



◆ **A FISTFUL OF DIAMONDS** ◆

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SuperPix0-D calibration review

Soundtrack

"Black Diamond" Stratovarius 1997 - <http://www.youtube.com/watch?v=Tn58-Nl9NYw>

"Black Diamond" Kiss 1974 - http://www.youtube.com/watch?v=_Yu1G0tNmqq

“I know I can’t stay by your side forever,
but I know I won’t forget your beauty,
my Black Diamond.”

Stratovarius, *Black Diamond*



Run 4681

CALIBRATION PARAMETERS

MySQL query RUN 4681

Chip2DACStart	Chip2DACStop	Chip2DACStep	Chip2TrigValue	Chip2TimeWindow	Chip2Type	Chip2RDclk	Chip2FastClk
672	736	4	160	2500	SPX0	20MHz_0	40MHz_180



Total: **17** DAC steps



Acquisition time **2.5 us**



Column Steps **32** (2 cols SM0 & 2 cols SM1)



Double reset after each trigger



Expected events: DAC steps*Col
Steps*Triggers = **87040**

“Darkness will fall on the city
It seems to follow you too
And though you don’t ask for pity
There’s nothin’ that you can do, no, no ”

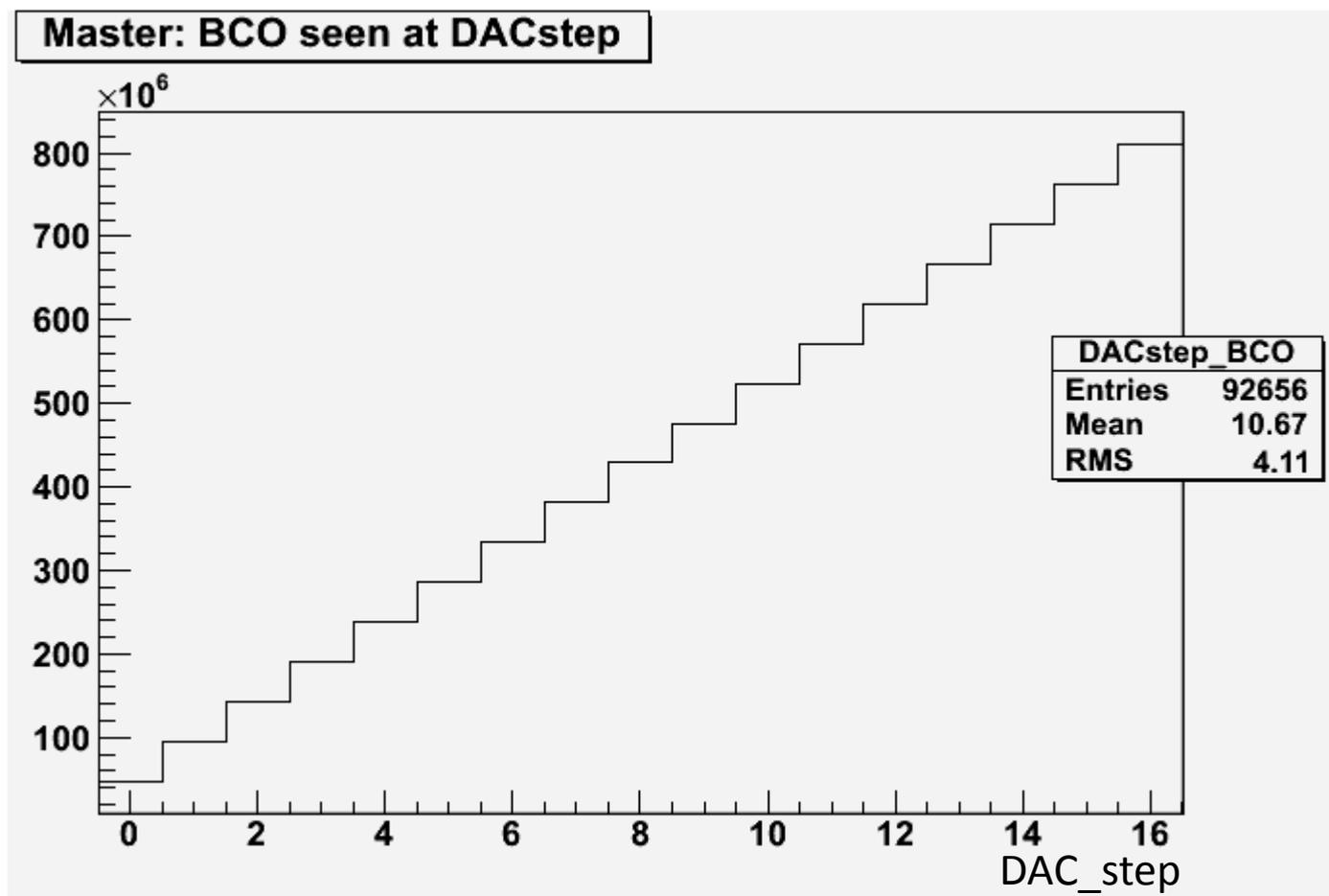


Kiss, Black Diamond

Run 4681

CALIBRATION DATA

Calibration linear progress



Qualitative plot

Quality of Data



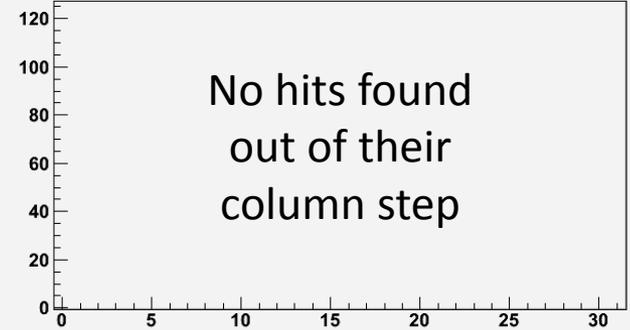
Double hits found

doubleHits	
Entries	0
Mean x	0
Mean y	0
RMS x	0
RMS y	0



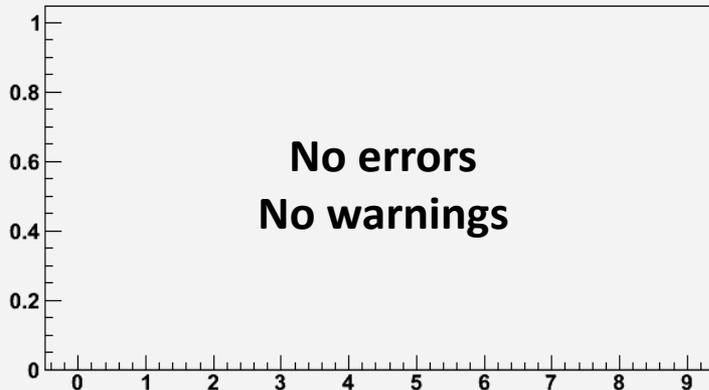
Columns found (y) out of enabled matrix portion in a given col step (x)

hcolsOut	
Entries	0
Mean x	0
Mean y	0
RMS x	0
RMS y	0



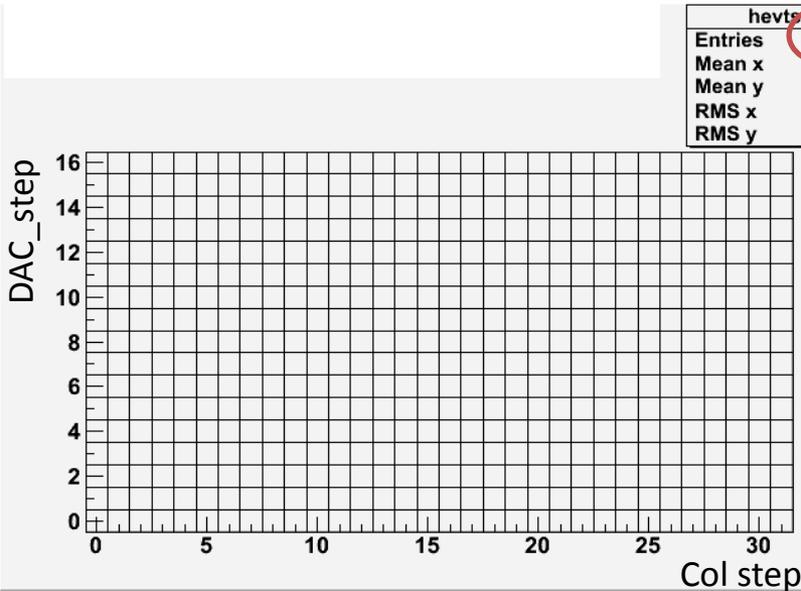
Warning flags

hbitWarning	
Entries	0
Mean	0
RMS	0

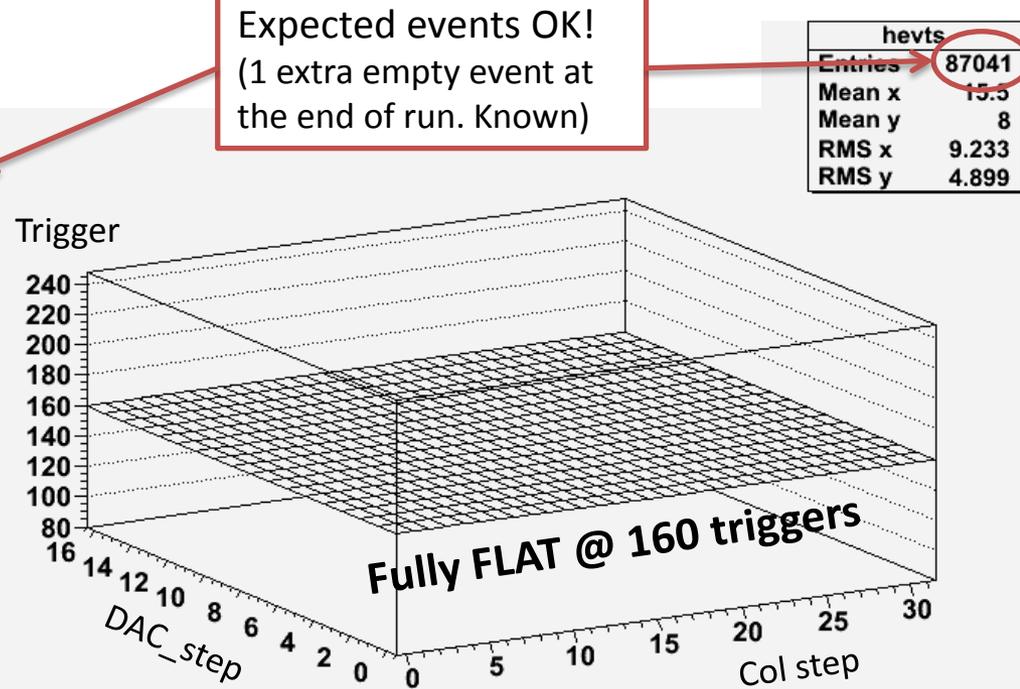


Triggers per Calibration step

Number of triggered events found for each calibration step (DAC step vs Col step)

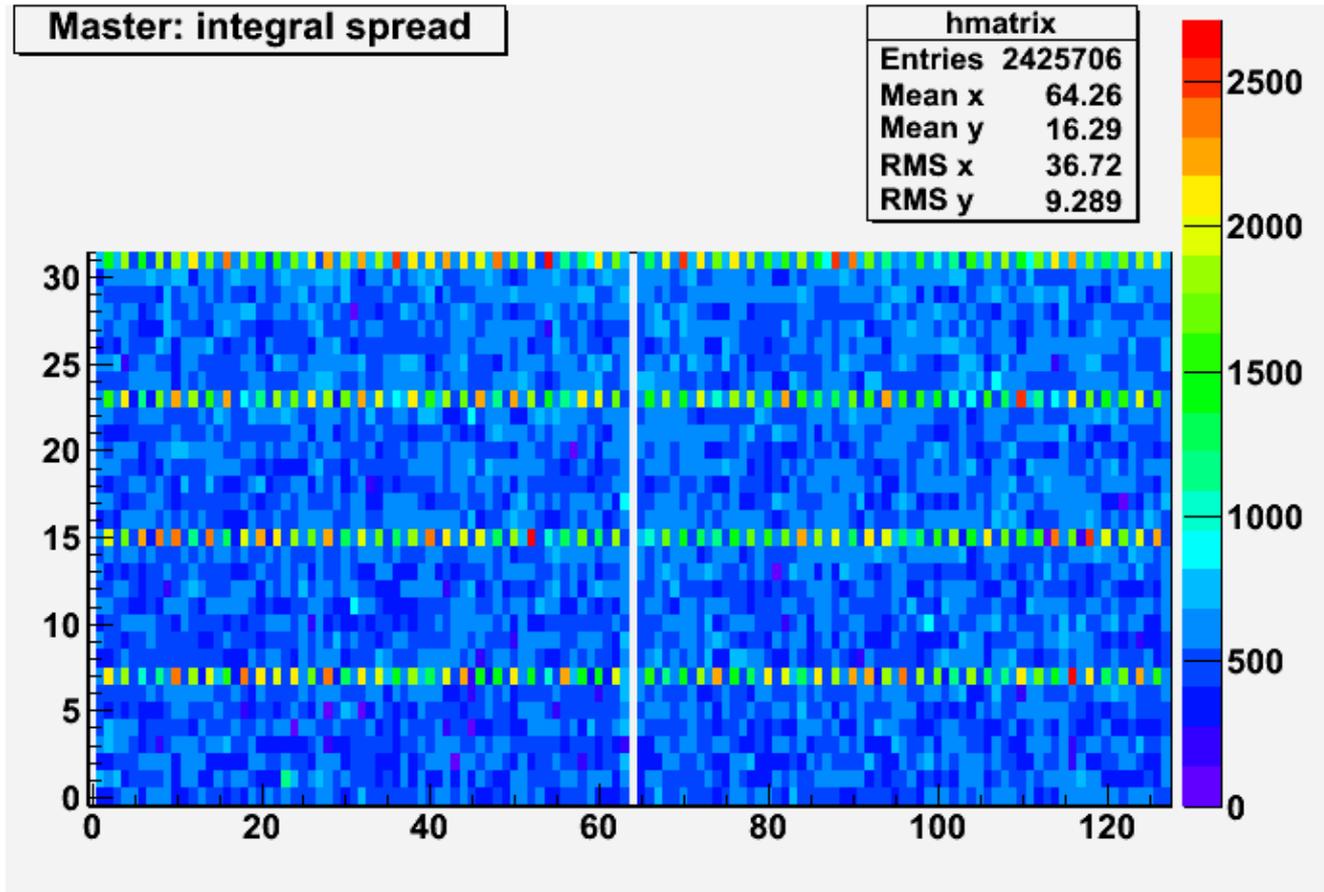


(BOX view)



(LEGO view)

Calibration integral hit spread



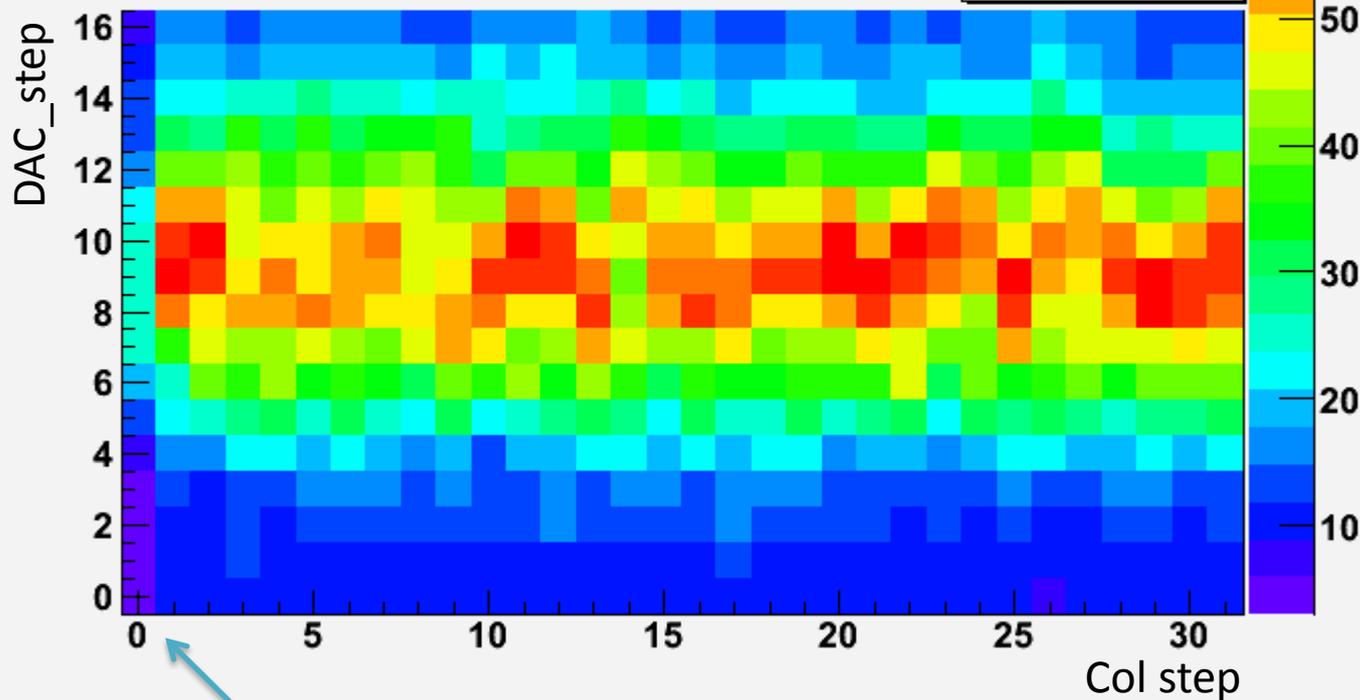
Columns with address 0 & 64 are rejected by firmware

Baseline Overview



Average number of hits per event in each calibration step (DAC step vs Col.Step)

hmeanNhitXStep	
Entries	544
Mean x	15.8
Mean y	8.823
RMS x	9.081
RMS y	3.745



Not really well centered to baseline and DAC range quite narrow

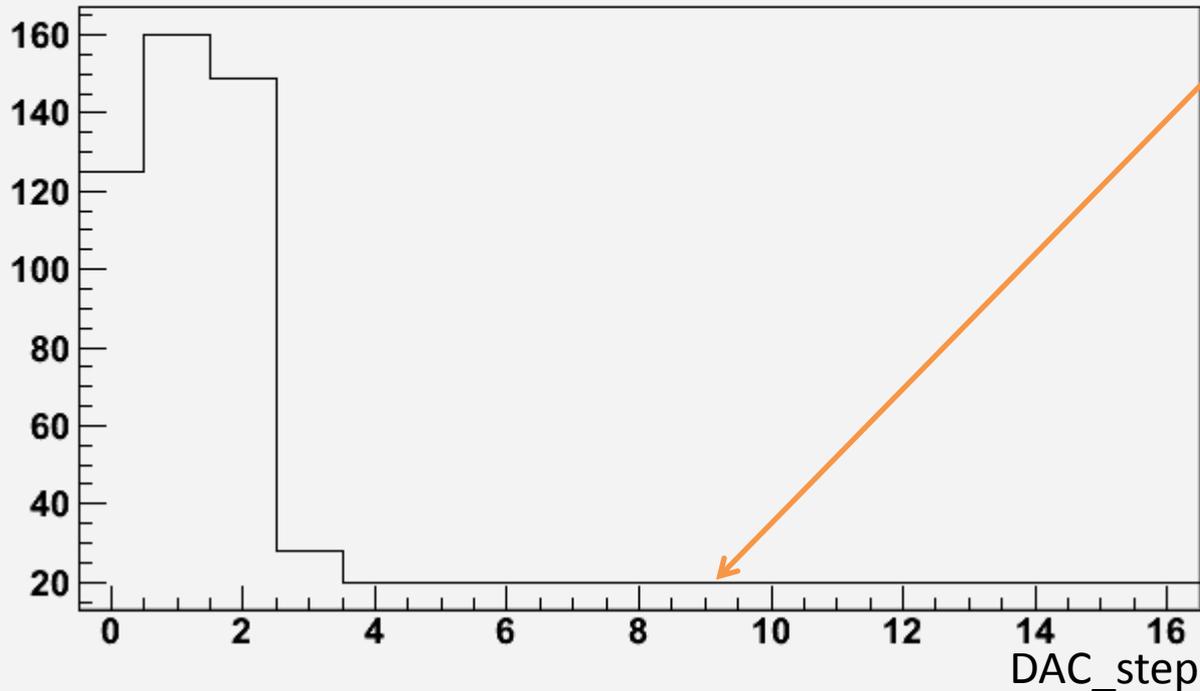
Columns with address 0/64 are rejected by firmware (half statistics for these bins, OK)

Sample: Pixel 33



Master: pixel 0033

hpixel_0033	
Entries	722
Mean	4.352
RMS	4.849



Plateau at 20 over the total of 160 triggers

MANY PIXELS in the same situation

When these 20 latches occur?

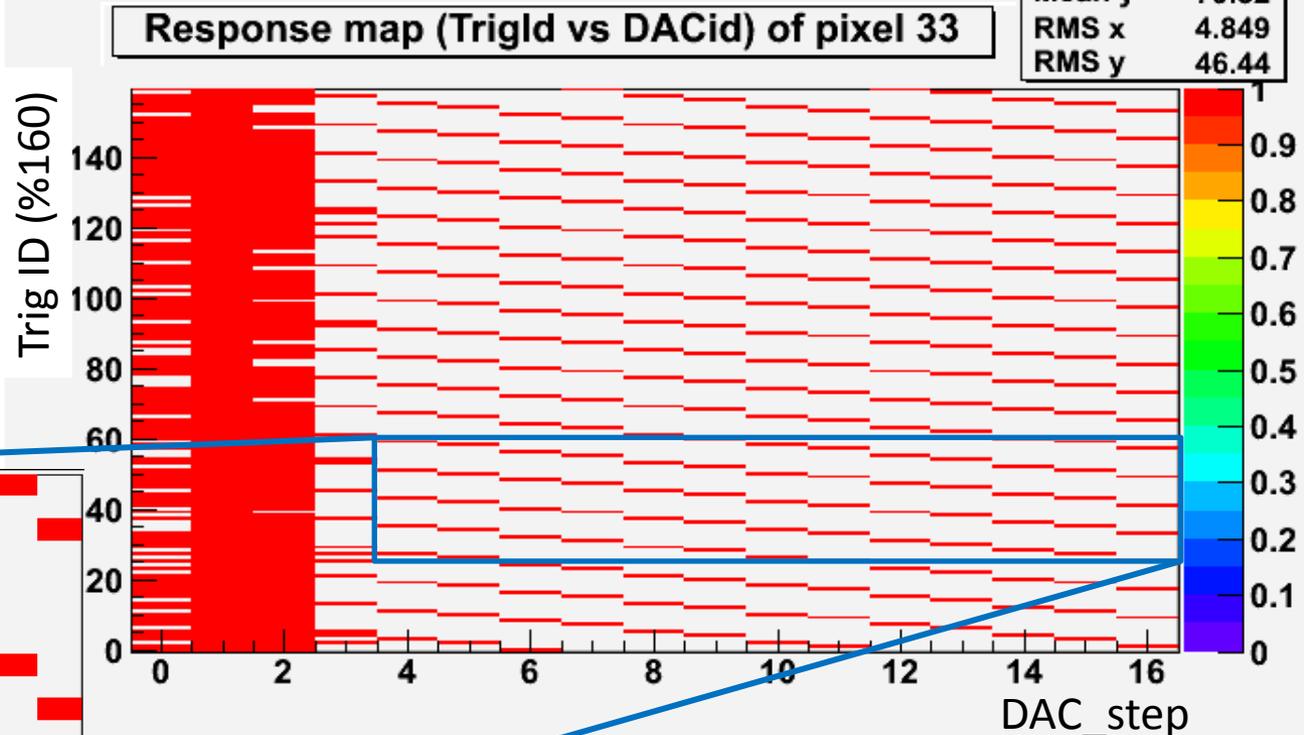
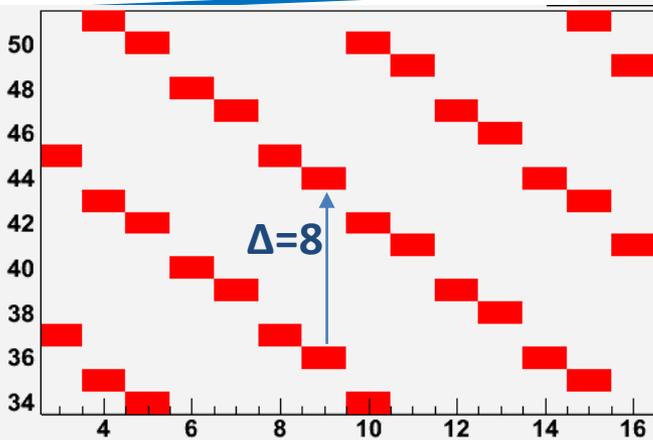
So **smooth** that it's hard to think they are random...

Do they present a recurring pattern in time?

Sample: Pixel 33



... it seems the answer is:
YES



1 hit every 8 triggers
WITHIN a DAC step

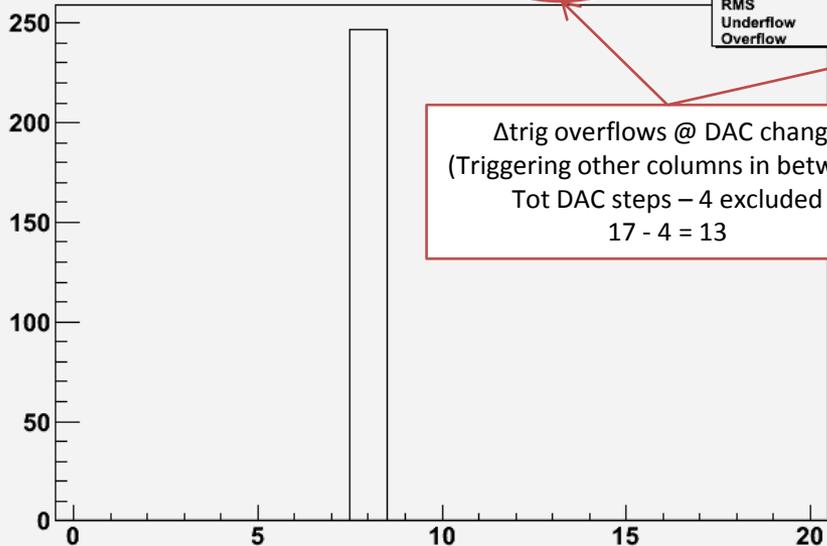
Differential trigger ID

Analyze ONLY the periodic region (DACstep>3)

Calib. Parameter:
Triggers per step = 160

Δ trigID

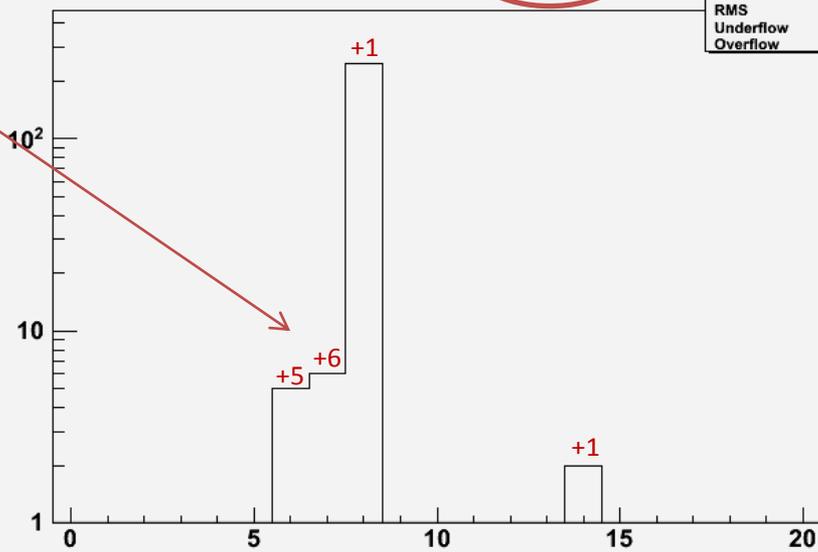
Differential Trigger ID when PX 33 latches (DACID>3)



Δ trig overflows @ DAC change
(Triggering other columns in between)
Tot DAC steps – 4 excluded
 $17 - 4 = 13$

Δ trigID %160

Differential Trigger ID when PX 33 latches (DACID>3)



Within a DAC step, Δ trigID is always 8

Δ trigID is still **ABOUT** 8 counting modulo 160.
Setting DAC takes **not always the same time**

Summary/Conclusions

"Lucid in the sky with diamonds..."

- Data structure is OK
 - Events structure OK
 - Calibration process OK
 - Control words
 - Warnings / Errors
 - Number of trigger per step
- FE data
 - Not really centered to baseline and narrow DAC range
 - Strange behavior above baseline
 - Periodic pattern
 - Period hard to calculate off-line
 - $O(\text{ms})$

King
Diamond



THE END

