Testing CHESS1

Vitaliy Fadeyev, Zach Galloway , Herve Grabas
Alexander Grillo , Zhijun Liang , Abe Seiden
Jennifer Volk, Forest Martinez-Mckinney

University of California, Santa Cruz

Reminder of active pixel in HV CHESS1 chip

- Active pixel=passive pixel + built-in amplifier
- 4X4 pixel array
- This talk will focus on the active pixel array APA08
  - 8-Nwell inside one pixel
  - Pixel dimensions is 45X800 um

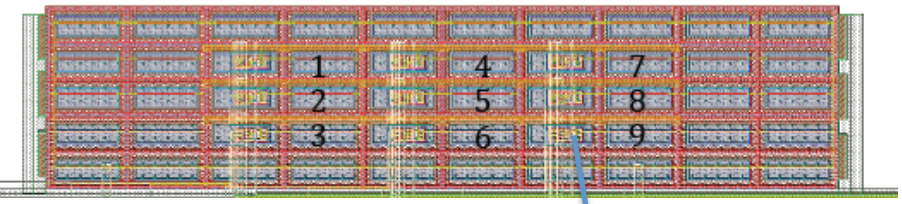
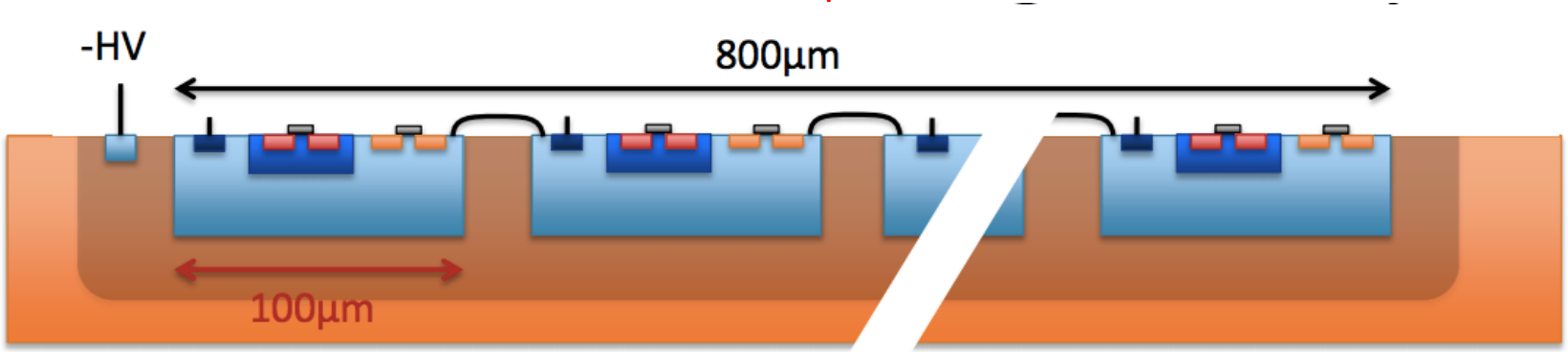


Table 3.4-a Active Pixel Array Spatial Specification for HV-CMOS Technology

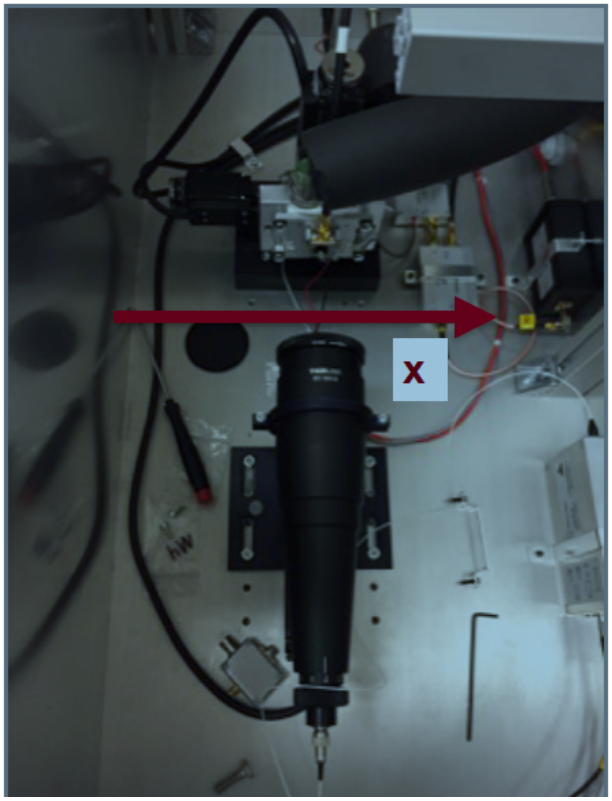
APA #	Pixel Dimensions	Diode Area Fraction
APA01	45μm x 100μm	30%
APA02	45μm x 100μm	50.4%
APA03	45μm x 200μm	30%
APA04	45μm x 200μm	50.4%
APA05	45μm x 400μm	30%
APA06	45μm x 400μm	50.4%
APA07	45μm x 800μm	30%
APA08	45μm x 800μm	50.4%

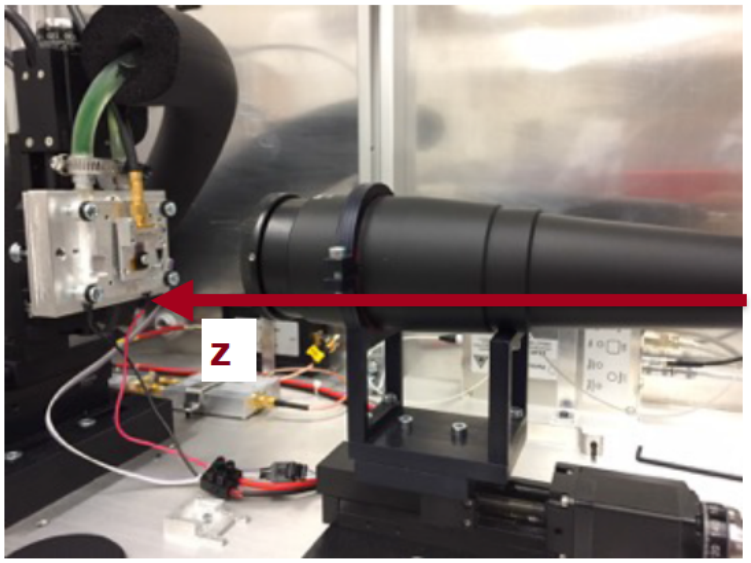
Zoom in one pixel in APA08



Reminder to TCT system

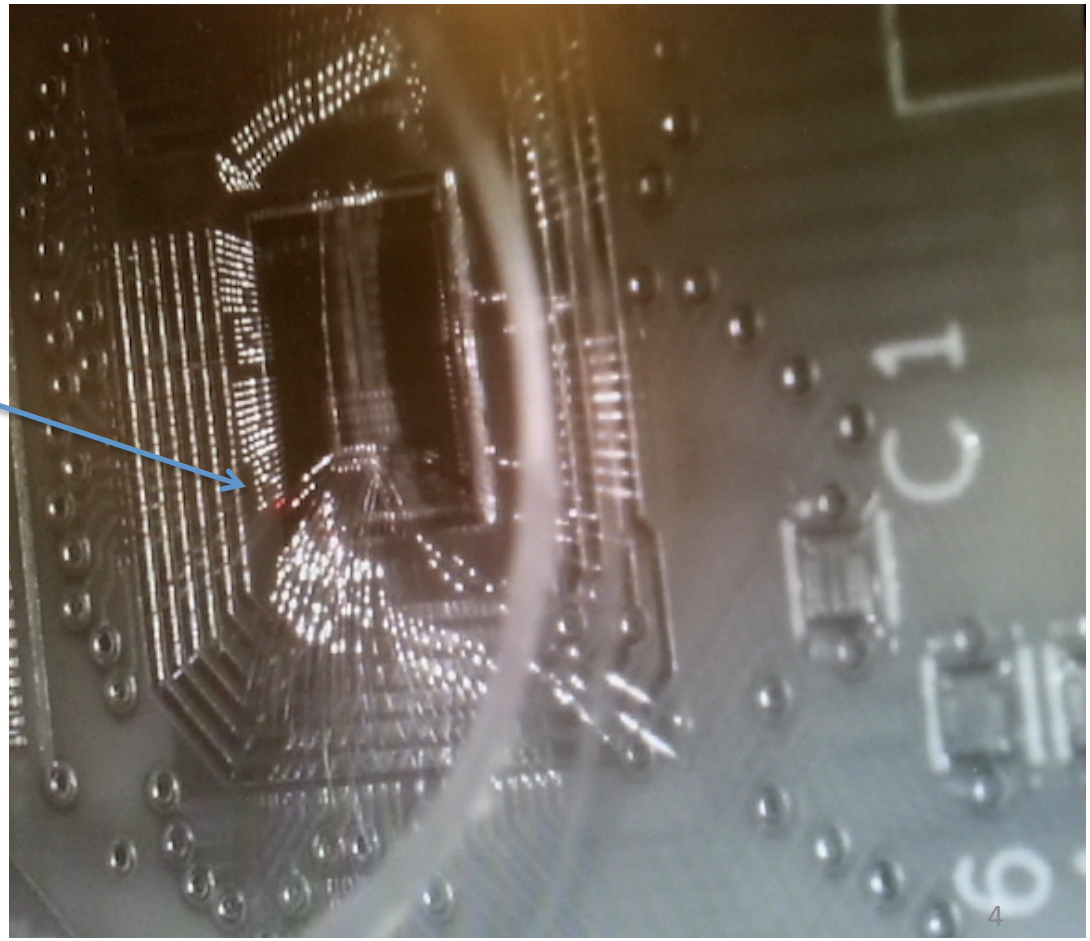
- Commissioning Transient Current Technique (TCT) system in UCSC
- Laser injection for CMOS chess1 active array





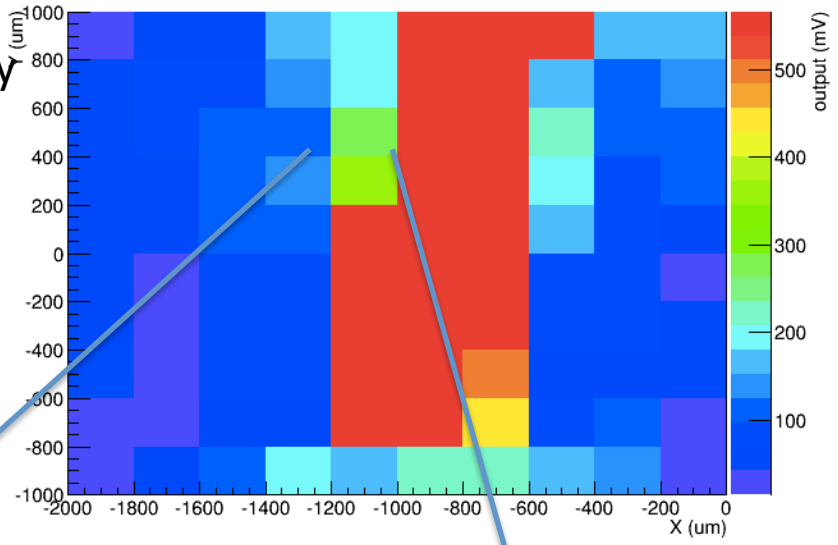
2D laser scan

Laser beam spot

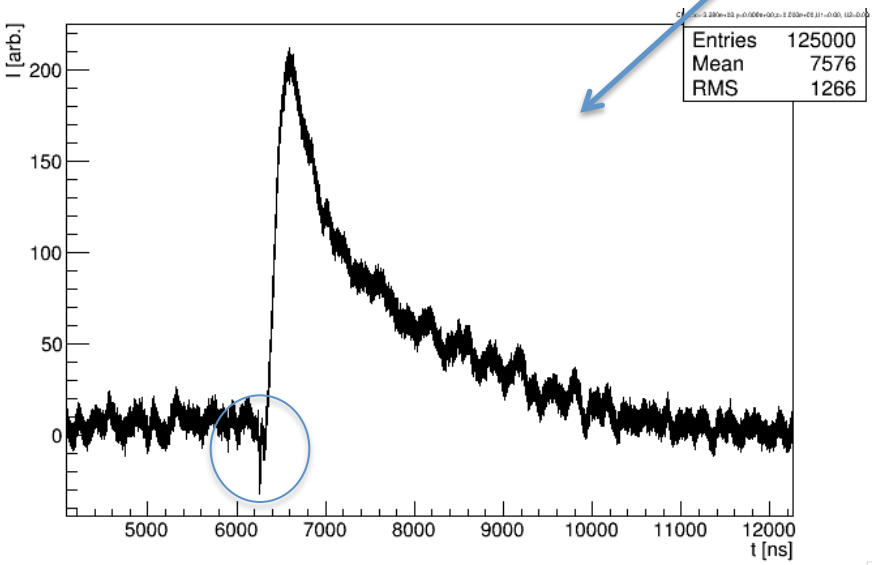


First scan

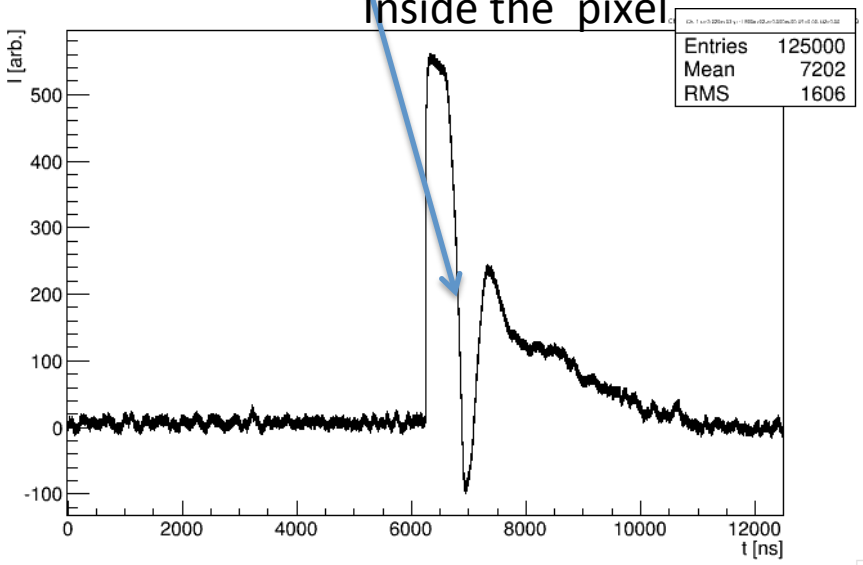
Using red laser
Shooting on one pixel in APA08 active array



Out of pixel region

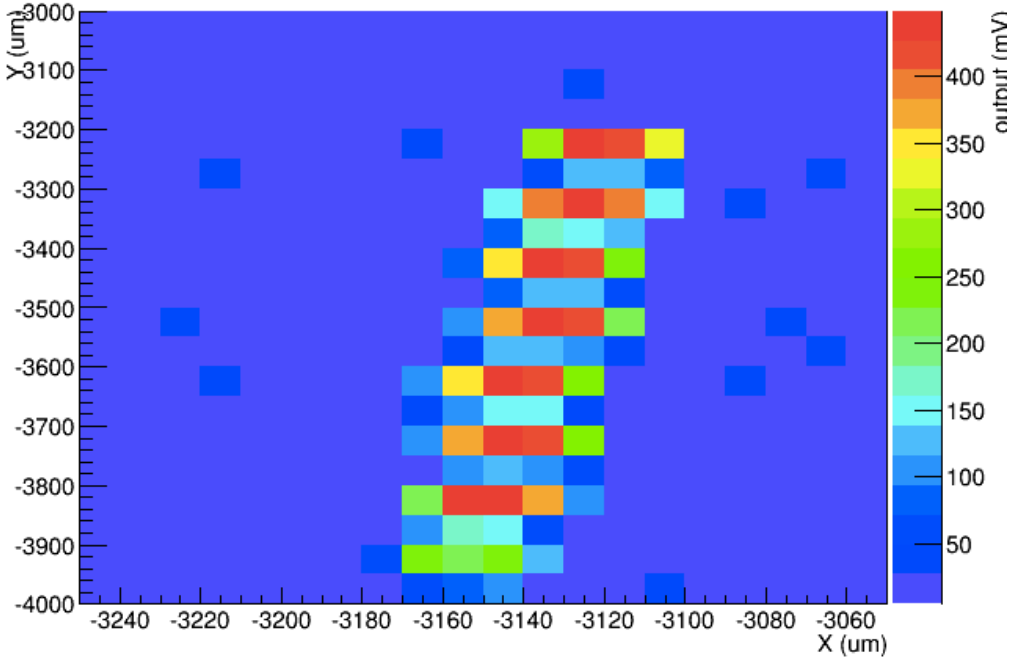


Inside the pixel



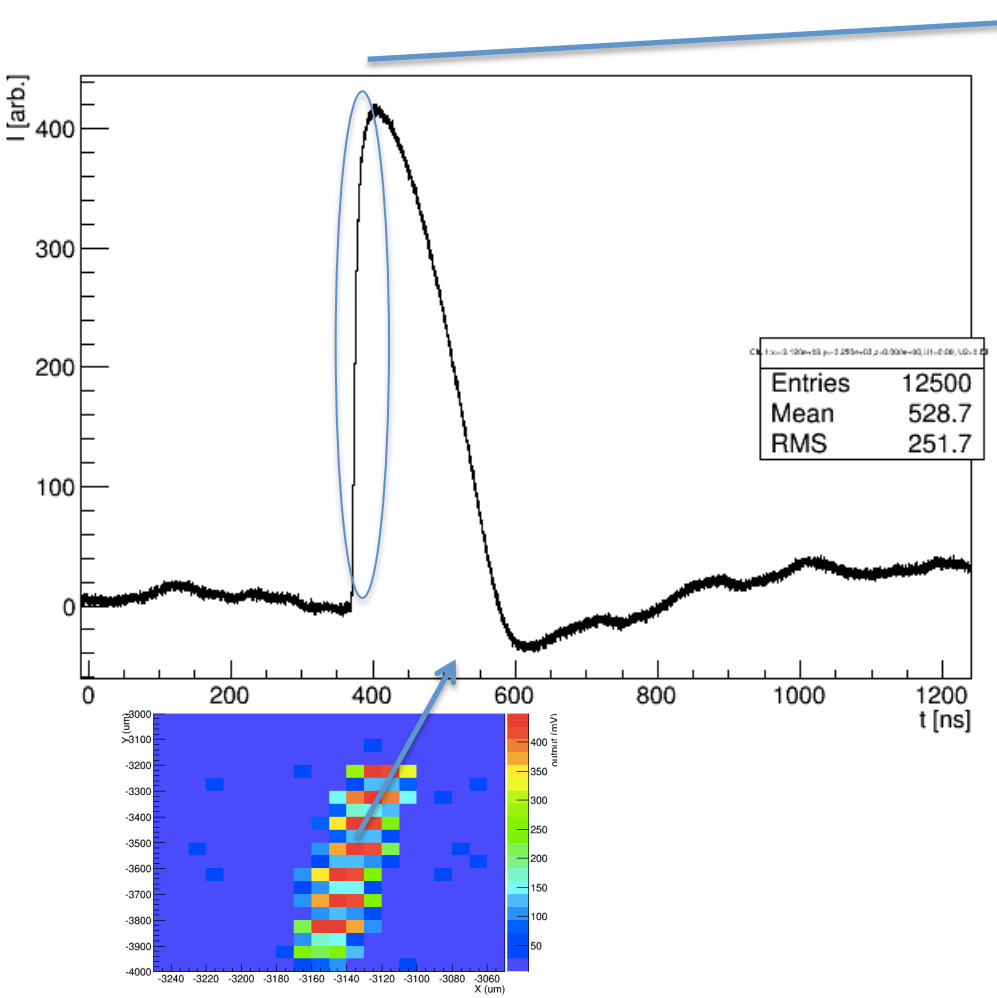
Refined laser scan on one segment of activity pixel

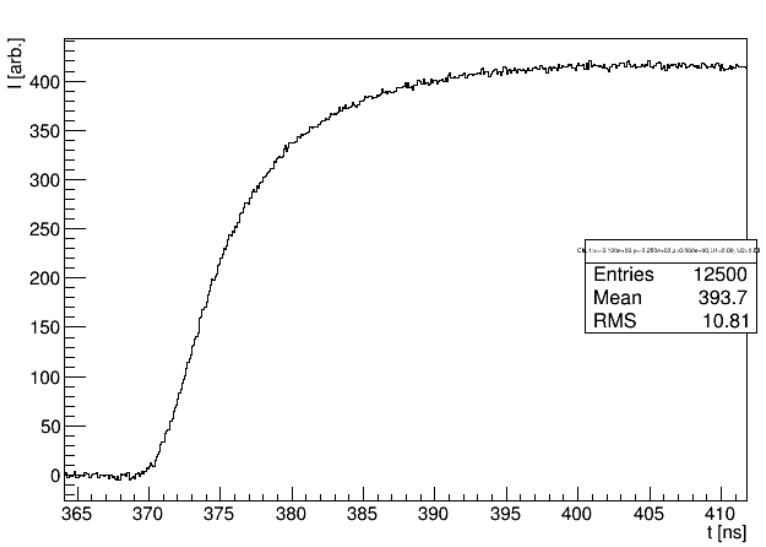
- Expected 8 N-well in one segment
- Red region is N-well
- Laser beam size seems is small enough to see the metal between two N-well.



Signal pulse shape

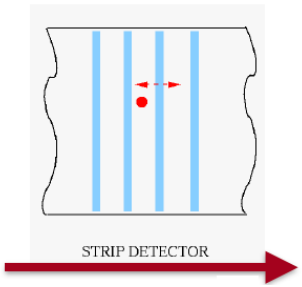
- Very fast rise time (~15ns)

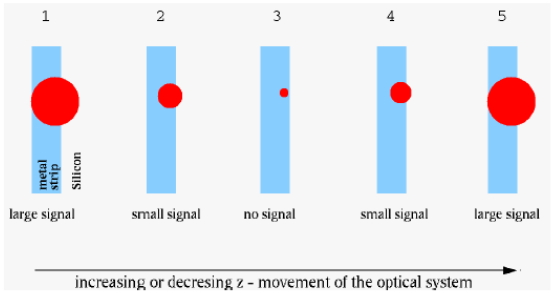


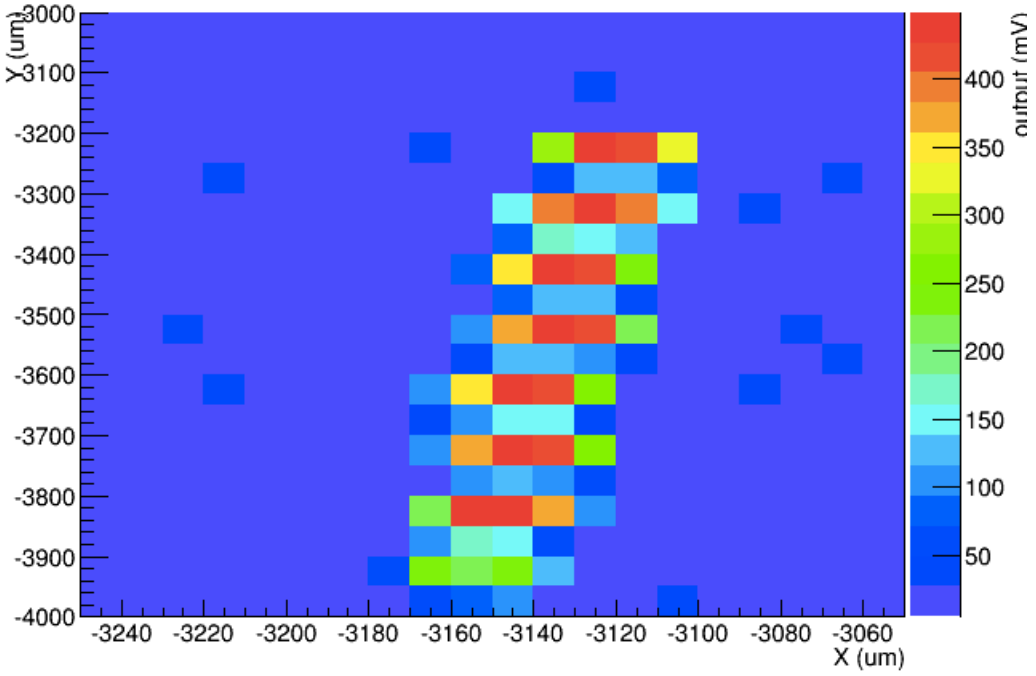


Introduction

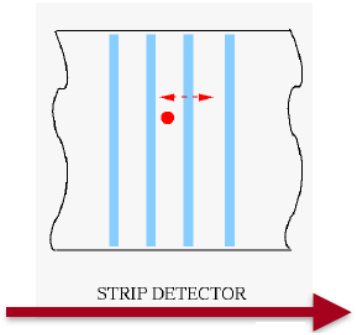
- Use the metal between N-wells for laser focusing

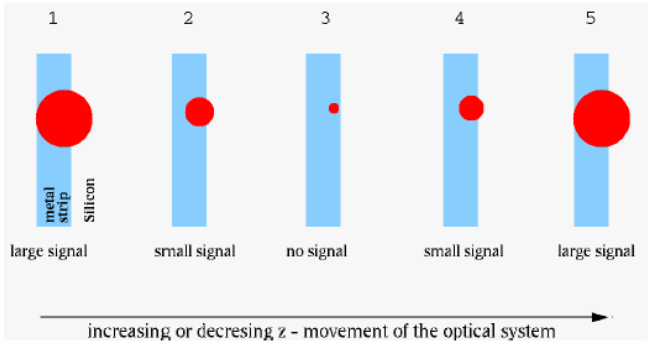






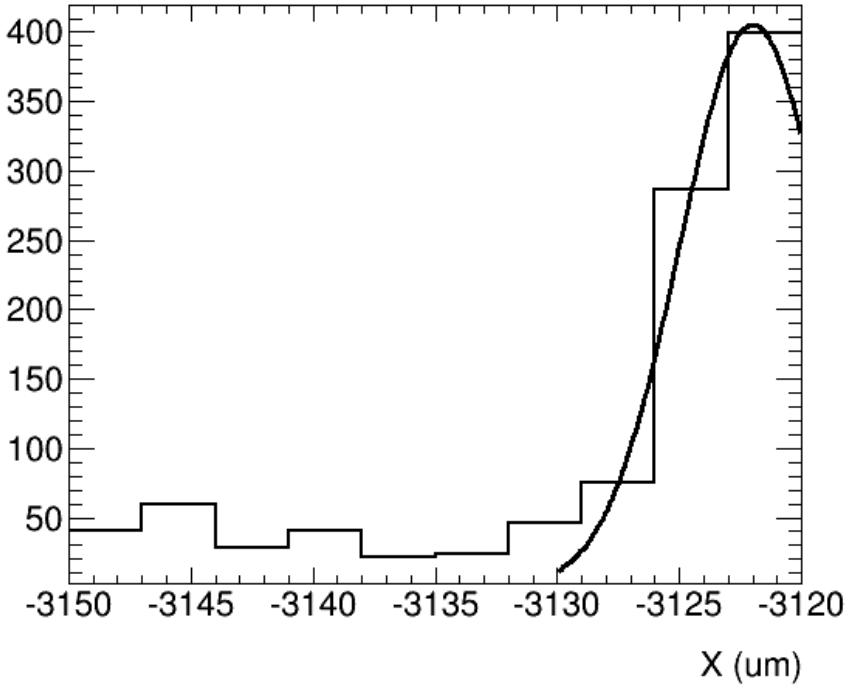
Beam spot size in different Z





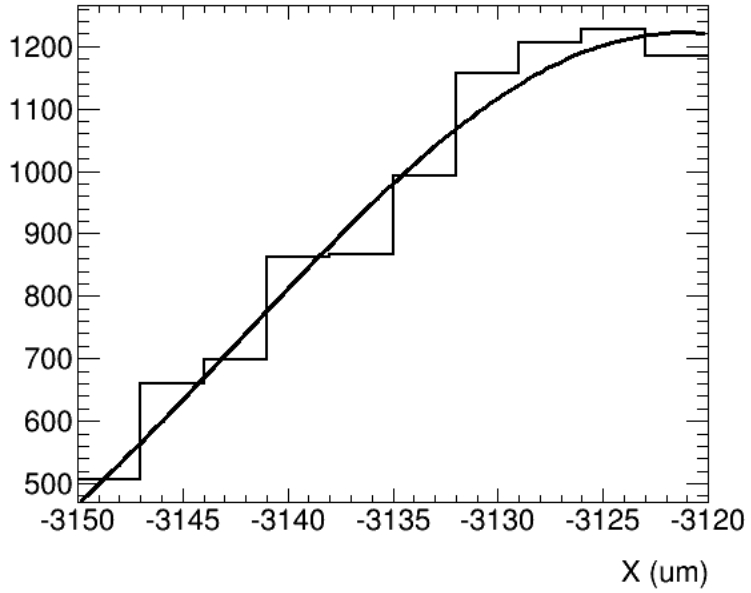
Z=-500um

Signal size (mV)



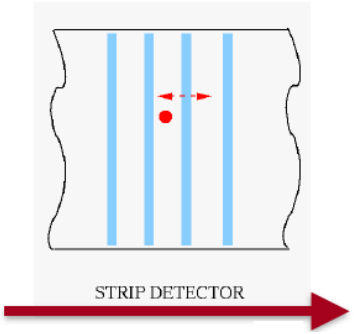
Z=100um

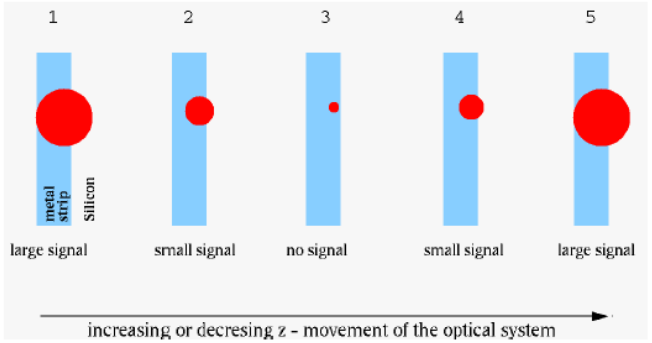
Signal size (mV)

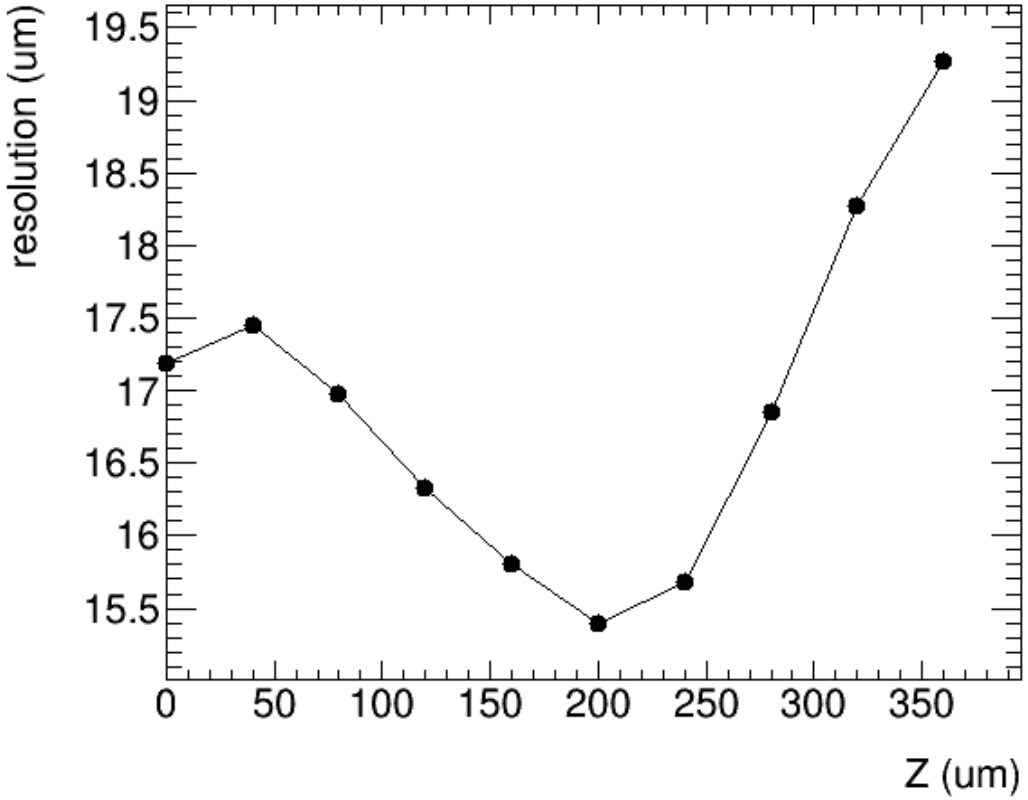


The peak is limited by X scan range

Beam spot size in different Z

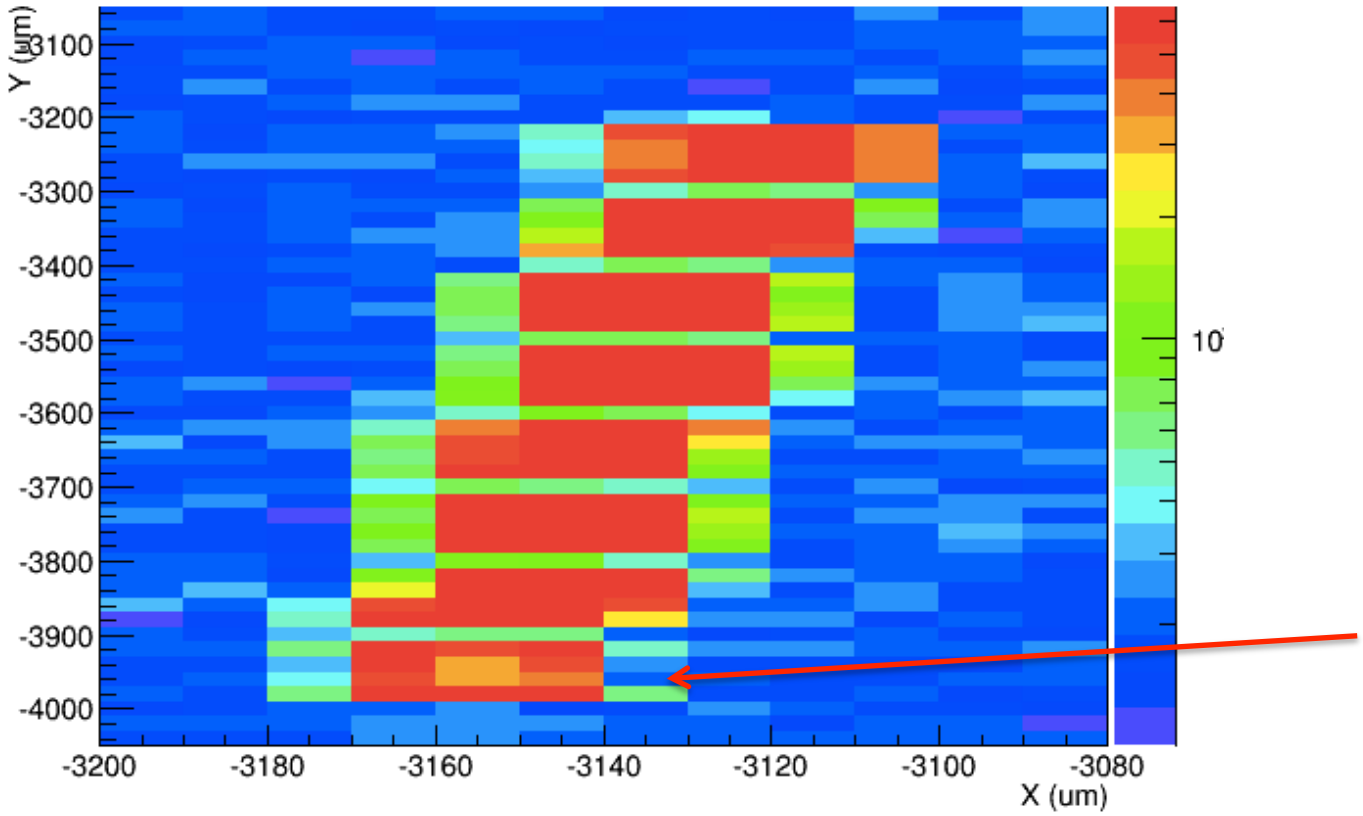






Laser scan in one pixel after focusing

- Red region is the N-well.
- Can see all 8 N-well inside one pixel
- Metal layer between each N-well.
- More metal is on the bottom N-well
  - Due to Built-in amplifier

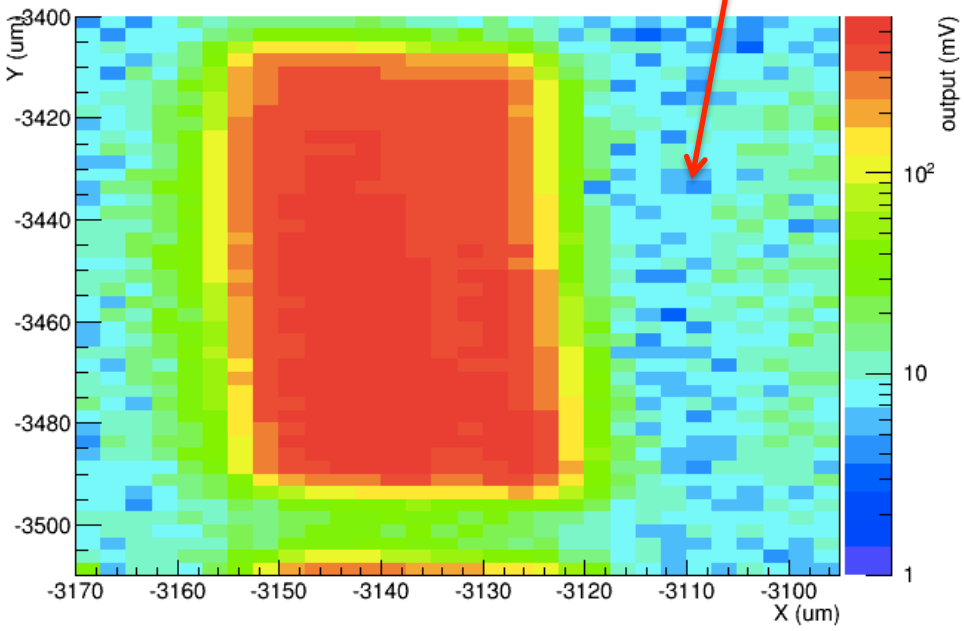


Zoom in one N-well

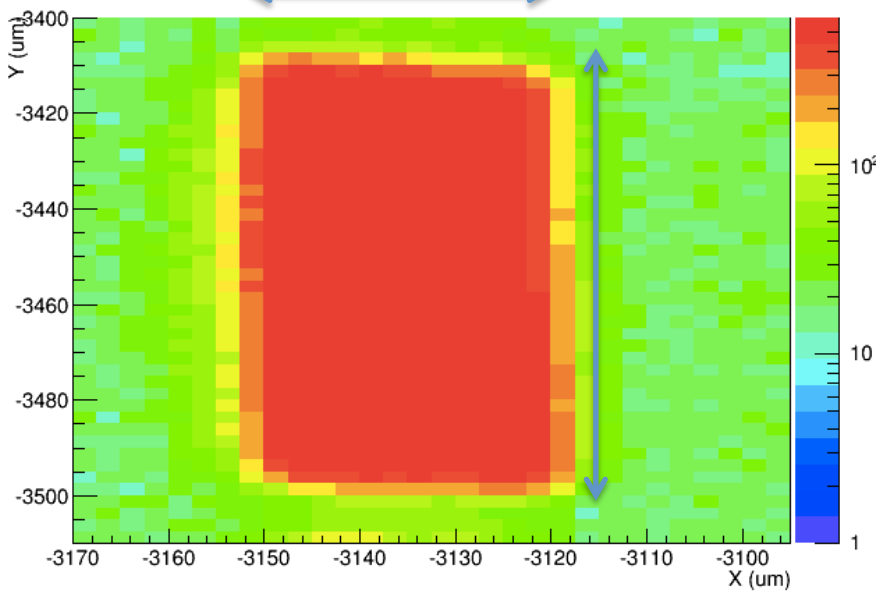
- Very good uniformity inside N-well

Diffusion is reduced
When biased

V_bias=60V

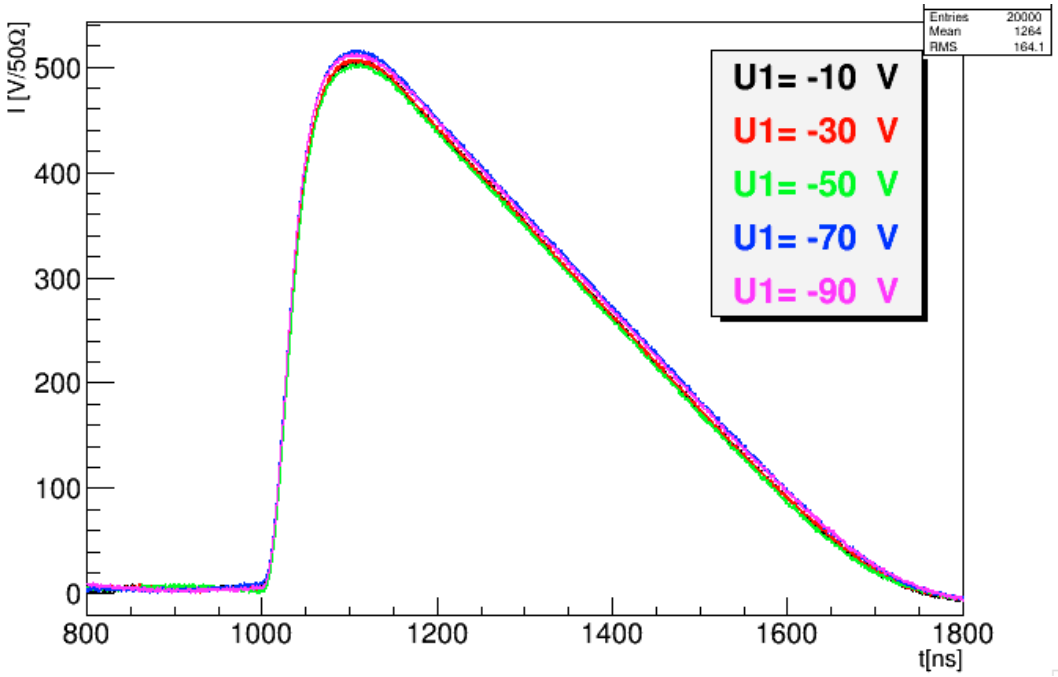


V_bias=0V



V_bias scan

- Signal response has no clear dependence of zon V_bias
- Likely to be laser power is too high
  - built-in amplifier has been saturated



Summary

- Testing one of pixel in active array
- 2D scan shows good signal response uniformity

- Next step
  - Reduce laser power to study the signal response to MIP
  - Study the bias voltage dependence