

Power pulsing

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Summer Student Programme

CLIC - Compact Linear Collider

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Overview

- 1 Motivation to power pulsing
- 2 Power pulsing test with CLICpix2 assembly
- 3 Future studies

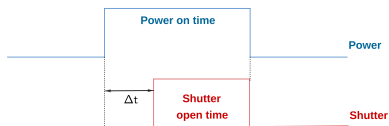


Introduction

- **'Power pulsing'** : provide power in small intervals, and the rest of the time keep the electronics off.
- In general, power pulsing can be applied to the analogs and digital electronics. For CLICpix2, we only do **analog power pulsing** (APP).
- **Main advantages** :
 - Reduce power consumption
 - Reduce heat dissipation
 - Not need for cooling pipes
 - Low material budget



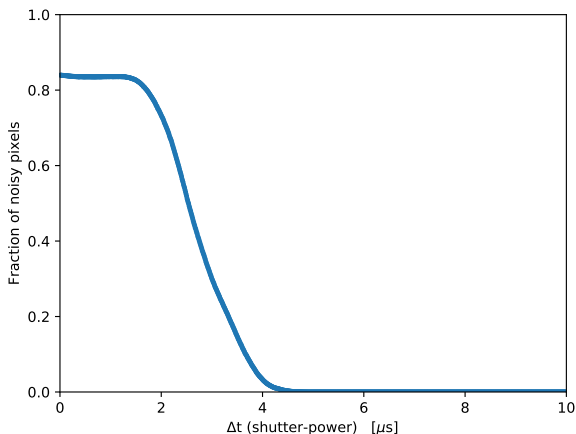
Introduction



- **Goal** : determinate the most efficiency delay between the power-on and the shutter-open states (Δt).
- Power pulsing with CLICpix2.
- Measurements performed at the laboratory.



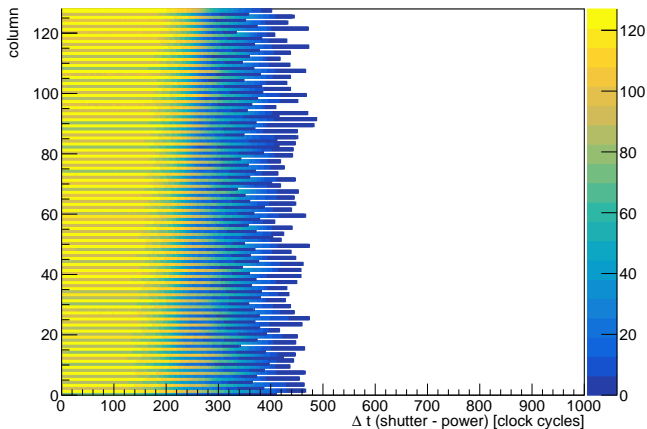
Pixel noisy stabilisation time



- Not all pixels response due to voltage drop.
- Stabilisation of the hit count at around 4-5 μs .



Power on response as function of the pixel column number

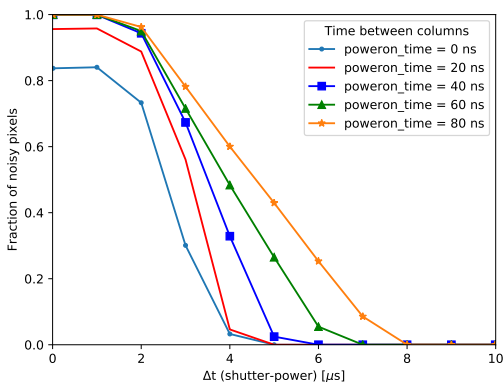


- Columns with low number become stable faster.
- Pattern between even and odd columns due to layout.



Power on response as function of the pixel column number for $poweron_timer = 8$

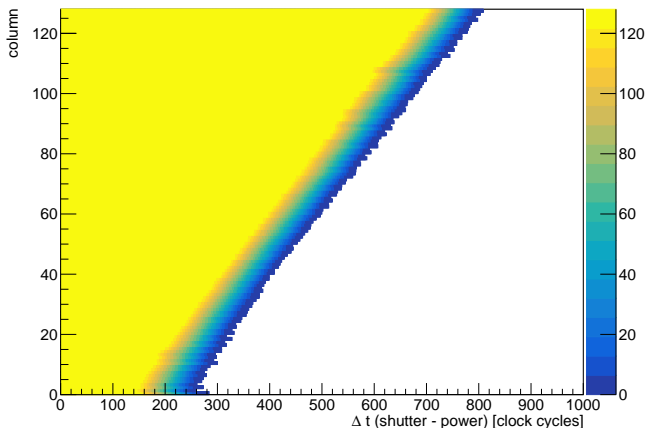
- $poweron_timer$: "Number of clock cycles to wait between two consecutive columns are turned on"



- Increasing the $power_timer$ we avoid spikes in power, but takes longer to stabilise.



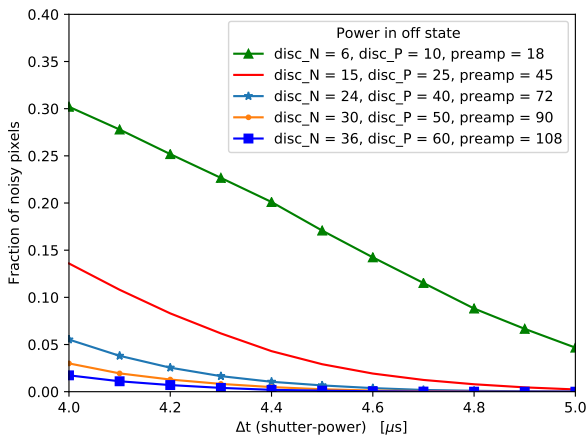
Power on response as function of the pixel column number, $poweron_timer=8$



- Columns with low number become stable faster.

Power consumption in the off-state

- Most power consuming nodes for APP : preamplifier and 2 discriminators (N, P).



- Looks like we choose between power saving and delay time.

Future studies/ideas

- Play with ***poweron_timer***, increasing it, obtain new plots using logarithmic x-axis, check manual controls...
- Play with **power in the off-state**.
- **Test pulsing**
- **Power consumption** measurements
- **Temperature** effects

