Laser test on CHESS1 chip

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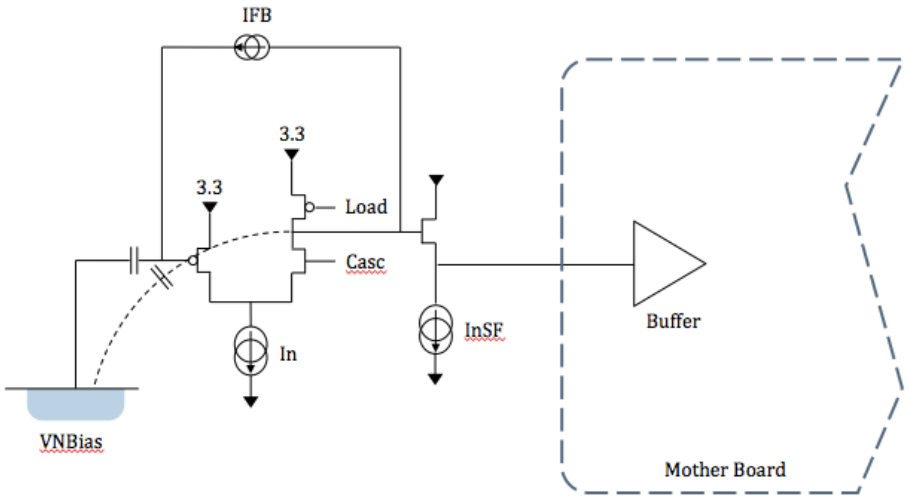
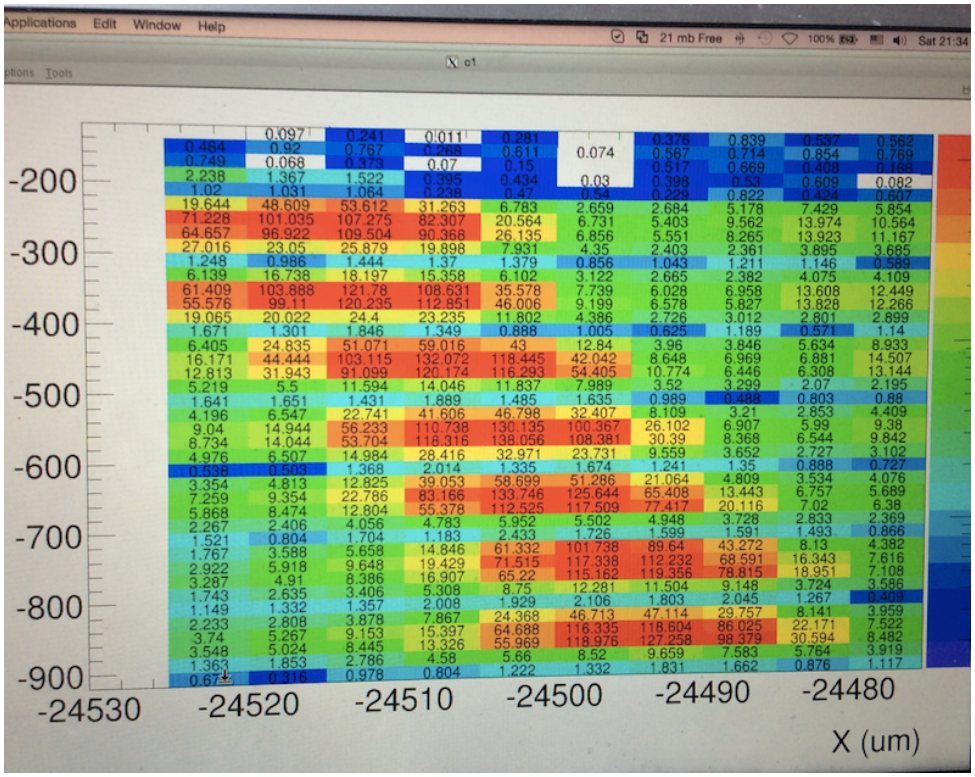
Amplifier biases setup for CHESS I active pixel testing



	Config 7	Config 8
VPFB	2.664V	2.7V
VNSF	0.57	0.75
VCasc	2.6V	2.6V
VPload	2.1V	2.1V
VN	1V	1V
VNBias	340mV	150mV

Laser focusing and 2D scan

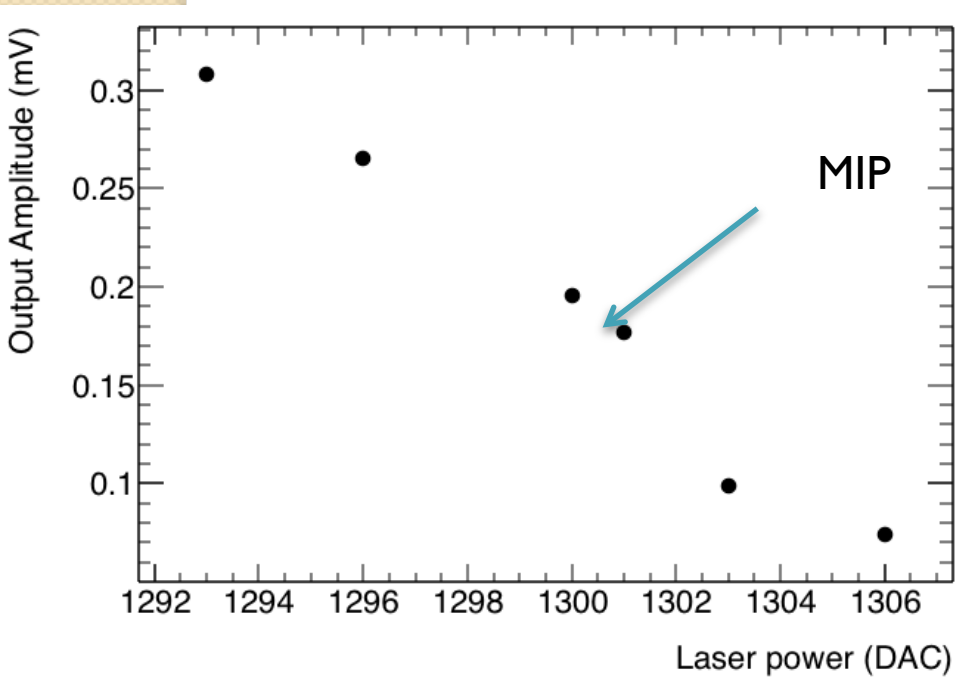
- IR Laser is focused to about 5um beam spot size.
- A 2D scan on one pixel in APA07 (45X800um).
  - N-well can be clearly seen.



Laser power VS output amplitude

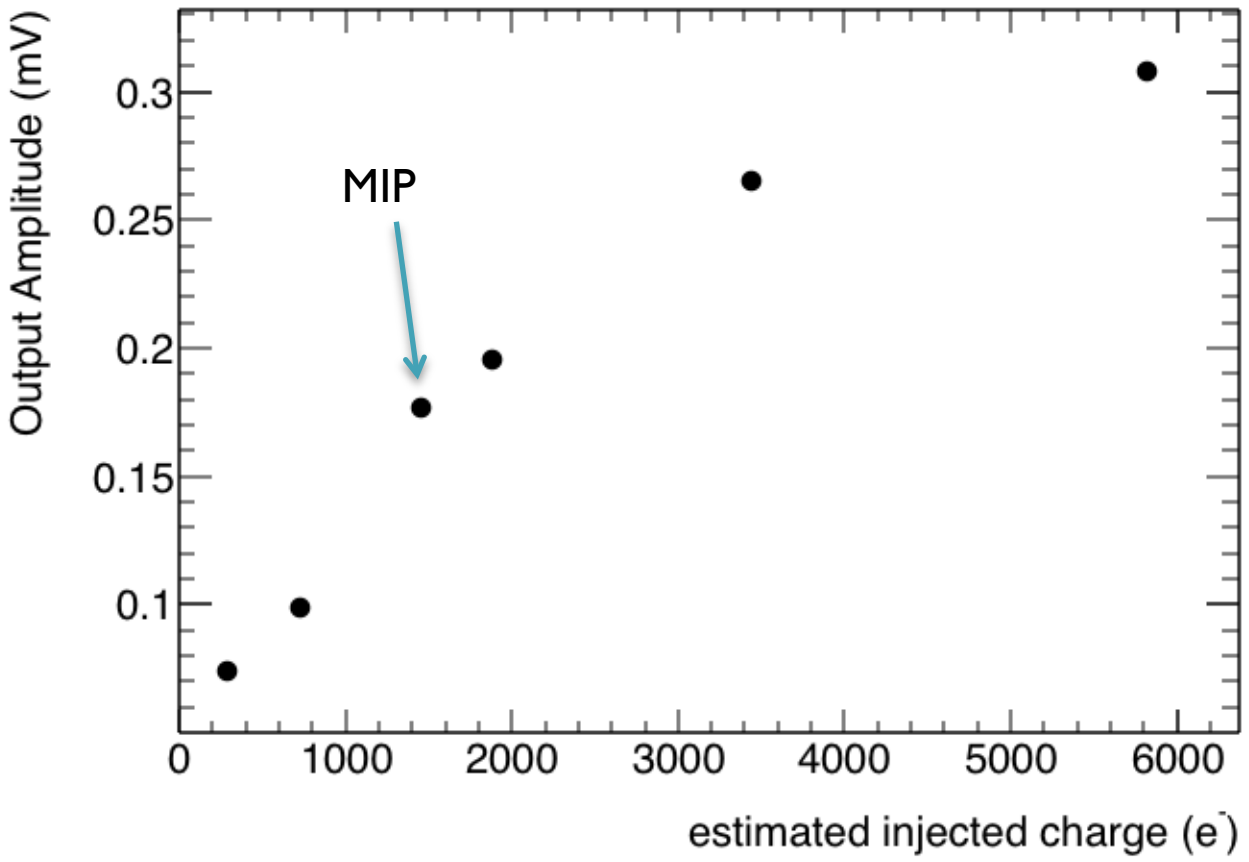
- Try to reproduce the charge deposition of MIP using focused laser beam.
- But it is not very sure which laser power value corresponding to MIP
  - Check CHESS1 signal output in different laser power

V_bias =120V , config 8



Injected charge VS output amplitude

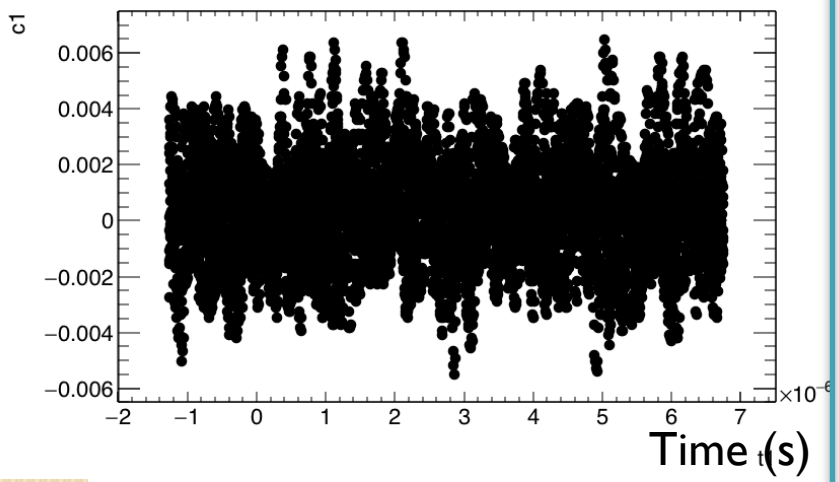
- Based on the calibration by Zach.
- We correlated the laser power with estimated injected charge.

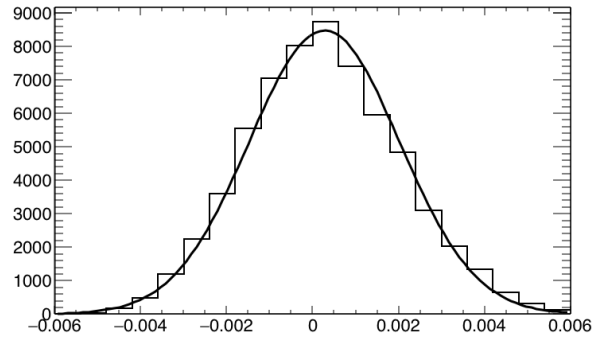


Signal pulse in MIP (config 8)

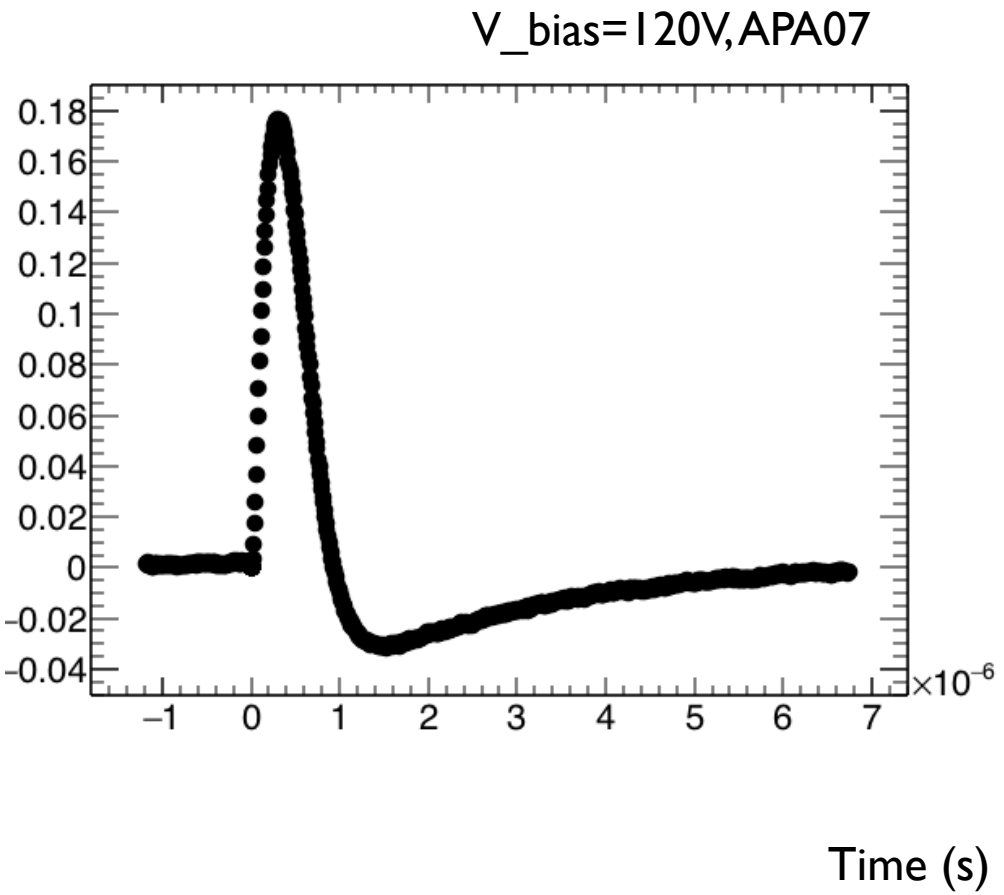
- Signal to noise study
  - Signal amplitude in charge deposition of MIP is about 180mV
  - Noise level is about 1.8mV
  - Signal to noise ratio is about 100 before irradiation using config 8.

Noise





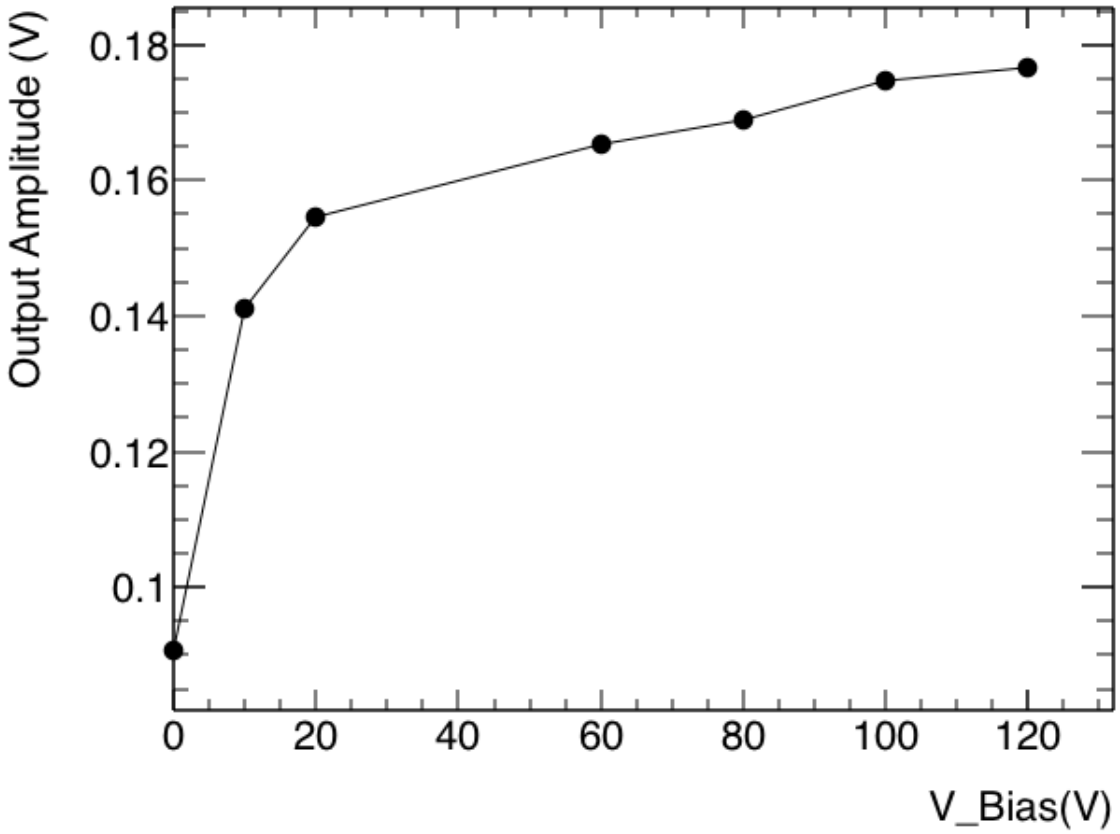
MIP Signal (emulated with laser)



HV bias dependence

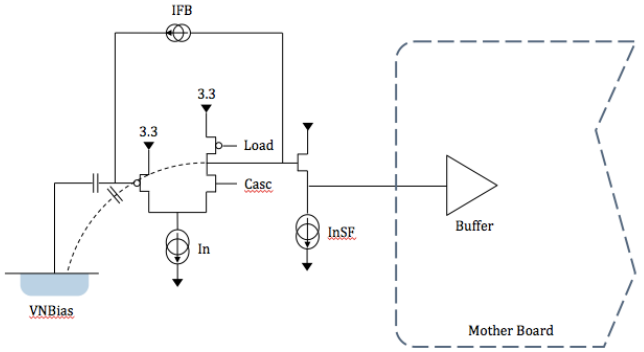
- Output amplitude is about 90mV without HV bias.
- After HV bias, output amplitude is 180mV
- Saturated at 20V ?

MIP Signal (emulated with laser), APA07

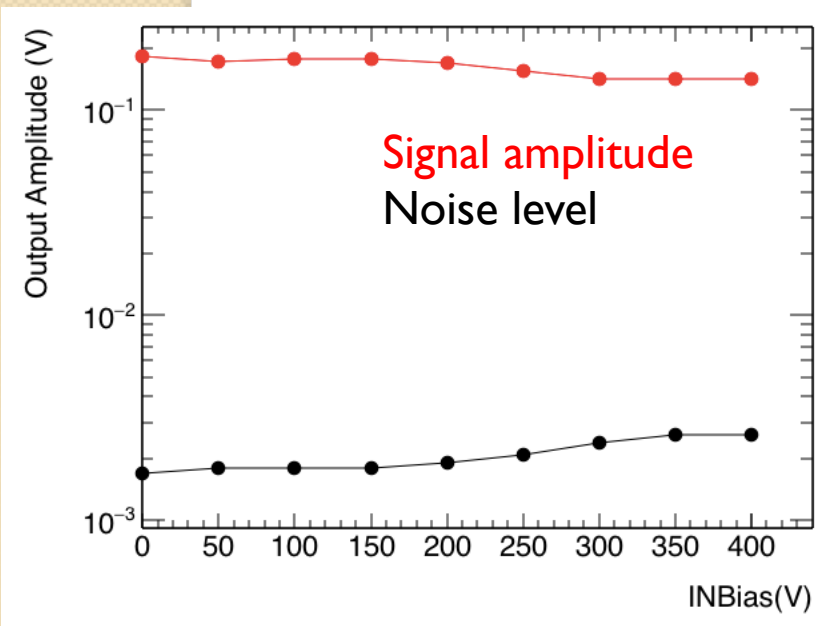


Modifying VNBias

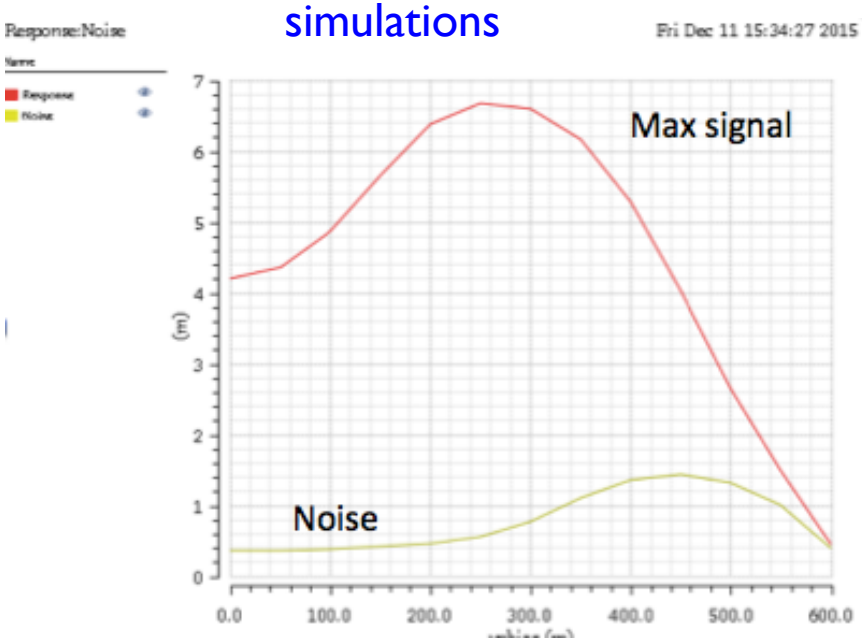
- VNBias controls the bias of the Pixel diode. Value shouldn't be changed .
- Simulations and measurements are quite different for VNBias dependence.



measurements



simulations



Summary

- Use laser to emulate the charge deposition of MIP.
- Study signal to noise ratio of active pixel in CHESS1.
  - Signal amplitude is about 180mV
  - Noise level is about 1.8mV
  - Signal to noise ratio is about 100.
- V_bias dependence is also studied
  - Saturated at 20V