HRPPD #25 ageing studies
Preliminary analysis

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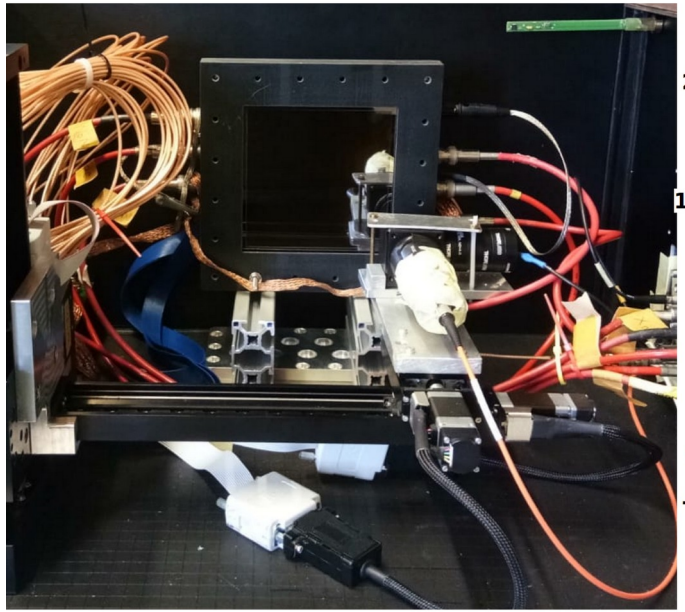
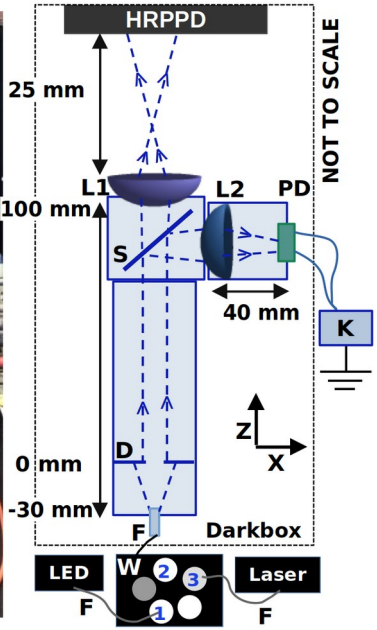
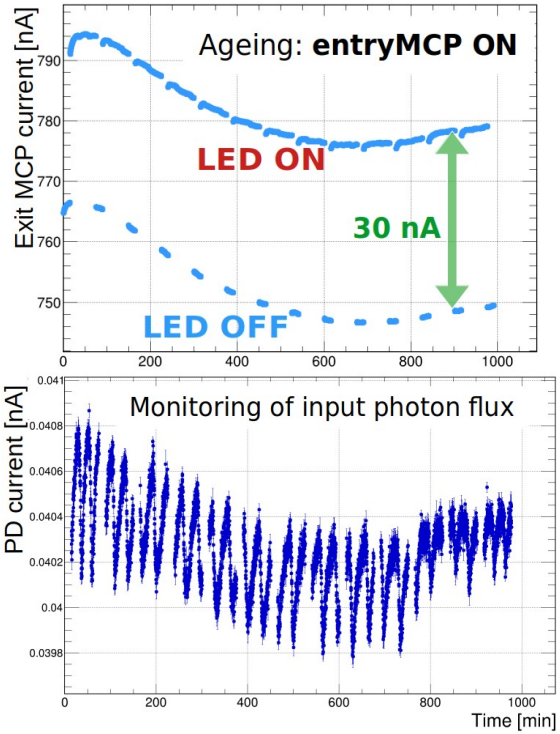
Ageing studies

- Two Accelerated Ageing (~1 cm spot, defocused). I) One MCP active, II) Both MCPs active
- **LED** for illumination, 2D QE scans, average QE
- **Pulsed laser** (λ =405 nm) for gain, PDE
- Monitoring of input illumination by Photo-Diode (Keithley current)
- Ageing Region and Reference Region for comparison

Simulation:
10^{14} photons/cm^2 = 10 years ePIC







Scans – 4 scans each region – two H, two V

- Scan of amplitude and PDE in step of 0.5 mm
- Pulsed laser; focused spot (< 1mm)
- Lambda~0.2 (~ 20% non empty events)
- Digitizer, each run 100k events, sum of 16 pads

Ageing Region (D1B)

Y [mm]				
47.25	8 0	7 1	13 2	14 14
44.50	18 4	17 5	20 6	19 7
41.00	22 8	21 9	24 10	23 11
37.50	32 12	31 13	29 3	30 15
X [mm]	106.85	103.35	100.10	96.60

H1 H2 V1 V2

Pads
Digitizer channel

Reference Region (A1T)

Y [mm]				
47.25	33 0	29 1	31 2	32 3
44.50	23 4	24 5	21 6	22 7
41.00	19 8	20 9	17 10	18 11
38.00	14 14	13 13	7 12	8 15
X [mm]	42.50	38.60	35.10	32.00

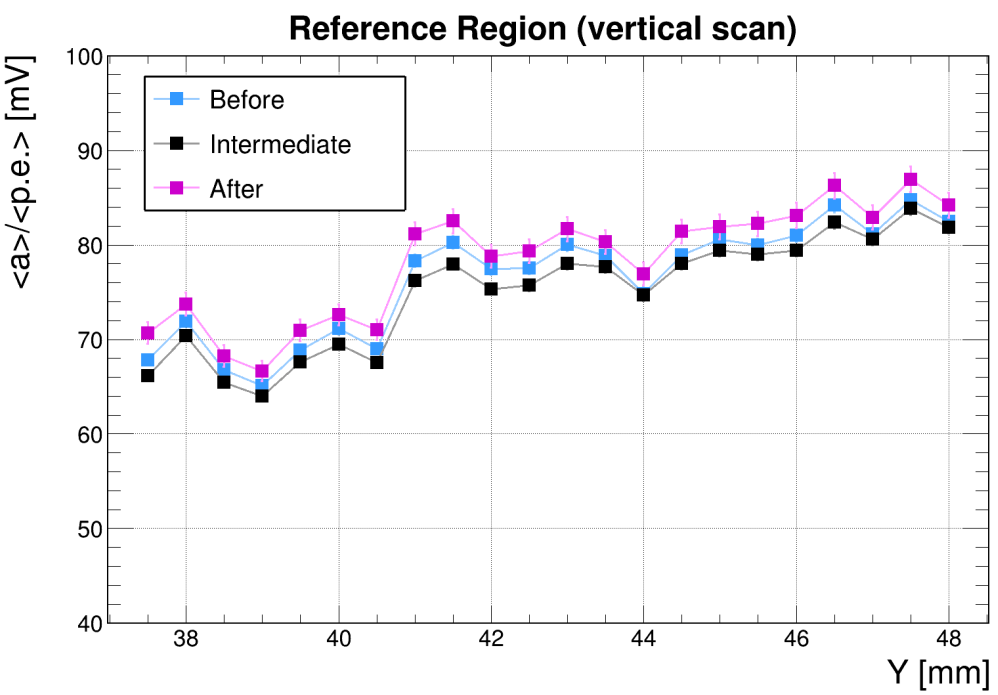
H1 H2 V1 V2

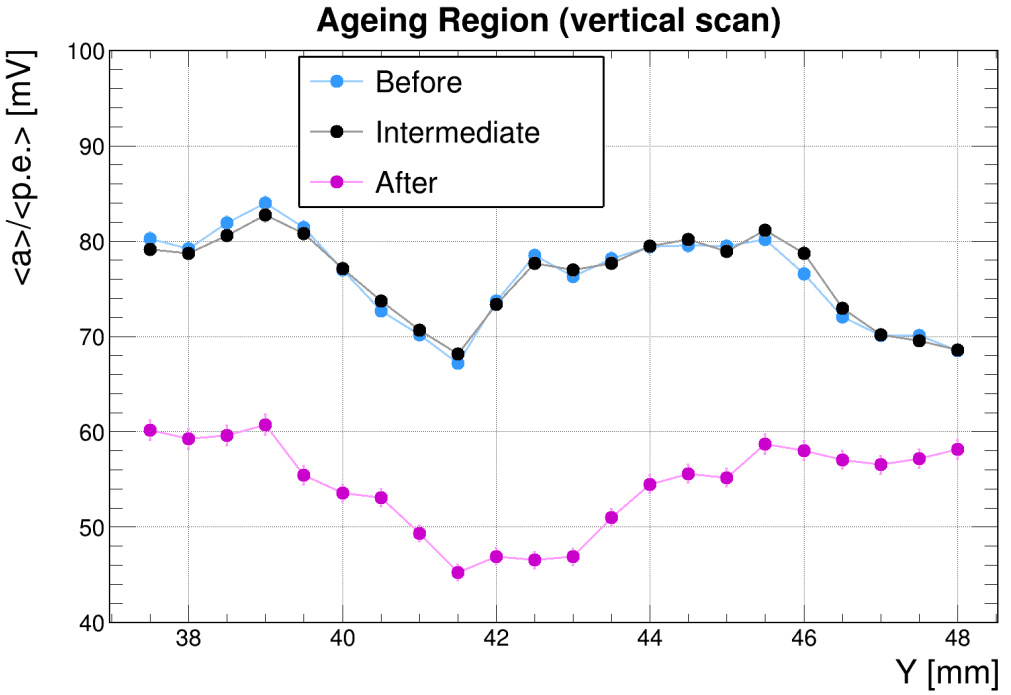
Pads
Digitizer channel

Scans – <amplitude>/<p.e.>

- Correction factor, $\mu = \lambda/\varepsilon$; $P(0)=e^{-\lambda} = (1- \varepsilon)$; $\varepsilon=N_{coin}/N_{TR}$
  average number of p.e. per non empty events
- We look at <a>/μ instead of <a>, run by run
- Get rid of fluctuation coming from the laser

Scans – amplitude/<p.e.>

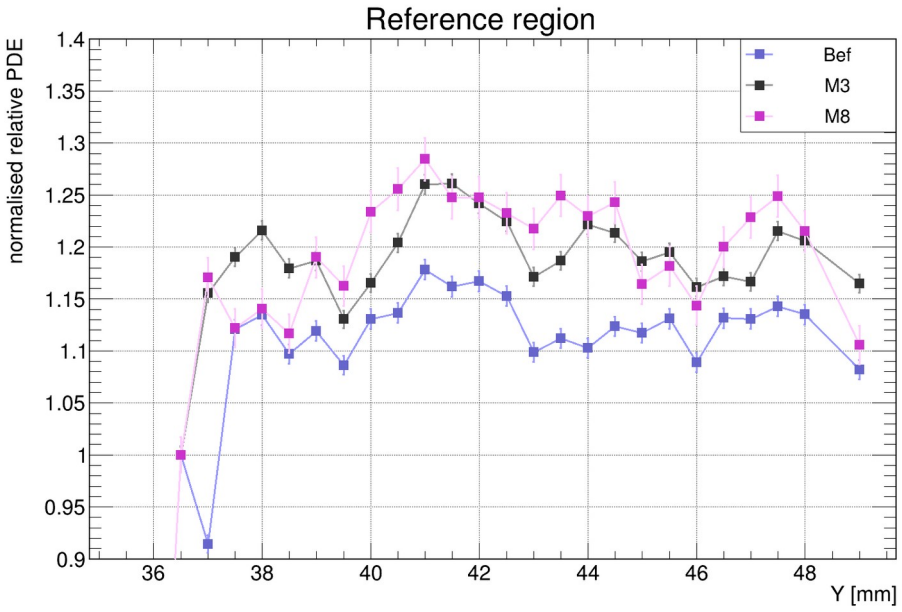


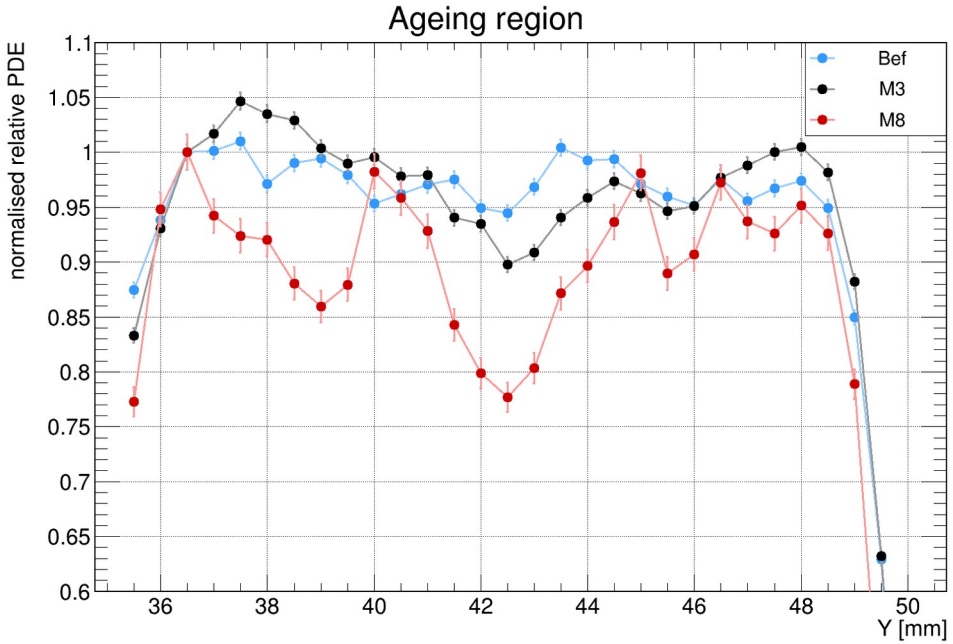


Within 5-6 %

~ 30% depletion after both MCPs active

Scans – relative PDE





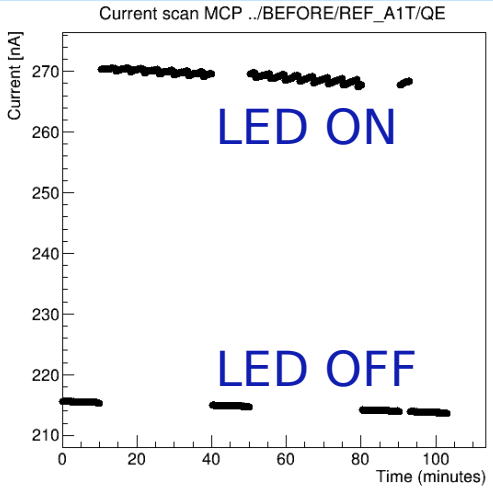
Within 5-6 %

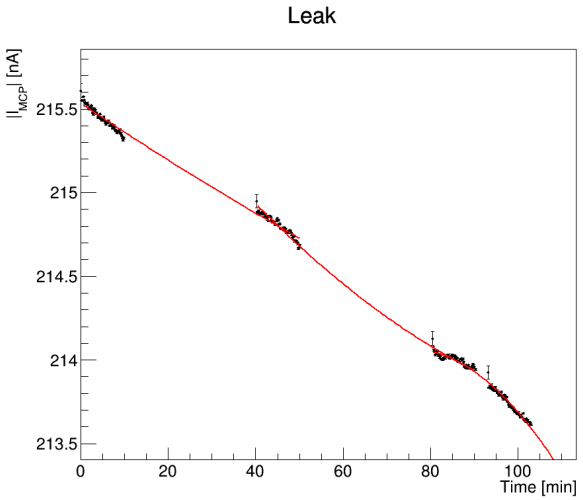
~ 20% drop after both MCPs active

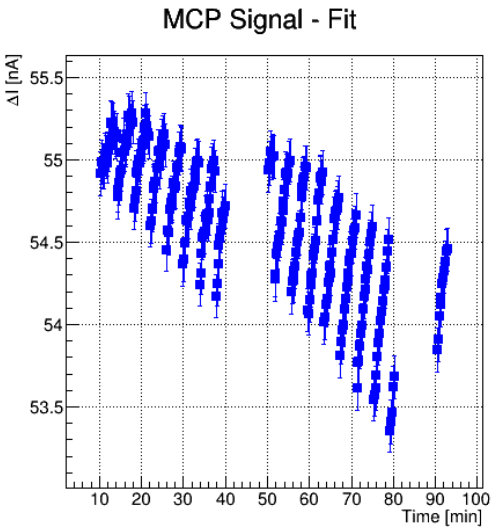
QE scans

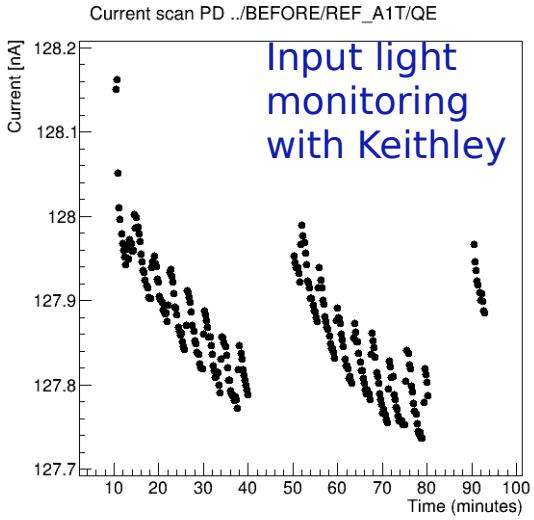
- 2D QE Scans over 4 x 4 pads in steps of 0.3 mm
- Continuous LED
- Focused spot
- Input illumination monitored by Photo-diode current
- -50 V at Photocathode

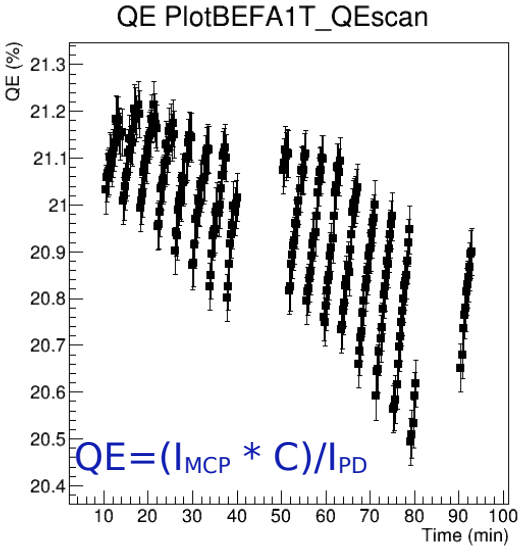
2D QE scan – an example

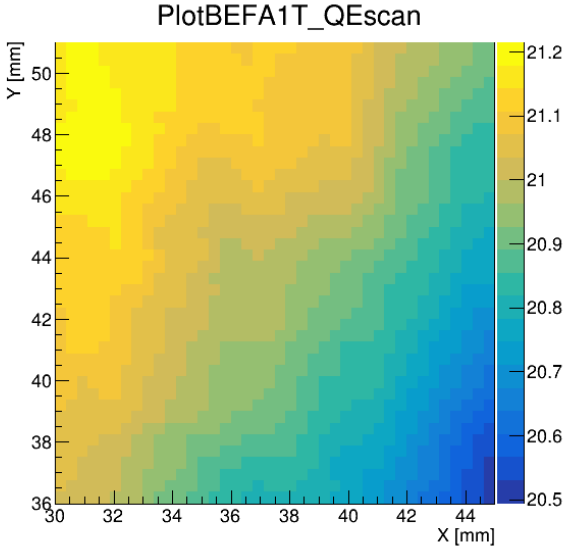






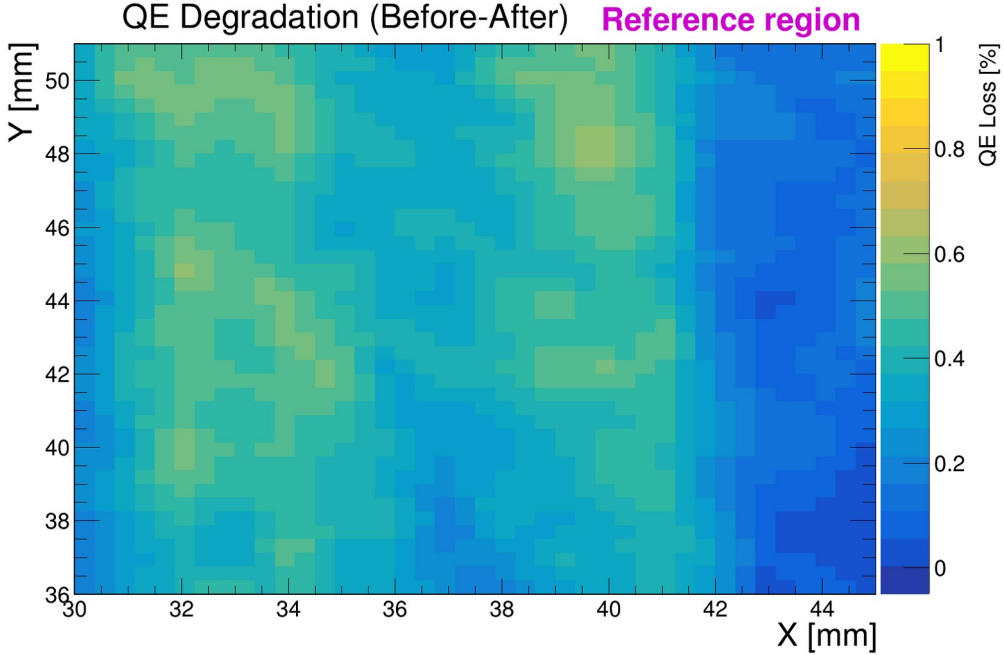


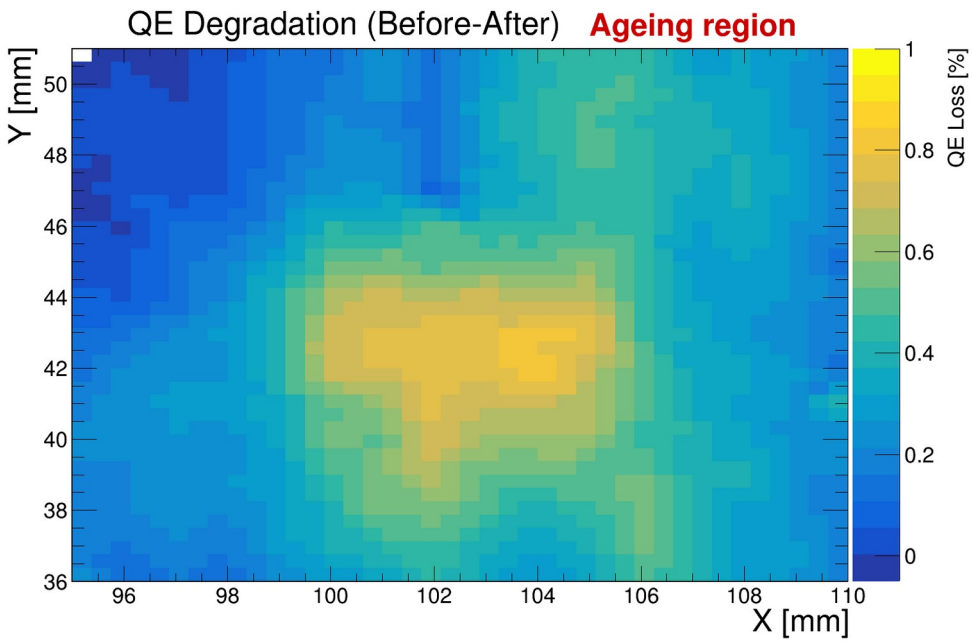




QE degradation

Colour axis represents QE After minus QE Before [%]





~ 0.8% degradation in the aged spot