



# Faulty core columns in CROC quad assemblies

B. Raciti, IT ASIC & Electronics System – 8<sup>th</sup> June 2023



## Injection pattern and faulty core columns

Issue:

- All quad assemblies tested so far presented an odd injection pattern independent of the sensor design and HDI (LF HPK, TEPX TBPX)  $\rightarrow$  chip related issue
- This is due to the presence of faulty pixels in some of the core columns sending corrupted data ٠

A quick test can be done by running a **pixelalive** scan activating the **flag for the data integrity**.

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Each digit corresponds to a core column (8 cols)

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00:03:55 E No data	collected> retry	
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	<pre>EN_CORE_COL_1 value = 111111111111111 (0 = disabled</pre>	
	<pre>EN_CORE_COL_2 value = 111111111111111 (0 = disabled</pre>	
	<pre>EN_CORE_COL_3 value = 111111 (0 = disabled)</pre>	
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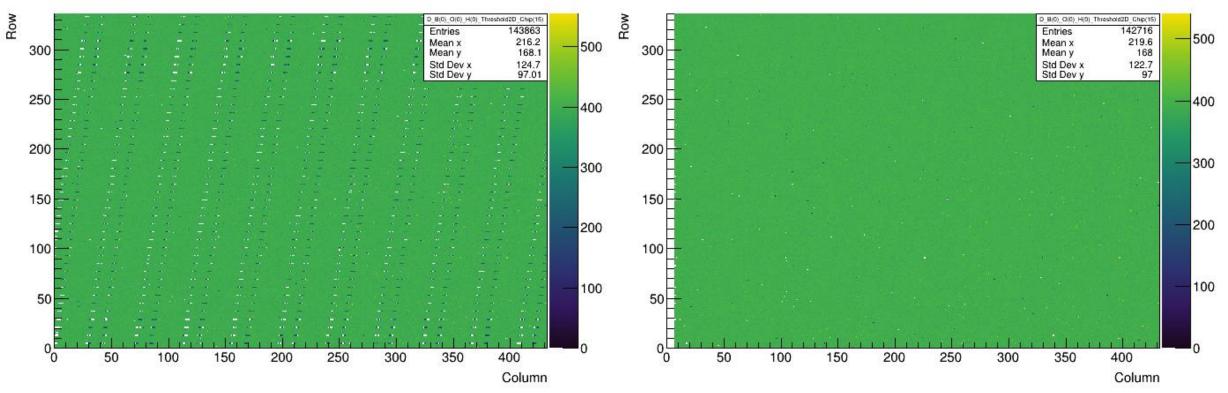
# Injection pattern and faulty core columns

Just a handful of pixels are faulty (otherwise none of the pixels in these core columns would be tunable).

• These pixels are neither noisy nor stuck

 $\rightarrow$  they send corrupted data that cannot be decoded

- Since multiple pixels are injected simultaneously, the entire batch of data has to be discarded
  - → origin of the injection pattern and complete failure of the noise scan (simultaneous readout of the entire matrix)



D\_B(0)\_O(0)\_H(0)\_Threshold Map\_Chip(15)



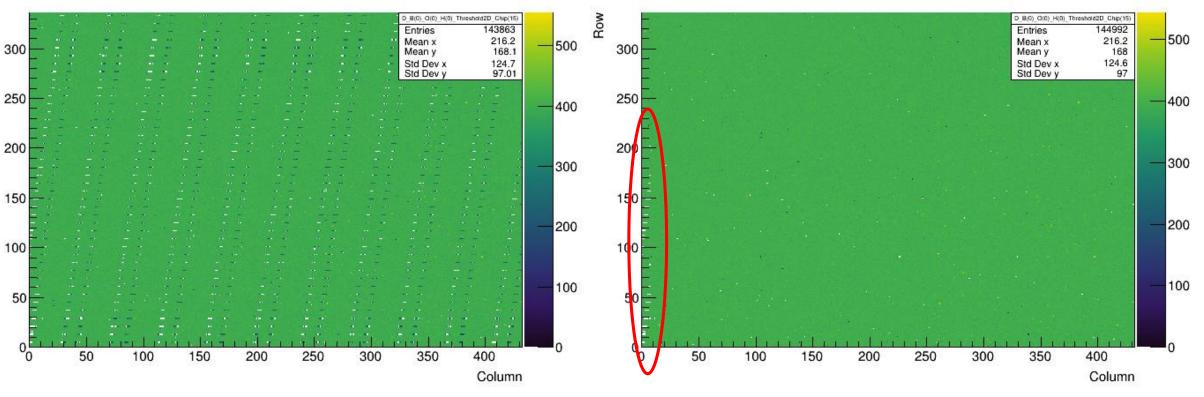
Row

# Injection pattern and faulty core columns

The faulty can be identified by looking at the intersection between the injection pattern and the faulty core column:

- By disabling them by hand, most pixels of the faulty core columns can be "saved"
- Just a fraction of the pixels belonging to columns [0,..,7] and the injection pattern must be disabled
  → most pixels can be recovered (useful e.g. to study big pixels)

D\_B(0)\_O(0)\_H(0)\_Threshold Map\_Chip(15)

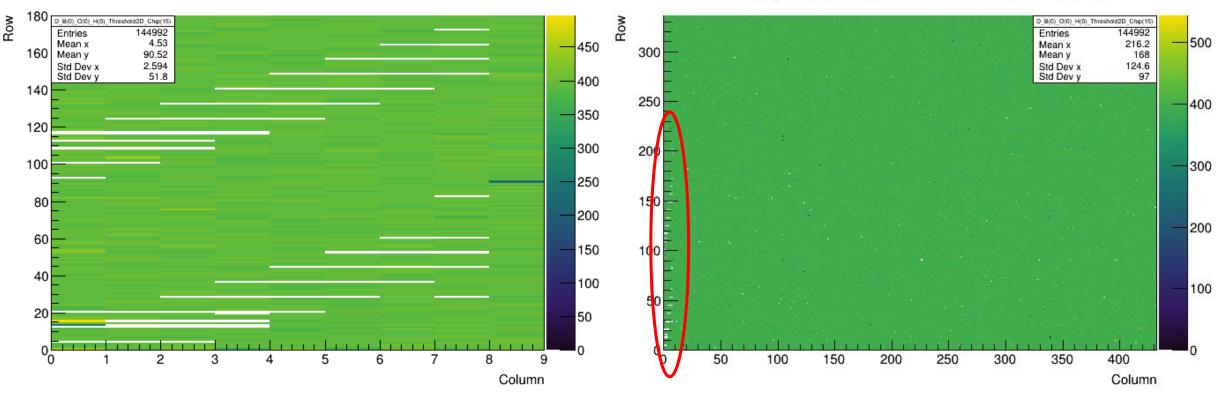




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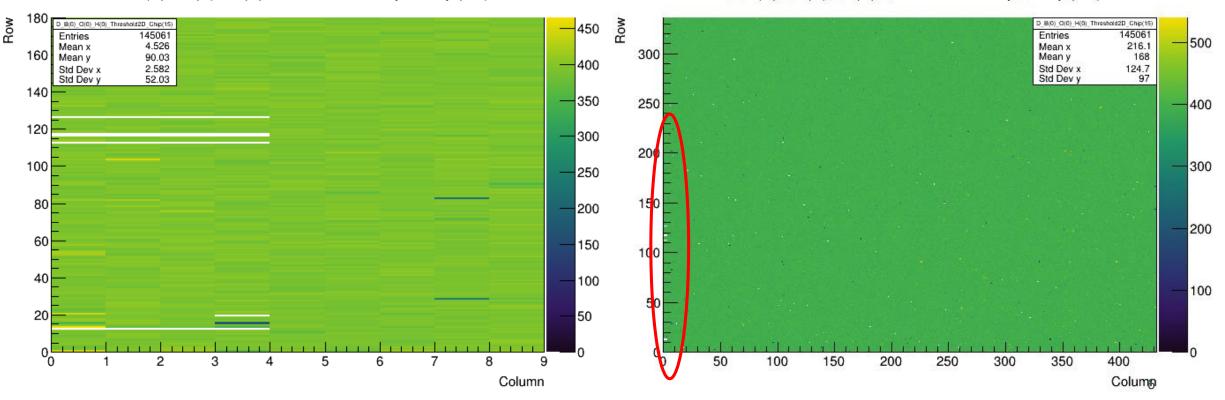
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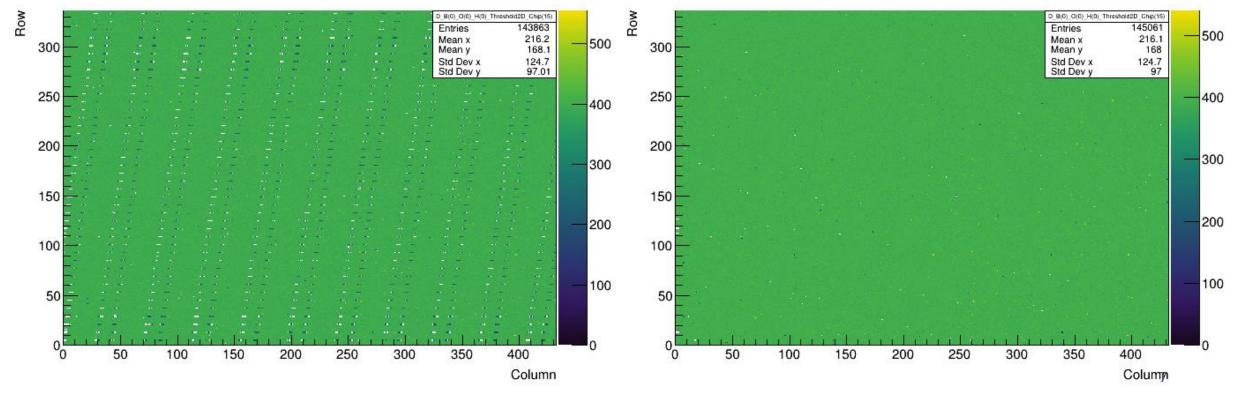




### Conclusion

Outlook:

- Testing a **digital module** to check if the issue could be associated to the **flip-chipping procedure**
- Implementing a pixel-by-pixel data integrity scan acting exclusively on the faulty core columns to automatically disable the faulty pixels



D\_B(0)\_O(0)\_H(0)\_Threshold Map\_Chip(15)