector DAQ



- SKIROC2:64ch ASIC
  - Preamp, self trigger
  - 12bit PHADC with 15 memory/pixel
  - Charge injection to test electronics
- DIF
  - Handle command/data with HDMI link
- LDA
  - Communicate with multiple DIFs, CCC and PC(via ethernet)
- CCC
  - Send clock/spill to LDA

# Setup

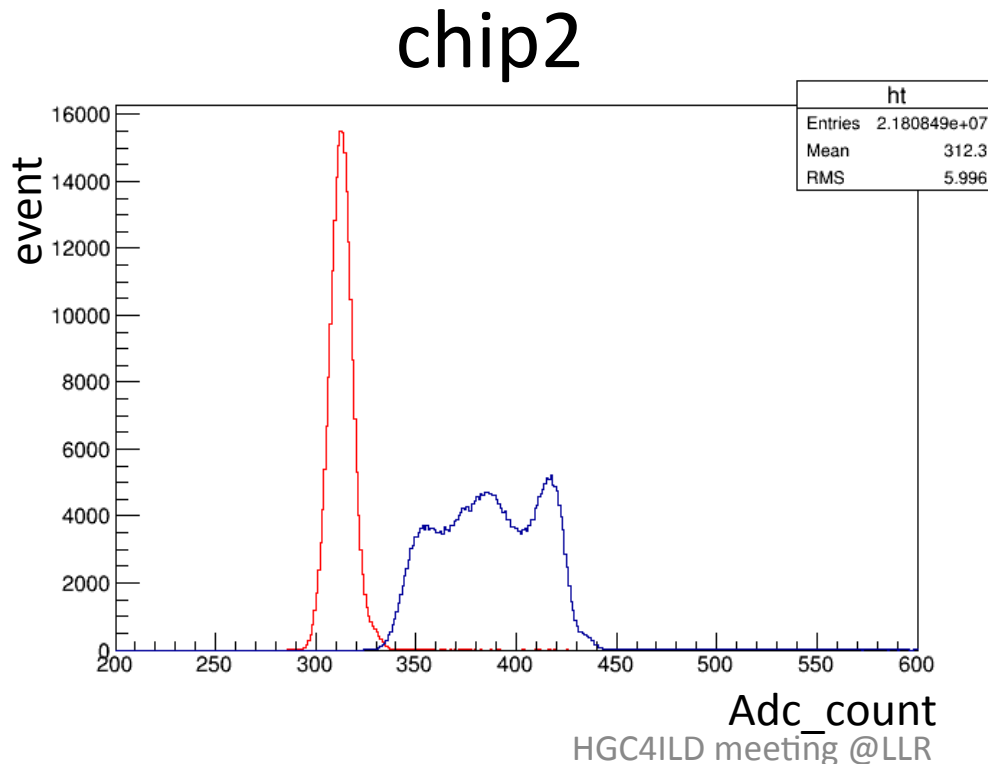


Chip 2 has no merged and noisy channels

- Spill:3ms
- All merged channels are masked
- Some noisy channels are also masked(chip 0,1,3)

# Gain calibration

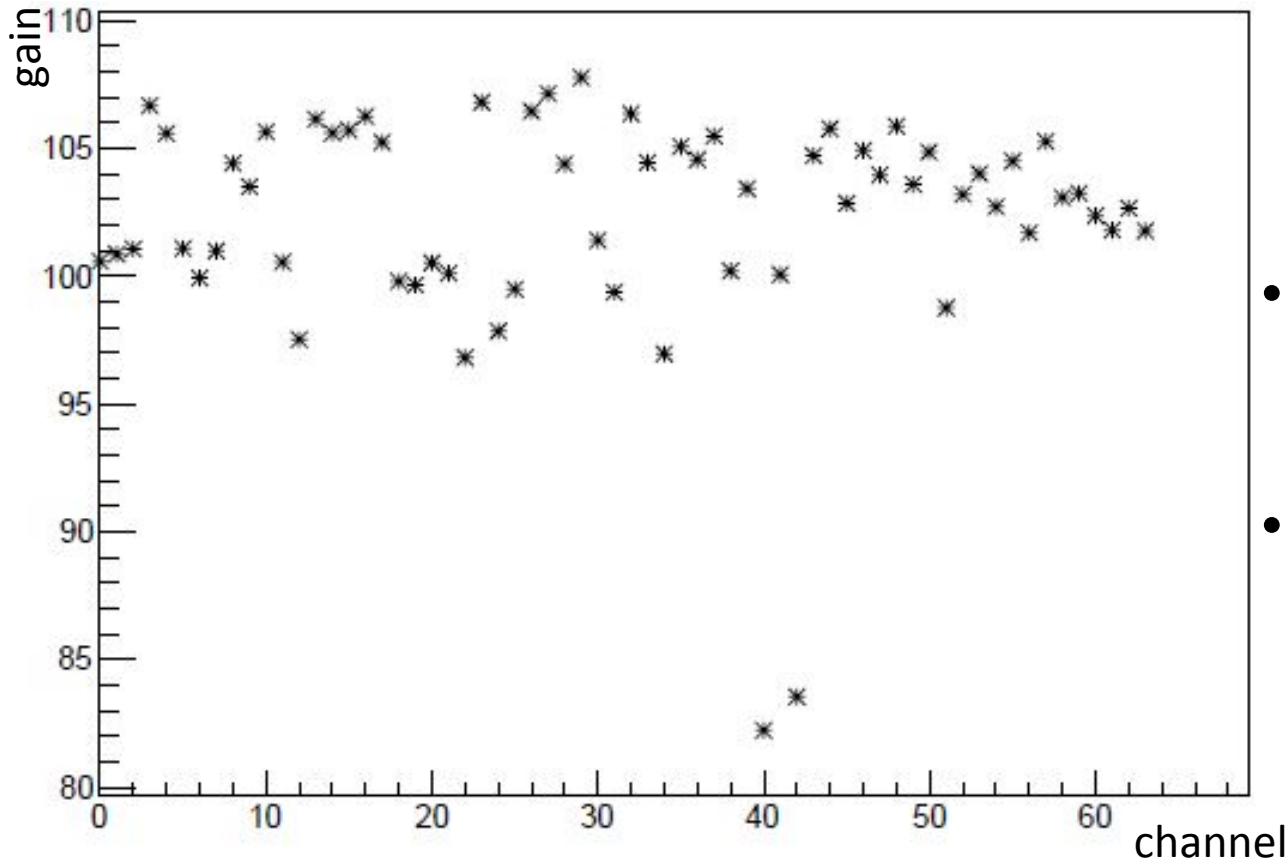
- Calibration with cosmic is inefficient because we can only acquire 3ms /spill due to the limitation of electronics(readout time is 50-100ms)
- We measured gain used isotope  
( $^{57}\text{Co}$ -> 122keV(86%),136keV(11%), gamma ray)



- Red line : pedestal
- Blue line : signal
- Only first memory cell of each channel is used for the analysis because we suffer from unstable ground level for following memory cells in current electronics

# Gain calibration

## chip2 gain

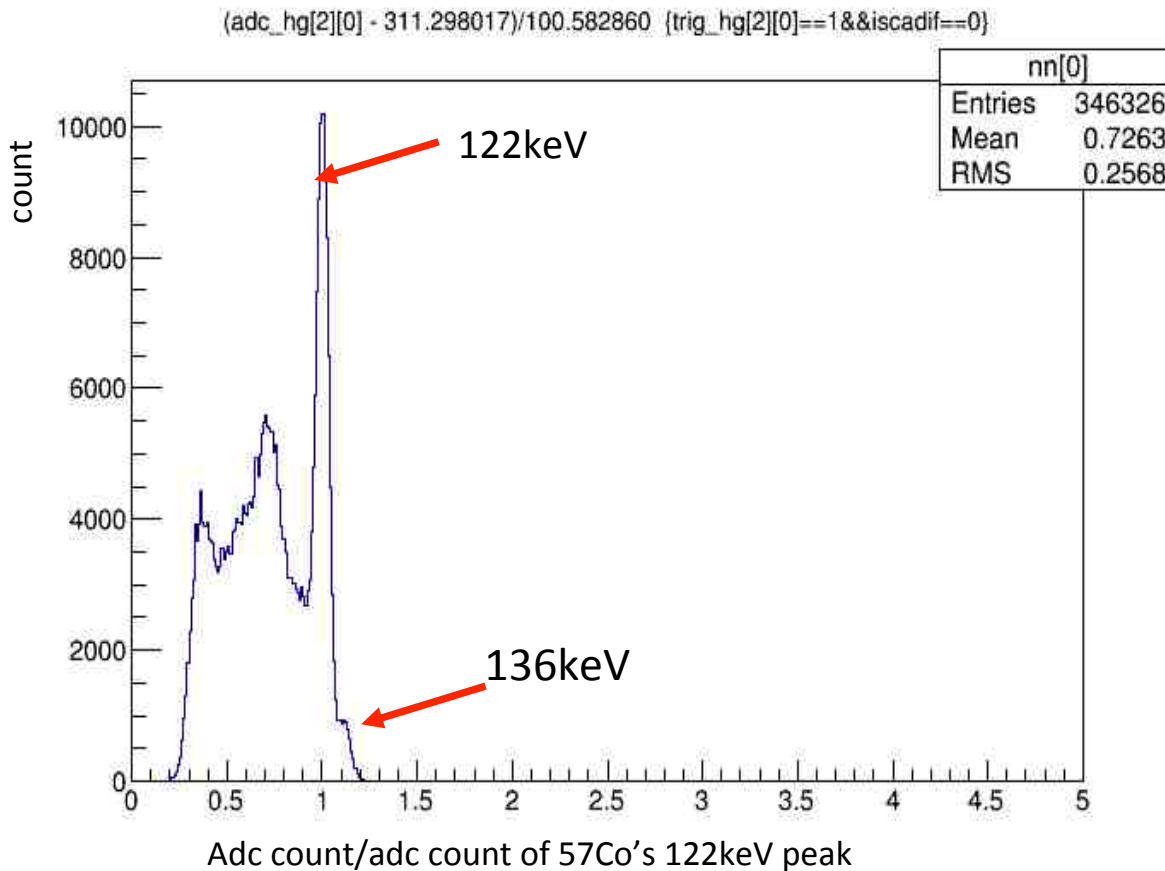


- Gain is defined by the difference between pedestal peak and signal peak
- Gain distribution is around 5% in most of channels
- Two channels with lower gain (by around 20%) found

Gain difference can be caused by electronics

# Gain calibration

57Co spectrum after pedestal/gain calibration

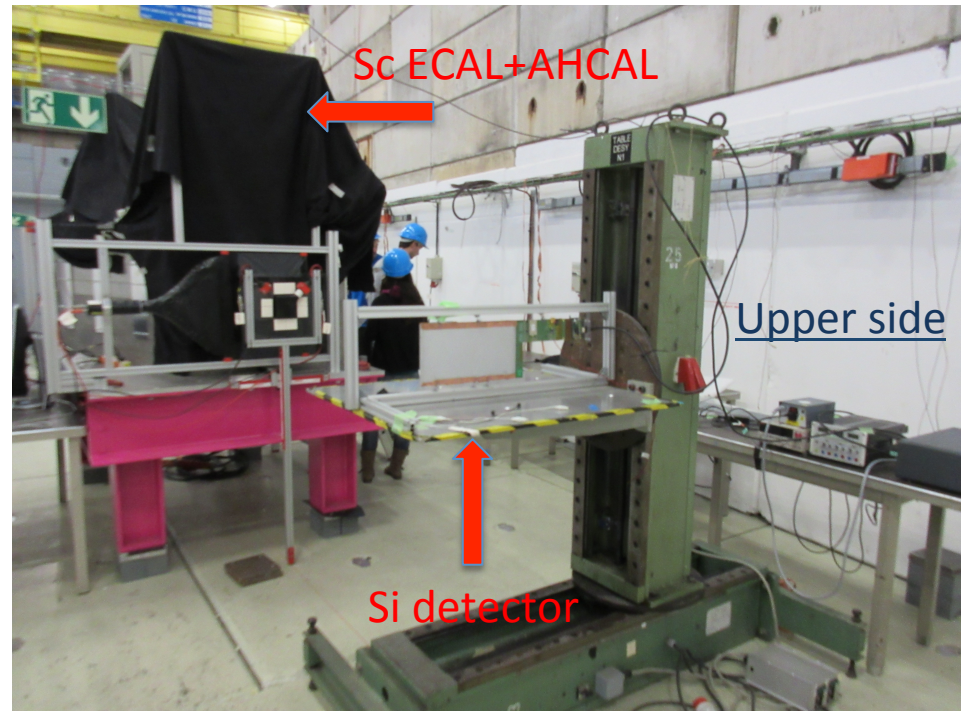


- Pedestal subtracted and gain calibrated per channel
- This figure is chip2 summed up 64 channels

3	0
2	1

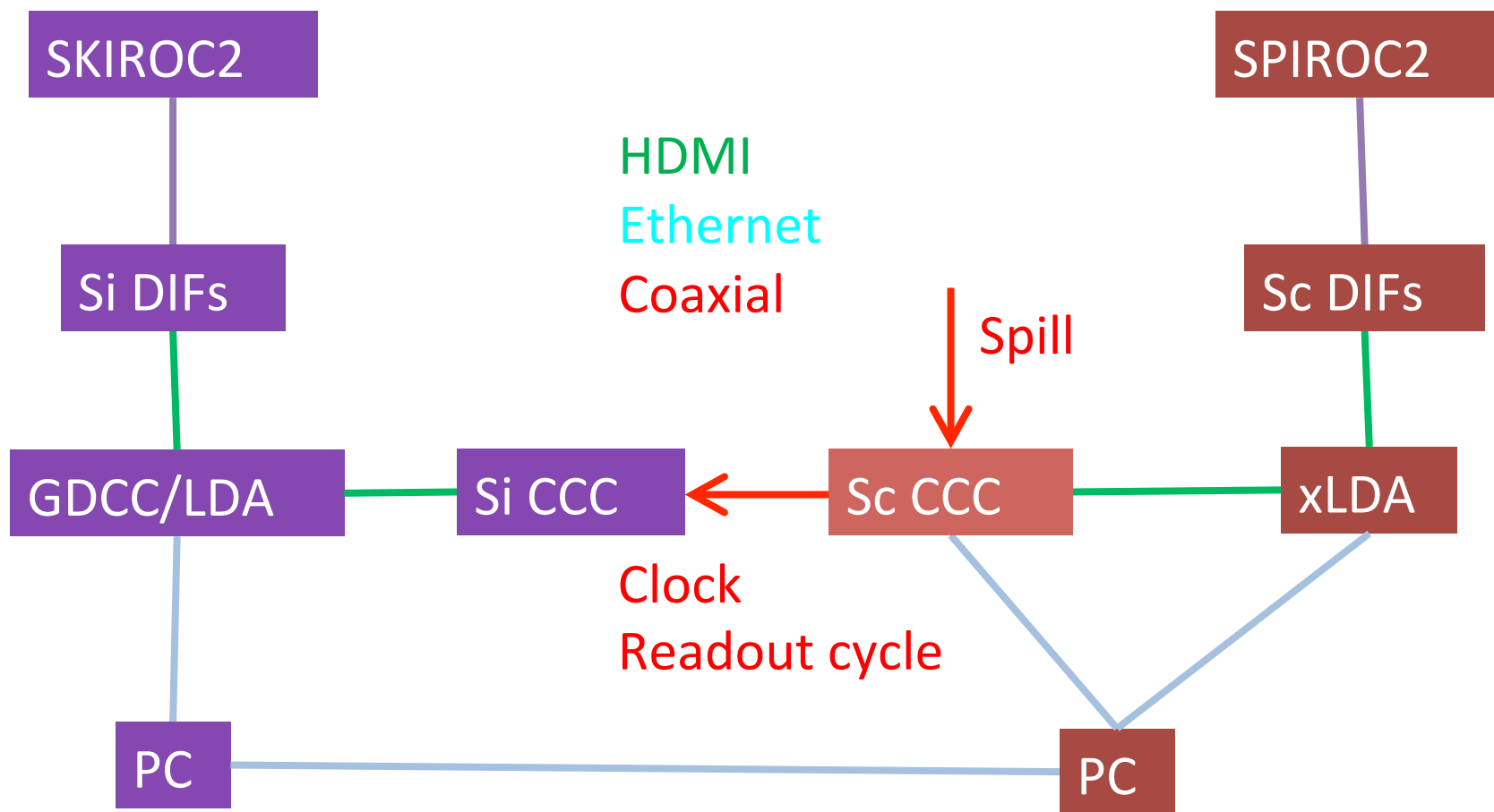
# Beam Test Setup

- We set up at T9 line in PS(11/26-12/8)
- One Si slab was set in front of Sc ECAL and AHCAL
- We tested Si detector and combined run (Si and Sc)

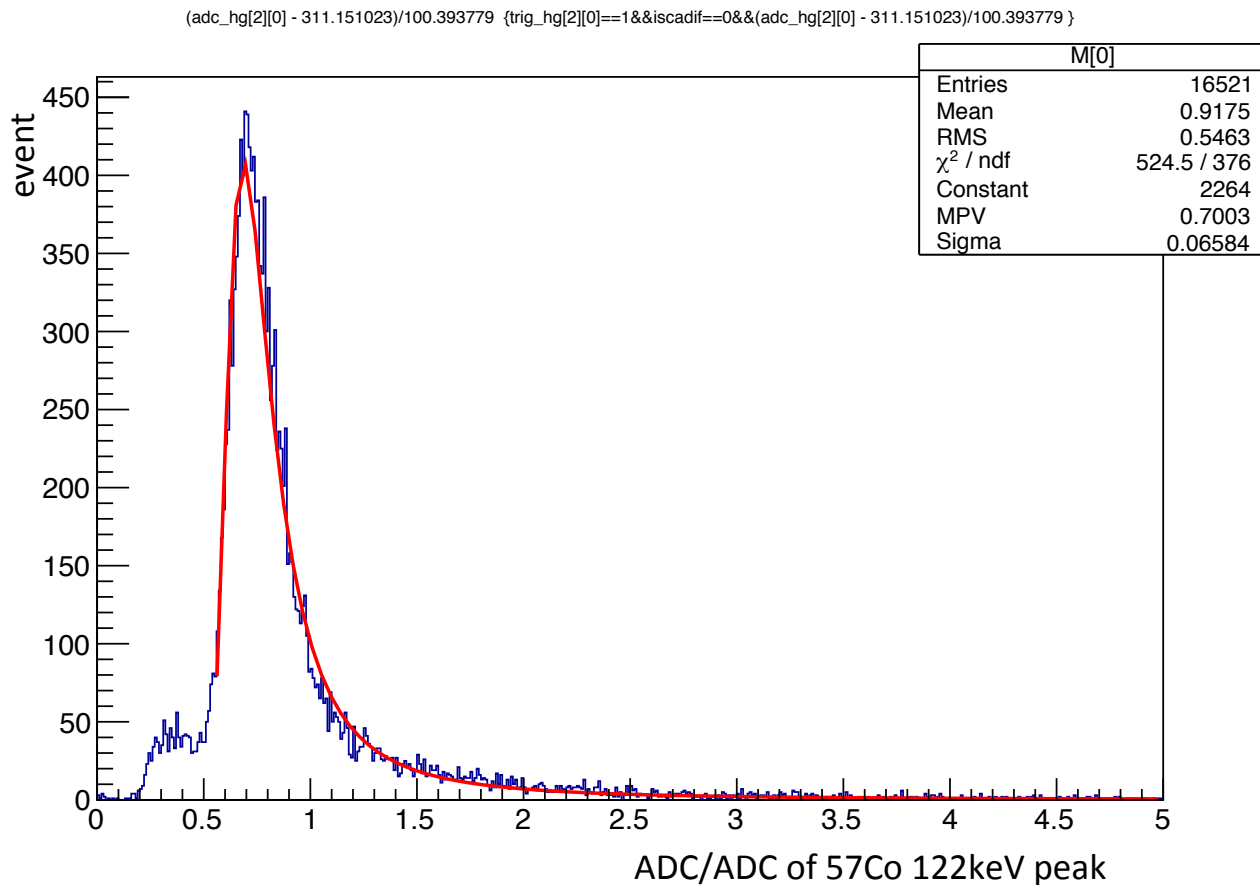




# Si and Sc DAQ



# 7 GeV muon MIP signal (Si)

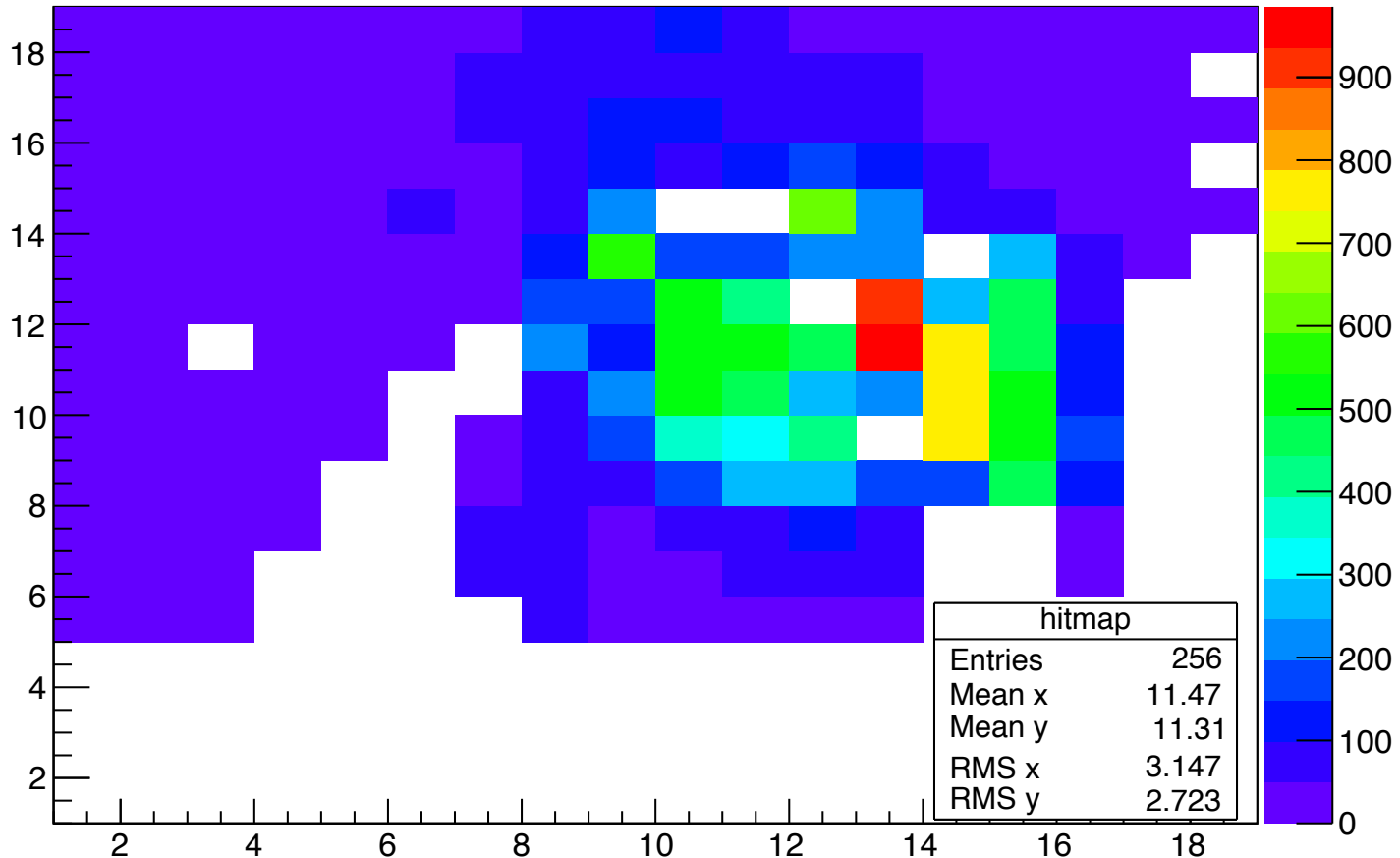


This signal's pedestal has been already subtracted and signals have been calibrated gain per channel too .

We were able to observe MIP peak at around  $0.7 \times 122\text{keV} = 85\text{keV}$ .

- 8GeV pion run hitmap

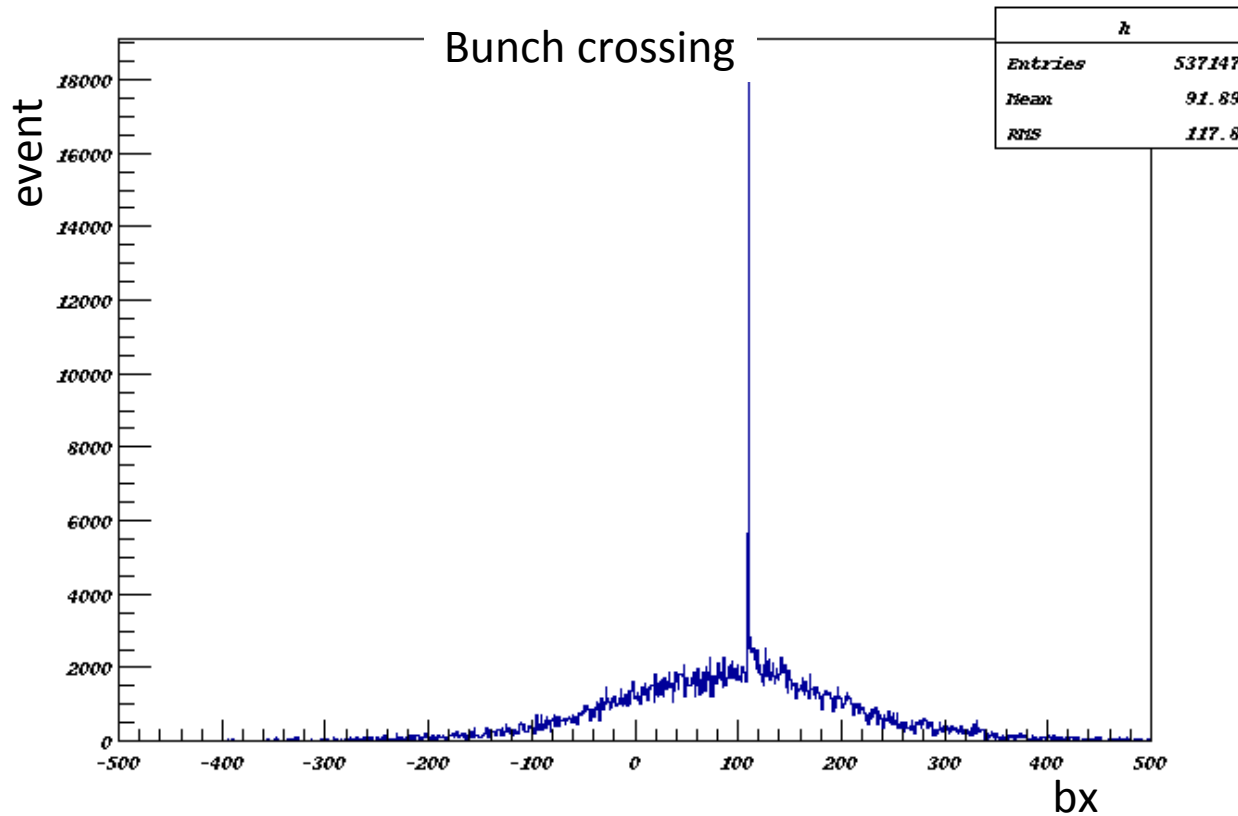
hitmap



This figure shows 8GeV pion run hitmap. White pixels are masked channels because of merged or noisy channels.

We could observe silhouette of pion beam.

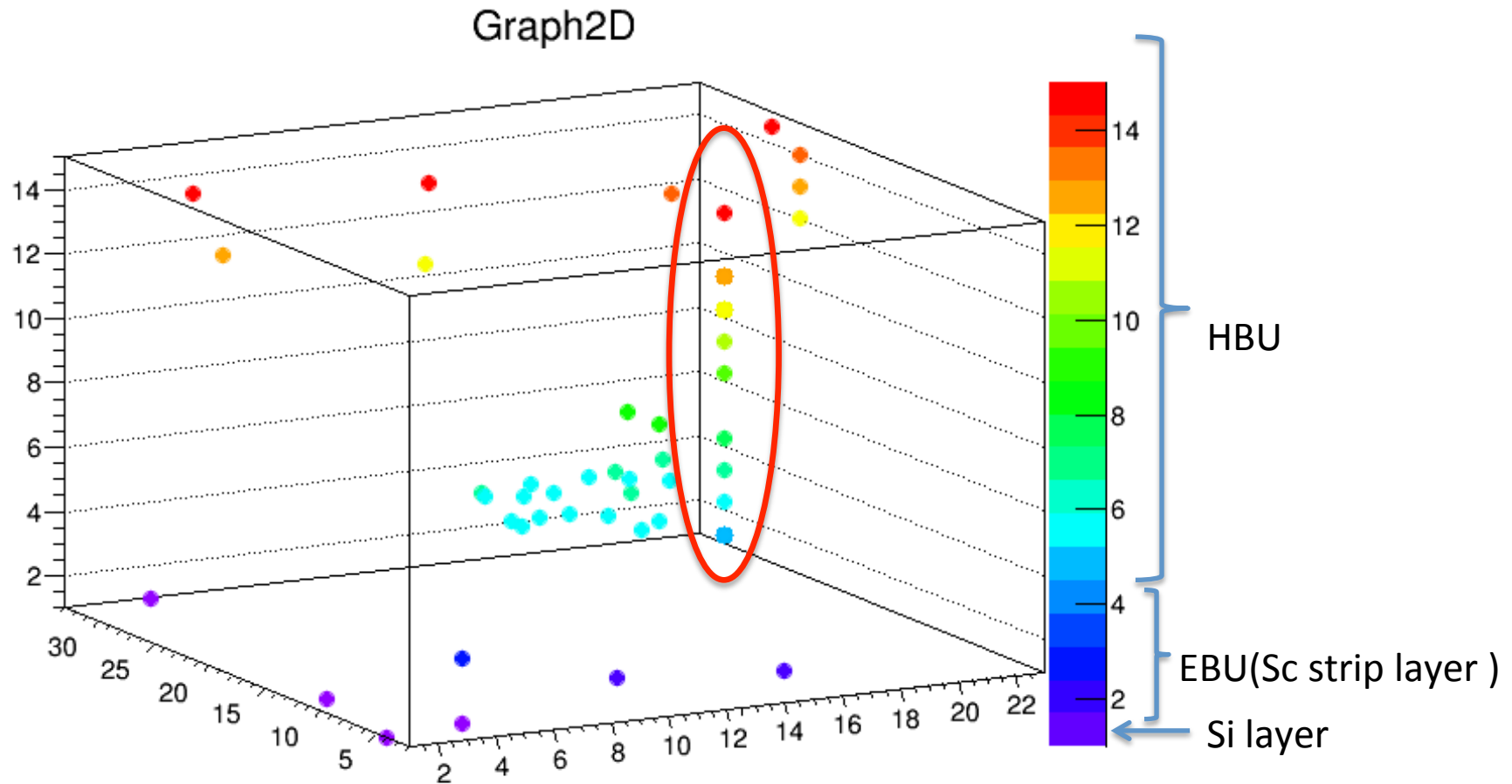
# Si & Sc's distribution of "bx"



Evidence of synchronization of Si and Sc layers

- BX number: tagged at SKIROC/SPIROC by counting BX clock(2.5 MHz in Si, 250 kHz in Sc)
- Difference of electronics caused fixed 'time shift' on the origin of BX number
- Si hits are selected and compared with every Sc hits at the same readout cycle
- Compare the BX number reported from Si and Sc ASICs
- The peak shows the fixed time difference (of  $\sim 110$  Sc BX = 440 usec) which is consistent with measured delay of electronics

# Track of muon event



This figure shows event of muon's track. This track is all HBU event. EBU layers and Si layer have not arranged completely yet. But, we can observe track event.

# Summary and plan

- We were able to test combined DAQ at PS.
- We succeeded to get Si MIP signal.
- We could observe like a track of muon.

## Plan

- We will more analyze synchronized data

# BACKUP

# Sc layer layout

