



# Variation of Memory Cells on AGIPD02

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# Outline

- Measurements
- Summary



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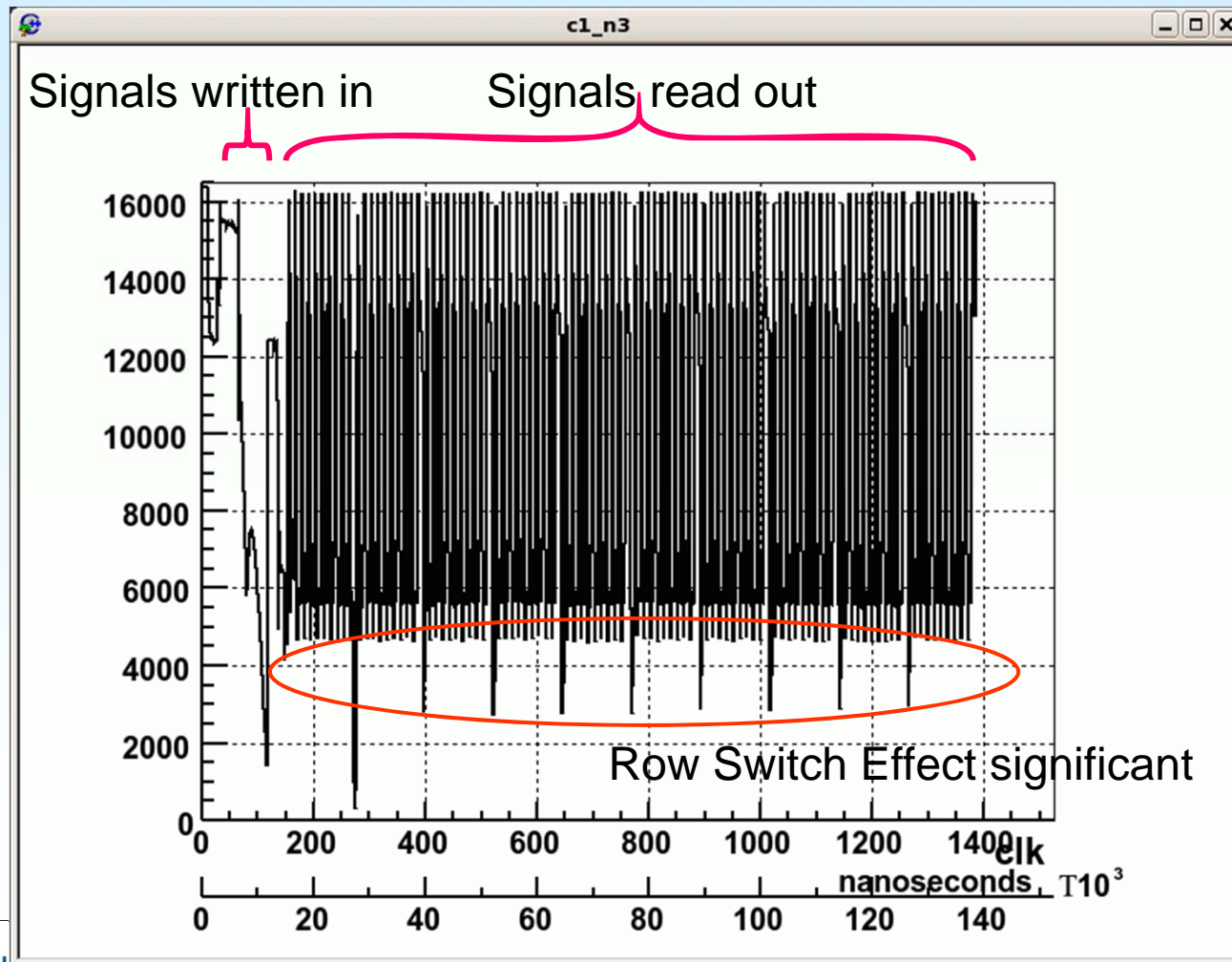
- Measurements
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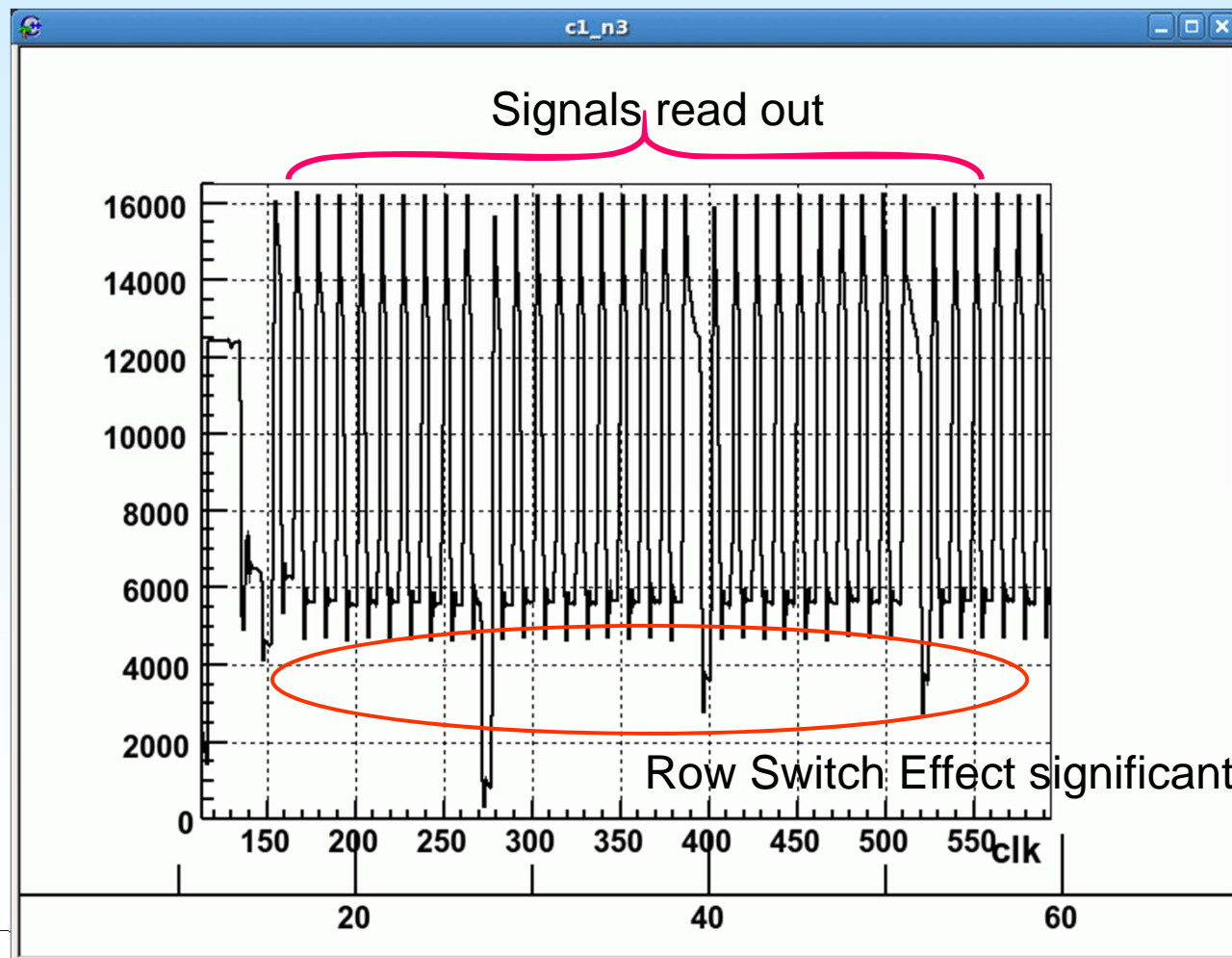
## Measurement Concept

- 1) Writing all cells of one pixel at the same time
  - Influence of test current source negligible
- 2) Reading the cells of one pixel
- 3) Comparing the output signals at the same sampling time

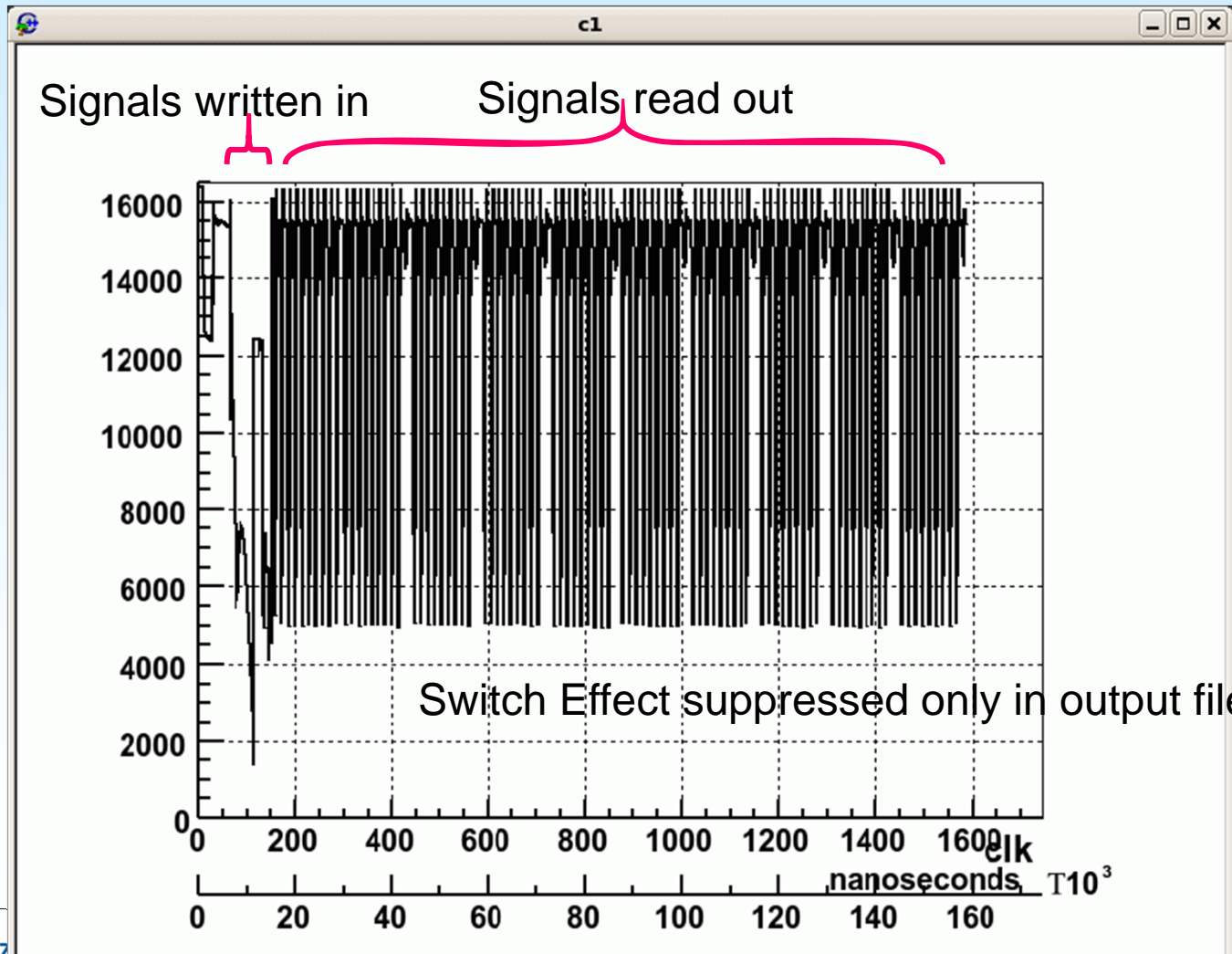
# Measurements 10x10 Cells



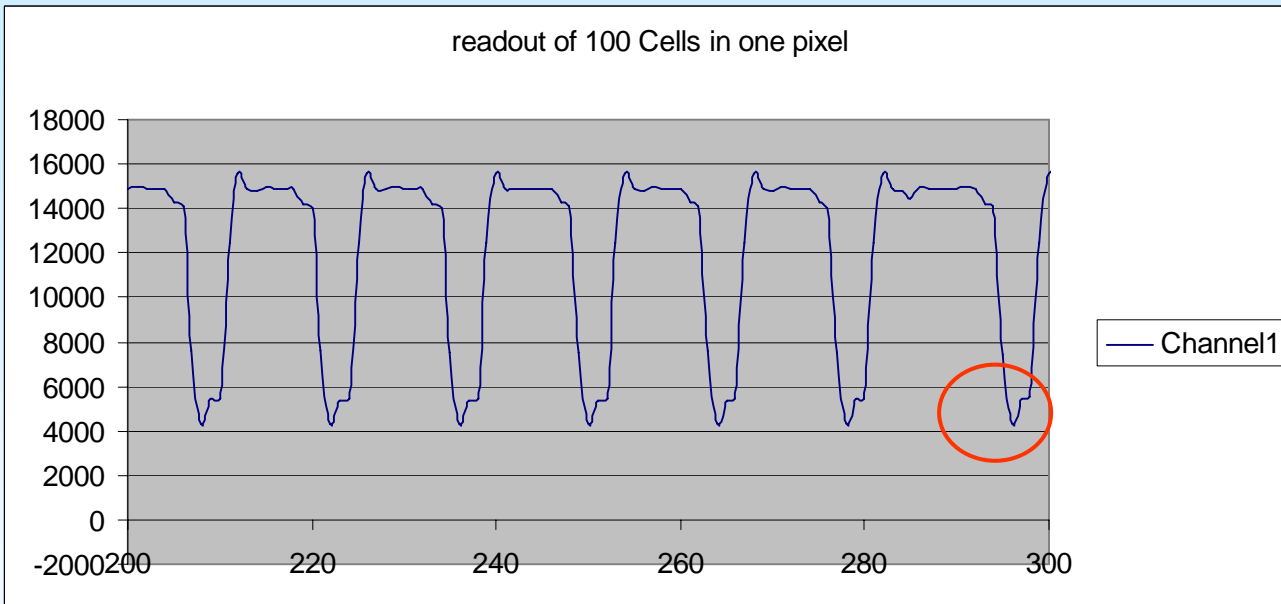
# First 3x10 Cells (Zoom)



# Measurements 10x9 Cells

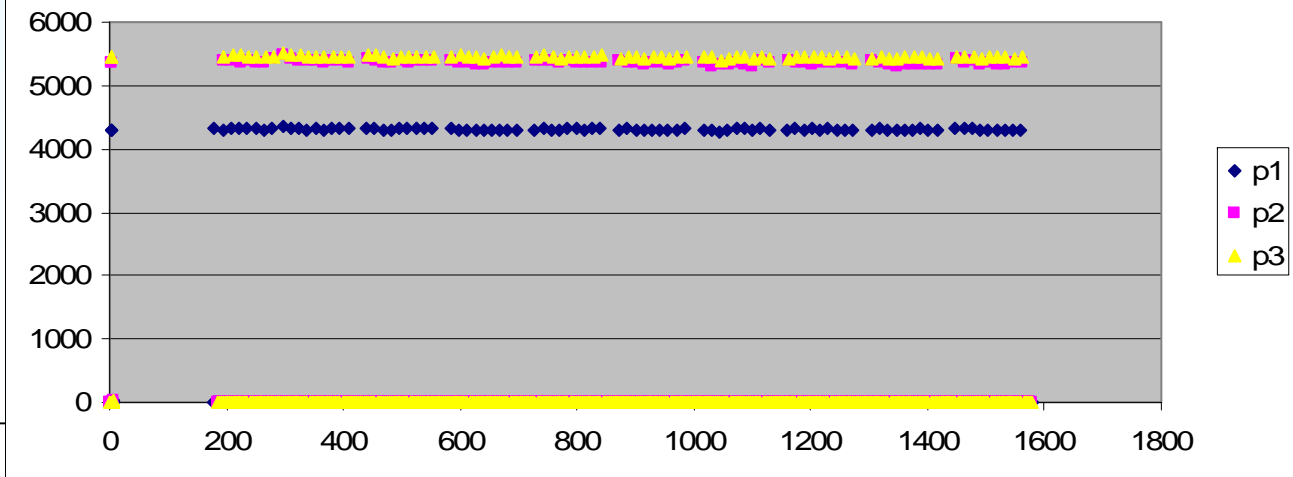


# Column 1-4: cell with pfet-dgnncap



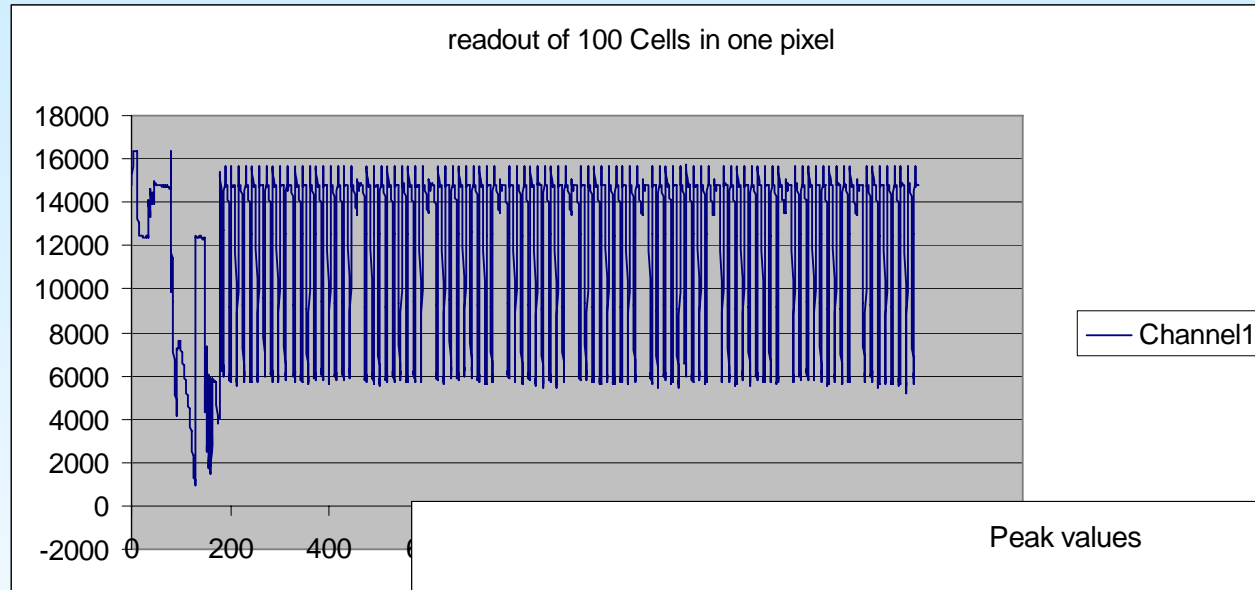
Switch effect from cell to cell still available;  
Variation from cell to cell is tiny

P1	P2	P3
Median	Median	Median
4306	5365	5450
Mean	Mean	Mean
4307	5364	5448
StdDiv	StdDiv	StdDiv
15	28	20





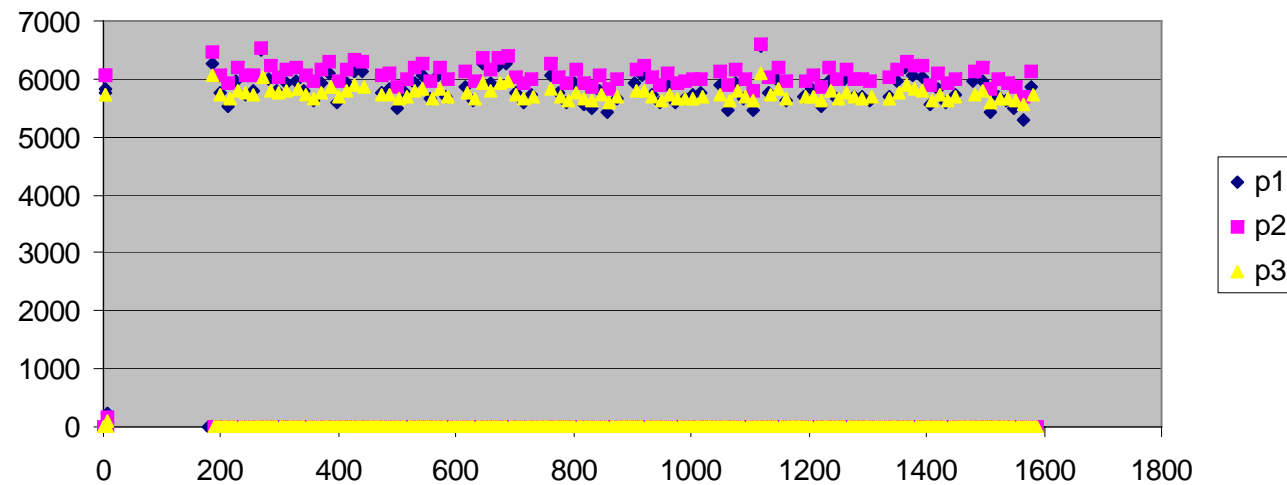
# Col 5-8: cell with dgpfet-dgncap



Switch effect comparable to variation of cells;

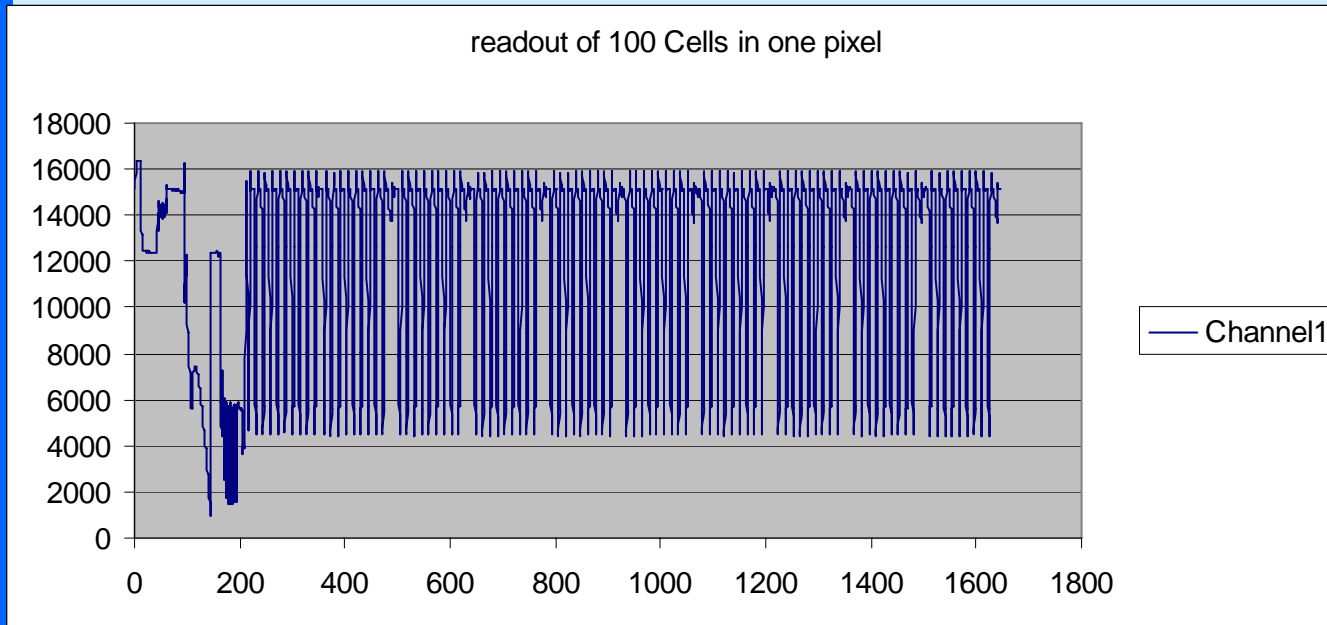
Variation of cells is much stronger than cells with PFET-switches, because the DGPFET needs 2.5V bias voltage to be working stably.

P1	P2	P3
<b>Median</b>	<b>Median</b>	<b>Median</b>
5773	6047	5721
<b>Mean</b>	<b>Mean</b>	<b>Mean</b>
5813	6076	5739
<b>StdDiv</b>	<b>StdDiv</b>	<b>StdDiv</b>
237	164	101



# Col. 9-12: cell with pfet-dgncap

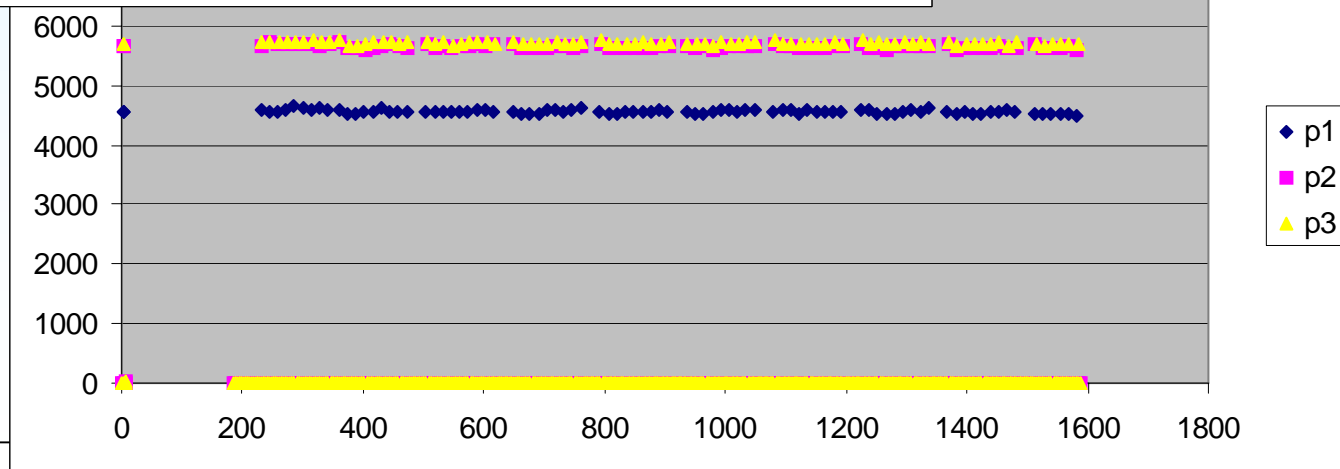
## Pre-amp fast



Switch effect  
from cell to cell  
still available;

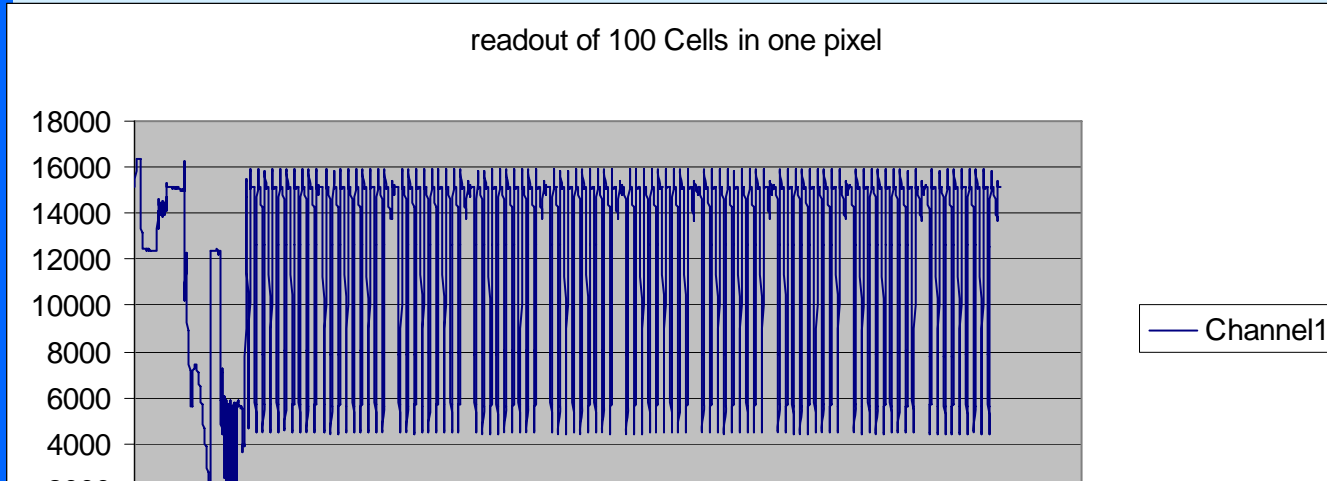
Variation from  
cell to cell is  
tiny

P1	P2	P3
Median	Median	Median
4561	5648	5705
Mean	Mean	Mean
4560	5651	5706
StdDiv	StdDiv	StdDiv
29	30	22



# Col. 13-15: cell with pfet-dgncap

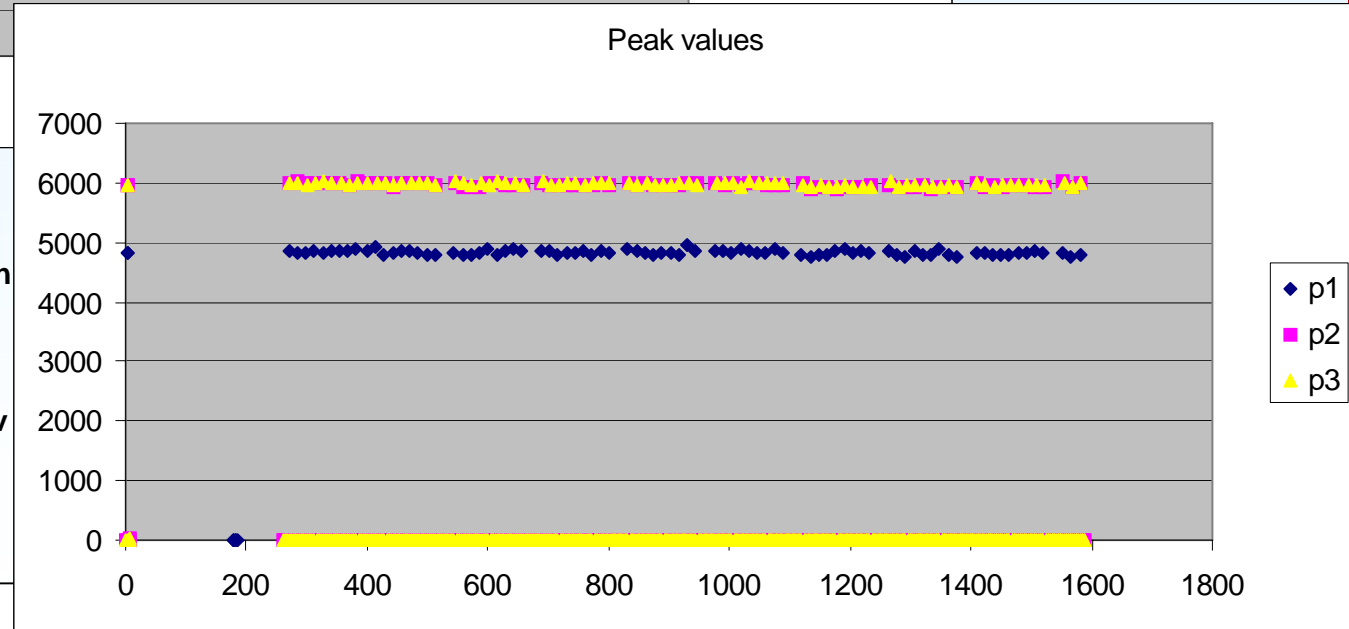
## Pre-amp with protect diode



Switch effect  
from cell to cell  
still available;

Variation from  
cell to cell is  
tiny

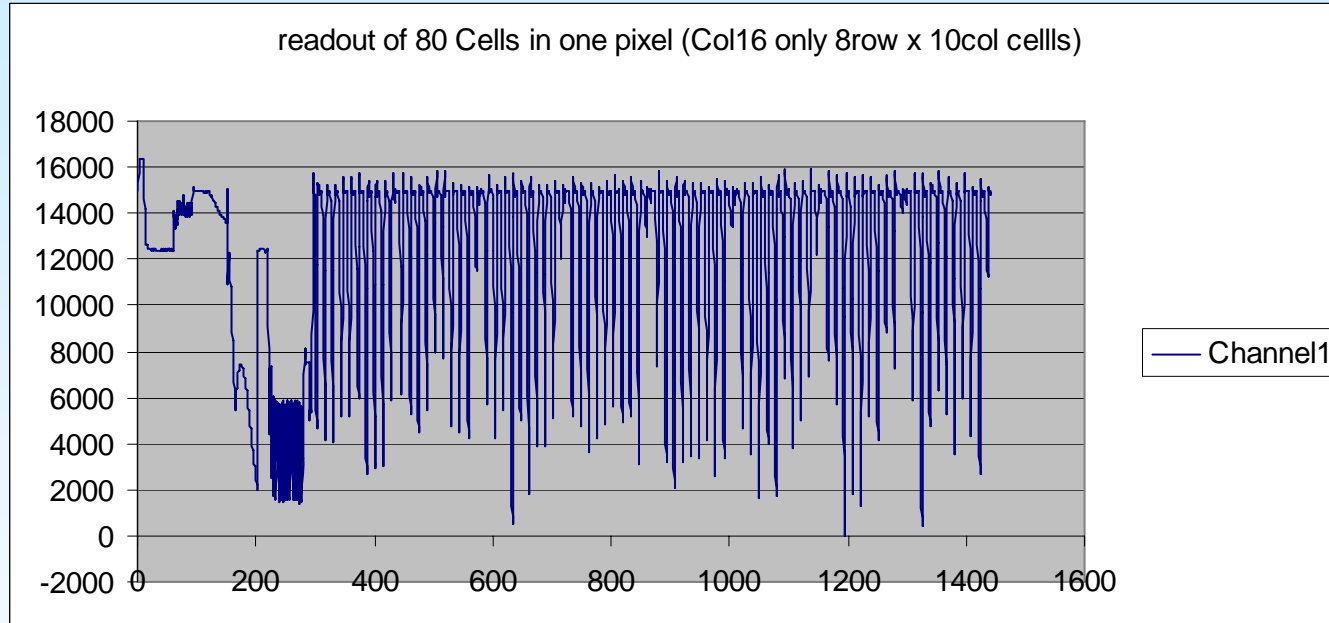
P1	P2	P3
Median	Median	Median
4820	5963	5978
Mean	Mean	Mean
4828	5964	5976
StdDiv	StdDiv	StdDiv
36	27	24



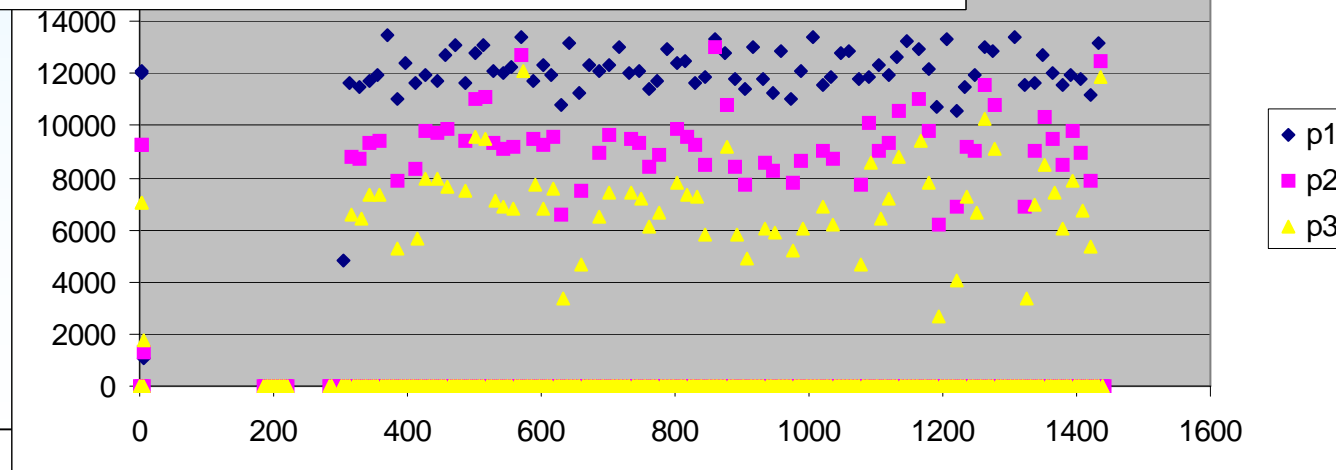
# Col. 16: 8row x 10col cells with pfet-dgncap, buffered



Variation from cell to cell is very strong, due to the DGNFET in OpAmp of buffer, which needs **2.5V bias** instead of 1.5V.



P1	P2	P3
Median	Median	Median
12040	9231	7024
Mean	Mean	Mean
12077	9270	7011
StdDiv	StdDiv	StdDiv
1088	1327	1773





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- Cells with pfet-dgncap are stable enough
- Cells with dgpfet-dgncap are instable, because dgpfet needs higher bias voltage (2.5V) than applied in the measurement (1.5V)
- Difference of Preamps are not significant
- Buffered Cells are very instable (because DGNFET were used in the Op-Amp of buffer, which needs also 2.5V bias voltage)