Test Beam 2010 Results
DHP emulation on the DCDB Hybrid

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Overview

- Test Beam

- DHP emulation structure

- Zero Suppression data analysis

- Issues and conclusions

- Laboratory analysis

- Results for the next DHP iteration

# Test Beam

▸ DCDB Hybrid installed in the EUDET telescope

6th DEPFET Workshop, Bonn 2011 7/02/2011

Test Beam

▸ **DCDB Hybrid installed in the EUDET telescope**

Test Beam

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▸ ## DCDB Hybrid installed in the EUDET telescope

- Current Test system

6th DEPFET Workshop, Bonn 2011

7/02/2011
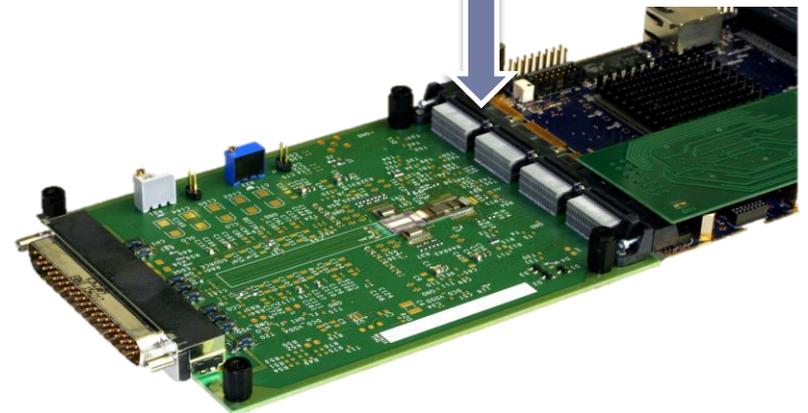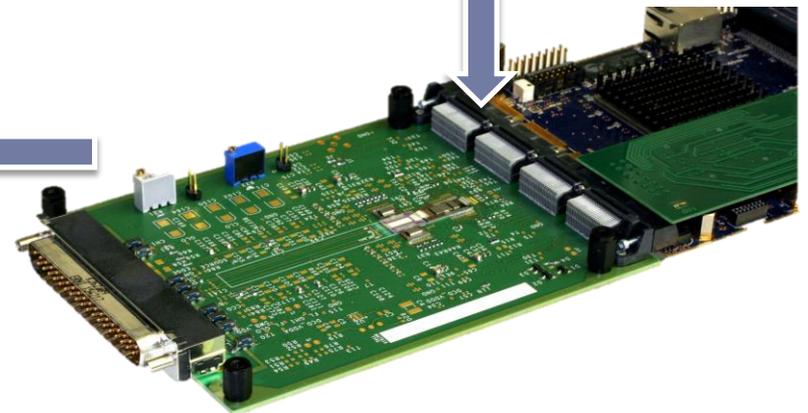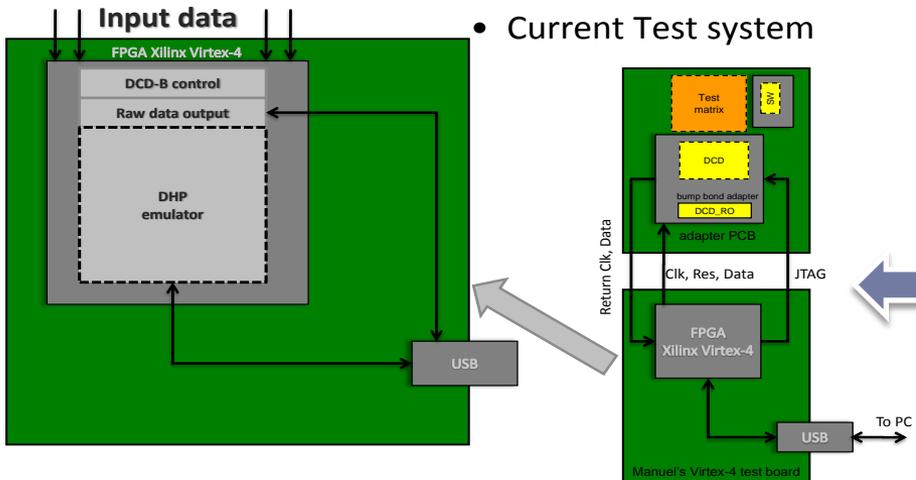
DHP emulator structural schematic

DCD output

↓

Deserializer and CM extractor

Pedestal subtraction ← Pedestal memory

Threshold detection, zero suppression → Pedestal update

Fifo 1

Hit position scanner

Fifo 2 (output=>USB)

DHP CORE
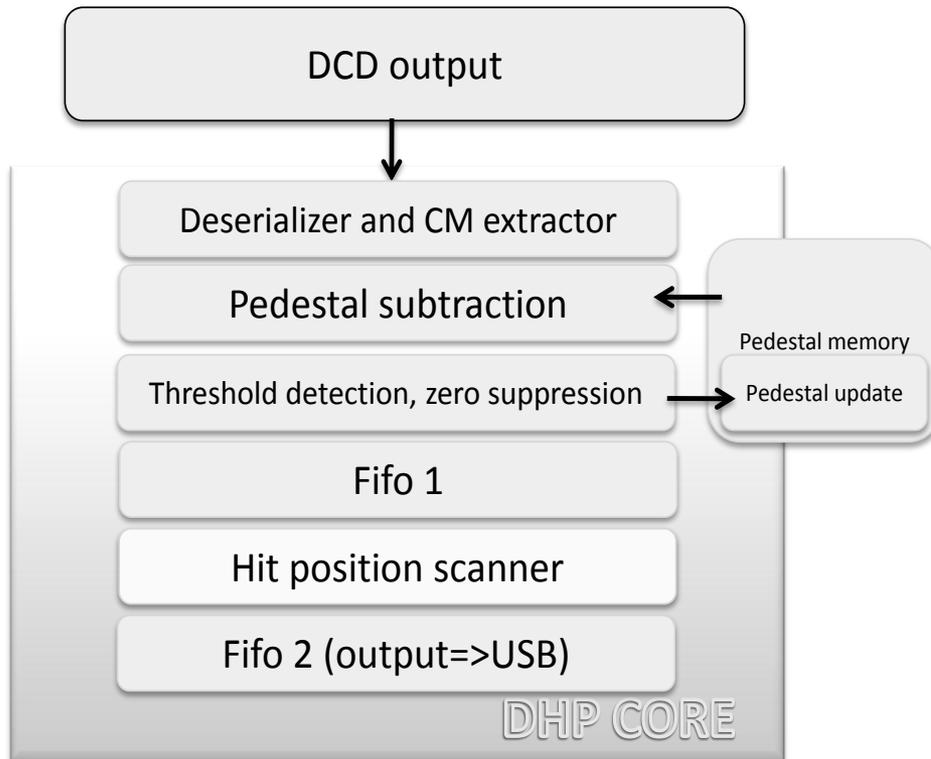
•CM subtraction and all other operations are done using 16 bits precision to avoid introducing additional digitization error
•Pedestals update:

$$P_{n+1} = \frac{255P_{n-1}' + P_n}{256}$$

Zero-Suppressed runs

▶ **Strategy used:**

  ▶ Using given flexibility test different modes of DHP data processing on real data + real-time conditions

  ▶ Check for the quality of the data reconstruction

  ▶ Check for possible data processing issues

▶ Conditions

  ▶ Trigger rate: ~1kHz(limited by EUDET telescope)

  ▶ 100MHz clock

  ▶ ~200kHz matrix refresh

### Trigger rate histogram
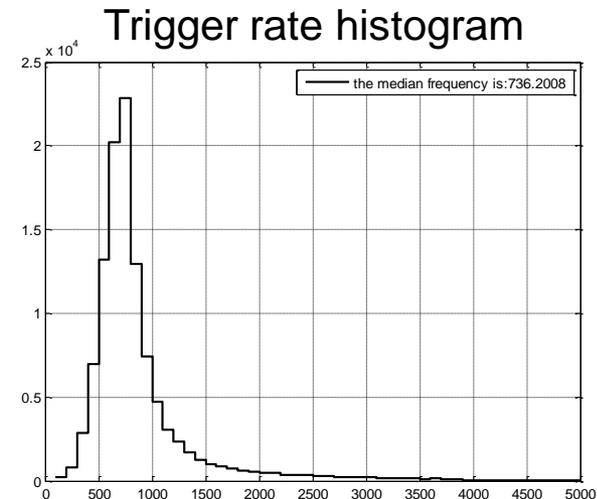
Some results
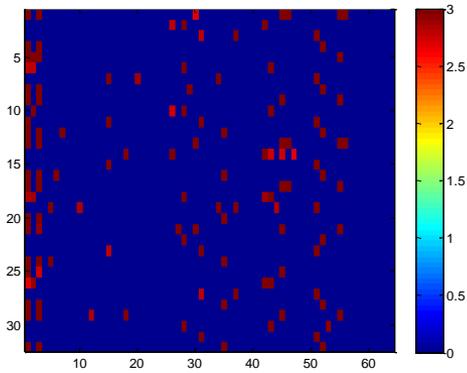
Hot Pixels map

Cluster energy distribution, ADU
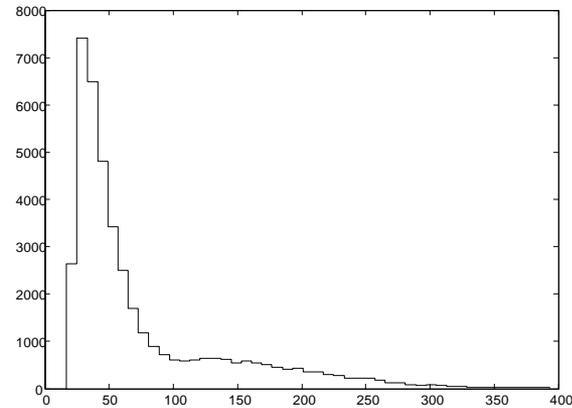

Pixels with signal per trigger
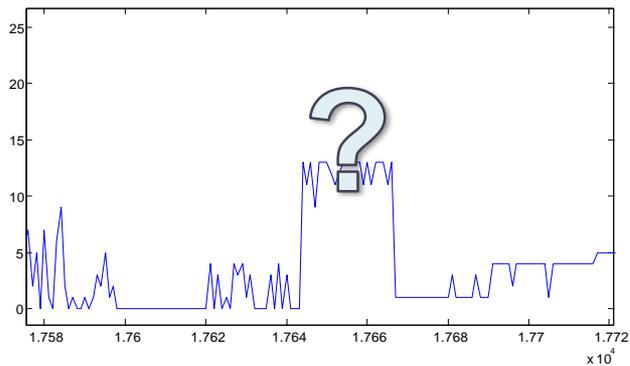
Some results

Hot Pixels map
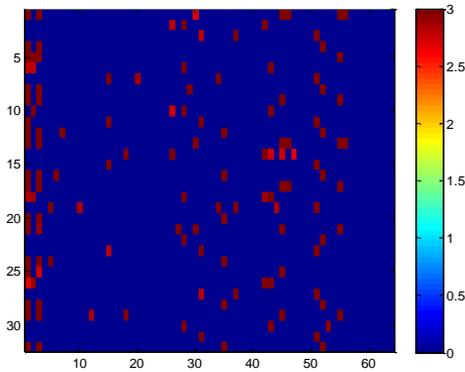
Cluster energy distribution, ADU
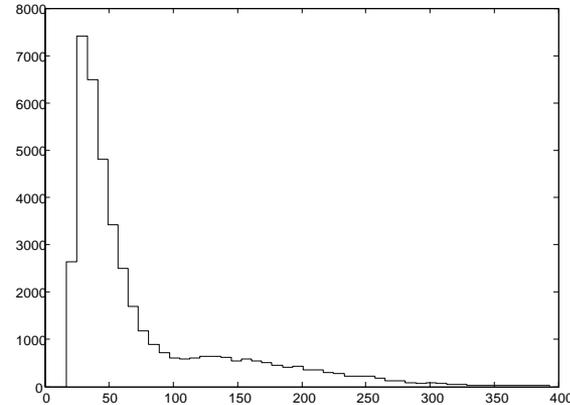

$\Delta t \sim 1ms$ or several 100 of clears
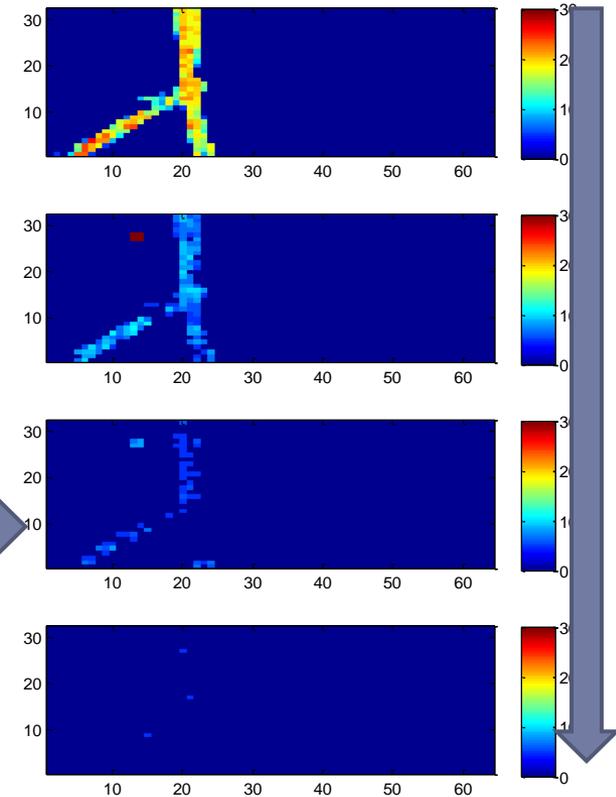
Pixels with signal per trigger
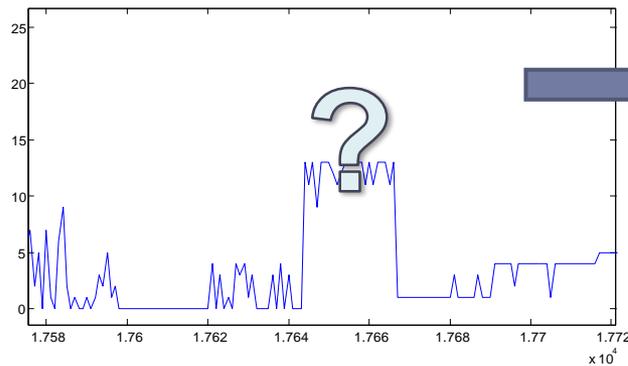
Clear problem

▸ ## Confirmed in the raw data

▸ 4 trailing events:
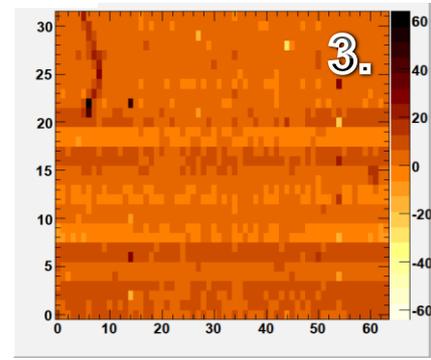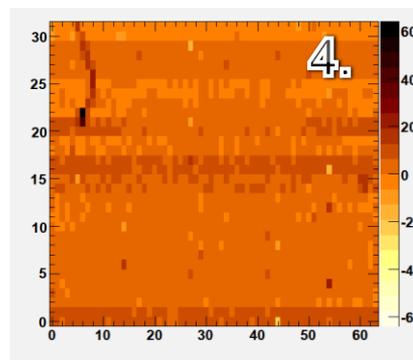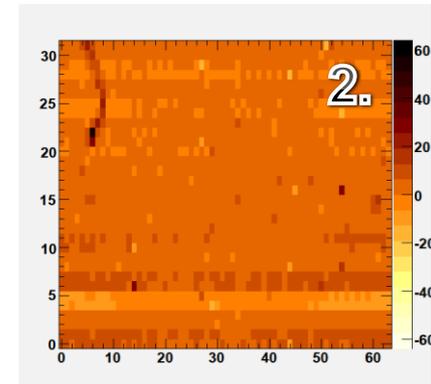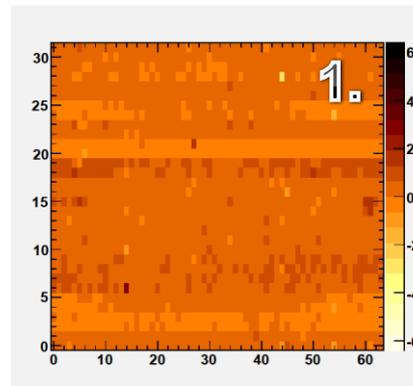
Wiring problem
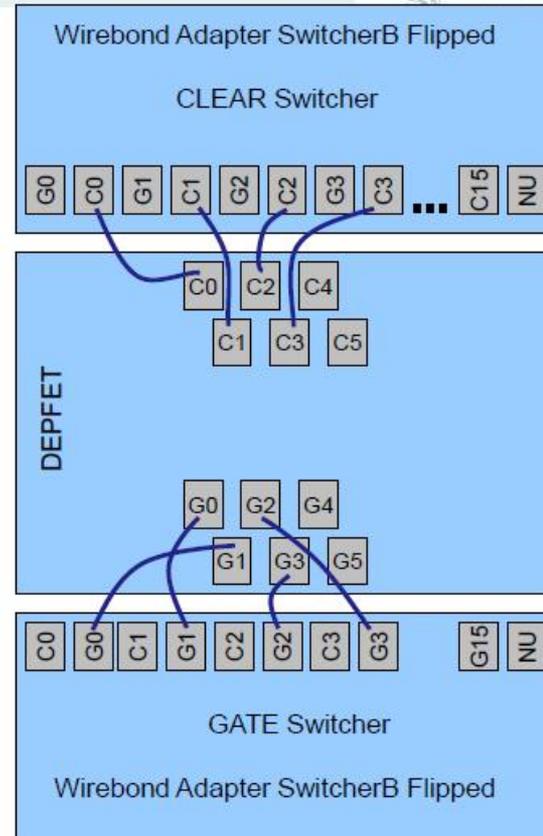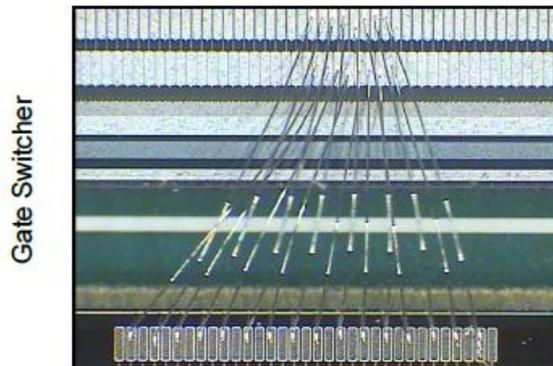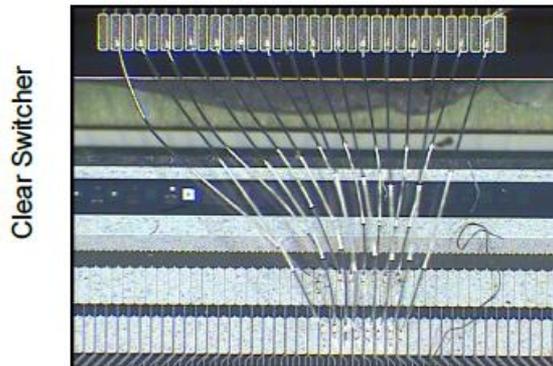
Issues and output

- DHP emulation working correctly
- Clear problem discovered => data is not fully usable
- No apparent need for dynamic pedestals update so far:
  - Static pedestals run didn't show visibly worse result
  - Slow variations are still possible(see next slides)
- Pixel masking is necessary
- Optimized processing scheme is under discussion

- Not done yet:
  - Efficiency (using EUDET telescope track reconstruction)

Temperature Behavior of pedestals (Tetsuishi Kishishita)

Pedestals vs temperature

(row, col)=(11, 23)
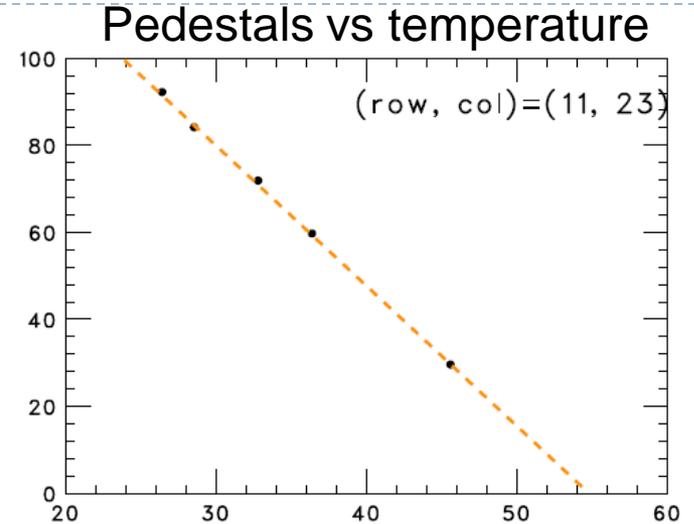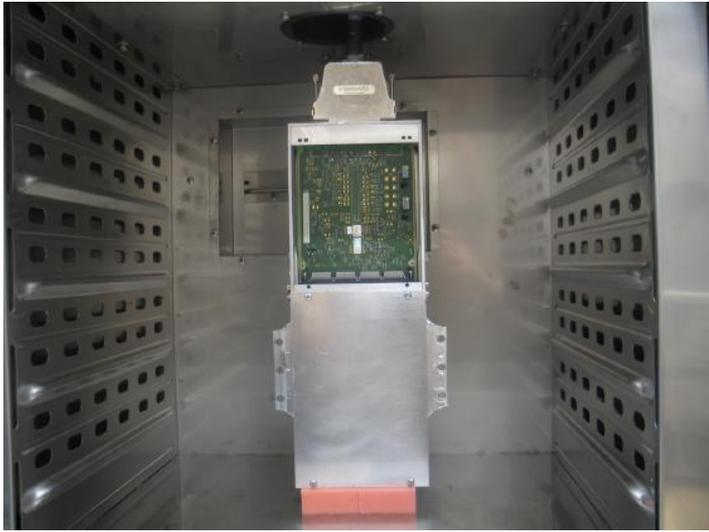
Pedestals slope histogram

TC [-ADU/deg]

Proposal for the DHP 0.2

DCD output

Pedestals subtraction ← Pedestal

Common Mode subtraction — Pedestal Update

?

Fifo 1

Hit finder

Clustering

Fifo2

DHP CORE
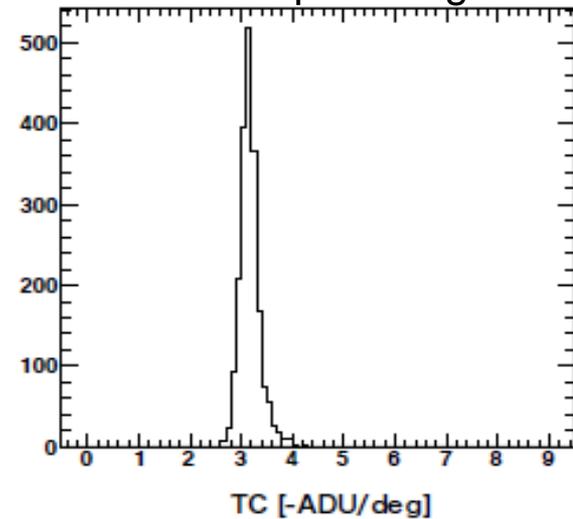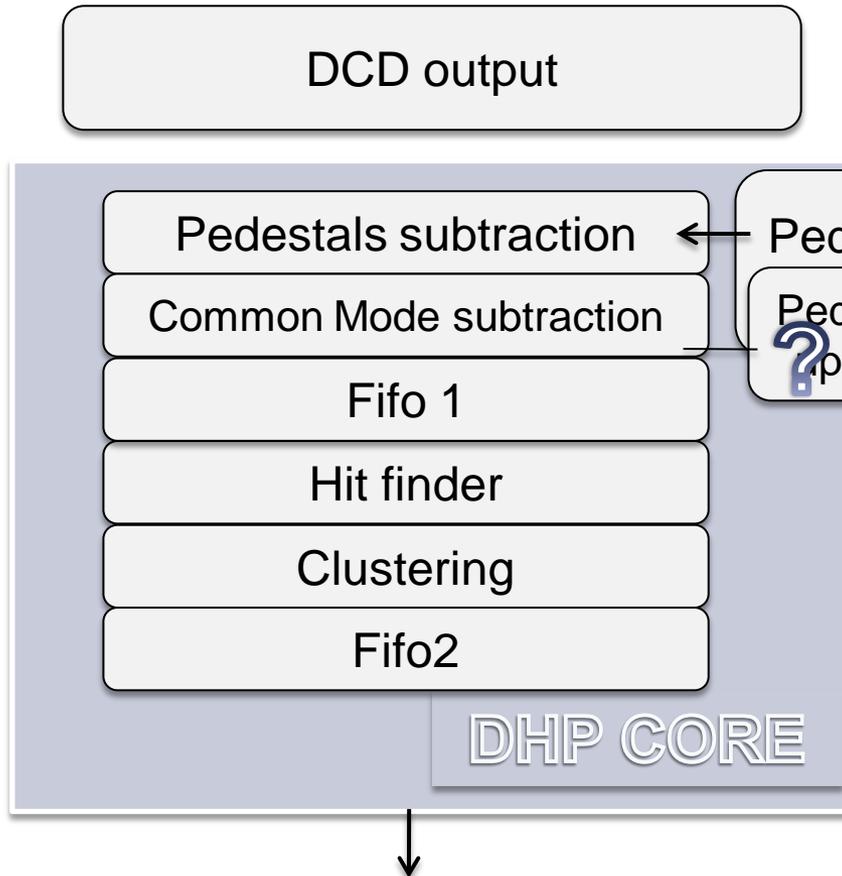
▸ ## Modifications

- ▸ Common mode:
  - ▸ Median or two parse average

- ▸ Pedestals:
  - ▸ Slow update through JTAG
  - ▸ (option) dynamic update

▸ ## Open questions:

- ▸ Need input data for:
  - ▸ Fifo sizes optimization
  - ▸ Clustering

Proposal for the DHP 0.2

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DCD output

Pedestals subtraction ← Pedestal

Common Mode Pedestal

Option a:
Median
- Better than simple average
- Too resource gourmand architecture

Option b:
Two parse average
- $\widetilde{CM} = \frac{\sum a_i}{N}$
- $CM = \frac{\sum \begin{cases} (a_i < \widetilde{CM}):a_i \\ (a_i \geq \widetilde{CM}+Tr):\widetilde{CM} \end{cases}}{N}$

▶ **Modifications**
  ▶ Common mode:
    ▶ Median or two parse average

    edestals:
    Slow update through JTAG
    (option) dynamic update
  en questions:
  eed input data for:
    Fifo sizes optimization
    Clustering

Thank you