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DHPT data rate tests

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Plan

Overview

DHQ

DHQ

DHQ (DHH DAQ) features:

- Receives UDP frames from DHC or reads BonnDAQ/TUM files
- Builds event from received frames
- Decodes hits addresses
- Checks format errors in incoming data
- Could be used for fast raw files offline analysis
- The code is available as a library
- Closes NIH-bug in TU Muenchen

The code available on Stash (`pxd_sc_dhh/dhh_support_sw/dhq`)

Occupancy test purposes

- Ensure that DHP continues work with very high occupancy (more than 3%)
- Find conditions with maximum possible occupancy operation

Test steps

- Pattern with occupancy level (range from 0 to 100%) uploaded into DHP memory
- Readout window from 1 to 192 gates (full frame)
- Test done in three modes:
  - w/o pedestal subtraction and w/o common mode correction
  - with pedestal subtraction and w/o common mode correction
  - with pedestal subtraction and with common mode correction
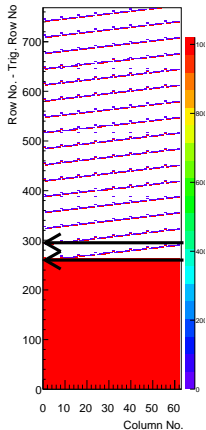- Trigger frequency 100 Hz, number of events approx. 10 000

All tests on Stash (`pxd_sc_dhh/dhh_support_sw/dhh_test`)
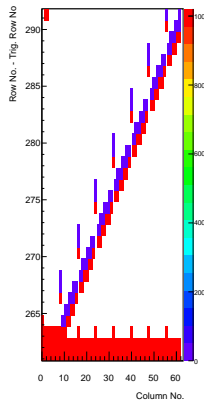
W/o pedestal subtraction/CM

100% occupancy without CM
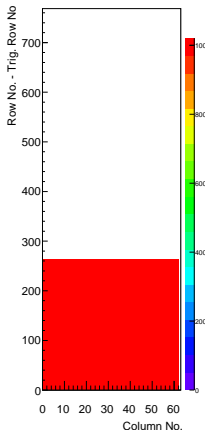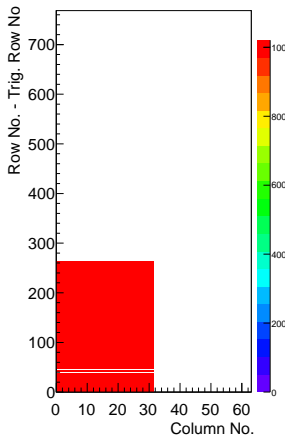

66 gates. No data losses
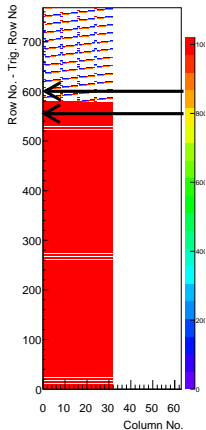
192 gates, data losses from the gate No. 67
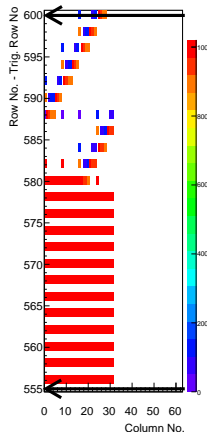
Structure of remaining hits after data loss

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With pedestal subtraction/CM

25% occupancy with Common Mode Correction

66 gates, no data losses

192 gates, data losses from the gate No. 145

Structure of remaining hits after data loss

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Overlapping triggers

Overlapping triggers emulation

- Trigger window is enlarged to 4×768 rows to emulate overlapping trigger
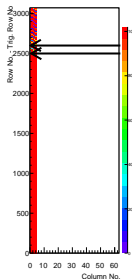- FCK length stays corresponding 768 rows
- Trigger frequency 100 Hz

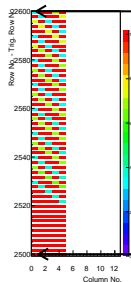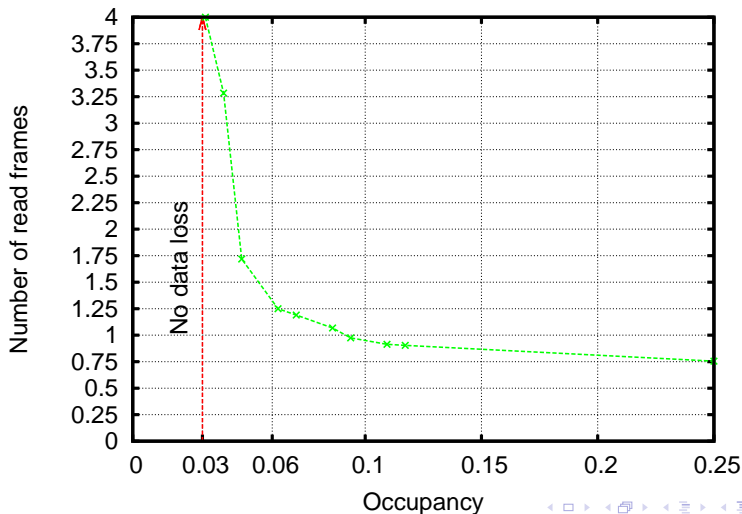# Overlapping trigger emulation
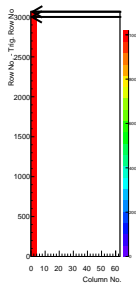
3% occupancy
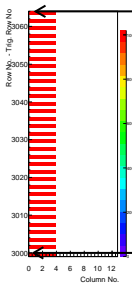
Structure of pattern

4% occupancy, data loss

Structure of lost hits

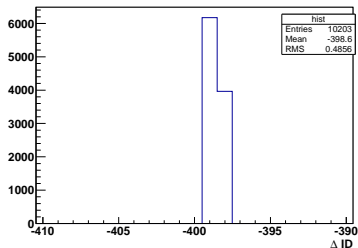# Maximum possible occupancy w/o data loss

Occupancy test

Test summary

- DHP can send 66 fully occuped gates without data loss
- In case of overlapping trigger 3% occupancy level has been achieved
- DHP handles data correctly even with 100% occupancy level just throwing away the data

Frame ID consequense test

- Difference between the last DHP frame ID in the previous event and the first frame ID in the current event
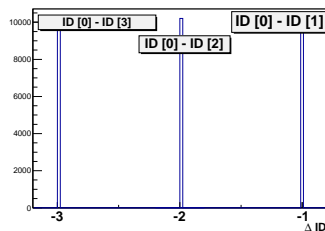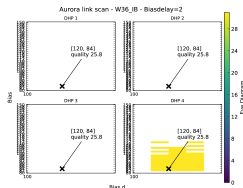

Difference between DHP frame ID "inside" the event
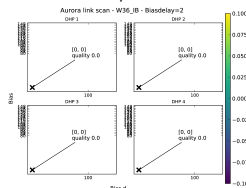
Bias and Bias D optimization

Bias and Bias D optimization, 76.5 MHz

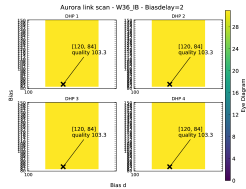Nominal parameters (Core Voltage 1.2V, IO Voltage 1.8V, frequency 76.5 MHz):

Low frequency (62.5 MHz):

76.5 MHz with increased voltage: Core 1.2V, IO 1.9V:
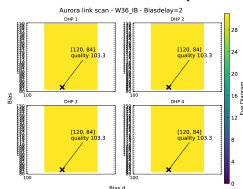
Core 1.3V, IO 1.8V:

Conclusion

Occupancy test

- DHP recovers itself succesfully even with 100% occupancy just throwing away the data
- No data loss with 3% occupancy

Optimal stable link parameters

- Optimization of Bias and Bias D parameters almost does not improve the stability of links

Thank you for your attention