

Charge collection and E-TCT measurements with CHESS-1 chip

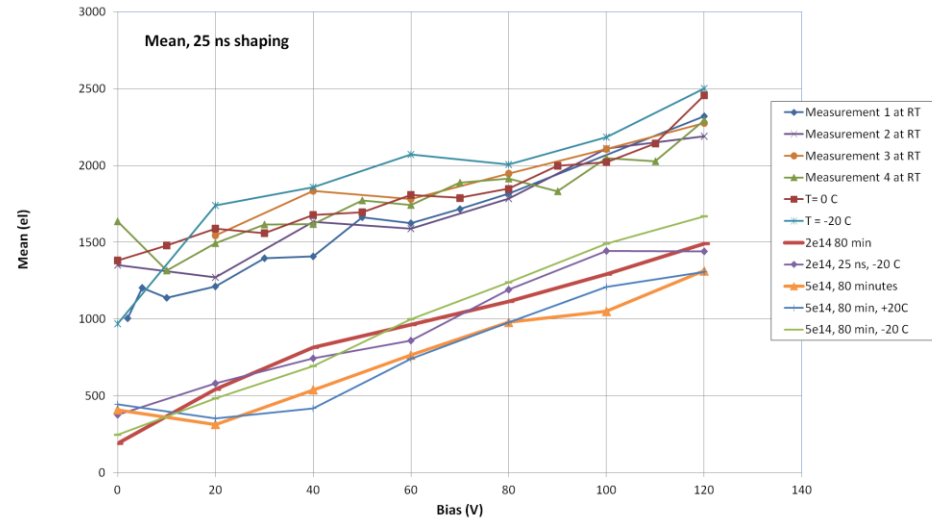
I. Mandić et al.,
Jožef Stefan Institute, Ljubljana, Slovenia

Correction:

- voltage drop on bias resistor not taken into account

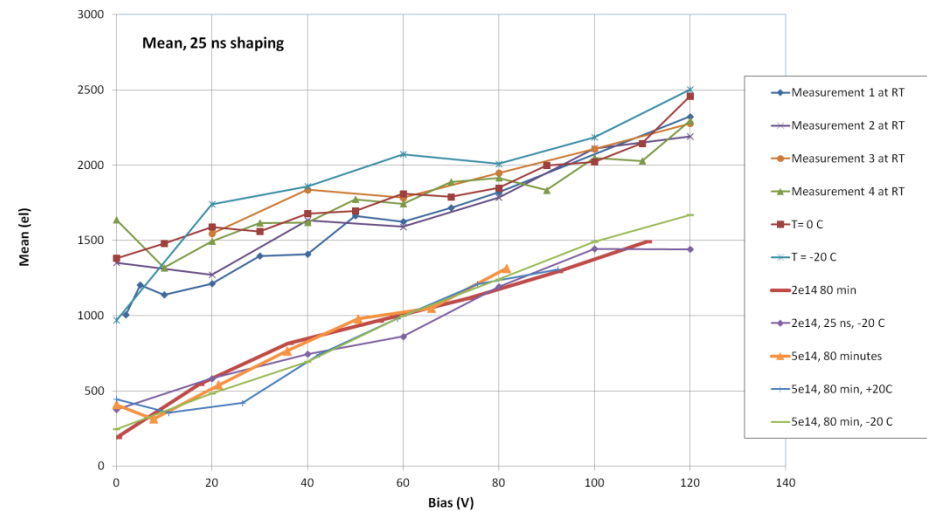
Plot shown in the last meeting:

- curves after irradiation not correct



Corrected plot:

- more uniform after irradiation
- temperature dependence smaller
- lower leakage current

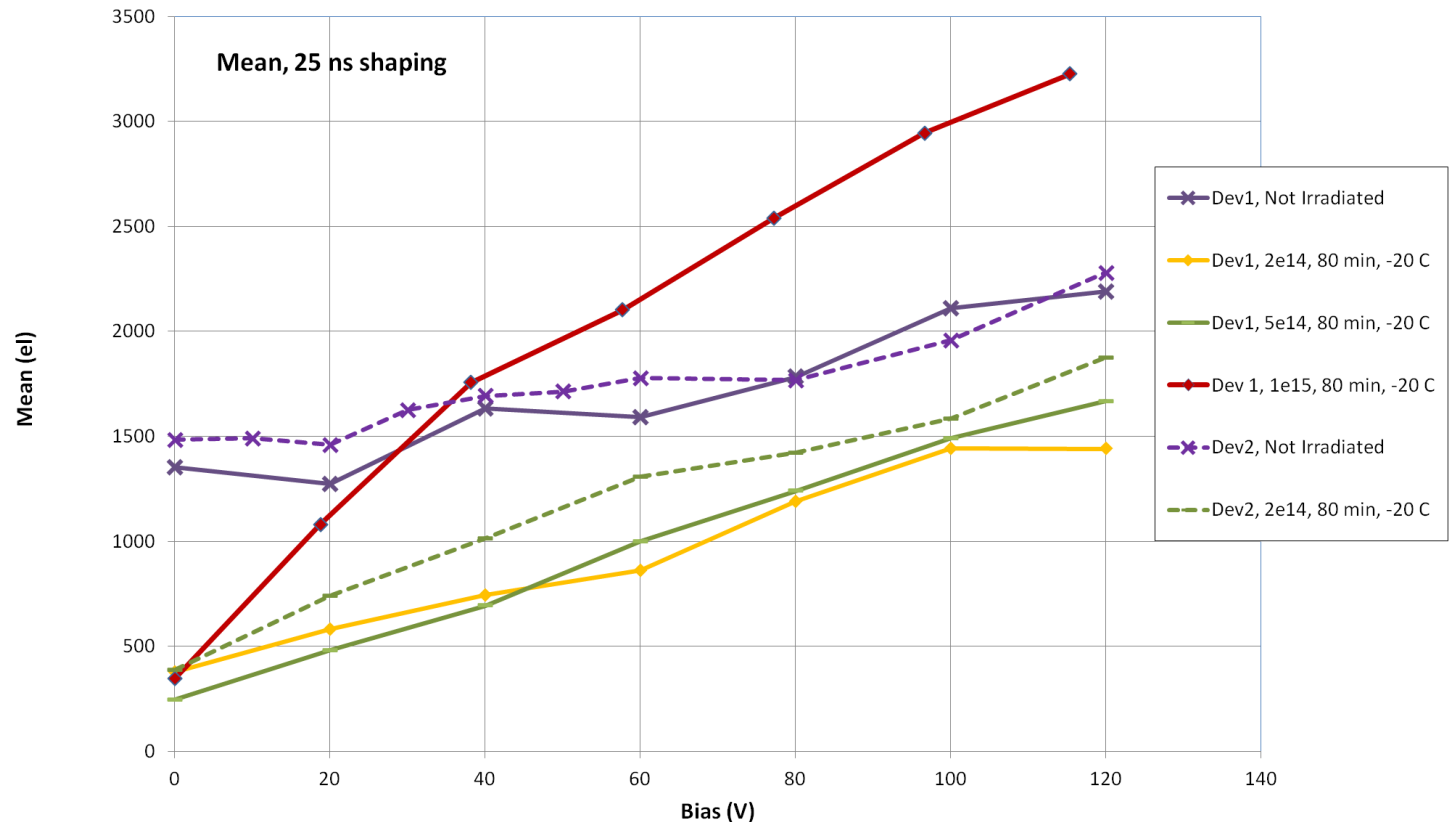


New measurements with Sr-90:

1. device 1: reached fluence $1e15$ n/cm²
2. device 2: before irradiation and $2e14$ n/cm²

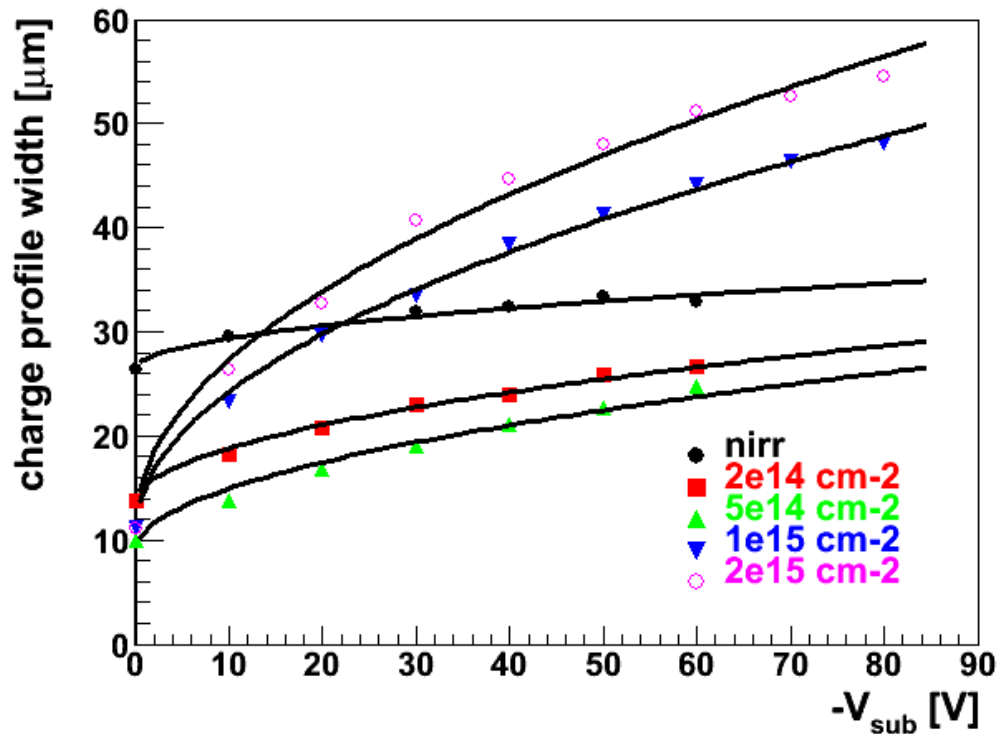
→ large collected charge measured at $1e15$

→ larger charge than before irradiation → depleted region increases (effective acceptor removal)



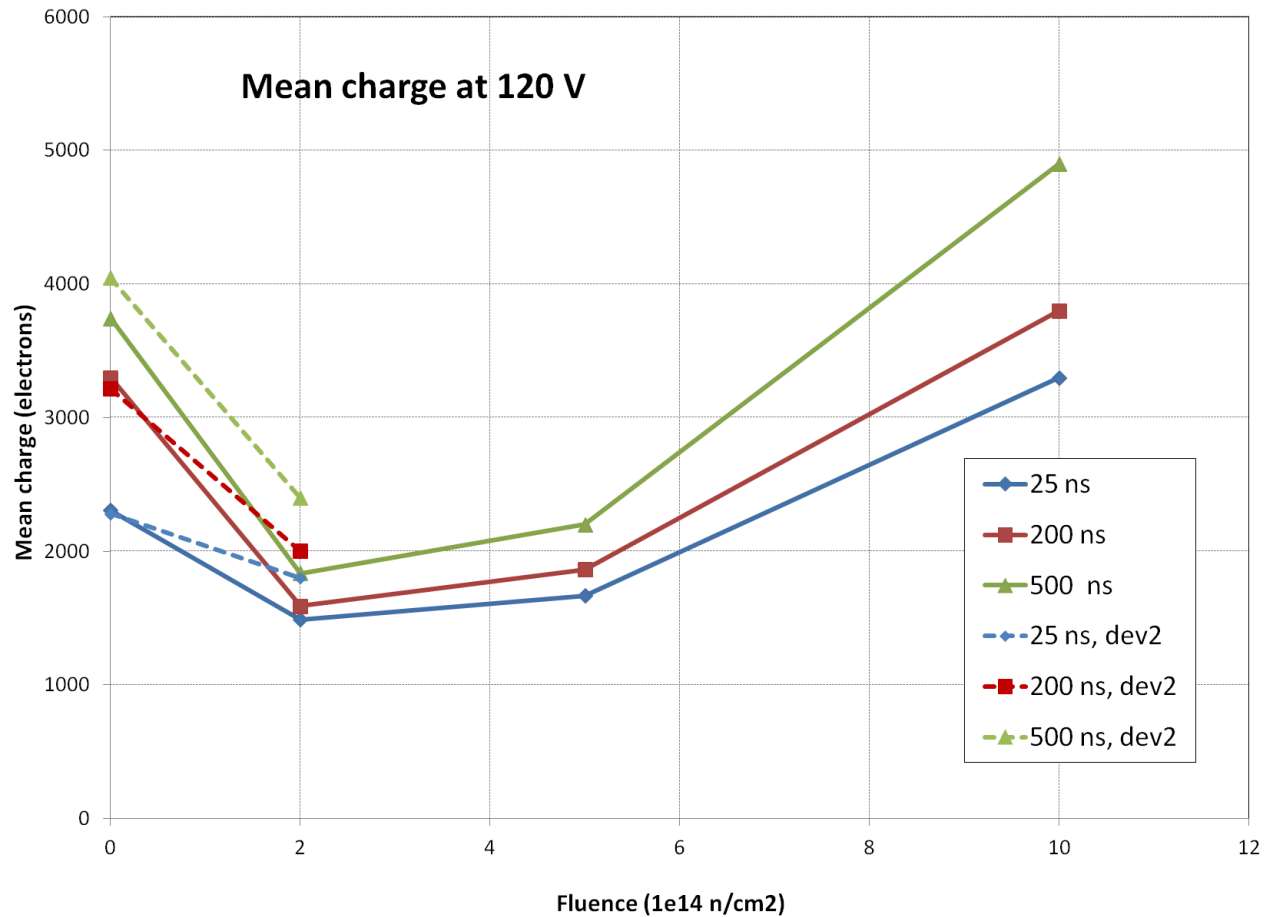
- Consistent with measurement with E-TCT measurements on HVCMOS2FEI4 chip by G.Kramberger (more info in <https://indico.cern.ch/event/334251/session/1/contribution/15/material/slides/0.pdf>)

Charge collection region measured with E-TCT on HVCMOS2FEI4 chip



- effective acceptor removal: depletion region increases with fluence
- collected charge first drops with fluence because of reduced diffusion

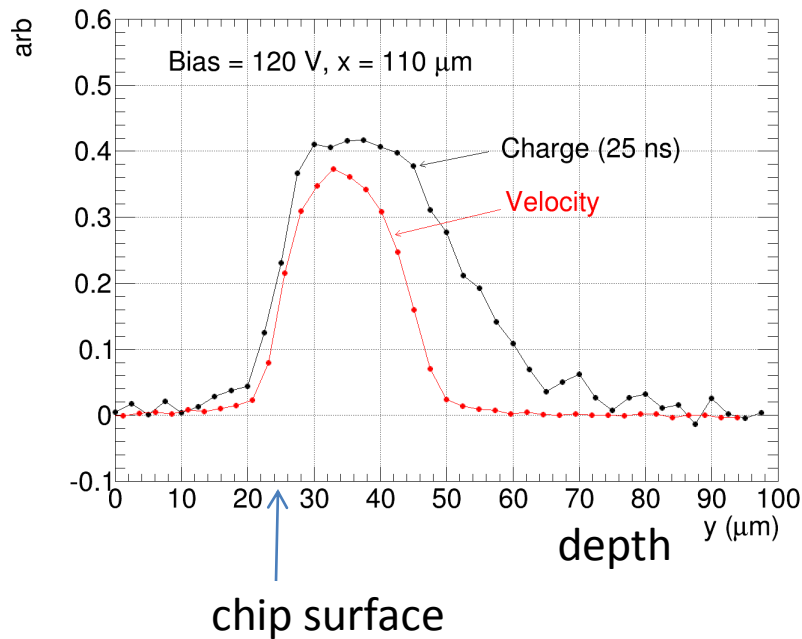
- mean charge vs. Fluence :



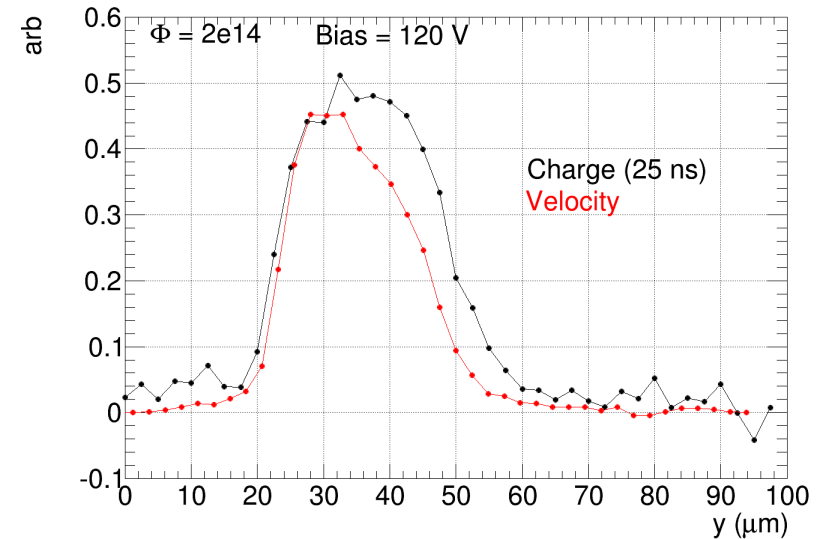
- device 2 somewhat smaller charge drop at 2e14 compared to device 1

Charge collection and velocity profiles across pixel centre

Not irradiated



Irradiated $2e14$

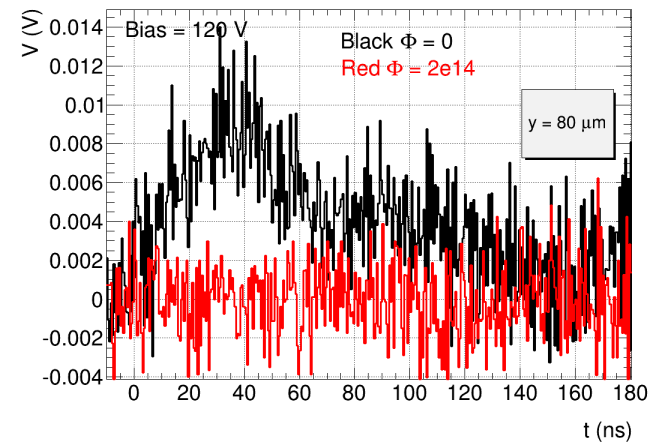
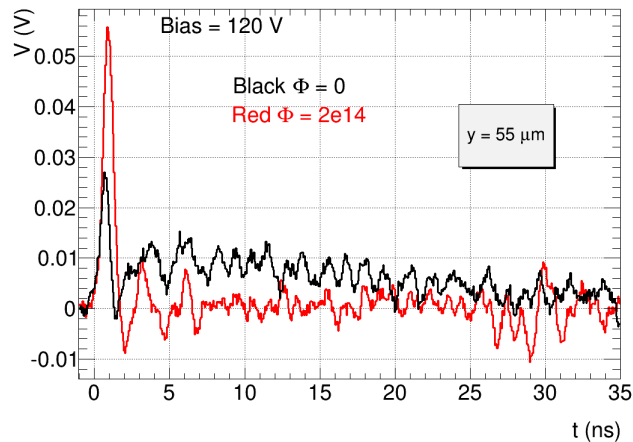
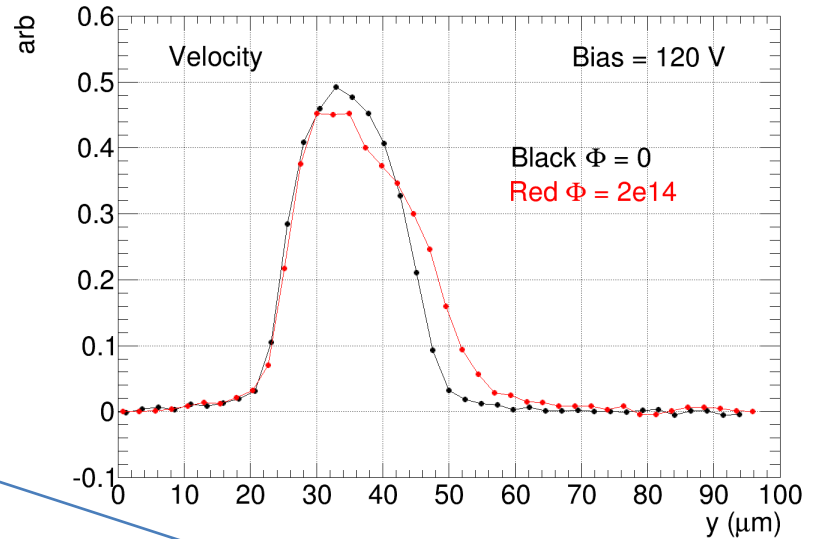
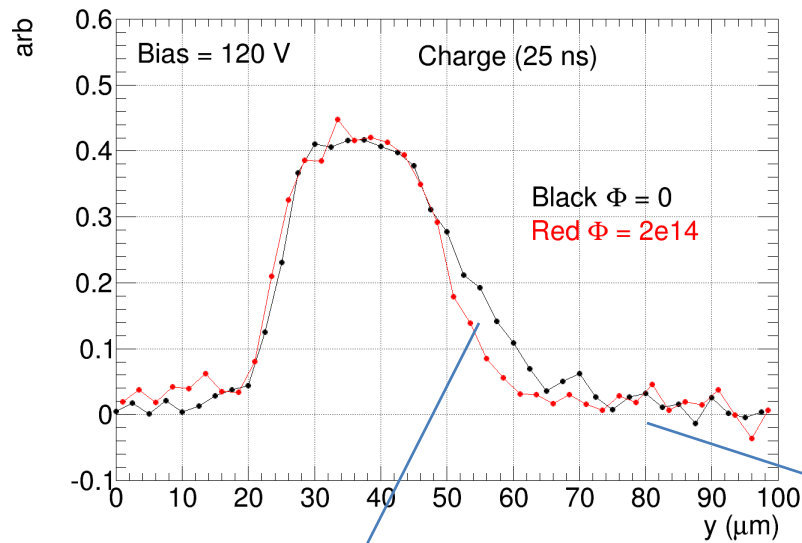


After irradiation:

- smaller difference between charge collection and velocity (depleted) region

After irradiation:

- charge collection region narrower
- field (velocity) region seems to increase (expected in case of acceptor removal)
- no long tails in induced current pulses (less diffusion)



Summary:

- after irradiation with $1e15$ neutrons charge larger than before irradiation measured with Sr90 setup
- consistent with E-TCT measurements on HVCMOS2FEI4 chip by G. Kramberger
→ depleted region increases because effective doping concentration is reduced by irradiation
- collected charge may increase with more irradiation (acceptor removal still helps) or decrease (acceptor removal saturated, trapping ...)