

SOI CHIP - TESTBEAM PREPARATION STATUS

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June 20, 2016

Outline

- 1 Short reminder
- 2 Setup and measurements
 - Setup
 - Measurements
- 3 Conclusion - problem list

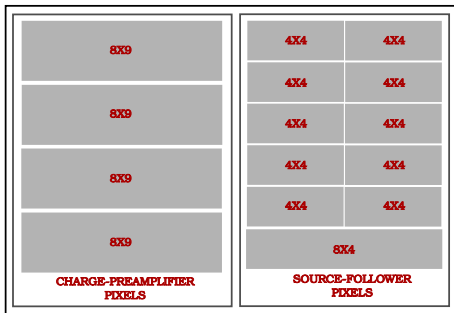
Cracow SOI pixel matrixes

CHIP INFO:

- ① charge-preamps + source-follower pixel matrix
 - 16×36 pixels
 - $30 \mu\text{m} \times 30 \mu\text{m}$ pixels size $\rightarrow \sim 0.52 \text{ mm}^2$ matrix area
 - rolling shutter
- ② self-triggering pixel matrix
 - charge preamp pixels, column 6b SAR ADC, time information
 - 4×8 pixels, $100 \mu\text{m} \times 30 \mu\text{m}$ pixels size $\rightarrow \sim 0.1 \text{ mm}^2$ matrix area

Differences in submatrixes

- different sensor layouts
- different transistor types in switches
- different input transistor sizes



SOI wafer info

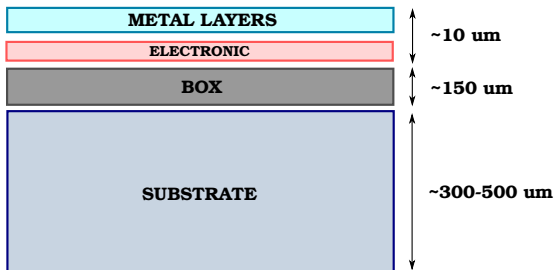
WAFER TYPES:

Double SOI(p) - $\sim 2k \Omega$

CZ(n) - $\sim 700 \Omega$

FZ(p) - $\sim 7k \Omega$

FZ(n) - $\sim 2k \Omega$



Which questions we could answer...

1 Design

Charge-preamp - Szymon

Source-follower + readout - Piotr

ADC - Roma

Self-triggering - Szymon & Roma

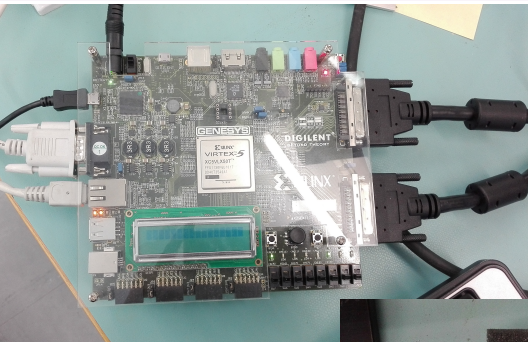
2 Measurement setup

PCB board - Piotr

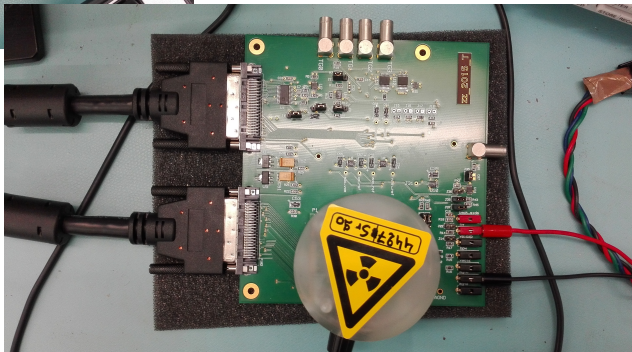
FPGA (chip-board communication) - Piotr

DAQ Software - Szymon & Roma

Setup



- FPGA - PC → Ethernet
- one readout PCB + 4 mezzanine boards with chips
- DAQ Software - ROOT 6





Setup

PCB version 1

- Reasonable data → no "blinking" pixels,
- **Preliminary results looked promising.**

PCB version 2

For testbeam issues the second version of readout PCB was prepared.

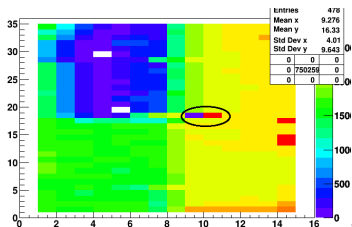
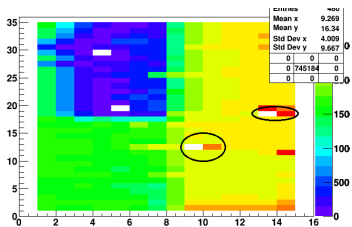
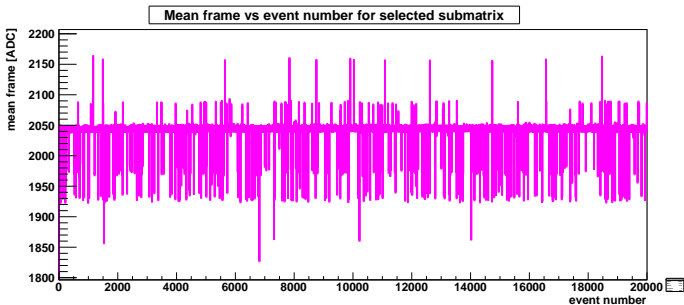
Planned changes:

- Detector position,
- Trigger signals.

PCB v2 + updated firmware → need to be debug more carefully.

Measurements

- CZ(n) wafer, only pedestal



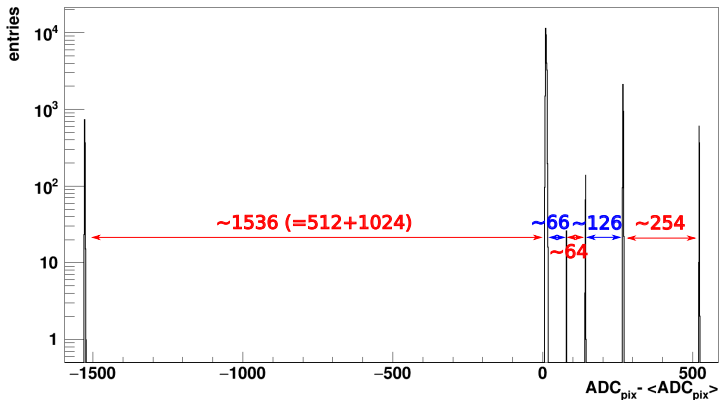


Pedestal analysis

- mean pixel pedestal ($\langle ADC_{pix} \rangle$) calculated from 50k events
- spectrum of single pixel ($ADC_{pix} - \langle ADC_{pix} \rangle$) should be Gaussian with $\mu = 0$
- **observation: many peaks on binary scaling distances** → **probably there is some bits shift in firmware**

hPedestalSinglePixSpec[0]

Histogram Statistics	
Entries	50000
Mean	0.000
Std Dev	256.000
Skewness	0.000
Kurtosis	0.000



Problems - conclusion

Firmware status:

1 TRIGGER ISSUE

- Probably tomorrow we will try to implement new Firmware.
- The details of what were done in the new firmware version will be send by Piotr in the next few days.

2 DATA READOUT

- There must be a bug in readout (→ **"blinking" pixels**) that makes impossible acquisition of reasonable data.

Sad conclusion

Most probably we will not be able to take part in the testbeam with SOI pixel detectors.