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Test of TI-LGAD and iLGAD for single photon per bunch resolution for energies lower than 1 keV

Goal: Single photon resolution for each bunch for energies between 500-1000 eV with collection times shorter than 2ns, in order to avoid pile-up from photons from different bunches (e- bunch injection rate 500 MHz).

SLS electron bunch filling pattern:

Hybrid-mode filling pattern

Short: 390 filled bunches out of 480 bunches,
with camshaft at bunch 465

Setup:

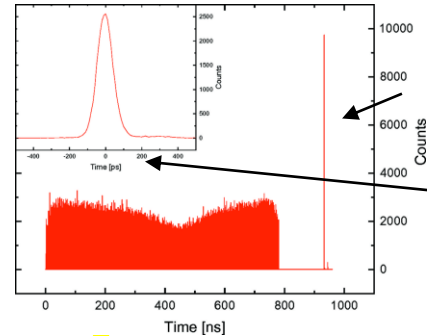
Pin hole $\phi = 50 \mu\text{m}$

Current amplifier 60dB

TI-LGAD:

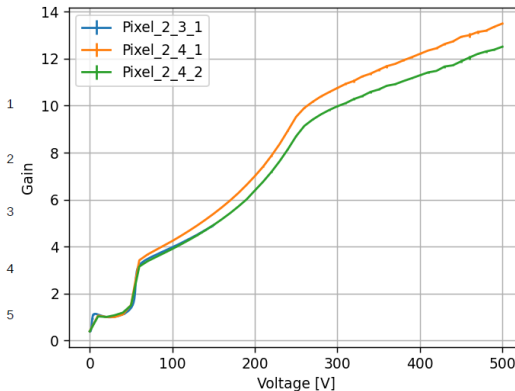
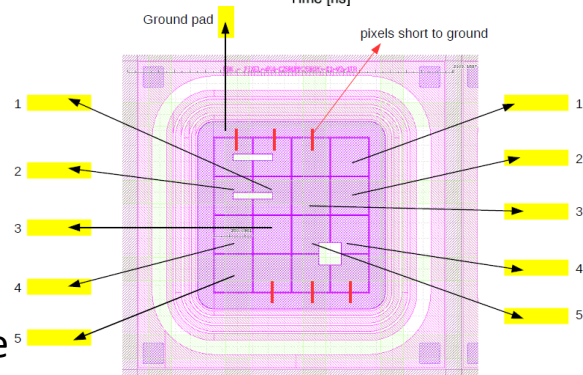
Sensor 2.3, just pixel 1 measured

Bias voltage fixed to 320V. Not possible



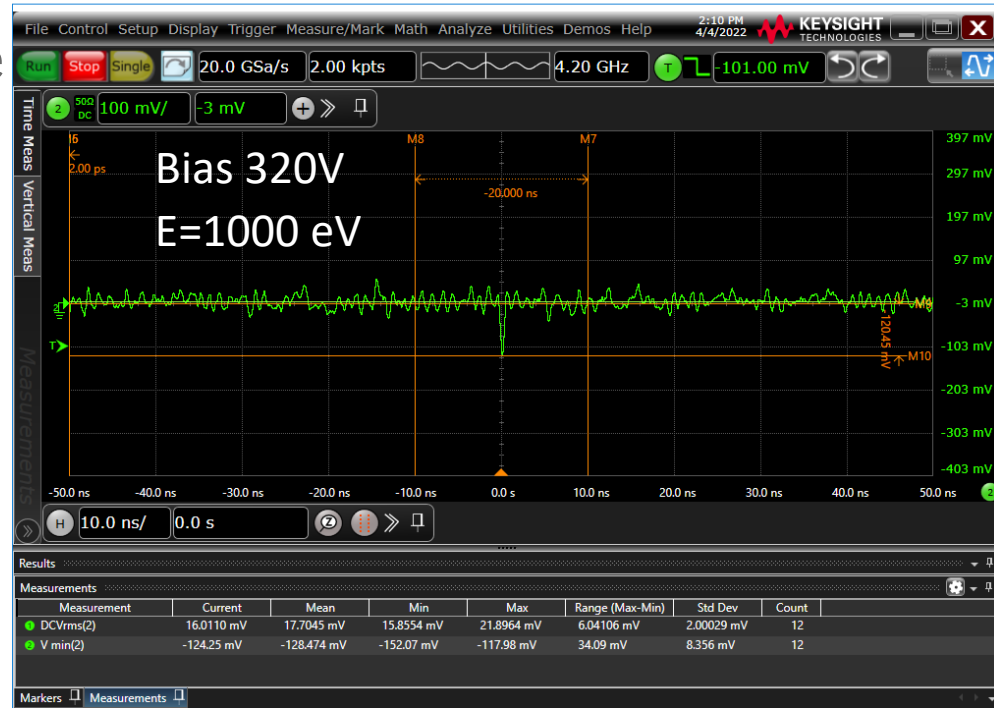
camshaft bunch 1.042 MHz

20th filled bunch



TI-LGAD (50 μm thin sensor):

- Single bunch resolution down to 500eV (but the high harmonics were not suppressed). We couldn't measure it for lower energies due to the small opening on the metallization.
- Collection time ~ 500 ps.



Since we have two iLGAD with TEW from W14 already mounted, we also tested the one with higher gain ~ 4.66 at 300V for 1keV photons.

iLGAD with TEW(300 μm thin sensor):

- It was possible to see the camshaft bunch in the bucket bunch down to 300 eV.
- Collection time ~ 7 ns
- Gain @ 300V for 1keV photons $\rightarrow 4.66$ (measured at SIM beamline)

