Ladder tests with ^{90}Sr at BNL

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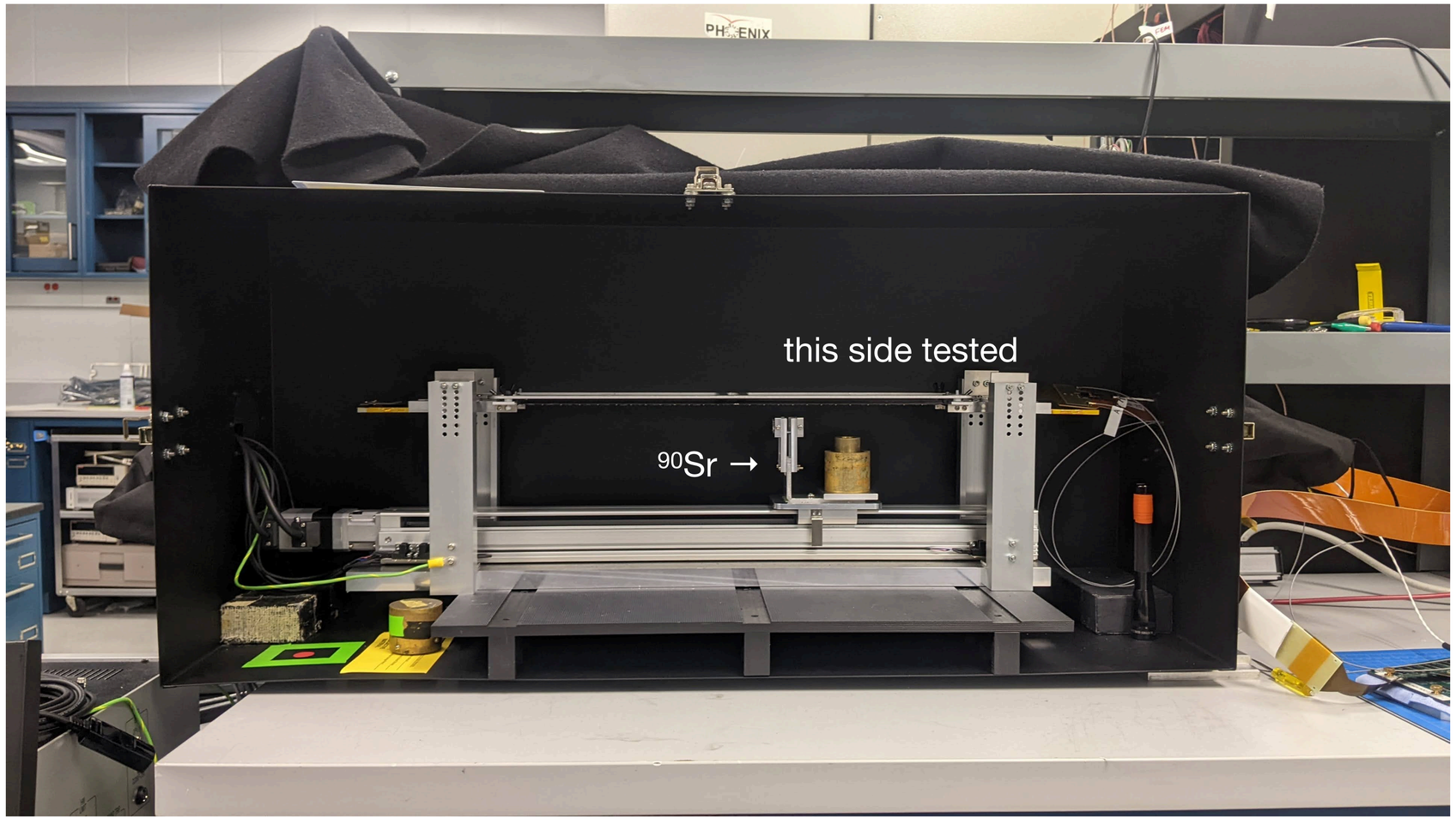
Testing mass production ladders with a radiation source



The motor controller →

ROC here

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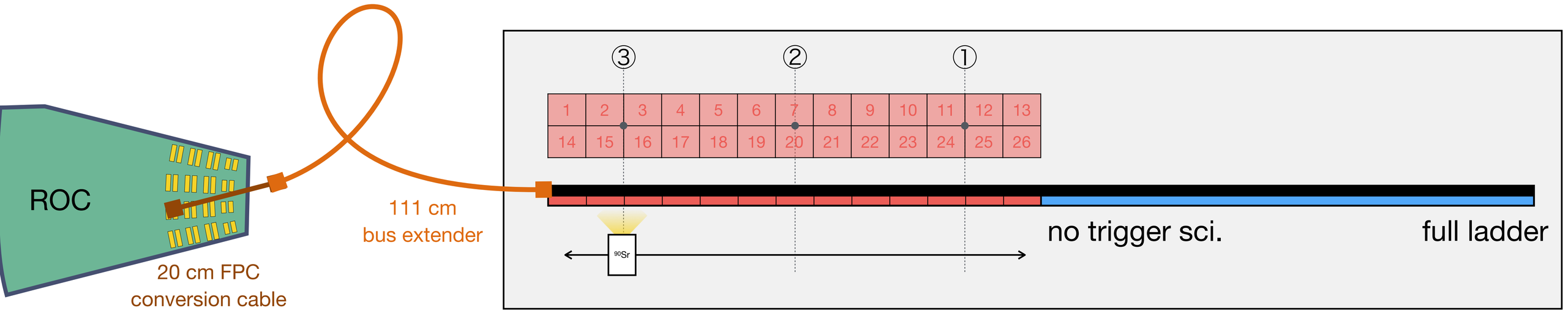


Procedure

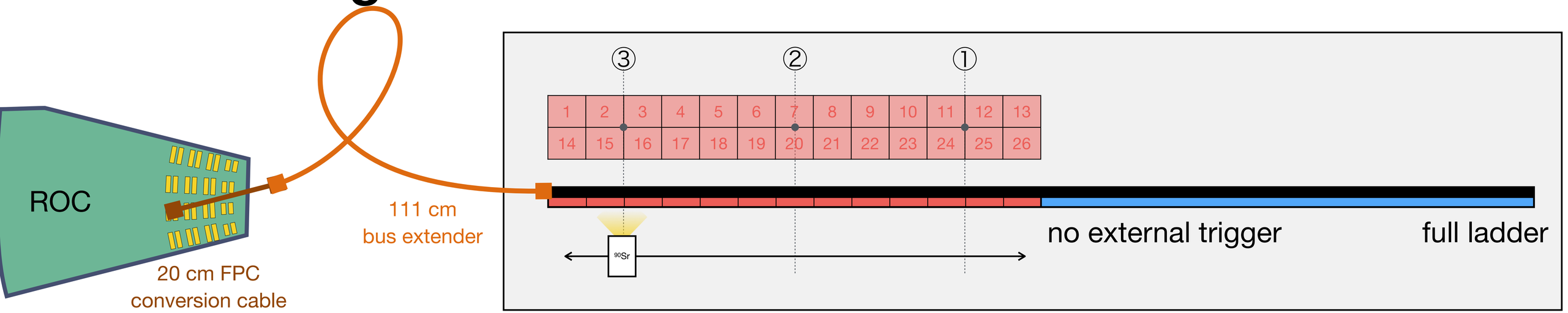
1. Setting and connecting the tested side to port C2
2. Taking calibration data
3. Changing to port C3
4. Moving ^{90}Sr below ①
5. Starting radiation measurement in the external trigger mode with continues TTL high signal to FEM external trigger input
6. After 15 min, masking all chips, moving ^{90}Sr below ②, turn the motor control unit off, unmask all chip
7. Restarting measurement for 15 min
8. After 15 min, masking all chips, moving ^{90}Sr below ③, turning the motor control unit off, unmask all chip
9. Restarting measurement for 15 min, then finishing the radiation measurement.
10. Turning bias off, removing ^{90}Sr
11. Start radiation measurement without ^{90}Sr for 10 min.
12. Start radiation measurement without ^{90}Sr with low DAC setting (DAC0=15, DAC1=30) for 5 min.
13. Changing port C3
14. Taking calibration data

due to strange ampl vs ADC with C3

not to have noise from the controller

proposed by Jin

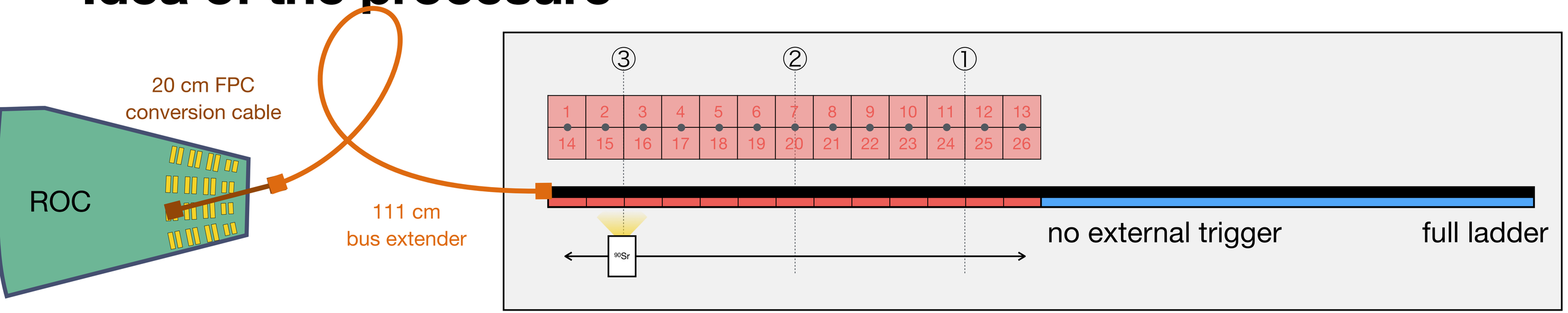
Testing mass production ladders with a radiation source, DAC settings

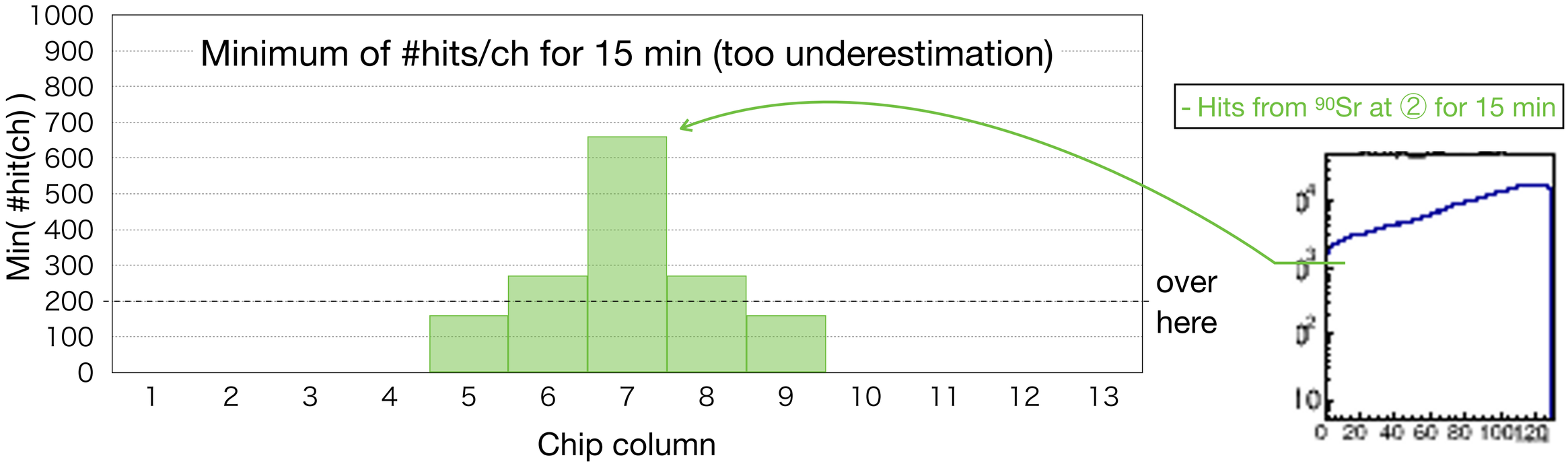


DAC settings

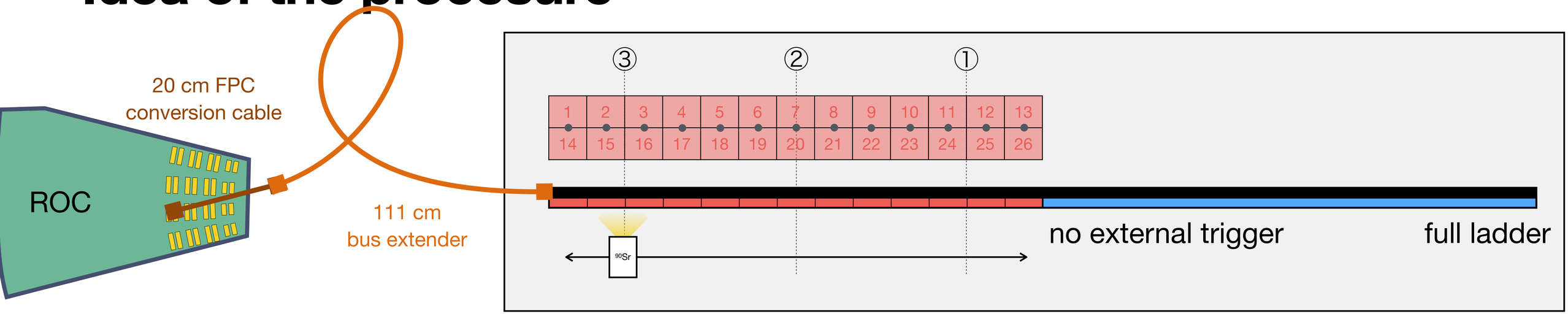
Ladder	Calibration	^{90}Sr & BG(high DAC)	BG (low DAC)
DAC0	20	40	15
DAC1	25	50	30
DAC2	30	60	60
DAC3	35	90	90
DAC4	40	120	120
DAC5	45	150	150
DAC6	50	180	180
DAC7	55	210	210

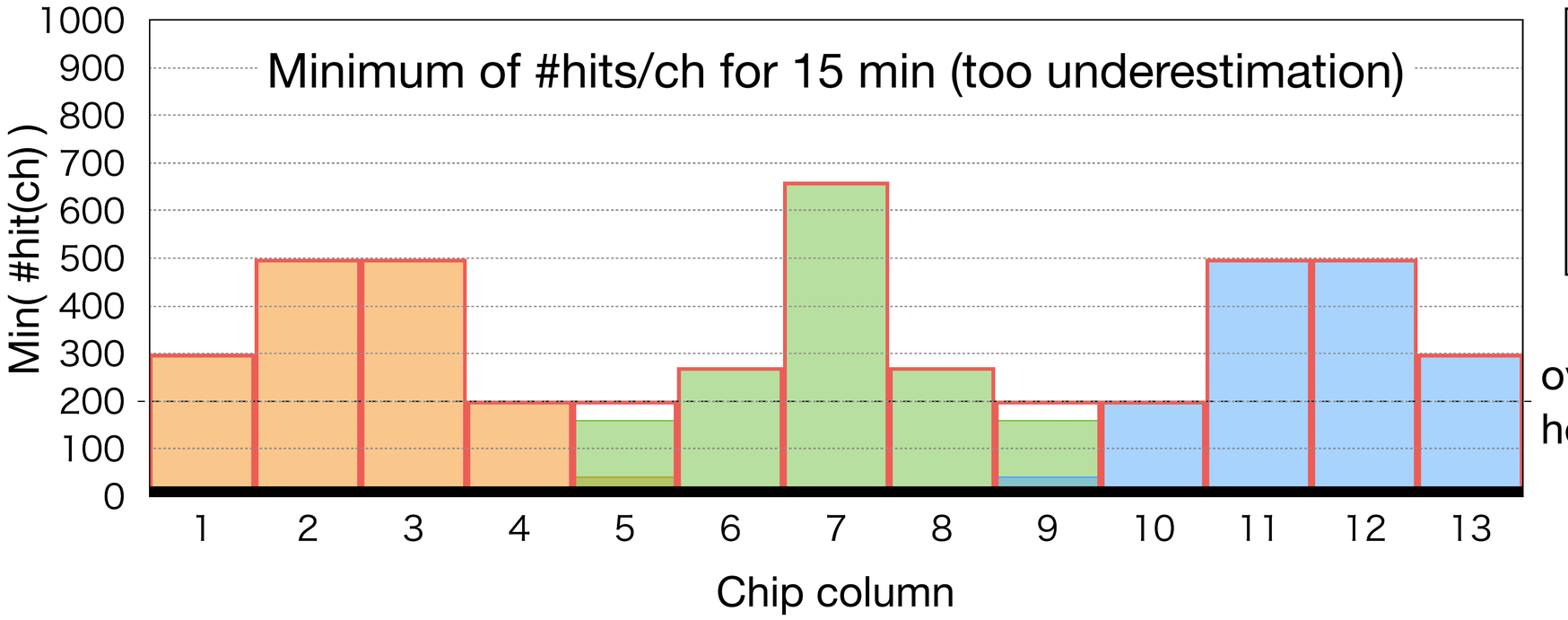
Testing mass production ladders with a radiation source, Idea of the procesure





Testing mass production ladders with a radiation source, Idea of the procesure



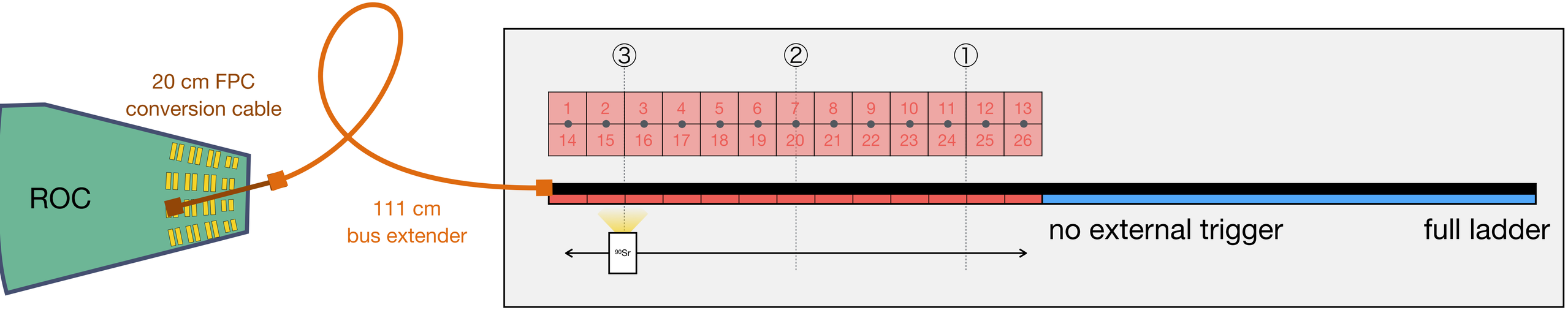


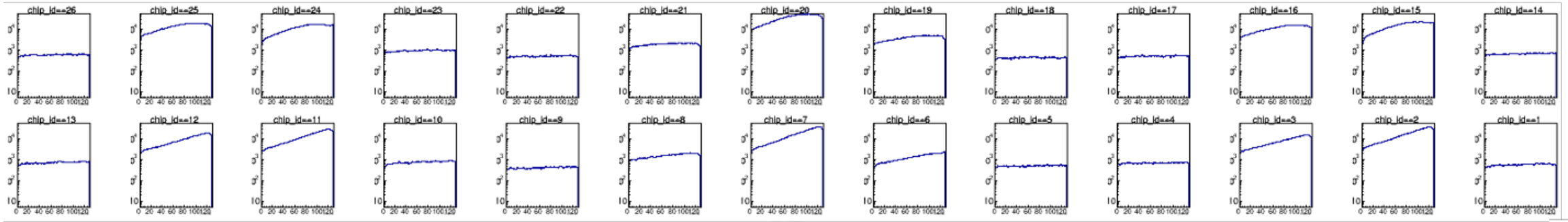
- Hits from ^{90}Sr at ① for 15 min
- Hits from ^{90}Sr at ② for 15 min
- Hits from ^{90}Sr at ③ for 15 min
- Sum
- Hits without ^{90}Sr for 15 min

over here

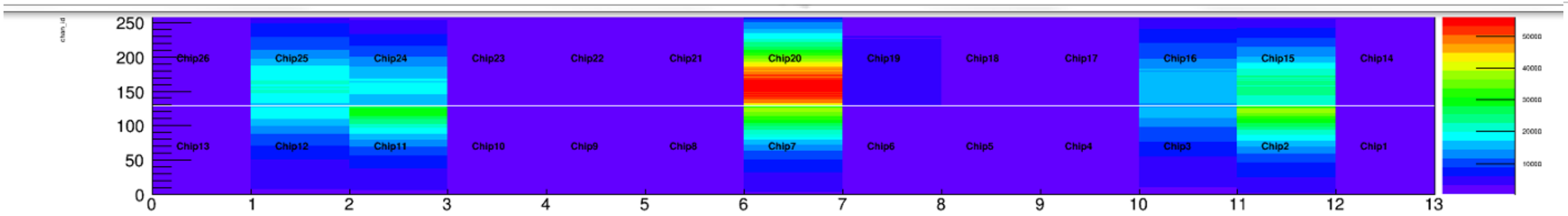
Sum of 3 points measurements makes >200 hit/ch/15min.
Hits without ^{90}Sr > 10/ch/10min.
→ This procedure is fine in statistical point of view.

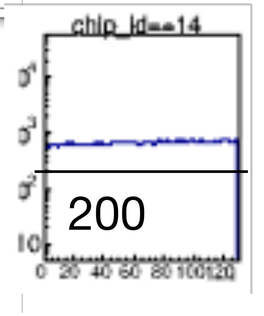
Testing mass production ladders with a radiation source





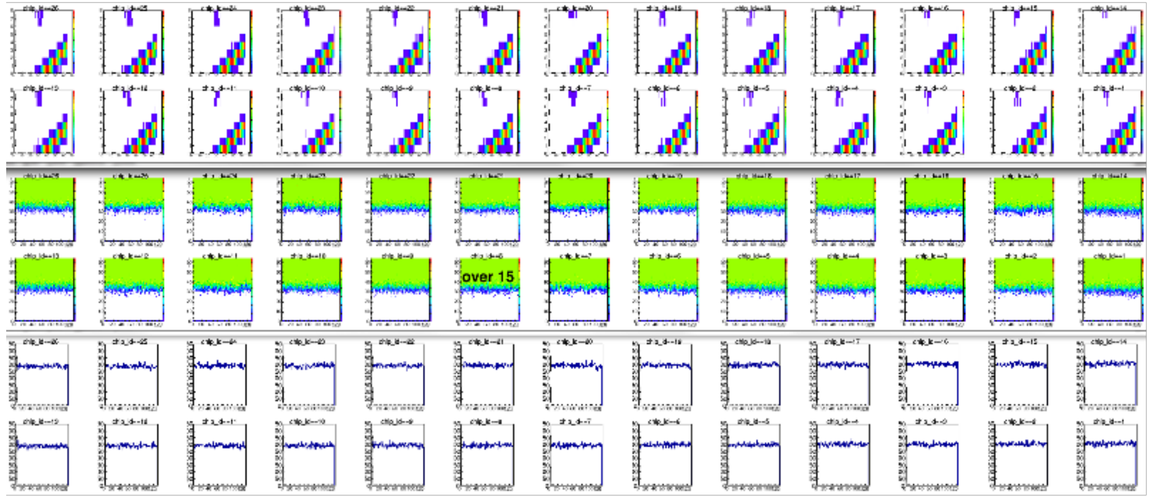
PB1-L005
South





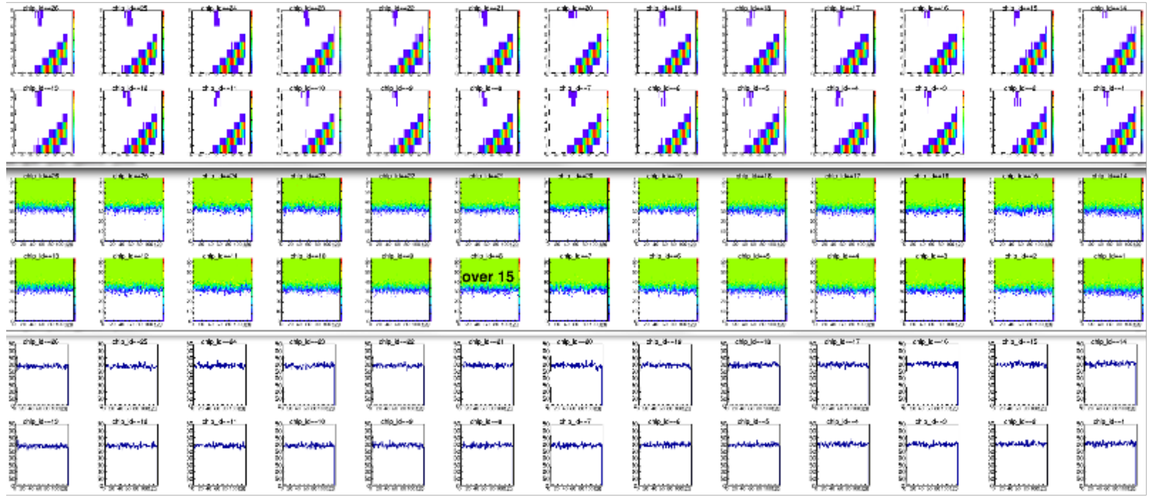
Good ladder: PB1-L005 North

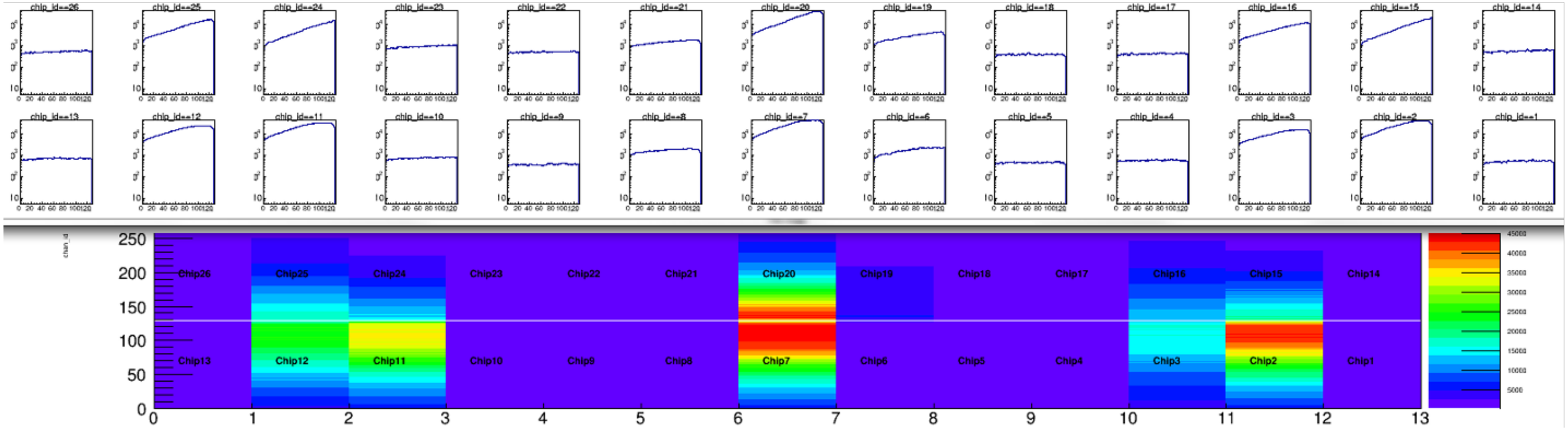
Calibration measurements before and after testing



Good ladder: PB1-L005 North

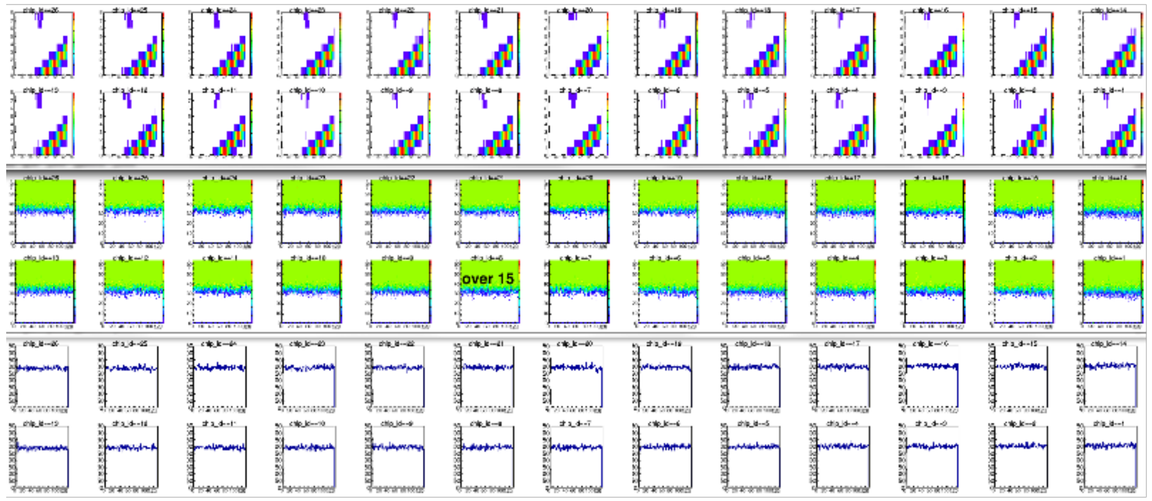
Calibration measurements before and after testing



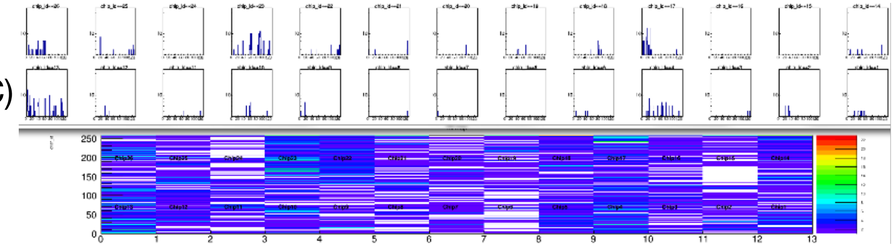


Good ladder: PB1-L005 North

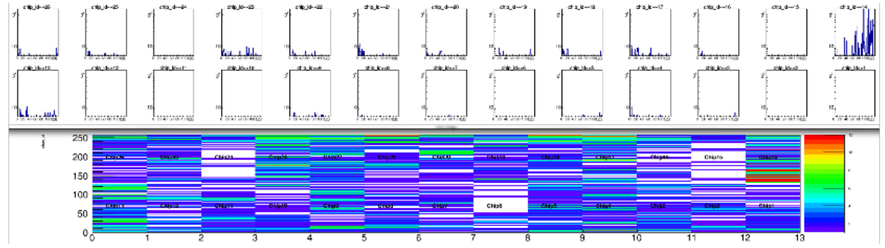
Calibration measurements before and after testing

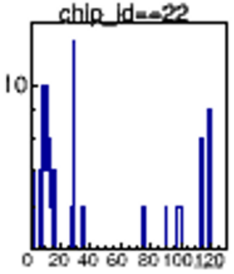


BG (high DAC)

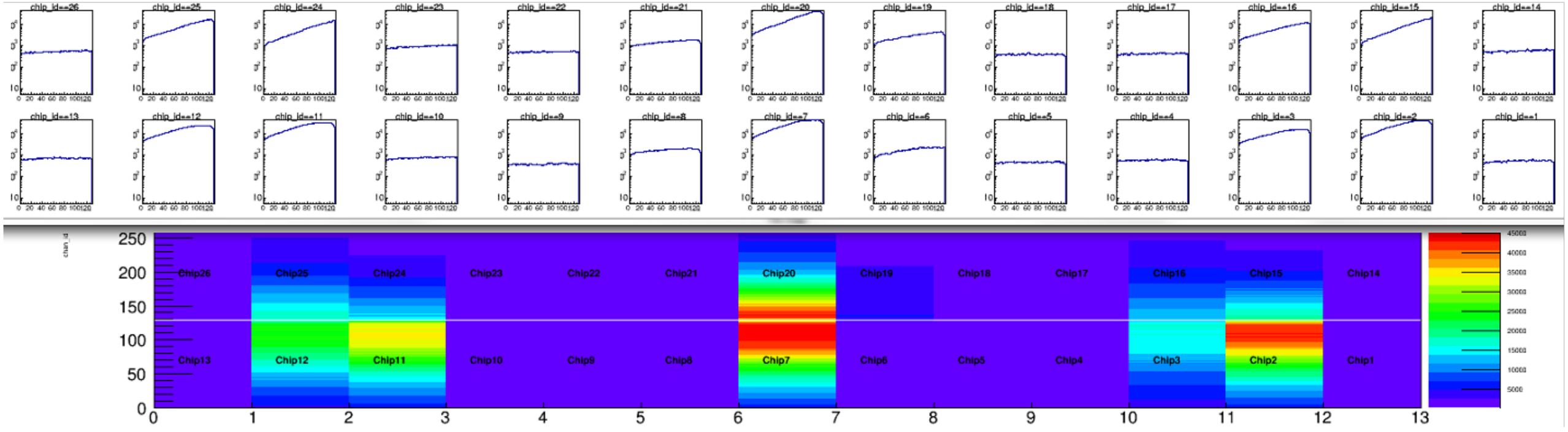


BG (low DAC)



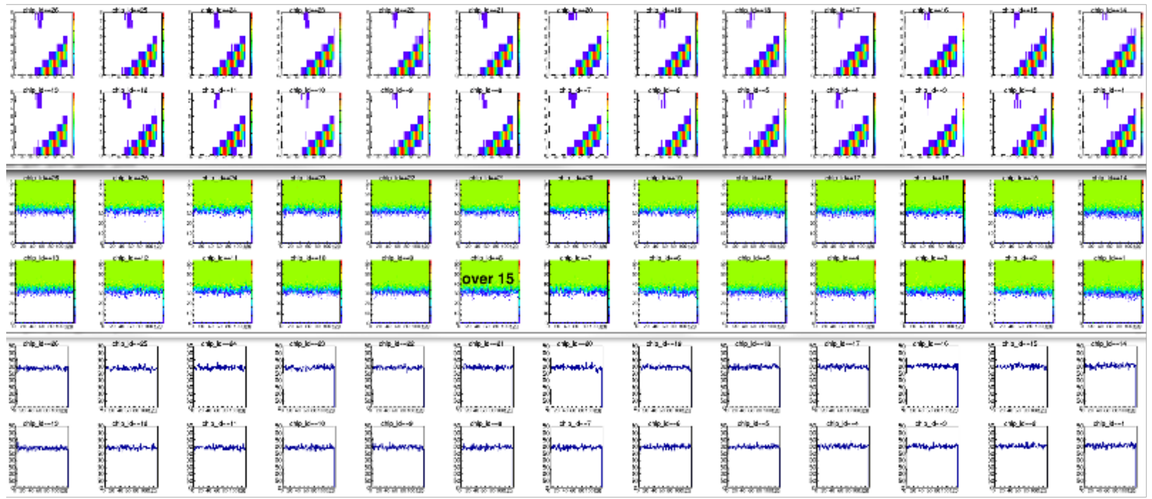


Typical ch dist without ^{90}Sr (not this ladder)

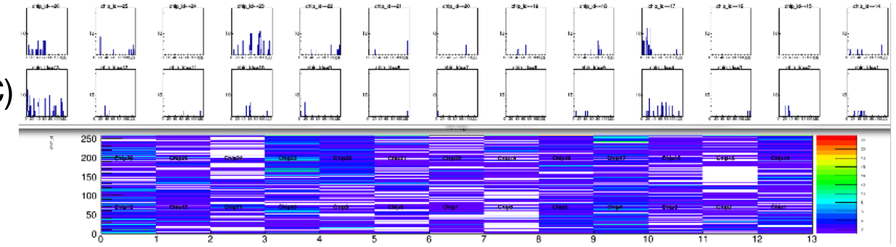


Good ladder: PB1-L005 North

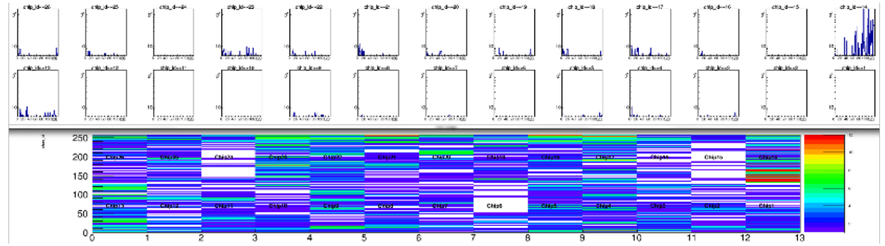
Calibration measurements before and after testing

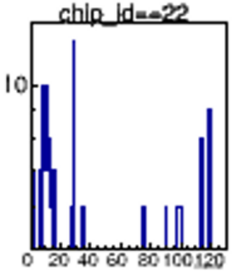


BG (high DAC)



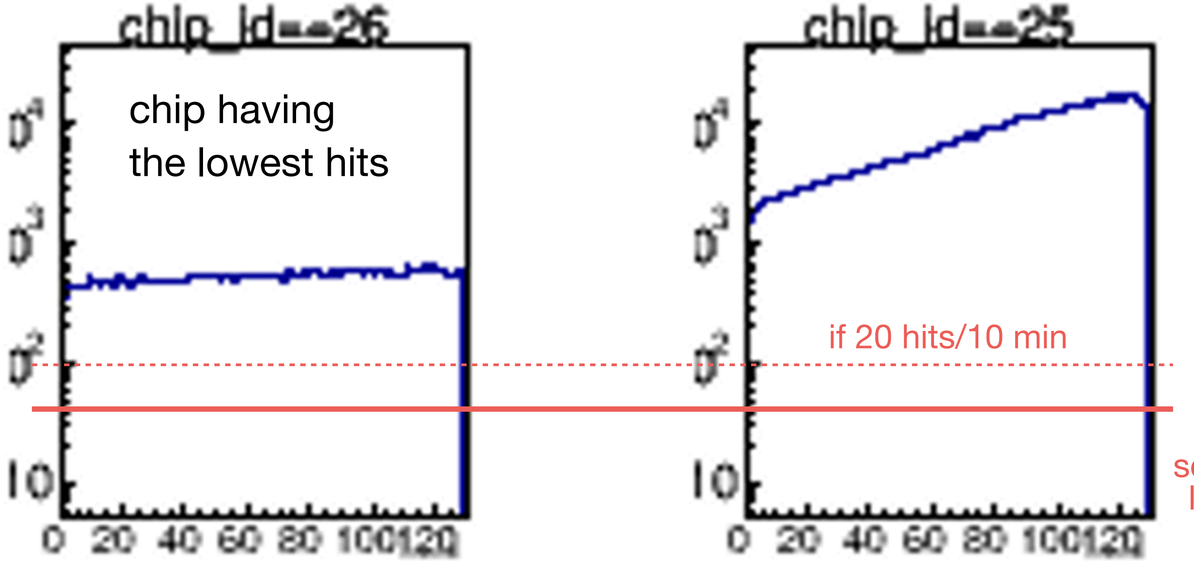
BG (low DAC)





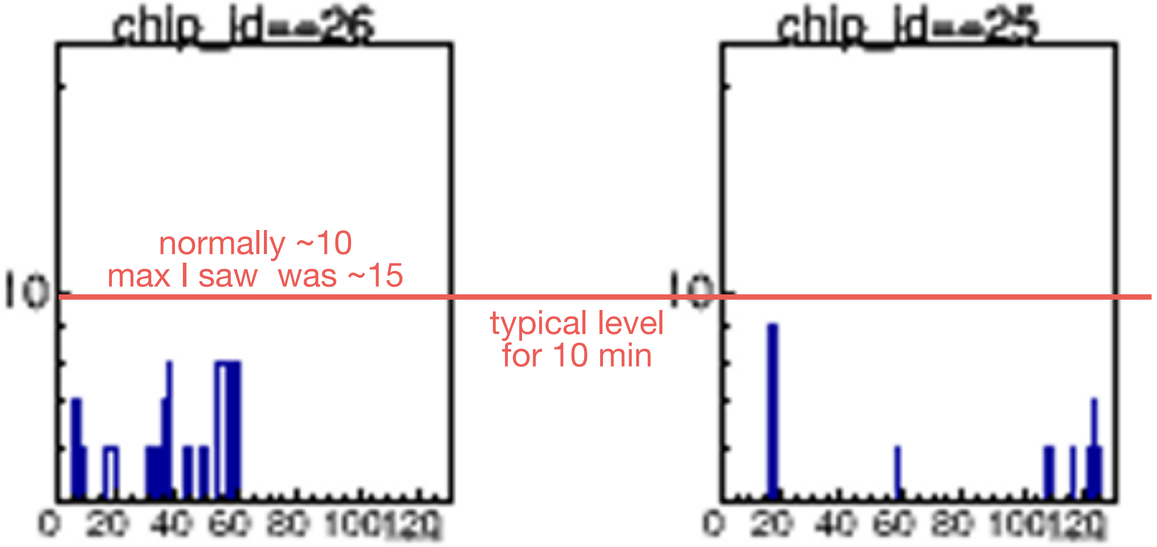
Typical ch dist without ^{90}Sr (not this ladder)

With ^{90}Sr for 15+15+15 min



scaled level

Without ^{90}Sr for 10 min



Current status (without masking)

cp: chip
ch: channel

Ladder	Side	Class	#bad ch from classification	Calibration at the beginning	^{90}Sr	BG (high DAC)	BG (low DAC)	Calibration at the end
PB1-L001	North	1	20	cp25 always half	OK cp25 looks reasonable	<~15	as usual	cp25 always half
	South			OK	OK	<~15	noisy: 1	OK
PB1-L004	North	1	33	dead: 1	dead: 2	<11	as usual	dead: 1
	South			dead: 1	dead: 1	<~15	as usual	dead: 1
PB1-L005	North	1	14	OK	OK	<11	as usual	OK
	South			OK	OK	<11	as usual	OK
PB1-L006	North	1	14	noisy: 1	noisy: 1	<10 noisy: 1	OK if the noisy channel masked	OK
	South							
PB1-L007	North	1	25	OK	OK	<~15	as usual	OK
	South							

Noisy channels cause problems. If masked, the problems were gone.

Current status (without masking)

cp: chip
ch: channel

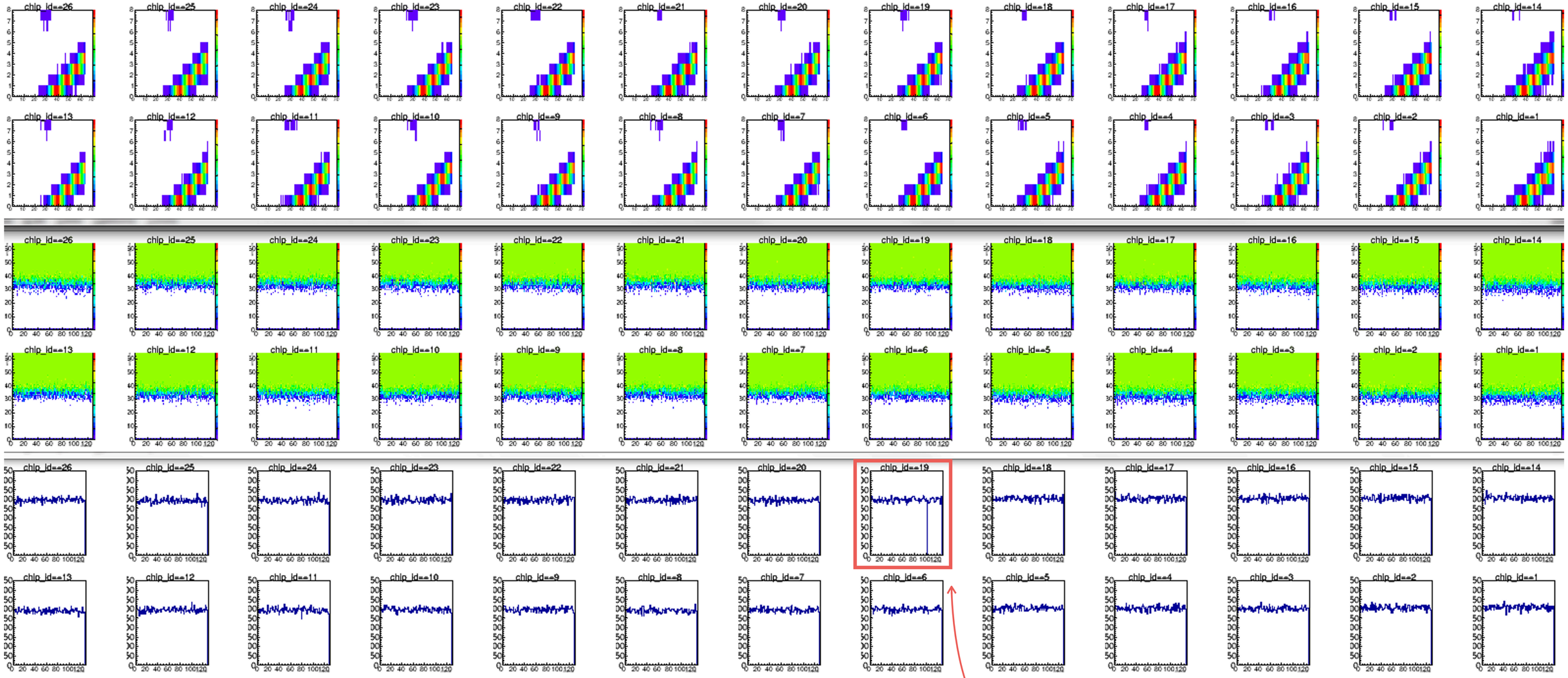
Ladder	Side	Class	#bad ch from classification	Calibration at the beginning	^{90}Sr	BG (high DAC)	BG (low DAC)	Calibration at the end
PB2-L001	North	1	14	noisy: 1	OK	<~15	as usual noisy: 1	noisy: 1
	South			OK	OK	<~15	<15	OK
PB2-L002	North	1	28	OK	OK	<12	as usual	OK
	South			noisy: 1 dead: 1	OK if noisy/dead ch are masked	<~15		noisy: 1 dead: 1
PB2-L003	North	4	138	OK	OK	<12	as usual	OK
	South			too bad				
	North							
	South							
	North							
	South							

Noisy channels cause problems. If masked, the problems were gone.

Interesting phenomenon

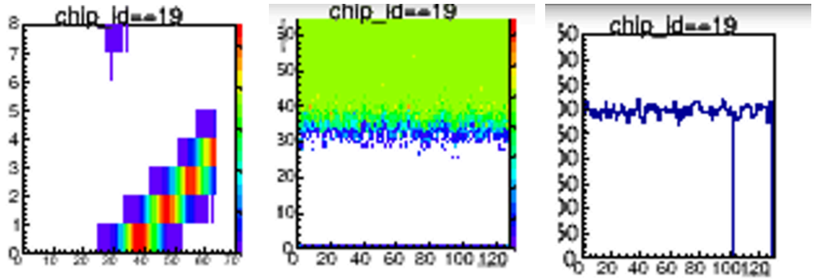
PB1-L004 South (class-1, 33 bad channels in this full ladder)

Calibration measurements look OK

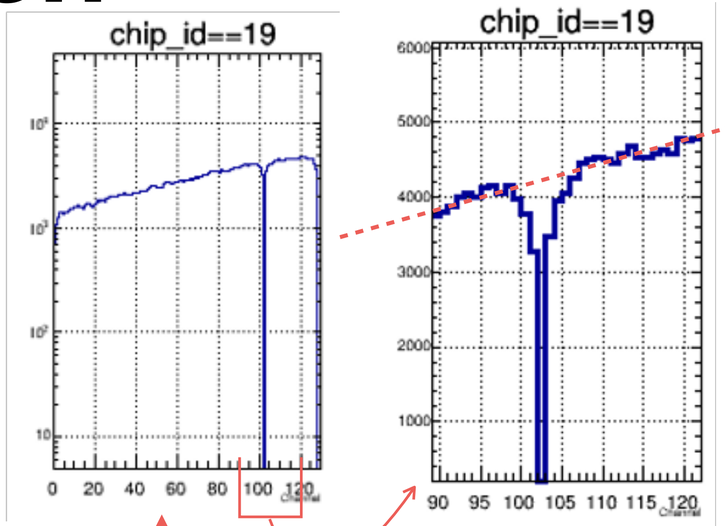


Interesting phenomenon

PB1-L004 South (class-1, 33 bad channels in this full ladder)



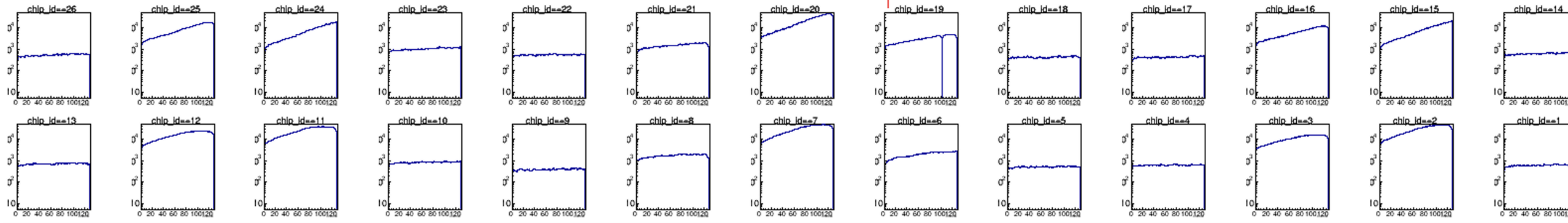
Calibration measurements look OK

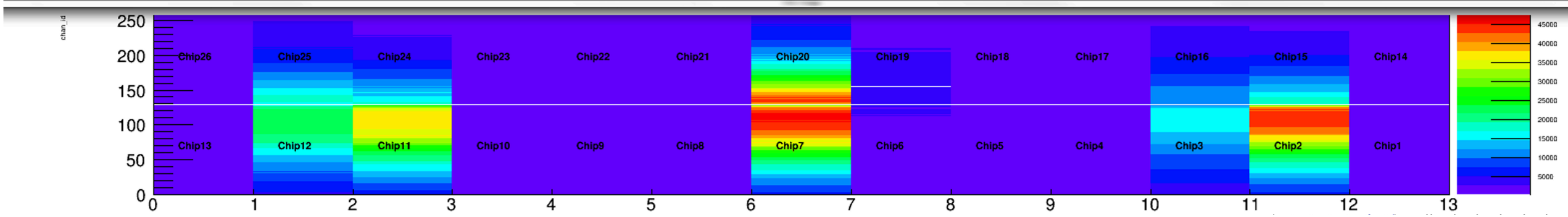


Channels around the dead ch have less hits than expected.

The measurement was done without any mask.

I'll try with masking the dead ch later.





Radiation measurement looks OK

Comments, Impressions, etc.

Good ladders are really stable. They are always good.

Noisy channels sometimes create a huge amount of noise, noise assigned to other chip/ch. Masking the channel solves the problems normally. But our understanding/experience of noise behavior is not perfect.

I should check the noisy/dead channel map made from the ladder classification when testing ladders.

Sometimes, I face problems that may be due to readout. Restarting power supplies solves this kind of problem. I hope the new Felix readout system is better than the current one.

It’s not easy to reproduce noise conditions… So investigation takes time.

Generally, ladders work well. I just need to learn how does a bad channel behaves.