

Total Dose Ionising Irradiation of APV25S1 Chips (QA)

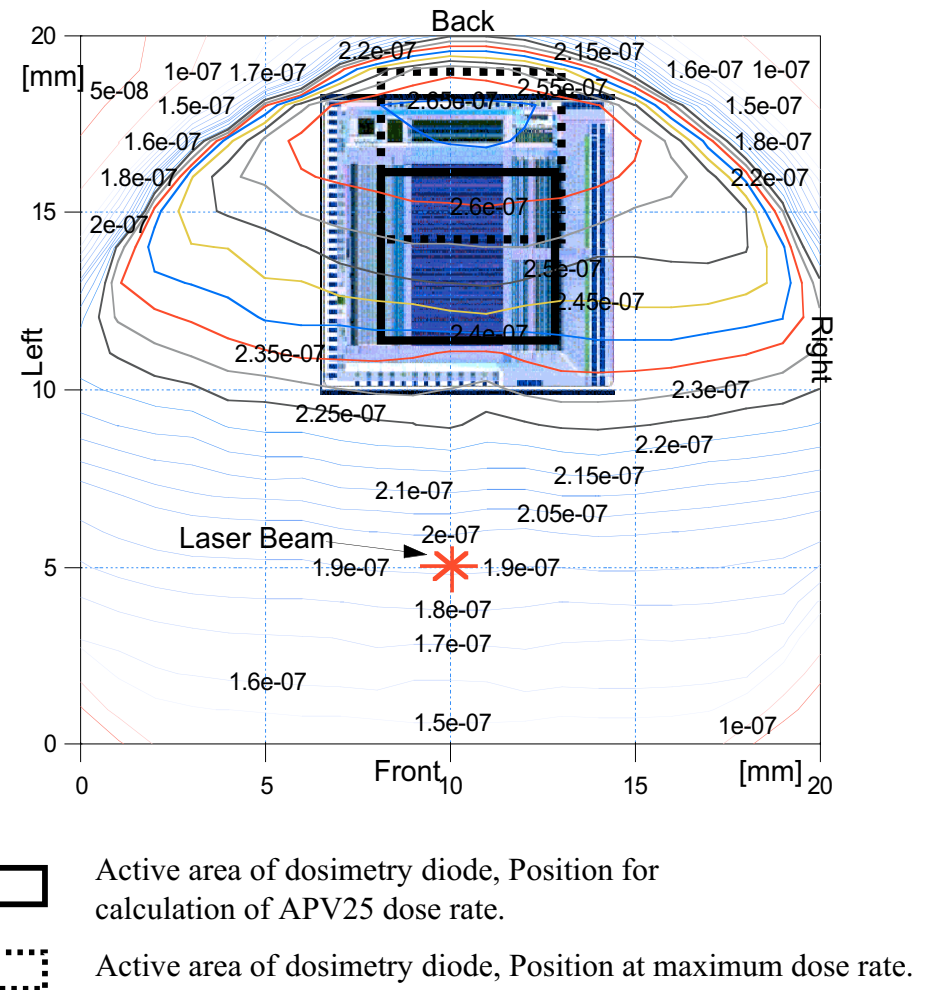
Outline:

- Testing Considerations
- Chip Characterisation
- Current Status
- Chip Measurement Example
- Results on all Chips
- Summary

Testing Considerations

X-ray Irradiation:

- 10-keV X-ray field is uniform to within 10% across the chip.
- Chip is biased during irradiation with a continuous random cycling through the pipeline cells.
- Irradiation to 10Mrad(SiO_2) takes ~15hrs.



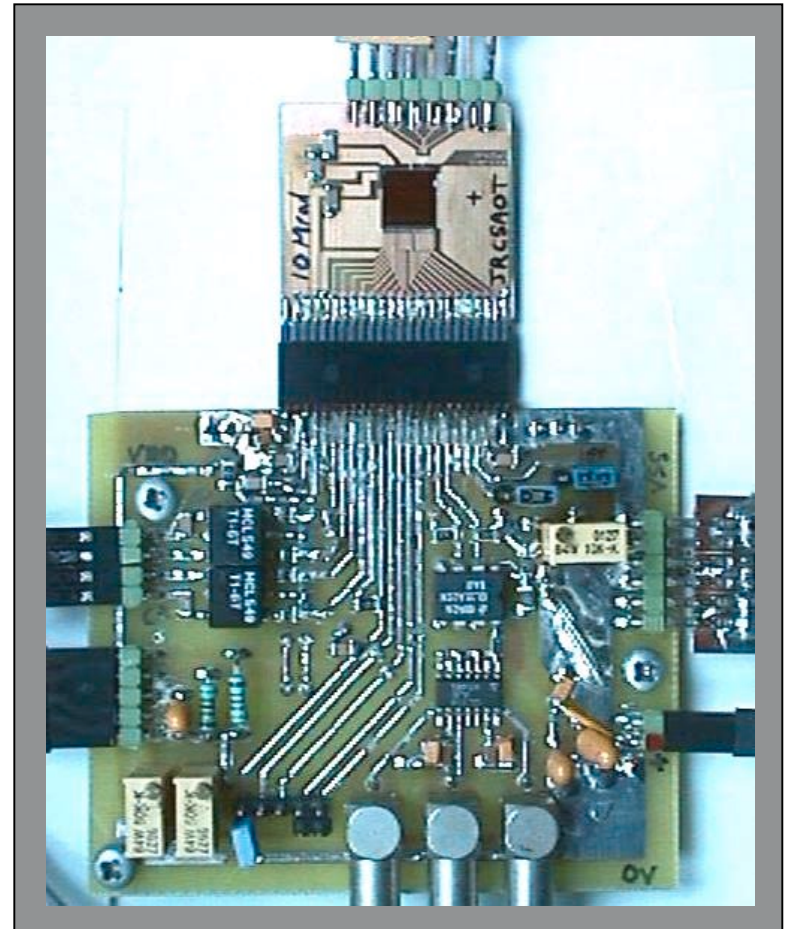
Chip Characterisation

Chip is tested Prerad and after irradiation using an automated testing setup including:

- Pulse shaping tuning in peak mode.
- Gain and linearity with externally applied pulse.
- Noise.
- Internal calibration.

Plans (IC and Padova)

- Irradiate 1 chip/wafer.
- Anneal irradiated chip (process takes a week and can only anneal one chip at a time currently).



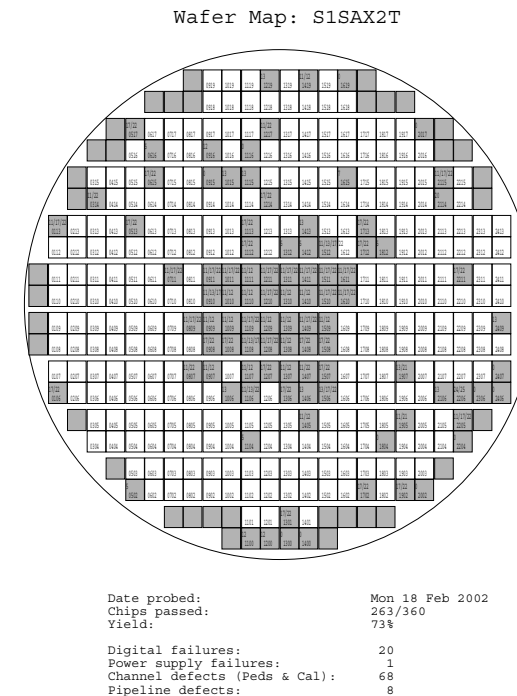
Current Status

➤ Irradiated chips:

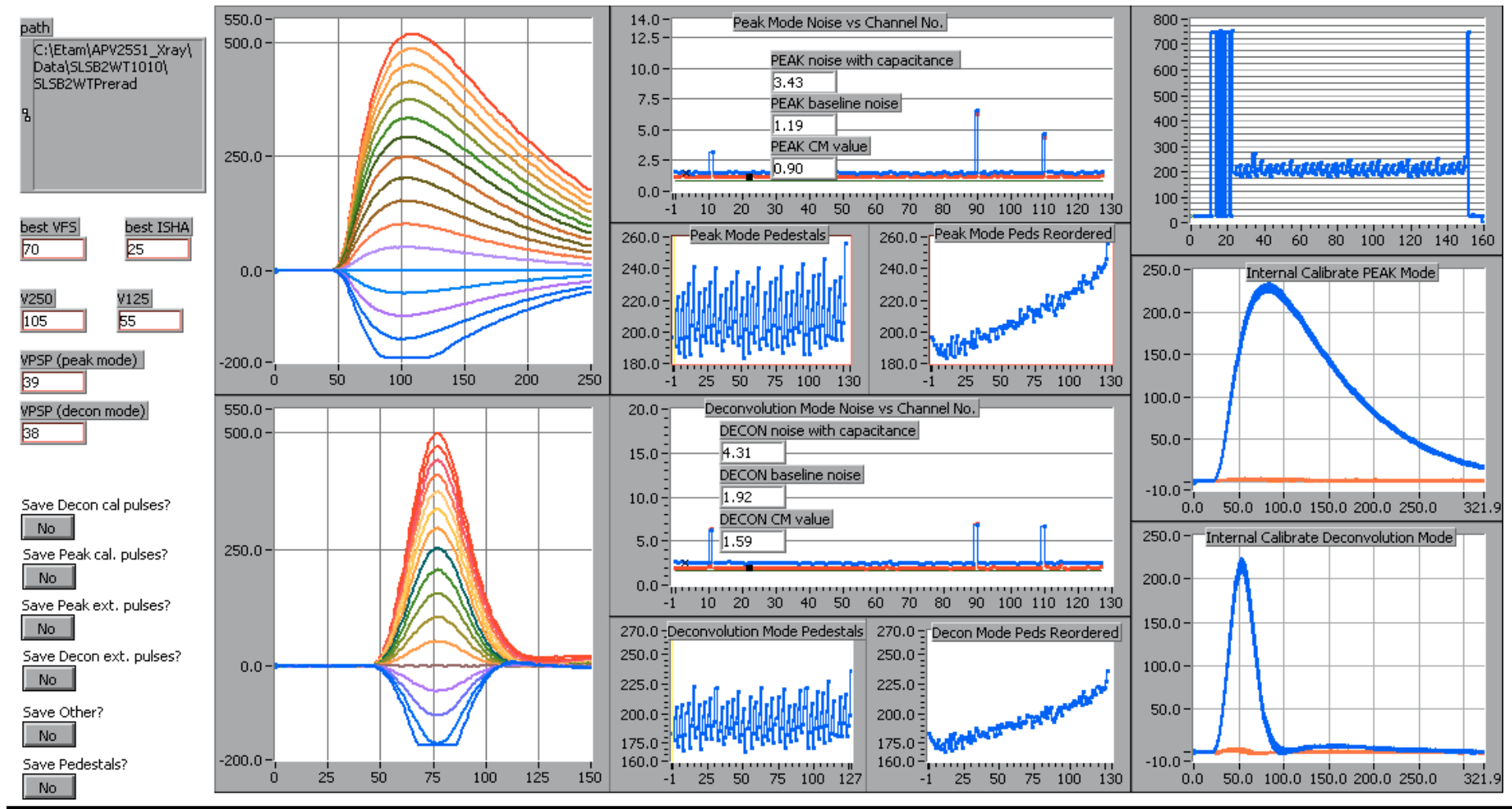
- 1 chip from each of the 10 engineering-run wafers.
- 1 chip from each of the 13 diced wafers from the 3rd production lot. (chip taken close to the centre of the wafer).

➤ IC X-ray machine now unavailable due to refurbishment work (~until November 02).

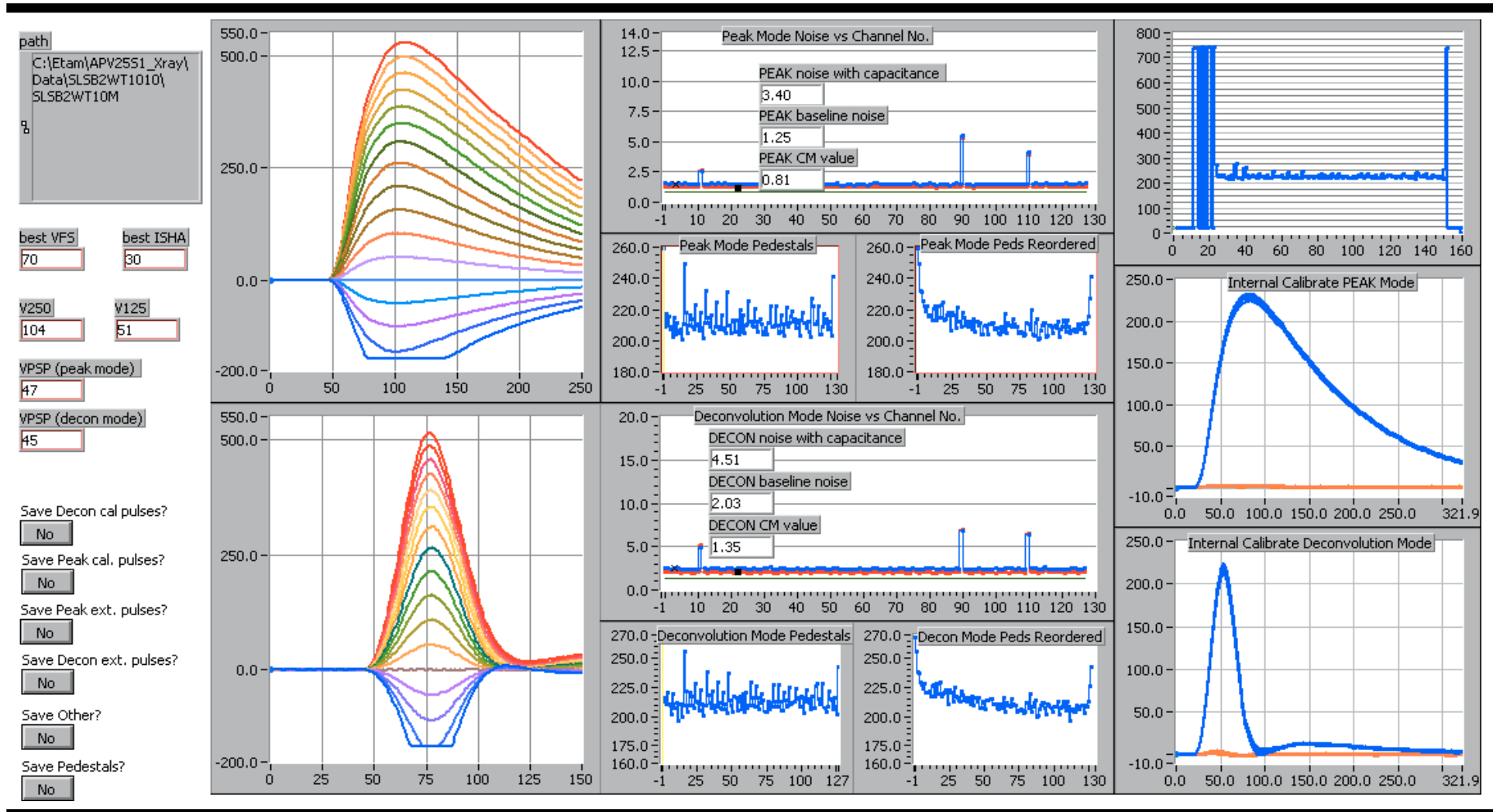
➤ Annealing still ongoing.



Chip measurement: Prerad



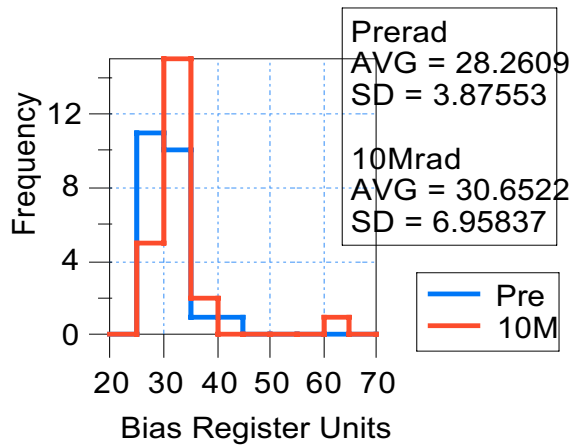
Chip measurement: 10 Mrad(SiO₂)



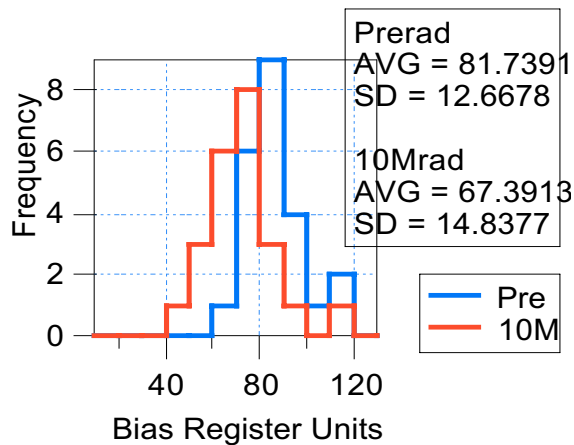
All 23 Chips: Bias Register Settings

Pulse Shape Parameters

ISHA

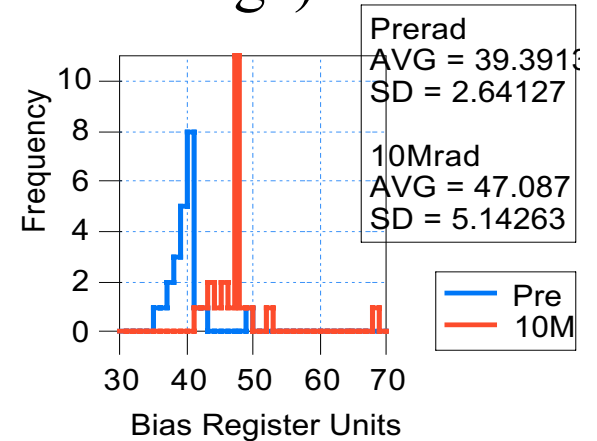


VFS

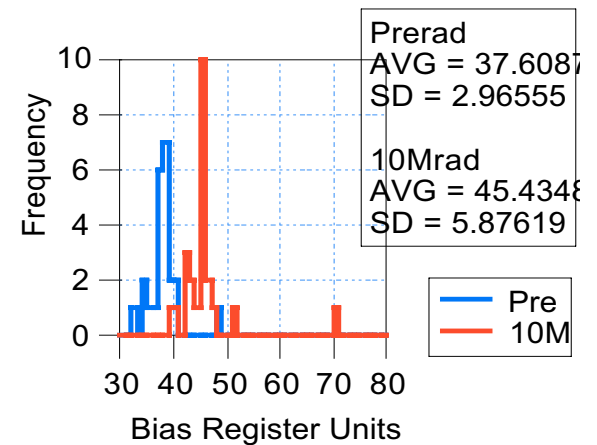


Baseline (1/4 of full range)

VPSP Peak



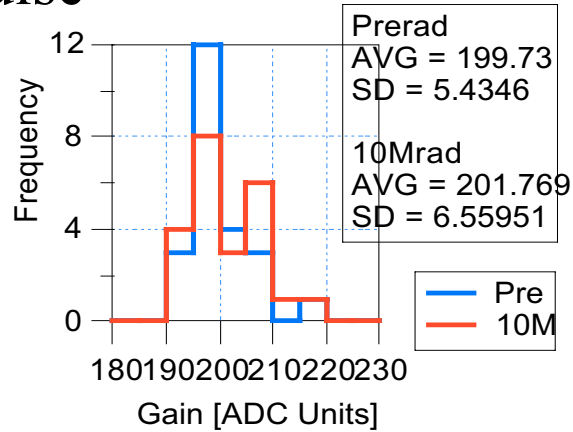
VPSP Decon



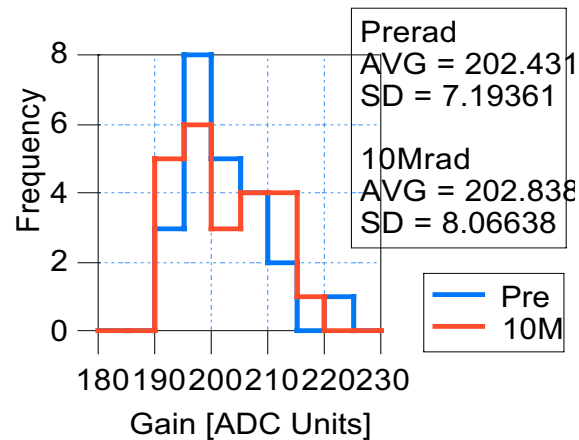
All Chips: Gain

External Pulse

Peak

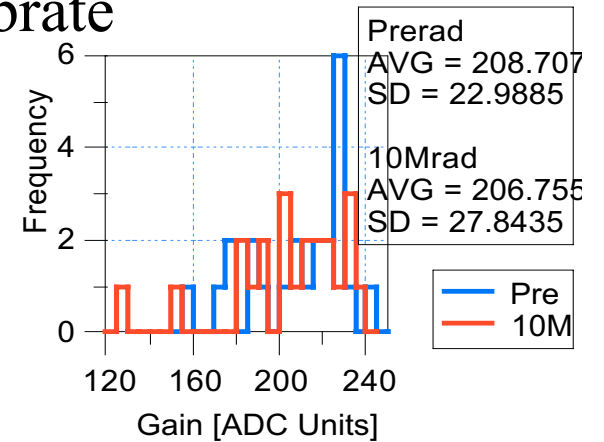


Deconv.

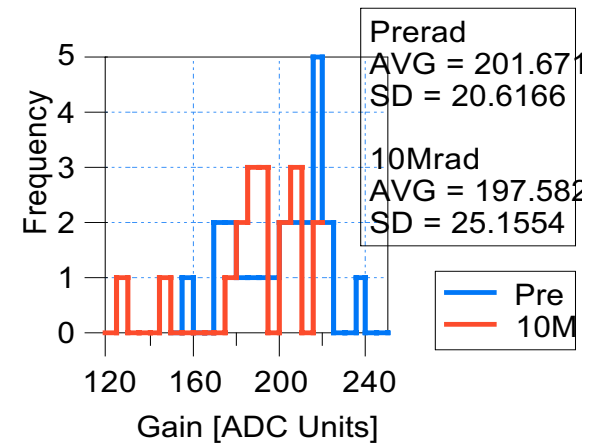


Internal Calibrate

Peak



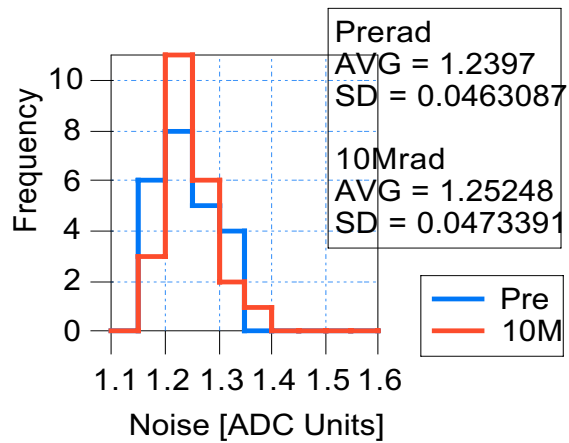
Deconv.



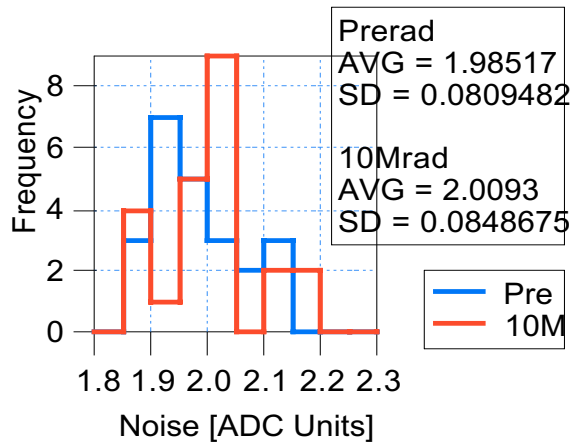
All Chips: Noise

Baseline Noise

Peak

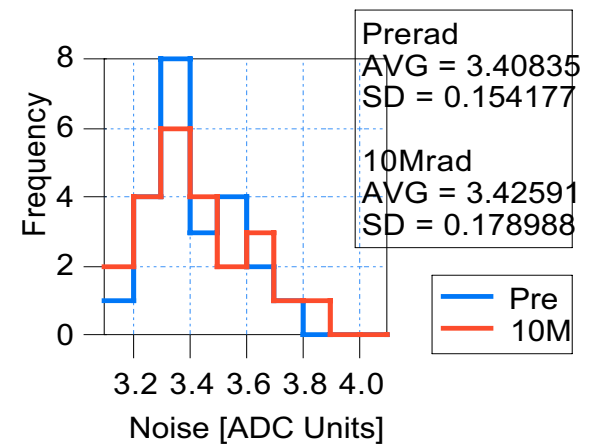


Deconv.

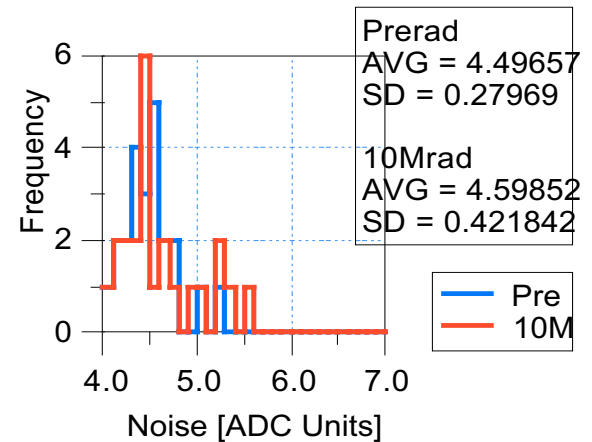


Extra Input Capacitance

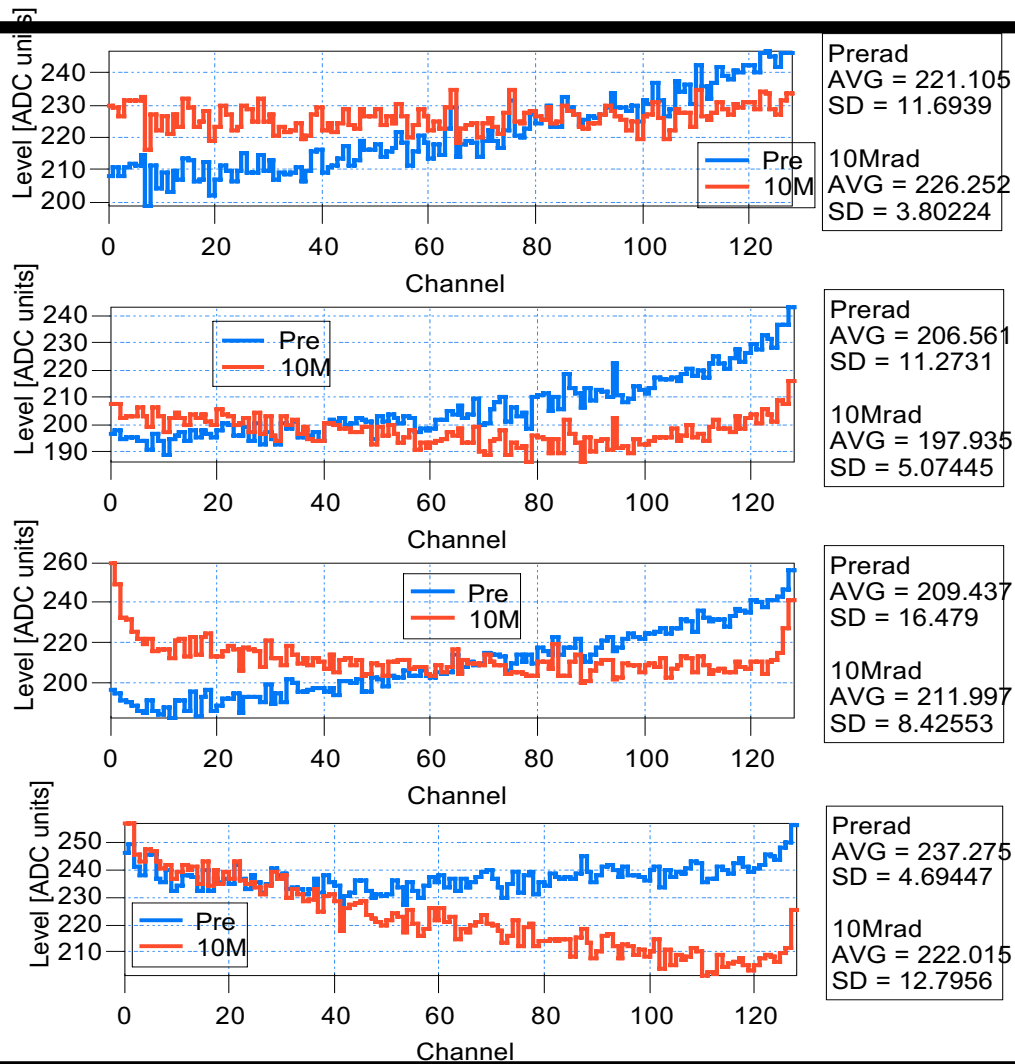
Peak



Deconv.

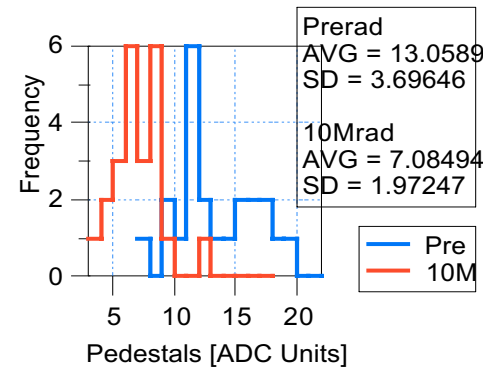


Shape of Pedestals



Peak mode pedestals

S.D. Statistics



Summary

- 23 chips irradiated.
- All fully operational after 10Mrad(SiO₂).
- No significant change in noise or gain.
- Annealing studies to be done.