## **DEPFET Clear Performance**

**Previous studies and plans for PXD** 

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Principal requirements for the clear process: complete and fast.

- Complete Clear
  - means that every reset results in the same pedestal current.
  - measurements:
    - global: if clear is not sufficient, the pedestals spread should be larger.
    - Iocal: the studies in F. B. Mueller's thesis [Chapter 6.10]
- The measurement is performed by shining a well collimated laser onto a single pixel in the matrix. Four consecutive frames are read out.



## Best region (DCD4, switcher 1)

Clear Efficiency

20.0 0.7 -0.1 -0.2 -0.4 -0.7 28 1.8 0.1 0.0 -0.3 19.5 0.1 2.1 -0.4 0.2 19.0 0.7 0.4 18.5 4.6 0.4 -0.2 -0.1 0.5 24 8.2 4.0 0.3 0.1 18.0 -0.2 15.4 17.5 1.1 0.2 5.2 -0.1 20 9.4 2.1 1.5 -0.1 17.0 20.3 16.2 1.7 0.4 16.5 4.2 ≥ 16.0 20.4 10.1 26.4 2.1 0.2 16 Clear 15.5 ADU 27.1 19.4 15.9 4.9 1.3 15.0 21.0 10.8 27.7 19.5 1.7 12 14.5 26.7 21.8 19.6 16.8 4.1 18.7 8.5 14.0 27.7 20.8 14.9 13.5 26.1 24.6 18.4 19.3 18.6 18.5 13.0 28.6 25.4 23.9 12.5 30.2 26.9 24.6 20.8 17.3 12.0 27.6 27.8 21.8 18.2 26.3 28.8 28.9 18.0 11.5 26.1 11.0 27.1 28.5 24.4 19.9 26.6 -2.0 -1.5 -1.0 -0.5 0.0 ClearGate in V

Figure 6.43: Pixel:  $row_{geo}=74$ ,  $col_{geo}=215$ : Signal of pixels after being cleared once, corresponding to frame 2. All electrons are completely removed from the *internal Gate* where the signal is approximately 0 ADU.

## Worst region (DCD1, switcher 6)



Figure 6.44: Pixel:  $row_{geo} = 753$ ,  $col_{geo} = 10$ : Signal of pixels after being cleared once, corresponding to frame 2.

- Test plans with DESY setup (full DHH)
  - With radiative source
  - DHH configuration for taking consecutive frames for each trigger
    - e.g. 2 consecutive frames: trg\_len: DHE 3100, DHI 3072
  - Can not distinguish frames in bonndaq data.
    - Check the fraction of 'uncomplete clear'-like hits in large sample.

Evt. DHE. DAC. Hit[col row sig cm] 6 H1041 40700391 [126 766 139 9]

6 H1041 40700391 [87 57 13 9] 6 H1041 40700391 [81 77 13 9]

6 H1041 40700391 [87 57 13 10]	
6 H1041 40700391 [126 766 141 9]	
6 H1041 40700391 [125 766 111 9]	
6 H1041 40700391 [ 81 560 8 9]	
6 H1041 40700391 [ 76 526 8 10]	
6 H1041 40700391 [106 513 17 9]	
6 H1041 40700391 [ 77 483 16 10]	
6 H1041 40700391 [ 84 445 23 10]	
6 H1041 40700391 [ 68 337 10 9]	
6 H1041 40700391 [ 65 336 11 9]	
6 H1041 40700391 [115 253 8 9]	
6 H1041 40700391 [ 98 239 60 9]	
6 H1041 40700391 [101 196 61 8]	
6 H1041 40700391 [101 176 60 9]	

6 H1041 40700391 [81 77 13 10]

## Fast Clear

- The length of clear pulse
- Measurements in F. B. Mueller's thesis [Chapter 6.10]
  - A tiny needle is placed on the output pad of the last Clear output of the last Switcher.
  - The ClearOn voltage is set to 20 V and the Clear pulse is measured for different lengths of the applied Strobe Clear signal.



Figure 6.40: Clear pulse of the last Switcher Clear output driver ( $row_{gate} = 192$ ) for different lengths of the Strobe Clear pulse.